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HP Key Notes

Have You Seen the HP-85?

How often have you wished, while you put your programmable calculator in your pocket or briefcase in preparation to leave the office at the end of a day, that it was a computer? Many, many times, we'll bet! Well, now you *can* have a *real* computer that you *can use* almost anywhere, anytime.

In case you haven't heard, Hewlett-Packard's Corvallis Division now makes a personal computer for professionals. It's the HP-85, a complete computer system designed for individual use. In the lab, on your desk, or in your study, the HP-85 provides professional computing power when and where it's needed. That means no more waiting for data to be processed and returned. A big plus for the professional.

Comparable in size to a portable typewriter, the HP-85 boasts a completely integrated keyboard, CRT display, thermal printer, magnetic tape unit, and operating system. And at 20 pounds, it offers the added convenience of portability—*true portability.*

The HP-85 contains many features not ordinarily found in a personal computing tool. The HP-85's extended BASIC language is easy to use, yet with more than 140 commands and statements, it provides an extremely powerful problem-solving ability.

In addition to a typewriter-like keyset, the keyboard has a numeric keypad, system control and editing keys, and eight "soft" keys that may be defined by the user to select optional courses for program execution.

A highly detailed graphics system is a standard part of the HP-85. And because the 16 graphics statements are integrated into the HP-85's BASIC language, you can draw graphs, label axes, plot data, and control the graphics display either from the keyboard or in programs. User-defined graphics, another graphics feature, allows the user to create and to display custom characters such as symbols, logos, etc.

The bidirectional printer is built-in and whisper-quiet. Yet with a single command it will transform display contents into printed copy.

Magnetic tape cartridges supply the HP-85 with high-quality digital tape storage. High search speed and data access rates coupled with automatic tape directories give the HP-85 superior storage capabilities. Each magnetic tape cartridge can hold up to 217K bytes in up to 42 separate files, plus a "catalog" command tells you exactly what is on any tape. And you can double RAM capacity to 32K or expand ROM firmware from 32K to 80K with optional modules that plug right into the HP-85.

Also, it's easy to enhance the system's capability by adding powerful HP peripherals like a high-speed full-width line printer, full-size plotter, or flexible-disc drive.* You can also streamline your problem-solving with HP Application Pacs that offer pre-programmed solutions in a wide variety of disciplines on prerecorded magnetic tape cartridges.

But don't just look at the picture; go experience the HP-85 for yourself. However, please note: **The HP-85 is not available by mail-order from Hewlett-Packard.** In the U.S., call 800-547-3400 (in Oregon call 758-1010) for the HP-85 Dealer nearest you, or call your local HP Sales Office. Outside of the U.S., please contact the dealer or HP Sales Office nearest you.

Contact your local dealer or HP sales representative for availability information.
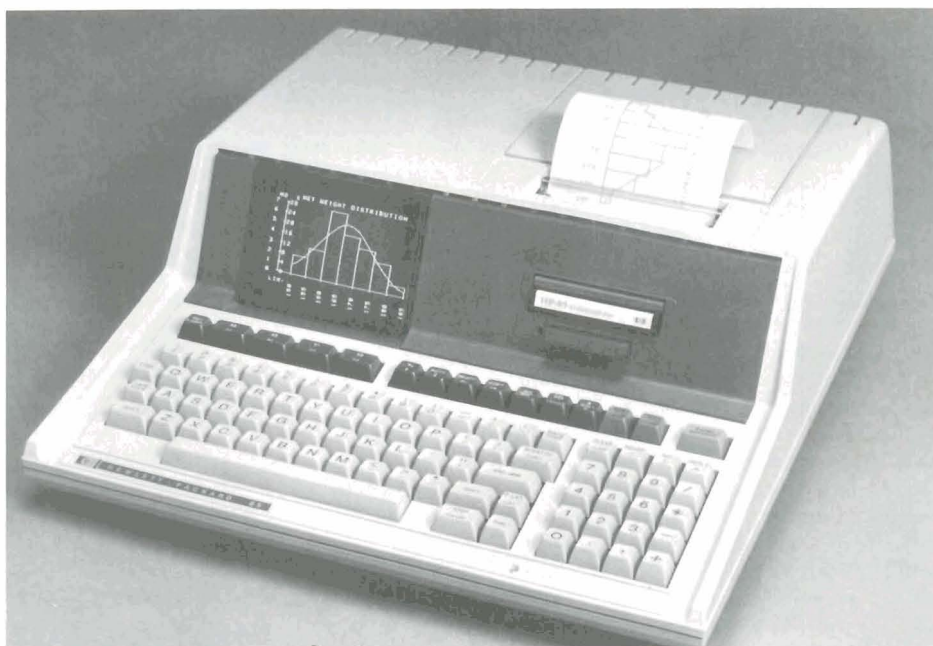
Hewlett-Packard's New HP-85 Personal Computer for Professionals

All prices in this newsletter are suggested retail prices excluding applicable state and local taxes–Continental U.S.A., Alaska and Hawaii

Editorial

A lot of you jumped on me about the photo of "...all the calculators that HP has produced..." that appeared on the cover of the last issue, because it did not include the HP-46 and the HP-81. Well, *you* are right; HP *did* produce those desktop versions of the HP-45 and HP-80, but they were produced in Loveland, Colorado, at our Desktop Computer Division. You see, what I *meant* to say was "...all the calculators that this HP Division has produced... ." There sure are a lot of sharp eyes out there ... and a lot of HP-46/81 owners!!

While we're on the subject of mistakes, there were a couple of them in the last issue. On page 6, in the first column, the "VIEWSZE" routine will not work for SIZE 000. Just add an INT between lines 11 and 12 and it will correct that flaw. Then, in the next column, under the "ΣFIND" routine, line 12 should have been x>y and lines 28 and 32 should have been x<>z. You wouldn't believe how those errors occurred, so I won't tell you. The author's original tape was correct, so you can blame me for that one. And, then in the next column on page 6 (an unlucky page number?), at the end of the third-to-last line under "Mathematics Pac," that should have been FS?C. Somehow, our typesetting machine dropped the C after I proofread the original tapes. That same insidious machine also misinterpreted some codes on its punched-tape input and garbled an entry on page 11, third column, under **Vic Schmidt's** contribution. Under "Spherical to Cartesian," Y:5u should be "Y:θ," and near the end, there should have been "Y:y" between X:x and Z:A. I've already apologized to Mr. Schmidt, so I'll now apologize to all our readers who were confused and frustrated by this error. But other than that, you all seemed to like the last issue very much.

I still get a lot of programs in the mail, presumably so they can be printed in KEY NOTES. Please submit all programs to the Libraries, here or in Europe. *We do not print programs in the newsletter* because, for one thing, the selection process would be nearly impossible to control, and how could we be fair to everyone? But we'll still highlight good programs that are submitted to the Libraries.

For those of you who did not see Vol. 3 No. 3, I'll repeat an editorial note that appeared atop column 3 on page 4: *Pressing and holding any key other than R/S slows the Catalog listing so you can follow it easier.* This did not appear in original printings of the owner's manual, so **Kim A. Heathman** of Phoenix, Arizona, suggested I repeat it for all of our *present* readers. (It has been added to the manual.)

Sharp-eyed *habitues* of KEY NOTES probably noticed a small change on the cover (or did you?). This issue is dated March instead of February. And from now

until further notice, KEY NOTES will be mailed worldwide from Portland every March, June, September, and December. You can attribute this change to a severe case of type B influenza, a long-overdue long vacation last December, and the added time that it took to coordinate printing and shipping of worldwide editions from only one source: Corvallis. And, although you've had to wait longer than usual for this issue, we'll bet that it was worth the wait.

Letters to the editor should be addressed to:

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Corvallis, Oregon 97330 U.S.A.

We cannot guarantee a reply to every letter, but we do guarantee that every letter will be read by the editor, and as many as possible will be answered either in KEY NOTES or in a personal response. Please be sure to put your return address on the face of your letter. Letters sometimes get separated from envelopes.

"Base Conversion" Revisited

It would be the understatement of the last year if we said that this routine has caused "a bunch" of mail. So, here, for the very last time, is the last word on the subject.

The original "Base Conversion" routine was written by Cass Lewart and printed on page 12 of Vol. 3 No. 2. Following that, Bob Edelen sent in a "fix" that was printed on page 10 of Vol. 3 No. 3. It now appears that the "fix" was not 100 percent correct but, first, a letter from Mr. Lewart.

My routine works with arguments up to 9 digits long. However, as expected, it may introduce errors in the least significant digit in some 10-digit arguments. Mr. Edelen's "fix" is no fix at all. Though $3486784400_{10} \rightarrow$ base 9 is performed correctly, it fails for 3486784396, where my unmodified routine gives the right answer.

Unfortunately, there is no simple way to correct for round-off error for an *arbitrary* set of arguments except by increasing the 10-digit accuracy of the calculator or by performing integer modulo arithmetic (replace division with repeated subtraction). I did not want to do it in my KEY NOTES submission because it would obfuscate (confuse) the basic novel algorithm.

Well, an awful lot of people still attempted to "correct" the original routine. The general consensus of the letter-writers' ideas was to add "DSP0, RND" between steps 033 and 034 instead of the "INT" added as a fix by Mr. Edelen. And this brings up a fact that we all tend to lose sight of once in a while: These routines are published for your use as *ideas* that other users have developed. We do not mean to imply that each and every one is perfect. Quite often, a novel arrangement of steps is the really critical thing we

want you to see, not necessarily the routine itself.

