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September—December 1980 Vol. 4 No. 3



HP Key Notes

A Very Special HP-41C ...

Hewlett-Packard calculators have been used for just about everything imaginable, but the following news release presents one of the better applications from the many we hear about. It is being printed here for two reasons: to let all of you know about it in hopes of helping someone else, and to show our appreciation for the unselfish dedication of a certain college professor in Pennsylvania. Here's the release:

GREENVILLE, PA.—Beeps and bleeps in electronic games tell youngsters of all ages the score, but these sounds coming from a calculator give a blind Thiel College coed an opportunity to be a winner.

For **Peggy Butler**, a senior sociology major from the Pittsburgh suburb of Manor, the ability to use a highly sophisticated calculator with ready access to statistical data opens doors to career fields which previously have been closed.

Peggy developed vision difficulties soon after birth, and by the time she was in elementary school was legally blind. She is a graduate of the School for the Blind, Pittsburgh, and is assisted in getting around Thiel by her pilot dog, Cheyenne.

But developing such an instrument has not come easily and has been a labor of love on the part of one of her instructors, **Dr. Mervin Newton**, associate professor of mathematics at the western Pennsylvania liberal arts college.

Dr. Newton has spent more than 300 volunteer hours in the last year in programming a Hewlett-Packard HP-41C to perform statistical and scientific functions to enable Peggy and other blind students to have the same facilities in mathematics and statistics to complete their courses as their sighted counterparts.

The specially programmed calculator enables Peggy to graduate with a high level of skills, enhancing her vocational opportunities. For example, in her field Peggy could be a research sociologist on her own and would not need someone else to do the statistical analysis for her.

The calculator would enable her to "read" mathematical tables more easily than if they were in Braille. In fact, using Braille tables would be extremely cumbersome, for each table or page of printed numbers would yield four or five Braille pages. With the number of tables needed, Braille would be unworkable because of the sheer volume and the time necessary to reference each number.

In addition to developing Peggy's programs in sociology, Dr. Newton is working on a financial version which would be applicable for students interested in banking. Having these skills a blind student could become a loan officer because financial functions that are required to use tables would be readily available by the calculator.

Dr. Newton estimates he will have another 100 to 150 hours to develop these business programs.

What motivates a person to put in this kind of time? "Well," Dr. Newton explains, "it's my job to help people learn, and when they need extra help because of handicaps, I'm willing to assist them. And besides, I'm a calculator nut. It's my hobby, and I enjoy trying to get the maximum output from each machine. I collect calculators like other people collect stamps."

Thiel and its personnel have attempted to provide reading and counseling services for its blind students and have had at least one such person on campus annually for the last decade.

"Because of the costs, blind students face critical problems in securing sophisticated technical equipment which would significantly help them. Blind persons are a distinct minority group, and the number of blind

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During an interview with Valorie Norman (right) on TV channel 33's "Good Morning Youngstown" show, Peggy* Butler (left) and Dr. Mervin Newton discuss the calculator programmed for blind students. With them is Peggy's pilot dog Cheyenne.

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

Library Corner

All of the programs highlighted in KEY NOTES are available worldwide. However, *before you order any, be sure to read the paragraph below: "Ordering Programs."*

USERS' PROGRAM LIBRARY EUROPE NEWS

Because of the present long lead time that is necessary in publishing any publication of the magnitude of KEY NOTES, there is still quite a gap in time from when we print until you read KEY NOTES in Europe. This lost time is gradually being eliminated, but we are still at the mercy of the time it takes to physically clear Customs and import-export details on each end of the shipping function. Once in Europe, it also has to be distributed through the maze of postal services and many borders in the European area. However, we are making progress, and by the next issue, we will cut the present delay in half; that should be good news for all of you.

Also, remember that, now that you can acquire programs listed in KEY NOTES, these *are* available at the Users' Program Library Europe, in Geneva. You do not have to—and should not—order them from Corvallis.

CORVALLIS LIBRARY NEWS

Addendum 1 to the November 1979 *Catalog of Contributed Programs* has been mailed and by now should have been received by our subscribers. Now we are in the process of putting together the data and information for a complete reprinting of the *Catalog*, which is scheduled to go to the printer on December 1.

A long-overdue mailing to our Library subscribers outside the U.S. has just been completed. The package includes *Addendum 1* to the *Catalog* and the last two KEY NOTES (March 1980 V4N1 and August 1980 V4N2). We will establish a more regular mailing schedule for our friends in other countries, and wish to express our appreciation of their patience.

ORDERING PROGRAMS

HP-67/97 and HP-41C programs mentioned in KEY NOTES are now available from both the Library in Corvallis and the Library in Geneva. **Readers in Europe should order from Geneva** (address on back cover) to get quicker service. Readers elsewhere should order from Corvallis, where programs cost \$6* each, and each program includes documentation and a prerecorded magnetic card (or cards). Whenever possible, use the Users' Library Order Form in your *Catalog of Contributed Programs* to place orders for programs you

see in KEY NOTES. If you do not have an order form or if you are ordering from Europe or Asia, a plain piece of paper with your name and address and the program numbers you desire is certainly adequate.

Make certain that your address is legible and complete.

Mail your order and a check or money order to the Corvallis address shown on the back cover of KEY NOTES. Don't forget to include your State or 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).

Here's a helpful hint for customers outside the U.S.: We have found that your orders are handled in a more efficient and timely manner if you will send, *attached to your order*, an International Money Order, a Foreign Draft or the equivalent, or a check. *Any of these must be in U.S. dollars, drawn on a U.S. bank*, otherwise they will be returned to you, which involves a long delay for you. Much time is wasted and orders are held up in trying to match orders and checks that are sent in separately, or written on checks for non-U.S. banks and in foreign currency. Another option for you is to use such major credit cards as American Express, VISA, or MasterCard.

Orders *not* delayed by the above problems can normally be shipped within 48 hours after they are received in Corvallis.

LIBRARY SUBSCRIPTIONS

In the United States, the fee for a one-year subscription to the Users' Library is \$20.* If you live outside the U.S., the fee is \$30* because of considerably higher postage and handling charges. KEY NOTES is presently free in the U.S., but in areas outside the U.S. you must be a member of the Library in order to receive it. The only exception is the free one-year subscription presently offered to most purchasers of the HP-41C.

NEW PROGRAMS

Here are some recent submittals to the Corvallis Users' Library. All of the programs in this issue are available worldwide, *but before you order, be sure to read (above): "Ordering Programs."*

* U.S. dollars. Orders from anywhere outside the U.S. must include a negotiable check (or money order), in U.S. dollars, drawn on a U.S. bank. All orders from anywhere outside the U.S. must include an additional 10 percent for special handling and air mail postage. (For example, an order for two programs = $\$6 \times 2 = \$12 + \$1.20 = \13.20 total.) If you live in Europe, you can order directly from Geneva, but make certain you make payment as required by the Users' Program Library Europe; the above \$6 fee is good only for orders to the Corvallis Library.

(41C) Mastermind—9 Colors (#00436C)

This program plays a nine-color version of the popular "Mastermind" game. It uses a simple random-number generator to establish the four-color target (can have duplicate colors). The user then tries to discover the target with successive trials. The program will score each trial with an "X.Y" system, where: X is the number of colors in their correct locations and Y is the number of colors correct but *not* in their right locations. A score of 4.0 is a win, a score of 0.0 is a totally incorrect trial. (Enhanced from an HP-65 program by D. Crouse of Allison Park, PA.) *Required accessories: None* (103 lines, 5 pages)
Author: **Charles S. Hodge**
El Toro, California

(41C) Blind Numerical Operations (#00499C)

This program will enable Blind people to "read" the numerical display. This is accomplished by the calculator supplying the correct number of audio tones for each digit. Special audio signals indicate decimal and/or negative numbers. The original number is returned unaltered to the display (except for SCI and ENG displays, which are returned unaltered only when they will not fit the normal FIX display). *Required accessories: None*. (84 lines, 6 pages)
Author: **Mike O'Regan**
Nottingham, United Kingdom

(41C) Aerodynamic Properties of a Finite Wing (Prandtl) (#00506C)

This program calculates the span-wise load distribution and associated aerodynamic coefficients for high-aspect-ratio wings. A 10 control-point, horseshoe vortex approximation to Prandtl's lifting line theory is used. The program is restricted to symmetrically loaded unswept wings with linear taper and twist and to incompressible flow fields. *Required accessories: Math Pac I and two Memory Modules*. (366 lines, 13 pages)
Author: **John Orosa**
University of Florida

(41C) Navigation Package (#00511C)

This program solves celestial sight of any heavenly body and gives line of position. It contains an almanac for sun and stars. A nautical almanac is required for the moon and planets. The program also solves Great Circle problems and Dead Reckoning sailings. Although it uses 722 lines, only 8 storage registers are used. The program is easy to operate, with prompting and automatic execution. *Required accessories:*

HP Computer Museum

www.hpmuseum.net

For research and education purposes only.

