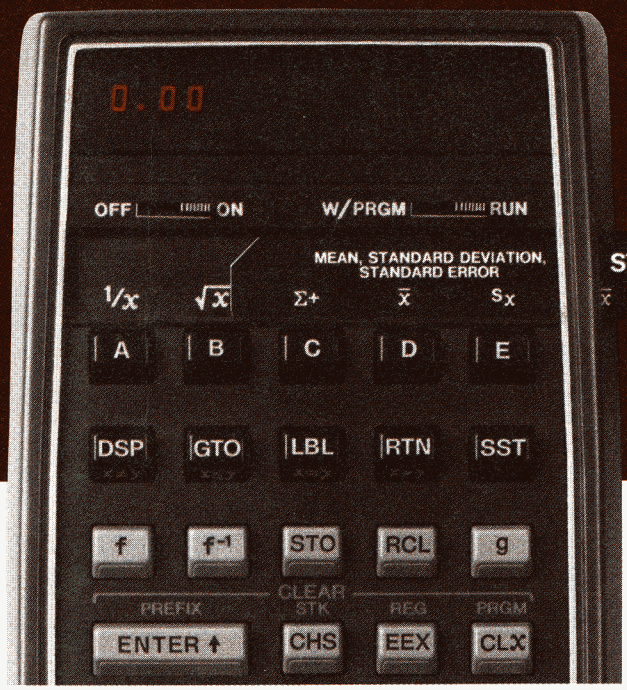
HP-65 KEY NOTE

for HP-65 owners

HEWLETT hp PACKARD



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The End—And Start—Of An Era

This is the last issue of the HP-65 KEY NOTE—*in its present format*. But don't despair! The next issue, which will be released in November, will be called, simply, KEY NOTE. Why the change? Well, if by now you've noticed the table of contents—or cheated by already turning the page—you'll realize why we changed the name.

There are many pleasant surprises in store for you on the next seven pages, so don't miss a word. You'll find three new calculators, some price reductions, and even a new—and usable—pause function for the HP-65.

And let us assure you that, although some new programmable calculators are on the horizon, the HP-65 is not going to be forgotten. As an HP-65 owner, you will continue to receive KEY NOTE, it will continue to include HP-65 programming and software information, and the HP-65 Users' Library will continue as before.

Now, for the big question: *Will my HP-65 programs be compatible with the HP-67 and HP-97?* The answer is: No...and yes. Bear with us a moment and we'll explain that double answer.

The HP-65 architecture was developed around a 6-bit word. Each step of program memory was represented internally, and on the magnetic card, by six ones and/or zeros. This scheme allowed only 64 (or 2^6) possible one-step instructions. With those 64 instructions, it was possible to merge the most important multiple keystroke operations—such operations as recall, store, and stack manipulation. However, other multiple keystroke operations required more than one step in memory.

In the HP-67/97, *all operations were merged into single program steps*. However, this required a larger, 8-bit word for internal representation of each program step. This larger 8-bit word makes the HP-67/97 fully-merged instruction-set possible, but it does make *direct* compatibility with the 6-bit system—or with the HP-65—impossible.

However (sometimes, a very useful word!), all is not lost. In the next KEY NOTE, we will publish an article, replete with examples and keycodes, that will show you how to convert HP-65 programs to the HP-67/97. Then, although an HP-65 card cannot be read in an HP-67/97, you can at least use all those programs you purchased, sweated over, and nurtured so carefully. (However, *blank* HP-65 cards are interchangeable with HP-67/97 cards.)

We believe that the HP-67 and the HP-97 are two very powerful breakthroughs in fully programmable calculators. When you examine the facts and features on the following pages, we believe that you, too, will believe it.

Inside This Issue

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

Enter The HP-67 And HP-97

What offers about 3.4 times the programming power of the HP-65? If you were listening to local radio newscasts on July 1, or read your evening newspaper on that day, you might have heard about the HP-67 or HP-97.

The HP-67 and HP-97 are the most powerful personal calculators Hewlett-Packard's ever built! Both can handle programs of up to 224 steps. In both, **all** prefix functions and operations are merged, allowing you to store two or three keystrokes as a single program instruction.

Both have 3 levels of subroutines, 10 user-definable functions, 10 conditional/decision functions, 4 flags, and 3 types of addressing: label addressing, relative addressing, and indirect addressing. Also, for the first time ever in a battery-powered calculator, *you can directly record the contents of all 26 data storage registers on a separate magnetic card* for easy reloading later! The result: you save program steps.

The HP-67 and HP-97 also have a ''smart'' card reader that *automatically* records the display mode, angular mode setting, and flag status separately from your program so you never have to waste program steps for these ''housekeeping'' chores. But there's more! It also prompts you—via a ''Crd'' display—when there's additional information on the card that must be loaded into the calculator. *Moreover, it's virtually impossible to improperly load programs or data from the cards.*

In addition, this ''smart'' card reader enables you to automatically expand the capacity of either calculator *beyond* 224 steps. How? It's very easy! At the appropriate point in your program—and under program control—the card reader *can automatically turn on and read another card!*

A lot of you wished for a backstep (BST) key on the HP-65. To improve editing, right? Well, editing on the HP-67 and HP-97 is a snap. Not only is there a BST key and an SST key, at any time you can ''go to'' any step number in your program. Better still, the step number and all keycodes of every instruction are displayed for your convenience.

