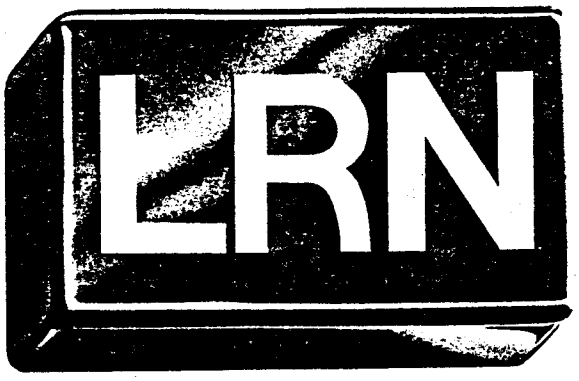


* T I P P C N O T E S *
* *
****

NEWSLETTER OF V7N1-2, 1982.

THE TI PROGRAMMABLE CALCULATOR CLUB.

9213 Lanham Severn Road
or P.O. Box 710, Lanham MD 20706.

Welcome back to this, the third year of the TI PPC NOTES or LRN if you prefer. To appease the many people who complained about the (too) small print-out of the program listings, we went back to 70 % reductions as opposed to 50 % ones. Readability has been restored and the possibility of disasters, such as occurred in last issue, has been reduced. I have sent a new, and darker printed, copy to everyone who wrote me about it. If you are one of those members who received a poorly printed copy and still haven't told me about it, I will be happy to send you one on request. Please help me reduce administration time by including a return address label and, if you want to be really nice, a large SASE. Thank you.

The long winter evenings seem to have worked wonders on our membership. I am suddenly swamped with such an enormous amount of very good contributions that even a 32-page issue couln't contain it all. But most of it was too good to lay fallow for more than a month. So, I hope you will enjoy this enlarged issue.

Palmer Hanson Jr. has written several articles about subjects that seem to fascinate him: Fast Mode, CROM firmware, and others. In this issue you will find two of his recent master pieces. Palmer also wrote a compilation on TI-59 firmware in which he included all the latest findings. He submitted it to PPX but, as it was not application oriented, it was rejected. Palmer then offered to make it available at nominal cost to the PPX members. He also wants to make that offer to the TI PPC club members. The 20-page treatise can be had for $ 4.00 by writing to Palmer at 2149 14th Ave SW, Largo FL 33540. A bargain !

On this same subject, we have picked up another fan in the form of a student at Delft Technical University in the Netherlands, Robert Prins. His contribution on new CROM discoveries can be found on page 28.

We finally have a good index. Bob Fruit tells us about it on pages 11 and 12. It is nicely cross-referenced and it is really helpful when you are hunting for everything written on a specific subject.

I acquired a word processor program for the TI-99/4A and some articles in this issue have been produced on it. It allows you, for example, to write in two columns, exactly 38 characters wide, each column right-justified. Once I have become an expert on it, I hope to write the larger part of the Notes that way. It seems to read easier than long, 80-character lines. The program has a few ideosyncrasies (or idiotisms, as I sometimes call it in utter frustration) which I am trying to weed out.

My typewriter had an RS-232 interface in its "innermost" all along, so that you will not know which is computer written and which was done by means of the two-finger hunt-and-peck method. Both look alike in the final form.

Maurice E.T. Swinnen

IN THIS ISSUE:

Dear Maurice,

To Bob Fruit (v6n8p14) I cannot answer how long the 59 would take six volts but I would suggest this for the future: Go to a Radio Shack store and get a four-cell battery holder. They come in AA, C and D sizes. Then short out one cell position.

Now if you use NiCd cells (1.25 volts) you are supplying the same voltage of the TI battery pack. If you use standard alkaline or Leclanche (1.5 volts) you are high by 1.25 volts. Using the lantern battery you were high 2.25 volts. I would guess that three D size cells would last twenty hours.

This is sacrilege speakinh of series-parallel conversion (v6n9/10p7) but have you seen the graphical method?

Take a sheet of linear/linear graph paper. Make the abcissa and ordinate scales the same. Call one R, the other X.

To go from parallel to series, draw a line between the two points. Then construct a second perpendicular to the first line that passes through the origin. The intersection of the two lines is the coordinates of the series equivalent. To go from series to parallel, just reverse the procedure. Locate the point of Rs, Xp. Connect it with the origin and then a second line, perpendicular and intersecting the R and X axis at the Rp and Xp.

A little faster than the TI-59 It is not as accurate as the TI-59 b_ut, as you know, as accurate as the components in the stockroom.

Sincerely
Evan H. B.

Dear Evan,

Several other members and my own EE training told me that Bob was a little high on the "voltios" which could have caused a few too many "amperios" to flow through his machine, sometimes with "resultados desastrosos."

With respect to the series/parallel converter, in my technician days I also used the graphics method with success, sometimes accompanied by the sneers of the engineers surrounding me. Now that I am in the other camp and in these days of super-calculating power available at our desks, I sometimes forget the simplicity of those good, old days. Thanks for reminding me.

Maurice

Estimado Señor Swinnen,

Es un placer para mi escribirle a Usted y volverlo a felicitar por su magnifica revista.

Sinceramente,
Jose Miguel G.G.

How about that? All the way from Chula Vista en el estado de California.

Muy agradecido por sus palabras alentadoras.

Mauricio Swinnen Boonen
Localidad de Lanham
Estado de Maryland

Dear Maurice,

In an answer to Mr. Bob Fruit (v6n8p14), as a missionary in the boondocks of Irian Jaya, I too had a real problem when I wanted to use my calculator. We had a diesel generator on for three hours per night, but that tied me down too much.

Checking the circuitry of the calculator I found that it had a bridge input, so it didn't matter if AC or DC was fed in. Therfore polarity is of no importance, unless TI have skimped on components lately.

Eventually I hooked up my TI-58 to a wet cell motor bike battery (I cut the power cord from the charger and fitted it with appropriate sockets) which, if my memory serves me right, gives 6.7 volts on full charge. This battery would actually charge my Nicad calculator battery. However, it would get quite warm, so the way to reduce it would be to put two silicon diodes into the line, the forward bias of which would be about 1 volt. This scheme would reduce the voltage to the calculator to 5.5 to 5.8 volts. The diodes need to be in series and capable of at least 300 mA (for the TI-58) possibly 1 A for the TI-59.

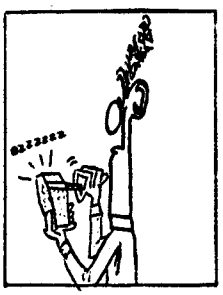
p.s. I have now solved the problem entirely by installing a $ 40,000 hydro-electric scheme.(25 KVA) Admittedly a power overkill, we do make use of the "excess" power for our schools, government post, army post, church administration, hospital, Bible school and missionary homes.

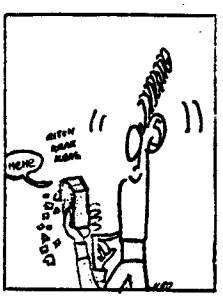
p.p.s.If someone could get hold of a TI components manual, it would be interesting to see what the maximum voltages are for each of the components in our calculators.

Yours sincerely,
Wesly D.

Dear members,

Wesley's home is in Australia, where he is on a six month vacation right now. He plans to go back to Irian Jaya after that. We wish him lots of luck.





Maurice,

As a student at the University of Hawai, I haven't much time to spend programming and exploring. However, I sincerely hope that at some point in the near future I can repay you and all the other hard-working (programming)members, who have contributed so much to my knowledge and understanding of the TI-59, by making significant contributions to the NOTES myself.

Please find enclosed an extra $ 10.00 check to put in the club's kitty to help defray expenses.

THANKS MUCH.

Sincrely,
Daniel R.M.

Dear Dan,

Thanks for the nice words and the extra check. Just for that I will refrain from publishing the two remarks you sent me about speedy calendars at the U of Hawai. Really now, a program that prints a year's calendar 3 seconds before the program begins executing! And that other one that does the calendar trick 3 seconds before the calculator is actually turned on! You'll never catch me publishing such drivel!

Dan, could you send me some elevated temperatures, nicely packed. It is getting cold here in Maryland during January.

Maurice

Dear Mr.Swinnen,

Enjoyed reading the Peter Poloczek account (v5n2p3) as a parallel to my experience of frustration wrestling with the problem of compatibility....

....After spending countless expletives concerning the vagaries of the read-only 59 mechnism-and the nerve of the TI-59 to be incompatible with such loving programs I devised- I decided, in a moment of weakness, to make my own brew of magnetic cards a-la-mama-mia hoping to appease the intransigent TI-59....

Trial and error leads me to believe the culprit to lie in the lower left-hand corner fillet of the magnetic card. The radius of the fillet was governed by the needs of the TI-59 manufacture of the blanking dies.

If the fillet could be eliminated, I reasoned, the problem would also be eliminated as the card in the travel would be guided correctly and the readout would be triggered at the precise entry moment.

To this end, and perhaps for your personal satisfaction, I am enclosing several of the cards I made up to show you, Sir, what I mean.

I wonder if you will agree as to the source of the incompatibility?

Sincerely
Casmer R.D.

Dear Casmer,

Your cards work perfectly and are compatible with ANY of my TI-59's. If you now could find a way of printing a yellow or white background on these black cards so that one may write on them.... Any other ideas on the subject, anybody?

Maurice

DO YOU BELIEVE THIS ONE ? - In the Wall Street Journal of Friday NOV 6, 1981 on page 27 I read the following:

" There is even some evidence that calculators have become too sophisticated for continued growth. Two years ago, Southern Methodist University began urging graduate business students to buy the TI-59, but this year switched to the less powerful MBA model.'The 59 was too complex,' says Elbert B. Reynolds Jr., an associate professor of accounting at the school. Indeed, using the TI-59 is so involved that Southern Methodist has done well financially with a course for which its students pay $ 235 to learn how to use a $ 180 calculator."

AND THIS ONE ? - From Electronic News, Monday, DEC 28, 1981, page 9:

" The Antenna.- Holding Hands: Look for Texas Instruments to introduce a hand-held computer with an alphanumeric keyboard as early as June. The new device, which would compete with those offered by Radio Shack, Casio, Panasonic, Quasar and Sharp, will not replace TI's top-of-the-line, engineering TI-59 programmable hand-held calculator, but will position the Texas firm in the high-end, general-purpose hand-held market."

? " Many people resist the introduction of such machines which will alleviate the labour of men. They claim, those machines will rob the bread from the mouths of the poor people. Under this pretext, the authorities of the city of Regensburg recently outlawed the use of weaving and knitting machines. Besides the fact that this ordinance was completely ignored by the people of Regensburg, I am of the opinion that there is always enough opportunity to work at any useful endeavour, even if the new task is rather unfamiliar to you. Because this new task will cease to be unfamiliar once you have gotten used to it ! "

Gottfried Wilhelm Leibniz (1646-1716)

ARTICLES WANTED.- Paul Snigier, the editor of Digital Design, 1050 Commonwealth Ave., Boston MA, 02215, says in the editorial on page 6 of the DEC 1981 issue: " We are looking for authors to write heavy articles. Starting January 1, 1982, we will pay authors an honorarium for articles and Designer's Notebooks submitted after this date at a rate of $ 35 to $ 75 per printed page for feature articles and $ 70 for Designers's Notebooks..... Known as design ideas or cookbook recipe circuits or software, Designer's Notebook articles are short descriptions of design problems and solutions, circuits or brief programs/subroutines that are clipped by EEs and used in design. Have you designed and breadboarded a novel and useful circuit that would interest other engineers? Or have you written a unique microcomputer (or even programmable calculator) subroutine or program? If so, then we invite you to share your experience with our readers..... Mail first class to: Features Editor, Digital Design, Morgan-Grampian Publishing, 1050 Commonwealth Ave., Boston MA, 02215."

LASER BEAMSPLITTER PROGRAMS,- Robert T. Pitlak, Electro-Optical Systems Design, OCT 1981, pp 63-68. A pgm for designing a Rhomb Beam Splitter and a second one to design a Wedge Beam Splitter. As usual, Robert wrote practical and user-friendly programs to be used with the TI-59/PC100. The programs are based on two designs for uncoated beamsplitters, devellopped by William S. Heaps of the Goddard Space Flight Center in Greenbelt, MD. They are particularly useful for dye laser users.

PERSPECTIVE DRAWING,- Morton P. Matthew of Litchfield CT, (of Rhymes fame) has submitted to TI PPX a super program on that subject. The name he has given it is "PERSPECTIVE- IN DEPTH." It might be given the number 698004, a revised version. If you are interested in this 37-page jewel replete with every example immaginable, please call or write to PPX in Lubbock, TX. Mr. Hayes is the analyst to contact.

AN ENHANCED DECIMAL POINT TRICK.- Björn Gustavsson sends me a new routine, which could have a lot of practical use. In his explanation he talks about a "soft" and a "hard" display.So, for the benefit of the newcomers, let me explain first of all what is meant by these two terms.

When you enter a number in the display, say two digits, it is possible to add a third digit to it, as long as it stays "soft", that is, as long as you don't press the equal key, or a STO nn, or a similar key. Thus, to a "soft" number it is always possible to add one more digit, whereas a number that has been hardened somehow (pressing =, STOnn) it is not possible. When I say "add a digit to it" I DON'T mean + 5 =, for example. I just mean "press the digit key"and if you had, say 25 in the display and you pressed 7 you would end up with 257. Pressing now 9 you would have 2579, and so on. Once you press =, the number cannot be changed anymore, it has become "hard."

Now, with respect to Björn's newest trick: It is demonstrated by means of the short routine below. Enter a number, any number and press A. The word SOFT will be printed. Now enter the same number, but follow it by pressing =. This time the word HARD will be printed. This routine will distinguish between a hard and a soft display !

As you can see there are two LBLs A' : If you enter a hard number, the one at step 000 will be called. If you enter a soft number, the one at step 025 will do its tricks.

Of course, you may use any label you want, but the first occurrence of the duplicated label must be at step 000.

For our newcomers, to enter the 2ND (code 21) in the program, use the same trick as used with DSZ or HIR: STO 21 BST BST DEL SST.

Using this new trick, Björn has written an RPN simulator. Unfortunately, it is not possible to use any mathematical functions without pressing EE INV EE, which will re-soften the hard display and cancel the hidden digits in the number. Otherwise, as a simple RPN four-banger it works better than I have ever seen. I will publish it next issue.

It is interesting to remember that the Snow brothers used a similar trick to distinguish between a soft and a hard display in their MR. MAGIC card trick game in v5n3p10.

The original decimal point trick was explained in v5n3p7.

```
000  76 LBL    009  01  1     018  16 A'     027  25 CLR
001  16 A'     010  06  6     019  69 OP     028  03  3
002  25 CLR    011  92 RTN     020  04  04     029  06  6
003  02  2     012  76 LBL     021  69 OP     030  03  3
004  03  3     013  11  A     022  05  05     031  02  2
005  01  1     014  21 2ND     023  25 CLR     032  02  2
006  03  3     015  93  .     024  92 RTN     033  01  1
007  03  3     016  21 2ND     025  76 LBL     034  03  3
008  05  5     017  21 2ND     026  16 A'     035  07  7
                                             036  92 RTN
```

OP 09 FROM A MODULE,- In one of his letters Björn Gustacsson gives me the following cryptic message: " If you want to try OP 09 from a module, you'll find and "OP*" at step 052 in RPN-1 (next step is 04)"

Looking on step 052 of the RPN Simulator module I found indeed the (unintended) code 84 = OP IND. It is part of an address (GE 184) and the next step is a "4". If you now key from the keyboard SBR 052 it will execute an apparent OP IND 04. With a "9" stored in Register 04 you will then execute for all practical purposes an OP 09. That command loads down a program from a module into user memory. PGM 01 of the RPN module contains 725 steps, so to download that one you'd better be in 2 OP 17 partitioning. Thus, to do the whole trick, press from the keyboard:

2 OP 17 4 STO 09 CLR PGM 01 SBR 052 .

The printer will print four lines of nonsense and stop. Pressing LRN will reveal that you are at step 253 of user memory with a program downloaded. If you press LRN again followed by RST and LIST you will find that, what you are listing is indeed PGM 01 of the RPN module.

