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HP Key Notes

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NEW HP-75C Portable Computing System

On August 23, 1982, Hewlett-Packard announced a new portable, battery-operable personal computer, the HP-75C. (The C is for *Continuous Memory*.)

The new HP-75C features extensive BASIC language programmability as well as time and appointment functions. Its small size (10 by 5 by 1.25 inches; or 25.4 by 12.7 by 3.2cm); its ability to run on batteries; and its *Continuous Memory* make it a true portable computer for virtually any application anywhere in the world — on land, at sea, or in the air — or in outer space, for that matter.

The HP-75's uncluttered keyboard even permits touch-typing, yet it is extremely versatile. Every key can be redefined by the owner, and the redefined keys can be given new labels by snapping on keyboard overlays, thereby customizing the HP-75C for specific applications. A "hidden" numeric pad is built-in to facilitate lengthy numeric entries.

The HP-75C features 16k bytes of user memory (random-access memory, or RAM) built in. User memory can be increased with the plug-in 8k Memory Module to 24k bytes. Three software module plug-in ports in the HP-75C accept 8k- or 16k-byte read-only Memory (ROM) Modules. The ROM-based modules let the computer be customized for specific applications and also free all the user memory for data. With three 16k-byte plug-in modules, the 48k-byte built-in operating system and 24k bytes of user memory, the HP-75C's maximum memory is 120k bytes.

The ROM-based operating system means the computer is ready to use when turned on, and user memory is not diminished by operating system or plug-in software. The large operating system features 169 instructions, of which 147 are BASIC commands, statements, or functions.

A 32-character, liquid-crystal display serves as a movable window on a 96-character line and features character descenders.



(Continued on page 2.)

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

HP Computer Museum
www.hpmuseum.net

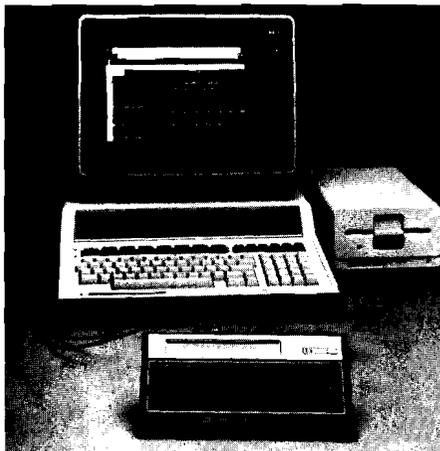
For research and education purposes only.

One type of off-line mass storage is integrated into the HP-75C. A hand-pulled magnetic-card reader, through which cards containing programs or data are pulled, reads or writes up to 1.3k bytes per card. A peripheral mass-storage device is available, but the card reader gives the HP-75C integrated mass-storage *even in the completely portable mode.*

Multiple files, which can interact, are an important part of the computer's capabilities. Program files, data files and appointment files can be named, saved in RAM, and programmed to interact with each other.



The HP-75C comes with built-in Hewlett-Packard Interface Loop (HP-IL). HP-IL lets battery-operable computers communicate with a range of peripherals and other computers, and is designed to be inexpensive and easy to use.

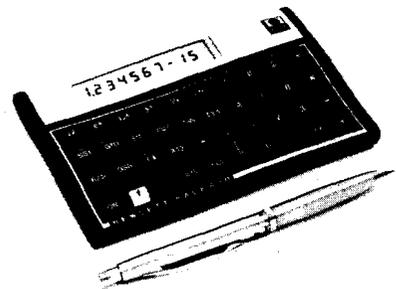


There is no end to what this marvelous creation can accomplish, with its complete range of peripherals; its ability to interface to instruments; its current and future software; and its total dedication to **portable, personal computing** — anywhere, anytime. No amount of words, here, could fully describe the total capabilities of the HP-75C. You simply have to see one and hold it in your hands. So check with your local HP Dealer or your HP Sales Office. It will be in great demand, so be patient.

By the way . . . the HP-75C weighs only 26 ounces (0.74 kilogram). But, if its *capabilities* could be "weighed," you would need to measure them in "tons!"

More Power at Your Fingertips

In June, at the Consumer Electronics Show in Chicago, Hewlett-Packard introduced two more significant contributions to the world of pocket keystroke programmable calculators. Designated the HP-15C and the HP-16C, these new calculators command an enormous range of computational power that, because of their petite size, is not readily apparent. In the same family of rugged, slim-line, liquid-crystal-display calculators initiated by the HP-11C and HP-12C — which were introduced last year (see V5N3p1) — these two new models solve an unprecedented number of engineering and computer-science problems.



The HP-15C Keystroke-Programmable Scientific Calculator is the most powerful "stand-alone" handheld calculator on the market today;

HP-86 Introduced

The modular design is the most visible feature of the new **HP-86 Personal Computer**, introduced by Hewlett-Packard on July 12. And, modularity means that you can build a flexible, low-priced system around the HP-86 to meet your changing needs.

The HP-86 consists of a powerful microprocessor and a keyboard in one package. The keyboard features a standard alphabetical pad and a numeric pad, plus, there are seven shiftable user keys for a total of fourteen user-definable functions. There are also six display editing keys to greatly simplify changes, corrections, additions, etc.

In addition to the operating system and the display RAM, the HP-86 has 64k bytes of user RAM. And, like the HP-87, this user RAM is expandable to half a million bytes with the addition of plug-in memory modules in the four ports in the back of the computer. These ports also let the user expand the capability of the HP-86. The HP 82900 CP/M* system, the HP 82950 modem, additional ROMs, as well as HP Memory Modules can be plugged into the ports.

In designing your HP-86 system, you can choose between a 9-inch and a 12-inch display monitor, and the HP-86 easily interfaces with the HP 82905B Dot-Matrix Impact Printer. A new disc drive, the HP 9130, with a 270k byte capacity, provides your system with plenty of mass storage. The new machine is also compatible with HP's personal-computer modem and a variety of printers and graphics plotters.

But, software is the key to the appeal of this new computer. All of the HP Series 80 BASIC software will run on the new HP-86 and, with the addition of HP's plug-in CP/M System, the CP/M operating system and associated software will run on the HP-86. New software for accounting, data-base management, tax planning, and word processing is available and this new software complements HP's existing graphics, electronic worksheets, and data-communication programs.

Two data-communications software solutions let the HP-86 communicate with other computers and with information services such as **THE SOURCE**** and **Dow Jones News/Retrieval*****. In fact, a free hour of connect time on the Dow Jones News/Retrieval and **THE SOURCE** is included with the purchase of the HP modem or HP's Data Communications Pac, giving the new user an introduction to information services.

This short article can only begin to touch on the wonders of this new computing marvel, the HP-86. See your local HP Dealer for a more complete picture of why the HP-86 is the solution to your computing needs; also for a very pleasant surprise: the HP-86 is the lowest priced personal computer ever offered by Hewlett-Packard.

*CP/M is a registered trademark of Digital Research, Inc.

**THE SOURCE is a service mark of Source Telecomputing Corp., a subsidiary of The Readers Digest Association, Inc.

***Dow Jones News/Retrieval is a registered trademark of Dow Jones & Company, Inc.



Hewlett-Packard's Series 80 family of personal computers now includes (from left) the portable HP-85; the new, low-price HP-86; and the new HP-87XM, with its 128k bytes of built-in user memory. They are at your HP Dealer now; don't miss them!

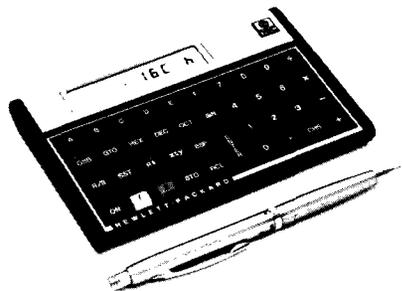
it even includes such novel, highpowered mathematical and computational tools as matrices and complex numbers, besides the already known "Solve" and "Integrate" functions. The HP-15C also offers 67 storage registers that can be allocated to a maximum of 448 program lines as you need them.

For the first time in a handheld pocket calculator, systems of linear equations are easy to handle. This marvelous "genius" can invert an 8 by 8 matrix in 85 seconds or solve a 7 by 7 system in 28 seconds. Or you can have five matrices — adding to a total of 64 elements (maximum) — stored in its memory. Furthermore, the operations involving matrices are executed by simply calling the descriptor of the matrices to the X- and Y- registers. Also, the descriptor can be any letter from A to E. But, best of all, the display provides alphanumeric annunciators to tell you, at any time, what matrix you are using, its dimensions, and what element you are in.

The ease of use of the Complex Functions — the Real and the Imaginary — will delight anyone who, because of job title or field of study (navigators, civil engineers, aviators, surveyors, students, teachers, etc.), has to express as a single mathematical entity, a magnitude and an angle, a distance and a direction, etc. To handle this function, the HP-15C has two parallel stacks, one for the real part, the other for the imaginary part of a complex number; you perform operations on the contents of both stacks *simultaneously*.

In particular, electrical engineers will love the *complex matrices* capability of the HP-15C. Just think: such complex, lengthy, error-prone computations as ladder networks and impedance calculations will be a pleasure, not a chore, with an HP-15C, because it solves such problems with consummate ease.

There are numerous matrix operations, including multiplication, "division" (multiplying times the inverse), addition, subtraction, inversion, determinants, norms, etc. In fact, the HP-15C has so many powerful features and functions — even a built-in random-number generator — you simply have to go to your HP Dealer and see for yourself.



The brochure for the HP-16C begins: "The most powerful calculator ever designed for computer science and digital electronics applications," so it's no mystery why we named it the "Computer Scientist." It has four number bases: binary, octal, decimal, and hexadecimal; four Boolean operators (AND, OR, EXCLUSIVE OR, NOT), extensive bit-

manipulation capability, and variable word size (up to 64 bits), plus one's and two's complements. These features, combined with the HP-16C's programmability, give it the absolutely unique, highly desirable capability of emulating or "decoding" the single numerical instructions of any commercially available processor. As an example of this, the HP-16C Owner's Manual includes a program that will enable you to convert between IEEE standard floating-point binary format and the floating-point decimal format used in the HP-16C itself.

So, if you are a technical professional, here is the tool you once wished: "If only they would make one . . .!" It's here, and its programmability adds *more* power: you can now perform such tasks as simulating processor instructions. For example, the HP-16C can hold a maximum of 203 program lines, or 101 16-bit data registers. And you can use the handy insert/delete editing tools to debug your programs. Plus, you get 16 program labels, 4 levels of subroutines, 6 flags, and 8 conditional branching tests . . . and a lot more.

The HP-16C has virtually no competition. The only other model in this market offers no programmability, no binary base capability, no variable word size (maximum number of digits displayed: 8), and very limited bit-manipulation functions.

As we said about the HP-15C, seeing is believing. But you won't *really* believe what this extraordinary calculator can do — and how easily — until you visit your HP Dealer and see for yourself. And don't wait too long! They are in great demand . . .

NEW HP-41 Module Announced

Hewlett-Packard recently announced another module for your HP-41, the 00041-15042 Automatic Start and Duplication Module (AS & CD). It will be available at your local HP Dealer after September 1982.

Although this is a specialized module, it does provide two new important capabilities:

- Automatic start of program execution when the HP-41 is turned on, and
- Duplication of cassettes used in the HP 82161A Digital Cassette Drive.

The automatic start feature provides a means of writing "foolproof" HP-41 programs. With the Automatic Start Module installed, the HP-41 goes through a special sequence when it is turned on, and this sequence allows you to write programs that automatically set status, configure memory, access peripherals, or prompt the user. The automatic start feature looks for one of the following three conditions in an attempt to start program execution when you turn on the HP-41.

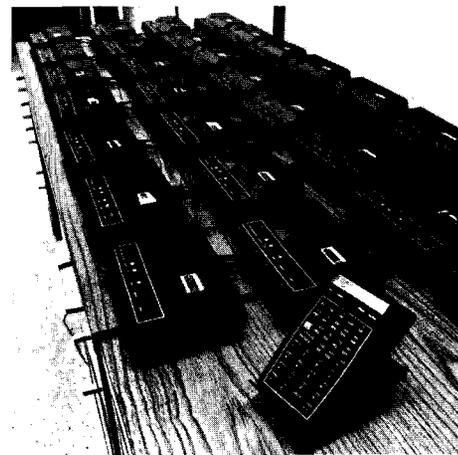
- A program labelled RECOVER in HP-41 main memory.
- A program labelled RECOVER in an HP-41 port with a lower number than that of the port containing the AS & CD Module.
- A "write-all" file named AUTOST on an HP-IL mass storage device.

