inside:

- New Plotter/Printer ROM gives the HP-85 Powerful Graphics Capabilities.
- A Close Look at the HP-IB Interface
- Merging Programs Using the CRT RAM
- HP-85 Service Policy—You Now Have Several Options

contents

basic EXCHANGE

HEWLETT PACKARD Summer 1980 VOL. 1 NO. 1

software highlight

Personal and Business Decision-Making on the HP-85

Your HP-85 Personal Computer was designed to help you make decisions in your personal and professional life. Applications software in such areas as math, statistics, finance, and circuit analysis can help you analyze data and find answers to specific problems. In addition, a general problem-solving tool is available to assist you in quantitative decision-making. It's called the **HP-85 Linear Programming Pac**.

Basically there are two different approaches to decision-making. The first is the intuitive approach, based on "hunches" or "gut feeling." This is a very subjective method. The decision-maker usually has great difficulty in explaining to others how the decision was actually made. This method may be acceptable where the person making the decision doesn't really have to explain it to anyone. It is not acceptable, however, in a complex business organization where we have come to accept the fact that our decisions are subject to review by others, sometimes years after they were made.

As a result, we've come to rely more and more on the second approach to decision-making, the rational approach. This is an objective method. It is a logical, stepwise procedure that includes defining the problem, gathering data, organizing and evaluating the data according to some predetermined set of criteria, testing possible choices against the problem definition, and selecting the best choice.

The objective decision-making process has been immensely aided in this century by the advent of the digital computer. Masses of data, which would take us a lifetime to sift through, may be digested and evaluated by a computer

in a matter of minutes or seconds. And now, with the HP-85 Personal Computer, this capability is made available to you as an individual.

In computer-aided decision-making, writing a program that fits the problem is called modeling. A model is just an attempt to describe the real world in an approximate manner. Just as a model airplane is only a scaled-down version of the full-sized working aircraft, a real-world problem that we want to solve by computer must be a scaled-down, limited version in order to be manageable.

Because the computer works with numbers rather than a physical reality, we further reduce our real-world model to numbers and equations. This is called mathematical modeling. We structure a mathematical representation of all the things we would like to consider in making our decision. When we have designed the model, we collect data on all possible choices, test each possible choice against the model, and select the choice that best fits the model.

To appreciate the power of mathematical modeling, consider that an aircraft manufacturer designing a new airframe might spend weeks building one physical model and testing it in a wind tunnel. Computer simulation using a mathematical model of the airframe and the forces acting upon it allows dozens of different designs to be tested in the same time at far lower cost.

Many types of mathematical modeling are available for computer decision-making. One of the most valuable and widely used tools is the technique known as linear programming, or LP for short. "Linear" comes from the fact that all of the relationships described by the model are linear.

Every LP model consists of two parts. The first is the objective function. This is a linear algebraic equation that states our objective. We may want to maximize profit or output, or we may want to minimize cost or time, for example. The second part is a set of linear algebraic constraint equations that describe the relationships among all the parts of the model.

To get an idea of how LP might be used, let's take a relatively simple example. Suppose it's a hot summer day and we want to set up a lemonade stand. We plan to sell lemonade and iced tea, and feel that we can sell all we can make of either drink. A cup of lemonade uses 3 teaspoons (tsp) lemon powder and 2 tsp sugar. A cup of iced tea uses 1 tsp lemon powder, 2 tsp tea powder and 1 tsp sugar. Lemon powder costs $.03/tsp and we have 70 tsp. Tea powder costs $.04/tsp and we have 50 tsp. Sugar costs $.01/tsp and we have 60 tsp. Paper cups cost $.02 each and we have 50 cups. We have water and ice cubes, free, in unlimited quantities. Based on the recipes for lemonade and iced tea and on the costs of the materials, lemonade costs $.13/cup and iced tea $.14/cup. We plan to sell a cup of either drink for $.25. Our objective is to make as much profit as we can. We must decide how much of each drink to make and then compute how much profit we'll make.