I was unable to put that sequence in user memory and execute the trick that way. I don't know what this trick can be used for. Maybe somebody figures out something.

ERRATA - Synthetic-Hydrograph Computations on Small Programmable Calculators, Thomas E. Croley II, re: V6N6/7P19

According to G. David deBruin of Huntington, N.Y., steps 283 and 284 are reversed in the program "Synthetic Hydrographs Given Runoff Volume" (page 135). The proper sequence should be: ... RCL 03 X RCL 01 = 2nd PRT INV SBR

ERRATA. v6n9/10p5: Computation Finite and Infinite Machines: The author's name is NOT R. Taysum, but D.H. Taysum, and the program should have been:

```
LBL E + 4 = PAU + 10 = PAU DIV 2 = PAU GTO E
```

The first equal sign was inadvertantly left off, a fact most members spotted right away, but for which I apologize nevertheless.
Sorry about that, Dave.

ERRATUM - My PC100 had an inexplicable hickup when listing the program on v6n9/10p18 and I must have been in an end-of-the-year mood for failing to spot it. It left out two program steps, which, I must admit, would be rather difficult to guess: Step 333 is a code 93, decimal point and step 407 is a code 10, ten.

ERRATATATATATATA,- Yes, I need that many tata's to draw your attention at the granddaddy of all boo-boos. In v6n9/10p26 we published Phillip Brassine's Register Operations. Through a misunderstanding (doesn't that do it always?) I published the wrong user's instructions (from version I) with the correct and working program. (Version II) I thank Greg Hoehn for courageously attempting to make sense out of the mess. His corrections actually worked. (he redid the program! to fit the description.) But I prefer to leave the program as-is and publish the corrections to the user's instructions, supplied by Phillip Brassine himself. They can be found on the next page. (the entire one)

AND ANOTHER ERRATUM- in v6n9/10p16, the Fast Mode Twelve Days of X-Mas program doesn't run as published. Again, I must have tested version I, which ran alright. Then Lem must have sent me Version II, in which a + was missing, which screwed up the works. In any case, steps 090 and following should be 4 + STO 00. This means that some of the indirect and subroutine addresses have to have a 1 added to them. The easiest way to make the corrections is as follows:

```
In keyboard mode GTO 042 LRN and change that code 29 to 30.
                 GTO 080                          29 to 30.
                 GTO 089                          29 to 30.
                 GTO 095                           1 to 2.
                 GTO 100                          29 to 30.
                 GTO 103                           6 to 7.
                 GTO 109                          29 to 30.
                 GTO 091 LRN and INSert +
```

Lem says he is so ashamed it happened, he is thinking of changing his name and moving to another state. I don't have that problem. Nobody knows where Maryland is anyway.

RADAR CALCULATIONS USING THE TI-59 PROGRAMMABLE CALCULATOR, William Skillman, Artech House, 610 Washington Street, Dedham MA 02026 USA. Hardcover, 400 pages, $ 40.00. Available May 1982.
Everybody will recognize Bill as one of the most active contributors to the old SR-52 Notes and initially to the TI PPC NOTES. Bill has been hard at work lately to make his book a success. Once I get hold of a copy I'll do my best to describe its contents for you in a coming issue.

Corrections to TI PPC Notes V6N9/10 page26

REGISTER OPERATIONS.- Philip Brassine

Line

2 do a variety of operations on blocks of registers, from R01 through

4 1.LOAD DATA IN GROUPS OF REGISTERS. Load side 1-A by pressing CLR and sliding the A-side

6 To load the same data in R(x) to and including R(y), enter x, press C,y,R/S, data,

8 enter 40 C 43 R/S 234+/- and 45 C 48 R/S 567 R/S

8 after 234 +/- insert R/S

13 2.TRANSFER OF A BLOCK OF REGISTERS. First of all, load side 1- B again.

15 v, press A', enter w, press R/S, enter x, press R/S (delete again.)

17 to a location starting at R57, enter 42 A' 46 R/S 32 R/S and 45 A' 47 R/S 57 R/S

21 C' enter 1, press R/S, enter m, Press R/S.

22 For example, you want to exchange R58-R59 with a block starting at R32, enter 58 C'

31 5.SHIFT LEFT OF A BLOCK OF REGISTERS. This routine is located on side 1-B of the card.

33 enter r, press D', enter q, press R/S.

36 ending in R49 to a location starting with R30. Enter 30, D', 49, R/S.

38 6.CLR A BLOCK OF REGISTERS. This routine is located on side 1-A of the card. Load side

39 1-A by press CLR and sliding 1-A into the slot.

40 if you want to CLR block R(f) through and including R(g) enter f, press B, enter g,

41 press R/S. Suppose you want to CLR R32 through R35, enter 32, B, 35, R/S.

Note: Add to paragraph 5. Any empty (0) registers within a block will be passed (deleted) in the shifting process.

Side 1B	XFR	XFR/CLR	EXC	SHIFT	
Side 1 A	PRINT	CLEAR	GRP INPUT		

BATTLESHIP,- The Snow brothers & Maurice Swinnen. This game program is the well-known game of Battleship, in which one opponent lays down a number of "ships" consisting of straight-line blocks of one square wide and from one to four blocks long. Various rules tell you not to lay ships alongside the border, not to touch each other, and so on. Make up your own rules if you want. The other opponent is expected to "shoot" at the flotilla by indicating the coordinates of his/her shots, after which opponent # 1 indicates if those shots are hits or misses. As the second opponent is mostly "shooting blind", there is always the suspicision that opponent # 1 is or at least can introduce some cheating.

In this version that is hardly possible, as the TI-59 is an incorruptable umpire. One opponent lays down the ships, in a 9 by 9 grid, and the other opponent enters the shots into the calculator. The latter will now decide if those shots are hits or misses. It will even check how many blocks are there still to be sunk and display that number after each shot. When all the blocks have been marked by a hit, it will print SUNK and print the final talley, graphically, of all the hits and misses. Any cheating on the rules in the initial laying down of the ships will be revealed at that moment.

During the shooting the calculator will even signal if you have a bad memory (the one in your head this time) and shot more than once into the same quadrant, by printing a derisive OCCUPIED. You may, of course, replace this word in the program with any other, more insulting one, such as TURKEY.

This program was originally written by Ralph Caton of Jenks, Oklahoma. Although it played alright, it had a lot of user-unfriendly features. Here follow a few of them and the enhancement we made:

1. The original program was recorded on two mag cards. This one needs only one.
2. Mr. Jenks' program needed 559.49 partitioning. Ours the turn-on one.
3. The entry of ships had always to be done in a specific order, like 1.02 A' 2.02 B' 3.02 C' and 4.02 D'. Deviation from that order made the program crash. Our program allows simple entry through R/S, in ANY order.
4. The original program used the word SHIP or a four-block ship only. Our program allows ships of ANY length.
5. In Mr. Jenks' program the only way to see the final grid was to sink all the ships. This was sometimes very frustrating, in case of dispute. Here, pressing C at ANY time will reveal the grid with the game in progress.

INSTRUCTIONS: Record the keyed-in program on two sides of a mag card in 6 OP 17 partitioning. (the turn-on one) Mark the card as follows:
A = INIT, B = GRID, C = OUTPUT, E = INPUT. ENTER Y.oX R/S.

User Instructions:

1. For each new game, always initialize by pressing A.
2. To lay down your armada of ships, enter as Y.0X in which
   Y = the vertical y-parameter, 1 through 9, left hand side.
   X = the horizontal x-parameter, 1 through 9, the bottom of the graph.
   0 = a zero.
   Thus, to lay a ship-block at Y=2 and X=3 enter as 2.03 R/S
3. To obtain the grid with the ships on it so far, press B at any time. After that you may continue laying some more ships, press B, and so on.
4. Your opponent enters the shots in the same way as you layed your ships but presses E instead. Thus a shot at Y=2 and X=3 is given as 2.03 E.
5. During the ship-laying the display will keep a talley of ship-blocks laid so far. During the shooting the display will keep a talley of ship-blocks still to be destroyed.(decreasing talley this time)
6. In case of extreme dispute, just press C. It will reveal the entire game and (hopefully)settle any argument.

NOTES: 1. The NOPs in 369 through 380 are left on purpose. (honest) In case some of my friends in Europe want to insert longer words than our cryptic SUNK, they will have some space to do it in, without having to renumber all the direct addresses. SUNK in German translates as VERSENKT, you see, and in Dutch it is even worse GEZONKEN.
2. In the final print-out a MISS is marked as an M, while a hit looks like a small explotion. (the exclamation mark) You may change those if for any reason you don't like them, of course. The M is at steps 139-140 and the exclamation mark you will find at steps 126-127.

battleship (continued)

3. In the test diagram you call by pressing B, the ship blocks are printed by means of the square 0 (code 32) which you may change, of course. The 32 is at steps 021-022.
4. May all the wars you will ever be involved in be fought like this one, inside a programmable calculator or computer. It is much more fun that way, believe me.

```
 1
 2
 3
 4
 5
 6
 7
 8
 9
   987654321

 1 ▯▯▯▯ ▯▯▯
 2
 3         ▯
 4         ▯
 5         ▯
 6
 7 ▯     ▯▯
 8
 9 ▯▯
   987654321

      9.09     HIT
      9.08     HIT
      9.07     MISS
      7.09     HIT
      7.07     MISS
      7.05     MISS
      7.03     HIT
      7.04     HIT
      5.02     HIT
      4.02     HIT
      3.02     HIT
      1.02     HIT
      1.03     HIT
      1.04     HIT
      1.05     MISS
      1.06     HIT
  OCCUPIED
      1.07     HIT
      1.08     HIT
      1.09     HIT

   SUNK

 1 ▫▫▫▫M▫▫▫
 2
 3         ▫
 4         ▫
 5         ▫
 6
 7 ▫ M M▫▫
 8
 9 ▫▫M
   987654321
```

000	91	R/S
001	42	STO
002	00	00
003	59	INT
004	42	STO
005	23	23
006	75	-
007	01	1
008	95	=
009	44	SUM
010	23	23
011	01	1
012	44	SUM
013	19	19
014	43	RCL
015	23	23
016	85	+
017	01	1
018	95	=
019	42	STO
020	24	24
021	03	3
022	02	2
023	42	STO
024	26	26
025	43	RCL
026	00	00
027	22	INV
028	59	INT
029	65	×
030	01	1
031	00	0
032	00	0
033	95	=
034	61	GTO
035	02	02
036	22	22
037	75	-
038	05	5
039	95	=
040	71	SBR
041	02	02
042	34	34
043	74	SM*
044	23	23
045	61	GTO
046	00	00
047	53	53
048	71	SBR
049	02	02
050	34	34
051	74	SM*
052	24	24
053	29	CP
054	43	RCL
055	19	19
056	75	-
057	43	RCL
058	20	20
059	95	=
060	67	EQ
061	03	03
062	56	56
063	81	RST
064	76	LBL
065	15	E
066	42	STO
067	00	00
068	59	INT
069	65	×
070	02	2
071	95	=
072	42	STO
073	23	23
074	42	STO
075	24	24
076	43	RCL
077	00	00
078	22	INV
079	59	INT
080	65	×
081	01	1
082	00	0
083	00	0
084	95	=
085	42	STO
086	21	21
087	06	6
088	32	X:T
089	43	RCL
090	21	21
091	77	GE
092	02	02
093	07	07
094	75	-
095	01	1
096	95	=
097	65	×
098	02	2
099	95	=
100	22	INV
101	28	LOG
102	42	STO
103	29	29
104	03	3
105	00	0
106	42	STO
107	49	49
108	71	SBR
109	03	03
110	87	87
111	43	RCL
112	29	29
113	35	1/X
114	65	×
115	73	RC*
116	23	23
117	71	SBR
118	04	04
119	32	32
120	67	EQ
121	01	01
122	36	36
123	71	SBR
124	01	01
125	86	86
126	07	7
127	03	3
128	42	STO
129	26	26
130	01	1
131	44	SUM
132	20	20
133	61	GTO
134	01	01
135	43	43
136	71	SBR
137	01	01
138	65	65
139	02	2
140	08	8
141	42	STO
142	26	26
143	03	3
144	00	0
145	44	SUM
146	23	23
147	44	SUM
148	24	24
149	61	GTO
150	00	00
151	25	25
152	69	DP
153	00	00
154	03	3
155	01	1
156	42	STO
157	27	27
158	03	3
159	02	2
160	42	STO
161	28	28
162	61	GTO
163	02	02
164	67	67
165	03	3
166	00	0
167	02	2
168	04	4
169	03	3
170	06	6
171	03	3
172	06	6
173	69	DP
174	00	00
175	69	DP
176	04	04
177	22	INV
178	58	FIX
179	43	RCL
180	00	00
181	69	DP
182	06	06
183	69	DP
184	00	00
185	92	RTN
186	02	2
187	03	3
188	02	2
189	04	4
190	03	3
191	07	7
192	00	0
193	00	0
194	69	DP
195	00	00
196	69	DP
197	04	04
198	22	INV
199	58	FIX
200	43	RCL
201	00	00
202	69	DP
203	06	06
204	69	DP
205	00	00
206	92	RTN
207	75	-
208	05	5
209	95	=
210	32	X:T
211	01	1
212	22	INV
213	44	SUM
214	23	23
215	22	INV
216	44	SUM
217	24	24
218	32	X:T
219	61	GTO
220	00	00
221	94	94
222	42	STO
223	25	25
224	06	6
225	32	X:T
226	43	RCL
227	25	25
228	77	GE
229	00	00
230	37	37
231	61	GTO
232	00	00
233	48	48
234	65	×
235	02	2
236	95	=
237	22	INV
238	28	LOG
239	58	FIX
240	00	00
241	52	EE
242	95	=
243	59	INT
244	22	INV
245	52	EE
246	55	÷
247	01	1
248	00	0
249	00	0
250	95	=
251	59	INT

Listing continued on next page.

Battleship Listing (continued)

```
252  65  ×
253  43  RCL
254  26   26
255  95  =
256  92  RTN
257  76  LBL
258  12  B
259  69  OP
260  00   00
261  01   1
262  42  STO
263  27   27
264  02   2
265  42  STO
266  28   28
267  02   2
268  42  STO
269  21   21
270  01   1
271  00   0
272  42  STO
273  00   00
274  08   8
275  32  X:T
276  43  RCL
277  21   21
278  77  GE
279  02   02
280  89   89
281  69  OP
282  01   01
283  01   1
284  44  SUM
285  21   21
286  61  GTO
287  02   02

288  97  97
289  85  +
290  02  2
291  95  =
292  69  OP
293  01   01
294  01  1
295  44  SUM
296  21   21
297  73  RC*
298  27   27
299  69  OP
300  02   02
301  05  5
302  00  0
303  32  X:T
304  43  RCL
305  28   28
306  67  EQ
307  03   03
308  22   22
309  73  RC*
310  28   28
311  69  OP
312  03   03
313  02  2
314  44  SUM
315  27   27
316  44  SUM
317  28   28
318  97  DSZ
319  00   00
320  03   03
321  49   49
322  01  1

323  02  2
324  01  1
325  01  1
326  01  1
327  00  0
328  00  0
329  07  7
330  69  OP
331  00   00
332  69  OP
333  02   02
334  06  6
335  00  0
336  05  5
337  00  0
338  04  4
339  00  0
340  03  3
341  00  0
342  02  2
343  69  OP
344  03   03
345  69  OP
346  05   05
347  98  ADV
348  81  RST
349  69  OP
350  05   05
351  61  GTO
352  02   02
353  74   74
354  76  LBL
355  13  C
356  98  ADV
357  03  3

358  06  6
359  04  4
360  01  1
361  03  3
362  01  1
363  02  2
364  06  6
365  69  OP
366  00   00
367  69  OP
368  02   02
369  68  NOP
370  68  NOP
371  68  NOP
372  68  NOP
373  68  NOP
374  68  NOP
375  68  NOP
376  68  NOP
377  68  NOP
378  68  NOP
379  68  NOP
380  68  NOP
381  69  OP
382  05   05
383  98  ADV
384  61  GTO
385  01   01
386  52   52
387  43  RCL
388  23   23
389  44  SUM
390  49   49
391  43  RCL
392  29   29

393  35  1/X
394  65  ×
395  73  RC*
396  49   49
397  71  SBR
398  04   04
399  32   32
400  67  EQ
401  02   02
402  06   06
403  69  OP
404  00   00
405  03  3
406  02  2
407  01  1
408  05  5
409  01  1
410  05  5
411  04  4
412  01  1
413  03  3
414  03  3
415  69  OP
416  02   02
417  02  2
418  04  4
419  01  1
420  07  7
421  01  1
422  06  6
423  00  0
424  00  0
425  00  0
426  00  0
427  69  OP

428  03   03
429  69  OP
430  05   05
431  91  R/S
432  59  INT
433  55  ÷
434  01  1
435  00  0
436  00  0
437  95  =
438  22  INV
439  59  INT
440  65  ×
441  01  1
442  00  0
443  00  0
444  95  =
445  59  INT
446  29  CP
447  92  RTN
448  76  LBL
449  11  A
450  47  CMS
451  69  OP
452  00   00
453  03   3
454  01   1
455  42  STO
456  27   27
457  03   3
458  02   2
459  42  STO
460  28   28
461  61  GTO
462  02   02
463  67   67
```

PROGRAMMING PUZZLES.-
by Charlie Williamson.

