PPX Exchange

Vol. 6 Number 2 Copyright 1982 March/April 1982

Least Squares Anova

By Johann Blough

Editor's Note: PPX gratefully acknowledges the contributions of Mr. George William Thomson and Mr. Stan Millwright in the preparation of this article.

Many times it is desirable to express one variable in terms of another, and the hard-wired statistical functions of the TI-59 allows the user to analyze a collection of points with relatively little pain. The user, through the use of [OP]s 11-14 can extract the pertinent information concerning the data points he has entered such as the slope, Y-intercept, mean, standard deviation, and correlation coefficient, and if he so desires, the user can interpolate additional data points.

However, many times the user will not carry his analysis any further on the assumption that the correlation coefficient gives the best indication of "goodness of fit". This assumption is a very poor measure for most statistical analysis, and therefore the analysis of variance table is used.

When utilizing distribution tests the Applied Statistics Library contains several programs designed to minimize lengthy hand calculations.

Analysis of Variance allows for the simultaneous comparison of all the populations and also allows for the data to pooled for added stability. This is accomplished by comparing the sample variances using a F-probability distribution test. The F-distribution determines whether to accept the mean or the regression line to represent the data, or in other words, does Y change with respect to X, or is the correlation

continued on page 2

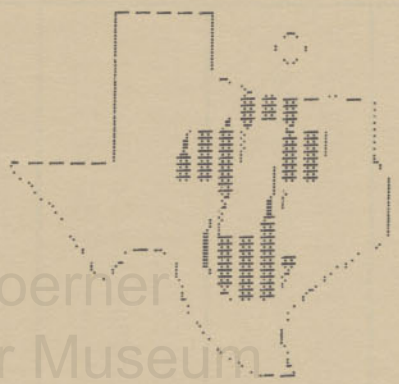
Acceptance Criteria

Because of the outstanding response from our membership over the past five years our program library has grown, and our software catalog contains over three thousand programs in various professional fields. To improve the quality of the service offered by PPX to its members and to current problems experienced by the PPX staff and membership, we are considering the possibility of revising our acceptance and revision criteria. We feel that our membership has built PPX, and your comments and suggestions for the improvement of PPX are vital. So, please take a moment to review our Program Analysts' comments and add your own. We would greatly appreciate a response from you by May 15, so that we may publish the major points raised by the membership.

continued on page 6

High Rez Graphics

By Frank Dever



Editors Note: Through experimenting with unusual key sequences, some TI-59 owners have found that their calculators will respond to certain illegal key sequences not intended by the designers. By-products of these key sequences include fractured displays, access to hard-wired functions, a fast mode and the subject of this article — printer interrupt.

The sequence described in this article is a command which tells the printer its job is over before a complete character is printed. Known results outlined in this article are the discoveries of avid TI-59 fans. This is not a Texas Instruments designed feature, but rather a machine 'quirk'; therefore, there may be unpredictable results which have yet to be discovered.

The user should exercise caution in observing the limitations outlined below. The failure to do so can cause a 'system crash' from which control can only be regained by turning the calculator off and on. Use of the printer interrupt may have unexpected consequences. The number of dots printed is affected by timing differences on each TI-59/PC-100A(C) combination. Texas Instruments cannot endorse the use of the printer interrupt nor will Texas Instruments be responsible for software damage caused thereby. This item is presented solely as an item of interest to TI-59 owners.

One of the most recent and interesting of the 'quirk' variety discoveries is the 'print interrupt' pseudo-code. Insertion of

continued on page 3

Lease Squares Anova cont'd from page 1

merely due to chance? The F value is the ratio of the mean square regression to the mean square error (or standard error of fit). If this value is significantly greater than one the analyst can say that data is better represented by the regression line than the mean.

Through the use of the following least squares ANOVA program, the user can have a complete ANOVA table, and as the statistical registers are not disturbed during the calculations, data points can be added or dropped at the user's discretion. The outputs include the mean square regression (MSR), the sum of the squares error (SSE), the mean square error (MSE) also known as the standard error of the fit, the sum of squares total (SST), the F value, and all corresponding degrees of freedom (DF).

The user selects his level of significance and would use the F chart corresponding to his selection. If the computed value of F is less than the critical value of F from the table the user can accept that the data is represented more accurately by the mean.

000	76	LBL	065	75	-	130	10	10	195	53	(
001	10	E'	066	43	RCL	131	55	÷	196	43	RCL
002	22	INV	067	08	08	132	43	RCL	197	07	07
003	76	LBL	068	54	)	133	11	11	198	55	÷
004	15	E	069	42	STO	134	54	)	199	43	RCL
005	86	STF	070	09	09	135	42	STO	200	12	12
006	00	00	071	75	-	136	12	12	201	54	)
007	53	(	072	43	RCL	137	87	IFF	202	87	IFF
008	69	OP	073	07	07	138	00	00	203	00	00
009	13	12	074	54	)	139	45	YX	204	23	LNX
010	65	×	075	42	STO	140	92	RTN	205	92	RTN
011	43	RCL	076	10	10	141	61	GTO	206	76	LBL
012	01	01	077	87	IFF	142	32	X↕T	207	23	LNX
013	85	+	078	00	00	143	76	LBL	208	69	OP
014	32	X↕T	079	55	÷	144	45	YX	209	06	06
015	65	×	080	92	RTN	145	69	OP	210	22	INV
016	43	RCL	081	61	GTO	146	06	06	211	86	STF
017	06	06	082	42	STO	147	98	ADV	212	00	00
018	75	-	083	76	LBL	148	03	3	213	98	ADV
019	53	(	084	55	÷	149	06	6	214	98	ADV
020	43	RCL	085	98	ADV	150	03	3	215	98	ADV
021	01	01	086	03	3	151	06	6	216	92	RTN
022	33	X2	087	06	6	152	03	3	217	76	LBL
023	55	÷	088	03	3	153	07	7	218	53	(
024	43	RCL	089	06	6	154	69	OP	219	69	OP
025	03	03	090	01	1	155	04	04	220	06	06
026	54	)	091	07	7	156	76	LBL	221	01	1
027	42	STO	092	69	OP	157	32	X↕T	222	06	6
028	08	08	093	04	04	158	43	RCL	223	04	4
029	54	)	094	43	RCL	159	09	09	224	00	0
030	42	STO	095	10	10	160	87	IFF	225	02	2
031	07	07	096	71	SBR	161	00	00	226	01	1
032	87	IFF	097	53	(	162	33	X2	227	04	4
033	00	00	098	76	LBL	163	92	RTN	228	00	0
034	52	EE	099	42	STO	164	61	GTO	229	69	OP
035	92	RTN	100	53	(	165	04	1/X	230	04	04
036	01	1	101	43	RCL	166	76	LBL	231	92	RTN
037	92	RTN	102	03	03	167	33	X2	232	00	0
038	61	GTO	103	75	-	168	71	SBR	233	00	0
039	54	)	104	02	2	169	53	(	234	00	0
040	76	LBL	105	54	)	170	76	LBL	235	00	0
041	52	EE	106	42	STO	171	04	1/X	236	00	0
042	98	ADV	107	11	11	172	53	(	237	00	0
043	98	ADV	108	87	IFF	173	43	RCL	238	00	0
044	03	3	109	00	00	174	03	03	239	00	0
045	00	0	110	43	RCL	175	75	-	240	22	INV
046	03	3	111	92	RTN	176	01	1	241	86	STF
047	06	6	112	61	GTO	177	54	)	242	00	00
048	03	3	113	44	SUM	178	87	IFF	243	98	ADV
049	05	5	114	76	LBL	179	00	00	244	98	ADV
050	69	OP	115	43	RCL	180	35	1/X	245	98	ADV
051	04	04	116	69	OP	181	92	RTN	246	92	RTN
052	43	RCL	117	06	06	182	61	GTO	247	00	0
053	07	07	118	03	3	183	22	INV	248	00	0
054	71	SBR	119	00	0	184	76	LBL	249	00	0
055	53	(	120	03	3	185	35	1/X	250	00	0
056	01	1	121	06	6	186	69	OP	251	00	0
057	69	OP	122	01	1	187	06	06	252	00	0
058	06	06	123	07	7	188	98	ADV	253	00	0
059	76	LBL	124	69	OP	189	02	2	254	00	0
060	54	)	125	04	04	190	01	1	255	00	0
061	00	0	126	76	LBL	191	69	OP	256	00	0
062	53	(	127	44	SUM	192	04	04	257	00	0
063	43	RCL	128	53	(	193	76	LBL	258	00	0
064	02	02	129	43	RCL	194	22	INV	259	00	0
									260	00	0

