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T R S - 8 0 U S E R S G R O U P
N E W S L E T T E R

SEPTEMBER 1978 FAYETTEVILLE, NC VOLUME 1, NUMBER 8

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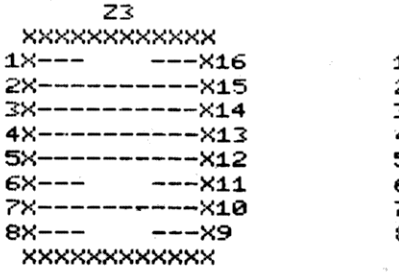
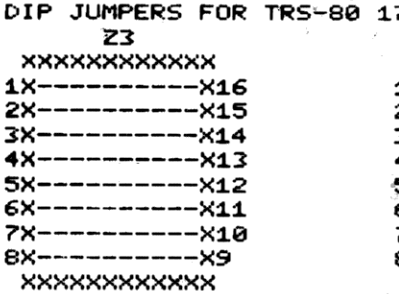
DIP JUMPERS FOR TRS-80 1700069D BOARDS LEVEL I



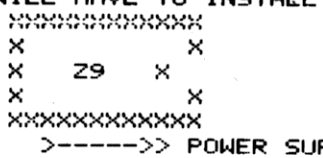
DIP JUMPERS FOR TRS-80 1700069D BOARDS LEVEL II



NO CHANGE IN JUMPERS FOR THE EXPANSION INTERFACE

16K'S OR 32K'S RAM CHIPS FOR THE EXPANSION INTERFACE

IF YOU ARE GOING TO PUT 16K'S IN YOUR INTERFACE
YOU WILL HAVE TO INSTALL THE CHIPS IN Z9 THRU Z16.



THERE ARE 4 WIRES (YELLOW, GREEN, ORANGE, & RED)
COMING FROM THE LEVEL II ROM ADAPTOR. IF THESE
WIRES ARE PRESSED AGAINST THE BOARD ONE OF THE
SHARP PINS COULD SHORT-OUT ONE OF THE 4 WIRES.
BEFORE YOU PUT YOUR KEYBOARD UNIT BACK TOGETHER
CHECK TO MAKE SURE THIS IS OK.

The Evolution of "Life"

Conway's game of "Life" has long been of interest to me, but until I recently received my TRS-80 with Level II BASIC, I had no means of displaying its patterns. I quickly translated Gene Perkins' "Life" program (TRS-80 Users Group Newsletter, Vol. 1, No. 3, pp. 12-14) for Level II BASIC and was very pleased with its display. The slow operation did bother me (55 seconds per generation for a 20 x 20 field). Changing to integer variables only reduced the time to 48 seconds.

Apparently a different approach was needed. Since I had 16 K of memory, I could afford to put an array representing the whole field into the program, and then invert the updating logic. The array update routine now does nothing until it finds a live cell on the screen; then it adds "1" to each of the eight array positions representing the surrounding cells. When the entire array has been updated, its contents are quickly transferred to the screen. This reduced the time per generation for a 20 x 20 field to about 25 seconds, still too slow. It did have the advantage of showing a stationary pattern most of the time, with brief updating periods.

The next improvement was to update only the active area of the field; it is really necessary to check only the area that already has live cells, plus one row or column in each direction. That was the jackpot! Now a small, moving figure such as a "glider" requires only about 3 seconds per generation, even on a full sized field that would have required over 5 min. per generation using my first translation.

The program is now fast enough for small figures (in my opinion), but still slows down too much if the patterns expand. Does anyone have any further ideas? Perhaps a machine language "Life" program?

The final program has a few operational changes from Gene Perkins' version:

1. Only Conway's rules of "Life" are followed: Each cell is surrounded by eight neighbor cells in a checkerboard pattern. Each generation is determined by the preceeding generation:
   a) Any live cell with 2 or 3 neighbors stays alive.
   b) Any empty cell with 3 neighbors gives birth.
   c) All other cells die, from either overcrowding or isolation.
2. The maximum field size has been expanded slightly to 62 x 40.
3. The initial "seed" cell is placed in the center of the field.
4. U, D, R, and L are used for moving the "seed" cell up, down, right, or left, respectively. S sets a live cell, and E ends the seeding routine. Note that it is necessary only to touch the appropriate key to cause action to be taken; it is not necessary to press ENTER.
5. Due to the memory required by the array, I estimate that a 4 K TRS-80 would have a maximum field size of 16 x 16 using this program, or a differently shaped field of the same area.

The patterns that develop from simple symmetric figures are especially interesting, as are the interactions between moving figures such as "gliders" and "spaceships". Here's to "Life"!

Glider

Spaceship

Delmer D. Hinrichs
2116 S. E. 377th Ave.
Washougal, Washington 98671

```
10 CLS : PRINTTAB(10) "* * *  CONWAY'S GAME OF 'LIFE'  * * *"
15   '   - -  BY D. D. HINRICHS FOR TRS-80 LEVEL II BASIC  - -
20 DEFINT A - Y : O = 0 : P = 1 : Q = 2 : PRINT
30 INPUT "UNIVERSE WIDTH (9 TO 62)" ; W
40 INPUT "UNIVERSE HEIGHT (9 TO 40)" ; H
50 IF W < 9 THEN W = 9
60 IF W > 62 THEN W = 62
70 IF H < 9 THEN H = 9
80 IF H > 40 THEN H = 40
90 DIM A(W+1, H+1) : CLS
100 PRINT "U = UP,  D = DOWN,  R = RIGHT,  L = LEFT,  S = SET,  E = END"
105   '   - - - -  DRAW BORDER  - - - -
110 FOR I = 0 TO W+W+3 : SET(I, 6) : SET(I, H+7) : NEXT I
120 FOR Y = 7 TO H+6 : SET(0, Y) : SET(P, Y)
130 SET(W+W+Q, Y) : SET(W+W+3, Y) : NEXT Y
140   '   - - - -  INPUT 'LIVE' CELLS  - - - -
145 X = W/2 :Y = H/2 + 6 :S = 0 :X1 = X :X2 = X :Y1 = Y :Y2 = Y
150 I = X + X : SET(I, Y) : SET(I+P, Y)
160 PRINT@ 65,"NEXT CELL?"; : Z$ = INKEY$ : IF Z$ = "" GOTO 160
170 IF S = 0 THEN RESET(I, Y) : RESET(I+P, Y)
180 S = 0
190 IF Z$ = "U" AND Y > 7 THEN Y = Y - P ELSE 200
195 IF Y < Y1 THEN Y1 = Y : GOTO 150 ELSE 150
200 IF Z$ = "D" AND Y < H+6 THEN Y = Y + P ELSE 210
205 IF Y > Y2 THEN Y2 = Y : GOTO 150 ELSE 150
210 IF Z$ = "R" AND X < W THEN X = X + P ELSE 220
215 IF X > X2 THEN X2 = X : GOTO 150 ELSE 150
220 IF Z$ = "L" AND X > P THEN X = X - P ELSE 230
225 IF X < X1 THEN X1 = X : GOTO 150 ELSE 150
230 IF Z$ = "S" THEN S = P : GOTO 150
240 IF Z$ <> "E" GOTO 160
250   '   - - - -  SET NUMBER OF GENERATIONS  - - - -
260 E = 0 : G = -P : XL = X1 : XH = X2 : YL = Y1 : YH = Y2
270 G=G+P :PRINT@ 0,"GENERATION ";G;"                              "
280 IFG>=E PRINT@ 39,; :INPUT "NO. OF GENERATIONS"; E :GOTO 280
290 PRINT@ 39, "                                  "
300 X1 = W : X2 = P : Y1 = H + 6 : Y2 = 7
310   '   - - - -  CLEAR ARRAY  - - - -
320 FOR X = XL TO XH : FOR Y = YL-6 TO YH-6
330 A(X, Y) = 0
340 NEXT Y : NEXT X
350   '   - - - -  COMPUTE ARRAY VALUES  - - - -
360 FOR X = XL TO XH : I = X + X : A = X - P : B = X + P
370 FOR Y = YL TO YH
380 IF POINT(I, Y) THEN 390 ELSE 490
390 C = Y - 7 : F = Y - 6 : D = Y - 5
400   '   - - - -  SET ACTIVE AREA BOUNDRY  - - - -
410 IF X <= X1 AND X > P THEN X1 = X - P
420 IF X >= X2 AND X < W THEN X2 = X + P
430 IF Y <= Y1 AND Y > 7 THEN Y1 = Y - P
440 IF Y >= Y2 AND Y < H+6 THEN Y2 = Y + P
450   '   - - - -  UPDATE ARRAY  - - - -
460 A(A,C)=A(A,C)+P : A(X,C)=A(X,C)+P : A(B,C)=A(B,C)+P
470 A(A,F)=A(A,F)+P : A(B,F)=A(B,F)+P
480 A(A,D)=A(A,D)+P : A(X,D)=A(X,D)+P : A(B,D)=A(B,D)+P
490 NEXT Y : NEXT X
500 XL = X1 : XH = X2 : YL = Y1 : YH = Y2
510   '   - - - -  UPDATE SCREEN  - - - -
520 FOR X = XL TO XH : I = X + X : K = I + P
530 FOR Y = YL TO YH
540 ON A(X, Y-6) + P GOTO 560,560,570,550,560,560,560,560,560
550 SET(I, Y) : SET(K, Y) : GOTO 570
560 RESET(I, Y) : RESET(K, Y)
570 NEXT Y : NEXT X
580 GOTO 270
```