However, we don't want any of you to think that we won't print a correction or improvement to a routine published in your KEY NOTES, providing it aids or helps the majority of people. Nor do we want any of you to feel that we, or you, are infallible. Remember, programming is an indefinite art: there are innumerable ways to write routines, and none is perfect.

New HP-41C Software

Three new application pacs became available in February. They are:
Clinical Lab and Nuclear Medicine 00041-15024 $45*
Securities 00041-15002 $45*
Stress Analysis 00041-15027 $45*
In April, the following two new pacs will be released:
Structural Analysis 00041-15021 $75*
Home Management 00041-15023 $45*
And in case you've forgotten, Application Pacs that have been available for some time are:
Mathematics 00041-15003 $45*
Statistics 00041-15002 $45*
Surveying 00041-15005 $45*
Financial Decisions 00041-15004 $45*
You will also be interested in knowing that five more pacs are presently in various stages of production. They will appear before mid-year. We'll tell you more about them in the June KEY NOTES.

U.S. dollars. See note at bottom edge of cover.

Important HP-41C Information

Quite often, the initial buyers of a complex calculator discover a few things about the product that were not known at the time of introduction, or were known but were not highlighted in the original version of the owner's manual. These items are then incorporated in later revisions of the manual, but we want *all* HP-41C users to be aware of them. Perhaps the following two paragraphs should be included as the first items under Service, on page 242. (You might even have received them as an addendum card with your present manual.)

Using state-of-the-art technology, the HP-41C Continuous Memory circuits operate continuously—even while the calculator is turned off. Because these circuits are always drawing very low power from the batteries, they are susceptible to disruption at all times. Disruption can be caused by *inserting or removing plug-in modules or peripherals while the power is turned on; electrostatic discharge to the unit; strong magnetic fields; plugging devices into the HP-41C that are not supported by Hewlett-Packard for use with the HP-41C; or other*

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conditions that can traumatize the calculator.

Of course, all causes of disruption should be avoided, but should disruption occur, the most common symptom is a loss of keyboard control of the calculator. The HP-41C has been designed to allow recovery from these conditions. The procedure for resetting the calculator is to simply remove the battery pack and replace it again immediately. This will reset the HP-41C without causing a **MEMORY LOST** condition (unless the trauma itself was great enough to cause a **MEMORY LOST** condition). After several attempts, if this procedure fails to reset the calculator, work through the service procedure in the *HP-41C Owner's Handbook and Programming Guide*, page 242.

The next three paragraphs might be added on blank pages 253/254 in your present handbook.

Program Mode Power-Off. If you turn off the HP-41C (or if it turns off automatically) while the unit is in PRGM (program) mode, you should toggle into and back out of PRGM mode again when you resume operation. This ensures that changes made to programs in previous editing sessions will be compiled by the HP-41C system.

Program Clearing Restrictions. When you wish to clear very long programs (longer than 233 lines), you must set the HP 82143A Printer (if present) to MAN (manual) mode when you execute the CLP function. Programs longer than 1089 lines must be cleared using DEL nnn. (For example, to clear a 1980-line program, execute DEL and press [EEX] 980.) Refer to the *HP-41C Owner's Handbook and Programming Guide*, page 135, for more information about long programs.

ALPHA String Testing Restrictions. If you are testing two ALPHA strings that were originally longer than six characters (when created in the ALPHA-register), then you must perform the following procedure to ensure proper string truncation and test results. Strings can only be tested with the [x≤y?] or X≠Y? functions.
1. Store the first string into a register using ASTO nn. If the string is not longer than six characters, skip this step and go on to step 4.
2. Clear the ALPHA register with [CLA].
3. Recall the string into the ALPHA register using [ARCL] nn.
4. Store the string into the X-register using [ASTO] [] X.
5. Store the second string into a register using [ASTO] nn. If the string is not longer than six characters, skip this step and go on to step 8.
6. Clear the ALPHA register with [CLA].
7. Recall the string into the ALPHA register using [ARCL] nn.
8. Store the string into the Y-register using [ASTO] [] Y.
9. Execute [x≤y?] or X≠Y?.

We Have a New Number!

After April 1, 1980, you can place toll-free telephone calls directly to the factory, providing the call originates in the Continental U.S.

To give you better and faster service, we've moved our toll-free number from Nevada to Corvallis, Oregon—the home of Hewlett-Packard calculators. This new service will be available Monday through Friday of each week, from 7:00 a.m. to 7:00 p.m., Pacific Standard Time.

This new service consists of direct phone lines to the factory, with special operators assigned to answer your calls, which will terminate at these phones. Calls on the toll-free number can NOT be transferred to other phones in the factory. This new service will be available for:
1. Locating HP Dealers and/or Full-Line Accessory Dealers.
2. Product or literature inquiries.
3. Service information.
4. Status on new-product availability.
5. Ordering calculators, accessories, or software.

The service will NOT be available for answering technical questions nor for applications assistance. Those functions will be handled, as before (not toll-free), by the Customer Support department.

Oh, yes ... the number is **800-547-3400**, excluding Alaska and Hawaii (in Oregon call **758-1010**).

Software Changes

If you have early copies of the following two HP-41C or HP-67/97 Application Pacs, you should make the following corrections in your copy. Later copies have an addendum card, or the corrections have been incorporated in the finished product.

HP-41C STRESS ANALYSIS PAC and HP-41C STRUCTURAL ANALYSIS PAC

In the program, "Simply Supported Continuous Beams" (version 1A*), an error was found in the "FIXR" option. If you have a beam with a fixed right end, follow the procedure described in the user instructions up to the point of executing "MOMENTS." Before executing "MOMENTS," perform the following keystrokes.

[RCL] 19, 7, [–], 0, [STO] [//] [] [Y]

*You can distinguish the "1A" version of the module (which contains the error) from the "1B" version (which is correct), with the following procedure.

Turn off the HP-41C and remove all peripherals. You do not need to remove memory modules. Insert the "Stress" or the "Structures" module. Press [//] [CATALOG] 2. The first entry in the catalog specifies the module name (STRESS or STRCTA), followed by the revision code (1A, 1B, 1C, ... etc.). If the revision code on your module is 1A, follow the above procedure. For later revisions, ignore the above procedure.

HP-41C FINANCIAL DECISIONS PAC

1. In the FINANCE 1B Module, the prompts for the Modified Internal Rate of Return (MIRR) program were inadvertently reversed. When SAFE RATE=? is displayed, key in the risk rate. Likewise, when RISK RATE=? is displayed, key in the safe rate. In the example on page 25 of the applications book, the risk rate is 8% and the safe rate is 10%.

2. The "Bonds" program does not correctly calculate the yield of a short-term bond. When you wish to determine the yield of a bond held for one full coupon period or less, you must do the following:
   a. Store either the call price or 100 in register 19.
   b. CF 22
   c. Press [E] to calculate the yield.

HP-67/97 M.E. PAC

Program ME1-09A, "Helical Spring Design," has been found to contain an error. Lines 147 (STO 8) and 148 (GTOA) should be deleted and replaced with GTO5. The bottom of page 09-11 should be changed to:
Sure enough, insufficient clearance. Try the smaller wire..

.035 [R/S] →——→ 19.6600***		(Coils)
[B] →—→—→—→—→186.303 ***		(S$_s$, psi)
[C] →—→—→—→—→5.000 00		(Code)

Since the design checks out, calculate the dimensions:

[E]	1.563 00***	(L$_f$)
	758.0 –03***	(L$_s$)
	190.0 –03***	(D)
	225.0 –03***	(OD)

To receive a revised card (ME1-09B), **you must mail your old card to: HP Service Department; P. O. Box 999; Corvallis, Oregon 97330.** This new card will be available on or after June 2, 1980.

HP-67/97 BUSINESS DECISIONS PAC

Program BD1-11A, "Savings—Compouding Periods Different From Payment Periods," has been found to contain an error. Step 007 (F0?) should be changed to SF0, and CF0 should be inserted between steps 005 and 006.

To receive a revised card (BD1-11B), **you must mail your old card to: HP Service Department; P. O. Box 999; Corvallis, Oregon 97330.** This new card will be available on or after June 2, 1980.

Fitting 67/97 Programs Into The HP-41C

We have heard comments that some HP-41C owners are having difficulty in fitting HP-67/97 programs into their calculator when it does not contain a Memory Module. Well, as you know, we want *all* of our customers to be happy, so we made an attempt to load every HP-67/97 Application Pac program into the HP-41C (one at a time, of course!). Of the 207 programs, 105

fit without any program changes and 102 did not. However, approximately 10 percent of the programs that did not initially fit, *did fit* after using several of the tips and techniques listed below.

TIPS AND TECHNIQUES

What can you do if a program won't fit in the basic HP-41C? Fundamentally, you need more program memory, and if you don't have Memory Modules, the only way to gain memory is to decrease data storage requirements.

Let's assume that the HP-41C is sized for 26 data storage registers (as it should be when initially attempting to load an HP-67/97 program). From this starting point, you can take the following steps to seek more program memory.

1. Notice the correspondence between HP-67/97 and HP-41C data storage registers.

HP-67/97 Registers	HP-41C Registers
Primary Registers	R00-09
Secondary Registers	R10-19
A	R20
B	R21
C	R22
D	R23
E	R24
I	R25

Our objective is to reduce the data register requirements (thus increasing program memory), so you must first analyze the program's data register usage, using the program listing. If the I-register is used, go directly to step 2. If not, review registers A thru E (in that order), checking to see if the HP-67/97 program accesses them or not. The HP-41C SIZE requirement can be reduced by one for each *successive* unused register, starting with the I-register. For example, if registers I and E thru C are unused, but register B is used, you can down-size the HP-41C to SIZE 022.

