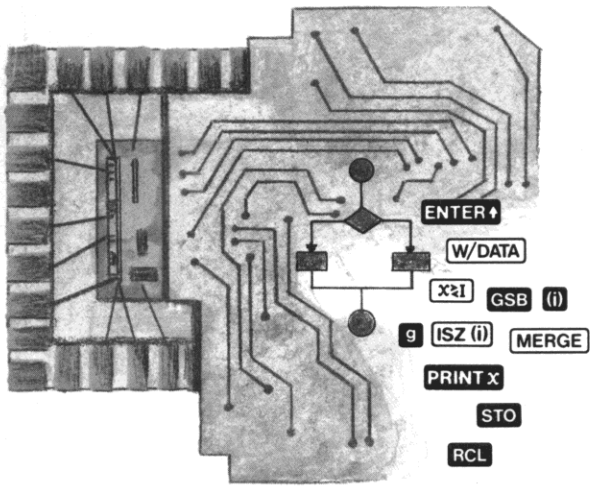


Featuring, this issue:

HEWLETT hp PACKARD

HP Key Notes

June 1977 Vol. 1 No. 2

To Know One Is To Want "01"

For over 38 years Hewlett-Packard has not assigned the model number "01". There it sat . . . waiting.*

Meanwhile, rumors, leaks, conjecture, and guesswork suggested that the magic #01 was to be a watch or wrist calculator.

Well, as you can see, the "01" is here. But at the risk of disappointing a few people, we made it more than a watch, more than a wrist calculator . . . we made it the one and only **HP-01**. Now what, you might ask, is that?

The **HP-01** *is personal information* . . . fast, accessible, reliable. Its six interrelated function groups, four types of data, and direct numerical entry provide a range of information limited only by its wearer. Because the **HP-01** is always there, the information is more timely, and thus more valuable.

The **HP-01** *is personal distinction*. Because it is worn on the wrist, it is designed to be boldly attractive. The result is a unique design, from the stylus in the clasp to the compound curvature of the case.

Finally, the **HP-01** *is Hewlett-Packard*. It steps beyond today's products to create a class of its own. It is made easy to use by "friendly" microprogramming and full literature support, including a 100-page *Owner's Guide*. And it includes the traditional HP commitment to quality and post-sale service.

One thing the **HP-01** is *not* is readily available . . . at least not yet. Because we believe that fine jewelers can best serve the **HP-01** customer, we are busy establishing a network of **HP-01** fine jeweler dealers. **The HP-01 will be available only through them. It will NOT be sold directly from the factory.** In the U.S., a dealer should be near you soon. Unfortunately, the rest of the world will have to wait a bit longer.

For more information, in the U.S. you may call, toll free, 800-648-4711 (702-323-2704 collect, in Nevada).

So, if you can't get an **HP-01** as soon as you'd like to, just remember one thing: at least HP KEY NOTES readers were among the first to know that HP has achieved another first, the **HP-01.**

*****When HP acquired the F.L. Moseley Company in 1958, Moseley had a "model 1" product, but it was not an "assigned" HP model number. HP started with model number 200A for its first product. Why 200A? Because "the number sounded important."*

Price Reduction

On April 1 we reduced the price of the HP-91 Scientific Printing Calculator. Originally $500 when it was introduced, it is now only $325.* This was the first battery-operated scientific calculator that delivered a printed record of all your calculations, no matter where you went.

At the new, lower price, this calculator could make a mighty fine companion to an HP-97. Or a fantastic gift for a June graduate headed for college this year.

*(*U.S. dollars. See notice on bottom edge of Cover.)*

Owes It All To HP-65 ...!

Many issues ago we ran an article about the HP-65 in *the* White House. It's owner was (and still is) **Dr. Gus W. Weiss, Jr.,** who at the time was an Economist on the Council on International Economic Policy and a Senior Staff Member at The White House.

Several weeks ago we discovered, in a telephone conversation with Dr. Weiss, that he had just been promoted to Director of the Council on International Economic Policy, and that his immediate supervisor is the President. So, all you folks who think the HP-65 is *passe,* just keep in mind that, although he said somewhat jokingly, "...and I owe it all to my HP-65...", there *is* some measure of truth in the statement.

Today, Dr. Weiss's venerable HP-65 has been supplanted by an HP-67 (and, on occasion, an HP-97), but his faithful HP-65 and hundreds of programs are still just as valuable for rapidly solving some of the country's vexing economic problems.

This story has a moral: There is an American saying that any child can become president of the United States. So pass your HP-65 down through your family and maybe you'll increase the odds in favor of your son or daughter. After all, look what one did for Dr. Weiss...!

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

Library Corner

Although the HP-65 is no longer in production, the HP-65 Users' Library continues to grow. As of June 16, there were 5,355 programs logged into the Library. But infinitely more important is the fact that new *applications* continue to be found for this marvelous machine that started the whole programmable pocket calculator phenomenon.

As of June 15, there were 994 programs logged into the HP-67/97 Users' Library, and new programs flow in almost faster than we are capable of reviewing them. Some of these new programs are highlighted under "NEW HP-67/97 PROGRAMS." We even included two from Europe, one from Canada, and one from Australia!

ORDERING PROGRAMS

Any program you see in HP KEY NOTES can be ordered from either the Users' Library in Corvallis, Oregon, or from the Users' Library in Geneva, Switzerland. (Both addresses are on the back cover.) For most of the world, use the program number listed next to the program's title, then order it from Corvallis. The only exception is if you live in the European areas; in that case, *use the number listed in italic type below the program abstract,* then order it from Geneva.

Payment for programs must conform with the instructions from *your* Library area. Always use order forms if possible, and be sure to include any state or local taxes.

SUBMITTING PROGRAMS

If you submit programs to the Library and use an HP-97 to list the program steps on tape, you know that it saves a lot of work and makes very legible copy. However, we would like to ask a favor of you. Please submit the tapes as soon as possible and try to keep them from direct exposure to fluorescent lights or sunlight. If left too long in an exposed state, the blue ink starts to fade. Then, when we try to photocopy the program to send it out on an order, the listing is barely legible, and we have a disconcerted customer.

For better service to all members, send in your programs as soon as possible after you have applied printout listings. Also, please do not put transparent adhesive tape directly on the blue ink symbols. A chemical reaction soon fades the ink. If you are sure the problem is not with the paper or from exposure to light, perhaps your calculator needs some repairs or adjustments.

FUTURE OF CORVALLIS HP-65 USERS' LIBRARY

The U.S. and Canadian HP-65 Users' Library continues, even though the last HP-65 has been built. The over 5000 programs in the Library will be available through 1981, in keeping with Hewlett-Packard's policy of supporting products that are no longer in production.

Responding to the sharp decrease in program submittals (many HP-65 programmers have graduated to the HP-67/97), we plan to publish the last Catalog Addendum later this year. To have your newest HP-65 program considered for inclusion in this final Corvallis Addendum, it should be postmarked no later than August 30, 1977. Submittals postmarked later than August 30 will be returned.

We will announce the availability of the addendum in the future HP KEY NOTES, which will also contain an *Addendum Request Form*. If you subscribed or resubscribed to the HP-65 Users' Library after July 31, 1976, you will be able to receive this Addendum without charge, simply by mailing this pre-addressed postage-paid *Addendum Request Form*. On the other hand, if you have not subscribed since July 31, 1976, and if you have a U.S. or Canadian mailing address, you will be able to use this *Addendum Request Form* to purchase this last Catalog Addendum (plus other abstracts you may not have received) for $8.00 (U.S.).

NEW HP-67/97 PROGRAMS

We've included in this issue a lot more abstracts than usual. That's because we have had an unusually fine bunch of programs submitted. You will also find a few more programs highlighted throughout this issue; they were considered to be either a level above the others or of such unusual value that we deemed it worthwhile to draw your attention to them.

If you would like to see *your* program in HP KEY NOTES, keep one thing in mind: We cannot highlight a program that, although accepted into the Library, is difficult to use, hard to understand, or not neatly and carefully documented. What we are after are the programs that have widespread use, solve unique problems, use clever and innovative programming tricks and routines, or merely appeal to the most people. As you can imagine, it is difficult to pick a few, because all of you do a pretty good job of programming your particular problems. So don't feel badly if we fail to choose *your* program.

We hope you enjoy the programs chosen for this issue. We are also happy to report that a large Catalog Addendum is being assembled and will soon be finalized so it can go to the printer. We are certain it will contain something for every HP-67/97 User.

NOTE: Because some of the following programs rely on "waveforms" or plotted curves that can be generated with the HP-97 printer they are not recommended for HP-67 owners. They are preceded by "(97)" in the program title. They *can be used* with an HP-67, but it will require some very tedious and lengthy pencil-sessions to arrive at the plotted data that the HP-97 so easily prints out on tape. (See program #00514D for an illustration of one of these tapes.) Programs that are equally usable on both calculators are marked by "(67/97)" preceding the program title.