If a program labelled RECOVER is found, the HP-41 will start running from RECOVER. If RECOVER is not found, the HP-41 will attempt to load the AUTOST file from a mass storage device in the Interface Loop.

Note that you do NOT have to have the HP 82160A HP-IL Module in place in order to use the automatic start feature. However, *it is necessary* to use it in order to use the cassette duplication feature of the AS & CD Module.

The cassette duplication (or mass copy) feature lets you easily duplicate programs and data. All the information on one HP 82161A Digital Cassette Drive can be copied to as many as 29 other cassettes (as you can see in the accompanying photo). Now, this can allow software suppliers to "manufacture" their own software, provide a means for individual users to "back-up" their cassettes, and enable volume end-users to copy and distribute data in cassette form.

If your question is, "Will it permit copying cassettes with private files?" the answer is no. If your question is, "Are there any shortcomings?" the answer is yes. But only this: This module has XROM numbers that are incompatible with the Machine Design Application Module. If you plug both of these modules into the same HP-41, operation will be unpredictable. Other than that, this is a really convenient addition to the HP-41 system, as you can see here in graphic detail!



Here are 30 HP 82161A Digital Cassette Drives placed in a continuous loop that is controlled by only one HP-41 and an HP-IL Module and an AS&CD Module. This setup was used in the Corvallis Users' Library to make 29 identical copies of a master cassette. Cassette duplication, as you know, is one of the Library's special services (\$12 includes cassette). This is not only an impressive sight but also an impressive sound. The cassette drive has an intriguing sound — like no other device — and 30 of them whirring away attracts many curious ears!

**IS YOUR ADDRESS
BEING UPDATED?**
(See page 7c.)

NEW HP-IL/GPIO Interface

The new HP 82165A HP-IL General Purpose Input/Output Interface now allows you to connect to HP-IL systems, other devices that contain parallel-interface ports. In other words, this interface connects the internal electronics of such a device to the loop, permitting communication between it and other HP-IL system components. Now, you will find it fairly easy to connect to your HP-IL system, devices produced by manufacturers other than Hewlett-Packard.

For example, suppose your company uses a computer *not* made by Hewlett-Packard, and you own an HP-41/HP-IL system that you want to use as a portable data collector for more timely accounting of shipments and inventory. If your computer has parallel ports, you are in business. (If not, we'll gladly sell your boss a new HP-86 or HP-87!) With the new GPIO interface, your information could be transferred each hour from an HP-41, acting as a portable data collector, to your company's permanently installed computer. By this easy and efficient method, your company would be confident that their shipments and inventory summaries were no more than one hour old. Neat, eh?

The new HP 82165A HP-IL/GPIO Interface is at your local HP Dealer right now. Check it out. It's probably just the "tool" you need for your application.



NEW HP-41 Impact Printer

The new HP 82905B Printer, first shown at the Consumer Electronics Show (CES) early in July, is another HP-IL peripheral for the amazing HP-41 Handheld Computer.

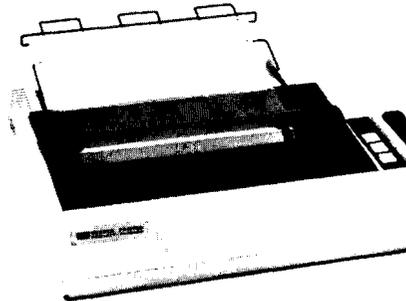
This new peripheral is a full-size, 80-column impact printer that produces permanent, high-quality copy and dot-mode graphics. Principal features are:

- 80-characters-per-second bidirectional operation.
- Variable column width (40 to 132 per 8.5-inch page).
- Five user-selectable print modes.
- Self diagnostics.
- Will accept single- or multi-part paper forms.

With user-developed software, individuals or companies now can assemble low-cost systems that not only compute solutions, but also print them quickly and efficiently on custom, multi-part forms. The end result could be anything — tax returns, paychecks, invoices, forecasts, inventory reports, etc. Other uses include fully documented, permanent, HP-41 program listings and automated test and measurement records.

The new printer also works equally well with HP-IL-equipped Series 80 Personal Computers, providing added versatility when these desk-top models are used in conjunction with HP handheld computers.

By the time you read this, the new HP 82905B Printer should be at your local HP Dealer. Don't miss a demonstration!



NEW HP-41 Touchpad

In V6N1p6a we published a photo and an article about a "Custom Keyboard" that was available to Corvallis Library Members, and it nearly started a stampede from all over the world.

So, to prove that we do listen to you, that "special-order" device is now an official HP-41 accessory. This new accessory is a membrane Touchpad with the standard HP-41 keyboard nomenclature. It snaps in place over your keyboard in the same manner as the usual overlays. It not only protects your keyboard from dust and spills but also enhances the aesthetics of your HP-41 Handheld Computer.

This new HP-41 Touchpad (HP 82200A) should be at your local HP Dealer by the time you read this. Call first for price and availability. And remember: this accessory is still available from the Corvallis Users' Library for 1 "point." **DO NOT ORDER IT FROM THE FACTORY OR FROM GENEVA!** (See V6N2p8a "A Change is in Order," or read "Potpourri," on page 9.)



AND . . . /OR?

It all began with a letter that appeared in the V5N2 issue of KEY NOTES on page 12, column c. The letter was from **Claude Roeltgen** of Mondreange, Luxembourg, and it dealt with the subject of constructing the complex conditionals "OR" and "AND" on the HP-41. The information contained in this letter was valuable and very correct.

Everything remained quiet on the subject until V6N1p12c. There, we published a letter from our good friend, **Frank Wales**, of Glasgow (not Glaskow), Scotland. Unfortunately, because of a few of our typographical errors and our subsequently sleepy eyes, plus a misinterpretation by Mr. Wales, that letter can be a source of confusion. In his letter, Mr. Wales claims that there is an error in Mr. Roeltgen's solution for the "IF A

AND B THEN instruction" conditional. But a careful inspection reveals no error. (See the second paragraph of Mr. Wales' letter and the second paragraph of Mr. Roeltgen's letter.) Nevertheless, being enamored of what we read and being slightly gullible, we proceeded to edit Mr. Wales' letter, and we even added some truth tables to the end to clarify his argument. This brings us to the final error in the article: in the first truth table, the sequence under "instruction performed?" should be 1,1,1,0.

Now for the good news . . . In the editorial comment at the end of Frank Wales' letter, we wrote a short routine to do the "IF A AND B THEN instruction" relationship, and we wrote that we were anxious to see a shorter version. (See KEY NOTES V6N1p12c.) Since that comment appeared, we have been swamped with letters from people all over the world. All of these

letters included a shorter version of that routine (about two bytes shorter) and thus our anxieties have been satisfied.

- 01 A
- 02 inverse of B
- 03 FS? 30
- 04 instruction

The key to this routine is in line 03. This line can be replaced by any conditional that will always test false. A stack test (i.e., X=0) will work, if you know the condition of the stack, and it will save one more byte.

There is no possible way to individually credit everyone who sent in this routine. However, the first one we received was from **George Snyder** of Stoneham, Massachusetts. Thanks to everyone else who contributed. Please don't send any more; we already have enough to fill a book.

Library Corner

CORVALLIS LIBRARY NEWS

If you are not a Users' Library member and would like to know more about the Library and its many benefits, drop us a line (address on back cover). The fee is not only reasonable but also probably tax-deductible at income tax time. Also, you get coupons for 4 free programs, so how can you lose? Plus, Library members get KEY NOTES free, anywhere in the world. This is one of the few bargains left in this "inflated" world!

ORDERING PROGRAMS

HP-67/97 and HP-41 programs featured in KEY NOTES are available from both the Library in Corvallis and the Library in Geneva (except where stated otherwise). Readers in Europe should order from Geneva (address on back cover) to get quicker service. Readers elsewhere should order from Corvallis. Each program includes documentation and prerecorded magnetic cards; HP-41 programs include bar code.

Mail your order and a check or money order to the Corvallis or GENEVA address on the back cover of KEY NOTES. Don't forget to include your State or local taxes. Or, in the U.S., you can place your order by calling toll-free: 800-547-3400, except from Alaska and Hawaii. (In Oregon call 503-758-1010, NOT TOLL FREE.)

When ordering from outside the U.S., attach your payment to your order. Much time is wasted and orders are held up trying to match checks and orders that are sent in separately. Your payment can be in the form of an International Money order, a Foreign Draft, or the equivalent. Any payment must be in U.S. dollars, drawn on a U.S. bank, otherwise it will be returned to you. Another option for payment is to use such major credit cards as American Express, VISA, or MasterCard.

Orders are usually shipped within 2 working days after they are received in Corvallis. However, if you need a program yesterday, call us today at 503-757-2000, extension 3371. Although we can't get it to you yesterday, if you call before 12:00 noon, we'll get it in the mail today.

FUN AND GAMES . . . AND OTHER BOOKS

Amid all of the technical literature being developed by the Corvallis Users' Library is a new HP-41 Games II Solutions Book (00041-90443). It will be available by the time you read this, and the price is still \$12.50* This collection of old and new best-sellers is destined to be just as popular as its predecessor, HP-41 Games Solutions book (00041-90099).

Another new book, available September 1, is the HP-41 Structural Design Solutions Book (00041-90441). Because this Solutions Book is larger (over 140 pages) and requires a cassette, it is priced at \$30* (which includes a recorded cassette). But we are certain that structural engineers will call it a bargain when they see a section properties data base of 226 files, and a routine that allows creation of special section property files.

Also under development, and scheduled for an introduction later this year, is an HP-41 Matrices and Complex Numbers "Math" Solutions Book (00041-90442). We'll probably announce it in the next KEY NOTES (Nov. V6N4).

By the way, if there is a subject area that you would like to see covered by an HP-41 Solutions Book, write directly to the Corvallis Users' Library (address on back cover).

BEFORE YOU ORDER any of the Solutions Books mentioned above, make sure you first check with your local HP Dealer. Remember: All direct orders (whether to Corvallis or to the Corporate Parts Center — see page 9) include a \$3.50* handling charge per order. These books should be on the dealer's shelves by the time you read this, no matter where you live.

WINNING PROGRAMS

The 1982 Users' Library Submittal Contest was announced in KEY NOTES (V6N1). This contest began in March and it will run through August. Each month, ten winning programs will be chosen on merit by our review panel. And, the authors of these winning programs get to choose a fabulous HP product as their prize! The top two winners every month will be awarded either an HP-IL Digital Cassette Drive or an HP-IL Thermal Printer/Plotter (both include HP-IL modules). The other eight winners will be awarded either a Time Module or an Extended Functions Module.

In the last issue, we featured the 10 winning programs for the month of March. What follows are the 10 winning programs for April and the 10 winning programs for May.

APRIL WINNERS

(41) Windmill Design #01719C (Price \$10*)
This program evaluates a horizontal axis windmill at specified conditions of wind velocity and rotor RPM. Inputs to the program are the blade parameters of chord and twist angles at sequential values of radius R. The program evaluates performance at each input point and numerically integrates to determine output power and blade thrust forces.

