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Inside the ZX80 Keyboard

Handling Character Strings

SYNTAX ZX80[®]

A PUBLICATION OF THE HARVARD GROUP

SYNTAX ZX80 is a brand-new monthly newsletter created just for you. We bring you news, reviews and forecasts of hardware, software and applications for your ZX80 or MicroAce, as well as technical details for circuit-builders. SYNTAX also provides a forum for users to share advice and problems about programs, vendors and topics of mutual interest. As more products become available, we'll bring you the ads and releases that keep you informed.

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And SYNTAX readers like what they get every month. Subscribers know they can depend on us.

After receiving only three issues of SYNTAX ZX80, I find that I anxiously await the next issue . . . keep up the good work!

Martin Irons
Goshen, NY

Congratulations on the brass-tacks, down-to-earth approach of your newsletter. I'll be looking forward to future issues.

Otis Imboden
Washington, DC

Many readers get their first issue and immediately order the back issues — more proof that they like what they see.

What's special about our publication? Just look through one issue. We work hard to bring you a quality newsletter. We strive to print useful programs of above-average accuracy. As any computer magazine editor can tell you, program listing accuracy is tough to achieve, but we boost our average with every issue. We test each program to make sure it works, it fits in the designated RAM, and it runs when you follow the directions. We print program listings in screen-image format to make it easier for you (it's sure not easier for us!) to enter programs accurately. We invented Syntactic Sums[™] as an additional aid for you in getting error-free programs. With your subscription you also get access to hundreds of other readers, and our staff experts are available by phone to answer your questions or help you solve problems with your machine.

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SYNC

May/June 1981

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Volume 1, Number 3

SYNC is published bi-monthly for \$10.00 per year by Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950. Second class postage paid at Morris Plains, New Jersey 07950, and additional entry offices.

Postmaster: Send address changes to SYNC, P.O. Box 789-M, Morristown, NJ 07960.

Subscriptions in USA: 6 issues \$10; 12 issues \$18; 18 issues \$24. UK and foreign airmail subscriptions: 6 issues £10; 12 issues £18; 18 issues £25. Call (800) 631-8112 toll-free (in NJ, 201-540-0445) to begin your subscription.

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Letters



Randomizing Your Music

Dear Editor:

In Richard Forsen's program—"Making Music with the ZX80"—lines 0001 to 0999 can be replaced with a simple continuous random music generator.

```
500 LET P=RND 17
510 LET X=RND(8)*10
520 GO SUB 970+P*30
530 GO TO 500
```

Forsen's pitch scale (lines 1000 to 1500) may be used intact. When this program is run, it produces a continuous series of tones of random pitch and duration. The limits within which pitch and duration vary may be changed by altering the quantities in lines 500 and 510. Reducing the pitch limits somewhat will increase the frequency with which the tones seem to have some melody.

Cecil Bridges
1248 N. Denver
Tulsa, OK 74106

Crash Advice

Dear Editor:

David Tebbutt (*SYNC* Jan/Feb '81) has found one too many ways to crash the ZX80. As Hugo Davenport (*ZX80 Manual*, p. 114) states, pressing EDIT in response to INPUT "doesn't actually crash the system." However, Mr. Davenport offers no further help.

In this situation, a LIST will appear with part or all of the line to which the cursor is presently positioned shown in an apparent EDIT mode. RUBOUT the entire line. Enter the required response, providing quotation marks if INPUTting a string. Press NEWLINE and proceed.

I hope this will be of help.

Sincerely yours,
SUNFLOWER SYSTEMS
Karl Brendel
420 South Eighth
Salina, KS 67401

More Channel 2 Tips

Dear Editor:

I'm quite impressed with the first issue of *SYNC*. Its format, quality and contents echo the best of *Creative Computing*—the favorite of friends and acquaintances. I have, however, an important recommendation for you, your staff, and writers which will be of help to other beginning micronauts such as myself: Please indicate in the introduction to program listings the minimum RAM requirements. Some of us aren't yet able to guess by looking at a listing if it will fit in 1K! It'll save a lot of unnecessary typing and disappointment.

For those ZX80 owners who are experiencing interference problems with TV connections, I've listed several suggestions. In the Bay Area, VHF Channel 2 is used for regular broadcasting. This makes it very difficult to eliminate station signals.

1. If you monitor your LOADING with an earphone, unplugging it when not in use will eliminate the interference it causes the television receiver.

2. Some metal objects seem to create annoying distortions and ripples in the screen image when near the ZX80. Removing card file boxes, paper hole-punchers and even stacks of cassette tapes has helped in my case.

3. Try touching the shielded TV cable (which plugs into the ZX80) to one of the VHF terminal screws now accepting a signal from the ZX80 adapter box. I have found this to produce enough of a ground to clear up unstable displays and ghosts. Just tape the cable in position.

Respectfully,
Colin Alexander
120-28th Street
San Francisco, CA 94131

Tic Tac Toe

Dear Editor:

In Jeffrey Hoffman's "Tic, Tac, Toe" (*SYNC* 1:32) a CLS statement must be added to keep the screen display from overflowing:

```
442 CLS
```

The program also has some algorithmic problems:

1) The final board is not displayed when there is a winner on move nine.

2) Moves to occupied spots forfeit the player's turn (noted by Hoffman).

The first problem can be solved by adding three lines and changing nine others. The new lines are:

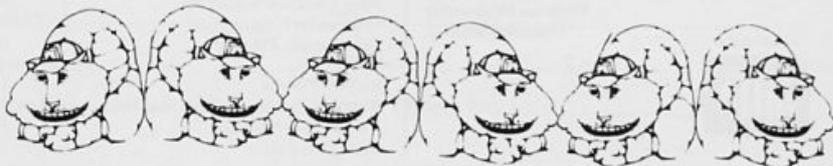
```
5 LET Z=0
175 IF Z=1 THEN GOTO 470
178 IF Q=10 AND Z=0 THEN GOTO
490 to THEN LET Z=1
```

The lines to be changed are:

```
100 Change to FOR Q=1 TO 10
370-440 Change THEN GOTO 470 to
THEN LET Z=1
```

This letter is not meant to be negative but an incentive to maintain high editing standards for *SYNC*—we the readers care.

SYNCly,
Peter Beck
54 Richwood Pl.
Denville, NJ 07834



Glitchoidz Report

The GLITCHOIDZ REPORT will pass on to our readers errors, problems, and other Glitchoid activities which have been discovered. We welcome your contributions to this column.

Random Graphics (1:22)

Some readers reported difficulties in getting this program to run. It will run as printed. Note especially the last two paragraphs.

Castle Doors (1:30)

As many readers have found, this is a 2K game.

Correct:

```
48 IF D=2 THEN A=RND (30)
```

```
140 Insert a space after PRINT
```

Basic Accounting with Decimal Currencies (1:36) 2K

Make the following line additions and corrections:

```
197 GOSUB 1000
```

```
350 LET X=G
```

```
360 LET Y=G2
```

```
365 GOSUB 8000
```

```
465 GOSUB 600
```

```
8010 GOSUB 2000
```

```
Omit 8100
```

Artillery (2:27)

The GLITCHOIDZ had their biggest triumph to date in *SYNC* in shooting down the Artillery game. We were almost in shell-shock when we discovered the magnitude of their success, thanks to many readers. Enter the following corrections in your program:

```
200 PRINT "X"  
630 STOP  
1000 CLS  
1010 PRINT "****KABOOM****"  
1020 PRINT " DIRECT HIT"  
1030 INPUT Z#  
1040 CLS  
1050 IF NOT Z#="N" THEN RUN  
1060 STOP  
2000 CLS  
2010 PRINT "          *****KABLAM*****"  
2020 PRINT "TOO BAD -- THEY GOT YOU FIRST"
```

Note: in Line 500 ** means "power" and is correct. It must be entered on the "H" key.



Memory Display (2:16)

Note in using this program:

Lines 50 and 90: no spaces between "".

The program displays addresses only below \$8000.

Correction: 200 LET X=PEEK(A+1)

Truth in Programming (2:18)

Column 3:

```
30 IF CODE(G$)=52+(N/2=N-N2)*
```

Three lines further:

...to be evaluated as -1

Widget (2:23)

```
330 PRINT "LAST MONTH YOU SOLD  
";S;"00"
```

Tic Tac Toe (2:32)

Lines 270 to 360: add LET after THEN
Lines 370 to 440: add GOTO after THEN

□

First Aid for Your Keyboard

Cecil Bridges

You have a normal screen and nothing happens when you punch a key, or you punch a key and the wrong symbol pops up. Your problem may be caused by keyboard switches that are permanently closed. Look at the keyboard at an angle against a light. If some or all the keys seem to be quite dented in, they may be pressing down against the contacts on the printed circuit board without releasing.

The ZX80 keyboard is prone to this problem because of the way it works: a sheet of aluminum foil is dented in and pressed against contacts on the printed circuit board when a key is pressed. The vinyl-aluminum sandwich that is the keyboard does not have enough sufficient elasticity to pop back, and the key acts as if it were permanently pressed down.

Short of replacing it, the following procedure may rejuvenate your little machine. Take the case apart enough to clear the edges of the keyboard, and gently peel the sticky aluminum foil and vinyl keyboard off the sticky surface. Do not lay the sticky foil keyboard on any surface on which it would pick up anything. Do not fold the keyboard. Do not smear the gooey stickum on the clear spaces on the foil under the keys. If you managed this successfully, lay the foil keyboard right back down in the same position from which you removed it, pressing gently to re-stick. Peeling up the keyboard may straighten out the dents somewhat, or release air trapped between the two sticky surfaces, so that the abnormally closed contacts are now again open. If yours is like my MicroAce, it will now work like gangbusters. □

Cecil Bridges, 1248 N. Denver, Tulsa, OK 74106.

ZX81 Announced in Great Britain

Sinclair Research is now advertising the new ZX81 computer in British computer magazines. An improved version of the ZX80 computer, the ZX81 has been redesigned to incorporate a number of new features. The ZX80 reduced the number of integrated circuits to 21, but the ZX81 further reduces the number of chips to four by using a new custom-built chip that replaces 18 others. The 8k Basic ROM chip (now also available for the ZX80 as a drop-in replacement) gives the user the capacity to use decimals with 8 place accuracy, to work with log and trig functions (with their inverses), to plot graphs, and to make animated displays. A new 40 key keyboard expands the number of key words that can be entered by one key stroke, e.g., PEEK, POKE, SCROLL. This eliminates typing out these words.

Twenty new graphics characters and 54 inverse video characters increase the graphics capabilities. Users have the choice



of two speed modes: "slow" and "fast" which is four times the "slow" mode and comparable to other personal computers. The slow mode eliminates screen flicker. Although the 1K RAM is the same as for

the ZX80, it can be expanded by plugging in the new 16K memory unit. (So can the ZX80.)

The ZX81 will sell in Great Britain for £69.95, but it will not be available in the U.S. for the foreseeable future. Even if we colonials fly to Britain to buy it, the British version will not work with an American TV set. However, ZX80 users can have most of the capabilities (excluding the animated display) if they upgrade to the new 8K Basic ROM which is now available in the U.S. for \$39.95 plus shipping from Sinclair Research (see Resources Column).

Sinclair has also announced that a 32 column printer will be available in the summer of 1981 for about £50. This will work with the 8K ROM machines.

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Software Review...

Unfriendly Skies

David Lubar

Name: *Super ZX80 Invasion*
(1K and 2K)
Type: Fantasy Game
System: Sinclair ZX80; MicroAce
Format: Cassette
Language: Basic
Summary: Best action game we have seen for the ZX80.
Price: \$14.95 plus \$1.50 shipping
Manufacturer: SOFTSYNC, INC.
P.O. Box 480
Murray Hill Station
New York, NY 10156

A cult has grown around the game of *Space Invaders*. Individuals with glazed eyes and pockets full of quarters have been known to haunt arcades for hours, sending countless rows of aliens to a laser death. Now, Sinclair owners can experience the same mania in their own homes. Using

an active display to produce true animation, Softsync has given us *Super ZX80 Invasion* for the Sinclair. The tape comes with both 1K and 2K versions of the game. Let's start with the 1K program.

The player has a ship (or laser base, depending on your interpretation) at the bottom of the screen. The ship can be moved left or right using the arrow keys. The 0 or 9 key is used for shooting. Above the player, rows of aliens rain down missiles. The aliens move slowly across the screen, and the entire group moves closer to the player on each pass. If you shoot them all before being hit five times, you are rewarded with another screenful of aliens. That's basically it. The 1K version doesn't keep score, so you have to remember how many frames of aliens you have destroyed. Your ship contains a number telling you how many ships are left. When the number reaches zero, the game starts over. There are three skill levels available in the 1K version.

The program is fast, which introduces a problem. You have no chance to get set. As soon as it starts, the aliens are shooting at you. You can lose two or three ships before even touching a key. When your last ship is destroyed, there is no pause. The game starts again. If you are down to one ship and one alien, it can be hard to tell who hit who.

The 2K version does keep track of the number of frames completed. It also allows for fifty different skill levels, more aliens, and extended play for each frame completed. Unfortunately, there is no way to stop the game and change skill levels. Once it is running, you can only stop it by pulling the plug. To go to a different skill level, you have to reload the tape.

Despite these problems, the game is fun, assuming you aren't easily frustrated. It is probably the best Sinclair game to hit the market so far. The programmers have to be congratulated for putting so much into 1K of space. □

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Handling Character Strings in the ZX80

Hasse Taube

From the first day I tried to operate my new ZX80, I have been looking for a way to simulate some of the character-string operations possible in other programming languages, but not in the ZX80 Basic. An idea mentioned by Michael Kirkland in *Personal Computer World*, February, 1981, on using USR(47) to obtain the address of the end of the variables provided me with the key to start my programming tricks in the ZX80.

Consider the following piece of code:

```
100 LET AS="ABCDEFGHJKLMNOPQ"
200 LET A=USR(47)
Then A is the address of the byte after the last "".
```

Consider also:

```
100 LET AS="ABCDEFGHJKLMNOPQ"
200 LET A=USR(47)-2
```

A will contain the address of the last byte of the previous character string; in this case, A will be the address of the letter Q.

In order to use this facility, you should not have any other statements between 100 and 200 in the examples mentioned above. To test this on your ZX80, enter the following short program:

```
100 LET AS="ABCDEFGH"
200 LET A=USR(47)
300 PRINT CHR$(PEEK(A))
```

This should give the letter G as output, i.e., the last character in a character string AS.

You know, of course, that you can always get the first character in a character string by a piece of code like this:

```
100 LET AS="ABCDEFGH"
200 LET B5=CHR$(CODE(AS))
```

Then the variable B5 will get the value A, i.e., the first character of the character string AS.

It is, however, not so easy to get the last—or in fact any other than the first character. This is now possible with the use of the technique just described.

Suppose you want the last character of a string variable after a value has been assigned to it by an INPUT:

```
100 INPUT AS
200 LET A=USR(47)-2
300 PRINT CHR$(PEEK(A))
```

If you run this program and input, say, QWERTY, the output should be Y.

In other words, if you use:

```
(line number) LET A=USR(47)-2
immediately after an assignment of a string variable by a LET-statement or by an INPUT-statement, the variable A will point to the last character in the string.
```

If you know the length of the string, it is easy to take a substring from it. Suppose you know that the length of the string is 5 as in the following example:

```
100 LET AS="ABCDE"
200 LET A=USR(47)
300 LET B5="XX"
400 LET B=USR(47)
500 POKE B-2,PEEK(A-5)
600 POKE B-3,PEEK(A-6)
700 PRINT B5
```

Then the output will be AB, i.e., the first two characters from the string AS.

By using the example above with other values in statements 500 and 600, you could, of course, get another substring from AS. Also, if you would like to take a larger substring than just two characters as in the example, you probably would set up for a FOR...NEXT loop to do the POKE's and PEEK's.

Suppose you do not know the length of the string variable from which you want to take, say, the second and third characters. How can you find the length of a string variable? Several methods are available. The first uses the TLS in a loop like this:

```
100 INPUT AS
200 LET B5=AS
300 FOR I = 1 TO 1000
```

```
400 LET AS = TLS(AS)
500 IF AS = "" THEN GO TO 1000
600 NEXT I
1000 LET AS=B5
1100 PRINT I
```

Then the output-value will be the length of the string which you input.

A much more interesting method for finding the length of a string also gives you the address of the beginning of the string. In this second method strings are internally stored in the ZX80 as follows:

—One byte with a code for the name of the string;

—The string itself from first character to last character;

—The ending quote.

The first byte contains a value which is equal to decimal 96 plus the code for a letter and which names the string. For example, a string named AS will have $96+38=134$ (decimal) in the first byte. A string named ZS will have $96+63=159$ (decimal) in the first byte. To understand these examples, you must know that the ZX80 representation for A is 38 and Z is 63. (See your instruction manual for the ZX80.)

To find the address of the first byte of the string in a string variable, you must set up a loop to test for the value in the first byte, described above. Assuming you know the address of the byte after the ending quote from USR(47), this should be fairly simple:

```
100 INPUT AS
200 LET A=USR(47)
300 FOR I=0 TO 1000
400 LET J=A-2-I
500 IF PEEK(J)=134 THEN GO TO 1000
600 NEXT I
1000 PRINT I
```

The program above will print out the length of the string which you input, but more interestingly, after statement 1000, J will point to the first byte of AS, and J+1 will point to the first byte in the string itself. □

Hasse Taube, Ericavej 39, DK 2820 Gentofte, Denmark.

More Truth in Programming

David Lubar

The other day, while blithely working on a program, I discovered that something was amiss. I had made an assumption about a certain Boolean operator, and passed on the information without checking my assumption. As Murphy's law would have it, the assumption was wrong. Going back to the article in issue two of *SYNC*, there is a discussion of various tricks with logical operators. For example, to test whether a number is not zero, you could use the following program.

```
10 INPUT N
```

```
20 IF N THEN PRINT "NOT ZERO"
```

There is no problem here. The expression will only be true if N has a value other than zero. I had assumed that the converse was also true, believing expressions such as

```
IF NOT N THEN PRINT "THE NUMBER IS ZERO"
```

would also work. To put it bluntly, they don't. The reason for this is that NOT can function in two different ways (actually, it always functions in the same way, but has two different applications). When working only with true and false (values of -1 and 0), NOT will always make a true expression false, and make a false expres-

sion true. So far, so good. As long as the universe is restricted to the values 0 and -1, there is no problem.

Before going on, try the following on your computer. Ask it to PRINT NOT (0). Then ask it to PRINT NOT (-1). As you can see, this works in the expected manner. Now try PRINT NOT (5). You might expect an answer of 0, since 5 (or any number other than zero) is considered to be true when evaluated logically. But life is not that simple. What NOT actually does is to take each bit in the byte and change it. Ones become zeroes, zeroes become ones. Now, if you've been trying all this, you'll have found that any positive number N, when used in PRINT NOT(N) will produce a negative number. This has to do with the way the Sinclair stores numbers. In positive numbers, the highest bit is set to zero. In negative numbers, this bit is set to one. Since NOT changes each bit, it will change the sign of most numbers.

You've probably also noticed that PRINT NOT (5) does not produce -5. This, also, is tied in with the way numbers are stored in the Sinclair, and will be discussed in a later issue.

By now, it should be obvious that you can't test for zero with IF NOT (N) THEN PRINT "THE NUMBER IS ZERO". If N is 0, NOT (N) will produce a value of -1, making the expression true. In this case, that is what we want. When N is zero, the expression will be true, and the statement "THE NUMBER IS ZERO" will be printed. And if N is -1, there is still no problem, since NOT (-1) will produce 0, making the expression false. But if N is any other number, NOT (N), as we've seen, will return a value other than zero or minus one. And, when evaluating the IF...THEN statement, the Sinclair will consider any value other than zero to be true. So IF NOT (N) THEN PRINT "THE NUMBER IS ZERO", will end up printing the message for any value of N other than minus one.

To sum it up, as long as an expression produces only logical values (0 or -1), you can safely use NOT. Expressions such as IF NOT (A=B) THEN GO TO 10, or IF NOT (X 5 AND Y 8) THEN GO TO 10 are fine. They only deal with logical operators. The value inside the parentheses will be either zero or minus one. But if other integers enter the expression, it's not safe to use NOT. □

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BUG-BYTE

Black Hole Bill Eckel

Black Hole is a game based on a machine language program on my Elf II which uses the RCA 1802 Microprocessor. I understand it was originally called "Teaser." The challenge of rewriting it in Basic for the small memory could not be resisted. The program takes a little over 1K of memory.