Two Memory Modules; Printer and Card Reader optional. (722 lines, 22 pages)

Author: **Bill Kohlmoos**
Ely, Nevada

(Navigation? In East Central Nevada? Well, Ely is at 6,421 feet in altitude, so I suppose you can see the stars very well! Regardless, Mr. Kohlmoos has done a good job, despite being 550 miles from the Pacific Coast.—Ed.)

(41C) Yacht Racing Rules Judge (#00520C)

The program uses a decision tree to determine which yacht should be disqualified in any "right-of-way" situation. Multi-boat situations are not directly covered but may be resolved by solving for two adjacent yachts and then iterating. The program will assist both race protest committees and students of NAYRU rules. Required accessories: *Three Memory Modules; Printer and Card Reader desirable.* (367 lines, 12 pages)

Author: **Lawrence M. Kazanowski**
Walled Lake, Michigan

(41C) Banner (#00530C)

This program greatly facilitates making special characters for the printer, and it will cause them to be printed at the normal size or in "banner" form. In banner form, characters are printed vertically along the paper; that is, when the characters exit the printer, they are facing downwards. Each "dot" is printed as a double-wide character 31, a sort of checkerboard square. You may also label columns. The size (length) of the banner is limited only to the number of current storage registers allocated. *Required accessories: Printer; program should be run with one Memory Module.* (214 lines, 9 pages)

Author: **David Hayden**
Rocky Hill, New Jersey

(97) Perspective Plottings for Architecture and Engineering (#04419D)

Given the three-dimensional coordinates of a set of points, this program computes and prints the respective coordinates for a perspective projection on a vertical plane, corresponding to a given position of the view point. (222 lines, 17 pages)

Authors: **Antonio Costa & Celia Zatti**
Belo Horizonte, Brazil

SOME SPECIAL PROGRAMS

Occasionally, programs submitted to the Library are put in a category of "Special Program," by virtue of length, value, etc. The two programs that follow are "Special,"

and both are labors of love by their authors.

Back in November of 1979 (Vol. 3 No. 4) we published the abstract for **#67000-99973, Full Poker—5-Card Draw**, by **John C. Nelson** of Des Moines, Iowa. This masterpiece of documentation was 47 pages, 7 magnetic cards, 1,147 lines, and included even a cross-referenced flow diagram. It sold for \$22.50,* and many an HP-67/97 owner thought it worth the price. But, to get to the point, below the abstract in KEY NOTES was an editorial note that started: *Here is a good challenge for someone with an HP-41C* Well, someone *did* convert poker to the HP-41C, and we are happy to print the following abstract.

This "special" program is titled, **Poker—5-Card Draw #67000-99966**, and the price is \$22.50.* The author of this epic is **Norman J. Gordon** of Los Altos Hills, California. His HP-41C version of poker consists of 945 lines, 9 magnetic cards, 20 pages, and all of the wonderful features of the HP-41C, in particular alpha prompting. Here's the abstract:

(41C) You play a fully automatic game of Five-Card Draw-Poker, with full prompting for all phases of ante, betting, drawing, raising, staying, etc. You play *against* the calculator, which can be assigned as aggressive a personality as you wish. *This is a full simulation*, including a bluffing capability. Be aware of one important detail: the calculator does not cheat! *Accessories required: Three Memory Modules and a Card Reader.*

Our second "special" was initially developed for the HP-65 but was adapted and later improved for the HP-67. It is actually a collection of programs that were adapted from many sources, including HP's Navigation Pac, and all of them related to "Search and Rescue (SAR)," having been originated while the author was attending the National Search and Rescue School at the U.S. Coast Guard Training Center, Governors Island, New York. This special program encompasses 811 lines, 10 magnetic cards, and 53 pages, of which, three pages explain exactly what the "pac" is, what it does, and how to use it. As you now suspect, it is a monumental and well-documented effort. It was contributed by **Terence M. Bills**, presently at the USCG Base in Ketchikan, Alaska. It is titled: **Search and Rescue Pac #67000-99970**, and the price is \$26.50*.

Here is the abstract:

(67/97) The SAR PAC system of programs is designed for rapid solution of Search and Rescue position, area, and coverage problems in the oceanic environment. The SAR PAC develops all solutions without the use of maneuvering boards or other graphic aids, and it is designed for use by SAR planners and units. Programs that make up this pac are: Wind Current Factors; Wind Current Vector; Vector *U.S. dollars. See "Ordering Programs" on page 2 before you order these Special programs. These programs are available only from the Corvallis Library.

Addition; Position Shift by Vector; SAR Datum; Position Error/Search Area; SAR Decision Aid; Search Planning; Sector Search; and Speed-Time-Distance. *They are NOT available separately.*

"Petals Around the Rose"

No, we're not using calculators to grow flowers. But, then, a few of you already do know what the title means. For those who don't, here's the story behind "Petals Around the Rose," at least as told by the author of this HP-41C program, **Edward M. Keefe** of Ankeny, Iowa, who writes absolutely remarkable appendages to his fascinating programs.

"Once upon a time ... during World War II, General Montgomery called his staff together and declared that he would grant a weekend pass to any and all officers who could come up with the correct answer to a simple guessing game.

He produced five dice and proceeded to roll them. Each time, he queried, "How many petals are there around the rose?" He assumed that all of his officers, being highly educated men, would "crack the puzzle" in short order. But, as the story goes, at the end of an entire weekend of tiring dice rolling, no one had cracked the puzzle. Since that day, very few people have actually solved the puzzle (except for several hundred precocious children, a handful of mathematical geniuses, and some adults who claim to have psychic powers). Those who have successfully solved the puzzle have since banded together in a society known as the Order of the Rose. There is only one rule for this noble society and that is the rule of OMERTA—silence!—secrecy! No one may reveal the method by which she or he has solved the puzzle and what is the significance of the phrase "Petals Around the Rose."

I, personally, have seen grown men and women driven to much drink after many hours of trying to guess the significance of the five, frustrating dice and the cabalistic and oft-repeated phrase "Petals Around the Rose."

I have also since realized that, for those who tend to be introspective and like to "watch" their brain at work, this little puzzle provides an interesting, but somewhat erstwhile, illustration of the rudiments of the scientific method in process."

Well, that's the story; here's the abstract:

(41C) Petals Around the Rose (#00479C) (\$6.00*)

The HP-41C "rolls" five dice (watch them dance across the display!). You are to guess the number of "petals around the rose." The HP-41C will tell you if your guess is right or wrong. After 10 incorrect guesses it will give one hint. And, after three correct guesses in a row, it will dub you a "knight or lady" of the rose. *Accessories required: One Memory Module.* (145 lines, 7 pages)

* U.S. dollars. This is a regular Library program, and it is available from both Geneva and Corvallis. See "Ordering Programs" on page X.

HP-41C Flags—Part 1

Because of its length, this article was split into two parts. Part 1 covers general flag concepts and flags 00-29 except flags 12, 13, and 21. Part 2 will cover all remaining flags, and will be published in the next issue of KEY NOTES.

Flags are often confusing to the beginning programmer, and they are frequently inefficiently used. The HP-41C not only offers the programmer more flags than previously available on any personal programmable calculator, but also more powerful flags and new flag instructions. Before we explore the flags on the HP-41C, let's describe and define the flag concept in general.

