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In this segment we shall give some examples of Degenerate Conics which consist of points, parallel lines, intersecting lines and no loci. Also included are several new programs and a few revised programs which will make for more efficient problem solving and drawing of Second Degree Conics.

**SUMMARY**

AX' + BXY + CY' + DX + EY + F = 0 General Form 2nd Degree Conic
AX' + BXY + CY' + DX + EY + F = 0 No BXY term
AX' + DX + EY + F = 0 Parabola x' = 2py
CY' + DX + EY + F = 0 Parabola x' = 2px
AX' + BXY + CY' + EY + F = 0 No DX or EY terms, h = 0, k = 0 No translation.
AX' - CY' = 0 X Lines (intersecting lines)
-AX' - CY' = 0 No locus
AX' + CY' = 0 Point
AX' + DX + F = 0 Quadratic (Parallel Lines)

**NO BEEP**
1. Enter values  2. XEQ"CONIC"
3. Translation
   a) If BXY term use matrix form to calculate h and k. (If no DX and no EY, XEQ"RMVXY")
   b) If no BXY term but DX and EY terms XEQ"TRANS"
   c) XEQ"SUM"
4. XEQ"RMVXY" (If BXY term)
   5. XEQ"STAFOR"
   a) Calculate points on curve.
   6. XEQ"ROTATE" (If BXY term)
   XEQ"INVT" (If no BXY term)
7. Use values X and Y from step 6 to check in equation I.

**BEEP**
1. Enter values.  2. XEQ"CONIC"
3. XEQ"RMVXY" (If BXY term)
   XEQ"TRANS" (If no BXY term)
   Reduce A'x' to A' = 1 by dividing equation by A'.
4. Form STANDARD FORM. Calculate points on curve.
   5. XEQ"INVT"
   6. XEQ"ROTT" (If BXY term)
7. Use values X and Y from step 6 to check in equation I.

**EXAMPLE 1**

I X' + 4XY + 4Y' - 8 = 0

```
DO    SEE
XEQ"CLRGC"   1 STO 18   1
4 STO 19   19
4 STO 20   20
8 CHS STO 23  -8
XEQ"CONIC"   -160(PSE)BEEP
             - 2 parallel lines
XEQ"RMVXY"   -1.3333(PSE)
             .6000
```

**EXAMPLE 2**

I X' + 4XY + 4Y' + 4X + 8Y + 3 = 0

```
DO    SEE
XEQ"CLRGC"   1 STO 18   1
4 STO 19   19
4 STO 20   20
8 CHS STO 23  -8
XEQ"CONIC"   -160(PSE)BEEP
             - 2 parallel lines
XEQ"RMVXY"   -1.3333(PSE)
             .6000
```

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EXAMPLE 3

I \[ X^2 + 6X + 8 = 0 \]

DO

\[
\begin{align*}
\text{XEQ"CLRG"} & : 1 \\
\text{6 STO 21} & : 6 \\
\text{8 STO 23} & : 8 \\
\text{XEQ"CONIC"} & : -4 \text{(PSE) BEEP} \\
\text{2 parallel lines} & \\
\end{align*}
\]

I is in quadratic form (†)

\[
\begin{align*}
\text{XEQ"QE"} & : -2 \\
\text{R/S} & : \text{ROOT 1} = -2 \\
\text{R/S} & : \text{ROOT 2} = -4 \\
\text{R} & (†) \text{ RCL 18 ENTER} \\
\text{RCL 21 ENTER} & \\
\text{RCL 23} & \\
\text{XEQ"QE"} & \]

† RCL 34 ENTER
RCL 37 ENTER
RCL 23
XEQ"QE"

This is in quadratic form.

† RCL 34 ENTER
RCL 37 ENTER
RCL 23
XEQ"QE"

EXAMPLE 4

I \[ X^2 - Y^2 - 6X - 10Y - 16 = 0 \]

DO

\[
\begin{align*}
\text{XEQ"CLRG"} & : 1 \\
\text{1 STO 18} & : -1 \\
\text{6 CHS STO 21} & : -6 \\
\text{10 CHS STO 22} & : -10 \\
\text{16 CHS STO 23} & : -16 \\
\text{XEQ"CONIC"} & : \text{X LINES NO BEEP} \\
\text{(intersecting lines)} & \\
\text{Since there is no BXY term, XEQ"TRANS"} & \\
\text{XEQ"TRANS"} & : H = 3 \\
\text{R} & : K = -5 \\
\text{XEQ"SUM"} & : 0 \\
\text{Form for intersecting lines} & \]

† RCL 18
RCL 20
RCL 23
II (X')' - (Y')' = 0
IIa \[ Y' = \pm X' \]

Standard form for line \[ Y = mX + b \]

From IIa \[ m = 1 \text{ and } m = -1 \]

Inverse tan 1 = 45° and -1 = 135°
If $X'=1$ then $Y'=1$

$X'$ STO 40
$Y'$ STO 41

XEQ 'INVT'
R/S

$X=4$
$Y=-4$

Substitute $X$ and $Y$ into I for check.

**EXAMPLE 4**

\[
I \quad X'-Y'=-6X-10Y-16=0
\]

\[
\begin{aligned}
\text{Y} & \quad \text{Y'} \\
\text{X} & \quad \text{X'}
\end{aligned}
\]

\[
\begin{aligned}
P(4, 4) & \\
P'(1, 1)
\end{aligned}
\]

\[
\begin{aligned}
Y' & = -X \\
Y' & = X
\end{aligned}
\]

\[
\begin{aligned}
135^\circ & \\
45^\circ & \\
(X')^2 - (Y')^2 & = 0
\end{aligned}
\]

---

**EXAMPLE 5**

\[
I \quad X^2 + XY - 6Y^2 = 0
\]

**DO**

XEQ 'CLRG'
1 STO 18
1 STO 19
6 CHS STO 20

XEQ 'CONIC'
X LINES NO BEEP
(intersecting lines)

**SEE**

No DX and no EY terms, XEQ 'RMVXY'

XEQ 'RMVXY'
.14286 (PSE)
.98995

R/S

4.06505
1.03553
0

-6.03553

---

**EXAMPLE 6**

\[
I \quad 9X'^2 + 24XY + 16Y^2 - 36X - 48Y + 61 = 0
\]

**DO**

XEQ 'CLRG'
9 STO 18
24 STO 19
16 STO 20
36 CHS STO 21
48 CHS STO 22
61 STO 23

XEQ 'CONIC'
+2500 BEEP
+ NO LOCUS

XEQ 'RMVXY'
-3.42857 (PSE)
.2800

R/S

53.1301
25
0
-60
0
61

**SEE**

25$(X')^2 - 60X' + 61 = 0$
This is in quadratic form (+)
XEQ"QE" 1.2
R/S ROOT 1=1.2±1i

No real root thus no locus.

