HP-65 KEY NOTE

for HP-65 owners

HEWLETT hp PACKARD

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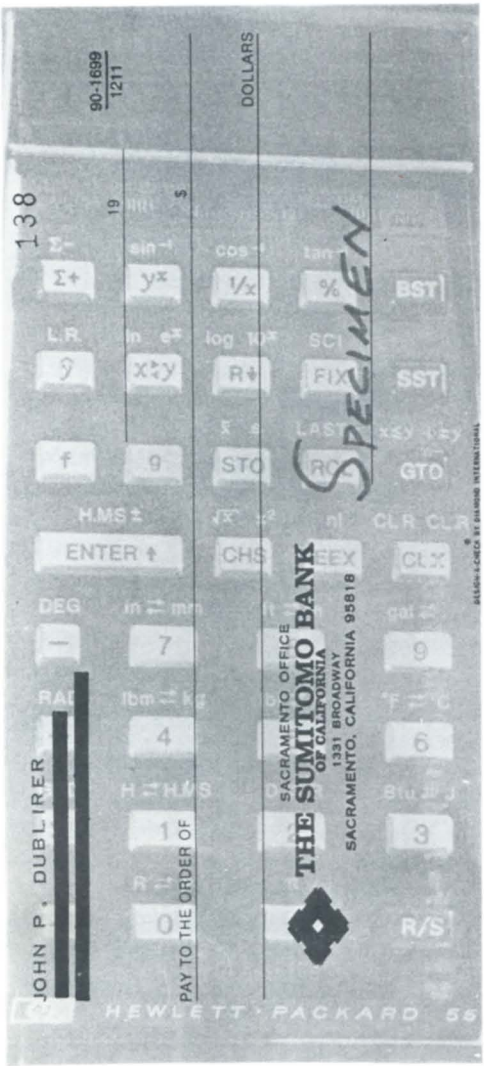
You Can Bank on It!



Are HP calculator owners proud of their machines? You can bank on it! The photo you see here is one owner's way of showing his pride in his calculator. *John Dublirer* of Sacramento, California, sent us one of his new personal checks to show us the unique design on them. Here's a copy of his letter:

"I hope the enclosed check draws at least a smile. Although I now own an HP-65, I used to own an HP-55, and my bank printed my checks to reflect the fact. My new 'HP-65 checks' are forthcoming. Perhaps this could be shared with KEY NOTE readers through photocopy?"

You were right about sharing, *Mr. Dublirer,* but your blue-gray check was not easy to copy. We finally used some fine-grain film and a good "micro" lens and tried several exposures. But it was worth the effort, and we are sure that most HP-65 owners will get a kick out of your unusual check.

Free Software*—Limited Time Only

That's right! From February 1 through April 30, Hewlett-Packard is *giving away* $195 worth of software with each purchase of an HP-65 calculator. This offer is valid only in the United States and is in effect only until April 30. Anyone who purchases an HP-65 during that time will receive a choice of four HP application pacs and a choice of 5 out of the 15 most popular programs in the HP-65 User's Library.

Why are we doing this? Because Hewlett-Packard wants new owners to take advantage of the extensive software developed for the HP-65. For example, there are 14 application pacs—each one contains up to 40 specialized programs: Chemical Engineering I, Stress Analysis I, Surveying I, Machine Design I, Medical I, Aviation I, Navigation I, Finance I, Math I and II, Statistics I and II, and Electrical Engineering I and II.

Also, there are about 4000 contributed programs in the User's Library. As a matter of interest, we determined the 15 programs that you thought were the most popular. Those who buy an HP-65 from Feb. 1 to April 30 can select (free) any 5 of these programs from the following list:

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

Moon Rocket Landing Simulator
Alternating-current Calculator
Stock Investment Portfolio
Blackjack
Hunt a Moving Submarine
Fast Fourier Transform
Savings Account Compounded Daily
Biorhythms
Smith Chart Analysis
Boolean Logic Evaluation
Lease vs. Purchase Analysis with Interest
Frequency Table (Histogram) of 23 Classes
Stop Watch
Bell-Fruit: Standard Slot Machine
Income Tax Averaging

So, if you have a friend who has long admired your calculator, now is the perfect opportunity for him or her to purchase a calculator of their own. (Who knows, maybe your grateful friend will select a free application pac for you for passing the word along!)

**Void where prohibited by law.*

New Applications Book

Here's a good item for those of you who own HP-21's or who bought an HP-21 for your son or daughter. The *HP-21 Applications Book* contains dozens of keystroke solutions drawn from the varied areas of statistics, mathematics, finance, navigation, and surveying. Thus, whether your interest lies in solving a particular problem, or in learning more about the power of the HP-21 calculator, this book will help anyone get the most from an HP-21.