Our next step is to convert our descriptive model to a mathematical model. Let's take the objective function i.e., making the most profit, first. This consists of a series of problem variables, each variable having a coefficient. We have two variables: lemonade (L) and iced tea (T), each measured in cups. Since our objective is to maximize profit, the coefficient for each variable is its profit contribution per cup. Profit is sales price less cost, on a per cup basis. For lemonade it is $.25 − $.13 = $.12, and for iced tea it is $.25 − $.14 = $.11. Therefore, our objective function is:

Maximize $Z = .12 \times L + .11 \times T$

The variable Z is simply the value of the objective function that will be computed for us. If, for example, we sell ten cups of lemonade and ten cups of iced tea, the value, Z, of the objective function is $.12 \times 10 + .11 \times 10 = \$2.30$.

The number of cups of lemonade and iced tea we can sell is limited or constrained by the resources available. There are four of them: lemon powder, tea powder, sugar, and paper cups. For each limiting resource we can describe a constraint mathematically.

For example, lemon powder is used at the rate of 3 tsp/cup of lemonade and 1 tsp/cup of iced tea; also we have a maximum of 70 tsp lemon powder. This statement is converted to the following constraint inequality:

$$3 \times L + 1 \times T \leqslant 70$$

The above is called a constraint because it states a limit on the size of the objective function based on the availability of the lemon powder resource. It's called an inequality because of the $\leqslant$ sign. By examining this constraint you can see that if we make only iced tea, we could make up to 70 cups. If we make only lemonade, we could make up to 70/3, or 23.3 cups. And we can make any combination of the two drinks as long as the constraint of 70 tsp is not exceeded. The other three resources can be evaluated in the same manner. The LP problem, stated in full, then appears as follows:

Maximize $Z = .12 \times L + .11 \times T$

subject to:

$3 \times L + 1 \times T \leqslant 70$	lemon powder
$2 \times T \leqslant 50$	tea powder
$2 \times L + 1 \times T \leqslant 60$	sugar
$1 \times L + 1 \times T \leqslant 50$	paper cups

After we have formulated the problem in the above manner, we can solve it using our HP-85 and the Linear Programming Pac. The time required for solving the problem is only a few seconds, whereas to solve it manually might require an hour or longer.

The LP solution tells us a number of interesting things. For maximum profit we should make 15 cups of lemonade and 25 cups of iced tea. This combination will eam us a profit of $4.55. Any other combination will be less profitable than this one, as you can determine simply by substituting other values for L and T in the objective function and constraint inequalities. In making the optimal combination of drinks, we will use all of the lemon powder and tea powder, while we will have 5 tsp sugar and 10 paper cups left unused. The lemon powder and tea powder are "scarce" resources. This means that we could make more drinks, and thus more profit, if we had more of these scarce resources. For example, within limits, each additional teaspoon of lemon powder would improve our

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

profitability by $.04 above the cost of the powder itself. Knowing the true economic value of this scarce resource tells us how much we'd be willing to pay for it in the market place.

We've already learned a great deal about our proposed business. However, we can learn even more by modifying the problem slightly and then resolving it. Suppose our cost for sugar doubles to $.02/tsp. Suppose there is a shortage of tea powder or paper cups. Suppose the demand for iced tea falls and we can only sell a maximum of 15 cups. Any of these factors would change the model and change the optimal solution. By using the Linear Programming Pac we can examine a variety of models, play "what if," and prepare ourselves in case changes occur in the market place.

Linear Programming really is a very powerful tool for making quantitative decisions, both in your personal and professional life. To make real use of the technique requires developing an ability to translate descriptive models into mathematical models of the LP form. The **HP-85 Linear Programming Pac** assumes that you have already gained this familiarity. If not, we suggest you start by studying an introductory text on linear programming or quantitative methods of decision-making.

The complete **HP-85 Linear Programming Pac** is contained in a convenient fitted binder and includes a prerecorded cartridge containing the LP programs and an instruction manual that describes the programs and gives detailed instructions and examples.