(+) RCL 34 ENTER³
RCL 37 ENTER³
RCL 23
XEQ"QE" ¹

EXAMPLE 7

I  X³+Y³+4X-6Y+20=0

DO

XEQ"CLRC" ¹
1 STO 18 1
1 STO 20 1
4 STO 21 4
6 CHS STO 22 -6
20 STO 23 20

XEQ"CONIC" +14 NO BEEP
NO LOCUS

0 STO 40
0 STO 41
XEQ"XEQ" ³
R/S X=3
Y=-1

Substitute X and Y into I for check.

EXAMPLE 8

I  14X³-4XY+11Y³-88X+34Y+149=0

II  -(X')²/7-(Y')²/7=1

Since the sum of negatives is not positive, there is no locus for a real value.

EXAMPLE 9

I  X³+3XY-3Y³+6X+9Y+9=0

DO

XEQ"CLRC" ¹
1 STO 18 1
3 STO 19 3
4 CHS STO 20 -3
6 STO 21 6
9 STO 22 9
19 STO 23 9

XEQ"CONIC" X LINES NO BEEP

XEQ"XEQ" ³
R/S X=3
XEQ"RMVXY" 9, 18.43495
R/S 0

0 STO 17
0 STO 16

XEQ"RMVXY" 9, 0
R/S 0

18.43495
1.5
0
-3.5
0

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EXAMPLE 9

I  \( x^2 + 3xy - 3y^2 + 6x + 9y + 9 = 0 \)

Y = \( y = \frac{-m - \frac{1}{m}}{3} \)

X = \( x = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( \tan^{-1} m = \theta \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

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\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( Y' = \frac{1}{m} \)

\( X = \frac{1}{m} \)
PROGRAM C/F CALENDAR FUN

By Samuel J. Hartman #12556
8554 Coffey Avenue Apt. #3
N. Hollywood, CA 91601

By Spencer J. Hartman #8544
2432 Stow Street
Sierra Madre, CA 91024

This keen little program can be used for determining the days between two dates in years, months and days... It will print out the day of the week for any selected date... and it also will calculate the number of years, months, and days in a specified number of days.

The program is useful in that it will determine the age of a parent, for example, when his children were born. Enter the two dates and the age is printed out. Or, it can determine the time span between two birthdays... in years, months, days.

How many times have we asked ourselves, “How old was I when junior was born?” Or, “How many years separate Mary and Tom?”

Most programs of this type are called Calendar Functions. We have named ours Calendar Fun!

To run the program, XEQ C/F and answer prompts for LATEST YEAR?, MONTH?, and DAY? Press R/S after each entry.
Program will print out the number of days between dates, also the number of years, months and days. Press R/S to repeat or USER A.

Label B. Press USER B. A data chart of corresponding numbers and days is printed out. Answer prompts for YEAR?, MONTH, and DAY? The date is printed out and a number which corresponds with the day of the week. i.e 5 = Friday 0 = Sunday etc.

Label C. Press USER C and answer prompt for # OF DAYS? The program prints out the number of Years, Months, and Days in that time span.

Great for determining the present ages of family members, differences in years, months, and days between ages etc.
Also the day of the week born, or anniversaries and so on.

R/S
C/F

REGISTERS: 45

ROW 1 (1-4)

ROW 2 (4-4)

ROW 3 (4-8)

ROW 4 (8-10)

ROW 5 (11-15)

ROW 6 (15-20)

ROW 7 (21-25)

ROW 8 (25-27)

ROW 9 (27-28)

ROW 10 (29-33)

ROW 11 (33-39)

ROW 12 (39-41)

ROW 13 (42-49)

ROW 14 (49-51)

ROW 15 (52-59)

ROW 16 (60-63)

ROW 17 (64-70)

ROW 18 (70-76)

ROW 19 (77-83)

ROW 20 (83-89)

ROW 21 (89-93)

ROW 22 (94-100)

ROW 23 (100-104)

ROW 24 (105-110)

ROW 25 (110-110)

BITS & PIECES

Here is a short program I wrote to quickly change the contrast of the HP-71B depending on the viewing angle needed. I use the 71 in many different situations and this program makes it easy to change the contrast from desktop to lap viewing. Run the program from basic; the screen will clear to display CONTRAST = n, where n is the current contrast. Press the "+" or "-" keys to adjust the contrast up or down to the desired viewing angle. The default contrast is saved in line 40, to reset the contrast to the default position, press "R". When you have the proper angle selected, press "E" to exit the program.

10 ! CONTRAST ADJUSTMENT
20 ! By John M. Wargo (11826)
30 DIM A$,$,$, @ INTEGER C
40 C1=HTD(PEEK($"2EF",1)) @ ! C1 = starting CONTRAST
50 C=C1 @ C$="Contrast = " @ FIX 0
60 CONTRAST C @ DISP C$,C
70 A$=KEY$:
80 IF A$="+" AND C=15 THEN 70 ELSE IF A$="-" THEN C=C+1 @ GOTO 60
90 IF A$="-" AND C=0 THEN 70 ELSE IF A$="+" THEN C=C-1 @ GOTO 60
100 IF A$="R" THEN C=C1 @ GOTO 60
110 IF A$="E" THEN 120 ELSE 70
120 FIX 4 @ PUT ":#3" @ END

I also have a question that I hope you or some of the PPC members can answer for me. The other day I turned on Fred, my HP-41CV, and I couldn't get it to work. Every time I pressed a key, or tried to execute a program or function, the 41 would emit a continuous tone while it was working. I tried many things to get it to stop doing this, even tried to reset the memory, but none of this would work. I eventually had to take the batteries out and let it sit for a while. When I put the batteries back in the next day, everything worked fine. Can any of you tell me what happened? I remember reading about something like this a few years ago, but I can't remember where or when.

John M. Wargo (11826)
83 Hawthorne Ave., Akron, Ohio 44303

8 PPC Journal V14N6 June 1987
PROGRAM DESCRIPTION

Program Title: SIGNAL GENERATOR LEVELS

Contributor's Name: Trevor H Phillips

Address: 30 Ngatihe St.,

City: PO BOX
State/Country: N. Z.
Zip Code:

Program Description: Equations, Variables Program converts between the various calibration systems used on signal generators allowing a level to be converted to the units used on the instrument available. A user definable reference is also included to allow for instruments not covered by the program, or for use as a reference. The impedance of the generator is selectable and may be changed at any time during program use. All levels are stored for future reference.

\[ P = \frac{V^2}{R} \]
\[ \frac{dB}{10} = \text{Ref. Power} \]
\[ V = \sqrt{PR} \]
\[ P = \frac{dB}{10} \times \text{Ref. Power} \]

Necessary Accessories: Nil

Operating Limits and Warnings: Watch out for some signal generators which are calibrated in E.M.F. as opposed to P.D. a factor of 2 can result (6 dB)

Always enter the impedance before starting conversions.

Reference(s):

This program has been verified only with respect to the numerical example given in Program Description II. User accepts and uses the program material AT HIS OWN RISK in reliance solely upon his own installation of the program material and without reliance upon any representation or description concerning the program material.