Available after January 1, 1976, this terrific after-Christmas or back-to-school gift is priced at only $10.00. The order number is 00021-90016, and you can get one at your local HP dealer (department store), at your nearby college bookstore, or by ordering directly from Hewlett-Packard's Advanced Products Division (address on back cover).

If you haven't purchased an HP-21, but are thinking of doing so, consider this: the new *HP-21 Applications Book* will be offered to anyone who purchases an HP-21 between January 12 and March 15, 1976. Included in the sales package will be a coupon for a free book. When the coupon is returned with the warranty card, we will mail the free book to you.

Library Corner

As of December 17, there were 3,970 programs logged into the HP-65 Users' Library. The range of subjects covered by these programs is truly astonishing; the *Catalog of Contributed Programs* reads like a ''Who's Who'' in the sciences. Yet, despite all this amazement, you keep punching keys and turning out more and more interesting programs. No doubt about it, HP-65 owners are very erudite and proliferous programming people!

CATALOG NEWS

If you haven't by now received the first Supplement to the Catalog, it is probably in the mail on its way to you. There are 1,345 new programs in the Supplement. That makes a grand total of 3,367 programs that have been published in catalog-form. Using a trusty HP-65 and the number published at the top of this column, that leaves 603 programs that have *not* been published in the Catalog or Supplement. All of which makes an excellent lead-in to the next paragraph.

NEW PROGRAMS

In the last issue, the first new-program listing was a 671-step program for predicting the course of benzene-ring substitutions (#03110A). We weren't the only people to recognize *Lee La Munyon's* expertise. On page 34 of the November 1975 issue of *Industrial Research* magazine, there is a nice review of the program, plus a final statement that attests to our statement about the ''teaching'' possibilities of this program for chemistry students.

Now, to keep you from getting *too* interested in the new Supplement, here are some programs submitted after the supplement went to press. If possible, use an order form from the Catalog to order these programs. **Use the program number shown here.** Send only checks or money orders, payable to Hewlett-Packard Company. Be sure to include any state or local taxes. (Each numbered program has a nominal charge of $3.00.)

Flesch Readability Test (Order #03845A)

Twenty-five years ago, *Rudolph Flesch* published a method for evaluating written material. His test is an objective procedure for measuring the human interest and reading ease of a piece of writing. The program simulates the nomogram that Flesch's test requires. Outputs of the program are a human interest score (from 0 to 100 or ''dull'' to ''dramatic'') and a reading ease score (from 0 to 100 or ''very hard'' to ''very easy''). (95 steps)
Author: *George M. Wright*
Silver Spring, Maryland

Airship Lift with Superheat (Order #3818A)

At any altitude, this program computes the lift of an airship (blimp, dirigible, balloon, etc.) of known gas volume or the volume required to produce a known amount of lift. The input variables are total volume, percent gas cell fullness, gas temperature and specific gravity, and atmospheric pressure, temperature, and humidity. (93 steps)
Author: *Roy L. Froid*
Santa Ana, California
(A very interesting and well-documented submittal. Ed.)

Custom Home and Budget Analysis (Order #03566A)

This program estimates the future monthly house payment of a custom-built home when given its size (square feet) and other input parameters (interest rate, down payment, etc.) or, at the users' discretion, it determines the house size when given a desired monthly house payment. It also estimates the amount of the mortgage loan. Applications: real estate agents, builders, consumers, mortgage companies, etc. (93 steps)
Author: *Larry L. Cagle*
Tulsa, Oklahoma

The Match Game (Order #3426A)

This game is intended for two players. Each player plays 10 consecutive times, selecting 10 consecutive 4-digit numbers (digits vary from 1 to 5). When there is a match of 2 digits, 2 points are scored; of 3 digits, 6 points; of 4 digits, 12 points; of 2 pairs, 4 points. Otherwise, there is no scoring. The player with the higher score wins the game. (99 steps)
Author: *Dr. Leo S. Reich*
West Orange, New Jersey

Automobile Tire Purchase Aid (Order #03428A)

The program accepts price, excise tax, and estimated life (mileage) for up to three different tires and computes the best buy, based on the number of miles expected for dollars spent. ''Best buy'' is indicated by displaying the entered tire price for identification and miles per dollar, as a single, split display. Single tire price, miles per dollar, and four-tire-set price also can be recalled for each case. (100 steps)

Author: *Robert A. Plack*
Phoenix, Arizona

Characteristics of Macro Lenses (Order #03862A)