Black Hole

You are in space looking at your computer screen which shows a star surrounded by black holes.

```
0 0 0
0 * 0
0 0 0
```

To escape you must get the pattern to be a black hole surrounded by stars.

```
* * *
* 0 *
* * *
```

You can only fire at stars. The stars explode, leaving a black hole, but they also produce new stars in other locations. What the galaxy will look like after you fire at a star is important.

```
1 x . x 2 x . x 3 x . . . x . . . x . . . . .
x x . . . . . x x 4 . . x 5 x . . 6 x x . . . .
. . . . . x . . . x . . . x 7 x . x 8 x
. . .
. x x
. x 9
```

The number is the star fired upon. The x's are the holes changed to stars or stars changed to holes (the reverse of what they used to be). The .s are the star or holes that are unaffected.

For convenience sake the computer displays the star numbers in a block next to the galaxy pattern. Examples are:

```
0 0 0      1 2 3      Shoot star 5      0 * 0      1 2 3
0 * 0      4 5 6      will result in      * 0 *      4 5 6
0 0 0      7 8 9      this      0 * 0      7 8 9
```

Do not end with all black holes or you will be lost in space forever!

```
0 0 0
0 0 0
0 0 0
```

The lowest possible number of turns to solve the problem is eleven. There are many ways to solve it; here are two:
5.2.8.1.7.3.5.9.2.8.5
5.2.1.3.8.7.5.2.9.8.5

You cannot read the program listing and figure out how to solve it. It is very challenging game which will give hours of fascinating fun.

Bill Eckel, 7336 South 71st Ave., Omaha, NB 68157.

5 REM BLACK HOLE WRITTEN BY BILL ECKEL APRIL
2, 1981

```

10 DIM X(9)
14 FOR I = 1 TO 9
16 LET X(I) = 0
18 NEXT I
20 LET X(5) = 1
25 CLS
30 PRINT "BLACK HOLE"
32 PRINT
34 PRINT
35 LET I = 1
40 PRINT " ";
42 FOR A = 1 TO 3
44 IF X(I) = 1 THEN PRINT "*";
46 IF X(I) = 0 THEN PRINT "O";
48 LET I = I + 1
49 PRINT " ";
50 NEXT A
52 PRINT " : I-3; " " I-2. " "; I-1
53 PRINT
54 IF NOT I = 10 THEN GOTO 40
56 PRINT
58 PRINT
60 GOSUB 1000
65 PRINT "WHICH STAR?"
70 INPUT S
75 IF S = 1 OR S = 9 THEN GOTO 70
78 IF X(S) = 0 THEN GOTO 70
85 LET X(S) = 0
90 GOSUB S * 100
95 GOTO 25
100 LET B = 2
110 GOSUB 980
120 LET B = 4
130 GOSUB 980
140 LET B = 5
150 GOSUB 980
160 RETURN
200 LET B = 1
210 GOSUB 980
220 LET B = 3
230 GOSUB 980
240 RETURN
300 LET B = 2
310 GOSUB 980
320 LET B = 5
330 GOSUB 980
340 LET B = 6
350 GOSUB 980
360 RETURN
400 LET B = 1
410 GOSUB 980
420 LET B = 7
430 GOSUB 980
440 RETURN
500 LET B = 2
510 GOSUB 980
520 LET B = 4
530 GOSUB 980
540 LET B = 6
550 GOSUB 980
560 LET B = 8
570 GOSUB 980
580 RETURN
600 LET B = 3
610 GOSUB 980
620 LET B = 9
630 GOSUB 980

```

```

640 RETURN
700 LET B = 4
710 GOSUB 980
720 LET B = 5
730 GOSUB 980
740 LET B = 8
750 GOSUB 980
760 RETURN
800 LET B = 7
810 GOSUB 980
820 LET B = 9
830 GOSUB 980
840 RETURN
900 LET B = 5
910 GOSUB 980
920 LET B = 6
930 GOSUB 980
940 LET B = 8
950 GOSUB 980
960 RETURN

```

```

980 IF X(B) = 0 THEN GOTO 986
983 IF X(B) = 1 THEN X(B) = 0
984 RETURN
986 LET X(B) = 1
990 RETURN
1000 FOR I = 1 TO 9
1010 IF X(I) = 1 THEN GOTO 1050
1020 NEXT I
1025 PRINT "YOU BLEW IT"
1030 PRINT "YOU ARE LOST IN SPACE FOREVER"
1040 STOP
1050 IF X(5) = 1 THEN RETURN
1060 FOR I = 1 TO 4
1070 IF X(I) = 0 THEN RETURN
1080 NEXT I
1090 FOR I = 6 TO 9
1100 IF X(I) = 0 THEN RETURN
1110 NEXT I
1120 PRINT "CONGRATULATIONS"
1130 PRINT "YOU FOUND THE BLACK HOLE"
1140 STOP

```

SAMPLE RUN

BLACK HOLE

```

O O O      1 2 3
O * O      4 5 6
O O O      7 8 9

```

WHICH STAR?

5

BLACK HOLE

```

O * O      1 2 3
* O *      4 5 6
O * O      7 8 9

```

WHICH STAR?

2

BLACK HOLE

```

* O *      1 2 3
* O *      4 5 6
O * O      7 8 9

```

WHICH STAR?

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The SYNC Challenge

In our first issue we challenged our readers to fit the Hamurabi game from Creative Computing's *Basic Computer Games* into the 1K memory of the ZX80. A number of readers took us up on the challenge and submitted their entries. The results are as follows:

- First place** (a one year subscription to *SYNC* and a *SYNC* T shirt):
Michael Hodgkins
46 Broadway
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- Second place** (a one year subscription to *SYNC*):
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Hammurabi in 1K

Michael Hodgkins

```
2 LET Y=1
4 LET P=100
6 LET A=1000
8 LET G=A*3
10 PRINT "WE HAVE ";G;" BUSHELS"
15 PRINT "POPULATION ";P
20 PRINT "CITY OWNS ";A;" ACRES"
25 LET T=RND(9)+16
30 IF Y=11 THEN GOTO 250
35 PRINT "LAND PRICE ";T;" BUSHELS/ACRE"
40 PRINT "BUY HOW MUCH"
45 INPUT F
50 IF F=0 THEN GOTO 70
55 LET A=A+F
60 LET G=G-F*T
65 GOTO 90
70 PRINT "SELL HOW MUCH"
75 INPUT F
80 LET F=-F
85 GOTO 55
90 CLS
95 LET R=RND(9)
100 LET G=G-R*9
105 PRINT "FEED YOUR ";P;" SUBJECTS--MAX ";G
110 INPUT F
112 IF F>G THEN GOTO 110
115 CLS
120 LET G=G-F
125 LET F=P-R-F/20
135 IF F<0 THEN LET F=0
140 PRINT F;" STARVED"
145 IF F>10 THEN GOTO 245
150 LET P=P-F
155 PRINT "SOW GRAIN"
157 PRINT "CITY OWNS ";A;" ACRES"
160 PRINT "WE OWN SEED FOR ";G
165 PRINT P*9;" CAN BE TENDED"
170 INPUT F
175 IF F>P*9 OR F>A OR F>G THEN GOTO 170
180 CLS
185 LET G=G+RND(5)*F-F
190 PRINT "YR ";Y
195 IF R=1 THEN GOTO 225
200 PRINT R;" PEOPLE ENTERED CITY"
205 LET P=P+R
210 PRINT "RATS ATE ";R*9;" BUSHELS"
215 LET Y=Y+1
220 GOTO 10
225 PRINT "PLAGUE"
230 PRINT P-P/2;" DIE"
235 LET P=P/2
240 GOTO 210
245 PRINT "MURDERER"
250 PRINT "END OF REIGN"
```

To run, press RUN and NEWLINE. Then enter your choices as called for by the computer.

When you reach "END OF REIGN" and want to start again, press any key and then press RUN and NEWLINE.

The game begins by telling the player the state of the economy he is to manage. The lines of the game function as follows:

- | | |
|---------|---|
| 2-8 | Set up variables, year, population, acreage, and grain. |
| 10-20 | PRINT information on the screen. |
| 25 | Sets random land price. |
| 30 | Year counter to check for end of reign. |
| 35-45 | PRINTs land price and asks how much the player wishes to buy. |
| 50 | If no land is bought, the program jumps to 70. |
| 55-60 | Adjusts acres and grain according to the transaction. |
| 70-85 | Asks how much land the player wants to sell; then goes to 55 to adjust variables as before. |
| 95-100 | Chooses a random number to be used for a variety of things. First it subtracts the amount of grain eaten by rats. |
| 105-145 | Tells the player to feed subjects; checks that he is not feeding them more grain than he has; works out how many people starved and the remaining grain. If the number starved is too large, it jumps to 245. |
| 155-170 | Instructions to sow grain, telling player how much grain may be sown, tended, etc. |
| 175 | Checks that he is not cheating. |
| 185 | Decides crop to be harvested. |
| 190-210 | Gives readout of year's events. |
| 215 | Increments year number by 1. |
| 220 | Returns to beginning of new year. |
| 225-240 | Plague routine; approximately half the people die. |
| 245 | Prints MURDERER if more than 10 people have starved. |
| 250 | Final statement; game over. |

The program uses almost every byte of memory available. The same variable F is used for all INPUT's to save memory and also a single random number R is used for the number of people entering the city, the number of bushels devoured by rats, and the test for a plague. A plague occurs when R=1, thus avoiding the complications caused by "1 PEOPLE" entering the city. □

Auto-Display-Changing

Dr. I. S. Logan

Introduction

The standard ZX80 is supplied with a 4K ROM and 1K of memory. There are 22 commands that can be used in the Basic provided in the 4K ROM. However, there is no command that will cause the display to be shown for a specified length of time before a change is made to show the next display. The advertisements for the 8K ROM mention a command called PAUSE which is expected to perform this function.

The following program constructs the machine code routine for such a PAUSE command. The actual program occupies about 1/4K, leaving the programmer a little under 3/4K in which he can store his different displays.

The actual displays are constructed using Basic PRINT commands in the version given here, but there is no reason why machine code constructed displays should not be used if greater speed or complexity is required. (See *SYNC*, vol. 1, no. 1)

A certain amount of 'flicker' is produced between displays because the routine 'returns to Basic' after the specified time period. This 'flicker' can be eliminated only by remaining in machine code and synchronizing the program perfectly.

The Theory

The Screen and Keyboard routine, decimal address 316-437, Hex. address 013C-01B5, in the 4K monitor program

can be considered the dominant routine in the operation of the ZX80.

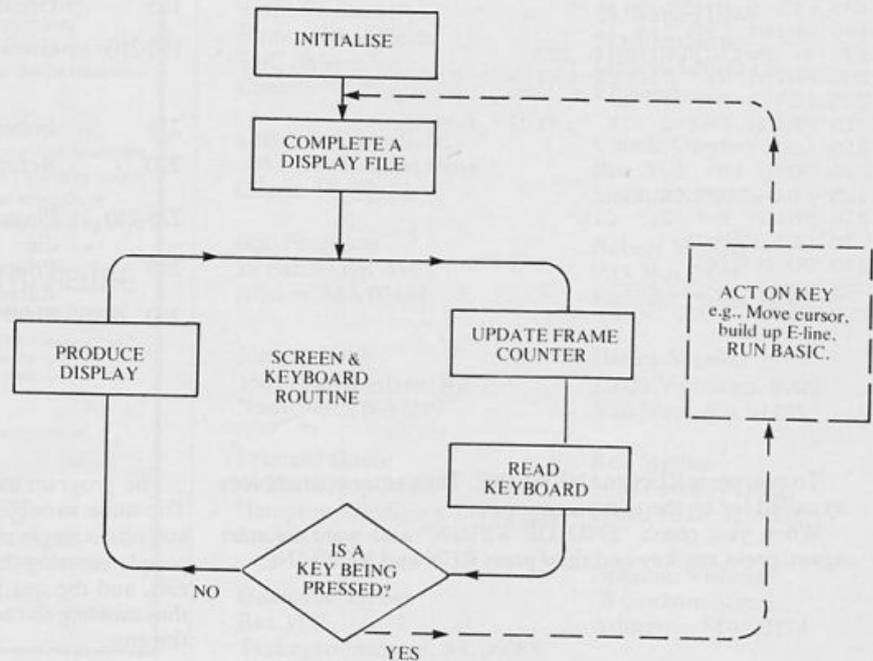
It is this routine that both reads the Keyboard and produces the display on the TV screen. It therefore follows that this routine cannot be called unless a complete display file has already been constructed.

The routine can be divided into three parts:

- Part 1. Update the frame counter.
- Part 2. Test the Keyboard for new input.
- Part 3. Produce the display of the current display file.

If there is no key being pressed, then the whole routine is executed over and over again. However, if a key is being pressed, then an exit is made from the routine to handle the 'interruption.' This may lead to the cursor being moved, characters being added to the current E-line, or the RUNNING of a Basic program. As long as the programmer has not created a 'never ending loop,' the Screen and Keyboard routine will eventually be re-entered and a display will again appear on the TV screen.

The flow diagram below illustrates the normal operation of the ZX80.



Dr. I. S. Logan, 24 Nurses Lane, Skellingthorpe, Lincoln LN6 0TT England. This article is the second in a series.

The Program

The program, although fairly simple, is quite difficult to enter. Therefore do it slowly and carefully. SAVE the partly entered program *often*.

Step 1

Enter the following lines and then SAVE:

```

2 REM 12345678901234567890123456789
01234567890123456789012345678901234
56789012345678901234567890123456789
01234567890123456789012345678901234
4 GO TO 28
6 LET A=USR(16428)
8 CLS
    
```

} Reserve 134 locations.
Do not use all spaces!

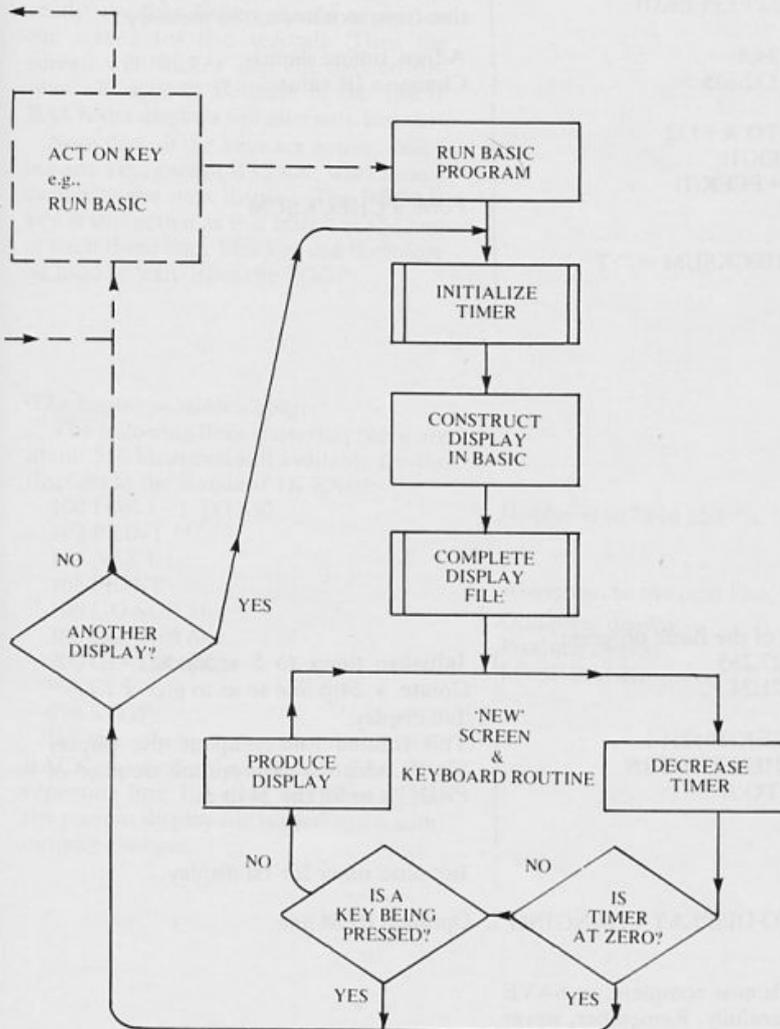
} A will return the Keyboard codes.

The AUTO-DISPLAY-CHANGING program copies most of the Screen and Keyboard routine from the 4K monitor program into the memory and adds a timing loop so that the display can be held for up to 256 frames, about 5 seconds. The programmer is then able to use this 'new' routine to produce a display on the TV screen.

It is important to emphasize again that a complete display file of 24 lines must be constructed before the routine is called. In the following program the display file is completed by calling the subroutine at line 16. However, this can also be done in machine code if required.

The following flow diagram shows how the ZX80 operates with the 'new' routine:

From now on NEVER use LIST or HOME.



The magazine for Sinclair ZX80 users

SYNC

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Step 2

Make the following check:

Enter as a direct command:

PRINT PEEK(64*256+199) & NEWLINE and the value 118 should appear. (This is the 'end of line marker' for line 6 and the correct address must be known.)

Step 3

Enter the following lines and then SAVE.

```

10 LET A=16428
12 POKE A,205
14 POKE A+1,59
16 POKE A+2,64
18 POKE A+3,33
20 POKE A+4,199
22 POKE A+5,64
24 POKE A+6,34
26 POKE A+7,38
28 POKE A+8,64
30 POKE A+9,96
32 POKE A+10,105
34 POKE A+11,201
36 POKE A+12,205
38 POKE A+13,173
40 POKE A+14,1
42 POKE A+15,58
44 POKE A+16,43
46 POKE A+17,64
48 POKE A+18,61
50 POKE A+19,200
52 POKE A+20,50
54 POKE A+21,43
56 POKE A+22,64
58 FOR I=319 TO 427
60 POKE 16132+I,PEEK(I)
62 NEXT I
64 POKE A+24,4
66 POKE A+132,135
68 LET T=0
70 FOR I=A TO A+132
72 PRINT PEEK(I);
74 LET T=T+PEEK(I)
76 NEXT I
78 PRINT
80 PRINT "CHECKSUM = ";T
SAVE.

```

Call the routine at line 42

The address of the end of line 6

The return address needs to be stored in System Variable 16422 and 16423

Return Keyboard codes in HL register pair.

Call screen production subroutine.

Fetch timer from 16427.

Decrement timer.
Exit if timer is zero.

Restore timer.

Copy most of Screen and Keyboard routine from monitor to the memory.

Adjust timing slightly.
Change a JR value.

Form a CHECKSUM

Now enter RUN 10 & NEWLINE. The screen will now display the machine code that has been entered into line 2 and held off the screen.

The correct CHECKSUM is 14421; correct any errors before proceeding.

Step 4

Delete all the lines from 10 to 80 (inclusive) by entering the line number and NEWLINE over and over again.

SAVE the program. It should consist of lines 4-8 on the screen and line 2, off the screen.

Step 5

Enter the rest of the Basic program:

```

10 POKE 16427,255
12 POKE 16421,24
14 RETURN
16 LET A=PEEK(16421)-1
18 IF A=0 THEN RETURN
20 FOR A=1 TO A
22 PRINT
24 NEXT A
26 RETURN
28 GO SUB 8
30 REM AUTO-DISPLAY-CHANGING

```

Initialize timer to 5 seconds.

Create a 24th line so as to give a 'full display.'

This routine will complete the display file. It adds the appropriate number of PRINT's to fill the 24 lines.

Initialize timer for 1st display.

Optional REM line.

The program is now complete, so SAVE this version carefully. Remember, never use LIST or HOME.

Using the program

It is not really the author's intention in this article to describe at any great length just how the program can be used. The following examples are given so that the reader can start to see for himself how different problems are tackled.