The object of these problems is to hone your programming skills by minimizing the number of steps needed to accomplish the objective. The step count should include the label address at the beginning and a RTN at the end. The best solutions will be published in a coming issue.

1. MAX-MIN SORTER WITHOUT USING T-REGISTER COMPARISONS. Place a in the display register (or x-register if you prefer) and b in the t-register. Devise a routine which will place max(a,b) in the t-register. An obvious routine would be:

```
LBL A GE 006 X:T RTN
```

But for this puzzle the use of the t-register comparisons (emphasis on COMPARISONS) is NOT permitted. Charlie has a sorter which will accomplish the task in 40 steps and which uses only the x-register, the t-register and the pending operations stack. Can you do better ?

2. POWERS OF MINUS ONE. Place an integer in the display. Devise a routine which will display (-1) to the nth power. Palmer Hanson has bettered Charlie's original routine with an eleven-step one.

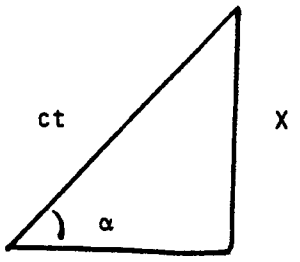
PHYSICS. - William Buechner of Arlington MA sends me these useful subroutines. His accompanying letter explains as follows:

While thumbing through back issues of the NOTES I noticed the short routine on time dilation. This is just one axample of the use of trig functions to simplify many relativistic calculations (a technique unknown to many particle physicists.

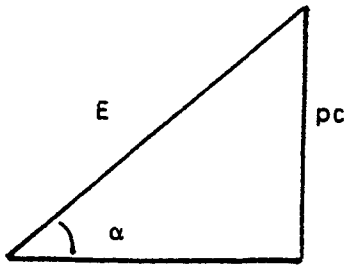
In the Lorentz transformations for space-time and for energy-momentum $\beta = (v/c)$ and $\gamma = (1 - \beta^2)^{-1/2}$ enter in. Also in dynamics they are needed in relationships such as $E = mc^2 = \gamma m_0c^2$, $T = E - m_0c^2 = (\gamma - 1)m_0c^2$, $pc = \beta E = \beta\gamma m_0c^2$, etc.

Hence subroutines for β, γ, and $\beta\gamma$ are useful for getting any two when the other is known. Attached are examples of the subs I use a good deal.

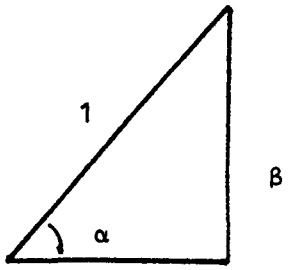
They are based on a triangle extracted from the Lorentz diagram (also unknown to many professionals)



space-time



energy-momentum



equiv. trig.

In each case, $\sin\alpha = \beta$

LBL A= $\beta \rightarrow \gamma$
LBL B= $\beta \rightarrow \beta\gamma$
LBL C= $\gamma \rightarrow \beta$
LBL D= $\gamma \rightarrow \beta\gamma$
LBL E= $\beta\gamma \rightarrow \beta$
LBL E'= $\beta\gamma \rightarrow \gamma$

```
000  76 LBL
001  11  A
002  22 INV
003  38 SIN
004  39 COS
005  35 1/X
006  92 RTN
```

```
007  76 LBL
008  12  B
009  22 INV
010  38 SIN
011  30 TAN
012  92 RTN
013  76 LBL
014  13  C
015  35 1/X
016  22 INV
017  39 COS
```

```
018  38 SIN
019  92 RTN
020  76 LBL
021  14  D
022  35 1/X
023  22 INV
024  39 COS
025  30 TAN
026  92 RTN
027  76 LBL
028  15  E
```

```
029  22 INV
030  30 TAN
031  38 SIN
032  92 RTN
033  76 LBL
034  10 E'
035  22 INV
036  30 TAN
037  39 COS
038  35 1/X
039  92 RTN
```

FOR SALE : Thermo-paper for the PC100. Package of 3 rolls for under $ 5.00. Excellent quality, deep black. Call Walter Kolb during the day at (202) 433-5013 or evenings at (703) 751-8832.

SIMPLE PROGRAM,- Here is a deceptively simple program by Robert Caldwell from Sunnyvale California. From power-up place in user-memory the following program:

LBL A STO 01 R/S STO 01 R/S

1. Enter an integer x (any of your choice) and press A.
2. Enter a second integer y and press R/S."y" should now be in R01.
3. Enter integer x and press DMS A.
4. Enter integer y and press DMS R/S. Without peeking, what is now in R01 ?
   Do step 3, LRN LRN and step 4. Now what is in R01 ?

Circular Stepping During Listing of the Revealed Firmware--P. Hanson

V5N1p7 and V5N3p6 describe keyboard sequences which permit readout of the firmware which mechanizes the statistics and conversions functions. Neither discussion mentioned a quirk which had been reported in earlier discussions of downloading of the firmware which appeared in V3N10p4 and V3N12p5 of 52 Notes, namely the "circular stepping" which would occur during an attempt to list the revealed firmware. Patrick Acosta, who does not have a PC-100, suggested that the quirk might be caused by previously unrecognized hexadecimal h22 commands at locations 488 and 504 of the downloaded firmware. My tests confirm Patrick's hypothesis.

The "circular stepping" quirk was originally reported in V3N10p4 of 52 Notes by Steffen Seitz. He observed that an attempt to continue listing of the firmware past step 487 resulted in a return to step 039 with an abs instruction, the 040, 041, ... 487 are as before. This circular stepping will continue for as many iterations as you are willing to expend printer paper. In V3N12p5 of 52 Notes Steve Bepko reported that if the program counter was SST'd past location 488 then additional printer listing could be obtained up through location 503. At what would have become step 504 the circular stepping to location 039 occurred. In a personal letter Patrick Acosta suggested that the unusual "circular stepping" behavior might be associated with the code 22 which is seen at 488 and 504 when SSTing rather than listing. He hypothesized that the code at those locations might really be hexadecimal code h22 rather than the normal code 22 (INV). To test the hypothesis I synthesized code h22 at location 016 of an otherwise clear memory with the following sequence (again due to Patrick):

Starting from turnon, or	
Cms-CP	Clears memory
GTO-016-LRN-SBR-BST-LRN	Puts code 71 in location 016 and returns pointer to 016.
10-Op-17-CLR	Sets partitioning to permit synthesizing hexadecimal codes.
Pgm-12-SBR-999	Flashing 0. in the display
R/S	Flashing 0. 00 in the display
DMS	Flashing 0 in the display
LRN	016 55 in the display
Ins	016 55 in the display
LRN-RST-CLR	0 in the display. Calculator returned to normal mode.
GTO-016-LRN	016 22 in the display confirming that h22 is at location 016
SST	017 02 in the display
SST	018 10 in the display
SST	019 38 in the display
SST	020 30 in the display
SST	021 31 in the display
SST	022 30 in the display
SST	023 71 in the display
SST	024 03 in the display
SST	025 00 in the display
If you check the remainder of the user memory you will find zeroes	
RST-List	See listing

Note that "circular stepping" occurs each time location 016 is encountered. Also for this set of conditions the code that had been verified to be at locations 017 through 022 by the SST process appears at locations 000 through 006 with the listing process. The conclusion that h22 code causes circular stepping during listing appears inescapable.

Patrick's conjecture that something is different about the code at locations 488 and 504 is supported by the listing in Table VI of Patent No. 4,153,937. The final character for the constants 0, 13, 14, and 15 all appear as a code C (hexadecimal 12) in that table. The equivalent locations in the downloaded firmware are 384, 488, 496, and 504. Locations 384 and 496 list as code B (keycode 12) In the table in the patent the final character pair for the equivalent locations is 0C. I suspect that the code is really h12, not code B (keycode 12). Locations 488 and 504 in the firmware as downloaded by successive SST commands and readout from the display appear as code INV (keycode 22). In the table in the patent the final character pair for the equivalent locations is 1C, or h22 and Patrick Acosta defines hexadecimal codes.

000 00 0	014 00 0	012 00 0
001 00 0	015 00 0	013 00 0
002 00 0	000 02 2	014 00 0
003 00 0	001 10 E'	015 00 0
004 00 0	002 38 SIN	000 02 2
005 00 0	003 30 TAN	001 10 E'
006 00 0	004 31 LRN	002 38 SIN
007 00 0	005 39 COS	003 30 TAN
008 00 0	006 71 SBR	004 31 LRN
009 00 0	007 00 00	005 39 COS
010 00 0	008 00 00	006 71 SBR
011 00 0	009 00 0	007 00 00
012 00 0	010 00 0	008 00 00
013 00 0	011 00 0	009 00 0

AN INDEX FOR THE TI PPC NOTES.- From the several proposals I received for this task (many thanks to those members who did so) I found that the one by Bob Fruit was the most complete one and at the same time made it very easy to find the subject, author or what-have-you you were looking for. Obviously, Bob must have put an enormous amount of time in this endeavor. In order not to waste too much space on it, I have reduced Bob's original write-up by 50 % (the only 50 % reduction in this issue) and pasted everything up on one 8½ by 11 inch sheet. You will find that one on the next page.
Needless to say that I have been using Bob's index. To appease you constant complainers about ligibility, this one, in the 8½ by 11 inch size, is perfectly readable. Even without glasses, I can do it, and I am 55 years old.

So, don't write to me, but send your checks or money orders to Bob Fruit directly. As with any other article or program offered in these pages, overseas members may write to me directly, as in the past is always done. I'll see to it that they get a copy. I'll send you the bill at new years !

INDEXES FOR THE TI PPC NOTES

Robert Fruit
100 Fuller Road
Hinsdale, Ill 60521

I have prepared two different indexes for the TI PPC NOTES. Both indexes cover the two years that the TI PPC NOTES have been around. I find the indexes quite useful and would like to make them available to you.

First let me describe the indexes to you. The first index is a straight alphbetical listing by title. Each line has the title, author, an indicator that a program is included (P means that there is a program included), catagories that the piece covers, special calculators (SR-52, SR-56, TI-57, TI-59), location of the article, and any cross-references. When I know what I am looking for, this 9 page index is a fast place to find it.

When I only know the subject matter, not the title, the second index is what I turn to. The second index lists articles by their subject. The catagories are:

April Fools	Games	Plotting
Articles vol 5	Graphics mode	Programs
Articles vol 6	Help Requests	Sources of Information
Author	HIR Codes	Speed Programs
Brain Teasers	Mathematics	SR-52 Articles
Club Challenges	Module	Sr-56 Articles
Club Module	Newcomers Corner	TI-57 Articles
Diagnostics	Other Clubs	TI-59 Articles
Fast Mode	Patent Information	Utility Programs
Firmware	Pictures	

Within each catagory the articles are in alphabeticla order by title (except for the catagory author, obviously). The list of articles in each catagory is short enough to easily find the one or two pieces you want. The only exceptions to this are the three general catagories; articles, authors, and programs. I don't think that it takes me more than 30 seconds to typically identify the articles that I want from this 25 page index.

Probably the best feature of both these indexes is that they cross-reference the articles. When you are looking at an article you usually don't know if there has been a correction or additional information for it. This one feature has saved me a lot of time in getting programs to work correctly.

Both indexes are printed on standard size computer paper and then reduced to 8½ x 11 size paper. The indexes are copied on both sides of the paper and have the standard 3 hole punch. I will only supply the indexes as a set, not seperately. $10.00 is needed to cover the coping and mailing costs. I already have 150 copies of the indexes. I will mail the indexes within a week of getting the paid request. Should demand warrent it, I will get additional copies of the indexes.