After identifying any possible downsizing by the above technique, resize the HP-41C and again attempt to load your HP-67/97 program. If it fits, great! If it doesn't, don't give up; just continue to step 3.

2. If the I-register is used, you must scan the program listing to see if it contains any of the following HP-67/97 functions:

ISZ I	ISZ(i)
DSZ I	DSZ(i)

If *any* of these functions are contained in the program listing, you *must* use SIZE 026, for they all access R25 in the HP-41C. There is no recourse if SIZE 026 prevents successful program loading when one of the functions listed above is present in the program. If the I-register is being used for other than loop control, continue on to step 3.

3. You must now attempt to modify the program in a way that will enable you to further decrease your SIZE requirements.

This can be done by reassigning register usage from high-numbered HP-41C equivalent registers to lower-numbered HP-41C equivalent registers. For example, if the HP-67/97 E-register is used (R24 in the HP-41C) but the HP-67/97 A-register (R20 in the HP-41C) is not, you can reduce the HP-41C SIZE requirement one register by modifying the HP-67/97 program to use register A instead of E.

Before beginning the modification procedure, test to see what the maximum allowable size is by attempting to load the program while using a successively smaller allocation of data registers. Once the program fits, you know how extensive your program modifications must be. For example, before making the modification suggested above (using register A instead of register E), you should check to see if SIZE 023 will allow the program to fit. If it does, that modification alone is sufficient. If not, more extensive modification is needed and it makes sense to see if this is possible before attempting to do so.

There are several important guidelines to consider when reassigning data registers. These are so important that they should be considered as rules by those not thoroughly familiar with the program being modified.

a. Be extremely careful when primary/secondary register commands are used within the program. If they are used simply to access an extra data register (i.e., P⇌S, STO 1, P⇌S) you can modify the program once it resides in the HP-41C by deleting the register exchanges and changing STO 1 to STO 11 (HP-41C register 11). If the P⇌S command is isolated (not paired like the earlier example), it is best not to tamper with it. In this case, no reassignments should be made to any of the HP-67/97 primary or secondary registers. Reassignments are therefore limited to registers A thru E (HP-41C registers R20-24).

b. If any statistical operations are performed in the HP-67/97 program, no reassignments should be made for any of the HP-67/97 secondary registers. Reassignments should be limited to the HP-67/97 primary registers (R00-09 in the HP-41C) and registers A thru I (HP-41C registers R20-25). Also, double-check for primary/secondary exchanges whenever statistical functions are present in the HP-67/97 program.

c. After modifying a program, test its operation with known data. Many (>30) modifications may be necessary to successfully reassign register usage, and the user should make sure that all modifications were properly made.

EXAMPLES

To give you a more positive "feel" for converting HP-67/97 programs for use on the HP-41C, here are a few examples of several conversions we made, using the tips and techniques described above.

1. *Standard Pac*, "Triangle Solutions SD-07A." This program did *not* fit into the HP-41C when SIZE 026 was used. A review of the data register usage indicated that the I-register was *not* used. After down-sizing to 025, the program successfully fit into the HP-41C.

2. *Surveying Pac*, "Resection SU1-08A." Using SIZE 026, this program would not fit into the HP-41C. (Primary registers 0 thru 8 and registers A thru E were used in this particular program.) And since the I-register isn't used, we tried SIZE 025, but that didn't work either. So a test was made to see if SIZE 024 would work, and it did. Then, with seven program modifications, register 9 (HP-41C register 09) was used instead of register E (HP-41C register 24). The program now successfully fit and functioned in the HP-41C.

3. *Surveying Pac*, "Intersections SU1-03A." In this program, primary registers 0 thru 9 were used, as were registers C, D, and E, which presented a "fitting" problem. This program would not fit into the HP-41C using either SIZE 026 or 025. Testing showed that it *would* fit using SIZE 023. Therefore, the data assigned to register D was reassigned to register A, and the data in register E was reassigned to register B. This procedure required 17 program modifications, but it allowed the HP-67/97 "Intersections" to successfully fit and function in the HP-41C, using SIZE 023.

4. *Games Pac*, "Tic-Tac-Toe GA1-11A." Used in this popular program were primary registers 0 thru 9, except register 2, plus registers A, B, E, and I. It was found that SIZE 026 would not work, so a search was made for indirect control statements in the program listing, but none were found. Satisfied that the I-register was used simply for data storage, a test was made to identify the SIZE requirement. SIZE 024 enabled the program to fit. Register usage was then reassigned from registers E and I to registers C and D (21 modifications were necessary to do that), and this allowed the HP-67/97 program to successfully fit and function in the HP-41C.

CONVERSION ANALYSIS

To make it easier for you to assess your collection of HP-67/97 Application Pac programs, we've listed below all the programs that will fit *without any modifications* into the basic HP-41C. But don't forget: all of the HP-67/97 Application Pac programs *will* fit into the HP-41C if you use one Memory Module. And remember: if you modify a program, always test it with known data to make sure that it works.

The following listing is by Application Pac program number/Users' Library number and, in parentheses, the HP-41C SIZE requirement.

Surveying Pac

SU1-04/00085D (025)	SU1-11/00092D (008)
SU1-07/00088D (010)	SU1-13/00094D (020)
SU1-09/00090D (025)	SU1-15/00096D (026)
SU1-10/00091D (022)	SU1-17/00098D (026)

Games Pac

GA1-02/00175D (010)	GA1-10/00183D (010)
GA1-03/00176D (006)	GA1-14/00187D (022)
GA1-04/00177D (024)	GA1-19/00192D (017)
GA1-09/00182D (026)	

Standard Pac

SD1-01 (026)	SD1-11 (026)
SD1-02 (026)	SD1-12 (000)
SD1-06 (026)	SD1-14A (009)
SD1-07 (025)	

E.E. Pac

EE1-01/00020D (025)	EE1-13/00032D (005)
EE1-02/00021D (026)	EE1-14/00033D (021)
EE1-08/00027D (006)	EE1-15/00034D (021)
EE1-11/00030D (008)	EE1-16/00035D (026)
EE1-12/00031D (007)	

M.E. Pac

ME1-01/00038D (025)	ME1-17/00056D (024)
ME1-03/00040D (026)	ME1-19/00058D (026)
ME1-10/00049D (026)	ME1-21/00060D (010)
ME1-11/00050D (026)	ME1-23/00062D (010)
ME1-15/00054D (022)	ME1-23/00062D (024)
ME1-16/00055D (025)	

C.E. Pac

CE1-01/01123D (025)	CE1-06/01128D (026)
CE1-04/01126D (026)	CE1-16/01138D (025)
CE1-05/01127D (026)	CE1-18/01140D (010)

Stat Pac

ST1-02/00102D (026)	ST1-12/00112D (026)
ST1-03/00103D (023)	ST1-14/00114D (021)
ST1-04/00104D (026)	ST1-15/00115D (009)
ST1-06/00106D (022)	ST1-16/00116D (004)
ST1-07/00107D (022)	ST1-18/00118D (003)
ST1-09/00109D (022)	ST1-19/00119D (025)
ST1-10/00110D (007)	ST1-20/00120D (009)

Clin. Lab. & Nuc. Medicine Pac

CL1-01/00001D (026)	CL1-10/00010D (026)
CL1-02/00002D (026)	CL1-11/00011D (026)
CL1-03/00003D (026)	CL1-12/00012D (026)
CL1-04/00004D (026)	CL1-13/00013D (026)
CL1-05/00005D (026)	CL1-14/00014D (026)
CL1-06/00006D (026)	CL1-16/00016D (020)
CL1-07/00007D (026)	CL1-18/00018D (023)

Business Decisions Pac

BD1-01/00122D (026)	BD1-11/00132D (025)
BD1-02/00123D (026)	BD1-14/00135D (008)
BD1-03/00124D (025)	BD1-15/00136D (009)
BD1-05/00126D (009)	BD1-16/00137D (026)
BD1-06/00127D (026)	BD1-19/00140D (026)
BD1-07/00128D (026)	BD1-20/00141D (026)
BD1-08/00129D (007)	BD1-22/00143D (026)
BD1-10/00131D (008)	

Navigation Pac

NAV-01/01371D (022)	NAV-09/01379D (024)
NAV-03/01373D (010)	NAV-10/01380D (021)
NAV-04/01374D (026)	NAV-13/01383D (003)
NAV-06/01376D (026)	

Math Pac

MA1-04/00066D (026)	MA1-10/00072D (026)
MA1-05/00067D (026)	MA1-12/00074D (026)
MA1-08/00070D (026)	MA1-17/00079D (020)
MA1-09/00071D (026)	MA1-19/00081D (020)

was the solution.

If you can't restore the previous **SIZE**, you will have to do other byte-saving procedures; such as:

1. Shorten ALPHA labels or ALPHA strings, if any are used.
2. Delete some END instructions and put RTN in place of them.
3. Use stack registers for indirect or looping control, instead of using a storage register. This will allow you to use a smaller SIZE, so that your program can be longer—or fit, if it didn't before.