Simple display changing

Enter the lines:

```
100 PRINT "DISPLAY ONE"  
196 GO SUB 16  
198 GO SUB 6
```

```
} A very simple 1 line display.  
} Complete display file.  
} Produce the display.
```

```
200 PRINT "DISPLAY TWO"  
296 GO SUB 16  
298 GO SUB 6  
300 GO TO 100  
996 CLS  
998 STOP  
RUN
```

```
} Another simple display.  
} Complete the 2nd display.  
} Produce the display.  
} LOOP BACK
```

As long as the program is entered correctly, the first display should appear on the screen for five seconds. Then the screen will 'flicker' and the second display will appear. Because of the LOOP BACK the displays will alternate forever!

Note that all the keys are active. Pressing any key, except BREAK, will cause a switch to the next display. The BREAK key is still active as it is tested at the end of each Basic line. This key can therefore be used to 'exit' from the LOOP.

The largest possible display

The following lines show that there are about 550 locations still available for the displays in the standard 1K ZX80.

```
100 FOR I=1 TO 550  
102 PRINT " ";  
104 NEXT I  
106 PRINT  
196 GO SUB 16  
198 GO SUB 6  
200 GO TO 198  
996 CLS  
998 STOP
```

In the above program the LOOP BACK is used in a different way. By repeating line 198 over and over again, the current display file is used again without any changes.

```
} Display is to have 550 '*s.
```

```
} Always go to the next line.  
} Complete display.  
} Produce display.  
} LOOP BACK.
```

Find the number

The following game shows how the A variable returns the keyboard code.

In the program a random number in the range 1-5 is the first generated. Then the keys that are pressed by the player are tested for the correct key value.

Each time a key is pressed the score is incremented. At the end of each 5 second period without a key stroke the score is also incremented.

```
100 REM FIND THE NUMBER  
102 LET N=RND(5)  
104 LET N=521*(N=1) OR 1033*(N=  
2) OR 2057*(N=3) OR 4105*(N=4) O  
R 8201*(N=5)  
106 LET T=1  
108 GO TO 204  
200 PRINT "SORRY. TRY AGAIN"  
202 LET T=T+1  
204 PRINT  
206 PRINT "I KNOW THE KEY. DO  
YOU? (1-5)"  
296 GO SUB 16  
298 GO SUB 6  
300 IF NOT A=N THEN GO TO 200  
302 PRINT "WELL DONE"  
304 PRINT "YOU TOOK""T;"" GO";  
306 IF NOT T=1 THEN PRINT "ES"  
308 PRINT  
310 PRINT "PRESS NEWLINE TO RES  
TART"  
312 INPUT AS  
314 IF NOT AS="" THEN STOP  
316 CLS  
318 RUN
```

The Key values

The Screen and Keyboard routine scans the keyboard and returns in the BC register pair a KEY VALUE that is different for every stroke. As there are 78 key-strokes, there are 78 different key values.

In the 'Build up an E-line' routine these key values are changed to the range 1 to 78; then the look up table is used to find the correct ZX80 character codes.

However, in order to make the AUTO-DISPLAY-CHANGING program as short as possible, the conversion of key values to character codes has not been included.

The following program can be used to show the KEY VALUES:

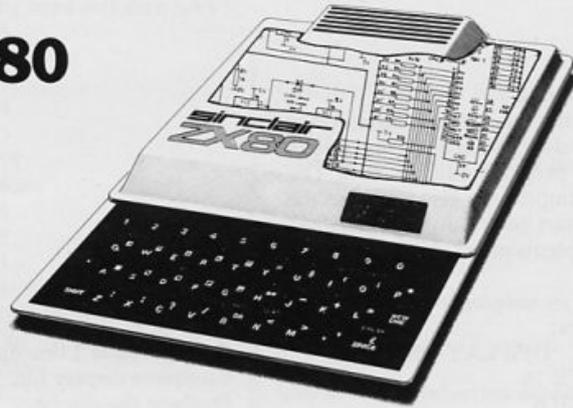
```
100 REM KEY VALUES  
102 LET A=0  
104 PRINT A  
196 GO SUB 16  
198 GO SUB 6  
200 GO TO 104
```

Conclusion

Many other kinds of programs can be written using the AUTO-DISPLAY-CHANGING routine. The author has a very nice digital clock, but the 'flicker' is a little annoying. Much of the background work for this article is discussed in the author's *The ZX80 Companion* which contains a more elementary version of this particular program.

Looking inside the ZX80

by Harley Shanko



Since the materials supplied with the ZX80 had no machine language examples, I decided to write routines to let Basic show me the ROM contents. These routines resulted from that effort; later they were combined to permit switching from one mode to another.

The object code routine OBJ allowed me to generate a 'hand-disassembled' listing of the 4K ROM, and SYMB to see the 'printables'—this allows locating the Basic statement look-up table, single key codes expansion, and the 'integral function' expressions. CODE allows a look into the details of how the Basic lines are stored (note: constants are stored in decimal form as entered, unlike some Basic's) and permits easy counting of the number of bytes consumed by each line.

Use of the program is straightforward. After RUN, the selection is displayed. The operation and keyboard activity are as follows:

- Selection:** Enter number (1 to 3) of desired listing (plus NEWLINE); the address is then requested—enter decimal value of address beginning.
- Continue:** Hit NEWLINE.
- Change:** To change selection, hit any other key (except SPACE or NEWLINE) plus NEWLINE to return to selection mode.
- Exit:** After listing and cursor returns, hit SPACE then NEWLINE twice.

The display is in standard format, with the address in hex at the left and data contents to the right. OBJ presents a cluttered display. Since the program uses

about 1/2 K and the displayed information uses 336 bytes, formatting with spaces between bytes (hex-pairs) can only be done by either displaying fewer lines or using OBJ as a stand-alone program to increase readability. SYMB is better as it is textual. Look at ROM beginning at 006C (108

decimal) for the keyboard matrix decoder, 00BD (189) for the single-key code expansion, 0BC0 (3008) for the integral function decoder, or at RAM at 4028 (16424) to see this program as stored by the ZX80. Use of CODE at 4028+ details exactly each byte of the program.

zx80---looking inside the zx80

ZX80 (1K) MEMORY LISTER

Selection

```

10 PRINT "1=OBJ 2=SYMB 3=CODE"
15 REM BY H SHANKO-22FEB81
20 INPUT S
22 CLS
24 IF S>3 THEN GO TO 10
26 PRINT "ADDR="
28 INPUT N
30 LET P=S*100
52 CLS
54 FOR A=1 TO 16
56 IF S=3 THEN FOR A=1 TO 20
60 LET X=N
62 GO SUB B0
64 PRINT " ";
66 GO SUB P
68 PRINT
70 NEXT A
72 INPUT N#
74 IF N#="" THEN GO TO 52
75 IF N#="" THEN STOP
76 GO TO 10

```

```

80 PRINT CHR$(X/4096+28)
82 LET X=X-(X/4096)*4096
84 PRINT CHR$(X/256+28);
86 LET X=X-(X/256)*256
88 PRINT CHR$(X/16+28);
90 LET X=X-(X/16)*16
92 PRINT CHR$(X+28);
94 RETURN
95 LET X=PEEK(N)
97 GO TO 88

```

```

100 FOR L=1 TO 8
110 GO SUB 95
120 GO TO 250

```

```

200 FOR L=1 TO 16
210 LET X=PEEK(N)
220 IF X>127 THEN LET X=X-128
230 IF X<12 OR X>63 THEN LET X=0
240 PRINT CHR$(X)
250 LET N=N+1
260 NEXT L
270 RETURN

```

```

300 GO SUB 95
310 PRINT,CHR$(PEEK(N));
320 LET N=N+1
330 RETURN

```

- Test if selection OK
- Enter beginning address now
- Set selection GOSUB address
- Set #lines to 16 or 20 lines
- Get address and display it plus SPACE
- Go to selection subroutine do "CRLF" for each line until done
- Get keyboard entry test if "continue" or "stop"
- Otherwise is "new selection"
- 4-hex entry for decimal-hex conv. calculate next hex digit
- 3-hex entry
- 2-hex entry
- 1-hex entry
- Get byte at address
- Set for 8 bytes/line get byte and loop until done
- Set for 16 char/line
- Get byte remove if "inverted video" exclude non-textual char.
- Display char.
- Increment address and loop until done
- Get byte at address, display it do SPACE and display CODE
- Get next address

Harley Shanko, 15025 Vanowen, #209, Van Nuys, CA 91405.

A byte-search routine **BYT** was used before disassembling the ROM to locate data, such as Z80 unconditional **CALL**, **JMP**, **RET** addresses, although it will search for any byte. Unfortunately, adding **BYT**, like most other routines to the program, will cause **OBJ** and **SYMB** selections to bomb-out with "4" type errors, not enough memory, before completing the display. However, **CODE** and **BYT** will still be usable. An alternate solution is to make a second file by deleting a selection and its routine and substituting **BYT**. To add **BYT**, follow printout labeled **FIGURE 1**.

Another routine generated was a ZX80 dot-matrix routine **DOT** to study the characters at an 8x scale; the characters are 7 x 6 in an 8 x 8 box and **DOT** forms a **SPACE** or inverted one for each dot in the character. As a fifth selection, modify the program so that printout will appear as in **FIGURE 2**.

Line 520 displays a 'period' for the character dot location where the dot should be **OFF**; this provides a reference for the character location in the box. For a true

Figure 1.

```

change 10  add ...4=BYT... to print statement
       24  change ...S>3... to ...S>4...
       56  change ...S=3... to ... S>2...
add    36  IF S<4 THEN GO TO 52
       58  PRINT "BYTE=";
       40  INPUT B
       42  GO SUB 410
       400  LET N=N+1          Incr. address
       410  IF NOT PEEK(N)=B THEN GO TO 400  Loop until match
       420  RETURN
  
```

Figure 2.

```

change 10  add ...S=BYT...
       24  change ...S>3 (or 4)... to S>5...
add    500 LET X=PEEK(N)      Get byte
       510 FOR L=1 TO 8      Do 8 dots/line
       520 LET C=27          "space"
       530 IF X<128 THEN GO TO 560  Test msb
       540 LET C=128        If ONE, invert
                                   "space"
                                   Remove msb, if
                                   ONE
       550 LET X=X*2        Do left shift
       570 PRINT CHR$(C);    Display dot/no dot
       580 NEXT L          Loop until done
       585 LET N=N+1      Then incr. address
       590 RETURN
  
```

representation, change 520 to **LET C=0**. If a 0,1 type (binary) display is desired, change **C=28** at 520 and **C=29** at 540. The ZX80 dot matrix is located at **0E00**

through **0FFF**; thus to see the characters enter decimal **3584 (=0E00)**. Because of their size, only two characters per display are possible. □

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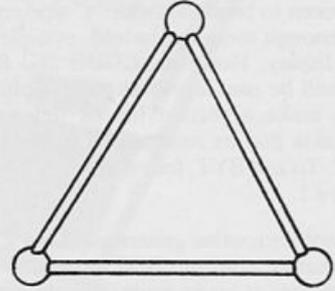
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puzzles & problems

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The Lucky Number



any persons have what they consider a "lucky" number. Show such a person the row of figures subjoined — 1, 2, 3, 4, 5, 6, 7, 9 (consisting of the numerals from 1 to 9 inclusively, with the 8 only omitted) — and inquire what is his lucky or favorite number. He names any number he pleases from 1 to 9, say 7. You reply that, as he is fond of sevens, he shall have plenty of them, and accordingly proceed to multiply the series given above by such a number that the resulting product consists of sevens only.

Required, to find for each number that may be selected the multiplier which will produce the above result.
(From *Merlin's Puzzler*)

The Puffer-Belly Problem



Conrail passenger and freight train out of Hoboken, New Jersey, was heading west towards Morristown, home of Creative Computing, at a speed of 45 miles per hour. Along the way the train meets and is passed by a Dover local train heading east at 36 miles per hour. An alert passenger on the Conrail train, for some reason unknown to us, clocks the Dover train as it passes by him. He finds that it takes exactly 6 seconds for the Dover train to pass by his window. Using the information above, can you calculate the length of the Dover train?

A Seven-Letter Charade



Right, Hermione, let's see what you learned this year at St. Trinian's. From the four following hints you should be able to deduce the word asked for by this charade. The numbers refer to positional letters within the word.

"My 1, 2, 7 is an extreme point."

"My 3, 4, 5, 7 is what the reader will be when he solves this puzzle."

"My 5, 2, 3, 1, 4 is in heaven."

"My 4, 5, 6, 7 is the earth."

"My whole is a country in Europe."

The Three Jealous Husbands

Three jealous husbands traveling with their wives find it necessary to cross a stream in a boat which holds only two persons. Each of the husbands has a great objection to his wife crossing with either of the other male members of the party unless he himself is also present.

How is the passage to be arranged?

The Four Jealous Husbands

Arithmeticians have racked their brains to devise a means of transit for four husbands and four wives under the same conditions stated in the previous puzzle, but, with a boat holding two persons only, the problem is insoluble. If we suppose, however, that the boat contains three persons, it may be solved.

How is this passage to be arranged?

(The two puzzles above are from *Merlin's Puzzler 3*)

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Your editor, Charles Barry Townsend

Answers on page 35.



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When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

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The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

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Hangman	23 Matches
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	Word

Mastermind 2K

Raymond Fowkes

This game is played much like the original board version. The computer selects a code of four colors from a possible six: red, orange, yellow, green, blue, and white (duplicates allowed). It is now up to you to find, in nine moves or less, the exact color and position of each element of the code by entering four colors of your choice, first letters only, one at a time. The computer then compares the guess with the pre-selected code, first for black pegs and then for white pegs. The pegs are displayed next to the corresponding guess. A black peg means a right color in the right position, a white peg means a right color in the wrong position.

For example, suppose the hidden code was R B W B, and the first guess was R G B O. You would be given one black peg and one white peg because 'red' is in the right position and 'blue' is correct but in the wrong position.

These features make this program superior to many other versions of this game.

The game continues until 1) the code is broken and "uncovered," 2) "Q" is entered, signifying 'quit,' or 3) all nine tries are used.

Conversion

This program is designed for a 2K system, but can be reduced to 1K by doing the following:

Delete lines 10-140, 250-320, 720-770.

Change lines:

```
330 PRINT "RUYGBW " (3 sp.)
480 POKE C+214+2*E, B(E)
560 POKE C+203+E, 9
660 POKE C+203+E, 128
800 POKE C+D*20+2*B+11, 0
810 POKE C+D*20+2*B+12, A(B)
830 POKE C+D*20+19, 0
840 STOP
```

```
5 RANDOMIZE
10 PRINT " MASTERMIND" (After " leave 2 sp.)
20 PRINT
30 PRINT " I WILL SELECT A CODE OF FOUR" (2 sp.)
40 PRINT "COLORS AND YOU MUST TRY TO BREAK IT USING THE CLUES I GIVE YOU."
50 PRINT
60 PRINT " A BLACK PEG MEANS A RIGHT" (3 sp.)
70 PRINT " COLOR IN THE RIGHT POSITION." (1 sp.)
75 PRINT
80 PRINT " A WHITE PEG MEANS A RIGHT" (2 sp.)
85 PRINT " COLOR IN THE WRONG POSITION." (1 sp.)
90 PRINT
100 PRINT " YOU HAVE 9 TRIES." (6 sp.)
110 PRINT
115 PRINT " INPUT Q TO QUIT AND/OR, " P TO PLAY AGAIN." (4 sp. and 7 sp.)
120 PRINT
125 PRINT " TYPE IN P TO PLAY." (6 sp.)
130 INPUT A$
135 IF NOT A$="P" THEN STOP
140 CLEAR
150 DIM A(3)
160 DIM B(3)
170 DIM C(3)
180 FOR B=0 TO 3
190 LET A(B)=RND(6)
200 IF A(B)=1 OR A(B)=2 OR A(B)=3 THEN LET A(B)=A(B)*8+36
210 IF A(B)=4 THEN LET A(B)=39
220 IF A(B)=5 OR A(B)=6 THEN LET A(B)=A(B)*7+20
230 NEXT B (Generate code)
250 CLS
300 PRINT "B = BLUE Y = YELLOW O = ORANGER = RED G = GREEN W = WHITE
310 PRINT " ■ = BLACK PEG",CHR$(128); " = WHITE PEG
320 PRINT
330 PRINT " ";
340 FOR F=1 TO 11
360 PRINT CHR$(128);
370 NEXT F
380 FOR C=1 TO 9
390 PRINT
400 PRINT
410 PRINT 10-C, " ";
420 NEXT C
430 FOR D=1 TO 9
440 FOR E=0 TO 3
450 INPUT A$
460 LET B(E)=CODE(A$)
470 GO SUB 900
480 POKE C+310+2*E, B(E)
490 IF A$="Q" THEN GO TO 720
500 LET C(E)=A(E)
510 NEXT E
520 LET E=0
530 FOR B=0 TO 3
540 IF NOT B(B)=C(B) THEN GO TO 590 (Check for black peg)
550 LET E=E+2
560 POKE C+299+E, 9
570 LET B(B)=0 (Destroy matching pairs)
580 LET C(B)=1
590 NEXT B
600 IF E=8 THEN GO TO 780
610 FOR B=0 TO 3
620 FOR F=0 TO 3
630 IF C(B)<2 THEN GO TO 700
640 IF NOT C(B)=B(F) THEN GO TO 690
650 LET E=E+2 (Check for white pegs)
660 POKE C+299+E, 128
670 LET B(F)=0
680 GO TO 700
690 NEXT F
700 NEXT B
710 NEXT D
720 LET A$=" TOO BAD"
730 FOR B=97 TO 103
740 LET A$=TL$(A$)
750 GO SUB 900
760 POKE B+C+D*20, CODE(A$)
770 NEXT B
780 GO SUB 900
790 FOR B=0 TO 3
800 POKE C+D*20+2*B+107, 0
810 POKE C+D*20+2*B+108, A(B)
820 NEXT B
830 POKE C+D*20+115, 0
840 GO TO 130
900 LET C=PEEK(16396)+PEEK(16397)*256-D*20
910 RETURN
```

Raymond Fowkes, P.O. Box 336, Coalinga, CA 93210.

[Instructions]

Sample Runs (2K)

MASTERMIND

I WILL SELECT A CODE OF FOUR COLORS AND YOU MUST TRY TO BREAK IT USING THE CLUES I GIVE YOU.

A BLACK PEG MEANS A RIGHT COLOR IN THE RIGHT POSITION.

A WHITE PEG MEANS A RIGHT COLOR IN THE WRONG POSITION.

YOU HAVE 9 TRIES.

INPUT Q TO QUIT AND/OR P TO PLAY AGAIN.

TYPE IN P TO PLAY.

B = BLUE Y = YELLOW O = ORANGE
R = RED G = GREEN W = WHITE
■ = BLACK PEG □ = WHITE PEG

Y R B W

[Code is only "uncovered" after it is guessed, all turns are used, or a quit]

9

8

7

6 ■ ■ ■ ■ Y R B W [Correct answer]

5 ■ □ Y Y G R

4 ■ ■ Y Y O W

3 ■ G W G W ■ is chr 9

2 ■ O R O R □ is chr 128

1 □ □ B B Y Y

"P"

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"It says the odds of you making that hand are 2,385,000 to 1, and the odds are 3 to 2 that a nut like you will try for it."

B = BLUE Y = YELLOW O = ORANGE
R = RED G = GREEN W = WHITE
■ = BLACK PEG □ = WHITE PEG

TOO BAD □ R B O G □

9

8

7 Q [Quit]

6 ■ □ □ □ B G O R

5 □ □ □ □ B R G O

4 ■ □ □ □ B O R G

3 ■ ■ R R R G

2 ■ □ O O O B

1 ■ B B B Y

9:135

Sample Runs (1K)

ROYGBW □ G R G Y □

[Code is only "uncovered" after it is guessed, a quit, or all turns are used]

9

8

7

6 ■ ■ ■ ■ G R G Y [Correct answer]

5 ■ □ G W B R

4 ■ ■ G W O Y

3 ■ Y B B Y

2 □ R O R O

1 ■ □ G G W W

9:840

Graphics Surprises

James H. Parsons

When we combine the uncertainty of the ZX80's randomizing feature with its graphics capacities, we have the ingredients for a lot of fun. For example, the Crazy Quilt program uses only two instructions, yet it fills the screen with a zany tangle of symbols and spots:

Crazy Quilt

```
10 PRINT CHR$(RND(9))+2);  
20 GO TO 10
```

Using " $((RND(9)+2))$ " to assign the characters to be printed insures that only the keyboard graphics symbols, CHR\$(2) through CHR\$(11), will be selected; and it avoids the blank space, CHR\$(0), and the null string, CHR\$(1). By changing the range of numbers being randomly selected, we can fill the screen with letters, numbers, punctuation marks, inverse characters, or any combination of these so try numbers other than 9 and/or 2.