Dalton operates a package delivery service. During the morning run he picks up packages from his customers, and during the afternoon he delivers them. To save time he asks his customers who have packages to be picked up to place a brightly colored sign in their window. As he drives his route, he looks for his signs in his customers' windows and only stops if a sign has been placed in the agreed location.

The example above illustrates the flag concept. The sign is the flag. When the customer places the sign in the window he "sets" the flag. When he removes the sign he "clears" the flag. When Dalton drives by he looks at the window to see if the sign is present (flag set) or not (flag clear). In doing this he tests the flag. He then takes one of two actions. He stops if the sign is present (flag tests set) or he continues if it is not (flag tests clear). It is important to realize that the customers' actions are independent of Dalton's. The customer may change his mind (and the sign) several times during the day as to whether he wants Dalton to stop. As long as he has the sign up when Dalton drives by he will have his packages picked up.

The flag does not take a stack or data register. A flag is a memory that stores the information *set* or *clear*. The flag test instruction is a form of conditional branch instruction that directs one of two courses of program execution. An instruction sequence that implements the ideas of Dalton's Delivery Service is shown below. Flag 05 is used.

```
01 FS? 05
02 STOP
03 Continue
```

The Flag Set test, FS?, follows the memory aid rule "do if true." If the flag tests true—that is, it is set—do the following instruction. If the test is not true—that is, the flag is clear—skip one line.

The HP-41C has four, simple, general-purpose flag instructions. They are:

SF nn—Set Flag nn
CF nn—Clear Flag nn
FS? nn—Flag Set test nn
FC? nn—Flag Clear test nn

where nn is a two-digit flag number (nn may range from 00 to 55, with certain restrictions). The Flag Clear test is the logic inverse of the Flag Set test in that the next instruction line is executed if the flag is clear (tests true) rather than set. This type of general-purpose flag is a simple flag. Programming, however, like life, is not always simple, as Dalton soon found out.

Dalton was pleased with his flag,—er, sign—idea until one day he stopped to pick up some packages and his customer said, "Sorry you stopped Dalton, I forgot to take down the sign." It soon became obvious to Dalton that he should take down the sign when he entered the building, so he immediately adopted this practice. Now, he would know that his customer intentionally put up the sign for a package pick-up.

The flag operation that Dalton's new procedure performs is test, then clear the flag. Two new flag instructions on the HP-41C perform this type of operation. They are:

FS?C nn—Flag Set test, then Clear flag nn.
FC?C nn—Flag Clear test, then Clear flag nn.

These new and more powerful instructions are illustrated in figure 1. The problem illustrated is one in which you want to execute a routine twice, using a flag to control program execution.

SF 05	SF 05
LBL 01	LBL 01
:	:
FC? 05	FS?C 05
GTO 02	GTO 01
CF 05	:
GTO 01	:
LBL 02	:

Figure 1. Execute Routine 01 twice. Routine on left uses simple flags, routine on right saves five bytes by using "test then clear" flag instruction.

The routine on the left in figure 1 illustrates a dilemma for the efficiency conscious programmer. If the flag test is true, the programmer has only one program line in which to do what he/she wants to do, then continues execution with the next program lines. Very often the instruction that follows the flag test is a GTO or XEQ instruction because of this.

Consider this application: In a game program, flag 05 is set to indicate that any score obtained would not be added to register 01 if the player makes the wrong move; otherwise the player's score is added. Assuming the score is in the X-register, the flag test would be:

FS?C 05 Normal use of flags, only one
CLX program line executed if true;
ST + 01 continues with this line.

This application is an excellent example of using a flag instruction. Suppose, however, you only wanted to subtract 10 from the score instead of giving no score for a wrong move. This requirement is not met with a single flag test, and you may be tempted to use a subroutine. However, the following instruction sequence is memory efficient and simply tests the flag twice to gain an extra "test true" program line.

FS? 05 Testing flag twice gains an
10 extra program line.
FS?C 05 A subroutine may use more
— memory than the two-byte flag
ST + 01 test to perform the same
 operation

The HP-41C has 56 flags available to the user. These are of two types: General Purpose and Dedicated. The general purpose flags are used in program the same way Dalton used his signs. The dedicated flags are used to control the calculator or its peripherals. Table 1 lists all 56 flags with number, name, and action taken if set. The HP-41C may change the status of a flag under certain conditions, and this information is given in the **Status at Turn-on** column.

The table is divided into two parts: **FULL-USE FLAGS** and **TEST-ONLY FLAGS**. The full-use flags, except the printer flags, are discussed below. All remaining flags will be covered in the next issue of KEY NOTES.

Flags 00-04 These first 5 of the 11 general-purpose flags show their set status as annunciators 0-4 in the display. These flags are useful for editing purposes, warnings, and prompts. If the clear flag instruction follows the set flag instruction too closely, the display will not have enough time to turn on the annunciator so that the eye can see it. Three to five program lines between them is usually adequate. A good training exercise is to write a short program that repeatedly sets flags 00-04 in sequence and then clears them in reverse (or same) order.

Flags 05-11 These seven flags, like flags 00 to 04, are general-purpose flags implementing the function Dalton performed with his signs. Their concept is illustrated in the examples above.

Flag 11 If set, flag 11 will cause program execution to start where the program pointer is when the HP-41C is turned on. Once turned on, the HP-41C clears the flag (see table 1), so the program should include an SF 11 instruction if automatic execution is desired. A playful trick that illustrates the features of flag 11 is to key the following into a friend's HP-41C.


LBL E Press "E" in USER mode.
 SF 11
 OFF
 GTO E Program execution starts here
 at turn-on.

The same routine may be recorded on a magnetic card. If flag 11 is set when it is recorded, program execution will start immediately at the beginning of the program when the program is read back in. Perhaps the following routine, recorded with flag 11 set, would be handy to have around for your overly curious HP-41C friends. Mark the card: "Do Not Read This Card."

NOTE

WALL cards record the program pointer. If a set of WALL cards, recorded with flag 11 set, is read in, program execution starts at the recorded program pointer.

LBL 14
 CF 27 Clears USER annunciator.
 CF 21 Prevents printer from printing.
 MEMORY LOST
 AVIEW
 STOP

Flag 14 Set flag 14 to write on a "clipped-corner" card. The flag need only be set once for a multi-track write operation. Flag 14 is cleared when the write operation is completed or terminated using the correction  key. This flag allows all recorded magnetic cards to have their corners clipped for "accidental write" protection.

Flags 15-20 These flags are reserved for future use, but may be used as general-purpose flags. Note that they are cleared when the HP-41C is turned off. In your program documentation, be sure to note that they are being used.

Flag 22 Numeric input from the keyboard sets flag 22. Numeric input may be detected by testing flag 22, as illustrated by the following demonstration routine.

01 LBL E Starts routine (in USER Mode).
 02 CF 27 Turns off USER mode for clean display.
 03 CF 22 Insures flag not set by previous entry.
 04 INPUT?
 05 AVIEW Asks for input.
 06 PSE Waits for numeric input.
 07 FS? 22 Tests flag 22.
 08 BEEP Signals calculator detected input.
 09 GTO E Continue wait loop (display blinks).

The HP-41C will only accept inputs during the PSE statement.

Flag 23 This flag is similar to flag 22 with the exception that ALPHA input sets the flag. The routine above may be used to demonstrate flag 23 by changing line 07 to FS? 23, by adding AON following line 03, and by changing line 03 to CF 23. Because

the routine turns on ALPHA, any key except R/S will set the flag.

Flag 24 If a numerical calculation produces a number too large or too small, that is, overflow (± 9.99999999999), program execution will stop and an error message "OUT OF RANGE" will be displayed. This is also true for manual operation. If flag 24 is set, the error message will not be displayed, and a value of "all nines" will be used as the "answer." Program execution will not stop.

Flag 25 This popular and often-used flag is always cleared, when an improper operation is performed. This is a general error flag that may be used to detect if an error

occurred. The illustrative routine below calculates the factorial of a number and displays N > 69 is this condition occurs. Try programming this without using flags and you will probably use more memory.