67/97 Wind Chill Index and Equivalent Temperature (#00580D)*

How cold is "cold"? Temperature and wind both affect the heat loss from the surface of the body. The effect of these two factors is expressed as an "equivalent temperature" that approximates the still air temperature that would have the same cooling effect. This program accepts inputs of either miles per hour or meters per second, or degrees in Fahrenheit or Celsius, and calculates the equivalent temperature in either degrees Fahrenheit or Celsius. The Wind Chill Index (WCI) is expressed in kilocalories/meter^2/hour. (111 steps)

Author: **Fred A. Lummus**
Greenville, Texas

**In European areas, order by number 00217D.*

67/97 35mm Photomacrography (#00913D)*

This program (from Europe) quickly solves some vexing problems of photographing things at very close ranges. Input the lens *f*—number of your 35mm camera and the guide number of your flash, then choose one lens aperture and select the pertinent datum of your photomacrography problem; for example: a particular magnification rate, or the maximum size of your subject, or the length of your extension tube (or bellows), or the diopter strength of your close-up lens. Your HP-67/97 then calculates (or recalls): the magnification rate, the photographic range, the depth of field, the necessary bellows extension length, the equivalent necessary diopter strength of the close-up lens, the distance from subject to film-plane, the distance from subject to flash.

The program doesn't compute the distance from subject to film-plane when using a close-up lens. Also, the guide number of the flash must be the real guide number for ASA 50 and for the approximate distance from subject to flash. (161 steps)

Author: **Francis Parent**
Strasbourg, France

**In European areas, order by number 50097D.*

67/97 Biorhythm Critical Days (Complete) (#00549D)*

Biorhythmic critical days are days when a person is most susceptible to be accident-prone, error-prone, or emotionally unstable. This program allows a look into the future to identify these critical days in any of three modes: the next 30 calendar days, the next 10

GTO page 4

Card Storage Made Easy

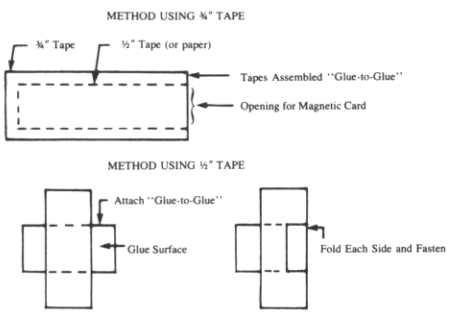
If you are looking for new ways to organize and store your collection of HP-65 magnetic cards, or if you want a method to keep your new HP-67/97 cards from becoming disorganized, here is a letter that will solve your problems or give you new ideas.

Dear Key Noters:

The HP magnetic cards can be conveniently located on rotary file cards, on 3 × 5 file cards, on pages of the application pac books, on program forms, on User Instructions forms,... on almost anything, by using two small pieces of tape. You simply bond ½-inch-wide transparent tape along the center of ¾-inch (or wider) transparent tape and attach 1- or 2-inch lengths where you wish to hold or store a magnetic card. The card will slide into the opening formed by the ½-inch tape under the wider tape.

If only ½-inch wide tape is available, wrap one short length around the middle of another to form a ½ × ½-inch opening when attached to a surface. Use two of these short openings, spaced 1 inch apart. Bend the page slightly to grasp the edges of one end of the card and flatten the page while withdrawing the card.

Happy filing and retrieving,
Richard A. Milroy
Annapolis, Maryland



394 Steps On 3 HP-65 Cards

Just before Christmas we received the following HP-65 program. It is, to say the least, a fine example of what can be accomplished with "only" 100 steps of program memory in a pocket calculator. And, although most of the material was available to the author, there is one formula that was developed by the author.

(65) Tournament Bridge: Major-Event Pairs-Games Awards (#05266A)*

A program that computes the master point awards for all major-event pairs-games. This includes overall and section awards for open, masters, nonmasters, novice, men's, women's, mixed and unmixed pairs, and regional consolations. It does not include sectional consolations, side games, team games, or individual events. (394 steps)

Author: **Robert L. Patton, Jr.**
Arlington, Texas

**In European areas, order by number 51608A.*

For Star Trek Fans

One of the phenomenons of American television was the program, *Star Trek*. It was especially popular because it occurred at a time when space exploration was a reality, not fiction. If dealt with the "starship" *Enterprise,* on various missions in outer space. And, although discontinued as a regular weekly program on prime time, its charisma lingers on with a following of fans known as "Trekkers."

As you get into the following program, you realize what an extraordinary accomplishment it represents. In 798 steps and 8 magnetic cards, the author has captured the same aura of the TV show. This program was also translated by us and included in the HP-67/97 Games Pac 1. (See page 9.) It is also available from the HP-67/97 Library (in Corvallis, only, as #00179D). This is truly a work of art and a treatise on multiple-card programming and implementation. Our very late—but sincere—congratulations to Mr. Gregory.

(65) Space War (#04200A)*

The mission of the *Enterprise* is to seek out (by use of long- and short-range sensors) and destroy (by use of photon torpedoes and phasers) the three Klingon ships in space, which consists of 5184 sectors divided into 64 quadrants, before 15 stardays elapse. There also exists a starbase to resupply energy and photon torpedoes to a docked *Enterprise*. Klingons can destroy an unshielded *Enterprise*. Similar to space war found on some minicomputer systems. (798 steps)

Author: **Walter Lee Gregory, Jr.**
Newport News, Virginia

**In European areas, order by number 51607A.*

"Must" Reading For Game Programmers

Whether or not you program games on your HP-65/67/97, you'll find it no waste of time to read an article in the March 1977 issue of *Scientific American* magazine. Starting on page 137, the article "Mathematical Games," by **Martin Gardner** (recreational mathematics wizzard) is of interest to all programmable calculator owners. It even mentions the new *HP-67/HP-97 Games Pac 1,* but the article is, primarily, about a simple two-person game. Also mentioned is Wythoff's "nim" (game). *(And I almost hesitate to tell you this, but there is quite a dissertation on the relationship of Fibonacci numbers and the golden ratio–as they apply to nim, etc. You see, I've been accused of "a protracted exchange" on Fibonacci numbers in KEY NOTES, so now I'm gun-shy about mentioning those utterly fascinating sequences. Ed.)*

Two Programs Of Rare Quality!

As our Applications Engineers look through dozens and dozens of programs submitted to the Users' Libraries, they sometimes send one or two directly to HP KEY NOTES. The reason could be that the program is unusually well documented, serves an unusual application, has very clever routines, or is on an altogether different subject. The first program, below, fits the last category. And, not only is it unique, it is topical, it works well, it is very well documented, and it has wide appeal. The second program, below, is for a rather specialized, technical application but it is in an area of chemistry that gets a lot of attention, and we get quite a few programs for calculations of this sort. However, the interesting thing about this one is that it will handle acids or bases with up to four different ionization constants; i.e., multiprotic acids. Most programs handle acids/bases with only one or two ionizable entities. Never have we seen one for four. The calculations get too complex for most people. But, in this case, the author has developed a very sophisticated looping arrangement to handle the calculation.

(67/97) Estimating Obesity, Body Fat, Surface Area, and Total Body Water (#00832D)*

Obesity may be defined as an excessive amount of body fat. A simple method of estimating the fat content in the living subject is based on measurements of body weight (W) and height (H), corrected for sex and frame size. This program calculates the W/H^2 Index, a crude measure of obesity. Body fat, body surface area, and total body water for men and women also can be calculated using either English or metric units of weight and height. (200 steps)

Author: **Andrew C.M. Coile**
Bethesda, Maryland

**In European areas, order by number 00226D.*

(67/97) Weak Acid/Base Titration Curve (#00831D)*

For a weak acid or base, the program accepts up to four dissociation constants, volume, and molarity; for strong base or acid titrant, it accepts normality. Then, for each titrant volume entered, the program computes the pH. the 3–, 4–, 5–, or 6–degree equation in H or OH (as needed) is solved by iteration to obtain pH, so the method is quite general and will work for a very wide range of concentrations. (223 steps)

Author: **Karl Marhenke**
Aptos, California

**In European areas, order by number 00225D.*

critical days, or the next 3 multiple critical days. Subsequent groups for each mode are available; however, the modes cannot be mixed and the ability to specify a different number of days is not available. This program is limited to only a 200-year calendar of March 1, 1900, through February 28, 2100. (221 steps)

Author: **Fred A. Lummus**
Greenville, Texas

**In European areas, order by number 00213D.*

(97) Biorhythm-Biological Cycles With 31-Day Printout (#00550D)*

This program is the companion printing version of program 00195D in the Corvallis Library. A given birthdate and a starting date are converted to Julian Day-Number display. A 31-day printed tape with the 23-day, 28-day, and 33-day cycles is output from the starting date. Any Julian or Gregorian data from January 1, 4713 B.C., may be input (209 steps)

Author: **Rex H. Shudde**
Carmel, California

**In European areas, order by number 00214D.*

67/97 Compass Deviation-Coefficients (#00912D)*

This program (from Switzerland) computes the coefficients of any compass deviation curve, from deviation at compass courses N, NE, E, SE, S, SW, W, and NW, and stores the coefficients in registers A thru E. Function B computes the compass deviation (d) at any compass course from the compass deviation coefficients stored in R_A to R_E by: d = A + B sin Cc + C cos Cc + D sin 2 Cc + E cos 2 Cc. (This is Archibald Smith's formula.) (120 steps)

Author: **Robert F. Menzi**
Geneva, Switzerland

**In European areas, order by number 50081D.*

(67/97) Pinball Wizzard (#00321D)

(Here he is again, the inimitable wizzard of scintillating calculator games. And this time he's nearly outdone himself! Incredibly well documented. Ed.)

