HP-41
Advanced Programmable Calculators

HP-71
Handheld Computers
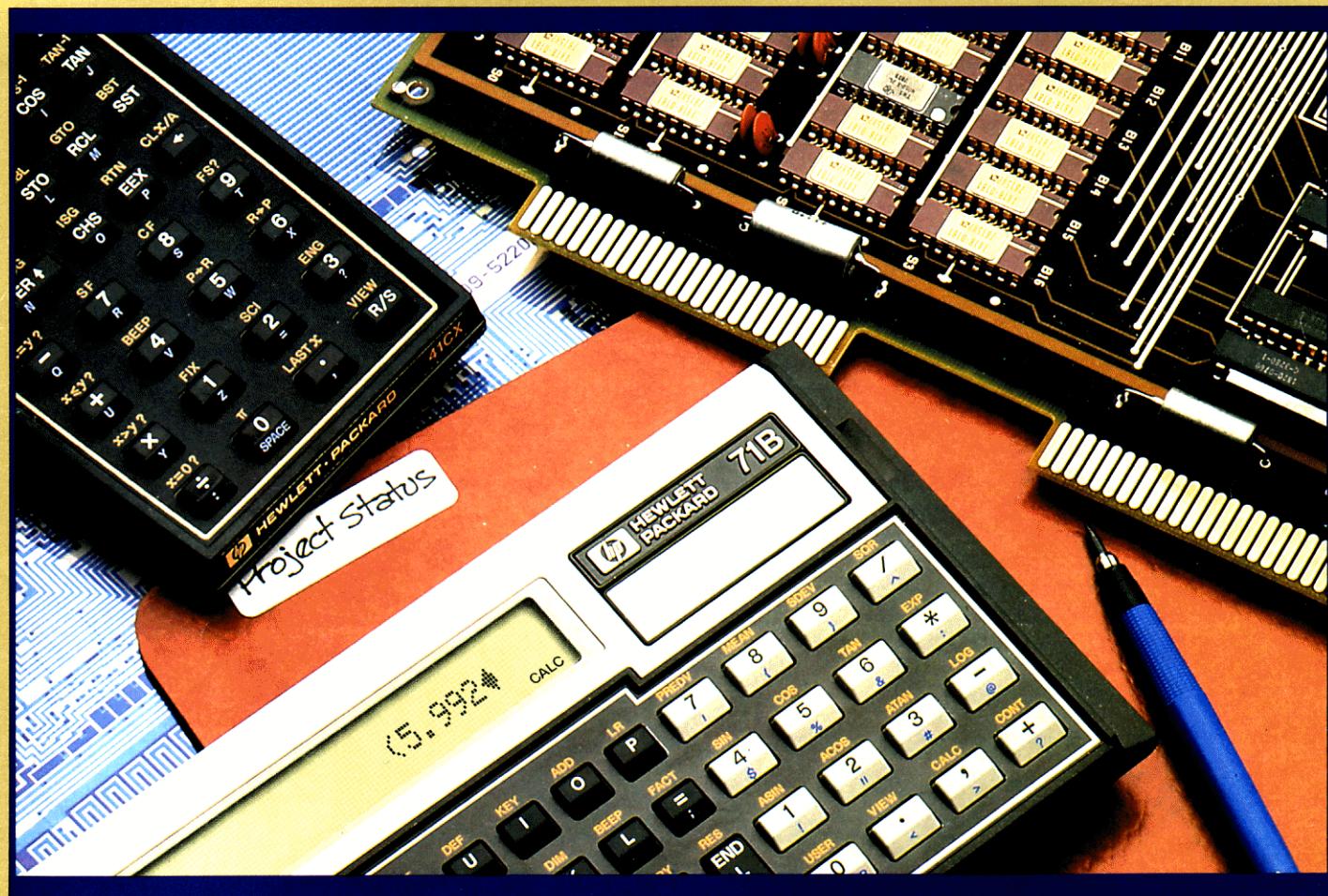
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Work Smarter, Not Harder

With Advanced Calculators and Handheld Computers From Hewlett-Packard
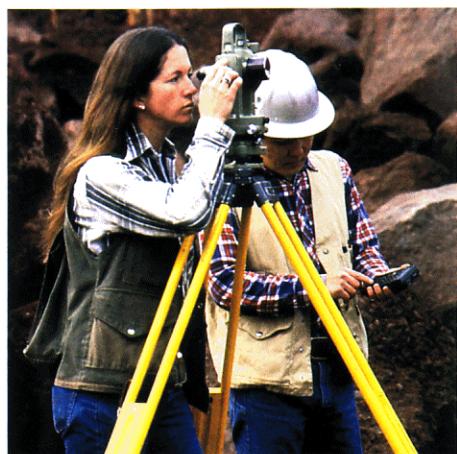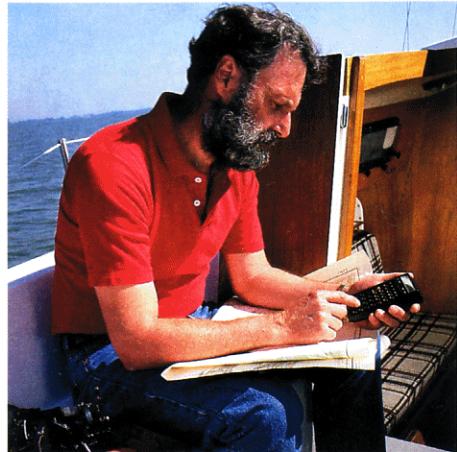
Whether your field is science, engineering, or business, you have to perform tough arithmetic calculations and analyze data every day. Hewlett-Packard has the computational tools you need to complete those tasks efficiently and effectively. The HP-41 Advanced Calculator and HP-71 Handheld Computer give you the calculating and computing power you need to work smarter — not harder.

Both the HP-41 and HP-71 offer ROM-based operating systems, user-definable keyboards, and non-dedicated I/O (input/output) ports. All this in combination with built-in programming features make it exceptionally easy to customize these products. And they're the heart of expandable computer systems for scientific, engineering, and business applications. Simply by adding peripherals, modules, software, and HP-IL (Hewlett-Packard Interface Loop) interfacing, you can expand HP-41 and HP-71 capabilities to those of low-cost computer systems — and still take advantage of user-friendly operation. There's plenty of software, too, from HP-written solutions books and application pacs with plug-in modules to user-written programs.

The HP-41 Advanced Calculator — Calculate, Analyze, Monitor and Control.

Whether you're performing arithmetic calculations, analyzing data, or controlling a system, the HP-41 Advanced Calculator can adapt to your task.

From your classroom problems to complex instrument control, the HP-41 grows as your needs grow. Maximum portability is guaranteed by the size and battery-powered capabilities of the HP-41.

Choose between two HP-41 models — the HP-41CV with 2,237 bytes of main memory, or the HP-41CX with 3,105 bytes of main and extended memory. In addition to all the built-in functions of the HP-41CV, the HP-41CX features built-in Time and Extended Functions/Memory modules, a text-file editing function, and 19 other functions not available as HP-41CV options.

A host of software programs extend the calculating capabilities of the HP-41. Choose from HP-written application pacs with plug-in modules, and Solutions Books with bar code and keystroke listings. Application areas include statistics, math, navigation, real estate, and financial decisions. Thousands of user-written programs are available from the Users' Library. And of course, you can write your own programs.

The HP-41 Advanced Calculator is friendly, too; you won't have to learn a programming language to get your job done. The RPN (Reverse Polish Notation) logic system allows you to solve your most complicated calculations with ease. And you'll see the intermediate results of each operation so you can recover from errors easily.

Calculate, analyze, monitor, or control. Your HP-41 Advanced Calculator will do it all — anywhere!

*HP-IL Interfacing
capability for battery-operated cassette drive, battery-operated printer, instrumentation control, video monitor, color graphics plotter, full-width printers, larger systems, acoustic coupler (modem).

*Magnetic Card
reading capability, inexpensive, convenient distribution.

*Bar Code
reading capability easily reproduced on paper.

*Four Plug-in Ports
for software modules, peripherals, interfacing, memory expansion modules, and added flexibility.

*12-Character LCD
with scrolling to 24 characters.

*RPN Logic

Built-in Time Module
provides time, calendar, alarm, and stopwatch functions.

*58 Functions
on the keyboard.

*Continuous Memory

Text-File Editor
up to 254 ASCII characters per record for storing information.

*Alphanumeric Keyboard
name and label programs, functions, and results.

Built-in Extended Functions/ Memory Module
adds memory, power, and flexibility in setting up and manipulating programs.

24K-Byte Operating System
over 200 separate operations.
(HP-41CV – 12K-byte operating system, 128 separate operations.)

*Applies to both HP-41CX and HP-41CV.

The HP-71 Handheld Computer — Your BASIC Number Cruncher!

The HP-71 Handheld Computer takes over where the HP-41 leaves off. Its 64K-byte enhanced BASIC operating system supports seven file structures and provides high calculation speeds which are further improved by FORTH and assembler capabilities. For interfacing, HP-IL provides data transfer rates up to 5,000 bytes per second. Powerful CALC mode (a nonprogrammable advanced calculator operating mode), combined with a 10-digit keypad allows not only quick solutions, but fast, easy input of numeric data, too.

The HP-71 has 17.5K bytes of built-in user memory. Its versatility is enhanced by the four RAM/ROM ports, so you can add any combination of RAM or ROM modules. In fact, a maximum of 256K bytes of ROM can be used at once — a potential of 273.5K bytes of memory. And that's an extraordinary amount of power to hold in one hand!

Take advantage of already-tested HP software in a variety of applications. Convenient plug-in modules, mini data cassettes and magnetic cards are several of the media available to you.

The HP-71 is an "open machine," too. HP has documented the internal specifications, and they are available to you. You can create your own hardware, software, firmware, and interfaces — in fact, you're limited only by your imagination!

And whether you're creating sophisticated programs or crunching numbers, the HP-71 backs you up with the power, accuracy and versatility you demand.

Liquid-crystal Display
22-character window on a 96-character line displays upper- and lowercase letters with true descenders. Use cursor keys to step through programs one line at a time. Create your own special characters. Scroll to view the entire line of large, easy-to-read characters. Display annunciators at both ends of the display serve as mode indicators.

Battery Power
four 1.5V, AAA size batteries assure portability. Or, use the optional ac adapter.

HP-IL Interface
option for connecting to a wide variety of battery-powered devices for mass storage, display, printing, plotting, test, and measurement.

Card Reader
option to use small, inexpensive, magnetic cards for mass storage and easy program loading.

BASIC Language
powerful programming language.

Typewriter-like Keyboard
enter alphabetical information quickly and easily. Redefine the keys to suit your changing needs, and store the redefinitions to use later.

Four Ports
accept any combination of memory modules or application software to increase computation power.

CALC Mode
cut your one-time calculations down to size.

Five-level Command Stack
recall any of your last five commands for editing and re-use.

Continuous Memory
turn your HP-71 off and return later without losing calculations and programs.

10-digit Key Pad
*fast, easy input of numeric data.*

Hewlett-Packard
HP-41/HP-71 Hardware Overview

Read and Store Information:

A.) HP 82161A HP-IL Digital Cassette Drive
B.) HP 82104A HP-41 Card Reader
C.) HP 82400A HP-71 Card Reader
D.) HP 82153A HP-41 Optical Wand
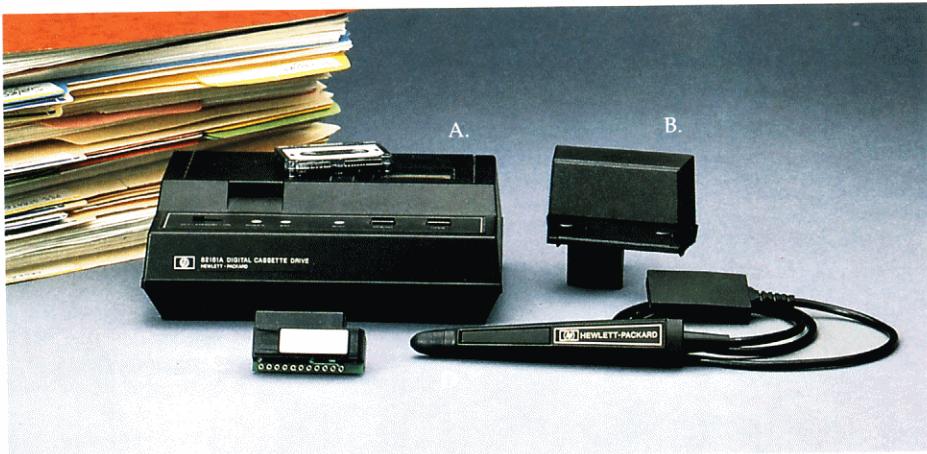
## Put It On Paper And Draw Your Conclusions:

A.) HP 2225B ThinkJet Printer
B.) HP 82162A HP-IL Thermal Printer/Plotter
C.) HP 82143A HP-41 Printer/Plotter
D.) HP 2671A/G HP-IL Alphanumeric/Graphics Thermal Printers
E.) HP 7470A HP-IL Graphics Plotter

## Measure and Gather Data:

A.) HP 3421A HP-IL Data Acquisition/Control Unit
B.) HP 5384A/5385A HP-IL Frequency Counters
C.) HP 3468A HP-IL Digital Multimeter
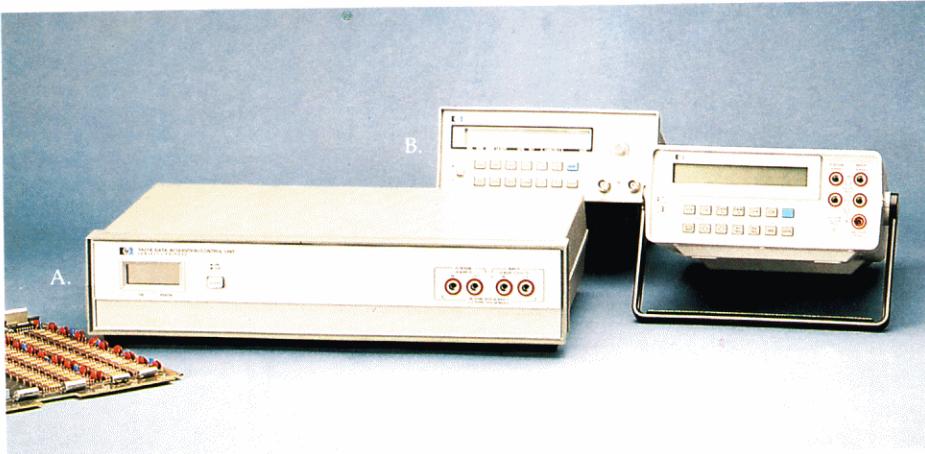
Enhance Your Performance and Communication:

A.) HP 82168A HP-IL Acoustic Coupler (Modem)
B.) HP-IL Interface Modules:
HP 82160A HP-41 HP-IL Interface Module
HP 82401A HP-71 HP-IL Interface Module
C.) Enhancements:
HP 82180A HP-41 Extended Functions/Memory Module
HP 82181A HP-41 Extended Memory Module
HP 82182A HP-41 Time Module
HP 82183A HP-41 Extended I/O Module
HP 82184A HP-41 Plotter Module
00041-15043 HP-41 Automatic Start and Cassette Duplicating Module
00041-15043 HP-41 Development Module
HP 82420A HP-71 4K-Byte Memory Module
D.) HP 92198A Mountain Computer HP-IL 80-Column Video Interface
E.) Interfaces:
HP 82164A HP-IL/RS-232C Interface
HP 82169A HP-IL/HP-IB Interface
HP 82938A HP-IL/Series 80 Interface
HP 82165A HP-IL/GPIO Interface
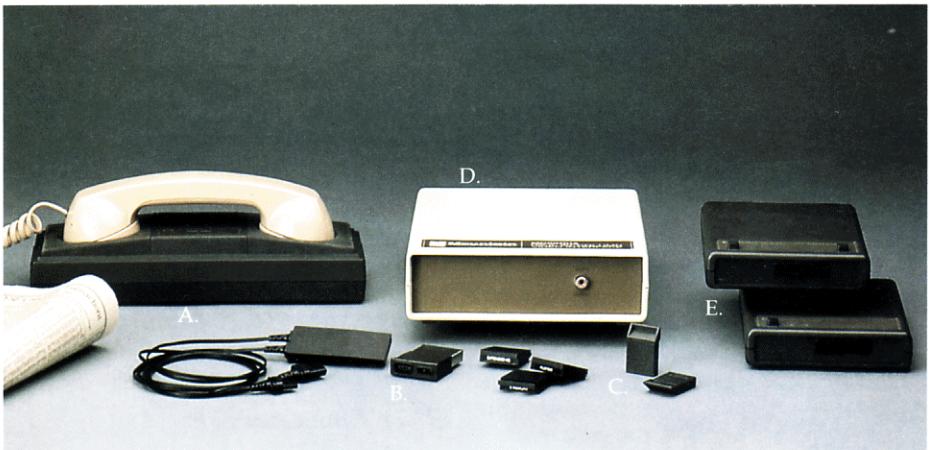
For more hardware information, see:

Hewlett-Packard
HP-41/HP-71 Software Overview

Engineering Applications

HP-41 Application Pacs
- Aviation
- Circuit Analysis
- Machine Design
- Mathematics
- Navigation
- Petroleum Fluids
- Standard
- Stress Analysis
- Structural Analysis
- Surveying
- Thermal and Transport Science

HP-41 Solutions Books
- Antennas
- Chemical Engineering
- Civil Engineering
- Control Systems
- Electrical Engineering
- Fluid Dynamics
- Geometry
- Heating/Ventilating/Air Conditioning
- High-Level Math
- Mechanical Engineering
- Physics
- Solar Engineering
- Surveying
- Test Statistics
- Time Module Solutions

HP-71 Application Pacs
- AC Steady State Circuit Analysis
- FORTH/Assembler
- Math
- Surveying

HP-71 Solutions Books
- General Utilities (basic subprograms)
- Math
- Software Development Utility

Scientific Applications

HP-41 Application Pacs
- Aviation
- Clinical Lab and Nuclear Medicine
- Mathematics
- Navigation
- Petroleum Fluids
- Standard
- Statistics
- Surveying

HP-41 Solutions Books
- Chemistry
- Geometry
- High-Level Math
- Optometry I
- Optometry II
- Physics
- Surveying
- Test Statistics
- Time Module Solutions

HP-71 Application Pacs
- Curve Fitting
- FORTH/Assembler
- Finance

- Math
- Surveying
- Text Editor

HP-71 Solutions Books
- General Utilities (basic subprograms)
- Math
- Software Development Utility

Business Applications

HP-41 Application Pacs
- Financial Decisions
- Home Management
- Mathematics
- Real Estate
- Securities
- Standard
- Statistics

HP-41 Solutions Books
- Business Statistics/Marketing/Sales
- Calendars
- Home Construction Estimating
- Lending, Savings and Leasing
- Real Estate
- Small Business
- Time Module Solutions

HP-71 Application Pacs
- Curve Fitting
- Finance
- Math
- Text Editor

HP-71 Solutions Books
- General Utilities (basic subprograms)
- Math

Entertainment

Application Pacs
- Games (HP-41)

Solutions Books
- Games (HP-41)
- Games (HP-71)
- Games II (HP-41)

For more software information, see:
HP-41/HP-71 Software, page 37.
Users' Library, page 40.
HP-71 Development System, page 42.