LBL A
 SF 25
 FACT N > 69 causes error, operation
 FS? 25 not performed, flag 25 cleared.
 STOP
 N > 69
 AVIEW
 STOP

(Continued)

Table 1. HP-41C Flags

FLAG NO.	FLAG NAME	IF SET (OR SET BY)	STATUS AT TURN-ON*
FULL-USE FLAGS			
00-10	General Purpose	00-04 annunciators.	M, 1
11	Automatic Execution	Program execution starts when HP-41C is turned on.	C
12	Printer Double Wide	Prints all double wide.	C
13	Printer Lowercase	Alphabets in lowercase letters.	C
14	Card Reader Overwrite	Writes on cards with clipped corners.	C
15-20	Future use		
21	Printer Enable	Flag 55 usually set.	2
22	Numeric Input	Numeric data entry.	C
23	Alpha Input	Alpha data entry.	C
24	Range Error Ignore	Range error is ignored.	C
25	Error Ignore	Operation not performed, flag cleared.	C
26	Audio Enable	Tones audible.	S
27	User Mode	USER mode.	M, 1
28	Decimal Point	Radix is decimal point.	M, 3
29	Digit Grouping	Comma separates groups of three digits.	M, 3
TEST-ONLY FLAGS			
Set = Yes, Clear = No; "NONEXISTENT" if set or clear is attempted			
30	Catalog	Executing "CATALOG"	C, 4
31-35	Peripheral	Connected peripheral.	NA
36	Number of Digits	8 of 9 digits displayed.	M, 1
37	Number of Digits	4, 5, 6, or 7 digits displayed.	M, 1
38	Number of Digits	2, 3, 6, or 7 digits displayed.	M, 1
39	Number of Digits	1, 3, 5, 7, or 9 digits displayed.	M, 1
40	Display Format	FIX display; SCI if both clear.	M, 1
41	Display Format	ENG display; SCI if both clear.	M, 1
42	Grads Mode	GRAD mode; DEG if both clear.	M, 1
43	Radians Mode	RAD mode; DEG if both clear.	M, 1
44	Continuous On	(XEQ ON) Won't shut off in 10 minutes.	C
45	System Data Entry	System data entry.	
46	Partial Key Sequence		C, 4
47	Shift Set	"SHIFT"	C, 4
48	Alpha Mode	ALPHA mode.	C
49	Low Battery	Low battery.	M
50	Message	Display contains status/error message.	C, 4
51	SST	Single-step.	C, 4
52	Program Mode	PRGM mode.	C, 4
53	I/O	I/O device is ready.	NA
54	Pause		NA, 4
55	Printer Existence		2

* **NOTES:** C = Cleared.
 M = Maintained by Continuous Memory.
 NA = Not applicable.
 S = Set.
 1 = "Master Clear" clears flag.
 2 = Flag 21 is set to match flag 55 at turn-on.
 3 = "Master Clear" sets flag.
 4 = Always tests clear.

NOTE

It is always wise to clear F25 (FS?C 25) after use to ensure that other improper operations do not occur unnoticed. Try it!

Operations that use data registers that are "NONEXISTENT" because of incorrect size may make good use of flag 25. Instead of stopping with "NONEXISTENT" in the display, they may display "SET SIZE NNN" etc.

Flag 26 This flag "turns off" the TONE and BEEP instructions. Each TONE takes about 1/4 second, and this time may be "saved" when flag 26 is cleared.

Flag 27 This flag controls USER mode. Include a CF 27 in your routines if you have assigned functions to numeric keys to avoid conflicts of "numbers versus functions."

Flag 28 Users in the United States separate the integer and decimal parts of a number with a decimal point radix. Users in Europe often prefer a comma for the radix. For a decimal point, set flag 28; for a comma, clear flag 28.

Flag 29 Often commas are used to group digits to the left of the radix in groups of three. If flag 28 is clear and flag 29 is set, the grouping is done with decimals and the radix is a comma. The number 123456.7891 (U.S. convention, radix is decimal) would be displayed as shown below for all combinations of flag 28 and 29.

Remarks	Display	Flag 28	Flag 29
European, no grouping	123456,7891	clear	clear
European, grouped	123,456,7891	clear	set
U.S., no grouping	123456.7891	set	clear
U.S., grouped	123,456.7891	set	set

Flag 29 has an important use with AVIEW. If you want numbers displayed as integers without a decimal point, use FIX 0 with flag 29 cleared before ARCL and AVIEW instructions.

All flag instructions are two bytes and may be used as indirect instructions. Proper use of the HP-41C flags can save memory. The examples given for the flags discussed were intended to illustrate their characteristics. In our next issue we will continue with the printer control flags and the TEST ONLY flags 30-55.

We Get Letters

Every once in a while we like to show you a letter about our products, because we know that you are convinced they are the best. And, let's face it, we like to brag about them because we *are* proud of our calculators. They have survived all sorts of abuse, but here is a new wrinkle!

Gentlemen:

I am a physicist, working at the Raman Research Institute, Bangalore, (India).

I have been a user of one of the HP handheld calculators for some time. Recently, there was an unintentional demonstration of the inherent ruggedness of this calculator.

One weekend, by mistake, I left my calculator, without its protective case, on top of my desk, and with my second-floor office window open. Over the weekend, the office was ransacked by a herd of monkeys, and several of my things, including the HP-27 without its protective case, were thrown out of the window—a drop of about 20 feet—onto a bed of thin grass but otherwise hard soil. The calculator still works perfectly.

Yours sincerely,
Radendra Bhandari

recorded on the same card (-12A), merely turn the card end-for-end and pass it through the HP-65 again. (On the HP-65, only one edge—or track—was recorded on prerecorded cards.)

LBL	÷	1	RCL 3
D	STO 2	STO	×
f	LBL	+	STO
TF 1	2	1	+
GTO	0	RCL 1	5
2	STO 1	DSP	—
STO 4	STO 5	0	RCL 3
*RCL 3	RCL 6	R/S	—
STO 6	f	DSP	CHS
*RCL 2	SF 1		R/S
*RCL 7	LBL	3	GTO
*RCL 5	1	RCL 4	1
×	STO 3	RCL 2	

*STD-12A card register/data

Is the HP-65 Dead?

No! And here's a contribution to prove that it still lives on, faithful as ever. It is from **Charles Carrier** of Long Beach, California, and it is actually a routine that adds to and improves one of the *Standard Pac* programs.

HP-65 Amortization Schedule. This routine generates a direct repayment (mortgage) loan schedule. The STD-12A card is used to input data, and the payment that is calculated (rounded) should compare to that actually assessed. (Any discrepancy should be resolved!) Because it can be

R ₁ N	R ₅ E Int. Paid
R ₂ i/100 n	R ₆ PV ₀
R ₃ PV _{current}	R ₇ n**
R ₄ PMT	R ₈ PMT ₀ **

N = Payment Counter

**Not used in running program.

If appropriate, key in the new payment amount. Press the **[D]** key and, in the running program, the first R/S is the payment number (DSP 0), followed by the current PV (principal value). After a payment number is displayed, RCL 5 gives the total interest paid up to that point. Also,

"Roll" Your Own Bar Code!

Because **John T. Orr** of Spokane, Washington did such a neat job of compiling his letter, we decided to photo-

graph his letter and reproduce it here for you. We don't advocate that you rush down to the store and buy a typewriter like Mr. Orr's, but we *do* advocate the incredible ingenuity of our readers. Thanks, Mr. Orr, for sharing your discovery with KEY NOTES' readers.

Dear Editor:

At least one typewriter, which does not use a daisy wheel print element can produce bar code readable using an HP-41C wand!

I use an Olivetti Lexikon 94C, with an "OCR" typing element(ball), and set the horizontal spacing at 18 characters per inch. The shifted "6" key produces a vertical bar 1/36" wide followed by a 1/36" space, so a 0 is made with one keystroke. The "1/2"—"1/4" key produces a 1/18" bar usable as a 1, however the following space must be inserted by pressing the space bar and the back space key(either one first). This method makes a narrow bar code which is difficult to read with the wand, however a wider bar may be produced by shifting down a half space, and repeating the key sequence.



"BEEP"

Doubt if this meets the HP standards for bar code--However it does work with my wand and HP-41C!