For either HP-67 or HP-97 use, this program simulates an actual pinball machine, including two flippers, out hole bonus, thumper bumpers, slingshots kickers, special star roll-overs, bonus advance star roll-overs, top roll-overs, kickout holes, free ball drop targets, free game scoring, spinner gate, optional tilting possibility, and either conservative (standard) or liberal (easy) scoring options. The calculator keeps track of games, amount spent, number of balls to play, total score, etc. (222 steps)

Author: **Craig A. Pearce**
Berwyn, Illinois

**In European areas, order by number 00204D.*

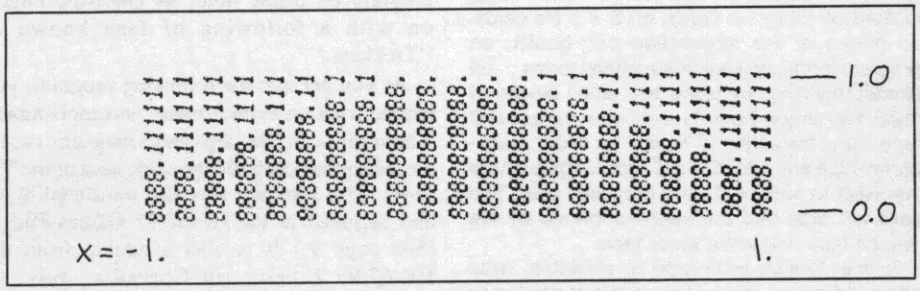
(97) Plot Subroutine (#00785D)*

This program (actually, a subroutine) uses two registers (8 and 9) and two labels (8 and 9). It operates on the value in the display, produces a normalized function, and prints a formatted display in which a decimal point represents the function value. The area "under" the curve is represented by 8's, "over" the curve by 1's.

(As you can see in the drawing, this clever subroutine has all sorts of possibilities for many applications–but read on...! Ed.)

Author: **James A. Weber**
Renton, Washington

**In European areas, order by number 00228D.*



(97) Curve Plotting Routine (#00732D)

Given (1) the function to be plotted, (2) the plotting interval, and (3) the number of points to be plotted, this routine plots the function using the HP-97 printer. Two unique features were incorporated: (1) the values are pre-scanned for maximum and minimum (and printed), and (2) if the output interval contains zero, the zero level is indicated and points are plotted with respect to it. Ten print positions (across) are used. (184 steps)

(Terrific program! We are impressed. Ed.)

Author: **Arthur E. Anderson III**
Mountain View, California

**In European areas, order by number 00223D.*

67/97 Dog Races (#00370D)*

A program that gives all 36 win and quiniella odds on 8 dogs, then stops on handicapping tips. If shows the race in progress in a maximum of seven steps then stops on the finish order. If gives all win, place, show, quiniella, perfecta, and trifecta payoffs, plus the Daily Double and Big Q if a previous race has been run. All payoffs vary with the popularity of the dogs. Payoffs can be with or without a percent taken out. A random-number "seed" is the only entry that must be made before the first race. (335 steps)

Author: **Donald L. Miller**
Tampa, Florida

**In European areas, order by number 00206D.*

67/97 Flag Test Routine (#00233D)*

This routine may be used in the process of program editing and debugging to indicate the status of the four flags in the calculator. It uses only one label and the Z and T registers of the stack. Even the use of the label can be avoided by placing the routine at the top of the program and initiating it by pressing [RTN] [R/S]. The X and Y stack registers and all storage registers, as well as flag status, are undisturbed by the test. (27 steps)

Author: **Howard B. Kutner**
New York, New York

**In European areas, order by number 00203D.*

67/97 Star Trek-Advanced (#00369D)*

Here are 1113 steps of decision-making that puts the pressure on you, the captain. You fly the *U.S.S. Enterprise* on a triaxial coordinate system, tracking down Klingon, Romulan, and Vallician war vessels, in addition to a stranded Nubian freighter. Functions include advanced sensor system, course controls, shields, phasers, photon torpedoes, transporter, tractor beam, Romulan cloaking device, self-destruct, and even a practice "firing range."

(For all the thousands (millions?) of Star Trek fans, here is a tour de force of HP-67/97 programming. After 29 pages of documentation and 6 cards, you'll notice you've been up half the night mastering this "game" program ...or going into orbit! A truly monumental job. However, I must admit that Walter Lee Gregory did it a year ago–and on the HP-65, no less–with 798 steps, 8 cards, and a truly astounding 46 pages of beautiful documention; it must be the all-time record for programmable pocket calculator programming. See page 3. My congratulations to both of you! Ed.)

Author: **Larry G. Schneider**
Wilkes-Barre, Pennsylvania

**In European areas, order by number 00205D.*

(97) Colinear Antenna Gain and Pattern (#00514D)*

The program calculates the gain of center-fed dipole antennas and colinear arrays of center-fed dipoles. It also calculates relative gain at selectable angles (elevation angle for vertical antenna), or uses the HP-97 printer to plot relative gain in selectable decibel steps. Also included is provision for progressive phase shift to evaluate beam tilt. (220 steps)

(Here's a printout (below) that we ran on an HP-97. Very clever and neat, right? Ed.)

```
-1111118111.  ***
-1111111181.  ***
-1111111118.  ***
-1111111118.  ***
-1111111118.  ***
-1111111181.  ***
-1111111181.  ***
-1111118111.  ***
-1118111111.  ***
-8111111111.  ***
-1111811111.  ***
-1111811111.  ***
-1111811111.  ***
-1118111111.  ***
-8111111111.  ***
-8111111111.  ***
-1181111111.  ***
-1118111111.  ***
-1118111111.  ***
-1181111111.  ***
-1811111111.  ***
-8111111111.  ***
-8111111111.  ***
-8111111111.  ***
-8111111111.  ***
-1811111111.  ***
-1811111111.  ***
```

Author: **Kenneth R. Wetzel**
Ridgecrest, California

**In European areas, order by number 00211D.*

67/97 Jack of Eagles (#00727D)*

A guessing game! (From Australia!) On each move, the human enters a positive or a negative number; the machine has already analyzed the human's previous moves and anticipates his/her choice. If correct, the machine's score goes up; if wrong, the human's score goes up. The human can cheat if so desired. (208 steps)

(Jack of Eagles, a science fiction novel by James Blish, is concerned with psychic abilities; the program converts the machine into a mind-reader. Ed.)

Author: **Dick Jenssen**
Parkville, Victoria, Australia

**In European areas, order by number 00222D.*

(97) Graph of a Function (#00764D)*

This program was written primarily for the HP-97 and is not very usable on an HP-67 because the real value is in the printout. Given a function F(χ) (and you have 112 steps available to define F!), the calculator (printer) will draw the graph of F from two given end-points. Very accurate graphs can be obtained simply by gluing together more printout strips. (112 steps)

(The possible applications for this program are nearly unlimited. Nice work! Ed.)

Author: **Moshe M. Breiner**
Cambridge, Massachusetts

**In European areas, order by number 00224D.*

67/97 Ballistics Trajectory Computations (#00371D)*

The program computes remaining velocities, energies, flight times, and maximum rise and drops of bullets at user-specified intervals. (210 steps)

(This program required considerable theoretical development–approximately two years of spare time. It allows full trajectory calculations. The author uses the program to compute trajectories as a service for a small fee. Ed.)

Author: **David M. Ivey**
Macon, Georgia

**In European areas, order by number 00207D.*

67/97 Phase of Moon Dates (#00702D)*

Given a month and year during the 200-year period from March 1900 through February 2100, this program will determine the date for each phase of the moon within plus or minus one day. Also, a correction factor may be optioned for different time zones. (214 steps)

Author: **Fred A. Lummus**
Greenville, Texas

**In European areas, order by number 00221D.*

67/97 Fixed-Time Traffic Signals 1 (00575D)*

This program (from Canada) calculates the optimum setting of fixed-time traffic-control signals and the characteristics of any flow, at any cycle length on any phase. (224 steps)

(A remarkably well-researched and well-documented program. Too bad it isn't a de rigueur requirement for traffic-control-managers in all the large congested cities throughout the world. But even then, you still couldn't find a place to park ... . Ed.)