HP-41 Advanced Calculators combine the speed, power, and accuracy of computers with the portability, touch-key simplicity, and low cost of hand-held calculators.

Take Your Choice.

There are two HP-41 models from which to choose — the HP-41CX and the HP-41CV. The two models differ in the amount of extended memory, as well as in functionality and expandability.

The HP-41CV, with 128 built-in functions, is powerful enough for many applications. The addition of Extended Functions/Memory and Extended Memory modules lets you expand when your needs grow.

The HP-41CX offers the most functions and greatest expandability of the HP-41 family. With 20 additional functions for enhanced programming (see functions list, p. 11), the HP-41CX has the power and flexibility to solve most complex problems. The built-in Time and Extended Functions/Memory modules leave the four I/O ports open for other peripherals and software plug-ins. Text-file editing is an added built-in feature in the HP-41CX.

HP-41 Memory Capabilities

	HP-41CV	HP-41CX
Main memory		
Bytes	2,237	2,237
Registers	319	319
Extended memory		
Bytes	868 (optional)	868
Registers	124 (optional)	124
Extended Memory Modules*		
Bytes	1,666	1,666
Data registers	238	238
Maximum memory		
Bytes	6,437	6,437
Data registers	919	919

Features	Benefits
• Advanced calculator power.	Solves complex problems quickly, anywhere.
• Battery powered.	Offers maximum portability. Optional battery pack may be recharged easily.
• Four I/O ports.	Potential for plug-in ROM software, peripherals, interfacing, and more, to provide problem-solving versatility.
• RPN.	Consistent, effective logic system. Friendly. Saves time in calculations.
• User-definable keyboard.	Assigns any program or function to almost any key. Customizes the keyboard to the user's needs. Toggle selection of either User or Normal keyboards for customized key performance or original key functions.
• Continuous Memory.	Entire contents of memory, including key assignments, are preserved even when the HP-41 is turned off. No reloading of programs necessary.
• Alphanumeric keyboard.	Names and labels programs, functions, and results. Prompts in words for easy interpretation.
• Software.	Pre-tested solutions assure fast, accurate results. Plug-in ROM modules, magnetic cards, cassettes, and bar code available.
• Custom Products.	HP can manufacture your own software as plug-in modules, magnetic cards, or cassettes; you choose the key labels.

You can further expand the memory with non-volatile extended memory modules to give either model a maximum of 919 registers.**

HP-41 Features.

• **RPN.** Reverse Polish Notation provides a consistent and efficient logic system. RPN is fast, eliminating the need for equals and parenthetical keystrokes. Error recovery is simplified by automatic storage of the last entry. It also lets you see your intermediate results.

• **Four input/output ports.** Plug in ROM software modules or add to existing memory capacity with plug-in memory modules. The HP-IL Interface Module plugs in to allow connection to peripheral devices. A Plotter Module provides plotting and bar code capabilities for the HP-41 with the HP 7470A Plotter; a Time Module expands your system with time information and time-controlled operations. The Extended I/O Module enhances the HP-41's control of the HP-IL loop. Customize your applications with plug-in Custom Modules that

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*Add a maximum of two.

**All information in the extended memory is organized in program, data or text files. The functions necessary for accessing these files are available in the Extended Functions/Memory Module and in the HP-41CX.

provide your own means of permanent and private program storage. The Time and Extended Functions/Memory modules are built right into the HP-41CX, leaving all four ports open for other special-function plug-ins.

- **Software.** A broad range of available software provides immediate, accurate solutions. HP-written application pacs with plug-in modules, Solutions Books with keystroke listings and bar code, and Users' Library programs are just a few of the software options available.

- **Expandable.** Maximum memory is 6.4K bytes with two extended memory modules. Interfacing capabilities allow the use of various printers, plotters, monitors, mass storage devices, acoustic couplers, instruments, and access to the power of larger computers.

- **Redefinable keyboard.** Over 200 separate operations (over 128 in the HP-41CV) reside in the HP-41CX function library, with 58 of these right on the keyboard. Each key may be redefined. Or, choose an operation from an application pac or program and assign it to almost any key.

- **Continuous Memory.** Preserve everything from stored data to user-defined keyboard assignments while the HP-41 is turned off. Enter frequently needed calculations once, and then perform them as often as necessary, without having to reenter the program.

- **Built-in operating system.** A 24K-byte operating system (12K in the HP-41CV) allows for immediate solutions to complex problems.

- **Portable.** Four 1.5V N-sized, alkaline batteries supply all the power you'll need. Carry the HP-41 in your pocket or briefcase. There will always be room for it on your desk or workstation.

- **Liquid-crystal display.** The display is easy to read and helps to eliminate glare problems from sunlight and other sources. Low power consumption minimizes battery drain. The display allows you to view ten digits or twelve alpha characters. Automatic scrolling shows you up to 24 alpha characters.

HP-41 Specifications

DIMENSIONS . . .14.2 cm (5.6 in) x 7.9 cm (3.1 in) x 3.3 cm (1.3 in)

WEIGHT . . . . . .205 g (7.2 oz) with batteries

POWER

Batteries . . . . . . .four 1.5V, size N batteries (replaceable by user)

Battery Current (worst case) . . .20 mA (operating) 2 mA (idle) 50 μA (off)

Average alkaline battery life . . . .up to 6 months (battery life depends upon use, less when a peripheral device without its own power source is in use)

OPERATING REQUIREMENTS

Operating temperature . . .0° to 45°C (32° to 113°F)

Storage temperature . . . −20° to 65°C (−4° to 149° F)

Humidity . . . . . .40°C at 95%

DISPLAY

Capacity . . . . . .10 digits; 12 alpha characters displayed (scroll to view 24); 12 annunciator words; each character position consists of 17 segments, including 3 punctuation segments.

CHARACTER RANGE

A-Z, a-e, 0-9, plus 37 special characters, some of which can be obtained only by using optional plug-in peripherals.

DYNAMIC RANGE

$\pm 1.000000000 \times 10^{-99}$ to $\pm 9.999999999 \times 10^{99}$, plus zero.

Numbers are shown with a maximum of ten digits, or an 8-digit mantissa and a 2-digit exponent.

Displayed numbers are rounded to the last displayed digit, calculations are performed internally with at least ten digits.

HP-41 ADVANCED CALCULATORS COME COMPLETE WITH:

- The appropriate owner's documentation:
  HP-41CX Owner's Manual (Vol. I and Vol. II)
  HP-41CX Pocket Operating Guide
  HP-41CV Owner's Handbook and Programming Guide
  HP-41CV Guide for the Experienced User
  HP-41CV Quick Reference Card
- And the following:
  Tough, pliable carrying case
  Four type N batteries
  Overlay packet
  Users' Library subscription card

HP-41 FUNCTIONS LIST

■—Shift key.
+—Addition operator.
−—Subtraction operator.
*—Multiplication operator.
/—Division operator.
1/X—Reciprocal.
10↑X—Common antilogarithm.
ABS—Absolute value.
ACOS—Arc (inverse) cosine.
ADV—Advance paper.
AOFF—Alpha mode off.
AON—Alpha mode on.
APPEND—Append characters (⊢).
ARCL—Alpha recall.
ASHF—Alpha shift left.
ASIN—Arc (inverse) sine.
ASN—Assign.
ASTO—Store Alpha data in register.
ATAN—Arc (inverse) tangent.
AVIEW—Alpha view.
BEEP—Beeper.
CAT—Catalog.
CF—Clear flag.
CHS—Change sign.
CLA—Clear Alpha register.
CLD—Clear display.
CLP—Clear program.
CLRG—Clear register.
CLΣ —Clear statistics registers.
CLST—Clear stack registers.
CLX—Clear X-register.
COPY—Copy program from module or peripheral into program memory.
COS—Cosine.
D—R—Degrees to radians conversion.
DEC—Octal to decimal conversion.
DEG—Degrees mode.
DEL—Delete program memory lines.
DSE—Decrement, skip if equal.
EEX—Enter exponent.
END—End program.
ENG—Engineering notation.
ENTER↑—Enter number in X-register into Y-register.
E↑X—Natural antilogarithm.
E↑X − 1—Natural antilogarithm for arguments close to zero.
FACT—Factorial.
FC?—"Flag clear" test.
FC?C—"Flag clear" test and clear.
FIX—Fixed point display.
FRC—Fractional portion of number.
FS?—"Flag set" test.
FS?C—"Flag set" test and clear.
GRAD—Grads mode.
GTO—Go to label.
HMS—Decimal hours to hours, minutes, seconds conversion.
HMS+—Hours, minutes, seconds addition.
HMS−—Hours, minutes, seconds subtraction.
HR—Hours, minutes, seconds to decimal hours conversion.

INT—Integer portion of number.
ISG—Increment, skip if greater.
LASTX—Recalls LAST X register contents to X-register.
LBL—Program label.
LN—Natural logarithm.
LN1 + X—Natural logarithm for arguments close to one.
LOG—Common logarithm.
MEAN—Mean.
MOD—Modulo (remainder).
OCT—Decimal to octal conversion.
OFF—Power off.
ON—Power on (continuous) function.
P—R—Polar to rectangular conversion.
PACK—Pack program memory.
%—Percent.
%CH—Percent of change.
PI—Pi (3.141592654).
PROMPT—Prompt.
PSE—Pause.
R↑—Roll up stack.
R—D—Radians to degrees conversion.
R—P—Rectangular to polar conversion.
R/S—Run or stop a program.
RAD—Radians mode.
RCL—Recall data from register into X-register.
RDN—Roll down stack.
RND—Round.
RTN—Return.
SCI—Scientific notation.
SDEV—Standard deviation.
SF—Set flag.
Σ+—Accumulations for statistics.
Σ−—Accumulation correction.
ΣREG—Statistical register block specification.
SIGN—Sign of x.
SIN—Sine.
SIZE—Size of data storage register allocation.
SQRT—Square root.
ST+—Storage register addition.
ST−—Storage register subtraction.
ST*—Storage register multiplication.
ST/—Storage register division.
STO—Store numeric data in register.
STOP—Stops program execution.
TAN—Tangent.
TONE—Tone.
VIEW—View register contents.
X=0?—"X = 0?" conditional test.
X≠0?—"X ≠ 0?" conditional test.
X<0?—"X<0?" conditional test.
X< = ?—"X≤0?" conditional test.
X>0?—"X>0?" conditional test.
X = Y?—"X = Y?" conditional test.
X≠Y?—"X ≠ Y?" conditional test.
X<Y?—"X<Y?" conditional test.
X< = Y?—"X≤Y?" conditional test.
X>Y?—"X>Y?" conditional test.
X<>—Exchange X- and any register.
X<>Y—Exchange X- and Y- registers.
XEQ—Execute.

X↑2—Square.
Y↑X—Exponential.

FUNCTIONS UNIQUE TO THE HP-41CX

ASROOM—Number of bytes left in working ASCII file.
CLALMA—Clear alarm by Alpha register.
CLALMX—Clear alarm by X-register.
CLRALMS—Clear all alarms.
CLRGX—Clear a specified block of registers.
ED—Text Editor.
EMDIRX—Access extended memory directory.
EMROOM—Number of unused registers in extended memory.
ΣREG?—Return number of first statistics register to X.
GETKEYX—Return ASCII code to X-register and keycode to Y-register.
RCLALM—Recall alarm.
RESZFL—Resize ASCII or data file.
SWPT—Activates stopwatch and sets pointers.
CAT6—Lists all user key assignments in order of key code.
X=NN?—conditional test.
X≠NN?—conditional test.
X<NN?—conditional test.
X≤NN?—conditional test.
X>NN?—conditional test.
X≥NN?—conditional test.

CALCULATOR MODES

USER—User mode key.
PRGM—Switches into/out of Program mode.
ALPHA—Switches into/out of Alpha mode.

EDITING

←—Correction key.
GTO.—Go to the line number of Alpha label.
GTO..—Go to end of program memory.
BST—Back step.
SST—Single step.

HP-41 ACCESSORIES

- HP-41CX Owner's Manual
    Vol. I Basic Operation (00041-90474)
    Vol. II Operation in Detail (00041-90492)
- HP-41CX Pocket Operating Guide (00041-90475)
- HP-41CV Owner's Manual (00041-90313)
- HP-41CV Guide for the Experienced User (00041-90259)
- HP-41 Overlay Kit (82152A)
- HP-41 Module Holders (2) (82151A)
- Multipurpose Rechargeable Battery Pack (82120A)
- AC Adapter/Recharger (for HP 82143A and HP 82120A) (82059D)
- HP-41 50 Blank Overlays (82172A)
- "Creating Your Own Bar Code" Manual (82153-90019)
- Vinyl Case (Card Reader) (82111A)
- Program Pad (00097-13154)

Hewlett-Packard
HP-71 Handheld Computer

The HP-71 Handheld Computer – a portable, 12-ounce package that puts a powerful calculation mode, BASIC language, and expansion potential right at your fingertips. The HP-71 offers a built-in operating system larger than many desktop computers. Use it alone or configured as part of an HP-IL (Hewlett-Packard Interface Loop) system for expanded, personalized calculating.

HP-71 Features.
- **CALC mode.** A powerful, nonprogrammable operating mode, CALC is easy to learn and simple to use. It is optimized for calculations to handle your most complex computations. Expressions are easy to key in — work from left to right in true algebraic format, and watch your intermediate results develop as you go along. Twelve decimal digits of accuracy assure you of precise results. And, CALC mode interacts with BASIC; a variable assigned a value in BASIC retains that value in CALC mode, and vice versa. Any numeric expression that can be keyed in and evaluated in BASIC can also be evaluated in CALC mode. You can use all of the built-in HP-71 numeric functions and operators, as well as your own single-line functions. Statistics functions are built-in, allowing you to perform computations on up to 15 independent variables. And a complete set of trig functions lets you evaluate complex equations with no extra effort.

- **BASIC programming language.** Develop your programs in a friendly, familiar language. Over 240 functions, statements, and operators complement a language powerful enough to handle almost all of your programming needs. To

Features	Benefits
• CALC mode.	Fast, accurate solutions to complex calculations. Easy to use and edit. Increase computational flexibility by sharing variables with BASIC.
• Built-in 64K-byte ROM BASIC operating system.	Powerful file management system. Simple to program using over 240 keywords. Efficient, accurate computations with results to 12-digit precision.
• User-definable keyboard.	Reduce program and data entry time by assigning specific functions to specific keys. More efficient use of operating time.
• Four RAM/ROM ports.	Increase memory and storage capacity. Add to problem-solving versatility by combining plug-in ROM and RAM modules.
• Software.	Pre-tested solutions assure fast, accurate results. Choice of media: plug-in modules, magnetic cards, and cassettes.
• Optional HP-IL interface.	Tap the resources of larger computers. Control instruments without being present. Print, store, and expand display capabilities by adding peripherals and accessories.
• Optional Card Reader.	Convenient and inexpensive off-line storage of data and programs. Easy program loading.

help increase your programming versatility and flexibility, create subprograms. Parameters can be passed from main programs to the subprograms. The enhanced HP-71 BASIC supports the IEEE Radix Independent Floating-Point Math Standard to give you more control and accuracy in your computations.