(In your letter, your tip about deleting ENTER to save a byte won't work, Mr. Malaga. Although you key in, say 36, then ENTER, then 6, and delete the ENTER as you key it in, the HP-41C always knows that 36 and 6 must be two separate entries, so it deletes the ENTER—at your command—but it puts a "null" byte in its place. Even executing PACK will not remove this null byte; otherwise you would have 366 in memory and not 36 and 6. Of course, this deletion of ENTER does cut down on listings, and it does save some paper in your printer, but don't be fooled into thinking you are "saving" bytes. Ed.)

Let's travel over to Evanston, Illinois, now, for a contribution that should be of interest (pun intended!) to nearly everyone. **Richard Sperling** is the author of this neat routine.

"25 Words" (More or Less!)

Your letters indicate that you both appreciate and value this column. Well, that's good, because we enjoy bringing it to you. Let's face it, calculators can be interesting *and* a lot of fun. That's why we publish such a variety of material in this column. And, speaking of variety, let's start the ball rolling with a "clean house!"

This first routine is the contribution of **James M. Dzierzanowski** of Pennsylvania State University in University Park, Pennsylvania. We have to admit that it's a "clean" routine (no pun intended!).

(41C) The HP-41C Continuous Memory circuits add a great deal of power to everyday calculations. With this feature, I have found that better housekeeping of statistical registers, the stack, and addressable storage registers is necessary. As a habit, I like to clear the Continuous Memory, so previous results will not interfere with future calculations. A short housekeeping routine is:

```
01♦LBL "CLEAN"      05 CLA
02 CLΣ              06 FIX 2
03 CLST             07 TONE 4
04 CLRG             08 RTN
```

The statement FIX 2 is included to establish a default fixed point display of two significant figures. The TONE 4 command signals the user that program execution is completed.
(Line 02 is not necessary if line 04 is done. Ed.)

And now, Mr. Dzierzanowski, meet our next contributor, **Ernesto A. Malaga**, of Los Angeles, California. Both of you were on the same track!

(41C) Willing to clear just *some* registers? The HP-67/97 had a way to do it: f CLREG. But the HP-41C has none. But wait! There *is* the CLΣ function. If you want to clear R_{10} thru R_{18}, for example, just press—or program:

XEQ "ΣREG" 10	to clear R_{10} thru
CLΣ	R_{15}, and
XEQ "ΣREG" 13	to clear R_{13} thru
CLΣ	R_{18}.

Done! Consumption=6 bytes. The longer sequence 0, STO 10, STO 11, ..., STO 18 would use-up 13 bytes!

Next, we have another tip from **Mr. Malaga**. This time he's found a way to "extend" the basic HP-41C.

(41C) Sometimes, when keying in a program that uses all the memory registers not used for storage, you'll find a situation where the last two or three steps will not fit, and the display will keep showing PACKING and TRY AGAIN. So, try this:

1. Delete key reassignments of standard HP-41C functions, and try again. If this is not enough, go on to step 2.
2. Reduce the allocated number of storage registers by one, thus using a smaller SIZE.
3. Key in the program steps that didn't fit, and then PACK memory.
4. Restore the previous SIZE.

Surprisingly, this works! I've found myself many times in this situation (I have no memory modules yet), and it almost always

(67/97/41C) My contribution to "25 Words" is a routine for calculating "effective" interest cost. It is the net cost of borrowing: "Actual interest, less the reduction in income taxes resulting from including the interest cost on the income tax return as a deduction."*

Input the amount borrowed ENTER, the amount of interest ENTER, and the tax rate (from your income tax bracket). Press A and the routine will calculate the effective after-tax cost and the effective after-tax interest rate.

001	*LBLA	009	%
002	STO3	010	-
003	R↓	011	PRTX
004	STO2	012	RCL1
005	R↓	013	÷
006	STO1	014	EEX
007	R↑	015	2
008	R↑	016	x
		017	RTN

Enter the interest and tax rates as whole numbers; that is, enter 12 percent as 12 and a 50 percent tax bracket as 50.

*Reference: **Fundamentals of Financial Accounting**, revised edition, 1977, Welsh and Anthony, pp. 15-16.*

Next is an improvement on a routine we printed in the last issue. It is the contribution of **Fred A. Kanel** of Research Triangle Park, North Carolina.

(67/97/41C) Here's a version of the A/B=C/D ratio equation routine shown at top center on page 12 of Vol. 3 No. 4. This version saves four lines of memory.

Continued

001	*LBLA	010	R↑
002	X=0?	011	+
003	GTO2	012	ENT↑
004	R↓	013	*LBL1
005	X=0?	014	R↓
006	GTO1	015	÷
007	R↓	016	x
008	GTOA	017	RTN
009	*LBL2	018	R/S

Instructions are the same: (A) 13, ENTER; (B) 22, ENTER; (C) (unknown) 0, ENTER; (D) 44, Ⓐ. After Ⓐ is pressed, the answer "26" will appear in the display.

The last routine works well on either the HP-67/97 or the HP-41C. But here is a routine from **David Spear** of Philadelphia, Pennsylvania, that was designed specifically for Mr. Spear's HP-41C, and it uses only 14 lines of memory. However, it also works quite well on the HP-67/97. Try it.

(41C/67/97) Here is an interchangeable solution to A/B=C/D in only 14 lines. Start by entering the data into the stack; for example, (A) ENTER; (B) ENTER; (C) ENTER; (D) XEQ RATIO. The unknown should be entered as 0 in the appropriate position (Terry Mickelson's idea in Vol. 3 No. 4). The routine uses the transposition AD=BC. If either A or D is 0, the other is divided into B*C. If neither is 0, the routine loops to test B and C, and divides the other into A*D. If you forgot to enter 0 for the unknown, the routine signals by continuing to loop.

01*LBL "RATIO"		08	RDN
02	RDN	09	GTO "RATIO"
03	X=0?	10*LBL 01	
04	GTO 01	11	RDN
05	X<>Y	12	/
06	X=0?	13	*
07	GTO 01	14	RTN

(Very good, Mr. Spear. But for HP-67/97 owners not familiar with HP-41C code, here's some help. Change line 001 to LBLA and line 009 to GTOA. Lines 2, 8, and 11 are "roll downs." The asterisk in line 13 denotes "multiply" on the HP-41C. Ed.)

How about two more HP-41C tips from **David Spear**? He's really been busy with that new calculating marvel.

(41C) Most people double a number by keying ② ✕. This uses 2 lines, 3 bytes, and loses the T-register. Keying ENTER + uses one less byte. But the best way is to key STO + [ ] ✕. This uses only 1 line, 2 bytes, and saves the T-register.

(It not only saves space, Mr. Spear, it also runs faster in a program. Very good tip! Ed.)

(41C) Here is a solution to the quadratic equation $ax^2 + bx + c = 0$. It takes 19 lines and uses no registers. Key in a, ENTER, b, ENTER, c, XEQ QUAD. If the roots are imaginary, the annunciator will show that flag 1 is set. The real part will be in the X-register, the imaginary part in the Y-register.

01*LBL "QUAD"		11	X>0?
02	X<> Z	12	SF 01
03	ST/ Z	13	ABS
04	ST+ X	14	SQRT
05	CHS	15	ST- Z
06	/	16	X<>Y
07	STO Z	17	FC? 01
08	ENTER↑	18	+
09	*	19	RTN
10	-		

(Neat! But one thing to watch: If first example gives complex results, second time through would also give complex results. Flag 01 is never cleared. Ed.)

Let's jump across the world, now, to Nova Gorica in Jugoslavija (Yugoslavia, to us! And this author's home is about 33 kilometers north of Trieste—as the crow flies. Thought we didn't know, eh?) This contribution is from **Dipl. Ing. Rajer Jernej**.

(67/97) As a contribution to "25 Words," I send you this routine that I use to solve the formula for χ^2. The original contribution by Michael Tarnowski, which was printed on page 11 in Vol. 3 No. 3, required 24 lines of memory, whereas mine uses only 14 lines.

001	*LBLA	009	CHS
002	R/S	010	+
003	STOA	011	GTOA
004	-	012	*LBLB
005	X²	013	SF2
006	RCLA	014	GTOA
007	÷	015	R/S
008	F2?		

This routine can be used autonomously or as part of other programs. To use it, press [CLX], then Ⓐ, and key in O_i, ENTER, E_i then press [R/S]. To delete wrong values, key in O_i, ENTER, E_i, then press Ⓑ and [R/S]. The value of χ^2 is constantly visible in the X-register.

(I received a lot of mail about Mr. Tarnowski's routine, but must admit no one quite duplicated this contribution that came from a small town on the Italy/Yugoslavia border just north of Monfalcone. As you can see, HP-67's do get around! And, for that matter, so does your KEY NOTES! Ed.)

There aren't many contributions to this column from Ireland. This one is from **Tom Veale**, who lives with his HP-67 in Dublin.

(67/97) The following routine will produce a 1-second pause or, alternatively, a 5-second pause, depending on the status of flag 1, which is preset by a trigger (in this case LBLe) on the HP-67. This I find useful in checking inputs that I have written down (using the 5-second pause), by rerunning the program with the 1-second pause, which is sufficient for comparing the written figures with those displayed.

001	*LBLe	on-off trigger.
002	F1?	
003	GTO9	
004	SF1	
005	i	1 in display indicates F1
006	RTN	set.
007	*LBL9	
008	CF1	
009	0	0 in the display indicates
010	CF2	F1 clear.
011	RTN	
050	F1?	pause choice function.
051	SF2	
052	F1?	
053	PRTX	5-sec. pause when F1 is
054	F2?	set.
055	F2?	
056	PSE	1-sec. pause when F1 clear.

