

PET User Notes

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Double the Resolution of Your PET

FJ Campbell 1902 Woodland Dr., Yardley, PA 19067

Normally, the screen displays 25 x 40 characters which are memory mapped from 1000 locations beginning at 32768. For uses such as curve plotting this resolution is very coarse. But, it can be doubled to 50 x 80 by using the small square characters of one-fourth block size. The trick is to divide each large square into four parts and use a 4 bit binary number to represent the 16 states possible at any screen location. If we let the small square at lower right represent the least significant bit and go around counter-clockwise to the most significant bit then the 16 graphic characters take the order: 32, 108, 124, 225, 126, 127, 226, 251, 123, 98, 255, 254, 97, 252, 236, 160. For instance, binary 1001 (decimal 9) represents the two bottom squares 'on' and this corresponds to graphic character 248. Now, to set a square the binary number 0001, 0010, 0100 or 1000 (decimal 1, 2, 4 or 8) is logical ORed with the present value of the screen location and the new graphic character code is POKEd in memory. To reset the point we can use the logical AND NOT function.

I have written a subroutine for plotting and have driven it with a SWAT game. The subroutine is contained in locations 6000 to 6050. It is initialized with a GOSUB 6000, and a point is plotted by executing GOSUB 6020 with X, Y in the range $0 \leq X \leq 79$, $0 \leq Y \leq 49$, and the variable IC% set to 1.

```
1 REM FRANK CAMPBELL, 1902 WOODLAND DR.,
YARDLEY, PA 19067
10 PRINT"cd SWAT
11 PRINT"cdUSING THE EIGHT DIRECTIONS CE
NTERED ON"
12 PRINT"cd'5', MOVE THE DOT AROUND THE
SCREEN"
13 PRINT"cdTO CATCH THE FLY."
14 PRINT"cdHIT 'P' ANYTIME TO PLAY SWAT
20 PRINT"cdcd
21 PRINT"cdHIT 'D' FOR DOODLE, THEN
22 PRINT"cdHIT 'S' TO SET A POINT AND
24 PRINT"cdHIT 'R' TO RESET A POINT

10 PRINT"cd SWAT
11 PRINT"cdUSING THE EIGHT DIRECTIONS CENTERED ON"
12 PRINT"cd'5', MOVE THE DOT AROUND THE SCREEN"
13 PRINT"cdTO CATCH THE FLY."
14 PRINT"cdHIT 'P' ANYTIME TO PLAY SWAT
20 PRINT"cdcd DOODLE
21 PRINT"cdHIT 'D' FOR DOODLE, THEN
22 PRINT"cdHIT 'S' TO SET A POINT AND
24 PRINT"cdHIT 'R' TO RESET A POINT
40 GOSUB 6000:REM INITIALIZE PLOT SUBR
45 N%=10:GOTO 60
50 PRINT"cs
51 X=40:Y=25:N%=5
52 X1=79*RND(1):Y1=49*RND(1):M1=0
53 PRINT"hx,Y=",X"cl ",Y"cl "
54 GOSUB 6020
55 IF M<>M1 GOTO 60
57 POKE M,102:POKE M-1,102:POKE M+1,102:POKE M-40,102:
POKE M+40,102
58 POKE M-41,102:POKE M-39,102:POKE M+39,102:POKE
M+41,102
59 GOTO 52
60 GET A$:REM GET KEYBOARD CHARACTER
64 IF A$="P" OR A$="D" THEN B$=A$:GOTO 50
```

```
65 IF A$="S" OR A$="R" THEN B$=A$:GOTO 60
66 IF A$="" GOTO 70
68 IF A$>"9" OR A$<"1" GOTO 60
69 N%=VAL(A$)
70 ON N% GOTO 90,100,110,120,170,130,140,150,160,60
90 X=X-1:Y=Y-1:GOTO 170
100 Y=Y-1:GOTO 170
110 X=X+1:Y=Y-1:GOTO 170
120 X=X-1:GOTO 170
130 X=X+1:GOTO 170
140 X=X-1:Y=Y+1:GOTO 170
150 Y=Y+1:GOTO 170
160 X=X+1:Y=Y+1
170 IF X<0 THEN X=0
175 IF X>79 THEN X=79
180 IF Y<0 THEN Y=0
182 IF Y>49 THEN Y=49
184 IC%=1
185 IF B$="P" GOTO 190
186 N%=5
187 IF B$="S" GOTO 53
188 GOSUB 6020
189 FOR I=0 TO 50:NEXT I:IC%=0:GOTO 53
190 REM MOVE FLY WITH RANDOM FORCE
193 A=2*RND(1):B=1*RND(1)
195 D=.01+(X1-X)↑2+(Y1-Y)↑2
200 X1=X1+(A*(X1-X)+B*(Y1-Y))/D
210 Y1=Y1+(A*(Y1-Y)+B*(X1-X))/D
220 IF X1<2 THEN X1=2
225 IF X1>77 THEN X1=77
230 IF Y1<2 THEN Y1=2
235 IF Y1>47 THEN Y1=47
240 M2=33728+INT(X1/2)-40*INT(Y1/2)
244 IF M2=M1 GOTO 53
250 POKE M1,32
260 POKE M2,42
270 M1=M2
300 GOTO 53
6000 REM HIGH RESOLUTION PLOT SUBR.
6001 REM VARIABLES USED ARE GC%(15),IC%,JC%,KC%,X,Y,M
6002 REM GOSUB 6000 ONCE TO INITIALIZE
6003 DIM GC%(15)
6004 DATA 32,108,124,225,126,127,226,251,123,98,255,254,
97,252,236,160
6007 FOR M=0 TO 15:READ GC%(M):NEXT M
6008 RETURN
6010 REM GOSUB 6020 TO PLOT X,Y POINT
6015 REM IN RANGE 0<=X<=79, 0<=Y<=49
6016 REM IC%=1 SETS THE POINT AND IC%=0 RESETS THE POINT
6018 REM THE SCREEN MEMORY LOCATION IS RETURNED IN M
6020 M=33728+INT(X/2)-40*INT(Y/2)
6022 IF M<32768 OR M>33767 THEN RETURN
6024 JC%=PEEK(M):KC%=0
6028 IF JC%=GC%(KC%) GOTO 6040
6030 IF KC%<>15 THEN KC%=KC%+1:GOTO 6028
6035 KC%=0
6040 JC%=1
6042 IF INT(Y)-2*INT(Y/2) THEN JC%=2
6045 IF INT(X)-2*INT(X/2) GOTO 6048
6046 JC%=12-4*JC%
6048 IF IC%=1 THEN POKE M,GC%(JC% OR KC%)
6049 IF IC%=0 THEN POKE M,GC%(KC% ANDNOT JC%)
6050 RETURN
```

General Notes

Commodore should have an expanded User Manual available in several weeks which will be mailed to PET owners. Commodore also will have a printer available in about 2 months. The price will apparently be \$595 for an 80 column, 120 character/second unit which will print PET graphics as well as the alpha-numeric set -- sounds like a good unit.