In scientific photography, resolution is of utmost importance in rendering a specimen in great detail and accuracy. This program computes resolution and depth of focus for the most-used close-up lens—the macro lens. (49 steps)
Author: *Peter A. Guerard*
New Britian, Connecticut

Brownian Motion (Order #3800A)

The program simulates Brownian Motion or particle diffusion in three-dimensional space. Parameters of the simulation include average collision-free distance, maximum number of changes of direction, and radius of spherical absorption barrier. Flag one (set) programs the analogous two-dimensional motion in the XY plane. (99 steps)
Author: *Dr. Mordecai Schwartz*
Woodmere, Long Island, NY

Synchronous Belt Indexer (Order #3801A)

These programs compute interrelated geometric parameters associated with linear incremental motion, using a constant angle driver such as a stepping motor or Geneva drive mechanism, and synchronous (toothed) belt and pulleys or chain and sprockets. Practical examples in common use are station-to-station positioning of a production line conveyor, punched-card/paper-tape indexing, step-and-repeat mechanisms, etc. (300 steps)
Author: *Thomas Hender*
San Jose, California

Sequential Multiplication Product Display (Order #03881A)

The program, using two magnetic cards, computes the product of two numbers, either or both of which may contain up to 17 digits, and displays the product sequentially in four parts. The first display contains up to 10 digits, the second display 8 digits, the third display 8 digits, and the fourth display 8 digits. (199 steps)
Author: *John M. Novak*
San Francisco, California

Electric Appliance Operating Costs (Order #03824A)

With the rapidly escalating cost of electric power, this program will provide a rapid, and sometimes surprising, answer to where some hidden costs have cropped up. It is specifically designed to work with TVA power rates but should be readily adaptable to any other rate system. (89 steps)
Author: *Samuel J. Ovenshine*
Oak Ridge, Tennessee

Complex Arithmetic Stack (Order #03883A)

This program permits use of the HP-65 for complex numbers in the same fashion that the stack is utilized for real numbers. Included are addition, subtraction, multiplication, and division of complex numbers as well as exponentiation. Accuracy is maintained by not using polar arithmetic. (99 steps)
Author: *Rayner K. Rosich*
Arvada, Colorado

Why Does My Display. . .?

After publishing in KEY NOTE a few of the seemingly innocuous key routines that produce rather spectacular (and mystifying) flashing displays, we were challenged by many HP-65 owners to explain just what happens during these weird displays. For that matter, many people wanted to know what happens during even a normal routine. Well, taking into consideration that there are proprietary areas we cannot discuss, here is the explanation we promised to you.

The display is controlled by three internal registers. (These are apart from the ''stack'' registers.) Two are part of the processor. In very common terms, the registers are nothing more than a bunch of electronics that can store numbers. Each register is 14 digits long. The three registers are designated as A, B, and C. Normally, the C-register contains the scientific notation form of x. The A- and B-registers are on the processor and are used in a special way to generate the display. Basically, to generate a display of x, the scientific notation form that's in the C-register is rearranged, and the numbers are put into the A-register in the normal display form. At the same time, numbers are set up in the B-register as a series of 0's and 2's and 9's to create blanked and unblanked digits, plus the decimal point in the display. Again, basically, the A-register contains the value and the B-register contains the blanking and unblanking information and the decimal point location.

The A- and B-registers are also used for two other things. When the calculator does a computational function, the A- and B-registers are used as ''working'' registers—or ''processing'' registers—to manipulate the data and do the operation. For instance, when a tangent computation is in progress, the A-, B-, and C-registers are occupied and busy; the normal form might be in A while B and C are doing something—or it might be in B while A and C are doing something.

Inside the calculator, in the microprogramming, is a command called *Display Toggle* and another command called *Display Off*. *Display Off* blanks the display independent of what is in the A- and B-registers. *Display Toggle* switches the display from on to off, or from off to on. When a program is run in the calculator, the display is ''toggled'' every time a step is ''fetched'' from memory. So, every other memory step it reverses the state of the display, independent of what's in the A- and B-registers. This makes the display ''flash.'' It would have been just as easy to have designed it to *not* flash. But, if the display flashes, you *know* the calculator is doing something—that it is working. No flashing would trigger two human doubts: it's not working!. . .and, it sure takes a long time! So you see why we chose the present design.

Let's look at an example. Here's a display trick from *Charles J. Schilling* of Philadelphia, Pa. *(Note: The steps EEX, O, CHS can be replaced with a 1. Ed.)*

(continued)

f	ENTER
PRGM	f^{-1}
LBL	TAN
A	g
EEX	π
0	RCL 9
CHS	÷

Switch to RUN and press A. Very interesting, right? The display "turns on" when the divide step is "fetched" from memory. Then the divide routine goes away and it starts dividing, using the A- and B-registers. So, with the display on, the divide routine is using A and B, and whatever happens to be in A and B generates something in the display. And while it's dividing, remember that the display is ON. That's what you're seeing when you press A—the divide routine actually working.