Walls and Dikes

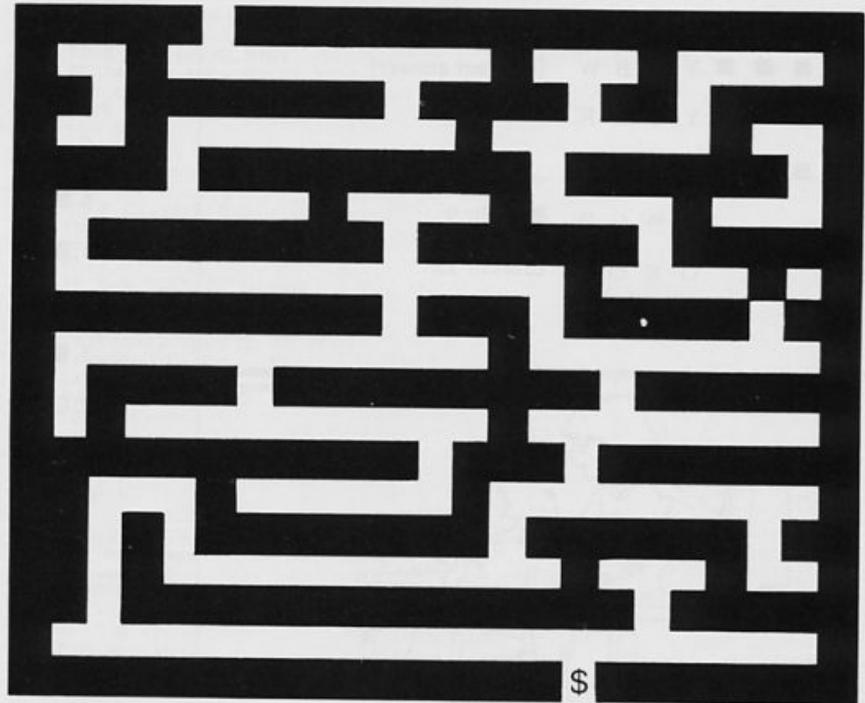
A more challenging application of graphics and randomizing is found in "Walls and Dikes." This program generates a maze in which the configuration of the baffles is fixed randomly within parameters which the player can set. In order to make spaces for traveling within the maze, the program alternates rows of "walls" with rows of "dikes." The wall rows are solid with just a few randomly-placed spaces to pass through. The dike rows are completely open, except for several randomly-placed dikes. To keep maze travelers from sneaking around the ends of wall lines, there is a 19 x 23-space frame around the whole maze. A randomly-placed opening in the top of the frame lets maze travelers in. In the bottom of the frame is a randomly-located treasure marked by a \$.

The prospective maze traveler enters the densities (from 1 to 100) of the walls and dikes. When the computer draws a maze according to the densities specified, the maze traveler must try to find a way from the door at the top of the frame through the maze to the treasure at the bottom. Relatively "thin" densities of walls and dikes (for example, W=10, D=5) present no challenge, while extremely dense configurations (for example, W=95, D=65) cease to be passable mazes at all. Densities of about W=88 and D=9 seem to give the most satisfactory results. At these

densities, some of the mazes produced will be ridiculously easy to get through, while some others will be impassible. Most will be somewhere in between.

The blank line just above the bottom of the frame avoids the frustration of finding a wall or dike sitting right on top of the treasure, and sealing it in. With the blank line, the treasure is always accessible from some part of the maze.

Try experimenting with different densities for the walls and dikes. Try using different symbols for the parts of the maze.



NEWLINE
" "

James H. Parsons, 2575 Eastleft Dr., Columbus, OH 43221.

Typical Run of "Walls and Dikes"

The player starts the program running by pressing RUN and NEWLINE and the display on the screen says:

WALLS AND DIKES
WALL DENSITY?

The player enters a number from 1 to 100, indicating the percentage of space to be filled in by solid horizontal walls.

DIKE DENSITY?

The player enters a number from 1 to 100 indicating the desired percentage of space to be filled in by dikes.

The screen goes blank for a few seconds, and then a maze appears. The maze is framed on all four sides, but there is a gap in the top part of the frame for the player to "enter" by, and a dollar sign in the bottom part of the frame—the "treasure."

The location of the door and treasure is determined randomly, as is the distribution of walls and dikes, once their densities have been set. Under the frame is printed:

NEWLINE

When the player presses NEWLINE, the maze is replaced by:

WALL DENSITY

The game begins again. □

```
10 PRINT "WALLS AND DIKES"
20 PRINT "WALL DENSITY?"
30 INPUT W
40 PRINT "DIKE DENSITY?"
50 INPUT D
60 CLS
70 LET A$=CHR$(128)
80 LET B$=CHR$(0)
90 GO SUB 1000 (Makes the top of the frame.)
100 FOR C=1 TO 8 (100-250 generates 8 wall line/dike
line pairs.)
110 PRINT A$; (Left side of frame for dike lines.)
120 FOR K=1 TO 21 (120-160 generates dike lines.)
130 LET E=RND(100)
140 IF E<D THEN PRINT A$;
150 IF NOT E<D THEN PRINT B$;
160 NEXT K
170 PRINT A$ (Right side of frame for dike lines.)
180 PRINT A$; (Left side of frame for wall lines.)
190 FOR G=1 TO 21 (190-230 generates wall lines.)
200 LET H=RND(100)
210 IF NOT H<W THEN PRINT B$;
220 IF H<W THEN PRINT A$;
230 NEXT G
240 PRINT A$ (Right side of frame for wall lines.)
250 NEXT C
260 PRINT A$; (Left side of frame for blank line.)
270 FOR L=1 TO 21 (270-290 generates the blank line.)
280 PRINT B$;
290 NEXT L
300 PRINT A$ (Right side of frame for blank line.)
310 LET B$="S" (For treasure in bottom of frame.)
320 GO SUB 1000 (Makes the bottom of the frame.)
330 PRINT "NEWLINE" (Reminds player how to get a replay.)
340 INPUT Z$ (Player hits NEWLINE.)
350 CLS
360 GO TO 20
1000 PRINT A$; (Keeps door/treasure out of left corners.)
1010 LET A=RND(21) (Chooses location of door/treasure.)
1020 FOR B=1 TO 21
1030 IF NOT B=A THEN PRINT A$;
1040 IF B=A THEN PRINT B$; (Prints the door/treasure.)
1050 NEXT B
1060 PRINT A$ (Keeps door/treasure out of right corners.)
1070 RETURN
```

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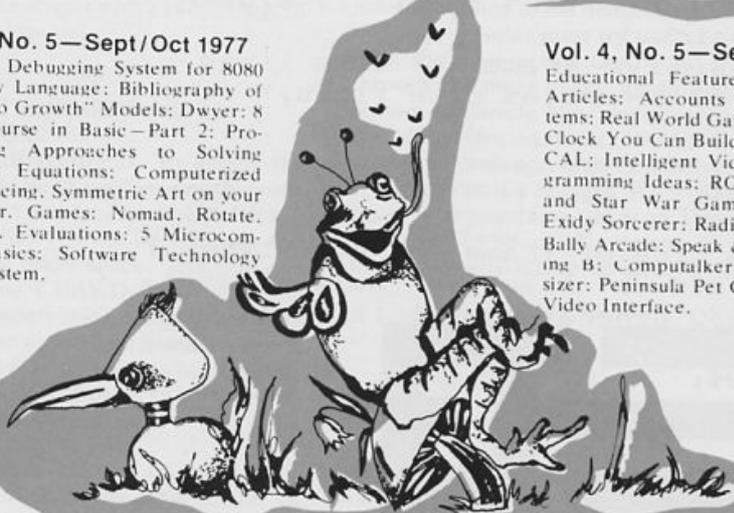
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ROM

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Variable Conversions in the ZX80

Joseph Sutton

There are many cases when it is convenient to convert one type of variable to another, such as numeric to string, or string to numeric. In the ZX80 variable conversions from numeric to string are done with the STR\$() function. The reverse conversion is not available with the 4K Basic. Given a string variable containing numbers, the program below looks at each number individually to determine its magnitude. The CODES for the numbers go from 28 to 37 (CODE ("0") = 28, CODE ("1") =

29, etc) so that by subtracting 28 from the CODE you get the number itself. By using CODE (A\$) - 28

then remove the first character with TLS ().

108 LET A\$ = TLS (A\$)

X is then tested with an IF statement to verify that it is a number from 0 to 9, and if it is, it is put into the numeric N with LET N = (N * 10) * X.

109 IF NOT X < 0 AND X < 10 THEN
LET N = (N * 10) + X

Let's assume we have a string containing "123." Line 107 sets X equal to 1 (29-28), then line 108 removes the "1" from A\$, and line 109 sets X equal to 1 (N = (0 * 10) + 1). If we return to 106 and start again, A\$ = "23", X = 2 and N = 12 (N = (1 * 10) + 2). If we go through a third time, A\$ = "3", X = 3 and N = 123 (N = (12 * 10) + 3). Now we need something to test for the end of the string.

113 IF X = -27 THEN RETURN

115 GO TO 107

In the ZX80 all strings end with a "null" character with a CODE of 1. Line 113 tests for this and returns to the main program when the end is detected. Line 115 keeps the routine going until line 113 finds the end. Now, with one more line, we have a Basic subroutine for doing the missing conversion.

103 LET N = 0

107 LET X = CODE (A\$) - 28

108 LET A\$ = TLS (A\$)

109 IF NOT X < 0 AND X < 10 THEN
LET N = (N * 10) + X

113 IF X = -27 THEN RETURN

115 GO TO 107

This subroutine will search the string A\$ until it finds a number. It will then put the numbers into N, stopping when it finds the end of the string, ignoring all other characters. The routine will also destroy the contents of A\$, so A\$ must be saved if you want it for later use.

With only minor modifications it can be made to accept decimal numbers and scientific notation. First N becomes an ARRAY containing the integer portion in N (0), the fractional portion in N (1), and the exponent (for scientific notation) in N (2). To use this routine as a subroutine all three portions of the ARRAY must be set to zero at the beginning. S is the counter to tell the ZX80 in which part of the ARRAY to place the numbers. We also have to add lines to detect decimal points and "E" if scientific notation of the form 1.5 E 3 is required (1.5 * 10³). Line 110 is added to detect minus signs and lines 116 and 117 properly locate the minus signs. When the fractional portion of the number is processed, the leading zeros are removed. If they are not kept track of, errors will occur; 1.005 would become 1.5, etc. Line 114 detects leading zeros and Z equals the number of leading zeros. In line 30 of the main program you will notice the expression TLS (STR\$ (10 ** Z)). IF Z = 2 (2 leading zeros), 10 ** Z = 100 and the expression becomes the string "100" with the "1" removed or "00". This replaces the zeros in the print statement. No more than four leading zeros can be used (10 ** 5 = 100,000 and you get error message 6, arithmetic overflow). □

```

10 INPUT A$
20 GOSUB 100
30 PRINT N(0); ". "; TL$(STR$(10**Z)); N(1); "*10**"; N(2)
40 STOP

100 LET Z=0
101 LET Y=0
102 DIM N(2)
103 LET N(0)=0
104 LET N(1)=0
105 LET N(2)=0
106 LET S=0
107 LET X=CODE(A$)-28
108 LET A$=TL$(A$)
109 IF NOT X<0 AND X<10 THEN LET N(S)=(N(S)*10)+X
110 IF X=192 THEN LET Y=Y+S+1
111 IF X=-1 THEN LET S=1
112 IF X=14 THEN LET S=2
113 IF X=-27 GO TO 116
114 IF X=0 AND S=1 AND N(1)=0 THEN LET Z=Z+1
115 GO TO 107
116 IF Y=1 OR Y=4 THEN LET N(0)=N(0)*-1
117 IF Y=3 OR Y=4 THEN LET N(2)=N(2)*-1
118 RETURN

```

This is the full subroutine with all the fancy things added and a small "main" program.

ENTERING
1.414E-3
150
-500.8E6
-5.003E-9

PRINTS ON SCREEN
1.414*10**-3
150.0*10**0
-500.8*10**6
-5.003*10**-9

Joseph Sutton, 170 S. Hillside Ave., Succasunna, NJ 07876.

Sourcebook of Ideas

Graphics, Games and Gold

Martin Oakes

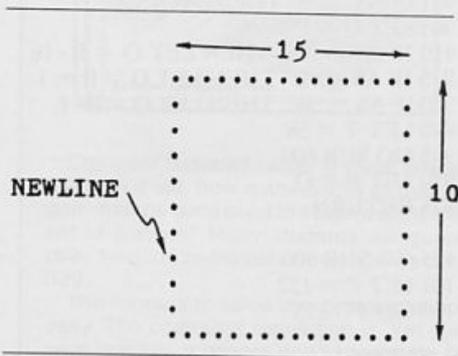


Figure 1. The Game Area.

Games can be divided into three broad classes. The first has a clearly defined play area which remains the same each time the game is played. Chess, backgammon, tic-tac-toe, and all the card games fall into this category. The second class requires a random area which regenerates differently each time the game is played. Into this group fall the adventure, hunt and seek classics. The last class encompasses all the animated games involving flight and shooting, such as Star Wars and Space Invaders, which require real-time inter-action.

I decided to write my own game using as much of the ZX80 graphics as possible, but without waiting for the 8K Basic ROM and 16K RAM expansion to become available. My choice of game was influenced by several considerations. Everyone knows what the successful outcome of a chess, backgammon, or card game should be, so there is little room for invention. The game either meets expectations or fails. Since the computer

Martin Oakes, 2100 Oriole Dr., Freeport, IL 61032.

May/June 1981

10	CONSTANTS
100	MAIN PROGRAM
200	-CONT-
300	SQUARE GAME AREA
400	RANDOM WOOD
500	PEEK IN DISPLAY
600	POKE IN DISPLAY
700	RANDOM PATH
800	
900	MOVE CHARACTER
1000	SEARCH FOR CHARACTER
1100	
1200	FIND AND REPLACE
1300	GOOD OR EVIL?

Figure 2. Organization of Program.

is to be a player, it must be a worthy opponent. A dynamic game would have to wait until the 8K ROM becomes available because the screen goes blank during computation with the 4K Basic.

My choice then was to plan an "adventure" type of game, which has the added bonus that the writer can make his own rules.

From the beginning I did not expect to fit all the features I wanted into 1K of memory. So instead I wrote a series of subroutines which could be independently de-bugged and set aside to wait for the arrival of more memory. At that time they would be at joined together to make a working program.

The hero is to roam within a randomly generated wood, cave, or castle. In the final version the monsters and treasures he encounters may appear as drawings. The game area is a rectangle 15 characters or columns by 10 lines. Later it can be expanded to occupy as much of the screen as required. See Figure 1.

Each feature of the game is written as a subroutine starting at a line number which is a multiple of 100. See Figure 2.

Variable Conversions in the ZX80

Our hero is going to begin his journey in a wood:

```
400 FOR L = 1 TO 10
405 LET M = L
410 IF L > 5 THEN M = 10 - L
415 LET A = RND (3) + 5 - M
420 FOR C = 1 TO A
425 PRINT CHR$ (128);
430 NEXT C
435 LET B = RND (3) + 2 + M
```

```
440 FOR C = 1 TO B
460 PRINT CHR$ (9);
465 NEXT C
```

```
470 LET D = 15 - A - B
475 FOR C = 1 TO D
480 PRINT CHR$ (128);
485 NEXT C
490 PRINT
495 NEXT L
RUN this program.
```

We now have a grey wood surrounded by a black border. Each time this is run it is generated differently. We now add randomly dispersed clearings where our hero will find treasures and do battle.

```
445 LET F = 9
450 LET E = RND(12)
455 IF E = 10 THEN LET F = 0
460 PRINT CHR$ (F);
```

Note that line 460 is replaced. RUN this part. Now let's make it into a subroutine called from a main program.

```
100 GO SUB 400
299 STOP
```

```
497 RETURN
RUN this.
```

The Jan/Feb 1981 issue of *SYNC* describes on p. 23 how to use the memory address stored in D-FILE to locate the display file.

```
600 POKE ( PEEK (16396) + PEEK
(16397) * 256 + Q ), T
605 RETURN
```

```
101 LET Q = 12
102 LET T = 58
103 GO SUB 600
```

RUN this. The letter U appeared in the top line of the display. Let's change this to place the U at different points. The

game area is a matrix of 15 x 10 characters, but because of the NEWLINE character, each line is really 16 characters long.

```
101 INPUT Q
104 GO TO 101
```

RUN this. The program waits for an input. Try each of the following.

```
1(NL)
3(NL)
17(NL)
```

32(NL) Oops! We destroyed the NEWLINE character. Enter two alphabetic characters to exit with error 2/101. Delete lines 101, 103, 104.

Now we will develop a subroutine to allow our hero to move around within the wood.

```
900 INPUT A$
901 IF A$ = "0" THEN STOP
905 LET Q = P + 16
910 IF A$ = "N" THEN LET Q = P - 16
915 IF A$ = "E" THEN LET Q = P + 1
920 IF A$ = "W" THEN LET Q = P - 1
940 LET T = 58
945 GO SUB 600
970 LET P = Q
975 RETURN
```

```
125 GO SUB 900
101 LET P = 152
150 GO TO 125
```

RUN and enter E,N,W,S to get a string of U's. Type 0 to exit from line 901.

Now we want to erase the trailing (old) positions of U to leave only one in the display.

```
950 LET T = 9
955 LET R = Q
960 LET Q = P
965 GO SUB 600
970 LET P = R
```

RUN this.

Our hero must be confined to the wood until he has earned the right to move on to other adventures.

```
925 IF Q ( 1 OR Q ) 160 THEN GO TO
975
```

```
930 GO SUB 500
```

```
935 IF NOT T = 9 THEN GO TO 975
Look in location Q, to which we will
move from the present position P.
```

```
500 LET T = PEEK (PEEK (16396) +
PEEK (16397) * 256 + Q)
505 RETURN
```

RUN and try to move our hero into a clearing or out of the wood. Exit with 0(NL).

This subroutine searches for a specific character on a line and replaces it.

```
1200 LET P = L * 16
1205 FOR C = 1 TO 15
1210 LET Q = P + C
1215 GO SUB 500
1220 IF T = S THEN GO TO 1235
1225 NEXT C
1230 RETURN
1235 LET P = Q
1240 LET T = U
1245 GO SUB 600
1255 RETURN
```

Our hero is fated to be cast randomly into the wood to begin his journey.

```
105 LET L = RND (10)
110 LET S = 9
115 LET U = 58
120 GO SUB 1200
RUN this.
```

Now that we have some working subroutines we can set them aside and delete them from memory to make space for new ones.

We will work with a less fancy wood, so delete lines 400-497, and substitute:

```
300 LET F = 9
305 FOR L = 1 TO 10
310 FOR C = 1 TO 15
315 IF RND (10) = 10 THEN LET F = 0
```

```
320 PRINT CHR$ (F);
325 LET F = 9
330 NEXT C
335 PRINT
340 NEXT L
345 RETURN
```

For the purpose of checking out the next subroutines, our hero can begin at the bottom of the game area, so delete lines 1200-1255.

Simplify the main program to read:

```
100 GO SUB 300
101 LET P = 152
125 GO SUB 900
150 GO TO 125
299 STOP
```

RUN this and exit with 0(NL).

Our hero cannot enter a clearing in the wood, but he needs to know when he has found one. For this we need a search for a neighboring character routine.

```
1000 LET Q = P - 16
1005 GO SUB 500
1010 IF T = S THEN GO TO 1060
1015 LET Q = P + 16
1020 GO SUB 500
1025 IF T = S THEN GO TO 1060
1030 LET Q = P + 1
1035 GO SUB 500
1040 IF T = S THEN GO TO 1060
1045 LET Q = P - 1
1050 GO SUB 500
1055 IF T = S THEN GO TO 1060
1060 RETURN
```

When our hero finds the clearing, we will replace it with an inverse X.

```
1300 LET T = 189
```

```
1305 GO SUB 600
```

```
1310 RETURN
```

Since a clearing is a blank space, $S = 0$. Add to the main program:

```
102 LET S = 0
```

```
130 GO SUB 1000
```

```
135 IF T = S THEN GO SUB 1300
```

RUN this program and move our hero around with N, S, E, or W.

