PET User Notes

Publication of the PET User Group P.O. Box 371 Montgomeryville, PA 18936

Volume 1 Issue 7 November-December 1978

Commodore finally announced a number of new PET products which will enable PET owners to easily build a complete system.

These include: 2001-16N (16K graphics) at $995; 2001-16B (16K business) at $995; 2001-32N (32K graphics) at $1195; and 2001-32B (32K business) at $1195. All of these models include full size keyboards, but cassette is optional at $95.

Three printer models were announced: 2021 (80 column electrostatic) at $549; 2022 (80 column dot matrix tractor feed) at $995; and 2023 (80 column pressure feed dot matrix) at $849.

Additionally, two disk drive versions will be available. These are the 2040 (343K net capacity on two drives) at $1095, and the 2041 (171.5K net on one drive) at $595.

Delivery for all the products is supposed to begin in May (1979 I). The disk and printers will be packaged in nice metal cases in the style of the PET.

The currently available 2001-8 PET will continue to be sold in its present format. No word yet on replacement ROMs for the 8K, but the new models will have a new ROM set.

I saw a copy of the PET User Manual recently. It was printed in 8.5 x 11 format like the 6500 Programming Manual, and contained about 120 pages. I think the price is $9.95. The chapter titles are: Welcome to Your PET Computer; Unpacking Your PET; Basic Keyboard Input; Beginning BASIC; Elementary Programming; Advanced Programming Techniques (string variables, functions, subroutines, FOR-NEXT loops, subscripted variables); PET Communication with Outside World (previously published); Machine Language Programming (most of this previously published, but does include Machine Language Monitor source code); and Errors and Diagnostics (error messages). The manual has nothing magic. It seemed to neglect graphics completely, and only mentioned PEEK and POKE in the same brief note that "Intro to Your PET" used. Never-the-less, it is obviously the best effort Commodore has made yet for PET.

6550 RAM chips are now $18, rather than the previous $30. They are currently available from MOS Technology Customer Service, 950 Rittenhouse Road, Norristown PA 19403. Add $1.25 shipping per order. New PETs again are using 6550 chips.

PET repair policy has changed. Current charges are $25 per machine plus parts cost plus $3 shipping, or $20 per component (like cassette drive, main logic board, video board) plus parts.

If you haven't received Machine Language Monitor and preliminary manuals and you received your PET prior to 1 October 1978, send Commodore your serial number and a photocopy of your sales slip with your request. I don't know what later purchasers receive.

Since repair prices have increased, here are several suggestions. Make sure the power connector plug fits tightly onto pins on main logic board (many machines have this problem). If they don't, remove the spring clips from the plug and bend to add more spring tension. Inspect the wires leading to the tape read/write head on occasion--since the head snaps back and forth frequently, the wires can fray and break. Both suggestions are from Commodore Customer Service. From Don Nyre, Newport Beach CA: spray something like Miller Stephenson Contact-Re-Nu into both ends of the multi-contact slide switch mounted on the cassette circuit board to prevent sticking. Mike Lundberg, Omaha NE wrote that his and several other machines in his area experienced problems like permanent cursor loss, no keyboard control, and a screen full of garbage. The problem was caused by an oily residue under the IC's which Mike cleaned with 95% isopropyl alcohol.

Have received several suggestions and requests for product and software reviews. I'm very reluctant to get involved in this. I hope the User Notes will be primarily a forum for deriving full potential from your computer, and I think the best way to accomplish this is through exchange of hardware and software ideas at nominal cost.

I do not personally have time to review very many products, and would hate to have my purely subjective opinions construed as gospel. I would also not like to publish a rave review written by a software author's cousin, nor would I care to include a negative review by someone associated with a competitive product. If you do want reviews, however, I will print them--but would like to receive comments from more than one person using each product in case there are dissenting opinions.

The instigation to write this blurb on reviews was receipt of a letter from Sanford D. Sadowsky, Scotch Plains, NJ. Mr. Sadowsky sent a scathing indictment of Video Checkers by Compu-Quote, stating that the publicity brochure misrepresented the software package, the program played very poorly, and the package wasn't worth $14.95.

In general, I don't think very many software products, especially games and diversions, are worth that price. There are currently a number of sources for decent software at reasonable prices. I also think it's a good idea to call or write for complete information before purchasing, and if the product does not measure up to claims, you should ask for a refund at a minimum. Additionally, shipment by UPS COD only costs 85¢ extra, and might be good protection for slow delivery. Remember, with the advent of microcomputers, there are at least another 100,000 new entrepreneurs out there.

SIGN UP FOR THE NEXT 6 ISSUES

Although late, this is the last issue of Volume 1. If you liked the User Notes, please re-subscribe. I will do another 6 issues at a minimum, and more if the interest is there. To date, less than half of you have signed up again (about 1000 out of the current 2500).

Thanks for all the encouraging letters also. I promise to try more diligently to get the notes out on time for the next issues. The primary reason for the slight price increase is to have a steady part-time person to help with typing, responses to letters, mail list maintenance, and do the "programs on tape" on a more timely basis. This should help a lot -- I'm sure I would enjoy doing the User Notes if they didn't take as much time and effort.

PET User Notes published 6 (or more) times a year by Gene Beals, PET User Group, Box 371, Montgomeryville, PA 18936. Subscription is $6 for 6 issues in U.S. and Canada, and $12 for airmail to other countries.

Announcements

Charles LaForce, 9130 Balcom Ave, Northridge CA (213) 886-0755 is interested in talking to San Fernando Valley PET people.

Program Design, 11 Idar Court, Greenwich, Conn 06830 is offering a number of educational games for preschool to adult levels. Prices range from $10 to $30.

Connecticut microComputer, 150 Pocono Road, Brookfield, CT 06804 has application notes "Software Delay for Slow Carriage Return Printers Using CmC ADA 1200", and "Output Formatting".

Chuck Johnson, 17104 Via Alamitos, San Lorenzo CA 94580 has 2 Atari joysticks, connectors, and a SNAKE demo program for the joysticks at $36. I think he will also send you a nice application note he has written if you want to put the package together on your own.

Bill Maddox, 9715 Heidelberg St, San Antonio TX 78233 has a Star Trek program in which the Enterprise is matched against nine equally strong Klingon vessels. Unless the Enterprise acts, it will be sought out and destroyed by the Klingons. Three levels of difficulty -- $4.

James Mendenhall of Competitive Software, 21650 Maple Glen Dr, Edwardsburg MI 49112 is selling a Home Utilities tape for PET at $9.95. All orders received by March 1979 will also include a free assortment of games.

Micro Software Systems, P O Box 1442, Woodbridge VA 22193 announced BILLBOARD, a commercially oriented display and advertising program for $49.95. Billboard moves inch high characters across the PET screen from right to left to display your messages.

Robert Elliott Purser, P O Box 466, El Dorado CA 95623 publishes a reference list of PET, TRS-80, and Apple cassettes. The list is published quarterly at $4.

GPA Electronics, 906 Blair Ave, Oakland CA 94611 sell an IEEE to 20ma ($59.95) or RS-232 ($74.95) Printer Interface with switch selectable baud rates.

Skyles Electric Works, 599 N. Matilda Ave-Suite 26, Sunnyvale CA 94068 announced 8K ($250), 16K ($450), and 24K ($650) static memory units for PET. Also announced was a "Big Keyboard" for $125 to provide full size keying in parallel to the existing keyboard.

Kenneth Ralston of Micro Systems Laboratory, 1492 Oak Grove Circle, Santa Ana CA 92705 announced an RS-232 adapter for PET with software selectable baud rates at $51.95.

Expandor Incorporated, 400 Sainte Claire Plaza, Upper St. Clair, PA 15241 has an IEEE/TTL Parallel Adapter for their Black Box Printer. The Interface is $98, and the printer is $396 without base and cover ($30 extra).

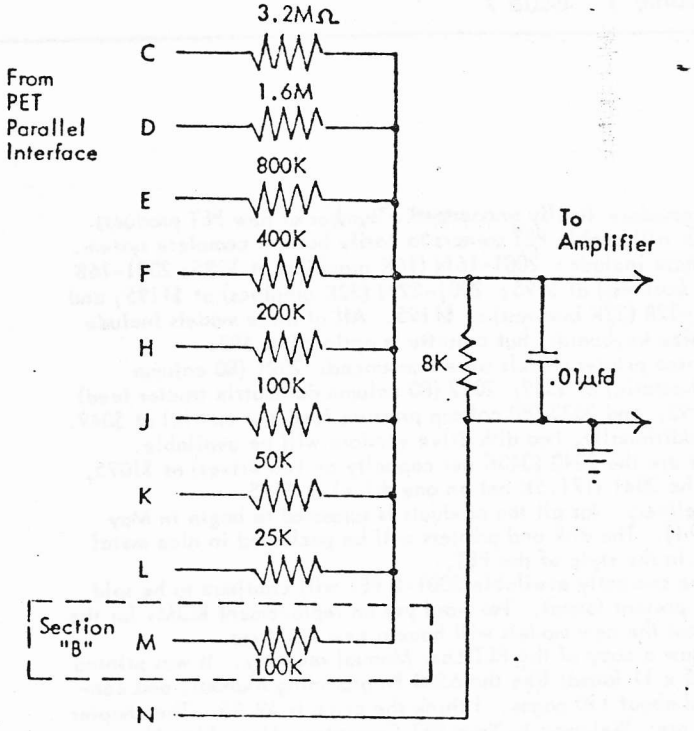
Nestar Systems, Inc, 810 Garland Dr, Palo Alto CA 94303 announced Cluster/One, a low cost distributed processing system which can connect up to 15 PETs through a high speed bus. The central machine (a PET) allows each independent processor to access disk storage and print capability.

Poor Man's D/A Converter

Jim Butterfield

Cheap, good for generating Chamberlin-style music. Precision resistors are preferred, but most anything will generate a recognizable sound.

Section B of the diagram supports the CB2 sound effects, so that one interface board covers most sound requirements.



The capacitor provides some reduction of the sampling frequency (when generating music) .. tone controls on the amplifier will also help, if available.

[ed. note: "Chamberlin-style music" is something worth listening to if you haven't heard it. For background on this, see the excellent article written by Hal Chamberlin in Sept. 1977 Byte magazine. The music is a combination of digital to analog output and 6502 software. MTU (Hal Chamberlin and David Cox) manufacture an excellent, low cost DAC board with on-board audio amplifier. They will be revising the unit in the near future to use a single 5 volt supply (currently 5 and 12 volt) which will make it easier to use with PET. Current model is MTU K-1002 at $40.]

Programs on Tape

$2 for the first program including cassette and postage, $1 for each additional
-- max 4 per tape. This comes to $5 for each 4 programs. This "programs on tape service" is priced to cover the cost of a part time person to copy and mail the tapes. If you have a program to add to the list, please send it on tape. We will copy it and return your tape (with program of your choice). Please do not send commercial programs.

SEQUENCE -- you have to sort a character list
STATECAPS --quiz on states and capitals from Kilobaud 3/78
RACETRACK -- see listing in V. 1, Issue 3 - RE McGee
DEFLECTION -- F Dunlap
ADDITION -- math drill -- F Dunlap, C Pitcairn
OTHELLO -- from Byte 9/77
BAGELS -- like Mastermind - J Butterfield
Cash flow/Return on Investment - R Goldsmith
STAR TREK
BLACKJACK -- D Liem-nice graphics, humorous patter by dealer
LIFE 40*25 -- F Covitz
LIFE 64*64 -- F Covitz
DO-ALL -- JK Johnson from Kilobaud
TRAP -- trap the PET, avoid being trapped
SUPER MASTERMIND -- JR Marcou
LUNAR LANDER -- JR Marcou
NIM -- J Butterfield
QUBIC -- 3D Tic-Tac-Toe
LIST MEMORY -- Charles Combs
MACHINE LANGUAGE MONITOR -- loads in low memory
TIME -- large clock display
BIORYTHM -- K Finn - concise code - 30 statements
KING -- business-social simulation game
BREAKOUT -- J Butterfield - paddle ball
SWATPLOT -- F Campbell (see V.1,Issue 3) - 80*50 plot
TYPEWRITER -- M Richter, R Julin - no printer interface yet
WUMPUS - hunt the wumpus
MARKET -- corporate simulation
CONCENTRATION -- Francis Chambers -displays 52 cards
ESP TEST -- Francis Chambers - test your ESP powers