To use the following program simply enter the data using [x ⇆ t] and [2nd] [Σ +]. After all data has been entered and the program has been either keyed in or read from a magnetic card, press [E]. The complete ANOVA table would be printed. In the absence of the PC-100A(C), initialize by pressing [2nd] [E']. The user would press [R/S] for each subsequent piece of information, and the results will be displayed in the same order they are printed.

The following data is used to execute the sample program.

DATA

X	Y
4	33
4.5	42
5	45
5.5	51
6	53
6.5	61
7	62

```
      631.75      MSR
          1.    D.F.

19.96428571       SSE
          5.    D.F.
3.992857142       MSE

651.7142857       SST
          6.    D.F.

158.2200358         F
```


from the Analyst's Desk

Mr. Wade Swoboda has notified us of an error in program #048014G "Linear Forecast". An indexing error which results in the loss of a data point causes a non-linearity in the program. The error is easily corrected by deleting [OP] 20 at locations 145-146 and reinserting [OP] 20 at locations 153-154. The corrected listing would read as follows:

133	76	LBL	143	76	LBL	153	69	OP
134	12	B	144	28	LOG	154	20	20
135	01	1	145	43	RCL	155	69	OP
136	02	2	146	00	00	156	29	29
137	75	-	147	69	OP	157	97	DSZ
138	43	RCL	148	14	14	158	07	07
139	00	00	149	59	INT	159	28	LOG
140	95	=	150	94	+/-	160	00	0
141	42	STO	151	72	ST*	161	00	0
142	07	07	152	09	09			

continued on page 6

High Rez Graphics cont'd from page 1

this code in the learn mode will, when executed by a program, instruct the printer to halt. The result of this printer interrupt is that the character being printed is restricted to as few as two rows of dots. The discovery was made by the dilligent efforts of Michael Sperber, Gerald Schuetzer, and Johan Berger. Also contributing to the development of the technique is Maurice Swinnen, Editor *TI PPC NOTES* and Dave Leising.

No doubt it has already occurred to the more avid fan of the TI-59 that this discovery is a fantastic opportunity to experiment with high resolution graphics. And so it is. Included in this article is all the information you need to get started printing high resolution graphs of functions, pictures of your favorite comic book character, or whatever. Your imagination is the limit.

However, be forewarned that the function outlined in this article was not designed by Texas Instruments and therefore you may have unexpected difficulties in the use of the printer interrupt. It has been the author's experience that endless loops are a frequent malady.

How does it work? On command, the thermal printhead will print 20 characters (blanks are also considered characters), each one as a matrix of dots, 7 rows by 5 columns. The characters are printed one row at a time. After each row, the printer advances the paper for the next row of dots. After printing the entire matrix for each of the 20 characters, the printer will advance the paper for the next set of characters to be printed. The calculator is designed to continue to execute program instructions while the printer is carrying out a print instruction. It is this feature that makes the printer interrupt work. A command to print is sent to the printer and very shortly afterwards a special printer interrupt described below is relayed to the printer. This causes the printer to stop, leaving the characters vertically incomplete.

The printer-interrupt command is created by placing a special 'pseudo-code' in program memory. But before attempting to use this instruction, the user should make note of the following limitations and restrictions when using the printer interrupt. Failure to do so may result in an endless loop from which keyboard control can only be regained by turning the calculator off and on again. Keep in mind that the list given below may not be complete; there may still be much to learn about the printer-interrupt instruction.

1) The Master Library module should be installed when sequences in this article are used.
2) The pseudo-code must be inserted in a location evenly divisible by eight.
3) The sequences given for the insertion of the pseudo-code will leave a [RTN] instruction in the step following the code. This is essential for the operation of the printer-interrupt. The next 7 steps following the [RTN] will contain meaningless code.
4) Since 9 [OP] 17 is used in the initialization sequence, the insertion of the printer-interrupt moves the eighth step following the pseudo-code through step 239 over one step. This results in the loss of step 239. It is suggested that if your program is longer than 238 steps, a [NOP] is inserted in step 239. Be sure to repartition the calculator to the partitioning required by the program after initialization.
5) All labels must preceed the pseudo-code.
6) The display must contain a zero when the printer-interrupt is executed.
7) Error conditions or EE display modes must not be present when the printer-interrupt is executed.
8) Location 000 must contain an [INV] [SBR] instruction. Execution is transferred to this location after the printer interrupt is encountered in a program.
9) On some printers, a complete line of interrupted characters will arrest the paper advance.
10) Magnetic cards recorded after initialization will not contain the appropriate pseudo-code. To avoid this, record your program before initialization.
11) The differences in timing on various calculator-printer combinations may affect the number of rows of dots that are printed. This may make a program using the printer-interrupt run differently on different machines.

To Insert The Pseudo-Code:

1) Turn the calculator on.
2) Position the program counter to one of the locations given in the initialization table by pressing [GTO] followed by the three digit location number.
3) Press [LRN].
4) Find the key strokes corresponding to the location you have chosen in the pseudo-code initialization table, and key them in.
5) Press [LRN].
6) Reposition the program counter to the location in which you intend to insert the pseudo-code by pressing [GTO] followed by the three digit location number.
7) Initialize the pseudo-code by pressing the sequence: [9] [2nd] [OP] [1] [7] [2nd] [Pgm] [1] [2] [SBR] [4] [4] [4] [R/S] [2nd] [P/R] [LRN] [2nd] [Ins] [LRN] [CLR] [RST]. The display will begin flashing when [SBR] [4] [4] [4] is pressed. Press [A] and the print code table with full and interrupted characters will be printed.

Pseudo-Code Initialization Table

TO INSERT AT STEP	STARTING AT STEP	KEY IN THE FOLLOWING
008	008	[lnx] [(]
016	016	[SUM] [2nd] [Ind] [9] [0]
024	024	[SUM] [2nd] [Ind] [8] [0]
032	032	[2nd] [OP] [2nd] [Ind] [5] [9]
040	040	[RCL] [2nd] [Ind] [.]
048	048	[STO] [2nd] [Ind] [x^2]
056	056	[RCL] [2nd] [Ind] [3] [0]
064	064	[STO] [5] [1] [Bst] [Bst] [2nd] [Del] [Sst] [D]
072	072	[INV] [RCL]
080	080	[INV] [RCL]
088	088	[2nd] [PGM] [2nd] [Ind] [5] [1]
096	096	[STO] [2nd] [Ind] [x^2]
104	104	[RCL] [2nd] [Ind] [7] [0]

Each data register is associated with eight program locations. This grouping of eight appears to be important in determining the locations in which the pseudo-code may be inserted. To our knowledge, only in a location which is evenly divisible by eight has the pseudo-code been successfully inserted.