A second mode of operation (Flag 1 set) allows the user to determine optimum blade twist angles, chord and RPM. A complete description of equations and program flow diagrams are given in the documentation. *Required accessories: 2 Memory Modules.* (449 lines, 939 bytes, 45 pages)

Author: Emery Gasperek
Camillus, New York

(41) Dose #01731C (Price \$10*)
The ICRP multi-compartment respiratory tract model is used to predict doses to organs from radionuclide depositions in the nasopharyngeal, tracheobronchial, and pulmonary regions. For gastrointestinal tract doses, the four-segment model is used. Ingestion is included for the sake of completeness. Infant, child, and adult doses are displayed for arbitrary uptake and exposure time episodes. The program is not designed to address noble gases. *Required accessories: Three Memory Modules.* (668 lines, 1199 bytes, 29 pages)

Author: John Ferman
Minneapolis, Minnesota

(67/97) Propulsion Gas Turbine Annual Fuel Consumption for a Ship #04801D (Price \$6*)
Employing an empirical formula to estimate specific fuel consumption for gas turbine main engines, this program calculates the annual propulsion fuel consumption for a ship operating in an assumed (user specified) operating profile. Required input includes: ship speed versus power relationship, assumed operating profile, shaft RPM as a function of ship speed, and reduction gear ratio. (224 lines, 17 pages)

Author: James Baskerville
McLean, Virginia

(41) Geodesic Arc Length, Azimuth #01660C (Price \$6*)

Input the latitude and longitude of two points and this program will calculate the distance between those points, the azimuth, and the back azimuth, based on the reference ellipsoid of your choice. Uses the Andoyer-Lambert formulas with a second order flattening term as derived by Thomas. *Required accessories: One Memory Module.* (308 lines, 357 bytes, 12 pages)

Author: Brian Iwatake
Aiea, Hawaii

(41) Superelevated Roadway Design with Elevations #01768C (Price \$10*)

Calculates roadway centerline and shoulder elevations for superelevated roadway curves rotated about the centerline. The program can be used in conjunction with the HP Surveying Module; however, the required subroutines are supplied with this program. In addition to solving for various combinations of horizontal and vertical alignments, the program provides checks of several design parameters. *Required accessories: 3 Memory Modules (2 Memory Modules if used with the HP Surveying Module).* (684 lines, 1265 bytes, 25 pages)

Author: Greg Laragan
Lewiston, Idaho

(67/97) Saturated Steam Flow Pressure Drop #04788D (Price \$6*)

This program calculates pressure drop in lines for turbulent saturated steam flow by dividing the line into sections to account for the changing specific volume of the steam. The user provides the inside pipe diameter, saturated steam mass flow rate, equivalent pipe length, and inlet steam pressure. No physical property data input is required. The program includes routines to calculate the specific volume of saturated steam and saturation temperature as a function of the absolute pressure. (204 lines, 10 pages)

Author: Randall Soo-Hoo
San Francisco, California

(41) Symbol Selection And/Or Permutation #01753C (Price \$6*)

This program will systematically select and/or permute a non-null subset of a symbolic set of up to ten members. A SCAN/POINTER algorithm is utilized for both selection and permutation. The definition of "selection" used in this program is "a combination in the natural order of the set." The program checks all values for range and validity. *Required accessories: One Memory Module.* (239 lines, 520 bytes, 18 pages)

Author: Randy Cooper
Cypress, Texas

(Continued)

(41) Cylinder Radar Cross Section #01796C (Price \$6*)

This program calculates the bistatic radar cross section of a totally reflecting, nonabsorbing circular cylinder for a plane wave incident perpendicular to the cylinder axis. The polarization can be at any specified angle to the cylinder axis. Restrictions on the cylinder size and radiation wavelength are minimal. *Required accessories: One Memory Module.* (379 lines, 607 bytes, 18 pages)

Author: **Glenn Stumpff II**
Dayton, Ohio

(41) Cantilever/Suspended Span Beams #01741C (Price \$10*)

This program calculates all positive and negative moments, joint shears, and reactions for lines of cantilever/suspended beams. The user chooses the live-load variation factor, spacing of supports (columns) and of point-load(s). One to five point loads can be located between supports. Output is complete and self-contained. The program is useful for service load or limit states design. Use S.I. or Imperial units. *Required accessories: Printer, Quad Memory Module.* (1119 lines, 1659 bytes, 20 pages)

Author: **Frank Anrep**
Toronto, Canada

(41) Interactive Flight Information Manager #01804C (Price \$12*)

This program is used for preflight planning and enroute flight plan verification, time and distance estimation and recall, fuel management and data storage. Features include: extensive alphanumeric prompting, functional keyboard, clock function, extensive data storage/recall capability, look ahead/look back for distances, times, and fuel reserves, plus automatic printing with the HP 82162A or 82143A Printer. *Required accessories: Four Memory Modules.* (807 lines, 1719 bytes, 25 pages)

Authors: **John Shaughnessy, Ph.D.**
Newport News, Virginia
Jeffery Farmer
Morganfield, Kentucky

(Mr. Gasperek and Mr. Ferman are the "big winners" for April, and they chose a new Digital Cassette Drive or a new Printer. Congratulations to all of you. It is especially nice to see that those "old" HP-67/97 machines are still solving esoteric problems — Ed.)

MAY WINNERS

(41) Fluid Flow Through Square-Edge Orifice #01787C (Price \$22*)

This program computes the flow of a fluid (from a gas to a viscous liquid) through an orifice in a pipe. Required data are the fluid viscosity and density and, if a gas, the pressure, molecular weight, and heat capacity ratio. The size of the pipe and orifice must be known, as well as the pressure drop across the orifice. Results are valid for turbulent and laminar flows, and for diameter ratios (orifice to pipe) as high as 0.8. *Required accessories: Quad Memory Module, Extended Functions/Memory Module, Extended Memory Module. Card Reader and Printer will be helpful.* ("ORFC" consists of a main program and 17 auxiliary programs all loaded on 37 tracks, 19 cards; 29 pages of documentation)

Author: **Norman Samish**
Houston, Texas

(41) Pipe-Sizing for Compressible Flow #01859C (Price \$18*)

This program is designed to solve a broad range of pipe-sizing problems for compressible flow. The program assumes that flow is isothermal, and that either the upstream pressure or the downstream pressure is known. The Mach number can be found at the inlet and, more importantly, at the outlet, where sonic velocity may limit the flow. The documentation of this program is complete and explicit. *Required accessories: Quad Memory Module, Card Reader or Wand, Extended Functions/Memory Module.* (778 lines, 1447 bytes plus data, 56 pages)

Author: **Jeffrey Huang**
Corvallis, Oregon

(41) Financial Institutions Analysis #01857C (Price \$10*)

With the data of averaged balances and Profit-and-Loss Statements of two or more (infinite) periods, this program analyzes and/or simulates with 50 outputs for each two periods the key variables determining the performance of a financial institution. These key variables include: return, net income, losses, debt, and others. *Required accessories: Four Memory Modules, Printer optional.* (535 lines, 1351 bytes, 22 pages)

Author: **Raul E. Barragan-N**
Bogota, Colombia

(41) Electric Rate Analysis #01858C (Price \$8*)

This program is used to compare the monthly charges for electric energy usage under two different rate schedules. Each rate schedule can have up to five energy blocks, a monthly customer charge, and a monthly minimum charge. The program will calculate the total monthly charge under both rates for a given kilowatt-hour (kWh) usage, and the percent increase (decrease) of the second rate over the first rate. Output to the printer consists of printing each rate schedule, a table heading, and a comparison of charges at specified kWh usages. Either a single kWh value can be entered or the user can define a range of kWh values to be compared. *Required accessories: 3 Memory Modules, Printer.* (669 lines, 1513 bytes, 18 pages)

Author: **John Brown**
Boise, Idaho

(41) The Wire Calculator #01777C (Price \$6*)

This program simplifies wire sizing problems associated with aerospace electrical subsystem design and implementation. It solves for wire gauge, length, current, voltage drop, temperature, resistance, and provides for either English or metric input/output. The basis is orbiter specification MB0150-048 (MIL-W-81381A) for nickel-coated wire in sizes #26 thru #0 gauge. *Required accessories: 2 Memory Modules.* (325 lines, 792 bytes, 17 pages)

Author: **James Fuhrman**
Anaheim, California

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

(41) Shortcut Multicomponent Distillation Design #01778C (Price \$6*)

If the compositions of the feed, overhead, and bottoms streams are known and the relative volatilities are known, this program will calculate the minimum reflux ratio and the minimum number of stages. Then, it will calculate the number of stages or reflux ratio given one of the two. The program uses Underwood and Fenske equations with the Gilliland correlation. *Required accessories: 2 Memory Modules.* (326 lines, 572 bytes, 21 pages)

Author: **Robert Green**
Starkville, Missouri

(41) Oxygen Deficit in a Polluted Stream With Time #01806C (Price \$10*)

This program determines the oxygen deficit in a polluted stream with time. Oxygen deficit will be printed out in 1/10-day intervals until it is at a maximum. Input data may be entered either manually or by a data card. The computed maximum oxygen deficit and the original input data can be saved on a magnetic card. The calculation of the variation with time of the dissolved oxygen in a polluted stream is important in water-resources engineering. Along with the program is a brief discussion of this topic and a summary of the methods used to calculate the oxygen deficit in a polluted stream. *Required accessories: 3 Memory Modules, Printer.* (367 lines, 1039 bytes, 21 pages)

Author: **Choo-Heun Jonas Lee**
Seoul, Korea

(41) Eigenvalues/Vectors for Nth Order Systems #01814C (Price \$10*)

This program will compute eigenvalues/vectors for systems up to and including 7th order. It uses the standard format $BX = [\gamma] AX$, where A is diagonal and B is symmetric. Options include finding the square roots of the eigenvalues and normalizing the eigenvectors. SIZE check, data correction, and data review subroutines are included. A plotting program for mode shapes is also included. *Required accessories: Minimum of 3 Memory Modules; Quad Memory Module required for 6th and 7th order systems, Printer is optional; Printer and Card Reader necessary to merge and run plotting routine.* (775 lines, 1372 bytes, 24 pages)

Author: **Wm. Brewster Davis**
La Jolla, California

(67/97) Design of Crossflow Finned Tubular Heat Exchangers #04809D (Price \$8*)

This program calculates the principal dimensions of a crossflow finned tubular heat exchanger. Temperatures, pressures, and heat transfer requirements for the specific application are required input, as well as geometric friction and heat transfer data for the particular finned surface being considered. Derivation of technique and a practical example are provided. (224 lines, 45 pages)

Author: **James Baskerville**
McLean, Virginia

(67/97) Performance Ranking of Finned Tubular Heat Exchanger Surfaces #04810D (Price \$16*)

The objective of this program is to determine, from a large field of candidate surfaces and geometric arrangements, which surface is optimum for a particular heat exchanger application. The traditional method of presenting friction factor and heat transfer data for finned

tubes is transformed to permit performance comparisons. A design example is provided. (448 lines, 126 pages)

Author: **James Baskerville**
McLean, Virginia

(The "big winners" for May are Mr. Samish and Mr. Huang, but our congratulations go to all ten of you. This Contest sure is bringing some excellent programs into the Library — Ed.)

HP-41 Software Update

If you own any of the HP-41 Application Pacs listed below, be sure to carefully read this article.

HP-41 FINANCIAL DECISIONS PAC

The *Financial Decisions Pac* has had two revisions since it was originally introduced. If you have an early copy of this pac, you have read about these corrections either in KEY NOTES or via the addendum card provided with your pac. In general, the errors can be easily corrected with simple keystrokes. For your convenience, the programs involved and the corrections to them are reprinted below.

All errors have been corrected and these corrections have been incorporated in the finished product currently available. If you execute these programs regularly and have found your *Financial Decisions Pac* inconvenient to use because of the extra keystrokes required, you may exchange your current module for the most recent version. Use the following procedure to determine which version you have.

Turn off your HP-41 and remove all peripherals. You do not need to remove Memory Modules. Insert your "Finance" module. Press [] [CATALOG] 2. The first entry in the catalog specifies the module name (FINANCE) followed by the version code (1B, 1C, 1D). If the revision code on your module is 1B, there are two errors in your module, and they are explained below under **Financial Decisions Pac 1B**. If the revision code is 1C, there are three errors in your module, and they also are explained below, but under **Financial Decisions Pac 1C**. Revision code 1D is the latest (correct) version of the module.

Financial Decisions Pac 1B

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

2. The "Bonds" program does not correctly calculate the yield of a short-term bond. When you wish to determine the yield of a bond held for one full coupon period or less, you must do the following:

- Store either the call price or 100 in register 19.
- CF 22
- Press [E] to calculate the yield.

Financial Decisions Pac 1C

1. The 360 calendar mode in DAYS does not calculate the correct number of days between dates when the first date occurs on the 31st day of the month and the 2nd date occurs any day except the 31st. The result is 1 day less than the correct answer.

2. After initialization of the "Compound Interest" program ([XEQ] MONEY) or after clearing the financial registers ([], E), if I is the variable solved for when N, PV, and FV are known ($\text{PMT} = 0$), you cannot solve for another variable until a value has been stored.

3. When $I = 0$ in the "Compound Interest" program, you cannot solve for N, PV, PMT, or FV (gives DATA ERROR or an incorrect result).

