HP-41’s Again Aboard Columbia

Unless you have been hiding in an igloo near the North Pole for the last year or so, you know all about the space shuttle Columbia, which we featured on the cover of V5N1. And, because you read KEY NOTES, you know that the astronauts use our HP-41 handheld computers onboard Columbia for various flight-related, radio-contact, and backup operations. And, no, their programs are not in the Users’ Library nor are they for sale. They contain NASA proprietary information and are for use only on the space shuttle.

For the last Columbia flight, near the end of last March, the two HP-41 computers were purchased over-the-counter by NASA from a Houston, Texas, office-equipment store, and were tested rigorously before being approved for flight. They are identical to the hundreds of thousands of HP-41’s sold since 1979.

One HP-41 computer, dedicated to what NASA calls the acquisition-of-signal program, was the only convenient means the shuttle crew had to estimate the time, location, and radio frequency of their next contact with Earth. Also, if the astronauts are awakened at night by an alarm, they can tell at a glance how long it will be before they can discuss the problem with Mission Control.

The second HP-41 computer acts as an electronic secretary for the astronauts—reminding them of daily chores with alarms and flashing messages. Each morning, the astronauts programmed their computer with five to ten alarms. That way they didn’t have to write down on paper all their scheduled activities. In other words,

(Continued on page 16)

We Get Letters...

And we know that you are going to not only like this one but also use it for your purposes. There’s a lot of emphasis on a lot of words in that opening sentence, but for good reasons, as you will soon learn. Take a very close look at the photograph reproduced here; we’ll bet you’ll never suspect what it represents. Anyway, before you peek inside KEY NOTES, here’s the letter we received from Mrs. Keith Olson of Cupertino, California.

"Some time ago, my husband bought an HP-41. Soon thereafter he wanted a safe, 

(Continued on page 15)
Corvallis Library Corner

There are now over 4793 HP-67/97 programs and 1730 HP-41 programs in the Corvallis Users' Library, and we get more and more each and every day of the week. And, as much as we are grateful for your excellent output, there are a few subjects we'd like to see covered. For example, Andrew N.C. Cruickshank, a Town Planner and Economist who lives in London, England, recently wrote and asked if we had any programs in his field—programs such as population projection, property development, regional economic analysis, etc. And we are often surprised that there aren't more programs for farmers.

But one must admit that, all in all, you are a very prolific and excellent society of calculator programmers, and we congratulate each and every author who has taken the time to share a program through the Library.

ORDERING PROGRAMS

HP-67/97 and HP-41 programs featured in KEY NOTES are available from 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.

SUBMITTING PROGRAMS (Corvallis)

Programs submitted to the Corvallis Users' Library should be on Hewlett-Packard standard Library submittal forms, or they should include at least the documentation required by those forms. To maintain the high quality of the programs submitted to the Users' Library, we encourage you to closely follow the Users' Library Contributor's Guide for the HP-41, HP-67, and HP-97. Complete and orderly documentation is essential to ensure the acceptance of a program into the Library.

We also encourage you to read the ongoing KEY NOTES column, "In the Key of HP." This column addresses some of the things we look for when we are reviewing programs that are submitted to the Users' Library.

Programs that are submitted to the Corvallis Library for the HP-67 or HP-97 must include magnetic cards, and HP-41 programs must include either magnetic cards, reproducible bar code, or a data mini-cassette for use with the new HP-82161A Digital Cassette Drive. (The cassette will be returned to you.) It would take far too long to check and review all the many program submittals if we had to key them in line by line. Also, there is always an increased chance of error when someone keys in handwritten keystrokes.

The management of the Corvallis Users' Library reserves the right to reject programs which, in its opinion, do not represent a significant contribution, are not clearly or sufficiently documented, or are, not otherwise appropriate for the Corvallis Library.

THE CORVALLIS CONTEST

The 1982 Corvallis Users' Library Submittal Contest is well under way. The ten winners for March have been chosen and these winners are featured elsewhere in this column. All of our authors are to be congratulated for the fine contributions they have made to the Corvallis Library.

There are 50 more prizes to be awarded in this contest! Last year, 50% of the total contest entries arrived during the last month of the contest, so send your programs in early to increase your chances of winning. This contest runs through August, 1982.

THE POINT PROGRAM (Corvallis Only)

The Corvallis point program has been enthusiastically received by everyone. For those who missed the announcement, the authors of all HP-67/97/41 programs currently accepted for the Corvallis Library, are being issued point certificates, (one per accepted program). These points are then redeemable, by the Corvallis Library, for a vast array of HP products. Depending on the amount of points you have accumulated, you can choose from products that range from a Solutions Book or custom keyboard (presently valued at one point) to an HP-85 Personal Computer (presently valued at 100 points)! A complete list of the available merchandise can be obtained from the Corvallis Users' Library.

Now, in addition to the opportunity to win prizes in the contest, many diligent authors are well on their way toward earning enough Corvallis points to "purchase" their favorite HP products. The point program is not retroactive. We cannot exchange Library coupons for points, nor can we redeem "Users' Program Library Europe" point certificates.

THE CUSTOM KEYBOARD (Corvallis Only)

Foremost on the list of requested items is the custom keyboard. Everyone wants one! The keyboard (with the standard key configuration) is presently obtainable only from the Corvallis Library for one point, or in lieu of the 25% discount offered on orders of 6 or more Corvallis Users' Library programs. In other words, if you order 6 or more programs and do not take the 25% discount, you can request a custom keyboard in lieu of the discount.

MINI-SOLUTIONS

Our new Solutions Book, Time Module Solutions I 00041-90395, is in stock and is being shipped. It greatly compliments the HP-82182A Time Module, and demonstrates just how versatile and indispensable your HP-41 is. Time Module Solutions I and all solutions books are now available recorded. Magnetic cards are $20* per book; mini-data cassettes are $12* for the first Solutions Book requested and $8* for each subsequent book recorded on the same cassette.

MINI-SERVICES

A mini-cassette duplicating service is a new Corvallis Users' Library offering. Send us a cassette with your favorite collection of programs, and we will copy it for you—in any quantity. The cost for this service is $12* per cassette requested (that $12* includes the price of the cassette). This new service provides an ideal opportunity for businesses, clubs, and organizations to distribute their "custom" software collections to members.
MANY REQUESTS
In response to many customer requests, the Library, long ago, established standards by which programs are accepted for the Corvallis Users' Library. Our review staff checks each program for complete and accurate documentation, friendliness, and ease of use. All programs submitted must be accompanied by magnetic cards, bar code (HP-41), or mini-data cassette (HP-41), and should solve a problem sophisticated enough to warrant its purchase. These guidelines will ensure top-quality software for you.

Our review staff is available to answer any questions regarding either existing Library programs or programs that you are developing to submit to the Users' Library. Call 503-757-2000 and ask for extension 2886 between 9 am and 4 pm.

ORDER TURNAROUND TIME
The Library has finally reached its goal of giving you 48-hour turnaround on mail and TOLL-FREE phone orders, and we are proud to tell you that we intend to maintain that goal.

Orders telephoned directly to the Library (503-757-2000 X3371) always ship that same day, regardless of the number we may receive!

The Corvallis Users' Library is your Library. Write us with recommendations for services or with any suggestions on how we might serve you better.

“Old” Contest Winners

Because of the overwhelming number of programs submitted during December for the 1981 Users’ Library Contest, the announcement of that month’s winners and the Grand Prize winners did not make the press date for the last issue of KEY NOTES. We are featuring these winners in this issue.

The December winners all chose HP-41CV’s as their prizes and, as you know, each of the Grand Prize winners is now the proud owner of an HP-85 Personal Computer!