RESOLUTION IS AFFECTED BY:

1) The timing of the calculator-printer combination. Some calculator-printer combinations will print a different number of rows of dots than others given the same amount of time to do so.
2) The number and type of instructions executed between the print instruction and the execution of the printer-interrupt. For example, [OP] [05] [CLR] "[pseudo-code]" will print fewer rows of dots than [OP] [05] [DMS] "[pseudo-code]" because of the differing amounts of time required to execute [CLR] and [DMS]. Also, the insertion of [NOP]s between the print instruction and the pseudo-code will slightly affect the number of rows of dots printed.
3) The location at which the pseudo-code is inserted. On our printers, two rows of dots are printed using the printer-interrupt in location 008 and [OP] 05 beginning in location 006. However, the entire character is printed normally (without paper advance afterwards) using the printer-interrupt in location 140 and with [OP] 05 beginning in location 138.

Here is a program written by Don O'Grady which prints out the TI Logo as shown on the front page. You may find the techniques used in this program useful in your own printer-interrupt programs. Notice that [lnx] and [(] are in steps 008 and 009 respectively. These codes must be present during insertion of the pseudo-code.

1) Set partitioning by pressing [0] [2nd] [OP] [1] [7].
2) Key in program exactly as listed.
3) Record on magnetic cards, if desired.
4) Enter the pseudo-code at location 008 using the method outlined in the pseudo-code initialization table.
5) Execute the program by pressing [GTO] [0] [1] [7] [R/S].

000 92 RTN	068 11 A	136 04 4	204 05 5	272 11 A	340 69 OP	408 07 7
001 00 0	069 00 0	137 07 7	205 07 7	273 07 7	341 04 04	409 69 OP
002 00 0	070 69 OP	138 58 FIX	206 04 4	274 04 4	342 11 A	410 01 01
003 76 LBL	071 03 03	139 04 04	207 69 OP	275 00 0	343 07 7	411 05 5
004 11 A	072 11 A	140 69 OP	208 02 02	276 00 0	344 04 4	412 06 6
005 00 0	073 06 6	141 04 04	209 75 -	277 05 5	345 07 7	413 00 0
006 69 OP	074 06 6	142 58 FIX	210 11 A	278 03 3	346 04 4	414 00 0
007 05 05	075 00 0	143 02 02	211 05 5	279 07 7	347 95 =	415 06 6
008 23 LNX	076 00 0	144 07 7	212 00 0	280 04 4	348 58 FIX	416 05 5
009 53 (	077 69 OP	145 04 4	213 00 0	281 07 7	349 04 04	417 69 OP
010 00 0	078 03 03	146 07 7	214 00 0	282 04 4	350 69 OP	418 03 03
011 00 0	079 11 A	147 04 4	215 95 =	283 69 OP	351 03 03	419 75 -
012 00 0	080 00 0	148 07 7	216 69 OP	284 03 03	352 85 +	420 11 A
013 00 0	081 69 OP	149 04 4	217 02 02	285 02 2	353 00 0	421 01 1
014 00 0	082 03 03	150 69 OP	218 32 XIT	286 05 5	354 69 OP	422 03 3
015 00 0	083 11 A	151 03 03	219 85 +	287 69 OP	355 02 02	423 95 =
016 00 0	084 02 2	152 11 A	220 05 5	288 04 04	356 05 5	424 69 OP
017 69 OP	085 07 7	153 11 A	221 00 0	289 58 FIX	357 06 6	425 03 03
018 17 17	086 58 FIX	154 05 5	222 00 0	290 09 09	358 58 FIX	426 05 5
019 58 FIX	087 08 08	155 07 7	223 00 0	291 07 7	359 06 06	427 03 3
020 09 09	088 69 OP	156 04 4	224 95 =	292 04 4	360 69 OP	428 69 OP
021 25 CLR	089 02 02	157 06 6	225 69 OP	293 07 7	361 01 01	429 01 01
022 69 OP	090 11 A	158 07 7	226 03 03	294 04 4	362 11 A	430 58 FIX
023 00 00	091 07 7	159 07 7	227 11 A	295 69 OP	363 05 5	431 09 09
024 06 6	092 00 0	160 04 4	228 32 XIT	296 02 02	364 06 6	432 69 OP
025 06 6	093 69 OP	161 69 OP	229 85 +	297 07 7	365 00 0	433 02 02
026 07 7	094 03 03	162 03 03	230 06 6	298 06 6	366 00 0	434 11 A
027 06 6	095 11 A	163 11 A	231 00 0	299 07 7	367 95 =	435 00 0
028 07 7	096 05 5	164 07 7	232 00 0	300 06 6	368 69 OP	436 69 OP
029 06 6	097 06 6	165 02 2	233 00 0	301 07 7	369 03 03	437 01 01
030 07 7	098 58 FIX	166 04 4	234 95 =	302 06 6	370 04 4	438 02 2
031 01 1	099 06 06	167 00 0	235 69 OP	303 07 7	371 07 7	439 05 5
032 00 0	100 69 OP	168 00 0	236 02 02	304 06 6	372 69 OP	440 69 OP
033 69 OP	101 03 03	169 00 0	237 75 -	305 07 7	373 01 01	441 02 02
034 02 02	102 11 A	170 07 7	238 11 A	306 69 OP	374 11 A	442 02 2
035 11 A	103 05 5	171 69 OP	239 68 NOP	307 01 01	375 05 5	443 07 7
036 02 2	104 01 1	172 03 03	240 05 5	308 11 A	376 03 3	444 00 0
037 07 7	105 58 FIX	173 11 A	241 00 0	309 00 0	377 69 OP	445 00 0
038 00 0	106 08 08	174 07 7	242 00 0	310 69 OP	378 01 01	446 07 7
039 00 0	107 69 OP	175 04 4	243 95 =	311 04 04	379 07 7	447 04 4
040 00 0	108 04 04	176 05 5	244 69 OP	312 04 4	380 00 0	448 00 0
041 00 0	109 58 FIX	177 06 6	245 02 02	313 07 7	381 00 0	449 00 0
042 00 0	110 04 04	178 00 0	246 85 +	314 58 FIX	382 00 0	450 00 0
043 00 0	111 07 7	179 00 0	247 07 7	315 08 08	383 05 5	451 00 0
044 02 2	112 05 5	180 02 2	248 04 4	316 69 OP	384 02 2	452 69 OP
045 05 5	113 01 1	181 04 4	249 02 2	317 01 01	385 07 7	453 03 03
046 69 OP	114 69 OP	182 07 7	250 07 7	318 07 7	386 58 FIX	454 11 A
047 02 02	115 03 03	183 04 4	251 00 0	319 04 4	387 02 02	455 05 5
048 11 A	116 11 A	184 69 OP	252 00 0	320 00 0	388 69 OP	456 69 OP
049 11 A	117 06 6	185 03 03	253 07 7	321 00 0	389 03 03	457 02 02
050 01 1	118 07 7	186 32 XIT	254 04 4	322 02 2	390 11 A	458 11 A
051 00 0	119 04 4	187 58 FIX	255 07 7	323 05 5	391 02 2	459 69 OP
052 00 0	120 07 7	188 04 04	256 04 4	324 07 7	392 00 0	460 00 00
053 69 OP	121 69 OP	189 02 2	257 69 OP	325 04 4	393 00 0	461 05 5
054 03 03	122 04 04	190 07 7	258 03 03	326 07 7	394 06 6	462 06 6
055 11 A	123 58 FIX	191 00 0	259 11 A	327 04 4	395 05 5	463 00 0
056 00 0	124 09 09	192 00 0	260 85 +	328 69 OP	396 02 2	464 00 0
057 69 OP	125 07 7	193 04 4	261 01 1	329 03 03	397 07 7	465 69 OP
058 03 03	126 04 4	194 07 7	262 04 4	330 75 -	398 69 OP	466 01 01
059 11 A	127 07 7	195 69 OP	263 00 0	331 11 A	399 03 03	467 06 6
060 02 2	128 04 4	196 04 04	264 00 0	332 05 5	400 05 5	468 05 5
061 05 5	129 07 7	197 02 2	265 95 =	333 03 3	401 06 6	469 69 OP
062 00 0	130 04 4	198 07 7	266 69 OP	334 69 OP	402 58 FIX	470 02 02
063 00 0	131 06 6	199 00 0	267 02 02	335 01 01	403 04 04	471 07 7
064 02 2	132 07 7	200 00 0	268 06 6	336 02 2	404 69 OP	472 04 4
065 07 7	133 69 OP	201 00 0	269 02 2	337 07 7	405 01 01	473 07 7
066 69 OP	134 03 03	202 00 0	270 69 OP	338 58 FIX	406 11 A	474 04 4
067 03 03	135 11 A	203 05 5	271 04 04	339 02 02	407 04 4	475 07 7