To receive your replacement module, send your current *Financial Decisions Pac* Module (versions 1B or 1C only) to your nearest HP Service Center along with a request for a ROM update. DO NOT RETURN ANY ID modules! A list of Service Centers is printed on the Service Card you received with your HP-41. If you can't determine your nearest Service Center, ask your local HP Dealer for the address.

HP-41 STRESS ANALYSIS AND STRUCTURAL ANALYSIS PACS

The early copies of the *HP-41 Stress Analysis Pac* and *Structural Analysis Pac* have an error in the "Simply Supported Continuous Beams" program (version 1A*). This error was originally reported in the March 1980 issue of KEY NOTES (V4N1), along with the keystrokes that could be used to correctly execute the program. Currently available copies of these pacs are correct. An Addendum Card that contains a detailed description of any errors, plus ways in which to "get around them," may be obtained by writing to:

Hewlett-Packard Co.
Customer Support
1000 N.E. Circle Blvd.
Corvallis, OR 97330 USA

In your request, be sure to include the name of your pac and the version of your module.

While the early copies of these two pacs are still very usable, those of you who regularly use this program may want to exchange your current module for a corrected version. To receive your replacement module, send your incorrect version 1A module to your nearest HP Service Center along with a request for a ROM update. A list of Service Centers is printed on the Service Card you received with your HP-41. If you can't determine your nearest Service Center, ask your local HP Dealer or HP Sales Office for the address.

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

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

WARNING

Do not send any application modules to the United States from a country outside the U.S. Your module could get tangled up in Customs and you might lose it or cause an enormous delay.

KEY NOTES Correction

This letter from **George Killian**, of Stamford, Connecticut, explains a small problem that appeared in the last issue of KEY NOTES (V6N2P13a).

Don Thayer gave a routine for computing Julian Day Numbers and, as an example, he stated that the JD# for July 4, 1980 was 2,444,425. This answer is both right and wrong! The JD# is the number of successive days starting at January 1, 4713 B.C. (on the Julian calendar). However, by convention, the JD# changes at noon, not at midnight. This is so all astronomical observations of a given night will occur on a given Julian Day Number. Thus, 2,444,425 is the JD# for July 4, 1980 before noon, while 2,444,426 is the JD# for the same date after noon and until noon of July 5, 1980.

Software Corrections

Chris Verhoef, of Velsen, Netherlands, recently wrote to remind us that the 14 X 14 Math Pac matrix dimension was based on the HP-41C with three Memory Modules. Now, with the Quad RAM or the HP-41CV, a 16 X 16 matrix is possible.

We also have a correction to the Users' Library *High-Level Math Solutions Book*. The problem is located in the program "4 X 4 Matrix Operations" (the last program in the book). The indices of the output inverted matrix do not increment properly. To make the program run correctly, change line 427 to XEQ 08, omit line 426, and add FC? 09 after line 41.

Is Your Address Correct?

Rarely does a day go by that doesn't bring a big stack of KEY NOTES marked: "Not Deliverable — Address Unknown." Not only is it frustrating for us to see you not receive something you enjoy, it is also quite expensive for both HP and you. Every time your copy of KEY NOTES doesn't reach you, we have to pay at least \$0.25 to get it back, so we can know that your address is incorrect. Then it costs about \$1.00 to get it back to you. Needless to say, this is a total waste of funds and resources that can be better used to bring you more information, more pages, or more issues per year.

But we cannot keep your address current unless you inform us when you move. And because it is growing increasingly expensive to pay for "returned, undeliverable" KEY NOTES, we are faced with increasing costs that eventually must be passed on to you in order to keep KEY NOTES alive and growing bigger and better — and more often. Since you often mention in your letters that you'd like to receive KEY NOTES more often, here is your golden opportunity to bring that dream a lot closer. If you faithfully report your address changes, we can save a lot of totally wasted money, which in turn can be channelled into providing more benefits to you.

It's up to you. Less needless costs mean more helpful benefits. If everyone conscientiously helps to eliminate this expense, everyone will reap the benefits.

Entrepreneurs, Where Are You?

If software is not your *forte* or if you have not learned to program like a *virtuoso* or *virtuosa* and cannot create, literally, *glissandos* of creative code and cause the HP-41 to pour out *crescendos* of data or solutions, you are not playing our tune of the moment and need read no further.

If, however, you compose in a higher key or register, and if you have some *really good* programs that you think can make it into the HP PLUS program, we're finally in tune, and we can play some beautiful music together. (Don't laugh; it got *your* attention . . .)

Okay, what does the HP+ program do for you? First, *your* software is listed in a special section of the *Catalog* that is mailed to all members of the Users' Library and distributed through the HP Dealers; Second, we give *you* access to over 1500 HP Dealer outlets. That, my dear "composers," is distribution power that can put money in your pocket, a very welcome thought in these "uneconomic" times.

What does HP require from you? Easy — just good quality software. We want to hear those HP-41's "singing" all over the world. But we also want you to be ready to commit resources to selling and supporting your programs.

In what areas do we see opportunities? How about data management (with the cassette drive and extended memory)? How about time management, agriculture, remote data collection, medical applications, dental applications, navigation, sales? The list could go on and on, but it doesn't need to. What makes the *entrepreneur* special is that he or she goes into areas that no one ever dreamed of.

What do *you* see as the new areas? Are you playing our song? Can you "tickle that keyboard" and make the HP-41 "sing"? For more information on how HP PLUS can work for you, write:

HEWLETT-PACKARD CO.
1000 N.E. Circle Blvd.
Dept. 5360K
Corvallis, OR 97330 USA

The X<>F Function

Michel Walch of Ville D'Avray, France (though not in our atlas, we hear it's very close to Paris), requested that we elaborate a bit on the explanation of the X<>F function that appears on page 13 of the *HP-82180A Extended Functions/Memory Module Owner's Manual*. The following hypothetical example should clarify the general application of X<>F.

Joan Jones is creating an extensive program that will require the use of 20 flags. She is planning to submit this program to the Users' Library, and she knows that by using the peripheral flags (flags 11-20) as general purpose flags, she would be limiting the program's usefulness. Also, Joan's printer uses flag 12 and 13, her Video Interface uses flags 15 and 16, and she occasionally uses flag 17 to suppress the carriage return output to her HP-IL loop.

However, having recently purchased an Extended Functions/Memory Module (X functions), Joan is elated by the fact that the X<>F function is going to make the manipulation of these 20 flags very easy.

Joan's first move is to establish three blocks of eight flags each. She labels each flag with two numbers, as follows:

Block 0	Block 1	Block 2
(0,0)	(1,0)	(2,0)
(0,1)	(1,1)	(2,1)
(0,2)	(1,2)	(2,2)
(0,3)	(1,3)	(2,3)
(0,4)	(1,4)	(2,4)
(0,5)	(1,5)	(2,5)
(0,6)	(1,6)	(2,6)
(0,7)	(1,7)	(2,7)

This gives her a total of 24 flags, of which, 4 will not be used.

Initially, in her program, Joan would like flags (0,3), (0,5), and (0,6) to be set and all of the rest of the flags to be clear. This means, according to page 12 of the manual, that the initial numeric value for block 0 will be $8 + 32 + 64 = 104$. And, since all the flags in block 1 and block 2 are clear, the initial numeric value for block 1 and block 2 is zero.

Joan decides that register 00 will be used to store the numeric value for block 0 throughout the program. Likewise, register 01 will contain the numeric value of block 1, and register 02 will contain the numeric value of block 2. Initially, in the program, 104 is stored in register 00 and 0 is stored in both registers 01 and 02.

Early in the program, Joan wishes to test and perhaps change the status of a few of the flags in block 0. She uses the program lines RCL 00; X<>F. This places block 0 into the first 8 flags of her HP-41. Now, if she wishes to set flag (0,2) and clear flag (0,6) she uses the program lines SF 02; CF 06.

A little later in the program, Joan wishes to save block 0 and manipulate the flags in block 1. She uses the program lines RCL 01; X<>F; STO 00. Now, Joan's HP-41 flags 00 to 07 correspond to block 1 flags (1,0) to (1,7), and register 00 contains the updated numeric value of block 0. Joan's program can now easily manipulate flags in block 1. To set flags (1,0), (1,1), (1,5), and (1,7), she uses SF 00; SF 01; SF 05; SF 07. To set flag (0,2) if flag (1,4) is set, she uses CF 09; FS? 04; SF 09; RCL 00; X<>F; FS?C 09; SF 02; X<>F; STO 00.

Later in the program, when Joan wishes to access block 2, she uses RCL 02; X<>F; STO 01. This places block 2 in HP-41 flags 00 to 07 and updates the numeric value of block 01.

You can see from this simple example that the X<>F function provides the HP-41 user with an almost unlimited number of general-purpose flags. By sacrificing a few registers for blocks of flags (at 8 per) and a few bytes for moving these blocks of flags in and out of HP-41 flags 00 to 07, the possibilities are . . .

LBL 00
GTO 00

or, in other "words," endless.

More About HP-IL Control Operations

In the last issue (V6N2P10b) we reviewed the use of general HP-IL I/O functions. This is a continuation of that discussion.

FINDID

The FINDID function enables the HP-41 to locate certain types of devices in the interface loop. Using this feature, a programmer can design software to eliminate the user's concern about the order of connecting devices in the loop.

For example: A programmer is developing software to be used by nontechnical personnel. An HP 82165A GPIO Converter, that is connected to a parallel printer, has been implemented for page-formatted output. The programmer wants the user to be able to connect the loop in any legal configuration, without regard to device location. The FINDID command will allow this to be done by simply using this program sequence:

```
01 "HP82165A"  
02 FINDID  
03 SELECT
```

The first line places the I.D. of the desired device in the ALPHA register. The second line locates the specified device and returns the loop location to the X-register. The third line SELECT's the device at the location specified by the value in X. After these three short steps, the programmer may begin to accumulate data in the printer buffer or print ALPHA data.

The capability of the FINDID function to determine a device location by its device I.D. is termed "Device Identity" in official HP-IL parlance. Many devices on HP-IL, such as the HP 82161A Digital Cassette Drive and the HP 82162A Thermal Printer, respond to another type of code called "Accessory Identity" but do not respond to Device I.D. These devices are automatically found for you, without additional programming. The devices available today that do require you to SELECT them prior to communication are: the HP 82165A GPIO Converter, the HP 82166A HP-IL Converter, the HP 3468A Digital Multimeter, and the HP 82905B HP-IL 80-Column Impact Printer.

The search that is initiated by the FINDID function begins at the currently selected device. For example, if device 2 is the currently selected device and there are two HP 82165A GPIO Converters in the loop, one at location #1 and one at location #4, then a FINDID in search of a GPIO converter would return a 4 to the X-register.

INSTAT

This command allows the programmer to query the selected device as to its current status. From previous discussions we know how to find certain devices, and to SELECT any device. Each device has a status word (or words) that consists of one or more 8-bit bytes that may be accessed by the HP-41.

For example: Assume that the HP-41 has just displayed the message "TRANSMIT ERROR" after attempting a "READP." How can the exact problem be determined?

First, count around the loop from the HP-41 in the direction of the small (male) connector until you locate the cassette drive in question. Key-in, to the X-register, the location of the drive, then key: SELECT; INSTAT. This sequence selects the device specified in the X-register and brings the first, and only the first, status byte from that device into both the X-register and flags 0-7. Now, the X-register has the decimal representation of the first binary byte of status, and flags 0 through 7 are set or clear to the actual binary status of this byte. If, for instance, the X-register had the number 24, flags 3 and 4 would be set. An analysis of the flags shows:

128	64	32	16	8	4	2	1	Value
7	6	5	4	3	2	1	0	Flag
0	0	0	1	1	0	0	0	Status

Flag 3 = Value of 8

Flag 4 = Value of 16

Total of 24

Page 11 of the *HP 82161A Digital Cassette Drive Owner's Manual*, tells us that a status of 24 indicates a time-out error; no data detected on tape. That is, you may now conclude that your tape, or the data on the tape, is defective.

The duplication of the status message in flags 0-7 is an aid to the programmer. It provides an easy test for specific device status changes.

We Get Letters . . .