SHARK BAIT -- JK Johnson - hangman style program
FLEA RACE -- JK Johnson
AWARI -- Hans-J Koch -German instructions - nice graphics
CHASE with Sound
STAR LANES -- Gerald Hasty - from Interface Age future-world business simulation
KALEIDOSCOPE -- Jerry Panofsky - People's Computers
HEXDEC -- Wayne Reindollar - converts and pokes values into memory for machine language programs
24 Second QUBIC -- Mike Louder
DOODLER -- Jim Brannan - draw type program
GNIP GNOP -- Jim Brannan - 2 player ping pong
PONG -- People's Computers
CURFIT -- J Butterfield -fits data to 6 curves
TRIANGLE -- J Butterfield - solves any triangle
METRIC -- J Butterfield - does metric conversions
DATES -- J Butterfield - day of week, days between
TRENDLINE -- J Butterfield - fits, forecasts, graphs
MILEAGE -- J Butterfield - distances from Latitude/Longitude
FACTORS -- J Butterfield - prime factors for any number
MORTGAGE -- J Butterfield - schedule of payments
FINANCE - J Butterfield - present, future value etc.
ADDER - Earl Wuchter - PET as printing adder (nicely done)
BATTLESHIPS -- J Butterfield - you vs. computer
MOONLANDER -- J Butterfield - graphics
CRYPTO -- J Butterfield - cryptogram solving aid
JOTTO -- J Butterfield - guess a word
POEMS -- J Butterfield - write poetry
MYSTERY -- J Butterfield - you can't list it!
MIMONDIS - high monitor and disassembler from SPHINX. Modified by H. Chow
ELIZA -- adapted for PET by Dennis Cumberton - the computer psychologist
HAMMURABI -- social simulation
SLOT MACHINE -- Michael Richter
CRAPS -- Michael Richter
BREAKOUT with Sound
POP SHOT -- from SPHINX - shooting gallery with sound
STARS -- John Broomhall - children's number guessing game
LINEQN -- Frank Alexander - solves linear equations using matrix invert subroutine.
POUNCE -- John Broomhall - kids game.If you don't pounce the right number of spaces, the mouse might run into his hole.
STAR WARS -- John Broomhall
AUTO-DOODLE -- Frank Levinson - draws very nice rectangular patterns
FOURIER --Frank Levinson - very nice high density graphing - visual demo of Fourier approximation curve fit.
CRAPS2 -- Earl Wuchter-not a crap game; rolls dice & displays statistics on the rolls. Shows odds, displays dice.
DRAW POKER -- Earl Wuchter
SOLITAIRE POKER -- D Howe-submitted by E Herstein - solitaire version of draw poker. Displays odds as you play.
PRO FOOTBALL -- Modified by Carl Hennig from SRI Library
RENUMBER -- Bill Seiler - machine language version
MATCH GAME -- L Uher - 23 matches
STAR TREK IV -- Francis Chambers - updated version with good graphics and more features
BRAIN STRAIN -- Ed Herstein - try to get lights on in all but the center square
SNAKE -- submitted by Ed Herstein - a 0,1, or 2 player Trap game that speeds up the longer you go.
YAHTZEE -- Pete Rowe submitted by Ed Herstein - dice game
HANGMAN -- Grant Paul - has list of 500 words
HANGMAN 2 -- for 2 players with PET keeping score - needs a little work on display & graphics.
TAPE TEST -- Bob Huenemann - Help to evaluate tape errors.
COPY --R Julin - data file manipulation
TALK & TALKER -- R Julin - Send ASCII characters between 2 PETs via parallel user port.
LEM -- submitted by Horst Brinkler - lunar lander includes attitude angle and orbit consideration as well as time, altitude, & velocity. English or metric measurements. No graphics.
INDEX -- David Wilcox - tape index to locate a specific program on a tape.
KENTUCKY DERBY -- Tom Baker - Horse race for any number of people with betting - good looking horses.
MAZE -- Hans-J Koch - Creates a single solution maze up to 19*10. Use cursor keys to find way through.
FLIGHT SIMULATOR - submitted by Jerry Panofsky - instrument flying. Try to take off and land safely.
BACKGAMMON -- Bill Hood
PPONG -- P. Rowe submitted by Ed Herstein - similar to deflection with land mines
FN MACHINE -- P. Rowe submitted by Ed Herstein-feed numbers through machine, see output, deduce function.
WEIGH - Guess the lightest and heaviest object in 3 tries.
KLINGON CAPTURE -- Mark Turner - grid game from KILOBAUD
SIMON -- Gary Mayhuk - sound repetition game
OTHELLO/2 -- F. Dunlap Modified by J Mendenhall
DIGIT SPAN -- number recall in sequence and reverse sequence for progressively long numbers
CENTRAL LIMIT -- Dave Heise - graphs results of repeated samples of any given size, showing averages tend to be normally distributed.
CHI SQUARE -- Dave Heise - constructs repeated random 4-fold tables and computes significance test for each. Nice graphic representation of statistical values.
MONEY CHANGER -- Max Yoder - give correct change for amount shown. Basis of a good educational program. No graphics.
BABY -- Sally & Stan Klein - try to keep your sanity while feeding & diapering your baby yet have time to yourself
SAM--R Tansony-shoot down enemy planes from your missile base
CHECKERS -- William Anderson
PET ORGAN -- Wm. Anderson - Sound plays 3 octaves of notes
STARWAR -- John Ball - save planet from enemy fighter planes. 10 levels of difficulty.
LONG DIVISION - - E Lichten-long division tutorial by grade level
NEAT PROGRAM -- Chris Crawford
TANKS -- E Lichten - shoot Russian tanks which are faster & able to move through the mine fields
FAIR OPTION VALUE -- Joe Kot - Evaluates stock option prices.
TRACE -- Brett Butler-traces basic program or direct entries
KEYBOARD -- Neil Harris/J Butterfield - musical keyboard, will remember and play back tune
MARKS -- J Butterfield - keeps track of names and grades, shows low, high, and average. Keeps tape file
PORTFOLIO -- J Butterfield - keeps track of stocks. Buy, sell, evaluate, and save on tape.
MERGE -- J Russo/H Chow - merge two or more program segments
M7171 -- J Russo/H Chow - high monitor with merge capability
IMAGE -- P Rowe, modified by H Chow - save any portion of memory on cassette

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Star Sounds -- CB2 Sound

Rick Church
Helena,MT.

```
10 POKE 59467,16
20 POKE 59466,15
30 A=1
40 FOR T =1 TO 20
50 FOR X=255 TO 100   STEP -A
60 POKE 59464,X
70 NEXT X: NEXT T
80 A=A+1: GOTO 40
```

```
10 POKE 59467,16
20 POKE 59466,15
30 A=255
40 FOR X=A-4 TO A
50 POKE 59464,X
60 NEXT X
70 IF A<5 THEN END
80 A=A-1:GOTO 40
```

Two Player Games with One Keyboard

by Michael Riley, Philadelphia

Under normal operation, two player games on the PET are limited by key lock out - that is, when one key is held down, the other keys are locked out.

Games that need a limited number of keys can be played with the help of K=PEEK(59410). Normally, 59410 contains 255. When any of the keys "rvs", "[", "spc", "<", "." or "=" are depressed, certain bits will be reset. These bits are 1,2,4,8,64, and 128 respectively.

Games involving more than a few keys require a machine language routine, however. To do this, first set the interrupt disable. Then add 240 [$F0] to the row number of the key that you want to sense. Store the sum in E810. Then look to see what is in E812. E812 will contain the values of the column number bits. If the value of the column number bit is 0 (reset or off), then the key is being held down. (see keyboard chart accompanying article)

The following program stores the number 240 through 249 in E810 and transfers the results of E812 to the first 10 bytes on the screen. The purpose of the program is to demonstrate graphically how keys can be sensed.

You may wish to write your own routine or simply change this one so that the ten information bytes are stored somewhere other than on the screen. They can then be PEEKed with a simple BASIC command and "ANDed" with the proper bits in order to reveal the location of keys that are being held down simultaneously.

```
033A  78        SEI
033B  A0 F0     LDY #$F0
033D  A2 00     LDX #$00
033F  8C 10 E8  STY $E810
0342  AD 12 E8  LDA $E812
0345  9D 00 80  STA $8000,X
0348  E8        INX
0349  C8        INY
034A  E0 0A     CPX #$0A
034C  D0 F1     BNE $033F
034E  58        CLI
034F  60        RTS
```

```
100 FORX=826TO847:READR:POKEX,R:NEXTX
110 SYS826
120 PRINT"hddd   "
130 GOTO110
826 DATA120,160,240,162,0,140,16,232
830 DATA173,18,232,157,0,128,232
841 DATA200,224,10,208,241,88,96
```

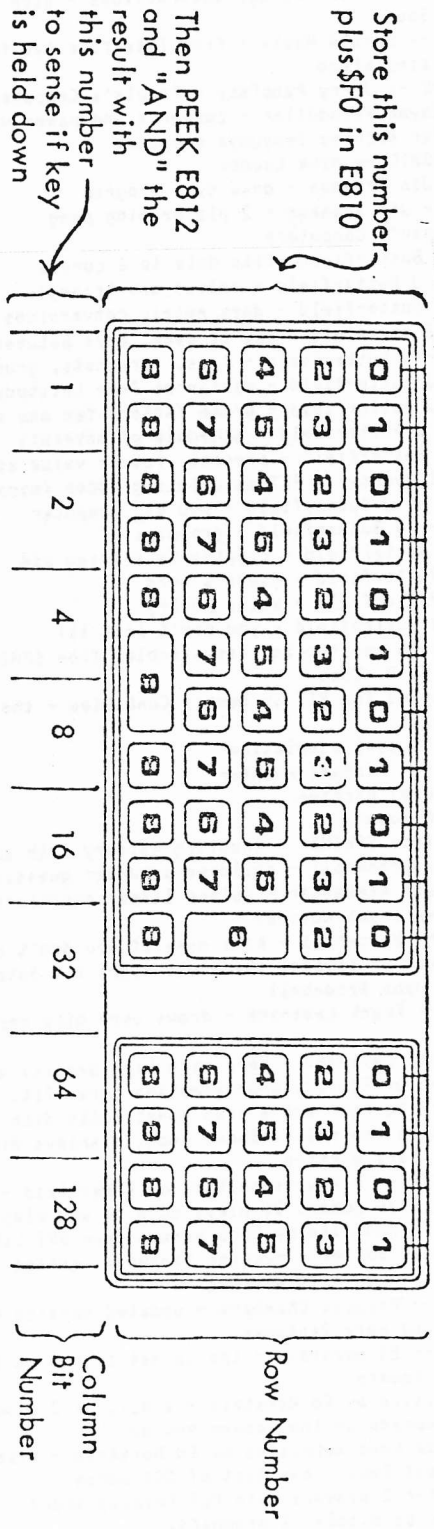
GET String Routine

John Bell McLean, VA

This routine acts as a substitute for an INPUT statement and it allows commas, semicolons, colons, etc. to be used, which cannot be used in INPUT.

```
 10 O$="      40 blanks                          "
 2500 REM GET STR ROUTINE
 2505 Z$="";B$="? ";X$=""
 2510 A=PEEK(245)+1
 2515 IF A>21 THEN PRINT "ddd":A=A-3
 2516 POKE 245,A:PRINT "u";B$
 2520 GET X$: IF X$="" THEN 2520
 2530 IF X$=CHR$(13) THEN PRINT:RETURN
 2535 IFASC(X$)<160ANDASC(X$)>96ORASC(X$)<30THENZ$
=LEFT$(Z$,LEN(Z$)-1):GOTO2555
 2540 Z$=Z$+X$
 2555 POKE 245,A:PRINT"u";B$;Z$;O$:GOTO 2520
 3000 REM
 3100 PRINT"   u=cursor up;  d=cursor down"
```

Note: Line 2535 makes the cursor controls and delete key list character entered.
Line 2515 allows room at the bottom of the screen for two lines without scrolling during entry.



Verifying Tape Loads

By Jim Butterfield Toronto

When you get a bad cassette tape load, PET says ?LOAD ERROR. So if you don't get the error message, just READY, that means your tape read is good, right?

Wrong. For unknown reasons, PET only warns of certain kinds of errors. As many users know by now, you can get a bad load with no warning from PET.

To check for a good load, just type ? ST after the load is complete. A reply of 0 (zero) means the load is OK. A reply of any other means a bad load.

SOFTWARE for PET

TUNNEL VISION and KAT & MOUSE $7.95
Two excellent maze programs. In Tunnel Vision, you view the maze from inside in perspective. If you get lost in attempting to reach the exit, the program provides you a map showing the trail. In Kat & Mouse, you must find your way through the maze before the hungry Kat finds you. Each maze has only one solution, and each is unique.

KITE FIGHT & SIMON $7.95
Kites is a completely original two player action game with its own unique strategies. Includes 4 pages on real Indian Fighter Kites.
In Simon, you must repeat what you see and hear. Simon is a fun game with great graphics and sound.

All by Michael Riley

LUNAR LANDER - The most sophisticated lander available with auto-pilot in case of pilot errors. Includes sound on descent and the Star Spangled Banner upon a successful landing. By Jeff Jessee and Bob Freeman.

MORSE CODE - Learn morse code painlessly. Morse Code will sound out any letter you key in, or it will give the sounds for code recognition practice. By Bob Freeman

BOTH FOR $9.95

MICROCHESS by Peter Jennings $17.95
Offers 8 levels of play to suit everyone from beginner to the serious player. It examines as many as 6 moves ahead.

BRIDGE CHALLENGER $13.45
You and the dummy play 4 person Contract Bridge against the PET. The program deals hands according to your criterion for high card points. You can review tricks, swap sides, or replay cards after each hand.

STIMULATING SIMULATIONS $13.45
Dr. CW Engels' book of 10 interesting simulation games with complete documentation, instructions, and suggestions for modification and enhancement. Includes cassette with programs keyed in for you.