DECEMBER WINNERS

(41) General Network Reduction Program #01526C (Price: $12*)

This program analyzes networks of up to 80 elements. The allowed network elements are resistors, capacitors, inductors, re-actors, and rigid voltage and current sources, in any serial or parallel combination. Output functions are voltages, currents, or impedances in any branch of the network. If the printer is available, either amplitude or phase transfer functions can be plotted. Required Accessories: 4 Memory Modules for 80 network elements, Printer if plots are desired. (443 lines, 905 bytes, 32 pages)

Author: Dieter Lange

Hamburg, Germany

And, the third winner for December was the game program Flipo #01477C (Price: $12*) that we featured in V6N1p6A. The author of Flipo is Robert Swanson of Portland, Oregon. (Hearty congratulations are in order for these three authors! The time and effort that went into writing and documenting these programs is astounding. Thanks, to all three of you; we know you will enjoy using your HP-41CV’s—Ed.)

Winning Programs

We announced the 1982 Users’ Library Submittal Contest in the last issue of HP KEY NOTES. 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 may choose a prize of either an HP-1L Digital Cassette Drive or an HP-IL Thermal Printer/Plotter (both include HP-IL Modules). The other eight winners may choose either a Time Module or an Extended Functions Module.

Here are the ten winners for the month of March. The authors of the first two programs chose a Printer and a Cassette Drive as their prizes.

(41) Sun Shade #01692C (Price: $12*)

Architects, engineers, and designers of solar-related equipment and structures will find this program useful. Its primary purpose is to compute the shadow cast by a shading device. The shading device may be horizontal, vertical, or oblique. Sun altitude, sun azimuth, and effective sun latitude are computed for daylight hours at any location in the world. Many other solar geophysical parameters are available such as declination, times of sunrise and sunset, Equation of Time, etc. Time may be specified as either apparent solar time or local standard time. A correction to standard time may be made for daylight saving time.

Two powerful new design tools are introduced. A dimensionless S/L ratio that lets you calculate shading by a simple multiplication or division, and SHADE LINE, a sunrise to sunset history of a shadow and/or the S/L ratio. Required accessories: Printer, 3 Memory Modules, Card Reader or Wand recommended. (624 lines, 1317 bytes, 46 pages)

Author: Bill Kraengel, Jr.

Valley Stream, New York

(41) Fire Danger #01586C (Price $12*)

This program computes fire danger for both grasslands and forests; outputs include a numerical index, a hazard rating (LOW, MODERATE, HIGH, VERY HIGH, and EXTREME), rate of spread on level and sloping ground, and, in the case of forest fires, flame height, the hazard of crown fire, and spotting distance. A subprogram computes a drought index required for quantifying forest fires, and another subprogram computes relative humidity from basic meteorological data. Fire danger can be forecast and projected forward from conditions in the morning or on the day(s) before.

The complete program has three parts; the main program—Fire Danger—and two subprograms—Drought Index, and Relative Humidity. The main program can be used separately, or with either, or both subprograms. A flow diagram for the complete Fire Danger program is included.

(Continued)
(67/97) Trigg's Trend Analysis
#04775D (Price: $6*)

Levey-Jennings control charts are commonly used in laboratories to monitor analytical variation. Unfortunately, they do not permit the simple detection of non-random trends with much sensitivity. This program provides Trigg's technique for the quantitative detection of trends in quality control data. Data may be stored on cards for ongoing evaluation. (105 lines, 7 pages)

Author: Mike McDonald
Buffalo, New York

(41) Auto Banner #01891C (Price: $6*)

This program, using commands from the Extended Functions Module, will translate an ALPHA string and automatically print a Banner output. This program is incredibly fast. The user simply keys in the ALPHA string and automatically prints a Banner output. This program is increasingly popular. (186 lines, 205 bytes plus 92 data registers, 31 pages)

Author: Christopher Erickson
Pullman, Washington

(41) Equilibrium Flash #01569C (Price: $8*)

Given the number of moles and the K values (ratio of the fraction of the component in the vapor phase to the fraction in the liquid phase) of up to 10 compounds, this program will compute the equilibrium phase compositions. Ideal K's are calculated if the critical properties and boiling points of the components are furnished. A rugged algorithm is used that always comes to a solution. Required accessories: 3 Memory Modules. (487 lines, 1081 bytes, 11 pages)

Author: Norman Samish
Houston, Texas

(41) Ventilated Loudspeaker Box Tunings
#01451C (Price: $12*)

Using data on the loudspeaker in question, this program solves for the "optimum" vented enclosure and permits the user to vary the tuning parameters to test alternate tunings. A 1/3-octave response listing is provided and, with the accessory printer, the frequency response is plotted. Required accessories: 4 Memory Modules. (460 lines, 1643 bytes, 29 pages)

Author: Thomas Bouliane
Buffalo, New York

(41) Symbolic Logic—Summary and Applications #01894C (Price: $12*)

This program is a relatively complete treatment of elementary symbolic logic. Logical operators defined include AND, OR, AND NOT, IMPLICATION (if and only if), and EXCLUSIVE OR. The operators are based on the definitions of Lukasiewicz (WookahYVeech; the "father" of RPf) and thus hold for only one kind of three-valued logic. These same definitions will work for Boolean Logic when the base is 2. Thus the program may be used to simulate digital logic circuits. The user must write the programs to simulate these circuits, but examples are given to show how to do this expeditiously. A "cookbook" of compound conditionals is included in the documentation. Required accessories: 1 Memory Module. (186 lines, 398 bytes, 31 pages)

Author: Edward Keefe
Ankeny, Iowa

(41) Thermodynamic Properties of Saturated and Superheated Steam
#01893C (Price: $12*)

Calculate the thermodynamic properties: specific volume, enthalpy, and entropy, of saturated (liquid and vapor) and superheated steam given temperature and pressure. One equation of state, Martin's, is used over the entire range of temperature and pressure, down to VR = 0.56. The calculated properties are within the tolerances given by the International Skeleton Tables (Steam). Required accessories: 4 Memory Modules; Printer helpful. (1047 lines, 1765 bytes, 36 pages)

Author: Robert Wooley
Midland, Missouri

Best Sellers

We have had a lot of queries lately about the popularity of certain programs, and this is usually followed with the question: "What are the most popular programs in the Library?" So we compiled a list of the best-selling programs since January 1982, and here they are. They are presented in numerical order, which is not necessarily their order of sale. Notice that most of them have already appeared in KEY NOTES. We congratulate these authors and encourage them to continue their level of excellence in the future.

HP-67/97 PROGRAMS

- Star Trek Advanced #00386D (Price: $6*) Author: L.G. Schneider
- English Metric Conversions #00434D (Price: $6*) Author: E.R. Kool
- Tape Selection: Criteria of Ben Graham and James Rea #01544D (Price: $6*) Author: K.L. Hellams
- Feeder Sizing and Voltage Drop #00787D (Price: $6*) Author: N.J. Peros
- Oil Gas Downhole Pressure Build-up Analysis #03246D (Price: $6*) Author: D.G. Olson
- Hex/Decimal, Hex Arithmetic for Microprocessors #00900D (Price: $6*) Author: D.T. Brown
- Photographic Exposure Guide #04551D (Price: $6*) Author: J.P. Patterson
- Curve Fits #04719D (Price: $12*) Author: E.A. Taylor

HP-41 PROGRAMS

- Simplex Algorithm #00320C (Price: $6*) Author: L.A. Esterhuizen
- Wizard of Pinball #00061C (Price: $5*) Author: C.A. Pearce
- List of 2/3 Functions on one Graph #00732C (Price: $6*) Author: J.L. Gilby
- Hunt the Wumpus II #00783C (Price: $6*) Author: B.J. Wheeler
- Advanced Star Trek #01321C (Price: $12*) Author: J.P. Patterson
- Rubik Cube Solution #01342C (Price: $12*) Author: J.L. Gilby
- Phone Directory #01459C (Price: $6*) Author: J.P. Glass

* 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: $4 \times 2 = $8 + $1.20 = $11.20 total.) If you live in Europe, you should order KEY NOTES Programs directly from the Geneva UPLE, 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.
FEEDBACK, by Fred D. Waldhauer, is another new book just off the press. It is hardbound (with dust cover), 651 pages, and in 6.3 by 9.1 inch format (16 by 23 cm). And because the programs in this book deal specifically with the HP-41, we know a lot of our readers will want to see it.