Okay, now it's flashing strange things and turning on and off. It's flashing on and off because part of the process in the divide routine is producing nines in the B-register. A digit 9 in the B-register causes the corresponding display position to turn off (or, in other words, to go blank). In summary, something is happening inside the calculator which causes it to produce 9's in the B-register and turn it off in the middle of the divide routine. That is what is happening in all these "display trick" cases.

Okay. So why is it doing this? Well, the reason the display does this only with RCL 9 is because register R_9 contains invalid data. When register R_9 is used for "scratch" (intermediate results) in the trigonometry routines—or whenever else it can be used for scratch—it may end up containing data that the divide routine is not designed to handle. In other words, out-of-bounds data or misaligned, unformatted data, etc. It wasn't designed to handle this "off-beat" programming. The HP-65 *was* designed so that trigonometry routines leave information in register R_9, "scratch-pad" information that the divide routine can't work with because it does not satisfy the design criteria. (This use of register R_9 is explained in your *HP-65 Owner's Handbook.)*

A second phenomenon during some of these display tricks is that the entire keyboard "locks out" while the display is flashing. Now what causes this? Basically, when the HP-65 is off doing math routines, it just doesn't "look" at the keyboard to see if a key is being pressed. You see, the internal software (internal machine programming) is organized so that, at a certain point, there is a little routine that asks: "is a key down, and what key is it?" And maybe over at another point there is a math routine, and when it is at *this* point, it cannot recognize any key "down"; it just ignores it. It has to "ask" the keyboard if a key is down, and if it isn't asking, it isn't seeing. But, when a program is running, this isn't true. The HP-65 is designed to look for a key after every memory step during a program run. Also, when you are doing a function and you press a key, the calculator will see that key, but it will ignore it because it cannot actually "see" a key *while a function is in progress.*

So there you are. This should answer the vexing problem: What is that crazy display that occurs at various times?

What Hath John Started?

One of the most popular articles (in terms of letters to the Editor) that has appeared in KEY NOTE was "Easy Fibonacci Numbers." When *John Taylor,* of Boulder, Colorado, sent in his letter, little did he know of the avalanche of mail it would eventually create. We still get letters about Fibonacci tricks with the HP-65 and want to thank all of you for your inputs. Space does not permit printing all of them, and quite a few are duplicates of ideas we've printed. But, here is one more letter that should interest you. It's from *Donovan Smith* of El Cerrito, California.

"Everyone seems to be getting into the 'act' that *John Taylor* innocently started in the Spring 1975 issue. Therefore, I can't resist the temptation to point out that *Carl King* should *now* write to point out that his *(King's)* recommendation to *John Taylor* can (I think) be applied to *Ralph Erickson's* HP-25 program. That is, so far as I can see, *Erickson's* HP-25 program can be shortened by one step, simply by changing his line 07 from ENTER to GTO 01 and then deleting his line 08, i.e., the equivalent of *King's* program.

I discovered this because I do *not* have an HP-25, but my wife and I gave our daughter and son-in-law one as a going away present when they recently moved to Mainz, West Germany, for the duration of his postdoctoral fellowship in the Theoretische Gruppe, Institut fur Kernphysik der Universitat (Gutenberg U). So, with just the illustrations in an HP-25 advertising brochure, I have fun simulating the HP-25 with my HP-65, adapting HP-65 programs to what I *think* will work on their HP-25. In my latest aerogramme, I first simply copied *Erickson's* program without any thought, except of my daughter's interest in Fibonacci numbers when she was in high school. Then, I thought I'd better confirm it by a quick simulation on my HP-65, but I goofed on the GTO step and got a geometric series, instead. In the process of correcting my error, I realized that the third ENTER is unnecessary; i.e., if *Erickson's* line 07 is changed from ENTER to GTO 01, then his line 08 can be deleted. And *then* I looked back at *King's* program and realized that *that,* in effect, is what *he* did (with a LBL A, which is, of course, unnecessary).

P.S. Our daughter's last postcard says that HP's are very big in the Nuclear Physics Group."

Well, *Mr. Smith,* here's another challenge for your HP-25 brochure-to-HP-65 simulator. This is an excerpt from a letter from *Bob Edelen* of Aurora, Colorado.

"In response to the many ways to generate Fibonacci numbers, below is one of the shortest.