- **Built-in operating system.** The powerful, calculation-oriented 64K-byte operating system allows for high-level programming in addition to repetitive calculations.

- **Five-level command stack.** Your last five commands are stored in HP-71 memory so that you can recall any of them to modify and reuse. That's a real time saver when you're executing a series of com-

mands, or when you need the combined results of several equations.

- **Expandable.** The HP-IL interfacing option opens the door to a broad array of accessories, peripherals, instruments, and other computers. Print, store, retrieve, and display information, as well as communicate with larger computers.

- **Four RAM/ROM ports.** Choose your memory requirements, to a maximum of 33.5K bytes of user-accessible memory. Plug in up to four 4K-byte RAM modules to increase your memory and storage capacity by 16K bytes. The HP-71 is capable of directly addressing 512K bytes. And, you can add ROM

software modules for speedy execution of specific solutions. Customize your applications with plug-in Custom ROM Modules to add unique problem-solving capabilities and a means of permanent, private storage. Any of the internal or external RAM can be set aside for program or data storage so you can locate files quickly and protect them from some memory reset conditions. You can also remove memory modules without disturbing files in the rest of RAM.

- **Typing aids.** Often-used keywords or instructions can be displayed simply by pressing a shifted key. Reduce your program and data entry time by using these built-in typing aids.

- **Redefinable keyboard.** Each key on the keyboard can be redefined (except the blue and gold shift keys) to increase your calculating efficiency. Redefine the shifted key functions, too, and further expand the number of functions available to you. Assign your own typing aids to any convenient key, execute a particular statement or program from the keyboard, and simplify data entry while you're running a program.

- **Multiple file structure.** The number of files in HP-71 memory is limited only by the amount of available RAM. Seven different file types are supported: BASIC, BIN, LEX, DATA, TEXT, KEY, and SDATA.

- **Clock/calendar.** A built-in quartz-crystal clock can be set with an accuracy of 1 second per month or better. It runs even when your HP-71 is turned off. Create and use clock/calendar dependent programs that must begin and run when you can't be there to control the process. Three independent timers are available for your use.

- **Software.** HP-written software in a variety of applications is available to give you ready-to-go solutions. Each application pac comes with a convenient plug-in module and complete documentation.

Physical Specifications

DIMENSIONS . . .19 cm (7.5 in) x 9.7 cm (3.8 in) x 2.5 cm (1.0 in)

WEIGHT . . . . . .340 g (12 oz) with batteries

POWER
Batteries . . . . . . .four 1.5V, size AAA alkaline batteries (replaceable by user)
Battery Current . .10 mA (operating)
.75 mA (idle)
.03 mA (off)
Average alkaline
battery life . . . .60 operating hours (battery life depends upon use)
AC adapter (82059D) optional. (Does not recharge batteries.)

OPERATING REQUIREMENTS
Operating
temperature . . .0° to 45°C (32° to 113°F)
Storage
temperature . . . −40° to 55°C (−40° to 131° F)
Humidity . . . . . .0% to 95% relative humidity

DISPLAY
Liquid-crystal display
Character font . . .6 x 8 dot matrix
Capacity . . . . . . .96 characters per line
Window size . . . .22 characters (scroll to 96 characters)
Character set . . . .256 characters

CHARACTER RANGE
A-Z, a-z, 0-9, plus 65 special characters.

NUMBER RANGE
Real Precision . . . −9.99999999999E499 to −1E-499, 0, 1E-499 to 9.99999999999E499
Short Precision . . . −9.9999E499 to −1E-499, 0, 1E-499 to 9.9999E499
Integer Precision . −99999 to 99999
Variable Types . . .Numeric, String, Numeric array, String array
Numbers are shown with a maximum of 12 digits, or a 12-digit mantissa and a three-digit exponent. Calculations are to 12-digit accuracy.

CLOCKS & TIMERS
Perpetual clock calendar; 24-hour format. Time function returns time to the nearest hundredth of a second.

Accuracy Range . .15 seconds/month to 3 minutes/month
Adjustable
clock speed . . . . ±10%

BEEPER
The beeper is programmable with parameters for duration and tone. The frequency range is approximately 5 to 6200 Hz.

REDEFINABLE
KEYS 159

MULTIPLE FILE STRUCTURE
The number of files in HP-71 memory is limited only by the amount of available RAM.
Seven different file types are supported:
BASIC—Contains BASIC programs.
BIN—Assembly language programs to be executed as programs or subprograms.
LEX—Add new BASIC keywords.
DATA—Store numeric and string data.
TEXT—Transfer or receive files from other computers as string data.
KEY—Store and retrieve redefined key assignments.
SDATA—Transfers data to and from an HP-41 Advanced Calculator.

LANGUAGE
Extended HP BASIC (over 240 instructions)

HP-71 Handheld Computer (cont.)

ROM/RAM

Built-in operating
   system ROM . . .64K bytes
                   Four 16K, 32K, 48K, or
                   64K byte plug-in ROMs
                   make an additional 256K
                   ROM possible.
Built-in
   user RAM 17.5K
Enhancement
   Memory Module
   (HP82420A) . . .4K bytes
Maximum system
   RAM (with
   four Memory
   Modules) . . . . .33.5K bytes
Maximum
   allowable system
   RAM . . . . .416.5K bytes

CONTINUOUS MEMORY

Retains data and programs even when the
   computer is turned off.

HP-71B HANDHELD COMPUTERS COME COMPLETE WITH:

• HP-71 Owner's Manual
• HP-71 Reference Manual
• Quick Reference Guide
• Blank Keyboard Overlay
• Four AAA Batteries
• Users' Library/Third Party Software Card
• Carrying Case

HP-71 FUNCTIONS LIST

PROGRAM ENTRY/EDITING

AUTO—Numbers lines automatically.
DELETE—Deletes program line(s) from
   current file.
EDIT—Assigns "current file" status to
   specified file.
FETCH—Displays any line of current pro-
   gram.
LIST—Displays listing of specified lines in a
   file.
NAME—Names the workfile.
PLIST—Prints listing of specified lines in a
   file.
PRIVATE—Limits access to file and restricts
   changes in its protection.
REM (!)—Enables entry of comments in pro-
   gram lines for program documentation.
RENUMBER—Renumbers lines in current
   file.

SECURE—Protects file from being altered or
   purged.
TRANSFORM—Transforms BASIC file to
   TEXT file, or reverse.
UNSECURE—Clears file access restriction
   set by SECURE.
@—Appends a statement in a multiple-state-
   ment line.

PROGRAM EXECUTION

CALL—Transfers program execution to
   subprogram.
CHAIN—Purges current file, copies
   specified file into main RAM, and exe-
   cutes that file.
CONT—Continues execution of suspended
   program.
RUN—Executes a BASIC or binary program.

PROGRAM CONTROL

BYE—Turns computer off.
CALL—Transfers program execution to
   subprogram.
CHAIN—Purges current file, copies
   specified file into main RAM, and exe-
   cutes that file.
DEF FN—Indicates beginning of user-
   defined function definition.
END—Terminates a subprogram, user-
   defined function, or program.
END DEF—Causes normal return from a
   multiple-statement user-defined function.
END SUB—Causes normal return from
   subprogram invoked by CALL statement.
FN—Transfers program execution to
   specified user-defined function.
FOR . . . NEXT—Defines loop that is re-
   peated until loop counter exceeds
   specified value.
GOSUB—Transfers program execution to
   subroutine.
GOTO—Transfers program execution to
   specified statement.
IF . . . THEN . . . ELSE—Provides condi-
   tional execution.
OFF—Turns computer off.
OFF ERROR—Disables any previous ON
   ERROR statement.
OFF TIMER—Deactivates corresponding
   ON TIMER # statement.
ON ERROR GOSUB—Executes specified
   subroutine when an error occurs.
ON ERROR GOTO—Executes specified
   branch when an error occurs.
ON TIMER #—Interups program at specified
   time and causes specified branching to occur.

ON . . . GOSUB—Transfers program execu-
   tion to selected subroutine.
ON . . . GOTO—Transfers program execu-
   tion to selected statement or line.
ON . . . RESTORE—Selects which DATA
   statement will be used by next READ
   statement.
PAUSE—Suspends program execution.
POP—Cancels pending return of program
   execution from current subroutine.
RETURN—Returns program execution to
   statement following invoking GOSUB.
STOP—Terminates a subprogram, user-
   defined function, or program.
SUB—Identifies beginning of subprogram.
WAIT—Causes program execution to wait
   for specified number of seconds.

DEBUGGING

CONT—Continues execution of suspended
   program.
DEFAULT—Sets math exception traps to
   specific values.
ERRL—Returns lines number of most recent
   error or warning.
ERRM$—Returns message text of most re-
   cent error or warning.
ERRN—Returns error number of most recent
   error or warning.
ON ERROR GOSUB—Executes specified
   subroutine when an error occurs.
ON ERROR GOTO—Executes specified
   branch when an error occurs.
PAUSE—Suspends program execution.
TRACE—Traces program execution and
   variables in a running program.

STORAGE ALLOCATION

CLAIM PORT—Returns independent RAM
   to main RAM status.
DESTROY—Deletes variables and arrays
   from memory.
DIM—Allocates memory for string or REAL
   variables and arrays.
FREE PORT—Switches a portion of main
   RAM to independent RAM status.
INTEGER—Creates INTEGER variables and
   arrays.
MEM—Returns number of bytes available in
   memory.
OPTION BASE—Specifies subscript lower
   bounds for arrays.
REAL—Creates REAL variables and arrays.
SHORT—Creates SHORT variables and
   arrays.

SHOW PORT—Displays type and size of all plug-in memory devices and independent RAMs.

STAT—Selects or creates a statistical array.

LOGICAL AND RELATIONAL OPERATORS

AND—Performs logical And of its operands.

EXOR—Performs logical Exclusive Or of its operands.

NOT—Performs logical Not of its operand.

OR—Performs logical Or of its operands.

=—Performs Equality test on its operands.

#—Performs Inequality test on its operands.

<>—Performs Less Than or Greater Than test on its operands.

<—Performs Less Than test on its operands.

<=—Performs Less Than or Equal To test on its operands.

>—Performs Greater Than test on its operands.

>=—Performs Greater Than or Equal To test on its operands.

?—Performs Unordered Comparison test on its operands.

ARITHMETIC OPERATORS

+—Addition.

-—Subtraction.

×—Multiplication.

/—Division.

DIV—Divides one argument by another and returns integer portion of quotient.

^—Exponentiation.

%—Percent.

GENERAL MATH

ABS—Returns absolute value of its argument.

CEIL—Returns smallest integer greater than or equal to specified argument.

CLASS—Returns value indicating class of argument.

DVZ—Returns divide-by-zero flag number (-7).

EXPONENT—Returns exponent of its normalized argument.

FACT—Returns factorial of non-negative integer argument.

FLOOR—Returns greatest integer less than or equal to argument.

FP—Returns fractional part of numeric value.

INT—Returns greatest integer less than or equal to argument.

INX—Returns inexact result flag number (-4).

IP—Returns integer part of argument.

IVL—Returns invalid operation flag number (-8).

LET—Assigns value to variable.

MAX—Returns larger of two values.

MIN—Returns smaller of two values.

MOD—Returns remainder of modulo reduction.

OPTION ROUND—Selects roundoff setting.

OVF—Returns overflow flag number (-6).

RANDOMIZE—Specifies a "seed" for the RND function.

RED—Returns remainder of argument reduction.

RES—Returns value of most recently executed numeric expression.

RMD—Returns remainder of division.

RND—Returns next real number in a pseudo-random number sequence and updates current seed.

SGN—Returns -1, 0, or 1 if argument is less than zero, equal to zero, or greater than zero, respectively.

SQR—Returns square root of argument.

SQRT—Alternate spelling for SQR.

UNF—Returns underflow flag number (-5).

LOGARITHMIC OPERATIONS

EXP—Returns the number $e = 2.718281828$ . . . raised to power given by argument.

EXPM1—Returns value of $e^{argument} - 1$.

EXPONENT—Returns exponent of its normalized argument.

LGT—Alternate spelling for LOG10.

LN—Alternate spelling for LOG.

LOG—Returns natural logarithm (base e) of argument.

LOGP1—Returns $\ln(1 + argument)$.

LOG10—Returns logarithm (base 10) of argument.

TRIGONOMETRIC OPERATIONS

ACOS—Returns arccosine of its argument.

ACS—Alternate spelling for ACOS.

ANGLE—Returns polar angle determined by (x,y) coordinate pair.

ASIN—Returns arcsine of its argument.

ASN—Alternate spelling for ASIN.

ATAN—Returns arctangent of its argument.

ATN—Alternate spelling for ATAN.

COS—Returns cosine of its argument.

DEG—Converts argument in radians to degrees.

DEGREES—Sets unit of measure for expressing angles to degrees.

OPTION ANGLE—Selects unit of measure for expressing angles.

RAD—Converts arguments expressed in degrees to radians.

RADIANS—Sets unit of measure for expressing angles to radians.

SIN—Returns sine of its argument.

TAN—Returns tangent of its argument.

STATISTICS

ADD—Adds coordinates of a data point to data set represented by summary statistics in current statistical array.

CLSTAT—Clears all elements in current statistical array.

CORR—Returns sample correlation coefficient between a specified pair of variables.

DROP—Removes coordinates of a data point from the data set represented by summary statistics in current statistical array.

LR—Specifies current linear regression model and computes intercept and slope for that model.

MEAN—Returns sample mean of specified variable.

PREDV—Returns predicted value of dependent variable.

SDEV—Returns standard deviation of specified variable.

STAT—Selects or creates statistical array.

TOTAL—Returns total of specified variable.

CONSTANTS

EPS—Returns HP-71's smallest positive, normalized number (1.0 E-499).

INF—Returns machine representation of positive infinity.

MAXREAL—Returns maximum positive finite number that the HP-71 can represent (9.99999999999E499).

MINREAL—Returns smallest positive number that HP-71 can represent (0.00000000001E-499).

NAN—Returns Signaling NaN.

PI—Returns 12-digit value representing π.

STRINGS

&—Concatenation operator.

CHR$—Converts numeric value into ASCII character.

LEN—Returns length of specified string.

NUM—Returns ASCII numeric code for first character of string.

POS—Returns position of given substring.

STR$—Returns string representation of value of argument.

UPRC$—Converts lowercase letters to uppercase.

HP-71 Functions List (cont.)

VAL—Converts a numeric expression within a string expression to a numeric value.

VER$—Indicates versions of system ROMs and LEX files.

INPUT/OUTPUT

ASSIGN #—Associates symbolic channel number with specified file and opens that file.

BEEP—Causes specified tone to sound.

BEEP OFF—Disables beeper.

BEEP ON—Enables beeper.

CONTRAST—Adjusts display contrast.

COPY—Copies information from source file to destination file.

CREATE—Creates a data file.

DATA—Contains data that can be read by READ.

DELAY—Sets line and character scroll rates in display.

DISP—Displays numeric and string data.

DISP USING—Displays items according to specified format.

DISP$—Returns string containing all readable characters in display.

ENDLINE—Specifies end-of-line sequence used in PRINT and PLIST statements.

ENG—Selects engineering display format.

FIX—Selects fixed dislay format.

GDISP—Sets specified dot pattern in display.

GDISP$—Returns 132-character string reflecting dot pattern in display.

IMAGE—Controls format of displayed and printed output.

INPUT—Enables assigning values to program variables from keyboard.

KEYDOWN—Returns 0 or 1, depending on whether key is being pressed.

LC—Selects between uppercase and lowercase lock on keyboard.

LINPUT—Assigns display line to string variable.

LIST—Displays listing of specified lines in a file.

ON . . . RESTORE—Selects which DATA statement will be used by next READ statement.

PLIST—Prints on print device a listing of specified lines in a file.

PRINT—Causes print list to be sent to print device.

PRINT USING—Causes print list to be sent to print device according to specified format.

PRINT #—Writes data items to data file in memory.

PUT—Enters a specified key code into key buffer.

PWIDTH—Defines line length of PRINT and PLIST statements.

READ—Assigns values from DATA statements to variables.

READ #—Reads data items from data file.

RESTORE—Specifies which DATA statement will be used by next READ operation.

RESTORE #—Sets specified file pointer to indicated record number.

SCI—Selects scientific notation display format.

STD—Selects standard BASIC display format for numbers.

TAB—Moves DISP or PRINT position ahead to specified column. (Refer to the **DISP** or **PRINT** keyword entry.)

UPRC$—Converts lowercase letters to uppercase.

USER—Activates or deactivates user-defined key assignments.

WIDTH—Defines line length for DISP and LIST statements.

WINDOW—Sets display window size and location.

GRAPHICS

GDISP—Sets specified dot pattern in display.

GDISP$—Returns a 132-character string reflecting dot pattern in display.

FILE MANAGEMENT

ADDR$—Returns string representing hexadecimal address of specified file.