REPORT NO. 10 LISTING OF T.I PPC NOTES ARTICALS 11

TITLE	AUTHOR	PGM					
LIFE CYCLE MODLE PROFITABLE	PEEMER,R		SOURCES			V06N2P9	
LINEAR REGRESSION,TRANSFORM	WORTMANGT		ARTICAL	MATH		V05N6-10P10	
LIQUID + GAS FLOW	PELLETIER		SOURCES			V05N6-5P10	
LIST WITH OUT PAPER	CANAZA,J		ARTICAL			V05N9-10P19	
LIST WITH OUT PAPER	NEEF,R	P	ARTICAL	UTILITY		V05N7P9	
LOAN SCHEDULE			SOURCES			V06N3P6	
LOAN SCHEDULE	MATTESCH	P	ARTICAL			V06N9-10P24	
LOG ANALYSIS BY MICROMETER	ASQUITH,G		SOURCES			V06N3P10	
MAG-CARD READER ADJUSTMENT	POLOCZEK		ARTICAL	FIRMWARE		V05N2P3	
MAGIC SQUARE 4 X 4	SKILLMAN	P	ARTICAL	MATH		V06N3P4	
MAGIC SQUARES	RISTANOVI	P	ARTICAL	MATH		V06N3P4	
MAKE UP YOUR MIND	NEUSCH	P	ARTICAL	GAMES		V05N2P10	
MAN,FOX,CHICKEN,CORN,RIVER	SKELLMAN	P	ARTICAL	GAMES		V05N1P10	
MANUAL PLOTTER-SCALER		P	ARTICAL	PLOTTING		V05N1P5	V05N3P3
MARKET	SNOW,RICH	P	ARTICAL	GAMES		V05N9-13P25	
MASTER LIBRARY ACCESS ROUT.	VALENTINO		SOURCES			V05N3P6	
MASTER LIBRARY PRINTING ROUT	PORTER,J	P	ARTICAL	MODULE		V05N8P16	
MASTER LIBRARY PRINTING ROUT	VALENTINO	P	ARTICAL	MODULE		V05N1P7	V05N3P4 V05N8P16
MASTERMIND	O GRADY,D		ARTICAL	GAMES	SR56	V06N2P9	
MASTERMIND ON THE TI-57	COPPENS,F	P	ARTICAL	GAMES	TI57	V05N6P12	
MATH UTILITY MODULE			ARTICAL	MODULE		V05N4-5P11	V05N7P5 V05N7P9
MATH UTILITY MODULE	BERG,PAUL		ARTICAL	MODULE MATH		V05N7P9	V05N9-10P19
MATHEMATICAL ASTRONOMY 15.95	JONES,A		SOURCES			V05N8P12	
MAZE	AGY,WALLA	P	ARTICAL	GAMES		V06N9-10P6	
MAZE 4-MAZE-ING	SWINNEN,M	P	ARTICAL			V06N9-5P22	
MECHANICAL ENGINEERING	RAABE,GUS		HIR			V05N3P5	
MEMORY FAILURE DIAGNOSTICS	BLAYNEY,D	P	ARTICAL	UTILITY DIAGNOS.		V05N2P9	V05N6P3 V05N8P16
MEMORY FAILURE DIAGNOSTICS	HANSEN,P		ARTICAL	DIAGNOS.		V05N6P3	
METALWORKING			SOURCES			V06N4-5P21	
MICKY MOUSE			ARTICAL	PICTURES		V06N4-5P28	
MICKY MOUSE	DE WEES,P	P	ARTICAL	PICTURES		V06N6-7P12	
MICRO MILLENIUM	EVANS,C		SOURCES			V05N7P12	
MICROWAVE CIRCUIT DESIGN AND	ALLEN,J		SOURCES			V05N9-10P4	
MIND-TASCHEN-COMPUTER-CLUB			OTH CLUB			V05N4-5P2	
MIRROR FUNCTION	LEISING,D		ARTICAL	HIR FIRMWARE		V06N3P4	
ML SURVIVAL GUIDE	FISH,FRED		SOURCES	MODULE		V05N9-10P22	V06N6-7P1
ML-09 SIMPSONS APPROXIMATION	CANAZA,J		ARTICAL	MODULE		V05N9-10P19	
MODULE SELECTOR $199.95			ARTICAL	SOURCES		V05N8P1	
MOTHBALLING PROGRAMS			ARTICAL			V05N4-5P3	
MOUSE CODE,FAST MODE	LEISING,D	P	ARTICAL			V05N9-10P23	
MORTGAGE	AGY,W	P	ARTICAL			V06N6-5P10	
MORTGAGE SCHEDULE 4-4-56	VOGEL	P	ARTICAL	MATH	SR56	V05N6-5P16	
MOS FET FOR AIDS LSI DESIGN	PINKHAM,E		SOURCES			V05N7P4	
MOSAIC	LEISING,D	P	ARTICAL			V06N6-7P13	
MR MAGIC CARD TRICK	STAUM	P	ARTICAL	GAMES		V05N3P10	
MUSICAL CHIMES	AGY,WALLA	P	ARTICAL			V06N9-10P11	
N PERMUTED BY N FACTES	ROSEDALE		UTILITY			V05N8P4	
N-C BRANCH OR JMP TO BRANCH	SWINNEN,M		NEW CUMP			V06N6-5P29	
N-C CAL PRGMS STEPS + A TIME	SCHWEPP		NEW CUMP			V06N9-10P32	
N-C EFFICIENT ALGORITHMS GCD	VOGEL,G		NEW CUMP	MATH		V05N7P11	
N-C HEX CODES	SWINNEN,M		NEW CUMP	HIR		V05N7P12	
N-C HIRS FOR UP CODES 1-4	VOGEL,G		NEW CUMP	HIR		V05N1P14	
N-C WORD MARKET STATUS	WESMULLER	P	NEW CUMP			V05N4P13	
N-C PETALS AROUND A ROSE		P	NEW CUMP	GAMES		V06N2P15	
N-C POSTAL RATES	SWINNEN,M	P	NEW CUMP			V05N7P11	V05N8P12

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```
00   86 3 LBL 3
01   61 0 SBR 0
02  -76   INV GE
03   51 3 GTO 3
04   86 4 LBL 4
05   61 2 SBR 2
06   76   GE
07   51 4 GTO 4
08   33 5 RCL 5
09   81   R/S
10   01    1
11   84   +/-
12   39 1 PRD 1
13   39 2 PRD 2
14   39 3 PRD 3
15   39 4 PRD 4
16   39 7 PRD 7
17   51 3 GTO 3
18   86 0 LBL 0
19   33 6 RCL 6
20   34 5 SUM 5
21   61 1 SBR 1
22  -61   INV SBR
23   86 2 LBL 2
24   33 0 RCL 0
25  -34 5 INV SUM 5
26   61 1 SBR 1
27  -61   INV SBR
28   86 1 LBL 1
29   43    (
30   33 5 RCL 5
31   23   X²
32   55    ×
33   33 1 RCL 1
34   75    +
35   33 5 RCL 5
36   55    ×
37   33 2 RCL 2
38   75    +
39   44    )
40   55    ×
41   33 5 RCL 5
42   23   X²
43   75    +
44   33 5 RCL 5
45   55    ×
46   33 4 RCL 4
47   85    =
48  -61   INV SBR
49   00    0
```

ROOTS OF $ax^4 + bx^3 + cx^2 + dx + e = y$

Isaac Sanchez, Puerto Rico.

This TI-57 program will find the real roots of of a fourth degree polynomial. The parameter a must be negative; if not, store the negative of a, b, c and d in corresponding memories, then store e in memory 7 as it is. The difference between the value of the roots given and the exact value is equal or less than 0.01. When two of the roots are negative and equal the calculator with not stop at them. The same should happen when two are positive and equal.

NOTE: watch for AOS in memory 6.

HOW TO USE:

a, b, c, d	*STO 1, 2, 3, 4*
-e	*STO 7*
.01	*STO 0*
.1	*STO 6*

RST R/S

First root will appear in about 1 min. 20 sec.

Then press R/S R/S R/S

See X_2, X_3, X_4

EXAMPLE:

-4, 0, 5, 0, STO 1, 2, 3, 4
-(-1) STO 7 (this should be 1 STO 7)
.01 STO 0
.1 STO 6
-4 STO 5
RST R/S *-1.01 = X_1 in 1 min 20 sec.*
R/S R/S R/S *-0.51 ; 0.49 ; 0.99*

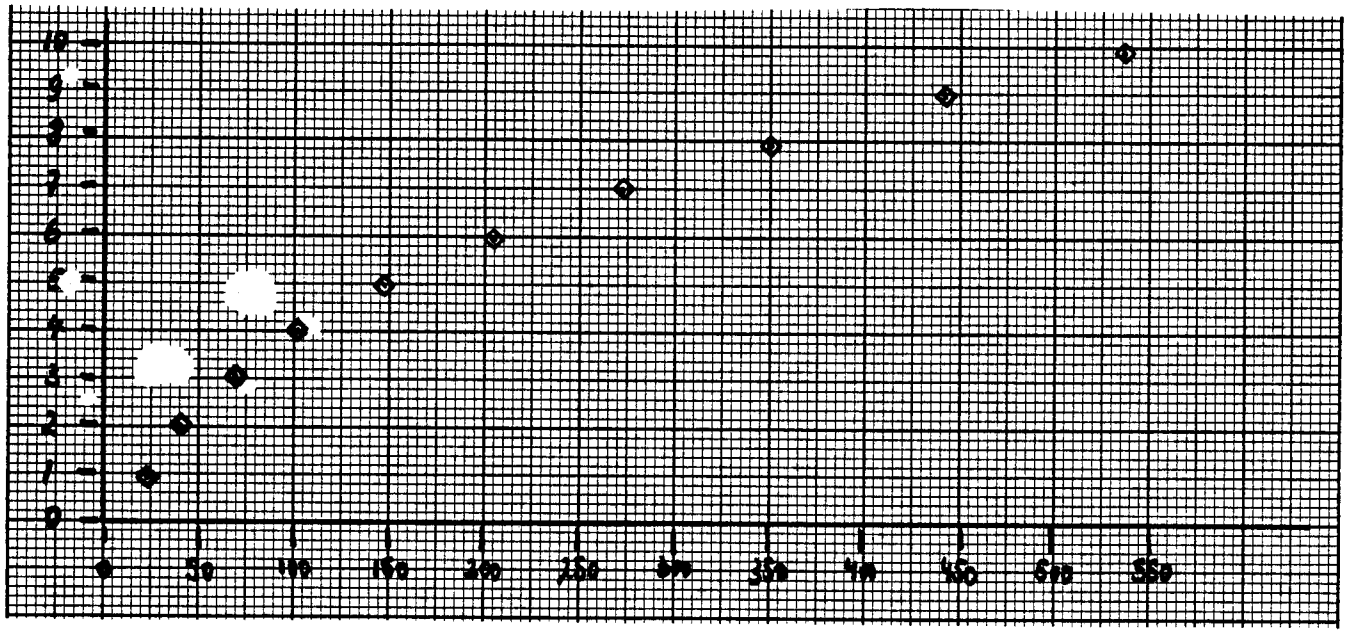
Note in the listing that GE means $X \geq T$

NEWCOMER'S CORNER,- Fitting Data to Curves. Suppose you observe the change of one variable with respect to another, (be it engineering, financial, what have you) and you tabulate your observations neatly as follows:

1	15.2
2	33.1
3	61.25
4	99.2
5	147.1
6	204.9
7	273.2
8	350.9
9	438.9
10	539.25

In finance, for example, the 1,2,3... could mean first second, third, etc. week and the larger numbers might mean increasing sales in thousands of dollars.

The first thing that comes to our mind is,"what would a curve, plotted with these figures, look like?" That is simple enough. We take some curve plotting paper, lay out the correct scales in both horizontal and vertical directions (I will not bore you with difficult to remember names such as abcissa and ordinate, names you were haunted with in high school) and start plotting.



We notice at once that our sales are rapidly increasing (the curve goes steeper as the weeks go on. Nothing more can be gleaned from that curve. Of course, every shrewd business man or woman would like to know, for example, what sales would be after, say, 21 weeks, or 45 or 103. But that would require extrapolating our curve, which we could do graphically, given enough paper, or by means of our beloved calculator. And this is exactly what we are going to do here.

The TI-59 needs, of course, a mathematical description, a formula, to be able to forecast sales in the future. You have to able to tell the calculator, for example: multiply the "x" I enter by 23.4567 and add to the result 345.789. The final result will be the new y, the value in the future.

It is beyond the scope of these few pages of the newcomer's corner to explain in detail the theory(and possibly its proof) behind the formulas used in curve fitting programs. Suffice it to say that a program of this kind is rather complex to write and even more complex and time consuming to test for possible bugs. But USING such a program is as simple as saying "bonjour" (according to the French). You just enter your data pairs, that is, in the example above, 1 and 15.2, followed by 2 and 33.1, and so on. After you have entered them all you test the closeness of fit of these data to standard equations contained in the program. There are eight of those in the program. Each time the program will supply you with a sort of figure of merit, called the correlation coefficient. (sorry for the long name, but that is what the statisticians call it.) The abbreviation for it is "R^2". This is a number between 1 and 0. The closer it is to 1, the better your data will fit to that particular standard curve or equation. Thus, if your calculator says: "Sir, or Madam,

newcomer's corner (continued)

your data fit with an R^2 = 0.99974534"you are doing alright. Never expect a fit of 1. Perfection is not of this world. And most of the time you have to be satisfied with an R^2 of 0.89345673 and count your blessings.

The program itself consists of three mag cards, 5 card sides. It was originally written by Frank Blachly and me, that is Frank worked out the fit to the first seven curves and I added an eighth, polynomial, fit to it. There is a shorter version in existence, which is available from PPX under the name EIGHT CURVE FIT by Frank Blachly # 208040D. That one happened because we gave a copy of the present program to Bill Skillman, who slashed program steps left and right and added such niceties as an automatic output of only the closest fitting curve data.(saves paper)

And there are many other curve fitting programs available, one more specialized than the other. Once you learn how to use this elementary one, the others will be a cinch.

Now, keying in the two programs (yes, there are in reality two of them) requires a little care. First of all, put your calculator in 3 OP 17 partitioning and key in the larger of the two programs, 719 steps in total. There are no alpha registers in this program. All the print data is placed "in line." Return your calculator to 6 OP 17 partitioning and record the entire program on two mag cards, three card sides (1, 2 and 3)

Next place your calculator again in 3 OP 17 and key in the shorter program, 282 steps. Leave your calculator in 3 OP 17 partitioning and record that program on one mag card, sides 1 and 2.

Mark the first two cards with DATA FIT TO 7 CURVES and the last card with POLYNOMIAL FIT.

Now, as for using the programs:

1. *Read in the first two cards, sides 1, 2, 3. Initialize by pressing 2nd E'. See a zero appear in the display, nothing else.*
2. *Enter your first x, in the example a 1. Press A.*
   Enter your first y, in the example 15.2 and press R/S. After a few seconds the printer will print a 1 (meaning point 1) followed by 1 X and 15.2 Y .
   Wait another few seconds:a 1 appears in the display, meaning ready for the next point. The digit in the display is handy to know which was the last point entered, in case you get interrupted by the phone or some other annoying contrivance.
3. *From now on, each x and its companion y, may be entered by means of R/S. No need to press A after entering x. Needs to be done only for the very first point.*
4. *Suppose you make a mistake in entering. If x has been entered (erroneously) only, just repeat it and follow it by pressing A this time.*
   If an erroneous y has been entered, both x and y has to be deleted. This is done as follows: Enter the wrong x and press 2nd A', enter the wrong y and press R/S.
   Now enter the correct x and press A, enter the correct y and press R/S, after which you may go on with nothing but R/S presses again.
5. *After all your data points have been entered, you are ready for some computation.*
   With the first program, the larger of the two, you may compute fit to the following standard curves or equations: Linear curve, log arithmic curve, quadratic curve, hyperbolic curve, the inverse linear curve, the exponential curve and the power curve. Don't let those names scare you. The program will print a mathematical formula as the heading for each of the seven curve fits. You will easily recognize what to do with that mathematical equation.

   So, for now enter a 1 (meaning curve 1, linear) and press B. The printer will print the R^2 for that curve. If you see that it is rather close to 1.00000 you might also want to now what the A and B in the equation are equal to. So, press R/S and when A is printed, press R/S again to see B printed.
   Now enter a 2 and press B. Again follow it up with two R/S pressings, and so on. Just follow the example to see what was done. You might notice that curve 3 gives a rather close R^2. Normally I would be satisfied here.
   At curve 7 I get a blinking R^2, probably do to a divsion by zero (illegal) Just press CE and go on.
6. *You may now enter some number representing x and expect a predicted y. To do this, enter x, say 21, (for week # 21) and press D. Output will be y', the predicted y corresponding to 21. You may enter also a y and expect a predicted x'. To do this, enter y, say 5000 (for 5000 Kdollars) and press E. See output x' (the week number that sales volume will be attained)*

newcomer's corner (continued)

7. *We are not through yet. Not by a long shot. Suppose you don't find any of the curves fitting close enough to your liking. Then you might try the shorter program, the polynomial curve fit.*
   Your calculator has been put in 3 OP 17 by the larger program, the one you have in your calculator now. Also in your calculator are your data and data bases generated by the program. If, for some reason, you want to preserve those data, record them on side 4 of the second mag card, but do it in 6 OP 17.
   Otherwise, if you now want to try a closer fit with the polynomial curve fit program just press CLR and enter side 1 of the third mag card. Press CLR again and enter the second side of that card. UNDER NO CIRCUMSTANCES TURN OFF YOUR CALCULATOR. YOUR DATA WOULD BE LOST COMPLETELY. The polynomial program needs those data.
8. *Compute a polynomial fit by pressing A. The output will be an R^2.*
   Again, if you want to know how much A, B and C is in the equation, press R/S three times in succession to see A, B and C printed.
   If you subsequently want to now the predicted y' for a given x, enter x and press E. See y' printed. In the example we computed the predicted sales for the 21th week, the 45th week and the 103th week. Don't expect your business to grow at such a phenomenal pace. This is only theory. Practice is something else.

   What do we do now with such a fit to an equation. Well, we can use this equation to write a program that will compute any predicted y from a given x.
   It would look more or less like this:

   (Enter x) LBL A STO 00 R/S
   (Compute y) LBL B (5.001704545 X RCL 00 X^2)+ (2.955492429 X RCL 00) + 7.264166657 = R/S

   This, of course, using the formula given by curve 8, the polynomial curve.

   If you had been satisfied with the closeness of curve 3, the B part of the above program would be as follows: (A part would be the same, of course)

   LBL B 13.69479853 + (5.25588835 X RCL 00 X^2 = R/S

   Try both ways and see which comes closer. Use as x some of the orginally entered numbers(from 1 through 10).

   Looking back over this article I see that I have possibly incurred the ire of the purists by drawing my plot with x and y inverted. But,as the bart of Avon once said, "a rose by any other name smells still as sweet", whatever you call x IS x and your y wil be YOUR y, no matter if the convention says to use the horizontal for x and the vertical for y. (see, no abcissa nor ordinate, simply horizontal or vertical)

Maurice E.T. Swinnen

Program listing on next pages.

1.		6.		-9.			3.
1.	X	6.	X	10.	X		Y = A +BX²
15.2	Y	204.9	Y	539.25	Y		.9998749873 R²
							13.69479853 A
2.		7.		10.			5.25688835 B
2.	X	7.	X	10.	X		
33.1	Y	273.2	Y	537.1	Y		
3.		8.		1.			Y = AX² + BX + C
3.	X	8.	X	Y = A +BX			5.001704545 A
61.25	Y	350.9	Y	.9545285755	R²		2.955492429 B
4.		9.		-102.7733333	A		7.264166657 C
4.	X	9.	X	57.97424242	B		.9999996076 R²
99.2	Y	438.9	Y				
5.		10.		2.			21. X
5.	X	10.	X	Y = A+BLNX			2275.081212 Y'
147.1	Y	539.25	Y	.7554547477	R²		
				-105.6781369	A		45. X
				213.025919	B		10268.71303 Y'

Data Fit to 8 Curves - listing I