The author, Fred D. Waldhauer, is a supervisor in the Transmission Technology Laboratory at Bell Laboratories in Holmdel, New Jersey. His work has concentrated on feedback processes and digital communications. He is the author of papers on circuits, feedback, and high-speed digital transmission actions, and 14 patents in these fields. Mr. Waldhauer is also a Fellow of the IEEE (1977), a professional engineer (New Jersey), a member of the Audio Engineering Society, and he received his M.S. in electrical engineering from Columbia University.

This book describes the first new, original approach to feedback in over 50 years, with important applications for electronic circuit design. Mr. Waldhauer greatly simplifies feedback analysis and design by adopting a new pattern based on "anti-causal analysis"—the analysis of feedback from output to input. This approach makes the feedback analysis problem easy to trace from the initial rough approximation to the final exact analysis and design. It offers a neat solution to what has always been a difficult problem.

In the book there are many examples and calculator programs that enable the reader to apply its principles to all problems involving feedback structures. Most of the examples are derived from electrical circuits. These examples range from audio-frequency design to microwave integrated circuits. The Table Of Contents is:

1. Feedback Amplifiers: An Alternate Foundation
2. Polynomials of Loss: Various Descriptions of Polynomials
3. Elements of Feedback Synthesis: A Case Study
4. Signal Flow Graphs of Polynomials, Rational Functions, and Circuits
5. Signal Delay in Feedback Systems
6. Two-Port Analysis of Circuits and Devices
7. Feedback Analysis of the Bipolar Transistor
8. Two-Port Feedback Analysis
10. Output-Stage Design
11. Noise and Input Stages
12. Differential and Operational Amplifiers

Appendix A. Programs For Manipulating Polynomials

Appendix B. Feedback Analysis and Synthesis Programs

For readers who want to apply the new methods directly to their own designs or to check the designs given in the book, 31 programs are provided, all written for the HP-41C or HP-41CV. These programs cover most aspects of the material in the book. One of these programs synthesizes feedback systems for a prescribed performance; another converts the HP-41 into a "two-port network calculator." Included are the four basic functions of addition, subtraction, multiplication, and the matrix inverse, as well as lead interchange operations. This "calculator within a calculator" is itself programmable, and can convert numerical results into network properties including loss, input and output impedances, and sensitivities as functions of frequency.

An outgrowth of courses taught by the author in Bell Laboratories, this book will serve inclusion courses and professional seminars. Electronics engineers, technicians, and upper-division electrical engineering students should find it a more direct approach to the design of feedback systems and circuits.

The price is $47.50 (U.S. dollars) and, before you rule it out, remember that it contains 31 programs for the HP-41, replete with example, listing, etc. Check your local bookstore or agent first, and remember that this is a new book that might take months to get to faraway places. As a last resort, in Europe and Asia contact:

John Wiley & Sons, Ltd.
Baffins Lane, Chichester, Sussex PO 19 1UD England

In Australia and nearby areas, contact:
Jacaranda-Wiley, Ltd.
GPO Box 859
Brisbane, Queensland 4001 Australia

In the U.S., Canada, and Mexico, contact:
John Wiley & Sons, Inc.
Wiley Interscience Division
605 Third Avenue
New York, NY 10158

Appendix C. Two-Ports, Transistors, and ABCD Matrices.

Something For Nothing

In the V5N3 issue of KEY NOTES, John Loux discussed inoperative functions in the "In The Key of HP" column under the subtitle "Indices." This discussion brought in a lot of mail dealing with "no-ops," and indices in general, and we thought you would enjoy seeing some of the suggestions that we received.

First, Robert Whipple of Washington, D.C., has this to say.

My candidate for using the inoperative line following in SQG or OSE is a simple dot-dash decimal point. As I understand it, this takes only one byte (the same as CLD) and it has the advantage that it is visually close to a completely blank line as you can get.

(Continued)
in a program listing. (This advantage is less pronounced, of course, in a program listing done in TRACe mode.) Instead of initializing a nonindexed value with a value like 1.999 and incrementing it with a simple ISG, I initialize it with the value 1 and follow the ISG with a single decimal point, thus saving 3 bytes of memory.

And, from John Allen in Nashua, New Hampshire, we have this.

KEY NOTES is great and I appreciate your suggestions for a "NOP" following DSE or ISG instruction. In the program I was writing, I couldn’t use CLD because I wanted to program 1 2 3 4 5 6 X<>X as you point out, takes one more byte, and also takes too long to write I’m lazy. So why not DEG? It works fine and only takes one byte! So do RAD or GRAD, if you’re in one of those modes.

Now, Miles Abernathy of Austin, Texas, has this to say.

A handy “do nothing” step is LBL nn. If nn is 00 to 15, it’s only one byte, and it doesn’t change any register.

Thanks, to you three, and to everyone who sent us setters dealing with this subject.

In the Key of HP

Most of the information you find in KEY NOTES is contributed by HP calculator users, just like yourself, who live in all parts of the world. This ongoing column is, for the most part, written by John Loux who is a Technical Advisor in the Corvallis Users’ Library. His articles contain information, tips, and techniques that will help you to write more useful and efficient programs. Here’s his latest.

THE DIGITAL CASSETTE DRIVE

The HP-41 has been recently endowed with the ability to access and manipulate large amounts of data and program information. I am speaking, of course, of the introduction of the HP 82161A Digital Cassette Drive. But, as with all technological innovations, the advantages gained are coupled with increased responsibility. The Users’ Library is most concerned with the programmatic manipulation of the cassette drive. We know that program authors need to be made aware of the potential advantages and disadvantages inherent to the device before they can effectively generate application programs that use it. Hence, this article.

MANUAL MANIPULATION OF CASSETTE FUNCTIONS

To a computer user, the computer’s access to mass storage is seldom a concern and is often transparent. This is as it should be. The user should not be burdened with how the currently used application program stores and retrieves data or chains program sections. It is for just this reason that all functions of the cassette drive (except NEWM) are programmable. The combination of the necessary functions being programmatically accessible with the powerful decision-making ability of the HP-41 makes it possible for a well-written program to handle virtually all aspects of cassette drive manipulation.

The program author should keep in mind that one of the main reasons that programmable calculators exist is for user convenience. The Library therefore feels that it is generally unacceptable for a submitted program to require manual intervention to deal with programmatically manipulable features of a device.

DATA SAVING

Because the HP-41 has a limit to the amount of read/write memory that it supports, programs that deal with (comparatively) large volumes of data often find themselves critically limited in the amount of information that can be stored. Even if room can be found, many times data must be destroyed by manipulations in the program. In the latter case, further calculation on the same data must be preceded by re-storing the data or this reason, perhaps the greatest advantage that the cassette drive affords is the ability to retain data for further and future uses. Cassette data files make it possible to access data without loading all of it into calculator memory, thereby reducing the need for a large number of calculator data registers. The cassette data file also can be easily reused without being modified.