NEITHER HP NOR THE CONTRIBUTOR MAKES ANY EXPRESS OR IMPLIED WARRANTY OF ANY KIND WITH REGARD TO THIS PROGRAM MATERIAL INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER HP NOR THE CONTRIBUTOR SHALL BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF THE FURNISHING, USE OR PERFORMANCE OF THIS PROGRAM MATERIAL.
# PROGRAM DESCRIPTION II

**Sample Problem (Sketch if Desired)** A signal of -100 dBm is required. The only available signal generator is calibrated in dBu, and has a 50 ohm output. Find the level to set it to.

**Example 2.**

The sensitivity of a receiver for 12 dB SINAD is specified as 0.5 uV + 3 dB.

Two sets were measured as having 0.7 uV and 0.9 uV sensitivity, respectively.

The input impedance of the sets is 75 ohms. Are they in spec?

**Example 3.**

What voltage will be applied to a 100 ohm load by a +0 dBf signal?

## SOLUTION:

<table>
<thead>
<tr>
<th>Input</th>
<th>Function</th>
<th>Display</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>a</td>
<td>58.0</td>
<td>Impedence.</td>
</tr>
<tr>
<td>100</td>
<td>chs c</td>
<td>100.0</td>
<td>-100 dBm.</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>6.99</td>
<td>6.99 dBu = -100 dBm.</td>
</tr>
</tbody>
</table>

**Example 2.**

<table>
<thead>
<tr>
<th>Input</th>
<th>Function</th>
<th>Display</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>a</td>
<td>75.0</td>
<td>Impedence</td>
</tr>
<tr>
<td>0.5</td>
<td>ex 6 chs a</td>
<td>5.5</td>
<td>spec. level in volts.</td>
</tr>
<tr>
<td></td>
<td>h sf 3</td>
<td>3.33</td>
<td>converted to power</td>
</tr>
<tr>
<td></td>
<td>f e</td>
<td>0.00</td>
<td>Set flag to load reference.</td>
</tr>
<tr>
<td>0.7</td>
<td>ex 6 chs a</td>
<td>7.0</td>
<td>Reference loaded.</td>
</tr>
<tr>
<td></td>
<td>f e</td>
<td>6.53</td>
<td>1st. sensitivity in volts.</td>
</tr>
<tr>
<td>0.9</td>
<td>ex 6 chs a</td>
<td>9.0</td>
<td>converted to power</td>
</tr>
<tr>
<td></td>
<td>f e</td>
<td>10.8</td>
<td>2.92 dB above ref (in spec).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.11</td>
<td>2nd sensitivity in volts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>converted to power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.11 dB above ref. (out of spec).</td>
</tr>
</tbody>
</table>

**Example 3.**

<table>
<thead>
<tr>
<th>Input</th>
<th>Function</th>
<th>Display</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>a</td>
<td>100.0</td>
<td>Load in Ohms.</td>
</tr>
<tr>
<td>80</td>
<td>d</td>
<td>100.0</td>
<td>dBf to power</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>3.16</td>
<td>Converted to voltage 3.16 mV</td>
</tr>
</tbody>
</table>
**USER INSTRUCTIONS**

<table>
<thead>
<tr>
<th>STEP</th>
<th>INSTRUCTIONS</th>
<th>INPUT</th>
<th>FUNCTION</th>
<th>DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Load side 1 and 2 of card.</td>
<td>Ohms</td>
<td>f a</td>
<td>Ohms</td>
</tr>
<tr>
<td>2</td>
<td>Enter impedance of generator</td>
<td>Volts</td>
<td>A</td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB u</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB m</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB 0m</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB W</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB 100u</td>
<td>f b</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB 100m</td>
<td>f c</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dB f</td>
<td>f d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If this is the reference for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a user defined level</td>
<td></td>
<td>h SF 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>f e</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>For output in selected units</td>
<td></td>
<td>Units reqd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>press key as above</td>
<td></td>
<td>dB user</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>For conversion to user reference</td>
<td>f e</td>
<td>dB user</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>For conversion to a different impedance; Enter new impedance</td>
<td>Ohms</td>
<td>f a</td>
<td>Ohms</td>
</tr>
<tr>
<td></td>
<td>Press key for units required</td>
<td></td>
<td>Equivalent Power in units selected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To review any previously entered units ; Keys A to E are stored in registers A to E respectively.(dB 100 mV) in A1-L 3</td>
<td>ACL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The table above outlines the procedures for using the device, including loading cards, entering specific parameters, and reviewing data.*

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**PPC Journal**

**V14N6**

**June 1987**
# PROGRAM LISTING

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Note: Refer to HP-41C OWNER'S HANDBOOK AND PROGRAMMING GUIDE for specific information on keystrokes. The function index is found at the very back of the handbook. Refer to Appendix E in 67 or 97 OWNER'S HANDBOOK AND PROGRAMMING GUIDE for exact keystrokes.
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 40</td>
<td>F</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LBL 0</td>
<td>31 25 07</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>STO 3</td>
<td>33 03</td>
<td>Enter</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GSB 0</td>
<td>31 22 00</td>
<td>dB 100 mV.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 50</td>
<td></td>
<td>00</td>
</tr>
</tbody>
</table>

---

*Note: Refer to HP-41C OWNER'S HANDBOOK AND PROGRAMMING GUIDE for specific information on keystrokes. The Function Index is found at the very back of the Handbook. Refer to Appendix E in 67 or 97 OWNER'S HANDBOOK AND PROGRAMMING GUIDE for exact keystrokes.*
### REGISTERS, STATUS, FLAGS, ASSIGNMENTS

#### DATA REGISTERS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Last power</td>
</tr>
<tr>
<td>1</td>
<td>Impedance</td>
</tr>
<tr>
<td>2</td>
<td>dB 100 uV</td>
</tr>
<tr>
<td>3</td>
<td>dB 100 mV</td>
</tr>
<tr>
<td>4</td>
<td>dB fW</td>
</tr>
<tr>
<td>5</td>
<td>User power</td>
</tr>
</tbody>
</table>

#### STATUS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>1B7</td>
</tr>
<tr>
<td>TOT. REG.</td>
<td></td>
</tr>
<tr>
<td>ENG</td>
<td>X</td>
</tr>
<tr>
<td>FIX</td>
<td>SCI</td>
</tr>
<tr>
<td>DEG</td>
<td>X</td>
</tr>
<tr>
<td>RAD</td>
<td>GRAD</td>
</tr>
</tbody>
</table>

#### FLAGS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>INIT</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>S/C</td>
</tr>
<tr>
<td>SET INDICATES</td>
<td>CLEAR INDICATES</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Data entry</td>
</tr>
</tbody>
</table>

#### ASSIGNMENTS

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>KEY</th>
<th>FUNCTION</th>
<th>KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volts</td>
<td>A</td>
<td>Ohms</td>
<td>a</td>
</tr>
<tr>
<td>dB uV</td>
<td>B</td>
<td>dB 100 uV</td>
<td>b</td>
</tr>
<tr>
<td>dB mW</td>
<td>C</td>
<td>dB 100 mV</td>
<td>c</td>
</tr>
<tr>
<td>dB fW</td>
<td>D</td>
<td>dB f</td>
<td>d</td>
</tr>
<tr>
<td>dB W</td>
<td>E</td>
<td>User</td>
<td>e</td>
</tr>
</tbody>
</table>

### KEYBOARD CARD LABELING

#### SIGNAL GENERATOR LEVELS

<table>
<thead>
<tr>
<th>CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNAL GENERATOR LEVELS.</td>
</tr>
<tr>
<td>Volts dB uV dB mW dB fW dB W</td>
</tr>
<tr>
<td>f Ohms dB 100 uV dB 100 mV dB 1</td>
</tr>
</tbody>
</table>

#### KEYBOARD

#### SYSTEM CONFIGURATION

This is a translation of a HP-67 program called Signal Generator Levels (number 4821 in the HP-67 library).