```
000 76 LBL
001 17 B'
002 07  7
003 42 STO
004 00  00
005 22 INV
006 86 STF
007 40 IND
008 00  00
009 97 DSZ
010 00  00
011 00  00
012 05  05
013 92 RTN
014 76 LBL
015 19 D'
016 22 INV
017 87 IFF
018 00  00
019 00  00
020 22  22
021 94 +/-
022 92 RTN
023 76 LBL
024 10 E'
025 22 INV
026 58 FIX
027 17 B'
028 03  3
029 69 OP
030 17  17
031 25 CLR
032 47 CMS
033 91 R/S
034 76 LBL
035 16 A'
036 86 STF
037 00  00
038 76 LBL
039 11  A
040 42 STO
041 14  14
042 91 R/S
043 42 STO
044 07  07
045 32 X:T
046 43 RCL
047 14  14
048 32 X:T
049 22 INV
050 87 IFF
051 00  00
052 00  00
053 55  55
054 22 INV
055 78 Σ+
056 43 RCL
057 03  03
058 19 D'
059 98 ADV
060 99 PRT
061 04  4
062 04  4
063 69 OP
064 04  04
065 43 RCL
066 14  14
067 69 OP
068 06  06
069 04  4
070 05  5
071 69 OP
072 04  04
073 43 RCL
074 07  07
075 69 OP
076 06  06
077 23 LNX
078 42 STO
079 08  08
080 19 D'
081 44 SUM
082 10  10
083 33 X²
084 19 D'
085 44 SUM
086 11  11
087 43 RCL
088 07  07
089 35 1/X
090 19 D'
091 44 SUM
092 12  12
093 33 X²
094 19 D'
095 44 SUM
096 13  13
097 43 RCL
098 14  14
099 23 LNX
100 42 STO
101 09  09
102 19 D'
103 44 SUM
104 17  17
105 33 X²
106 19 D'
107 44 SUM
108 18  18
109 43 RCL
110 14  14
111 35 1/X
112 19 D'
113 44 SUM
114 19  19
115 33 X²
116 19 D'
117 44 SUM
118 20  20
119 43 RCL
120 14  14
121 33 X²
122 33 X²
123 19 D'
124 44 SUM
125 22  22
126 43 RCL
127 07  07
128 65  ×
129 43 RCL
130 09  09
131 95  =
132 19 D'
133 44 SUM
134 24  24
135 43 RCL
136 07  07
137 65  ×
138 43 RCL
139 14  14
140 33 X²
141 95  =
142 19 D'
143 44 SUM
144 25  25
145 43 RCL
146 07  07
147 55  ÷
148 43 RCL
149 14  14
150 95  =
151 19 D'
152 44 SUM
153 26  26
154 35 1/X
155 44 SUM
156 27  27
157 43 RCL
158 14  14
159 65  ×
160 43 RCL
161 08  08
162 95  =
163 19 D'
164 44 SUM
165 28  28
166 43 RCL
167 08  08
168 65  ×
169 43 RCL
170 09  09
171 95  =
172 19 D'
173 44 SUM
174 29  29
175 43 RCL
176 01  01
177 42 STO
178 08  08
179 43 RCL
180 02  02
181 42 STO
182 09  09
183 43 RCL
184 04  04
185 42 STO
186 15  15
187 43 RCL
188 05  05
189 42 STO
190 16  16
191 43 RCL
192 06  06
193 42 STO
194 23  23
195 43 RCL
196 14  14
197 45 Yˣ
198 03  3
199 95  =
200 19 D'
201 44 SUM
202 21  21
203 22 INV
204 86 STF
205 00  00
206 43 RCL
207 03  03
208 91 R/S
209 61 GTO
210 11  A
211 76 LBL
212 12  B
213 98 ADV
214 99 PRT
215 32 X:T
216 17 B'
217 69 OP
218 00  00
219 43 RCL
220 10  10
221 42 STO
222 01  01
223 43 RCL
224 11  11
225 42 STO
226 02  02
227 43 RCL
228 17  17
229 42 STO
230 04  04
231 43 RCL
232 18  18
233 42 STO
234 05  05
235 43 RCL
236 29  29
237 42 STO
238 06  06
239 07  7
240 67  EQ
241 03  03
242 45  45
243 43 RCL
244 15  15
245 42 STO
246 04  04
247 43 RCL
248 16  16
249 42 STO
250 05  05
251 43 RCL
252 28  28
253 42 STO
254 06  06
255 06  6
256 67  EQ
257 03  03
258 51  51
259 43 RCL
260 12  12
261 42 STO
262 01  01
263 43 RCL
264 13  13
265 42 STO
266 02  02
267 43 RCL
268 27  27
269 42 STO
270 06  06
271 05  5
272 67  EQ
273 03  03
274 56  56
275 43 RCL
276 08  08
277 42 STO
278 01  01
279 43 RCL
280 09  09
281 42 STO
282 02  02
283 43 RCL
284 19  19
285 42 STO
286 04  04
287 43 RCL
288 20  20
289 42 STO
290 05  05
291 43 RCL
292 26  26
293 42 STO
294 06  06
295 04  4
296 67  EQ
297 03  03
298 61  61
299 43 RCL
300 16  16
301 42 STO
302 04  04
303 43 RCL
304 22  22
305 42 STO
306 05  05
307 43 RCL
308 25  25
309 42 STO
310 06  06
311 03  3
312 67  EQ
313 03  03
314 66  66
315 43 RCL
316 17  17
317 42 STO
318 04  04
319 43 RCL
320 18  18
321 42 STO
322 05  05
323 43 RCL
324 24  24
325 42 STO
326 06  06
327 02  2
328 67  EQ
329 03  03
330 71  71
331 43 RCL
332 15  15
333 42 STO
334 04  04
335 43 RCL
336 16  16
337 42 STO
338 05  05
339 43 RCL
340 23  23
341 42 STO
342 06  06
343 61 GTO
344 03  03
345 73  73
346 86 STF
347 07  07
348 61 GTO
349 03  03
350 73  73
351 86 STF
352 06  06
353 61 GTO
354 03  03
355 73  73
356 86 STF
357 05  05
358 61 GTO
359 03  03
360 73  73
361 86 STF
362 04  04
363 61 GTO
364 03  03
365 73  73
366 86 STF
367 03  03
368 61 GTO
369 03  03
370 73  73
371 86 STF
372 02  02
373 04  4
374 05  5
375 00  0
376 00  0
377 06  6
378 04  4
379 00  0
380 00  0
381 01  1
382 03  3
383 69 OP
384 02  02
385 87 IFF
386 07  07
387 04  04
388 14  14
389 87 IFF
390 06  06
391 04  04
392 25  25
393 87 IFF
394 04  04
395 04  04
396 38  38
397 87 IFF
398 03  03
399 04  04
400 49  49
401 87 IFF
402 02  02
403 04  04
404 60  60
405 04  4
406 07  7
407 01  1
408 04  4
409 04  4
410 04  4
411 61 GTO
412 04  04
413 70  70
414 04  4
415 04  4
416 05  5
417 01  1
418 05  5
419 01  1
420 01  1
421 04  4
422 61 GTO
423 04  04
424 70  70
425 05  5
426 04  4
427 05  5
428 01  1
429 05  5
430 01  1
431 01  1
432 04  4
433 04  4
434 04  4
435 61 GTO
436 04  04
437 70  70
438 04  4
439 07  7
440 01  1
441 04  4
442 06  6
443 03  3
444 04  4
445 04  4
446 61 GTO
447 04  04
448 70  70
449 04  4
450 07  7
451 01  1
452 04  4
453 04  4
454 04  4
455 07  7
456 00  0
457 61 GTO
458 04  04
459 70  70
460 04  4
461 07  7
462 01  1
463 04  4
464 02  2
465 07  7
466 03  3
467 01  1
468 04  4
469 04  4
470 69 OP
471 03  03
472 22 INV
473 87 IFF
```

Listing continued on next page

Data Fit to 8 Curves - listing II

```
474  05  05
475  04  04
476  82  82
477  02  2
478  06  6
479  03  3
480  69  □P
481  01  01
482  69  □P
483  05  05
484  03  3
485  05  5
486  07  7
487  00  0
488  69  □P
489  04  04
490  69  □P
491  13  13
492  33  X²
493  69  □P
494  06  06
495  91  R/S
496  76  LBL
497  13  C
498  87  IFF
499  07  07
500  05  05
501  30  30
502  87  IFF
503  06  06
504  05  05
505  30  30
506  69  □P
507  12  12
508  42  STO
509  07  07
510  32  X:T
511  42  STO
512  14  14
513  01  1
514  03  3
515  69  □P
516  04  04
517  32  X:T
518  69  □P
519  06  06
520  91  R/S
521  01  1
522  04  4
523  69  □P
524  04  04
525  43  RCL
526  14  14
527  69  □P
528  06  06
529  91  R/S
530  69  □P
531  12  12
532  42  STO
533  07  07
534  32  X:T
535  42  STO
536  14  14
537  01  1
538  03  3
539  69  □P
540  04  04
541  32  X:T
542  22  INV
543  23  LNX
544  69  □P
545  06  06
546  91  R/S
547  01  1
548  04  4
549  69  □P
550  04  04
551  43  RCL
552  14  14

553  69  □P
554  06  06
555  91  R/S
556  76  LBL
557  14  D
558  98  ADV
559  32  X:T
560  04  4
561  04  4
562  69  □P
563  04  04
564  32  X:T
565  69  □P
566  06  06
567  87  IFF
568  06  06
569  05  05
570  97  97
571  87  IFF
572  04  04
573  06  06
574  10  10
575  87  IFF
576  02  02
577  06  06
578  22  22
579  87  IFF
580  07  07
581  05  05
582  96  96
583  87  IFF
584  05  05
585  06  06
586  04  04
587  87  IFF
588  03  03
589  06  06
590  16  16
591  69  □P
592  14  14
593  61  GTO
594  06  06
595  25  25
596  23  LNX
597  69  □P
598  14  14
599  22  INV
600  23  LNX
601  61  GTO
602  06  06
603  25  25
604  69  □P
605  14  14
606  35  1/X
607  61  GTO
608  06  06
609  25  25
610  35  1/X
611  69  □P
612  14  14
613  61  GTO
614  61  GTO
615  61  GTO
616  33  X²
617  69  □P
618  14  14
619  61  GTO
620  06  06
621  25  25
622  23  LNX
623  69  □P
624  14  14
625  32  X:T
626  04  4
627  05  5
628  69  □P
629  04  04
630  32  X:T
631  69  □P

632  06  06
633  91  R/S
634  76  LBL
635  15  E
636  98  ADV
637  32  X:T
638  04  4
639  05  5
640  69  □P
641  04  04
642  32  X:T
643  69  □P
644  06  06
645  87  IFF
646  06  06
647  06  06
648  99  99
649  87  IFF
650  07  07
651  07  07
652  05  05
653  87  IFF
654  05  05
655  06  06
656  74  74
657  87  IFF
658  04  04
659  06  06
660  80  80
661  87  IFF
662  03  03
663  06  06
664  86  86
665  87  IFF
666  02  02
667  06  06
668  92  92
669  69  □P
670  15  15
671  61  GTO
672  07  07
673  10  10
674  35  1/X
675  69  □P
676  15  15
677  61  GTO
678  07  07
679  10  10
680  69  □P
681  15  15
682  35  1/X
683  61  GTO
684  07  07
685  10  10
686  69  □P
687  15  15
688  34  ΓX
689  61  GTO
690  07  07
691  10  10
692  69  □P
693  15  15
694  22  INV
695  23  LNX
696  61  GTO
697  07  07
698  10  10
699  23  LNX
700  69  □P
701  15  15
702  61  GTO
703  07  07
704  10  10
705  23  LNX
706  69  □P
707  15  15
708  22  INV
709  23  LNX
710  32  X:T

711  04  4
712  04  4
713  69  □P
714  04  04
715  32  X:T
716  69  □P
717  06  06
718  91  R/S
719  00  0

000  76  LBL
001  11  A
002  98  ADV
003  53  (
004  53  (
005  53  (
006  43  RCL
007  03  03
008  65  ×
009  43  RCL
010  25  25
011  75  -
012  43  RCL
013  16  16
014  65  ×
015  43  RCL
016  08  08
017  54  )
018  42  STO
019  06  06
020  65  ×
021  53  (
022  43  RCL
023  03  03
024  65  ×
025  43  RCL
026  16  16
027  75  -
028  43  RCL
029  15  15
030  33  X²
031  54  )
032  42  STO
033  05  05
034  75  -
035  53  (
036  43  RCL
037  03  03
038  65  ×
039  43  RCL
040  23  23
041  75  -
042  43  RCL
043  15  15
044  65  ×
045  43  RCL
046  08  08
047  54  )
048  42  STO
049  04  04
050  65  ×
051  53  (
052  43  RCL
053  03  03
054  65  ×
055  43  RCL
056  21  21
057  75  -
058  43  RCL
059  16  16
060  65  ×
061  43  RCL
062  15  15
063  54  )

064  42  STO
065  02  02
066  54  )
067  55  ÷
068  53  (
069  53  (
070  43  RCL
071  03  03
072  65  ×
073  43  RCL
074  22  22
075  75  -
076  43  RCL
077  16  16
078  33  X²
079  54  )
080  65  ×
081  43  RCL
082  05  05
083  75  -
084  43  RCL
085  02  02
086  33  X²
087  54  )
088  54  )
089  53  (
090  53  (
091  42  STO
092  01  01
093  94  +/-
094  65  ×
095  43  RCL
096  02  02
097  85  +
098  43  RCL
099  04  04
100  54  )
101  55  ÷
102  43  RCL
103  05  05
104  54  )
105  42  STO
106  00  00
107  25  CLR
108  69  □P
109  00  00
110  04  4
111  05  5
112  69  □P
113  01  01
114  06  6
115  04  4
116  00  0
117  00  0
118  01  1
119  03  3
120  04  4
121  04  4
122  69  □P
123  02  02
124  07  7
125  00  0
126  00  0
127  00  0
128  04  4
129  07  7
130  00  0
131  00  0
132  01  1
133  04  4
134  69  □P
135  03  03
136  00  0
137  00  0
138  04  4
139  04  4
140  00  0
141  00  0