We can do something more interesting when our hero finds a clearing. This routine POKEs a random number into the clearing representing gold, which our hero collects.

```
1302 LET V = V + X
```

```
1303 LET T = X + 28
```

```
1305 GO SUB 600
```

```
1310 RETURN
```

```
104 LET V = 0
```

```
901 IF A$ = "0" THEN GO TO 980
```

```
980 PRINT "GOLD", V
```

```
985 STOP
```

As you RUN this and move our hero around, he collects the gold. When 0(NL) is typed, his treasure is displayed. At this point we have all the rudiments of an adventure game. From here we can use our imagination to change the options in subroutine 1300.

Are you in SYNC?

If not, you should be. We would like any programs, translations of existing programs, games or tips which you have to pass on to fellow Sinclair ZX-80 or Micro-Ace owners. Articles are much more lively if accompanied by photos (black and white), diagrams, and illustrations. If you do not have an output printer, please type program listings and carefully check them against the listing on the screen. Sample runs should be included with programs rather than just a description of what the program does. Articles should be typed, double space. Your name and address, with phone number should be on first page; all other pages should be numbered. All submissions should include return postage. Payment ranges from \$15 to \$40 per printed page.

Please send all submissions to:

SYNC

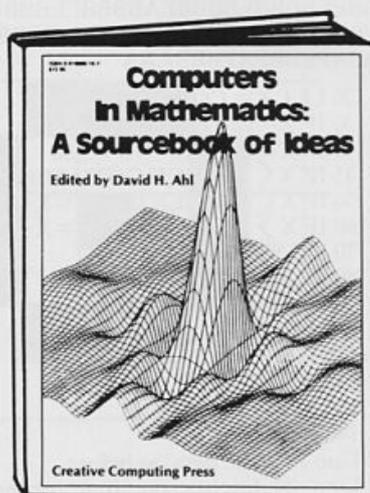
39 E. Hanover Avenue

Morris Plains, New Jersey 07950

May/June 1981

Sourcebook of Ideas

Many mathematics ideas can be better illustrated with a computer than with a text book.



Consider Baseball cards. If there are 50 cards in a set, how many packs of bubble gum must be purchased to obtain a complete set of players? Many students will guess over 1 million packs yet on average it's only 329.

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A Trick and a Graphic System

by Keith Comer

The ZX80 version of Basic is missing a few statements you may use to using. Getting those graphic characters to do anything really impressive seems downright impossible. The potential is there, but how do you squeeze it out? Using a simulated DATA statement, I have developed a graphic system to allow easy production of graphic displays.

First, let us consider the pseudo-DATA statement. Suppose you need the values 6,4,9 and 7 for some obscure task. Watch:

```
10 LET A$="6497"  
20 LET X=CODE(A$)-28  
30 GOSUB 1000  
40 LET A$=TL$(A$)  
50 IF A$="" THEN STOP  
60 GOTO 20
```

Now, line 10 is the "DATA" statement. The terms are just slammed together in a string (A\$).

Line 20 fetches the ASCII code for the first character in the string (which is 34) and by subtracting 28 gets the real number you want (which is 6).

Line 30 goes to the part of the program that is to perform that obscure task. The variable X is holding the value you want.

Line 40 clips off the first data element in order to get at the next one.

Line 50 checks to see if the string is empty, in which case we are done and can STOP.

Line 60 starts the whole thing over again (in traditional reiterative fashion).

Obviously, if you need data with more than one digit per entry, you need to trim the digits off one at a time and reconstruct the number from those digits. If you needed 27, 32, 2, and 23, you would use:

```
10 LET A$="27320223"  
20 LET X=(CODE(A$)-28) * 10  
30 LET A$=TL$(A$)  
40 LET X = X + CODE(A$) - 28  
50 GOSUB 10000  
60 LET A$ = TL$(A$)  
70 IF A$ = "" THEN STOP  
80 GOTO 20
```

Notice that there are no commas between the data elements and that the 2 has to go in as 02.

So how does all this number crunching help you realize those incredible graphic displays you have been dreaming about? Watch again:

```
10 LET A$="££££££££££5E55E5E£BB  
BBEEBBBBBEBBEEABBBBEEBBBBBE£  
PBBBEEA3AA4ABBBBAAAE£BBBBAA  
A3APBBBEAPBBBAAA"
```

```
20 LET X= CODE (A$)  
30 IF X=12 THEN PRINT  
40 IF X=12 THEN GOTO 80  
45 IF X < 38 THEN GOTO 110  
50 IF X < 48 THEN LET X=X-36  
60 IF X > 47 THEN LET X=X+80  
70 PRINT CHR$(X);  
80 LET A$=TL$(A$)  
90 IF A$ = "" THEN STOP  
100 GOTO 20  
110 FOR N=1 TO X-28  
120 PRINT " ";  
130 NEXT N  
140 GOTO 80
```

Line 10 is the data, as before.

Line 20 fetches the first (or next) character, as before.

Lines 30 and 40 look for the ASCII code 12, which is the £ symbol. It is used to effect a line feed. (Imagine a cross between an "L" and an "F".) This allows you to proceed down the page without typing spaces to the end of each line.

Line 45 checks for an ASCII code which would indicate a number. The routine at 110 will print that many spaces, up to 9 of course; remember, only one digit per data element. This is mainly a convenience, but I have noticed that many pictures I have done are mostly spaces.

Line 50 and 60 convert the ASCII codes of letters from the data line to ASCII codes of graphic symbols. You can save a few bytes (and forsake clarity) by using:

```
50 IF X < 48 THEN LET X = X-116  
60 LET X=X+80
```

Line 70 prints the selected graphic symbol.

Lines 80, 90, and 100 should be obvious.

Lines 110 to 140 are the spacing routine referred to by line 45, a simple FOR-NEXT loop.

Now the system works like this: Turn to page 78 in the ZX80 instruction manual and put the letters A through J next to graphic symbols 2 through 11 (ASCII). Put letters M through V next to symbols 130 through 139. The reason that K and L are skipped is so that K can be converted to ASCII code 128 which is the inverted space or a solid black square.

That completes the program. The system allows the use of all the graphic symbols with equal ease, not just the ones on the keyboard. They are all available with one keystroke of typing each. The result is that the screen can be used with the effect of double the resolution, because symbols are used that access any quarter, or any combination of quarters, of each graphic block.

All you do to construct your picture is to draw what you want on graph paper. Your field is 64 squares wide and 46 squares high.

So get your drawing the way you want it. It helps to fill in the squares of the graph paper "all or nothing" (Figure 1). Then divide the picture up into "four squares." This is where the resolution gets halved into the 32 by 23 screen (Figure 2). I just draw over the original lines of the graph paper with ink of another color, every other line. Then convert each "four square" to its corresponding letter from the graphic symbol chart you have just written (Figure 3). Remember to use the £ sign when you get to the end of a line. Now just string the letters together into a data statement for line 10 like this:

```
10 LET A$="GNE£ACA£DN"
```

The advantage of this system is that the program itself is fairly short so you can store a rather elaborate (and/or big) picture in line 10. It cannot hold enough characters to do a full screen (at least not with 1K) but it will hold more than 200. Since it is storing them as one byte each, I doubt that there is a way to store it any tighter. When you save a program, you have also stored the picture.

A few examples are probably in order:

```
INVADERS: "FBKKBE£KRQRQK£NK  
RQKN£DPDCOC"  
"1BOKPB£MKNKKA£E  
QKNKRCE£BNININB"  
HEART: "FK£OP£K£K£K£K£QK  
K£K£1QK£K£2QC"  
FACE: "2BRNPE£10C3QE£MC5QE  
R2C1C1DA£A1E1C1E1A£  
Q1S2FCMC£DP1N£NCF£  
1DPE1BR£3N£N£"
```

More extreme is the

```
CASTLE: "£78F£78M£77FKP£65M1F  
KKKP£650E1M1M£550KK  
EM1M6A£65AA1M1M£BE3  
FP£65AA101MR40KE£65  
AAOC1M4OKK£E£6BBB  
2ANC2M5A1A£5FA1M2A  
3KM4FA1P£502M2A3KM  
4M2M£4FA2DN£C4M4R2  
DA£4M£B£E£8M£B£B£A3P£  
7A1K20N£P7K1M£7A30C  
2DP6K1M£7A3A4M8M£7  
A3A4M8M£7A3A4M8M£7  
PBBBA4M£B£B£B£B£B£O"
```

Keith Comer, 16889 Nichols St. #d, Huntington Beach, CA 92647.

If you want to do wider spacing, you can use this routine to get two digit's worth of spaces. Eliminate lines 30 and 40 if you want to save space; just space all the way to the end of each line. Replace lines 110 to 140 with:

```

110 LET Z = (X-28) * 10
120 LET AS = TL$(AS)
130 LET Z = Z + (CODE (AS) - 28)
140 FOR X = 1 TO Z
150 PRINT " ";
160 NEXT X
170 GOTO 80

```

Using this modification you can "draw" a U.S. MAP "3232323226E12PRNNNNN NNNQC06OK11MC09DNRS03RQC1101 2ARA01OSO12A12PAPRCM13A17M13 Q17R13ME16A14PE14OC15PE13A17Q BBBE03FBRNNPA21QBFR04DK23PR 06QA22DA" □

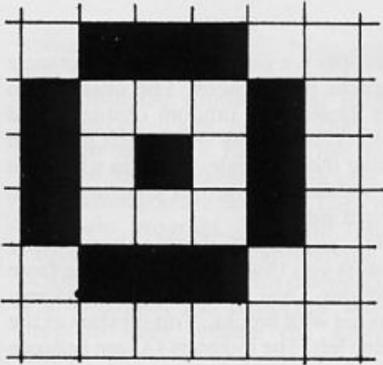


Figure 1.

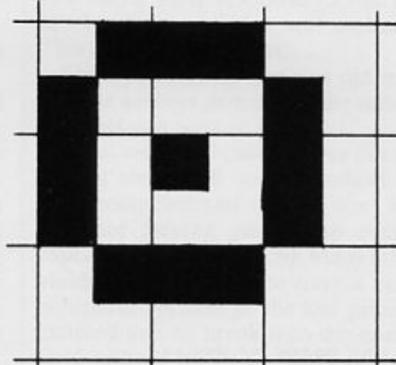


Figure 2.

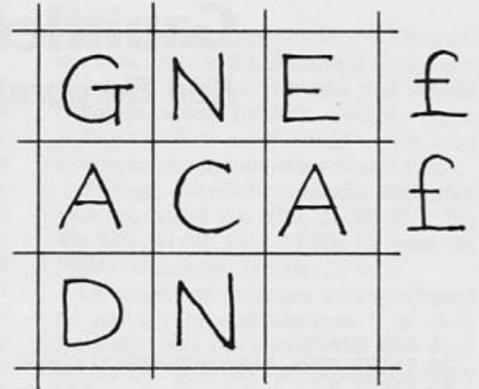
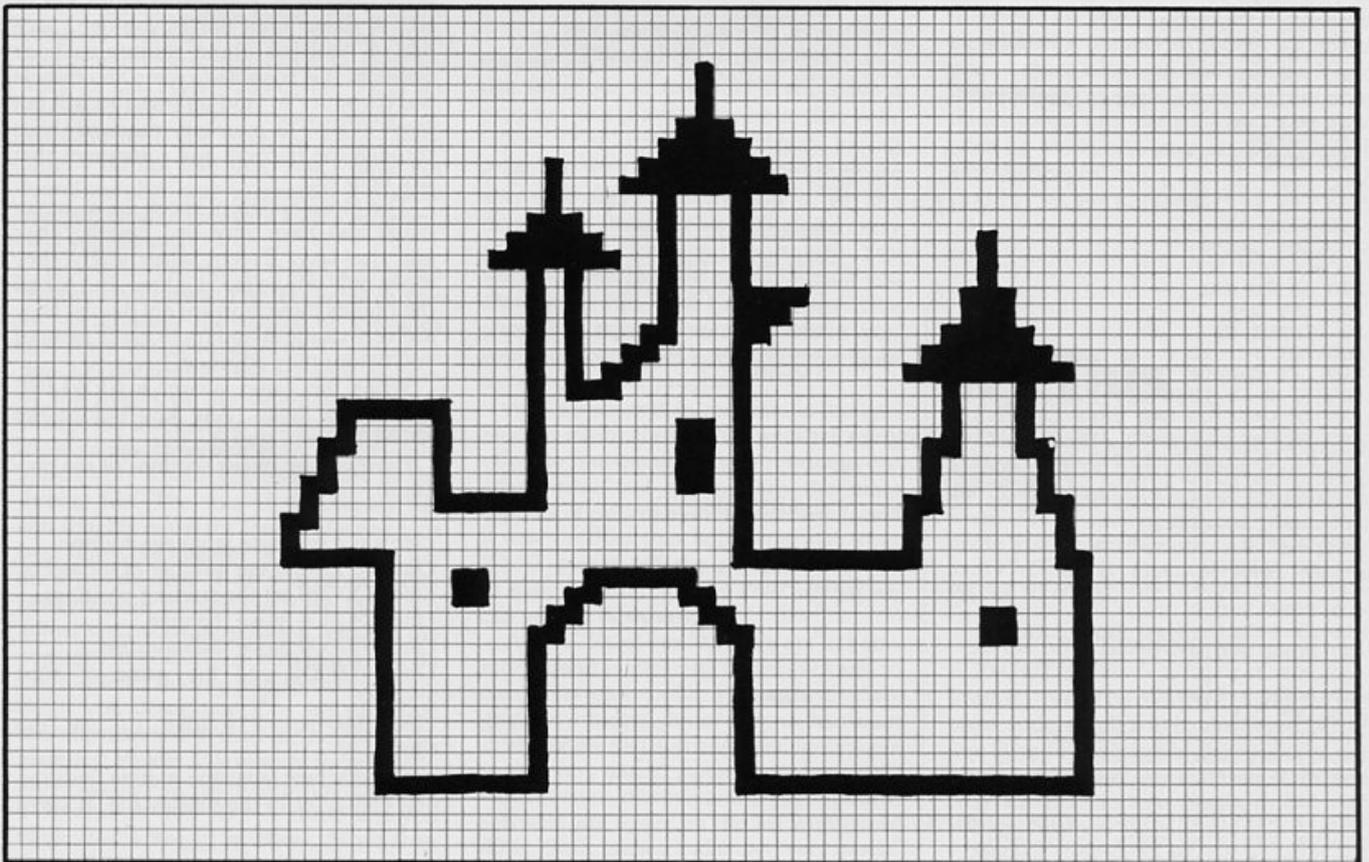
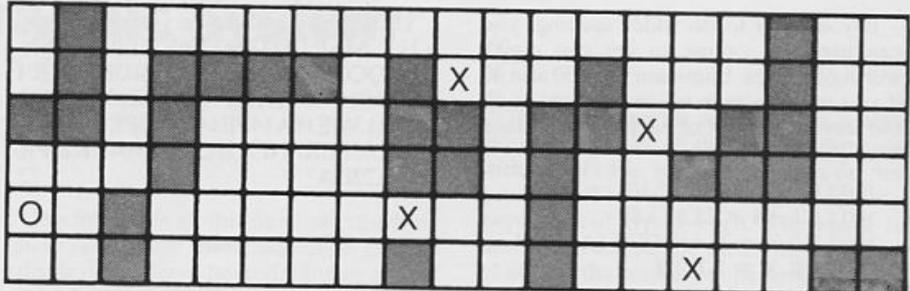


Figure 3.



Sample Output "Castle"



Gauntlet

Ken Berggren

```

1 REM SPACE
70 PRINT "HOW MANY MONSTERS?(1-4)"
80 INPUT N
90 LET C=0
100 LET D=0
110 CLS
115 IF N>4 THEN GO TO 70
120 DIM U(N)
130 FOR L=1 TO 6
140 FOR K=1 TO 20
170 PRINT CHR$(-(RND(8)>5)*9);
180 NEXT K
190 PRINT
210 NEXT L
220 FOR J=1 TO N
230 LET B(J)=RND(L-1)*K-2-(K/5)*(J-1)
240 NEXT J
250 LET G=K*3
260 GO SUB 900
270 GO TO 430
280 LET S=G
290 INPUT C$
300 FOR J=1 TO 2
310 LET C=CODE(C$)
320 IF C=58 THEN LET S=S-K
330 IF C=41 OR S<0 THEN LET S=S+K
340 IF C=43 OR C=39 AND S=(S/K)*K THEN LET S=S+1
350 IF C=39 THEN LET S=S-1
360 IF S>(L-1)*K THEN LET S=S-K
370 IF S+1=((S+1)/K)*K THEN GO TO 700
380 LET C$=TL$(C$)
390 NEXT J
395 GO SUB 900
400 IF PEEK(S+D)=61 THEN GO TO 600
405 POKE D+G,0
410 IF PEEK(S+D)=0 THEN LET G=S
430 POKE D+G,52
440 FOR J=1 TO N
450 POKE D+B(J),0
460 LET C=K
470 IF B(J)/C=G/C THEN LET C=1
480 IF B(J)-G<0 THEN LET C=-C
490 IF PEEK(D+B(J)-C)=9 AND RND(9)>4 THEN LET C=0
500 LET B(J)=B(J)-C
510 IF PEEK(D+B(J))=52 THEN GO TO 600
515 IF RND(9)>7 THEN GO TO 460
520 POKE D+B(J),61
530 NEXT J
540 GO TO 280

```

```

600 PRINT "GOTCHA"
610 GO TO 800
700 PRINT "YOU ARE FREE"
800 GO SUB 900
810 POKE D+G,20
840 INPUT C$
850 IF C$="" THEN RUN
900 LET D=USR(16427)
910 RETURN

```

Subroutine Loader

```

100 POKE 16403,100
110 FOR J=1 TO 5
120 INPUT C
130 POKE 16426+J,C
140 PRINT J,C
150 NEXT J

```

DECIMAL LISTING

1	42
2	12
3	64
4	35
5	201

Gauntlet is a game played on a rectangle 19 spaces by 6 spaces. The object is to run a gauntlet of random obstacles and monsters, beginning on the left side and crossing the rectangle. You win when you have successfully moved your marker to the right side.

First you must decide how many monsters you think you can handle, from one to four. Then . . . the screen is randomly sprinkled with blocks. You (O) start at the extreme left. The monsters (X) are between you and your goal, the extreme right.

You move by entering the letters U,D,F or B. For example, to move down and back diagonally you would enter DB or BD. A single letter moves you one space and a Newline alone maintains your position. It is possible to jump an obstacle but if you try to land on one you will not move at all. The monsters frequently blast through the barriers and sometimes that can help you.

The monsters drool green drool, never bathe and have very bad breath. They are also lazy. Except when angry they move only one space at a time. But for all their faults these guys are not dumb. They are very cautious and try to get in front of you before they advance.

When the game is over a NEWLINE will run it again. Any key before the NEWLINE will stop it.

Here are the major sections of the program:

- Line 1 is a machine language routine.
- Lines 70-120 set the number of monsters.
- Lines 130-210 set the starting positions.
- Lines 280-430 move the man.
- Lines 440-530 move the monsters.
- Lines 600-850 end the game or start another.
- Lines 900-910 a routine to call the routine.
- The machine language routine finds the first character in the display file. It saves

Ken Berggren, 104 Ridgeway Ave., Louisville, KY 40207.

SYNC

Reader Survey

about ten bytes over PEEKing and, with only 1K, every little byte counts.

To load the routine, enter REM and five spaces. Then type in the "loader program" and run it. Enter the five numbers from the "decimal listing" and double check them when you are through. Then type in the main program. You will find that various letters appear around the place newlines are entered. This can be ignored. The condition will disappear when the program lines replace the subroutine loader.