If, in a program, the pause "choice function" occurs frequently, it could best be treated as a subroutine in order to save steps.

The above may be useful to your readers. I have not noticed such a routine in KEY NOTES. It is an interesting illustration on the use of test-cleared flags (F2 in this example).

How about a couple of short routines from **George Miller** of Cincinnati, Ohio? There must be several dozen variations of the first one, but we're printing it for those who haven't as yet discovered this trick.

(41C) The following routine is a simple-minded "locking" device that prevents tampering with the HP-41C by those unfamiliar with its operation. Line 03 sets the auto-execution flag, then line 04 turns off the calculator. Line 05 is the first line executed when the ON key is pressed.

01*LBL "LOCK"	
02*LBL 00	
03	SF 11
04	OFF
05	GTO 00
06	END

Instructions:
1. Instead of turning off the HP-41C, key in XEQ "LOCK," and it will turn itself off!
2. Attempts to turn on the HP-41C will be indicated by the auto-execution "beep" and the calculator staying OFF.
3. To override the "LOCK," simply hold down the R/S key while pressing the ON key.

The use of GTO 00 in line 05 allows more rapid execution than the use of GTO "LOCK."

(41C) The following two subroutines are handy for requesting input from many programs where input without stopping the running program is desired. The calling program provides a prompting message in the ALPHA-register, and the subroutine provides a steady display while waiting for a response. After the response, control is returned to the calling program. One level of subroutine call is used to provide this service. The first subroutine takes 20 bytes, the second, 23 bytes.

```
01◆LBL "NUM?"        01◆LBL "WORD?"
02 AVIEW             02 CF 23
03 CF 22             03 AON
04◆LBL 01            04 AVIEW
05 PSE               05◆LBL 01
06 FC?C 22           06 PSE
07 GTO 01            07 FC?C 23
08 RTN               08 GTO 01
                     09 AOFF
                     10 RTN
```

Instructions:

1. Load prompting message into ALPHA-register.
2. a. For numeric input, XEQ "NUM?".
   b. For alpha input, XEQ "WORD?".

Control is returned to the calling program, with the numeric response in the X-register or the alpha response in the ALPHA-register.

This next input is not a routine, but it is a contribution, and something you might overlook on the HP-41C. It's from **John L. Gafford** of Waco, Texas, who, in the August 1979 issue, was from Jackson, Michigan, proving that Americans are very peripatetic people.

(41C) A comment on Craig Pearce's "SIZE" routine in Vol. 3 No. 4, page 5. His instructions are LBL "SIZE," and the first line of his program is 01 LBL "SIZE." If one uses one of the standard functions as a program label (i.e., "SIZE"), then the function cannot be executed from the keyboard until the program label is removed or changed to some name other than a standard function.

For a change, how about a routine from the land that produces exceptional tapestries, among other things. This routine is the product of **Didier de Callatay** of Brussels, Belgium— or is it? We'll let *you* decide....

(67/97) Please find here a little "moving average" routine: very short (less than 25 lines), very fast (less than 25 tenths of a second), very powerful (up to 24—yes! less than 25— entries in the "moving average,") and very easy to use (less than 25 words to explain).

```
001   *LBLA
002   X≠I
003   X=0?
004   RCLE
005   X≠I
006   ST+0
007   RCL i
008   ST-0
009   R↓
010   STOi
011   DSZi
012   SF3
013   RCL0
014   RCLE
015   ÷
016   RTN
```

Store the number of sets of data in the moving average in register E. For each entry, press [A], and see the "moving average" of the last (R_e) entries.

Well, I forgot to say that this routine was written by my daughter, who is less than 25 ... months (exactly 16; see photograph).

(Very clever presentation for this column, Mr. de Callatay! But I'm not convinced that your daughter was the author. However, since I'm retiring 3 years from now, perhaps your daughter ... naw, it's too good to be true! P.S. I edited your explanation; that's why it's now over 25 words. Ed.)

There are many, many "SIZE" routines for the HP-41C, but we've never seen one quite the same as this next contribution. The author is **David B. Rifkind** of Tucson, Arizona.

(41C) Here is a modified version of the "SIZE" routines printed in Vol. 3 No. 4. It uses a nice technique called a "bracketing loop" for much faster execution with large "SIZES."

```
01◆LBL "SIZE?"      16◆LBL 01
02 10.4001          17 ISG Y
03 ENTER↑            18 CLX
04 SF 25            19 RCL IND Y
05◆LBL 00            20 FS? 25
06 ISG Y            21 GTO 01
07 CLX              22 RDN
08 RCL IND Y        23 FIX 0
09 FS? 25           24 "SIZE="
10 GTO 00           25 ARCL X
11 CLX              26 AVIEW
12 10.0001          27 FIX 4
13 -                28 RDN
14 ENTER↑            29 RTN
15 SF 25
```

I like to have routines that leave the X-register alone, and this one does.

Not far from Arizona—in fact in Gardendale, Texas— there's another HP-41C owner, by the name of **Patrick Murphy**. Let's see what he's doing with his new calculator.

(41C) Here is a little tidbit that may be suitable for your "25 Words" column. These are fast octal ←→ decimal conversion routines that handle real numbers. There may be some error in the result if the number is irrational in octal, or if the precision of the calculator is exceeded during calculation. The stack is destroyed, but no registers are used.

```
01◆LBL "ROCT"       01◆LBL "RDEC"
02 ENTER↑            02 ENTER↑
03 INT              03 INT
04 OCT              04 DEC
05 RCL Y            05 RCL Y
06 FRC              06 FRC
07 1073741824       07 1 E10
08 *                08 *
09 INT              09 INT
10 OCT              10 DEC
11 1 E10            11 1073741824
12 /               12 /
13 +               13 +
14 RTN             14 RTN
```

There were some letters about the article, "SST-ing Thru Subroutines" (on the HP-97), which appeared in Vol. 3 No. 2, page 12. It seems many people were interested in a possible solution for this on the HP-67. Well, here's one from **Charles H. Bowles** of Marathon Shores, Florida.

(67) Mr. Schaeffer is right, his method of "SST-ing" through subroutines on the HP-97 will not work on the HP-67. But here is one that will; in fact, two that will.

Method 1. If you have an unused LBL and program space, and you want to SST through the program *and* subroutines, insert an "f GSB n" as the second step of any subroutine you wish to be able to SST through. LBLn will read "f LBLn, h RTN." You can then SST through any program, including the subroutines.

Method 2. While holding down the SST key, press R/S and hold it. Release the SST key (still hold R/S). Then release the R/S key and immediately press it again. You will be at the first step of the subroutine and can proceed to SST through it, and it will RTN to the proper place at the proper time.

(Seems Somewhat Tedious but Sure Seems To work. Someone Studying This might Sense Some Traps, but we think Mr. Bowles Sure Solved That problem! Ed.)

Russian Calculators?

In the last issue, one of you asked a question regarding calculators in Russia. So we're happy to bring you the following news, which we thought would interest you.

Dear Mr. Horn:

In reply to Mr. Santoyo's letter published in the November 1979 issue of KEY NOTES (Vol. 3, No. 4), I am glad to furnish the following information about calculators made in the U.S.S.R.

I was there for a four-week period in October 1979, and I looked carefully in the stores in Moscow as well as in Leningrad, in addition to asking some colleagues in the Institute of Control Sciences at Moscow and in the Computer Centre at Leningrad. At that time they were making calculators in the U.S.S.R., but these were of the non-programmable type. The best one you could get in Moscow was the simple four-function plus reciprocal and square-root type, and it cost 50 rubles (approximately $75.00 U.S. at the official rate of exchange). Since this was rather expensive (the average salary of scientists was between 300 to 500 rubles per month), I did not see any of the scientists with personal calculators. Most of them were using slide rules.

When I brought this matter up for discussion at the Computer Centre, I was told that they were aware of the bad effect of the calculator on the high school students in the U.S.A. and, hence, the official policy was not to make calculators available at a low price.

In the Scientific Exhibition in Moscow, they had as an exhibit a scientific non-programmable calculator, but I was told that this was not available in the market.

Yours sincerely,

Professor Naresh K. Sinha
McMaster University, Ontario, Canada

Library Corner

There are now over 4,250 programs in the HP-67/97 Library and over 350 programs in the HP-41C Library. And when you consider that there are over 5,500 programs in the HP-65 Library, it brings up an astonishing statistic: *There are over 10,000 programs in the Corvallis Users' Library!* No matter how you look at it, that is quite a huge mass of information, and it covers just about every subject known to modern science, industry, and medicine. Our heartiest congratulations go to all of the authors for making this milestone possible.

CATALOG UPDATE

If you are a current subscriber to the Users' Library and as of this date have not received the last (November) update for the *Catalog of Contributed Programs*, contact the Library by mail or phone. The next *Catalog* update is scheduled for release in the May/June time-frame. We'll have more about that in the June KEY NOTES.

HP-85 LIBRARY

Once again the Library has expanded to meet the needs of another distinctive product, the HP-85 Personal Computer for Professionals. If you have not seen this marvel, the Library staff recommends that you get to your dealer *fast* and test one.

The HP-85 Users' Library is a separate, unique entity. Subscriptions are $40* a year for the U.S. and Canada, and $60* a year for all other countries (except Europe). Europe will have their own HP-85 Library, so contact them (Geneva) for prices in that area.

