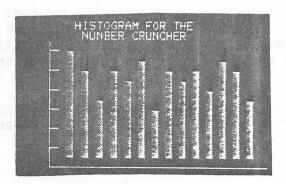
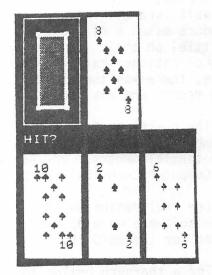


COMMODORE PET -- COMPUTER OR A TOY?

Collins opinion generally divided by the Mason-Dixon line.



Bar-graph of internal Random Number Generator



From Blackjack 2 game

Previously owned calculators wanted:

HP-67 or 97: Stanley J. Smith 137-138, X2441. Scientific, prefer HP, \$10 - \$20: Gayle Buroker, X4087.

TIME TO RE-UP

To continue receiving this dandy document on the care and feeding of personal analytic engines, see the last page.

THE PET 2001: COMPUTER OR TOY?

Our co-workers in Dallas think highly enough of the PET to have arranged for a discount to employees (\$720 instead of \$795), and for payroll deduction, and no carrying charge on the payroll deduction. As you can see, much of the math, scientific, and engineering software for the PET was written in Dallas. And Dallas has set-up a system---through Wanda Fox---whereby software and cassette recordings of any of their listed programs are available. Here in Cedar Rapids a few have taken the PET serious enough to have placed one in Building 106 and six in Building 137, all avaible to employees for company work. Since the start of the payroll deduction plan 309 PETS have been bought by employees, with 42 of them in Cedar Rapids. Evidently some of us--who have full access to all the computers within the company--still want a PET in our homes.

Why, not a computer

I believe that most of the reasons why the PET was not considered a computer have now been taken care of between Commodore and the PET users groups. In the beginning Commodore seemed to feel little reaponsibility beyond selling the unit. No technical documentation such as principles of operation or schematics were available, and even the instruction manual was merely a few-page pamphlet. Now Commodore makes a diagnostic tape and schematics available, and they've improved (a little) on their instruction books. Today there are enough PET owners, clubs, and publications that just love to talk software, so that problem no longerexists. Before, there was the bare PET. Today, floppies, printers, other peripherals, and added memory are available.

The question of computational accuracy is, to me, still unanswered. Perhaps, if Number Cruncher readers want it, we can organize a show-and-tell for PET owners and potential owners. Or---again if there is sufficient interest---the Eastern Iowa Computer Club could be persuaded to have a meeting devoted to the PET.

One frustration we at Collins have, is that the PET uses a 6502 chip; but all of the software development at Collins, software that would be nice to utilize, is written for the 6800 chip.

For a thorough evaluation, read "PET's First Report Card; An Objective Evaluation", Kilobaud, May 1978. But remember that at this early date Commodore had not taken care of things that they now have.

Some "Unlisted" calculator programs

The following are some programs I've run across that may not be listed in the Current Awareness Bulletin.

"HP-67/97 Tracks Communication Satellites", Electronics, March 1, 1979

"Replacement Analysis In Your Pocket", Industrial Engineering, October 1978. (for the SR-52).

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"Computing Calculators in Communications Engineering Design," <u>Mobile</u> Times, March 1979 (for TI 58 and 59)

HP-19C/29C Programming Problems

The Queen Board game on pp. 52-54 of the applications book will work if you add step 49 "RCL 2", and change step 79 "GTO9" to"GTO5".

Bob Miller 108-115

Rockwell AIM-65 User Report?

Perhaps in the next issue we can have a report from someone in Cedar Rapids who has one of these machines.

Eastern Iowa Computer Club

For those interested in seeing what this club is all about, visitors are welcome to their 7:00 P.M. meetings on the last Sunday of every month at the REC Building in Marion. They have a flea market from 7:00 - 7:30 when their regular meeting starts. Presently their club project is building MODEMS so their computers can stay at home and still talk to each other. In the future they see building a central system to handle message switching between the stayat-home computers. In May the 100 sum members are planning a software contest. Presently there are about 6 members with PETs.

If you'd like a copy of their newsletter drop a card so stating to:

Eastern Iowa Computer Club Box 164 Hiawatha, Iowa 52233

"Next Week We (Pet users) Gotta Get Organized"

There has been some interest in having a seperate Collins Users-Club for PET users. If you are using, or intend to use, the PET please answer the lastpage questionnaire as to:

- (A) The Number Cruncher being adequate as a users club.
- (B) PET users need their own group.
- (C) PET users should join the Eastern Iowa Computer Club.

PET Basic for HP (RPN) Calculator Users

An introduction to BASIC programming for those who are use to solving problems on an RPN type calculator.

BASIC would be learned by programming the PET to do what you now do on your handheld calculator plus providing graphic display, programming capability, and data storage capability. As an example, how do you do complex arithmetic on the PET? FORTRAN does it neatly, the RPN calculators do it acceptably, and BASIC

doesn't do it at all. So you would have to learn how to make the best of the worst situation. This learning and experimenting process will yield a familiarity with BASIC that should be of value in programming desk-top computers such as the HP-9825, HP9845, and any large computer using BASIC.

The course would probably be held two days a week from 4:30 - 5:30 or during lunch breaks. If you're interested, so indicate on the last page "re-up" sheet.

Low-Cost Home Computer Sales

Electronic News, 3/12/79 quotes a Dataquest study of low-cost home computer

sales:

Radio Shack 100	,000 units
	000 units
Apple 20	000 units
MITS/Pertec 3	000 units

PET computers Available for Company Work

There is a PET in 106 and five in building 137 for employees to use for company work. In 137 they are located in the Automatic Test Equipment lab, Reliability, the computer terminal room, and two in engineering areas. So heres a chance to (meekly) show the 1100/80 that you can be a little independent.

Micro-Software News

A new newsletter is being published to inform employees of new additions to the Micro-Software Database on file in Dallas. Requests to be on the mailing list should be addressed to Wanda Fox, 407-120. NOW AVAILABLE IN THE CEDAR RAPIDS INFORMATION CENTERS:

As a service to the Cedar Rapids ROCKWELL-COLLINS personnel, the Information Centers are now ordering programmable calculators and microcomputers on a twelve month payroll deductionsplan. This plan is offered at no interest charge. Following is the current price list:

Manufacturer	Retail Price	*Employee Price
Commodore		
PET 2001	\$ 795 .00	\$720.00
Hewlett-Packard		
HP-67	\$450.00	\$373.50**
HP-97	\$750.00	\$622.50
Texas Instruments		
TI 59	\$299.95	\$239.95
PC 100A (Printer)	\$199.95	\$159.95
<u>_Rockwell_International</u>		
<u>IK Byte Memory</u>	\$375.00	\$325.00 + \$4.75 freight
4K Byte Memory	\$450.00	\$390.00 + \$4.75 freight

* Employee price does not include state and local tax. ** Depending on volume ordered the discount may be either 16% or 17%.