This program converts between the various calibration systems used on signal generators allowing a level to be converted to the units used on the instrument that's available. A user definable reference is also included to allow for instruments not covered by the program, or for use as a reference. The impedance of the generator is selectable and may be changed at any time during program use. All levels are stored for future reference. Watch out for some signal generators calibrated in E.M.F. as opposed to P.D., a factor of 2 (6 dB) can result. Always enter the impedance before starting conversions.

The minimum SIZE is 011. No printer is used. The top row of keys are used so any key assignments must be removed for this program. The keys are used as follows:

1) A is used for Volts
2) a is used to set impedance in ohms

**By Rose Cooling #12433**

R.R. #1
Kimberley, Ontario
Canada NOC 1G0

PPC Journal  V14N6  June 1987
3) B is used for dB uV
4) b is used for dB 100uV
5) C is used for dB m
6) c is used for dB 100mV
7) D is used for dB 6m
8) d is used for dB f
9) E is used for dB W
10) e is used for USER reference. To set it
first do SF 22 then press e.

Let's try some examples to make all of this
clearer.
1. A signal of -100 dBm is required. The only
available signal generator is calibrated in
dBu, and has a 50 ohm output. Find the
level to set to.
First, set the impedance level. Then set to
the desired value and type. Finally convert
to available type.
50, press a
-100, press C
press B to see 6.99 (dBu)

2. The sensitivity of a receiver for 12
dB signal is specified as 0.5 uV ±3 dB. Two sets
were measured as having 0.7 uV and 0.9 uV
sensitivity respectively. The input impedance
of the sets is 75 ohms. Are the two sets in
spec?
Again, first set the impedance. Then set the
specification level in volts. Use this value
as the USER standard (remember to do SF 22
first). Enter the first voltage and convert
to USER standard, then do the same for the
second voltage.
75, press a
0.5 -06, press A
0.7 -06, press A
press e to see 2.92 (in spec. <3 dB)
0.9 -06, press A
press e to see 5.11 (out of spec. >3 dB)

3. What voltage will be applied to a 100 ohm
load by a 60 dBf signal?
Again, start by setting the impedance. Enter
the desired value and type, then convert
100, press a
80, press d
press A to see 3.16 -03 (3.16 mV)

This should give you the idea of how to use
this program. It's very powerful so just read
over the instructions, try the examples then
try your own values. I hope this program can
help you with your conversions!

<table>
<thead>
<tr>
<th>FFF</th>
<th>14 STO 06</th>
<th>27 E-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>024</td>
<td>15 RTO</td>
<td>29 /</td>
</tr>
<tr>
<td>03</td>
<td>164 LBL 01</td>
<td>36 XEQ 09</td>
</tr>
<tr>
<td>04</td>
<td>17 STO 06</td>
<td>32 REN</td>
</tr>
<tr>
<td>05</td>
<td>18 RCL 01</td>
<td>33 XEQ 02</td>
</tr>
<tr>
<td>06</td>
<td>19 RCL 01</td>
<td>34 STO 07</td>
</tr>
<tr>
<td>074</td>
<td>21 STO 00</td>
<td>35 XEQ 00</td>
</tr>
<tr>
<td>08</td>
<td>22 REN</td>
<td>36 E-12</td>
</tr>
<tr>
<td>09</td>
<td>234 LBL B</td>
<td>37 RCL 01</td>
</tr>
<tr>
<td>10</td>
<td>24 FSTC 22</td>
<td>38 /</td>
</tr>
<tr>
<td>11</td>
<td>25 RCL 02</td>
<td>39 /</td>
</tr>
<tr>
<td>12</td>
<td>26 RCL 02</td>
<td>40 E-12</td>
</tr>
<tr>
<td>13</td>
<td>27 RCL 02</td>
<td>41 REN</td>
</tr>
</tbody>
</table>

**PPC Journal**

V14N6

June 1987
The routine is executed by initializing the stack: "X": modulo, "Y": Enn, "Z": X and executing "CC" (X, ENTER, Enn, ENTER, mod, ENTER, XEQ "CC").

At the beginning of the routine, R equals 1. Enn is tested to be odd or even. If Enn is even, Enn is halved and X is squared mod Z. The new values are stored for X and Enn. If Enn is odd, R is changed to X times R mod Z. Enn is then tested to equal 1. If Enn does not equal 1, it is halved (integer portion used) and X is squared mod Z. The test for Enn being even or odd is repeated as the routine loops until the Enn equals 1. When Enn equals 1, the routine ends.

Example:

\[ 2^{13} \equiv R \pmod{5} \]

calculates R to be equal to 3.

```
01 \text{LBL} "CC"
02 \text{STO} L
03 \text{E}
04 \text{RCL Y}
05 \text{E}
06 \text{STO Y}
07 \text{LBL 00}
08 \text{STO 00}
09 \text{MO2}
10 \text{RCL} Y
11 \text{X} \times \text{X}
12 \text{RCL} L
13 \text{STO} Y
14 \text{X} \times \text{X}
```

**CALCULATING CONGRUENCE**

Calculating congruence is useful in finding prime numbers, factoring, and RSA (Rivest, Shamir, & Adelman) public key cryptography. The technique presented here allows the manipulation of extremely large numbers in a format easily handled by the HP-41C and other programmable calculators.

The following equation is used:

\[ X \text{ Enn} \equiv R \pmod{Z} \]

**"Enn" is the exponent in 41C notation**

\( X \text{ Enn is said to be congruent to } R \pmod{Z}. R \text{ is the remainder after } X \text{ is raised to the power of Enn and the result divided by the number } Z \text{, called the modulus of } X \text{ Enn. The remainder after division of the number by the modulus is the residue of the number. Note: } X \text{ and Enn must be positive integers.} \)

The routine presented here works by using the theorem from number theory that states, "The residue of the square of a number is congruent to the square of the residue of the number".

**CALCULATING LARGE FACTORIALS**

Most calculators that have a factorial function can internally calculate factorials only up to \( N = 69 \). Beyond 69, approximations must be used because of processor limitations.

Routine "LFACT" uses the sharpened Stirling formula to approximate large factorials.