Someone recently asked me (your *Ed.*), "How many letters do you get? Do you really read *all* of them?" The answer to the first question is: I never counted them, but in 8 years, the total must be *very much more* than 10,000. And to the second question, the answer is: yes, every one of them — unless they are merely about a missing issue, just an order, or some such piece of clerical business. And I liked the wit, humor, and expertise evident in *this* one.

"Here is my little contribution to 'character building.' I thought possibly you folks at the Library and the readers of KEY NOTES might find it of some interest. I think it nicely illustrates the expanded graphics of the HP 82162A Thermal Printer.

NANTUCKET



"Perhaps I have opened a door through which others will follow: there may be a computer Picasso hiding somewhere, madly punching keys on his HP-41 and as yet undiscovered."

Robert L. (Keystroke) Gardner
Anamosa, Iowa

Potpourri

Here is a new column that you are going to find in all future issues. It will contain — as the name implies — a mixture of news and miscellaneous announcements to keep you up to date with what is happening in the world of personal calculators and computers.

PPC CONFERENCE IN UK

In the last issue (V6N2p15b), we reported that a users' group had been formed in England. The founder of that group, **David M. Burch**, recently informed us that he had a very gratifying response from the article. He also told us that this new group — now called PPC-UK — will hold a National Conference on Saturday, 9 October 1982, in central London for easy access for most areas of the country.

As an added attraction, **Richard J. Nelson**, founder of the PPC in Santa Ana, California, in 1974, will be on vacation in London and will attend this National Conference. If you can make it, don't miss any presentation he might make. He can make an HP-41 do things that are seemingly impossible!

Mr. Burch also now has his first Journal off the press and intends to publish eight times a year. The PPC-UK covers all of the United Kingdom, and overseas members are welcome.

For information about the National Conference or PPC-UK, contact:

David M. Burch/PPC-UK
Astage,
Rectory Lane,
WINDLESHAM, Surrey
GU20 6BW England
Phone: Home: 0278-75440

or
Chris Tossell
30 Kirkham Road,
Harrogate,
HG1 4EL England
Phone: Home: 0423-504148

NO MORE FACTORY ORDERS

If you didn't read V6N2p8a, "A Change is in Order," maybe you should. We are still rerouting factory orders or returning them. As of **June 1, 1982**, Corvallis Division will no longer accept direct-mail and telephone orders for calculators, handheld computers, and accessories. To order calculators and accessories in the future, please contact your local authorized HP Dealer. They should have stock on hand for immediate purchase. To locate your nearest HP Dealer in the continental United States except Oregon, please call toll-free (800)547-3400. In Oregon, Alaska, and Hawaii, call (503)758-1010.

If you do not live near an HP Dealer, you can order calculators and accessories through the HP Corporate Parts Center. They will accept purchase orders (\$20 minimum), checks, money orders, and cash. However, C.O.D., credit card, and telephone orders will not be accepted. Be sure to include a \$3.50 handling charge, plus your state and local taxes. Mail your orders to:

Hewlett-Packard Company
Mail Order Department
P.O. Box 7220
Mountain View, CA 94042

This notice and the above changes apply only to domestic orders. Neither Corvallis Division

nor the above Mail Order Department will handle orders from anywhere outside the U.S.

The Corvallis Users' Library will continue to accept and process orders for subscriptions (KEY NOTES and Library) and programs. But remember that the Library does not accept purchase orders for orders under \$20.

NEW CLUBS FORMED

If you live in or near Argentina and want to meet other HP-41 owners who enjoy programming, you can contact **Pablo Montoreano** at this address:

Beruti 2828 8° "B" (1425)
Cap. Fed. Argentina

If you live in or near France, you might be interested in a PPC Chapter that was recently started there by **Jean-Daniel Dodin**, who you can contact at:

77 rue du Cagire
31100 Toulouse, France

If you live in or near Norway, a new HP-41 users' group has been formed. This group is dedicated to HP-41 programming and intends to publish a member's journal every two months. For information, contact:

Norsk Data Samfunn
HP-41C(V) User Group
Tuengen Alle' 11
Oslo 3, Norway

It would be helpful to include a large self-addressed and stamped envelope when you write to any of the above clubs.

"BLACK" THERMAL PAPER

Some HP-91/92/97 owners have been using the newer HP 82175A Thermal Printing Paper that was designed ONLY for the HP 82143A and 82162A Printer/Plotters that are HP-41 peripherals. Using the new black thermal paper in your HP-91/92/97 will cause premature printhead wear. Use the HP 82045A paper that is specifically for these older calculators.

PENS FOR CARDS

Quite a long time ago, we reported that the Sanford Sharpie® #3000 soft-tip pen would do a good job of marking magnetic cards. Some time ago, **George M. Langdon** of Stamford, Connecticut, wrote about another Stanford pen, but we mis-filed his letter and only recently found it. He has had good luck with the #3500 Sharpie® *extra-fine-point market with 0.4mm hard plastic tip. It's available in black, red, green, and blue ink [and so is the #3000, now — Ed.]* and works very nicely on Mr. Langdon's cards. Thanks for the tip, Mr. Langdon; sorry about the delay.

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

NEW HP DEALER AGREEMENT

Earlier this year, Hewlett-Packard and Computerland Corporation entered into an agreement for Computerland stores to market HP's personal calculators, computers, and associated peripheral products. Computerland is the world's largest chain of computer stores, with over 250 stores in the U.S. and 300 worldwide.

Now, in addition to all our former HP Dealers, you have many places in which to see and actually use the HP Series 80 Personal Com-

puters, peripherals, and accessories. Computerland and other dealers that market the Series 80 products also will carry the new HP-75 Portable Computing System.

HOW TO SAVE MONEY

If you use your personal programmable calculator or personal computer — handheld otherwise — to advance yourself in your job, position, or business, make sure you check with your tax accountant about declaring it — and any software, books, or accessories you buy for it — as a tax deduction. It is very probable that you can save quite a bit of money, as this is a perfectly legal deduction if you qualify. Check your income tax instructions for both State and Federal rules.

ERSATZ PROGRAMMING!

Synthetische Programmierung auf dem HP-41C/CV is a translation in German of the book written by Dr. William C. Wickes (references: V6N1p7c; V5N3p10a; V4N3p8). So if you live in Germany or if you speak and read German better than English, you probably will be delighted to hear of this translation.

The translator was **Deutsch von Heinz Dalkowski**, and he did an absolutely marvelous job, making many good improvements and even fixing some errors. These 150 pages are essential if you are interested in this subject.

Look first for the book at your local bookstore. If that fails, or if you live outside of Germany, write to the following address for more information. The price in Germany is 30 DM.

**Heldermann Verlag Berlin
International Bookshop
Herderstr. 6/7
D-1000 Berlin 41**

HAPPY BIRTHDAYS!

Did you know that August marks the Eighth Anniversary of KEY NOTES (originally HP-65 KEY NOTE)? The first issue was 8 pages, and 16,000 copies were printed; however, we had "left-overs" for 7 years! Since then, we've had print-runs as high as 208,350 copies (V5N3). In 8 years, nearly 2 million copies have been distributed all over the world. (Back issues are currently available back to V3N3; see page 15.)

Also, the HP-41 was 3 years old on July 16. It is hard to believe that 37 months have come and gone since then. And, no, I'm not permitted to tell you how many there are in the world today. But the word "many" comes to mind!

APOLOGY & CORRECTION

In the last issue (V6N2p3c), the author of the beautiful program, "The Ultimate Calendar — A.D. and B.C. #01593C," was erroneously listed as **William Hutchins** of Los Angeles, California. Sorry for the error **Mr. Hitchins**; we apologize for misspelling your last name.

(Do you have any news for this column? Send it to us for consideration. We will print all information that may be of use to our readers — Ed.)

NOTE: The users' groups and clubs mentioned above are not sponsored, nor in any way officially sanctioned, by Hewlett-Packard.

Feedback

This new column contains reader feedback about articles or routines that appeared in previous issues. Though much of the information presented here is useful on its own, you will find that it is a good idea to have your library of KEY NOTES handy while reading this column.

Weimar, California is the birthplace of this comment from **G. Robert Harvey**. This is a *time-saving, bytesaving tip*.

(V5N2P11c) (41) Even shorter than the "GTO U" instruction (suggested by John O'Shannessy to return fast execution to the top two rows of keys) is simply CF 27. This can be placed as the last command before the RTN or END command in the program. The program global pointer is thus still within the last-run program so that restarting the last-run "user" program again requires only [RTN] [R/S].

As CF requires only 2 bytes and GTO "U" requires 3, 1 byte is saved per program. Also, the 8 bytes required for the short (LBL "U", END) program are not used.

The mention of Seattle, Washington, brings to mind the street musician playing clarinet against the harmonizing call of the seagulls that hover over the waterfront marketplace. Seattle is the home of **Chuck Dinsmore** and an HP-IL system. Here's his input.

(V6N2P9b) (41) The article regarding the sending of 8 data bits gives the clue on how to set the new printer to PARSE mode and how to create a byte value greater than 127. The sequence CLX; ENTER; 1; BLDSPEC: 124; BLDSPEC is used to create byte value 252 by those who don't own the Extended Functions/Memory Module. Those who do own the X-Functions Module simply use 252; XTOA. Values less than or equal to 127 can be created by using BLDSPEC directly. When the byte sequence is built and placed in the ALPHA register, SF 17; OUTA may be executed. Here is a listing of a small routine to set the new printer to PARSE mode. Many thanks for all the valuable information given to us in HP KEY NOTES.

```
01+LBL "PARSE" 15 49
02 CLA 16 XEQ 01
03 CLX 17 72
04 ENTER↑ 18 XEQ 01
05 1 19 SF 17
06 BLDSPEC 20 OUTA
07 124 21 CLA
08 XEQ 01 22 ADV
09 27 23 RTN
10 XEQ 01 24+LBL 01
11 38 25 BLDSPEC
12 XEQ 01 26 ARCL X
13 107 27 CLX
14 XEQ 01 28 END
```

(If you have more than just the printer in your HP-IL system, be sure to place the device address of the printer in the X-register and execute SELECT before OUTA is encountered in the program. Mr. Dinsmore's letter came to us printed on HP-41 printer paper. None of the

words were broken at the end of the line, so we assume he used — you guessed it! — PARSE mode — Ed.)

Jeffrey Smith, of La Palma, California, is a regular contributor to HP KEY NOTES. Here is his improvement on a routine that appeared in the last issue. His additions add to the utility of the routine.

(V6N2P12b) (41) The routine submitted by **W. A. C. Mier-Jedrzejowicz** is very good but, just to be safe; flag 22 should be cleared before the PROMPT, and then tested immediately afterwards. If the flag is still clear, then you can assume that there was no entry and that the stack was not lifted. I have inserted lines 04, 05, 06, and 07; this has the added benefit of re-using the value that was in register nn when there is no entry.

```
01 X<>nn ; Save X-register
02 RDN ; Prepare for stack lift
03 "message" ; User's prompt
04 CF 22 ; Assume no entry
05 PROMPT ; Permit input
06 FC?C 22 ; Only [R/S] pressed?
07 Rt ; Then lift the stack
08 X<>nn ; Save new or old value
```

Denmark is divided into fourteen counties plus the communities of Copenhagen and Frederiksberg. Fyn is one of those counties and its capital city is Odense, the home of **Kim Grun**, who contributed this routine.

(V5N3P13a) (41) The dual temperature conversion routine by **Alan Marcus** uses 63 bytes of program memory plus 4 data registers (this makes a total of "91 bytes"). My version uses only 57 bytes of program memory and no data registers. It works in the same manner as the one of Alan Marcus: the program prompts for the temperature to be converted and displays the dual answers labeled with F and C. Additional data entries followed by R/S skip the "TEMP?" prompt.

```
01+LBL "TEMP" 14 CLA
02 FS?C 22 15 ARCL X
03 GTO 01 16 "F "
04 FIX 1 17 X<>Y
05 "TEMP?" 18 LASTX
06 PROMPT 19 -
07+LBL 01 20 1.8
08 ENTER↑ 21 /
09 ENTER↑ 22 ARCL X
10 1.8 23 "C"
11 * 24 CF 22
12 32 25 AVIEW
13 + 26 END
```

(Note that, for both this routine and Alan Marcus' routine, only one of the resulting answers will be meaningful. For instance, if you wish to convert 56 degrees Fahrenheit to Celsius, input 56, run the routine, and the calculator will display: 132.8F 13.3C. Since the input was in Fahrenheit, the meaningful answer is in Celsius, or 13.3C. If the input was in Celsius to be converted to Fahrenheit, the meaningful answer would be the one labeled F. This method of disregarding input units is probably quite effi-

cient for such shorter conversions. Don't forget to key in the two spaces after the F in line 16 — Ed.)