HP-65	HP-25
W/PRGM	PRGM
f	f PRGM
g LST X	01 f LAST X
g x⇄y	02 x⇄y
+	03 +
RTN	04 f PAUSE
RUN	05 GTO 01
	f PRGM

Now, to load either machine with the first two terms:

(1) Key in the first term and press ÷.
(2) Key in the second term.

For the HP-65, each press of A will give the next term. For the HP-25, press R/S and the calculator will generate the sequence automatically. For the standard Fibonacci numbers, use 1 for the first and second terms.

The routine is very well adapted to the HP-45, as it embodies only three steps: LST X, x⇄y, and +. These three steps are repeated for successive terms."

A Math Pac 1 Note

Recently we received a letter from *R. D. Mindlin* of Ridgefield, Connecticut, about a problem he had with a program in our *HP-65 Math Pac 1.* His program modification is a good one, so we want to pass it on to all of you.

"Hyperbolic Tangent: Avoidance of Under(Over)Flow/Stop. *Math Pac 1* pro-

gram 1-18A for tanh x develops underflow/stop for $228.0 < x < 230.2$ and overflow/stop for $x > 230.3$. This is not desirable if tanh x appears as a factor in a program involving both small and large x where, for $x > 227$, the program should supply tanh $x - 1$ (e.g., the series expression for the torsional rigidity of a rectangular prism. See Timoshenko and Goodier, "Theory of Elasticity," p. 278.) Here is an alternative program for tanh x that satisfies the requirement.

LBL	f^{-1}
A	LN
2	ENTER
x	1
2	+
2	STO 1
7	2
g x⇄y	−
g x>y	RCL 1
2	÷
2	CHS
CHS	RTN

Input X, then press A."

A Neat Storage Tip

From *Bill Jones* in Coffeyville, Kansas, we received this neat tip about storing constants:

"Below is a short program for use in the HP-65. Actually, this would be used as a segment within an actual program. It will allow the user to store up to ten 1-digit constants; five 2-digit constants, etc.

Assume that the following 2-digit constants are to be used in a program:

12, 34, 56, 78, 90

Store them in register 6, preceded by a decimal.

. 12 34 56 78 90

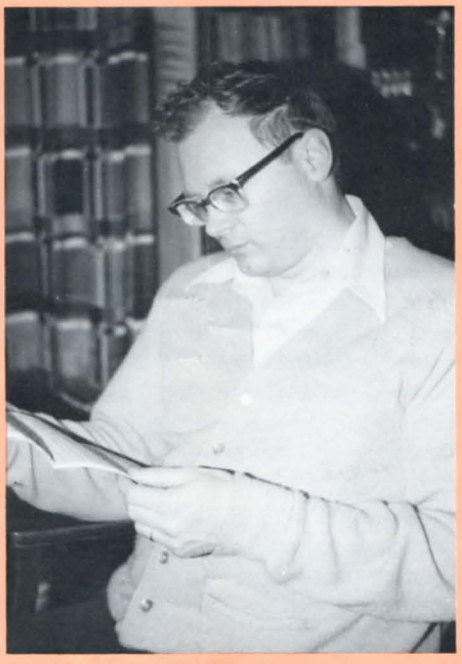
Then the program becomes:

LBL
A
RCL 6
[100]
x
STO 6
f
INT
STO −6
RTN

Altering the term (100) in the box allows longer or shorter constants to be used. Each time through this loop the display changes to the next constant."

HP-65 Users Club

The HP-65 pocket programmable calculator has proven itself as a powerful and unique personal problem-solver. By now, you have found that the machine is more than a computational tool because it also plays the role of educator and entertainer. The enthusiasm that you have for your machines is illustrated by the activities of some users in forming a Users Club: *The HP-65 Users Club*. Founded in June 1974 by Richard Nelson, the HP-65 Users Club serves as an information exchange media for the assembly and dissemination of information related to the care, use, and application of the HP-65 calculator. Over 600 members in Canada, Columbia, England, Germany, Mexico, Portugal, Puerto Rico, Switzerland, and the United States actively participate in the club's activities.



Richard J. Nelson

The primary objective of the club is to provide a means for HP-65 users to share their questions, problems, experiences, programs, and professional expertise for the common goal of obtaining the maximum use from their HP-65. The club has three main activities:

- Monthly Newsletter. A small-print, 10-page newsletter, called *65 NOTES*, is sent each month to club members.
- Membership Identification. Members receive a membership list, which facilitates locating people with similar interests.
- Program Sharing. Members may participate in individual program swapping by adding their program titles and statistics to the "Share A Program" data base.