GRAPHICS UTILITY PACKAGE $13.45

All From Personal Software

ABTAPE1 $8.00
Includes Life, Biorythm, Othello, Mastermind II, Multiprimer (math tutorial-deduction game), and Capture

CmC Word Processor $24.95
The best available word processing software for the PET

BOOKS books BOOKS books BOOKS

BASIC for Home Computers - Albrecht, Finkel, Brown $5.95
New programmed instruction text on MICROSOFT BASIC

BASIC and the Personal Computer - Dwyer & Critchfield $12.95

Stimulating Simulations - Dr. C. William Engel $4.00

Programming a Micrcomputer:6502 - Caxton Foster $8.95

My Computer Likes Me *when I speak BASIC - B Albrecht $2.00

6500 Programming Manual - MOS Technology $6.50

6500 Hardware Manual - MOS Technology $6.50

Hewlett-Packard IEEE-488 Standards Manual $1.50

Instant BASIC - Jerald R. Brown $6.00

How to Profit From Your Personal Computer - TG Lewis $7.00

ACCESSORIES

Cassette Tapes

- Premium quality high output, low noise in 5 screw housings
  C-10 (5 min/side) 10/$6.25 50/$27 100/$52
  C-30 (15 min/side) 10/$8.00 50/$36 100/$67
  Certified Digital Cassette Tape 300 foot (C-64) 10/$19.50
  In digital 5 screw housing with slide write protect tabs, with Norelco box

Soft plastic boxes 10/$1.00
Norelco-style hard plastic two piece hinged box 10/$1.25

PET Edge Connector Plugs with Keys
Second Cassette Port $1.75
User or IEEE-488 Port $2.50
Memory Port $4.95

Protect-A-PET $9.95
Custom fitted clear vinyl dust cover with quality stitched seams for those rare occasions when you're away from your PET

BETSI PET to S-100 Interface Motherboard $149
Four slot motherboard - On board sockets and decoding circuitry hardware with four 100 pin edge connectors. Assembled.

BETSI Kit - one S-100 connector $119

Power Supply for BETSI and static RAM boards $34
8 volt/6 amp. Assembled in case

S-100 8K Static RAM (Problem Solver Systems) $149
Assembled, tested, and burned-in at factory 120 day warranty PERFECT FOR BETSI

S-100 16K Static RAM (Problem Solver Systems) $295

PET IEEE to Printer Interface by GPA Electronics
Assembled and tested -- includes an additional connector, thus leaves bus open for additional peripherals.
20 ma $59.95
RS-232 $74.95

KIM-1 $161
SYM $238
Write for list of PET and KIM accessories

We pay shipping on prepaid orders in excess of $6.00. Add $.75 for orders less than $6.

A B Computers PO Box 104 Perkasie PA 18944 (215) 257-8195

M7171 Monitor and Merge in High Memory

Jim Russo, Henry Chow Detroit

M7171 now has the ability to load and link several BASIC programs, to allow several subroutines to be combined into one program, or to simply have more than one program resident in memory at one time.

M7171 is loaded by the BASIC command LOAD. It is started by SYS7171. When M7171 is started, it reserves the top 1K (of an 8K PET) for itself. Exit from M7171 by the command X.

When the PET loads M7171, it then considers Program Memory to be full. If you wish to type in a new BASIC program, use the NEW command to free up memory. If yo wish to load a BASIC program from tape, use the BASIC command LOAD.

To load a BASIC program after the BASIC program already in memory, enter M7171 by the command SYS7171, then use L 01, or L 01,NAME to load the tape. If the tape contains a BASIC progam which will fit in the remaining memory, it is loaded, and control is returned to BASIC. If the program does not fit, M7171 prints ? and refuses to load it. If the tape contains a machine-language program, M7171 loads it normally and retains control.

If you wish to combine several BASIC routines into one program, the line numbers of the sections should not overlap each other; and the lowest-numbered section should be loaded first. If you violate this rule, BASIC will proceed as follows: when looking for a line number, it starts at the beginning of the program and scans forward until it finds it; if it first finds a larger line number, it assumes the one it was looking for doesn't exist. The screen editor can be used to re-order the program, but since the screen editor is subject to the same restriction in finding lines, you will need to experiment for awhile to get down the techniques of editing an out-of-order program.

If your program stops with an out-of-memory error, you may free the 1K used by M7171 by giving the BASIC command POKE 135,32.

One application of these techniques is the use of the RESEQUENCER program (D63777-R63888) to resequence a program already in memory. If M7171 was not already in memory, the pointers for the existing program can be read by the command ?PEEK(124);PEEK(125). Then load M7171 and use POKE 124, :POKE 125, to restore the pointers. Use M7171 to load RESEQUENCER, and then start it by the command RUN 63888. RESEQUENCER prints an * for each line, and the line numbers of any lines where the new argument of GOTO, GOSUB, or THEN has more digits than the old one, and may have overwritten the command.

```
1C00  EA EA EA EA EA EA EA A9   1CD0  5E 1E 90 0D A2 00 81 11
1C08  00 85 86 A9 1C 85 87 A9   1CD8  C1 11 F0 05 68 68 4C 9B
1C10  27 8D 1B 02 A9 1C 8D 1C   1CE0  1C 20 F7 1C C6 21 60 A9
1C18  02 A9 00 85 82 A9 1C 85   1CE8  1B 85 11 A9 00 85 12 A9
1C20  83 A9 43 85 21 D0 12 A9   1CF0  05 60 A9 0D 4C D2 FF E6
1C28  42 85 21 D8 4A 68 85 1E   1CF8  11 D0 06 E6 12 D0 02 E6
1C30  68 85 1D 68 85 1C 68 85   1D00  0A 60 3A 3B 52 4D 47 58
1C38  1B 68 69 FF 85 19 68 69   1D08  4C 53 1D 1D 1D 1D 1D 1D
1C40  FF 85 1A BA 86 1F 58 20   1D10  1E 1E C1 B1 2C 5E D7 FB
1C48  F2 1C A6 21 A9 2A 20 22   1D18  9E 9E 20 50 43 20 20 53
1C50  1E A9 52 85 0D D0 2B A9   1D20  52 20 41 43 20 58 52 20
1C58  00 85 CA 85 0D 85 0A 20   1D28  59 52 20 53 50 A5 0D D0
1C60  F2 1C A9 2E 20 D2 FF A6   1D30  06 20 F2 1C 20 37 1E 20
1C68  20 E0 02 F0 04 E0 03 D0   1D38  37 1E A2 00 BD 1A 1D 20
1C70  06 20 3A 1E 20 37 1E 20   1D40  D2 FF E8 E0 13 D0 F5 20
1C78  90 1E C9 2E F0 F9 C9 20   1D48  F2 1C A2 2E A9 3B 20 22
1C80  F0 F5 A2 07 DD 02 1D D0   1D50  1E 20 37 1E 20 08 1E 20
1C88  0F A5 20 85 0E 86 20 BD   1D58  E7 1C 20 BB 1C F0 4D 20
1C90  0A 1D 48 BD 12 1D 48 60   1D60  90 1E 20 4F 1E 90 48 20
1C98  CA 10 E9 A9 3F 20 D2 FF   1D68  3F 1E 20 90 1E 20 4F 1E
1CA0  4C 57 1C 38 A5 13 E5 11   1D70  90 3D 20 3F 1E A0 00 B9
1CA8  85 0B A5 14 E5 12 A8 05   1D78  4A 1F 30 06 20 D2 FF C8
1CB0  0B 60 A5 11 85 19 A5 12   1D80  D0 F5 29 7F 20 D2 FF 20
1CB8  85 1A 60 85 21 A0 00 20   1D88  2A F3 F0 20 A6 0A D0 1C
1CC0  3A 1E B1 11 20 13 1E 20   1D90  20 A3 1C 90 17 20 F2 1C
1CC8  F7 1C C6 21 D0 F1 60 20   1D98  A2 2E A9 3A 20 22 1E 20
```

```
1DA0  37 1E 20 04 1E A9 08 20
1DA8  BB 1C F0 DB 4C 57 1C 4C
1DB0  9B 1C 20 5E 1E 20 4F 1E
1DB8  90 03 20 B2 1C 20 E7 1C
1DC0  D0 0A 20 5E 1E 20 4F 1E
1DC8  90 E5 A9 08 85 21 20 90
1DD0  1E 20 CF 1C D0 F8 F0 D4
1DD8  20 CF FF C9 0D F0 0C C9
1DE0  20 D0 CC 20 4F 1E 90 03
1DE8  20 B2 1C A6 1F 9A A5 1A
1DF0  48 A5 19 48 A5 1B 48 A5
1DF8  1C A6 1D A4 1E 40 A6 1F
1E00  9A 4C 8B C3 A2 01 D0 02
1E08  A2 09 B5 10 48 B5 11 20
1E10  13 1E 68 48 4A 4A 4A 4A
1E18  20 29 1E AA 68 29 0F 20
1E20  2B 1E 48 8A 20 D2 FF 68
1E28  4C D2 FF 18 69 06 69 F0
1E30  90 02 69 06 69 3A 60 20
1E38  3A 1E A9 20 4C D2 FF A2
1E40  02 B5 10 48 B5 12 95 10
1E48  68 95 12 CA D0 F3 60 20
1E50  5E 1E 90 02 85 12 20 5E
1E58  1E 90 02 85 11 60 A9 00
1E60  85 0F 20 90 1E C9 20 D0
1E68  09 20 90 1E C9 20 D0 0E
1E70  18 60 20 85 1E 0A 0A 0A
1E78  0A 85 0F 20 90 1E 20 85
1E80  1E 05 0F 38 60 C9 3A 08
1E88  29 0F 28 90 02 69 08 60
1E90  20 CF FF C9 0D D0 F8 68
1E98  68 4C 57 1C 4C 9B 1C 20
1EA0  90 1E A9 00 85 EE 85 FA
1EA8  A9 23 85 F9 20 5E 1E 29
1EB0  0F 85 F1 20 90 1E A2 00
1EB8  20 CF FF C9 2C F0 55 C9
1EC0  0D F0 0B E0 10 F0 F1 95
1EC8  23 E6 EE E8 D0 EA A5 20
1ED0  C9 06 D0 C8 A2 00 8E 0B
1ED8  02 A5 F1 D0 03 4C 9B 1C
1EE0  C9 03 B0 F9 20 67 F6 20
1EE8  3B F8 20 FF F3 A5 EE F0
1EF0  08 20 95 F4 D0 08 4C 9B
1EF8  1C 20 AE F5 F0 F8 4C 6B
1F00  1F 20 22 F4 20 8A F8 20
1F08  13 F9 AD 0C 02 29 10 D0
1F10  E5 4C 57 1C 20 4F 1E A5
1F18  11 85 F7 A5 12 85 F8 20
1F20  CF FF C9 20 F0 F9 C9 0D
1F28  F0 A4 C9 2C F0 03 4C 9C
1F30  1E 20 4F 1E A5 11 85 E5
1F38  A5 12 85 E6 A5 20 C9 06
1F40  F0 92 A2 00 20 B1 F6 4C
1F48  57 1C 0D 20 20 20 20 20
1F50  20 20 20 20 20 30 20 20
1F58  31 20 20 32 20 20 33 20
1F60  20 34 20 20 35 20 20 36
1F68  20 20 B7 A5 7C 38 E9 04
1F70  85 27 A5 7D E9 00 85 28
1F78  A0 00 B1 27 F0 06 E6 27
1F80  D0 02 E6 28 C8 B1 F3 D0
1F88  07 C8 B1 F3 C9 04 F0 06
1F90  20 4D F6 4C 01 1F A5 28
1F98  91 F3 88 A5 27 91 F3 A0
1FA0  03 B1 F3 18 65 27 91 F3
1FA8  C8 B1 F3 65 28 E9 03 91
1FB0  F3 C9 1C 90 03 4C 9B 1C
1FB8  20 4D F6 20 22 F4 20 8A
1FC0  F8 20 13 F9 AD 0C 02 29
1FC8  10 F0 03 4C 9B 1C A0 AE
1FD0  20 3F F3 4C EE F3 24 24
```

D63777-R63888 (Delete and Resequence)

modifications by Jim Russo and Henry Chow

```
. 63777 PRINT"DELETE LINES J TO K (J,K)":INPUTJ,K
  63778 PRINT"3":FORI=JTOJ+8:IFI>KTHEN63780
  63779 PRINTI:NEXT:PRINT"J="J+9":K="K":GOTO63778
  63780 POKE525,10:FORI=0TO9:POKE527+I,13:NEXT:PRINT"";:END
  63888 PRINT"RESEQUENCE":INPUT"FIRST,INCREMENT";Z,K
  63985 DIML(256):L=1025:DEFFNR(X)=PEEK(X)+256*PEEK(X+1)
  63986 DEFFNM(X)=INT((K*X-K+Z)/256)
  63987 N=FNR(L):X=FNR(L+2):IF X<63777 THEN A=A+1:L(A)=X:L=N:G
OTO 63987
  63989 L=1025:FOR B=1 TO A:N=FNR(L):POKE(L+3),FNM(B)
  63990 POKE(L+2),K*B-K+Z-256*FNM(B)
  63991 F=0:FOR C=L+4TON-1:P=PEEK(C):IF P=13TOR P=14TOR P=16TT
HEN F=1:GOTO 63999
  63992 IF F>0THENF=0:IFP<58 THENF=1:G=G+1:IFP>47THEN D=10*D+P
-48:GOTO 63999
  63993 IF D=0 GOTO 63999
  63994 FOR E=1 TO A:IF D=L(E)GOTO 63996
  63995 NEXT E:D=0:G=0:GOTO 63999
  63996 D=0:E$="      "+STR$(E*K-K+Z):H=LEN(E$):C=C-G:IFP<48THE
NG=G-1:C=C+1
  63997 IFH-6>GTHENPRINTB*K-K+Z;E*K-K+Z;
  63998 FOR I=1TOG:POKE C,ASC(MID$(E$,I+H-G,1)):C=C+1:NEXT I:G
=0
  63999 NEXT C:L=N:PRINT"*";:NEXT B:END
```

[ed. note: this is a modification to the previously published RESEQUENCER with line delete capability added. Henry and Jim use it in conjunction with MERGER or M7171. This version will resequence ON..GOTO with an error signal and will change the number if you leave enough spaces before the line numbers.]