Now, we have this comment from **Cicero Brilho**, of Sao Paulo, Brazil.

(V5N3P12a) I refer to Mr. Waldi's contribution to introduce a German word "Quersumme" and the small program to compute it with the HP-67/97.

I adopted that program to my HP-34C to find out which numbers are equal to the Quersumme of their square, cube, . . . , double, triple, etc. I found that Mr. Waldi forgot in the first case (square) the logic zero and in the second case (cube) he forgot the number 18 and also the logic numbers zero, -1, -8, -17, -26, and -27.

On a pair of dice, there are 36 separate combinations that can result from 1 toss. Of those combinations, 6 give a value of 7 [(6,1) (5,2) (4,3) (3,4) (2,5) (1,6)]. This means that the probability of getting a 7 for 1 roll of a pair of dice is 6 in 36 or 1 in 6; thus, $p = 1/6$. That was easy. However, what are the chances $P(k)$ of getting exactly 5 ($k = 5$) 7's in 23 ($n = 23$) tosses of a pair of dice? **Robert Swanson**, of Portland, Oregon, may have the answer.

(V6N1P11a) (41) "BIPROB" is a stack solution for the Binomial Probability Distribution. Just key in n , [ENTER], p , [ENTER], k , XEQ "BIPROB." In about two seconds, see $P(k)$ displayed. Warning: n and k must be non-negative integers. Ranges: $0 < n < 70$; $0 \leq k \leq n$; $0 < p < 1$. (Excluding the label and RTN, this routine is six lines and 5 bytes shorter than Serge Drogi's similar routine.)

```
01*LBL "BIPROB" 13 X<>Y
02 SIGN 14 ST- L
03 X<>Y 15 X<> T
04 ST- Y 16 LASTX
05 LASTX 17 Y↑X
06 Y↑X 18 LASTX
07 LASTX 19 FACT
08 FACT 20 /
09 ST/ Y 21 *
10 X<> L 22 *
11 R↑ 23 END
12 FACT
```

Next, we offer this comment from **Frank Harrison**, of Paris (we assume that's France).

(V6N2P8c) (41) In the article, "Linear Interpolation on the HP-41", it should be noted that this routine can also be used for extrapolation.

Proof can be obtained from the example given, by substituting the position of 1.75 and 1.58, using the answer given for $T(C)$ of 200.7008 at 1.58. The new answer will be 205.76.

**IS YOUR ADDRESS
BEING UPDATED?
(See page 7c.)**

Routines, Techniques, Tips, Etc . . .

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

There are many prolific HP-41 fans in Australia. The following routine comes from one of those fans. The routine is an interesting concept and you will be the judge of its utility. It was contributed by **Peter Lichtenberg** of Darwin, Australia.

(41) This is a routine to detect input errors of data pairs (X, Y), by using a double entry technique. I am applying it in surveying where coordinates are the data. Because many of my programs use this routine, I use the global label "IN" and, for fast access, position the routine at the end of program memory. It works as follows:

```
01*LBL "EXAMPLE"
02*LBL 00
03 *P Y↑X ?*
04 PROMPT
05 XEQ "IN"
06 FS?C 00
07 GTO 00
08 .
09 .
10 .
11 END
01*LBL "IN"
02 X<> T
03 X*Y?
04 GTO 01
05 RDN
06 RDN
07 X*Y?
08 GTO 01
09 RDN
10 RTN
11*LBL 01
12 "ERROR"
13 CF 21
14 RVIEW
15 PSE
16 SF 21
17 SF 00
18 RTN
```

At line 04 of "EXAMPLE," input the two values twice, in this manner: Y [ENTER] X [ENTER] Y [ENTER] X [R/S].

By inserting, after line 11 of "IN" — 1; ST+ 01; ST+ 02 — and then, after line 08 — 1; ST+ 01 — you will find in register 01 the number of executions of "IN" and in register 02 the number of errors. With this record, I found that 3% of my inputs were wrong, even though I was using the correction key.

Next, we have a routine contributed by **James Glass**, of Sherman Oaks, California. Those with a Time Module will be able to make good use of this routine.

(41) This routine, AUTOCLK, is handy if you want your HP-41 to "wake up" displaying the clock (of course, this assumes you have the Time Module installed). The program lets you turn off the calculator, then turn it on again, and still have the clock active. To clear the clock display, just press the back-arrow key.

```
01*LBL "AUTOCLK" 05 SF 11
02 SF 11 06 CLOCK
03 OFF 07 GTO 01
04*LBL 01 08 END
```

With his letter, Mr. Glass included his version of the ADOW routine shown on page 74 of the Time Module manual. His routine made use of the Extended Functions Module to save 1 byte over the original version. Taking his idea, we were able to change a few lines to save a few more bytes. So, here is another, slightly modified, contribution from **James Glass**.

(41) This routine makes use of extended functions to shorten the ADOW routine. If the day number is not needed in the X-register, line 09 may be deleted, and if the display of the day name is not required, line 13 may be deleted.

```
01*LBL "ADOW" 08 AROT
02 "SATFRITHUWEDTUE" 09 LASTX
03 "MONSUN" 10 ASHF
04 -3 11 ASHF
05 DATE 12 ASHF
06 DOW 13 RVIEW
07 * 14 END
```

In past issues of KEY NOTES we have published several routines to "guard" the HP-41 from use by people unfamiliar with its workings. This next contribution is along those same lines. It was contributed by **Walter Bican**, of Vienna, Austria.

(41) I found another method, that needs no program lines at all and scarcely uses any storage room, to prevent others from fooling around with my HP-41. It goes like this:

Switch to ALPHA, clear ALPHA, and ASTO the cleared ALPHA in the X-register.

If any flags are visible (for example, USER), clear them. Turn off the calculator.

Now, if anybody turns on the HP-41, there is nothing to see. In the case that this person presses the ON key several times, the result is the same. Eventually, this person will assume the calculator is ruined and will leave it alone. The worst that can happen is that the HP-41 will turn itself off after 10 minutes.

(Of course, we who know better, know that entering any number or pressing the correction key will put the HP-41 back in business — Ed.)

What are the advantages of the HP-35 over the HP-41? Well, **Richard Partridge**, of Princeton, New Jersey, can name one.

(41) There are times when I want my HP-41 to display all significant figures, yet suppress trailing zeroes — in other words, to act like an HP-35. There are several ways to do this, none of them simple or elegant. The enclosed routine is the best I have found.

```
01*LBL "HP-35" 09 10
02 8 E-3 10 *
03 X<>Y 11 ISG Z
04 ENTER↑ 12 GTO 01
05*LBL 01 13*LBL 02
06 FRC 14 FIX IND Z
07 X=0? 15 X<>Y
08 GTO 02 16 END
```

(Continued)

We recently received two letters that were somewhat complementary. The first letter was from **P. G. Glockner**, who lives in Calgary, Alberta, Canada. Mr. Glockner was interested in finding the most convenient method of accessing registers greater than 99 for the storage and retrieval of data. The second letter came from a Biology student by the name of **Christopher Lafoiet**, who lives in Buie's Creek, North Carolina. Maybe, Mr. Lafoiet's routine is just what Mr. Glockner is looking for.

(41) I am a student in Biology, and I find that in Biometry I have to use registers higher than 99 to store varied numbers from the keyboard. In response to this problem, I wrote a routine that I think would qualify for your "Routines, Techniques, Tips, Etc." column and could be used by those who have loads of data to manipulate. The STOL routine is assigned to the STO key, and RCLL to the RCL key.

```
01*LBL "STOL"      10*LBL "RCLL"
02 X<> L          11 X<> L
03 RDN            12 RDN
04 "STO----"      13 "RCL----"
05 AVIEW          14 AVIEW
06 PSE            15 PSE
07 X<> L          16 X<> L
08 STO IND L      17 RCL IND L
09 STOP           18 END
```

Milli, micro, nano, pico — if these prefixes have a familiar ring, then you will be interested in the following technique. It was submitted to **KEY NOTES** by **Ed Keefe**, of Ankeny, Iowa. The Extended Functions Module is required to implement this technique.

(41) To establish a FIX-ENG display format (displayed numbers overflow and underflow into ENG notation rather than SCI), do the following:

ENG n; RCLFLAG; FIX n; 41.043; STOFLAG.

This will result in both flags 40 and 41 being set. This display format is favored by some electronic technician students. To save this display (plus the status of all the rest of the flags), use RCLFLAG and then store the resulting ALPHA data. The FIX-ENG mode may then be restored by recalling the ALPHA data into the X-register and executing STOFLAG.

Michael D. Daniels recently wrote to us but didn't write his address on the letter. The envelope was separated from the letter and therefore we have to assume he lives in Anytown, U.S.A. Though we don't know where he lives, we do know that he owns an Extended Functions/Memory Module and that he uses this routine.

(41) While using my new Extended Functions/Memory Module, I came across the need to read a program from cards into extended memory. I have found this routine to be very helpful.

To use this routine, one must first press GTO . . . , then key in "REX". This makes it the last routine in memory. XEQ "REX," enter the name of the routine to be put into Extended Memory, and that's it! The routine

first stores the named program in main memory so there must be room. This routine also destroys the T-register but leaves X, Y, and Z alone.

```
01*LBL "REX"      09 CF 21
02 "NAME?"       10 AVIEW
03 AON            11 RSUB
04 STOP           12 ASHF
05 AOFF           13 SAVEP
06 ALENG          14 PCLPS
07 "ENTER "      15 RDN
08 AROT           16 END
```

(Be sure to key that blank space in line 07 — Ed.)

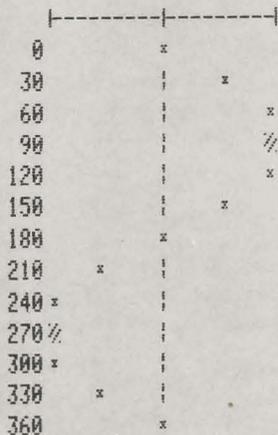
Over in Germany, **Walter Holl** is making good use of his HP-41 and Printer. Mr. Holl lives in the small town of **Nauheim**. Here's his routine.

(41 with Printer) The PRPLOT routine does not distinguish between y-values that are outside the selected plotting range (YMIN . . . YMAX) and those y-values that are equal to YMIN or YMAX, respectively. This can result in a misinterpretation of a graph. The following routine avoids this problem by printing an "invalid-symbol" if y exceeds the limits of the plot. To use the routine, simply add XEQ "<>" after the y-value is calculated in the function to be plotted. The sample printout shows a plot of the function $y = \sin(x)$.

```
01*LBL "<>"       09 STO 03
02 RCL 00         10 RDN
03 X>Y?          11 RTN
04 GTO 00         12*LBL 00
05 CLX           13 "DDDDDD"
06 RCL 01         14 ASTO 03
07 X<Y?          15 END
08 GTO 00
```

```
01*LBL "SIN<X>"
02 SIN
03 XEQ "<>"
04 END
```

```
PLOT OF SIN<X>
X <UNITS= 1> ↓
Y <UNITS= E-1> +
-9.00          9.00
          0.00
```



Now, let's journey to the "Big Apple," where the bright lights and the beautiful sounds offer round-the-clock entertainment to Miss Liberty. Ah, New York City, the home of **Dr. Keith Bernstein**, who owns an HP-41, a Printer, and an Extended Functions Module.

(41?) I have been an HP-41 user for the past ten months. I think the system is great, but I have been unhappy with one feature: the inability to specify formatted fields in the accumulation of fixed numbers with the 82143A Printer. With the addition of the 82180A Extended Functions/Memory Module, I have solved this problem with a simple subroutine titled "FA" (Formatted Accumulation). It requires an HP-41, the 82180A Module, and a Printer.

First, the user inputs the total number of places in the field, remembering to include the radix, possible separators, and any extra spaces to the left of the first printed digit to separate it from the left margin or a previously accumulated field. Then the user specifies the condition of flags 28 and 29 and fixes the number of decimal places. Finally, the number to be accumulated is placed in the X-register by a PROMPT or a register recall, then "FA" is executed.