Order forms are available from:

Jan Gorman	106-216	Information	Center	x2138
Debra Hawes	137-127	Information	Center	x2343

December 14, 1978

SOME SOFTWARE AVAILABLE FROM THE MICRO-SOFTWARE DATABASE

The following programs may be ordered by contacting Wanda Fox, Dallas Casnet 437-2330 or by sending written request to 407-120.

	24(1) 115350 States - 200
Programs in BASIC	
ACCESSION NUMBER	TITLE
001203	Inventory
001231	Function Approximation Fast Fourier Transform Subroutine
001232	Bond Yields
001245	Financial Projections
001247	Financial Projections Plotting Routines
001248	Annuities for Payments and Withdrawals for Loans
001249	Profit Analysis
001250	Interest Rates for Various Interests with Different Compound
001251	Rate of Retirement Pay
001252	Savings Account Accumulation
001253	Population Projections
001335	Fast Fourier Transforms
Programs for PET	
001227	Microwave Network Analysis
001230	Formatting Dollars and Cents
001244	PET Broadband Matching
001283	Base Conversion
-> 001306	6502 Assembler for PET
Programs for HP-19C/29C	
001271	Resistive/Reactive Circuit Calculations
001272	Impedance of a Ladder Network
001273	Standard Resistance Values
001274	Exponential Growth of Decay
001275 001276	Equations of Motion
001278	Kinetic Energy RPM/Torque/Power
001278	Black-Body Thermal Radiation
001279	Conservation of Energy
001280	Mohr Circle for Stress
001281	Polynomial Evaluation Real and Complex
001282	Sine Cosine and Exponential Integrals
001284	Cubic Equations
001285	Synthetic Division
001286	Hyperbolic Functions-Inverse Hyperbolic Functions
001287	Polynomial Evaluation Real or Complex
001288	Roots of F(x) Equal 0 in an Interval

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Programs f	or HP-19C/29C		
ACCES	SION NUMBER		TITLE
00	01289		3X3 Matrix Inversion
	01290		Base B Arithmetic
	01291		Gaussian Quadrature (Finite ab F(x) DX)
	01292		Gaussian Quadrature (Finite A F(x) DX)
	01293 01294		Bessel Function (J(x)) Gamma Function
	01298		Hexadecimal to/from Decimal Conversion
00	01302		Bubble Sort
	01307		Direct Reduction Loan Amortization Schedule
	01308 01309		Internal Rate of Return Straight Line Depreciation Schedule
	01310		Sum of Years Digits Depreciation Schedule
	01311		Variable Rate Declining Balance Depreciation Schedule
	01312		Crossover Point Declining Balance to Straight Line Depreciation
	01313 01314		Nominal/Effective - Effective/Nominal Rate Conversion
	01314		Break-Even Analysis
Programs fo			
•			
	01201		Thyristor Conduction Angle/Output Power Normal Probability Functions (Derivatives)
	01266 01295		Factor of an Integer
	01299		Hexadecimal to/from Decimal Conversion
	01300		Numerical Quadrature Integration
	01387		Probability Function Chi-Square Probability Functions Poisson Individual and Cumulative Sum
	01388 01394		Negative Binomial and Cumulative Distribution
	01395		Binomial and Cumulative Binomial Distribution
	01396		Hypergeometric and Cumulative Hypergeometric Distribution
00	01400		Bessel Functions, First Kind, Integer Order
Programs fo	or HP-67/97		
00	01205		Bridged T Resistor Analysis for Thin Film Trimming
	01228		Signal-to-Noise Detection for Target Detection
	01229 01254		Radar Parameter Equations Sound System Design
	01296		Four Dimension Curve Fit
	01297		Successive Bisections
	01301		Numerical Quadrature Integration
	01303 01304		Sunrise/Sunset Newton's Secant Method
	01304		English to Decimal Feet Conversion
	01316		Dual Radial Position Fixer
	01364		Put and Call Option Fair Values
	01365 01366		Call Option Evaluation Routines for Option Writers
	01367		Empirical (Chicago Board Option Exchange) Call Pricing
	01368		Warrant and Option Hedging
	01369		Bull Spread Option Strategy
	01370 01371		Butterfly Options Stock Price 30-Week Moving Average with Data Storage
	01372		Exponential Smoothing
	01373		Multiple Linear Regression
	01374		Curve Fitting Selecting Best Function
	01377 01389		Analysis of DC Parameters of Current-Mirror Circuit Calendar Algorithms
	01390		Federal Income Averaging Tax
00	01391		Curve Fitting
	01392		Curve Fitting One Card Curve Fit
	01393 01397		Sidereal Time
	01398		Base to Base
Programs fo	or Rockwell Mod	lel 960	
	01208		- Quantitive Addition
00	01209		Pseudo Random Numbers
	01210		Permutations and Combinations
	01211 01212		Spearman's Rank Correlation Coefficient for Ranked Data Chi-Square Distribution
	01213		F-Distributuion
00	01214		Student's T-Distribution
	01215		Inverse Normal Distribution Cumulative Normal Distribution
U	01210		cumulative Normal Distribution

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Programs for Rockwell Model 960 (continued)

ACCESSION NUMBER LTHE 001213 Hoperspectic Distribution 001223 Chi-Saper for an Rc. Couplinging: Tables 001230 Chi-Saper for an Rc. Couplinging: Tables 001223 Chi-Saper for an Rc. Couplinging: Tables 001223 Chi-Saper for an Rc. Couplinging: Tables 001223 Linesr Regression Analysis 001234 Linesr Regression Analysis 001235 Artimetic Improvement Samples 001236 Rubotis', Tom Variable Descriptive Staffices 001235 Artimetic Improvement Samples 001236 Rubotis', Tom Variable Descriptive Staffices 001237 Main and Standard Deviation for Grouped Data 001238 Natrix Impersion 001239 Natrix Impersion 001240 Huerrical Integration by Trepezaid Rule 001241 Traverse Bearing and Eury 001243 These Theory in Conversion 001244 Treverse Dearing and Eury 001245 Golution of Differential Equations 001245 Golution of Differential Equations 001245 Golution of Differential Equations	Programs	for Rockwell Model 960) (continued)	
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001341 Wall Footing Design 001342 Beams in Flexure				
001342 Beams in Flexure				
001343 Aviation Library Diagnostic			Beams in Flexure	
		001343	Aviation Library Diagnostic	