476	04	4	528	69	DP	580	01	01	632	07	7	684	02	02	736	00	0
477	58	FIX	529	03	03	581	02	2	633	04	4	685	11	A	737	04	4
478	04	04	530	75	-	582	07	7	634	02	2	686	58	FIX	738	07	7
479	69	DP	531	04	4	583	00	0	635	07	7	687	09	09	739	69	DP
480	03	03	532	07	7	584	00	0	636	05	5	688	69	DP	740	03	03
481	11	A	533	69	DP	585	00	0	637	03	3	689	00	00	741	11	A
482	58	FIX	534	04	04	586	00	0	638	69	DP	690	05	5	742	05	5
483	02	02	535	58	FIX	587	02	2	639	03	03	691	06	6	743	06	6
484	04	4	536	09	09	588	07	7	640	11	A	692	69	DP	744	00	0
485	07	7	537	00	0	589	02	2	641	06	6	693	02	02	745	00	0
486	69	DP	538	69	DP	590	05	5	642	00	0	694	11	A	746	06	6
487	01	01	539	01	01	591	69	DP	643	07	7	695	02	2	747	02	2
488	58	FIX	540	06	6	592	02	02	644	04	4	696	07	7	748	69	DP
489	04	04	541	05	5	593	04	4	645	07	7	697	00	0	749	03	03
490	05	5	542	69	DP	594	07	7	646	04	4	698	00	0	750	11	A
491	05	5	543	02	02	595	58	FIX	647	00	0	699	69	DP	751	05	5
492	69	DP	544	11	A	596	08	08	648	00	0	700	03	03	752	03	3
493	04	04	545	02	2	597	69	DP	649	00	0	701	04	4	753	00	0
494	11	A	546	07	7	598	04	04	650	07	7	702	07	7	754	00	0
495	58	FIX	547	69	DP	599	11	A	651	69	DP	703	69	DP	755	05	5
496	02	02	548	01	01	600	02	2	652	03	03	704	02	02	756	03	3
497	02	2	549	07	7	601	07	7	653	11	A	705	11	A	757	69	DP
498	05	5	550	00	0	602	69	DP	654	06	6	706	05	5	758	03	03
499	69	DP	551	00	0	603	04	04	655	02	2	707	03	3	759	11	A
500	01	01	552	00	0	604	58	FIX	656	69	DP	708	69	DP	760	06	6
501	05	5	553	00	0	605	09	09	657	02	02	709	02	02	761	07	7
502	03	3	554	02	2	606	05	5	658	05	5	710	11	A	762	06	6
503	06	6	555	07	7	607	03	3	659	03	3	711	69	DP	763	07	7
504	07	7	556	06	6	608	69	DP	660	07	7	712	02	02	764	69	DP
505	07	7	557	05	5	609	01	01	661	04	4	713	58	FIX	765	03	03
506	00	0	558	69	DP	610	58	FIX	662	07	7	714	02	02	766	11	A
507	00	0	559	02	02	611	02	02	663	07	7	715	05	5	767	58	FIX
508	00	0	560	05	5	612	05	5	664	00	0	716	06	6	768	09	09
509	06	6	561	03	3	613	06	6	665	00	0	717	69	DP	769	98	ADV
510	05	5	562	02	2	614	69	DP	666	02	2	718	03	03	770	98	ADV
511	69	DP	563	07	7	615	02	02	667	07	7	719	11	A	771	98	ADV
512	02	02	564	58	FIX	616	05	5	668	69	DP	720	05	5	772	98	ADV
513	58	FIX	565	06	06	617	04	4	669	03	03	721	06	6	773	92	RTN
514	06	06	566	69	DP	618	95	=	670	11	A	722	00	0	774	61	GTO
515	05	5	567	04	04	619	69	DP	671	05	5	723	00	0	775	00	00
516	03	3	568	11	A	620	03	03	672	03	3	724	00	0	776	17	17
517	69	DP	569	07	7	621	11	A	673	69	DP	725	00	0	777	00	0
518	04	04	570	02	2	622	69	DP	674	02	02	726	04	4	778	00	0
519	11	A	571	95	=	623	00	00	675	69	DP	727	07	7	779	00	0
520	07	7	572	69	DP	624	04	4	676	03	03	728	69	DP	780	00	0
521	04	4	573	03	03	625	07	7	677	11	A	729	03	03	781	00	0
522	07	7	574	85	+	626	69	DP	678	04	4	730	11	A	782	00	0
523	04	4	575	58	FIX	627	02	02	679	07	7	731	05	5	783	00	0
524	07	7	576	09	09	628	07	7	680	69	DP	732	03	3	784	00	0
525	04	4	577	05	5	629	04	4	681	03	03	733	00	0	785	00	0
526	07	7	578	06	6	630	07	7	682	11	A	734	00	0	786	00	0
527	04	4	579	69	DP	631	04	4	683	69	DP	735	00	0	787	00	0

The following program (reprinted with permission) by Dave Leising produces a print-code table with the characters printed as they appear normally and as they appear after an immediate interrupt. Note: all printers may not print the same portion of the characters. On our printers, they appear as shown.

Initialize the pseudo-code by pressing the sequence: [9] [2nd] [OP] [1] [7] [2nd] [Pgm] [1] [2] [SBR] [4] [4] [4] [R/S] [2nd] [P/R] [LRN] [2nd] [Ins] [LRN] [CLR] [RST]. The display will begin flashing when [SBR] [4] [4] [4] is pressed. Press [A] and the print code table with full and interrupted characters will be printed.