Author: **Paul O. Roer**
Vancouver, B.C., Canada

**In European areas, order by number 00216D.*

(67/97) Game of "Life" (9 × 9) (#00463D)*

The game of life was originally described in *Scientific American* magazine, October 1970, in an article by **Martin Gardner.** The game was originated by **John Conway.** In the game, organisms exist as cells on a grid (9 × 9 in this version) and die or reproduce according to a simple genetic rule. The symmetry generated is very interesting. A generation takes less than 3 minutes to run, compared to 50 minutes for a previous program. In fact, it takes 1 minute and 50 seconds to run on an HP-67 and 2 minutes and 10 seconds on an HP-97 ... that is, to compute the generation. It then takes 1 additional minute to display on the HP-67 or 13 seconds to print on the HP-97. (210 steps)

Author: **John R. Rausch**
Franklin, Ohio

**In European areas, order by number 00210D.*

(97) Linear Life (#00462D)*

"Linear Life" implements two distinct transformation principles, *static* and *dynamic,* that act upon linear digital arrays of variable length to evolve patterns of great depth and beauty. The generative principles are logically simple but operationally deep and offer many challenges to the user. (224 steps)

(The author of this program is well-known to HP-65 Library Users. But let's let him tell it in his words. Ed.)

"The three HP-65 Library programs, *(Life-Line* (03695A), *Life-Line 9* (04933A), and *Cyclic Life-Line 5* (04934A), utilize a unique transformation principle acting on linear digital arrays to generate deep and unusual 'Life' patterns. Each program was limited to specific linear dimensions, and only the smaller arrays were able to generate cyclic groups automatically or incorporate pause controls. My program for the HP-97, *Linear Life,* represents a considerable expansion in capacity—to linear arrays of length 2-10 for moduli of range 2-10, with incorporation of full cyclic control and print formatting. In addition, an alternative 'static' transformation principle is available, more clearly analagous to Conway's *Life* concept of neighborhood effects and instantaneous next-generation evaluation. Both static and dynamic transformations yield extraordinary numerical and spatial patterns. I've spent many hours with these transformations, have gotten some remarkable results, yet have barely scratched the surface. I think HP-97 Users will enjoy this program."

Author: **Dr. Mordecai Schwartz**
Woodmere (L.I.), New York

**In European areas, order by number 00209D.*

(67/97) Telephone Directory (#00442D)*

This program will store 19 name codes and phone numbers, allowing you to change them, delete them, or review them. The capacity is limited only by the number of data cards used.

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Significantly, the program will check and let you know if another data card is needed. (185 steps)

(A clever program. An alphabetic overlay is used on the calculator so you can "dial" the name and recall the person's phone number. No area codes can be stored, and the program is based on phone numbers of seven numbers or less. Good work! Ed.)

Author: **Ruben J. Carril**
Glendora, California

**In European areas, order by number 00208D.*

(67/97) Bubble Sort Routine (#00619D)*

This program sorts any combination of data registers 0 through 20, in ascending or descending order, as defined by the user. It is primarily designed to be "called" as a subroutine of a main program. A sketch is included to pictorially display the comparison mechanics and indexing of a bubble sort routine. (69 steps)

Author: **Lee M. LaMunyon**
Picayune, Mississippi

**In European areas, order by number 00219D.*

(67/97) Synchronous (Belt) Indexer, 2 Pulleys (#00573D)*

This program computes geometric parameters for incremental motion systems that use a constant-angle driver such as a stepping motor or Geneva drive mechanism, and synchronous (toothed) belt and pulleys, chain and sprockets, or gear and rack. Common examples are production-line work positioners and punched-card/tape indexers. The program yields step-angle/pulley-size combinations having a linear cumulative error within such user-defined limits as belt length, center distance, and number of belt teeth engaged (on the smaller pulley). (224 steps)

(If this looks familiar, it should! The author also wrote a similar program for the HP-65. Both versions of the program provide flexibility of starting point input: stepper angle 0°, number of steps per driver revolution, or number of driver pulley teeth are accepted. Lengthy combination searches may be manually halted at random, reviewed, and resumed from the point of interruption by pressing R/S, the desired review key(s), and A ENTER↑ A. *The programs may also be used to calculate geometries of two-pulley, non-indexing synchronous belt transmissions. All in all, a tremendously good program for machine designers, for mechanical engineers, or even for college students. Documentation rates with the very best. Ed.)*

Author: **Thomas A. Hender**
Corvallis, Oregon

**In European areas, order by number 00215D.*

(67/97) Duplicate Backgammon (#00628D)*

The program generates 25,000 backgammon dice throws from each seed and compiles match score. It also stores any number of games up to 21 per card, including each game score, then duplicates throws for each game, with players exchanged and the games in random order. The program also compares each replayed game score with the original score and compiles the overall score. Unlimited interruptions are allowed. And the combined score of each game is reviewed after completion of the rematch. If the HP-97 is used, the scores are printed on tape. And, as a bonus, the program includes a flowchart. (224 steps)

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

**In European areas, order by number 00220D.*

67/97 Chicago Bridge Scorekeeper (#00615D)*

Program accepts points scored above and below the line for each of four hands of so-called Chicago Bridge. Partnership data are initially input. Above- and below-line scores are entered and totals are printed after each hand is scored. *WE* scores left of the decimal point; *THEY* scores to the right. Vulnerability is indicated in the display according to the rules of Chicago Bridge. The initial team to deal is always *WE*. Game and part score bonuses are automatically awarded. At the completion of four hands, the HP-97 automatically totals, converts net score to ± 100's *WE*, and sums and prints net scores by player. (The program is written so that 4 or 5 individuals' scores can be accumulated.) Team make-up can be changed after each session of four hands. (188 steps)

Author: **Jack E. Kahoun**
Millbrae, California

**In European areas, order by number 00218D.*

67/97 Discounted Cash Flow/Present Value Analysis (#00528D)*

This is a program to solve the general equation for investment analysis: $PV = F0 + F1/(1 + i) + F2/(1 + i)^2 + \ldots + FN/(1 + i)^2N$. When the internal rate of return (i) or the present value (PV) is the unknown variable, up to 22 cash flows (F0, F1, ... F21) can be given. When N or $F1 = F2 = .. = FN =$ PMT is the unknown, values of F0, i, and the third variable known (PMT or N) must be given. After the unknown value is calculated, the program can flash, year by year, the discounted and accumulated cash flow. (224 steps)

Author: **Hernan Anzola**
Stanford, California

**In European areas, order by number 00212D.*

Some True Believers!

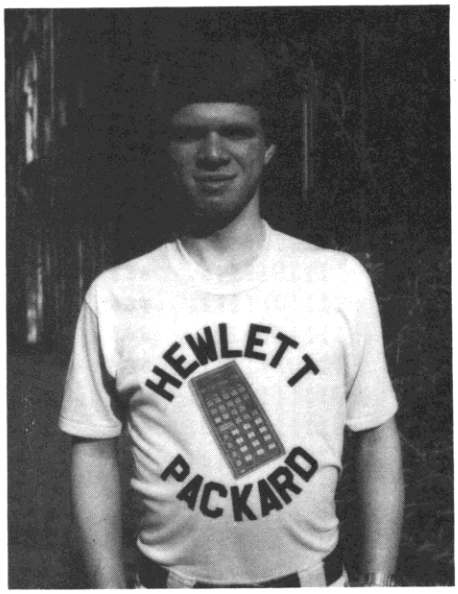
A lot of people were amused by the "calculator cake" photo in the last issue. So, here are two more photos you'll probably enjoy. They came with the following letter.

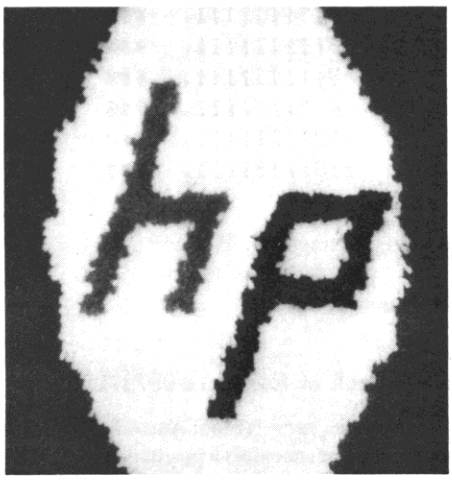
Dear Sirs:

I thought you might enjoy seeing the enclosed picture of my boyfriend, **Larry Schneider.** His HP-67 shirt was given to him as a twenty-first birthday present this past February by his roommates at Harvard. It matches very well the gift I gave him—a latch-hooked wall-hanging of your symbol, a picture of which I have also enclosed.

Sincerely,

Sally Seeherman, Waltham, Massachusetts





(It would be a fair assumption that Mr. Schneider is an avid HP fan. It also would seem a fair assumption that Ms. Seeherman is an HP fan. However, I'll bet that she is a more avid Schneider fan than HP fan! Anyway, thanks for sharing the photos with all the other KEY NOTES readers. Too bad we couldn't print the logo photo in color. The "h" is blue, the "p" is black, the center is white, and the "surround" is bright red. Thanks again. Ed.)

Smart Card Reader Is Outsmarted

As you all know, software can be a very trying thing to make completely devoid of errors. And in the last issue of HP KEY NOTES, we inadvertently added history to the above observation. In the article "Outsmarting the HP-67 'Smart' Card Reader" (page 6), we gave you some good information. However, there is a small problem that can crop up when you use that information. But let's let **Craig Pearce** of Chicago, Illinois, tell it his way.