I've seen no mention in your newsletter about how handy an AM radio is near your keyboard to verify CLOAD and CSAVE action - and for the marvelous sounds that sometimes ensue when programs run!! One fellow out here has developed programs to play MUSIC this way with his TRS-80!
FRED BLECHMAN, 23958 ARCHWOOD ST., CANOGA PARK, CA 91304

```
100  REM * COPYRIGHT FRED BLECHMAN 1978 *
105  CLS
110  PRINT:PRINT"                FORTUNE TELLING PROGRAM"
115  REM * P.M.=739 *
120  PRINT:PRINT"      THE COMPUTER WILL LIST SEVERAL TYPICAL QUESTIONS"
130  PRINT"FOR YOU TO ASK THE 'FORTUNE TELLER'.  YOU MAY CHOOSE TO "
140 PRINT"ASK YOUR OWN QUESTION INSTEAD.  JUST ENTER THE APPROPRIATE"
150  PRINT"NUMBER.....(FOR ENTERTAINMENT PURPOSES ONLY). "
180  PRINT:INPUT"WHEN READY TO START, PRESS ENTER";A$
190  CLS
200  PRINT:INPUT"WHAT IS YOUR NAME";B$
205  INPUT"WHAT MONTH WERE YOU BORN? (MONTH NUMBER)";N
206  N=10*N
207  FORI=1TON:J=RND(32767):NEXTI
210  PRINT:PRINT"   ";B$;", CHOOSE ONE OF THE NUMBERS BELOW:"
220  PRINT:PRINT"(1) SHOULD I MAKE THAT TRIP I'M THINKING ABOUT?"
230  PRINT"(2) IS HE/SHE SERIOUS, OR JUST PLAYING THE FIELD?"
240  PRINT"(3) SHOULD I TELL HIM/HER THE WHOLE TRUTH?"
250  PRINT"(4) SHOULD I ASK MY BOSS FOR A RAISE?"
260  PRINT"(5) WILL I BE RICH AND FAMOUS SOME DAY?"
270  PRINT"(6) IS THE INVESTMENT I'M CONSIDERING A GOOD ONE?"
280  PRINT"(7) SHOULD I ACCEPT HIS/HER INVITATION?"
290  PRINT"(8) SHOULD I GET OUT OF TOWN FAST???"
300  PRINT"(9) IS IT TIME FOR A JOB CHANGE?"
310  PRINT"(10) ASK ANY YES OR NO TYPE OF QUESTION"
320  PRINT:PRINT:PRINT"WHAT NUMBER DO YOU WANT, ";B$;:INPUTA
330  IF A=10 GOTO 560
340  X=RND(10)
345  CLS
350  IF X=1 GOTO400
355  IF X=2 GOTO405
360  IF X=3 GOTO410
365  IF X=4 GOTO415
370  IF X=5 GOTO420
375  IF X=6 GOTO425
380  IF X=7 GOTO430
385  IF X=8 GOTO435
390  IF X=9 GOTO440
395  IF X=10 GOTO445
400  PRINTAT453,"YES, IT APPEARS SO.  BUT BE AWARE THAT":GOTO450
405  PRINTAT453,"CERTAINLY! HOWEVER, ON THE OTHER HAND,":GOTO450
410  PRINTAT453,"NO, IT DOESN'T LOOK LIKE IT, BUT":GOTO450
415  PRINTAT453,"THAT'S FOR SURE! BUT, ON THE OTHER HAND,":GOTO450
420  PRINTAT453,"I'D SAY YOU COULD COUNT ON IT, BUT":GOTO450
425  PRINTAT453,"ARE YOU KIDDING? I'D TELL YOU EXCEPT THAT":GOTO450
430  PRINTAT453,"THE FUTURE IS CLOUDY, ESPECIALLY SINCE":GOTO450
435  PRINTAT453,"HOW SHOULD I KNOW? I'VE GOT PROBLEMS, LIKE":GOTO450
440  PRINTAT453,"HECK, I DON'T KNOW! YOU MUST CONSIDER THAT":GOTO450
445  PRINTAT453,"ACCORDING TO MY CRYSTAL BALL, YES! BUT"
450  Y=RND(10)
460  IF Y=1 GOTO510
465  IF Y=2 GOTO515
470  IF Y=3 GOTO520
475  IF Y=4 GOTO525
480  IF Y=5 GOTO530
485  IF Y=6 GOTO535
490  IF Y=7 GOTO540
```

```
495  IF Y=8 GOTO545
500  IF Y=9 GOTO550
505  IF Y=10 GOTO555
510  PRINT"ALL MY SECRETS ARE IN MY TURBAN - WHICH WAS JUST STOLEN!":GOTO580
515  PRINT"I NEED SOME WINDEX FOR MY CRYSTAL BALL,";B$;"!":GOTO580
520  PRINT"UNDER THIS SLICK GRAY EXTERIOR, I'M ONLY WIRES & STUFF!":GOTO580
525  PRINT"IT WOULD TAKE A $300 PERSONAL SEANCE TO BE SURE!":GOTO580
530  PRINT"MY CRYSTAL BALL IS - LIKE SOME PEOPLE - CRACKED!!":GOTO580
535  PRINT"IN CASE I'M WRONG, REMEMBER WHAT THIS READING COST YOU!":GOTO580
540  PRINT"THAT'S A REALLY DIFFICULT QUESTION,";B$;"!":GOTO580
545  PRINT"MY MAGIC CARPET COULD BE STEERING ME WRONG, ";B$;"!":GOTO580
550  PRINT"THE FUTURE IS REALLY WHAT YOU MAKE OF IT,";B$;"...":GOTO580
555  PRINT"IF YOU DON'T LIKE MY ANSWER OH, FAITHLESS ONE, TRY ASTROLOGY!"
556  GOTO580
560  CLS:PRINT:PRINT:PRINT"TYPE IN QUESTION, THEN HIT 'ENTER'";:INPUTA$
570  GOTO 340
580  FOR D=1 TO 2500:NEXTD:GOTO210
590  END



 96  REM * REM STATEMENTS 96-99 KEEP LIST FROM SCROLLING *
 97  REM
 98  REM
 99  REM
100  REM * COPYRIGHT FRED BLECHMAN 1978 *
101  REM * 23958 ARCHWOOD ST., CANOGA PARK, CA 91307 *
102  REM * P M =2135 *
103  REM * CLOCK SPEED IS SET AT LINE 170 *
110  CLS:PRINT
120  PRINT"                MY $600 DIGITAL CLOCK!"
121  PRINT:PRINT:PRINT"     SET THE HOURS, MINUTES AND SECONDS YOU WANT"
122  PRINT"AS A STARTING TIME, IN EITHER 12 OR 24 HOUR FORMAT...."
123  PRINT:PRINT:INPUT"WHEN READY TO SET STARTING TIME, HIT 'ENTER' ";A$
125  PRINT:H=0:M=0:S=0:F=0:X=0
130  REM * LET H=HOURS, M=MINUTES, S=SECONDS, F=FORMAT *
131  CLS:PRINT:PRINT:PRINT
135  INPUT"12 OR 24 HOUR FORMAT";F
136  IF (F<>12)*(F<>24) PRINT"INVALID ENTRY! TRY AGAIN":GOTO 135
140  INPUT"STARTING HOURS";H
145  IF F=12 THEN IF H=0 PRINT"INVALID ENTRY! TRY AGAIN":GOTO140
146  IF F=12 THEN IF H>12 PRINT"INVALID ENTRY! TRY AGAIN":GOTO140
147  IF H>23 PRINT"INVALID ENTRY! TRY AGAIN":GOTO 140
150  INPUT"STARTING MINUTES";M
155  IF M>59 PRINT"INVALID ENTRY! TRY AGAIN":GOTO 150
160  PRINT:PRINT"THE CLOCK WILL START COUNTING ONE SECOND AFTER THE "
161  PRINT"NEXT ENTRY.  SET AHEAD AND ENTER 1 SECOND BEFORE TIME SET."
164  PRINT:INPUT"STARTING SECONDS";S
165  IF S>59 PRINT"INVALID ENTRY! TRY AGAIN":GOTO 164
166  CLS
167 PRINT:PRINT:PRINT"           MY $600 ";F;"HOUR DIGITAL CLOCK!"
168  PRINTAT 404,"HOURS","MINUTES","SECONDS"
170  FOR X=1 TO 450:NEXT X
175  PRINTAT 468,H,M,S
180  S=S+1
190  IF S=60 THEN M=M+1
200  IF S=60 THEN S=0
210  IF M=60 THEN H=H+1
220  IF M=60 THEN M=0
225  IF H=24 THEN H=0
226  IF F=24 GOTO 250
230  IF H=13 THEN H=1
250  GOTO 170
```