	0	1	2	3	4	5	6	7
0		0	1	2	3	4	5	6
1	7	8	9	A	B	C	D	E
2	-	F	G	H	I	J	K	L
3	M	N	O	P	Q	R	S	T
4	.	U	V	W	X	Y	Z	+
5	×	*	(	π	e	(	)	,
6	↑	%	+	/	=	'	×	÷
7	²	?	÷	0	Σ	▲	Σ	Σ

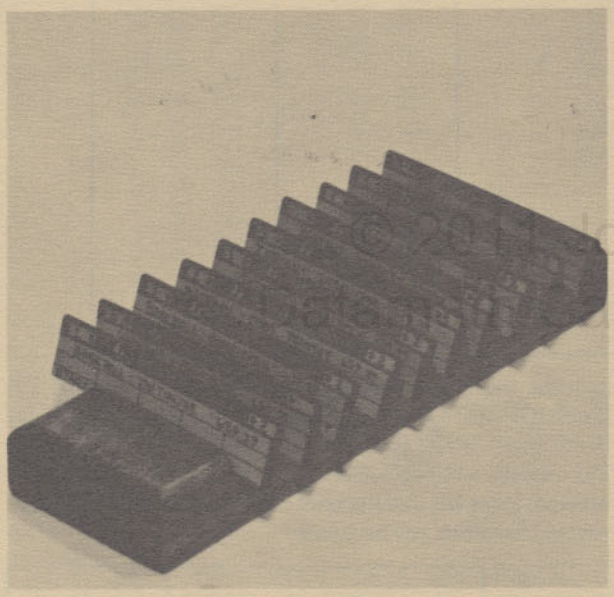
000	92	RTN	032	69	DP	064	52	EE	096	07	7	128	22	INV
001	76	LBL	033	02	02	065	69	DP	097	32	X:T	129	59	INT
002	11	A	034	04	4	066	01	01	098	69	DP	130	55	÷
003	61	GTO	035	00	0	067	01	1	099	05	05	131	01	1
004	00	00	036	00	0	068	00	0	100	25	CLR	132	00	0
005	17	17	037	00	0	069	00	0	101	71	SBR	133	00	0
006	69	DP	038	05	5	070	00	0	102	00	00	134	85	+
007	05	05	039	00	0	071	02	2	103	06	06	135	01	1
008	23	LNX	040	00	0	072	00	0	104	98	ADV	136	95	=
009	53	(	041	00	0	073	00	0	105	01	1	137	82	HIR
010	00	0	042	06	6	074	69	DP	106	85	+	138	36	36
011	00	0	043	69	DP	075	02	02	107	09	9	139	82	HIR
012	00	0	044	03	03	076	03	3	108	09	9	140	38	38
013	00	0	045	07	7	077	00	0	109	09	9	141	69	DP
014	00	0	046	00	0	078	00	0	110	09	9	142	05	05
015	00	0	047	00	0	079	00	0	111	09	9	143	25	CLR
016	98	ADV	048	00	0	080	04	4	112	00	0	144	71	SBR
017	22	INV	049	08	8	081	00	0	113	35	1/X	145	00	00
018	58	FIX	050	00	0	082	00	0	114	95	=	146	06	06
019	25	CLR	051	00	0	083	00	0	115	82	HIR	147	98	ADV
020	22	INV	052	69	DP	084	05	5	116	35	35	148	82	HIR
021	57	ENG	053	04	04	085	69	DP	117	01	1	149	18	18
022	01	1	054	69	DP	086	03	03	118	85	+	150	59	INT
023	69	DP	055	05	05	087	06	6	119	09	9	151	22	INV
024	01	01	056	69	DP	088	00	0	120	09	9	152	77	GE
025	02	2	057	00	00	089	00	0	121	09	9	153	01	01
026	00	0	058	69	DP	090	00	0	122	93	.	154	06	06
027	00	0	059	05	05	091	07	7	123	09	9	155	25	CLR
028	00	0	060	01	1	092	00	0	124	35	1/X	156	92	RTN
029	03	3	061	52	EE	093	00	0	125	95	=	157	61	GTO
030	00	0	062	06	6	094	69	DP	126	82	HIR	158	11	A
031	00	0	063	22	INV	095	04	04	127	37	37	159	00	0

Analyst Desk cont'd from page 2

• Mr. L.M. Leeds recommends that users may time a program which will run for many minutes by putting the calculator adjacent to an AM radio tuned to 720 kHZ. When the program is running the R.F. radiation emits one or two chirps per second. When the program has terminated and the run stops, the sound changes to a low frequency growl which immediately attracts attention. You may have to tune the radio a bit to find the best setting.

• Due to the many programs already available in the statistics category, we are no longer accepting submissions in this area unless it can be demonstrated that a substantial need to our membership is being filled. Of course, any submissions which satisfy the specified requirements of a Programming Corner request will be accepted. We appreciate your cooperation in this matter and are open to any comments or suggestions you may have on this subject.

• Mr. Fred L. Hubbard found that when running multiple card programs he needed something to hold the cards neatly and conveniently in place. He designed and built the simple card holder shown below.



The holder is simply a 1" x 2" piece of hardwood with a kerf's cut at a 60 degree angle 3/8" on center and 1/4" deep.

• It has come to our attention that some of the Electronics Engineering Packettes contain a serious misprint in the Field Effect Transistor Analysis program #658008. This misprint is in the packette only and the individual program available through PPX is correct as listed. The necessary corrections are from locations 300-322 would read as follows:

```
299  69 DP      310  06  6      321  71 SBR
300  03  03     311  69 DP      322  30 TAN
301  02  2      312  04  04     323  71 SBR
302  07  7      313  98 ADV     324  99 PRT
303  04  4      314  98 ADV     325  71 SBR
304  05  5      315  69 DP      326  48 EXC
305  03  3      316  05  05     327  92 RTN
306  06  6      317  98 ADV     328  00  0
307  02  2      318  92 RTN     329  00  0
308  04  4      319  76 LBL     330  00  0
309  03  3      320  10 E'
```

• An error has been reported in the Inverse Days Between Dates program that appeared in the January/February issue of the Exchange. By inserting [x t] at location 092, the program will run correctly. The absolute addresses are correct as listed.

• We have been flooded with calls and letters concerning the [HIR] code [82] contained within a program. The [HIR] XY code, where XY is a two digit argument specifying the hierarchy register and the function to be performed, accesses the internal hierarchy registers of the calculator. A complete explanation of [HIR] may be found in Vol. 4 No. 3 of the Exchange, and interested members may obtain a copy of this article by sending a self-addressed envelope to the Exchange Editor. The following table defines the X argument where the Y argument specifies the hierarchy register number 0-8.

X	OPERATION
0	STO
1	RCL
3	SUM
4	Prd
5	INV SUM
6-9	INV Prd

Acceptance Criteria cont'd from page 1

Keep in mind that we are not at liberty to revise a program other than to make the program abstract shorter for publication in the catalog or newsletter. Without having the experience of our members in all professional categories, one modification by us could alter the validity of the program.

I. SUBMISSION ABSTRACT

Many times the program title exceeds the character limitation imposed upon us by our computer format. For this reason, the program title should be limited to forty-two characters or less.

The submission abstract should give an overview of the program as well as all necessary inputs and outputs, and be limited to 250 characters. If the Program Analyst edits an abstract on an unfamiliar subject, member interpretation of the abstract becomes difficult.

Members would like to see the User Benefits contain pertinent information as to who will use the program, when will it be used and what is the practical application.

II. LEGIBILITY

Many members have expressed the desire to see the programs typed. Even though an individual can sometimes decipher his own handwriting, this may not be true for the membership as a whole. Also, a typed program, when photocopied, is more legible than one which is handwritten.

Photocopying of printer listings is another problem frequently encountered. There are two types of thermal paper available for use on the PC-100A(C) print cradles. The paper that photocopies well is TI-30250 thermal tape and has a grey tint print. The second type of thermal tape has a blue/purple tint and will not photocopy clearly. If a printer is not available many members recommend that program listings be typed. The program listing should not exceed the black border

Acceptance Criteria cont'd

on the listing sheet as portions of the listing may be cut off during the photocopy process. A couple of problems encountered by the PPX staff is that occasionally a program listing which is taped or stapled becomes torn before reaching the program analyst, and over time, cellophane tape will yellow. For this reason, we suggest that the listings be glued to the listing sheet.

Finally, drawings and diagrams should be large enough to present the pertinent information for program continuity. They should also be contained within the black borders of the submission abstract to insure that the entire drawing is photocopied.

III. SUBSTANCE

The programs should provide professional, educational, or entertainment utility. A well-rounded software catalog with programs catering to all ages and professions is the prime objective of PPX.