Dear Editor:

My main reason for writing is the article on "Outsmarting the HP-67 'Smart' Card Reader" on page 6. While the solution given in the article will produce the desired results (that is, placing a **Crd** prompt on a card which has data on one side and a program on the other), there is an error-trap that one can fall into, as follows:

By storing the 112-step program on side one and placing the 113th step in the machine, the **Crd** prompt *will* be placed on side one and, then, the data *can* be stored on side two. However, reading in side one, with the **Crd** prompt pulse on it, will not clear the previous 113 through 224 steps, if a program was already in the machine.

At first glance, this may not seem like much of a problem, but when one thinks about it, the dangers become visible. Suppose your current 112-step program (the one just loaded over an old one in the machine) calls for a jump to, say, LBL 8, the label being located somewhere earlier in the machine's memory. Also, suppose the previous program residing in memory had a LBL 8 somewhere in its bottom half of program space (steps 113 through 224). The jump will cause the pointer to search down in memory from the GTO 8 command and encounter the LBL 8 of the previous program, *starting program execution there instead!*

Also, one of my programs requires, actually, 113 steps, the 113th being some halt command (a RTN or R/S). By allowing the second half of program space to be cleared to all R/S's allows this program to be stored on one side of the program card. This will not happen if the article is followed.

There is a solution to this dilemma, however. Simply reverse the situation. The program should be placed on side two of the card. Side one will contain the data. The **Crd** prompt is placed on the card by simply pressing the sigma + (summation) key, which will put data in the secondary registers.

Now, all one has to do is record the program on side *two* of the card and, then, in the RUN mode, press W/DATA. Side *one* of the card is fed through and the display will show the word: **Crd.** The user then just presses any key (usually a CLX) and the card is recorded.

Now, when the card is read into the machine, the data is stored in the primary registers and the HP-67/97 sees the code that tells it to display the **Crd** command on the readout, expecting more data. However, side two contains the program and *that* is loaded in the program memory. Since the program side contains no **Crd** prompting code, the steps from 113 to 224 are cleared to R/S as they should be, and all is well. A step-by-step summary of these rules follows:

TO RECORD A DATA/PROGRAM CARD

1. Load program into memory.
2. Fill the necessary data registers.
3. Switch to the W/PRGM mode.
4. Write (feed in) side *TWO* of the program card, placing the program on that side.
5. Switch to the RUN mode.
6. Press the sigma + (summation) key. This stores data in the secondary registers.
7. Press f, WRITE DATA (or, on the 67,f, W/DATA).
8. Feed in side *ONE* of the program card. Display should show **Crd.**
9. Press CLX to clear the prompt word. *DO NOT* feed the card through again until this step is performed!
10. The card is now recorded with the data on side one, the program on side two and, when read into the machine, it will show the necessary **Crd** prompt when side one is read, telling the user that side two is also needed.

I hope that this will be of some help to your readers. I found this out the hard way on my "Bell Fruit" program, which uses the clearing of step 113 as an important HALT in that particular program.

Yours sincerely,
Craig A. Pearce

HP-67 Alarm Clock?

We get all kinds of letters. Some are highly technical. Some are complimentary. Some are indignant. Some are bizarre. Some are amusing. Some are highly interesting or unusual. We suppose the following letter could be classified as being in the last category, and it could also fall into several others. But, all that aside, the program works, and it could give rise to similar applications, but for other solutions.

Dear Editor:

Just recently I became aware of a rather unusual use for my HP-67 that may be of interest to some of your readers.

I've been a practitioner of TM (transcendental meditation) for a number of years. One of the problems with the technique, as any of your readers who practice TM will know, is that of *timing* your meditations. you must either interrupt yourself to glance at your watch, or depend on a loud commercial alarm that jangles the nerves enough to cancel half the good effects of the meditation.

Anyway, while working on an EE program with my HP-67, it suddenly occurred to me that the soft buzzing noise made whenever the HP-67 reads a card would be an absolutely *perfect* "alarm" for my meditations! The program below is the result of that discovery.

f LBL E	CHS
2	h ST I
7	g DSZ (i)
4	GTO (i)
×	h PAUSE
STO 1	h RTN
1	

Using the program is easy. Simply enter the number of minutes that you want the timer to run, press E, and place any program or data card into the card-reader slot. When the time is up, the HP-67 will read the card, and the "alarm" will go off!

Obviously, this is not a timer with split-second accuracy, but for the use mentioned above, it is more than adequate.

Yours truly,
Dave Rose, Forest Park, Georgia

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.

HP-67/97 BUSINESS DECISIONS PAC 1

Programs BD1-01A *(Internal Rate of Return)* and BD1-02A *(IRR-Groups of Cash Flows)* have been rewritten to correct some cases where the iteration routine did not converge. The documentation and User Instructions remain the same. To receive new magnetic cards BD1-01B and BD1-02B, send your old cards to: *Service Department* (U.S. address on back cover).

HP-67/97 MATH PAC 1

It is possible that you may have an error on the card for *Base Conversions,* MA1-03A (page 03-01). To find out, convert the following base 10 number to base 8.

$$65535_{10} \rightarrow 177777_8$$

If you do not get this answer, send your old magnetic card to: *Service Department* (U.S. address on back cover), and they will send you a corrected card (MA1-03A) and program listing.

HP-67/97 SURVEYING PAC 1

Several corrections and changes have been made in Surveying Pac 1. An article in the January 1977 HP KEY NOTES called attention to corrections in programs SU1-14A, *Predetermined Area* and SU1-17A3, *Lambert Data.* Corrections or improvements have also been made to the following programs.

SU1-01A, *Traverse, Inverse, and Sideshots.* On page L01-02, at line number 191, change STO 5 to STO +5. This change allows traverses with more than one curved side to be run, with proper calculation of the total area of the traverse. To obtain a new magnetic card, send your old card to: *Service Department* (U.S. address on back cover).

SU1-03A, *Intersections.* On page L03-01, between line numbers 083 and 084, insert two steps: F2? and GTO 4; and between line numbers 094 and 095, insert: LBL 5. On page

GTO *page 8*

L03-02, after line number 193, add three steps: LBL 4, SF2, and GTO 5. This change improves the accuracy of the "offset" portion of the program and eliminates **Error** displays that formerly occurred with some inputs. To obtain a new magnetic card, send your old card to: *Service Department* (U.S. address on back cover).

SU1-13A, *Azimuth of the Sun*. On page L13-02, line number 144, change − (minus) to + (plus). This change corrects an error in the refraction correction. In addition, Users should take care to input the "hour difference" using the proper sign. If the sun's declination is *increasing*, as between the winter and summer solstices, the hour difference is *negative*. (Unfortunately, some almanacs or ephemerides do not mention this distinction.) Specifically, the example on page 13-01 should be run with a negative hour difference input (i.e., –0′.76).

These changes are covered in a forthcoming Addendum Card that will accompany a revised magnetic card. If you work through the examples in the current handbook (on pages 13-01 and 13-02) using these changes, you will get considerably different values than those in the handbook. The correct values are shown on the Addendum Card. To obtain a new magnetic card, send your old card to: *Service Department* (U.S. address on back cover).

SU1-15A *Earthwork*. The program as recorded and listed in the current edition of the Surveying Pac does not allow freedom of input of elevation and offset distances in the calculation of volume by average end area. The following changes allow you to input the data, starting at any station.

On page L15-01, after line number 009, add:

STx1	RCL 0	STO 0
RCL 1	ST+2	RCL 2
STO−2	R↓	2
R↓	STO 1	÷
x⇄y	R↓	STO 3
STx0		

Then, delete all steps for line numbers 010 through 023. Finally, insert STO 1 and STO 0 between line numbers 053 and 054. To obtain a new magnetic card, send your old card to: *Service Department* (U.S. address on back cover).

SU1-18A2, *Mercator to Geographic*. On page L18-02, insert CHS between line numbers 160 and 161. Also, delete the GSB1 at line number 164. This change improves the accuracy of the program. For example, in the problem on pages 18-02 and 18-03, in which geographic coordinates are calculated from state plane coordinates and then converted back to geographic coordinates, you will now obtain the results:

C ⟶ 349231.2940 *** x
2357247.272 *** y

in very close agreement with the original geographic coordinates shown on page 18-02.

The above changes to Surveying Pac 1 are incorporated in all new magnetic cards and current editions of the pac handbook. If you have older cards with incorrect listings, send your old cards to: *Service Department* (U.S. address on back cover), and we will send you corrected cards.

Surveying Pac users will also be interested in two other notes about using their programs.

In SU1-07A, *Vertical Curves and Grades*, a PC, or beginning station, of 0 (zero) cannot be used. The PC input must be a number greater than zero, otherwise the program thinks you are inputting PI, the intersection of the tangents.

Here is another correction to SU1-07A. We suggest that you input a very small positive number, say 10^{-6}, or a "pseudo" station number, say 10 + 00, to obtain the proper outputs when the beginning station is 0 + 00.