Some of the values for the routine are not character codes, and they do strange things when the ZX80 tries to put them on the screen. Some codes will crash a program. To play it safe push the REM statement off the screen with more program lines or use POKE 16403,100. *Then do not use LIST without a line number*, at least not until you have the program on tape. I do not like that, but I have not found another way to protect a routine and still be able to save it with a program. Any suggestions?

Here are some ways to tailor the program to your own tastes. The TO value in line 140 determines the length of the lines that form the gauntlet. The TO value in line 130 determines the number of lines or the height of the gauntlet. You can change the shape of the display by adjusting those values. However, in 1K this program allows only about 125 characters in the display file. The size of the display file will roughly equal the length of a line plus one, times the number of lines. If you get an error number 4 or 5, it is probably because your display file is too large. To adjust your starting position, change the constant in line 250. A zero starts you on the top line. Adding one to the constant drops you down one line. Be sure that this constant is less than the height of the gauntlet! Finally, if you want to be able to move farther in each turn, increase the TO value in line 300. A three lets you move like a knight in chess. More than three and you are practically unbeatable. □

In our first issue of *SYNC* we asked you to tell us about yourselves so that we will be able to make *SYNC* the magazine you want. Your response to our survey has been very positive and enthusiastic. This is what you told us.

First, you told us that you did not like to have surveys printed on the other side of pages you want to keep!

Next, we found that for four out of five of you the ZX80 (or MicroAce) is the only computer you own. About half of you are having your first computer experience with the ZX80. Many admitted yielding to the desire to have a personal computer because of the low price. This enabled you to break into the computer field without making a heavy investment in equipment before you were sure that computers would be a part of your personal activities. The other half have access to a computer at work or at school.

Topping the request list for *SYNC* content is a strong desire for programming tips (four out of five). So if you have a program to submit, remember that your fellow *SYNC* readers are clearly having great fun with their ZX80s, but they are also very eager to learn how to get the most out of their machine. They see every program as a learning opportunity. You will have their deepest appreciation if you share what you have learned about programming through notes in which you point out special tips and explain the main elements in your program.

A close second in requests is for new product information. While we make every effort to find out about new products, our advertisers and readers are the main sources of information. If you have found a new product that helps you with your ZX80, please tell the seller, distributor, or manufacturer about *SYNC* so that we can get the news around.

About 75% of our readers want to know more about interfacing techniques and to have software tutorials. Hardware tutorials, graphics software, device control, hardware evaluations, and software evaluations are in the "very much" column for about 60%. Educational, mathematics, and business software are lower on the list with about 40%. While games make the "very much" column for 40%, "very much" and "okay" together include 90% of our readers.

Fiction, puzzles, and advertising came in at the bottom of your list for highest choice, but near the top for your second choice.

For most of our readers additional memory tops the list of planned equipment purchases for 90% with disk and printer capabilities next for 60%. *Creative Computing* and *Byte* are the most widely read computer magazines other than *SYNC*.

The age distribution checks show that 14% are under 20; 27%, 21-30; 31%, 31-40; 13%, 41-50; 13%, 51-60; 1% over 60. Males outnumber females 37 to 1.

Of course, all these are averages based on our survey compilations. It is clear from not only the survey, but also your letters that you have an amazing variety of interests involving your ZX80. Even though the survey summary may not show that other readers have the same special interests as you (and your comments mentioned a number of them), we invite you to share what you find with us. Your fellow readers are always looking for new things to do with their ZX80s. You may open up whole new interests, possibilities, and challenges. □

Try This

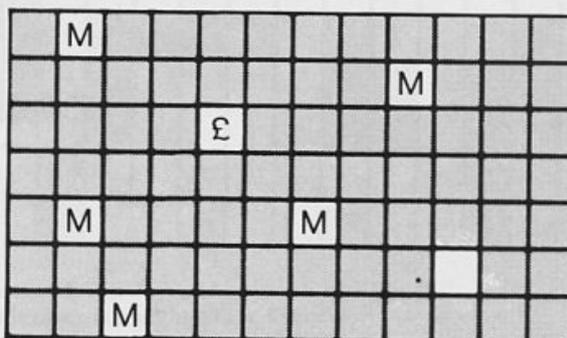
This column will feature short programs to show off your ZX80, impress your family and friends, and tickle your imagination when *SYNC* arrives at your place. We invite your contributions. Address them to *SYNC*, 39 E. Hanover Ave., Morris Plains, NJ 07950.

```
10 PRINT CHR$(RND(3));
20 GOTO 10
Press RUN and NEWLINE. Disregard the error code which will be displayed. After you have fully absorbed the results of the routine, press any key and then RUN and NEWLINE again. Our thanks to:
Nigel Searle
Sinclair Research Ltd.
50 Staniford St.
Boston, MA 02114 □
```

Forest Treasure 2K

Paul Frahm

```
10 FOR I=1 TO 20
20 FOR J=1 TO 30
30 PRINT " ";
40 NEXT J
50 PRINT
60 NEXT I
70 DIM A(50)
80 DIM B(75)
90 LET C=0
100 LET E=RND(20)
110 LET F=RND(30)
120 LET T=RND(619)
130 POKE PEEK(16396)+256*PEEK(16397)+T,0
140 FOR I=1 TO 75
150 LET B(I)=RND(1000)+17300
160 NEXT I
170 LET M=RND(619)
180 POKE PEEK(16396)+256*PEEK(16397)+M,50
190 LET C=C+1
200 LET A(C)=PEEK(16396)+256*PEEK(16397)+M
210 IF A(C)=PEEK(16396)+256*PEEK(16397)+T THEN GOTO 490
220 LET H=F+31*(E-1)
230 POKE PEEK(16396)+256*PEEK(16397)+H,12
240 LET N=PEEK(16396)+256*PEEK(16397)+H
250 FOR I=1 TO C
260 IF A(I)=N THEN GOTO 460
270 NEXT I
280 IF N=PEEK(16396)+256*PEEK(16397)+T THEN GOTO 430
290 INPUT A$
300 IF A$="S" THEN LIST
310 POKE PEEK(16396)+256*PEEK(16397)+H,18
320 FOR I=1 TO 75
330 IF B(I)=N THEN GOTO 400
340 NEXT I
350 IF A$="R" AND F<30 THEN LET F=F+1
360 IF A$="L" AND F>1 THEN LET F=F-1
370 IF A$="D" AND E<30 THEN LET E=E+1
380 IF A$="U" AND E>1 THEN LET E=E-1
390 GOTO 170
400 LET F=F+RND(9)-5
410 LET E=E+RND(9)-5
420 GOTO 170
430 POKE PEEK(16396)+256*PEEK(16397)+T,148
440 PRINT "YOU HAVE TAKEN THE TREASURE"
450 GOTO 500
460 POKE PEEK(16396)+256*PEEK(16397)+H,19
470 PRINT "THE MONSTER HAS KILLED YOU"
480 GOTO 500
490 PRINT "THE MONSTER HAS STOLEN THE TREASURE"%
500 PRINT "ANOTHER GAME? (Y/N)"
510 INPUT B$
520 CLS
530 IF B$="Y" THEN RUN
540 LIST
```



"Forest Treasure" is based upon "Random Graphics" by Gary McGath in the Jan/Feb 1981 issue of *SYNC*. You are riding through a forest, seeking the gold treasure. You are represented by "£" and the treasure is a blank space. During your ride you may encounter enchanted (invisible) walls. When touched, these walls will alter your path, sending you in different directions (sometimes even leaping over the wall!). You may also encounter a monster, represented by the "M" square. This monster has the magical ability to duplicate itself in its search for you. If you run into a monster, or if the monster lands on you, or if the monster steals the treasure, you lose. If you get the treasure, you win. You control your movements by entering U, D, R, or L for up, down, right, or left, and then pressing NEWLINE. Entering S will exit you from the program.

Paul Frahm, 21123 Dettmering, Matteson, IL 60443.

Translating From Other Basics

David Lubar

A command found in many versions of Basic, but not in the Sinclair, is ON ... GOTO. This is usually found in the form ON X GOTO 110, 120, 130. The command makes a jump depending on the value of X. In this example, if X is 1, the program will jump to 110, if X is 2, control goes to line 120, and if X is 3, the program continues at 130. If X is outside the expected values, the program will fall through to the next line. In other words, for any value N of X, the program will jump to the Nth line listed in the expression.

The simplest way to replace this command is to use a series of IF...THEN statements. The above example is equivalent to

```
10 IF X = 1 THEN GOTO 110
20 IF X = 2 THEN GOTO 120
30 IF X = 3 THEN GOTO 130
```

If there are many numbers involved, this process can get tedious. Fortunately, there are other ways to Sync the cat. The Sinclair allows for the use of expressions with a computed GOTO. For example, the above command can be replaced with GOTO 100 + 10 * X. In many cases, you can renumber a translation so the lines

used in ON...GOTO will be part of a simple progression. But there are cases where the progression is not simple.

Take a line such as ON X GOTO 90, 450, 376, 10. Rather than look for an algorithm that will produce the correct number, it is easier to set up an expression. Using the logical capabilities of the Sinclair, we can produce an expression that has the desired sum for any X value. What we need is a series where the sum of each member is zero unless it matches the desired X value. When there is a match, the sum will be the value of the desired line for the jump. The above line can be replaced with GOTO ABS ((X=1) * 90 + (X=2) * 450 + (X=3) * 376 + (X=4) * 10). This expression will produce the desired results. Those parts of the expression where the equality fails will produce a value of 0. When there is a match, the result will be correct except for having a negative value. This is caused by the use in the Sinclair of -1 to signify true. The ABS takes care of that.

Another common Basic operation is the LEN function. The expression LET X = LEN (A\$) will give X a value equal to the number of characters in A\$. If A\$ is HELLO, then X will be 5. This expression has many uses. Once you know the length

of a string, you can manipulate it in various fashions. While the Sinclair does not have the LEN function, it does have TLS which removes the first character of a string. Using TLS in a loop, the length of any string variable can be determined. The basic approach is to keep chopping off the first character of a string until there is nothing left. If you count how many beheadings have occurred, you will know the length of the string. Here's one way to do it.

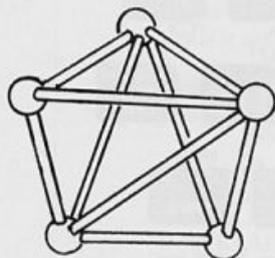
```
10 INPUT A$
20 LET L = 0
30 LET B$ = A$
40 IF B$ = "" THEN GOTO 100
50 LET B$ = TLS (B$)
60 LET L = L + 1
70 GOTO 40
100 PRINT A$; "HAS A LENGTH OF"; L
```

The program is fairly straightforward. Since TLS destroys the variable, A\$ is preserved by using B\$ for the operation. When B\$ has only one character left, the result of TLS (B\$) will produce a null string (represented in line 50 as a pair of quotes with nothing between them).

That's all for now. If you have any specific functions you would like to see covered here, drop me a line.

puzzle answers

A Building Problem:



Lucky Number: Multiply the selected number by 9, and use the product as the multiplier for the larger number. It will be found that the results will be respectively as under:

```
12345679 x 9 = 111 111 111
" x 18 = 222 222 222
" x 27 = 333 333 333
" x 36 = 444 444 444
" x 45 = 555 555 555
" x 54 = 666 666 666
" x 63 = 777 777 777
" x 72 = 888 888 888
" x 81 = 999 999 999
```

It will be observed that the result is in each case the "lucky" number, nine times repeated.

The Puffer-Belly Problem: The speed of the two trains in relation to one another is $45 + 36 = 81$ miles per hour. This equates out to:

$$\frac{5,280 \times 81}{60 \times 60} = 118.8 \text{ feet per second}$$

The length, then, of the Dover train is $6 \times 118.8 = 712.8$ feet.

A Seven-Letter Charade: The answer is the word ENGLAND. The other words are END, GLAD, ANGEL, LAND.

The Three Jealous Husbands: For the sake of clearness, we will designate the three husbands A, B, and C, and their wives a, b, and c, respectively. The passage may then be made to the satisfaction of the husbands in the following order:

1. a and b cross over, and b brings back the boat.
2. b and c cross over, c returning alone.
3. c lands and remains with her husband, while A and B cross over. A lands, B and b return to the starting point.
4. B and C cross over, leaving b and c at the starting point.
5. a takes back the boat and b crosses with her.
6. a lands and b goes back for c.

The Four Jealous Husbands: Distinguishing the four husbands as A, B, C, and D, and the four wives as a, b, c, and d, respectively, the answer to this version is:

1. a, b, and c cross over; c brings back the boat.
2. c and d cross over; d brings back the boat.
3. A, B, and C cross over; C and c bring back the boat.
4. C, D, and c cross over.
5. c takes back the boat and fetches d.

Sinclair ZX80

8K Basic ROM and 16K-Byte RAM Pack Specifications

The 8K Basic ROM and the 16K-Byte RAM pack are now available from Sinclair Research (see Resources column). The specifications for these units are as follows.

ZX80 8K BASIC ROM

The 8K Basic ROM for the ZX80 is designed for high-level, full-facility computing. The chip—a drop-in replacement for the existing 4K Basic ROM—comes with a new keyboard template and a supplementary operating manual.

Key features of the new 8K BASIC ROM include -

- fully floating-point arithmetic to 9-digit accuracy,
- logs, trig, and their inverse functions,
- graph plotting facility,
- animated displays using PAUSE n,
- full set of string-handling facilities,
- n dimensional arrays,
- n dimensional string arrays,
- cassette LOAD and SAVE with named programs.

Full specification follows.

Numbers

Stored in 5 bytes in floating point binary form giving 9×10^{-44} to 1.1×10^{43} accurate to 9 1/2 decimal digits.

Variables

Numeric: Any letter, followed by alphanumerics.
 String: A\$ - Z\$.
 FOR-NEXT: A - Z.
 Numeric arrays: A - Z.
 String arrays: A\$ - Z\$.

Arrays

Numeric arrays: 'n' dimension, subscript range starts at 0.
 String arrays: 'n' dimension, subscript range starts at 0. If the last subscript is omitted it's treated as a fixed length string.

Strings

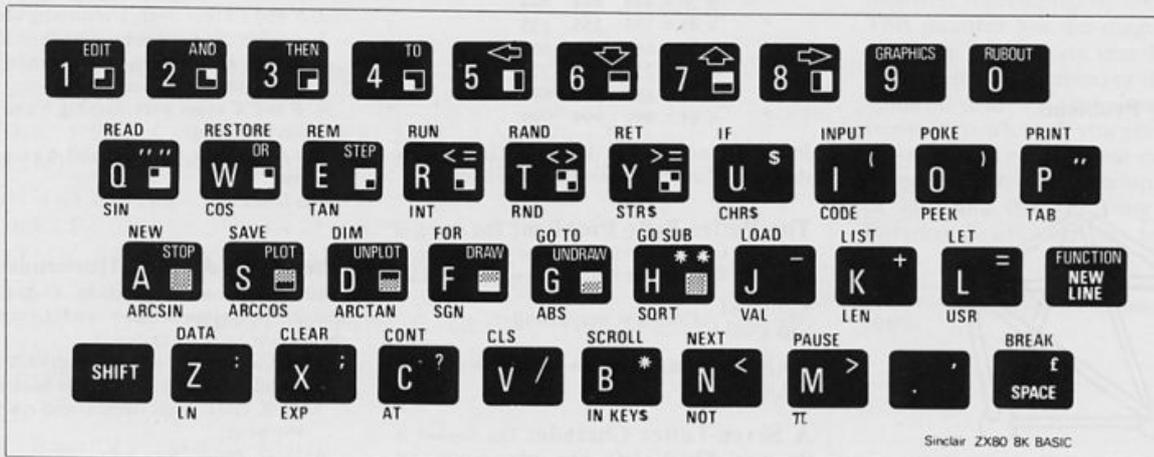
Undimensioned strings can be any length.
 Can be concatenated (+).
 Substring eg B\$ = A\$(2 TO 4).
 Literal strings eg C\$ = "QWERTY".

Statements available

In this list,

v represents a variable.
 x.y.z represent numerical expressions.
 m.n represent numerical expressions that are rounded to the nearest integer.
 e represents an expression.
 f represents a string valued expression.
 s represents a statement.

Note that arbitrary expressions are allowed everywhere (except for the line number at the beginning of a statement). Thus "GOTO LN A ** 2" is valid.



Keyboard template for new 8K BASIC ROM.

CLEAR	Deletes all variables, freeing the space they occupied.		
CLS	(Clear Screen) deletes all PRINT output in the display file.		
CONTINUE	Resumes execution of the last run program—repeats the last statement if an error was detected, otherwise restarts at the next one. Note that a command (immediate execution) statement counts as a program and so destroys the re-entry data.	PAUSE n	Sends the display file to the TV screen for n frames (50 frames per second) or until a key is pressed.
DATA...	Standard, but no unquoted strings.	PLOT m,n	Sends the PLOT position (a system variable) to (m,n) and blacks in that pixel. Also changes the PRINT position.
DIM...	Deletes any array or string with the same name, sets up space for a new array in the usual way, and initialises its element to 0 or " ".	POKE m,n	Writes n in byte m in RAM.
DRAW m,n	Let (u,v) be the current PLOT (q,v.) position. Draws a line as straight as possible from (u,v) to (u + m, v + n) by blacking in pixels (quarter character squares). Changes the PLOT and PRINT positions.	PRINT...	Mostly standard. The display file has 22 lines of 32 characters each (2 zones of 16 characters) and when this is filled it is sent to the TV with error 5. CONTINUE carries on with the program with no loss of data.
FOR A TO B STEP C	Generally standard, but entirely dynamic in its action.	PRINT AT m,n	Moves the PRINT position to line m, character n.
NEXT	The effect of a NEXT statement is to look up the corresponding FOR-variable, increment its value by the STEP, check whether the limit is exceeded and if not jump to the looping line number.	PRINT TO de	Alters the PRINT format. Here d is an optional digit between 1 and 8 (default value 8) and e is an optional letter E. From now until another such formatting item, numbers will be printed to d significant digits, and if E is present they will always be printed using scientific notation.
GOSUB n	Transfers control to BASIC subroutine.		On switch-on, the format is initialised so that numbers are printed to 8 digits and scientific notation is avoided where possible. Note that PRINT does not change the PLOT position.
GOTO n	Jumps to line n.	RANDOMIZE	Standard
IF x THEN s	If x is true (defined to mean greater in absolute value than 2 ⁻¹¹²) then s is executed. The standard values of true and false as yielded by relational operators are 1 and 0.	RANDOMIZE n	If n is given this is made the value of the seed of the random number generator.
INPUT v	Outputs the display file to the screen with no special INPUT prompt; the rest is standard. Cannot be used as a command (immediate execution) statement.	READ v	Reads v from a data statement.
LIST	Lists from start of program.	REM...	Remember, for program comments.
LIST n	Lists program starting at line n with program cursor pointing at line n.	RESTORE	Reinitialises the data (so it can be read again).
LOAD f	Looks for a program called f on tape and loads it and its variables.	RETURN	Return from subroutine.
NEW	Default n = 0. Erases BASIC program and variables.	RUN	RUNs the BASIC program.
NEW n	n is used to alter a system variable known as RAM TOP, which is the address of a byte in RAM. The area from RAM TOP on is untouched by the BASIC system, and POKED programs can be left there in safety.	RUN n	CLEAR followed by GOTO n.
		SAVE f	Saves program and variables on tape and calls it f.
		SCROLL	Scrolls display file up one line, losing top line and making space at bottom.
		STOP	
		UNDRAW m,n UNPLOT m,n	These are like DRAW and PLOT, but blank out pixels instead of blacking them in.

Functions	Type of Operand	Result
	number	Negate
ABS	number	Absolute magnitude
ARCOS	number	In Radians
ARCSIN	number	In Radians
ARCTAN	number	In Radians
CHR\$	number	The character whose code is x.
CODE	number	The code of the first character is x (or 0 if x is empty)
COS	number	In radians.
EXP	number	e^x .
INKEY \$	number	Reads the keyboard. The result is a character representing the key pressed, otherwise the empty string.
INT	number	Integer.
LEN	string	The length of x.
LN	number	Natural log
NOT	number	Exclusive—ORs the first byte of x with 113, so that NOT 0 = 1, NOT 1 = 0. Unlike the other functions, NOT has binding power 4 (between AND and the relational operators) NOT A = B has the same value as NOT (A=B) (and A < > B).
PEEK	number	The value of the byte in store whose address is x.
PI		π (3.1415927)
RND		A random number between 0 and 1.
SGN	number	Yields -1, 0, +1.
SIN	number	In Radians.
SQRT	number	Square root.
STR\$	number	The string of characters that would appear on the screen if x were PRINTed.
TAN	number	In Radians.
USR	number	Converts x to an address in store and calls that address as a machine code subroutine. On return, the result is the contents of the h1 register pair.