Place the factorial to be calculated in "X" and execute "LFACT". At completion, the
number in "X" is the approximated mantissa and the number in "Y" is the exponential power ("X" E "Y").

Example:

\[ 101! = 9.4259 \times 10^{159} \]

<table>
<thead>
<tr>
<th>LFACT</th>
<th>17 *</th>
<th>33 \times 10^{3}</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 LBL LFCT</td>
<td>18 135</td>
<td>34 PI</td>
</tr>
<tr>
<td>02 ENTER</td>
<td>19 \times 10^{3}</td>
<td>35 *</td>
</tr>
<tr>
<td>03 STO 2</td>
<td>20 /</td>
<td>36 2</td>
</tr>
</tbody>
</table>
| 04 
 | 21 - | 37 2 |
| 05 \times | 22 E | 38 SQRT |
| 06 \times | 23 + | 39 LOG |
| 07 \times | 24 LOG | 40 |
| 08 \times | 25 \times 10^{3} | 41 ENTER |
| 09 \times | 26 E | 42 INT |
| 10 \times | 27 END | 43 \times 10^{3} |
| 11 \times | 28 | 44 FPC |
| 12 \times | 29 \times 10^{3} | 45 10X |
| 13 \times | 30 10X | 46 END |
| 14 \times | 31 | 47 |
| 15 \times | 32 | 48 |
| 16 \times | 33 | 49 |

**LFACT**

**REGISTERS: 10**

**ROW 1 (1-4)**

| \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) |

**ROW 2 (4-14)**

| \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) |

**ROW 3 (15-21)**

| \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) |

**ROW 4 (22-34)**

| \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) |

**ROW 5 (35-46)**

| \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) |

**ROW 6 (46-46)**

| \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) | \( \times \times \times \times \times \times \times \) |

---

**Questions & Answers**

By Ross Cooling #12433

**QUESTION --**

I'm a new member to PPC and I have some questions I hope you can answer.

1) Is there an annotated listing of the ZENROM?
2) Did Jim De Arras publish a second part to his HP-41 Bus article in PPCJ V7N3?
3) Is there a circuit board available for the design of the MLDDL published in PPCJ V9N3?

---

**Robert Reid (13240)**

330 Colorado Avenue #3

Pueblo, CO

U.S.A. 81004-2036

**ANSWER --**

Welcome to PPC and we hope you enjoy it!

1) I wrote Zengrange, publishers of ZENROM, and they aren't releasing the annotated source. Of course with the ZENROM you can disassemble it, but you won't have any labels or comments.

2) Unfortunately I don't believe a second part was published.

3) I'm not aware of a source for either item. Most people probably would have wire-wrapped their board. Even ERMAC0 on my MLDDL just used an old module (probably from combining modules) and a standard flat 12 ribbon cable.

4) There are a number of ways people have found of removing PRIVATE, some of which have been published. The ZENROM certainly makes it easier, especially with RAMED. So probably it is old news.

(I have transferred the ZENROM MCODE to my computer and disassembled it there, but haven't annotated it yet. If that's of any help to you can write me. I also found out that Lynn Wilkins made an MLDDL II, but can't find any schematic. If anyone knows of one please write or call me. I'm also trying to come up with an improved version, with the help of others.)

---

**QUESTION --**

I need a program that creates pre-specified key assignments. I have modified an existing key assignment program to do this, but it's too long and too slow. I know it's possible to have it run faster, but don't know enough about synthetic programming to be able to do it. Here's what it does:

First, it clears existing key assignments.
Next, it makes ten calls to set the new assignments like this:

\[ 161\text{ (XROM 06,02)} \]

\[ 130\text{ (Key 11)} \]

\[ 11\text{ (XEQ 03 (Key assignment portion))} \]

This assigns sequential XROM numbers to the top row of keys, and their shifts. i.e.

| XROM 06,03 | 06,05 | 06,07 | etc. |
| XROM 06,02 | 06,04 | 06,06 | etc. |

Is there anything that exists that does this, or is there anyone who could help me? If there is I would greatly appreciate it. I don't think this is all that complex, but it's beyond me!

---

**Warren Furlow (13223)**

5585 Coronation Ct.

Dunwoody, GA

U.S.A. 30338

---

**PPC Journal**

V14N6

June 1987
Wow! Warren, your requested program certainly is very specific. You don’t mention which HP-41 you have, but I get the impression it’s not a HP-41CX so you don’t have the PASN function. This request would be trivial with a CCD module using SAVEK, GETK, and MRGK to use extended memory to save key assignment combinations and switch or merge them very easily. There isn’t any program I’m aware of to specifically assign keys as you want (not in the PPCJ at least). Does anyone else know of a program to do this? If you want to send me your existing program, specific assignment examples, your HP-41 model type, and a list of what modules you have I’ll try my hand at trying to improve things for you.

In answer to some of Rick Wenger’s questions:
(V14N4P35-36)

3) Yes, the HP-71 does support PEEK, POKE and CALL, but certain areas are not to be PEEKed or POKEd with a FORTH ROM, nothing is sacred.

4) I doubt that Casio put a full assembler in the PC-5. I had one for a couple of days; I returned it when I found out that it was a simulator.

5) As far as I can tell, neither my TI-74 nor my TI-95 have machine language accessibility. The CALL keyword is used to call special subprograms, some of which are built-in. The subprograms can pass variables; some of the programs provided is called KEY and works like the keyword `INKKEY` found in some BASICS. You can also RUN programs in modules which fit in the one port in the TI-74. One of the programs is in the LRN PASCAL module, called PASCAL. This module, by the way, is a great way to learn some of the PASCAL language.

6) I would be delighted to provide reviews of the TI machines.

7) I believe that there is still a publication for TI machines.

Try writing to:
TI PPC Notes
P.O. Box 1421
Largo, FL 34294

David Metto (2339)
2754 Granada, Apt. 2A
Jackson, MI 49202

As Tapani described in his article we need a program file which is small and doesn’t have any side effects. For this purpose we create a datafile of size one and change it into a program file.

This is one of many ways you can do this:
1) remove the X-memory modules if you have any (SX won’t work with them). 2) 1 in X-register; " " (space) in alpha XEQ "CRFLD".
3) CLA
4) XTOA (still 1 in X-register)
5) ASTO X
6) EMROOM
7) 69 +
8) XEQ "X"

If you don’t loose this dummy program file called " ", you only have to do this procedure once.

To the program:

SAVEK : saves the key assignments to the file specified in alpha.

GETK : gets the key assignments from the file specified in alpha clearing the old key assignments.

MRGK : Adds the key assignments from the file specified in alpha to the old assignments (in case of an overlapping both assignments are lost).

SKX : "clears" the key assignments.

RKX : gets back the key assignments cleared by SXK.