Commodore should also be distributing some of their software later in April.

Calculator/Computer Magazine (a publication emphasizing educational uses primarily for children) has published some worthwhile articles on PET BASIC in addition to some interesting BASIC programs -- published by DYMAX, Box 310, Menlo Park, CA 94025.

Hardware

Convenience Living Systems, 648 Sheraton Drive, Sunnyvale, CA 94087 announced the EXPANDAPET for \$435 assembled and tested. The unit includes on board power supply, 16K RAM, sockets for 4K EPROM, 2 parallel I/O ports with handshake, slots for 3 option cards, and all cables and brackets (several option cards are available).

Forethought Products, Box 8066, Coburg, OR 97401 announced the PETS1 PET to S-100 interface/motherboard. The board is \$105 kit or \$160 assembled, and includes 4 slots, dynamic memory controller, and sockets for 8K 2716 EPROM.

Excel Company, 2241 Tamalpais Ave., El Cerrito, CA 94530 has introduced an ASCII Keyboard - PET interface for \$65 (\$75 for upper and lower case version), and they are offering a \$10 discount for early orders.

The Net Works, 5014 Narragansett #6, San Diego, CA 92107 has an IEEE to RS-232 board (with dual ports) for \$160 assembled and tested including on board power supplies.

Software

Warren D. Swan, 15933 S. Grove Avenue, Oak Forest, IL 60452 has a tape directory which will enable you to hold down the fast forward for the approximate time interval to locate programs on tape, as well as a number of other programs for sale.

Walter J. Rychlewski, 600 W. Mechanic, Independence, MO 64050 has a tape of several demonstration programs for PET for \$10.

Sawyer Software, 828 Lewis - Rt. 3, Dexter, MO 63841 is selling Accounting Pack 1 (\$25), Financial Pack 1 (\$15), and Chessboard (\$10) for PET.

MH Major, A to Z Inc., 300 Guaranty Bank Plaza, Corpus Christi, TX 78475 has a payroll program for bi-weekly pay periods which he says should run with up to 25 employees. \$15 for listing and cassette.

Software Exchange

Randy Julin, 15 Poncetta Dr. #322, Daly City, CA 94015
Michael Richter, 2600 Colby Avenue, Los Angeles, CA 90064
(2 bridge related programs, RPN calculator, Fourier series, hex arithmetic, 80 digit integer arithmetic, editor, word processor, others)

Programs on Tape

SEQUENCE -- you have to sort a character list
STATECAPS -- quiz on states and capitals from 3/78 Kilobaud
SWAT -- see article by F. Campbell in this issue
RACETRACK -- see listing in this issue -- RE McGee
DEFLECTION -- see listing in this issue -- F. Dunlap
ADDITION -- math drill -- F. Dunlap, C. Pitcairn
OTHELLO -- from 9/77 Byte
OTHELLO for 2 -- F. Dunlap
BAGELS -- like Mastermind -- J. Butterfield
Cash Flow/Return on Investment -- R. Goldsmith

\$2 for first program including cassette and postage, \$1 for each additional -- max 4 per tape. Most of the programs will be listed in this newsletter, so the programs on tape service is available only to save you key entry time. It is priced to hopefully cover the cost of a part time person to copy and mail the tapes.

Miscellaneous

Errors in previous newsletter: page 8 should have line 1100 RETURN; page 13 line 350 is missing left parenthesis -- should be (24-M).

Dr. Ted J. Cooper, Ohio Nuclear, CT Systems Eng., 6000 Cochran Rd., Solon, OH 44139 has developed a lot of hardware to interface PET to the outside world (including an LSI-11 interface). He would like to talk to some one who knows the system monitor well.

If PRINTING to cassette file, Frank Campbell suggests that you can use more than one variable in a PRINT# by including [" "] between variables: PRINT#1, N", "X\$.

Larry E. Ellison, 19 Huntingdon Lane, Willingboro, NJ 08046 wants to contact people interested in using the PET for Bible study.

JR Kinard, Austin, TX suggested hooking up a 2000 ohm earphone element between the Tape Read line and ground or +5V to listen to the audio signal for program searching.

Thanks to Richard Rosner (Connecticut Microcomputer, 150 Pocono Rd., Brookfield, CT 06804) for doing some program listings for us with his IEEE-RS232 interface and printer.

Generating Square Waves with the PET

JR Kinnard, 623 Amesbury Rd., Austin, TX 78752

At times it would be desirable to generate an audio signal from the PET to add special effects to games, experiment with computer music, have the computer call you after a long program, or perhaps drive a low speed MODEM for telephone line communication.

A programmable square wave generator is included in the MCS6522 which interfaces the PET Parallel User Port. When the tape drive is not in operation, the generator can be used to produce one of 514 different frequencies between 243HZ and 125KHZ on CB2 (User Port pin M). The feature of the 6522 which makes this possible is a recirculating shift register intended for serial data input and output. With a square wave pattern loaded into the shift register and the control set for free running output under timer controlled rate, a continuous square wave is produced on CB2.

The BASIC statements needed to control the output are as follows:

POKE 59467,16	Sets shift register to free running output mode.
POKE 59464,C	Sets shift rate. C is an integer of 0 to 255.
POKE 59466,D	Loads shift register. D should be 15, 51, or 85 for a square wave output.

The frequency of the square wave can be determined from the following equation:

$$\text{FREQUENCY} = \frac{500000}{(C+2)(D1)} \text{ HZ} \quad \text{Where: } \begin{array}{l} D1 = 8 \text{ for } D = 15 \\ D1 = 4 \text{ for } D = 51 \\ D1 = 2 \text{ for } D = 85 \end{array}$$

Reading or writing the shift register must be done last as this initiates the shifting operation. The control register at 59467 must be reloaded with 0 for the tape drive to write correctly.