5 August 1978

Dear Gordon:

Thanks for your listing of my "Conway's Game of 'Life'" that I sent to you; looks very nice that way.

Data recording and retrieval on tape has attracted some comments in the newsletter, so the following might save the members some of my mistakes:

For Level II BASIC, the manual says that up to 255 characters per data block can be stored, but is a little vague about the required overhead. By trial and error, I have found the following:

Digits per Number (Including decimal point (1) and exponent (4) if used.)	Maximum Numbers per Block
2	50
3	41
4	35
5	31
6	27
7	25
8	22
9	20
10	19
11	17
12	16
13	15
14	14
15	13
16	13
17	12
18	11
19	11
20	10
21	10

Twenty-one digits per number? Well, that's a double precision number with a decimal point and exponent (i.e., "D-15" or something similar). The numbers are apparently stored on tape as they are printed, so print some of your data to see how many digits per number you have. Note that the packing is exactly the same for integers, single precision, and double precision. Therefore you can write the data onto tape as integers, then read it as single or double precision with no problems. However, in general the reverse cannot be done.

If there is not room for all of the last number, it will be chopped. However, it will still be written, read, and used with no error signal, even though it may be missing some minor detail like an exponent! Watch out!

Since each data block has a leader, the only way to get reasonable data densities on tape is to pack as much as possible into each data block. To do this, I use a program format such as the following:

```
10 NT = (INT(N/32)+1)*32     ' N = No. of observations
20 DIM A(NT)                 ' NT = No. of observations on tape(blocks of 32)

30 PRINT # -1, N             ' Load data into array "A" here
40 FOR I = 1 TO NT/32
50 J = 32*(I-1)
60 PRINT#-1,A(J+1),A(J+2),A(J+3),  . . .  A(J+31),A(J+32)
70 NEXT I
```

Then to read the data from tape, exactly the same format is used, except that the equivalent of statement 30 precedes the equivalents of statements 10 and 20. Note that this format allows for a variable number of observations. The number of observations is recorded on the tape first, so that when the data is later read from tape, the program can automatically adjust for the amount of data to be read.

This requires that your data array be a little longer, to allow for a whole number of data blocks, but this is a small price to pay for faster data reading and writing. One thousand three-digit numbers can be written onto tape, or read from tape in about 4½ minutes, using 32 numbers per block (I could get only 32 variables listed in the "PRINT#-1" statement).

More than 32 variables can be listed in one 255-character statement line by using a buffer array and a variable format of " . . . B(15),B(16), . . ." etc., or still more by using separate variables, " . . . B1,B2, . . C1,C2, " etc., but this complicates the program.

One final note: When entering the "PRINT#-1" statement, leaving no spaces, I could enter only a 30-variable list. "ENTER"ing the list, then returning to it with "EDIT" allowed two more variables (or about 15 characters) to be added. Why? I have no idea!

Does anyone have a better system for storing data on tape? If so, please share it.