Programs that generate and/or manipulate data files should take advantage of the cassette drive’s ability to preserve initial data and not force the destruction of any accumulated data. In submitted programs, the purging or zeroing (clearing) of any data file should be well justified and well documented.

SINGLE VS. MULTIPLE DATA FILES

What appears to be a convenient way to segregate groups of data turns out to yield the slowest rate of data access. Multiple data files are an excellent way to segregate unrelated information but one must weigh the benefits of segregation against the speed and efficiency of access.

Movement through a single data file is relatively fast. Multiple blocks of information can be stored in the same data file if “pointers” to the beginning register of each block are stored in calculator memory. These pointers can be recalled and used with the SEEK and READRX functions to access the desired block. Also, short routines can be devised to calculate the necessary pointer value. In contrast, addressing a new data file each time a different block of data is needed requires the same seek function, and, in most cases, the added delay of searching the cassette directory for the file location and the delay of moving to the file.

There is no set rule to follow in judging between the two methods of data block access. Both have their merits. All that the Library asks is that the authors of programs that use large or multiple data files consider their options.

DOCUMENTATION

A point that again must be stressed is that a main reason that calculators and software exist is for user convenience. Program authors should realize that much of a useful program’s friendliness is lost if it is not documented well enough for the user to learn how to use it in a reasonable amount of time.

Documentation of the content and use of data files can be critical. The most obvious time that documentation of data file contents becomes a concern is when a file of constant value is destroyed. The user must be supplied with enough information to be able to resurrect the file. Another hopefully more common situation is where the user desires to write his/her own routines that access the author’s data files. To be able to do this, it is obviously important that the user understands the internal organization of the file.

The Library expects that the documentation that accompanies each program dealing with data files completely describes the contents of any constant file and completely describes the internal organization of any variable file. The reasons for and methods in which the program manipulates the file(s) also should be well described.

ERRONEOUS ASSUMPTIONS

Most critical problems with programs stem from assumptions that the author has made about the configuration and/or state of the calculator. Some invalid assumptions that may arise in dealings with data files on the cassette drive are:

1. The interface is in MANIO or AUTO10 mode. The assumption of one or the other mode is invalid unless the program itself has set either mode. This is not to say that the program must set one or the other mode. Many application programs may run equally well in either mode, so long as the selected device in MANIO is of the appropriate type. If either mode is required, the program should set it. In certain instances, a program may work differently (intentionally) in either mode. In this type of program, calculator flag 32 should be tested in order to determine the current mode.

2. The file pointer is currently pointing to the desired file. This assumption is also invalid unless the program itself has performed the required SEEK function.

3. The file to be output to exists or doesn’t exist. It is dangerous to assume that if a file exists whose name is the same as that which the program uses that it is necessarily the file the user wants to be accessed. If the named file exists, the user should be warned either by the program or by the documentation that the program may alter the contents. Unconditional creation of
data files can also cause problems if another file exists that has the same name or if the program destroys any file of the same name before creation. Creation, destruction, and modification of file information must be well documented. In each of these cases, the program could query the user before the action is taken, thus making certain that it is desirable.

**PROGRAM FILES**

The reader's first thought about the usefulness of the cassette drive in conjunction with program storage is probably along the lines of structuring a personal program library. Although this is a reasonable pursuit, it may not be the most important program application of the cassette drive.

One way to optimize the use of calculator memory is to split the program into functional segments that can be loaded as necessary from mass storage into calculator memory. This technique may require more logical planning in order to maintain program integrity and consistency, but the advantages gained by calculators with a limit to their memory are in most cases well worth the effort. The program's sections may "chain" each other into memory, each calling the next as its usefulness is exhausted. Alternatively, one master program may call several slave routines that replace each other in memory.

The Library recommends that program files and subprogram files be documented in the same complete fashion as that expected of all submitted programs. Subprograms require more documentation than "stand alone" programs in order to aid the user who desires to write his/her own routines that access the subprograms.

The cassette drive supports status, write-all, and key-assignment files. Because the Library is a user-oriented organization, we recommend that you follow certain guidelines when considering submitting one of these types of files. First of all, many users feel inconvenienced by programs (or documentation) that require key-assignments or that require a certain calculator status. For this reason, the Library recommends that submitted programs do not call key-assignment or status files without first giving the user a choice. Defining the keyboard or status of the calculator is best done in optional routines within the program, and these definitions should be well described in the documentation. Secondly, write-all files cause difficulties both for the Library and for program users. Users require obvious reprovision problems. For these reasons, the Library discourages the submittal of write-all files and PRIVATE programs.

**DEVICE DEPENDENCY**

It is not always obvious when a program requires a peripheral. For example, a program may use peripheral functions in such a way that if the peripheral is not in the system the functions are not encountered. Therefore, a program does not require a peripheral simply because it uses functions found only in that device. Neither can a program claim to require a mass storage device simply because the Library requires some sort of mass storage media with each submittal. A program requires a peripheral only when it cannot perform its function without the device.

In order to make programs accessible to the largest possible number of users, authors should not write programs that require peripherals unless they feel that the requirement is a definite enhancement to the program.

**New Special Service Offered**

We now offer at Corvallis, HP Dealer location, product information, prices, Users' Library information, and service prices and status for TDD (telecommunications devices for the deaf) and TTY (teletypewriter) users with hearing or speech impairments. Please dial 503-756-5566 (not toll-free).

**Addendum for 82180-90001 Manual**

If you own the HP 82180A Extended Functions/Memory Module Owner's Manual, part number 82180-90001, dated November 1981 or April 1982, you should mark the following changes in your copy of the manual. Later versions of the manual will have either the Addendum with them or the corrections will be incorporated in the manual.

**Page 8, under Configurations.** If you have the HP 82104A Card Reader plugged into the calculator and an HP 82181A Extended Memory Module plugged into port 2, and you execute the card reader function [VER], some information in that extended memory module may be changed. Therefore, you should avoid using the [VER] function if you are also using an extended memory module in port 2.

**Page 17, under Clearing Programs.** If you execute [PCLPS] from the keyboard, be sure the calculator is positioned in program memory. You can position the calculator in program memory in any of the following ways:

- Press [CATALOG] followed by [R/S] (as described under "Using CATALOG for Positioning" in your calculator owner's manual).
- Press [GTO] ALPHA label ALPHA using a label in program memory (one that is listed in CATALOG 1).

If the calculator is positioned to a program in a plug-in application module or device when you execute [PCLPS], the information in the calculator's memory will be lost and the calculator will display MEMORY LOST.

**Page 24, under [PURFL].** After a file in extended memory is purged, there is no working file. Therefore, before subse- quently executing functions that operate on the working file, you should execute a function (such as [SEEKPTA]) that defines the working file (that is, makes the specified file the working file refer to "Working Files," page 23). For example, after executing [PURFL], write the name of an existing file in the ALPHA register, then execute [SEEKPTA]—that file will now become the working file. After executing [PURFL], you should always define a working file before executing functions that operate on it; otherwise, all files in extended memory will be lost.

**Page 25, before Program File Operations.** If a register in a file contains a string of seven characters all having character code 255, and if another file closer to the beginning of extended memory is purged, then all information from that register to the end of extended memory may be lost. To ensure that this doesn't occur, avoid appending, inserting, or adding to a file more than six consecutive characters having the character code 255.

**Page 25, under Program File Operations.** If you execute [SAVEP] from the keyboard, be sure the calculator is positioned in program memory (as described above). If the calculator is positioned to a program in a plug-in application module or device when you execute [SAVEP], the information in the calculator's memory and in extended memory may be changed or lost.