In addition to the **HP-85 Linear Programming Pac** and the **HP-85 Standard Pac** (the latter is the pac which comes with the HP-85), the following Application Pacs are also presently available:

HP-85 AC Circuit Analysis Pac—interactive programs to assist in the design of circuits containing passive components, voltage-controlled current sources, and independent current sources. Results are plotted on the CRT.

HP-85 BASIC Training Pac—a modular training program for beginners. Covers both the HP-85 and the BASIC language.

continued on back page

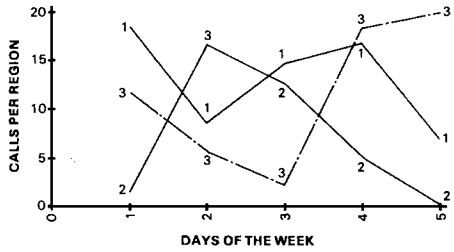
hardware highlight

The Plotter/Printer ROM

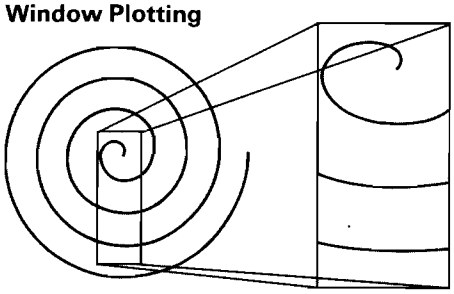
The HP-85 was designed as a totally integrated personal computer. All the functions you need—mass storage, display, printer—are built in and ready for use when you turn on the machine. Being integrated, though, does not mean limited, because the other major feature designed into the HP-85 is expandability. With two of the new products introduced this June, the HP-IB interface and the Plotter/Printer ROM, you can enhance your system to include a peripheral plotter and a full-width impact printer, and extend the already enhanced BASIC language of the HP-85 to boot.

The HP 7225A Graphics Plotter gives you high quality graphics on 8½ by 11 inch paper. It is full of such amenities as an electrostatic paper holddown that provides silent and secure paper positioning for a variety of paper sizes, and a built-in user-initiated confidence test to verify the performance of both the plotter and the HP-85. Thirty-eight instructions from a high level instruction set are built into the plotter to implement vector plotting, character-set and line-type selection, point digitizing, integer scaling, and labeling with programmable size, slant, and direction of characters.

THREE EUROPEAN SETS
with programmable
SIZE slant and
direction



Window Plotting



By using the intelligence built into the HP 7225A Graphics Plotter, the Plotter/Printer ROM can concentrate on BASIC commands that make graphics easy. For example, with the built-in graphic statements in the HP-85, drawing and labeling a set of axes might take ten or more statements; but the AXES statement, added by the Plotter/Printer ROM, draws x- and y-axes, places major and minor tics on the axes, and labels each major tic all in one program line.

Labeling, which is easy enough on the HP-85, becomes even simpler with the addition of a LABEL USING statement; and labels can be formatted just like the PRINT and DISPLAY statements.

The LORG (label origin) statement allows you to right justify, center, or left justify your labels automatically.

The addition of the plotter to your HP-85 system also provides graphic input capability. The DIGITIZE command reads the x- and y-coordinates of the pen position when the enter key on the plotter is pressed. Entire drawings can be entered into a data array for replotting at different scales, rotations, or mirror images.

The Plotter/Printer ROM also enhances the CRT graphics on the HP-85 with an extended BPLOT command and a new BREAD command, which allows you to read the contents of the CRT graphics display into a string variable. Thus, graphics generated with PLOT, DRAW, MOVE, and LABEL statements can be stored in a string for reproduction with the BPLOT command.

In addition, the Plotter/Printer ROM provides the capability to drive a peripheral printer such as the HP 2631B Impact Printer. This 132-column, 180-character-per-second, dot-matrix printer offers high throughput and multi-part forms capability. Some special features are multiple character widths, an optional high density character set, and versatile margin and forms control. And all this capability is accessed with a simple PRINTER IS command.