Functions	Type of Operand	Result
VAL	string	Evaluates x as a numerical expression (x must not contain the quote image character).
AND		Logical AND
OR		Logical OR

Relational operators

=	Equal
>	Greater than
<	Less than
<=	Less than or equal to
=>	Greater than or equal to
<>	Not equal

Graphics

All characters, their reverses, and all graphics can be entered directly from the keyboard.

ZX80 16K-BYTE RAM PACK

The complete module is designed to provide massive add-on memory capacity.

The 16K-BYTE RAM pack can be used for program storage or as a database. Yet it costs up to half the price of competitive additional memory.

Measuring approximately 3" x 3" x 1.25" the RAM pack plugs into the existing expansion port on the rear of the Sinclair ZX80 via an edge connector. No additional power supply is needed. □

TRONIC GAM



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"This one is called 'Kafka'. It is programmed to try to present the user from figuring out how to play it."



David Ahl, Founder and
Publisher of Creative Computing

Creative Computing

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Key Click Generator

by Matthew J. Johnson

This simple circuit will produce an audible tone whenever the ZX80 screen is blanked, yielding a click to indicate key closure, or a steady tone during processing.

Examination of the "SYNC" line (IC 19—PIN 5) with an oscilloscope reveals three constituent signals: Line Sync (denoted \overline{LS}); Frame Sync (\overline{FS}); and Keyboard (\overline{KBD}). These signals are low assertion, as indicated, and have period and repetition rates as follows:

Signal	Period	Rep. Rate
\overline{LS}	6 μ s	58 μ s
\overline{FS}	380 μ s	18ms
\overline{KBD}	6ms	N/A

The time constant of the RC low pass filter was chosen to allow the second gate to switch only on signals long with respect to \overline{FS} , i.e., \overline{KBD} . When SYNC returns high, the first gate sinks the discharge current of the capacitor via the Germanium diode, resetting the circuit. Germanium is used here to insure that the minimum negative-going threshold voltage ($V_T < 0.6V$) of the second gate is reached, turning off the buzzer. The Schmitt-trigger was chosen for its high positive-going threshold, enabling a less critical circuit design than would be possible using standard TTL.

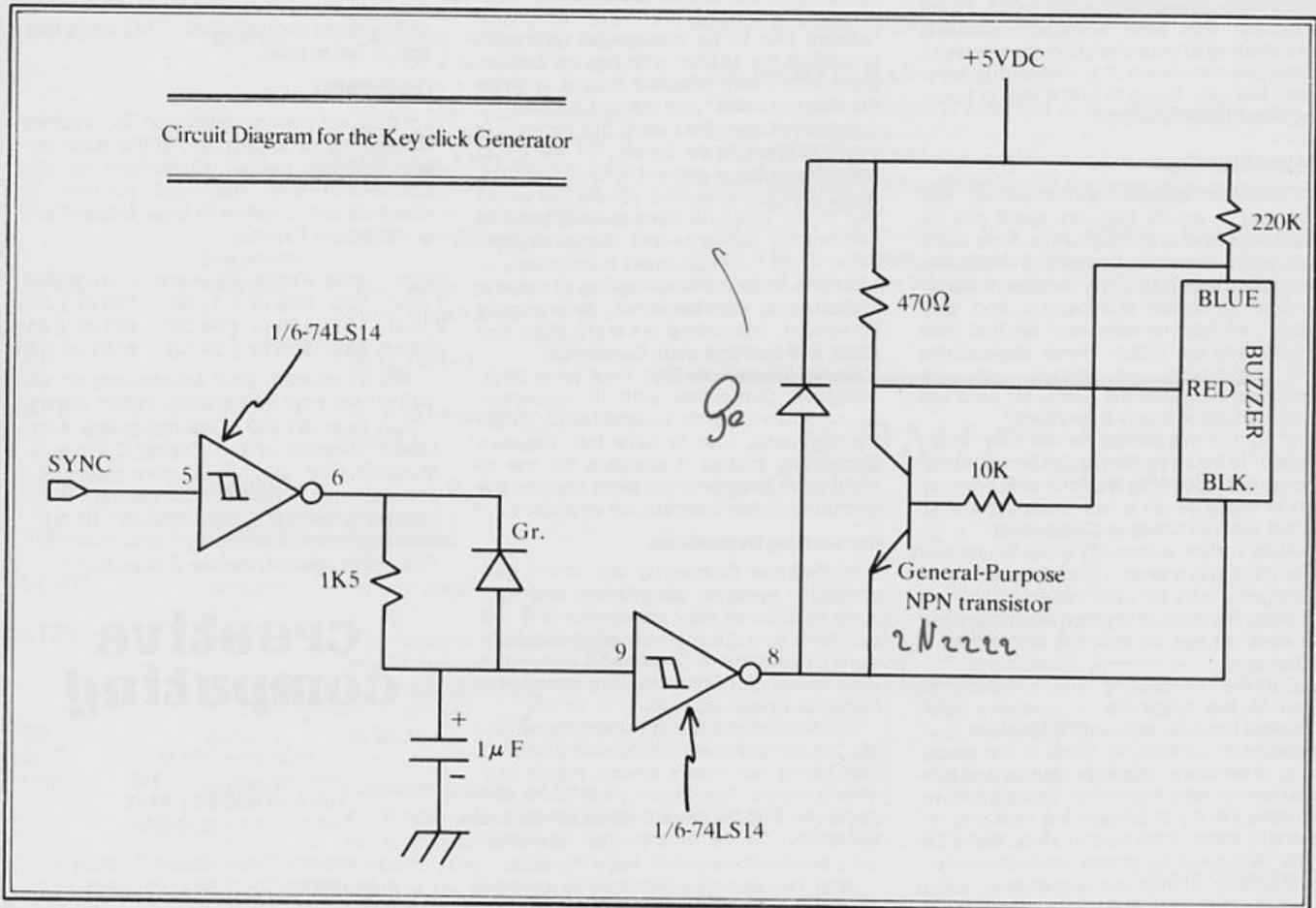
The buzzer (a piezoelectric job from Radio Shack #273-064) drive circuit is taken directly from the blister pack except for the diode added to PIN 8 to clamp positive oscillations to the five volt rail.

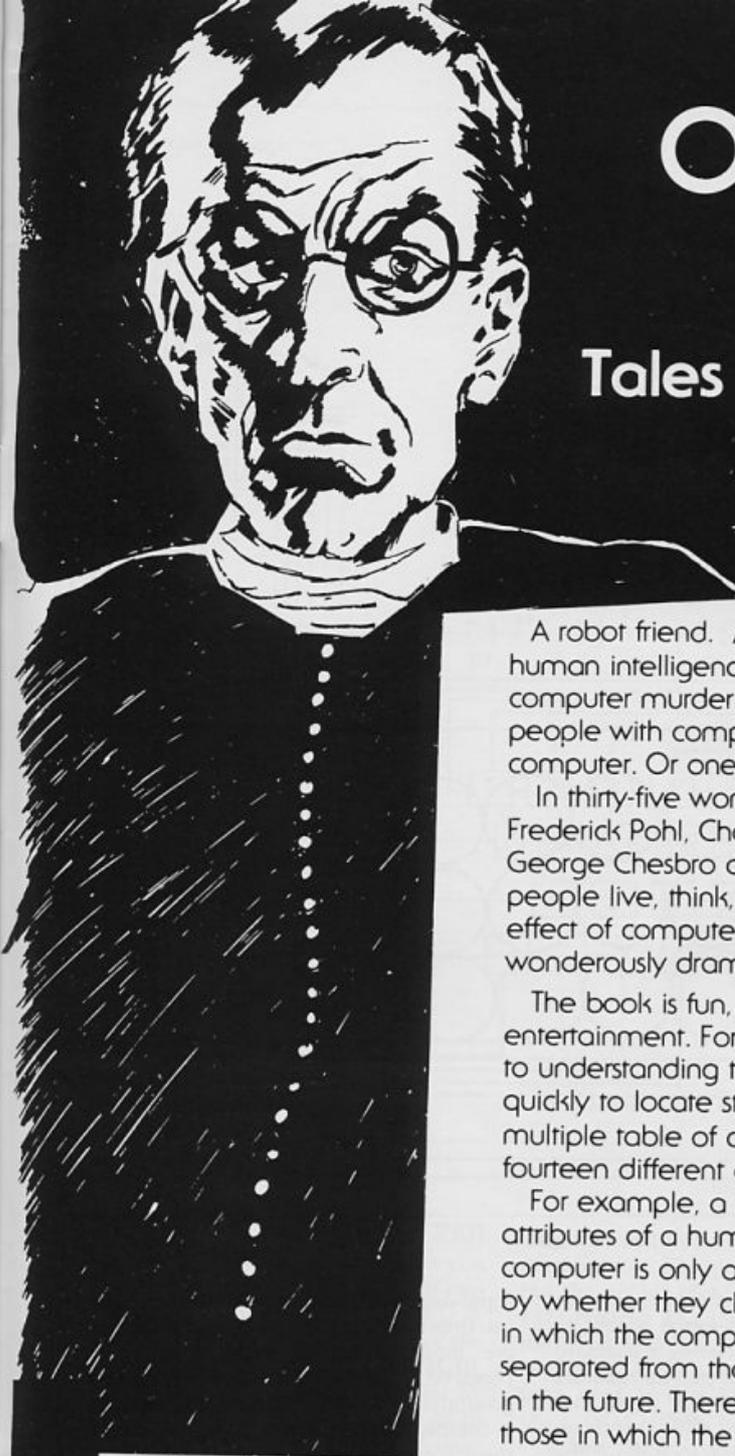
A 74LS121 one-shot could be used instead of the 74LS14 to eliminate the steady tone during processing, but I prefer having the sound as an indication of processing activity.

The Schmitt-trigger was "piggy-backed" on IC 19, picking up power and the common (PIN 5) SYNC signal with a dab of solder. I used that "double sided stick 'em stuff" intended for wall hangings to mount the buzzer across two other IC's. The balance of the circuit was "sky-wired" and the entire modification was neatly fitted within the standard ZX80 case, so as not to obtrude in an obvious manner. A bit of insulating tape may be needed on the inside of the cover to prevent shorts.

The audio feedback has made life with the ZX80 passive keyboard enjoyable and has freed my attention to concentrate on what—as opposed to how—I am typing. □

Matthew J. Johnson, 92 Devir St., Malden, MA 02148.





Only Fiction . . . or is it?

Tales of the Marvelous Machine: 35 Stories of Computing

A robot friend. A computer God. Artificial intelligence challenging human intelligence in a life and death struggle. A detective solving a computer murder. Computers tricking people or people tricking people with computers. A computer with a soul. Or power. A lonely computer. Or one in love with its operator.

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The book is fun, and will provide wonderful hours of entertainment. For the reader interested in a structured approach to understanding the potential roles of the computer, or wanting quickly to locate stories that support or challenge his viewpoint, a multiple table of contents is provided. This lists the stories in fourteen different categories.

For example, a list of stories in which the computer takes on the attributes of a human separates them from those in which the computer is only an intelligent machine. The stories are categorized by whether they clarify, improve, or worsen the human lot. Stories in which the computers have capabilities available today are separated from those in which the capabilities could be available in the future. There is a listing of the wildly whimsical stories and those in which the computer is utilized in a unique fashion.

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creative computing press

The ZX80 Keyboard

James H. Parsons

The ZX80's keyboard is of the simple membrane type which is matrix scanned to read a key. The principle behind a membrane keyboard is relatively simple and is illustrated below in Figure 1. The base layer is a printed circuit board which has a matrix of circular contacts, like those shown in Figure 2, laid out in a grid. Each contact has two traces running from it.

The top layer of the system is the flexible keyboard template. Located above each contact on the base layer is a small, circular contact. When a key is pressed, the contact on the bottom side of the template presses down on its respective keyboard contact, creating a conductive path, and thus closing the switch.

The process by which a key closure is located is called *matrix scanning*, and it works as follows. As you will note by looking at the schematic diagram of the keyboard in Figure 3, the rows of the keyboard are connected to the anodes of a group of diodes. The cathodes of the diodes are connected to the higher eight address lines. The columns of the keyboard are connected to the inputs of IC10, a 74LS365 tri-state bus driver. The diodes are used to inhibit sinking of the address lines by the pull-up resistors (R13-R17). The resistors are used just on good design principle and do not make any major functional difference in the machine; in fact, the system works without them.

To scan for a key, sequence through each address line, setting it low and all other high. Read the column data from IC10. When an address line is low, its respective diode will allow a logic 0 to pass through; when an address line is high, its respective diode will create an output similar to that of a tri-stated output.

James H. Parsons, 1921 Flintlock Terrace West, Colorado Springs, CO 80918.

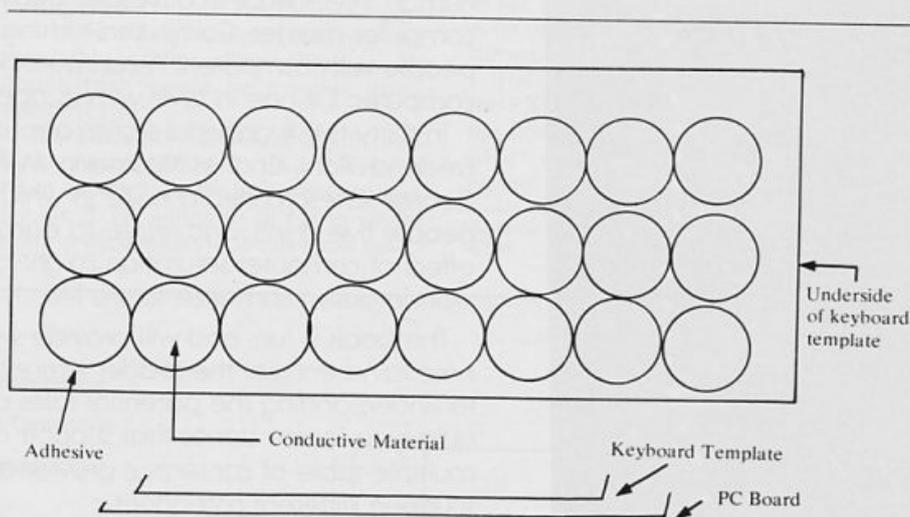


Figure 1.

When a key closure is made, either a low signal or a tri-state signal is sent to the input of IC10. IC10, being a standard 74LSxx gate, has internal pull-up resistors on its inputs. A tri-state type signal presented as input to IC10 will, therefore, allow the pull-up resistor to pull-up the

input line and turn the input transistor on, thus causing a logic 1 to be the effective input. When a logic 0 input is received, the input line becomes grounded, and the internal input pull-up is disabled, thus causing a logic 0 to be the effective input.

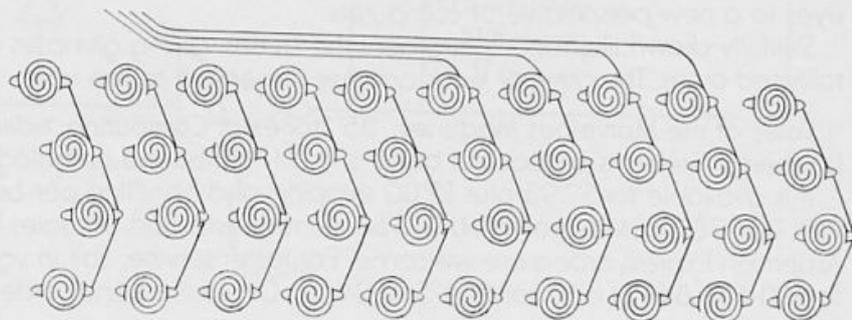


Figure 2.

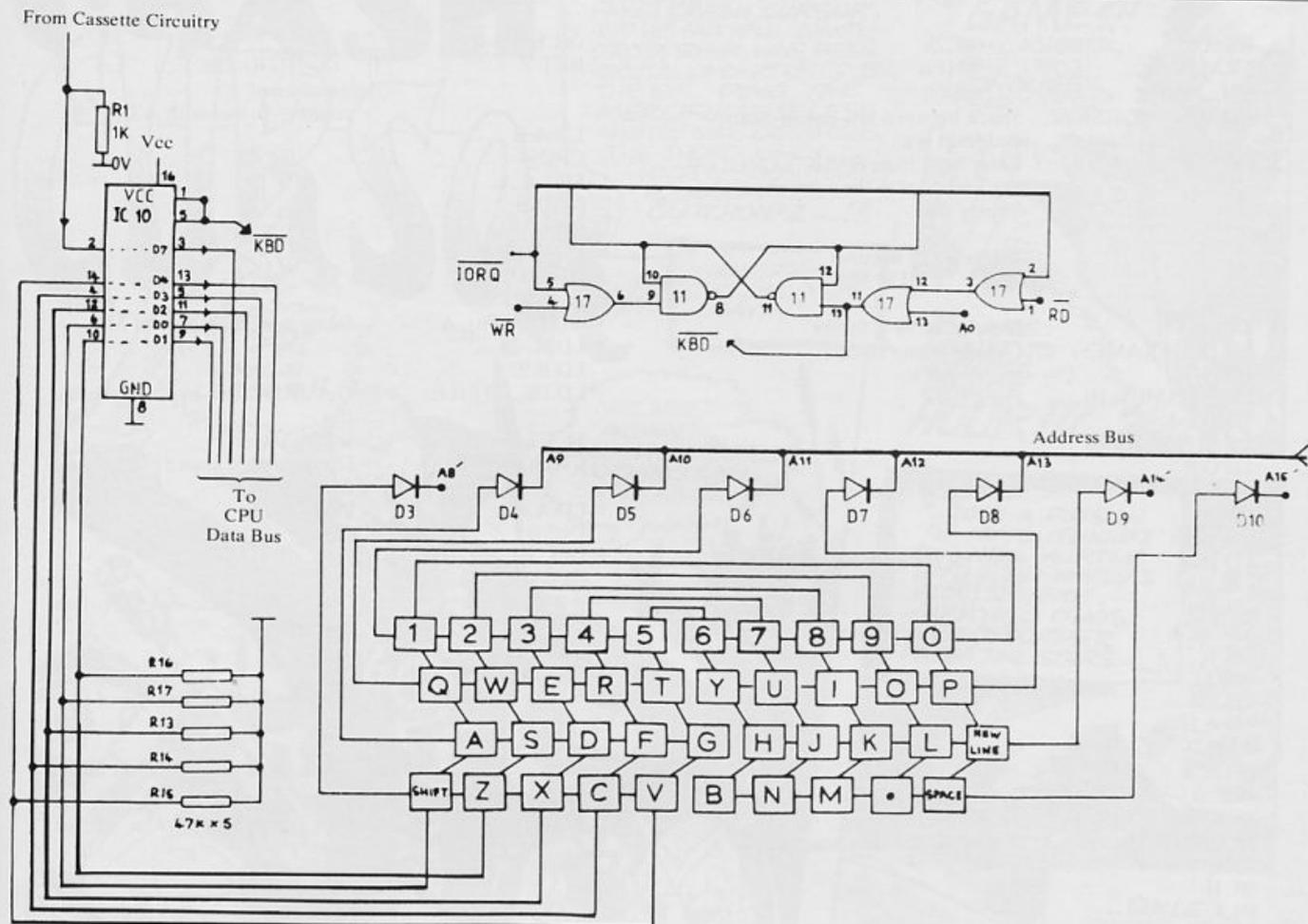


Figure 3.

IC10 is enabled when the signal $\overline{\text{KBD}}$ (see Figure 3) is active (i.e., low). As you will note, the signal is derived from two OR gates. Logically, the signal is $\overline{\text{KBD}} = \text{A0} + \overline{\text{RD}} + \overline{\text{IORQ}}$. Essentially, all of the three inputs must be low to enable IC10. This means that an I/O read (a Z80 IN instruction) is being done from any even address (i.e., any address with $\text{A0} = 0$).