IEEE Bus Handshake Routine in Machine Language

John A Cooke University of Edinburgh
reprinted from Commodore PET Users Club Newsletter, England

To use the IEEE-488 bus on the PET at maximum speed it is necessary to use machine language rather then BASIC 'INPUT' and 'PRINT'. The routine given here has been used with an HP3437A systems voltmeter to reach data transfer speeds of over 5000 bytes per second, corresponding to 2500 voltage readings in 2-byte packed binary format or 625 readings in 8-byte ASCII format. The best speed attained in BASIC is 75 readings per second transferred as character strings.

The IEEE Bus

Details of the IEEE-488 bus are given in PET documentation, but some clarification of the register addresses is helpful. These are:

HEX	DECIMAL	BITS	IEEE	DIRECTION
E820	59424	0-7	DIO 1-8	from bus
E822	59426	0-7	DIO 1-8	to bus; 'PET'controlled
E821	59425	3	NDAC	'PET' controlled
E823	59427	3	DAV	'PET' controlled
E840	59456	0	NDAC	from bus
		1	NRFD	'PET' controlled
		2	ATN	'PET' controlled
		6	NRFD	from bus
		7	DAV	from bus

Note that on the IEEE bus, 'high' is logic false and 'low' is logic true; and that the data bus must be left with all bits 'high' when PET has finished to avoid confusion of data put to the bus by other devices.

The Program

The program controls a given number of data transfers, each of 8 bytes, from the HP3437A to the PET. Each one is preceded by a trigger (GET - group execute trigger) on the IEEE bus, and the HP3437A must be correctly addressed as a 'talker' or a 'listener' at all times by sending MTA (my talk address) or MLA (my listen address) before transfers as appropriate. The sending of messages (GET, MTA, MLA, etc.) or data is controlled by the ATN line; ATN is true when messages are being sent.

The program and returned data are held in the top 2K of memory; this is hidden from BASIC using POKE 134,255: POKE 135,23 as the first line of the BASIC control program. The number of readings required is POKE'd into 6400 (decimal), then control passed to the machine language program by SYS(6144). The data bytes coming in on the IEEE bus are stored in locations 6401 (decimal) onwards; these are PEEKed out on return to BASIC, and converted into numbers using the function VAL. As the index register is used for counting, only 256 bytes can be transferred using this rogram, but it would be easy to modify the program to perform more transfers.

Dissassembled listings with comments and a separate listing (for ease of copying into BASIC DATA statements!) are given.

This program was prepared using a machine language handler written by the author, and the listings produced by this handler and by a modified version of the 'disassemble' part of the PETSOFT ASSEMBLER 'EXEC' program.

IEEE bus handshake routine - main program

```
1800 A200    LDX #00      prepare index register
1802 A9FB    LDA #FB      set ATN low
1804 2D40E8  AND E840
1807 8D40E8  STA E840
180A A928    LDA #28      MLA (28 for this device)
180C 8501    STA 01
180E 208018  JSR 1880     handshake into bus
1811 A908    LDA #08      GET
1813 8501    STA 01
1815 208018  JSR 1880     handshake
1818 A948    LDA #48      MTA
181A 8501    STA 01
181C 208018  JSR 1880     handshake
181F A9FD    LDA #FD      set NRFD low (ready to receive data)
1821 2D40E8  AND E840
1824 8D40E8  STA E840
1827 A9F7    LDA #F7      and NDAC low also
1829 2D21E8  AND E821
182C 8D21E8  STA E821
182F A904    LDA #04      set ATN high
1831 0D40E8  ORA E840
1834 8D40E8  STA E840
1837 A008    LDY #08      ready to count 8 bytes
1839 20B018  JSR 18B0     handshake data from bus
183C A502    LDA 02       result to A
183E 9D0119  STA 1901,X   store in  1901+X
1841 E8      INX
1842 88      DEY
1843 D0F4    BNE 1839     jump if Y not zero
1845 A9FB    LDA #FB      set ATN low
1847 2D40E8  AND E840
184A 8D40E8  STA E840
184D A902    LDA #02      set NRFD high
184F 0D40E8  ORA E840
1852 8D40E8  STA E840
1855 A908    LDA #08      set NDAC high
1857 0D21E8  ORA E821
185A 8D21E8  STA E821
185D A95F    LDA #5F      UNT
185F 8501    STA 01
1861 208018  JSR 1880     handshake to bus
1864 A904    LDA #04      set ATN high
1866 0D40E8  ORA E840
1869 8D40E8  STA E840
186C CE0019  DEC 1900     decrease counter
186F D091    BNE 1802     jump if not zero
1871 60      RTS          return to BASIC program
```

subroutine to handle handshake into bus

```
1880 AD40E8  LDA E840     NRFD ?
1883 2940    AND #40
1885 F0F9    BEQ 1880     jump back if not ready
1887 A501    LDA 01       ready:  get data byte
1889 49FF    EOR #FF      complement it
188B 8D22E8  STA E822     send to bus
188E A9F7    LDA #F7      set DAV low
1890 2D23E8  AND E823
1893 8D23E8  STA E823
1896 AD40E8  LDA E840     NDAC ?
1899 2901    AND #01
189B F0F9    BEQ 1896     jump back if not accepted
189D A908    LDA #08      accepted;  set DAV high
189F 0D23E8  ORA E823
18A2 8D23E8  STA E823
18A5 A9FF    LDA #FF      255(10) into bus
18A7 8D22E8  STA E822
18AA 60      RTS          return to main
```

subroutine to handle handshake from bus

```
18B0 A902    LDA #02      set NRFD high
18B2 0D40E8  ORA E840
18B5 8D40E8  STA E840
18B8 AD40E8  LDA E840     DAV ?
18BB 2980    AND #80
18BD D0F9    BNE 18B8     jump back if not valid
18BF AD20E8  LDA E820     get data byte from bus
18C2 49FF    EOR #FF      complement
18C4 8502    STA 02       store in $ 0002
```

```
18C6 A9FD   LDA #FD      set NRFD low
18C8 2D40E8 AND E840
18CB 8D40E8 STA E840
18CE A908   LDA #08      set NDAC high
18D0 0D21E8 ORA E821
18D3 8D21E8 STA E821
18D6 AD40E8 LDA E840     DAV high ?
18D9 2980   AND #80
18DB F0F9   BEQ 18D6     jump back if not
18DD A9F7   LDA #F7      set NDAC low
18DF 2D21E8 AND E821
18E2 8D21E8 STA E821
18E5 A9FF   LDA #FF      255(10) into bus
18E7 8D22E8 STA E822
18EA 60     RTS          return to main
```

IEEE bus handshake routine listing

```
1800 A2 00 A9 FB 2D 40 E8 8D
1808 40 E8 A9 28 85 01 20 80
1810 18 A9 08 85 01 20 80 18
1818 A9 48 85 01 20 80 18 A9
1820 FD 2D 40 E8 8D 40 E8 A9
1828 F7 2D 21 E8 8D 21 E8 A9
1830 04 0D 40 E8 8D 40 E8 A0
1838 08 20 B0 18 A5 02 9D 01
1840 19 E8 88 D0 F4 A9 FB 2D
1848 40 E8 8D 40 E8 A9 02 0D
1850 40 E8 8D 40 E8 A9 08 0D
1858 21 E8 8D 21 E8 A9 5F 85
1860 01 20 80 18 A9 04 0D 40
1868 E8 8D 40 E8 CE 00 19 D0
1870 91 60 EA EA EA EA EA EA
1878 EA EA EA EA EA EA EA EA
1880 AD 40 E8 29 40 F0 F9 A5
1888 01 49 FF 8D 22 E8 A9 F7
1890 2D 23 E8 8D 23 E8 AD 40
1898 E8 29 01 F0 F9 A9 08 0D
18A0 23 E8 8D 23 E8 A9 FF 8D
18A8 22 E8 60 EA EA EA EA EA
18B0 A9 02 0D 40 E8 8D 40 E8
18B8 AD 40 E8 29 80 D0 F9 AD
18C0 20 E8 49 FF 85 02 A9 FD
18C8 2D 40 E8 8D 40 E8 A9 08
18D0 0D 21 E8 8D 21 E8 AD 40
18D8 E8 29 80 F0 F9 A9 F7 2D
18E0 21 E8 8D 21 E8 A9 FF 8D
18E8 22 E8 60
```

```
0001 data to go into bus
0002 data from bus

1900 counter for number of data transfers

1901 start of results area
```

Getting Started in Machine Language

by Michael Riley, Philadelphia

The '6500 Programming Manual' has all the necessary information for programming the 6502. If you've never done machine language programming, however, you may wish to try 'Programming a Microcomputer: 6502'. This book contains most of the material in the manual, but is written more for beginners. 'The First Book of KIM' contains many game programs such as 'Lunar Lander' as well as some utility programs like 'Relocate'. The last page of this book has an excellent chart that makes finding of codes a breeze.

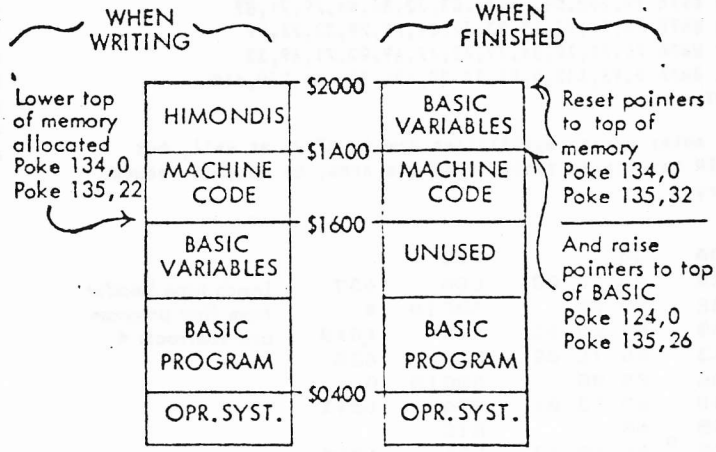
I have found that programming is much easier if I write first in BASIC to test the logic and then translate it one section at a time into machine code. A memory map of the ROM helps me to avoid writing routines that are already available.

A version of the Machine Language Monitor called 'HIMONDIS' (monitor and disassembler in high memory) is very helpful. Because it is in high memory, it can coexist with a BASIC program. The disassembler makes debugging much easier.

When writing a program, the pointers at 134 and 135 ($86 and $87 -- low byte first) are typically changed to point to a spot just below the machine language code.. This tells BASIC that it must store its variables below this point.

After the program is completed, you can restore these pointers so they point to the top of memory, while at the same time, raising the pointers which indicate the top of your BASIC program (124 and 125, or $76 and $77). This will cause your program to store its variables where HIMONDIS used to be, and allow you to save and load the entire program with a single SAVE or LOAD command.

[ed. note: 6500 Programming Manual is from Commodore/MOS Technology; Programming a Micro: 6502 is Addison-Wesley; and First Book of KIM is from Hayden.]



User Defined Functions

Joseph Patriarca

Modulus or Residue function. Result=A mod (M) or result is the remainder after A is divided by M. Note: M is a reserved variable and must be defined before the function is used.

```
DEF FNA(A)=A-ABS(M)*INT(A/ABS(M))
```
Result of residue always positive

To generate random numbers having a normal distribution with mean 0 and a deviation of 1 use:

```
FNN(x)=SQR(-2*LOG(RND(X)))*COS(2*pi*RND(X))
```

Inverse sine and cosine:

```
DEF FNS(x)=ATN(X/SQR(1-X*X)-(1=ABS(x))*1E-30))
DEF FNC(x)=ATN(SQR(1-X*X)/(X-(0=X)*1E-30))
```

Hyperbolic functions:

```
DEF FNS(H)=(EXP(H)-EXP(-H))/2
DEF FNC(H)=(EXP(H)+EXP(-H))/2
DEF FNT(H)=FNS(H)/FNC(H)
      or  =(EXP(H)-EXP(-H))/(EXP(X)+EXP(-X))
```

Inverse hyperbolic functions:

```
DEF FNS(HI)=LOG(HI+SQR(HI*HI+1))
DEF FNC(HI)=LOG(HI+SQR(HI*HI-1))
DEF FNT(HI)=0.5*LOG((1+HI)/(1-HI+(HI=1)*1E-30))
```

Log(10) X:

```
DEF FNL(X)=LOG*0.434294482
```

N!(factorial):

```
DEF FNF(N)=N^N*EXP(-N)*SQR(2*pi*N)
```
or more accurate:
```
DEF FNF(N)=N^N*SQR(2*pi*N)*EXP(1/(12*N)*(1-1/(30*N*N))-N)
```

Merger

Jim Russo and Henry Chow, Detroit

Load and run MERGER. Now load the first program that is to be merged. This program must have the lowest line numbers. Each program that is to be merged must have self-contained unique numbers. After the first program is loaded, use SYS826. Load the next program that is to be merged. Use RESEQUENCER to correctly position all line numbers beforehand if it is necessary. When the PET responds that the program is found, STOP the loading process with STOP key as soon as the title of the program is found. Use SYS844, and when the tape stops the two programs will be merged.

If another program is to be merged, use SYS826 and repeat the sequence.