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Programs for <u>TI-59</u> (continued)	
ACCESSION NUMBER	TITLE
001 344	Flight Plan With Wind
001345 001346	Flight Flan and Navigation Long Range Flight Plan
001347	Atmosphere Speed Temperature and Altitude
001348	Predicting Freezing Levels Lowest Usable Flight Levels
001349 001350	Wind Components and Average Vector Wind Triangle
001351	Dead Reckoning
001352 001353	Rhumbline Navigation Great Circle Flying
001353	Line of Sight Distance and DME Speed Correction
001355	Position and Navigation by One VOR
001356 001357	Area Navigation Course Correction
001358	Rate of Climb Turn Performance
001359 001360	General Weight and Balance Customized Weight and Balance
001361	Pilot Unit Conversions
001362	RNAV Flight Planning
001363 001378	Time Zone Conversions Testing Differences Between Proportions
001379	Histogram
001380 001381	Equation Solver Single Stage Model Rocket Performance
001382	Cubic Crystallography
001383 001384	Lighting Calculations by the Lumen Method
001384	Computed Constants of a Circular Light Polarizer RPN Simulator
001386	Stop Watch Timer
Programs in BASIC	
ACCESSION NUMBER	TITLE
001486 001487	Arctangent Algorithm Function Approximation with Two Variables
Programs for PET	
001488 001489	CAUER for Designing Lowpass Elliptic Filters B and C PLOT and The COMPONENT for Designing Butterworth and Chebyshev Filters
0014 90	Transient No. 1 for PET
001492 001493	SYNTHESIZER - Divisor Constants for Phase Lock Loop Frequency Synthesizer
001494	FACTORS - Prime Factors of a Given Number PADS - Attenuator Networks
001495 001496	FLC - Reactance of an L or C Element and Resonant Frequency
001498	FILTERS - Program for Active Filters-low and high pass PI NET - Pi-Network Impedance Matching
001498	COIL - Characteristics and Unknown Values
001499 001500	ANT PAT - Antenna Patterns ANTCZ - Antenna Clearance Area for Skywave Propagation
001 501	POLY - Area of a Polygon going in a Clockwise Direction
001502 001503	POLY II - Area of a Polygon with additional units of measure TV ANT - TV Antenna Length for any Channel
001 504	L, T, and Pi Network Matching
001507 001510	Fano Broadband Matching Z by Piecewise Hilbert Transform
001511	Recursive Ladder Network
001513 001514	Q Distribution Q Function Subroutine for Unconstrained Variables
Programs for HP-25	
001431	Stripline Near One Plane (Microstrip)-Loss Power Factor
001432	Stripline Near One Plane (Microstrip)-Analysis
001433 001434	Stripline Near One Plane (Microstrip)-Synthesis Stripline Between Two Planes-Analysis, Loss Power Factor
001435	Stripline Between Two Planes-Synthesis
Programs for <u>HP-67/97</u>	
001427 001428	Filter Loss/Mainline VSWR, Single Half Wave Length Shunt Bias Filter
001429	Compensated Shunt Bias Filter
001430	Stripline Microstrip Analysis, Synthesis and Loss
	Geographic Coordinates to Universal Tranverse Mercator and Conversely
001471 001472	Sunrise, Sunset and Twilight

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Programs for HP-67/97 (Continued)

ACCESSION NUMBER		TITLE	
001473		Reentry Trajectories	
001474 001475		Satellite Orbital Elements Satellite Tracking	
001476		Laser Equations for Propagation in the	e Atmosphere
001477 001478		Optimum Allocation of Resources Log-Linear Cumulative Average and Unit	Cost
001479		Time Phased Procurement Costing	
001480 001481		Cost/Benefit Stream Normal Function or Distribution and it	s Inverse
001481		Q Function (Offset Coverage Function)	
001483		Linear Programming and 3X3 Matrix Fourth-Order Differential Equations	
001484 001485		Ten Point Gaussian Integration	
001491		Three Quadrature Hybrid Conbiner Ampli Transmission Line Matching	itude Analysis
001506 001509		Norton L to T or Pi Transformers	100
001512		Four Complex Functions Program	
001515 001516		Quadratic Functions Products and Displacements	
001517	80 × 1240	O Squared Plus One to Parallel Z and H	Parallelled Reactance
001518		Lowpass to Bandpass Scaling and Minimu	im Standing Wave Ratio
Programs for SR-52			
001444		Plot Mathematical Functions with PC-10	00
Programs for SR-56			
001436		Parallel Impedance Addition	
001437 001438		Low-Pass Ladder Z-IN Passive Low-Pass Analysis	
001439		Voltage Intersection of 3 Tesistors	
001440 001441		Active High-Pass Analysis Pi Network Impedance Matching	
001442		Newton Iterative Solution	
001443 001448		Butterworth Lowpass Filter Transfer Function of Crystal Detector	c c
		Transfer Fanceion of orgatal Decessor	
Programs for <u>TI-59</u>			
001401		Master Library Diagnostic Matrix Inversion Determinants and Simu	Itaneous Fountions
001403		Matrix Addition and Multiplication	
001404 001405		Complex Arithmetic Complex Functions	
001406		Complex Trigonometric Functions	
001407 001408		Polynomial Évaluation Zeros of Functions	
001409		Simpson's Approximation (Continuous)	
001410		Simpson's Approximation (Discrete)	
001411 001412		Triangle Solution (1) Triangle Solution (2)	
001413		Curve Solution	
001414 001415		Normal Distribution Random Number Generator	
001416		Combinations Permutions and Factorial	S
001417 001418		Moving Averages Compound Interest	
001419		Annuities	
001420		Day of the Week and Days Between Date	S
001421 001422		Checking/Savings Account Management Degree, Minute and Second Operations	
001423		Unit Conversions (1) Length	Protection for a star star
001424 001425		Unit Conversions (2) Volume, Weight a Evaluation of Rosette Strain Gauge (6	nd Temperature O° and 45°) Data
001426		Combined Stresses (Mohr Circle Calcula	ations)
001445 001446		Convolve Functions in Time Domain Disassemble Micro-processor Machine G	ode
001447		Noise Bandwidth and RMS-Voltage Compu	
001449 001450		Statistics Library Diagnostic Random Number Generator	
001451		Univariate Data	
001452 001453		Bivariate Data Trivariate Data	·
001453		Analysis of Variance Data	
001455		Histogram Data Moans and Moments	
001456 001457		Means and Moments Histogram Construction	
		요구 같은 것은 것 같아요. 같이 같이 같이 봐. 이 나 봐.	