In SU1-14A, *Predetermined Area*, using the "two sides parallel" method does not work for rectangles or parallelograms. The program is designed for trapezoids. Of course, the rectangular case is easily solved by keyboard arithmetic. The parallelogram may be resolved into two congruent triangles and solved by the "triangle" portion of the program.

We wish to express our appreciation to sharp-eyed, concerned Users who suggested some of the above changes. Thank you.

HP-67/97 STANDARD PAC

For those of you who have had some problems with SD-13A, *Arithmetic Teacher*, after entering an optional seed, we apologize. There should have been a note in the program description referring to the pseudorandom number generator description on page L13-01. In particular, an optional seed should be chosen such that the quotient of (seed × 10^7) divided by 2 or 5 must not be an integer. Because of the method used in this generator, a seed of 0.25, or any multiple, always generates itself and sends this program into an infinite loop trying to come up with a problem that is different from the preceding one. If you want to modify your program so that this will not occur, make the following changes on page L13-03.

Line Number	Change
Between 20 and 21	Add: STO 6
Between 21 and 22	Add: RCL 6
	Add: x

It would still be wise to statistically test seeds before using them, to make sure that the resulting sequence is random and does not repeat itself quickly.

SD-07A, *Triangle Solutions*. Here's a very easy change. On page L07-03, at the bottom of the page, add the word "used" in the block for register 7. Somehow, it "dropped out" on the printing run.

SD-12A, *English–SI Conversions*. In order to agree with the "Remark" at the bottom of page 12-01 that the LAST X register contains the input value for all conversions except temperature, three steps need to be inserted in the program. A corrected card can be obtained by mailing your old card to: *Service Department* (U.S. address on back cover). Meanwhile, make the following insertions in the listing on page L12-02.

Line Number	Insert
Between 51 and 52	x⇄y
Between 67 and 68	x⇄y
Between 84 and 85	x⇄y

SD-15A *Diagnostic Program*. To ensure that the correct code is displayed from this program, two steps must be inserted in the program. As stated above, a corrected card can be obtained by sending in the old one. To correct your handbook, on page L15-02, insert a "RCL I" step between line numbers 154 and 155 and again between 161 and 162.

Surveying Pac Bonus

Many users of our *Surveying Pac 1* have requested a traverse program with bearing-quadrant outputs, rather than azimuths. So we now have a Users' Library program that does just that.

(67/97) Traverse, Inverse, and Sideshots With Bearing/Quadrant Outputs (#00866D)*

This program is a revision of pac program SU1-01A, *Traverse, Inverse, and Sideshots*. All angle outputs are in bearing-quadrant form. Inputs in the form of either bearings or azimuths are accepted by the program. It offers four major routines: (1) Bearing/Azimuth Traverse, (2) Field Angle Traverse, (3) Inverse, and (4) Sideshots. In addition, Slope Distance Reduction may be performed and Curved Sides may be included in the traverse. Because of program space limitations, the routine for Closure of Traverse was not included. You may obtain closure data by using the routine in SU1-01A after use of this traverse program. (217 steps)

Author: **Hewlett-Packard Co.**
Corvallis, Oregon

**In European areas, order by number 00227D.*

A Programming Aid

If you still have trouble programming problems for your own applications, perhaps you should try a new direction. The March 10, 1977, issue of *Machine Design* magazine presents an article on page 62 that might be what you are looking for. The article, "How To Make Your Calculator Think Like a Computer," was written by **Leon S. Levy,** Associate Professor in the Department of Statistics and Computer Science at the University of Deleware.

The article describes a new approach called "structured programming." In the five pages of text, flowcharts, and sample problems, the author has done a very good job of presenting a new approach to what is often considered a complex mess, and he shows how such

complex problems can be orderly and systematically solved.

If you have avoided programming because you thought it too complex, here is an article that could change your mind.

Are Calculators Computers?

Although the following magazine is very likely more available in the U.S. than in other parts of the world, if you can possibly get one (check your local public library), you won't be wasting your time. In the March 1977 issue of *Popular Computing* (Vol. 5 No. 3), there is an article on page 14 entitled, "Schwartz on Calculators." (Yes, he is the same **Dr. Mordecai Schwartz** whose program is featured on page 5 .

In the article, Dr. Schwartz adds some very interesting comments and facts about the often-asked question: Where is the dividing line between calculators and computers? Among the more interesting comments are those on the comparisons of the HP-65, HP-67, and the T.I. SR-52.

Quite a few people who own both an HP-65 *and* an HP-67 have written to us about the article. Mostly, they stated that they were sure that other HP-65/67 owners should be informed about the article, because it more or less discussed calculator/computer considerations that had not been published before. They also described it as "fascinating." We agree. Don't miss it.

HP Inspires Users' Group In Utah

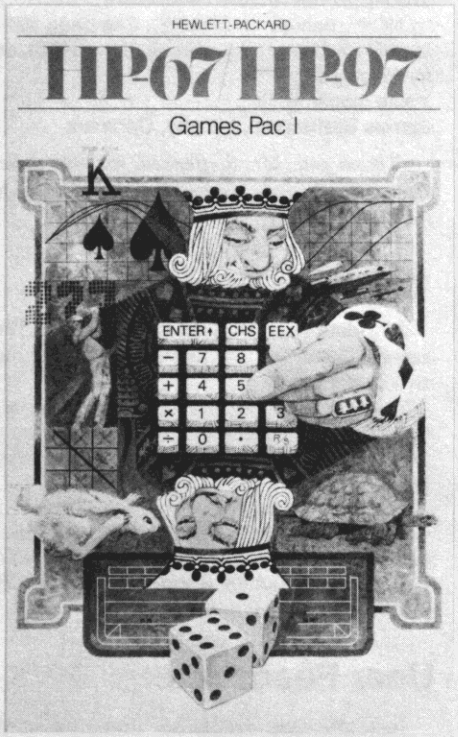
Brigham Young University, Provo, Utah, is the site of *Alpha Kappa Pi,* an association of calculator programmers who also turn out to be a small but devoted band of HP-67 owners. Essentially, the club is a mutual benefit society whose major efforts go into (1) sharing programs, (2) attracting new members, (3) stimulating original programming aimed at filling members' needs (including entertainment by calculator games!), and (4) providing a public service. Club President **Don Colton,** a graduate student in management, and Faculty Advisor **Eben Visher,** a member of the Mathematics Department, note that "A student considering the purchase of any calculator has available to himself a large number of calculator description sheets provided by manufacturers. Most students try not to buy in ignorance, but seeing beyond the confusing variety in calculator offerings is an awesome task. We use the influence of personal experience in aiding interested students and others in making the best purchase decision." Of course, for advanced calculators, *Alpha Kappi Pi* thinks that HP offers the best available.

Two New Accessories

Here are two accessories that were recently released. Although the games pac is primarily for the newer HP-67/97 calculators, the dc rechargers cover all of the *pocket* calculators produced by Hewlett-Packard to date.

A PAC OF GAMES!

If you *like* calculator games you'll *love* the new *Games Pac 1*. Consisting of 19 programs on 20 magnetic cards, the new pac has a little of everything for everyone. You can go from "Tic-Tac-Toe" to "Hexpawn" to "Super Bagels" in one evening. And, for once, your entire family can participate and learn why you bought a programmable calculator in the first place!



Get the whole family interested in "Racetrack"; up to five players can race. Then, to top off an evening—and challenge your mind—try a game of "Wari" (also known as "Man-Kalah").

All of the games are designed primarily to provide fun—to take you away from the tedium of everyday business—but they are also helpful in teaching principles of mathematics, physics, and logic.

The new 00097-13185 *Games Pac 1* is available now and is priced at only $35.*

FOR CARS, AIRPLANES, BOATS, OR ANYWHERE

As the Spring and Summer months get people out of the house and into boats, airplanes, recreational vehicles, and what-have-you, perhaps they will want to take along their calculators for navigation, surveying, business away from home, record-keeping, or just plain fun. But now they won't have to rely solely on the batteries in the calculator and, even better, they can charge the batteries in remote locations.

The new HP 82054A and 82055A DC Rechargers were released on April 1. Price is $35* for either model. The 82054A (pictured here) is for the calculators: HP-35/45/55/65/67/70/80. The model 82055A is for the calculators: HP-21/22/25/25C/27.

The dc recharger includes two power cables. One cable (pictured here) plugs into a conventional automobile cigarette lighter receptacle. The other cable is equipped with two lugs for fastening directly to 12-volt battery terminals. The input is not polarity dependent; either lug may be connected to either terminal of the battery.

The input voltage range is 10 to 16 volts dc (the typical 12-volt battery range), with transient protection from 125-volt, non-repetitive, 300-microsecond spikes (typical of automobile engines).

The dc recharger has a thermal protection circuit whose operation is indicated by a small red lamp. If the lamp is on, the dc recharger is charging the calculator battery. If it's off, the battery is *not* being charged and, hence, is being protected from possible high-temperature damage. The maximum ambient charging temperature with the calculator on is 35°C (95°F); maximum with the calculator off is 39°C (102°F). Whether the red lamp is on or off, the dc recharger supplies all power to the calculator without discharging the calculator battery.