Both of these peripherals use the new HP-IB interface to connect to the HP-85. As a peripheral interface, the HP-IB offers the user a simple, reliable, and well-proven interface. The interface module is simply plugged in to one of the four I/O ports in the back of the HP-85, and the standard IEEE-488 connector is attached to the peripheral. From then on you can forget about the interface and just use the peripherals as if they were part of the computer.

HP 7225A GRAPHICS PLOTTER SPECIFICATIONS

PLOTTING AREA:
y-axis: 203 mm (8 in.)
x-axis: 285 mm (11.2 in.)

PLOTTING ACCURACY
±0.25 mm (.01 in.) [includes linearity and repeatability and assumes the plotter has been "zeroed" exactly to the lower left (0,0) coordinates].

REPEATABILITY
.1 mm (.004 in.) from any given point and direction

ADDRESSABLE STEP SIZE
0.032 mm (.0013 in.) smallest addressable step.

PEN VELOCITY
250 mm/sec. (10 in./sec.) in each axis
350 mm/sec. (14 in./sec.) on 45 degree angle

CHARACTER PLOTTING SPEED
Up to 3 characters/sec for 2.5 mm characters.

SIZE/WEIGHT
Height: 140 mm (5.5 in.)
Width: 413 mm (16.3 in.)
Depth: 379 mm (14.9 in.)
Weight: 8 kg (17.6 lbs.)

communique

First, we'd like to welcome you to the growing number of HP-85 users. Demand for the HP-85 has greatly exceeded our expectations, and that's good news for all of us; with this tool in the hands of a wide variety of users with vastly different backgrounds and areas of expertise, we're sure to get some interesting applications and innovations. "Applications" is one of the central themes of *BASIC EXCHANGE.* Your applications are invited. Use this medium to share your ideas, and hopefully, a synergy will develop that will result in some great things for everyone.

The vitality of this newsletter will also depend on your inputs in other areas. "Quick Routines," for example, will be a sampling of useful subroutines, clever utilities, and exemplary programming contributed by readers. "Further Reading" can also benefit from the wide range of materials read by you, collectively. If you find something that would interest other HP-85 users, let us know about it. If you start a users' organization, let us know.

Remember, you don't need to rely exclusively on Hewlett-Packard for software support. We chose to use the BASIC language because of the wealth of software that exists in BASIC; any

program written in ANSI standard BASIC will run on the HP-85. However, programs that run on one machine won't run on another without modification if they use commands that are not part of the standard. For example, HP-85 commands like PLOT won't be recognized by all personal computers. Of course anything written in machine language won't be transportable to another manufacturer's machine either. So, to encourage vendors to provide HP-85 compatable software, we'll give their products exposure in *BASIC EXCHANGE.*

Lastly, let me say that letters on most any subject are welcome. You may send them to:

Curtis Adams, Editor
BASIC EXCHANGE
Hewlett-Packard Co.
1000 N.E. Circle Blvd.
Corvallis, OR 97330 U.S.A.

You may want to suggest new columns for future issues. I hope so; *BASIC EXCHANGE* is not cast in concrete. The newsletter will be refined in successive iterations and will evolve over the years. The direction it takes will be set by the readers. The 80-20 rule decrees that 80 percent of the input usually comes from 20 percent of the readers. You're invited to be in that 20 percent that will drive *BASIC EXCHANGE.*