---

KEY ASSIGNMENTS TO FILE

By Ritz Gerald #13026
38B1 Belved
Switzerland

After reading in the book "Synthetic Programming Made Easy" by Keith Jarett about writing alarms to files or cards, I thought it would be nice to do the same thing with the key assignments. I wrote a program that saves the registers "l" and "e", too. But after my exams I finally had the time to read the back issues. In the journal V10N1 page 60 I found a program written by Tapani Tarvainen which was much better than mine, using the fact that GETK restores the registers "l" and "e". But I don’t like that (after the modification in PPCJ V10N2P3) the ID-bytes of the buffers are normalized. So I changed the program. Also my program doesn’t go twice through the key assignment registers to get the needed filesize. I used the function RES2FL although the execution time of this function depends on the contents of the extend memory. The comparison shows that my program is between two and five seconds faster.

---

ANSWER --

---

PPC Journal
V14N6
June 1987
If you are sure that you have enough room in the main and the extended memory you may use the second version that doesn't check it and therefore is shorter (221 or 179 bytes).

P.S. SKX and RXX have the same effect as SK and RK from the PPC ROM but instead of two data registers we need the program file " "(space).
I wish you less MEMORY LOST's than I got while working with this stuff.

SAVEK
REGISTERS: 33
ROW 1 (1-4)
EQUIPMENT WANTED!

Digital Cassette Drive HP 82161A
Thermal Printer IL HP 82162A
HP-IL Interface Module HP 82160A
Extended I/O Module HP 82183A
Plotter Module HP 82184A

EQUIPMENT FOR SALE!

Peripheral Printer HP 82143A
$175.00

Call: John J. Lally #13248
Spokane, Wa. (509) 448 8188
Evenings

WANTED: HP-55, HP-65, HP-70, HP-10 in working condition. Also, I need an HP-01 Watch in good condition with manual. Please contact Art Leyenberger, (201) 386-4254.

FOR SALE: HP-41C $85, HP82143A printer $135, AME Port Extender $75, PPC ROM $35, Box 10 data cassettes $35, Wickes' Synthetic Prog. $5; HP 41 Modules: Time - $25, X Functions - $25, Quad Memory - $25, X Memory - $25, Dual Memory - $25. Also, PPC Club Newsletters Vols 1 through 11 $6 - $7/volume or $65 for entire set. Contact Art Leyenberger, (201) 386-4254.

PROGRAM EPHEM71

By D.M. Lazik #5454
P.O. Box 3105
El Segundo, CA 90245-6805

The program EPHEM71 calculates Sunrise-Sunset (SrSs) and/or Sun azimuth-elevation (78) for any given time and date. This program has served me well in making antenna boresight determinations using the sun as a noise source.

Make sure you enter your correct Latitude (L0 in line 132), correct Longitude (L5 in line 138), correct standard Meridian (S0 in line 154) and correct Magnetic Variation [ARA magnetic deviation] (M7 in line 166). This insures fast and easy local calculations with a minimum of button pushing. Another convenience for those in the Americas, is the use of A.E.C.M.P. (Atlantic ... Pacific) when the program prompts for a time zone. For those outside these five zones, enter an "X" and answer the next prompt with your nearest STANDARD TIME Meridian (0, 15, 30... -30, -15 etc.). If <END LINE> is pressed at this prompt, the variable S0 will be filled with the value you specify in line 154.

Follow the prompts, and when asked for a start (or stop) DATE, notice the machine wants a MONTH and DAY separated by a comma. October 16 would be entered as: 10,16 <END LINE>. Leading zeroes may be omitted. February 2nd may be entered as 2,2 <END LINE>. If 0,0 is entered for the start date, the machine will use the current date for calculations. TIME must always be entered. The format for ENTERING TIME is HH.MM, where 16.50 represents 16 Hours 30 minutes. 24 hour format is mandatory. Only the TIME Output (display) is actual modulo 60 clock time (HH:mm). As an example: Sunrise = 6.04 Sunset = 19.12 indicates literally, Sunrise = 06 Hours 04 minutes, Sunset = 19 Hours 12 minutes.

I generally enter a range of time, 6.0 to 7.0 (for example) with a 6 minute (-.1 hr) increment. For finer grain, you may want to select an increment of 3 minutes (.05 hr). To leave the program, simply enter '3' or 'Q' at the Do prompt.

Some obvious traps have been left out of the program. If you live on the North or South pole you will have to lie to the calculator. Also, I have reserved use of the numeral zero (0) as input for latitude, longitude, magnetic variation and date. This makes input for local calculations quick and easy.

Answers are fairly accurate, considering the liberal use of digit truncation techniques and a less than
elegant attempt to define a sphere "squashed at the poles" (or bulging at the equator).

So, the next time you are told to "get out of town by sun down", or want to tweak your E.M.E. array or need to know when hunting season really starts, set your HP-71B to the correct local time by tuning in the national bureau of standards, ask your local airport for the lat/lon and magnetic variation and you are all set!

If you don’t feel up to entering the program yourself or would like a working copy of the program sent to you, please send a SASE with proper postage and 5 each HP-71 pull cards to my address as listed at the beginning of the program.

EPHEM71 is 4649 bytes long.