**New HP-IL Video Interface Available**

The new HP 82163A Video Interface will be available at your local HP Dealer sometime in June—probably by the time you are reading this KEY NOTES. With this new device, the HP-41 will be capable of displaying on a monitor or TV, 96 Standard ASCII or inverse video characters, with up to 32 characters per line and 16 lines per display. The HP-41 also will be capable of screen control and cursor control. The HP 82180A Extended Functions Module will help to create the necessary commands to enable screen and cursor control.

The new HP-IL Video Interface is all that is needed if you want just a convenient way to output data and programs in video. The HP-41 printer commands in this new module will allow all normal character output to occur in a very friendly manner. Flags 15 and 16 in the HP-41 will control the PRINT (output) mode to the video display. For example, if flag 15 is SET, it will make the video display act like a printer in TRACe mode; and when flag 16 is SET, it will make the video display act like a printer in NORMAL mode. And, when both flags are SET, they will put the (Continued)
video display into a new “TRACE WITH STACK OPTION” mode that will cause stack registers X, Y, Z, and T to be “printed” (displayed) after each operation. Now you’ll be able to “see” how you left the stack and what is in it! (Very nice, yes?) Finally, with both flags CLEAR, the video display will be in MANUAL mode.

Best of all, this new video interface is an HP-IL device! Therefore, it will be compatible with future HP-IL devices. And, although you may be excited about “seeing” your HP-41’s innermost “secrets” on TV, be sure you call your local HP Dealer before you rush down to the store. This is going to be a popular peripheral, so make sure the Dealer has one and can demonstrate it for you.

Add “Racing Stripes” to Your Bar Code

In KEY NOTES V5N3 we proposed a method to increase security for programs reproduced in bar code. The method consisted of printing the bars over red background. After some further testing (including some tests volunteered by Richard Nelson and Noel Brinkley of PPC), we are back with the promised update.

It was found that some copiers checked relative contrast between printed information and a background color. These copiers could easily produce duplicates that a wand will read.

Introducing the racing-stripe approach! Several patterns and narrower stripes were tested. The stripes proved the most successful, especially when printed to overlay the leading and trailing edges of a row of bar code. These areas appear to be the most critical for the wand to successfully read the code.

The second discovery was that a thermal copier would not reproduce the red (as gray) because there is no carbon content in red ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink. This problem is easily overcome by printing the bars using a carbonless black ink.

Also, in V6N1, on page 13, column a, the second line in the routine MAG should be LBL A; and the name of the author of this routine is Jeffrey Smith not Jeffery Smith. Sorry, Mr. Smith. In V6N1p11b, the second paragraph of the description preceding John Hendrick’s PRDMS routine should read: For HHHhMM’S, substitute 104, ACCHR for lines 08 through 19.

The description of the “Stock Plotting” routine on the back page of V6N1 fails to mention that the calculator must be set to a minimum size of 18 and that the printer mode switch must be set to MAN. The “In the Key of HP” article in V5N3 on page 7 has a confusing sentence in the description of the modulo function. The second sentence of the second paragraph of this description should read: A number can be determined to be within a certain range if RANGE MOD X < RANGE.

In V5N2, there is a typographical error on page 8. In answer 22 of the answers to the HP-67/97 test, STO 1 should be STO 1.

New Club Formed in Germany

If you can read the German language, you might be interested in a new Club that was founded in November of 1981. Called CCD, for Computerclub Deutschland, the Club had over 1,000 members by February 1982. And all of the members are HP-41 users.

The Club prints a monthly newsletter, PRISMA, that contains many HP-41 programs, technical notes, Synthetic Programming, self-produced hardware, and much more. The newsletter is entirely written in German. Nearly all of the programs are for professional use, but a few games are printed. And all printed programs include bar codes.

Regular Club meetings are being held in nearly every large city in Germany, and members come from nearly all Western European countries. In German law, the Club is a “gemeinutzig anerkannter eingetragener Verein,” which, in English, means a nonprofit, legal club, controlled by public commissions. However, there is a fee for membership.

If you are interested in the CCD, write to the first chairman:
Oliver Rietschel, 1. Chairman
Computerclub Deutschland, e. V.
P. O. Box 373
2420 Euting, W. Germany

Be sure to include a self-addressed, stamped envelope. If you can’t include stamps, you can include at least two magnetic cards.

(Note: CCD is not sponsored, nor in any way officially sanctioned, by Hewlett-Packard—Ed.)

Linear Interpolation

On The HP-41

Here is a routine from the biggest state in the “lower 48.” Austin is the capital of this state—Texas—and it is the home of Philip Petersen, who sent this routine. (41) This short routine linearly interpolates multiple times after initial conditions are set, using only registers 00 for safekeeping. Besides the two ALPHA prompts (that take up many bytes), the routine is at peak efficiency and optimum ease of use.

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Sending 8-Bit Data
With the HP-41

(Note: This article presents the theory behind Library Program #01644C, Bar Code Generator, which appears in this issue of KEY NOTES—Ed.)

There are two methods currently available to the HP-41 user who wants to build 8-bit binary bytes of any value. (For example, in constructing bar code such as that used in Library Program #01644C.) The easiest method uses the XTOA function contained in the HP 82180A Extended Functions Module. The other, a more difficult method, uses the BLDSPEC function contained in the HP 82160A HP-IL Interface Module. It is this second method that forms the topic of the following discussion.

First, take a quick glance at figure 1. Now, if we were to look at the decimal equivalent value of each bit in a binary byte, we would find that the value of any byte with bit 7 set (the high order bit) would yield a value equal to or greater than 128.

128 64 32 16 8 4 2 1 Bit Value

x x x x x x x A binary 8-bit byte

7 6 5 4 3 2 1 0 Bit number

Figure 1. A Binary 8-Bit Byte

The byte value is the sum of all of the bit values.

- **Bit Bit Value**
- **Set Value** 128 64 32 16 8 4 2 1 Bit Value
- **1 2 1 0 0 0 1 0 1 0**
- **3 6 1 0 4 3 2 1 0 Bit Number**
- **128 138 **
- **BYTE VALUE**

Figure 2. Byte Value Example

Creating a byte (or bit pattern) using BLDSPEC is easy, and a simple matter, until we exceed 127 (decimal). But, first, take a look at figure 3 in order to create a byte with a value of 0 to 127.

Creating a binary byte with a decimal value of 32.

CLX ENTER! 32 BLDSPEC

Figure 3. Creating a Byte Value 0 to 127

This will leave in the X-register an alpha data byte—seen as a character—that is actually a bit pattern equivalent to the decimal value used prior to the BLDSPEC command. The CLX and ENTER commands are used to ensure that the Y-register is clear and to prevent the BLDSPEC command from making an unwanted combined pattern. However, being able to combine patterns is useful in making byte values of 128 or greater. Keying in 127, BLDSPEC would yield a bit pattern of 01111111. To set the 6th bit (which is actually bit 7; see figure 1), follow the example in figure 4.

Generating Bar Code
With the HP-41

Because many readers have expressed a desire to be able to "create" bar code at home or at the office—or anywhere, for that matter—we have included in this issue a program that will satisfy most of that desire. If that word "most" gives you the idea that this is not a perfect solution for home-generated bar code, you are right. But this program will enable you to print usable bar code.

There are some basic operating limits you need to know. First, you must use the new HP 82160A HP-IL Module and the new HP 82162A Thermal Printer. Second, you must use the new black HP 82175A Thermal Printing Paper. Third, you should read, in this issue, the article, "Sending 8-Bit Data With the HP-41," because it explains the theory behind the following program and a few software limitations. But make no mistake about this: With the HP-41 the HP-IL Module, the new printer, the new black paper, and the following program, you can generate immediately usable bar code. Here is an expanded abstract.