IV. ORIGINALITY

There is a tremendous amount of time and effort involved in writing and testing a program. For this reason PPX likes to assure authors that their programs will not be superceded by minor variations. Also, when the catalog is filled with abstracts which differ only slightly, members often find it difficult to determine which program will meet their specifications.

As an example, a minor variation would include a program for use with the printer when there is an existing program for use without the printer. A program designed with optional print routines would be ideally suited for all members, and this should be taken into consideration when designing a program.

V. REVISIONS

Many authors have expressed their confusion concerning what constitutes a revision. An attempt to revise another member's program is considered to be a suggestion. Our Program Analysts refer the suggestion to the original author for possible revision and resubmission.

In the event that an author substantially revises a program prior to the publication of the original program in the catalog update, the revised program will automatically supercede the original and no indication of revision will be carried in the catalog. For this reason many authors do not see their program 'revisions' listed as revisions.

VI. CUSTODIANSHIP

When members experience difficulty in running a PPX program, our staff first attempts to resolve the difficulty. In the event that our program analysts are not able to discover the problem a user is having with a PPX program, we forward the program memo to the author for his comments. This is necessary because we do not have the professional knowledge required to de-bug all of the programs we receive. If errors are discovered or improvements suggested the author maintains the exclusive right of correcting the program or utilizing the suggested improvements. In order for us to assist the membership when they are having difficulties, we need the original author's input concerning misconceptions or corrections in his program format. On occasion, we are not getting proper feedback from the original author. In these situations, we are unable to assist the member and have no recourse other than to 'freeze' the program.

VII. CHECKSHEET

This is an idea designed to assist authors in packaging their submissions. Although the current submission form contains this information under the heading Submission Checklist, the Checksheet would be a complete cover sheet containing the checklist as well as the author information and signature. Many times, through a slight oversight, items will be left out of the submission which will delay the acceptance of a program. The following are the items most frequently omitted from the submission. The Checksheet would not be distributed with the program but would be kept in the master program file at PPX.

1. Is the submission abstract signed and is it the original signature? Copies of the Author's signature are not acceptable.
2. Are all of the submission pages sequentially numbered and accounted for?
3. Do the recorded magnetic cards contain both the correct program and data? On occasion, members have sent the wrong set of magnetic cards or have not included the correct data.
4. Is the sample problem correct and complete?
5. Is all of the submission information legible and typed or printed clearly in black ink? Also, is all of the information contained within the black borders of the Submission Form?
6. Is the submission dated, and has the author included his membership number?

Once again, our main objective in considering revision of acceptance criteria is to improve the service we offer to the membership of PPX. We appreciate all comments and suggestions the membership has to offer, and seriously consider all member input. Thank you all for your continued support of PPX. We look forward to serving you even better in the future!

potpourri

1. When renewing your membership, keep in mind that the renewal fee is $20.00. We are receiving a number of membership renewals with checks and money orders for less than the full amount, and in the future it will be necessary for us to return these checks and orders and ask that you remit the full amount. Thank you for your cooperation in this matter.

2. The topical index and volumes of newsletters are complete. Four volumes — one each for 1978-1981 — are now available for $7.00 each. Please be sure to include any applicable state tax and the customary $2.00 shipping and

continued on page 8

Potpourri cont'd from page 7

handling. For those members who have collected the back issues, the topical index may be obtained by sending a self-addressed stamped envelope to the Exchange editor.

3. We would like to remind all members of the March 31, 1982 deadline for the programming challenge issued by Jay Claborn in the January/February issue of the Exchange. We would also like to add that programs designed for use in the "fast mode" do not meet the criteria as outlined in "The Challenge" and will not be considered.

4. We are finding that many members are not receiving their newsletters and catalog updates. The reason, more often than not, is that members have had a change of address which has never been forwarded to us. Although newsletters are mailed first class and can be forwarded, addendums to the catalog are mailed third class bulk rate, and are therefore returned to PPX. As mailing costs continue to rise, we at PPX are making every effort to refrain from passing these costs on to you, but we need your help. Please notify us as soon as possible with any change of address.

5. PPX regretfully announces the departure of Exchange editor Jay Claborn. Jay will be graduating from Texas Tech University in May with a degree in Mechanical Engineering. Starting with this issue our new editor is Pam Huneke. All newsletter correspondence can still be addressed to:

Texas Instruments, PPX
P.O. Box 53
Lubbock, TX 79408
Attn: PPX Editor

6. PERMANENT INK PENS!

Members have been having trouble finding pens that will write on magnetic cards without smearing when touched or inserted in the card reader. Permanent ink pens are recommended as they will not smear, smudge, or fade and can be found in most bookstores and stationery shops. For your convenience, we are now stocking a permanent ink pen which may be ordered for $2.00. There will be no shipping and handling charge for this item when purchased alone.

Simple Subroutines

By Frank Dever

This article is in response to requests for programming aids that are simple, useful, and not related specifically to a certain discipline such as Electrical Engineering, Finance, or Statistics. Also, a need for a "Beginners Corner' has been expressed. Please send us your opinion of the level of difficulty and utility of this article and whether you would like to see more of the same.

Of all common routines, data input and output are the most frequently found in any program. Often these input/output routines are rewritten for each use with a subsequent loss of time in the debug stage. The two routines presented are general enough to be recorded on a set of cards, and read in later to expedite the writing of a larger program. Register 00 is used in the routine as overhead, but this can be changed easily. The more experienced programmer may want to use a hierarchy register instead.

The first is a single key data entry with review and modify features. The use of the [R/S] key makes repetitive data entry more efficient.

To specify the first register to be used, enter the register number and press [A]. The data can be entered starting at any register after 00. Key in your data and press [R/S] to store the data in the proper register location. The number of the register in which data is being stored is flashed in the display after each press of the [R/S] key. The next available register number is then saved in the [x ⇆ t] register for easy reference. The routine fills each subsequent register with data until all of the data has been entered or until the partitioning limit is reached. Continue the input sequence until all data has been entered. Data can be stored in more than one block of memory by entering a new starting register number, pressing [A], and continuing the entry sequence.

To review data that has been entered, enter the starting location of the data block (the number of the lowest register in the block) and press [B]. Now each press of [R/S] will display the contents of the corresponding register. The number of the register being displayed is flashed in the display and the current register number is saved in the [x t] register. If you want to change a value being displayed, enter the new data, press [x ⇆ t], [A], and [R/S]. The old number is then replaced with the new one. To continue reviewing data, press [x ⇆ t], [B] and [R/S].

```
000  76 LBL    014  69 OP    028  00  00
001  11  A     015  20  20    029  66 PAU
002  42 STO    016  61 GTO    030  66 PAU
003  00  00    017  00  00    031  32 X:T
004  91 R/S    018  05  05    032  91 R/S
005  72 ST*    019  76 LBL    033  69 OP
006  00  00    020  12  B     034  20  20
007  32 X:T    021  42 STO    035  61 GTO
008  43 RCL    022  00  00    036  00  00
009  00  00    023  91 R/S    037  24  24
010  66 PAU    024  73 RC*
011  66 PAU    025  00  00
012  32 X:T    026  32 X:T
013  91 R/S    027  43 RCL
```

Program development usually takes place in stages. The first pass may use the display for all output. After the debug stage, print instructions are often added to produce a hard copy. Finally, [PRT] instructions can be replaced with [OP] 06 instructions to print the output data with alphanumeric tags. Alphanumeric tags help to clarify output data when the output is reviewed at a later time.