The HP-67 gives you shirt-pocket portability. The battery-powered HP-97 gives you attache-case compactness *plus a quiet, built-in thermal printer*. The thermal printer lets you list a program by step number, key mnemonic, and keycode; list the contents of the automatic memory stack; or list the contents of the data storage registers. Plus, you get three printing modes to choose from: MANUAL (so the printer prints *only* when the *Print x* operation is executed; NORMAL (the printer records *all* entered data and functions), or TRACE (the printer lists the step number, function, and result of each step of a running program, or the numerical entries, operations, and results of manual calculations).

So you see, the decision is not really hard to make. The HP-67 is ideal for those of you who want the powerful features of the HP-97, but do not require a printing capability. Yes, all programs written and recorded on the HP-67 can be loaded and run on the HP-97 (and vice-versa). The two calculators are completely compatible. Aha! But what about those *Print x* commands on the HP-97? No problem. When the HP-67 executes a *Print x* command, it pauses about 5 seconds and displays the current results so you can either write down or view the contents of the X-register while a program is running. And just to make sure you know what's going on, the decimal point blinks eight times during a *Print x* display.

However, we will tell you something that will make your decision easier. These two new calculators are built to the same fine Hewlett-Packard standards you encountered in the HP-65. Same ''feel'' and look of quality. Same first-class high-quality electronics. Same rigorous quality control checks. Same dedication to excellence. Because they are built by people who care, who are proud of their work and the final product.

And there's more. Much more. So many more features and details that it would take an entire KEY NOTE to tell you about them. So why not drop in after July 1 at your authorized Hewlett-Packard dealer and see these spectacular new calculators. If you get one in your hand, we'll bet you won't let go of it!

Have we forgotten anything?? Oh, yes, the prices. Well, since that is the best part, we saved it for last. The HP-67 is $450 and the HP-97 is $750. Now, isn't that a pleasant surprise??

A ''New'' HP-25 Debuts

On June 14, Hewlett-Packard announced another contribution to the pocket calculator world: The HP-25C Scientific Programmable Calculator with Continuous Memory. *It retains your programs and saves your data*–**even when you turn it off!**

Thanks to sophisticated complementary metal oxide silicon (C-MOS) circuitry, you no longer have to worry about losing a program by turning off the calculator. No matter how often you switch it on and off, the HP-25C retains the last program you stored, ready for use, until you clear it or enter a new program.

But what about changing batteries? What then? Well, even when changing batteries, the HP-25C will retain your programs and data. During changeover, a capacitor temporarily furnishes power to the continuous memory circuits. Depending on the charge of the battery being replaced, changeover time varies from 5 seconds to 2 minutes.

The HP-25C also retains all data in its 8 addressable registers and in the LAST-X register. This capability lets you use the HP-25C as a notebook. Or you can store conversion constants until needed later.

What about the cost? It's $200, and your local HP dealer should have some just about the time you receive this KEY NOTE. But, considering the demand for this new marvel, perhaps you better call first!

A New Pac?

We often get suggestions about subjects for new application pacs, and we do appreciate your suggestions and concerns. However, it is not feasible to initiate the horrible mountain of paperwork and attendant huge expenses if the demand is not great enough to at least "break even."

Several people have asked why we do not have a pac on the field of Space Science; for instance, why not Astronautics or Astrodynamics? Unfortunately, it simply isn't feasible at this time. Fortunately, however, we do have a Library contributor who has quite a collection of programs that would satisfy most Space Science enthusiasts. So, here, under one listing, is the collection of Space Science programs submitted by **Robert C. Wyckoff** of Tujunga, California.

00359A	Horizon Distance; Distance Over Surface
00625A	Orbital Parameters, No. 1
00702A	Relativistic Velocity—Kinetic Energy of a Body
00961A	Orbital Parameters, No. 2
01061A	Orbital Parameters, No. 3
01722A	Vertical Rocket Flight Parameters
02104A	Sexagesimal Arithmetic
02387A	Ballistic Missile; Range, Elevation Angle
02845A	Numerical Calculations
03765A	Rocket Propulsion Parameters, No. 1
04132A	Exponential Asymptote Approximation
04259A	Planetary Great Circle Distances

Library Corner

HP-65 LIBRARY NEWS

As of June 23 there were 4,799 programs logged into the HP-65 Users' Library. That's 585 more than reported in the last KEY NOTE. And no end is in sight. But what will be of more interest to you is the good news that another Catalog update is now in work. This update is scheduled for release by the end of summer.

What affect will the new calculators have on your HP-65 Users' Library? We want to assure you that the Library will continue to support your program orders and submittals for the HP-65 calculator. In other words, the introduction of the HP-67 and HP-97 will have *no* adverse affect on the HP-65 Users' Library.

HP-67/97 LIBRARY NEWS

The present Library will expand to accomodate the HP-67/97 calculators. But there will be a separate *Catalog of Contributed Programs*. And prices remain the same: $3.00 for each program purchased from the Library. In effect, the HP-67/97 Library will operate much the same as the HP-65 Library. And KEY NOTE will be offered free to owners of HP-67 and HP-97 calculators—provided they mail in a coupon that will be packed with each calculator. That coupon is part of a small brochure that describes in detail the Library and its functions.

HP-67/97 SOFTWARE

Already there are nearly 200 programs in the HP-67/97 Users' Library, and they will form the basis of the first Catalog. The initial HP-67/97 Applications Pacs will be:

Math Pac 1: Nineteen programs from the areas of number theory, algebra, trigonometry, analytical geometry, calculus, and special functions.