(41) Bar Code Generator #01644C
(Price: $6)

This program, when coupled with knowledge from the 82153-90019 Creating Your Own HP-41 Bar Code manual (pages are included in program), will allow the user to print up to 16 continuous bytes of bar-coded information. Required inputs are made as the decimal equivalent of the binary code. The program uses the BLDSPEC function to create the binary codes needed to print bar code. This entire operation could be (Continued)

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**On Creating and Using Cassette Data Files**

Data files must be "created" before they can be used. Unlike program files, a data file has to be created so that you can specify its size. With the HP-41, the HP 82160A HP-IL Interface Module, and the HP 82161A Digital Cassette Drive, a file is created by placing into the ALPHA register the name of the file (not more than 7 characters), and by placing in the X-register the number of required registers. For example, if we key in: ALPHA BILL ALPHA 3000 XEO ALPHA, the cassette drive will "create" a file named "BILL" and the file will have 3000 registers.

Now, suppose we want to store 10 registers (R10-R0) of information into cassette file "BILL" at locations 100 through 109. All we need to do is key in: ALPHA BILL ALPHA 100 SEEK 000 WDRX. The first part of this sequence will position the cassette drive at register 100 in file "BILL," and the second part will write HP-41 registers 10 through 19 into cassette drive registers 100 through 109.

But suppose we now want to recover those same 10 registers of information and place them into registers 00 through 09 in the HP-41. That's no problem. Just key in: ALPHA BILL ALPHA 100 SEEK 000 READRX and you can view those 10 registers in the HP-41 by recalling registers R0 through R9. In essence, we have made a duplicate copy of the information in R10 to R19 and put it into R0 to R9.
The printer in this example is at device location 2 (see HP-IL Module Owner's Manual, page 43). Key in: \[\text{SELECT} (\text{CA}) \text{SF} 17 \text{ 252} \text{ (XT0A 27) XTOA 38} \text{ (XT0A 107 XTOA 49} \text{ XTOA 72 A00 A80 A01} \text{ ALPHA OUTA).} \] This sequence sets your printer to PARSE mode. The ALPHA string used to set the printer to PARSE mode is now stored in register 01 and can be used again (\text{ARCL 01 OUTA}). The SF 17 suppresses the printer carriage return and line feed. Now, try the following:

\[\text{ALPHA: I WANT TO SEE PARSE ALPHA: ACA} \text{ (XT0A MOD OPERATE WITHOUT THE:} \] \[\text{ALPHA: ACA} \text{ (XT0A) EXTENDED I/O ROM INSTAL} \text{ (XT0A) ALPHA ACA} \text{ (XT0A) LED ALPHA ACA PRBUF).} \] This might not be the best operating mode, but you have to admit it does work.

**BARCODE:** Refer to the Bar Code listing. However, nothing is totally "free." We do not recommend leaving your printer continuously in STANDBY mode during normal operating conditions; that is, using your computer system at your desk, recharger plugged in, etc. The STANDBY mode (on both the printer and the cassette drive) is provided to conserve battery power during "remote" or automatic, unattended conditions. In other words, when the calculator is set to run a program unattended.) The recharger.AC adaptor might not always be able to keep up with the recharge rate plus supply continuous power for operations, so use STANDBY only for its intended purpose. However, you must admit that it is a powerful and extremely useful new mode.

Both of the HP-41 printers are excellent additions to your portable computer system, but if you own the HP-IL Module, you owe it to yourself to check the added features of the new HP 82162A Thermal Printer at your local HP Dealer. Don’t forget to take along this article!

**You, HP-IL, and Control Functions**

Have you asked yourself: “What good are the general I/O functions in the HP 82160A HP-IL Module?” You have? Well, then, let’s take a look at some of them.

**CONTROL FUNCTIONS**

On page 43 of the HP 82160A HP-IL Module Owner’s Manual, the general I/O functions are referred to as “Interface Control Operations.” There are 15 of these functions and, as it happens, for some applications they are the only method that can be used to make certain things happen on the Interface Loop. Although these functions are really very basic, they are a powerful set that allows a programmer to access information on just about any HP-IL peripheral.

Because it is not possible to discuss all of these Control Functions in this short column let’s look at just a few.

**AUTOIO:** As you know, the HP-41 was designed to be a fully “friendly” device. The AUTOIO (automatic input/output) function also was designed to continue this trend in its I/O operation. In this mode, the HP-41 will automatically locate friendly printer and mass storage peripheral devices connected to it, then initiate printing when it’s supposed to occur, and also interact with the mass memory (e.g., HP 82161A) when it is supposed to transfer data and/or programs. In either case, the HP-41 will automatically go to the first available printer or mass memory device in the Interface Loop and attempt its operation there. For example, if you have two printers in the Interface Loop and you want to cause an output on the second printer (see diagram), then you must “select,” that device prior to sending the data to it. AUTOIO is, however, the normal “cold start” condition.

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Because it is not possible to discuss all of these Control Functions in this short column let’s look at just a few.
MANIO: How many times have you wanted to do things with your HP-41 computer system that were not necessarily "the norm"? Well, MANIO allows for such times by giving you more direct control over what happens on the Interface Loop. An example of this can be found right here in this issue of KEY NOTES, wherein we wanted to create bar code on the HP 82180A Thermal Printer without using an "extension" module. Placing the printer in the MANIO mode allows the HP-41 to send 8-bit commands for bar code quite easily. The 8-bit mode instruction set is shown in tabular form on page 14 of the owner's manual for the HP 82180A.). But, in order to print bar code, you first must understand what bar code really is. And a good way to learn is to look at program #01644C and the article, "Sending 8-Bit Data With the HP-41." appearing elsewhere in this issue. Included with the documentation for #01644C are some pages from the book, "Creating Your Own HP-41 Bar Code." (This HP book was reviewed in VSN493, with a little spice of sound added to it. Run, see, and hear it!

And, back in the United States, Carl Vancini is busy working with his HP-97. Mr. Vancini lives in Stamford, Connecticut. (67/97) I noticed that the routine "Weighted Mean," developed for the HP-67/97 by D.L. King (VSN510b) does not produce the standard deviation. Here is a routine that produces the weighted mean with the corresponding standard deviation. The only limitation is that the weights shall be non-zero integers (1, 2, ...). To run, clear all registers, key-in the number, press ENTER, key-in the weight, press b. After all numbers and their weights are entered, press ÷ to obtain the weighted average, then press ÷ to obtain the standard deviation.

Example Input Output
Log 9 = 2 9 ENTER ÷ 2
Log 9 = 3 ÷ 1.4 ENTER ÷ .25
Log 1000 = 10 ÷ 10 ENTER ÷ .333

Now, here is a short and interesting routine. Matthew Tomezak of St. Cloud, Minnesota contributed this.

67/97 Routines and Tips

Pretoria is a capital city of South Africa located close to some major diamond mining areas. Also, Pretoria is the home of J.M.E. Graindor, the author of this next article, "Johannesburg, Czajowski's "song and dance" routine. How much is that goose in the window? The one that goes "BEEP, BEEP, TONE 9..."

(67) This subroutine is an improved version of the "Flying Goose" routine that appeared in VSN510b, with a little spice of sound added to it. Run, see, and hear it!

## 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 application. You might have to modify them to fit your personal application.

Now, from San Diego, California, we present Jaroslaw Czajowski's "song and dance" routine. How much is that goose in the window? The one that goes "BEEP, BEEP, TONE 9..."

(61) This subroutine is an improved version of the "Flying Goose" routine that appeared in VSN510b, with a little spice of sound added to it. Run, see, and hear it!
This next contribution describes an interesting technique that many will find useful. It came to us from Humbert Hans Suarez, who is a student at the University of Geneva in Switzerland.