Delmer D. Hinrichs
2116 S. E. 377th Ave.
Washougal, Washington 98671

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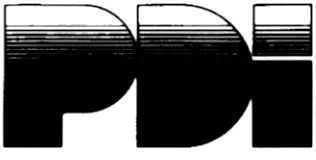

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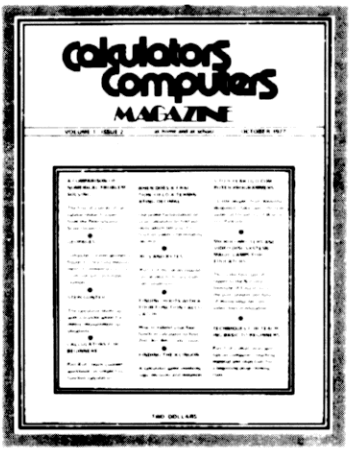

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Dear Mr. Gordon:

I just got my Level II and have discovered a couple of "hitches" --- use them in the bulletin if you want.

Keep up the good work.

PROGRAM WANTED

The May 1977 issue of QST Magazine had an article on a computer program to teach Morse code. I am still waiting for somebody to adapt this to the TRS-80. I bet it would be a good seller --- at least I would like to buy a copy.

LEVEL II TARGET PRACTICE GAME

Pages H5-H6 of the Level II Book give a target practice game. Line 240 of the program is apparently missing and should contain the same information as line 280, namely 240 PRINT@ CA,"*";: GOTO 30.

LEVEL II PRINT @

My Level II PRINT @ instruction would not work properly, giving me a syntax error (SN) when it was executed. My local Radio Shack dealer tried it and it worked fine for him. After some head-scratching, we determined that the problem was in the way that I entered the @ character.

As so many of the special characters require the use of the shift key, I was entering the @ character with the shift key pressed. This prints on the CRT display with the same @ character but apparently the level II program interprets it as a different character, hence the syntax error.

So, do not press the shift key when entering the @ symbol. Even though the CRT display says it is ok, the computer does not.

H.T.(Tom) ORR 249 JUANITA WAY PLACENTIA, CA 92670

```
1 REM THIS PROGRAM IS IN TWO PARTS TO PERMIT FULL INSTRUCTION
2 REM ON THE TRS-80 LEVEL I, 4K UNIT.  IT WILL REQUIRE AS PART
3 REM OF THE PROGRAM TO CLEAR WITH 'NEW' AND TO CLOAD THE ACTUAL
4 REM GAME PROGRAM.
5 CLS
10 PRINTAT15,"<< MERCY MISSION - YEAR 2000 >>"
20 REM*WRITTEN BY JOHN MARLER SAN JOSE,CA*
30 FORI=1TO1000:NEXTI:CLS
40 INPUT"WHAT IS YOUR LAST NAME";A$:CLS
50 FORI=1TO1000:NEXTI:PRINT"WELCOME TO ANOTHER GREAT ADVENTURE OF"
60 PRINT"CAPTAIN ";A$;"--SPACE HERO!":PRINT:PRINT
65 PRINT"CAPTAIN ";A$;" YOU MAY NOW OPEN YOUR ORDERS!"
70 INPUT"PRESS ENTER TO OPEN THE ENVELOPE";B$:CLS
80 PRINT"CAPTAIN ";A$;" ON THIS TRIP YOU ARE GOING TO BE ABLE"
90 PRINT"TO DETERMINE THE FOLLOWING INFORMATION:"
100 PRINT"   1. TOTAL ELAPSED TIME"
110 PRINT"   2. LOCATION BY X AND Y COORDINATES"
120 PRINT"   3. AMOUNT OF FUEL LEFT ONBOARD"
130 PRINT"   4. SPEED OF YOUR SHIP"
140 PRINT"   5. THE ANGLE YOU ARE TRAVELING"
150 PRINT"   6. YOUR DISTANCE FROM THE MINER'S COLONY"
160 PRINT:PRINT:PRINT
170 INPUT"PRESS ENTER TO CONTINUE ORDERS";B$
180 CLS:PRINT"YOU CAN CHANGE YOUR DIRECTION, INCREASE OR DECREASE"
190 PRINT"SPEED BY FIRING TWO TYPES OF ROCKETS;THESE ARE:"
200 PRINT"                M=MAIN ROCKETS"
210 PRINT"                B=BALLAST ROCKETS"
220 PRINT"     'C' WILL BE TO COAST"
230 PRINT:PRINT
240 PRINT"MAIN ROCKETS USE 1 UNIT OF FUEL, BALLAST USE 1/2 UNITS"
250 INPUT"PRESS ENTER TO CONTINUE ORDERS";B$:CLS
260 PRINT"YOU MUST DECIDE HOW MUCH FUEL TO BURN.THEN YOU MUST"
270 PRINT"DECIDE WHAT DIRECTION *TO FIRE YOUR ROCKETS*.  YOU ARE"
280 PRINT"ABLE TO ROTATE YOUR SHIP IN THIS MANNER.DIRECTIONS ARE:"
290 PRINT"          90"
300 PRINT"     135 *** 45"
310 PRINT"   180 ****** 0"
320 PRINT"     225 *** 315"
330 PRINT"          270"
340 INPUT"PRESS ENTER TO CONTINUE ORDERS";B$
350 CLS:PRINT"YOU MUST START TO FIRE IN THE OPPOSITE DIRECTION TO"
360 PRINT"SLOW DOWN PRIOR TO ARRIVAL AT 'ZETA'.  ARRIVAL MANDATES"
370 PRINT"ARE THAT YOU MUST BE WITHIN A DISTANCE OF 1 AND AT A"
380 PRINT"SPEED OF *LESS THAN 1*."
390 PRINT:PRINT
400 INPUT"PRESS ENTER TO GO ON";B$
410 CLS
420 PRINT"MAKE A MAP WITH A 10 BY 10 GRID PATTERN TO ASSIST"
430 PRINT"YOU IN MAKING A SUCCESSFUL TRIP."
440 PRINT:PRINT
450 INPUT"ENTER 1 TO START,2 TO REVIEW INSTRUCTIONS";Z
460 IFZ=2THEN70
470 CLS:PRINT"GOOD LUCK COMMANDER ";A$;"! YOU'LL NEED IT!"
480 FORI=1TO1000:NEXTI
490 CLS:PRINT"ENTER 'NEW' AND THEN 'CL.' TO GO ON"

1 REM NOTE THE USE OF SUBROUTINES FOR SQR(SQUARE ROOT) AND
2 REM ARCTANGENTS
3 REM DIM STATEMENTS CAN BE DERIVED FROM THE VARIBLE LISTING
15 CLS:PRINTAT15,"**** MERCY MISSION - YEAR 2000 ****"
16 FORI=1TO1000:NEXTI:CLS
17 REM CLEAR VARIABLES TO ZERO
18 X=10:Y=10:U=0:V=0:W=0:Z=0
20  F=10:D=98.995:P=3.1416:G=1
22  E=0
```

```
30  T=0
40  O=0: M=1: H=2: C=3
100 PRINT: PRINT"DATA READOUT:"
110  PRINTT;" HOURS"; TAB(32); F; " LITERS"
120 PRINT"LOCATION: "; X; Y; TAB(32); "DISTANCE= "; D
130 PRINTZ; " DEGREES"; TAB(32); "SPEED= "; V
200  J=RND(50)
210  IFJ>=6THEN290
212 PRINT"PROBLEMS:  ";
220  ONJGOTO230,240,250,260,270
230  PRINT"GYROS ANGLE ERROR":G=G+1:GOTO290
240  PRINT"FUEL LINE":F=F-.5:GOTO290
250  PRINT"LIFE SUPPORT":T=T+.05:GOTO290
260 PRINT"ALIENS FREEZE MOVEMENT ": U=0: W=0: Z=0: GOTO290
270  PRINT"METEORS":U=U+RND(0)-.5:W=W+RND(0)-.5
290  IFE<=0THEN300
292  E=E-1:GOTO450
300  INPUT "COMMAND (O, M, H, C) "; R
310 IF R<>1 THEN 320
312  B=1:GOTO350
320 IF R<>2 THEN 330
322  B=2:GOTO350
330 IF R<>3 THEN 450
340  E=5:GOTO450
350  INPUT "ANGLE "; A: A=A+20*G+RND(0)-10*G
360  A=A*P/180
370 J=B: GOSUB 800: L=B
372 GOSUB 700: Q=B: F=F-1/J
380 U=U+(.8+RND(A)*.4)*L/J
390  W=W+(.8+RND(0)*.4)*Q/J
400  IFU<>0THEN420
401  IFW<0THEN410
402  Z=90:GOTO450
410  Z=270:GOTO450
420  Q=A: J=B: A=W/U: GOSUB 1100
422  Z=B*180/3.14159
424  A=Q: B=J
430  Z=INT(Z+RND(10)-1)
440  IFU>=0THEN450
442  Z=Z+180
450  X=X+U:Y=Y+W
460  Q=A:A=U*U+W*W:GOSUB900
530  R=U*U+W*W: GOSUB 900: V=Q
540  R=(X-80)*(X-80)+(Y-80)*(Y-80): GOSUB 900: D=Q
600  IFF>=0THEN610
602  PRINT"OUT OF FUEL":GOTO658
610  IFD>=1THEN620
612  IFV>=1THEN620
614  PRINT"ARRIVED":GOTO630
620  T=T+.1
622  IFT<=10THEN100
630  PRINT"THE TRIP TOOK";T;"HOURS."
640  R=200*T
650  PRINT"YOUR RATING IS";R;"."
658  Y=1: N=0
660 INPUT"PLAY AGAIN";R
670  IF R=1 THEN 10
680  STOP
700  A=A-1.5708
710  GOSUB 800
712  A=A+1.5708
720  RETURN
750  A=ABS(A)
760  GOSUB 800
770  A=-A
```