Do not connect a speaker or earphones directly to the CB2 output of the PET. An amplifier is necessary to isolate the 6522 from inductive loads.

The TAPE #2 READ signal on User Port pin 8 (TAPE #2 READ and TAPE WRITE are reversed in the introductory manual) appears to be the CB1 line from the 6522 and carries the shift clock signal. With both CB1 and CB2 available, it may be possible to use the I/O port expansion scheme described in the MCS6522 Data Sheet.

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Interfacing an Audio Cassette Deck to the Cassette I/O Port of Your PET

Russell Martin Ames, Iowa

It is useful to have two tape record/playback units interfaced to a microprocessor. It facilitates file editing and allows the use of the one unit for programs and the second for the data files used by the program. An added advantage for PET owners is that the second tape unit can have useful features such as a tape counter, which the tape deck that accompanies the PET lacks.

A quick experiment shows the tape deck that comes with the PET works perfectly when attached to the second tape I/O port of the PET. This indicated the machine treats both ports the same, at least on a hardware basis. The operating system software (or, if you prefer, firmware) favors the #1 tape with various defaults on OPEN statements, etc. going to it. However, this does not affect our interfacing effort, which is a hardware exercise.

An examination of the none-too-plentiful documentation which Commodore provides with the PET shows that the tape I/O port consists of six lines. The A line is ground, which should be self explanatory. The B line is +5 volts (DC) which can be used to power the limited TTL logic used in the interface. The C line puts out +6.6 volts DC (approximately) which is also used to power the motor of the #1 tape drive. This line cannot be used to power the #2 tape drive in most cases. Many tape recorders use higher voltages and cannot be driven by +6.6 v. Even those that normally operate on six volts often are unable to draw enough power from the PET port to run at a constant tape speed, which is a necessity. However, this line is still useful, as will be seen later. The D line is the read line over which data is sent from the tape unit to the PET. The E line is the write line over which data is sent from the PET to the tape unit to be recorded. The F line is the sense line which tells the PET when to start the tape unit running. In the PET's #1 tape drive, pushing the PLAY button closes a switch to which the sense line has been connected to ground. When The PET senses this it turns on the +6.6v power to run the tape drive motor.

The figure shows the circuitry for an interface which can be used with any good quality (about \$40 retail) mono cassette recorder. It works as follows. A STSP switch is closed to ground from the sense line, after the recorder's controls have been set appropriately for record or playback. The six volt output from the motor line activates a relay which closes the remote control switch of the recorder. This turns on the recorder. The write line can come directly from the I/O port into the auxiliary (AUX) input of the recorder. The output from tape playback comes from the earphone output (EAR) through a signal diode, across a Zener diode (4.7 volt) and a 1000 ohm resistor, and into both inputs of a Schmidt trigger NAND gate. This digitizes the signal which is otherwise too sinusoidal for the PET to read. The NAND gate's output then goes to the read line of the I/O port.

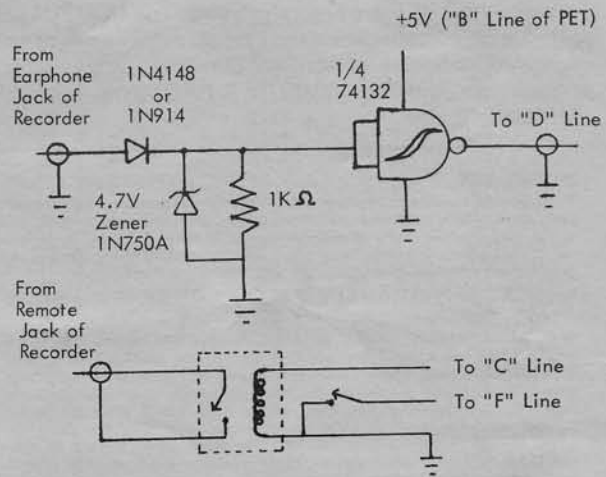
I have been using this interface for a month with quite satisfactory results. Files recorded with either tape unit can be played back on the other. My #2 tape deck has selectable Automatic Level Control or manual level control for recording. I use the latter with volume set to slightly more than 1/2 maximum. It also has a tone control which I have set to high, although I do not believe that is critical. I run the tape recorder on AC. Of course, shielded audio cable is used for the data transfer lines. I used a Cinch 251-06-30-160 edge card connector. Other parts, except for the Schmidt NAND gate and Zener diode, are available at Radio Shack.

I would like to thank Allen L. Chesley for his assistance in the design of this interface.

Parts

- 1 74132 TTL Quad 2 Input Schmidt NAND Gate
- 1 1N4148 or 1N914 Diode
- 1 1N750A 4.7 volt Zener Diode
- 1 6VDC SPDT Relay (Radio Shack 275-004)
- 1 1K Ω Resistor 1/4 Watt
- 1 SPST Switch (mini toggle switches are nice)
- 1 Edge Connector (Cinch 250-06-90-170 or 251-06-30-160 or other manufacturer's equivalent)

Misc. -- Chassis box, IC socket, assorted audio jacks, cable, wire, hardware



Stimulating Simulations by Dr. C. William Engle \$5
an interesting book containing 10 simulations written in BASIC with instructions and possible modifications included

PET programs on cassette -- all 6 for \$8
ABTAPE 1 includes Life, Biorythm, Othello, Mastermind II, Multiprimer (math tutorial-deduction game), and Klingon Capture