100 I EPEHERIS PGN FOR THE SUN
102 I EXCLUSIVELY FOR THE HP-71B
104 I
106 I O.M.LAZOK (5454)
108 I PD3 3105
110 I EL SEGUNDO, CA. 90245-8205
112 I (213)640-1273
114 I
116 I VER:71.4.2
118 I 05 MAY 87
120 I
122 DECEASE ALL @ FIX 1 @ RADIIANS @ OPTION BASE 1
124 CFLAG -15 @ X=15 @ X2=F1/2
126 I
128 BEEP 1490.05
130 INPUT "Ur LAT DD.d (-)If S:":L0
132 IF L0=0 THEN L0=33.75 I change L0=YOUR Latitude!
134 BEEP 1490.05
136 INPUT "Ur LON DD.d (-)If E:":L5
138 IF L5=0 THEN L5=118.45 I change L5=YOUR Longitude!
140 BEEP 1490.05
142 INPUT "TIME ZONE:A,E,C,M,P,X":Z
144 IF Z=4"A" THEN 50=60
146 IF Z=4"E" THEN 50=75
148 IF Z=4"C" THEN 50=90
150 IF Z=4"M" THEN 50=105
152 IF Z=4"P" THEN 50=120
154 IF Z=4"X" THEN 50=120
156 IF Z=4"X" THEN INPUT "Ur STD TIME Meridian":S0
158 BEEP 1490.05
160 INPUT "Daylite Save (1=?) ":D
162 BEEP 1490.05
164 INPUT "MagVar DD.d (-)If E":M7
166 IF M7=0 THEN M7=14.25 I change M7=YOUR MagVar!
168 BEEP 1490.05
170 INPUT "Leap Yr (1=?) ":Q0
172 IF Q=0 THEN DS=364 @ Q1=1 ELSE DS=365.242232 @ Q1=0.
174 K=360/D5
176 BEEP 1490.05
178 INPUT "Do: 175 ZSrSa 3/Q":;N1
180 IF N1=3 THEN 178
182 IF N1=3 OR N1=0 THEN 480
184 BEEP 1490.05
186 INPUT "Start Date (MM,DD,):";M1,D1
188 IF M1=1 OR D1=0 THEN GOSUB 452 ELSE NB=FP(DATE+.001)
190 @ 1000 @ N7=N9 @ GOTO 200
192 N0=NB
195 BEEP 1490.05
196 INPUT "Stop Date (MM,DD):";M1,D1
198 IF M1=1 OR D1=0 THEN N7=0 @ GOTO 200 ELSE GOSUB 452
200 N5=7=N9
202 IF N9=N7 AND N7(10 THEN DISP "FIRST") LAST: RE-DO
204 L1=RAD(L0)
206 IF FLAG(1) THEN L5=L6 @ CFLAG 1
208 IF N1=1 THEN L6=L5 @ SFLAG 1 @ L5=L5-1.5
210 IF L5=0 THEN M0=L5-50 ELSE M0=L5-50
212 M3=M0/X1 @ M8=RAD(M0)
214 IF N1=2 THEN SFLAG 2 @ GOTO 310
216 BEEP 1490.05
218 INPUT "START TIME(0-24):";N3 IF N3>24 THEN BEEP 500.1 @ DISP "TIME TOO LARGE" @ GOTO 214
220 N3=N3-D
222 BEEP 1490.05
224 INPUT "STOP TIME(0-24):";N4 IF N4>24 THEN BEEP 500.1 @ DISP "TIME TOO LARGE" @ GOTO 274
226 N4=N4-D
228 IF N34 IF N3>4 THEN DISP "START > STOP" @ STOP @ DO AGA
230 N4=0 @ GOTO 214
232 BEEP 1490.05
234 INPUT "INCREMENT (HH:mm):";I @ IF I=0 THEN I=1
234 B8=K2-L1
236 FOR N=N9 TO N7
238 GOSUB 424
240 GOSUB 480
242 FOR S=N3 TO N4 STEP I
244 S1=IF(S) @ S2=FP(S+1.5) @ S3=S1+S2
246 A1=X2-Z
248 IF S12 THEN C=RAD((12-S)*K1)+E0*M8 ELSE C=RAD((12
250 E=80-A1/2 @ F=(80-A1/2) / G=C/2
252 X=(COS(E))/(COS(F)*TAN(G))
254 Y=SINC(E)/SINC(F)*TAN(G)
256 XI=ATN(X)*2
258 YI=ATN(Y)*2
260 B=(X1+Y1/2)
262 A=X1-B
264 L=(B+A)/2 @ M=(B-A)/2
266 ZI=ATN(E)*SINC(L)*SINC(M)
268 CI=2*ATN(Z1)
270 A2=30*(DEG(CI)+1.5)
272 IF C10 THEN A2=A2-A0
274 A3=IP(60E)(A+1.5)
276 IF C10 AND A3 THEN A3=180-A3
278 IF S12 AND A3=180 AND A3=0 THEN A3=A3+180
280 IF A30 THEN A3=A3+360
282 IF L2-Z0 THEN 290
284 IF S512 THEN A3=IP(360-MB-E1+.5) @ A2=30*COS(MB=E0
286 IF A3)=360 THEN A3=A3-360
288 GOTO 292
290 IF S512 THEN A3=IP(180-MB-E1+.5) @ A2=30*COS(MB=E0
292 DISP "Sun is: " @ WAIT 1
294 FIX 2 DISP S3D:"Local Time" @ BEEP @ WAIT Z
296 STD @ DISP A3:"TRUE AZIMUTH" @ BEEP @ WAIT Z
298 IF A2(.1 AND A2).05 THEN A20
300 FIX 1 @ DISP A2:"Elevation" @ BEEP @ WAIT Z
302 BEEP 58.1 @ INPUT "RE-DISPLAY? ";AS
304 IF AS="Y" THEN 294
306 NEXT S @ NEXT V
308 GOTO 173
310 I D.M. LAKOK PCC# (5454)
312 BEEP 1490.05
314 INPUT "INCREMENT (IN DAYS): ";X5
316 IF X5=0 OR X5=5 THEN X5=51
318 FOR N=N9 TO N7 STEP X5
320 GOSUB 480
322 CI=K2
324 IF L1-Z0 THEN T=IP(360-E1-M7-M0+.5) ELSE T=IP(180
326 IF T2=360 THEN T=360
328 A1=C1-Z
330 BD=C1-L1
332 S4=(A1+B0+C1)/2
334 ON ERROR GOTO 352
336 T5=SQRT(SINC(S4-A1)*SINC(S4-B0)*SINC(S4-C1)/SINC(S4))
338 CS=T1/SINC(S4-C)}
HOW TO CONVERT HP-67/HP-97 PROGRAMS TO HP-41 FORMAT

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When the HP-41 was brought out in 1979 Hewlett-Packard was well aware of the large number of HP-67s and HP-97s in the marketplace. Since they had card readers built-in there would be a lot of programs on cards. To maintain compatibility to the HP-41, which is basically a superset of the HP-67, the HP-41 card reader (82104A) was given the ability to translate about 95% of the HP-67 code to HP-41 code. The remaining 5% was handled by MCODE routines built into the HP-41 card reader (they all start with 7, except PRECG). This was excellent, but meant for some programs that the card reader was needed to run the program.

This article is written for those who want to be able to do conversions of HP-67/HP-97 programs to HP-41 format, but not require the card reader afterwards. You may find it interesting to read the article in V14N19 of the PPC Journal, and you should read chapter 3 of the HP-41 card reader manual.

The first step is to read in the HP-67/HP-97 code into the HP-41, but you must prepare for it first. You have to set the SIZE to a minimum of 026, be in USER mode, and be at the end of memory. You should be warned that the mode (DEG/RAD/GRAD, FIX/SCI/ENG, and number of decimal places) will change to what values the HP-67 had when the program was saved. The card(s) read in the same as for the HP-41, but will go into a PACKING step after loading.

Now that you have the program loaded remember for later the modes the HP-41 is now in as you may want to modify the program later to put these values into it. When you go into program mode you'll see the first program line is 01 LBL 67 (whether the card came from a HP-67 or HP-97). You can delete it and insert your own label, and then go to the bottom and put an END on if you like and delete the then unnecessary STOP. At this point in time you may want to get a listing of the program, to make editing easier, and run the program as is.
The function \texttt{7CLREG} clears all the primary registers (00-09, 20-25), but not the secondary registers (10-19). If you have the CLRGX instruction on your HP-41 and the program doesn't: need the \texttt{T} register you can use:
\begin{verbatim}
0.009, CLRGX, RDN, 20.025, CLRGX, RDN
\end{verbatim}
A brute force method is:
\begin{verbatim}
X< 00, CLT, X> 00
\end{verbatim}
substituting 01-09, and 20-25 for 00. You may notice in the program the steps:
\begin{verbatim}
7CLREG, 7P<S, 7CLREG
\end{verbatim}
which mean they're also clearing the secondary registers so you can just use:
\begin{verbatim}
0.025, CLRGX, RDN
\end{verbatim}
or if you don't care about any other registers above 25 just use: CLRG.