PLEASE SEND ALL ARTICLES AND PROGRAMS ON TAPE. IF YOU HAVE A HARD COPY THAT IS IN THE 6IN FORMAT YOU MAY SEND IT IN. WHEN YOU MAKE THE TAPE TO SEND IN AN ARTICLE ALL PRINT STATEMENTS MUST BE ' LPRINT '

```
780 RETURN
790  A=A-6.2832
800  IF A<0 THEN 750
802  IF A>2*P THEN 790
810  B=A*A
820  B=1-B*(1-B*(1-B*(1-B*(1-B*(1-B/132)/90)/56)/30)/12)/2
830  RETURN
850  A=A/10
860  GOSUB 900
870  B=B+2.3026
880  RETURN
900 REM Q=SQUARE ROOT(R)
910  Q=0
920  IF R<=0 THEN 970
930  Q=1
940  S=Q
950  Q=(R/S+S)/2
960  IF ABS((R/Q)/Q-1)>= 0001 THEN 940
970 RETURN
1099  REM B=ARCTAN(A)
1100  B=A*A: IF B>=1 THEN 1130
1110  B=A*(1-B*(1/3-B*(.2-B*(1/7-B*(1/9-B*(1/11-B/13))))))
1120  GOTO1160
1130  IF B>1 THEN 1150
1140  B=.78540: GOTO1160
1150  A=1/A: GOSUB 1100: A=1/A: B=1.5708-B: IF A>0 THEN 1154
1152  B=B-3.14159
1154  RETURN
1160  IF A>0 THEN 1180
1170  B=-ABS(B)
1180  RETURN
2040  GOTO2000
```

Dear Gordon,

James B. Penny
1537 Ramada
Houston, TX 77062

HERE IS A WAY TO MODIFY YOUR T-BUG PROGRAM TO ALLOW YOU TO TYPE DOUBLE SIZED CHARACTERS (32 CHARACTERS PER LINE). IT WORKS ON LEVEL 1, DON'T KNOW ABOUT LEVEL 2. BUT I GUESS YOU DON'T NEED IT THERE.

FIRST LOAD T-BUG THEN TYPE THE FOLLOWING:

M4ØØØCD4ØØBFE2ACA914ØD7C3ØØ4ØXM4Ø9Ø48XM4111ØØXG

HIT CLEAR AND BEGIN TYPING IN 32 CHARACTER MODE. RETURN TO T-BUG ANYTIME BY TYPING ASTERISK (*). GO BACK TO DOUBLE SIZE (REALLY DOUBLE WIDTH) CHARACTERS BY TYPING THE LETTER G. NOTICE THAT YOU GET TWO CHARACTERS IN THE 64 CHARACTER MODE FOR EACH ONE THAT YOU TYPED IN THE 32 CHARACTER MODE. I'M REALLY NOT SHURE WHAT MAKES THIS THING WORK BUT THE KEY IS THE MODIFICATION TO THE MEMORY CONTENTS OF4090H. MAYBE SOME NEWSLETTER READER HAS A CLUE.

```
50  CLS PRINT"                    *** AMAZING ***"
60  REM *** BY STAN OCKERS - AUG. 1978 ***
70  REM *** FOR LEVEL 1 BASIC - TRS-80 ***
90  INPUT"WHAT'S YOUR NAME";A$
100 CLS:FORY=9TO45:FORX=4TO124:SET(X,Y):NEXTX:NEXTY
105 B=0
110 W=RND(29):Y=8:X=4*W+2:N=0:GOTO210
120 N=N+1:IFN=520THEN300
130 IF(POINT(X+4,Y)=0)*(POINT(X-4,Y)=0)*(POINT(X,Y+2)=0)*(POINT(X,Y-2)=0)THEN260
140 Z=RND(6):ONZGOTO150,150,170,170,190,210
145 ONZGOTO150,170,190,210
150 IFPOINT(X+4,Y)=0THEN170
160 FORI=XTOX+4:RESET(I,Y):NEXTI:X=X+4:GOTO120
170 IFPOINT(X-4,Y)=0THEN190
180 FORI=XTOX-4STEP-1:RESET(I,Y):NEXTI:X=X-4:GOTO120
190 IFPOINT(X,Y-2)=0THEN210
200 FORI=X-1TOX+1:FORJ=YTOY-2STEP-1:RESET(I,J):NEXTJ:NEXTI:Y=Y-2:GOTO120
210 IF Y=44THEN240
220 IFPOINT(X,Y+2)=0THEN150
230 FORI=X-1TOX+1:FORJ=YTOY+2:RESET(I,J):NEXTJ:NEXTI:Y=Y+2:GOTO120
240 IFB=1THEN150
250 B=1 FORI=X-1TOX+1:FORJ=YTOY+2 RESET(I,J):NEXTJ:NEXTI
260 Z=RND(29):X=4*Z+2:Z=RND(17):Y=8+2*Z
270 IFPOINT(X,Y)=1THEN260
280 GOTO130
300 X=4*W+2:Y=8:R=1:L=2:U=3:D=4:SET(X,Y):GOTO320
310 PRINTAT140,"BLOCKED"
320 F=0:G=0:H=0:K=0:PRINTAT0,"DIRECTION (R,L,U OR D)";
325 INPUTD
330 ONDGOTO340,380,420,460
340 GOSUB500:IFG=1THEN310
345 GOTO352
350 GOSUB500:IFS=1THEN320
352 RESET(X,Y):IFG=1THEN370
354 IFX=126THEN390
360 X=X+2:SET(X,Y):GOTO350
370 IFF=0THEN430
372 IFH=0THEN470
374 GOTO390
380 GOSUB500:IFK=1THEN310
385 GOTO392
390 GOSUB500:IFS=1THEN320
392 RESET(X,Y):IFK=1THEN410
394 IFX=2THEN350
400 X=X-2:SET(X,Y):GOTO390
410 IFF=0THEN430
412 IFH=0THEN470
414 GOTO350
420 GOSUB500:IFF=1THEN310
425 GOTO432
430 GOSUB500:IFS=1THEN320
432 RESET(X,Y):IFF=1THEN450
434 IFY=8THEN470
440 Y=Y-1:SET(X,Y):GOTO430
450 IFK=0THEN390
452 IFG=0THEN350
454 GOTO470
460 GOSUB500:IFH=1THEN310
465 GOTO472
470 GOSUB500:IFS=1THEN320
472 RESET(X,Y):IFH=1THEN490
474 IFY=46THEN430
480 Y=Y+1:IFY=45THEN590
485 SET(X,Y):GOTO470
490 IFK=0THEN390
492 IFG=0THEN350
494 GOTO430
500 G=POINT(X+2,Y):K=POINT(X-2,Y):F=POINT(X,Y-1):H=POINT(X,Y+1):S=0
510 C=(F+G+H+K):IF(C=1)+(C=0)THENS=1
520 RETURN
590 RESET(X,Y):Y=Y+1:SET(X,Y)
600 SET(X,Y):PRINTAT0,"CONGRATULATIONS ";A$;" !!! YOU DID IT.":R=Y
610 PRINTAT64,"WANT TO TRY AGAIN";:Y=1:INPUTQ
620 IFQ<>1THEN650
630 PRINTAT64:PRINTAT0:INPUT"A NEW MAZE";Q:IFQ=1THEN100
640 RESET(X,R):GOTO300
650 END
```