CAT—Gives catalog of file information.

CAT$—Returns catalog information for a specified file.

CLAIM PORT—Returns independent RAM to main RAM status.

COPY—Copies information from source file to destination file.

CREATE—Creates a data file.

EDIT—Assigns "current file" status to specified file.

FREE PORT—Switches a portion of main RAM to independent RAM status.

MEM—Returns number of bytes available in memory.

MERGE—Merges all or part of file into another file.

NAME—Names system workfile.

PRIVATE—Limits access to file and restricts changes in protection.

PROTECT—Write-protects one track of a magnetic card.

PURGE—Deletes file from RAM.

RENAME—Changes name of file.

SECURE—Protects file from being altered or purged.

SHOW PORT—Dislays type and size of all plug-in memory devices and independent RAMs.

TRANSFORM—Transforms BASIC files into TEXT files, or the reverse.

UNPROTECT—Removes the write-protection from one track of a magnetic card.

UNSECURE—Clears file access restriction set by SECURE.

TIME AND DATE

ADJABS—Performs an absolute adjust on system clock.

ADJUST—Changes clock time and specifies clock speed correction.

AF—Returns current value of clock accuracy factor and gives option of setting new adjustment factor.

DATE—Returns current clock date as an integer (*YYDDD*).

DATE$—Returns current clock date in year/month/day format.

EXACT—Calibrates system clock and tells HP-71 that time currently stored is the correct time.

RESET CLOCK—Nullifies effect of executing EXACT.

SETDATE—Sets date on system clock.

SETTIME—Sets time on system clock.

TIME—Returns time of day in seconds since midnight.

TIME$—Returns time of day in *HH :MM :SS* format.

SYSTEM SETTINGS AND FLAGS

CFLAG—Clears specified user and/or system flags.

DEFAULT—Sets math exception traps to specific values.

DEGREES—Selects degrees as unit of measure for angles.

DELAY—Sets line and character scroll rates in display.

DVZ—Returns divide-by-zero flag number (-7).

FLAG—Returns current value (0 or 1) of specified flag, and optionally selects new flag setting.

INX—Returns inexact result flag number (-4).

HP-71 Functions List (cont.)

IVL—Returns invalid operation flag number (−8).

OPTION ANGLE—Specifies unit of measure for expressing angles.

OPTION BASE—Specifies subscript lower bounds for arrays.

OPTION ROUND—Specifies round-off setting.

OVF—Returns overflow flag number (−6).

RADIANS—Selects radians as unit of measure for angles.

RESET—Resets user and system flags and traps to their system default settings.

SFLAG—Sets specified user and/or system flags.

TRAP—Returns trap for specified flag number and optionally selects new trap setting.

UNF—Returns underflow flag number (−5).

CUSTOMIZATION, KEYBOARD, AND DISPLAY CONTROL

ADDR$—Returns string representing hexadecimal address of specified file.

CHARSET—Specifies alternate character set in ASCII code range of 128 through 255.

CHARSET$—Returns string representing current alternate character set.

CONTRAST—Adjusts display contrast.

DEF KEY—Assigns character string to specified key.

DELAY—Sets line and character scroll rates in display.

DTH$—Converts decimal number to string representing its five-digit hexadecimal value.

FETCH KEY—Displays specified key assignment for editing.

FIX—Sets fixed display format and number of fractional digits to be displayed.

HTD—Converts string argument representing hexadecimal number to decimal number.

IMAGE—Controls format of displayed and printed output.

KEY—Assigns character string to specified key.

KEY$—Returns and deletes oldest key or keystroke combination from keyboard buffer.

KEYDEF$—Returns redefined value of a key.

KEYDOWN—Returns 0 or 1, depending on whether key is being pressed.

LC—Selects between uppercase and lowercase lock on keyboard.

LOCK—Sets password. Causes HP-71 to prompt for that password the next time computer is turned on.

PEEK$—Returns contents of specified section of memory.

POKE—Writes to memory at specified hexademical address.

PUT—Enters a specified code into key buffer.

STARTUP—Defines command string to be executed when HP-71 is turned on.

USER—Activates or deactivates user-defined key assignments.

WINDOW—Sets display window size and location.

HP 82420A MEMORY MODULE*

This module gives you an additional 4K bytes of programmable memory. Up to four modules plug into front ports on the HP-71 to give you a maximum of 16K bytes of additional RAM.

HP-71B ACCESSORIES

• Owner's Manual (00071-90001)
• Reference Manual (00071-90010)
• Quick Reference Guide (00071-90019)
• Blank Overlay Kit (five blank overlays) (HP 82462A)
• 30 Blank Magnetic Card Pack (HP 82707A)
• 100 Blank Magnetic Card Pack (HP 82708A)
• Carrying Case (HP 82461A)
• AC Adapter/Power Supply (HP 82059D)

Hewlett-Packard Enhancements

HP-41 Extended Memory Modules

Make your HP-41 even more versatile with Extension Modules. By adding one HP 82180A Extended Functions/Memory Module (built into the HP-41CX) and two HP 82181A Extended Memory Modules, you can give your HP-41 a maximum of 4.2K bytes of non-volatile mass memory.* The Extended Functions/Memory Module also increases the HP-41 programming set.

HP-41 Memory Configurations
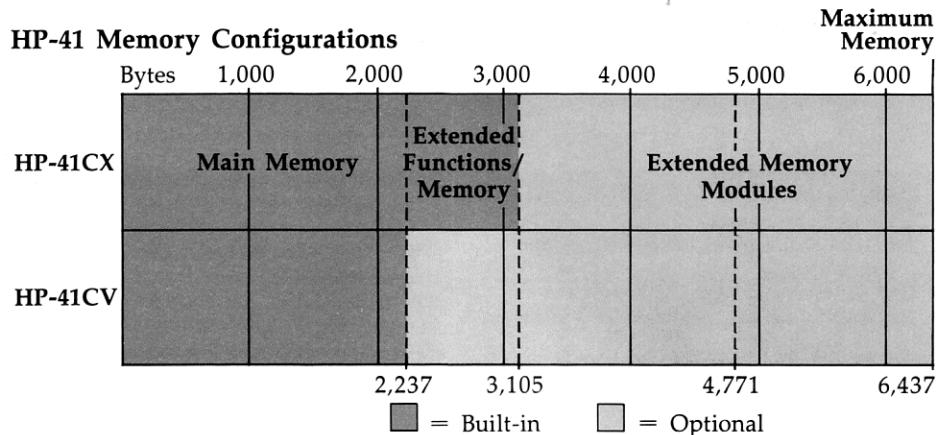
	Bytes	1,000	2,000	3,000	4,000	5,000	6,000	Maximum Memory
HP-41CX		Main Memory		Extended Functions/ Memory		Extended Memory Modules		
HP-41CV								
				2,237	3,105		4,771	6,437

■ = Built-in   □ = Optional

Physical Specifications

DIMENSIONS . . .3.2 cm (1.3 in) x 1.0 cm (0.4 in) x 2.9 cm (1.2 in)

OPERATING REQUIREMENTS

Operating
temperature . . .0° to 45°C (32° to 113°F)
Storage
temperature . . . −20° to 65°C (−4° to 149° F)

Extended Functions/Memory Module Functions List

PROGRAMMABLE FUNCTIONS

PASN—Programmable ASN function.
CLKEYS—Clear all key assignments.
PCLPS—Delete named program and all following it from main memory.
PSIZE—Programmable SIZE function.
SIZE?—Return number of data storage registers to X-register.
GETKEY—Return keycode for pressed key.
REGMOVE—Copy contents of a block of registers.
REGSWAP—Swap contents of two blocks of registers.

RCLFLAG—Recall flag-status data to the X-register.
STOFLAG—Restore flag status.
X<>F—X-register exchange with flag 00-07 status.
ATOX—Convert left-most ALPHA character to numeric character code.
XTOA—Convert X-register to its equivalent character and append to ALPHA register.
ALENG—Return number of characters in ALPHA register.
ANUM—Value of an ALPHA-formatted number.
POSA—Position of ALPHA character.
AROT—Rotate contents of ALPHA register.
APPCHR—Append contents of ALPHA register at the end of current register.
APPREC—Append contents of ALPHA register as a new record at the end of current file.
ARCLREC—Append record from current file to main memory.
CRFLAS—Create text (ASCII) file.
CRFLD—Create data file.
DELCHR—Delete characters in file.
DELREC—Delete record in current file.

EMDIR—Directory of extended memory files.
FLSIZE—Return number of registers in file.
GETAS—Copy text (ASCII) file from mass storage.
GETP—Replace last program in main memory.
GETR—Copy data file to main memory registers.
GETREC—Copy record from current file to main memory.
GETRX—Copy current data-file registers to X-register.
GETSUB—Copy program into main memory.
GETX—Copy current register in current file to X-register.
INSCHR—Insert contents of ALPHA register into text (ASCII) file.
INSREC—Insert contents of ALPHA register as a new record.
PURFL—Purge file.
RCLPT—Recall pointer value of current file.
RCLPTA—Recall pointer value of named file.
SAVEAS—Copy text (ASCII) file to mass storage.

*No more than one HP 82180A Extended Functions/Memory Module or two HP 82181A Extended Memory Modules should be plugged into an HP-41CV. The HP 82180A is required when using the HP 82181A.

Hewlett-Packard Interface Loop

The Hewlett-Packard Interface Loop (HP-IL) is a bit-serial interface designed for low cost, battery-operable systems. HP-IL lets you use your HP-41 or HP-71 as system controller, capable of transmitting and receiving data, and performing a wide variety of information management and instrument control functions. In this system, devices are connected by two-wire cables leading from the output port of one device to the input port of the next, until all devices form a closed loop. This loop structure provides a unique capability through auto address assignment, device capability identification, power ON/OFF control and error checking.

Several HP-IL peripherals support STANDBY mode, allowing you to power the peripherals on or off, under program control, to conserve battery life. The power ON/OFF feature lets you use an HP-IL system for remote applications.

HP 82160A HP-41 HP-IL Interface Module

The HP-IL Interface Module plugs into any one of the four ports in the HP-41 connecting your advanced calculator with the extensive family of HP-IL peripherals and instruments. The module gives your HP-41 simultaneous control of up to 30 devices on the loop. There are three function sets supplied by the HP-IL Module: printer, mass storage, and general input/output (I/O).

Features	Benefits
• Battery powered.	Completely field portable.
• Simple connector system.	Keyed cables for easy, error-free connection.
• Auto addressing.	Devices can be connected in any order.
• Manual addressing.	Control of two similar devices can be determined programmatically.
• Device-powered loop.	Each device powers its section of loop, allowing 30 devices and up to 10 meters between devices (up to 100 meters with twisted, shielded pairs).
• Automatic error checking.	Assures that the message sent was received correctly.
• Bit-serial, loop structure.	Allows automatic error checking.
• STANDBY mode.	Conserves battery life as programs control power up/power down.

Physical Specifications

DIMENSIONS . . .2.8 cm (1.1 in) x 1.2 cm (0.5 in) x 0.4 cm (0.2 in)

WEIGHT . . . . . . .42.5 g (1.5 oz)

CABLE LENGTH
(two attached cables) . . . . . . .80 cm each (31 in each)

OPERATING REQUIREMENTS
Operating temperature . . . .0° to 45°C (32° to 113°F)
Storage temperature . . . −40° to 75°C (−40° to 167° F)

DATA TRANSFER RATE
5,000 bytes per second
(HP-41—150 bytes per second)

HP-IL Module Functions List

PRINTER OPERATIONS
ACA—Accumulate ALPHA register into print buffer.
ACCHR—Accumulate character into print buffer.
ACCOL—Accumulate column into print buffer.
ACSPEC—Accumulate special character into print buffer.
ACX—Accumulate X-register into print buffer.
ADV—Advance paper, print the print buffer right-justified.
BLDSPEC—Build special character.
FMT—Accumulate format specifier into print buffer.
LIST—List program lines.
PRA—Print ALPHA register.
PRAXIS—Print y-axis.
PRBUF—Print buffer left-justified.
PRFLAGS—Print flags and other status information.
PRKEYS—Print reassigned keys.
PRP—Print program.
PRPLOT—Plot function interactively.
PRPLOTP—Plot function noninteractively.
PRREG—Print registers.
PRREGX—Print registers as directed by X.
PRΣ—Print statistics registers.
PRSTK—Print stack.
PRX—Print X-register.
REGPLOT—Plot single line using data in registers.
SKPCHR—Skip characters, accumulate in print buffer.
SKPCOL—Skip columns, accumulate in print buffer.
STKPLOT—Plot single line using data in stack.

(Continued on next page)

HP 82160A HP-IL Interface Module (cont.)

MASS STORAGE OPERATIONS

CREATE—Create new file with zero values.
DIR—Display or print a directory of stored files.
NEWM—Initialize medium.
PURGE—Remove file from medium.
READA—Read "write-all" file.
READK—Read key-assignment file·and reassign keys.
READP—Copy program file, replacing last program in memory.
READR—Copy data file into HP-41 registers.
READRX—Copy part of data file according to X-register.
READS—Read status file and set calculator status.
READSUB—Copy program file after last program in memory.
RENAME—Rename stored file.
SEC—Secure a stored file.

SEEKR—Position medium to specified file data register.
UNSEC—Unsecure a stored file.
VERIFY—Verify that a stored file can be read.
WRTA—Store "write-all" file onto medium.
WRTK—Store key assignments onto medium.
WRTP—Store program onto medium.
WRTPV—Store program onto medium and make file private.
WRTR—Copy all storage registers into data file.
WRTRX—Copy some storage registers according to X-register.
WRTS—Store calculator status onto medium.
ZERO—Fill data file with zero values.

INTERFACE CONTROL OPERATIONS

AUTOIO—Set interface to Auto mode.
FINDID—Find address of selected device.

INA—Input ALPHA string from selected device.
IND—Input decimal number from selected device.
INSTAT—Input status information from selected device.
LISTEN—Set device as a listener, or remove all listeners.
LOCAL—Set selected device to local mode.
MANIO—Set interface to Manual mode.
OUTA—Output ALPHA string to selected device.
PWRDN—Set all devices to low power state.
PWRUP—Set all devices to operating power state.
REMOTE—Set selected device to remote mode.
SELECT—Select device as primary device.
STOPIO—Stop I/O communication in loop.
TRIGGER—Trigger all devices set to respond.

HP 82401A HP-71 HP-IL Interface*

The HP-71 HP-IL Interface plugs into a specially designed port at the upper left corner of your HP-71, establishing a link to the world of instruments and peripherals. Connect directly to any HP-IL product, and to HP-IB, RS-232C and GPIO interfaces using converters.

The HP-IL Interface gives your HP-71 simultaneous control of up to 30 devices on the loop, and through secondary addressing, up to 930 devices. The 16K bytes of ROM in the Interface provide for printer, display, mass storage and general input/output (I/O) operations. Multiple HP-71s can be connected on the interface loop.

Physical Specifications

DIMENSIONS . . .5.2 cm (2 in) x 3.7 cm (1.5 in) x 1.3 cm (.5 in)

WEIGHT . . . . . . .18 g (.7 oz)

OPERATING REQUIREMENTS
Operating
  temperature . . .0° to 45°C (32° to 113°F)
Storage
  temperature . . . −40° to 55°C (−40° to 131° F)
Relative
  Humidity . . . . .0 to 95%

DATA TRANSFER RATE
5,000 bytes per second
(HP-71B to another HP-71B)

HP-IL INTERFACE FUNCTIONS LIST

SYSTEM SETUP
ASSIGN IO—Associates assign codes with HP-IL devices.
LIST IO—Lists all defined assign codes and their HP-IL addresses.
OFF IO—Suspends I/O operation.
RESET HPIL—Resets the HP-IL interface to a known condition.

RESTORE IO—Enables I/O operations to occur on HP-IL.

PRINTER AND DISPLAY OPERATIONS
DISPLAY IS—Assigns one HP-IL device to be the display device.
PRINTER IS—Assigns one HP-IL device to beused for all printing operations.

MASS STORAGE OPERATIONS
ASSIGN #—Associates an I/O channel number with a file and opens the file.
CAT—Gives a catalog of file information.
CAT$—Returns a string containing catalog information.
COPY—Copies a file from one location to another.
CREATE—Creates a data file.
INITIALIZE—Initializes a mass storage medium.
PACK—Packs directory and storage space on a medium.
PACKDIR—Packs only directory space on a medium.
PRIVATE—Permanently prevents a file from being changed or inspected.
PURGE—Deletes a file.
RENAME—Changes the name of a file.

SECURE—Prevents a file from being altered
or purged.
UNSECURE—Cancels security for a file.

**GENERAL I/O OPERATIONS –
DATA TRANSFER**

ENTER—Reads data from HP-IL into numer-
ical and string variables.
OUTPUT—Sends data from numeric and
string expressions to HP-IL.

**GENERAL I/O OPERATIONS –
HP-IL INTERACTION**

CLEAR—Clears an individual HP-IL device
or all HP-IL devices.
DEVADDR—Returns the address of a device.
DEVAID—Returns the accessory ID of a
device.
DEVID$—Returns a string containing the
device ID of a device.
ENABLE INTR—Specifies the events that
can cause an HP-IL interrupt.
LOCAL—Sets an individual HP-IL device or
all HP-IL devices to Local mode.