142  04  4
143  07  7
144  00  0
145  00  0
146  01  1
147  05  5
148  69  JP
149  04  04
150  69  □P
151  05  05
152  69  □P
153  00  00
154  01  1
155  03  3
156  69  □P
157  04  04
158  43  RCL
159  01  01
160  69  □P
161  06  06
162  91  R/S
163  01  1
164  04  4
165  69  □P
166  04  04
167  43  RCL
168  00  00
169  69  □P
170  06  06
171  91  R/S
172  01  1
173  05  5
174  69  □P
175  04  04
176  25  CLR
177  53  (
178  53  (
179  43  RCL
180  08  08
181  75  -
182  43  RCL
183  01  01
184  65  ×
185  43  RCL
186  16  16
187  75  -
188  43  RCL
189  00  00
190  65  ×
191  43  RCL
192  15  15
193  54  )
194  55  ÷
195  43  RCL
196  03  03
197  54  )
198  82  HIR
199  04  04
200  69  □P
201  06  06
202  91  R/S
203  03  3
204  05  5
205  07  7
206  00  0
207  69  □P
208  04  04
209  53  (
210  53  (
211  43  RCL
212  01  01
213  65  ×
214  43  RCL
215  06  06
216  85  +
217  43  RCL
218  00  00
219  65  ×
```

Listing continued on next page.

Data Fit to 8 Curves - Listing III (final)

```
220  43 RCL
221  04  04
222  54  )
223  55  ÷
224  53  (
225  43 RCL
226  03  03
227  65  ×
228  43 RCL
229  09  09
230  75  -
231  43 RCL
232  08  08
233  33  X²
234  54  )
235  54  )
236  95  =
237  69  DP
238  06  06
239  98  ADV
240  91  R/S
241  76  LBL
242  15  E
243  82  HIR
244  03  03
245  04  4
246  04  4
247  69  DP
248  04  04
249  82  HIR
250  13  13
251  69  DP
252  06  06
253  33  X²
254  65  ×
255  43 RCL
256  01  01
257  95  =
258  85  +
259  53  (
260  82  HIR
261  13  13
262  65  ×
263  43 RCL
264  00  00
265  54  )
266  85  +
267  82  HIR
268  14  14
269  95  =
270  32  X:T
271  04  4
272  05  5
273  06  6
274  05  5
275  69  DP
276  04  04
277  32  X:T
278  69  DP
279  06  06
280  98  ADV
281  91  R/S
```

Analysis and Adjustment of Survey Measurements, by Edward M. Mikhail, Ph.D., and Gordon Gracie, Ph.D.
Available from: Van Nostrand Reinhold
Price: $28.50

This is an excellent book not only for surveyors but all people who have to analyze and adjust data. This book includes an introduction to matrix algebra, least squares adjustment, probability and statistics, and pre-analysis. Matrix algebra is introduced in an easily understandable manner.

Topics covered include:

- Basic concepts -- measurement, error, probability and reliability
- Basic processes -- error propagation and linearization
- Adjustment -- simple procedures to least squares
- Probability -- random variables, probability distributions, expectation, variance, covariance and sampling
- Pre-analysis -- how propagation applies to the pre-analysis of measurements
- Survey statistics -- sampling distributions, statistical estimation, testing and error ellipses
- Plane coordinate surveys -- least squares adjustment of plane coordinate surveys

Pre-analysis is the analysis of component measurements before any work has begun. It provides the basis for evaluating the accuracy required for each measurement, meeting tolerances that may be imposed upon these measurements and for selection of suitable instrumentation and measurement procedures. If the reviewer had followed the procedure, it would have saved over two months of field work and office time.

Since the least squares adjustment requires a linear function (and what usable function is ever linear), the authors tell us how to linearize a function, do the adjustment and iterate this procedure until the desired accuracy is obtained. The methods of direct and indirect observations are discussed.

This book is filled with many worked-out examples in each section, which are easily followed, and show how everyday problems can be quickly solved.

Reviewed by Frank Blachly

ADDING MACHINE,- Did you know that your TI-59 cum PC 100 can be converted to the perfect office adding machine? And that the conversion takes only one half second? Just put your machine in the TRACE mode. To add, or subtract, a row of numbers, first press CLR then, say 123.45 + 345.67 + ... 22.23 - 10.99 = and see the result. I was very surprised that the large majority of TI-59 owners didn't know about this trick. I teach TI-59 programming, as you know, and make it a practice to ask the students about it at each seminar. Only one in twenty on the average knows about it.

MICROSTRIP, - Wallace Agy. An EE program. It calculates the width of lines or characteristic impedance of a printed circuit strip conductor opposite a ground plane. (microstrip) The following formula is used:

$Z = 87 / \sqrt{e_r + 1.41} \cdot \ln (5.98 \cdot h / 0.8 \cdot W + t)$

A Constant of 4.75 is used for e_r, the dielectric constant of the board. (For t, 0.0015) (1 oz copper)

t=thickness of the copper, h=thickness of the board, W=width of the copper strip.

Load the program, sides 1 & 2 and memories side 4. Press E to initialize.

Prompts are given. Press E to restart, or letter (A or B) to change parameters and recalculate.

```
**********

 MICROSTRIP DESIGN

**********

WHAT IS UNKNOWN ?

LINE WIDTH = A
IMPEDANCE  = B

IMPEDANCE ? R/S
      50.

BOARD THK ? R/S
      0.062

LINE WIDTH IS:
     0.1094

**********

LINE WIDTH? R/S
       0.1

BOARD THK ? R/S
      0.062

IMPEDANCE  IS:
      53.10

**********
```

NUMERIC	ALPHA	REG
302415	MIC	03
3532363735	RDSTR	04
2433001617	IP DE	05
3624223100	SIGN	06
4323133700	WHAT	07
2436004131	IS UN	08
2631324331	KNOWN	09
71000000	?	10
2724311700	LINE	11
4324163723	WIDTH	12
2430331716	IMPED	13
1331151700	ANCE	14
1432133516	BOARD	15
37232600	THK	16
24366200	IS:	17
7100356336	? R/S	18
64001300	= A	19
64001400	= B	20
0		21
5151515151	*****	22

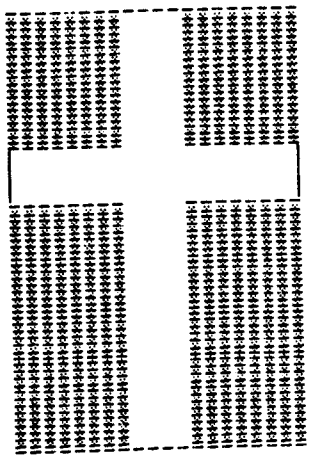
```
000  76 LBL
001  16 A'
002  69 DP
003  20  20
004  73 RC*
005  00  00
006  92 RTN
007  76 LBL
008  17 B'
009  69 DP
010  00  00
011  16 A'
012  69 DP
013  01  01
014  16 A'
015  69 DP
016  02  02
017  92 RTN
018  76 LBL
019  10 E'
020  16 A'
021  69 DP
022  03  03
023  16 A'
024  69 DP
025  04  04
026  69 DP
027  05  05
028  92 RTN
029  76 LBL
030  18 C'
031  43 RCL
032  22  22
033  69 DP
034  01  01
035  69 DP
036  02  02
037  69 DP
038  03  03
039  69 DP
040  04  04
041  69 DP
042  05  05
043  69 DP
044  00  00
045  98 ADV
046  92 RTN
047  76 LBL
048  15  E
049  18 C'
050  02  2
051  42 STO
052  00  00
053  01  1
054  08  8
055  42 STO
056  02  02
057  17 B'
058  10 E'
059  98 ADV
060  18 C'
061  17 B'
062  10 E'
063  98 ADV
064  17 B'
065  71 SBR
066  95  =
067  17 B'
068  71 SBR
069  95  =
070  98 ADV
071  92 RTN
072  76 LBL
073  11  A
074  01  1
075  02  2
076  42 STO
077  00  00
078  17 B'
079  71 SBR
080  85  +
081  91 R/S
082  42 STO
083  01  01
084  99 PRT
085  98 ADV
086  17 B'
087  71 SBR
088  85  +
089  91 R/S
090  42 STO
091  23  23
092  99 PRT
093  98 ADV
094  65  ×
095  05  5
096  93  .
097  09  9
098  08  8
099  95  =
100  23 LNX
101  85  +
102  53  (
103  53  (
104  43 RCL
105  01  01
106  65  ×
107  02  2
108  93  .
109  04  4
110  08  8
111  01  1
112  09  9
113  54  )
114  55  ÷
115  08  8
116  07  7
117  54  )
118  94 +/-
119  54  )
120  32 X:T
121  02  2
122  93  .
123  07  7
124  01  1
125  08  8
126  03  3
127  45 Y^x
128  32 X:T
129  95  =
130  75  -
131  93  .
132  00  0
133  00  0
134  01  1
135  05  5
136  95  =
137  55  ÷
138  93  .
139  08  8
140  95  =
141  32 X:T
142  01  1
143  00  0
144  42 STO
145  00  00
146  17 B'
147  43 RCL
148  17  17
149  69 DP
150  03  03
151  69 DP
152  05  05
153  32 X:T
154  58 FIX
155  04  04
156  99 PRT
157  22 INV
158  58 FIX
159  98 ADV
160  18 C'
161  92 RTN
162  76 LBL
163  12  B
164  01  1
165  00  0
166  42 STO
167  00  00
168  17 B'
169  71 SBR
170  85  +
171  91 R/S
172  42 STO
173  01  01
174  99 PRT
175  98 ADV
176  02  2
177  44 SUM
178  00  00
179  17 B'
180  71 SBR
181  85  +
182  91 R/S
183  42 STO
184  23  23
185  99 PRT
186  98 ADV
187  43 RCL
188  01  01
189  65  ×
190  93  .
191  08  8
192  85  +
193  93  .
194  00  0
195  00  0
196  01  1
197  05  5
198  95  =
199  32 X:T
200  43 RCL
201  23  23
202  65  ×
203  05  5
204  93  .
205  09  9
206  08  8
207  95  =
208  55  ÷
209  32 X:T
210  95  =
211  23 LNX
212  65  ×
213  03  3
214  05  5
215  93  .
216  00  0
217  05  5
218  95  =
219  32 X:T
220  01  1
221  02  2
222  42 STO
223  00  00
224  17 B'
225  43 RCL
226  17  17
227  69 DP
228  03  03
229  69 DP
230  05  05
231  32 X:T
232  58 FIX
233  02  02
234  99 PRT
235  22 INV
236  58 FIX
237  98 ADV
238  18 C'
239  92 RTN
240  76 LBL
241  95  =
242  69 DP
243  22  22
244  73 RC*
245  02  02
246  69 DP
247  03  03
248  69 DP
249  05  05
250  69 DP
251  00  00
252  92 RTN
253  76 LBL
254  85  +
255  43 RCL
256  18  18
257  69 DP
258  03  03
259  69 DP
260  05  05
261  92 RTN
```

FLAGS,- In v6n4/5p8 Richard Snow showed us how to draw the Stars and Stripes by means of
----- our newly discovered Graphics Mode. The members of Programbiten, our sister club in Sweden, have been busy drawing their respective country flags, the ones from Sweden, Norway, Danmark, Finland and Iceland.

Their procedure is similar to Richard's as you will notice. Press E to initialize. Instructions for key strokes in keyboard mode will be listed. This particular program to draw the Swedish flag is by Björn Gustavsson.

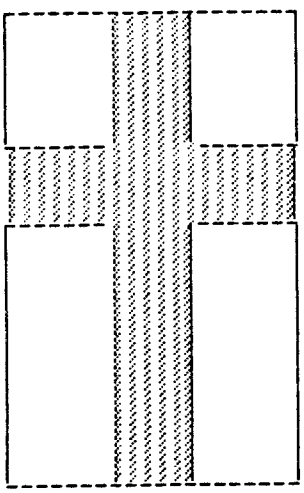
TRYCK NED:

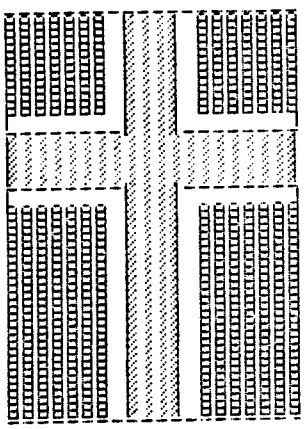
```
143  25 CLR
144  61 GTO
145  00  00
146  24  24
147  36 PGM
148  19  19
149  71 SBR
150  00  00
151  45  45
152  37 P/R
153  31 LRN
154  46 INS
155  31 LRN
156  81 RST
157  25 CLR
158  11  A
159  98 ADV
```

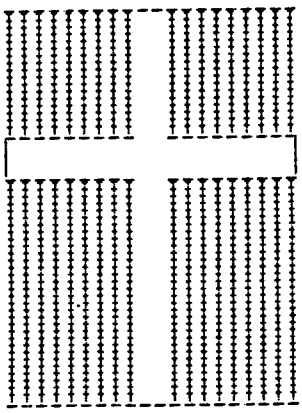


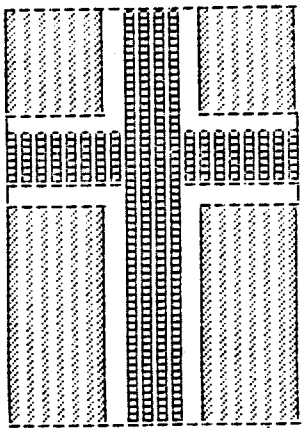
```
   31171662.   90
3735451526.   91
  646464.     92
6464640000.   93
   25.        94
2700000000.   95
  515151.     96
5151510000.   97
5151515151.   98
6464646464.   99
```