hardware domain

The HP-IB Interface

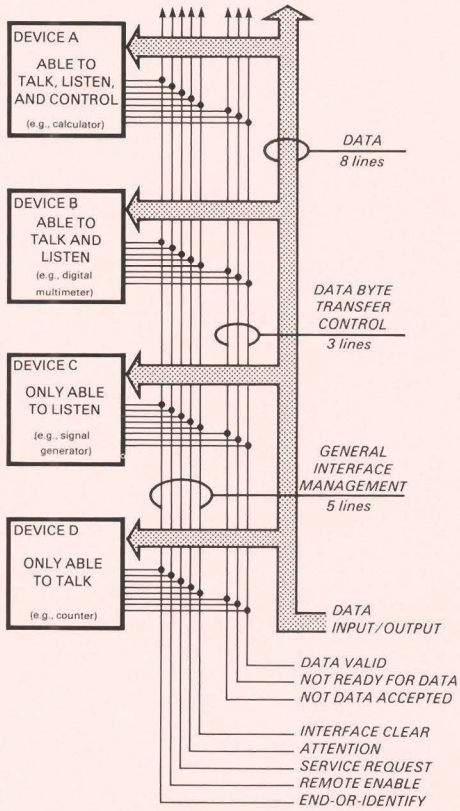
The HP-85 is now a desktop controller! All of HP's experience in systems has been combined in the I/O of this machine; it represents the state of the art in friendly instrument and peripheral control. With the I/O ROM and the HP-IB Interface, you can use the HP-85 for data acquisition and control applications in engineering design, production testing, or wherever you need to:

- Schedule measurement tasks.
- Set up instruments to perform specified tests and measuments.
- Monitor processes on-line.
- Process data and analyze and interpret the results.

An automatic system has many benefits over conventional manual measuring methods, including:

- More consistent results in repetitive measurements—a system is not subject to operator fatigue.
- Greater throughput because systems are faster.
- More thorough testing because system speed allows more parameters to be measured per unit time.
- Results can be expressed in familiar engineering or scientific units via on-line data processing.
- Greater accuracy because system errors can be measured automatically, stored, and compensated for in the results.
- Records can be generated, stored, and transmitted elsewhere.
- When an abnormal condition is sensed, adaptive capabilities can help pinpoint the problem.

The strengths of the HP-85 in this application are the power and simplicity of BASIC, the soft keys, the built-in timers, the keyboard lockout made possible by the I/O ROM, and the HP-IB access to literally hundreds of instruments from HP and other manufacturers that conform to the IEEE-488 specification. The HP-IB has proven to be the key to tying this tremendous range of instruments together into sophisticated, usable systems. What follows is a description of the HP-IB. It is included for the edification of the technically inclined.



The HP Interface Bus transfers data and commands between the components of an instrumentation system on 16 signal lines. The interface functions for each system component are performed within the component, so only passive cabling is needed to connect the system. The cables connect all instruments, controllers, and other components of the system in parallel to the signal lines.

Eight of the lines (**DIO1-DIO8**) are reserved for the transfer of data and other messages in a byte-serial, bit-parallel manner. Data and message transfer is asynchronous, coordinated by the three handshake lines (**DAV**, **NRDF**, **NDAC**). The other five lines are for control of bus activity, as follows:

Devices connected to the bus may be "talkers," "listeners," or "controllers." The controller dictates the role of each of the other devices by setting the **ATN** (attention) line high and

sending talk or listen addresses on the data lines (**DIO1-DIO8**). Addresses are set into each device at the time of system configuration either by switches built into the device or by jumpers on a PC board. While the **ATN** line is high, all devices must listen to the data lines. When the **ATN** line is low, only devices that have been addressed will actively send or receive data. All others ignore the data lines.

IFC (Interface Clear) is used only by the system controller to initialize the bus. It places the interface in a known quiescent state.

REN (Remote Enable) is driven by the system controller and is one of the lines necessary for an instrument to operate under remote control. Only instruments capable of remote operation use **REN**, and they monitor it at all times.

Any active device can set the **SRQ** (service request) line high. This indicates to the controller that some device on the bus wants attention, say a counter that has just counted down.

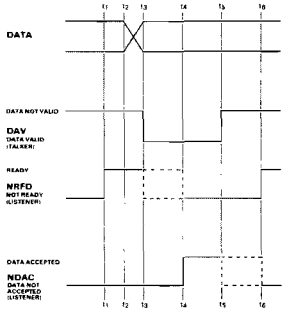
EOI (end or identify) is used by a device to indicate the end of a multiple-byte transfer sequence. When a controller sets both the **ATN** and **EOI** lines true, each device capable of a parallel poll indicates its current status on the **DIO** line assigned to it.