LOCAL LOCKOUT—Sets all HP-IL devices
to Local Lockout condition.
OFF INTR—Cancels HP-IL interrupt branch-
ing.
ON INTR—Defines how a program
branches when an enabled HP-IL inter-
rupt event occurs.
READDDC—Returns the number of the last
HP-IL device-dependent command
message received.
READINTR—Returns the value of the
interrupt-cause byte.
REMOTE—Enables all HP-IL devices to
change to Remote mode and can also set
an individual HP-IL device to Remote
mode.
REQUEST—Defines the HP-71 status byte
that is sent when serially polled by an
HP-IL controller.
SEND—Sends individual HP-IL messages on
the loop.
SPOLL—Returns a value that represents one
or more status bytes from an HP-IL
device.

STANDBY—Sets the HP-IL timeout period
and verify interval.
STATUS—Returns the HP-IL interface status.
TRIGGER—Triggers an event at an HP-IL
device.

**GENERAL I/O OPERATIONS –
PASSING CONTROL**

CONTROL OFF/ON—Sets the controller
status of the HP-71.
PASS CONTROL—Gives control of the
HP-IL system to another device.

BINARY FUNCTIONS

BINAND—Returns the value of the binary
AND operation.
BINCMP—Returns the value of the binary
complement.
BINEOR—Returns the value of the binary
exclusive-OR operation.
BINIOR—Returns the value of the binary
inclusive-OR operation.
BIT—Returns the value of one bit of an
integer.

HP 82182A
Time Module

(Built into the HP-41CX, optional for
the HP-41CV.)

The Time Module expands your
HP-41 system with time information
and time-controlled operations.
Using the quartz-crystal controlled
Time Module, your HP-41 can be-
come the heart of a time-based sys-
tem controller, an alarm clock, an
appointment reminder, a calendar,
a timer, even an advanced stop-
watch.

Physical Specifications

DIMENSIONS . . .3.2 cm (1.3 in) x 1.0 cm
(0.4 in) x 2.9 cm (1.2 in)

OPERATING REQUIREMENTS
Operating
temperature . . .0° to 45°C (32° to 113°F)
Storage
temperature . . .−20° to 65°C (−4° to
149° F)

Time Module Functions List

REAL TIME AND DATE
ADATE—Append number to ALPHA regis-
ter as a date.
ATIME—Append number to ALPHA register
as a time.
ATIME24—Append number to ALPHA
register in a 24-hour time format.
CLK12—Switch to 12-hour time display format.
CLK24—Switch to 24-hour time display format.
CLKTD—Switch clock to time and date
display.
CLOCK—Display the clock.
CORRECT—Set time and adjust accuracy
factor.
DATE—Place number for current date in
X-register.
DMY—Switch date format to Day-Month-
Year.

MDY—Switch date format to Month-Day-
Year.
RCLAF—Recall clock accuracy factor.
SETAF—Set clock accuracy factor.
SETDATE—Set clock date.
SETTIME—Set clock time.
TIME—Place current time number in X-register.
T+X—Adjust clock time by specified factor.
■ON—Display the clock.

CALENDAR FUNCTIONS
DATE+—Calculate new date from date and
number of days.
DDAYS—Calculate days difference between
two dates.
DOW—Replace a date number with a
Day-of-Week number.

STOPWATCH
RCLSW—Place stopwatch time in X-register.
RUNSW—Run stopwatch.
SETSW—Set stopwatch to specified starting
time.
STOPSW—Stop running stopwatch.
SW—Set the calculator to Stopwatch mode.

ALARMS
XYZALM—Set alarm.
ALMCAT—Provide listing of alarms.
ALMNOW—Activate past due label alarms.

HP 82184A
Plotter Module*

The 8K-byte Plotter Module fits easily into one of the HP-41's four ports to give you bar code generation and plotting capabilities. The Plotter Module enables you to use your HP-41 computer with the HP 7470A Graphics Plotter. It also enables your HP-41 to print HP bar code using the HP 82162A Thermal Printer/Plotter or the HP 7470A Graphics Plotter. Take advantage of ready-to-go bar code generation programs or write your own.

The Plotter Module also helps you produce high-quality plots on HP's low cost HP 7470A Graphics Plotter. This module contains 52 plotter functions to help you design your own programs. There is also a utility plotting program that enables you to produce framed, labeled plots, such as line and bar charts, without having to learn specific plotter functions.

Physical Specifications

DIMENSIONS . . .3.2 cm (1.3 in) x 1.0 cm (0.4 in) x 2.9 cm (1.2 in)

OPERATING REQUIREMENTS
Operating
   temperature . . .0° to 45°C (32° to 113°F)
Storage
   temperature . . . −20° to 65°C (−4° to 149° F)

HP 82184A Plotter Module Functions List

GENERAL PLOTTING FUNCTIONS
CLIPUU—Specifies plot bounds in user units.
CSIZE—Sets character space height.
CSIZEO—Sets character space height, aspect ratio, and slant.
DGTIZE—Identifies coordinates of current pen position.
DRAW—Draws line to point (x,y).
FRAME—Frames active plotting area.
GCLEAR—Advances page on plotters that have a page feed mechanism.
IDRAW—Draws line to a point x and y units from current point.
IMOVE—Moves pen to a point x and y units from current point.
LABEL—Prints contents of the ALPHA register.
LDIR—Sets angle of rotation for printing labels.
LIMIT—Sets graphics limits in millimeters.
LOCATD—Sets plot bounds by digitizing two opposite corners.

LOCATE—Sets plot bounds in graphics units.
LORG—Sets label origin position.
LTYPE—Selects line type.
LTYPEO—Selects line type and length of repeat pattern.
LXAXIS—Draws and labels x-axis.
LYAXIS—Draws and labels y-axis.
MOVE—Moves pen to point (x,y).
PCLBUF—Clears I/O buffer.
PDIR—Rotates axes for incremental and relative plotting.
PEN—Selects pen.
PENDN—Lowers pen.
PENUP—Lifts pen.
SCALE—Sets user scale.
SETGU—Switches module to graphics units mode.
SETUU—Switches module to user units mode.
TICLEN—Sets tick lengths.
UNCLIP—Resets plot bounds to graphic limits.
WHERE—Enters coordinates of last point and current pen status.
XAXIS—Draws x-axis.
XAXISO—Draws x-axis with ticks.
YAXIS—Draws y-axis.
YAXISO—Draws y-axis with ticks.
IPLOT—Moves or draws to a point x and y units from current point.
PLOT—Moves or draws to point (x,y).
PLREGX—Moves or draws to series of coordinate points stored in data registers.
RPLOT—Moves or draws a point (x,y) relative to an assumed origin.
BC—Plots a row of HP-41 bar code.

BCA—Creates bit pattern for Alpha-Replace bar code.
BCAA—Creates bit pattern for Alpha-Append bar code.
BCCKSM—Computes checksum of bit pattern in ALPHA register.
BCO—
   Plotter Option: Plots bar code row having user-specified leading and trailing bars.
   Printer Option: Prints a row of HP-41 bar code on HP 82162A Thermal Printer/ Plotter.
BCP—Generates bit pattern for program row.
BCREGX—Generates bit pattern from data in a series of storage registers.
BCSIZE—Calibrates module to pen width and sets HP or non-HP bar code type.
BCX—Creates bit pattern for nonsequenced bar code.
BCXS—Creates a bit pattern for sequenced bar code.

UTILITY PLOTTING FUNCTIONS
NEWPLOT—Initializes module for generating a plot.
PLANOT—Annotates plot according to NEWPLOT and REPLOT parameters.
PLINIT—Initializes module for plotting from NEWPLOT and REPLOT parameters.
PLTUXY—Generates a function or data plot according to NEWPLOT and REPLOT parameters.
REPLOT—Prompts for plot generation or parameter editing.
X?—Prompts for next x-coordinate.
Y?—Prompts for next y-coordinate.

*For use with HP-41 Advanced Calculators.

HP 82183A
Extended I/O Module*

The HP 82183A provides easy-to-use I/O functions that enhance the HP-41's control of the HP-IL loop. This 4K-byte module provides 59 functions that extend the I/O capabilities beyond those provided by the HP 82160A HP-IL Module. These functions enhance mass storage, character manipulation, HP-IL control and advanced control of the HP-41 and devices on the loop.

Physical Specifications

DIMENSIONS . . .3.2 cm (1.3 in) x 1.0 cm (0.4 in) x 2.9 cm (1.2 in)

OPERATING REQUIREMENTS
Operating
temperature . . .0° to 45°C (32° to 113°F)
Storage
temperature . . . −20° to 65°C (−4° to 149° F)

Extended I/O Module Functions List

MASS STORAGE OPERATIONS

COPYFL—Copies nonprivate file (named in ALPHA) from master device to device addressed by number in X.

DIRX—Returns to ALPHA file name whose position in primary medium's directory is specified by number in X.

FLLENG—Places in X the length of the file specified in ALPHA.

FLTYPE—For file named in ALPHA, places in X a two-character ALPHA string representing file type.

MCOPY—Copies contents of master medium onto all other media.

MCOPYPV—Same as MCOPY, except all HP-41 program files are made private.

MVERIFY—Checks each mass storage device to verify number of records specified in X can be read without error.

CHARACTER MANIPULATION FUNCTIONS

ALENGIO—Places in X the length of current ALPHA string.

ANUMDEL—Returns to X the value of a number represented by a string of numerical character in ALPHA register.

ATOXL—Removes first character from ALPHA and places in X the corresponding character code.

ATOXR—Places character code of last character of ALPHA string into X and deletes that character from string.

ATOXX—Places number in X with code for character in ALPHA position indicated by that number.

X<>FIO—Exchanges value in X with decimal equivalent of binary value represented by flags 00 through 07.

XTOAL—Adds to left of first non-null character in ALPHA the character corresponding to character code in X.

XTOAR—Appends to end of current string in ALPHA the character corresponding to character code in X.

YTOAX—Replaces character in ALPHA with another character specified by character code in Y.

HP-IL CONTROL FUNCTIONS

AID—Places in X the accessory ID of primary device.

CLRDEV—Resets primary device to its initial state.

CLRLOOP—Simultaneously clears all devices on loop.

DEVL—Sends to primary device the Device-Dependent Listener command number specified in X.

DEVT—Sends to primary device the Device-Dependent Talker command number specified in X.

FINDAID—Uses accessory ID to locate device of specific class or type.

ID—Returns to ALPHA a string containing ID of primary device.

POLL—Sends Identify message around loop and indicates loop's response by displaying a number from 0 to 255.

POLLD—Disables parallel poll response of primary device.

POLLE—Enables primary device to respond to a parallel poll.

POLLUNC—Disables parallel poll responses of all devices.

RCLSEL—Returns HP-IL address specified by most recent execution of SELECT.

SRQ?—Tests loop for service request by sending HP-IL Identify message.

STAT—Reads up to 23 bytes of status from primary device and stores these bytes as character string in ALPHA.

XFER—Until End of Transmission message received, transfers data from primary device to the device specified by the HP-IL address in X.

XFERC—Transfers data from primary device to device specified by HP-IL address in X.

XFERCL—Transfers data from primary device to device specified by address in X.

*For use with HP-41 Advanced Calculators.

XFERE—Transfers number of bytes specified by address in X.

XFERN—Transfers number of bytes specified in Y from primary device to device at address specified by value in X.

ADVANCED CONTROL FUNCTIONS

ADROFF—Disables the automatic loop addressing and talker/listener commands used by data transfer functions.

ADRON—Enables the automatic loop addressing and talker/listener commands used by data transfer functions.

DDL—Sends Device-Dependent Listener command message specified by value in X to all active listeners.

DDT—Sends Device-Dependent Talker message specified by value in X to currently active talker.

INAC—Replaces contents of ALPHA with string of bytes from primary device.

INACL—Replaces ALPHA contents with a dummy "D" character and a string of bytes from primary device.

INAE—Replaces ALPHA contents with string of bytes from primary device.

INAN—Replaces ALPHA contents with a string of up to 23 bytes from primary device, and terminates string with dummy "D" character.

INP—Causes primary device to send to HP-41 a series of bytes that the HP-41 can translate into a program.

INXB—Directs primary device to send one byte of data to X.

LAD—Switches to listener the device specified by HP-IL address in X.

LOCK—If primary device has remote override switch (for manually placing device into Local mode), disables this switch.

NLOOP—Places value in x indicating number of devices currently on HP-IL, excluding HP-41 itself.

NOTREM—Returns devices having Remote and Local modes to Local mode control, disables not-remote-enabled state.

OUTAC—Sends all but first non-null character in ALPHA string to device.

OUTACL—Sends string in ALPHA—minus first non-null character—to primary device.

OUTAE—Sends ALPHA string—minus first non-null character—to primary device.

OUTAN—Transmits to primary device up to 23 ALPHA characters, as specified by value in X.

OUTP—Sends from HP-41 to primary device the program containing the global label in ALPHA.

OUTXB—Sends to primary device the eight-bit byte equivalent of decimal byte value in X.

SEND—Sends to primary device the command message specified by command number in X.

TAD—Switches to talker the device specified by HP-IL address in X.

UNL—Removes all currently addressed listeners from listener status.

UNT—Removes current talker from talker status.

HP-41 Automatic Start and Cassette Duplication Module (00041-15042)

The automatic start feature provides a means of writing "fool-proof" HP-41 programs. With the automatic start module installed, the HP-41 goes through a special sequence when it is turned on. This sequence lets you write programs that automatically set status, configure memory, access peripherals, or prompt the user. The mass copy feature provides an easy-to-use means of duplicating programs and data. The information on one HP 82161A Digital Cassette Drive can be copied on to as many as 29 other cassettes.

HP-41 HP-IL Development Module (00041-15043)

Adding a second HP-41 to the HP-IL loop becomes a possibility with the aid of the HP-41 HP-IL Development Module. In Scope mode, a second HP-41 can be used for displaying the mnemonics of HP-IL messages as they travel around the loop. Giving direct access to the HP-IL integrated circuit, the Development Module allows you to change the contents of any control register and poll certain status bits. Characters can be inserted at, or removed from, any position in the Alpha register.

Features	Benefits
• Alpha register functions.	Add or remove characters from any position in the Alpha register.
• I/O buffer.	Circumvents the loss of characters with byte values of zero.
• Direct access to HP-IL integrated circuit.	Change the contents of any control register and poll certain status bits.

Hewlett-Packard
HP-41 Peripherals

HP 82104A Card Reader

The HP-41 Card Reader is a valuable peripheral that lets you save programs and data on small magnetic cards. This "smart" Card Reader keeps track of cards as they are read and it even prompts you for the next card. A security feature permits a program to be run, but not reviewed or altered through normal operations. An added bonus is that it also accepts program cards from the HP-67 and HP-97 calculators, automatically making the necessary translations into HP-41 code.

Features	Benefits
• Powered by HP-41's batteries.	Allows small size, total portability.
• 224-byte magnetic cards.	Programs and data easily modified. Cards easily stored. Easy to write contents on card's face. Inexpensive to duplicate.
• Uses one HP-41 port.	Leaves other ports free for peripherals, modules, application ROMs and HP-IL interfacing.
• Reads both HP-67/97 and HP-41 magnetic cards.	Thousands of Users' Library programs available.
• Writes contents of HP-41 registers onto cards.	Can record programs and data on space-saving magnetic cards for inexpensive off-line mass storage.
• Fits inside the HP-41 carrying case.	Compact, convenient, protected.

Physical Specifications

DIMENSIONS . . .7.4 cm (3.0 in) x 7.9 cm (3.2 in) x 3.6 cm (1.4 in)

WEIGHT . . . . . .92 g (3.2 oz)

COMPATIBILITY

Plugs into the HP-41, also reads HP-67/97 magnetic cards.

OPERATING REQUIREMENTS

Voltages . . . . . . .regulated 6 Vdc supplied by HP-41. Unregulated 6 Vdc supplied by HP-41 batteries.

Current . . . . .2 mA maximum (no card inserted)
200 mA maximum (card inserted, motor off)
500 mA maximum (card inserted, motor on)

Operating temperature . . .10° to 45°C (50° to 113°F)

Storage temperature . . . −40° to 75°C (−40° to 167° F)

HP-41 MAGNETIC CARDS

DIMENSIONS . . .7.11 cm (2.8 in) x 1.14 cm (0.45 in) x 0.003 cm (0.008 in)

WEIGHT . . . . . .0.258 g (0.001 oz) per card
00097-13141—40 Card Pac with holder
00097-13143—120 Card Pac with 3 holders
00097-13206—1000 Card Pac without holder

STORAGE CAPACITY . . . .16 registers (112 bytes) per track
2 tracks per card

READ/WRITING SPEED . . . . . .6.35 cm/sec (2.5 in/sec)

HP 82104A Card Reader Functions List

HP-41 FUNCTIONS

MRG—Merge program from card.
RDTA—Read data card.
RDTAX—Read data card as directed by X.
RSUB—Read subroutine.
VER—Verify track.