```
000  92 RTN
001  76 LBL
002  11  A
003  61 GTO
004  00  00
005  33  33
006  76 LBL
007  16 A'
008  43 RCL
009  99  99
010  69 DP
011  01  01
012  69 DP
013  02  02
014  69 DP
015  03  03
016  69 DP
017  04  04
018  76 LBL
019  17 B'
020  25 CLR
021  69 DP
022  05  05
023  68 NOP
024  74 SM*
025  80  80
026  00  0
027  00  0
028  00  0
029  00  0
030  00  0
031  00  0
032  02  2
033  00  0
034  42 STO
035  00  00
036  98 ADV
037  16 A'
038  43 RCL
039  98  98
040  69 DP
041  01  01
042  69 DP
043  04  04
044  43 RCL
045  97  97
046  69 DP
047  02  02
048  43 RCL
049  96  96
050  69 DP
051  03  03
052  17 B'
053  97 DSZ
054  00  00
055  00  00
056  53  53
057  69 DP
058  00  00
059  43 RCL
060  95  95
061  69 DP
062  01  01
063  43 RCL
064  94  94
065  69 DP
066  04  04
067  17 B'
068  17 B'
069  17 B'
070  17 B'
071  17 B'
072  17 B'
073  17 B'
074  17 B'
075  68 NOP
076  43 RCL
077  99  99
078  69 DP
079  01  01
080  69 DP
081  04  04
082  43 RCL
083  93  93
084  69 DP
085  02  02
086  43 RCL
087  92  92
088  69 DP
089  03  03
090  17 B'
091  03  3
092  06  6
093  42 STO
094  00  00
095  43 RCL
096  98  98
097  69 DP
098  01  01
099  69 DP
100  04  04
101  43 RCL
102  97  97
103  69 DP
104  02  02
105  43 RCL
106  96  96
107  69 DP
108  03  03
109  17 B'
110  97 DSZ
111  00  00
112  01  01
113  10  10
114  16 A'
115  98 ADV
116  98 ADV
117  98 ADV
118  98 ADV
119  00  0
120  92 RTN
121  76 LBL
122  15  E
123  25 CLR
124  35 1/X
125  69 DP
126  17  17
127  98 ADV
128  69 DP
129  00  00
130  43 RCL
131  91  91
132  69 DP
133  01  01
134  43 RCL
135  90  90
136  69 DP
137  02  02
138  69 DP
139  05  05
140  98 ADV
141  25 CLR
142  90 LST
143  25 CLR
144  61 GTO
145  00  00
146  24  24
147  36 PGM
148  19  19
149  71 SBR
150  00  00
151  45  45
152  37 P/R
153  31 LRN
154  46 INS
155  31 LRN
156  81 RST
157  25 CLR
158  11  A
159  98 ADV
```









Transparent Fast Mode - Palmer O. Hanson,Jr.

Ever since I became aware of Patrick Acosta's hexadecimal hl2 method for entering fast mode under program control I have been searching for a program sequence which would make the use of fast mode "transparent" to the user. That is, once the hl2 command has been properly placed with one of Patrick's techniques, then normal mode can be used for program entry from the keyboard, the calculator will automatically enter fast mode under program control, and the calculator will automatically be returned to normal mode at the end of the program sequence.

This automatic return to normal mode has not been available with earlier programs using the hl2 technique, particularly if the printer is used (V6N8p4 of TI PPC Notes). This limitation was the reason that the fast mode instructions for Patrick's 1 minute 23 second calendar printer, my 12 digit modulo 210 speedy factor finder, and my 13 digit modulo 30 speedy factor finder all called for the use of a RST from the keyboard to return the calculator to normal mode after completion of fast mode calculations.

Implementation of automatic return to normal mode requires two additional program steps. An R/S command (code 91) must be placed at location 000. The fast mode program sequence must be terminated with a RST command (code 81). However, for the RST command to be recognized during fast mode it must be immediately preceded by CLR, 2nd CLR, Pause, Print, the sequence EE-INV-EE or one of the number keys. This is the same rule that applied for an R/S to be recognized during fast mode (item 6 on V6N9/10p19 of TI PPC Notes). A fast mode demonstration program was written which not only includes the transparent method of fast mode operation, but also illustrates other hl2 fast mode concepts. The instructions for the demonstration program are:

1. Enter the program. An R/S is required at location 000. The remaining instructions are entered from locations 055 through 099. The Stflg 12 sequence at locations 071/072 can be entered by the key sequence 2nd-Stflg-B. The demonstration program is similar to Martin Neef's original counting program (V5N6p4 of TI PPC Notes) but with the ability to operate in either normal mode or in fast mode.

2. Press A to demonstrate normal mode. After about 36 seconds see a 3. in the display. Since the value of pi was called at location 097, the display of a 3. shows that the calculator is in Fix 0 mode as set by the commands at locations 069/070. In normal mode the calculator runs by the Stflg-12-Rad-CLR sequence at locations 071 through 074, sets flag 2 in the process, and jumps to location 082 when the B command at location 075 is encountered. You need not worry about filling up the subroutine return register by the use of B rather than GTO-B (see V6N6/7p30 of TI PPC Notes for a discussion of that problem) since the subroutine register will be cleared by the RST at location 099. The STO-16-R/S sequence at locations 076 through 078 is not used in normal mode, but is required to obtain the desired commands after the fast mode initialization process. The Pair of Nop instructions at locations 087/088 is required to permit use of the same absolute address for both normal and fast mode for the INV-EQ-089 test at locations 093 through 096.

3. Initialize for fast mode by synthesizing an h12 command at location 072. The initialization also changes other commands.

a. Press INV-Fix and see pi in the display.

b. Press 10-Op-17 and see 159.99 in the display. This sets the partitioning required by the initialization process.

c. Press CLR-STO-00-GTO-072. See a zero in the display. This locates the program pointer for the initialization and clears data register R00.

d. Press Pgm-12-SBR-999 and see a flashing 0. in the display. Do not clear the flashing display at this step or at either of the two following steps.

e. Press R/S and see a flashing 0. 00 in the display. If R00 had not been cleared in step 3.c above there would have been a 100 in R00 left over from the normal mode demonstration. In that case there would have been a 1. 02 in the display at this point and the synthesis of hexadecimal code would not occur. More generally, if R00 contains anything other than a zero at the start of the Pgm-12-SBR-999 sequence then the synthesis of hexadecimal code will not work as planned.

f. Press DMS. See a flashing 0 in the display.

g. Press LRN. See 072 03 in the display.

h. Press Ins. See 072 03 in the display.

i. Press Ins a second time. See 072 03 in the display.

j. Press LRN-RST-CLR and see a zero in the display.

k. If a printer is attached press GTO-072-List. The listing will show altered instructions at locations 073 through 079, two inserted instructions at locations 080 and 081, and the instructions which had been in locations 080 through 099 pushed down two steps to locations 082 through 101. Without a printer press GTO-072-LRN and SST through the program to verify the changes due to initialization. The command at location 072 seems to be unaltered. Either a program listing or a readout in LRN mode shows a 12 both before and after the initialization process. Location 072 was selected for the synthesizing of the h12 command to demonstrate this curious phenomena. The code in ROM as indicated by step 3.g is 03. The double insert sequence at steps 3.h and 3.i causes a two time hexadecimal subtraction of 03 from the 12 in RAM yielding a residual hexadecimal code of 0C at location 072 or RAM. 0C lists and displays as 12, but provides the h12 command (to use Patrick Acosta's notation) which permits fast mode entry.

l. Press A to demonstrate operation in fast mode. After about 22 seconds see a 3. in the display. Again, the 3. indicates that the calculator is in Fix 0 mode.

m. Press GTO-065-LRN-Nop-Lrn. The +/- instruction at location 065 has been changed to a Nop. This will change the sign of the initialization constant which must be in the display when the Stflg-h12 sequence is encountered. Press A to demonstrate fast mode with a positive initialization constant. After about 22 seconds see pi in the display. This demonstrates that certain initialization constants will cause the fix mode to change at fast mode entry, in this case to Fix 9.

n. Press GTO-069-LRN-Nop-Nop-Lrn. The Fix 0 instruction which had been at locations 069/070 have been changed to Nop instructions. Press A to demonstrate fast mode without a controlled Fix 0 mode prior to fast mode entry. After about 22 seconds pi will appear in the display. This demonstrates that the Fix 9 mode is permissible at fast mode entry if the initialization constant in the display contains no fractional part--see V6N8p3 of TI PPC Notes.
o. Press Fix 2. Then press A. After about 38 seconds see 3.14 in the display. This illustrates that fast mode entry with the Stflg-hl2 sequence cannot be obtained if the fix mode is other than 0 or 9. To avoid potential problems with left-over fix modes it is adviseable to include control of the fix mode prior to the fast mode entry sequence.
p. Press B to demonstrate normal mode. After about 36 seconds see 3.14 in the display. The display is still controlled by the Fix 2 mode.
q. Press INV-Fix to return to Fix 9 mode. press GTO-100-LRN-Nop-Lrn. This changes the Pause instruction which preceded the RST instruction to a Nop instruction. Press A and watch the flashing C at the left edge of the display closely. After about 22 seconds the variations in intensity of the flashing C will stop, and a dim steady C will appear at the left edge of the display. You will be unable to clear this state without turning the calculator off. This demonstrates the necessity that RST be preceded by certain instructions if it is to be recognized during fast mode.

In a subsequent article I will explain the easy way to control the changed instructions in the seven program locations immediately following the 0 modulo 8 locations which must be used for hexadecimal code synthesis. In the meantime, happy hexadecimal programming.

See listings on next page, please.

MODULE SELECTOR.- In last issue I wondered out loud whatever had happened to the module selector announced last year by American Microproducts. Well, I have received two of their production models, the manual one and the automatic one. I am impressed. They work just fine. The automatic one is available at $ 199.95 and the manual one at $ 119.95.

The automatic one is housed in a small, attractive plastic case and attached to the module port of the 59 by a flat cable and a connector looking like a module casing. The manual one fits inside the door of the PC100 (in fact you get a new door) and has a manual switch to change up to four modules.

Neither of the two requires external power. They derive all their power necessary from the calculator or printer itself.

I was very surprised to find that the manual model proved for me the most practical one of the two. It works just fine with all my older programs, in which I used mostly the ML module, but sometimes also the EE, the STAT or the M/U modules. Thus, those four are now permanently installed in the manual module selector. On the other hand, I haven't found time yet, and patience, to write a program where I could use fully the capabilities of the automatic module selector. Maybe it is due to the old adage of one not being able to teach an old fool new tricks.

So to sum it all up, I am very happy with the manual module selector and only moderately so with the automatic one. This, of course, not due to any flaw in quality. Both work without a hitch.

If you are in the market for such a device, write to American Microproducts Inc. 705 North Bowser, Richardson TX 75080, or call them at (214) 238-1815.

As always, foreign members may write directly to me. We'll arrange it somehow that you get it.

Before Initialization

000	91	R/S
001	00	0
002	00	0
003	00	0
004	00	0
005	00	0
006	00	0
007	00	0
008	00	0
009	00	0
010	00	0
011	00	0
012	00	0
013	00	0
014	00	0
015	00	0
016	00	0
017	00	0
018	00	0
019	00	0
020	00	0
021	00	0
022	00	0
023	00	0
024	00	0
025	00	0
026	00	0
027	00	0
028	00	0
029	00	0
030	00	0
031	00	0
032	00	0
033	00	0
034	00	0
035	00	0
036	00	0
037	00	0
038	00	0
039	00	0
040	00	0
041	00	0
042	00	0
043	00	0
044	00	0
045	00	0
046	00	0
047	00	0
048	00	0
049	00	0
050	00	0
051	00	0
052	00	0
053	00	0
054	00	0
055	76	LBL
056	11	A
057	02	2
058	85	+
059	02	2
060	52	EE
061	01	1
062	02	2
063	94	+/-
064	95	=
065	94	+/-
066	22	INV
067	52	EE
068	60	DEG
069	58	FIX
070	00	00
071	86	STF
072	12	12
073	70	RAD
074	25	CLR
075	12	B
076	42	STO
077	16	16
078	91	R/S
079	68	NOP
080	76	LBL
081	12	B
082	47	CMS
083	01	1
084	00	0
085	00	0
086	32	X:T
087	68	NOP
088	68	NOP
089	69	OP
090	20	20
091	43	RCL
092	00	00
093	22	INV
094	67	EQ
095	00	00
096	89	89
097	89	π
098	66	PAU
099	81	RST

After Initialization

072	12	B
073	68	NOP
074	68	NOP
075	70	RAD
076	61	GTO
077	00	00
078	84	84
079	91	R/S
080	80	GRD
081	68	NOP
082	76	LBL
083	12	B
084	47	CMS
085	01	1
086	00	0
087	00	0
088	32	X:T
089	68	NOP
090	68	NOP
091	69	OP
092	20	20
093	43	RCL
094	00	00
095	22	INV
096	67	EQ
097	00	00
098	89	89
099	89	π
100	66	PAU
101	81	RST

USING PROGRAMMABLE CALCULATORS FOR BUSINESS,- Louis Hohenstein. Delta Business Publications, P.O.Drawer 166, 1175 Peachtree Street NE, Atlanta, GA 30361. $ 10.50 soft bound, 6 3/4 by 10 inches, 256 pages. OCT 1981. Also available: John Wiley & Sons, 605 Third Ave. New York NY 10158.

Louis Hohenstein is a member of the TI PPC NOTES. Louis is also a recognized management specialist, and industrial engineer and a business writer. And, in my humble opinion, Louis is a fantastic programmer of the TI-59.

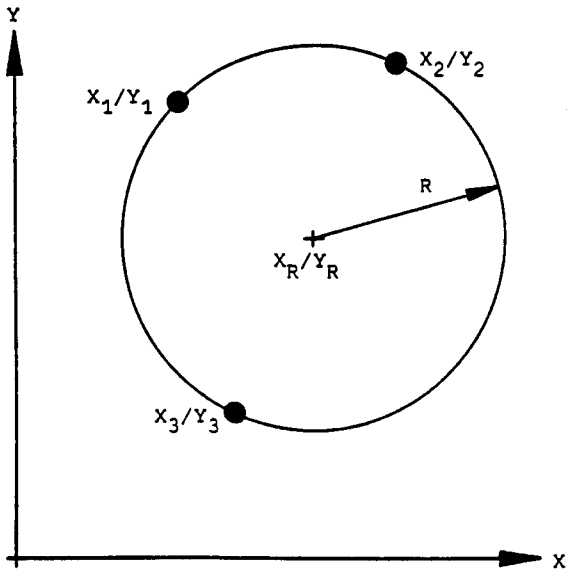
This book is highly recommended if you are using, or intend to use, you TI-59 for business. It explains what sort of calculators there are on the market for use in business, (even the HP-41C, which proves that Louis is not prejudiced at all with respect to calculators) it explains business forms and practices (which I find fascinating, especially the clear and simple way it has been explained to me for the very first time in my life) and it provides you with a wealth of TI-59 business program which come accompanied by lost of documentation.

One small shortcoming: the programs are all contained in an appendix, at the end of the book. When the use of the programs themselves is explained in the book, the documentation does not tell where to find them, on what page. That can be frustrating at times.

In the tradition of the Guide Michelin, I give this book *****.

TI-57 CIRCLE THROUGH THREE POINTS, Ingvar Magnusson.(Programbiten)

User instructions: Enter X1 and press STO 0, enter Y1 and press STO 1, enter X2 and press STO 2, enter Y2 and press STO 3, enter X3 and press STO 4 and finally enter Y3 and press STO 5. Then press RST R/S and see R. RCL 4 will make XR appear and RCL 5 will make YR appear.



00	33	4	RCL 4	25	23		X^2
01	-34	0	INV SUM 0	26	75		+
02	-34	2	INV SUM 2	27	33	0	RCL 0
03	33	5	RCL 5	28	39	7	PRD 7
04	-34	1	INV SUM 1	29	23		X^2
05	-34	3	INV SUM 3	30	85		=
06	33	2	RCL 2	31	39	3	PRD 3
07	55		×	32	39	2	PRD 2
08	33	1	RCL 1	33	33	3	RCL 3
09	65		-	34	-34	1	INV SUM 1
10	33	0	RCL 0	35	33	7	RCL 7
11	55		×	36	-34	2	INV SUM 2
12	33	3	RCL 3	37	33	6	RCL 6
13	85		=	38	-39	1	INV PRD 1
14	32	6	STO 6	39	-39	2	INV PRD 2
15	34	6	SUM 6	40	33	1	RCL 1
16	33	2	RCL 2	41	34	4	SUM 4
17	23		X^2	42	23		X^2
18	75		+	43	75		+
19	33	3	RCL 3	44	33	2	RCL 2
20	23		X^2	45	34	5	SUM 5
21	85		=	46	23		X^2
22	32	7	STO 7	47	85		=
23	38	1	EXC 1	48	24		$\sqrt{X}$
24	39	1	PRD 1	49	81		R/S

INV' (code 27) works like INV (code 22) except in two cases, says John Allen of Nashua, New Hampshire. When followed by X=T or X≥T, the t-comparison is not made and the instruction pair has the same effect as a simple GTO. For the second case, we recall that INV has no effect preceeding a simple letter subroutine call (A, B, etc.) but John finds that INV' A is like a simple A except that the label search starts at step 001 instead of 000. If we wrote, starting at the top of the listing, LBL A 2 + INV' A = RTN LBL A X^2 RTN, pressing A gets 6; but if we insert a zero at step 000 so that the first LBL A starts at step 001, we get a never-ending loop !

Maybe someone will find a use for these quirks or discover another meaning for INV'. I think we have always known that a program can distinguish INV' from INV as labels, although the mnemonics both list as INV.

NEW CROM DISCOVERIES.- R.A.H. Prins, of Delft, the Netherlands, writes:
"1. It is possible to download the CROM by simply calling a non-existent module. This will also enable us to initiate Graphics Mode without having a module plugged in.
2. It is possible to execute as a program the constants in CROM after step 380.

The first discovery is, in my opinion, of the greatest practical importance. The second one, which I discovered first, is fundamentally important and therefore I would like to start with a description of it here:

How did I discover it? Experimenting with sequences such as the one's by Patrick Acosta, (= xxx + 0.000000 xyzq = FIX 0 STF 7 INV) I discovered q = 2, 4 and 6 will put the calculator in Fast Mode, starting on step 8 X xy + z + 1 $\leq$ 473 (except when z = q, then -1)

When xyz $\leq$ 473 and q = 8 something is executed , even if no program nor module is present. The program executed here always ends in 0.78 in the display, but pressing = results in a display of 1.00.

When I subsequently placed the calculator in LRN, it showed to be on step 397, which elicited from me a cry of joy. What did happen here? If you compare the listing of CROM you find on steps 380-397 the following program:

B IND PRT RTN |x| FIX 2 LNX Y^X PRT DIV GRD SBR D, with D at step 397.

The calculator is in Fast Mode and status negates any RTN before step 397. It further crashes with a call to D.

The B on step 384 is, in my opinion, a hex code equal to 2. This explains then also a flashing display with 0.78 = ln(2) Y^X ln(2) with a pending DIV.

When LBL D is difined as follows: LBL D 1 PAU 2 PAU 3 PAU, then that part is executed perfectly. But the calculator now crashes on the $\bar{x}$ on step 403 and only turning it off and on again will do any good.

If you take for xyz = 503 then turning the calculator into LRN mode will reveal step 406 and now it is possible to SST to step 575. If you now go out of LRN again and and press SBR 0 LRN you will be at step 000 of the listing of the internal CROM. In order to list the CROM commands you will have to replace the LRN by LIST. If you use exclusiwley LRN's, however, you will see that each LRN advances you in the listing up to step 397. In order to go to a step larger than 100 use the following method: Store 100 in R00 and after you go into LRN at step 406 you press LRN SBR IND 00 followed by LRN again.

The re-starting of the program makes it a little more difficult to, say, initialize for example Plot 60. My method is:

999 + 0.0000005038 = FIX 0 STF IND 7 INV LRN CLR SBR 24 LRN INS SST SST SST BST RST .

You will now find at step 24 the code 1F. The RST on step 26 which you entered IS there in reality. This explains the why of the three SST's. We need three of them in this case, sometimes we need more of them. I was unable to find out why.

The greatest advantage of this method that it is possible to implant hex codes on each step from 000 through 872, (only the octet positions, of course) except on steps 576 through 799. Just store the address in R00 and go to it with SBR IND 00.

The advantage of this method is that it is possible to initialize the Graphics Mode without finding out which module happens to be in the calculator or even if there is one at all.

A last remark about above: Try, for example, 999 + 0.00000p5038 = FIX 0 STF IND 7 INV. The calculator now goes in LRN to step 406 + p X 800.

In order to compute xyz I have enclosed a short program. (listing) To use it, enter nnn and press A. Program returns with xyz."

000	76	LBL	008	54	)	016	82	HIR	024	82	HIR
001	11	A	009	55	÷	017	58	58	025	18	18
002	53	(	010	08	8	018	65	×	026	75	-
003	53	(	011	54	)	019	01	1	027	93	.
004	46	INS	012	53	(	020	00	0	028	05	5
005	75	-	013	82	HIR	021	85	+	029	54	)
006	93	.	014	08	08	022	08	8	030	92	RTN
007	01	1	015	59	INT	023	65	×			

Hydrologic and Hydraulic Calculation in BASIC for small Computers by Dr. Thomas E. Croley II, PhD.

Available from Institute of Hydraulic Research, University of Iowa, Iowa City, Iowa 52242 Price: $25

All you people out there who have small computers in addition to your calculators and who were wishing for Hydraulics software can now breathe a sigh of relief. Dr. Croley has done it again!

Following the same format as his two earlier books (V6N6/7P19), this book contains 21 programs written in BASIC (Microsoft, Inc's Version 5.1). Each program has a brief background section, program listing, user directions, example programs, and references.

The following topics are covered in this book: Unit Hydrograph from Complex Hydrograph; Linear Reservoir Cascade Unit Hydrograph; Synthetic Hydrographs (Gamma and Horton-Izzard); Overland Flow; Unit Hydrograph; Natural Channel Properties; Uniform and Critical Flow; Water Surface Profiles (Direct Step, Numerical Integration and Standard Step); Hydrograph Routing (Muskingum, Characteristic Reaches, and Kinematic); Log-Pearson Type III Distribution; Well Hydraulics (Steady and Unsteady Radial Flow); and Turbulent Pipe Flow.

These programs are available on an 8-inch floppy disk in standard CP/M format: single-sided, single-density, soft-sectored, 128 bytes per sector. The programs can be easily modified for use in other versions of BASIC. The disk is available for $100 each and comes with a 90-day warranty.

Review by Frank Blachly

A GRAPHIC UNDERLINING SUBROUTINE.- Lars Hedlund publishes this useful SBR in Program-biten 81-3, p11. It will produce a line of twenty identical characters when you have that character code in the display and you call it with A. You may, of course, call this routine (and define it that way) with any user-defined or common label of your own choice.