The most important aspect of the clubs' activities is the centralizing of the knowledge and experiences of each member with the newsletter publishing committee. The wheel is seldom re-invented by club members because *65 NOTES* reports all the latest applications and programming techniques each month. Most of the information published in *65 NOTES* is original and cannot be found elsewhere.

The information that the newsletter provides is useful to all HP calculator owners. More recently, HP-55 and HP-25 programs and programming techniques have been added in a regular column called "HP-55/25 Notes". The common bond of RPN and four-register stack encourages fruitful cross-pollination of programming ideas.

Local chapters have been formed in many U.S. cities and foreign countries. One of the most active is the German Chapter, with over 60 members. The German Chapter publishes its own monthly newsletter in German; it is called *DISPLAY*. *Heinrich Schnept,* the German Chapter coordinator and DISPLAY Editor, *has even built his own printer for his HP-65!*

For information about the club and a sample newsletter, send a self-addressed, business-size envelope with postage attached (two 13¢ stamps) to:

HP-65 Users Club
Editor 65 NOTES
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2541 West Camden Place
Santa Ana, California 92704, USA

(Note: The HP-65 Users Club is not sponsored, nor in anyway officially sanctioned, by Hewlett-Packard.)

HP-65 Traffic Monitor

Last issue, we told you about Canada joining the HP-65 Users' Library. And, already, we have some feedback from that large nation. *Jeff Shook,* HP Consumer Sales District Manager in Toronto, Canada, sent to us a press release that marks another unique application of the remarkable HP-65.

"CFCF Radio Skywatch *Travel Time:* An Exclusive Concept in Traffic Reporting Starts January 6.

A total new dimension will be added to CFCF radio's Skywatch traffic concept

(continued)

Monday morning, January 6th. Following hours of research involving detailed maps, input from the Engineering Department of the Quebec Ministry of Roads, and a Hewlett-Packard programmable calculator, CFCF Radio Skywatch 1 traffic reporter *Bob Benedettti* has developed a method of calculating the exact travel time through any problem area, and the travel time on a particular morning or afternoon from any given point to the downtown area, and vice-versa.

This new dimension in travel reporting will enable the motorist to make immediate commuting decisions never before possible. For example, a major tie-up on the Mercier Bridge could be computed to mean an hour and 10 minutes travel time for the Chateauguay-bound listener. Travel time via the Champlain Bridge to the same destination might be computed at only 45 minutes—thus saving the motorist 25 minutes on the road.

Benedetti's travel time is computed by timing an automobile through premeasured distances and projecting the results through the HP-65, using specifically designed programs.

As *Benedetti* says, 'We'll now be able to do somewhat more than simply report a traffic tie-up and suggest alternate routes. We'll now be able to translate traffic in terms of travel time and give motorists realistic alternatives: time-saving reasons for deviating from their regular travel pattern.''

Now why don't they do this in New York, Chicago, Los Angeles, San Francisco, and dozens of other congested cities? Well, maybe no one ever told them about this unique use of the HP-65! Here's your chance.

Application Pac Corrections

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

MACHINE DESIGN PAC 1

Progression of Four Bar System, MD1-10A, can give incorrect answers when link b is longer than link a. A corrected version, MD1-10B1, can be obtained by sending your old magnetic card to APD Customer Communications (address on back cover). This is a two-card program, but just send card #1 for exchange.

CARD UPDATE

Just to keep you up to date, here is a list of all of the application pac cards that have been changed to ''B'' or ''C'' versions:

SURV 1-01C	STAT 1-08B
SURV 1-02B	AV 1-01B
SURV 1-05B	AV 1-18C
SURV 1-31B	FIN 1-32B
E.E. 1-03B	NAV 1-12B
E.E. 1-08B	NAV 1-16B
E.E. 1-18B	CHM E 1-10B2

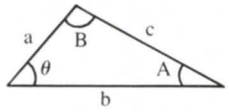
If you have an old card and need a newer one, send your old card to APD Customer Communications (address on back cover).

Triangle Trick Revived

In the Spring 1975 issue, we printed ''A Triangle Trick'' to evaluate the law of cosines. From *John M. Billings* of Alexandria, Virginia, we received an added feature to that trick.

''I would like to add my small contribution to a great trick. As listed, the third side of the triangle is displayed with ''y'' containing the exterior angle along side b. If all that is desired is the missing side, all is okay, but if the triangle is to be completely solved, only one step needs to be added. After − (minus) add CHS, then y will contain the interior angle opposite side a. Of course, g x⇄y before − (minus) will also work.''

Well, *Mr. Billings,* it seems that *your* idea gave *us* another idea! So here is a solution for the *entire* triangle.