In case of problems, check to be sure that the first program to be merged has its RAM location 124 and 125 (dec.) equal to the actual end of the BASIC program. If it isn't, the locations must be POKEd to the RAM location after the occurance of the first three 00's (end of program).

```
 89 A=826:FORI=1TO192:READBX:POKEA,BX:A=A+1:NEXT:END
 90 DATA 56,173,125,2,233,4,141,242,3,173,126,2
100 DATA 233,0,141,243,3,96,173,242,3, 141,123,2
110 DATA 173,243,3,141,124,2,56,173,125,2,234,234
120 DATA 168,173,126,2,233,4,170,152,24,109,242,3
130 DATA 141,125,2,138,109,243,3,141,126,2,56,173
140 DATA 125,2,237,134,0,173,126,2,237,135,0,16
150 DATA 13,32,77,246,32,34,244,32,138,248,32,238
160 DATA 243,0,169,206,160,3,32,39,202,0,96,83
170 DATA 32,84,79,79,32,84,79,32,77,69,82,71
180 DATA 69,32,0,96,11,137,150,137,10,130,130,2
190 DATA 56,173,125,2,237,134,0,173,126,2,237,135,0,48
200 DATA 5,32,77,246,96,169,134,160,3,32,3,32
210 DATA 39,202,84,72,73,83,32,80,82,79,71,82
220 DATA 65,77,32,65,83,32,84,79,79,32,76,79
230 DATA 78,71,32,84,79,32,77,69,82,71,69,32
240 DATA 0,96,135,5,92,94,98,126,39,116,230,118
READY.
```

[ed. note: merge capabilities are in M7171 as well, but MERGER resides in second cassette area, so doesn't reduce memory.]

```
033A  38          SEC
033B  AD 7D 02    LDA     637      Loads tape header
033E  E9 04       SBCIM   4        from first program
0340  8D F2 03    STA     1010     and subtracts 4
0343  AD 7E 02    LDA     638
0346  E9 00       SBCIM   0
0348  8D F3 03    STA     1011
034B  60          RTS
034C  AD F2 03    LDA     1010     Combines old tape
034F  8D 7B 02    STA     635      header with new
0352  AD F3 03    LDA     1011     header & checks
0355  8D 7C 02    STA     636      the length of pgm
0358  38          SEC              to see if its too long
0359  AD 7D 02    LDA     637
035C  EA          NOP
035D  EA          NOP
035E  A8          TAY
035F  AD 7E 02    LDA     638
0362  E9 04       SBCIM   4
0364  AA          TAX
0365  98          TYA
0366  18          CLC
0367  6D F2 03    ADC     1010
036A  8D 7D 02    STA     637
036D  8A          TXA
036E  6D F3 03    ADC     1011
0371  8D 7E 02    STA     638
0374  38          SEC
0375  AD 7D 02    LDA     637
0378  ED 86 00    SBC     134
037B  AD 7E 02    LDA     638
037E  ED 87 00    SBC     135
0381  10 0D       BPL     13
0383  20 4D F6    JSR     63053    Starts loading of
0386  20 22 F4    JSR     62498    2nd pgm if enough
0389  20 8A F8    JSR     63626    RAM is available
038C  20 EE F3    JSR     62446
038F  00          BRK
0390  A9 CE       LDAIM   206
0392  A0 03       LDYIM   3
0394  20 27 CA    JSR     51751
0397  00          BRK              Go to message
0398  60          RTS              that combined the
039A  20 54 4F    JSR     20308    program is too
039E  20 54 4F    JSR     20308    long for the
03A1  20 4D 45    JSR     17741    available RAM
03A4  45 20       EORZ    32
03A6  00          BRK
03A7  60          RTS
03AC  96 89       STXZY   137
03AE  0A          ASLA
03B2  38          SEC
03B3  AD 7D 02    LDA     637
03B6  ED 86 00    SBC     134
03B9  AD 7E 02    LDA     638
03BC  ED 87 00    SBC     135
03BF  30 05       BMI     5
03C1  20 4D F6    JSR     63053
03C4  60          RTS
03C5  A9 86       LDAIM   134
03C7  A0 03       LDYIM   3
03C9  20 03 20    JSR     8195
03CD  CA          DEX
03CF  48          PHA
03D0  49 53       EORIM   83       Message
03D2  20 50 52    JSR     21072
03D8  41 4D       EORIX   77
03DA  20 41 53    JSR     21313
03DD  20 54 4F    JSR     20308
03E1  20 4C 4F    JSR     20300
03E4  4E 47 20    LSR     8263     Old header stored
03E9  20 4D 45    JSR     17741    in 3F2 & 3F3
03EE  45 20       EORZ    32
03F0  00          BRK
03F1  60          RTS
```

PET Renumber 3.0

Bill Seiler

PET Renumber occupies 384 bytes at the end of an 8K PET RAM memory. The POKE 134,128 and POKE 135,30 statements set the top end of PET BASIC working memory below the PET Renumber routine. This protects Renumber from BASIC.

The SYS7808 transfers control to the PET Renumber Program.

The program uses the 1K of screen memory as a storage buffer for the old line numbers. It first copies the old line numbers to the screen buffer. On this first pass PET Renumber generates the new line numbers and inserts them at the beginning of each line.

On the second pass PET Renumber fixes the THEN, GOTO, GOSUB, and RUN line number references. It looks for these tokens followed by an ASCII number. If there is a number, it searches the old line number in the screen buffer and generates its new number. If the number is found, the new number is inserted after the token.

If the new line number is smaller or larger than the old, the source is appropriately expanded or compressed one byte at a time from the point where the new number is inserted.

After the second pass is completed, PET Renumber goes into a routine to fix line links, then goes back into BASIC.

Limitations:

PET Renumber uses the 1K TV screen RAM as a buffer. Old line numbers take two bytes each, thus the screen buffer can only hold 511 old line numbers. Also, the routine occupies 384 bytes of the 7167 bytes free to the user. This limits the size of the program after renumbering to 6783 bytes.

```
LOAD  PET RENUMBER
TYPE  NEW
POKE 134,128:  POKE 135,30
LOAD  the program to be renumbered
TYPE  SYS 7808
When the cursor returns your program is renumbered starting
at 100 step by 10.

To change the start number:
   POKE 7809,LLL   Lo BYTE   Start # in
   POKE 7813,HHH   Hi BYTE   2 byte binary

To change the step size:
   POKE 7817,SSS      step size < 256

THEN, GOTO, GOSUB, RUN, ON X GOTO, and ON X GOSUB will be
renumbered.

  Branches to non-existent line numbers will be converted to
branches to line number 65535 (an illegal line number).

Save PET Renumber with:
LOAD  PET RENUMBER
LOAD and RUN  Machine Language Monitor
TYPE  .S 01,PET RENUMBER,1E80,2000
```

SYMBOL TABLE

SYMBOL	VALUE		
AAAA	1FF9	ADDSTP	1FCA
BEGNUM	0064	BRTS	1FEA
CHRGET	00C2	CHRGOT	00C8
CDP20	1EA1	CDP80	1EC3
FACTO	00B1	FINI	C430
FN10	1F45	FN20	1F55
FOUT	DCAF	GP10	1FF3
INDEX1	0071	INDEX2	0073
MD10	1F96	MD20	1FA2
MD40	1FAF	MOVDWN	1F93
MU20	1F86	MU40	1F88
RENN	1EC8	RN10	1ED5
RN30	1EE6	RN35	1EE9
RN50	1EF8	RN60	1F13
RN75	1F2A	RN78	1F2C
SETFAC	1FC1	SETPTR	1FB0
STEP	004D	TOKEN	1FF6
VARTAB	007C		
ARTS	1FD5	BEGIN	004E
BUFX1	1FE4	BUFX2	1FE1
CMPX	1FD6	CDP10	1E9F
CDPNUM	1E8C	CRTS	1FE0
FINUM	1F3A	FLOATC	DB1B
FN50	1F62	FN60	1F69
GPAB	1FEB	INCNUM	000A
LINGET	C863	LINNUM	0008
MD30	1FA7	MD35	1FAD
MOVUP	1F71	MU10	1F74
MU60	1F8E	NUMX	0050
RN15	1ED8	RN20	1EE0
RN40	1EEC	RN45	1EEE
RN65	1F21	RN70	1F27
RN80	1F34	SCREEN	8000
SS	7FFE	START	1E80
TXTPTR	00C9	TXTTAB	007A

Direct Cursor Positioning/Animation in BASIC

John Bell McLean, VA

Rather than incrementally stepping the cursor to some X,Y coordinate on the screen, direct cursor positioning (placing it there in one operation) is a preferred method of plotting or animating your PET. After many hours of experimenting I developed the following DCP routine.

```
POKE 245,Y: PRINT "cu"; TAB(X); X$
```