Library programs for the HP-85 are available at $10* for each program listing and documentation. Members of the Library will receive a 40-percent discount on each program, so *their* net cost will be only $6* a program. But that's not the only membership benefit. As a member of the HP-85 Library you will receive (1) a catalog full of program abstracts, (2) special promotions available only to members, (3) access to lots of programming ideas, (4) a membership card with *your* number. And, best of all, if you subscribe within 60 days after purchasing your HP-85, you will receive a special cartridge containing programs written especially and exclusively for the HP-85 Users' Library.

ORDERING PROGRAMS

HP-67/97 and HP-41C programs are $6* each, and they include documentation and a prerecorded magnetic card. Whenever possible, use the Users' Library Order Form in your *Catalog of Contributed Programs* to place Library orders. If you want a program that you see in this issue of KEY NOTES, and you can't find an order form, a plain

piece of paper with your name and address and the program numbers you desire is certainly adequate. Mail your order and a check or money order to the Corvallis address listed on the back cover of this issue. Don't forget to include your State and local taxes. Or, in the U.S., you can place your order by calling toll-free: 800-547-3400, except Alaska and Hawaii (in Oregon call 758-1010). Yes, these are new numbers; see the article on page 3.

NEW PROGRAMS

Here are some new submittals you might like. Most do not appear in the new *Catalog* update. None of the programs in this issue are available in Europe at this time.

(67/97) The first one is a "special" that's titled, simply, **Navigation #67000-99971**, and the price is $43.50.* It is the work of **Captain Kenneth R. Orcutt** of Valley Center, California, who managed to program this large composition in 4059 lines, 20 cards, and 94 pages. So they don't call him the "Calculatin' Captain" for no reason!

This integrated set of navigation programs, used daily at sea by Captain Orcutt of Matson Navigation Company, is now available from the Library. Or you can purchase them separately, at the standard Library rate of $6* a program.

Captain Orcutt and his navigators have worked and reworked all of these programs from the bridge of a ship, so how can *you* go wrong? And you have to admit that the complete set is a software bargain, particularly when it *includes* cards. The set contains:

00455D Sun LOP Sight Reduction (224 lines, 1 card, 5 pages)
04160D Sun Azimuth (217-1-5)
00451D Sun Azimuth for Compass Adjustment (223-1-5)
00456D Time of Meridian Transit of the Sun and Meridian Altitude (223-1-5)
04161D Longitude by Sun Transit and Circles of equal Altitudes (218-1-5)
00457D Time of Sunrise and Sunset (222-1-5)
00453D Planet Sight Reduction (169-1-5)
00454D Moon Sight Reduction (172-1-5)
04162D Stars Sight Reduction (223-1-5)
04163D Star Azimuth (205-1-5)
04164D Star Identification and Sight Reduction (222-1-5)
00452D Stars and Planets (595-3-14)
00446D Great Circle Navigation, Including Composite and Rhumb Line (224-1-5)
00447D Sailings--Mercator, Rhumb, Great Circle (210-1-5)
04165D Voyage Planning, ETA and Speed (118-1-4)
04226D LORAN Line of Position (594-3-11)

Next are three programs that should be of interest to geologists and seismologists (and perhaps a lot of people living along the San Andreas Fault in California!). The programs are especially complete, even as to maps that show the continental shifts, so you can actually calculate the shifts that have taken place.

(67/97) Plate Tectonic Geometry— Pole of Several Rotations (#04229D)

The finite motion of a rigid plate on the surface of a sphere may be described as a rotation about an axis passing through the center of the sphere. In this program, a series of successive rotations about given poles of rotation may be concatenated, and the resultant pole and angle of rotation determined using the method of Phillips and Forsyth. (Will run okay on the HP-41C.) (224 lines, 5 pages)

Author: **Victor A. Schmidt**
Pittsburgh, Pennsylvania

(67/97) Plate Tectonic Geometry— Pole of Finite Displacement (#04230D)

This program allows the calculation of poles of rotation for finite motions of rigid plates on the surface of a sphere, given the latitudes and longitudes of two fixed points on the plate before and after rotation. The angle of rotation about the pole is also calculated. Useful in reconstructing plate motions and plate configurations throughout geologic time. (Will NOT run on the HP-41C without extensive modifications.) (326 lines, 2 cards, 7 pages)
Author: **Victor A. Schmidt**
Pittsburgh, Pennsylvania

(67/97) Plate Tectonic Geometry— Rotate a Point About a Pole (#04231D)

The program rotates a point A on a sphere about a specified pole B by a given angle of rotation, yielding the new latitude and longitude of point A. Useful in mapping problems and in reconstructing ancient plate motions from published poles of rotation. Faster and more convenient for this purpose than program #00075D. (Will run okay on the HP-41C.)
(168 lines, 6 pages)
Author: **Victor A. Schmidt**
Pittsburgh, Pennsylvania
(Very good, Mr. Schmidt! This author is in the Department of Geology and Planetary Science at the University of Pittsburgh. Ed.)

We seem to be stressing measurements in this batch of programs, and these next two are not out of line (!) for that subject. Best of all they point out the difference in the HP-67/97 and HP-41C, because the author has written the same thing for two different calculators. Notice that the HP-41C uses less lines.

(67/97) Straight Line Forced Thru Any Point (#04227D)

This program calculates the bearing of a least squares fit straight line forced through any given point. Predictions of new E' and N' on that line may be made from values of N and E. Coordinate pairs (N,E) may be added or deleted at any time. (113 lines, 6 pages)
Author: **Frank C. Blachly**
Hyattsville, Maryland

(41C) Straight Line Forced Thru Any Point (#00327C)

Abstract identical to #04227D, above, but outputs have ALPHA prompts and labels and the printout on the HP-41C printer makes a more-easily-recalled-at-a-later-date program. (86 lines, 6 pages)

Author: **Frank C. Blachly**
Hyattsville, Maryland

(Nice programming, Mr. Blachly. Too bad most people will never see both programs. Ed.)

Now, how about a program from a doctor at the famous Mayo Clinic, who refers to his programming as: "...I am a rank amateur at this and self-taught besides." But you'll agree, if you see this program, that **Dr. Tucker** has nothing to be ashamed of if he can do this type of work.

(67/97) Renal Clearance & Reabsorption (#04232D)

A program for calculation of body surface area from height and weight (inches and pounds), corrected and uncorrected clearance of creatinine, phosphorus (or uric acid), chloride, osmolality, and free water. In addition, it will provide an estimate of distal renal tubular reabsorption of chloride and percent of filtered phosphorus and chloride reabsorption. (189 lines, 8 pages)

Author: **Ross M. Tucker, M.D.**
Rochester, Minnesota

(Thank you, Dr. Tucker, for taking the time to document this program. I'm sure a lot of your peers will enjoy your work. Ed.)

And, lastly, we have quite a unique application for you, from a Research Horticulturist in the land of koalas and wallabies.

(67/97) Labour or Rhythmic Event Timer/ Predictor (#04228D)

The program can be used for timing and predicting contractions during labour or for events of similar rhythmic nature. Running the program requires the use of only two keys (START and FINISH), giving: the interval since the last contraction/event and then a countdown of time remaining until the contraction/event ends; or the duration of the last contraction/event and then a countdown of time remaining until the next contraction/event. Starting can be done using the calculator to time contractions/events until prediction is possible, or by manually inputting values for previous cycles. (221 lines, 5 pages)

Author: **Stephen C. Morris**
Gosford, NSW, Australia

(In almost 6 years of writing KEY NOTES, I've seen a lot of "diverse" or "unique" programs, but must admit this one is "different." But before you scoff at this, read the following excerpt from the author's letter. Good show, Mr. Morris! Ed.)

"Having seen several programs incorporating timers, a program was written enabling the HP-67 to handle all timing and prediction tasks, leaving me completely free to assist with breathing and massages. Despite initial skepticism by my wife and even incredibility by the assisting nursing staff, all were agreed that the HP-67 did a terrific job helping with the natural birth of our first child."

About Batteries . . . Continued

In the August 1979 issue, we defined the useful life you could expect from the disposable type N alkaline batteries that are used in the HP-41C. Defined were the maximum and minimum limits of these batteries. In that same article ("About Batteries . . ."), we also stated that an accessory AC adapter would be available early in 1980. However, we found that a nickel-cadmium battery pack that can be recharged either inside or outside of the calculator is by far the preferred accessory for the majority of users. Furthermore, a good many of you already own an AC adapter/recharger (for the HP 82143A Printer) that can be used with a rechargeable battery pack. Also, we have solved the technical problems associated with making nickel-cadmium batteries work well with a low-power CMOS* device. And so, for these reasons, we decided to offer a rechargeable battery pack instead of an AC adapter.

The new rechargeable battery pack will exactly replace and be interchangeable with the present battery case assembly you now have in your HP-41C. Built into the rechargeable pack is a recessed socket that aligns with the small port on the right side of your calculator just below the SST key. When the rechargeable pack is in your HP-41C, you can use the printer's AC adapter/ recharger to furnish power for the calculator by merely removing the small charging-port cover and inserting the plug from your AC adapter/recharger.

Now, when you use your calculator with a card reader and/or wand and/or memory modules, you will not rapidly deplete the batteries if you are a heavy user of all the peripherals.

You also can recharge the new pack while it is removed from the calculator, making it, effectively, also a "reserve" power pack. Thus, with two of the new packs, you should be able to calculate, read cards, and print to your heart's content. And, as a further backup, there's always the original battery case assembly and its four N-cells.