For \texttt{7RCLR} you can use: RCL 11, RCL 13 if you have your statistical registers starting at the default of register 11, otherwise adjust the register numbers as necessary.

The function \texttt{7PRSTK} will print the contents of the stack (X,Y,Z,T) if a printer is attached, otherwise it will just display them. If you don't care about the display portion just use:
\begin{verbatim}
FS? 21, PRSTK
\end{verbatim}
If you do want the display portion it's more complicated and will require something like:
\begin{verbatim}
FS? 21
PRSTK
FS? 21
GTO 01
VIEW T
PSE
VIEW Z
PSE
VIEW Y
PSE
CLD
PSE
LBL 01
\end{verbatim}
\texttt{PRREG} operates like \texttt{7PRSTK}, but works with the primary registers 00-09 and 20-25. Again, if you don't care about the display and the \texttt{T} register isn't used then use:
\begin{verbatim}
FS? 21
GTO 01
0.009
PRREGX
RDN
20.025
PRREGX
RDN
LBL 01
\end{verbatim}
If you do care about the display then use the above routine but just in front of the \texttt{LBL 01} put in \texttt{VIEW} \texttt{nn} and \texttt{PSE} as necessary.

\texttt{7GTO1} is simply \texttt{GTO} \texttt{IND} 25 if the value in register 25 is between 0 and 19. If the value is negative, on the HP-67 it would cause the program counter to go backwards that number of steps! Clearly that's not possible with the HP-41 so even the card reader just says \texttt{NONESTMENT}. \texttt{7GSBI} is very similar to \texttt{7GTO1} and can be replaced with \texttt{XEQ IND 25}. Again, negative values will produce \texttt{NONESTMENT}.

The next four functions are probably the hardest to translate. They are \texttt{7DSZ}, \texttt{7DSZI}, \texttt{7ISZ}, and \texttt{7ISZI}. \texttt{7DSZ} decrements the \texttt{I} register (Reg. 25 on the HP-41) and skips the
next instruction when it equals zero. \texttt{71SZ} does the same, except it increments instead of decrements. \texttt{7DSZ} decrements the register pointed to by \texttt{1} and skips the next instruction if the register was zero (an indirect operation). \texttt{71SZ} does the same as \texttt{7DSZ}, but decrements instead. If it was just the increment/decrement operation that was important, and the \texttt{T} register wasn’t used, you could use:

\begin{verbatim}
1, ST- 25, RDN for \texttt{7DSZ}
1, ST- IND 25, RDN for \texttt{7DSZ1}
1, ST+ 25, RDN for \texttt{71SZ}
1, ST+ IND 25, RDN for \texttt{71SZ1}
\end{verbatim}

You can also try using \texttt{1SG/DSE}, but you’ll need to understand the program pretty well and make other changes probably. Sorry, but this is the best I can offer for these functions.

That covers all the functions provided by the HP-41 card reader. Some aren’t too difficult to translate, and others are very difficult or impossible to do exactly as the HP-67 would. The important thing is to use some common sense when translating them and probably compromise somewhat (like the display aspects of the print functions).

Let’s get back to the programs from HP-67s as translated by the HP-41 card reader. You’ll also notice that the leading \texttt{1} is dropped from exponents (i.e. \texttt{1E2} is just \texttt{E2}). This is perfectly okay, and is actually how synthetic programming on the HP-41 started! You may also notice negative numbers have trailing negative signs, but this is okay too. LBLs \texttt{A-1} and \texttt{A-}\texttt{E} and \texttt{a-e} will be preceded by a \texttt{LBL 10-14} and \texttt{15-19} respectively. These are there in case there is a \texttt{GTO} or \texttt{QEX} of that routine to speed it up. You can safely remove all unnecessary \texttt{LBLs}.

Most other changes you can make aren’t needed, but will tend to reduce the byte count and/or speed up the execution. They include compacting the registers (i.e. if only registers \texttt{2}, \texttt{10}, and \texttt{25} are used you could change them to \texttt{1}, \texttt{2}, and \texttt{3}), and making use of functions the HP-41 has which weren’t on the HP-67 (i.e. the instructions \texttt{2*}, \texttt{execute faster as \texttt{ST+ X}}). Just be careful with all your changes and do a lot of testing, especially boundary cases.

Remember to include in your program, or documentation, the modes that the HP-41 needs to be in that you saved from the HP-67! Finally, rather than provide any examples here check PPC Journals starting with \texttt{V14N4} (April 1987) to see HP-67 programs and my translated versions. For the most part they are translated to remain as close to their original, rather than try to improve them.

Lastly for all those who don’t have HP-67s and don’t think this article applies to them, remember that PPC has the HP-67/HP-97 program library with thousands of programs in it. These are available to you for a few dollars per program, and a little effort in translating them on your part (but now you know how!). Happy translating!

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**CORRESPONDENCE**

PPC Club
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Dear PPC:

Until recently, we were able to make an occasional exception to our usual policy of not supporting Hewlett-Packard calculator products that had been modified by other than authorized Hewlett-Packard service personnel.

However, due to recent changes in our repair procedures, all Hewlett-Packard calculator products received for service that have been modified will be returned un repaired. This pertains to all non-HP modifications such as HP-41 speed up kits, 28C memory expansion, etc.

Effective immediately, exceptions to this policy will no longer be made and all modified units will be returned to the customer un repaired. Full details of our service and warranty policies are provided in the Owner’s Handbook of calculator model.

Lori W. Fuszek
Service Administrative Supervisor
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I think this is my third renewal — possibly my last. I’m still greatly underwhelmed. My referral to PPC was through the excellent book about the HP-71B by Joseph Horn. I soon found that PPC was little help for a 71B user. For every reference to the 71 there are 532 references to the HP-41. But I don’t have a 41.

I learned RPN on the HP-97 while I was still working. Now I’m retired and have acquired an HP-15C and the fascinating HP-71B.

I still eagerly devour anything that concerns the 71, but find it exceedingly sparse. The books by Horn and Richard Harvey are mighty helpful. A non-HP book on programming the 15C helped there. Now I find another problem. I recently bought both the 16C and the 28C. I find there is a plethora of books on the 16C, but only the non-understandable HP manual for the 28C.

A few articles on programming the 28C are sorely needed in the PPC Journal. I’ve learned how to write a program for finding the area of a pizza, and also one for finding the volume of a water or gasoline tank, but duplicating what I considered a simple program on the 15C for updating multiple bank account balances is so obscure that it is beyond me. I hesitate to question HP, since my only question directed that way about the 71 was answered politely and warmly with an effective "Read the Manual." That’s why I wrote the letter. I couldn’t understand the Manual.

I appreciate that you have had your problems at PPC but I still think that it should do us guys who don’t have 41’s some good too.

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Good point. This is your Journal, our material comes from you, our members. No input to PPC then no 71 input in the Journal. The cry from the members is more "Simple and Shorn Routines." There must be some 71 (and 41) programs out in the PPC world. Please send them in, we are anxious. Thanks.

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