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MORTGAGE [PMO-803] \$15.95 This program calculates mortgage information when provided with certain basic data. Calculated information includes: Principal paid to date; Interest paid to date; Total of payments paid to date; Outstanding principal; Outstanding interest; Total payments remaining; Mortgage equity; Interest and principal breakdown for any month.	Corporate Sciences, Inc. Data Base by any combination of: Return on equity; Yield; Payout ratio; Implied growth rate; PE ratio; Percentage growth; Debt to equity ratio; Current ratio.
ANNUAL REPORT ANALYZER [PAR-803M] \$22.95 (Manual Data Input) With Annual Report in hand, you input revenue and income figures for previous five years (estimated earnings, too, if you wish) as well as basic Balance Sheet data. This Street Ware program computes: Percentage year-to-year growth in sales, profits, and earnings per share; Average earnings per share and compound earnings per share over 5 years; PE Ratio; Profit margin for previous 5 years, with a graphic display that plots revenues against profit margins; Current ratio; Book value; Return on equity; Debt to equity ratio; Payout ratio; Dividend yield; Implied growth rate; Implied total return; Theoretical PE ratio; Theoretical value for stock.	OPTIONS [POP-803M] \$24.95 (Manual Data Entry) The National Corporate Sciences' version of the Black-Scholes equation, this program computes the theoretical value of an option. The program can be used to equal advantage by both options buyers and options writers. Value of option is graphically depicted by movement in stock price and days to expiration.
STOCK ANALYZER [PAR-803A] \$34.95 (Automatic Data Entry) (Used only with Street Ware Data Base. See below.) This tape includes a copy of ANNUAL REPORT ANALYZER [PAR-803M] on reverse side. The program is essentially the same as PAR-803M, except that data is automatically read from Data Base tapes simply by entering ticker symbols.	OPTIONS [POP-803A] \$24.95 (Automatic Data Entry) Same as OPTIONS [POP-803M] except that volatility and dividend data are supplied by a separate data base (available in March, 1978).
DATA BASE \$175.00 PER YEAR (Updated monthly; total of 12 tapes per year) (Used with PAR-803A and/or PSS-803, described below.) Includes statistical data on over 2,500 Industrial Stocks on the New York, American, and Over the Counter Exchanges. Data base tapes are updated monthly by stock exchange on a rotating basis, i.e., twelve tapes per year. Data includes: Ticker symbol, Corporate name, Industrial classification; Revenues, earnings, and earnings per share for previous 5 years; Estimated earnings for current year; Shares outstanding, current assets, current liabilities; Dividends, long-term debt.	FINANCE [PFI-803] \$12.95 A variety of useful financial formulas in one simple easy to use program. Includes: Compound interest; Discounts; Nominal and effective interest; Annuities; Loans; Depreciation; Earned interest table.
STOCKSCREEN [PSS-803] \$22.50 (Requires Second Tape Drive or PET Printer) Used with Data Base, described above. This program allows you to screen the 2,500+ stocks in the National	BONDS [PBO-803] \$9.95 A variety of bond programs to calculate interest and yield to maturity, present value and future value of bonds, effective yield, and basis price of bonds.
	CHECKBOOK [PCH-803] \$15.95 A cash receipts and disbursements program that will make it a breeze to keep accounts and up to date records. Checks can be sorted by type, e.g., medical, legal, tax-deductible, rent, food, etc. Available in March, 1978:
	INVENTORY CONTROL [PIC-803] (Requires Second Tape Drive)
	ACCOUNTS RECEIVABLE [PAR-803] (Requires Second Tape Drive) Pursuant to Rule 206(4)-1(A)(3) of the Securities and Exchange Commission, it should be noted that the above mentioned programs should not in and of themselves be utilized in making investment decisions. The scope and usefulness of the above programs are limited, with values in some cases being purely theoretical.

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.....PAR-803A	\$34.95	Stock Analyzer(Auto-incl.803M)PBO-803	\$ 9.95	Bonds
.....POP-803M	\$24.95	Options (Manual)PCH-803	\$15.95	Checkbook
.....PSS-803	\$22.50	StockScreenDATA BASE	\$175.00 per year	(subscription not assignable without consent)

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I have been messing around with the memory on my PET to see how the BASIC interpreter works. So far I have come up with the following information.

PET BASIC begins storing your program at locations 1024 on. Each line is stored in the following format: The first two bytes contain a pointer to the next statement, low order 8 bits first followed by the high order bits. For example, if the next statement starts at 420 hex, then the first two bytes of the statement will contain 20 and 4 hex, respectively. The next two bytes contain the line number, again in reverse order. For example the line number 500 would be stored as 244 and 1 decimal, respectively. Note $1*256+244$ equals 500. The maximum line number, 63999, is stored as 255 and 249 decimal. Following these 4 bytes is your "line" interpreted so that each keyword becomes one byte (see table below). The last byte in the line contains a zero, signifying end of line. The LISTER in BASIC merely "disinterprets" the line number and each keyword byte, printing out the keyword it represents in its place.

Also, here is a snady little disinterpreter (sub)program. Did you ever see a program list itself without using the LIST command? With very little modification this program will do just that. However, it was written for the adventurous soul who wants to see what is in the guts of his PET.

```

0 REM EXPERIMENTAL DISINTERPRETER BY WARREN D SWAN
10 CLR:T=8184-FRE(0)
20 DIM C$(255):C$(0)=CHR$(13)
30 FOR I=1 TO 31:C$(I)="rvs"+STR$(I)+"off":NEXT
40 FOR I=32 TO 127:C$(I)=CHR$(I):NEXT
50 FOR I=128 TO 202: READ C$(I):NEXT
60 FOR I=203 TO 254:C$(I)="rvs"+STR$(I)+"off":NEXT:C$(255)=" "
70 INPUT"LOWER, UPPER ADDRESS":L,U
80 IF U>65535 OR U<1 THEN U=T
90 FOR I=L TO U:P=PEEK(I):PRINT C$(P);
100 IF P=34 OR P=98 THEN PRINT C$(P)CHR$(20);
110 NEXT:PRINT:GOTO 70
500 DATA END, FOR, NEXT, DATA, INPUT#, INPUT, DIM, READ, LET
510 DATA GOTO, RUN, IF, RESTORE, GOSUB, RETURN, REM, STOP
520 DATA ON, WAIT, LOAD, SAVE, VERIFY, DEF, POKE, PRINT#
530 DATA PRINT, CONT, LIST, CLR, CMD, SYS, OPEN, CLOSE, GET
540 DATA NEW, TAB(, TO, FN, SPC(, THEN, NOT, STEP, +, -, *, /, ^
550 DATA AND, OR, >, =, <, SGN, INT, ABS, USR, FRE, POS, SQR
560 DATA RND, LOG, EXP, COS, SIN, TAN, ATN, PEEK, LEN, STR$
570 DATA VAL, ASC, CHR$, LEFT$, RIGHT$, MID$
    
```

Instructions: You will be asked for a lower core address and upper core address of the area you want disinterpreted. Usually the lower address should not be less than 1024. If you enter an upper address greater than 65535 or less than 1, the upper address will be set to the actual upper address of your program calculated in line 10. If you have a 4K PET the constant in line 10 should be changed to 4088 (I think). For example, to disinterpret this program, supply it with the lower and upper limit of 1024 and 0 respectively.