A fully charged pack will typically provide 6 to 12 hours of continuous run-mode *calculator* operation. Peripherals that draw power from the calculator's power supply will, of course, reduce the total power avail-

*CMOS: Complimentary metal-oxide-semiconductor.

able for calculator operation to something less than the 6 to 12 hours, depending on the extent of peripheral use.

The nickel-cadmium cells in the rechargeable battery pack operate much differently than the alkaline N-cells you now use. After the low-battery indicator turns on, the rechargeable pack will provide a reserve operating time of only 1 to 2 minutes—much less than that offered by alkaline batteries.

The following rechargers can be used with the new rechargeable battery pack.

Model	AC Voltage	Identification
HP 82059B	90 to 120	United States
HP 82066B	210 to 250	Europe
HP 82067B	210 to 250	United Kingdom
HP 82067B Opt. 001	210 to 250	Republic of S. Africa
HP 82068B	210 to 250	Australia
HP 82069B	90 to 120	Europe

The rechargers will *not* be provided with the new pack, primarily because many of you received one with the purchase of your HP 82143A Printer or with an HP-97, HP-92, HP-19C, HP-10, or HP-91.

This new product is nearly ready for distribution to our dealers, and we expect that it will be available for purchase on June 1. However, **that is still not a firm date.** But the June issue of KEY NOTES *will* present more details about the new pack, including photos, the price, etc.

In the meantime, there *is* one way you can extend the useful life of your N-cell batteries if you heavily use the peripherals. Because a significant amount of battery life remains for *calculator-only* operation after the batteries will no longer operate the card reader, many HP-41C owners are stretching disposable battery life by exchanging batteries in tandem with card reader use. They load in fresh batteries to operate the card reader, then use older batteries to use only the calculator.

To make this battery exchange easier for those of you who use that method, we have established a price and a place of purchase for HP-41C battery case assemblies. With *two* battery case assemblies, you can easily exchange a set of batteries at a time, rather than one at a time, thus saving time and trouble. Furthermore, it is easier to mark the battery case assembly than it is to mark small N-cell batteries.

In the United States, only (anyone with a ZIP-code address), you can order battery case assemblies (HP Part Number 00041-60009) for $1.00** each, plus any applicable sales tax and a $1.50** *per order* handling and shipping fee. Notice that we stated the fee is "per order." Get together with a friend or two or three and you still pay only $1.50. The battery case assemblies must be ordered from:

Continued

**U.S. dollars. See note at bottom edge of cover.

Customer Service Center
Hewlett-Packard Company
Mail Order Department
P. O. Drawer No. 2
Mountain View, CA 94043

Or, you can order by phone, using your Master Charge, VISA card or American Express credit card, by calling **415-968-9200**, extension 341 or 342.

In Europe and in other countries outside the U.S., contact your local HP Sales Office about the availability of the 00041-60009 Battery Case Assembly.

Another tip for stretching battery life is to make sure that the circuits inside the plug-in peripherals get initialized properly. When some of the peripherals are plugged in, in particular the card reader, their circuits may occasionally be powered-up in an indeterminate state that causes unnecessary current drain from the batteries. This condition corrects itself as soon as the calculator is turned ON. Therefore, to save battery life, it is a good idea to make sure the calculator has gone through at least one ON-OFF cycle before leaving the peripherals attached to the calculator for a long period of time.

Accessories Hot Line

You may have thought that ordering an accessory directly from the factory was the quickest way to obtain it. Chances are that you are wrong, especially if you live on the East Coast of the United States.

In their quest for cost efficiency in this era of double-digit inflation, our shipping department is NOT mailing accessories via first-class mail. So, unless you live in a remote area, there probably is an HP Full-Line Accessory Dealer near you who has that battery, application pac, recharger, or thermal paper you are looking for, and who will get it to you a lot faster than by ordering it from the factory.

Out of all the dealer outlets in the U.S. that handle our products, we have identified a large number of them who have committed to continually stocking certain "Class A" or "key" accessories (all batteries and rechargers, thermal paper, blank magnetic cards, software, etc.). And if they don't ... we expect to hear from you.

To locate a "Full-Line Accessory Dealer," all you have to do is call our toll-free number 800-547-3400, except Alaska and Hawaii (in Oregon call 758-1010), and ask for the nearest dealer. They are listed by ZIP-code number, so our operators can easily recommend one near you. In fact, now that we have our own operators (see page 3), they probably can give you almost *any* information you need, short of *exactly* how many and the *price* of accessories that the particular store has.

Because this program has been very successful and has contributed to greater customer satisfaction, as of February we have actively referred all of our "direct" customers to our Full-Line Accessory Dealers. And, with each accessory shipped from the factory to a "direct" customer, we have included a card that encourages them to call our toll-free number and use the services of our full-line dealers, who are very happy to see their businesses grow in this way.

Try it. You'll like it!

Indirect Addressing

One of the most powerful programming concepts implemented on programmable calculators is indirect addressing. In addition to saving lines in programs (program memory), indirect addressing allows the programmer to write programs that, without extensive logic testing, will perform operations based on previous results. But before we get into the details of indirect addressing, let's first review addressing in general.

The instructions programmed into the calculator usually require an argument of some kind. For example, the SIN key takes the sine of the angle (any number) in the X-register. The angle is the argument of the SIN instruction. In the case of the SIN instruction, the argument does not have to be part of the instruction because it is assumed that you have placed in the X-register the angle whose sine you want. Other isntructions, however, require that you provide the argument as part of the instruction itself. The STO (store) instruction is a typical example. If you wish to store a specific number, 3.14159 for example, in register 3, you would have STO 03 in your program. The 03 is the argument of the STO instruction. The calculator requires the user to complete the STO instruction with the location or address to store the number. The 03 in STO 03 is the address. Technically there are two arguments for the store instruction. One is the location of the number to be stored, the other is the location to store it. Since it is understood that all numbers to be stored by the STO instruction are in the X-register there is no need to specify the location of the number being stored.

The example of storing the number 3.14159 in register 3 illustrates direct addressing. The location in which the calculator is to store 3.14159 is specified in the instruction. Suppose, however, you wanted to store the number 3.14159 into a register that depended upon previous calculations and you couldn't predict what its number would be? To implement this concept, the address is specified by another register. For example, let's place the number 3 in register 17. The instruction STO IND 17 would store 3.14159 in register 3. The IND in the instruction means indirect. When the calculator implements the STO IND 17 it stores the X-register number into the register specified by the number in register 17.

If you haven't thought about indirect addressing, or haven't used it, you may not realize how handy it can be. But let's clarify one more detail of how the HP-41C implements indirect addressing before we show how to use this most powerful instruction. If you have a calculator available, try the illustrative routines as we proceed. In the last paragraph, the example used 17 as the argument of the STO IND instruction. The number 3 was stored in register 17 and served as the address at which to store the number 3.14159. The implementation of the indirect instruction is to use only the absolute value of the integer portion of the number in the argument register. This is very useful and it means that register 17 could have contained the number -3.4567 and the operation would have been exactly the same.

The following example illustrates how indirect addressing can save program memory. Suppose we wish to evaluate a random number generator for uniform production of the digits 1 thru 9. The problem is to generate digits, tally the number of each digit generated, and evaluate the totals for a uniform distribution; e.g., an equal number of each digit. The programming approach is to add all the 1's generated, all the 2's generated, etc., and keep the sum of the 1's in register 1, the 2's in register 2, etc. A program that uses this straightforward approach is shown below. For illustration and test purposes we will provide the input digits and use routine "A" to sort and tally them. The random number generator is omitted, but could easily be included, calling routine A as a subroutine after each digit is generated. Registers 1 thru 9 are assumed to be cleared before a given batch of digits are summed.

01♦LBL A	19 X=Y?
02 1	20 ST+ 05
03 X=Y?	21 CLX
04 ST+ 01	22 6
05 CLX	23 X=Y?
06 2	24 ST+ 06
07 X=Y?	25 CLX
08 ST+ 02	26 7
09 CLX	27 X=Y?
10 3	28 ST+ 07
11 X=Y?	29 CLX
12 ST+ 03	30 8
13 CLX	31 X=Y?
14 4	32 ST+ 08
15 X=Y?	33 X<>Y
16 ST+ 04	34 ST+ 09
17 CLX	35 CLX
18 5	36 RTN

The number of each digit summed is determined by recalling register n, and dividing

by n. The same operation can be performed using indirect addressing. Routine E (below) illustrates this, and table 1 compares the two routines.

1. LBL E
2. STO + IND X
3. CLX
4. RTN

Table 1. Routines A and E Compared

Routine	Stack Regs. Used	Speed	Program Lines	Program Bytes
A	2	fast	37	49
E	1	very fast	4	9

The indirect store instruction is greatly enhanced in the HP-41C because any register may be used as the argument. In this example, the input data itself directs its storage and summation.

The 26 HP-41C instructions that may have indirect arguments are tabulated in table 2, along with the ranges of the contents of their argument registers. The argument itself may be any valid HP-41C register 00 thru 99, X, Y, Z, T, or L. Routine E could have TONE IND X following the STO IND X if an audio indication of the digit stored were desired. However, this would slow down the program considerably.