Suppose that a, b, and θ are stored:

R_1 = a (2)
R_2 = b (4)
R_3 = θ (50°)

The keystrokes would be:

RCL 3	RCL 3
RCL 1	+
f^{-1}	f
R→P	COS
RCL 2	CHS
−	f^{-1}
CHS	COS = B (100.56°)
f	

R→P = c (3.12)
g x⇄y = A (29.44°)

Now all three sides and all three angles are solved with one short routine. Neat, eh?

A Well-Rounded Subroutine!

Necessity is sometimes the catalyst that causes people to look for easier or better ways to do something. *Robert Flye* of Longview, Washington, needed a subroutine to handle a problem. Some of you may have used this before, but we think many others will find it interesting.

''I needed a subroutine to round the output prior to cumulative storage, one that would round both positive and negative numbers. Its usage was after an f^{-1} R→P (32 01) conversion, where the contents of both x and y registers needed to be rounded and accumulated.

The Main Program		The Subroutine	
	.	LBL	23
	.	C	13
	.	ENTER	41
f^{-1}	32	g	35
R→P	01	ABS	06
C	13	÷	81
STO	33	g LST X	35 00
+	61	RCL 3	[34 03]
1	01	x	71
g x⇄y	35 07	.	83
C	13	5	05
STO	33	+	61
+	61	f	31
2	02	INT	83
	.	RCL 3	[34 03]
	.	÷	81
	.	x	71
	.	RTN	24

In this instance, 10.0 was stored in R_3 and rounding was to the nearest 0.01.

The subroutine will not accept 0 because of the division occurring at the fourth step.

Two other routines were developed to handle an input of 0, but their length increased and usability decreased. The first method is brute force, as follows:

LBL	23	2	02
A	11	f	31
RCL 1	[34 01]	INT	83
x	71	RCL 1	[34 01]
0	00	÷	81
g x⇄y	35 07	RTN	24
g x≤y	35 22	LBL	23
GTO	22	1	01
1	01	.	83
.	83	5	05
5	05	−	51
+	61	GTO	22
LBL	23	2	02

(Note rounding factor stored in R_1. The Y-register will shift to the Z- and T-registers.)

The second method is interesting in that the subroutine can return to the main pro-

gram by two routes. 0 input will return at the first RTN in the subroutine and real values will use the last RTN statement. The Y-register value will be retained.

LBL	23	RCL 1	[34 01]
C	13	x	71
0	00	.	83
g x=y	35 23	5	05
g↓	35 08	+	61
RTN	24	f	31
g↓	35 08	INT	83
ENTER	41	RCL 1	[34 01]
g	35	÷	81
ABS	06	x	71
÷	81	RTN	24
gLSTX	35 00		

R_1 holds the rounding factor; i.e., 10 for rounding to 0.1, 100 for rounding to 0.01."

Painted Cards?

Up to now we thought that every (well, *nearly* every) method of marking magnetic cards had been reported to you. But we have to give credit to *Louis C. Cargile, Jr.* of Texarkana, Arkansas, for his superb marking jobs.

Mr. Cargile uses a process that includes rub-on lettering and subsequent painting of the card with flat-black, aerosol-spray paint. The rub-on letters are then removed with tape (or, stubborn ones, with a needle), and the result is a startlingly professional job. The photo you see here is a copy of his second or third card. Since then his technique has improved!

The instructions on how to do this—and with what materials—are too extensive for KEY NOTE. However, if you are interested enough to want to do this yourself, we'll send a copy of the instructions. Address your request to KEY NOTE Editor (address on back cover).

A Sanitary 65

Some people are very meticulous and like to keep their HP-65's looking like new—all the time. Don't laugh! It could easily save the cost of a repair job. Anyway, here's an idea we'd like to pass along; it's from *William A. Smyth, Jr.* of Columbia, South Carolina, and it works well.

"The security cradle now protects my HP-65 in an additional way. I wrap the calculator, from below the first row of keys on down, in plastic sandwich wrap before placing it in the cradle. This simple, disposable cover protects the HP-65 from dust, liquids, perspiration, and soiled hands, while providing great visibility and, if stretched gently, helps my fingers to glide over the keyboard. The wrap should last from 1 to 10 days of use."

More And/Or

In the Summer 1975 issue we printed some interesting and/or decisions possible on the HP-65. Here are some more interesting ideas from *Fred Goll* of Klemme, Iowa.

"To supplement your article on using the flags as logical AND, OR, etc., here are several useful logical AND programs:

RCL 1	34 01
0	00
g x≠y	35 21
GTO	22
0	00
RCL 2	34 02
0	00
g x=y	35 23
R/S	84
g NOP	35 01
LBL	23
0	00

This program stops only if STO 1 and STO 2 are both 0.