Sincerely,

John T. Orr

perform other calculations as needed here. Then press **R/S** to continue.

In case you do something wrong, you can get back to "square one" by pressing **D** again. Also, with half the program memory, three registers, and four user-definable labels left, individual needs or applications can be readily accommodated.

(Thank you, Mr. Carrier, for this HP-65 input. It has been a while since I've seen one. Actually, most HP-65's are still going strong; it is only the inputs that are dead—or at least scarce.—Ed.)

The Pause That's Misleading

No matter how carefully one checks a book that contains information about complex machines, it seems that uncanny, inexplicable errors slip by. Sometimes the error is just *one* word, and in this case, it is a word that means just the *opposite* of what we wanted to say.

If you have a very early printing of the *Owner's Handbook and Programming Guide* for the HP-41C, you might have a copy that contains an error on page 147. In the next-to-last paragraph on that page, the sentence—in error—reads: "*Pressing any other keys during a pause, that is, any keys not associated with data entry, causes the pause to terminate the program and program execution halts.*" The last word in that sentence should be "*continues*," not "*halts*."

We thought we had caught that error, but evidently some copies of that handbook printing got into shipping boxes. Several people have written to KEY NOTES lately to inform us the error exists. Just change that one word, and you'll have a true statement.

Agronomists Wanted

We don't often print this type of letter, but we feel there is some merit in doing so *this* time. It just might result in getting more food to the world's poorer people. Herewith:

"I am an agronomist and a teacher at the Buenos Aires National University. I have an HP-67 and am looking for agronomy programs; that is, in addition to those listed in the HP-67/97 Users' Library. I'd like to contact other agronomists around the world. Please publish this letter in the next KEY NOTES, and this might lead to a greatly enriched "Agriculture" section of the Library."

Sincerely,
Daniel Leiva

Tacuari 572
(1706) HAEDO
Pcia de Bs. As.
REPUBLICA ARGENTINA



"I Owe It All To My HP"

If you have been a longtime reader of this newsletter (now in its seventh year!), you should recognize the person on the left in the photograph. (Reference: HP-65 KEY NOTE, V1N5p8, V2N2p6, V2N3p8.) Formerly on the White House staff, he is **Dr. Gus W. Weiss, Jr.**, who is just one of the "celebrities" who believes in and thoroughly uses an HP card-programmable calculator. In this case, Dr. Weiss applies his calculator to solving many of the vexing problems and challenges that confront the United States in these troubled times.

When we heard about Dr. Weiss winning another of the many awards he has received for his outstanding service to his Country, we asked him to send us some details and perhaps a photo. Here is his reply.

Dear Henry:

Enclosed is my promised photo with **Admiral Stansfield Turner**, Director of Central Intelligence, showing me receiving the Intelligence Medal Merit of the Central Intelligence Agency. The ceremony took place on 18 August 1980, and the award was for

economic and scientific intelligence.

Just now, I am special Assistant for Space Policy in the Office of the Deputy Under Secretary of Defense for Policy Review (Admiral Daniel J. Murphy), having come to defense from the White House in October 1977. I'm still going full-bore with my HP-67 (which I used on something as complicated as the reentry of SKYLAB), even though I've graduated to a full-system HP-41C. It has become my traveling ENIAC.

I still enjoy KEY NOTES, with all the tips, and am getting plenty of mileage out of the Users' Library.

Regards to all,
Gus W. Weiss, Jr., Washington, DC

(Congratulations, Dr. Weiss! I'll bet that a lot of readers think the title of this article is an exaggeration. However, I know it isn't; that's why I chose it. Also, it is very comforting to know that an HP-41C, in good hands, is helping to make this a better world in which to live. Thanks again, Dr. Weiss, for the photo and letter.—Ed.)

It's "That" Time Again!

If you don't live in the U.S. (most of you do), you can skip this article. It concerns the yearly duty each income-earning person in the U.S. is subject to: paying Federal Income Tax to the I.R.S. But it can be somewhat easier to compile your taxes if you use your HP-41C calculator, so we put together a *Users' Library Solutions Book* called *1980 Taxes*. The part number is 00041-90338 and the price at your HP dealer is \$12.50.* Bar code is included in this book. Among the programs are:

- Alternate Minimum Tax—Joint Returns.
- Maximum Tax—Joint Returns.
- Single Taxpayers Income Averaging—Tax Table A and Schedule Z.
- Married Individuals Income Averaging—Tax Table B and C, Tax Rate Schedule Y.
- Head of Household Income Averaging—Tax Table D and Tax Rate Schedule Z.
- New Jobs Credit.
- Estates and Trusts Tax Rate Schedule, State Death Taxes Credit Table, Estate and Gift Tax Table.
- Corporate Tax Schedule.

(Continued)

By the time you read this, the book should be available at your HP dealer. Or you can order directly from Corvallis; however, an added handling charge of \$3.50 (see **Editorial**) will increase the price of the book to \$16.00.* Be sure to include any State or local taxes (on the \$16 price).

And, don't forget the best part: the book is tax deductible!

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

Book Reviews

Books are reviewed or announced in **KEY NOTES** only as a service to our readers. A review here does not represent an endorsement by Hewlett-Packard. If you are unsure about the contents of a book, we suggest you first check with a local bookstore; if that fails, write to the publisher. Availability problems also should be addressed to the publisher, not to **KEY NOTES**.

CALCULATOR CALCULUS, by **Professor George McCarty** was first reviewed four years ago in HP-65 **KEY NOTE**, the predecessor of *this* newsletter. Since then, the book has been revised, and a new, soft-bound edition has been released. It covers such subjects as: Squares, Square Roots, and the Quadratic Formula; More Functions and Graphs; Limits and Continuity; Differentiation, Derivatives, and Differentials; Maxima, Minima, and the Mean Value Theorem; Trigonometric Functions; Definite Integrals; Logarithms and Exponentials; Volumes; Curves and Polar Coordinates; Sequence and Series; Power Series; Taylor Series; Differential Equations; and an appendix that covers "Some Calculation Techniques and Machine Tricks." Also included are "Reference Data and Formulas," and a Bibliography and an Index.

So, in 254 pages (5.3 by 8.5 inches; 13.5 by 21.6 cm) there is an enormous amount of information. Yet, the step-by-step methods, worked-out examples, simple exercises, and practical problems allow you to cut right through the normal confusion encountered in this subject. The author explains each idea with calculator examples instead of formal proofs. It is a *useful* book, and it is very clearly written and easy to read.

Dr. McCarty received his Ph.D. in mathematics at UCLA. He has taught at the University of Chicago and Harvey Mudd College (California) and is now at the University of California at Irvine.

The book lists for \$14.95* plus \$1 for postage and handling (or \$3 by AIR), U.S. or foreign. California residents must add 90c sales tax. If you order it, the address is:

EduCALC Publications
Box 974 (KN)
Laguna Beach, CA 92652 U.S.A.

And remember: for professionals, the cost is tax-deductible. Plus, the publisher offers a firm money-back guarantee.

SYNTHETIC PROGRAMMING ON THE HP-41C, by **Dr. William C. Wickes**, is a new book that just came off the press on November 21. It is in 8.5 by 11-inch (21.6 by 28 cm) format, is 96 pages, and is saddlestitch bound, with a "stiff" cover (much the same as our "Library Solutions" books).

If you own an HP-41C, and you like to have fun with your calculator, or you like to learn how to better use it, you will be interested in this book. "Synthetic Programming" is the art of HP-41C programming using "new" HP-41C functions and text characters not described in the *HP-41C Owner's Handbook and Programming Guide*. The "new" functions are created in program memory, or assigned to user keys, by "exotic" editing of standard functions. The techniques will work on any HP-41C and do not involve any modification of the calculator.

The book describes the complete theory and application of synthetic programming, starting from scratch. You *do* need to be familiar with the HP-41C owner's handbook, but you *do not* need any other calculator or computer experience. All of the information in the book was derived from actual experimentation with the HP-41C. The author is a calculator user—just like you.

No HP-41C peripherals are required (although any peripheral is helpful, just as for normal programming). However, temporary use of a Memory Module is necessary to get started for the first time.