RESTART 1Ø2

(an article on machine language)

By G. Frank Humiston

The hardware configuration of the TRS-8Ø causes it to activate NMI (Non-Maskable Interrupt) when it executes a HALT instruction. This means that op code 76_h can be thought of as a "RESTART 1Ø2" instruction rather than a HALT. The effect of the instruction is to call BASIC.

SAVE HUNDREDS ON YOUR NEXT
TRS-80 EQUIPMENT PURCHASE!

HOW WOULD YOU LIKE TO GET $60 OFF ON THE PURCHASE OF A TRS-80, 4K, LEVEL I SYSTEM, $130.00 OFF AN LINE PRINTER, $10.00 OFF LEVEL II, $60.00 OFF A DISK SYSTEM, AND $30.00 OFF AN EXPANTION INTERFACE. ALL NEW EQUIPMENT, FULLY WARRANTIED BY RADIO SHACK?! IT CAN BE DONE
I RECENTLY SAVED OVER $450.00 ON MY SYSTEM. HOW?

(1) SHAREHOLDERS' DISCOUNT. SINCE RADIO SHACK IS A DIVISION OF TANDY CORPORATION, ALL STOCKHOLDERS OF TANDY CORPORATION STOCK (NEW YORK STOCK EXCHANGE LISTED, 'TAN') ARE ENTITLED TO A FULL 10% OFF ON ALL RADIO SHACK PURCHASES. SHARES ARE PRESENTLY TRADING FOR BETWEEN $27 AND $28 PER SHARE. YOU NEED ONLY PURCHASE ONE SHARE TO BE OFFICIALLY LISTED AS A 'SHAREHOLDER' ON CORPORATE RECORDS. BROKERAGE FEES ARE EXTRA, BUT STILL ALLOW FOR A SUPSTANTIAL DISCOUNT.

(2) NO SALES TAX. IF YOU DON'T LIVE IN THE STATE IN WHICH YOU PURCHASE YOUR SYSTEM, YOU NEEDN'T PAY THE STATE SALES TAX, PROVIED THE EQUIPMENT IS SHIPPED TO YOU OUT OF STATE. I WAS RECENTLY IN LOUISIANA AND PURCHASED A GOOD DEAL OF EQUIPMENT. SINCE IT WAS SHIPPED TO ME IN VIRGINIA, I WAS NOT REQUIRED TO PAY LOUISIANA STATE SALES TAX.

(3) FREE SHIPPING. DON'T BE AFRAID TO NEGOTIATE WITH YOUR RADIO SHACK STORE MANAGER. SOME MANAGERS ARE 'INDEPENDENTS' (A DIFFERENT TYPE OF FRANCHISE FROM THE TANDY CORP. WHICH ALLOWS MUCH GREATER LADITUDE IN SALES AGREEMENTS) AND CAN GIVE YOU A PRETTY GOOD DEAL. WITH ONLY A LITTLE PERSUASION I WAS ABLE TO GET THE LOUISIANA DEALER TO SHIP ALL MY EQUIPMENT VIA UPS (FULLY INSURED AND SECURLEY PACKED) DIRECTLY TO MY HOME IN VIRGINIA AT HIS EXPENSE. IT NEVER HURTS TO ASK!

HARRY A. HOPKINS, P.O. BOX 873, LANGLEY AFB, VA 23665

Sincerely,

Lee Barnett

Lee Barnett
G302 Club Key East Apt.
Greenville, South Carolina 29602

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[illegible]

SUBJECT: Double Size Characters & Graphics on TRS-80

I found Timothy Loos writeup on double size characters interesting. See Vol 1 No 4 Pg 4.

I dug into this further and developed two interesting programs. Program X2A displays alpha-nu characters X2 size. Program X2B displays graphics X2 size. Both the program and X2 control are stored on tape, one following the other.

The program procedure is detailed as follows:

WRITE

1. Type all letters and spaces twice. This insures display of all words because the X2 screen display is only for alternate characters.
2. Read the tape position dial on recorder before entering programs.
3. Press RECORD & PLAY keys.
4. Store on the tape by typing CS. Press ENTER key.
5. Type P.#"1"CS. Press ENTER key. Display says WHAT? READY.
6. Release RECORD & PLAY keys.
7. Return to beginning of program as noted in line 2 above.

DISPLAY

8. Press PLAY key.
9. Type N. Press ENTER key. This clears screen.
10. Type CL. Press ENTER key. Computer says CL. READY.
11. For alpha-nu display type L. Press ENTER key.
    For GRAPHICS display type RUN and then press ENTER key.
    For GRAPHICS display then press BREAK
12. Again type CL. Press ENTER key. This enters line 5 control.
13. Screen says READY. Release PLAY key.
14. Type 10CS.RUN Press ENTER key.

Line 1 program appears briefly on screen shifted to the right. After a slight pause, DOUBLE SIZE letters appear on the screen. The TRS-80 Screen Printer if available can be used to great advantage to print out memory contents. It prints out ALL stored characters but not the X2 size screen characters. The screen displays alternate stored characters, twice normal size.