During an I/O request ($\overline{\text{IORQ}}=0$), the contents of the A register are placed on the higher eight bits of the address bus. During a keyboard read, the higher eight bits of the address are referred to as the keyboard mask. Executing an IN A, FEh instruction will output the keyboard mask and then read the value of IC10 into the A register. (NB FEh is not the only possible port address; any even value will work.)

A simple routine to test for the BREAK key is shown below:

```
LD A,7Fh
IN A,(FEh)
RRA
JR NC,BRKPRS
```

The first instruction loads the keyboard mask into A. This particular mask has all but the ms bit of A (bit 7) set (i.e., 0111 1111 binary). The IN instruction puts out the mask and reads a column from the keyboard. With a mask of 7Fh, the column read is BREAK, EDIT, P, RUB-OUT, NOT, NEW, LIST, SHIFT.

When the IN terminates, if no keys were hit, all of the keyboard bits (i.e., d0-d4 of A) will be set. If a key is pressed, then its corresponding bit in A will be a logic 0, provided it was in the selected column. After the IN instruction, the data for the BREAK key will, therefore, reside in bit 0 of A.

The RRA instruction rotates the contents of register A one bit to the right. Bit 7 comes from the data in the carry flag. The carry flag is set to the data in bit 0 position of A (i.e., the data for the BREAK key). Now the carry flag will contain a 0 if BREAK was pressed; otherwise it will hold a 1. The next instruction, if the carry flag is clear, will jump to BRKPRS.

The keyboard and display subroutine scans the keyboard to see if a key was pressed; if not, it passes a frame to the display and loops back to the keyboard scan section. If a key is pressed, then the routine will return to its caller. This routine is shown in Listing 1.

To use the routine, execute a CALL 13Ch instruction. It will return a value in the BC register pair, which corresponds to the keyboard mask and column input for the key pressed. Bits 5, 6, and 7 will be set to ones by the OR 0E0h instruction at 55h. Bit 0 of B will be zero if SHIFT was pressed; otherwise it will be a 1. C will hold the keyboard mask. For example, if the Z key is pressed, B will hold F7h (i.e., 1111 0111) and C will hold FEh (i.e., 1111 1110).

Listing 2 shows a method for obtaining a ZX80 character in A. The subroutine FILLDF assures that there are enough NewLines in the display file.

I hope that this article has provided some insight into the workings of the ZX80 keyboard. □

Listing 1.

```

RESULT: EQU 4022h
FRAMES: EQU 401Eh
CH_ADD: EQU 4026h
LOOP: Call Show: Space between last line of chars
and fram sync
DISP: : Enter here from BASIC to get a
: key and display the current
: display file
:
: Address 319 decimal
: 13F hex
LD B.8
15 DJNZ 5 : Blow away 99 T-States
LD HL, (FRAMES) : Get old frame counter
INC HL : Increment it
LD (FRAMES),HL : Put it back
LD HL,-1
LD B,0FEh
LD C,B
IN A,(C) : Start frame sync
OR I
55 OR 0E0h
LD D,A : Zero bit for each key pressed
CPL : Flip bits
CP I
SBC A,A : 0 if any key pressed, else FFh
OR B
AND L
LD L,A
LD A,H
AND D
LD H,A
RLC B : Rotate mask left
IN A,(C)
JR C,55 : IF 0 in mask hasn't reach carry
RRA
RL H
RLA
RLA
SBC A,A
AND 24: 0 if US, 24 if UK
ADD A,32
LD (RESULT+1),A : 32 if US, 56 if UK
: no L has a 0 for each row in
: which a key, other than SHIFT,
: was pressed; H similarly for
: columns in d1-d5, d6-d7 are
: ones, d0=0, if SHIFT pressed,
: else d0=1
: 717 T-States since start of frame
: sync, 545 before end
LD BC, (CH_ADD) : Pick up last times key hits, or a
: value with
: d15d14=01 if first time around
LD (CH_ADD), HL
LD A,B
ADD A,2 : Now either carry is clear and BC
: indicates a key was pressed
: or carry is set and BC=FFFFh
: or FEFFh.
: N.B. Neither 0000h nor FF00h is a
: possible value for HL, since d6
: d7 are set and, if all of d1 to d5
: of H
: L=-1
: HL:=0 if HL=BC and C=FFH
SBC HL,BC
EX DE,HL
LD HL, RESULT
LD A, (HL)
OR D
OR E
RET Z
If (X_PTR)=BC, a key is
depressed and
: count = 0, exit with A.D.E=0
LD A,B
CP 254
SBC A,A.
AND B
RRA
LD (HL), A
DEC B
25: DJNZ 25
OUT (0FFh), A : frame sync ends at next M1
LD A,-20
LD B,25
LD HL, (D_FILE) : Get HL= first byte of display
: file
SET 7,H : Insure Interrupt
CALL SHOW : Display space above picture and
: 24
: lines of text
LD A,-13
INC B
DEC HL
DEC (IY + RESULT
+I-Y) : One less line below picture than
: above
JR LOOP
SHOW: LD C, (IY+RESULT
+I-Y) : #picture lines in first line of text
(31)
LD R,A
LD A,-35 : Value for R in subsequent lines
EI
JP (HL) : Will return to caller at end of
: picture

```

Listing 2.

```

KB_TAB: EQU 06Ch
FILLDF: EQU 05C2h
DISP: EQU 013Fh
KWLOW: EQU 0E6h
GETKEY: Call FILLDP : Fill display file w/reqd N/Ls
Call DISP
SRA B
SBC A,A
OR 38
LD L,5
SUB L
51: ADD A,L
SCF
RR C
JR C,51
INC C
JR NZ,GETKEY : If more than one bit set
LD HL,KB_TAB-1
LD E,A
ADD HL,DE
LD A, (HL)
JR,Z,52
ADD A,0C0h : Here if in KW state: i.e.. convert
: from
: letter to keyword
CP KWLOW
JR N,C,52
LD A, (HL)
52: RET : Here with char in A

```

CRASH CURSOR

THAT'S RIGHT, ADVENTURE-FANS! CRASH CURSOR, AND HIS FAITHFUL COMPLI-DROID, SYNK, HAVE BEEN BRUTALLY CAPTURED BY THE EVIL DING THE MERCIFULNESSLESS, AND HIS MAD CREATIONS, THE THOROLIGHTLY NASTY, SOON-TO-BE-HOUSEBROKEN-- GLITCHOIDZ...!!

...MORE THAN THAT, WE AINT SAYIN'...!

MY GAME?!!

WHY, AS EVER, ONE OF CONQUEST, DEAR DROID!

YOU ARE ABOUT TO WITNESS MY FINEST HOUR!!!

SO! CRASH CURSOR!!

WE MEET AGAIN! ONLY THIS TIME, NOTHING CAN SAVE YOU!!

...SOON A DIVISION OF MY 'GLITCHOIDZ' (TM) WILL HURTLE INTO YOUR WORLD'S ATMOSPHERE, CARRYING CHAOS AND DISORDER FROM THE STARS ...!

...ONCE THERE, THEY WILL CARRY OUT MY MOST RUTHLESS SCHEME TO DATE...!

...MICRO-MINIATURIZED, MY LEGIONS WILL INFILTRATE THE COMPLEX CIRCUITRY OF EVERY COMPUTER-SYSTEM ON EARTH, WREAKING HAVOK WHERE-EVER THEY CAN...!!

WATCH THAT SPEAR, SHORTY! I'M NOT PROGRAMED TO BE A PIN-CUSHION!!! WHAT'S YOUR GAME, DING?!

UH--
--I COULDN'T INTEREST YOU IN A LITTLE CASH, COULD I, DING, OL' BOY...?



SOON, THEY DESCEND...!!!
RIPPING, GNASHING, KNOSHING,
RENDING, TEARING, AND GENERALLY
DOING UNFRIENDLY STUFF TO
THE INNARDS OF ALL EARTH'S
PRECIOUS DATA RETRIEVAL
SYSTEMS !!!

MY GLITCHOIDZ
WILL TOTALLY
SABATOGUE YOUR
EARTH'S COMPUTER-
GUTTED FACE!

YES... THEY WILL
STRIKE AT EVERY
LEVEL...!

GOOTCH!

GNR.

WHERE'S THE
CURSOR? WHERE'S
THE READOUT?

...THINK OF IT! COMPUTER
GAMESTERS WILL LURCH,
DUMBFOUNDED, FROM
THEIR FAVORITE ROUNDS
OF 'SUPER INVADERS'
AND 'ADVENTURE' ... !!!

...AIR TRAFFIC WILL FALL,
UNGUIDED, FROM THE SKY...



DURN.



MA-J

"CORPORATE EMPIRES
WILL CRUMBLE OVER-
NIGHT, UNABLE TO
MAKE DECISIONS OR
JUGGLE BUDGETS...!"

I'M OUT
OF MEMORY!

EARTH WILL BE IN A
PANIC! NO ONE
WILL BE ABLE TO CASH
A CHECK! CREDIT-
CARDS WILL BE USE-
LESS! LIBRARY-CARDS
WILL BE REVOKED!
'READERS DIGEST'
WILL HAVE 2,000,000
WINNERS! YES! THE
SUPREME CHAOS! THE
ULTIMATE PANDEMONIUM!
BEDLAM ON EARTH!!!
COMPUTER-RAGE
IS HERE!!!!

MY TAPE WON'T LOAD!

MY
PROGRAM
CRASHED!

GEORGE! YA
SCREWED UP!!

YOOTZ!

"AND IN THE END,
ONLY I WILL
REIGN SUPREME..."

OH, THINK KYEW!
THINK KYEW! IT WUZ
NUTHIN'! RILLY...!

YAY,
DING

WHAR'Z
BISSON?

GOOD GO
DINGO!

YAY

"... DING! DING THE
MERCIFULNESSLESS!
MASTER OF EVIL. LORD
OF MEN. BINDER OF
DAEMONS. ETC. ETC. ETC..."

JORDACHE

BUT, SUDDENLY...



NO! THE COMPLI-DROID HAS FREED HIS OAFISH MASTER! THEY'VE BURST THEIR BONDS!
STOP THEM! NOW!

WHAT HO...!

NO SPEECHES! JUST DO YOUR VIOLENCE-THING!



FREE AT LAST! FREE TO DISPELL THESE NOISEY, RATHER UNHYGENIC LOUTS AND MAKE GOOD A THOROUGHLY HEROIC, IF HASTY, ESCAPE!

IF THAT MEANS WE'RE LEAVING, THEN I'M ALL FOR IT!

AWK!

BUT, ALAS...



... I COULD HAVE BEEN ANYTHING...!

...A SERVODROID TO THE EMPEROR!... A SIMPLE DATA-STORAGE COMPUTER!... A TOASTER!... A WASHER-AND-DRYER-COMBO!... ANYTHING!! HA!!

BUT NO-0000! I HAD TO GET HOOKED UP WITH AN ALLEGED SPACE-ADVENTURER WHO DOESN'T KNOW VENUS FROM DE MILO!

OH, BE STILL. AT LEAST WE'RE WARM, AND DRY...

... AND FAR, FAR FROM THE AWFUL, MATRIMONIAL CLUTCHES OF THAT SIRENESQUE FLOOZY ON PSORIOSIS IX...!



WANT SIRENESQUE FLOOZY?!!

WELL, GUESS AGAIN, YA OVER-PADDED BIG HAIRBAG FULL OF INDUSTRIAL WASTE !!!

NO, IT COULDN'T BE...



OH, BUT IT IS, CRASHY CURSOR! ...AND YOUR TROUBLES HAVE JUST BEGUN!



NEXT: THRILLS! SPILLS! CHILLS! FRILLS! MATRIMONY?
AS: **SYNK** **PREVAILS!!!**
BE THERE! ALOHA...

Resources for the ZX80 and MicroAce

We welcome entries from manufacturers and readers for the resources column. Please include the name of the item, a brief description, price, and complete data on how to obtain it. Send contributions to SYNC Resources, 39 East Hanover Avenue, Morris Plains, New Jersey 07950.

Software

- Moving graphics games
Super ZX80 Invasion (1K and 2K) and *Double Breakout*, Cassettes, \$14.95 each plus \$1.50 shipping. Check or money order to:
SOFTSYNC, INC.
P.O. Box 480
Murray Hill Station
New York, NY 10156
- Games and educational software. Hardware and technical information in the near future.
TENSOR TECHNOLOGY
4 Morning Dove
Irvine, CA 92714
- ZXBUG (1½K)
A machine code degugging program; useful for programming in machine code. An annotated disassembled listing of the 4K Basic. Much more software.
Artic Computing
396 James Reckett Avenue
Hull HU8 OHA
England
- 1K games:
Adventure Cassette (*Dragonslayer*; *Lunar Landing*; graphics)
Vegas Cassette (*Black Jack*, *Slots*)
\$6.95 per cassette (postage included); check or money order only.
J. Schwitalla
1235 Pickwick Place
Flint, MI 48507

- Games, subroutines, and teaching aids in Basic and Machine Code. SASE for complete list.
Zeta Software
P.O. Box 3522
Greenville, SC 29608
- 7 Games for the ZX80 and MicroAce (one cassette)
\$11 from:
New England Software
Box 691
Hyannis, MA 02601
- ZX80 Software on cassette. Games, educational, programming course.
Bug-Byte
251 Henley Road
Conventry CV2 1BX

Users Groups*

- Educational ZX80/1 Users' Group
Highgate School
Birmingham B12 9DS
U.K.
(Publishes a newsletter)
- ZX80 Amateur Radio Users' Group (for licensed amateur radio operators)
c/o K2MI, Martin H. Irons
46 Magic Circle Drive
Goshen, NY 10924
- National ZX80 Users Club
Membership free; publishes *Interface* magazine; send large, stamped, addressed envelope plus one 10p stamp to:
National ZX80 Users Club
44-46 Earls Court Road
London, W8 6EJ
England

Hardware

- Super Isolator, Model ISO-11
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\$94.95. Call (617) 655-1532
Electronic Specialists, Inc.
171 S. Main St.
Natick, MA 01760
- 16K-Byte RAM for massive add-on memory.
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8K Basic ROM (replacement chip for ZX80).
\$39.95 + \$4 shipping.
Phone orders (Visa, Master Card):
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Mail orders:
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1 Sinclair Plaza
Nashua, NH 03061
- Keyboard beeper, \$12
Burnett Electronics
908 Morris St.
Cincinnati, OH 45206
- 55 Key keyboards for the ZX80 or MicroAce.
Complete plans for \$5; keyboard \$14.95. Complete kit (keyboard, parts, etc.): \$29.95.
Schultz Systems
1026 Ferdinand
San Antonio, TX 78245

*The Sinclair ZX80 is innovative and powerful.
Now there's a magazine to help you get
the most out of it.*

Get in sync



SYNC magazine is different from other personal computing magazines. Not just different because it is about a unique computer, the Sinclair ZX80 (and kit version, the MicroAce). But different because of the creative and innovative philosophy of the editors.

A Fascinating Computer

The ZX80 doesn't have memory mapped video. Thus the screen goes blank when a key is pressed. To some reviewers this is a disadvantage. To our editors this is a challenge. One suggested that games could be written to take advantage of the screen blanking. For example, how about a game where characters and graphic symbols move around the screen while it is blanked? The object would be to crack the secret code governing the movements. Voila! A new game like Mastermind or Black Box uniquely for the ZX80.

We made some interesting discoveries soon after setting up the machine. For instance, the CHR\$ function is not limited to a value between 0 and 255, but cycles repeatedly through the code. CHR\$(9) and CHR\$(265) will produce identical values. In other words, CHR\$ operates in a MOD 256 fashion. We found that the "=" sign can be used several times on a single line, allowing the logical evaluation of variables. In the Sinclair, LET X=Y=Z=W is a valid expression.

Or consider the TL\$ function which strips a string of its initial character. At first, we wondered what practical value it had. Then someone suggested it would be perfect for removing the dollar sign from numerical inputs.

Breakthroughs? Hardly. But indicative of the hints and kinds you'll find in every issue of SYNC. We intend to take the Sinclair to its limits and then push beyond, finding new tricks and tips, new applications, new ways to do what couldn't be done before. SYNC functions on many levels, with tutorials for the beginner and concepts that will keep the pros coming back for more. We'll show you how to duplicate commands available in other Basics. And, perhaps, how

to do things that can't be done on other machines.

Many computer applications require that data be sorted. But did you realize there are over ten fundamentally different sorting algorithms? Many people settle for a simple bubble sort perhaps because it's described in so many programming manuals or because they've seen it in another program. However, sort routines such as heapsort or Shell-Metzner are over 100 times as fast as a bubble sort and may actually use less memory. Sure, 1K of memory isn't a lot to work with, but it can be stretched much further by using innovative, clever coding. You'll find this type of help in SYNC.

Lots of Games and Applications

Applications and software are the meat of SYNC. We recognize that along with useful, pragmatic applications, like financial analysis and graphing, you'll want games that are fun and challenging. In the charter issue of SYNC you'll find several games. Acey Ducey is a card game in which the dealer (the computer) deals two cards face up. You then have an option to bet depending upon whether you feel the next card dealt will have a value between the first two.

In Hurtle, another game in the charter issue, you have to find a happy little Hurtle who is hiding on a 10 X 10 grid. In response to your guesses, the Hurtle sends out a clue telling you in which direction to look next.

One of the most ancient forms of arithmetical puzzle is called a "boomerang." The oldest recorded example is that set down by Nicomachus in his *Arithmetica* around 100 A.D. You'll find a computer version of this puzzle in SYNC.

Hard-Hitting, Objective Evaluations

By selecting the ZX80 or MicroAce as your personal computer you've shown that you are an astute buyer looking for good performance, an innovative design and economical price. However, selecting software will not be easy. That's where SYNC comes in. SYNC evaluates software packages and other peripherals

and doesn't just publish manufacturer descriptions. We put each package through its paces and give you an in-depth, objective report of its strengths and weaknesses.

SYNC is a Creative Computing publication. Creative Computing is the number 1 magazine of software and applications with nearly 100,000 circulation. The two most popular computer games books in the world, *Basic Computer Games* and *More Basic Computer Games* (combined sales over 500,000) are published by Creative Computing. Creative Computing Software manufactures over 150 software packages for six different personal computers.

Creative Computing, founded in 1974 by David Ahl, is a well-established firm committed to the future of personal computing. We expect the Sinclair ZX80 to be a highly successful computer and correspondingly, SYNC to be a respected and successful magazine.

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Subscriptions in the UK are mailed by air and cost £10 for one year, £18 for two years or £25 for three years. Send order and payment to the UK address below.

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Needless to say, we can't fill up all the pages without your help. So send in your programs, articles, hints and tips. Remember, illustrations and screen photos make a piece much more interesting. Send in your reviews of peripherals and software too—but be warned: reviews must be in-depth and objective. We want you to respect what you read on the pages of SYNC so be honest and forthright in the material you send us. Of course we pay for contributions—just don't expect to retire on it.

The exploration has begun. Join us.

The magazine for Sinclair ZX80 users

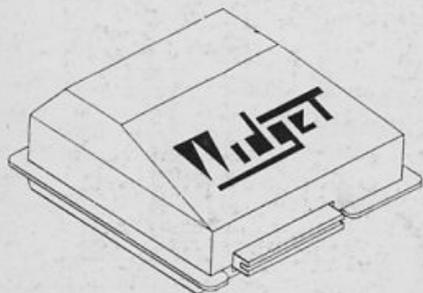
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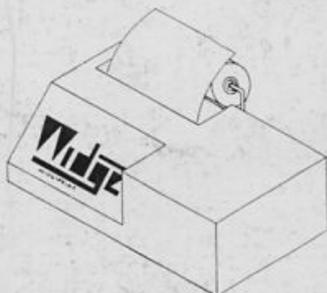
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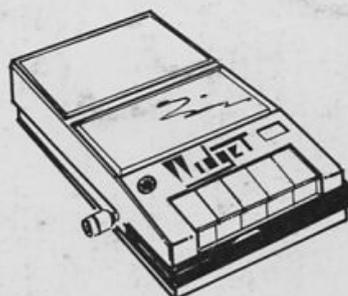
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