More Lights, Bells, and Whistles!
Warren D. Swan

How would you like to be able to make your PET's CRT blink, or turn it off or on at will without losing anything displayed on it? Simple! To turn it off, merely execute the statement POKE 59409,52 and the screen will be turned off. How do you turn it back on? There are two ways. First, execute the statement POKE 59409,60 or second, have the screen scroll up a line by printing off the bottom line.

Did you know that you can also sense when the RVS key is being pressed in your program? Location 59410 normally contains 255. However, pressing the RVS key will turn off the 0 bit changing it to a 254. Also, left bracket turns off the 1 bit, space turns off the 2 bit, and less-than the 3 bit. So if you want a command that will wait for the user to press the space key, just use WAIT 59410,4,4.

Number to Keyboard Conversion (Numbers in Decimal)

0: End of line	89: Y	148: SAVE
1-31: unused	90: Z	149: VERIFY
32: space	91: [150: DEF
33: !	92: \	151: POKE
34: "	93:]	152: PRINT#
35: #	94: ^	153: PRINT
36: \$	95: ←	154: CONT
37: %	96: space	155: LIST
38: &	97: !	156: CLR
39: '	98: "	157: CMD
40: (99: #	158: SYS
41:)	100: \$	159: OPEN
42: *	101: %	160: CLOSE
43: +	102: &	161: GET
44: ,	103: '	162: NEW
45: -	104: (163: TAB(
46: .	105:)	164: TO
47: /	106: *	165: FN
48: 0	107: +	166: SPC(
49: 1	108: ,	167: THEN
50: 2	109: -	168: NOT
51: 3	110: .	169: STEP
52: 4	111: /	170: +
53: 5	112: 0	171: -
54: 6	113: 1	172: *
55: 7	114: 2	173: /
56: 8	115: 3	174: ^
57: 9	116: 4	175: AND
58: :	117: 5	176: OR
59: ;	118: 6	177: >
60: <	119: 7	178: =
61: =	120: 8	179: <
62: >	121: 9	180: SGN
63: ?	122: :	181: INT
64: @	123: ;	182: ABS
65: A	124: <	183: USR
66: B	125: =	184: FRE
67: C	126: >	185: POS
68: D	127: ?	186: SQR
69: E	128: END	187: RND
70: F	129: FOR	188: LOG
71: G	130: NEXT	189: EXP
72: H	131: DATA	190: COS
73: I	132: INPUT#	191: SIN
74: J	133: INPUT	192: TAN
75: K	134: DIM	193: ATN
76: L	135: READ	194: PEEK
77: M	136: LET	195: LEN
78: N	137: GOTO	196: STR\$
79: O	138: RUN	197: VAL
80: P	139: IF	198: ASC
81: Q	140: RESTORE	199: CHR\$
82: R	141: GOSUB	200: LEFT\$
83: S	142: RETURN	201: RIGHT\$
84: T	143: REM	202: MID\$
85: U	144: STOP	203-254: unused
86: V	145: ON	255: ␣
87: W	146: WAIT	
88: X	147: LOAD	

Note: The keywords for the TAB and SPC functions carry the left parenthesis with them. The other functions do not.

For Example, The line 110 PRINT TAB(X);RND(1) would translate to: XX YY 110 0 153 32 163 88 41 59 187 40 49 41 0 where XX and YY are the pointer to the next instruction in core (YY*256+XX).

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Excerpted notes from Jim Butterfield, 14 Brooklyn Ave.
Toronto, Ontario, Canada M4M 2X5

PET has a little characteristic on FOR .. NEXT that might be
well to note. Try this quickie:

```
100 FOR J=1 TO 3
200 PRINT "J";
300 FOR K=1 TO 3
400 PRINT "K";
500 GOTO 700
600 NEXT K
700 NEXT J
```

An unlikely piece of coding; but line 500 could represent a con-
ditional statement which aborted the inner loop. Run it, and
you'll get JKJKJK.

Now - the theory is that you can put in NEXT without a var-
iable and it will work just as well; saves you memory, punchup
time, etc. Try replacing lines 600 and 700 by NEXT (without the
K and J) and run. What? You get a different answer: JKJK.

What does all this mean? Far as I can tell, it's OK to abort
loops, but: be sure to put the variable identifier in all your NEXT
statements if you do. I have checked several combinations of
aborted loops and they seem to behave OK. It might be a worth-
while habit to avoid using NEXT alone.

Spent a couple of hours on a TRS-80 last week. The BASIC is
limited, of course, but not so bad (peculiar: you get one array,
called A). What did take me aback is that the keyboard on the
unit I used was awful. Any time I hit the 1 key I'd get a random
number of 1's on the screen: anything from 1 to 1111111. Thought
the PET keyboard was something to grumble about .. I'll quit
complaining.

Have thrown together a little BAGELS program. No big deal,
but the following items might be considered as PET-characteristic:
--the clear screen, line 140; --dynamic array allocation, line 110;
--use of TAB and SPC, lines 200 and 260; -- use of compound
statements after IF, lines 280 and 350; --inclusion of a NEXT
statement within an IF statement, line 350; --conversion of a
variable into a single string digit, line 240; --use of the (numeric)
GET statement (line 220) with validation (line 230) and echoing
(line 240). The real moral of the story is using the screen and
input to provide a "natural" human interface .. which is hard to
do on other processors.

BAGELS

Jim Butterfield

The human interface can be greatly aided by PET's display capa-
bilities. Note how both input and output are enhanced in this
version if the well-known game. You may change the number of
digits or the maximum value of each digit by revising the values
of D and M in line 100.

```
100 D=4 : M=6          set game parameters
110 DIM A(D),B(D),C(D)  dynamic array allocation
120 FOR J=1 TO D : A(J)=INT(M*RND(1)+1)
130 NEXT J              generate mystery number
140 PRINT "cs BAGELS - J BUTTERFIELD" clear;header
150 PRINT: PRINT "I HAVE A NUMBER.."
160 PRINT ". .OF";D;"DIGITS EACH FROM";
170 PRINT " 1 TO";M
180 PRINT "CAN YOU GUESS IT?" : PRINT
190 FOR G=1 TO D+M
200 PRINT G; TAB(6);
210 FOR P=1 TO D              input each digit
220 GET X
230 IF X<1 OR X>M GOTO 220    legal?
240 B(P)=X : PRINT RIGHTS(STR$(X),1);
250 NEXT P
260 X=0 : PRINT SPC(4);
270 FOR J=1 TO D : C(J)=A(J)
280 IF A(J)=B(J) THEN X=X+1 : C(J)=0
290 IF A(J)=B(J) THEN B(J)=-1
300 NEXT J
310 IF X=D GOTO 430
320 PRINT X; "EXACT"; : X=0
330 FOR J=1 TO D
340 FOR K= 1 TO D
350 IF B(J)<>C(K) THEN NEXT K : GOTO 370
360 X=X+1 : C(K)=0
```

One User's Experience with "canned" PET Software
Wes Fasnacht, West Chester State College, West Chester, PA

On March 1st, I ordered the "Introductory Special" (\$9.95) and "Stimulating Simulations" (\$14.95) from Personal Software of Cambridge, MA; the "PET Cassette" from Don Alan Enterprises of Marlton, NJ; and the "PET Cassette" (\$8) from A B Computers of Perkasie, PA.