The result of the use of this subroutine is that the right-most digit and/or decimal point will always lie in the same column, making clear and easy-to-read printouts. I enclose a copy of the subroutine, a printing routine ("DEMO") that uses "FA," and a sample printout from "DEMO" with 4-, 11-, and 5-place fields.

```
01*LBL "FA"       09 XEQ "FA"
02 CLA            10 11
03 ARCL X         11 FIX 1
04 ALENG          12 SF 29
05 CHS            13 "11 PLACES"
06 RCL Z          14 PROMPT
07 +              15 XEQ "FA"
08 SKPCHR         16 5
09 ACP            17 FIX 0
10 END            18 CF 29
```

```
19 "5 PLACES"
20 PROMPT
21 XEQ "FA"
22 PRBUF
23 END
01*LBL "DEMO"    20 PROMPT
02*LBL A          21 XEQ "FA"
03 4              22 PRBUF
04 FIX 0          23 END
05 SF 28         456 7,269.1 12
06 CF 29         2 95,216.6 748
07 "4 PLACES"   4029 12.0 6
08 PROMPT        63 464.9 15
```

Here's another routine for use with the Extended Functions/Memory Module. The author of this routine is **Michael Edwards**, who is a student of engineering computer science at the University of Illinois, in Urbana, Illinois.

(41) This is a routine that finds the amount of space available in an Extended Memory ASCII file. It could be easily converted to a subroutine by omitting lines 2 through 7 and 24 through 32, and by changing line 20 to RTN. The routine returns, to

the X-register, the number of available bytes in the file that is named in the ALPHA register.

```

01*LBL "FLEFT" 17*LBL 00
02 FIX 0 18 GETREC
03 CF 29 19 FC? 25
04 "FILE NAME?" 20 GTO 01
05 AON 21 ALENG
06 STOP 22 -
07 AOFF 23 GTO 00
08 0 24*LBL 01
09 SEEKPTA 25 CLA
10 FLSIZE 26 ARCL X
11 7 27 "+ BYTES LEFT: "
12 * 28 ARCL Y
13 ASTO Y 29 ARCL Z
14 ASHF 30 AVIEW
15 ASTO Z 31 FIX 4
16 SF 25 32 SF 29
33 END

```

Lately, we have received a number of routines to round-up (in absolute value) any number (for example, -0.2 becomes -1.0 and 0.2 becomes 1.0). The shortest one that came through the mail had a body (excluding the LBL and END) of 13 bytes and it was from **Bulend Aktay**, of Stuttgart, Germany. Now, 13 bytes isn't bad. However, we were not wholly convinced that rounding-up a number was a function that should occupy more than 1 register of memory. So, three of us, **Chris Coffin** and **Harry Phinney**, of Customer Support, and your technical editor, put our heads together to come up with the shortest sequence of program lines to perform this function. INT: LAST X; FRC; X≠0?; SIGN; +; was our conclusion. That's two bytes apiece for a total of six bytes. The T and L stack registers are changed.

We are quite convinced that this is the most streamlined sequence for rounding-up a number in absolute value while maintaining the same sign (+ or -). However, we will welcome, and probably publish, any routine of 5 bytes or less that performs this same function.

Here's a tip from **John Ioannidis** of Athens, Greece.

(41) END functions much more identically to RTN than you have mentioned. In fact, executing END from the keyboard will result in the line pointer being positioned to the beginning of the program (line 00), just like RTN or GTO.000.

Next, we have a routine that was contributed by **Robert Greenberg**, of Tucson, Arizona.

The routine is designed for use with the printer, but the first portion of the routine (through line 18) can be used without the printer.

(41) I often have a need to see a plot of the values contained in a block of storage registers. For example, as a hydrologist I'm often confronted with having a block of storage registers containing a hydrograph's coordinates and a need to see the plotted hydrograph.

"SP" determines the extrema (the maximum and minimum values) of a specified

block of data registers. Using these values as the YMAX and YMIN constraints, "SP" then plots the contents of the block of data registers. "SP" assumes a full plot width of 168 (line 22) and a constant X interval.

Lines 01 through 18 may be used alone (followed by an END or RTN) to determine the extrema without plotting. The maximum and minimum values will be contained in the X and Y registers, respectively.

When "SP" is used in its entirety, it will plot data with the axis at 0 if YMIN < 0, otherwise the axis is placed at YMIN. After execution, the maximum and minimum values are recoverable in the Y and Z registers, respectively. "SP" uses no data storage registers, only the stack so it will plot any block of data registers.

```

01*LBL "SP" 16 X<>Y
02 STO L 17 ISG L
03 I E99 18 GTO 00
04 ENTER† 19 RCL Z
05 CHS 20 SIGN
06*LBL 00 21 RDN
07 RCL IND L 22 168
08 X>Y? 23*LBL 01
09 STO Y 24 RCL IND L
10 RDN 25 RDN
11 X<>Y 26 STKPLT
12 R† 27 ISG L
13 X<Y? 28 GTO 01
14 STO Y 29 END
15 RDN

```

To use, input a control number (iii.fffcc) similar to that used by the ISG and DSE functions where:

iii: is the lowest-numbered register in the data block

fff: is the highest-numbered register in the data block

cc: is the increment value (if cc is not specified, cc = 01 is assumed)

Example Input: 7.01903, XEQ "SP", will find the extrema and plot the contents of registers 07, 10, 13, 16, and 19.

Firenze, Italy, is the home of **Curzio Rositani**, who contributed this next tip. Anyone who has struggled with the development of a program that manipulates a variable-size matrix will appreciate Mr. Rositani's effort.

(41) I am suggesting a simple algorithm, that could be useful to people faced with the problem I have been faced with: the matter of handling matrix indices with the HP-41. I had to find the relationships between the indices themselves. This is not an elementary problem when working with a variable dimension matrix A_{ij} .

The general condition that relates the data-register number of an element to the indices of that element as it would be stored (by columns!) in the matrix A_{ij} follows:

VARIABLE DEFINITIONS:

u: The order of the matrix (number of rows).

a: The data-register number where A_{ij} is stored.

i: Index of row.

j: Index of column.

P_{ij} : The data-register number where A_{ij} is stored.

$$P_{ij} = a - 1 + u(j - 1) + i$$

$$i = [(P_{ij} - a) \text{ MOD } (u)] + 1$$

$$j = \text{INT} \left(\frac{P_{ij} - a}{u} \right) + 1$$

(Be sure to note that Mr. Rositani is storing his matrices in columns. That is, a 2 by 3 matrix would be stored in this manner:

$A_{1,1}$ — Register (a)

$A_{2,1}$ — Register (a + 1)

$A_{1,2}$ — Register (a + 2)

$A_{2,2}$ — Register (a + 3)

$A_{1,3}$ — Register (a + 4)

$A_{2,3}$ — Register (a + 5)

If you feel more comfortable storing your matrices in rows, that is:

$A_{1,1}$ — Register (a)

$A_{1,2}$ — Register (a + 1)

$A_{1,3}$ — Register (a + 2)

$A_{2,1}$ — Register (a + 3)

$A_{2,2}$ — Register (a + 4)

$A_{2,3}$ — Register (a + 5),

then you can still use Mr. Rositani's equations, but u becomes the number of columns, i becomes the index of the columns, and j becomes the index of the rows — Ed.)

Book Reviews

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

HP-41 RESERVOIR ENGINEERING MANUAL, by **D. Nathan Meehan** and **Eric L. Vogel**, is a new book just released by PennWell Books, a division of PennWell Publishing Company and a producer of many fine books about the petroleum industry.

D. Nathan Meehan is the district engineer in Champlin Petroleum Company's South Texas District in Corpus Christi. He has held a variety of reservoir and production engineering positions in Denver, Oklahoma City, Houston, and Fort Worth, including his most recent assignment as a project supervisor in Champlin's corporate planning and economics and acquisitions groups. Meehan received his BS degree in physics from the Georgia Institute of Technology and his MS degree in petroleum engineering from the University of Oklahoma. While at O.U., he

studied as a Mining and Mineral Fuel Resource Conservation Fellow and received the Henry DeWitt Scholarship for graduate study in mineral fuels. He has published dozens of articles dealing with enhanced oil recovery, reserve evaluation, and fluid properties and is a registered professional engineer.

Eric L. Vogel is a research and development project leader for business application software at Hewlett-Packard's Corvallis Division, which manufactures the HP-41 calculator. He worked part-time for Hewlett-Packard as an undergraduate at Oregon State University, where he received his BS degree in mechanical engineering in 1978. He joined Hewlett-Packard on a permanent basis in 1980 after working as a technical writer for a Corvallis-based software house. His most recent project with Hewlett-Packard is the *HP-41 Petroleum Fluids Pac*.

The HP-41 Reservoir Engineering Manual is a 364-page hardbound book (with dust cover) that contains the most comprehensive set of reservoir engineering programs available for the unique capabilities of the HP-41 handheld computer. Thirty-two practical programs will solve complex reservoir engineering problems, including: decline curves; oil and gas material balance; water influx; static and flowing bottom-hole pressures; gas deliverability; pressure buildups and drawdowns; waterflood performance; well logging; and discounted cash flow analysis.

The book's programs provide accurate performance estimates and forecasts by calculating fluid properties at current reservoir conditions for each step of the analysis. This is made possible only by using the HP 00041-15039 *Petroleum Fluids Pac*, which is required for the programs in the book.

Each program includes an overview, equations, examples, user instructions, and program listings. All programs work equally well with and without a printer. The last section of the book contains bar code for all the programs.

The contents are: Oil, Gas, and Water PVT Properties; Decline Curve Analysis; Volumetric Calculations and Reserves; Material Balance; Natural Gas Engineering; Pressure Transient Analysis; Waterflooding; Well Log Analysis; Economics; and Bar Code.

Although this book is not everybody's cup of tea, it definitely is an invaluable tool for any practicing reservoir engineer. The price is \$60* and it is available as follows:

In Japan, Hong Kong, Korea, Southeast Asia, and Australia, write to:

Warren Ball
Intercontinental Marketing Corp.
IPO 5056
Tokyo, Japan 100-31

In the U.S., Canada, South America, Europe, etc., write to:

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CURVE FITTING FOR PROGRAMMABLE CALCULATORS, by William M. Kolb, is a 125-page, spiral-bound book in 8.5 by 11 inch format (21.6 by 28 cm), and just off the press.



And if you are even remotely interested in curve fitting, this is the book for you. Long-time readers of KEY NOTES also will recognize the author's name as a long-time contributor to these pages (most notably, his article, "On Understanding Flags, "V1N3 p4).

The book provides all of the essential information needed to fit data to the most common curves. It avoids the usual mathematics and presents, instead, straightforward solutions that can be used with most calculators.

Basically, the book is a collection of curve-fitting formulas intended to help anyone who must occasionally perform data analyses. These formulas can be used to find a specific model for your data, or as a guide in choosing among several possible models. While not exhaustive, the book does include a comprehensive collection of the most useful one- and two-variable models.

The equations for these models are for scientific calculators and, if your calculator has fewer than 100 registers available, you may need to change register assignments before using the formulas. A positive asset in this book is the fact that register numbers are used consistently throughout, so that you can easily go from one model to another. Furthermore, another nice touch is that graphs of the various equations are provided to help select an appropriate model, and sample problems are included to assist in debugging programs.

There are three major parts. The first is a general discussion of curve fitting, and it is intended as a primer for beginners. Part II contains various statistical models and also the calculations necessary for estimating the coefficients. Part III is a series of appendixes that will help you program these models and even develop new ones.

One particularly neat piece of work in this book is the HP-41 program and bar code in the appendix that automatically fits 19 of the curves. The program displays the equation being fitted, computes the coefficients and adjusted coefficient of determination, and calculates the fitted value of Y for a given X. Data can be entered or deleted at any time. Also, a user-friendly input routine will handle such problem cases as zeros and negative numbers without "crashing" or stopping the program.

(Very, very neat, Bill! — Ed.)

As a final touch, all figures that are used to illustrate the text were drawn on an HP-85 Per-

sonal Computer, using a modified version of the HP-85's Standard Pac. The cover design also was done on an HP-85, using a program developed by the author.

The price of this fine book is \$14** postpaid anywhere in the U.S. or Canada, and \$17** postpaid to all other countries. Mail your orders to:

IMTEC
P.O. Box 1402
Bowie, MD 20716 U.S.A.