Statistics Pac 1: Basic and advanced functions. There are 21 programs, selected from the areas of general statistics, distribution functions, curve fittings, test statistics, probability, analysis of variances, analysis of covariance, quality control, and queuing theory.

E.E. Pac 1: These 19 programs provide solutions to some of the most important electrical engineering problems. The programs, although not all-inclusive for any particular engineer's needs, demonstrate the incredible power of the HP-67/97 calculators. Topics include transistor amplifier design, microwave design, and filter design.

Mechanical Egnineering Pac 1: These programs address common problems in the fields of statics, dynamics, kinematics, and stress analysis. Specific topics include beams, columns, linkages, cams, Mohr circle analysis, springs, gears, and vibrations. The package will be extremely useful to the designers of machines and machine elements.

Surveying Pac 1: The programs in this pac are designed to solve some of the commonly encountered problems in field data reduction, line and curve layout, earthwork, coordinate geometry, and geodetic reduction.

Clinical Lab and Nuclear Medicine Pac: Twenty programs to handle problems in clinical chemistry, nuclear medicine and RIA, and statistics.

Business Decisions Pac: These programs address frequently encountered problems in many areas of personal and business finance. Calculations for real estate, investment analysis, leasing, savings and annuities, business statistics, and other applications are included. Two sections, titled "Payroll" and "Inventory," discuss procedures for creating programs that meet the users specific requirements.

NEW PROGRAMS

Following are some interesting programs we've received in the past few months. As usual, it is quite a dilemma to pick those that appear to be the "best" from such a wide variety of excellent programs. So don't feel you've been ignored if your program isn't highlighted in KEY NOTE.

A few programs appear on later pages. Because of their nature, we felt they deserved more attention. *Any* program you see in KEY NOTE can be ordered for $3.00. If possible, use an order form from the Catalog. **Use the program number listed next to the program title.** Send only checks or money orders, payable to Hewlett-Packard Company. Be sure to include any state or local taxes.

Duplicate Backgammon (#04258A)

Simulates backgammon dice throws, with the option of a tournament start or automatic doubling. Each R/S displays two die values as X.Y, with the ordinal number of that throw in that game as the exponent. Each of 10^9 possible seeds generates a different sequence of 99 throws. Thus, by recording each game's seed, two players can compare skills, with luck equalized, by replaying any number of games with each player duplicating the other player's original throws. (92 steps)

Author: **Donovan E. Smith**
El Cerrito, California

Radius of Action to Same Base (#04254A)

Computes true heading and ground speed for both outbound and inbound courses, given: true course outbound, true airspeed, wind direction, and wind velocity. Also computes radius of action and time to turn for return, given total flight time available. First part of program may be used alone to solve class I wind triangles. (100 steps)

Author: **Robert M. Bugg**
Denver, Colorado

(continued)

Mini-Checkers, Game-Learning Program (#04325A)

Mini-checkers is a simplified checkers game played on a 4 × 4 board. Initially, the program "knows" only the list of all possible moves. As games are played, the program "learns" by trial and error to avoid losing-moves. If only losing-moves are possible, it deletes its preceding move. Thus, whole lines of unrewarding play can be deleted, instead of only the current losing-move, as with some other similar programs. (132 steps)

Author: **Delmer D. Hinrichs**
Washougal, Washington

Inversion of Laplace Transforms (#04590A)

This program numerically inverts Laplace transforms using the method of Stehfest (Algorithm 368, *Communications of the Association for Computing Machinery,* 1969). Seventeen program steps and register R_9 are available for programming the Laplace transform. (83 steps)

Author: **Richard J. Freedman**
Ann Arbor, Michigan

Racetrack Game (#04326A)

This two-person game simulates a two-car race on a road-racing track. The program keeps track of the velocity and the position of both cars. Players take turns advancing their cars. For each move, a player accelerates, decelerates, turns, or coasts, by selecting the direction and magnitude of thrust on the car. The display shows velocity, direction, and position. A collision destroys both cars. Traction is limited. The supplied track may be used, or users may design their own tracks. *One* person may race against time. (100 steps)

Author: **Delmer D. Hinrichs**
Washougal, Washington

Aviation Wind Triangles, Class I, II, III, IV (#04569A)

Solves class I, II, III, and IV aviation wind triangles. The program uses four parts of the three vectors (Flight—TH/AS; Ground—TC/GS; Wind—WD/WV) to find the remaining two. Class I finds heading and ground speed. Class II finds course and ground speed. Class III finds heading and airspeed. Class IV finds wind direction and wind velocity. (94 steps)

Author: **Robert M. Bugg**
Denver, Colorado

(Note: This program has been requested by quite a few aviators. Finally, here it is, thanks to Mr. Bugg. Ed.)