Virtually any HP-41C program can be enhanced with the use of synthetic functions and texts. Thus, the book should appeal to any HP-41C owner who does his or her own programming. To help you along, the book contains listings of 25 programs (bar code is provided for the longest routines). And, when you learn synthetic programming, your HP-41C will become an even "friendlier" machine than it was before.

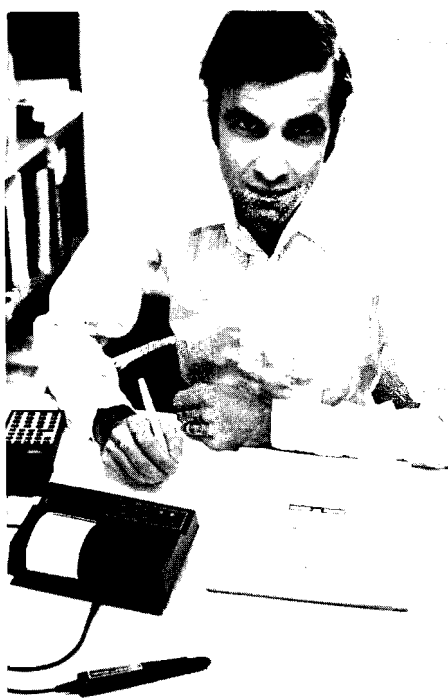
Is the book for everyone? We don't honestly know, but we do know that, before it was published, it was reviewed by both novice and expert programmers, and it didn't scare either group. It boils down to this: If you enjoy using your HP-41C and want to get *even more* out of it, you'll like this book.

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The author of this remarkable book started with an HP-45 and "graduated" to the programmable world of the HP-65, HP-67, and now the HP-41C. He is currently Assistant Professor of Physics at the University of Maryland (in College Park) and uses his HP-41C for such esoteric things as research in the application of quantum electronic devices, solving problems in astrophysics and cosmology, and solving the puzzle of Rubik's cube. He's married, has two children who are both budding "calculator freaks" [*his term, not mine—Ed.*], likes sailing and two-man volleyball, was born in California in 1946, and was selected as an "Outstanding Young Man of America, 1979" by the U.S. Jaycees. Mr. Wickes received his B.S. degree in physics from UCLA in 1967 (graduated Magna cum Laude; elected to Phi Beta Kappa and Sigma Pi Sigma). His M.A.



(1969) and Ph.D. (1972) are from Princeton University, where he stayed as assistance professor until 1977. And, as you *easily* can imagine, his name has been turning up lately in the newspapers.

As we said earlier, the book just came off the presses November 21, so if you want one, order it directly from the publisher:

Larken Publications
P.O. Box 987
College Park, MD 20740 U.S.A.

The price is \$9* plus \$1* postage and handling to U.S. addresses; overseas air mail orders should remit \$11.50.*

THE CALCULATOR AFLOAT, subtitled: "A Mariner's Guide to the Electronic Calculator," was written by **Captain H. H. Shufeldt, USN (Ret.)** and **Kenneth E. Newcomer**, and we are particularly proud to bring *this* book to your attention. Captain Shufeldt is an old friend of HP and Ken Newcomer was one of the original HP applications engineers who developed some of the original *Application Pacs* (he is now an engineer in our Research and Development Laboratory).

Captain Henry H. Shufeldt is a retired aircraft carrier captain who is responsible for many articles and books on navigation. He is co-author of the twelfth edition of Dutton's *Navigation & Piloting* which for many years was the standard text for maritime academies worldwide.

Ken Newcomer became acquainted with Captain Shufeldt when he was learning the science and practice of navigation so as to develop the HP-65 Navigation Pac. He was studying Shufeldt's *Slide Rule for the Mariner* when he had an opportunity to

visit the East Coast for an IEEE show, so he took enough time to visit Captain Shufeldt and to demonstrate what *calculators* could do in navigation.

It was at the Captain's suggestion that Ken submitted his first scientific paper to the Institute of Navigation, and it was the Captain who insisted that they could collaborate on a book. Their book proposal had already been turned down by one publisher when the Naval Institute Press approached the Captain about reprinting the slide rule book. He suggested that they print a new updated version instead and they agreed.

Ken has visited Captain Shufeldt's Maryland home only four times, but through those visits and their correspondence and telephone calls they have become fast friends. Each continues to be impressed with the abilities and accomplishments of the other. They have an idealized grandfather-grandson kind of relationship that both of them enjoy.

Of the many specialties that benefit from the existence of handheld computing power, the practice of navigation stands paramount. Almost no other discipline is as dependent on complicated trigonometric formulae. Until the advent of handheld calculators, however, most mariners were totally dependent on cumbersome tables of trigonometric and logarithmic functions for evaluating navigational equations. Such difficult-to-use tables made navigating somewhat tedious.

With the advent of the handheld calculator, however, mariners have been able to evaluate the navigational formulae many times more rapidly than they could before. The only drawback has been a lack of sources of equations suitable for calculator evaluation (many texts still "simplify" procedures using logarithms). Now, with *The Calculator Afloat*, nearly all formulae of interest to navigators are optimized for use with calculators. The use of elementary statistical functions for improved measurement accuracy is stressed, and an accurate perpetual almanac for the Sun, and 57 selected navigational stars are included.

This new book provides neophyte calculator users with the information they need to select a suitable calculator for navigation. There is a description of nearly all of the mathematical functions found on calculators, as well as clear instructions showing how to evaluate expressions on any calculator, whether algebraic or RPN.

In addition to presenting useful formulae and discussing calculator operation, this book presents explanations of many navigational techniques and includes numerous historical sidelights.

The Calculator Afloat lists for \$16.95* and may be ordered through your local bookseller or from:

Book Order Department
U.S. Naval Institute
Annapolis, MD 21402

Direct orders should include an additional \$2.50* for postage and handling.

For orders outside the U.S., send your order to:

Book Promotion Manager
Naval Institute Press
Annapolis, MD 21402 U.S.A.

and you will be billed when the book is shipped. You probably will be charged extra postage.

* All prices are in U.S. dollars. See note at bottom edge of cover. All orders from outside the U.S. should include an International Money Order, a Foreign Draft or the equivalent, or a check, and any of these must be in U.S. dollars, drawn on a U.S. bank.

Editorial

KEY NOTES SCHEDULE

The year 1980 is rapidly waning as I write this column, and heavily on my mind is an overriding conclusion: there will not be a "Number 4" issue of Volume 4 of HP KEY NOTES. There are many reasons for this but, predominantly, the *real* culprit is inflation. Also, world unrest has caused numerous distribution difficulties, and many times we were forced to reship entire shipments of KEY NOTES to make sure all of you received your copies. All of these problems take large chunks of time, so something had to give, and the schedule was the loser.

But don't despair! There is a solution to the problem. Next year (1981) we will produce KEY NOTES every four months instead of quarterly. Each issue will contain 16 pages; so, in effect, you still will be receiving 48 pages a year, as you have in the past. The first "new" issue will be mailed in February, and the subsequent issues are scheduled for June and September. If dates change, we will inform you in KEY NOTES.

HP-41C BAR CODE

If you own a wand for the HP-41C and use clear plastic sheets to protect bar code that has been photocopied, be aware that some types of plastic cause a reaction when in contact with the black material used in some photocopiers. What happens is, the page "sticks" to the plastic, and the imprint on the paper transfers to the plastic. It is okay to use these clear sheets to read bar code and protect it, but don't store your photocopied sheets in or under such plastics.

While I'm on the subject of Wands, here is an answer to the many questions in your letters: No, the HP-41C wand will not read the bar code on grocery store items.

(Continued)

LETTERS TO KEY NOTES

And, speaking of letters, here is some advice. (Reminds me of the famous American humorist, Will Rogers, who said, "Nobody likes vice, least of all advice!") When you address letters to KEY NOTES, you should refrain from including anything not associated with the newsletter. Questions about the calculator or its operation should be addressed to "Customer Support," and questions about the Users' Library should be sent to the address on the back cover. I cannot answer all the *usual* mail, so you'll get much faster service by writing to the proper service.