The Three-Wire Handshake

Information is transmitted on the data lines under sequential control of the three handshake lines. All listeners addressed on the HP-IB send a signal when they are 'ready for data.' The talker then initiates data byte transfer by signalling that 'valid data' is on the data lines. When each listening device successfully receives the message, it acknowledges with 'data accepted.'

When two or more devices are listening, all must acknowledge 'data accepted' before new data can be transmitted on the bus. Thus, data is transferred at the rate of the slowest listener participating in that particular conversation. High-speed and slow devices can be connected on the same bus. With data transfer between high-speed devices is not adversely affected, as long as the slow devices are not addressed or participating in the conversation.

The timing diagram below shows the relationship of these signal lines during a data byte transfer. At t_1 **NRFD** is set high to indicate all listeners are ready to accept data. At t_2 the talker places data on the lines and indicates the validity of the data at t_3 by placing **DAV** low. At some interval between t_3 and t_4 a listener may place **NRFD** low, but it must do so before—or at the same time that—**NDAC** is set high. The talker may return **DAV** high after it detects **NDAC** is high, which is shown at t_5. A listener may set **NDAC** low (shown between t_5 and t_6), but it must do so before **NRFD** is set high at t_6. When **NRFD** goes high at t_6, a new cycle begins.



HP INTERFACE BUS SPECIFICATION SUMMARY

Interconnected Devices:
Up to 15 maximum on one contiguous bus.

Interconnection Path:
Star or linear bus network up to 20 meters total transmission path length.

Signal Lines:
Sixteen active total; 8 data lines and 8 lines for critical control and status messages.

Message Transfer Scheme:
Byte-serial, bit-parallel, asynchronous data tranfer using interlocked three-wire handshake technique.

Maximum Data Rate:
The maximum fast-handshake speeds, assuming an infinitely fast peripheral, are 26.2K bytes/sec. for output and 25.5K bytes/sec. for input.

Address Capability:
Primary addresses, 31 Talk and 31 Listen. Secondary (2-byte) addresses, 961 Talk and 961 Listen. There can be a maximum of 1 Talker and up to 14 Listeners at a time.

Control Shift:
In systems with more than one controller, only one can be active at a time. The currently active controller can pass control to one of the others. Only the controller designated as system controller can assume control.

Interface Circuits:
Driver and Receiver circuits TTL-compatible.

software domain

Merging Programs

At some time, you may want to make a single program out of two separate programs. The procedure described here allows you to do so by using the CRT RAM as a buffer. Since the CRT memory can hold at most four screens (64 lines) of information, large programs may require the procedure to be repeated.

1. Initially, program *A* must be on a tape cartridge and program *B* must be in the system RAM, with *A* greater than *B* in length.
2. First, REN umber *B* so that the first statement number is greater than the last statement number in *A*. For example, if *A* is numbered from 10 to 50 and *B* is numbered from 10 to 50, REN umber *B* from 60 to 100.
3. Then, LIST *B*. Press LIST n times, until the entire program is in the CRT RAM or until the CRT RAM is full (n = 4).

4. Now, LOAD A. *B* is no longer in system RAM but is preserved in the display memory.
5. Press HOME. The cursor is now at the top of screen n.
6. Press END LINE, entering each line on the display into the system RAM as the cursor moves down the screen.
7. When all the program lines on the screen have been entered, SCROLL back to screen n − 1. Press HOME and repeat step 6.
8. When (up to four screens of) the program has been moved from CRT RAM to system RAM, give the new, merged program a new name and STORE it on tape.

It is necessary to work "backwards" from screen n to screen 1 so no program lines will be lost.

further reading

Donald Knuth, *THE ART OF COMPUTER PROGRAMMING, VOLUME 1—FUNDAMENTAL ALGORITHMS,* Addison-Wesley, Reading, 1973. This book is already considered a classic and is useful for beginning and expert programmers alike. It is not an introduction to computer programming, but deals with the analysis of algorithms or "the theory of the properties of particular computer algorithms." The author's purpose is not to teach the reader to use his subroutines, but to teach the reader to write better subroutines. The criteria for "better" are faster execution times and lower storage requirements.