Collocation Polynomial (Newton) (#04419A)

Using the Newton forward formula, this program computes the coefficients of a collocation polynomial of a maximum degree of 6 from values at equally spaced arguments. (400 steps, plus 28 optional steps)

Author: **Gert W. Backhaus**
Stamford, Connecticut

Triangle: Universal Solution, Area (#04300A)

This single-card program solves all possible plane triangle problems. Given three knowns of a triangle in any of six possible cases, the program solves for unknowns and stores answers in numbered order. All combinations that uniquely describe a triangle are covered. The area is computed and displayed. (97 steps)

Author: **Carl M. King**
Sarasota, Florida

Clock-Timer With Continuous Readout (#04424A)

With this program, your HP-65 becomes a digital clock, as well as an interval timer that is accurate to one second. The calculator displays the time continuously, showing hours, minutes, and seconds, using a special programming technique. It will use 12- or 24-hour time. An easy-to-use calibration routine is provided; it enables you to adjust the clock to an accuracy limited only by the temperature stability of the components. (98 steps)

Author: **David Elmore**
Rochester, New York

Individual Retirement Accounts (Keogh Plans) (#04251A)

Given a monthly deposit and annual rate of interest, this program calculates the value of a tax-sheltered Individual Retirement Account (Keogh Plan) after n years of service or at age of retirement. The resulting annual (monthly) pension, total contributions, and interest accumulated are displayed, plus the value of the account.

Author: **Lee D. Ratzan**
Newark, New Jersey

COGO Continues!

In the last issue we featured "The COGO-6500 Series of Coordinate Geometry Calculations for Surveyors." These CoOrdinate GeOmetry programs are the work of **Carl M. King** of Sarasota, Florida. Recently, Mr. King added two more programs, bringing the total to twelve. Here are abstracts for the two recent programs.

COGO-6511 To Inscribe Curve, Bearing Traverse, and Deflection Angle Traverse (#04550A)

This member of the COGO series solves coordinate geometry problems and reduces field data for the plat designer. A special option is the calculation of a curve inscribed at an angle of a traverse, so that the existing point becomes the P.I. (point-of-intersection) of the curve. Entry and readout follows the convenient COGO format. This program automatically accumulates area. (100 steps)

COGO-6512 Slope Shot Traverses and Inverse Traverse (#04782A)

This member of the COGO series solves coordinate geometry problems and reduces field data for the plat designer. The special feature of this program is the calculation of "slope shots." Entry and readout follows the convenient COGO format. This program automatically accumulates area as projected on the horizontal plane. (91 steps)

Are Flags (+) Or (−)?

Here's a very handy way to forever remember the difference between "set" and "test" flags, or ON or OFF flag conditions. And as a bonus, it will refresh your mind on some of the basic tenets of algebra.

Gentlemen:

One thing that used to take the fun out of programming for me was not being able to remember (with any certainty) the functions of the flags. I always had to refer to the owner's handbook until one day it came to me in a flash that the flags can be thought of as positive (+) and negative (−) numbers in an algebraic function.

From algebra, recall that:
(+) × (+) = (+)
(−) × (−) = (+)
(+) × (−) = (−)
(−) × (+) = (−)

Where:
f = (+)
f^{-1} = (−)
for any "set flag" or "test flag" function.

Rule:
A. If the product of the "set flag" function and the "test flag" function is positive (+), the program pointer will jump to the label indicated.
B. If the product of the "set flag" function and the "test flag" function is negative (−), the program pointer will skip two steps and continue.

EXAMPLES

	Setting Flag (Manual or Programmed)	Testing Flag (Programmed)	Product of signs, and path of program pointer.
#1	f SF1 (+)	f TF1 (+)	(+) Jumps to label indicated.
#2	f^{-1} SF2 (−)	f^{-1} TF2 (R/S)	(−) Skips two steps and continues.

Summary (Condensed Rule):
A. If product is positive (+), *Jumps.*
B. If product is negative (−), *Continues.*

I'm sure that a lot of HP-65 fans will appreciate it if you publish this tip.

Yours sincerely,
Roger Reed, Rocky Hill, Connecticut

(Thank you, Mr. Reed; we are sure that your handy rules will help some people unravel the mysteries of "set" and "test" flags. Ed.)

A New Use For R_8

If you thought there were no more new functions to discover in your HP-65, don't fail to read the following letter. And if the letter doesn't convince you, key in the accompanying "Digital Clock" program for a real eye-opener!

Dear Editor:

Other readers of KEY NOTE may be interested to know that R_9 does not have a monopoly on non-normalized invalid scratch numbers. **Heinrich Schnepf** of West Germany discovered recently that when a number slightly larger than 1 is stored in R_8 and subjected to g DSZ, the residue in R_8 is non-normalized and works nicely in pause routines. The superiority of R_8 scratch numbers over R_9 scratch numbers is that the programmer has a wider choice of pause durations and columns of digits available for the pause display because he has complete control over generation of the R_8 scratch number.

For example, if the scratch number in R_8 is generated from decrementing 1.000000001, pause durations of 11+ days are possible, but only one column of digits is available for the display. On the other extreme, if the scratch number is generated from decrementing 1.001, seven columns of digits are available for the pause display, but it only lasts about one second. Intermediate combinations are easily available at the choice of the programmer.

To illustrate the useful application of R_8-based scratch numbers, **Ron Ryen** (of Cedar Falls, Iowa) and I wrote the following program for a Digital Clock. Just enter the time as HH.MMSS and press A. The display shows a 6-digit pause display of the current time to the nearest 5 seconds every 5 seconds. The constant in R_2 can be adjusted to calibrate your individual machine.

Sincerely,
Dick Hoppe, Casco, Wisconsin

If you aren't familiar with entering time as HH.MMSS, here's an example. Suppose it is 25 minutes and 10 seconds after 11:00 o'clock. You would press the keys 11.2515, then [A]. Why 15 instead of 10? So you can start the "clock" on time. If you enter the exact time, your "clock" will be slow from the start. With practice, you can get quite accurate "starts."