THE HP-IL SYSTEM: An Introductory Guide to the Hewlett-Packard Interface Loop, by Gerry Kane, Steve Harper, and David Ushijima, is a new soft-cover (paperback), 106-page book in 7.3 by 9.1 inch format (18.5 by 23 cm).

Two of the authors of this book are professional writers assigned by the publisher to help the third author, Steve Harper. Mr. Harper has worked for Hewlett-Packard about 10 years and is presently serving as R&D project manager for HP-IL interfacing. He was involved in the final stages of the design of the HP-IL integrated circuit and the HP-IL protocol, and is named as a co-inventor on one of the HP-IL patent applications. He graduated from Brigham Young University in 1972 with an MS degree in electrical engineering.

Chapter 1 is an introduction of what the Interface Loop is, how it works, and what it does. In Chapter 2, you will learn how to configure a loop, from the simplest system using present peripherals to the more complex systems that include devices that do not have an HP-IL interface. Included are many, many diagrams and information on how to build a device interface.

From here on, the book gets into more detail, because more detailed knowledge of the loop system is a very necessary requirement if you plan to configure complex or custom-designed systems. Chapters 3, 4, and 5 introduce and cover the topic of HP-IL messages, and how they are used in a typical loop system. These chapters enable you to familiarize yourself with the HP-IL message structure. Messages are also listed in a glossary at the end of the book, plus, a brief summary of the way messages are organized and classified appears in appendix A.

Those interested in the design of HP-IL compatible equipment will find a basic hardware interface explained in chapter 4. Then, the details of the HP-IL functional specification necessary to begin designing an interface are introduced in chapters 6 and 7.

In all, a lot of information about the Interface Loop, but it is well segregated for the novice and the professional. If you intend to really apply the HP-IL system, you surely should read this book. It is priced at \$16.99** and can be obtained as follows: In the U.S., call (800)227-2895 for charge-orders, or write to:

OSBORNE/McGraw-Hill
630 Bancroft Way
Berkeley, CA 94710

In areas outside the U.S., write to the above address or check at your local bookseller's store. Orders from outside the U.S. will probably have added postage and handling charges. ➔

EduCALC Mail Store at 27963 Cabot Road; South Laguna, CA 92677 U.S.A. is another excellent source for calculator-related books, including those reviewed above. For an order form and a complete list of the well-over-50 different books they carry, write to the above address, and you will receive prompt service. Because they distribute books all over the world, those of our readers who have had trouble obtaining calculator-related books in the past now have a dedicated dealer who will respond to their orders.

PI A La Mode!

You might not find gold or silver anymore in the hills around Jerome, Arizona, but you will find a goldmine of ideas from **Stephen H. Lohr**. Here is a neat trick — or a puzzle — he sent to us for HP-41 owners. It will also work on HP-65/67/97 calculators.

From a Master Clear state, and without using the 0 and 9 keys or the [I] key, and with the fewest possible keystrokes, how do you get pi in the display?

Because it is too easy to just look at the answer before you try to figure it out, we've "hidden" the answer somewhere in this issue. And — we've added *our* answer, which uses *less* keystrokes than Mr. Lohr's answer.

A Key Birth, a Notable Birth

The first HP-65 KEY NOTE (the predecessor to KEY NOTES) was printed near the end of July, 1974. This means that, as of this issue, KEY NOTES is officially 8 years old. So, let's light 8 candles and program the following routine into our HP-41's. You may NOTE that the song is a bit off-KEY. All the credit for the routine goes to its contributor, **George Flushing**, of Boyton Beach, Florida. You can customize this routine to liven up any birthday party by changing line 28 to the celebrator's name and line 66 to the respective birthdate.

```

01+LBL "HPY"
02 CF 21
03 " HAPPY"
04 ASTO 00
05 " BIRTH"
06 ASTO 02
07 " DAY"
08 ASTO 03
09 " TO"
10 ASTO 04
11 " YOU"
12 ASTO 05
13 XEQ 01
14 XEQ 02
15 XEQ 01
16 XEQ 03
17 VIEW 00
18 TONE 1
19 VIEW 00
20 TONE 1
21 VIEW 02
22 TONE 8
23 VIEW 03
24 TONE 6
25 " DEAR"
26 AVIEW
27 TONE 4
28 "KEY NOTES"
29 AVIEW
30 TONE 3
31 TONE 2
32 TONE 2
33 VIEW 00
34 TONE 7
35 VIEW 00
36 TONE 7
37 VIEW 02
38 TONE 6
39 VIEW 03
40 TONE 4
41 XEQ 03
42 GTO 04
43+LBL 01
44 VIEW 00
45 TONE 1
46 VIEW 00
47 TONE 1
48 VIEW 02
49 TONE 2
50 VIEW 03
51 TONE 1
52 RTN
53+LBL 02
54 VIEW 04
55 TONE 4
56 VIEW 05
57 TONE 3
58 RTN
59+LBL 03
60 VIEW 04
61 TONE 5
62 VIEW 05
63 TONE 4
64 RTN
65+LBL 04
66 "AUGUST, 1974"
67 AVIEW
68 .END.

```

HPY

```

ROW 1: LINES 1-2
ROW 2: LINES 3-4
ROW 3: LINES 5-8
ROW 4: LINES 7-9
ROW 5: LINES 9-11
ROW 6: LINES 11-13
ROW 7: LINES 14-16
ROW 8: LINES 17-21
ROW 9: LINES 21-25
ROW 10: LINES 25-28
ROW 11: LINES 28-29
ROW 12: LINES 30-34
ROW 13: LINES 34-38
ROW 14: LINES 38-42
ROW 15: LINES 43-47
ROW 16: LINES 48-52
ROW 17: LINES 53-57
ROW 18: LINES 58-63
ROW 19: LINES 63-68
ROW 20: LINES 68-68
ROW 21: LINES 68-68

```

Back Issue and Subscription Information

Back issues of KEY NOTES are available back to V3N3, which introduced the HP-41. An index of these will be furnished on request. Available issues are:

- V3N3 August 1979 (12 pages)
- V3N4 November 1979 (12 pages)
- V4N1 March 1980 (12 pages)
- V4N2 Jun-Aug 1980 (12 pages)
- V4N3 Sep-Dec 1980 (12 pages)
- V5N1 Jan-Apr 1981 (16 pages)
- V5N2 May-Aug 1981 (16 pages)
- V5N3 Sep-Dec 1981 (16 pages)
- V6N1 Jan-Feb 1982 (16 pages)
- V6N2 Mar-May 1982 (16 pages)

Prices for KEY NOTES back issues are as follows. All prices include first-class or air mail. Payment must accompany your order and must be a check or money order

in U.S. dollars drawn on a U.S. bank. Or you may use your American Express, VISA, or MasterCard account; be sure to include your account number and card expiration date. Your order will be promptly mailed in an envelope.

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KEY NOTES is published quarterly in February, May, August, and November. A one-year subscription in the U.S. and Canada is \$5* a year. It is free (worldwide) in 1982 if you are a member of the Corvallis Users' Library (\$20* U.S. and Canada; \$35* elsewhere). Send your payment and complete name and address to the Corvallis address on back cover.

To get KEY NOTES in Europe, contact the UPLE (Geneva address on back cover). To get KEY NOTES elsewhere, contact your nearest HP Sales Office or send your name, address, and calculator serial number to the Corvallis Users' Library.

*U.S. dollars. See note at bottom of page 6.

What's in a Name?

For everyone who *really* reads KEY NOTES, here is an opportunity to become famous. And the individual who *does* become famous will owe such luck to Dr. Roger D. Metcalf (Arlington, Texas), who is responsible for this article.

Several weeks ago we received a letter from Dr. Metcalf. Here is an excerpt from it.

"Lately I have been having an identity crisis with my HP-41CV; that is, is it a super sophisticated calculator or true computer? Now, it seems as if some of the publications have solved my problem by considering the HP-41 a true handheld computer (See *Popular Electronics*, July 1982, "PE Compares New Handheld Computers.")

"So, now that I *know* the HP-41 is really a computer, my new worry is, what language does it speak? Certainly not BASIC, FORTRAN, etc. Sort of a FORTH, maybe? And RPN doesn't even come close to describing *all* the capabilities.

"How about a contest to 'Name That Language!?' Perhaps even a Custom Keyboard could be sent to the person who suggested the contest? (My address below!) I truly believe that a formal name for our 'Language' would add credibility in the popular press ..."

Well, Dr. Metcalf, *you* might have been jesting, but your editor isn't, as you already know, because *he knows* you now *have* that Custom Keyboard (HP-41 Touchpad) that no amount of dentistry could ever get for you before now. See how we really *do* listen? And *read* your letters?

So, honored KEY NOTES readers, Dr. Metcalf has *his* reward; now which one of you is going to win our contest to "Name That Language"? The rules are very simple, and everyone except Hewlett-Packard employees and their families may enter.

1. The "Language" name must be a clever acronym such as: radar, BASIC, scuba, FORTRAN, sonar, COBOL.
2. The acronym must relate to the HP-41.
3. The acronym must be original (new).
4. Only one entry per person is permitted.

HP KEY NOTES

June-August 1982 Vol. 6 No. 3

Programming and operating tips, answers to questions, and information about new programs and developments concerning Hewlett-Packard handheld computers. Published quarterly. See page 15. Reader comments or contributions are welcomed. Please send them to one of the following addresses.

Hewlett-Packard Company
Users' Library
1000 N.E. Circle Boulevard
Corvallis, Oregon 97330 USA
Hewlett-Packard SA
Users Program Library Europe
7, Rue du Bois-du-Lan
P.O. Box, CH-1217 Meyrin 2
Geneva-Switzerland

And if you don't know the definition of acronym, here is the dictionary copy: "A word formed from the initial letter or letters of each of the successive parts or major parts of a compound term." For example: BASIC = Beginner's All-purpose Symbolic Instruction Code; or: COBOL = COmmon Business Oriented Language. As you can see, we are giving you lots of latitude in your choice.

The contest ends at midnight (our time) on October 22, 1982, and the winner will be chosen by your editor and your technical editor, and their decision will be final. The winner will be announced in the November issue (V6N4); and the winner will receive as prizes:

1. An HP-41 Touchpad;
2. Four Library programs (of choice);
3. A personal, original, gift from the editor;
4. Worldwide fame and the envy of his/her peers!

Who knows? You just *might* get in future history books ...

Lohr: XEQ RAD █ COS* ST + - x
Ed: XEQ RAD █ COS* ENTER +

The Long and Short of Multiplication

Here's a routine that should catch the eye of any elementary or high school mathematics teacher. Jonathan Moffett, who is a high school teacher in Pittsworth (Queensland), Australia, contributed this jewel.

(41) Long multiplication is still taught in schools. Checking the answer is easy, but how does a teacher pinpoint where an error occurred? I find the following routine useful. The routine multiplies any two positive integers provided that the result is not greater than 1 E10. On the prompt

"N M" key in: number, [ENTER], multiplier, [R/S]. If a printer is attached, the whole problem is printed out. Otherwise, since flag 21 is set, press [R/S] to display each line. Since the product is left in the X-register, it is possible to chain problems. Flags 28 and 29 should be clear.

01+LBL "LM"	33 10
02 FIX 0	34 /
03 CF 01	35 INT
04 SF 12	36 STO 02
05 SF 21	37 LASTX
06+LBL 01	38 FRC
07 "N*M"	39 10
08 PROMPT	40 *
09 STO 02	41 RCL 03
10 X<>Y	42 INT
11 STO 01	43 10+X
12 VIEW X	44 *
13 *	45 RCL 01
14 STO 00	46 *
15 "X "	47 FC? 01
16 ARCL 02	48 VIEW X
17 FS? 55	49 ISG 03
18 ACA	50 GTD 03
19 ADV	51 FC?C 01
20 FC? 55	52 XEQ 02
21 AVIEW	53 RCL 00
22 XEQ 02	54 VIEW X
23 RCL 02	55 FS? 55
24 LOG	56 XEQ 02
25 INT	57 CF 12
26 X=0?	58 ADV
27 SF 01	59 RTN
28 .1	60+LBL 02
29 %	61 "-----"
30 STO 03	62 ASTO T
31+LBL 03	63 ARCL T
32 RCL 02	64 AVIEW
	65 END

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