The response from all three was good - all arrived in the March 7th mail. From Personal Software, I received two cassettes in plastic cases and a 64 page booklet to accompany the Simulations tape. This was all packaged nicely in a padded envelope. The envelope also contained a note with a friendly "hello" and instructions on what to do if the programs do not load properly. A card was included containing the name of the programs on each of the cassettes. I should also note that the tapes contained programs for the PET on one side and the TRS-80 on the other.

The tapes from A B Computers and Don Alan Enterprises simply came in cassette mailers with the vendor's name stamped on the box. Don Alan contained no indication of what programs are on the tape, while A B had a paper band around the cassette containing the program names.

The Personal Software Introductory Cassette contained four programs - Kingdom, One Queen, Matador, and Poker. Kingdom is a version of the Sumerian Game, a simulation of a King running his country. It's good for children. One Queen is a chess board game in which the user tries to outmaneuver the computer's queen. Matador is a bull fight simulation involving times responses on the part of the user. The Poker program wouldn't load. The Simulations tape contained 10 small programs called Art Auction, Monster Chase, Lost Treasure, Gone Fishing, Space Flight, Forest Fire, Nautical Navigation, Business Management, Rare Birds, and Diamond Thief. In the accompanying booklet, Dr. Engel, the author, gives a description of each and points out how it might be modified to expand the scope of the simulations. The simulations were interesting and provide a good base for user-developed extensions.

The A B Computers tape contained six programs - Othello, Mastermind, Klingcap, Biorythm, Multiprimer, and Life. These programs

were all well-done. Othello is a board game somewhat on the order of checkers. Mastermind plays the game of mastermind. Klingcap is a Klingon capture program. Biorythm displays a biorythm graph. Multiprimer is an interesting game involving multiplication. It has some good educational possibilities. Life plays John Conway's game of Life. At \$8, this tape is a good buy.

I was unable to load any programs from the Don Alan tape. The PET would display garbage characters as the name of the program and then terminate with a load error. Apparently the tape drives of their PET and mine were incompatible.

Personal Software included a phone number to call if I had trouble with their tapes, and a call to them resulted in a friendly and business-like conversation with a young lady. She said I had two choices: I could get my money back or they would send me a tape containing the Poker game. I chose the latter and we went on to discuss how I liked the programs and why the tapes can't always be read, etc. She was very knowledgeable and informative about the Personal Software products and operation. All told, my experiences with Personal Software have been very satisfying.

Don Alan had no phone number and no instructions on what to do if the tape was bad, so I wrote to them asking them for another tape. They have not had time to respond as of this writing.

One important area that needs attention by most of the programs is their method of interacting with the user. In many cases, inexperienced users did not know what to enter. If the person entered invalid data, it was not uncommon for the program to get confused and either abort or take some unusual actions. If we really want computers to be commonly used in home and school, programs will have to be very forgiving and helpful in the way they interact with the user. For example, a user should be able to type HELP in response to any input request and get an explanation and an example of what the program is looking for. Now is the time to adopt some standards of this type - before large amounts of software are developed. I'd be happy to hear from readers on this subject.

[ed. note: the Don Alan people have replaced any tape if the purchaser has experienced read problems]

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PET CHARACTER CODES

There are two ways to write to the screen of your PET: either POKEing screen memory (32768-33767) or by PRINTing. Besides this, there are two ways in which memory is interpreted by the character generator: standard mode (location 59468 = binary XXXX110X) or lower case mode (location ≠ XXXX110X). Some of this confusion may be simplified with a character code chart. In the chart the OFF and RVS columns refer to values POKEed in screen memory whereas CHR\$ refers to the PRINT statement. Thus, either POKE 32768,129 or PRINT CHR\$(18) CHR\$(65) will show a reverse A. Note that CHR\$(N) allows program control if the screen control character. This simple program:
 10 INPUT M,N:PRINT M;N;"AA"CHR\$(M)CHR\$(N)"BB":GOTO 10 allows you to explore the full CHR\$ set including cursor and reverse. The chart gives CHR\$ codes from (0-95) and (128-223). The missing values in the chart have the equivalents: (96-127) = (32-63), (224-254) = (160-190), and 255 = 222.

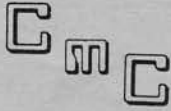
By referring to an ASCII code chart we see that ASCII (0-95) = PET(0-95) but that ASCII(96-127) = PET(192-223), ie, displaced by 96. The printing mode (standard or lower case) is set by POKEing an address. So as not to disturb any of the other bits in the peripheral control register a safe way to set the lower case mode would be: POKE 59468,PEEK(59468) OR 14 and reset it to standard mode with POKE 59468, PEEK(59468) AND 253 OR 12.