Heinrich Schnepf is the founder of the HP-65 Users Club in West Germany. Both **Ron Ryen** and **Dick Hoppe** are members of the American HP-65 Users Club. This club was described in page 5 of the Autumn 1975 KEY NOTE.

LBL	STO 3	B	CHS
A	1	RCL 2	4
STO 1	.	+	f
7	0	RCL 3	D.MS+
4	0	×	g X=Y
5	0	RCL 8	1
EEX	2	÷	g NOP
3	STO 8	1	STO 1
STO 2	g	3	GTO
EEX	DSZ	RCL 1	B
1	RCL 1	5	
6	LBL	EEX	

What? Another Pause Function?

At first, we thought so, but then we noticed a certain similarity between this routine and the work that **Dick Hoppe** has done on R_8 and R_9 pause routines. (See "A New Use For R_8" in this issue.) Nonetheless, you will be delighted with the following letter. You'll also be amazed to discover that the writer is only *13 years old!* He is also a member of the *HP-65 Users Club*—and so is Dick Hoppe. But how many 13-year-old boys can write a letter like this one?

Dear Editor,

In your last issue I read about how you can use the invalid data in R_9 to generate a pause function. The program was excellent except that data was limited to four digits.

In the enclosed program I wrote a geometric progression generator with an ≈ 5-second pause. The generator displays up to seven digits. The program first takes your data and divides it into a fraction. It then adds 999, which positions your data properly. This number is then divided by R_8, which toggles the pause function.

By varying the above constant, you can "fine-tune" the length of the pause. The content of R_8 determines the digits, which data will be displayed, and the length of the pause. The larger the number, the more digits are open for data display. In turn for this, the pause is made shorter, because of making the decrement time smaller. When R_8 is made smaller, the pause length is longer, but openings for displayed data are decreased.

Using the pause routine, you can develop many "weird" displays. For example, putting 1.000020001 in R_8, you get two decrementing counters *decrementing at the same time!* I don't have enough patience to tell you all about how the routine reacts to different fractions, but after a little experimenting, it is very easy to find out how the routine reacts.

To run the program (below), key in the program and store 1.002 in R_8 for a seven-digit display, 1.0002 for a six-digit display, etc. Then press [A]. The progression will be shown sequentially. When in the seven-digit mode, the display should look like this:

□□.□□□□□□□ □□
Data

The progression answer will be displayed in the underlined area. To stop the program, push a key until the pause function stops.

The program cannot be used with numbers over 9,999,999 since it will not be accurate, and the pause routine will go crazy. Also, be sure to put a number in R_8 before you push [A].

Sincerely,
Rob Chang, Los Altos, California

(Note: Although this is a very interesting piece of work, there are a few glitches in the program... . But it does work, especially the part about 1.000020001 in R_8. You will not believe your eyes–both of them! And you must enter a number in either the X-register or in R_2 for the geometric progression. Also, you must remove four B's when in 6-digit format. Plus, you'll find a few other idiosyncrasies as you play with the various routines. However, it is an interesting and informative piece of programming, and we extend our congratulations to this clever young man. Ed.)

LBL	Initializing process.
A	
STO 2	Store n.
1	
STO 3	Store n^a.
g	Prepare R_8.
DSZ	
LBL	
1	Start progression.
RCL 3	
RCL 2	
×	
STO 3	
7	Preparation of data
f^{-1}	for pause display.
LOG	
f	
INT	
1	
+	
÷	
9	
9	
9	
+	
STO 1	Ready for pause.
B	Pause 5 times.
B	(Delete 3 or 4 B's when
B	in 6-digit format.)
B	
B	
GTO	
1	Loop.
LBL	Pause routine.
B	
RCL 1	
RCL 8	Recall invalid data.
÷	
RTN	

Application Pac Corrections

If you own some of our application pacs, check the following corrections and mark them in your copy—or mail in your old card and we will send you a revised card. If your copy is correct, you have a later, revised issue of the book and/or card.

MACHINE DESIGN PAC 1

Harmonic Cam Design–Flat-Faced Follower, MD 1-15A, generated incorrect values for r_g. The formula for r_c on page 85 of the manual was incorrect. If you have an early issue of the pac, with an "A" card, send the A-card to APD Customer Communications (address on back cover) and they will send you a corrected magnetic card (MD1-15B) and an Addendum Card that contains the corrected formula and program listing.

Another Marking Tip

The dust had pretty well settled on the subject of marking cards when we received the following letter. It contains a good idea.

Dear Editor:

More on marking mag cards! I have used a film marking *pencil* (a Pentel PF 335) with good success. Advantages are: non-smearing, easy to use, legible, and erasable. Perhaps this tip has been known a long time by HP-65 owners, but I am passing it along "just in case."

Very truly yours,

A.B. Babcock, Jr., New York, New York

An Automatic Pilot?