where X$ is the character or string to be printed. Note that the Y coordinate (vertical) must be set first, and a PRINT"cu" statement is required before the TAB instruction. The PRINT following the POKE resets the cursor location, otherwise it causes a print after the previous cursor position and then resets the location.

```
LINE # LOC      CODE       LINE

0002  0000                ;*********************************
0003  0000                ;
0004  0000                ;
0005  0000                ;  RENUMBER PET BASIC
0006  0000                ;
0007  0000                ;    (C) COPYRIGHT 1978
0008  0000                ;    BY R. SEILER
0009  0000                ;    ALL RIGHTS RESERVED
0010  0000                ;
0011  0000                ;
0012  0000                ;*********************************



0014  0000                BEGNUM=100
0015  0000                INCNUM=10
0016  0000                VARTAB=$007C
0017  0000                FACTO=$00B1
0018  0000                LINNUM=$0009
0019  0000                TXTTAB=$007A
0020  0000                TXTPTR=$00C9
0021  0000                INDEX1=$0071
0022  0000                INDEX2=$0073
0023  0000                STEP=$004D
0024  0000                BEGIN=$004F
0025  0000                NUMX=$0050
0026  0000                SCREEN=$8000



0028  0000                ;****** BASIC SUBROUTINES ******
0029  0000                CHRGET=$00C2            ;GETS CHR FROM TEXT
0030  0000                CHRGOT=$00C8            ;GET LAST CHAR
0031  0000                FINI=$C430              ;FIXES LINE LINKS
0032  0000                LINGET=$0B63            ;MAKES ASCII INTO BIN
0033  0000                FLOATC=$DB1B            ;FLOAT A BIN #
0034  0000                FOUT=$DCAF              ;MAKE ASCII



0036  0000                ;*********************************
0037  0000                ;
0038  0000                ;
0039  0000                ; RENUMBER BASIC LINES
0040  0000                ;  STARTS AT BEGNUM
0041  0000                ;  AND NUMBERS BY INCNUM
0042  0000                ;  ALSO RENUMBERS THEN'S,RUN'S,
0043  0000                ;  GOTO'S,AND GOSUB'S.
0044  0000                ;  INCLUDING ON XX GOTO AND
0045  0000                ;  ON XX GOSUB STATEMENTS
0046  0000                ;
0047  0000                ;   ENTER BY SYS(7808),
0048  0000                ;   RETURNS TO BASIC
0049  0000                ;
0050  0000                ;
```



```
LINE # LOC      CODE       LINE

0051  0000                ;  DEFAULT :
0052  0000                ;   FIRST LINE NUMBER = 100
0053  0000                ;   STEP BY 10
0054  0000                ;
0055  0000                ;  FOR DIFFERENT START NUMBER
0056  0000                ;   POKE 7809,XXX  LO BYTE
0057  0000                ;   PE 7813,X  HI BYTE
0058  0000                ;
0059  0000                ;  FOR A DIFFERENT STEP
0060  0000                ;   POKE 7817,XXX  STEP SIZE <256
0061  0000                ;
0062  0000                ;
0063  0000                ;*********************************



0065  0000                      *=$1E80
0066  1E80
0067  1E80  A9 64       START  LDA #<BEGNUM     ;DEFAULT START
0068  1E82  85 4E              STA BEGIN         ;  AT 100
0069  1E84  A9 00              LDA #>BEGNUM
0070  1E86  85 4F              STA BEGIN+1
0071  1E88  A9 0A              LDA #INCNUM       ;STEP BY 10
0072  1E8A  85 4D              STA STEP



0074  1E8C                ;FILL SCREEN BUFFER WITH OLD
0075  1E8C                ;  LINE NUMBERS AND RENUMBER
0076  1E8C                ;  THE BEGINNINGS ONLY
0077  1E8C                ;
0078  1E8C                SS=SCREEN-2
0079  1E8C  A9 FE       COPNUM LDA #<SS         ;SCREEN PTR - 2
0080  1E8E  85 73              STA INDEX2
0081  1E90  A9 7F              LDA #>SS
0082  1E92  85 74              STA INDEX2+1
0083  1E94  A5 7A              LDA TXTTAB        ;BEGINING OF TEXT
0084  1E96  85 71              STA INDEX1
0085  1E98  A5 7B              LDA TXTTAB+1
0086  1E9A  85 72              STA INDEX1+1
0087  1E9C  20 C1 1F           JSR SETFAC        ;SET NEW # CTR
0088  1E9F  A0 03       COP10  LDY #3            ;POINT AT LINE #
0089  1EA1  B1 71       COP20  LDA (INDEX1),Y    ;GET LINE #
0090  1EA3  91 73              STA (INDEX2),Y    ;SAVE IN BUFFER
0091  1EA5  B9 AE 00           LDA FACTO-3,Y     ;GET NEW #
0092  1EA8  91 71              STA (INDEX1),Y    ;REPLACE OLD
0093  1EAA  88                 DEY
0094  1EAB  C0 01              CPY #1            ;POINTING AT LINK?
0095  1EAD  D0 F2              BNE COP20         ;NO-LOOP
0096  1EAF  B1 71              LDA (INDEX1),Y    ;YES-LAST LINE?
0097  1EB1  F0 10              BEQ COP80         ;YES-DONE!
0098  1EB3  20 E1 1F           JSR BUPX2         ;NO-BUMP PTR 2
0099  1EB6  AA                 TAX               ;SAVE HI LINK IN X
0100  1EB7  88                 DEY               ;POINT TO LO LINK
0101  1EB8  B1 71              LDA (INDEX1),Y    ;GET LOW
```

```
LINE # LOC     CODE       LINE

0102  1E8A  85 71        STA INDEX1      ;MAKE NEW PTR
0103  1E8C  86 72        STX INDEX1+1    ;  POINT AT NEXT LINE
0104  1E8E  20 CA 1F     JSR ADDSTP      ;GEN NEW NEW LINE #
0105  1E91  D0 DC        BNE COP10       ;BRANCH ALWAYS
0106  1E93              ;
0107  1E93  A9 FF        COP80   LDA #$FF        ;MAKE LAST # BIGGEST
0108  1E95  C8                  INY
0109  1E96  91 73               STA (INDEX2),Y  ;FINISH IN BUFFER
0110  1E98  C8                  INY
0111  1E99  91 73               STA (INDEX2),Y
0112  1E9B  A5 7A        RENN    LDA TXTTAB      ;START CHRGET AT SOURCE
0113  1E9D  85 C9               STA TXTPTR
0114  1E9F  A5 7B               LDA TXTTAB+1
0115  1EA1  85 CA               STA TXTPTR+1
0116  1EA3  D0 03               BNE RN15        ;GET HI LINK
0117  1EA5  20 EB 1F     RN10    JSR GRAB        ;SKIP LO LINK
0118  1EA8  20 EB 1F     RN15    JSR GRAB        ;GET HI LINK
0119  1EAB  D0 03               BNE RN20        ;SKIP IF NOT ZERO
0120  1EAD  4C 30 C4            JMP FINI        ;FINISH IF ZERO
0121  1EB0  20 EB 1F     RN20    JSR GRAB        ;SKIP LO LINE #
0122  1EB3  20 EB 1F             JSR GRAB        ;SKIP HI LINE #
0123  1EB6  20 EB 1F     RN30    JSR GRAB        ;GET BASIC SOURCE
0124  1EB9  AA           RN35    TAX             ;IS THIS END OF LINE?
0125  1EBA  F0 E9               BEQ RN10        ;YES-LOOP
0126  1EBC              ;
0127  1EBC  A2 04        RN40    LDX #4          ;LOOK FOR 4 TOKENS
0128  1EBE  DD F5 1F     RN45    CMP TOKEN-1,X   ;IS THIS ONE
0129  1EC1  F0 05               BEQ RN50        ;YES-THEN FIX IT
0130  1EC3  CA                  DEX             ;NO-TRY NEXT TOKEN IN TABLE
0131  1EC4  D0 F8               BNE RN45        ;NOT DONE-LOOP
0132  1EC6  F0 EE               BEQ RN30        ;TRIED ALL FORGET IT
0133  1EC8  A5 C9        RN50    LDA TXTPTR      ;YES-SAVE TEXT PTR
0134  1ECA  48                  PHA
0135  1ECB  A5 CA               LDA TXTPTR+1
0136  1ECD  48                  PHA
0137  1ECE  20 C2 00            JSR CHRGET      ;IS A # NEXT?
0138  1ED1  B0 E6               BCS RN35        ;NO-LOOP
0139  1ED3  20 63 C8            JSR LINGET      ;YES-MAKE A BIN #
0140  1ED6  20 3A 1F            JSR FINUM       ;FIND OLD #,MAKE NEW #
0141  1ED9  68                  PLA             ;MOVE PTR TO # BEGIN
0142  1EDA  85 CA               STA TXTPTR+1
0143  1EDC  68                  PLA
0144  1EDD  85 C9               STA TXTPTR
0145  1EDF  A0 00               LDY #0          ;SET INDEXS
0146  1EE1  A2 00               LDX #0
0147  1EE3  BD 01 01     RN60    LDA $0101,X     ;GET ASCII NEW #
0148  1EE6  F0 0F               BEQ RN70        ;IF ZERO THEN DONE
0149  1EE8  48                  PHA             ;SAVE IT
0150  1EE9  20 C2 00            JSR CHRGET      ;IS OLD CHR ASCII #?
0151  1EEC  90 03               BCC RN65        ;YES-SKIP TO REPLACE IT
0152  1EEE  20 71 1F            JSR MOVUP       ;NO-MOVE TEXT UP ONE
0153  1EF1  68           RN65    PLA             ;GET SAVED NEW #
0154  1EF2  91 C9               STA (TXTPTR),Y  ;REPLACE OLD
0155  1EF4  E8                  INX             ;NEXT ASCII IN NEW #
0156  1EF5  D0 EC               BNE RN60        ;BRANCH ALWAYS
```



```
LINE # LOC     CODE       LINE

0157  1EF7  20 C2 00     RN70    JSR CHRGET      ;ANY OLD ASCII LEFT
0158  1EFA  B0 08               BCS RN80        ;NO-FINISHED
0159  1EFC  20 93 1F     RN78    JSR MOVDWN      ;YES-MOVE TEXT DOWN ONE
0160  1EFF  20 C8 00            JSR CHRGOT      ;TEST NEW CHR IN OLD PLACE
0161  1F02  90 F8               BCC RN78
0162  1F04  C9 2C        RN80    CMP #',         ;IS THIS AN "ON"
0163  1F06  F0 C0               BEQ RN50        ;YES-DO THE REST
0164  1F08  D0 AF               BNE RN35        ;NO-THEN LOOP


0166  1F3A              ;FINDS OLD NUMBER IN BUFFER
0167  1F3A              ;  GENERATES A NEW LINE #
0168  1F3A              ;  PUT IT IN ASCII IN $0101
0169  1F3A              ;  ENDS IT WITH 00
0170  1F3A              ;  ENTER LINNUM=$0008 EQUAL
0171  1F3A              ;  TO OLD NUMBER
0172  1F3A              ;
0173  1F3A  20 C1 1F     FINUM   JSR SETFAC      ;BEGIN NUMBER
0174  1F3D  A9 00               LDA #<SCREEN    ;SET BUFFER PTR
0175  1F3F  85 73               STA INDEX2
0176  1F41  A9 80               LDA #>SCREEN
0177  1F43  85 74               STA INDEX2+1
0178  1F45  A0 01        FN10    LDY #1          ;START LINE # HI
0179  1F47  B1 73               LDA (INDEX2),Y  ;GET LINE #
0180  1F49  C5 09               CMP LINNUM+1    ;IS IT THE SAME?
0181  1F4B  F0 15               BEQ FN50        ;YES-MAYBE, CHECK LO
0182  1F4D  C9 FF               CMP #$FF        ;NO-DONE?
0183  1F4F  D0 18               BNE FN60        ;NO-INC NEW LINE #
0184  1F51  85 B1               STA FACTO       ;YES-DID NOT FIND IT
0185  1F53  85 B0               STA FACTO-1     ;MAKE # VERY BIG
0186  1F55  A5 B0        FN20    LDA FACTO-1     ;SWAP HI/LO FOR
0187  1F57  85 B2               STA FACTO+1     ;  CRAZY BASIC
0188  1F59  A2 90               LDX #$90        ;SET FOR FLOAT
0189  1F5B  38                  SEC
0190  1F5C  20 1B DB            JSR FLOATC      ;FLOAT IT
0191  1F5F  4C AF DC            JMP FOUT        ;MAKE ASCII IN BUFFER
0192  1F62              ;
0193  1F62  88           FN50    DEY             ;CHECK LINE # LO
0194  1F63  B1 73               LDA (INDEX2),Y
0195  1F65  C5 08               CMP LINNUM      ;IS LO SAME?
0196  1F67  F0 EC               BEQ FN20        ;YES-GO FLOAT IT
0197  1F69  20 CA 1F     FN60    JSR ADDSTP      ;MAKE NEXT NEW #
0198  1F6C  20 E1 1F            JSR BUPX2       ;BUMP INDEX 2
0199  1F6F  D0 D4               BNE FN10        ;BRANCH ALWAYS


0201  1F71              ;MOVES TEXT UP ONE BYTE
0202  1F71              ;
0203  1F71  20 B0 1F     MOVUP   JSR SETPTR      ;SETUP
0204  1F74  A0 00        MU10    LDY #0
0205  1F76  B1 71               LDA (INDEX1),Y  ;GET BYTE TO MOVE
0206  1F78  C8                  INY             ;POINT TO ONE HIGHER
0207  1F79  91 71               STA (INDEX1),Y  ;MOVE IT
```

Sawyer Software

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..... **$25.00**

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..... **$10.00**

All Programs include documentation, are in BASIC and on cassette.

*PET is a trademark of Commodore Business Machines, Inc.

Sawyer Software

201 Worley Road

Dexter, Mo. 63841

314-624-7611

```
LINE # LOC     CODE       LINE

0203  1E7B  20 D6 1F          JSR CMPX        ;ARE INDEX'S EQUAL
0209  1E7E  D0 08            BNE MU40        ;NO-SKIP
0210  1E80  E6 7C            INC VARTAB      ;YES-FINISHED BUT,
0211  1E82  D0 02            BNE MU20        ;  TEXT IS ONE BYTE
0212  1E84  E6 7D            INC VARTAB+1    ;  LONGER NOW
0213  1E86  88          MU20  DEY             ;LEAVE WITH Y=0
0214  1E87  60                RTS
0215  1E88                ;
0216  1E88  A4 71        MU40  LDY INDEX1      ;DO A BORROW
0217  1E8A  D0 02            BNE MU60        ;NO
0218  1E8C  C6 72            DEC INDEX1+1    ;BORROW
0219  1E8E  C6 71        MU60  DEC INDEX1
0220  1E90  4C 74 1F          JMP MU10


0222  1E93                ;MOVES TEXT DOWN ONE BYTE
0223  1E93                ;
0224  1E93  20 B0 1F    MOVDWN JSR SETPTR     ;SETUP
0225  1E96  A0 01        MD10  LDY #1
0226  1E98  B1 73             LDA (INDEX2),Y  ;GET BYTE TO MOVE
0227  1E9A  88                DEY             ;POINT ONE LOWER
0228  1E9B  91 73             STA (INDEX2),Y  ;MOVE IT
0229  1E9D  20 D6 1F          JSR CMPX        ;ARE INDEX'S EQUAL
0230  1EA0  F0 05            BEQ MD30        ;YES-SKIP
0231  1EA2  20 E4 1F    MD20  JSR BUPX1       ;NO-SLIDE UP ONE
0232  1EA5  D0 EF            BNE MD10        ;BRANCH ALWAYS
0233  1EA7  A4 7C        MD30  LDY VARTAB      ;DO A BORROW
0234  1EA9  D0 02            BNE MD35        ;NO
0235  1EAB  C6 7D            DEC VARTAB+1    ;BORROW
0236  1EAD  C6 7C        MD35  DEC VARTAB
0237  1EAF  60            MD40  RTS


0239  1EB0                ;SETS PTRS FOR TEXT MOVES
0240  1EB0                ;
0241  1EB0  A5 7C        SETPTR LDA VARTAB     ;END OF TEXT
0242  1EB2  85 71             STA INDEX1
0243  1EB4  A5 7D             LDA VARTAB+1
0244  1EB6  85 72             STA INDEX1+1
0245  1EB8  A5 C9             LDA TXTPTR      ;START MOVE HERE
0246  1EBA  85 73             STA INDEX2
0247  1EBC  A5 CA             LDA TXTPTR+1
0248  1EBE  85 74             STA INDEX2+1
0249  1EC0  60                RTS


0251  1EC1                ;SETS UP FACTO AND FACTO-1
0252  1EC1                ;  TO GENERATE NEW LINE #'S
0253  1EC1                ;
0254  1EC1  A5 4E        SETFAC LDA BEGIN
0255  1EC3  85 B0             STA FACTO-1
0256  1EC5  A5 4F             LDA BEGIN+1
```



```
LINE # LOC     CODE       LINE

0257  1EC7  85 B1             STA FACTO
0258  1EC9  60                RTS


0260  1ECA                ;ADDS STEP TO FACTO-1 AND FACTO
0261  1ECA                ;
0262  1ECA  A5 B0        ADDSTP LDA FACTO-1    ;GET LO
0263  1ECC  18                CLC
0264  1ECD  65 4D             ADC STEP        ;ADD INCREMENT
0265  1ECF  85 B0             STA FACTO-1     ;SAVE LO
0266  1ED1  90 02            BCC ARTS        ;NO CARRY-SKIP
0267  1ED3  E6 B1             INC FACTO       ;ADD CARRY
0268  1ED5  60            ARTS  RTS


0270  1ED6                ;COMPARES INDEX1 AND INDEX2
0271  1ED6                ;  ZERO FLAG SET IF EQUAL
0272  1ED6                ;
0273  1ED6  A5 71        CMPX  LDA INDEX1      ;CHECK LO
0274  1ED8  C5 73             CMP INDEX2      ;EQUAL?
0275  1EDA  D0 04            BNE CRTS        ;NO
0276  1EDC  A5 72             LDA INDEX1+1    ;MAYBE-CMP HI
0277  1EDE  C5 74             CMP INDEX2+1
0278  1EE0  60            CRTS  RTS


0280  1EE1                ;INCREMENTS INDEX2 ONE OR TWO
0281  1EE1                ;
0282  1EE1  20 E4 1F    BUPX2 JSR BUPX1       ;BUMP INDEX2 TWO
0283  1EE4  E6 73        BUPX1 INC INDEX2      ;BUMP INDEX2 ONE
0284  1EE6  D0 02            BNE BRTS
0285  1EE8  E6 74             INC INDEX2+1    ;ADD A CARRY
0286  1EEA  60            BRTS  RTS


0288  1EEB                ;GET A CHAR  SET ZERO FLAG
0289  1EEB                ;
0290  1EEB  A0 00        GRAB  LDY #0          ;ZERO INDEX
0291  1EED  E6 C9             INC TXTPTR
0292  1EEF  D0 02            BNE GR10
0293  1EF1  E6 CA             INC TXTPTR+1
0294  1EF3  B1 C9        GR10  LDA (TXTPTR),Y
0295  1EF5  60                RTS


0297  1EF6  89          TOKEN .BYTE $89       ;GOTO
0298  1EF7  8A                .BYTE $8A       ;RUN
0299  1EF8  8D                .BYTE $8D       ;GOSUB
0300  1EF9  A7          AAAA  .BYTE $A7       ;THEN
0301  1EFA                    .END
```