Standard Mode: Location 59468 = XXXX110X

OFF	RVS	CHR\$		OFF	RVS	CHR\$		OFF	RVS	CHR\$		OFF	RVS	CHR\$	
	64	192	192		80	208	208		96	224	160		112	240	176
	0	128	64		16	144	80		32	160	32		48	176	48
	65	193	193		81	209	209		97	225	161		113	241	177
	1	129	65		17	145	81		33	161	33		49	177	49
	66	194	194		82	210	210		98	226	162		114	242	178
	2	130	66		18	146	82		34	162	34		50	178	50
	67	195	195		83	211	211		99	227	163		115	243	179
	3	131	67		19	147	83		35	163	35		51	179	51
	68	196	196		84	212	212		100	228	164		116	244	180
	4	132	68		20	148	84		36	164	36		52	180	52
	69	197	197		85	213	213		101	229	165		117	245	181
	5	133	69		21	149	85		37	165	37		53	181	53
	70	198	198		86	214	214		102	230	166		118	246	182
	6	134	70		22	150	86		38	166	38		54	182	54
	71	199	199		87	215	215		103	231	167		119	247	183
	7	135	71		23	151	87		39	167	39		55	183	55
	72	200	200		88	216	216		104	232	168		120	248	184
	8	136	72		24	152	88		40	168	40		56	184	56
	73	201	201		89	217	217		105	233	169		121	249	185
	9	137	73		25	153	89		41	169	41		57	185	57
	74	202	202		90	218	218		106	234	170		122	250	186
	10	138	74		26	154	90		42	170	42		58	186	58
	75	203	203		91	219	219		107	235	171		123	251	187
	11	139	75		27	155	91		43	171	43		59	187	59
	76	204	204		92	220	220		108	236	172		124	252	188
	12	140	76		28	156	92		44	172	44		60	188	60
	77	205	205		93	221	221		109	237	173		125	253	189
	13	141	77		29	157	93		45	173	45		61	189	61
	78	206	206		94	222	222		110	238	174		126	254	190
	14	142	78		30	158	94		46	174	46		62	190	62
	79	207	207		95	223	223		111	239	175		127	255	191
	15	143	79		31	159	95		47	175	47		63	191	63
			141			147	19			145	17			148	20
			13			146	18			157	29			131	3

Lower Case Mode: Location 59468 ≠ XXXX110X, Same Except 193 to 218 Prints as Lower Case a to z Plus Different Graphics:

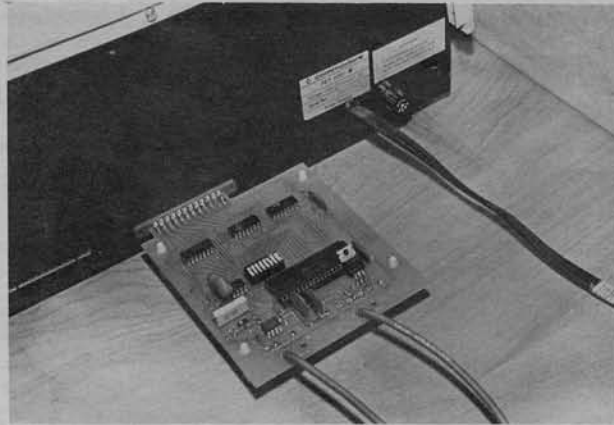
	105	233	169		122	250	186		94	222	222		95	223	223
--	-----	-----	-----	--	-----	-----	-----	--	----	-----	-----	--	----	-----	-----



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```

370 NEXT J
380 PRINT X; "MATCHES"
390 NEXT G
400 PRINT: PRINT "SORRY - IT'S;
410 FOR J=1 TO D : PRINT A(J); : NEXT J
420 GOTO 440
430 PRINT "YOU GOT IT!!!"
440 PRINT : PRINT "ANOTHER";
450 INPUT AS
460 IF LEFT$(AS,1)<>"N" GOTO 120

```

```

100 REM DEFLECTION
110 REM WRITTEN BY FRED DUNLAP 2/11/78
120 REM IDEA FROM KILOBAUD 2/78
121 PRINT:PRINT "GAME OF DEFLECTION":PRINT:PRINT
122 PRINT"DO YOU WANT INSTRUCTIONS (Y OR N)";
123 INPUT XS:IF XS="Y" THEN GOSUB 1000
130 PRINT "cs"
140 SS=32768
150 J=3 : REM NUMBER OF TARGETS
160 FOR I=1 TO J
170 A=INT(1000*RND(1))
180 IF PEEK(SS+A)=160 THEN 170
190 POKE SS+A,160
200 NEXT I
210 A=INT(1000*RND(1))
220 IF PEEK(SS+A)=160 THEN 210
230 U=A+SS
240 DIR=1:IF RND(1)>.5 THEN DI=-1
250 S=TI
300 GET XS
310 IF LEN(XS)<>0 THEN 600
320 NE=U+DI
330 IF ABS(DI)=1 THEN 430
340 IF DI>0 THEN 380
350 IF NE<SS THEN DI=-DI:GOTO 320
355 A=NE
360 IF PEEK(A)=77 THEN DI=-1:NE=NE-1
370 IF PEEK(A)=78 THEN DI=1:NE=NE+1
375 GOTO 530
380 IF NE>SS+999 THEN DI=-DI:GOTO 320
390 A=NE
400 IF PEEK(A)=77 THEN DI=1:NE=NE+1
410 IF PEEK(A)=78 THEN DI=-1:NE=NE-1
420 GOTO 530
430 IF DI>0 THEN 490
440 IF NE-40*INT(NE/40)=7 THEN DI=-DI:GOTO 320
450 A=NE
460 IF PEEK(A)=77 THEN DI=-40:NE=NE+DI
470 IF PEEK(A)=78 THEN DI= 40:NE=NE+DI
480 GOTO 530
490 IF NE-40*INT(NE/40)=8 THEN DI=-DI: GOTO 320
500 A=NE
510 IF PEEK(A)=77 THEN DI= 40:NE=NE+DI
520 IF PEEK(A)=78 THEN DI=-40:NE=NE+DI
530 POKE U,32
540 IF PEEK(NE)=32 THEN POKE NE,81:U=NE:GOTO 300
550 IF PEEK(NE)=160 THEN K=K+1
555 POKE NE,81:U=NE
560 IF K=J THEN 700
570 GOTO 300
600 IF XS="/" THEN A=78:GOTO 630
610 IF XS="\ " THEN A=77:GOTO 630
620 GOTO 320
630 IF PEEK(U+DI)=32 THEN POKE U+DI,A:T=T+1
640 GOTO 300
700 A=TI-S
710 B=INT(A/60+.5)
720 PRINT "csIT TOOK YOU" T"TRIES AND " B"SECONDS"
730 PRINT "TO GET ALL" J"OF THE TARGETS"
740 A=B/J
745 IF A<3 THEN PRINT "YOUR TOO GOOD. GO HOME!"
PRINT:PRINT:GOTO 900
750 IF A<5 THEN PRINT"YOU MUST HAVE BEEN
PRACTICING":GOTO 900
760 IF A<7 THEN PRINT"YOU ARE GETTING GOOD
AT THIS":GOTO 900

```