In the last issue, the article "How to Land on the Moon," prompted some interesting comments from HP-65 owners—and one letter from an HP-25 owner in Italy, of all places. The article also prompted **Delmer D. Hinrichs** (Washougal, Washington) to write another program: #04619A *Automatic Rocket Lander*. This program will *automatically* calculate the near-ideal descent and landing! Here's the abstract:

From 100 or 1,000 kilometers altitude, the program makes a soft vertical landing on the Moon or Mars. For each segment, the program decides whether to make a rocket burn or to allow free fall, and also when to reduce segment length. The user may elect to monitor each segment. Also, manual descent is possible. Realistic features are: gravity follows inverse-square law, ship gets lighter as fuel is used; an attempt to burn less than the remaining fuel causes a signal, and only the remaining fuel is burned; and an impact "crashes" the program. (182 steps)

This program gives a more accurate simulation of a rocket landing than does #00287A, by allowing for the actual inverse-square-law gravity field, and for the loss of rocket mass due to fuel usage. Also, segment time is variable, fuel usage rates need not be integers, and descent is made from higher altitudes to the surfaces of either the Moon or Mars. However, the major improvement is that this program will calculate a near-ideal descent and landing—*automatically! (And all we can add is: "Well done," Mr. Hinrichs! Ed.)*

Above Average?

Before you get to the whole question, we'll tell you that the answer to the above title is definitely NO! However, the following letter does raise some interesting thoughts. We thought you'd enjoy it.

Dear Sirs:

As of January 28, 1976, I have had the use of an HP-65 for one year. During that time I have used it 104 times for a total of 367 hours. The main use has been hydrographic work on estuaries; other uses have been in statistical analysis (Stat Pacs 1 & 2). Is this an average, or above or below average, usage? It is operating quite reliably after many, many programmings.

Santo A. Furfari, Davisville, Rhode Island

Offhand, Mr. Furfari, we'd say that was "below average" usage, based on the following. We know pretty accurately just who (which professions) own all the HP-65's out there. If you use a figure of 50 workweeks a year and 2 hours use a day—which must be some sort of "average"—you'll arrive at 500 hours a year. We know of owners who have two or more HP-65's and they get heavy use. Other owners carry their HP-65's everywhere (and we mean "everywhere"!), and use them much more than 2 hours a day. And we'll bet you that your letter will initiate a whole flood of letters from our "above average" HP-65 owners.

Oh, yes! We nearly forgot one more answer... to an unasked question: No, as far as we know, no one has "worn out" an HP-65. We're not so certain about the reverse of that, however!!

"Power Curve Fit" For HP-45 Timer?

After the article about the HP-45 "timer" appeared in the last KEY NOTE, we were "assaulted" with letters. Most were about our "accuracy" statement and methods, tricks, etc. to improve accuracy. Here's one example:

Gentlemen:

On page 8 of the Winter 1976 HP-65 KEY NOTE, you report that the accuracy of the HP-45 timer is only ±10% and that it is not possible to calibrate or adjust the timer without physically altering the calculator.

The times recorded from my HP-45 appear related to the true elapsed time by the power curve, $y = 1.187x^{.99}$, where x = HP-45 time and y = true elapsed time. The coefficient of determination, r^2, for this relationship is 1.000. The power curve and the coefficient of determination can be calculated from the HP-45 "times" and the true elapsed time by using the HP-65 Users' Library Program #00101A (Stat 1-24A "Power Curve Fit").

Although each HP-45 may have its own characteristic power curve, using the power curve and the HP-45 timer may make the timer's accuracy much greater than ±10%.

Sincerely yours,

Matthew Zack, Atlanta, Georgia

Another Storage Idea

If you daily carry many cards and programs with you for your HP-65, you might be looking for ideas on how to cut down the bulk you have to carry. Here's how one HP-65 owner solved the problem.

Dear Sirs:

Enclosed is a card which I find quite handy for storing program instructions in the HP-65 carrying case. It is cut from rolls of tracing cloth such as used by draftsmen. The card enclosed is for program STAT 1-22A, used in conjunction with STAT 1-05A.

Using this material, more than 20 program instructions can be stored in the soft leather carrying case. Writing on these cards can be with pen, india ink, or typewriter.

You may wish to pass this suggestion along to your HP-65 KEY NOTE readers (or even supply your program instructions on such cards).

Very truly yours,

Earl R. Kooi, La Grange, Illinois

Thank you, Mr. Kooi, for your input. For the reader's information, the "card" is 3 by 5 inches. Yes, others have suggested (and use) regular 3-by-5 file cards, which can be marked on both sides. Mr. Kooi's "cards" are, however, a lot sturdier than 3-by-5 card stock and have the asset of a background "ruling" of 10 squares to the inch.

One More For Fibonacci

Last issue, we said we did not want to belabor the Fibonacci-number subject, and—you guessed it—we now have to print one more version. It is quite a program and, furthermore, just about the ultimate in this type of programming. One word of warning, however. It runs for about 45 minutes...unless you shorten the display "pause."

Dear Editor:

Mr. Dick Hoppe's Fibonacci number generator (page 5, KEY NOTE V2N2) is indeed fascinating and leads to the question: Which Fibonacci number is presented? I have taken the liberty of adding a counter to Mr. Hoppe's program. This has been done in two ways. One, where the sequence number is presented for the same duration as the Fibonacci number and the other, where the sequence number is displayed for approximately half as long.

This program will display:

1. The sequence number; i.e., 1, 2, 3, ..., n.
2. The associated Fibonacci number: 1, 2, 3, 5, 8, etc.

Display times may be controlled by the integer prefixing EEX, CHS, 2, 3, STO 1. They may range from 1 through 9. The length of the display time is inversely related to the size of the integer; i.e., 9 provides a longer display than, say, 2. Thus, when generating the sequence number in any example, EEX is prefixed by 2. (See insert A.) The Fibonacci number display is made longer than the sequence number by prefixing EEX by 9. (See insert B.)