The STO and RCL instructions are probably the most commonly used indirect instructions. Close seconds, however, are GTO and XEQ. An example of an ALPHA application is the recall of a telephone number (and/or other desired information) from program memory when given a name. A program that displays the telephone numbers of JANET, BOB, and NANCY illustrates the indirect XEQ (line 7 in routine C).

```
01*LBL C          10*LBL "JANET"
02 "NAME"         11 "533-555-1212"
03 AON            12 RTN
04 PROMPT         13*LBL "BOB"
05 AOFF           14 "723-555-6767"
06 ASTO X         15 RTN
07 XEQ IND X      16*LBL "NANCY"
08 AVIEW          17 "621-555-4141"
09 STOP           18 RTN
```

To use the telephone retrieval program, press USER, then the C key. The "NAME?" prompt indicates you may key a name of up to six characters. Next, press R/S for the number. The program stores the name in the X-register and executes indirectly the label of the same name. If no label is found the very appropriate message "NON-EXISTENT" is displayed. Using this program, 16 to 18 names and telephone numbers may be stored in a *basic* HP-41C.

XEQ or GTO will only work with global labels. The single letters A thru J and a thru

Table 2. HP-41C Instructions That Can Be Executed Indirectly

Indirect Instruction	Argument Register Value Range	Error Message If Out of Range
STO IND nn*	000-318	NONEXISTENT
STO + IND nn	000-318	NONEXISTENT
STO – IND nn	000-318	NONEXISTENT
STO X IND nn	000-318	NONEXISTENT
STO / IND nn	000-318	NONEXISTENT
ASTO IND nn	000-318	NONEXISTENT
RCL IND nn	000-318	NONEXISTENT
ARCL IND nn	000-318	NONEXISTENT
VIEW IND nn	000-318	NONEXISTENT
GTO IND nn	00-99	NONEXISTENT
XEQ IND nn	00-99 or ALPHA NAME	NONEXISTENT
FIX IND nn	0-9	DATA ERROR
SCI IND nn	0-9	DATA ERROR
ENG IND nn	0-9	DATA ERROR
ISG IND nn	000-318	NONEXISTENT
DSE IND nn	000-318	NONEXISTENT
TONE IND nn	0-9	DATA ERROR
ΣREG IND nn	000-313	NONEXISTENT
ST IND nn	00-29	NONEXISTENT
CF IND nn	00-29	NONEXISTENT
FS? IND nn	00-55	NONEXISTENT
FC? IND nn	00-55	NONEXISTENT
FS?C IND nn	00-29	NONEXISTENT
FC?C IND nn	00-29	NONEXISTENT
X<> IND nn	000-318	NONEXISTENT
CAT IND nn	1-3	DEFAULTS TO CAT 3 IF ≥ 10 DATA ERROR

*Note: nn may be any valid HP-41C data register, 00-99, X, Y, Z, T, or L.

e cannot be used as labels without a special technique. A typical example where single letters would be used is a large letter banner printing program that uses a printing routine for each letter. If an "A" is to be printed, it is most convenient to store the "A" in the X-register and XEQ IND X. The "A" printing routine would have a LBL A. As mentioned above, "A" is not a global label. LBL AA, however, is a global label, and it is an easy matter to make all labels double labels and double the letters as they come up. The ALPHA register is used for this process. (The text is stored in scratch registers to free up the ALPHA register.) The program instructions would be:

ASTO X	Stores "A" in X-register.
ARCL X	ADD "A". Produces "AA".
ASTO X	Stores "AA" in X-register.
XEQ IND X	Executes global label AA.

The use of indirect addressing saves so much program memory that the added byte for each label to make a double letter label is still memory-efficient.

The HP-41C was used to illustrate indirect addressing, but the ideas also apply to the HP-67/97, HP-19C/29C, and the HP-34C, except that the argument is a single, fixed register. When indirect addressing is used with incrementing and decrementing counters, it becomes even more effective in saving program memory. From the above

examples you should be able to apply all the instructions in table 2 whenever you have multiple executions of an instruction with only a change in the data. Indirect addressing not only saves memory but also reduces logic testing in many applications.

About Foreign Orders

It is no secret that inflation and rising fuel costs have forced many businesses to curtail some services. And so we regret that we must stop accepting orders from any country outside of the U.S. To be more specific, until further notice, **any order that must be shipped to any address that does not include a U.S. ZIP code will be returned to the sender.**

As we said, this is regrettable. However, inflation has increased our costs to the point where we can no longer economically process foreign orders. There are also many extra mail costs and delivery problems and, of course, the many and diverse customs regulations. Then, too, the fluctuating currency-exchange rates are a constant headache and cause our costs to increase. It all boils down to one fact: We cannot continue to accept foreign shipment orders at the factory.

Beginning **April 1, 1980,** please send all of your accessories and product orders to your local HP dealer/distributor if you live outside of the U.S. Don't forget, as the dealer business increases, these dealers will stock more products and accessories, making them more available to you than ever before.

Price Changes

Over the years since the HP-35 was introduced, we have managed to maintain fairly stable prices for our products. In some cases we were able to lower prices, when costs to us decreased. And in many cases, when material costs or "normal" inflation caused added costs, we did not pass them on to you.

In today's world, however, things are vastly different. You all know what has happened in recent months to the prices of gold, silver, copper, and all products related to petrochemicals. Unfortunately—or fortunately, depending on how you look at it—our high-quality products use a considerable amount of plastics and precious metals. Therefore, effective March 3, 1980, the factory prices for the HP 82104A Card Reader and the HP 82143A Printer for the HP-41C were raised 10 percent. The new prices are:

HP 82104A Card Reader	$215*
HP 82143A Printer	$385*

All customer and dealer orders made on or before February 29 will be honored at the old price.

*U.S. dollars. See note at bottom edge of cover.

Book Reviews

The following book was published in September of 1979 but only recently came to our attention. It is NOT a book for financial neophytes, so if you are not comfortable with complex financial formulas or algorithms, make sure you examine the book at a bookstore before you plunge ahead and buy it.

However, for those involved in the intricacies of high finance, particularly in the analysis of investments, mortgages, leases, sinking funds and other financial arrangements in which the time value of money plays a critical role, this book is for you.

The book: *Financial Analysis Using Calculators: Time Value of Money*, is the product of three authors: **Elbert B. Greynolds, Jr.**, Assistant Professor of Accounting at Southern Methodist University (SMU) in Dallas, Texas; **Julius S. Aronofsky**, Professor and Chairman of Management Science and Computers (SMU); and **Robert J. Frame**, Professor of Finance and Director of the Management Center (SMU). It contains 473 pages and is produced only in a "soft-cover" edition. And the information presented in this book can be adapted to a large variety of calculators. Following is a list of the chapters.

1. Introduction
2. Manual Calculations
3. Basic Concepts in Compound Interest
4. Simple Annuities
5. General Annuities
6. Continuous Compounding and/or Continuous Payments
7. Variable Cash flows and Internal Rate of Return
8. Balloon Annuities: Applications Using Present Values
9. Special Applications

There are numerous applications scattered throughout the book. Also, because the chapters are functional (in the sense that they deal with basic problem-solving concepts or approaches) many types of applica-tions (e.g., mortgages, leases, capital budgeting, etc.) are encountered in several places. An applications index is provided in chapter 1 to assist the reader in locating illustrative material and examples of interest. And, last but not least, the book contains a large number of drill exercises, with answers provided for half of them.

In the Continental U.S., the book costs $12.95* (plus any applicable sales tax) and can be ordered from:
McGraw-Hill Book Co.
Princeton Road
Hightstown, New Jersey 08520

In Canada, if you cannot locate the book in a local bookstore, write to:
McGraw-Hill Ryerson Ltd.
330 Progress Avenue
Scarborough M1T 2Z5
Ontario, Canada

In all other countries, if you cannot locate this book write to:
Barbara Mutinsky
McGraw-Hill International Book Co.
1221 Avenue of the Americas
New York, N.Y. 10020 U.S.A.

Because of fluctuating currency exchanges, transportation costs, and so forth, the price of this book is subject to change, especially in countries outside the Continental U.S.A.

*U.S. dollars. See note at bottom edge of cover.

We Get Letters . . .

Gentlemen:

I have implemented the following section of code on my HP-41C. When assigned to a key, and when that key is used to turn off the calculator, this routine enables the calculator to "wake up" and display pertinent information about the owner (name and phone number). Of course, any information can be displayed, and if the calculator is lost, its return is not guaranteed. But this does let a considerate finder know who to contact, since the first act involved with finding a calculator is to take it out of the case and turn it on.

You may elect to use this information with every new HP-41C, or you may wish to publish it in your newsletter.

```
01♦LBL "OF"
02 SF 11
03 OFF
04♦LBL 00
05 SF 11
06 "  IF FOUND"
07 AVIEW
08 PSE
09 "   CALL"
10 AVIEW
11 PSE
12 "  DAVID ILER"
13 AVIEW
14 PSE
15 "  377-7656"
16 AVIEW
17 PSE
18 PSE
19 GTO 00
20 END
```

Now, I have a few questions for *you*. Are you going to make a data cartridge drive for the HP-41C? Are you going to make a plotter for the HP-41C? If so, when will they be available and what will be the suggested list price? Can you send me any information concerning these items?
Sincerely,
David L. Iler, Provo, Utah

(Good idea, Mr. Iler! But I am not permitted to answer all those questions. We do not disclose information on future products. No, that does not mean the above are future products. However, although it rains a lot, here in Oregon, we aren't getting rusty. Look at the HP-85 if you want some encouragement about the future. That's all I may tell you now. Ed.)

Address Correction Requested

Printed in U.S.A.