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Programs for TI-59 (Continued)

WF78-1012.

ACCESSION NUMBER	TITLE
001458	Theoretical Histogram
001459	Univariate Data Transforms
001460	Bivariate Data Transforms
001461	T-Statistic Evaluation
001462	Contingency Table Analysis Two-Way Classification
001463	Analysis of Variance
001464	Rank-Sum Test
001465	Multiple Linear Regression
001466	Normal Distribution
001467	Binomial Distribution
001468	Chi-Square Distribution
001469	F-Distribution
001505	Q Squared Plus One Series to Parallel Z and Paralleled Reactance
001508	Broadband Matching
	· · · · · · · · · · · · · · · · · · ·

The complete index of available software is given as Working Paper.

ON ACCURACY

Your calculator or for that matter any calculator or digital computer is a finite number machine.

As a consequence calculators and computers are not absolutely accurate for all operations on all numbers; the displayed accuracy depending on the algorithms used and the number of decimal places carried.

Table 1 illustrates the problem. The numbers in the table were obtained on an HP-65 by performing the operation:

$$(\sqrt{x})(x^2)-x=0$$
 error

Table 2 is a listing of accurate valves of the powers of 2 with which to compare the accuracy of your calculator. Often times the error is fairly obvious. For example on the HP-65.

$$2^{25} = 33554431.86$$

In this example the absolute error is 0.14. An interesting aspect of this example is that if we perform the inverse operation we will get 2.000 000 whether or not we add in the error quantity 0.14.

For most work the error problem is inconsequential since the accuracy is usually several orders of magnitude better than the accuracy of the input data or the accuracy required for the output data.

Ed Houghton

Table	2	Powers	of	2	

$\begin{array}{c} 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 $	1 2 4 8 16 32 64 128 256 512 1024 2048 4096 8192 16384 32768 65536 131072 262144 524288 1048576 2097152 4194304 8388608 16777216 33554422
6-0	33554432

2 ²⁶	67,108,864
227	134,217,728
228	268,435,456
229	536,870,912
230	1,073,741,824
231	2,147,483,648
232	4,294,967,296
233	8,589,934,592
234	1,717,986,9184
2 ³⁵	3,435,973,8368

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ON CURVE FITTING WITH

N-DEGREE POLYNOMIALS

OR

POLY WANTS A TRACKER

To extend Jim King's PET Directory Program to work with the longer C60 cassette it was necessary to find the empirical time relationship between normal speed and fast-forward to points along the tape. It was then necessary to find a mathematical curve that tracked this well enough to be used by PET. Determining the empirical relationship and finding a mathematical fit led me to areas that may be of interest to other number crunchers. A not too succinct summary is that:

- Using the first n terms of an m term polynomial approximation can be grossly inferior to using <u>all</u> the terms of the smaller, n degree polynomial.
- (2) An algebraic expression of the mechanical relationship between the times with normal and fast-forward speeds tracks the empirical relationship better than a general n degree polynomial of the same complexity.

The Emperical relationship between hormal time and Fast-Forward time.

In order to measure the time relationship I had to somehow mark points along the tape and then measure the number of seconds to each point in both normal run and fast-forward. I did this by noting when the perimeter of the tape being wound passed each of the calibration marks on the little window of the cassette. It was bad enough trying to eye-ball this with poor light, while watching the mirror on the bottom of the cassette to eliminate parallax, and while watching a stop watch, but that the tape didn't pack evenly so the tape perimeter wobbled back and forth along the scale. I ended by noting the time when the tape wobbled as far above each mark as below. (Reminds me of the limerick that starts, "There was a young lady from Mobile," and ends, "Or an off-center emery wheel.") The following table presents pairs of times to various points on the tape and Figure 1 shows the measured relationship between slue time:

 T_s , and normal run time, T_R

The mathematical relationship between "RUN" and "FAST-FWD" times to the same point.

To derive the relationship the following assumptions were made:

(1) In "RUN" speed the tape moves past the read-head at a <u>constant</u> linear speed.

MEASURED RELATIONSHIP BETWEEN TIMES AT NORMAL SPEED AND FAST FORWARD

Cassette Scale	Time Real	in Seconds Slue
0	0	0
5	135	12
10	220	18
15	320	26
20	435	33
25	570	40
30	685	48
35	840	55
40	975	62
45	1155	70
50	1295	76
55	1465	85
60	1640	92
65	1840	98
67	1922	102

- (2) At slue speed (FAST-FWD), the tape take-up spool is driven at a constant rotary speed.
- (3) The tape has constant thickness, thus providing a one-to-one relation between the circumference (linear) speed of the tape and the rotary speed.

These assumptions led to the following equation of normal run time, T_R , as a function of slue time, T_S , to common points along the tape.

$$T_{\rm R} = C_1 T_{\rm S} + C_2 T_{\rm S}^2 \tag{1}$$

Unfortunately PET wants to know slue time as a function of normal run time. Using the quadratic equation gives:

$$T_{S} = -K_{1} + \sqrt{K_{2} + K_{3}} T_{R}$$
 (2)

Using three pairs of points (including 0, 0) from figure 1, the constants can be determined. The problem remains, which set of three points out of the 15 will provide the best tracking for the algebraic expression?

The Statistics II pack for the HP-9825 desk top computer has, (Jim King pointed out to me), a program for finding the best least-square-error fit between an empirical curve and an N-degree polynomial. Equation (1) is a second degree polynomial so I used the 9825 to find its coefficients and then used the quadratic equation to find the constants in equation (2):

$$T_{\rm S} = -69.59 + \sqrt{4904.46 + 12.756} T_{\rm R}$$
 (3)

Figure 2 shows equation (3) and the measured points on the same graph. Evidently the assumptions of constant tape thickness, constant linear "RUN" speed, and constant "FST-FWD" angular speed were justified. Following this article is the derivation of slue speed time, T_S , as a function of run speed time, T_R .

A polynomial fit to the non-polynomial relationship.