An added bonus is that the Fibonacci number (FN) display will not run away after the FN exceeds 9999 because the sequence number display stops it. FN's larger than 9999 can be obtained by pressing any key during the rapidly decrementing FN display. Once stopped, RCL 7 will yield the sequence number and RCL 4 the FN. (Incidently, RCL 3 presents the next FN.) As a result, it may be determined that FN number 481 (sequence no.) exceeds the capacity of the machine ($9.999999999 \times 10^{99}$).

Sequence no. 480 has the value of $9.216845715 \times 10^{99}$. Further, the 19th FN is the largest FN smaller than 10,000 and has the value of 6765. The 20th FN is 10,946. The decrementing of the left of the FN display starts with the 44th FN.

I hope this is interesting; I've had a lot of fun with it.

Can someone explain why 88. 80000 0.0. is the display format?

Sincerely,

Jack B. Phillips, Clifton, Virginia

(After you have keyed in the program, press **A** *to start it. If you stop the program to observe FN's above sequence number 19, restart it by pressing* **R/S**. *Ed.)*

Fibonacci Number Generator With Sequence Counter

```
LBL
A
0
STO 7
9
EEX
CHS
2
3
STO 1
EEX
CHS
3
2
STO 2
1
CHS
f⁻¹
COS
1
STO 3
STO 4
LBL
B
1
STO
+
7
RCL 7
RCL 2
×
RCL 1
+
RCL
9
g NOP
÷
RCL 4
RCL 3
+
STO 3
g LST x
STO 4
RCL 2
×
RCL 1
+
RCL
9
g NOP
÷
B
RTN
```

Delete if different display lengths are desired.

Insert A:

```
2
EEX
CHS
2
3
STO 1
```

Insert B:

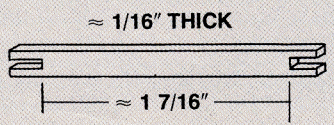
```
9
EEX
CHS
2
3
STO 1
```

ON-OFF Switch Fixture

If you carry your HP-65 (in its case) on your belt, you might have experienced the problem of accidental turn-on of the ON-OFF switch. For some people, this has long been a complaint. Others never have the slightest problem while "wearing" their HP-65.

Anyway, through the kindness of **Jerry Chamkis** of Kings Beach, California, here's a sure-cure he wants to share with all of you. Carefully measure the distance between the ON-OFF and W/PRGM-RUN switch tabs with the switches in the OFF and RUN positions. Then cut a small fixture as shown below. You can make it out of a large variety of materials: plastics, tempered cardboard, Micarta, fiberglass, etc. Just make sure the material is thick enough so it won't bow or bend.

When locked in place between the two switches, the fixture will prevent the switches from being accidentally bumped ON.



MEASURE CAREFULLY ON *YOUR* CALCULATOR!

Impossible? Not For An HP-65!

Not long ago we received a pleasant note from **William M. Kolb** (Upper Marlboro, Maryland) about a new program he had written. Using this program, the HP-65 does a seemingly impossible trick with a deck of playing cards. Or, in the words of Mr. Kolb: "I think you will be interested in the enclosed submission to the HP-65 Library since it may make the HP-65 the first pocket calculator (or computer) to ever do a magic act." Here's the abstract.

Impossible Discovery II (#04746A)

A deck of playing cards is cut several times and shuffled. The deck is then divided into two piles. A card is removed from the middle of either pile, noted, and placed in the middle of the other pile. Either pile is shuffled and read into the HP-65. The HP-65 will determine the selected card and follow up with another card discovery. (298 steps)

(Evidently Mr. Kolb found a way to improve his first card-trick program because he also "authored" program #04745A, Impossible Card Discovery, which is similar to the one above, but without the final touch. It is only 200 steps. Also, be advised that these programs use a programming routine that will be new to most of you. It is called "Lampman Split Logic," which is very logical, since **Dean Lampman** *(HP-65 Users Club) discovered it. Dean is presently doing an article about this discovery, and we will present it in the next KEY NOTE. Ed.)*

Another Wild Number!

This postscript to **Mr. A.B. Babcock's** letter about marking cards refers to an article in the last issue. Again, it attempts to define the awesome dynamic number range of the HP-65.

P.S. I have used a variation of **Bill Wild's** dynamic range example (Vol. 2, No. 2, page 7) for several years. Instead of cubic microns, I use grains of sand packed at 1000 grains per cubic millimeter. I can visualize sand grains better than cubic microns, at least when it's only 1 mm! My answer is "only" 1.197×10^{91} grains, using 15 billion light years radius (a recent estimate of the most distant quasar) and 9.46×10^{15} meters per light years (SI units). Furthermore, the HP-65 has capacity for at least 835,500,000 more universes! That is mind-google-ing!

(Well, Mr. Wild, it looks like Mr. Babcock has one-upped you...or has he? It appears that not even the vast universe is a challenge for the HP-65. Ed.)

For Information Squeezers

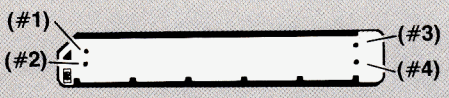
Because you can cram an awesome amount of information on a magnetic card, sometimes it is difficult to mark enough *words* on the card so that you can remember *how* to run the program.

There have been several neat ideas about coding cards to trigger your memory, but this idea is just about the ultimate. But...let's let *him* tell you.