```
000  76 LBL      009  05  05
001  11  A       010  82 HIR
002  55  ÷       011  06  06
003  09  9       012  82 HIR
004  09  9       013  07  07
005  85  +       014  82 HIR
006  01  1       015  08  08
007  95  =       016  69 DP
008  82 HIR      017  05  05
                 018  92 RTN
```

```
GGGGGGGGGGGGGGGGGGGG
HHHHHHHHHHHHHHHHHHHH
22222222222222222222
00000000000000000000
11111111111111111111
22222222222222222222
33333333333333333333
44444444444444444444
55555555555555555555
YYYYYYYYYYYYYYYYYYYY
ZZZZZZZZZZZZZZZZZZZZ
++++++++++++++++++++
xxxxxxxxxxxxxxxxxxxx
```

```
********************
xxxxxxxxxxxxxxxxxxxx
********************
rrrrrrrrrrrrrrrrrrrr
nnnnnnnnnnnnnnnnnnnn
eeeeeeeeeeeeeeeeeeee
((((((((((((((((((((
))))))))))))))))))))
00000000000000000000
00000000000000000000
00000000000000000000
```

ACTIVE FILTER DESIGN HANDBOOK,- G.S. Moschytz and Petr Horn, (dept. of Electrical Engineering, Institut fuer Fernmeldetechnik (telecommunications) Zurich, Switzerland) For Use with Programmable Pocket Calculators and Minicomputers, John Wiley & Sons, New York, 1981, 316 pages.

This well-written book on filter design contains eight chapters explaining the theory and practice of designing active electronic filters:

1. Introduction.
2. Frequency response and transfer function.
3. Sensitivity and figure of merit.
4. Design equations and flow charts.
5. Building blocks for cascaded filter design.
6. Tuning active filters.
7. Designing n-th order active filters.
8. Practical hints for active filter design.

In addition to the above eight chapters, the book contains 23 programs written in three different computer languages: TRS-80 Basic, Fortran and TI-59. (inexplicably, the authors insist , at various places in the book, that it is SR-59, instead of TI-59. Somebody along the line should have caught this disturbing error. It will hold back a lot of prospective costumers for the book, as they will not be sure if this is just an error or if maybe TI came out with a new calculator they didn't know of.)

The programs, in any of the three languages, work just fine, although the TI-59 could have been optimized a little.(things such as "SBR E'" or ")))=" could have been weeded out.) I calculated two filters, chosen at random, using each one of the computing languages. Then I actually built those filters on the bench. They worked as predicted within narrow tolerances. They only needed the most minimal fine adjustments.

I would have loved to see the menu (especially in Basic) written in plain English, rather than in cryptic acronyms. Does anybody know, right off the bat, what a BR-L/HPN-MQ is, pray tell? (it stands for Band Reject, Low/High Pass Notched, Medium Quality factor.) Memory is not that scarse anymore, is it? You might want to change that in your Basic or TI-59 programs. Even in the latter, there are oodles of memory left over, so that you may write the titles in plain English.

In total, I highly recommend this book to the practicing EE or electronics technician who wants to design active filters. It will save you time and aggravation. (see also "high blood pressure" and related ills.) It will take you more than several evenings to work your way through the book. But you will have learned everything there is to be learned about filters. You will never need another book. This one is THE bible.

THE MARKET PLACE,- This is a new feature we are instituting this time: Any member who wants to sell any surplus machines or supplies may advertise here. Please include your name and either your address or your telephone number or both. Prospective buyers should be able to contact you somehow. I have enough to do with writing the newsletter, so I can't be enthrusted with running a message service for you.

For Sale: TI-59 plus PC100A plus several modules, books, etc. Asking $ 250.00. Call Richard Schwartz in Arcadia, CA, tel.: (213) 447-6574.

For sale: TI-59 plus PC100A. Used five hours total. Asking $ 220.00. Contact Zoltan Kocsis, 13908 Castle Blvd. Silver Spring MD, 20904.
Call evenings (301) 890-6966.

TI-59's REVERSE-POLISH ROUTINE SIMPLIFIES COMPLEX ARITHMETIC, - John Bunk, University of Pittsburgh, PA. in Electronics, VOV 30, 1981, pp 135-135. By using a six-register stack the author was able to simplfy the programming for the usual complex arithmetic routines: A + Z, A - Z, A X Z, A DIV Z, A^Z, e^Z and 1/Z. Obviously, the author is an accomplished RPN programmer as well (no parenthesis whatsoever used!) but his AOS programming is also superb: a nice, concise style.

A TALKING TI-59.- Sensory Interface Equipment Inc., 4442 Kasson Road, Syracuse NY, 13215, has produced an exciting product: speech capability for the visually impaired, to be used in conjunction with the TI-59. As the market for this product is not very large, such things do not come cheap though. It is $ 1095.00 including a rechargable battery. Write Larry Waldon at the above address or call him after 5.00 PM (EST) at (315) 469-7182.

The device is really "Anwenderfreundlich." It could be considered an audible replacement for the PC100. It has provisions for slow speech, while learning to use the system. All data and keystrokes are spoken. Display is spoken whenever a computation is finished. It will also do a "trace" by speaking every instruction while running a program!

Of course it also does a respectable LIST. A few special ways of saying keys take a little to get used to: It says the MULTIPLY key as "STAR", the DIVIDE key as "SLASH" and the 2ND key as "UPPERCASE." An error condition is signalled by "MARK", probably for "QUESTION MARK" and something very attractive, it says all the keys A' through E' as "A BEEP" through E BEEP."

There is even a short mode, to save you time in LRN or LIST mode. In this short mode only the instruction code is spoken in the LRN mode and only the line number and the mnemonic in the LIST mode.

And to make it even more friendly to the user, the unit can be supplied such that it is possible to use it simultaneously with the TI-59 and the PC100.

No modification is required to your TI-59, as the original battery is replaced by a special rechargable one that has a cable from it to the speech adapter case.

The unit comes in a small attache case, 12 by 8 by 3 inches and there is room inside for your TI-59 and the power cord.

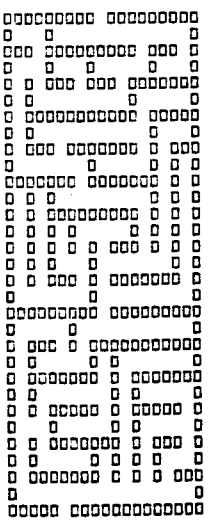
Besides this, the company also sells a TALKING PHONE DIRECTORY,a TALKING FREQUENCY COUNTER, a TALKING MULTIMETER, a TALK-A-FORM (to store up to 30 form formats on a small magnetic disk), a TALKING VOLTMETER and a general TALKING ADAPTER for any computer-based system. All this to allow visually handicapped persons execute a variety of tasks up to now difficult to impossible.

AIR CONDITIONING AND HEATING.- I have come across some useful articles and programs on this subject.

1. Energy-Saving Cost/Benefit Analysis, Richard Herherington, BYTE, FEB 1981, pp-266-270. Gives formulas to calculate heat loss with several insulation materials. The article contains a BASIC computer program, easily translated into TI-59ese.
2. Air Conditioning and Heating System, Louis C. Le Blanc, PPX # 738015. 12 pages. Gives all pertinent formulae. Uses British units.(BTU, grains /lb, etc.) The programming itself is excellent with nice print-outs with descriptors in the margin.
3. Whole House Heat Loss and Gain - Residential, Robert J. Hennessey, PPX # 738016, 16 pages. Good programming, print-out with descriptors in the margin, interactive use. (i.e. the program asks you questions) Author gives tables and flow diagrams.
4. Load Calculations for Residential Winter and Summer Air Conditioning, The Air Conditioners Contractors of America, 1228 17th Street N.W. Washington DC, 20036. This 48-page booklet is available from the address above at $ 11.00 plus $ 1.00 handling. It contains everything you ever want to know about the subject, neatly arranged in tables, formulas. It tells about measuring heat transmisssion, factors which affect heat loss, heat loss of a structure, heat loss calculation procedure, factors which affect heat gain, heat gain of a structure, duct heat gain, heat gain calculation procedure, how to calculate heat transfer multipliers, how to determine shaded and unshaded areas for heat gain calculation, and so on.
   This is by far the best book I ever saw on simple, practical calculation with respect to heat gain and heat loss. Well worth the modest investment of $ 12.00 US.

A-MAZE-ING., In v6n4/5p22 I showed you a program by that name. It was intended to be a challenge, as the program had some serious bugs in it. I am sad to say, none of our US members has responded to the challenge. But I saw the problem presented in Programbiten, the Swedish newsletter. They have a regular feature in it that goes under the name of UTMANINGEN and is run by Björn Gustavsson. (Utmaningen = Challenges)

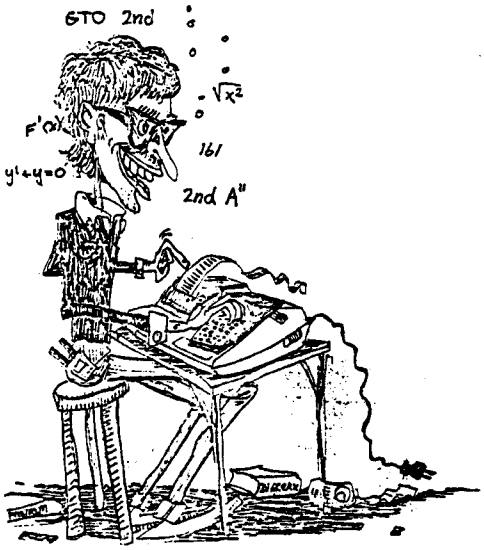
It didn't take long for them to come up with a solution. Lars Kristiansson wrote this modification, guaranteed NOT to produce "duds."

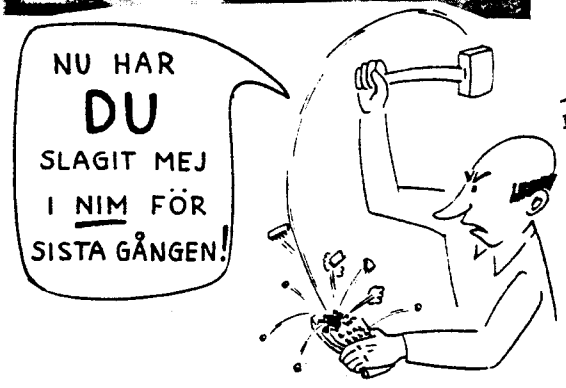


621	22	INV	652	69	UP
622	44	SUM	653	01	01
623	18	18	654	69	DP
624	22	INV	655	05	05
625	49	PRD	656	61	GTO
626	18	18	657	06	06
627	61	GTO	658	84	84
628	06	06	659	68	NOP
629	67	67	660	68	NOP
630	97	DSZ	661	68	NOP
631	18	18	662	68	NOP
632	06	06	663	68	NOP
633	71	71	664	68	NOP
634	03	3	665	68	NOP
635	02	2	666	68	NOP
636	00	0	667	98	ADV
637	00	0	668	71	SBR
638	69	DP	669	01	01
639	00	00	670	99	99
640	69	DP	671	08	8
641	04	04	672	00	0
642	03	3	673	42	STO
643	02	2	674	01	01
644	00	0	675	17	B'
645	00	0	676	16	A'
646	00	0	677	61	GTO
647	00	0	678	06	06
648	00	0	679	30	30
649	00	0	680	68	NOP
650	00	0	681	68	NOP
651	00	0	682	68	NOP

A FEW PHOTOGRAPHS FROM THE FAMILY ALBUM,-

The one on the left is Lars Hedlund, the dynamic editor of Programbiten, whom I met in August 1981 in Antwerp. The second picture is proof of it. Left is yours truly and on the right again Lars. Then on the far right a picture of Lars, in utter frustration while his calculator suddenly stopped working. As you can see, it was simply a case of "operator trouble" the device not being plugged in.





And on the left, Björn Gustavsson after he lost three consecutive games of NIM to the calculator.