To gain computer control back, the most sure-fire way is to always turn the TRS-80 Computer OFF, then after a few seconds to turn it back ON. Have fun! It may even be possible to display X4 size characters. The combination of X2 graphics and alpha-nu characters has many interesting possibilities. Perhaps X1 and X2 characters can be combined....

Roy Hempel PO Box 3730 Santa Monica, CA 90403

```
READY
>11   XX22AA     AALLPPHHAA--NNUU
>22   XX22     SSIIZZEE    PPRROOGGRRAAMM
>33   11223344556677889900
>44   AABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQ
>55   RRSSTTUUVVWWKKYYZZ
>66             !!##$$%%&&''(())**==
>77   <<>>--++??//;;++  EENNDD.
>CS.

READY
>P. @"1"CS.
WHAT?

READY
>_

@@@@@@@@>CL.
```

1.

ALPHA-NU
WRITE

```
READY
>L.
 11   XX22AA    AALLPPHHAA--NNUU
 22   XX22    SSIIZZEE    PPRROOGGRRAAMM
 33   11223344556677889900
 44   AABBCCDDEEFFGGHHIIJJKKLLMMNNOOPPQQ
 55   RRSSTTUUVVWWXXYYZZ
 66             !!##$$%%&&''(())**==
 77   <<>>--++??//;;++  EENNDD
>CL.

READY
>10CS. RUN
```

2.

ALPHA-NU
DISPLAY

The screen printer tape 1 was printed after typing all info on the TRS-80 keyboard and prior to storing on tape.

The screen printer tape 2 was printed after displaying all X2 info on monitor screen. Comparison of tape 2 and monitor screen shows clearly which characters are being picked up X2 size on the monitor screen.

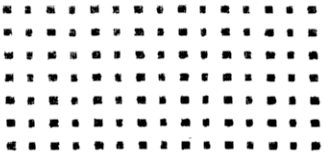
```
 11   CLS
 22   REM X2B GRAPHICS DISPLAY
 33   REM  X2 SIZE PROGRAM
 44   FOR X = 12 TO 54 STEP 3
 55   FOR Y = 6 TO 24 STEP 3
 66   SET (X,Y) : NEXT Y : NEXT X
 77   P.AT 584,  0
 88   GOTO 88
>CS.

READY
>P. @"1"CS.
WHAT?

READY
>_
```

3.

GRAPHICS
WRITE



GGRRAAPPHHIICCSS

4.
GRAPHICS
DISPLAY

```
BREAK AT 88
>CL.

READY
>10CS RUN
_
```

The screen printer tape 3 was printed after typing all info on the TRS-80 keyboard and prior to storing on tape.

The screen printer tape 4 was printed after displaying all X2 info on monitor screen. Comparison of tape 4 and monitor screen shows clearly which characters are being picked up X2 size on the monitor screen.

```
                20000 ;CHANGE TO RSM/1
                20010 ;FOR LINEPRINTER
42F4            20020          ORG     42F4H
4FC0            20030 PRTOUT   EQU     4FC0H
42F4 D5         20040 CRT      PUSH    DE
42F5 F5         20050          PUSH    AF
42F6 FE0D       20060          CP      13
42F8 2009       20070          JR      NZ,CRT1
42FA 110018     20080          LD      DE,1800H
42FD 1D         20090 WAIT     DEC     E
42FE 20FD       20100          JR      NZ,WAIT
4300 15         20110          DEC     D
4301 20FA       20120          JR      NZ,WAIT
4303 CDC04F     20130 CRT1     CALL    PRTOUT
4306 3E0E       20140          LD      A,0EH
4308 CDC04F     20150          CALL    PRTOUT
430B F1         20160          POP     AF
430C D1         20170          POP     DE
430D C9         20180          RET
4300            20190          END     4300H
00000 TOTAL ERRORS
WAIT    42F6
CRT1    4303
CRT     42F4
PRTOUT  4FC0
```

```
                10000 ;ADD TO RSM/1
                10010 ;FOR LINEPRINTER
4FC0            10020          ORG     4FC0H
0033            10030 VIDEO    EQU     33H
4FC0 CD3300     10040 PRTOUT   CALL    VIDEO
4FC3 D9         10050          EXX
4FC4 21E837     10060          LD      HL,37E8H
4FC7 56         10070 PRTLPS   LD      D,(HL)
4FC8 CB7A       10080          BIT     7,D
4FCA C2C74F     10090          JP      NZ,PRTLPS
4FCD 77         10100          LD      (HL),A
4FCE D9         10110          EXX
4FCF C9         10120          RET
4300            10130          END     4300H
00000 TOTAL ERRORS
PRTLPS  4FC7
PRTOUT  4FC0
VIDEO   0033
```

PLEASE SEND ALL ARTICLES AND PROGRAMS ON TAPE. IF YOU HAVE A HARD COPY THAT IS IN THE 6IN FORMAT YOU MAY SEND IT IN. WHEN YOU MAKE THE TAPE TO SEND IN AN ARTICLE HIT PRINT STATEMENTS MUST BE DELETED

```
100 REM STATES AND CAPITALS QUIZ PROGRAM
110 REM CONVERTED FOR TRS-80 LEVEL II BY BOB CHEEK
115 CLS
120 DIM A(50),B(4),C$(50),S$(50)
130 REM READ IN STATE AND CAPITAL ARRAYS
140 FOR I=1 TO 50
150 READ S$(I),C$(I) : NEXT I
160 FOR I=1 TO 50 : A(I)=0 : NEXT I : G=0 : N=0
170 CLS:PRINT "YOU HAVE YOUR CHOICE OF FILL-IN OR MULTIPLE CHOICE"
180 INPUT "WOULD YOU LIKE TO FILL-IN THE ANSWERS";Z$
190 IF Z$="Y" OR Z$="YES" THEN 230
200 CLS:PRINT "MULTIPLE CHOICE - ANSWER EACH QUESTION WITH 1,2,3, OR 4"
210 X=1 : PRINT "TO STOP TYPE 0 (ZERO) FOR YOUR ANSWER"
220 GOTO 250
230 CLS:PRINT "FILL-IN - YOU MUST SPELL EXACTLY! (SAINT IS ABBREVIATED ST.)"
240 X=2 : PRINT"TO STOP TYPE S FOR YOUR ANSWER"
250 PRINT
260 PRINT"YOU HAVE YOUR CHOICE OF WHETHER THE STATE OR CAPITAL IS ASKED"
270 INPUT"WOULD YOU LIKE TO ANSWER WITH THE CAPITAL";Z$
280 Y=2
290 IF Z$="Y" OR Z$="YES" THEN Y=1
300 PRINT:PRINT
310 REM PICK A STATE
320 FOR I=1 TO 10
330 R=INT(RND(50))
340 IF A(R)<>2 THEN 400
350 NEXT I
360 REM DON'T WASTE TIME PICKING ONE
370 FOR R=1 TO 50
380 IF A(R)<>2 THEN 400
390 NEXT R : GOTO 850
400 IF A(R)=1 THEN PRINT"TRY THIS ONE AGAIN"
410 IF X=1 THEN 520
430 IF Y=2 THEN 470
440 A$=C$(R)
450 PRINT "WHAT IS THE CAPITAL OF ";S$(R);
460 GOTO 490
470 A$=S$(R)
480 PRINT C$(R);" IS THE CAPITAL OF";
490 INPUT Z$
500 IF LEN(Z$)=1 THEN 810
510 IF Z$=A$ THEN GOTO 770 ELSE GOTO 760
520 REM THIS SECTION ASKS MULTIPLE CHOICE QUESTIONS
530 REM THE VALUE OF C IS THE CORRECT ANSWER
540 C=INT(RND(4))
550 REM PICK FOUR STATES FOR THE CHOICES
560 FOR I=1 TO 4
570 B(I)=INT(RND(50))
580 NEXT I
590 B(C)=R
600 REM MAKE SURE NONE ARE THE SAME
610 IF B(1)=B(2) OR B(1)=B(3) OR B(1)=B(4) THEN 560
620 IF B(2)=B(3) OR B(2)=B(4) OR B(3)=B(4) THEN 560
630 IF Y=2 THEN 690
640 REM PRINT CAPITAL CHOICES
650 PRINT "1. ";C$(B(1));TAB(20);"3. ";C$(B(3))
660 PRINT "2. ";C$(B(2));TAB(20);"4. ";C$(B(4))
670 PRINT "THE CAPITAL OF ";S$(R);" IS";
680 GOTO 730
690 REM PRINT STATE CHOICES
700 PRINT "1. ";S$(B(1));TAB(20);"3. ";S$(B(3))
710 PRINT "2. ";S$(B(2));TAB(20);"4. ";S$(B(4))
720 PRINT C$(R);" IS THE CAPITAL OF";
730 INPUT Z : Z=INT(ABS(Z))
```