Gentlepersons:

Please print the following information on "dots" in the next issue of KEY NOTE. It is my original suggestion, and I think it will be a great assist for information squeezers.

The four dots on the card are my own design. This information may be quite handy to those of you who must pack a lot of information onto one tiny magnetic card.



The top left dot (I) indicates that the card or program contains an initialization process by RTN R/S. Dot (2) indicates that the program needs initialization. Dot (3) is marked only if the card contains two programs, or two parts to a program (more than 100 steps). (Be careful when clipping the respective corner to prevent accidental erasure.) Dot (4) indicates that the card has been protected (the same program copied on both edges of the card). I hope these dots serve you well!

Sincerely,

Andy L. Burg, Los Angeles, California

Mr. Burg also chided us about the masthead on KEY NOTE. It seems that the "hand" in the photo is holding the magnetic card by the front and back—*not* by the edges. Well, he's

right—in a way—but we *did* use a clean hand! Anyway, Mr. Burg, this is the last time you'll see our *faux pas,* because this is the last issue under the HP-65 format. And all of this brings up an interesting question: Why didn't someone else notice the hand...including us? It just proves the old maxim: You can't win them all!

Two Price Reductions

Now you can buy the outstanding HP-25 Scientific Programmable Calculator for only $145. Even at $195 it was a good buy, but at the present, lower price, it is a genuine bargain. And in today's world of inflation and upward spiralling prices, a bargain is a mighty rare thing. So if you have a youngster heading back to college—or starting—this fall, here's your chance to present a gift that can be used in any course of endeavor.

But if $145 is a bit out of range, don't give up. Now you can buy the HP-21 Scientific Pocket Calculator for only $80. As a "starting" scientific calculator for a young student or beginning professional, it is hard to beat. Same HP quality. Same HP ruggedness. Same HP reliability. And if service is necessary, you'll find we stand solidly behind every calculator we sell.

After all, as you already know, making quality calculators is our business.

Don't miss out on these price reductions on our two most popular models.

Rotary File Idea

We won't waste words about this letter. It's an excellent idea that could solve the storage problem for a lot of HP-65 owners.

Dear Editor:

After reading all of the ideas that HP-65 users have sent in to make using the HP-65 more convenient, no one has yet addressed the problem of quickly and easily finding a desired program. I solved this problem for myself by obtaining a rotary file with plastic sleeves intended for business cards, and I sort of consider my HP-65 programs my "business cards."

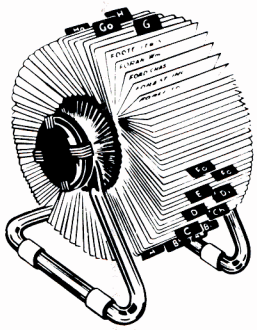
I have my programs filed alphabetically and cross-indexed to a card file that includes the Abstract and User Instructions. This makes it possible for me to quickly find and access any of my programs. My most-used programs are kept in my card file in their HP-65 Pocket Instruction Cards. When I leave my desk I do use the plastic card case (HP) to carry around my favorite or needed programs, but the convenience of access offered by the rotary file is unbeatable.

I purchased my rotary file through the catalog company JOAN COOK. The address is: Dept. S-5, P.O. Box 21157, Fort Lauderdale, FL 33316. The catalog number was 1277-P, and it cost $9.95 plus postage. I've enclosed a picture (from their catalog) of the file I purchased.* I've found this same rotary file in other catalogs, but this was the cheapest. I'm sure that it, or a suitable substitute, could be found in any large office supply center.

Since I've picked up so many excellent tips from other HP-65 users through KEY NOTE, I thought I should pass on a tip of my own.

Happy programming,
Joe Hopkins, Jr., Rolla, Missouri

**(Somehow, the picture became detached from the letter. In other words we lost it. So here is a photo–again, from a catalog–of the type of file Mr. Hopkins describes above. Ed.)*



Custom-Fit Case

Dear KEY NOTE:

For those people with hard-leather cases for any calculator—especially an HP-65—a better, smoother fit can be obtained as follows. Soak the case in warm water for 10 minutes. Then place the calculator in a plastic bag, making sure that moisture can't get into the bag. Next, fit the calculator (and perhaps a plastic card case) in the leather case and allow it to dry **slowly** overnight.

This process allows the softened leather to mold to the shape of the calculator. As a matter of interest, pistol holsters are often made this way.

Sincerely yours,
Ted Stanley, Sherborn, Massachusetts

A Special-Delivery Program

Pleasant surprises are always a nice way to start an afternoon—especially the day after a long holiday weekend.

On Tuesday afternoon, July 6, we had a very distinguished visitor. You read about him on the back cover of Volume 1 Number 5 and again on page 6 of Volume 2 Number 2. And, after being one of the best customers of the Users' Library, he finally documented a program, which he hand-carried here and personally submitted to our Librarian, **Bernice Alexander.** Here's the abstract.

Durbin-Watson Test (#04870A)

Given the sequence of errors from a previously computed linear regression (where an error is the observed value of the independent variable less the computed value), this program computes the Durbin-Watson test statistic for serial correlation of the disturbances. (49 steps)

Author: **Gus W. Weiss, Jr.**
THE WHITE HOUSE

(Actually, it was quite an honor to meet our distinguished guest. He said he was on the west coast on business...but I know better. He just couldn't wait to see the fabulous new HP-67's and HP-97's. Ed.)

HEWLETT-PACKARD COMPANY
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