```

770 IF A<11 THEN PRINT"KEEP PRACTICING -
YOU'LL GET BETTER":GOTO 900
780 IF A<20 THEN PRINT"WHAT A WHIMP":GOTO 900
790 PRINT"ARE YOU A SPAS?"
900 FOR I=1 TO 200:NEXT
902 A=EXP(LOG(J)/3)
905 PRINT"YOUR SCORE";INT(1000*(A/B+A/T))
910 PRINT:PRINT:PRINT"DO YOU WANT TO TRY AGAIN";
920 INPUT XS:IF LEFT$(XS,1)<>"Y" THEN 990
930 PRINT"HOW MANY TARGETS DO YOU WANT";:INPUT J
940 J=ABS(INT(J))
950 IF J<2 THEN 930
960 PRINT"cs":K=0:T=0:GOTO 160
990 END
1000 PRINT : PRINT "YOUR MISSION IS TO DEFLECT THE"
1010 PRINT"BALL INTO THE TARGETS."
1020 PRINT "YOU HAVE TWO CONTROLS OVER THE BALL;"
1030 PRINT "THE '/' AND THE '\'. WHEN YOU"
1040 PRINT "TYPE A SLASH IT WILL SHOW UP"
1050 PRINT "IMMEDIATELY IN FRONT OF THE BALL"
1060 PRINT "AND THE BALL WILL BOUNCE OFF"
1070 PRINT "THE SLASH. A SLASH ONCE LAID CANNOT"
1080 PRINT "BE CHANGED."
1090 PRINT:PRINT"HIT A KEY WHEN YOU ARE READY TO GO"
1100 GET XS:IF LEN(XS)=0 THEN 1100
1110 RETURN

```

Notes from Raynor Taylor on Machine Language Programming
Qtrs. 718 Charleston Naval Base, Charleston, SC 29408

Video Output Routine - Call as subroutine location (decimal) 58346 or (hex) E3EA to have ASCII character, passed in accumulator, printed on screen in next position. All registers, including accumulator are saved and are restored prior to returning.

To set upper bound in memory usage (keep BASIC where you want it) change (decimal) 134 or (hex) 86 and (decimal) 135 or (hex) 87 to desired location when no strings are being stored or after a CLR or NEW command. On the 8K PET, these locations are initialized as (hex) 00 20 corresponding to location \$2000, highest location plus one.

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```

5 REM***RACE TRACK BY ROGER E. MCGEE
6 REM***DONATED TO PET GROUP JAN. 1978
7 REM***EXPERIMENT WITH 115 TO VARY SPEED
10 PRINT"cs":PRINT:PRINT"DO YOU NEED INSTRUCTIONS?"
20 GETZ$:IFZ$=""THEN20
30 IFZ$="N"THEN50
40 GOSUB4000
50 PRINT"cs":CLR
60 X=0:B=6:H=32852
100 PHINT"cs":PRINT"7cd 11cr"
110 PRINT"HOW FAST(1-9)?"
111 GETA$:A=VAL(A$):IFA=0THEN111
112 PRINT"cs"
114 GOSUB1000:PRINT"ch 2cd 5cr";:A1=TI
115 FORK=1TOINT(350-(A*37)):NEXT
120 GETZ$:Z=VAL(Z$):IFZ=0THENZ=B
125 X=1
130 IFZ=6THENB=6:GOTO140
135 GOTO190
140 H=H+1
145 Y=Y+1
150 IFPEEK(H)=32THENX=0
155 Y=Y+1
160 PRINT"cl sp q";
165 Y=Y+1
170 IFX=1 THEN3000
175 Y=Y+1
180 GOTO115
190 IFZ=2THENB=2:GOTO200
195 GOTO250
200 H=H+40
210 IFPEEK(H)=32THENX=0
220 PRINT"cl sp cl cd q";
230 IFX=1 THEN3000
240 GOTO115
250 IFZ=4THENB=4:GOTO260
255 GOTO310
260 H=H-1
270 IFPEEK(H)=32THENX=0
280 PRINT"cl sp 2cl q";
290 IFX=1 THEN3000
300 GOTO115
310 IFZ=8THENB=8:GOTO320
315 GOTO370
320 H=H-40
330 IFPEEK(H)=32THENX=0
340 PRINT"cl sp cl cu q";
350 IFX=1 THEN3000
360 GOTO115
370 GOTO5000
1000 REM
  
```

Legend:
 cs - clear screen
 cu - cursor up
 cl - cursor left
 cr - cursor right
 cd - cursor down
 sp - space
 ch - cursor home
 lower case -
 graphic symbol on
 that letter key

```

1010 REM
1020 REM
1030 PRINT"
1040 PRINT"
1050 PRINT"
1060 PRINT"
1070 PRINT"
1080 PRINT"
1090 PRINT"
1100 PRINT"
1110 PRINT"
1120 PRINT"
1130 PRINT"
1140 PRINT"
1150 PRINT"
1160 PRINT"
1170 PRINT"
1180 PRINT"
1190 PRINT"
1200 PRINT"
1210 PRINT"
1220 PRINT"
1230 RETURN
3000 PRINT
3010 PRINT"ch 22cd";
3020 PRINT"SECONDS=";INT((TI-A1)/.6)/100
3025 FORK=1TO100:GETYS:NEXT
3030 PRINT"WANT TO TRY AGAIN?";
3040 GETZ$:IFZ$=""THEN3040
3050 IFZ$="Y"THEN50
3060 END
4000 PRINT"cs":PRINT:PRINT
4010 PRINT" THE OBJECT OF THE GAME IS TO MOVE"
4020 PRINT"THE BALL AROUND THE TRACK TO THE END"
4030 PRINT"WITHOUT HITTING THE WALLS. YOU WILL"
4040 PRINT"BE ASKED TO PICK A RATE OF SPEED"
4050 PRINT"WHICH WILL BE SUITABLE FOR YOU "
4060 PRINT"SKILLS. THE HIGHER THE NUMBER, THE"
4070 PRINT"FASTER THE BALL WILL MOVE."
4105 PRINT
4110 PRINT" TO MOVE TO THE RIGHT, HIT 6. DOWN"
4120 PRINT"IS 2, LEFT IS 4, AND UP IS 8."
4130 PRINT:PRINT"ARE YOU READY?"
4140 GETZ$:IFZ$=""THEN4140
4150 IFZ$="Y"THENRETURN
4160 GOTO4140
5000 PRINT"cs":PRINT:PRINT
5010 PRINT"YOU BOMBED OUT BOOB!";PRINT
5020 PRINT"YOU HIT THE WRONG KEY."
5030 GOTO3025
READY.
  
```

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