PLEASE SEND ALL ARTICLES AND PROGRAMS ON TAPE. IF YOU HAVE A HARD COPY THAT IS IN THE 6IN FORMAT YOU MAY SEND IT IN. WHEN YOU MAKE THE TAPE TO SEND IN AN ARTICLE ALL PRINT STATEMENTS MUST BE ' LPRINT '

```
740 IF Z<1 OR Z>4 THEN 810
750 IF Z=C THEN 770
760 A(R)=1 : PRINT "WRONG" : GOTO 790
770 A(R)=2 : N=N+1
780 PRINT "RIGHT! YOU HAVE";N;"CORRECT"
790 PRINT : G=G+1
800 IF N<50 THEN GOTO 310 ELSE GOTO 850
810 INPUT"DO YOU WANT TO STOP";Z$
820 IF Z$="Y" THEN 850
825 IF Z$="YES" THEN 850
830 PRINT "YOUR ANSWER FOR LAST QUESTION";
840 ON X GOTO 730, 490
850 PRINT
860 PRINT "YOU GOT";N;"RIGHT IN ";G;"GUESSES"
870 INPUT "WOULD YOU LIKE TO TRY AGAIN";Z$
880 IF Z$= "Y" OR Z$="YES" THEN PRINT : GOTO 160
890 DATA "ALABAMA","MONTGOMERY","ALASKA","JUNEAU","ARIZONA"
892 DATA "PHOENIX","ARKANSAS","LITTLE ROCK","CALIFORNIA"
894 DATA "SACRAMENTO","COLORADO","DENVER","CONNECTICUT","HARTFORD"
896 DATA "DELAWARE","DOVER","FLORIDA","TALLAHASSEE","GEORGIA"
898 DATA "ATLANTA","HAWAII","HONOLULU","IDAHO","BOISE","ILLINOIS"
900 DATA "SPRINGFIELD","INDIANA","INDIANAPOLIS","IOWA"
902 DATA "DES MOINES","KANSAS","TOPEKA","KENTUCKY","FRANKFORT"
904 DATA "LOUISIANA","BATON ROUGE","MAINE","AUGUSTA","MARYLAND"
906 DATA "ANNAPOLIS","MASSACHUSETTS","BOSTON","MICHIGAN"
908 DATA "LANSING","MINNESOTA","ST. PAUL","MISSISSIPPI","JACKSON"
910 DATA "MISSOURI","JEFFERSON CITY","MONTANA","HELENA","NEBRASKA"
912 DATA "LINCOLN","NEVADA","CARSON CITY","NEW HAMPSHIRE"
914 DATA "CONCORD","NEW JERSEY","TRENTON","NEW MEXICO","SANTA FE"
916 DATA "NEW YORK","ALBANY","NORTH CAROLINA","RALEIGH"
918 DATA "NORTH DAKOTA","BISMARCK","OHIO","COLUMBUS","OKLAHOMA"
920 DATA "OKLAHOMA CITY","OREGON","SALEM","PENNSYLVANIA"
922 DATA "HARRISBURG","RHODE ISLAND","PROVIDENCE","SOUTH CAROLINA"
924 DATA "COLUMBIA","SOUTH DAKOTA","PIERRE","TENNESSEE"
926 DATA "NASHVILLE","TEXAS","AUSTIN","UTAH","SALT LAKE CITY"
928 DATA "VERMONT","MONTPELIER","VIRGINIA","RICHMOND","WASHINGTON"
930 DATA "OLYMPIA","WEST VIRGINIA","CHARLESTON","WISCONSIN"
932 DATA "MADISON","WYOMING","CHEYENNE"
950 END
```

```
508 CLS:PRINT:PRINT
509 PRINT"              MY $600 ADDING MACHINE":PRINT
510 PRINT:PRINT"      THIS PROGRAM DISPLAYS AND ADDS OR SUBTRACTS"
511 PRINT"AND GIVES YOU SUBTOTALS AND TOTALS  JUST FOLLOW THE"
512 PRINT"INSTRUCTIONS  REMEMBER, TO GET A SUBTOTAL, JUST ENTER"
513 PRINT"A ZERO AND FOR THE GRAND TOTAL, ENTER ZERO AGAIN."
514 PRINT:PRINT:PRINT:INPUT"WHEN YOU'RE READY TO START, HIT 'ENTER' ";A$
515 CLS
520 PRINT:PRINT"ENTER EACH AMOUNT.  USE A NEGATIVE SIGN FOR MINUS"
521 PRINT"NUMBERS.  ENTER 0 FOR SUBTOTAL."
525 B=0:PRINT
530 PRINT"                    ";:INPUTA
535 IF A=0 GOTO 560
540 B=B+A
550 GOTO 530
560 PRINT:PRINT"THE SUBTOTAL IS";B
565 PRINT
570 INPUT"TO CONTINUE, ENTER 1.  FOR FINAL TOTAL, ENTER 0 ";C
580 IF C=1 GOTO 530
590 PRINT:PRINT"THE FINAL TOTAL IS";B
595 PRINT
600 INPUT"AGAIN? YES=1,  NO=0 ";D
610 IF D=1 GOTO 515
620 CLS:PRINTAT404,"GLAD TO HELP.  GOODBYE      ":PRINT:PRINT:PRINT
```

```
500  REM * COPYRIGHT FRED BLECHMAN 1978 *
501  REM * 23958 ARCHWOOD ST, CANOGA PARK,
502  REM * P.M. =2665 *          CA 91307 *
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