He does, though, present many useful algorithms ranging from numerical integration to sorting. For program listings, he uses his own machine language called "MIX." The programs are all rather short, and you shouldn't have much trouble understanding them.

Anyone who aspires to being a first-rate programmer has to pick up the information contained in Volume 1 somewhere along the line. It's about quality.

HARVARD BUSINESS REVIEW, "Graphic Shorthand as an Aid to Managers," George B. Blake, March-April, 1978. The author talks about how, in his company, over a hundred pages of reports were compressed into a one-page report by presenting the data graphically. He lists the many expected and unexpected benefits that accrued. In so doing, he has pointed out several good ways of using the graphics medium.

users' library

"You're in a narrow tunnel. To the north is a very dark chamber. There is a strong breeze blowing upward, and a sign says: DANGER: BOTTOMLESS PIT—What Next?? Will you fall into the bottomless pit, or will you find the treasure and escape the wrath of the enraged gnomes in the cavern?" This is a sample of the "GNOME" game each new subscriber to the HP-85 Users' Library receives. Other programs that make up the special subscription cartridge are a binary math program, a BPLOT program (makes using the graphics capabilities of the HP-85 much easier), and a binary verification program for use when recording programs onto tapes.

In addition to the special subscription cartridge, Library benefits include a copy of *THE HP-85 USERS' LIBRARY CATALOG OF CONTRIBUTED PROGRAMS,* a discount on library programs, access to lots of programming ideas, and special promotions available only to members. Subscription prices are $40.00* for U.S. and Canada, and $60.00* for International (except Europe). Our Library in Geneva will be set up to handle the HP-85 subscribers in Europe. Contact the Library for price information at:

Hewlett-Packard SA
USERS' CLUB EUROPE
7 Rue du Bois-du Lan
PO Box, CH-1217 Meyrin 2
Geneva-Switzerland.

The Catalog includes program information for both user-contributed and HP-written programs, a contributor's guide for submitting programs, and program order forms. Library programs, which comprise listings together with complete documentation, are available for $10.00* each to nonmembers, $6.00* to members. And a new feature is being incorporated into the Library—information is forthcoming on ordering your programs recorded on cartridges!!!

Special Offer ...

We are offering a free cartridge for each program submittal accepted into the Library through the end of October. We will record four programs of your choice on the cartridge—PLUS, a special game that is available now only through this promotion. So, get busy on those HP-85's and submit your programs.

quick routines

Pseudo-String Arrays

Although the HP-85 does not have built-in string arrays, you can simulate them as shown in the following example.

A parts file is to be kept for one hundred items with ten character alphanumeric part numbers and five related numeric quantities: quantity in stock, date of last order, etc. The routine listed below will enable you to access the quantities associated with any particular part number.

```
 10 OPTION BASE 1
 20 DIM P$[11000],V(100,5),Q$[11]
 .
 .
 .  GOSUB 990
 .
 .
 990 Q$="          "
1000 DISP "ENTER PART NUMBER";
1010 INPUT Q$
1020 Q$[11,11]="&"
1030 P=POS(P$,Q$)
1040 IF NOT P THEN DISP "PART NO
     T FOUND" @ BEEP @ RETURN
1050 I=INT(P/11)+1
1060 PRINT Q$[1,10]
1070 FOR J=1 TO 5
1080 PRINT V(I,J)
1090 NEXT J
1100 RETURN
```

continued on back page

* *U.S. price only. For information outside of U.S., please contact the sales office or dealer nearest you. Regional addresses appear on pg. 8.*

P$ is composed of groups of 11-character substrings, where the last character of each substring, which must be "&", acts as a delimiter between part numbers. The first ten characters of each substring are reserved for the part number, with blanks inserted after the part number if it is less than ten characters. When a match is found in P$ using the POS function, the relative position, I, is computed. I points to the appropriate row in the array, V, which contains the related numeric quantities. Line 990 initializes Q$ to ten places.

service

Hewlett-Packard is now offering on-site service for the HP-85. Under an on-site maintenance agreement, HP-85 system owners within 100 miles of an HP service office can get guaranteed next-day response. The price? $25.00* per month for the HP-85; additional agreements are available for peripherals including plotters, printers, and the new flexible disc drives.