WALL—Write all.
WDTA—Write data card.
WDTAX—Write data card as directed by X.
WPRV—Write private program card.
WSTS—Write status card.

HP-67/97 COMPATIBLE FUNCTIONS

7CLREG—Clear registers.
7DSP0 through 7DSP9—Display 0 through 9 decimal places.
7DSZ—Decrement and skip on zero.
7DSZI—Decrement and skip on zero indirect.
7ENG—Engineering notation.
7FIX—Fixed notation.
7GSBI—Go to subroutine indirect.
7GTOI—Go to label indirect.
7ISZ—Increment and skip on zero.
7ISZI—Increment and skip on zero indirect.
7P<>S—Exchange primary and secondary register contents.
PRREG—Print registers.
7PRSTK—Print stack.
7PRTZ—Print X.
7RCLΣ—Recall contents of statistics registers.
7SCI—Scientific notation.

HP 82153A Optical Wand

The HP 82153A Optical Wand makes using the HP-41 even faster and easier. Plug the Wand into one of the HP-41 ports, and load programs and data into memory by passing the Wand across a printed page of bar code. The Wand translates the information into HP-41 programs and data, and then loads it into the HP-41. Bar code is an inexpensive distribution medium for programs and data. Store your bar code sheets in a three-ring binder if you choose. And share your programs quickly and easily—just photocopy and distribute. To make your own bar code, refer to the Plotter Module on page 22.

Features	Benefits
• Reads special HP-41 bar code.	Makes low cost and high reliability possible.
• Plugs into and powered by the HP-41.	Economical data entry and processing. Portable.
• Inexpensive bar code.	Minimizes software distribution expense.

Physical Specifications

DIMENSIONS . . .13.0 cm (5.1 in) x 2.3 cm (0.9 in)

WEIGHT . . . . .55 g (1.9 oz)

CABLE LENGTH. .81.3 cm (32 in)

INTERFACE

Plugs into the HP-41 Calculator, reads HP-41 bar code only.

OPERATING REQUIREMENTS

Voltages . . . . . . .regulated 6 Vdc supplied by the HP-41. Unregulated 6 Vdc supplied by HP-41 batteries.

Current . . . . .2 µA maximum (read switch off, computer off) 65 mA maximum (read switch on, computer on)

Operating temperature . . .0° to 45°C (32° to 113°F)

Storage temperature . . . −20° to 65°C (−4° to 149° F)

OPERATING LIMITS

Scan Angle . . . . .within 25° of perpendicular (10° to 20° optimum)

Scan Speed . . . . .7.6 to 76 cm/sec (3 to 30 in/sec)

Subject to electro-magnetic interference.

HP 82153A Wand

FUNCTIONS LIST

WNDDTA—Scan one row of data bar code.
WNDDTX—Scan and store data bar code as directed by X.
WNDLNK—Scan and execute bar coded subroutine.
WNDSUB—Scan bar coded subroutine.
WNDSCN—Scan row of specialized bar code.
WNDTST—Scan bar code to test for correct reads.

HP 82143A Printer/Plotter

The HP 82143A Printer/Plotter is a whisper-quiet, battery-operable thermal printer that easily plugs into the HP-41. It gives you numeric, upper- and lowercase alpha, double-wide characters, plotting capability and intensity control for optimum contrast and readability. It even lets you define your own "special" characters. Portable and lightweight, the Printer/Plotter operates on batteries. The batteries can be recharged with the

HP 82059D AC Recharger that is included with the product. The Printer/Plotter is a valuable aid in

editing programs, checking long calculations, or presenting results in graphics form.

Features	Benefits
• Battery powered.	Allows complete portability.
• 24-character print line size.	Makes smaller print possible.
• Single- and double-wide characters.	Highlight output.
• Automatic right and left justification and centering.	Format control.
• 128-character set.	More precise communication.

Physical Specifications

DIMENSIONS . . .17.8 cm (7.0 in) x 13.2 cm (5.2 in) x 6.1 cm (2.4 in)

WEIGHT . . . . . .808 g (1.8 lbs) (includes paper and battery)

CABLE LENGTH 86 cm (34 in)

POWER REQUIREMENTS
Battery . . . . .four-cell, 4.4 to 6 volt, quick-charge, nickel-cadmium battery pack
Battery current, (worst case) . . . .250 mA (idle), 5 A (printing)
Recharging time . . . . .14 to 16 hours (printer/ plotter ON or OFF)
Operating time . . . .3 to 6 hours

CHARACTER SETS
96 standard ASCII
127 modified-expanded ASCII

SPECIAL MODES
Column, Double wide, Single wide

PRINT FORMAT
24 standard characters, 12 double-wide characters, 168 dot-columns per line
Upper- and lowercase letters

Special-character generation
Plotting capabilities
Graphics capabilities
43-character buffer

PRINTING
SPEED . . . . . . .24 characters/sec

OPERATING REQUIREMENTS
Operating temperature . . . .0° to 45°C (32° to 113°F)
Charging temperature . . . .15° to 40° C (59° to 104° F)
Storage temperature . . . . −40° to 55°C (−40° to 131° F)
Humidity . . . . . .10% to 90% (non-condensing) at 40° C

THERMAL PAPER
Width . . . . .5.7 cm (2.2 in)
Roll length . . . . . .25 m (80 ft)
Colors . . . . .blue, black
6 rolls/box

INTERFACE
Plugs into the HP-41 calculator, unique.

HP 82143A Printer

FUNCTIONS LIST
ACA—Accumulate ALPHA register.
ACCHR—Accumulate character.
ACCOL—Accumulate column.
ACSPEC—Accumulate special character.
ACX—Accumulate X-register.
ADV—Advance paper.
BLDSPEC—Build special character.
LIST—List program lines.
PRA—Print ALPHA register.
PRAXIS—Print axis.
PRBUF—Print buffer.
PRFLAGS—Print flags and status information.
PRKEYS—Print reassigned keys.
PRP—Print program.
PRPLOT—Plot function interactively.
PRPLOTP—Plot function noninteractively.
PRREG—Print registers.
PRREGX—Print registers as directed by X.
PRΣ—Print statistics registers.
PRSTK—Print stack.
PRX—Print X-register.
REGPLOT—Plot single line using data in registers.
SKPCHR—Skip characters, accumulate in print buffer.
SKPCOL—Skip columns, accumulate in print buffer.
STKPLOT—Plot single line using data in stack.

Hewlett-Packard
HP-71 Peripherals

HP 82400A Card Reader*

The HP 82400A magnetic Card Reader offers an inexpensive means of storage for your programs and data. Snap it into a specially designed slot; the card reader will not change the external dimensions of the HP-71.

Encode your cards as a private file so that they may be copied and executed, but not viewed or edited. Automatic verification assures the accuracy of the information on the cards. And, simple encoding protects your cards from being overwritten.

Features

- Powered by HP-71 batteries.
- Snaps into a special slot.

- 1.3K-byte magnetic cards.

Benefits

Allows small size and maximizes portability.

Leaves RAM/ROM ports free for memory and software modules. Outside dimensions of the HP-71 don't change.

Programs and data are easily modified. Cards are inexpensive to duplicate. Label contents on face of card. Store easily in a small space.

Physical Specifications

DIMENSIONS . . .5.3 cm (2.1 in) x 2.8 cm (1.1 in) x 2.2 cm (.9 in)

WEIGHT . . . . . .23 g (.8 oz)

COMPATIBILITY
Snaps into the HP-71. Cards are the same dimensions as those used in the HP-75; however, programs are not interchangeable.

OPERATING REQUIREMENTS
Supply
   voltage . . . . . . .4.25 to 6.5 volts
Current . . . . .7 mA (RUN mode)
                    18 mA (WRITE mode)
                    1 mA (STANDBY mode)
Operating
   temperature . . .0° to 45° C (32° to 113° F)
Storage
   temperature . . . −40° to 65°C (−40° to 149° F)

Hewlett-Packard
HP-41/HP-71 HP-IL Peripherals

HP 82161A
Digital Cassette Drive

The Digital Cassette Drive uses a digital-quality mini-cassette, capable of storing up to 128K bytes of information. Files can be located easily by name on the cassette drive. Rewind time is under 30 seconds and read/write operations are executed at nine inches per second, with search speed at 30 inches per second. All tape movement is under microprocessor control, unlike the more common audio cassette drives that must be operated manually. Buffer space is provided in the drive for temporary storage of directory information to help minimize access time and tape motion. The HP 82161A can locate files when under program control. It also features STANDBY mode, enabling an HP-IL controller to turn the Drive on or off remotely. This unique feature helps extend system battery life and allows for system operation in remote applications.

Features

- Battery powered.
- 128K bytes per cassette.
- Variable record length, file-by-name organization, tape directory.
- Internal buffer space.
- STANDBY mode.

Benefits

Take it anywhere.

Large storage capacity.

Access data quickly and easily; save file space.

Minimizes tape motion, access time.

HP-IL controller can turn drive on or off from a remote location; conserves battery power.

Physical Specifications

DIMENSIONS . . . 17.8 cm (7.0 in) x 13.2 cm (5.2 in) x 6.1 cm (2.4 in)

WEIGHT . . . . . . .798 g (1.8 lbs)

POWER REQUIREMENTS
Batteries . . . . .four-cell, 4.4 to 6 volt, quick-charge, nickel-cadmium battery pack
Pack recharging
   time . . . . .14 to 16 hours (Drive turned on or off)
Usage . . . . .ON—2 watts maximum (motor off)
   ON—3.5 watts maximum (motor on)
   STANDBY (on)—2.3 watts maximum (motor off)
   STANDBY (on)—3.8 watts maximum (motor on)
   STANDBY (off)—0 watts maximum (motor off)

DATA FORMAT
Number of tracks . . 2
Density . . . . .335 bits/centimeter (850 bits/in)
Format . . . . 256 bytes/record (8 bits/byte)
Formatted capacity 512 records (131,072 bytes)
Encoding method bi-phase/level-phase encoding

DRIVE MECHANISM
Type . . . . .two-motor, hub drive
Read/Write speed 23 centimeters (9 in) per sec
Search/Rewind
  speed . . . . .76 centimeters (30 in) per sec

INTERFACING
Type . . . . .HP-IL (Hewlett-Packard Interface Loop)
Default address on
  power up . . . . .undefined
Default address after
  auto address
  unconfigured . . .2

OPERATING REQUIREMENTS
Operating
  temperature . . . .10° to 40°C (50° to 104°F)
Charging
  temperature . . . .15° to 40° C (59° to 104°F)
Storage temperature
  without tape . . . −40° to 75°C (−40° to 167° F)

DIGITAL CASSETTE
Type . . . . .Hewlett-Packard Mini-Data Cassette (HP 82176A)
Tape length . . . . .24 m (80 ft)
Temperature
  limits . . . . .10° to 45°C (50° to 113°F)
Humidity (tape storage)
  limits . . . . .20% to 80% relative humidity

SPECIAL MODES
Standby

HP 82162A
Thermal Printer/Plotter

The HP 82162A provides fast print-outs with 24-character lines. It's battery-powered, so you can produce hard copy in the field.

This HP-IL compatible printer/plotter automatically centers and justifies text to the left or right. It has numeric upper- and lowercase alpha, double-wide characters, and intensity control for optimum contrast and readability. Additionally, it supports STANDBY mode that lets any HP-IL controller on the loop manage its power consumption.

Features

- Battery powered.
- Automatic centering and left or right justification.
- 24 characters per line.
- Both single- and double-wide characters.
- 128-character set.
- STANDBY mode.

Benefits

Take it anywhere.

Provides formatting control; saves time.

Makes smaller print possible.

Allows highlighting of output.

Allows more precise communication.

HP-IL controller can turn printer on or off from remote location; conserves battery power.

Physical Specifications

DIMENSIONS . . .17.8 cm (7.0 in) x 13.2 cm (5.2 in) x 6.1 cm (2.4 in)

WEIGHT . . . . . . 808 g (1.8 lbs) (includes paper and battery)

CABLE LENGTH . .86 cm (34 in)

POWER REQUIREMENTS
Battery . . . . four-cell, 4.4 to 6 volt, quick-charge, nickel-cadmium battery pack
Battery current, (worst case) . . . . 250 mA (idle), 5 A (printing)
Recharging time . . . . .14 to 16 hours (printer/ plotter ON or OFF)
Operating time . . .3 to 6 hours

CHARACTER SETS
96 standard ASCII
127 modified-expanded ASCII

SPECIAL MODES
Standby, Parse, Bar code, Column, Double wide, Single wide, 8-bit escape

PRINT FORMAT
24 standard characters, 12 double-wide characters, 168 dot-columns per line
Upper- and lowercase letters
Special-character generation
Plotting capabilities
Graphics capabilities
101-character buffer

PRINTING
   SPEED . . . . . . .24 characters/sec

OPERATING REQUIREMENTS
Operating temperature . . . .0° to 45°C (32° to 113°F)
Charging temperature . . . .15° to 40° C (59° to 104° F)

Storage temperature . . . . −40° to 55°C (−40° to 131° F)

Humidity . . . . . .10% to 90% (non-condensing) at 40° C

THERMAL PAPER
Width . . . . .5.7 cm (2.2 in)
Roll length . . . . . .25 m (80 ft)
Colors . . . . .blue, black
6 rolls/box

INTERFACE
Type . . . . .HP-IL (Hewlett-Packard Interface Loop)
Startup conditions . normal (inactive or active-listener, selected at power-on)
Default address . . .undefined (normal startup) or 1 (active-listener startup)

HP 2225B
ThinkJet Printer

The ThinkJet prints bidirectionally at 150 characters per second to produce 80-column pages quickly in the office or in the field. With sound pressure under 50 decibels, printer noise need never interrupt your train of thought again.

An inexpensive, disposable cartridge holds the print head and ink reservoir, and is capable of printing approximately 500 full pages before replacement. Ink is delivered to the paper on demand, and dries immediately.

The 11 x 12 dot-matrix format text mode has a logic-seeking feature to find the fastest print route. Add a bold mode that won't slow printing speed to handle most of your letter-quality needs. A ROMAN8 character set provides 216 printable characters to meet your multilingual printing needs. Print on single sheets or fanfold paper.

Features

- Disposable print head and ink reservoir.
- Operates at less than 50 decibels.
- Ink-jet print method.
- Up to 142 characters per line.
- Operates bidirectionally.
- ROMAN8 character set.

Benefits

Fast, clean, inexpensive replacement in one step.

Quiet.

Print head never touches the paper.

Full-page printouts available.

Produces pages quickly.

Allows printing in several languages.

Physical Specifications

DIMENSIONS . . .8.9 cm (3.5 in) x 29.2 cm (11.5 in) x 20.6 cm (8.1 in)

WEIGHT . . . . . . 2.5 kg (5.5 lbs)

POWER REQUIREMENTS
Battery . . . . 6 cell, 4.4 to 6 volt, quick-charge, nickel-cadmium battery pack (HP 82199A)
Battery current, (worst case) . . . . 20 mA (idle), 1.5 A (printing)
Recharging time . . . . .14 hours approximately (Battery either in printer or out)
Operating time . . . .over 200 typical pages

OPERATING REQUIREMENTS
Operating temperature . . . .10° to 40°C (50° to 104°F)
Storage temperature . . . . −20° to 60°C (−4° to 140° F)
Relative humidity . . . . .10% to 90%

PRINT FORMAT
Technique . . . . . .Ink-jet dot matrix
Speed . . . . .150 characters/sec; bidirectional; logic-seeking in text mode
Text mode character cell structure . . . . .11 x 12 dot matrix
Graphics mode resolution . . . . .96 x 96 or 192 x 96 dots/in
Characters per line 40, 71, 80, 142

Print Pitch (CPI)		Line Length (characters)
12.0	. . . . Normal	80
6.0	. . . . Expanded	40
21.3	. . . . Compressed	 142
10.7	. . . . Expanded–Compressed	 71

Character Set ROMAN8

Printhead life . . . . .500 typical pages

PAPER FEED
Pin feed
Friction

PRINT BUFFER
One kilobyte

HP 2671A/G Alphanumeric/Graphics Thermal Printers

The HP 2671A Alphanumeric Printer is both quiet and fast — 120 characters per second with a smart, bidirectional print path. The 9 x 15 dot matrix provides excellent character definition. Highlight with an underlining feature, print standard English or use Roman Extension for multilingual text.

In addition to all this, the HP 2671G offers high-resolution graphics capabilities for charts, tables, illustrations, and graphs.

Features	Benefits
• High throughput.	Rapid printing.
• Quiet.	Useable in quiet areas.
• 9 x 15 dot matrix.	Excellent character definition.
• Choice of paper available.	Use fan-fold forms or roll paper.
• Choice of print modes.	Multilingual output.