RCL 1	34 01
RCL 2	34 02 lower limit
g x>y	35 24
GTO	22
0	00
RCL 3	34 03 upper limit
RCL 1	34 01
g x≤y	35 22
RCL 1	34 01
R/S	84
LBL	23
0	00

This variation stops only if x is between STO 2 and STO 3, including the limits.

Additional examples are no doubt possible?!" (*Is that a challenge,* Fred? Ed.)

Twice Used Labels

In the Spring 1975 issue was an article entitled "Two is Better Than One." As a follow-on to that subject, we present the following letter from *Frank P. Rust* of Salt Lake City, Utah.

"Here is another way to use each label twice, providing the nature of the inputs allow this. Suppose in label A, set #1 of inputs is such that the last two inputs would never be equal. The second set may be any numbers. Then, on the second set, assuming there are no more than three inputs, simply enter a↑, b↑, c↑, A (rather than a↑, b↑, c, A) and follow with the g x=y or g x≠y tests, GTO a numbered label, and g R↓ to dispose of unwanted X-register contents. For example, if 'b' above were Reynold's number and 'c' the diameter of a pipe, this could be set #1 (or if 'b' were the interest rate and 'c' the amount of a loan, etc.).

Though I have not had occasion to use this when the input for one of the sets arises from the program or program memory, I see no reason why it wouldn't work as well.

P.S. If in the set with 'c↑' this entry is to be squared, you really have it made. The g R↓ is unnecessary."

Lots of Labels!

Have you ever felt the need for a lot more than the five (A thru E) user-defined keys on the HP-65? Well, then *Kurt Christner* of Carson City, Nevada, has just the thing for you.

"I have found a method to obtain up to 16 user-defined keys and 5 subroutines. The programming format is:

f_1	LBL	LBL	LBL
*	B	0	1
*	f_3	f_7	f_8
*	*	*	*
R/S	*	*	*
LBL	*	*	*
A	R/S	R/S	R/S
f_2	etc.		etc.
*			
*			
*			
R/S			

To execute program (function) f_1, press RTN and R/S. To execute programs f_2 through f_6, press A through E. To execute programs f_7 through f_{16}, press GTO 0 R/S through GTO 9 R/S. Also, f_2 through f_6 can be used as five subroutines, with f_1 and f_7 through f_{16} as main programs. However, the subroutines should end with RTN instead of R/S."

Default Program Tip

From *Fred Goll* of Klemme, Iowa, came a neat trick that could save much consternation.

"A Suggestion For The Absent-

Minded! If you have some unused letter labels and vacant program space, you can duplicate the default program at the end of your regular program. I frequently forget and push an undefined label, which messes up my calculation. At least, you could program:

LBL	23
C	13
LBL	23
D	14
LBL	23
E	15
RTN	23

This short-circuits the unused labels and prevents accidental mistakes.''

Another Default Program Tip

Elsewhere in this issue you saw a tip from *Fred Goll* about preventing mistakes because of the default programs. Well, here's an interesting tip from *Donald E. Hostetler* of North Augusta, South Carolina, that enables you to *save* some default programs.

''You advise the user to press f PRGM before keying in a new program. However, for simple, onetime programs or for programs using only one or two labels, one can, with a little care, leave the remainder of the standard functions operable. This is especially useful if one plans to use the program intermittently with other calculations; that is, the single-key R↑ and x⇄y functions are much more convenient than the double-key mode.

To program in this way, one merely has to press the desired GTO key in the RUN mode, then go to the W/PRGM mode and key in the program, ending it with a RTN. (One must remember that the LBL A or B, etc., is already keyed in.) The leftover steps from the built-in function can be left in, or deleted if space is tight. So far as I have been able to ascertain, this causes no problem.''

Price Changes

It's always nice to tell you some good news about prices. Unfortunately, there's some not-so-good news, too.

First, the good part. The three-pack (40 each) of 120 Blank Magnetic Cards (00065-67054) has been reduced from $50 to $40. The single pack of 40 Blank Magnetic Cards (00065-67010) has been reduced from $25 to $18.

Now, here's the other part:

		OLD	NEW
82002A	Recharger	$18.00	$20.00
82006A	Field Case*	20.00	30.00
82007A	Security Cradle*	25.00	30.00
82015A	Security Cradle	25.00	30.00
82016A	Field Case	25.00	35.00
82028A	Reserve Power Pack**	15.00	20.00

All prices shown here become effective on January 1, 1976.

*For the HP-35, -45, -55, -70, -80. **For the HP-21, -22, -25.

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Reader comments or contributions are welcomed. Please send them to the above address.

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