The next routine, "Tagger", is a subroutine which will add alphanumeric tags to your output data and save steps doing it. Merely replacing [PRT] with [OP] 06 requires more program steps since the following steps must be executed 1) the data must be saved, 2) the alpha code recalled, 3) [OP] 04 executed, 4) data recalled, and 5) [OP] 06 executed. "Tagger" is more efficient than this scheme if more than one subroutine call is used.

The alphanumeric codes corresponding to each print instruction must be stored before execution of the program. These alphanumeric codes can be stored in successive registers using the data entry routine discussed above, recorded on card sides 4 and/or 3 of a magnetic card, and read back in with the program before execution.

Simple Subroutines cont'd from page 8

Key in "Tagger" and record on a magnetic card. Before you begin a new program, read in "Tagger". Test and debug your program without reference to [LBL] [PRT]. When your program has been run with [PRT] commands and is performing properly, insert [x ◄ t], [X] [X], and [SBR] before [PRT] instruction in your program, where [X] [X] is the two address of the register corresponding to the alphanumeric code. Insertion is done quickly with a printed listing if the insertions are done starting with the highest location since lower locations are not affected by the insert. Users should be aware that absolute addressing in a program may be affected by insertions, and the program should be modified accordingly.

```
000   76 LBL
001   99 PRT
002   42 STO
003   00  00
004   73 RC*
005   00  00
006   69 OP
007   04  04
008   32 X:T
009   69 OP
010   06  06
011   92 RTN
```

PROGRAMMING CORNER

(This column serves a dual purpose. It informs members of what non-PPX software is currently available and also lists descriptions of programs our members would like to see.)

SENSORY INTERFACE

Mr. Larry Waldron, President of Sensory Interface, was kind enough to provide us with a product announcement for the SIE Speech Adapter. The SIE Speech Adapter provides speech output for the blind and visually handicapped when used in conjunction with the TI-58C/59 programmable calculators.

Two operating modes allow for 'on demand' speech or constant speech output and can be used to prompt the user during program execution. Any existing TI-58C/59 may be easily attached to the SIE Speech Adapter by removing the original battery pack and replacing it with a special adapter battery pack. The Speech Adapter itself is contained in a 12" X 8" X 3" attache case with space provided for the calculator and power cord.

For pricing and availability please contact:

Sensory Interface Equipment, Inc.
4442 Kasson Road
Syracuse, NY 13215

PPX is interested in interface equipment designed for the handicapped specifically for use with Texas Instruments programmable calculators. If you have information concerning this type of equipment, we would appreciate you sharing it with us.

SUN POWER

"Solar Energy Software" a publication of Sunshine Power Company includes a full set of programs for use on the TI-59. The programs are for use in the design of full solar energy systems, analysis of collector performance, and evaluation of system setting. Each program will provide results in either Metric of English units and will work equally well in the northern or southern hemispheres. Interested persons should contact:

Sunshine Power Company
1018 Lancer Drive
San Jose, CA 95129

PROGRAMS WANTED

The program requests for this issue are listed below. All submissions to fill these requests should be postmarked no later than June 30, 1982.

- A program to calculate the pricing of printed jobs. There are seventeen named work stations and each has an assigned hourly value. Labor, paper, and supply costs must be included.
- A program to accommodate linear and non-linear pro-

continued on page 10

ADDRESS CHANGES

In order to ensure uninterrupted service, please submit address changes to PPX at least six weeks prior to the effective date of the change. Send your name, membership number, old and new addresses to:

PPX
P.O. Box 53
Lubbock, TX 79408

Programming Corner cont'd from page 9

gramming problems with up to eight variables and eight constraint equations or inequalities.

- A program for the Holzer method of torsional analysis with only three of four inertial elements.
- A program to add, substract, multiply, and divide up to sixteen bit binary data for use with or without the printer.
- A program for handicapping horse races for both thoroughbreds and trotter/pacers. Input should be the horse's history and current odds. Output should be the highest payoff, which horse to bet on, and what bet (win, place, or show).
- A program to compute bridge deck elevations in which the roadway is curved while the beams are straight. The elevations must be computed along the center line of the beam at the center line of the bearings and usually 1/8 points along the beam.
- A program which disassembles 6809 machine code. Input should be up to an eight digit hexadecimal number, and output should be the appropriate alpha for the instruction mnemonic.
- A program to analyze and forecast economic time series which utilizes the method of Kalman Filtering.

Précis

This column presents the abstracts of some of the new PPX programs which have been recently accepted. The programs were selected by our analysts as being ones that would be of special interest to our members. You can purchase these programs at a cost of $4.00 each. Send your order to: Texas Instruments: PPX Department, P.O. Box 109, Lubbock, TX 79408. Include an additional $2.00 for postage and handling plus applicable state tax.

If you have a need for a specific program, send a note to PPX. There is a chance that the program may have already been written. If it has, we will put the abstract in the next issue of the Exchange. Requests for programs not yet written will be placed in the "Programming Corner" column.

018016H Payroll System
Calculates complete payroll data from input of hours worked. Uses pre-stored data. Includes regular, overtime, vacation and sick-time. Accumulates and outputs year-to-date totals for periodic reports. Output format is designed for direct transferal to paycheck stub. Programmed for NJ and PA state tax and bi-weekly payroll. Can be readily modified for other states and/or pay periods.
Donald B. Gemeinhardt, Hawley, PA
954 Steps, PC-100A

018015H Payback Analysis
Payback analysis is a tool of business management. It is used to justify expenditures based on savings. Use of a simple payback period is common; however, the necessary corrections for cost of interest and inflation have made the calculations too complex for simple calculators. When used with the printer, a short report is generated. The report prompts input requests and the results are labeled.
J. Robert Moody, East Cleveland, OH
461 Steps, PC-100A

028019H In-Plant Hourly Cost Rate
Calculates the hourly rate for various cost centers for in-plant printing production. Input data: equipment cost, employees, square footage, power requirements, salary, vacation and weekly hours. Inputs are computed as variables with additional determinants to obtain total annual center cost and factory cost. Hourly rate is established by percentage relationship of productive hours to center cost. Program sums primary statistics of centers for plant totals.
Dave G. Vequist, Pittsburg, KA
674 Steps

188047H 'Basis' Bond Pricing
Finds 'basis' price between or on coupon dates (agrees with values in monthly tables). Finds Yield to Maturity by close first estimate and very convergent h-correction. Calculates time for non-integral periods.
Ralph W. Snyder, Indianapolis, IN
413 Steps

198068H Standard Deviation of Net Present Value
Computes the net present value (NPV) and standard deviation of the NPV of an investment. Obtains a measure of the likelihood that the computed NPV will be realized.
Edward B. Flowers, Forest Hills, NY
219 Steps

208081HH Linearity Analysis from Multipoint Data
Least squares solutions for accelerometer linearity from static multipoint test data are compatible with Appendix B to IEEE Standard 530-1978 (the Fuhrman technique). Extensions of the method such as removal of a small angle assumption and solution for higher order coefficients are included.
Palmer O. Hanson, Jr., Clearwater, FL
958 Steps, PC-100A, Mod. 1

348034H Iterative Nonadaptive Automatic Integrator
This program attempts to integrate numerically any continuous function on (a,b) using the composite Boole's Rule and 2 Aitken's extrapolations to the limit.
Greg Howell, Los Angeles, CA
468 Steps, PC-100A

398261H Numerical and Graphical Interpolation
This is an adaptation of Miller's Interpolation Plotter program (PPX Exchange May/June 1981) to simplify use and to provide either numerical or graphical interpolation in any order. All inputs and outputs are printed and the number of tapes per plot are listed and labeled. All operations are controlled by user-defined keys and the program calls any needed library routines automatically. The plotting option is particularly helpful in determining the range of x over which and interpolation is valid.
W.W. Buechner, Arlington, MA
228 Steps, PC-100A, Mod. 10