Physical Specifications

DIMENSIONS . . .10.5 cm (4.1 in) x 42.8 cm (16.9 in) x 42.4 cm (16.7 in)

WEIGHT . . . . . . 6.9 kg (16 lbs)

POWER REQUIREMENTS
Line voltage . . . . . +5%, −10%
HP-IB Built-in
HP-IL Opt. 048
RS-232 Opt. 040
100, 120, 200 and 240 Vac, switch selectable
Frequency . . . . . .47.5/66 Hz
Power consumption . . .15 watts maximum non-printing
50 watts maximum printing

OPERATING REQUIREMENTS
Operating temperature . . . .5° to 35°C (41° to 95°F)

Humidity . . . . . .10% to 90% noncondensing

PRINT FORMAT
Technique . . . . . .dot-matrix thermal
Speed . . . . .120 characters/sec bidirectional; logic seeking in text mode
Character structure . . . . .9 x 15 dot-matrix

Print Pitch	Line length (characters)
16.2	132
10.0	80

Character Sets . . .128 USASCII
Line drawing

Roman Extension (international characters, 8-bit mode)

FORMS HANDLING
Form feed button
Margin control

FORMS SPECIFICATIONS
Thermal paper width . . . . .21.6 cm (8.5 in)
Paper options include fan-folded, page perforated; roll; or roll, page perforated

OTHER PRINTING FEATURES
Underlining character enhancement

OTHER
2671G raster graphics; Type; Unidirectional raster graphics copy; 90 dots/in. horizontal and vertical resolution; 720 dots across a raster row.

HP 7470A Graphics Plotter

The HP 7470A Graphics Plotter uses a two-pen system to produce high-quality color charts and graphs. It works with paper or overhead transparency film for your professional presentations.

More than 40 HP-GL (Hewlett-Packard Graphics Language) instructions are built-in, letting you program the plotter with simple commands to perform a variety of complex operations, such as selecting pen velocity and defining your own characters. Text can be written in any direction, with or without slant, and in many sizes. Built-in symbol plotting and seven dashed-line fonts help you clarify complex relationships.

Features

- High-quality graphics.

- 1000 points in a one-inch line (.001 in or .025 cm).

- Lines plotted up to 15 inches (38 cm) per second.

- Two built-in pen stalls; snap in additional pens as needed.

- Five internal character sets.

Benefits

Achieve more precise results.

Fine resolution of lines and curves.

Generate plots in minutes.

Print with two or more colors.

Eliminates need for software-generated characters.

Physical Specifications

DIMENSIONS . . . 12.7 cm (5 in) x
43.2 cm (17 in) x
34.3 cm (13.5 in)

WEIGHT . . . . . . 6.1 kg (13.5 lbs)

POWER REQUIREMENTS
−10%, +5%
HP-IB Opt. 002
HP-IL Opt. 003
RS-232 Opt. 001
100, 120, 220 and 240 Vac, switch
selectable
Frequency . . . . . . 48/66 Hz
Power
consumption . . . .25 watts maximum

OPERATING REQUIREMENTS
Operating
temperature . . . .0° to 55°C (32° to 131°F)
Storage
temperature . . . . −40° to 75°C (−40° to
167°F)

PLOTTING AREA
Y-axis . . . . .190 mm (7.5 in)

X-axis . . . . .273 mm (10.7 in)
metric setting
258 mm (10.2 in) English
setting

MEDIA SIZES
8½ x 11 in (ANSI A); 210 x 297 mm (ISO A4)

RESOLUTION
Smallest addressable
step size . . . . . .0.025 mm (0.001 in)

REPEATABILITY
With a
given pen . . . . .0.1 mm (0.004 in)
From pen
to pen . . . . . . .0.2 mm (0.008 in)

PEN VELOCITY
Pen down . . . . . .maximum—38.1 cm/sec
(15 in/sec)
programmable—1 to 38
cm/sec in 1 cm/sec
increments
Pen up . . . . .50.8 cm/sec (20 in/sec)

ACCELERATION
Approximately 2 Gs

HP 82168A Acoustic Coupler (Modem)

Use the portable coupler to talk to computers over voice-quality telephone lines from remote locations. The 300-baud device meets the Bell 113 standard and can be used anywhere a conventional (G-type) telephone receiver is available.

The battery-powered device is compatible with HP-IL (Hewlett-Packard Interface Loop). It can be turned on or off by a controller, or it automatically turns itself off after 10 minutes of inactivity. Mode changes are under software control, making communication easier.

The HP-41 Extended I/O Module, an HP-41 and HP 82168A Acoustic Coupler are all that are necessary for HP-41 operation of this battery-powered modem.

For additional data communications information, see the HP 82164A RS-232C Interface.

Features

- Portable, carry in briefcase.

- Operates at 300 baud.

- Automatic power off.
- HP-IL command controlled.

Benefits

Can be used from any conventional (G-type) phone receiver. Send or receive data while away from the office.

Compatible with most public and private data bases.

Minimal power drain.

Fully automatic operation.

Physical Specifications

DIMENSIONS . . . 25.7 cm (10.1 in) x 9.7 cm (3.8 in) x 5.7 cm (2.2 in)

WEIGHT . . . . . .650 g (22.9 oz)

POWER REQUIREMENTS
2.2 to 4.8 Vdc
Recharger
Input . . . . .90 to 120 Vac, 50 to 60 Hz, 7 watts
Output . . . . .8 Vac, 3 watts maximum
Power
consumption . . .440 mW

OPERATING REQUIREMENTS
Operating
temperature . . . .0° to 45°C (32° to 113°F)
Charging
temperature . . . .15° to 40° C (59° to 104° F)
Storage
temperature . . . .−40° to 65°C (−40° to 149° F)

TELEPHONE INTERFACE
Data transmission
rate . . . . .300 baud

Input buffer
capacity . . . . . .40 bytes
Output buffer
capacity . . . . . .40 bytes
Compatibility . . . .Bell-type 113 series coupler
Transmit frequencies
(Hz) . . . . .1070, 1270 (originate mode)
Receive frequencies
(Hz) . . . . .1070, 1270 (originate mode)
Frequency stability
control . . . . . . .crystal (parallel)
Receiver
sensitivity . . . . .−45 dBm (nominal)
Transmit
level . . . .−15 dBm (nominal)
Modulation . . . . .Frequency Shift Keyed (FSK)
Carrier detect
delay . . . . .1.5 sec (average)

CONTROL PROTOCOLS
ENQ/ACK
XON/XOFF
NONE

Hewlett-Packard
HP-41/HP-71 HP-IL Instruments

HP 3468A
Digital Multimeter*

HP's first HP-IL instrument is a low-cost, autoranging digital multimeter for your portable and bench applications. It electronically calibrates itself, measures ac and dc voltages and currents and makes four-wire and two-wire resistance measurements.

The device has 5½ to 3½ digits, five functions, and a 1-μV sensitivity.

Features	Benefits
• 5½ digit precision.	Accurate measurements for high performance needs.
• 1 μV dc and ac resolution; 300 volts maximum.	High sensitivity to detect small changes.
• HP-IL interface.	Low-cost automatic measurements.
• 5½ to 3½ digits of resolution; auto zero ON or OFF; speeds of 32 to 2.7 rps.	Selectable speed vs. accuracy for measurement flexibility.
• Pushbutton front panel.	Easy-to-change functions, low cost, and high reliability.
• Optional battery pack.	Portability and isolation.

HP 3421A Data
Acquisition/Control Unit*

The Data Acquisition/Control Unit provides low-cost automated measurement and control for your portable and bench test needs. Scan and measure up to 30 different channels or 56 single-ended channels of dc and ac voltage, resistance, temperature, and frequency; or read and write digital information and actuate control signals. It stores up to 30 analog readings in an internal buffer for later use by the computer.

Features	Benefits
• Battery power.	Take it anywhere.
• Display shows channels closed, digital states, and self-test conditions.	See what's happening at a glance.
• Built-in 300,000 count A/D with 1 μV sensitivity and good noise rejection.	Measure transducers with confidence.
• Front terminals are in parallel with the scanner's common bus.	Measure dc volts, ac volts, ohms, frequency or thermocouples conveniently on the bench.
• Switch from HP-IL to HP-IB or HP-IL/HP-IB interfaces.	Choose between low battery power and high computer performance.

HP 5384A/HP 5385A
(Option 003)
Frequency Counters*

Two electronic frequency counters provide low-cost measurement performance for your bench, field and system applications. Measurement resolution of 9 digits/second and a liquid-crystal display assure you of highly readable results. High input sensitivity across a broad range of frequencies lets you solve a variety of frequency measurement problems using just one counter. And, extensive signal conditioning provides reliable measurements.

Features	Benefits
• 9 digit/second resolution.	High measurement resolution.
• 15 mVrms sensitivity.	High sensitivity to detect small changes.
• Liquid-crystal display.	Large, easy-to-read characters indoors or outdoors.
• Battery power.	Use it in the field or at your workbench.
• Choose HP-IB or HP-IL.	Choose between automated bench and portable measurements or advanced system capabilities.

*Not available for purchase at retail outlets. For detailed specifications, contact your local HP sales office.

Hewlett-Packard
HP-IL Interfaces

HP 82164A
HP-IL/RS-232C Interface

The HP 82164A RS-232C Interface translates HP-IL signals into RS-232C signals and vice versa. It is designed to allow the interconnection of HP-IL systems with RS-232C devices. The interface operates in an asynchronous mode providing 5-, 6-, 7-, or 8-bit data formats with one or two stop bits and odd, even, zero, one, and no parity modes. A configuration control block allows the user to change the signals at the connector from a terminal (DTE) configuration to a modem (DCE) configuration so a host computer can be emulated.

HP 82169A
HP-IL/HP-IB Interface

The HP 82169A expands HP-41 and HP-71 control and communication capabilities by linking low-cost HP-IL (Hewlett-Packard Interface Loop) systems with high-performance HP-IB (IEEE 488) computers and lab equipment. It puts a variety of peripherals, instruments, and computers at your disposal, including more than 120 HP-IB-compatible devices made by HP and many more offered by other manufacturers.

With the HP-IB interface, you can operate HP-IB versions of the HP 82905B printer and the HP 7470A plotter; operate and control power supplies and instruments such as the HP 1980 oscilloscope; and talk directly with HP-IB computers such as HP Series 80, 100, 200, even the HP 1000 and 3000.

HP 82938A
HP-IL/Series 80 Interface

With the HP 82938A, a Series 80 computer can act as a system controller or device in an HP-41 or HP-71 HP-IL system. You can take advantage of Series 80 graphics capabilities to display information from an HP-41 or HP-71 in easy-to-understand graphs and charts. Or, with Series 80 data communications products, you can pass information to larger computers.

HP 82165A
HP-IL/GPIO Interface

Use your HP-IL system to control equipment operating with parallel bus structures. The GPIO interface contains the port buffering and a built-in power supply that operates from an HP standard ac adapter which is supplied with the interface. Interface to computers for data collection, to specialized devices in production or lab environments, and to other devices.

HP 92198A Mountain Computer HP-IL 80-Column Video Interface

You can use this interface to display data and listings from an HP-41 or HP-71 HP-IL system on a standard video monitor. Add an RF modulator and use it with a conventional TV set. View your word processing and other applications in 24 row by 80 column format, or choose 20 rows by 40 columns. Characters can also be displayed in inverse video (dark characters on a light background).

HP 82166C HP-IL
Interface Kit*

The HP-IL Interface Kit provides the special components necessary for building HP-IL into your product. Three components are key to implementing the HP-IL interface standard: the HP-IL integrated circuits, the HP-IL transformer set, and the HP-IL panel receptacle. Included are complete component-level documentation, four complete sets of parts for prototype evaluation, and HP-IL development software for use on HP-41 and HP-71 systems. Components may be purchased individually when design is completed.

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*Not available at retail outlets. To order an HP 82166C HP-IL Interface Kit, contact your local HP sales office.

Hewlett-Packard
HP-41/HP-71 Software

HP-41 Software

Application Pacs

HP-41 Application Pacs come complete with detailed manuals and plug-in application modules to increase the versatility of your HP-41 Advanced Calculator.

Aviation (00041-15018)
(For pre-flight use.)
- Flight Management
- General Aircraft Weight and Balance
- Flight Plan
- Determining In-Flight Winds
- Position by One or Two VORS
- Mach Number and True Airspeed

Circuit Analysis (00041-15006)
- General Network Analysis
- Ladder Network Analysis

Clinical Lab and Nuclear Medicine (00041-15024)
- Beer's Law
- Body Surface Area
- Creatinine Clearance
- Blood Acid-Base Status
- Oxygen Saturation and Content
- Red Cell Indices
- Total Blood Volume
- Thyroid Uptake
- Radioactive Decay Correction
- Radioimmunoassay
- Basic Statistics
- Chi-square Evaluation and Distribution
- t Statistics
- t Distribution

Financial Decisions (00041-15004)
- Compound Interest Solutions
- Internal Rate of Return
- Modified Internal Rate of Return (FMRR)
- Net Present Value
- Loan Amortization Schedules
- Depreciation Schedules
- Bond Price and Yield
- Days Between Dates

Games (00041-15022)
- Submarine Hunt
- Space War
- Super Bagels
- Hangman
- Pinball
- Craps
- Biorhythms
- Random Number Generator

Home Management (00041-15023)
- Home Budgeting
- Travel Expense Record
- Stock Portfolio Evaluation
- Checking Account Reconciliation
- Your Financial Calculator
- Accumulated Interest and Remaining Balance
- Home Owner's Equity Analysis
- The Rent or Buy Decision
- Tax Free Individual Retirement Account (IRA) or Keogh Planning
- The True Cost of an Insurance Policy

Machine Design (00041-15020)
- Circular Cams
- Generation of a Four Bar Linkage
- Progression of Four Bar System
- Progression of Slider Crank
- Gear Forces
- Standard External Involute Spur Gears
- Helical Spring Design
- Force Oscillator with Arbitrary Function
- Coordinate Transformation
- Points on a Circle
- Circle by Three Points
- Unit Conversions

Mathematics (00041-15003)
- Matrix Operations
- Solution to $f(x) = 0$ on an Interval
- Polynomial Solutions/Evaluation
- Numerical Integration
- Differential Equations
- Fourier Series
- Complex Operations
- Hyperbolics
- Triangle Solutions
- Coordinate Transformations

Navigation (00041-15017)
- Great-Circle Course and Distance
- Great-Circle Position
- Rhumb-Line Course and Distance
- Rhumb-Line Position
- Great-Circle Plotting and Voyage Planning
- Dead Reckoning
- Sight Reduction
- Perpetual Almanac—Stars, Sun, Planets, Moon
- Almanac Interpolator
- Sight Reduction Table
- Calendar Functions
- Greenwich Sidereal Time
- Star Almanac
- Fundamental Arguments
- Astronomical Coordinate Conversion
- Longitude to Latitude
- Input/Output Routines

Petroleum Fluids Pac (00041-15039)
- Z Factor
- Gas Isothermal Compressibility
- Gas Formation Volume Factor
- Gas Viscosity
- Pseudocritical Temperature and Pressure From Gas Gravity
- Gas Properties From Composition
- Oil Isothermal Compressibility
- Oil Formation Volume Factor
- Oil Viscosity
- Gas-Oil Ratio
- Bubble Point Pressure
- Two-Phase Formation Volume Factor
- Water Isothermal Compressibility
- Water Formation Volume Factor
- Water Viscosity
- Gas-Water Ratio
- Rock Compressibility
- Total Isothermal Compressibility
Includes unit management systems subroutines.

Real Estate (00041-15016)
- Compund Interest and Loan Amortization
- Internal Rate of Return
- Modified Internal Rate of Return
- Net Present Value
- Depreciation Schedules
- Income Property Analysis
- Graduated Payment Mortgage
- Wrap-Around Mortgage
- Home Owner's Equity Analysis
- The Rent or Buy Decision
- Price and Yield of a Mortgage Traded at a Discount/Premium
- APR of a Loan With Fees
- Present Value of an Increasing/Decreasing Annuity

Securities (00041-15026)
- Bond/Note Price and Yield
- Routines for Option Writers Using the Black-Scholes Evaluation Method
- Warranty and Option Hedging
- Yield on Call Option Sales
- Butterfly Options
- Bull Spread Option Strategy
- Convertible Bond Investment Analysis
- Stock Portfolio Valuation
- Bond Speculation Using Margin
- Convertible Security Analysis

Standard Applications Module (00041-15001)
- RPN Primer
- Calendar Functions
- Word Guessing Game
- Arithmetic Teacher
- Hexidecimal-Decimal Converter
- Financial Calculations
- Root Finder
- Curve Fitting
- Vector Operations
- Blackjack

Statistics (00041-15002)
- Basic Statistics for Two Variables
- Moments, Skewness and Kurtosis
- Analysis of Variance (One Way)
- Analysis of Variance (Two Way)
- Analysis of Covariance (One Way)
- Curve Fitting (Linear, Exponential, Logarithmic and Power Curve)
- Multiple Linear Regression
- Polynomial Regression
- t Statistics
- Chi-Square Evaluation
- Contingency Table
- Spearman's Rank Correlation Coefficient
- Normal and Inverse Normal Distribution
- Chi-Square Distribution

Stress Analysis for Mechanical Engineers (00041-15027)
- Section Properties
- Beams
- Simply Supported Continuous Beams
- Columns
- Mohr Circle Analysis
- Strain Gage Data Reduction
- Soderberg's Equation for Fatigue
- RPN Vector Calculator

Structural Analysis for Civil Engineers (00041-15021)
- Section Properties
- Beams
- Simply Supported Continuous Beams
- Settling of Continuous Beams
- Continuous Frame Analysis
- Steel Column Formula
- RPN Vector Calculator
- Reinforced Concrete Beams
- Reinforced Concrete Columns
- Effective Moment of Inertia for Concrete Sections

Surveying (00041-15005)
- Traverse, Inverse and Sideshots
- Compass Rule Adjustment
- Transit Rule Adjustment
- Intersections
- Curve Solutions
- Horizontal Curve Layout
- Vertical Curves and Grades
- Resection
- Predetermined Area
- Volume by Average End Area
- Volume of a Borrow Pit
- Coordinate Transformation

Thermal and Transport Science (00041-15019)
- Equations of State
- Polytropic Processes for Ideal Gas
- Isentropic Flow for Ideal Gases
- Conduit Flow
- Energy Equation for Steady Flow
- Heat Exchangers
- Black Body Thermal Radiation
Includes unit management system subroutines.