The HP-9825 worked so nicely for the polynomial of the inverse relationship, and the program was so easy to use, that I thought it would be interesting to see if a low degree polynomial would fit the direct relationship as neatly as the quadratic-root equation. The empirical curve was obviously non-linear, so there was no point in trying a first degree polynomial. The 9825 gave as the least square error fit the following second degree polynomial:

$$T_{c} = 2.279 + .07239 T_{p} - 1.0953 \cdot 10^{-5} T^{2}$$

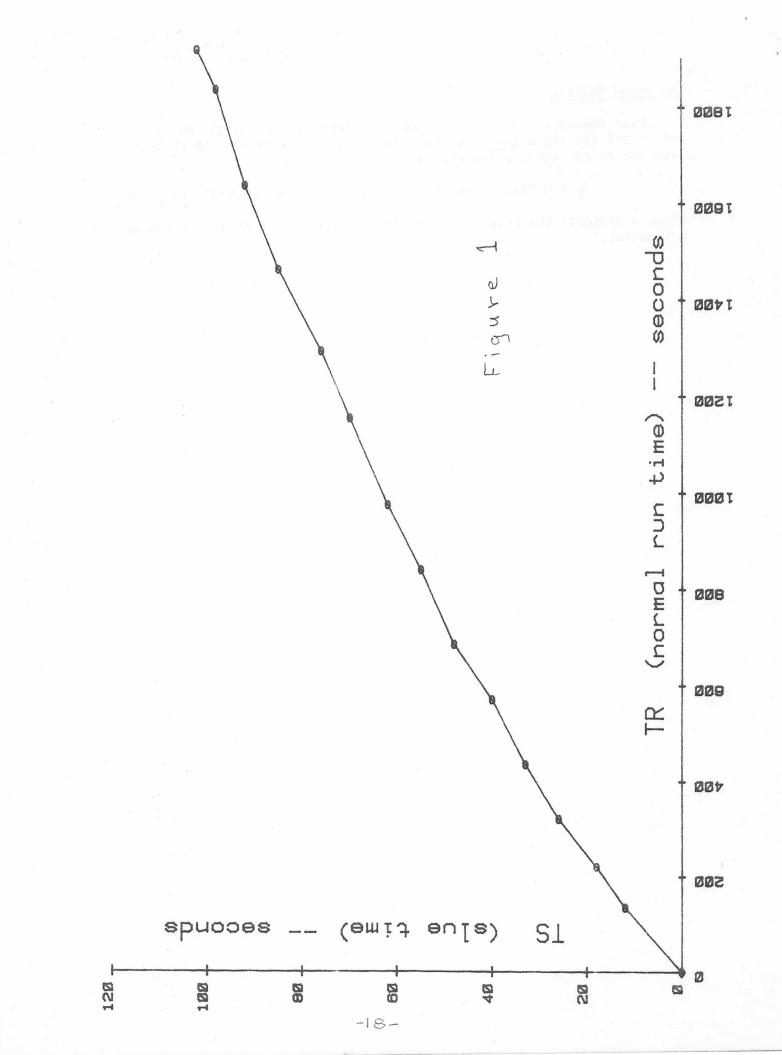
Figue 3 presents this equation along with the measured data. So, with the same number of constants and only one more operation the second degree polynomial is only slightly less of a fit as you can see comparing figures 2 and 3.

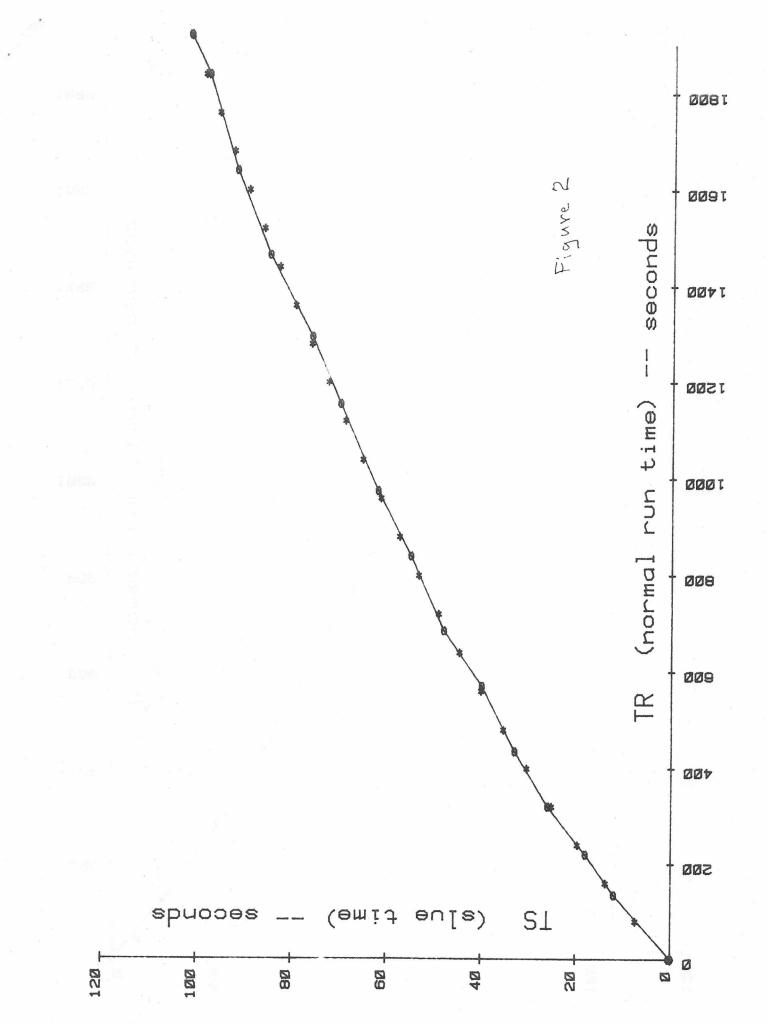
The grand fallacy

Even though I use the same number of terms in PET, might not I be better off fitting a <u>third</u> degree polynomial to the data? The HP-9825 gave the third degree polynomial as:

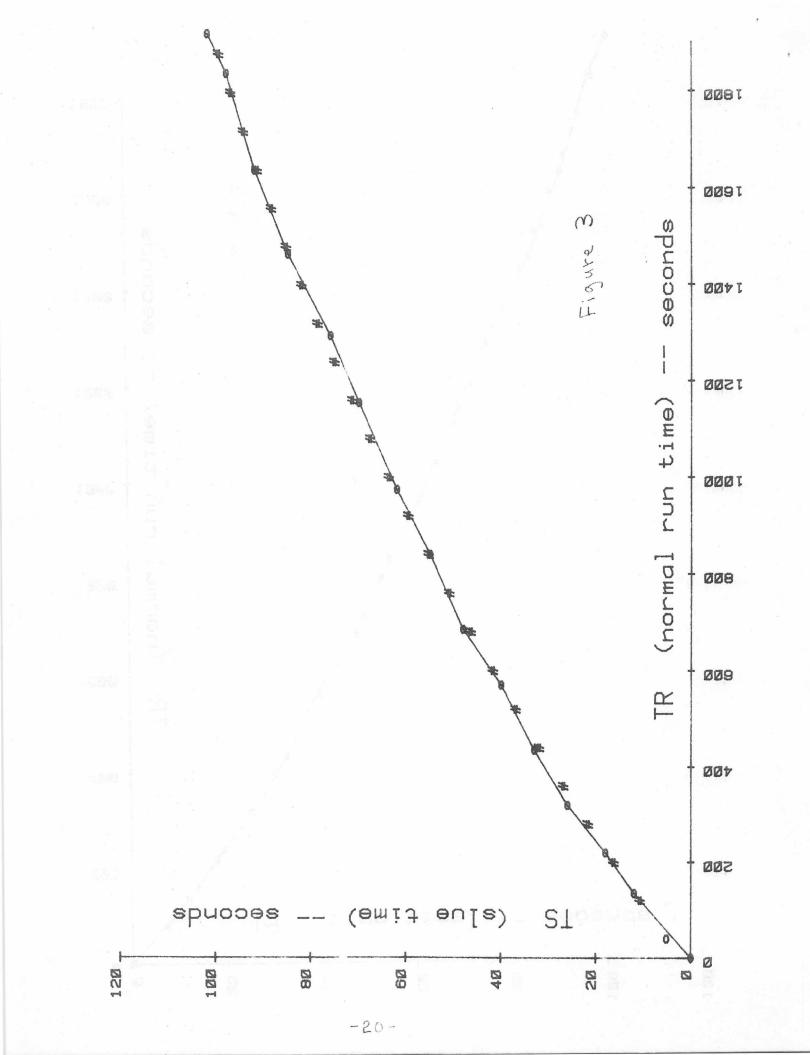
 $T_{S} = 0.8278 + .08305 T - 2.532 \cdot 10^{-5} T^{2} + 4.96 \cdot 10^{-9} T^{3}$

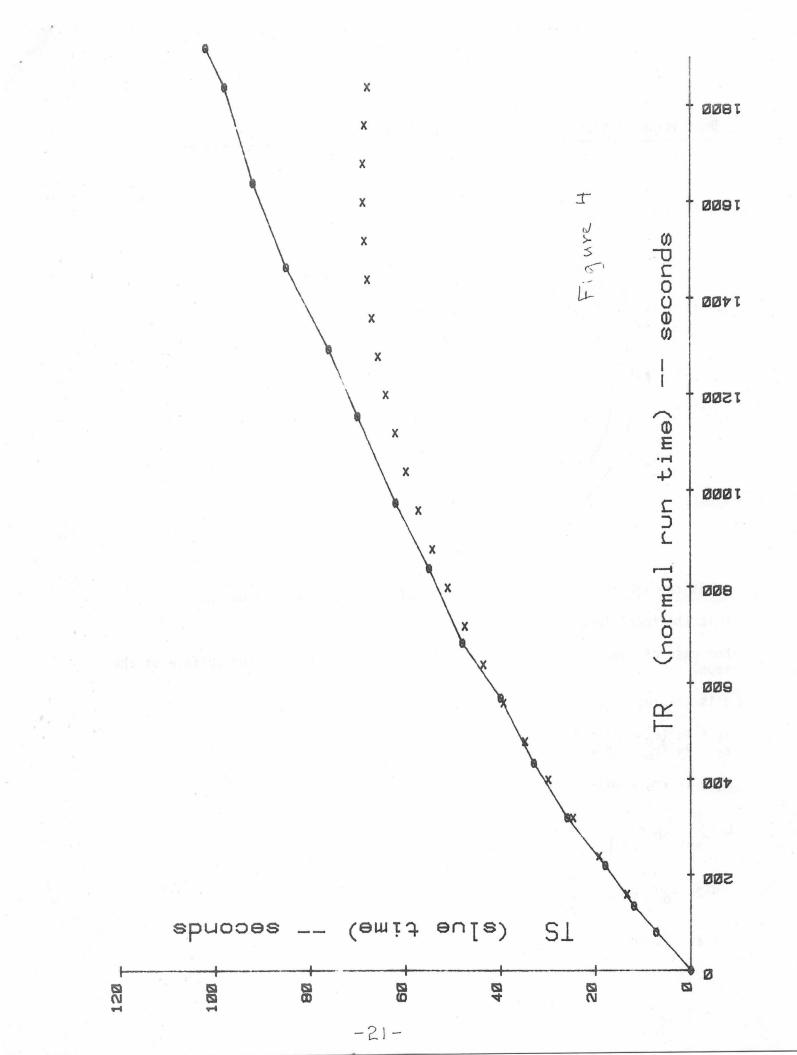
Figue 4 presents the results of leaving out the last term of a third degree polynomial.



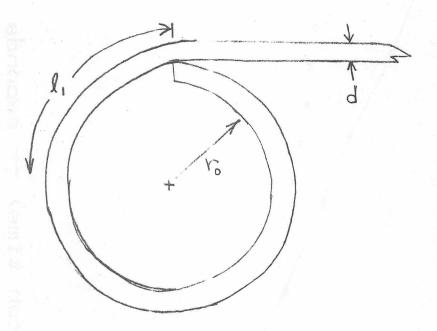


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Derivation of slue time, $T_{\rm S},$ as a function of normal run time $T_{\rm R}.$



 $\boldsymbol{\imath},$ is the length of the first turn of tape on a spool of radius $r_{0}.$

L is the total length of tape for N turns.

For ease of computation assume magnetic coating is on the outer surface of the tape.

d is the total thickness of the tape.

$$\begin{aligned} l_1 &= 2\pi \ (r_0 + d) = 2\pi \ r_0 + 2\pi \ d\\ l_2 &= 2\pi \ (r_0 + 2d) = 2\pi \ r_0 + 2\pi \ (2d) \end{aligned}$$
$$\begin{aligned} l_n &= 2\pi \ (r_0 + nd) = 2\pi \ r_0 + 2\pi \ (nd) \end{aligned}$$
$$\begin{aligned} L &= \sum_{n=1}^N \ l_n = \sum_{n=1}^N \ (2\pi \ r_0 + 2\pi \ nd) \end{aligned}$$
$$\begin{aligned} \vdots &= 2\pi \ r_0 N \ \div \ 2\pi \ d \ \sum_{n=1}^N \ n\\ = 2\pi \ r_0 N \ \div \ 2\pi \ d \ \sum_{n=1}^N \ n \end{aligned}$$

With a constant rotary speed, $\boldsymbol{\omega},$ the number of turns, N, to a given spot on the tape is:

$$N = \omega T_S$$

In the normal run speed the length of tape to the same spot is:

$$L = kT_R$$

Where k is the linear drive speed in inches / second. Assuming N >>1.