408074H Energy Conversions
A readout of ten common energy conversions of scientific interest may be obtained from an input of any one of the ten. The SI unit and dimensions of energy are also stated. The program can be easily altered to accomodate almost all other types of conversions.
Richard B. Gibbons, Shaker Heights, OH
480 Steps, PC-100A

408077H Physics Shorts I
Several short programs selected from frequently used or slightly more involved problems from general physics. The emphasis is on electricity, optics, radioactivity and exponential absorption.
Paul C. Sharrah, Fayetteville, AR
857 Steps, PC-100A

448015H Fuel Consumption
This program calculates the amount and percent of duff and slash fuel consumed in prescribed burns for jack pine, jack pine mixwood, upland black spruce, lowland black spruce, and balsam fir. Inputs include fuel type, Build Up Index, and preburn loading of duff depth and slash loading for Class A-E and Class F fuels.
Thomas G. Eiber, Thunder Bay, Ontario
537 Steps

508069H Alveolar-arterial (A-a) Oxygen Gradient
For a given patient, using the fraction of inspired oxygen, arterial partial pressure of carbon dioxide, this program will calculate the patient's A-a gradient and the expected A-a gradient in a normal person breathing that fraction of inspired oxygen to achieve a desired arterial partial pressure of carbon dioxide in the patient.
Judy Palmer, Erdenheim, PA
126 Steps

548011H Genetic Mapping Via Three-Point Testcross
Determines the parental gametes and outputs the correct sequence and dominancy of the three genes for one of the two parentals. Computes the map unit distances between the correctly sequenced genes and the coefficient of coincidence. Input parameters are the number of offspring for each of the eight gametic genotypes.
Kirk Mahoney, Fort Worth, TX
601 Steps

618072H Mole/Mass Stream Composition
This program converts mass fractions to mole fractions and vice versa. Required inputs are the molecular weights of the stream components, and the stream's mass or mole fractions. Output variables are the mass or mole fractions of the stream components. The maximum number of stream components is 25. Alphanumeric Prompting.
Robert L. Young, Cocoa Beach, FL
330 Steps, PC-100A

628209H Ringwall Foundation Design
Given certain parameters, this program will calculate and print the H/D ratio, ringwall thickness, ringwall height, actual soil pressure, horizontal reinforcing, and the vertical reinforcing. The basis of design for this program is the latest 318-77 code.
Richard S. Ringler, Missouri City, TX
694 Steps, PC-100A

668181H STPP Quasi-Steady Performance
Given certain basic inputs, this program will calculate the power output and efficiency of a solar thermal power plant operating at any selected normal direct insolation without storage. The program has been utilized for determining the performance of solar thermal power plants that utilize only direct normal insolation. Paraboloidal dish, parabolic trough, and central receiver heliostat systems are examples of systems to which this program applies directly.
James M. Bowyer, Arcadia, CA
311 Steps, PC-100A, Mod. 1

668182H Solar Insolation on a Flat Panel
This program calculates the solar insolation on a flat panel given to latitude, the azimuth angle (with respect to true south) at which the panel is oriented, the angle at which the panel is tilted (from horizontal), the altitude (above sea level) and the date. The insolation is computed in BTU/square feet and megajoules/square meter for each hour during the day. The daily total is also computed in each system of units. Atmospheric absorption is incorporated into the program as well as decreases in absorption due to increased altitude. Hourly printouts may be suppressed if only daily totals are desired.
James F. Sullivan, Cincinnati, Ohio
719 Steps, PC-100A, Mod. 1

758011H LBL to Addressing and Converse
A manual procedure is presented which is both practical and concise to simplify and reduce this work to a minimum. Two short programs are used, one for each form. An aid in developing basic programming skills.
Philip Brassine, Seattle, WA
134 Steps

788058H Reduction for Precession
This program calculates the position of a star relative to the equator and equinox of a date of interest from its position relative to the equator and equinox of an epoch. Uses a rigorous reduction method that takes into account the effects caused by precession, and if desired, proper motion on the position of a star. This program can also reduce the position of a star from one epoch to another epoch.
S.T. Bradley, Council Bluffs, IA
641 Steps, Mod. 1

798058H Alloying Gold
Given the weight of fine or karat gold, or of the wax model, the program will print out alloys and their weights to get eighteen (or fourteen) karat yellow gold and the weight of the eighteen (or fourteen) karat yellow gold.
David E. Browning, San Diego, CA
315 Steps, PC-100A

928061H Checker Problem Teacher
This program demonstrates the use of the TI-59 as a teaching machine. The user is lead step-by-step through several checker problems and a score is maintained. Up to 23 6-move and more for shorter problems. 31 problems are supplied.
John R. Gibson, Colorado Springs, CO
160 Steps

HELP!

The PPX Exchange is published bimonthly and is the only newsletter published by Texas Instruments for TI-59 owners. In order to make this the best newsletter possible for our membership, we need your help. We welcome all submissions for feature article and items of interest relating to the operation of the TI-59. When submitting an article for publication in the Exchange, please type and doublespace the submission. Authors of accepted feature articles for the newsletter will receive their choice of either a one year complimentary PPX membership or a Solid State Software™ module. All submissions should be forwarded to the following address:

Texas Instruments, PPX
P.O. Box 53
Lubbock, Texas 79408
Attn: PPX Exchange Editor

TI-59 Programming Seminars

There may be a seminar coming to your area. These seminars are open to anyone with a TI-59 regardless of programming background. The seminars provide both beginning and intermediate programming training on the TI-59 in a "hands on" fashion. Tuition for the two day class is $150.00 per person. This includes the instruction, workbook, and luncheon for the two days. You should supply your own TI-59.

To register send your check for $150.00 payable to Texas Instruments to:

TI-59 Seminar
Texas Instruments
P.O. Box 10508 M/S 5873
Lubbock, TX 79408

If you have any further questions regarding the seminars or if you would like information on setting up a company seminar, please contact Mary Ann Barley at 806—741-2202. The schedule for upcoming seminars is listed below.

SEMINAR DATES	LOCATION
April 1-2	St. Louis
April 8-9	Raleigh
April 15-16	Washington D.C.
April 20-21	Los Angeles
April 27-28	Charlotte
June 8-9	Dallas
June 10-11	Dallas
June 14-15	Oklahoma City
June 17-18	Albuquerque
June 24-25	Lubbock
June 28-29	San Antonio

Membership Renewals

Is your membership about to expire? To ensure that you will miss no newsletters, catalogs, or ordering privileges, check the renewal table to find out if your membership will expire soon. (If your number is not included in the range of the table, it is not time for you to renew). The next issues of the Exchange will list additional renewal dates.

A renewal card and reminder will be sent to each member before the time to renew. Return the card promptly to PPX with your check or money order for $20.00. Please do not procrastinate in returning your renewal material as our membership coordinator must remove delinquent members from our computer listing. Be sure to include your membership number on both your card and your check and mail to: Texas Instruments PPX Department, P.O. Box 109, Lubbock, TX 79408.

Membership Number	Renewal Date:
906015-906818	May 31
916790-917809	May 31
925577-926125	May 31
930684-931236	May 31
906919-907525	June 30
917909-918473	June 30
926126-926498	June 30
931237-931519	June 30

TEXAS INSTRUMENTS
INCORPORATED
PPX • P.O. Box 53 • Lubbock, Texas 79408
U.S. CALCULATOR PRODUCTS DIVISION

ADDRESS CORRECTION REQUESTED

BULK RATE
U.S. POSTAGE
PAID
Permit No. 1
Lubbock, Texas