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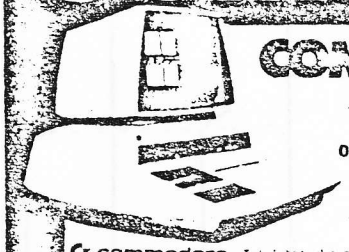

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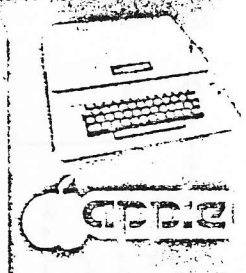

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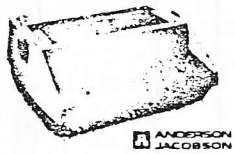

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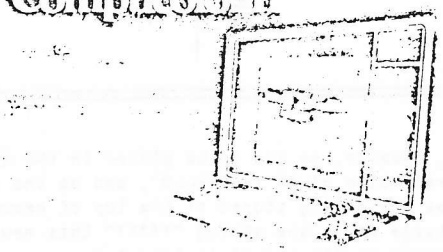

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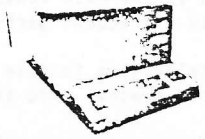

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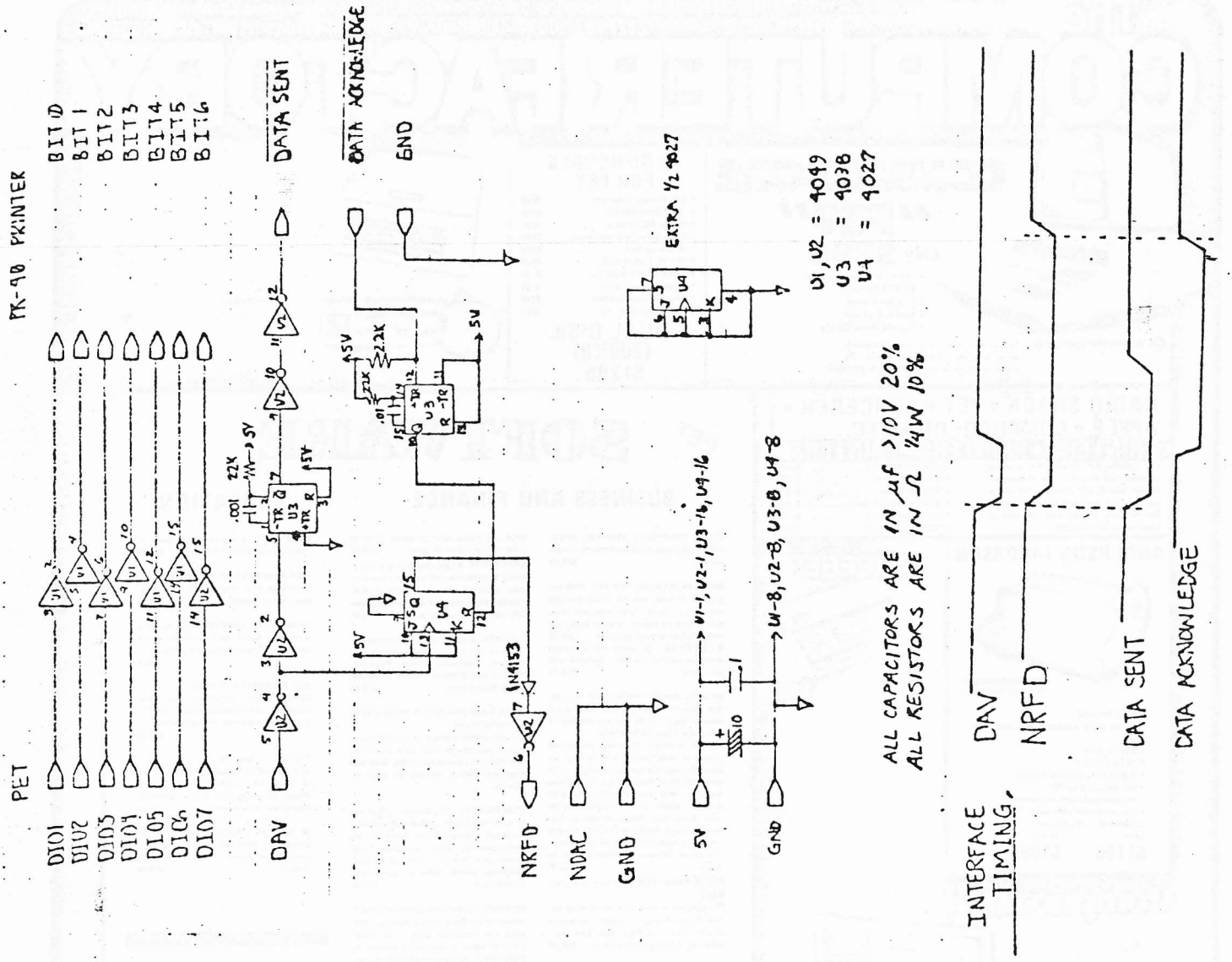

Memory Usage and Garbage Collection

By Jim Butterfield Toronto

Most people who take an interest in PET's inner workings know by now that storage from 1025 to 8191 is used as follows. Going up from 1025 there is your BASIC program, followed by a table of variables (with fixed, floating , string variables and FN definitions) followed by tables of arrays. The string variables and arrays, however, are only pointers; the actual strings are either within your BASIC program (as part of LET or DATA statements), or are stored from 8191 down.

Since programs, variables, and arrays sit in the bottom of memory, and strings sit at the top, you might think that the space in the middle is available. This isn't always true, as an example will show. Try the following program:

```
90 FOR J=8161 TO 8191: POKE J,42: NEXT J
100 X$="HELLOGOODBYEXXXXX?????"
110 A$=LEFT$(X$,5): GOSUB 500
120 A$=RIGHT$(X$,5): GOSUB 500
400 END
500 FOR J=8161TO 8191:PRINT CHR$(PEEK(J));:NEXTJ:PRINT
510 RETURN
READY.
```

This program will print two lines, showing you what's in the upper part of memory after execution of lines 110 and 120.

Note that X$ doesn't show up there; it's used directly out of your BASIC program and doesn't need to be stored again.

A$ is computed, however, so has to be placed in the string table. The first value of A$ is "HELLO", and on the first line, you'll see the string stored at the top of memory. Now, when we change A$ to the string "?????" this new value needs to be stored; you'll see it in line two.

But what's happening? The original string ("HELLO") is still in storage - even though it isn't needed any more. The question marks are stored below it; and the HELLO is now useless garbage, taking up memory space. As you generate new strings they too will be stored further down in memory, gradually filling up - and unwanted "garbage" will be left above.

This can't be allowed to continue, of course, or we'd run out of memory by filling it with unwanted "garbage". So eventually, we must perform a "garbage collection" routine to reclaim unused memory. Machine-language fanatics will find it in locations D404 to D5C3. It's lengthy and time-consuming so it's only performed as needed - usually when you run out of memory. This is the main reason that very large programs execute slowly - frequent garbage collections are required.

An easy way to force garbage collection to take place is to ask for a calculation of unused memory. Add the following line to the program:

```
130  A$=MID$(X$,6,7) : F=FRE(0) : GOSUB 500
```

You'll see that the new value of A$ ("GOODBYE") has been repacked into the top of memory. You may see part of the old strings below, but they will be written over when the space is used again.

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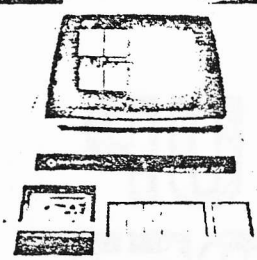

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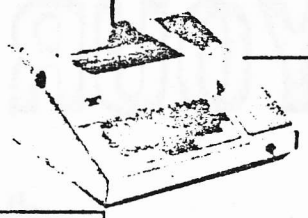

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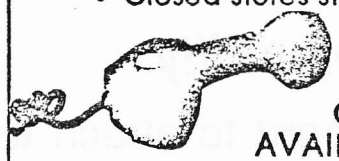

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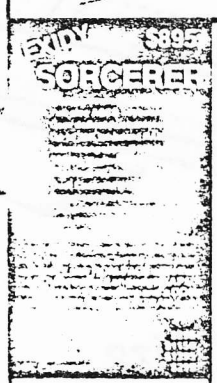

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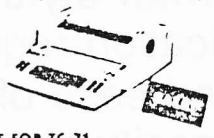

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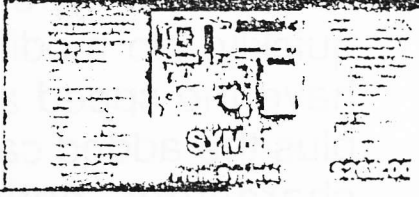

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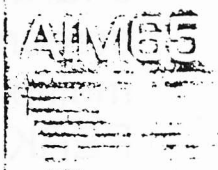

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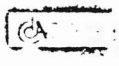

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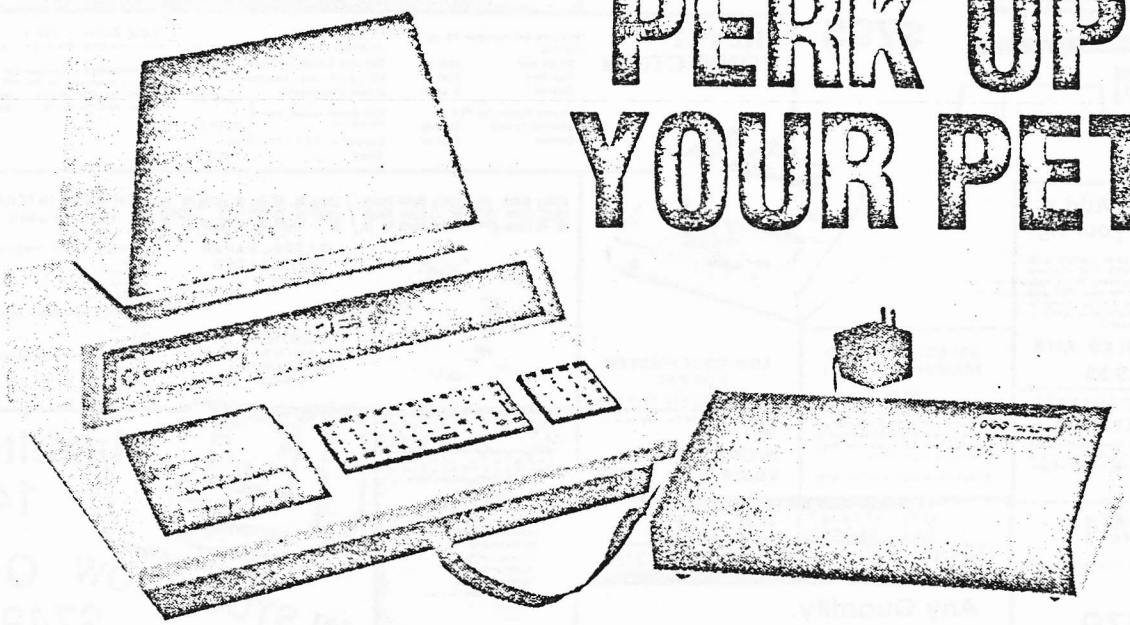

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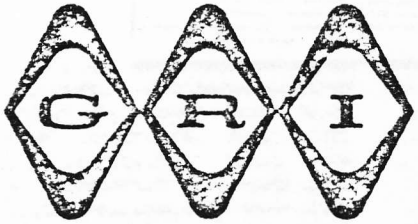

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Panic Button

Michael Riley Philadelphia

Load this program, type RUN100, then SYS826 to initialize it. If you lose the cursor because of an endless machine language loop, you can regain control by pressing the ! and # keys simultaneously.

To test "Panic Button" type SYS869. This is an endless loop at the end of the program. Press ! and # to exit the loop and regain control. SYS826 will reactivate the program.

If this program is used with a Monitor, the Program Counter and registers will be displayed by the Monitor when you press ! and #. Of course, the loop may have damaged your program beyond recognition, but at least you have a chance to find out what went wrong.

The program sits in the 2nd cassette buffer. To relocate it, the bytes that are now at 033C and 0342 must be changed so they point to the routine that now starts at 0349.