Letters to the editor should be addressed to:

Henry Horn, Editor
HP KEY NOTES
Hewlett-Packard Co.
1000 N.E. Circle Boulevard
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.

PARDON MY ERROR

In the last issue, I stated that the book, *Synthetic Hydrograph Computations on Small Programmable Calculators* was available in "a unique hard-cover (but loose-leaf!) binding." Unfortunately, the copy I had was a review copy and not the published version. The book *actually* sold in an 8.5-by-5.5-inch (21.6 by 14 cm) hard-cover cloth binding. My apology to the author, **Thomas E. Croley II** for that misinformation about his book.

NEW HANDLING CHARGE

Our Order Processing department has advised me that all factory orders will now be charged a fixed \$3.50* handling charge. We regret that this is necessary, but there is no way we can continue to handle single, separate orders without a charge. Remember that in the Continental U.S. you can call our toll-free number 800-547-3400 (in Oregon call 758-1010) and ask for your nearest "Full-Line Accessory Dealer." It is quicker to get calculators, accessories, and software from your local HP dealer than to order from here and, besides, you save the handling charge. Also, as the dealers' business increases, these dealers will stock even *more* products and accessories, making them more available to you than ever before.

"EXECUTION" TIMES

It appears that enough of you would like to know more about "execution times" to make it worthwhile to print an article about the subject. This is not as easy as it might seem to be, because there are many, many variables. Also, Hewlett-Packard does not publish a complete specification for execution times because there is no known way to insure where, how, and when the calculator will be used when it leaves our hands. And since we back our products 100 percent, we do not make claims we cannot guarantee. However, in an upcoming issue, probably Volume 5 Number 2 (June 1981), we'll print an article that should help you with the subject of "execution times."

BEST WISHES TO ALL

Once again it is the time of year to thank all of you for your support of KEY NOTES, for your participation, for your patience, and for your nice comments about the newsletter. On behalf of Hewlett-Packard, I wish all of you a happy, safe, and joyous holiday season; a prosperous New Year; and many happy hours of productive programming.

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

"25 Words" (More or Less!)

We know that you read and enjoy this column because it elicits more mail than any other part of KEY NOTES. (*And speaking of mail, don't fail to read the Editorial column.—Ed.*) Some readers have even requested that we devote the entire newsletter to this type of information. Well, *that's* not practical nor probable, but you will find this column greatly expanded in ensuing issues.

Our first contribution is from **Gregory L. Smith** of Phoenix, Arizona. Many people liked the "TEXT" routine in the last issue, and many wrote about it. But Mr. Smith's routine was easily the shortest.

(41C) I found the "TEXT" routine submitted by **Mr. Wuest** (Vol. 4 No. 2) both interesting and useful. However, by applying better use of machine characteristics, by using some slight changes in logic, and by even moving some steps around, I produced a revised version that requires 33 percent fewer bytes of memory and should execute more quickly. The only functional difference between the two versions is that my routine advances the paper one line when exiting the program, a feature I find quite acceptable.

01+LBL "TEXT"	07 " "
02 "TEXT?"	08 ASTO X
03 AON	09 PREUF
04 PROMPT	10 X=Y?
05 ACA	11 GTO "TEXT"
06 ASTO Y	12 ROFF

From Arizona we next visit the "City of Brotherly Love" (Philadelphia, Pennsylvania) for a contribution from **Thomas Benjamin Miller**.

01+LBL "STKDISP"	10 XEQ 00
02 X<> L	11 "Z="
03 "L="	12 XEQ 00
04 XEQ 00	13 "T="
05 RT	14+LBL 00
06 X<> L	15 ARCL X
07 "X="	16 AVIEW
08 XEQ 00	17 PSE
09 "Y="	18 RDN

(41C) This routine displays the contents of the stack. In addition, the contents are labeled. Included are the registers L, X, Y, Z, and T.

(*Very good, Mr. Miller; however, watch out for that AVIEW at line 16. It causes a halt if flag 21 is set and there is no printer attached to the HP-41C. Maybe it would be best to add CF21 right after line 01—Ed.*)

From Pennsylvania, let's travel to Switzerland to see what a *new reader* of KEY NOTES has to contribute. The city is Bottmingen and the HP-41C owner is **Alfredo Mariani**.

(41C) As a new member of the Users' Program Library Europe I received HP KEY NOTES (March 1980) for the first time and I was very delighted about the presentation of the many useful hints and tricks. So I presume the following routine might be of general interest, too, for it mops up the contents of any number of registers desired; the remaining registers are left untouched for further use. As an additional benefit, the stack registers are cleared at the same time.

01+LBL "MOP"	07 ISG 10
02 .009	08 GTO 01
03 STO 10	09 0
04+LBL 01	10 STO 10
05 0	11 TONE 9
06 STO IND 10	12 RTN

While we're in Europe, let's see what **Manfred Mickoteit** of Koblenz, Germany, is doing with his HP-41C. And we promise that this is the last "SIZE" routine we'll print.

(41C) Many thanks for sending HP KEY NOTES, Vol. 4 No. 1, dated March 1980. The included tips are very helpful for programming. After testing them, I found, that the

"SIZE" routine printed on page 7 doesn't work below size 10, and at zero. Here is my modified version of the "SIZE" routine.

```
01*LBL "SIZE?" 17 CLX
02 .4001 18 RCL IND Y
03 ENTER↑ 19 FS? 25
04 SF 25 20 ISG Y
05*LBL 00 21 FS? 25
06 ISG Y 22 GTO 01
07 CLX 23 RDN
08 RCL IND Y 24 FIX 0
09 FS? 25 25 INT
10 GTO 00 26 "SIZE="
11 CLX 27 ARCL X
12 10.0001 28 AVIEW
13 - 29 FIX 4
14 ENTER↑ 30 RDN
15 SF 25 31 RTN
16*LBL 01
```

(What is this strange fascination with "SIZE" routines? I've received several dozen variations to correct the shortcomings of the routine in Vol. 4 No. 1, and every one of them was different. Herewith, to save much time and space, I declare a moratorium on "SIZE" routines.—Ed.)

As long as we're visiting Germany, why not stop in on Klaus Werner Hoenow in Hamburg, and see what he's contributed to "25 Words."

(41C) Tabulating two or more columns of numbers with the printer might be problematic: if the quantity N of digits before the decimal point varies, the columns won't be right-justified. Using the subprogram ACXR instead of ACX will solve this problem, if the maximum quantity of digits before the decimal point (plus leading blanks) is stored into the Y-register and the number to be printed is stored into the X-register before executing ACXR.

```
01*LBL "ACXR" 12 INT
02 CF 29 13 X<=0?
03 RCL Y 14 GTO 01
04 2 15 ST- Y
05 - 16*LBL 01
06 RCL Y 17 RDN
07 RND 18 SKPCHR
08 X=0? 19 RDN
09 GTO 01 20 RND
10 ABS 21 ACX
11 LOG 22 RTN
```

Meanwhile, back in Middleton, Wisconsin, Dr. Norbert L. Schmitz, and Engineering Consultant, has a neat hint for HP-41C users. It is:

(41C) As a supplement to HMS and HR routines, the following 29-byte routine converts angles (or time) expressed decimally as DDD.ddd to or from DDD.MMmmm (degrees, minutes, and decimal minutes). For celestial navigation programs using sextant data in

degrees, minutes, and tenths. FIX 3 (line 06) is useful. Lines 06, 03, 05, and 07 can be omitted if flag 1 is always cleared before executing the DD (decimal degrees) routine.

```
01*LBL "DMT" 18 FRC
02 SF 01 11 ST- Y
03 GTO 00 12 .6
04*LBL "DD" 13 FC?C 01
05 CF 01 14 1/X
06 FIX 3 15 *
07*LBL 00 16 +
08 FIX 3 17 RTN
09 ENTER↑
```

In Blackburn, Australia, there is at least one HP-41C owner who doesn't need a stopwatch. He is Graeme Leith, and here is why he doesn't.