(41) There is one problem that often occurs while creating HP-41 programs: You have two programs, one that begins with, say, LBL "MAIN", and one that begins with LBL "USER" that has a LBL 01, a LBL 02, and a LBL 03. The program "MAIN" wishes to call as subroutines sometimes LBL 01, sometimes LBL 02, and sometimes LBL 03. But the calculator searches numeric labels solely in the program from which these labels were called.

One solution could be to put global ALPHA labels by the LBL 01, LBL 02, and LBL 03. However, this solution consumes lots of memory space and search time. A better solution is to put a GTO IND X at the beginning of the "USER" program and to call LBL 01 by—1; XEQ "USER", and LBL 02 by—2; XEQ "USER", and so on.

1st solution 2nd solution

LBL "MAIN" LBL "MAIN"
XEQ "1" 1
XEQ "2" 2
XEQ "3" XEQ 00
END 3
XEQ 00
LBL "USER" LBL 00
LBL "1" XEQ "USER"
LBL "2" END
LBL "3" LBL 02
GTO IND X
LBL 01
LBL 02
END
LBL 03

This is a good demonstration of "the law of conservation of bytes through conservation of global-ALPHA labels," Mr. Suarez; however, your second solution does not conserve search time, as implied by your letter. The first solution requires one global label search, while the second solution requires a global label search, and therefore, because of the indirect GTO statement—a step-by-step local label search. So, our advice is: weigh the byte savings against the increased execution time before using this technique—Ed.)

This technique came to us in a letter titled, "How to Double Your Local (ALPHA) Labels From 15 to 30." Undoubtedly, this method has its drawbacks but, then again, it may be just what you're looking for. The letter was sent to us by Vandale John, who lives in Adinkerke, Belgium.
(41) This way of programming is very interesting in programs made for such conversions as feet<>meters, inch<=>mm, gallons<>liters, Fahrenheit<>Celsius, and so on. For example:

\[
\begin{align*}
01 & \text{LBL } "^\circ\text{F}" \times \quad 07 & \text{STOP} \\
02 & \text{LBL A} \quad 08 & \text{LBL B} \\
03 & \text{X<>Y} \quad 09 & \text{RDN} \\
04 & \text{GTO A} \quad 10 & 3048 \\
05 & .3048 \quad 11 & \text{END} \\
06 & * \quad 12 & \text{END}.
\end{align*}
\]

How to use:
(a) Position the calculator to the program (GTO [ALPHA] F<>M [ALPHA]):
(b) Press USER on:
(c) To convert 2.25 feet to meters, press 2.25 [A], and see 0.6858;
(d) To converting 0.6858 meters to feet, press 0.6858 [ENTER] [A] and see 2.25 feet.

As you can see, the ENTER key becomes a shift function. This gives us 30 labels—A, A’, B, B’, ..., a, a’, ..., e, and e’—good for 15 conversions.

Here's a routine to help us through the day. Don Thayer of San Leandro, California, sent in this one.

(41) While converting my HP-67 programs for use with my HP-41 and its printer, I discovered many of them required the conversion from a Gregorian Date to the equivalent Julian Day number. Not wanting to restructure the data register assignments, I developed the following program, titled "DAY," which uses only 72 bytes and does not require any data registers other than the stack. The routine is valid from March 1900 through February 2100 and was derived from the Standard Pack for the HP-67.

To use, enter the date in the form MM.DDYYYY and execute DAY. Example: July 4, 1980 (7.041980) = 2,444,425.

1. Store 100 in register 00 and store 12 in register 01. You wish to compute 100 + (12/100) = 100.12 But, with the above routine you get 12.12
Of course, you can change the routine to:
RCL 00
RCL 01
1
%/=

But, that is not always possible; i.e., when, instead of RCL 00, the X-register contains the result of a previous computation.

*(You're very right, Mr. Brunings. It would not be wise to go through all your programs and indiscriminately change every 100, / to a 1/100—Ed.)*

Palmdale, California, is the home of Mr. Burke. Though Mr. Burke claims that he isn't interested in stocks, he is interested in making the "STOCK" routine that we printed on the back page of the last issue easier for us to use. Here's his letter.

(V6N1p16) (41) The routine for plotting the weekly stock chart, "STOCK," does not exploit the capabilities of the HP-41 and HP 2143A combination to their most useful extent. Specifically, I prefer program initiation to start at the front of the program, and then branch to subroutines only after the input data has been handled. The inputs for plotting itself could be entered from PROMPT's asking (Continued)
for the specific item as known to the user, instead of the input name used by PRPLOT, which may not make too much sense in the context of the program. This method then uses PRPLOT for the actual plotting.

I have found that this approach leads to faster use of any program, especially if you haven’t used it for some time. The input prompts tailored to the particular requirements of the program prevent confusion as to what is meant by the input request. I am sure that only a few stock analysts could interpret “AXIS?” and “X MINT?” correctly if they did not use the program frequently enough to become familiar with the basic inputs required by PRPLOT, but they would need no refresher to understand “PURCHASE PRICE?” or “START DAY?” The listings enclosed indicate the way I would initialize the program, and request the necessary plotting inputs, in terms the user could identify without reference to a coding sheet.

I use this approach a lot. It takes up some room in the machine for “gingerbread,” but the CV has room to spare for most programs. Also, having the program keep track of its own inputs prevents the occasional “oopsl” when you input the proper program functioning internally, which should not have to be reviewed every time a program is run.

Anyway, here is an amended listing and output of what my “STOCK” routine would look like... if I was interested in stocks.

```
01 LBL “BEGIN”
02 “START DATE,”
03 “-MMDD, YYYY
04 PROMPT
05 GTO “DATE”
06 LBL “IN”
07 “STOCK”
08 ASTO 11
09 “MIN PRICE?”
10 PROMPT
11 STO 08
12 “MAX PRICE?”
13 PROMPT
14 STO 01
15 “PURCHASE PRICE?”
16 PROMPT
17 STO 04
18 “START DAY?”
19 PROMPT
20 STO 08
21 “TIME SPAN DAYS?”
22 PROMPT
23 STO 09
24 “WEEKLY PTS.”
25 AVIEW
26 7
27 10
28 XROM “PRPLOT”
29 .END.
```

This procedure allows for fast execution of X < Y and RDN as well as faster local label location after any pause in execution. It allows a user to continue a routine or choose a new routine with a minimum of label search time. The key to this procedure is lines 01 to 04. Line 02 stops to show results or prompt for input. Line 03 returns if LBL 99 was XEQ’ed but not if GTO’ed. Line 04 stops extra R/S’s from doing anything. Lines 05 through 10 do the X < Y and RDN functions rather than letting the HP-41 search for them (always the longest search). Unfortunately, this prevents them from being used in response to a prompt (leaves the HP-41 at line 03). The following lines are branches to long routines followed by short routines. An XEQ 99 will stop, then return when R/S is pressed. A GTO 99 will stop and not continue.

(The concept used here is well worth studying. The slow response of many lengthy programs can be eliminated by taking advantage of the “jump-distance storage” characteristics of the local-label GTO and XEQ statements. We do have a suggestion, though. Rather than using LBL F for X < Y and LBL G for RDN, try assigning these functions to their respective keys. Then, when you press one of these keys at a halt in the program, the local-label search is bypassed and the function X < Y or RDN is performed immediately. Using the local-ALPHA labels F and G will both move the program pointer, as mentioned in the letter, and clear the subroutine return stack. Of course, if you can work around these two drawbacks, the method of using local-ALPHA labels has the advantage of not requiring you to make key-assignments—Ed.)