To save with monitor: .S 01,PANIC,033A,0368

```
 51 -033A 78       SEI       MAKE HDWR
 52 -033B A9 49    LDA# (49) INT VECT
 53 -0330 8D 19 02 STA  0219 POINT TO
 54 -0340 EA       NOP       TEST ROU-
 55 -0341 A9 03    LDA# (03) TINE
 56 -0343 8D 1A 02 STA  021A
 57 -0346 58 60    CLI RTS NOP
>58 -0347 A9 F0    LDA# F0   TEST FOR ! AND #
 59 -034B 8D 10 E8 STA  E810 KEY. IF NO
 60 -034E AD 12 E8 LDA  E812 THEN ON TO
 61 -0351 C9 FD    CMP# FD   NORM HDWR
 62 -0353 F0 03    BEQ  0358 INT.IF YES
 63 -0355 4C 85 E6 JMP  E685 THEN RESTORE
 64 -0358 A9 85    LDA# 85   HW VECTOR
 65 -035A 8D 19 02 STA  0219 AND JMP
 66 -035D A9 E6    LDA# E6   THROUGH
 67 -035F 8D 1A 02 STA  021A BRK
 68 -0362 6C 1B 02 JMPI 021B VECTOR.
 69 -0365 4C 65 03 JMP  0365 <TEST LOOP
 70 :
 100 FORX=826TO871:READR:POKEX,R:NEXT
 826 DATA 120,169,73,141,25,2,234,169,3,141,26,2,88
 841 DATA 96,234,169,240,141,16,232,173,18,232,201
 850 DATA 252,240,3,76,133,230,169,133,141
 856 DATA 25,2,169,230,141,26,2,108,27,2,76,101,3
```


New Discovery ?

Even at this late date there are still some surprises hidden in your PET. Frank Chambers writes from Ireland to suggest that you input one of these lines and then call for a listing. ("s" means SPACE key; "_" means SHIFTed character.)

```
4502sREM,*Bs∅s(s*B+N:4

11234sREM,$=/Z∅?$Y$?+)s;!"B'U
```

Decimal to Hex Conversion - 4 Lines

Mr. Kim Clark, Anaheim CA

```
 1 A$="0123456789ABCDEF":INPUT"DEC/HEX";A:B=1
:C=9:D=16^C:PRINT"u"A"1 = ";:A=A+1
 2 IFA-D>0THENA=A-D:B=B+1:GOTO2
 3 PRINTMID$(A$,B,1);:B=1:C=C-1:D=16^C:IFC>-1
GOTO2
 4 PRINT"          ":GOTO1
READY.
```

A One Line BASIC Program

Henry Chow, Detroit

```
100 F=826:L=841:FORN=1000TO1011:PRINTN;"DATA";
200 FORP=FTOL:PRINTPEEK(P);"cursor left";:NEXTP
300 PRINT:F=L+1:L=L+16:NEXTN:END
```

[ed. note: some of you might question the the phrase 'One Line' in the title. Henry sent the routine as one line using PET BASIC abbreviations. I changed it to 3 lines for convenient listing. The program converts machine language code in the second cassette buffer area into DATA statements.]

REQUESTS

Software single step feature for machine language programs.
Write KIM tapes from PET under software control.
Read KIM tapes using PET with minimal hardware.
More machine language routines (completely explained and documented.

MISCELLANEOUS

Stan Klein, Joint Science Dept, Claremont Colleges, Claremont CA 91711 is interested in contacting people interested in simulations in biology, chemistry, physics, and psychology at the college level.

CONNECTICUT microCOMPUTER

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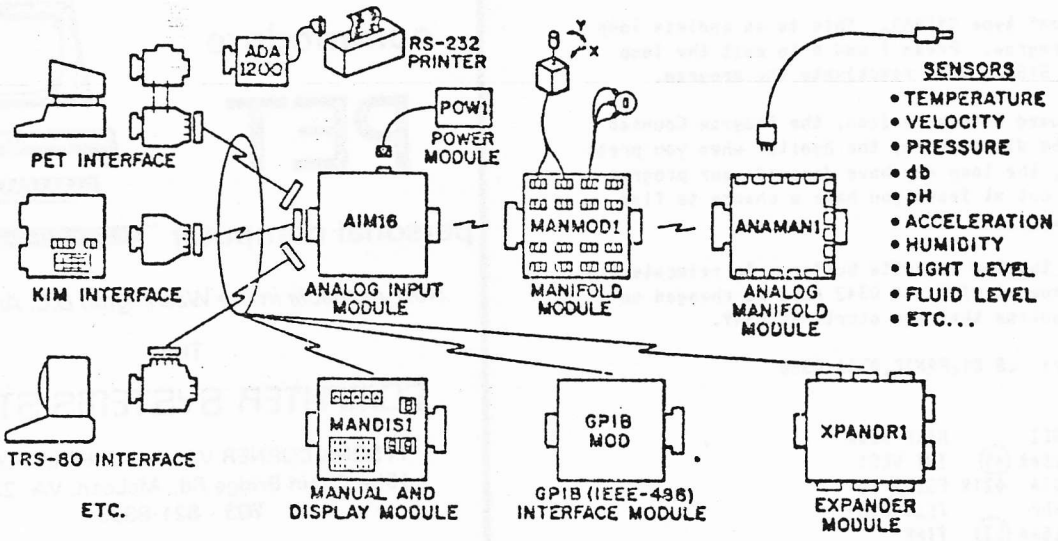
DAM SYSTEMS



DAM SYSTEMS by CmC
A complete system of modules to let your computer listen to the real world.

DAM SYSTEMS PRICE LIST

AIM16I - Analog Input Module
16 8-bit analog inputs - 100 microsecond conversion time - 3 state output - requires one 8-bit computer output port for control and one 8-bit computer input port for data — $159.00

AIM162 - Analog Input Module
As above plus greater accuracy - gold plated contacts - pilot light - switch selectable start, enable and ready polarities. — $229.00

POW1 - Power Module
Supplies power for one AIM16 module. — $14.95

ICON - Input Connector
20 pin card edge connector - solder eyelets — $9.95

OCON - Output Connector
For connecting the AIM16 to a computer - 18 pin card edge connector - solder eyelets — $9.95

AIM16b Starter Set
Includes one AIM16I, one POW1, one ICON and one OCON. — $189.00

AIM162 Starter Set
Includes one AIM162, one POW1, one ICON and one OCON. — $259.00

MANMOD1 - Manifold Module
Use in place of ICON. 16 3-screw terminal barrier strips for connecting joysticks, potentiometers, voltage sources, etc. Eliminates the need for soldering. Plugs into the AIM16. — TBA

ANAMAN1 - Analog Manifold Module
Use in place of ICON. Connects DAM SYSTEMS SENSORS to the AIM16 without soldering - sensor cables just plug in. Plugs into the AIM16 or the MANMOD1. — TBA

SENSORS
Sensors for temperature, pressure, flow, humidity, level, pH, motion, etc. — TBA

COMPUTER INTERFACES
For the PET, KIM, TRS-80, etc. Use in place of OCON. Eliminates the need for soldering or special construction. — TBA

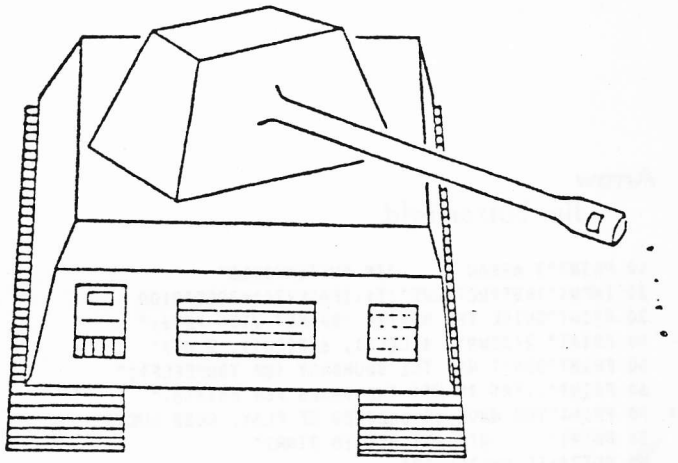
MANDIS1 - Manual and Display Module
Connects between the AIM16 and the computer interface. Allows manual or computer control of the AIM16. Displays channel number and data. — TBA

GPIB MOD - GPIB (IEEE-488) Interface Module
Allows the DAM SYSTEMS MODULES to be used with the GPIB bus instead of a computer's other I/O ports. — TBA

XPANDR1 - Expander Module
Allows up to 128 8-bit analog inputs (8 AIM16 Modules) to be connected to one system. — TBA

Introducing

TANKTICS



If you've gotten tired of playing children's games on your PET, consider TANKTICS, the most sophisticated computer game available. TANKTICS is a computer game which simulates armored combat during World War II. You command a force of up to ten tanks; your mission is to take and hold an assigned objective. Opposing you is the PET itself, armed with twice as many tanks as you have. The PET's tanks are just as fast and powerful as your own, so to win you must maneuver your tanks more shrewdly than PET. This isn't easy---PET's sophisticated software allows PET to play a very good game. To beat PET, you must carefully judge the effects of terrain, range, and individual tank facing as you plan your move. You must consider and utilize the element of surprise, for you do not know the position of an enemy tank unless one of your tanks can see it. TANKTICS is a "think" game rather than an "action" game, so you have all the time you need to plan your move. In sum, TANKTICS provides a tense and challenging game that can be played many times without losing its richness.

With each game of TANKTICS, you get: 1) tape cassette containing TANKTICS program in two segments (1.4K machine language segment and 5K BASIC segment); 2) 31 playing counters; 3) 17" x 22" map depicting the battlefield; 4) 8 page player's manual explaining how to play and giving tactical hints.

TANKTICS is now available for shipment. To order, send check or money order for $15.00 (Calif residents add 6% sales tax) to:

PLEIADES Game Co
202 Faro Ave
Davis, CA 95616

Please allow one to three weeks for personal checks to clear the bank.

Arrow

Jim Butterfield

```
10 PRINT"3 ARROW 2    JIM BUTTERFIELD"
20 INPUT"INSTRUCTIONS";Z$:IFASC(Z$)=78GOTO100
30 PRINT"GUIDE THE MOVING 'SNAKE' WITH KEYS:"
40 PRINT" 2(DOWN), 4(LEFT), 6(RIGHT), 8(UP)"
50 PRINT"DON'T HIT THE BOUNDARY (OR YOURSELF);"
60 PRINT"..TRY TO HIT THE BOXES FOR POINTS."
70 PRINT"YOU HAVE 60 SECONDS OF PLAY. GOOD LUCK!"
80 PRINT"     HIT ANY KEY TO START"
90 GETZ$:IFZ$=""GOTO90
100 DIMP(80),D(3)
110 D(0)=22:D(1)=60:D(2)=62:D(3)=30
120 T9=32768:T6=3599:POKE59468,12
130 M1=59467:M2=59466:M3=59464
140 PRINT"cs   SCORE: 0"
150 FORJ=32808TO32847:POKEJ,81:POKEJ+920,81:NEXTJ
160 FORJ=32848TO33728STEP40:POKEJ,81:POKEJ+39,81:NEXT
170 V=20:H=35:V1=0:H1=-1:P2=10:D1=1
180 TI$="000000"
190 PRINT"home";RIGHT$(TI$,2):IFTI>T6GOTO480
200 GETZ$:IFZ$=""GOTO230
210 Z=(ASC(Z$)-50)/2:IFZ<>INT(Z)ORZ<0ORZ>3GOTO230
220 D1=Z:D=Z-1.5:V1=INT(ABS(D))*SGN(D):H1=SGN(D)-V1
230 V=V-V1:H=H+H1
240 P=32768+V*40+H
250 P9=PEEK(P):POKEM1,16:POKEM3,29*D1+80:POKEM2,15
260 R6=R7:R7=R7+1:IFR7>P2THENR7=0
270 P1=P(R7):P(R7)=P:POKEM1,0:IFP1<>0THENPOKEP1,32
280 POKEP,D(D1):P1=P(R6):IFP1<>0THENPOKEP1,81
290 IFP9<>32GOTO400
300 IFRND(1)>.05GOTO190
310 FORV3=V2-1TOV2+1:P3=V3*40+T9:FORH3=H2-1TOH2+1:IFPEEK(P3+
H3)<>102GOTO330
320 POKEP3+H3,32
330 NEXTH3,V3:T=0:POKEP8,32
340 V2=INT(RND(1)*20)+3:H2=INT(RND(1)*36)+2
350 FORV3=V2-1TOV2+1:P3=V3*40+T9:FORH3=H2-1TOH2+1:IFPEEK(P3+
H3)<>32GOTO340
360 NEXTH3,V3:FORV3=V2-1TOV2+1:P3=V3*40+T9:FORH3=H2-1TOH2+1
370 POKEM1,16:POKEM2,15:POKEM3,30
380 POKEP3+H3,102:POKEM1,0
390 NEXTH3,V3:T=9*RND(1):P8=V2*40+H2+T9:POKEP8,49+T:GOTO190
400 IFP9<>102GOTO460
410 T$=TI$
420 T=T-1:S=S+1:POKEP8,T+49:POKEM1,16:POKEM2,15
430 PRINT"home+9 cursor right";S
440 FORJ=100TO30STEP-1:POKEM3,J:NEXT:POKEM1,0:IFT>=0GOTO420
450 P2=P2+1:TI$=T$:GOTO310
460 POKEM1,16:POKEM2,15:POKEM3,200:FORJ=1TO1000:NEXT
470 POKEM1,0
480 PRINT"ANOTHER GAME?2   ===";
490 GETZ$:IFZ$=""GOTO490
500 IFZ$="Y"THENCLR:GOTO100
510 IFZ$<>"N"GOTO490
520 PRINT"3";
```

ed. note: this program uses sound.
If you have not already done so, get an edge connector for the parallel port and hook up an audio amplifier using pins CB2 and Ground. If you do not have an amplifier, an inexpensive choice would be a Radio Shack 'Micro-Sonic' speaker-amplifier for $10.95.

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