19.-1 STREE V. . 64

$$L = 2\pi Nr_{0} + 2\pi d \frac{N^{2}}{2}$$
$$kT_{R} = 2\pi \left[r_{0} (\omega T_{S}) + \frac{d}{2} (\omega T_{S})^{2} \right]$$

PET Tape-Directory Program

Jim King, GTPD's Director of Engineering has written a program that provides a Fast-Forward slue to a named program on cassette. This can be used instead of the normal-speed tape search for the named program. On a C60 cassette the maximum time on a rewound tape to the header of a program is reduced from 30 minutes to 1.5 minutes.

Jim's program first presents a table-of-contents for the tape of up to 15 programs per tape side. The PET user types in the first unique characters of a title (the whole name need not be typed), <u>simultaneously</u> presses the RETURN key and the Fast-Forward lever on the tape unit, and then the tape unit STOP lever when told to do so by PET. This positions the tape from 10 to 20 normal-speed seconds before the header. The LOAD or RUN command is then used to load the program.

The program operates by taking the normal run time in seconds associated with the named program, uses an equation to convert this to Fast-Forward time, and sets a clock that tells the user when the fast-forward time has elapsed. The program uses the first three terms of a power series to approximate the relation between normal run time and fast-forward time to the same point on the tape. The approximation is valid for up to 15 minutes, the maximum run time on a C30 cassette. The directory Table of Contents can have up to 15 programs listed.

I've modified Jim's program by including instructions on how to add titles and how to use the directory, increased the listings from 15 to 24, and changed the time relationship equation to one that can be used with up through C60 cassettes (if they all have the same thickness tape). With the directory and instructions both in the same program it takes an intolerable 90 seconds to load. So I made the first program on a tape the directory and the second, the instructions for using the directory. Those who no longer need instructions can have the directory on the screen in 40 seconds.

My instructions for adding a new program to the tape and directory say you must have the tape positioned, ready for loading, <u>before</u> you key your new program into the PET. I thought this necessary because I required loading the previous program in order to position the tape properly. The LOAD instruction would of course wipe out any program in PET.

Allan Tupker pointed out a scheme whereby getting to the proper point does not require destroying the program in the PET. First, the tape is rewound to some point before the present last-program. Then type VERIFY "(last program name)". The VERIFY instruction gets you just past the last recorded program without destroying any program in the computer.

Anybody wanting a copy of Jim's faster-loading directory of up to 15 programs on a C30 cassette, or my programs for up to 24 programs on a C60 cassette, should send a Maxell (or equivalent quality) cassette to: Bob Gehring, MS 137-324.-13e

A PET LIBRARY-TAPE FOR THE OCCASIONAL USER

A major problem in running a PET program, that you wrote weeks ago, is that of having adequate prompts and instructions. Back when you wrote the program you obviously didn't need detailed instruction, and even if you did write instructions, by now they are probably fugitive notes that can't be found. And if you have a program written by someone else, that you never have run, the problem can be even worse. You can of course (or rather you or the program writer <u>could have</u>) used some of the limited program capability to include instructions as part of the program. I can get about 100 average sized programs on a C60 cassette so it would seem reasonable to use tape to store instructions and documentation instead of the so-dear capability of the main program.

DOC Sample

The documentation sample I use consists of five pages (CRT screens) of text. Each page consists of twenty-two (22) lines of thirty-nine (39) characters of text for about one hundred fifty (150) words per page. The next to the last line is blank, and the last line has the page number and instruction for flipping pages, such as:

"p.5 Type L,N,1,2,....5"

Where typing L gives the last previous page, N the next page, and 1 page 1.

The Files on Tape

My one-tape library tape has the following sequence of files:

INDEX 24: A table of contents listing plus the timer program for a "Fast Forward" slue to a named program from the table.

INDEX 24 INSTRUCTIONS: These are the instructions for adding new programs to, and using the index.

<u>DOC SAMPLE:</u> This consists of five blank pages that can be copied, text added, and placed in front of each new program that is added to the tape. If the documentation has the same name as its program, the high-speed slue takes you directly to the documentation first. Then a LOAD instruction will load the program. If there are times when you want to go directly to the program first, you could carry separate names in the index.

DOC, FIRST PROGRAM

FIRST PROGRAM

DOC, SECOND PROGRAM

BASIC BASIC

We have procured from Commodore a copy of tutorial presentation of the BASIC language. This tape is designed to be used on a PET. The tape presents information to the user and then poses questions and problems to be solved. This is an ideal tool for the uninitiated micro-computer user.

The tape can be borrowed from Bob Gehring, 137-324. The following are titles to sections of the tape: 138

- 1. Introduction, Line numbers
- 2. Variables, Input, List, run
- 3. Print, End
- 4. Numbers, Strings, Expressions, Hierarchy, Let, Homework (H.W.)
- 5. H.W., IF/Then, GOTO, H.W.
- 6. H.W., Read/Data, Arrays
- 7. Looping, For/Next, H.W.
- 8. H.W., GOSUB, On GOTO, On GOSUB
- 9. Saving Programs, Sample Programs
- 10-15. Six Sample Programs

Frank Helsell Looking for PET Pals

Frank Helsell, 137-152 wonders if there are other PET owners interested in audio and music applications for the PET?

PET Periodical Publications

PET users may be interested in the following periodicals. Some of these may no longer be published.

PET Newsletter Lawrence Hall of Science University of California Berkley, California

I have not seen this, but it is recommended by our friends in Dallas.

The PET Cassette 929 North Port Drive Room 6 Madison, Wisc. 53704

Wanda Fox, Dallas, has received several issues late last year.

PET User Notes P.O. Box 371 Montgomery, Penn. 18936

This is available through the Current Awareness Bulletin.