This accessory has long been wanted by many of our calculator Users. Now it is a reality, and you can get one at your local HP dealer.

ORDERING INFORMATION

Always check *first* with your local HP dealer for accessories, or check with your local HP Sales Office. If you cannot find an accessory that way, as a last resort, order directly from the factory in Oregon (U.S. address on back cover).

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There are, however, a few things you must do to make sure that a factory order is accepted. You must: (1) order by product name and accessory number; (2) pay for your order with a negotiable check, in U.S. dollars, and drawn on a U.S. bank; and (3) allow 4 to 6 weeks for shipment. Also, *we cannot accept orders from European Bloc nations, and import regulations make it impractical to accept orders from Brazil and Mexico.*
*(*U.S. dollars. See notice on bottom edge of Cover.)*

Attention Attención Achtung Attenzione

Because of cost and time restrictions, all documentation associated with the Users Libraries *is in English only*. That includes this newsletter, all library programs, all library catalogs, and all library documentation. Therefore, all correspondence to the Library or newsletter should also be in English.

Some Users have written to the libraries to ask why no keycodes are on the program listings of the library programs. The answer is simple to explain: The keycodes for the HP-67 and HP-97 are not the same, because the keyboards are not the same. That is why the codes are not listed. Anyway, it is easier to key in a program from the keystroke listing than from the keycode listing.

Programming Tip Corrected

At least one sharp-eyed reader caught an error in the last issue. Here is a letter from **Dave Sheehan** of San Francisco, California.

I would like to comment on a programming tip that I read in the January 1977 HP KEY NOTES. It was submitted by **Art Leyenberger** of Ridgewood, New Jersey. (See page 5, column 3.) The article was titled "Testing Register Contents of HP-67".

In testing his subroutine I found that if a register held the same value as its register number (e.g., the number 4 stored in register 4), the program would halt at that register and not continue. This occurs because of the condition in step 12 (g x=y) and in step 13 (R/S). I have what I consider an improved subroutine to test register contents.

f LBL A	DSP 0
RCL (i)	h PAUSE
f x≠0	RCL (i)
GTO B	DSP 2
f ISZ	h PAUSE
GTO A	f ISZ
f LBL B	GTO A
h RC I	

This modified subroutine will automatically stop with an **Error** display after 25 = 25 because (i) will be incremented to 26, and there is no storage register 26. Changing the f -x- display to h PAUSE cuts the display time in half.

Pardon Our NOP!

In the last issue of HP KEY NOTES, we published an article "Converting HP-65 Programs To The HP-67/97." Instruction 9 stated: "The HP-67/97 does not have a NOP (no operation) statement. If it is necessary to have a 'filler' step, you may insert a label (e.g., LBL 9), which is never called."

The above statement is true; it works. However, it took a sharp-eyed and alert HP-67 owner in Denmark to point out a very simple and more logical key to use. Here's his letter.

Gentlemen:

Although you have doubtless received the same comment from many other quarters already *(nope, you were the first one! Ed.)*, may I point out an error in paragraph 9 of your remarks on converting HP-65 programs to the HP-67/97? The HP-67 has an exact equivalent of the HP-65 "g NOP", namely "h SPACE". See page 304 of the *HP-67 Owner's Handbook* (June 1976), and try for yourselves!

Yours sincerely,
James Steffensen, Lyngby, Denmark

(Thank you, Mr. Steffensen, for your letter. However, the rule we printed still is valid for the HP-97. Ed.)

Two Tips From A User

In a note from **Donald B. Rowley** of Torrance, California, we received the following two suggestions.

The operation N!, where n is a non-integer or n <0, should be added to the list of improper operations in appendix C of the owner's handbooks for the HP-67 and HP-97.

In a long program, you can conserve labels by using the same label repeatedly for forward references. Label 0 is used in this way in the Standard Pac programs, but the technique is not pointed out in the text.

User Feedback

Just after we caught an omission in the HP-67/97 handbooks, we received the following letter from **Terry Mickelson** of Duncan, B.C., Canada.

Dear Editor:

Flag 3: Consider the following short program and you will correctly come to the conclusion that it will operate once and stop at step 005.

LBL A, 1, F?3, GTO A

To prove the point, key in the program and run it by pressing [A]. Now switch to W/PRGM and it may be seen that step 005, R/S, has been done and the program has stopped. So what's the problem? Well, it's deceptively simple. Try to get the same result by stepping through the program; i.e., switch back to RUN, press [GTO] [A] and single-step through the program. This time flag 3 is always set and the program continues in a never-ending loop. The reason appears to be that the numerical entry appears in the display under SST conditions, and the calculator cannot tell the difference between a program-generated and keyboard-generated number, so flag 3 is set whenever any number appears in the display in SST mode. If the number is deleted from the program it will operate in the same way *in either mode*, so the problem is isolated to any number (except pi).

The point to be made is obvious and may explain the difference in SST vs RUN modes. The cure is to clear flag 3 after a program-generated number appears so that the operation becomes the same as if the RUN mode was in use.

When this omission was caught, we initiated a change in the handbooks and sent the change to our printer so that future copies will be correct. You can correct your handbook by adding the following statement in your handbook. HP-67 owners can add the statement at the bottom of page 257 and show it as an insert after the second paragraph under "Test-Cleared Flags" on page 256. HP-97 owners can add the statement at the bottom of page 235 and show it as an insert after the first paragraph on that page. The statement is:

"Note that flag F3 is also set if the SST key is used in RUN mode to single step through a program that contains digit entry, and it is set *as soon as the step containing the digit is reached.*"

Shorter And Faster

It is not unusual for someone to eliminate a few steps from a program or routine—even one of ours. It is *very* unusual for *anyone* to eliminate half—or more—of the steps in a subroutine! But **Gustave Kutzko** of Cincinnati Ohio, has done just that, as follows.

Dear Sir,

I could not resist the urge to modify the subroutine, shown on page 9 of the Vol. 1 No. 1 HP KEY NOTES, which avoids the problem of division by zero when computing the tangent (y/x) and returns arctangent (y/x) in "conventional" notation ($-90° \leq \theta \leq 90°$). The following routine will accomplish the same result with 11 fewer HP-67/97 program steps and (at least) one less trigonometry function evaluation.

LBL 1	RTN
x = 0	LBL 0
GTO 0	→P
÷	R↓
TAN^{-1}	RTN

In marine navigation problems, one defines the sense of East longitude and East meridian angle ("t") as negative. Deriving equations for longitude and azimuth (heading) in the form

$$\theta = \arctan(y/x),$$

with y and x being independently derived, lets one use R→P to compute the numerical value of the angle with the proper sense and with $|\theta|$ less than 180°. For example, in the HP-65 Navigation Pac 1 program, NAV 1-10A, *Great Circle Navigation,* the computation of H_i (initial heading) can be shortened by 9 HP-65 steps.

Incidentally, several days after we received the above letter, we received another one from **G.D. Van der Starre** of Nootdorp, Holland. He also arrived at the shorter subroutine shown above. *(P.S. Mr. Van der Starre, we will answer your Math Pac question in a letter. Ed.)*

Last Chance For Bargain HP-65 Pacs*

We still have some leftover "used" HP-65 application pacs. By "used" we mean that they have been on dealers' shelves and were traded back to us for the new HP-67/97 pacs, or they are some pacs returned to us on our 15-day free trial offer. Although these are all officially "used" items, *they will be covered by our same Full One-Year Warranty that covers any new calculator or software pac.* (Warranty available on request.)

In fairly good supply are:

00065-67001 Math Pac 1
00065-67002 Math Pac 2
00065-67003 Surveying Pac 1
00065-67004 Medical Pac 1
00065-67005 Statistics Pac 1
00065-67007 E.E. Pac 1

In fairly limited supply are:

00065-67042 Aviation Pac 1
00065-67045 Navigation Pac 1
00065-67050 Chem. Engrg. Pac 1
00065-67051 Stress Analysis Pac 1
00065-67052 Machine Design Pac 1

All other "used" pacs have been sold and are no longer available. You can, of course, still buy *new* HP-65 application pacs, and these will be available for quite a while.

ORDERING INFORMATION

All the "used" pacs listed above are priced at $19.95 each. To order them, use the product name and accessory number and send your order to *Order Processing* (U.S. address on back cover). Make your check or money order payable to *Hewlett-Packard,* and be sure to include your state or local taxes.

**This offer is good only in the United States (including Hawaii and Alaska).*

A Note About "Key Notes"

Because there was a 6-month gap in the changeover from HP-65 KEY NOTE to HP KEY NOTES, a lot of people write to ask us if they missed an issue. Specifically, we get many requests for the "November 1976" issue.

To save you the trouble of writing and to save us much time, here is a listing of all newsletters released to date. *None, except the last one, are available.* All back issues have been depleted, and it is not economically feasible to reprint them.