(41C) Have you spent all your money on your new HP-41C and now can't afford a stopwatch? That was my dilemma, so I simply wrote this super-accurate routine for timing on the HP-41C.

```
01*LBL "S-WATCH" 06 .000055
02 "CURRENT TIME" 07 HMS+
03 PROMPT 08 VIEW X
04 FIX 4 09 GTO 00
05*LBL 00 10 RTN
```

When using the routine, the response to "CURRENT TIME" is just that. Key in the time in HH.MMSS and press R/S. This is accurate to hundredths of seconds. If the "watch" runs too fast, slightly increase the number in line 06. Do the opposite if it runs too slowly. Because the HP-41C uses a crystal-locked system, all HP-41C's should work identically, thus eliminating the need for fine tuning. (But just in case ...)

(Your "timer" works, all right, but not all HP-41C's "work identically," Mr. Leith. They do NOT contain a crystal; they use an oscillator, and it will not guarantee "times" or accuracy to hundredths of seconds. You can fine-tune the routine to be quite accurate but, again, we want everyone to know that, as a timer, the HP-41C will never give the Rolex people—and many others—sleepless nights. Simply put, the HP-41C was designed to be the world's best calculator system, not a stopwatch. That you can make it keep fairly accurate time is only "icing on the cake."—Ed.)

Now for some HP-67/97 routines! And to start off, we have this contribution from Edwin J. Borrebach of Monroeville, Pennsylvania, a town just east of Pittsburgh.

(67/97) I just got around to reading Vol. 3 No. 2, page 6, and saw David L. Smith's routine of 18 lines to check long division and show the remainder. How about these 11 lines, to be run in DSP 0?

```
001 *LBL4 067 R↓
002 + 008 LSTX
003 LSTX 009 FRC
004 X=Y 010 X
005 INT 011 R/S
006 PSE
```

When a letter starts, "I enjoy KEY NOTES very much, especially the "25 Words" column," how can we refuse to read it? We can't. We didn't. Here is a contribution from that letter-writer, Karl-Ludwig Butte of Fulda, West Germany.

(67/97) There is a very useful instruction in BASIC, the ON X GOTO ...—instruction; for example, ON X GOTO 110, 120, 130. If X=1, the program continues with statement 110. If X=2, it continues with statement 120 and so on. To simulate this on the HP-67/97, use the subroutine shown below. Be sure, however, that the I-register contains 0 at any start of the subroutine. The subroutine compares the value in the X-register with the contents of the I-register. The program then branches to that label that is equal to the value in the X-register. This value should be between 0 and 19 to address the possible labels.

It is also possible to exchange the ISZ I instruction in line 002 with DSZ I to use the back-step function of GTO(i) if there is a negative value in the I-register. In that case, the X-register also has to contain a negative value.

```
001 *LBLA 005 GTOi
002 ISZI 006 R↓
003 RCL I 007 GTOA
004 X=Y? 008 RTN
009 R/S
```

(One more thing: if X ≤ I when the routine is called, the program will never stop running.)

From Howell, Michigan comes this neat input from our old friend, Douglas K. Parrish. It seems he's becoming "chained" to his calculator!

(67/97) I have a contribution to "25 Words." Whether it's ever been done, I don't know. But here it is. The handbook (pages 68, 69) is somewhat vague about constant arithmetic and its application to subtraction and division. Addition and multiplication present no problems, but the other two processes do. Consider them solved! Try these:

Subtraction

1. k (Press constant, k, to be chain-subtracted.)
2. CHS
3. 1, 1, 1 (Press ENTER three times.)
4. n_i (Press base number from which k is to be subtracted.)
5. +, +, ... (Press + the desired number of times.)

Division

1. k (Press constant, k, to be chain-divided.)
2. 1/x (Press reciprocal.)

(Continued)

3. 1, 1, 1 (Press ENTER three times.)
4. n_i (Press base number into which k is being divided.)
5. \times, \times, \dots (Press \times the desired number of times.)

In Voerde, West Germany, Christian Franke had had his HP-41C only three weeks when he was prompted to send two good ideas to KEY NOTES.

(41C) If you make "normal" keyboard calculations with large numbers in SCI or ENG 9 mode, you cannot see the last two digits of the mantissa, which are "hidden" behind the exponent. So, you might want to have a "VIEW MANT" function. Here is a short one, using only the ALPHA register.

```
01 LBL "MANT"      04 PROMPT
02 CLA             05 END
03 ARCL X
```

Assign it, for example, to "shifted" ENTER (= CATALOG) like it is on the HP-34C, and you get a convenient way to see the entire number without losing any register (except ALPHA).

(41C) Some of you familiar with the HP-67/97 might regret that it is impossible to record the status together with the program on a magnetic card. In fact, it is possible! If a program, for example, needs a cleared flag 0, FIX 2, and RAD mode, key it in as follows:

```
01 CFO      05 LBL "PROGRAM"
              (beginning of program)
02 FIX 2    :
03 RAD      :
04 RTN      END
```

The routines furnished in "25 Words" are contributed by people from all walks of life and with various levels of mathematical and programming skills. While these routines might not always be the ultimate in programming, they *do* present new ideas and solutions that others have found for their applications. You might have to modify them to fit *your* personal application.

HP KEY NOTES

September—December 1980 Vol. 4 No. 3

Programming and operating tips, answers to questions, and information about new programs and developments. Published periodically for owners of Hewlett-Packard fully programmable personal calculators. *Reader comments or contributions are welcomed. Please send them to one of the following addresses.*

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(Continued from page 1)

college students is even smaller," Dr. Newton explains. "As such, it is not commercially possible to develop the specialized hardware which would be so helpful to them.

"If we were to have asked a commercial firm to develop the program used by the calculator, it would have cost some \$30,000, and that becomes prohibitive for most individuals or even institutions," he said.

An example of what has been done is the

Just Before We Went to Press ...

... we decided to hold the newsletter a short time so that we could tell you about this announcement of new products and significant price reductions. The new products were introduced on January 7 at the Consumer Electronics Show at Las Vegas, Nevada, and the price reductions became effective January 1, 1981.

NEW PRODUCTS

Heading the list is the **HP-41CV Alpha-numeric Full-Performance Programmable With Maximum Continuous Memory**, and it is priced at \$325.* That's a long name ... but so is its capacity! Built into it is five times the memory of a standard HP-41C; the equivalent of the HP-41C and four HP 82106A Memory Modules! Specifically, the HP-41CV contains 319 storage registers versus 63 in the HP-41C. And *all* of the memory is *Continuous*, which is a definite advantage for advanced programmers who want to store a lot of programs. Plus, with all this built-in memory, you now have all four ports free to use for peripherals. And, before you ask, no, you cannot add more Memory Modules, because the HP-41CV is already at full capacity.

Next on this list is the new **HP 82170A Quad Memory Module** for the HP-41C, which is priced at \$95.* This one Memory Module is the equivalent of four HP 82106A Memory Modules. When installed in a standard HP-41C, it makes the HP-41C the

talking calculator, but that does not have the flexibility which the HP-41C possesses in the area of mathematics.

Now that Dr. Newton has developed his programs, he has met with the American Association for the Blind to determine if the instrument could have broader usage. Dr. Newton and Thiel also have attracted the interest of the Lions club, which promotes vision conservation.

equivalent of an HP-41CV, and allows three ports to be used for peripherals. You cannot, however, use single-density modules if the Quad Memory Module is used. But you *can* use standard single-density modules if the Quad Memory Module is removed from an HP-41C.

Finally, there are two new systems. The **HP-41 System I** is an HP-41CV and Card Reader combination for \$495,* and the **HP-41 System II** is an HP-41CV and Card Reader and Printer combination for \$840.*

You can examine these new products in more detail at your nearest HP dealer, who will be glad to answer any questions you might have.

LOWER PRICES

Three calculators have been reduced in price. They are:

- HP-32E Scientific With Statistics, from \$70 to \$55.*
- HP-33C Programmable Scientific With Continuous Memory, from \$110 to \$90.*
- HP-41C Alphanumeric Full-Performance Programmable With Continuous Memory, from \$295 to \$250.*

Also reduced in price were the HP-41C Application Pacs. All pacs formerly \$45 are now \$30,* and all pacs formerly \$75 are now \$45.*

The last reduction is for the HP 82120A Rechargeable Battery Pack. Its price was reduced from \$40 to \$30.*

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

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