Next, we have a valuable suggestion for those with a card reader. This information came from Tom Flegel of Berkeley, California. (V5N3p13a) (41) I have found Julius Zechmeister’s idea, on how to find local labels quicker, very useful. My most commonly used program has many local labels and some large routines. The search for a label often took as long as the routine itself. With the example in KEY NOTES as an inspiration, I developed a new routine to do the same from any spot in a program for any label. Here is how I implemented it.

```
01 LBL 99
02 STOP
03 RNT
04 GTO 99
05 LBL F
06 GTO 99
07 LBL 99
08 LBL G
09 RDN
10 GOTO 99
11 LBL A
12 GOTO A
13 LBL B
14 GOTO B
15
16 21
17 LBL H
18 : [SHORT ROUTINE]
19 30 GTO 99
```

This makes the Stock Plotting routine easier to use. Just add lines 92 to 115 to the end of the listing from V6N1p16, and add lines 01 to 05 to the beginning of that listing; then execute "BEGIN." The HP-41 will ask the necessary questions and then prompt you for the weekly data to be plotted. Be sure to set a minimum size of 18 and to have your printer switch set to MAN—Ed.)

If you have ever had to wait one second or longer while your HP-41 is searching for a local-ALPHA label, you will appreciate this next subject. Joseph Senecu of Roseville, California, contributed this elaboration of a previous suggestion.

(41) Regarding Vally Lambrecht’s routine, this and other routines with card reader prompts should have flag 21 clear before the AVIEW statement. Otherwise, the program may halt at the AVIEW and a normal program card-read will result. Incidently, RSUB (KROM 30.04) will not clear the same program that contains it. I find it will work correctly without an END.

(41) The way, Vally Lambrecht's routine can be adapted to call subroutines from the HP-IL Digital Cassette Drive or to call routines from Extended Memory—Ed.)

Routines to solve the quadratic equation are a popular subject in KEY NOTES, and these routines keep getting shorter and shorter. The quadratic equation is

```
x^2 + bx + c = 0
```

And the roots of this equation are

```
x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}
x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}
```

This routine was contributed by Paul Baker of Stillwater, Oklahoma. The program works entirely in the stack, it handles both real and complex roots, and the body of this routine—excluding the LBL and the END—is only 26 bytes. Can you beat that?

(41) When I saw Brent Tranberg’s quadratic solution routine, I became curious as to how it could be modified to solve for complex roots. Here’s my simple suggestion:

```
01 LBL “SLV”
02 X^2
03 X<>
04 PROMPT
05 STO 11
06 -2
07 STO 08
08 ENTER
09 STO 02
10 RT
11 CF 01
```

The user executes the program just as before; however, flag 01 will remain activated in the display to indicate complex roots of the form \(x_1 = u \pm iv\) where the real component \(U\) is in the X-register and the imaginary component \(V\) is in the Y-register.

Thank you for a most informative newsletter. I read KEY NOTES cover to cover! (Thank you, Mr. Baker, for a fine example of efficient programming, and for the nice words about KEY NOTES—Ed.)
Now, let's travel to Sollentuna, Sweden, where Gerhard Rombach is keeping busy by reading KEY NOTES and programming his HP-41. Here is his contribution.

(V6N3p314c) (41) Fred Lipshultz's program "GEN2" was very clever—but you have to do the conversion the other way (converting a number in any base to a number in base 10.)

Here is my solution: Change the last line (line 42) in "GEN2" to STOP and continue as follows. Otherwise you have to store the base in register 04 and the number in register 01.

43 CLX 58 X<>Y
44 ST0 03 59 SF 01
45 ST0 05 60 RCL 04
46 LBL 03 61 RCL 03
47 RCL 01 62 YX
48 X<>Y 63 *
49 GTO 04 64 1
50 1 E-1 65 ST+ 03
51 * 66 X<>Y
52 INT 67 F5?C 01
53 ST0 01 68 ST+ 05
54 LASTX 69 GTO 03
55 FRC 70 LBL 04
56 1 E1 71 VIEW 05
57 * 72 END.

New Club Formed in England

Elsewhere in KEY NOTES you will find a notice about a new calculator club in Germany. Just before we went to press, we received a letter about one more new club. Here's the letter.

"I have recently formed a Users' Group for HP Personal Programmable Calculators in Britain and would be grateful if you could give the Group a mention in the next issue of KEY NOTES. The Group is called "PPC-GB" (Personal Programming Center-Great Britain) and is a chapter of PPC in the USA, but membership is open to all users of HP programmable calculators."

(Continued)

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 (10 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)

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 $55* 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 4.
"I hope that the Group will compliment KEY NOTES, UPLE, and PPC by becoming a local forum for exchange of information, programs, and applications; for personal contact between members; for arranging meetings; and for the very important provision of a local "expert" to aid new users (or even a shoulder to cry upon when a program doesn't work).

"At present I am working on the prospect of a summer conference (half or one day meeting) and am trying to arrange with HP-UK and Dealers to provide demonstration equipment, speakers, and perhaps even a visit to HP here in the UK.

"I shall keep you informed of progress as the Group becomes more established and send you a copy of our newsletter when it is published. In the meanwhile, I would be grateful for any advice or help that you can offer—especially regarding user groups and producing newsletters."

With many thanks, David M. Burch

We are happy to see our valued customers get together and form little groups, because it is a very good way to spread information, ideas, and comradeship. If you are interested in this new Group or want further information, contact Mr. Burch at the following address. It would be a nice gesture to include a self-addressed, stamped envelope.

David M. Burch/PPC-GB
Astage,
Rectory Lane,
WINDLESHAM, Surrey,
GU20 6BW England
(Note: PPC-GM is not sponsored, nor in any way officially sanctioned, by Hewlett-Packard.)

Columbia...(Continued)

the HP-41 helped them to keep on top of all of their daily "housekeeping" activities.

In addition to helping the crew organize its time, the second HP-41 computer was kept ready for flight-critical, deorbit-burn calculations. Once during each orbit around the Earth, the shuttle has an opportunity to land at one of six contingency locations. During a routine flight, Mission Control supplies the shuttle crew with deorbit-burn information. Should the shuttle encounter an emergency, however, the astronauts would rely on the HP-41 for these calculations.

Two other programs—one to help balance the Columbia prior to re-entry, and another to pin-point Earth observation sites—also are available to the crew and would be run on the HP-41's.

The HP-41's do not take the place of the shuttle's larger, general-purpose computers. However, they do complement the shuttle's larger systems and provide the crew with personal-computer convenience. Also, new and different HP-41 programs can be written between flights—quickly enough to keep up with many of the astronauts' changing computational needs.

We are very proud of the HP-41, and we are happy that NASA chose this handheld marvel for use on the space shuttle. Already the new Time Module is an asset to this mission and, in the future, the new HP-IL Module and the various HP-IL peripherals will surely prove their usefulness. We'll keep you informed as NASA makes more use of the HP-41 system.

Letters...(Continued)

Well...you can imagine how many HP-41 system "cases" we see every month, but we have to admit this one is, as they say, "far out." But we also have to admit that it's very clever and that it certainly does fulfill the security requirements that were intended. We congratulate Keith Olson and nominate him the "HP-41 Owner of the Quarter."

Mr. Olson works for Sperry-Univac in the Bay Area and uses his HP-41 system extensively at the office to make his job easier. If he is as clever at his job as he is in contriving unique cases for his calculator, his employer should hold onto him! And, before we forget it, thank you, Mrs. Olson for the letter and photos.

Now, here's another letter you will enjoy. How many people do you know who have "HP-41CV" on their automobile license plate? Well, now you know at least one! Here's his letter.

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