HP KEY NOTES, January 1977, Vol.1, No.1
HP-65 KEY NOTE, July 1976, Vol.2, No.3
HP-65 KEY NOTE, Winter 1976, Vol.2, No.2
HP-65 KEY NOTE, Autumn 1975, Vol.2, No.1
HP-65 KEY NOTE, Summer 1975, Vol.1, No.5
HP-65 KEY NOTE, Spring 1975, Vol.1, No.4
HP-65 KEY NOTE, Winter 1975, Vol.1, No.3
HP-65 KEY NOTE, Autumn 1974, Vol.1, No.2
HP-65 KEY NOTE, Summer 1974, Vol.1, No.1

Another thing we want to clarify is that HP KEY NOTES does *not* have a fixed schedule. It is our desire to print it quarterly, but many factors can influence that schedule. For example, if we print 12 pages per issue, three times a year, we give you 36 pages of information and save one-fourth on postage (not a small factor today). If we print quarterly, in 8-page issues, you get only 32 pages per year, and our postage costs skyrocket. Considering that we have printed *well over* 2.5 million *pages* of the newsletter since its beginning, the cost is something that cannot be easily overlooked.

We know that you enjoy HP KEY NOTES, so we make every effort to send it to you as often as possible. After all, it also helps us to remind you that HP cares about you—even *after* you've bought our products.

HP-65 "Digs Up" A New Field

Ever on the alert for new or unique applications for our calculators, we traced down this one submitted by our sales office in Albuquerque, New Mexico. It seems that the HP-65 has entered the field of archeology.

If you—or a colleague—are at all interested in archeological research, you will want to read an article, "Programmable Pocket Calculators: Some Archeological Applications," in the March 1977 issue of *Newsletter of Computer Archaeology.* The author of the article is **Landon D. Smith,** who is with the USDA Forest Service.

The article discusses the use of programmable calculators/computers in the field of archeology. The context of the discussion centers around the use of the HP-65, describes its characteristics, and includes some programs written for specific tasks that would be of particular interest to the archeological profession. Also stated is the fact that the HP-65 was found to be a very versatile instrument and that it is recommended for use in the archeological profession. *(However, anyone considering a programmable calculator, today, for this application should first investigate the HP-67 or HP-97. They are much more "powerful" than the HP-65 and therefore capable of being more easily utilized for archeological work. Ed.)* The newsletter mentioned above is edited by **Sylvia W. Gaines** and is published by:

Department of Anthology
Arizona State University
Tempe, Arizona 85281

The newsletter is published quarterly. Back issues can be obtained at cost.

99 Is Really 59

Some people wrote to us about **Bob Edelen's** HP-65 f→D.MS and f^{-1}→D.MS routines on page 10 of the January 1977 HP KEY NOTES. Here is one letter, from **John Ball** of Harvard, Massachusetts.

Try converting 1°99989 to D.MS using the routine in HP KEY NOTES. The correct answer is not 1°99'99."6, but rather 1°59'59."6. This difficulty occurs with a borrow across the second-minute or minute-degree boundary. I don't know of any short fix.

So we checked with Mr. Edelen, and he sent the following letter to us. It clears up the mystery.

Dear Editor:

I checked the routine on many values and did not ever use a value that caused dd.9999nnnn to appear. I see now how it occurs. Also, John Ball missed the other times that this anomaly will occur. It does so not only on angles less than ½ second below an integral number of degrees but also on angles less than ½ second below an integral number of minutes. For example; 4.216583 degrees goes to 4 degrees 12 minutes 99.6988 seconds. Thus it can be seen that the routine is okay to use as long as one realizes that 99 minutes or 99 seconds means 59 of either one. Obviously, one uses the routine for output only, and the result of the conversion will not be used as input to a computation. I think the routine is a good one, because it is short and fast. All we need do is tell the Users about the 99 to 59 interpretation.

Thank you, Mr. Edelen, for clearing up this problem. We, too, think the routines are good, and we hope this puts this subject to rest.

"Equation Keystrokes" Follow-On

The people who commented on **C. Ray Kolker's** "Equation Keystrokes ONLY!" article in the last issue certainly did enjoy reading it. And we can assure you that Mr. Kolker enjoyed working with us on the project, and that he received a lot of personal satisfaction from seeing his idea in print. Here is a letter about the article.

Dear Sir:

I was fascinated with the "Equation Keystrokes Only" concept in January *KEY NOTES.* As a 65 owner, I found a few parallels that wouldn't surprise any other member of the HP-65 Users Club. Let me add a suggestion that, in the hands of a 67 programmer, might make the "logical skeleton" even more compact.

Using the multi-level subroutine capability along with the index I, one might have one subroutine serve programs A, B, C, . . . With a little more squeezing and index I, one might even manage to get all the LBL1, LBL2, LBL3 segments in a single sequence. Though this might cost steps, it might also allow merging of the skeleton program with a variety of separate equation keystroke sets kept on different cards.

Yours very truly,
Dr. Jack Schwartz, Nashua, New Hampshire

Conversion Caution

Here is another consideration to keep in mind if you convert HP-65 programs for use on the HP-67/97.

In the January HP KEY NOTES, we ran an article on page 3: "Converting HP-65 Programs To The HP-67/97." An additional cau-

GTO page 12

tion, *A GSB command will enable the stack lift,* should be added to the use of item 4, regarding conditional branching.

Many HP-65 programs, lacking a conditional to compare x with zero, used a CLX, followed by an x–y conditional test. On the HP-67/97, if such a conditional has a GSB command as one or both of its alternatives, the stack lift will be enabled. Subsequent number entry in the subroutine will preserve in the stack the (unwanted) zero that resolved from CLX. The example shown is from the *HP-65 Surveying Pac 1* (see pages 104, 105).

HP-65
CLX
g x>y
3 6 0 + Adds 360 if test met; adds 0 if test not met.

ORIGINAL CONVERSION	MODIFIED CONVERSION
HP-67/97	HP-67/97
CLX	x<0?
x>y	GSB 0
GSB 0	.
.	.
.	.
.	.
LBL 0	LBL 0
3 6 0 + Number entry after stack-enabling GSB will carry unwanted 0 from CLX into stack	3 6 0 +
RTN	RTN

Remember: When converting programs from the HP-65, making full use of the power of the HP-67/97 will prevent this problem.

One-Step Program Runs Forever

For an HP-67/97, what is the shortest, longest-running program possible? Well, since you asked the question, here is the answer. However, be prepared to watch your HP-67/97 display blinking . . . forever!

The program is, simply: GSB (i), or GTO (i), and store –224 (or –224 × n, where n is a positive integer, n < 4) in the I-register, for execution. The keystroke sequence is: switch to W/PRGM and press f CLPRGM GSB (i). Then switch to RUN and press: 224 CHS STO I RTN R/S.

Rounding The HP-67/97 Display

Here is a 26-step routine that most HP-67/97 Users can apply to their programs if they have trouble in rounding the display.

Dear Editor:

There are many times when, while writing a program, I want to change the rounding of the display to display the exact number of decimal places necessary to show the whole number, without trailing zeros or truncating and rounding off the display. I find this subroutine very useful, and I believe that many HP-67/97 Users will find it just as beneficial.

f LBL 1	x	GTO 4
DSP 0	f ISZ	f LBL 3
f FIX	g FRAC	9
0	f x ≠ 0	h ST I
h ST I	GTO 2	f LBL 4
RCL 1	9	DSP (i)
f LBL 2	h RC I	RCL 1
1	g x > y	h RTN
0	GTO 3	

It is important to note that this subroutine assumes that there is a value stored previously in register 1.

Sincerely,
Gary M. Tenzer,
Pacific Palisades, California

On Marking Cards

It is not our policy to promote pen, pencil, or marking products that can be used to annotate information on blank magnetic cards. However, over the past three years, some products seem to have emerged as the most popular ones with HP-65/67/97 owners.

After many letters about one product, a telephone call from **Stanton Perry** of Riviera Beach, Florida, prompted us to bring you the following summation.

Most people are satisfied with pencil markings for everyday use. Some use pencil and then spray their cards with a clear "fixative" to keep the pencil marks from smudging. The next choice is a wide variety of soft-tipped ink pens. Some are better than others. We have not found one better than the No. 3000 Sanford's *Sharpie** soft-tipped pen.

Another favorite, especially for small, virtually permanent lettering, is the capillary type of pen used by artists and for drafting, etc. The point is a small tube, and the ink is a virtually permanent, water-soluble type that is usually black. There are several brands of capillary pens and several brands of ink. Stanton Perry uses this method and finds it superior to all other markers.

Finally, some people use "rub-on" lettering. It comes in a nearly endless number of sizes, type faces, and even colors. These letters, however, *can* come off, but many people use them and have no trouble with them.

It is also interesting to note that quite a lot of people write to us and tell us they have no trouble at all marking their cards. But they don't mention how they do it or what they use. And, inevitably, the last question is: what do *we* use to mark *our* cards? Well, three methods prevail. Mostly we use pencils. Often-used cards get the soft-tip pen treatment, and for neat, small lettering, the capillary pens are favorites.

**Sharpie is the registered trademark of the Sanford Corporation, Bellwood, Illinois.*

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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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