HP-85 owners farther than 100 miles away from an HP service office can still get an on-site maintenance agreement, but with a slightly longer response time and a slightly higher price tag, depending on the distance.

Those who don't require such quick service can opt for a $17.00* per month field-repair-center service agreement, where a unit needing service is shipped to one of the designated HP field repair centers located throughout the world. HP guarantees to fix and ship the unit within three days of receipt.

Maintenance agreements are offered on a worldwide basis for all HP-85's whether sold by computer stores, office machine dealers, or HP's sales force. Machines that are out of warranty must be inspected by HP before they will be covered by either of these agreements.

Of course, you can still get service without one of these maintenance agreements. You can even get on-site repair without an agreement in some areas. This is the most expensive alternative. The lowest-cost route is for you to ship your HP-85 to the factory or a field repair center, or return it to your dealer and pay the cost of the repair.

For additional information on HP service alternatives, call your local HP dealer, HP sales office, or the toll-free number mentioned elsewhere in this issue.

* *U.S. price only. For information outside of U.S., please contact the sales office or dealer nearest you. Regional addresses appear on pg. 8.*

---

continued from page 7

HP-85 General Statistics Pac—five program sections providing one-sample analysis, paired-sample analysis, test statistics, distributions, and multiple linear regression.

HP-85 Financial Decisions Pac—an easy-to-use Pac including interest, loans, discounted cash flow, bonds, breakeven analysis, and more. Generates graphic representations of the solutions.

HP-85 Math Pac—simultaneous equations, roots of f(x) = 0, integration, differential equations, FFT's, Fourier series, complex operations, and more.

HP-85 Text Editing Pac—allows you to enter, modify, store, and output such things as specification sheets, reports, and letters. Includes matched string search and replace.

HP-85 Games Pac—Entertainment ranging from "Lander" that simulates the console of a spaceship as you land on the planet of your choice to "Birthday Plot" that generates your own personal graphic design. 20 programs.

HP-85 Waveform Analysis Pac—FFT's, inverse transforms, correlation, power spectrum, and more. Also provides dual data block entry for cross correlation, cross power spectrum, and convolution. Results can be plotted.

For a brochure that describes any particular Application Pac in detail, you may call our toll-free number, 800-547-3400 excluding Alaska and Hawaii (in Oregon call 758-1010). This service is available Monday through Friday from 6:00 a.m. to 6:00 p.m., Pacific Time, exclusively for:

1. Locating the HP dealer nearest you.
2. Product or literature inquiries.
3. Service information.
4. Information on new product availability.

The service is not available for answering technical questions nor for applications assistance. Those functions are handled by the Customer Support department (not toll-free) at 503-757-2000.

HEWLETT PACKARD

BASIC EXCHANGE
Summer 1980 Vol. 1 No. 1

Information about new hardware and software, new policies, programming and operating suggestions, further reading, and feature articles. Published four times a year for owners of Hewlett-Packard personal computers.
Reader comments and contributions are welcomed and should be addressed to the editor.

Hewlett-Packard Company
1000 N.E. Circle Blvd.
Corvallis, OR 97330 U.S.A.

Hewlett-Packard S.A.
7 Rue du Bois-du-Lan
P. O. Box, CH-1217 Meyrin 2
Geneva - Switzerland

Hewlett-Packard Intercontinental
3495 Deer Creek Road
Palo Alto, CA 94304 U.S.A.

Address Correction Requested
Return Postage Guaranteed

BULK RATE
U.S. POSTAGE
PAID
PERMIT NO. 814
PORTLAND, OR

Printed in U.S.A.