The PET Paper Box 43 Audubon, PA. 19407

I have the first five issues of this, with the last one dated July 1978. I don't know if they are still publishing. The first issue I have is 14 pages, and the last issue 26 pages. The following is the table of contents for the last issue:

Standard Symbols User Group Info PET Prose Advertising and Subscription Rates PET Parade Simple Memory Test for your PET The Legend of the Marvelous, Magical, Mystical, Miraculous Micromachine. Use a Baudot Teletype With Your PET by Jerome Salko PEEKing & POKEing at PET The Status Word (ST) New PET Accessories Flea Market Software Exchange Software Shelf Software Sales RENUM & UNLIST: A Listing PET I/O (reprinted from SPHINX by Richard Tobey) Reader Questionnaire

If anyone wants to borrow my copies, drop a note to: Bob Gehring, 137-124

Software Hardware Products Directory New England Electronics Co., Inc. 248 Bridge St. Springfield, MA 01103 (413) 739-9626

DOCUMENTATION

WB#1 "Getting Started with Your PET" WB#2 "PET String and Array Handling" WB#3 "PET Graphics" WB#4 "PET Cassette and Input/Output" WB#5 "PET Miscellaneous"

The Music Box: Hardware and software enabling user to compose, play, and hear music on the PET. \$49.95

Other programs: War games package #1, LEM lunar lander, Blackjack, Deflection, Hunt the WUMPUS, PET Othello, NEECO Game Pack, Masterbrain, Grades, Slot Machine, Statistics, Queen, Depreciation, Biorhythm, Bullfight,...Poker, Two Player Chess, Accounting PAK #1, Business Graphics,...Schedule Planner #2

In support of the dual drive disk system; Diskmon, Diskmon Assembler Listing, Pet Assembler Programming Guide, FORTRAN, PLM.

PET PUBS

The following publications will be of interest to PET computer users.

Commodore PET Users Club Newsletter

Commodore Business Machines, Inc. has formed the Commodore U.S. PET USER's CLUB. The charter of the User's Club is to provide a method of sharing up to date information, applications and programs relating to the PET computer between the many PET owners, users and manufacturers. We have received Volume I, Issue 1 of the Commodore Pet Users Club Newsletter. This newsletter contains product news, details on current software, time saving tips on programming, peripherals and attachments, and a User's Directory to other sources of PET information. The cost of a one year's membership in the Users Club is \$15.00. Membership applications are available from Wanda Fox, Mail Code 407-120, casnet 437-2330, in Dallas.

WORKBOOK 6 - TIS SERIES NOW AVAILABLE

We have acquired workbook 6 in the TIS workbook series. This workbook titled "PET CONTROL AND LOGIC STATEMENTS" is available for review in each local library or Information Center. The workbook can be purchased for \$3.95 plus tax from the following address:

Total Information Services P.O. Box 921 Los Alamos, New Mexico 87544

Literature for PET

A series of information manuals are available for the PET micro-computer. The set consist of six manuals covering the following subjects:

MEDIT (Micro editor for PET) Getting Started with Your PET - Workbook 1 String and Array Handling - Workbook 2 Graphics - Workbook 3 Cassette - Workbook 4 Miscellaneous - Workbook 5

The cost of this set is \$34.20 including tax and shipping. They can be be ordered from the following address:

Total Information Services P.O. Box 921 Los Alamos, New Mexico 87544

A set of these manuals are available in each local library of Information Center for review before ordering.

PET PROGRAMS DOCUMENTATION ON FILE AT BUILDING 137 TERMINAL ROOM

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000126	Gaussian Random Number Generator
000157	Atmospheric PSK/FSK
000181	A Pet Optimizer
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000329	Area of a Polygon
000330	Parts of a Triangle
000331	Analysis of Two Vectors
000332	Operations of Two Vectors
000333	Angle Conversion: Radians to Degrees
000334	Angle Conversion: Degrees to Radians
000335	Coordinate Conversion
000336	Coordinate Plot
000337	Plot of Polar Equation
000338	Plot of Functions
000339	Linear Interpolation
000340	Curvilinear Interpolation
000341	Integration: Simpson's Rule
000342	Integration: Trapezoidal Rule
000343	Integration: Gaussian Quadrature
000344	Derivative
000345	Roots of Quadratic Equations
000346	Real Roots of Polynomials: Newton
000347	Roots of Polynomials: Half-interval Search
000348	Trig Polynomial
000349	Simultaneous Equations
000350	Linear Programming
000351	Matrix Addition, Subtraction, Scalar Multiplication

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Basic Software Library -- Vol. II Engineering and Statistics

Scientific Research Inst. 1976 P.O. Box 490099 Key Biscayne, FL 33149

Index to Other Volumes:

Vol. 1

Part 1, Business and Personal Bookkeeping Part 2, Games and Pictures

Vol. 2

Part 3, Math and Engineering Part 4, Plotting and Statistics Programs Appendix A, Basic statement definitions

Vol. 3

Part 5, Advanced Business Programs

Vol. 4

General purpose programs

Vol. 5

Experimenter's Programs Appendix B, Statement Conversion Algorithms

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Vol. 6 beausepsed motel events and theread light therein in a sector of the ORI 100

A Complete Business System

Getting Started With Your PET (about 100 pp.)

- I. Introduction
- II. PET BASIC calculator mdoe
- III. Inputting a program
- IV. Getting information out of your program.

V. Getting information into your program

- VI. Data representation
- VII. Using the cassette for program storage

PET PROGRAMS ON MAG TAPE AT CEDAR BLDG. 137

Bob Gehring, 137-124 has mag tape copies of the following programs. Send him a tape cassette (Maxell best) for a copy of any of these. His documentation copies cannot be recopied, so write to Wanda Fox, 407-120 for documentation copies.

Database Access	ion Number	Program Title
157 *		"ATMOS PSK/FSK"
181 *		"A PET OPTIMIZER"
379 *		"PIERRE"
732 *		"PET POISON DIST"
1131		"FINLOSS" "INFLOSS" "FINDELAY" "INFDELAY"
1132		"HDLC"
1142		"GENERAL VLACH" "EVEN VLACH" "ODD VLACH"
1188		"PRIMARY HU" "EQUIVALENT RANDO" "INTERMEDIATE HU" "FINAL ROUTES"
1227		"M.W.NTWRK.ANALYS"
1244 * 1283		"LEVMAT102078" PET BROADBAND MATCHING "BASE CONVERSION"
1306 *		"ASSEM1" "EXEC" "MODIFYED EDIT" "6502 DISASSEMB" "ASSEM2, EDIT" "EDIT"

Database Accession Number	Program Title
1488 *	"CAUER"
1490 *	"TRANSIENT #1"
1492 *	"SYNTHESIZER"
1493 *	"FACTORS"
1494 *	"PADS"
1494 *	"FLC"
1496 *	"FILTERS"
1497 *	"PI NET"
1498 *	"COIL"
1499 *	"ANT PAT"
1500 *	"ANT CZ"
1501 *	"POLY"
1502 *	"POLY II"
1503 *	"TV ANT"

*TAPE 2 BASIC BASIC - Side A - Contents through Lesson #4-4

Side B - Lesson #5-1 through Sample Programs *Bob Gehring has <u>a</u> copy of the documentation for these programs