Solutions Books

HP-41 Solutions Books provide complete step-by-step keystroke listings to help equip you with answers to your general or specialized programs. Solutions Books are available on magnetic cards and mini data cassettes; HP-41 Solutions Books come with printed bar code.

- Antennas (00041-90093)
- Business Statistics/Marketing Sales (00041-90094)
- Calendars (00041-90145)
- Chemical Engineering (00041-90100)
- Chemistry (00041-90102)
- Civil Engineering (00041-90089)
- Control Systems (00041-90092)
- Electrical Engineering (00041-90088)
- Fluid Dynamics & Hydraulics (00041-90139)
- Games I (00041-90099)
- Games II (00041-90443)
- Geometry (00041-90084)
- Heating, Ventilating & Air Conditioning (00041-90140)

- High-Level Math (00041-90083)
- Home Construction Estimating (00041-90096)
- Lending, Savings & Leasing (00041-90086)
- Mechanical Engineering (00041-90090)
- Optometry I (General) (00041-90143)
- Optometry II (Contact Lens) (00041-90144)
- Physics (00041-90142)
- Real Estate (00041-90136)
- Small Business (00041-90137)
- Solar Engineering (00041-90138)
- Structural Design (cassette based) (00041-90441)
- Surveying (00041-90141)
- 1982 Taxes (00041-90455)
- Test Statistics (00041-90082)
- Time Module Solutions I (00041-90395)

HP-71 Software

Application Pacs

HP-71 Application Pacs come with plug-in modules and complete documentation to enhance the computational versatility of your HP-71 Handheld Computer.

AC Steady State Circuit Analysis (82481A)
- Construct and analyze circuit models using:
  Resistors
  Capacitors
  Inductors
  Transmission lines
  Voltage controlled current sources
  Open or shorted stubs
- Print or display AC voltage gain, phase and group delay at any node in circuit at any frequency using linear or logarithmic frequency instruments

- Simulate and analyze circuits such as:
  Passive filters
  Active filters
  Operational amplifiers
  Transistor amplifiers
- Solve a circuit with up to 72 branches and 24 nodes (three memory modules required)

Curve Fitting (82484A)*
- Fit a general (and possibly nonlinear) model function with up to 20 unknowns
- Determine local minima or maxima to a general real valued function with up to 20 variables
- Matrix editor
- Built-in library of 84 possible model functions:
  46 general models
  Polynomials up to degree 19
  Linear models up to order 19
- Direct-execution menus
- Call user-written model and provide gradient approximation automatically

Finance (82482A)
- Time value of money calculations: n, i, PV, PMT, FV
- Uneven cash flow analysis: NPV, IRR
- Amortization schedules
- Depreciation:
  ACRS
  Straight line
  Declining balance
  Sum-of-year digits
- HELP file

Math (82480A)*
- Real and complex math operations:
  Inversion
  System solution
  Transpose
  Conjugate transpose
  Determinant
  Arithmetic

  Norms
  Inner product
- Numeric functions:
  Hyperbolics and inverses
  GAMMA function
  IEEE NEIGHBOR
  Scaling functions
- Base conversions:
  Binary, octal, decimal, hexadecimal
- Implicit and explicit redimensioning of arrays
- Solve
- Integrate
- Finite Fourier Transform

Surveying (82483A)
- File management routines:
  Assign
  List coordinates
  Clear coordinates
  Duplicate points
  Balance traverse and adjustment
  Rotate points
  Translate points
  Scale coordinates
- Coordinate geometry routines:
  Start
  Lines
  Curves
  Radial stakeout
  Area/traverse computations
- Store up to 550 points without additional memory

Text Editor (82485A)*
- Format text output:
  Text input and output
  Fill and justify lines
  Copy and center lines
  Test for end of page
  Start paragraphs
  Set margins
  Page length
  Line spacing
  Skipping lines
  Page number
  Merge files
  Use distribution list
*Available Spring, 1984.

- Insert formats:
  Text, Exit, List, Print, Copy, Move, Delete, Search, Replace
- HELP file
- Simple memo, letter and report generation

Solutions Books

HP-71 Solutions Books provide complete step-by-step keystroke listings to help equip you with answers to your general or specialized programs. Solutions Books are available on magnetic cards and mini data cassettes.

- Games (00071-90065)
- General Utilities (basic sub-programs) (00071-90066)
- Math (00071-90064)*
- Software Development Utility (82440A)

For more HP-71 software information, see page 8.

Users' Library Software

The Users' Library is another source of software solutions for HP-41 and HP-71 owners. Library members enthusiastically contribute programs spanning such applications as real estate, navigation, medicine, and mechanical engineering.

Each program has been reviewed by the Library's technical staff and comes with complete documentation, to give you ready-to-go solutions. You can expect detailed program descriptions, warnings, or limits; sample problems and examples as appropriate; instructions on running the program; and step-by-step listings of program keystrokes.

Program documentation includes individual program listings. (HP-41 program documentation includes HP bar code.) You can also purchase Library programs on pre-recorded magnetic cards, or on mini data cassettes for use in the Digital Cassette Drive.

When you subscribe to the Library, you will receive the appropriate software catalog, two HP Solutions Books** of your choice, and notification of special discounts and promotions.

For more information about Library solutions, contact the Users' Library, 1000 N.E. Circle Blvd.; Corvallis, OR 97330.

*Available Spring, 1984.
**Offer excludes HP-41 Structural Design.

Hewlett-Packard
HP-41/HP-71 Custom Products

HP's successful Custom Products Program combines customer-generated software and powerful HP-41 and HP-71 advanced computational products. Any time your application dictates that many people have access to the same programs and data, you'll want to consider HP's Custom Products Program.

There are several options from which to choose, and all are designed to tailor a problem-solving system to your professional demands. Use Custom Software Modules and Custom Magnetic Cards for program storage; HP-41 users can choose Custom Bar Code, too. Custom Keyboard Overlays and HP-41 Custom Keyboard Touchpads personalize your keyboard to make data entry and program execution faster and easier.

Up to four Custom Software Modules, available in the following byte capacities, may be used at a time:

HP-41	HP-71
4K	16K
8K	32K
	48K
	64K

The right custom option puts power and portability to work for you, swiftly transforming questions into answers and problems into solutions.

For more information on Custom Products, contact your local HP sales office.

HP-71 Development System

The HP-71 – An "Open" Machine

The HP-71 by itself is an extremely powerful machine. Add accessories, peripherals and instruments to further increase and enhance its problem-solving versatility. Hewlett-Packard also provides the tools with which you may choose language options and move between languages. Hardware and software developers are encouraged to dig deeper and develop hardware, software and interfaces that will make the HP-71 an indispensable tool for all kinds of applications.

Software Development Utility (82440A)*

Develop your own HP-71 BASIC, FORTH, or Assembly language source files using a personal computer word processing program. Then transfer the files to the HP-71. Included in the Software Development Utility are the HP-71 transfer programs on magnetic cards. Listings of typical programs on personal computers that work directly with the HP-71 program to effect the file transfer are also included. Choose your file-transfer option; either HP-IL, HP-IB, or RS-232C. (HP-IL/HP-IB or HP-IL/RS-232C interfaces are required.)

FORTH/Assembler (82441A)*†

The FORTH/Assembler ROM provides you with an extended software development environment for your HP-71. The FORTH operating system lets you write application programs in FORTH that execute faster than programs written in BASIC. HP-71 FORTH enhances the FORTH 1983 Standard word capability set with string manipulation words, floating point words and HP-IL words. The FORTH operating system is compati-

ble with the HP-71 BASIC operating system so you can switch between FORTH and BASIC environments without program or data loss; reconfiguring the HP-71 is not necessary. Programs written in one language can execute routines written in the other language. FORTH also provides you with an RPN calculator capability.
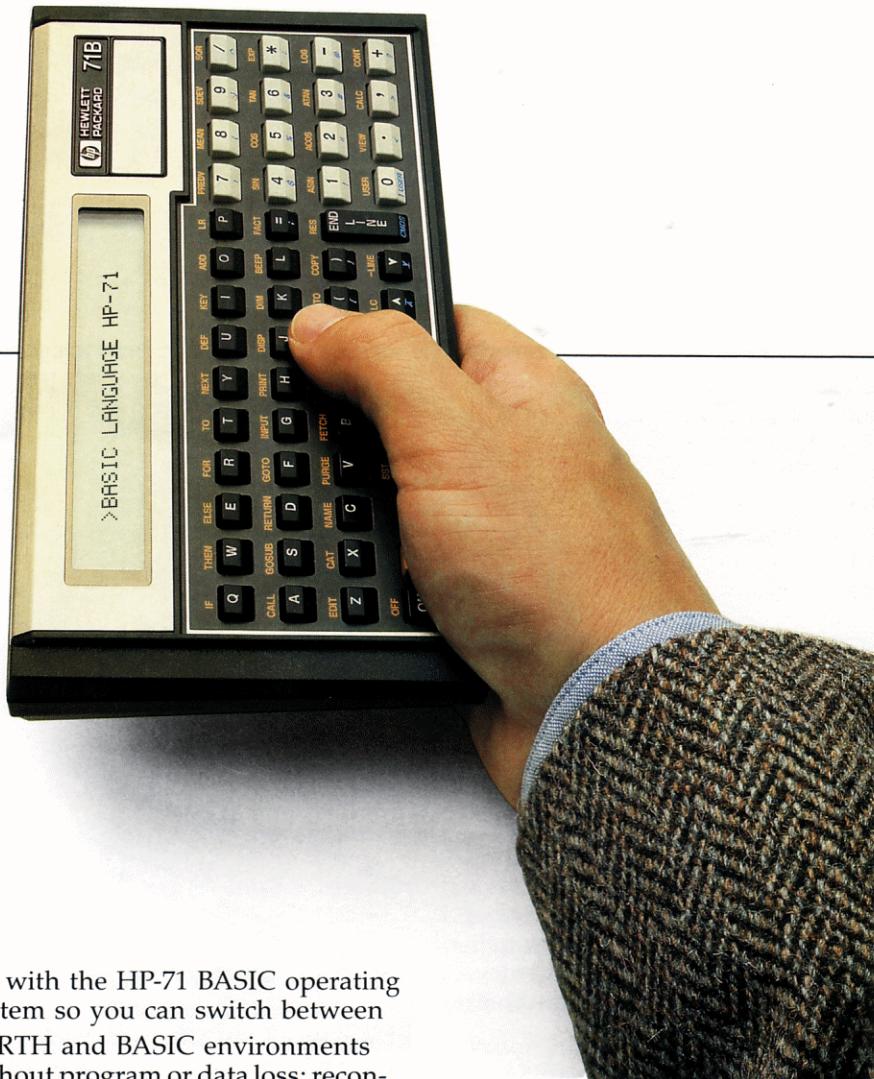
An assembler, written in FORTH, provides the same command set as the assembler used to develop the HP-71 operating system. Use it to create FORTH primitives, HP-71 binary files, or language extension (LEX) files to extend the BASIC language.

Use the text editor to create and edit text files for use as source files for BASIC, FORTH or Assembly language programs, as well as non-programming related purposes.

A BASIC keyword, <KEYBOARD IS>, lets you use any terminal device connected to your HP-71 through an interface as an external keyboard and display for the HP-71. The keyword <DISPLAY IS> is provided in the HP-IL Interface (HP 82401A).

Hewlett-Packard encourages software and hardware developers to delve deeper into the HP-71. To support these efforts, the internal specifications of the HP-71 have been documented and are available. The information includes details on the internal operation, entry points into the operating system, source code listings, an HP-IL interface description, and hardware bus specifications.

The Internal Design Specifications (IDS) Documents

Different apects of HP-71 internal operation are covered in each specification document.

Volume I: Detailed Design Description (00071-90068)

- System Start-up and Memory Configuration
- Memory Structure
- System Control
- The BASIC Interpreter
- Language Extension and Binary Files
- BASIC File Considerations
- Statement Parse, Decompile, and Execution
- Utilities
- Message Handling
- File System
- Table Formats
- Internal Data Representation
- Numeric Computation Algorithms
- Clock System

- HP-71 Assembler Instruction Set
- HP-71 Code Examples
- HP-71 Resource Allocation

Volume II: Entry Point and Poll Interfaces (00071-90069)

- Documents entry and exit conditions of 25 categories of supported system entry points.
- Documents interfaces to operating system polls of LEX files.
- Index of entry point names and global symbol values.

Volume III: Operating System Source Listings (00071-90070)

- Full assembly listings of the 76 modules that comprise the HP-71 operating system.

HP-IL (82401-90023)*

- Internal Design Notes
- Extended Command Syntax
- Examples of HP-IL Operation
- I/O Processor Firmware Specification
- HP-IL Poll Interfaces
- HP-IL ROM Utility Routines
- HP-IL LEX File Source Listings

Hardware Design Specification (00071-90071)*

- Describes each bus line and its purpose; specifications and schematic diagrams are included.
- Describes the CPU (from a hardware perspective).

*Available Spring, 1984.

HP-41/HP-71 Features and Functions Comparison Chart

Use this Comparison Chart to choose the HP Advanced Computational product that best meets your needs.

	HP-41CV	HP-41CX	HP-71B
Memory			
Built-in memory (bytes)**	2,237		
Built-in extended memory (bytes)**			
Maximum extended memory (bytes)**	4,200		
Maximum additional main memory			
Maximum memory (bytes)**	6,437		
Maximum expandable memory (bytes)** †	6,437	6,4	
System Features			
Alpha/display/keyboard	■	■	■
Audible tones	■	■	■
Calendar functions	S	■	■
Clock	S	■	■
Stopwatch, alarms	S	■	■
Redefinable keyboard	■	■	■
Text-file editor		■	
Programming Features			
BASIC language			■
RPN logic system	■	■	
Algebraic operating system (CALC mode)			■
FORTH/Assembly languages			■
Program labels	■	■	■
Numeric program labels	100	100	
Subprograms			■
Redefined keys††	68	68	■
User-defined functions	■	■	■
Conditional tests	14	20	
Flags	56	56	
String manipulation	■		■
Recursion			■
Indexed looping (DSE, ISG)	■	■	■
Indirect parameter specification	■	■	■
Insert/Delete editing	■	■	■
Levels of subroutines	6	6	
File management system			■
Business Features			
Amortization	S	S	S
Beginning/end of period selection	S	S	S
Bond: yield-to-maturity	S	S	S
price	S	S	S
Net present value (NPV) and internal rate of return (IRR)	S	S	S
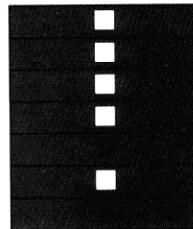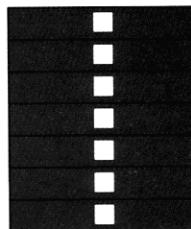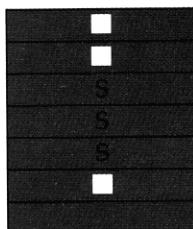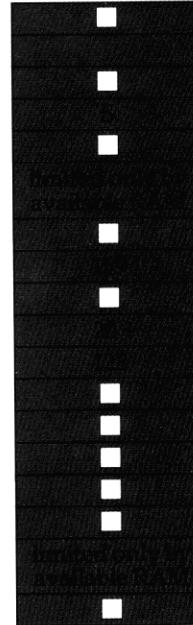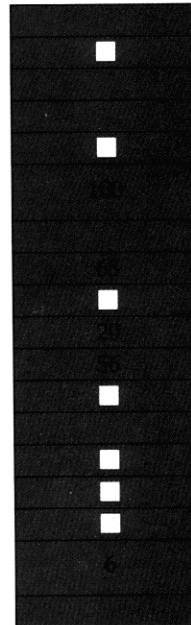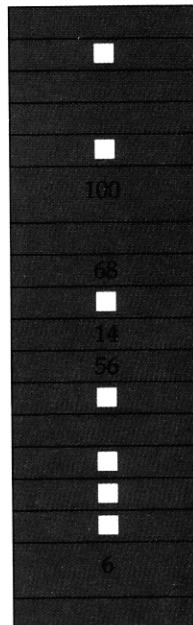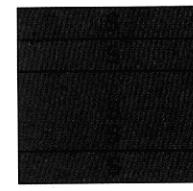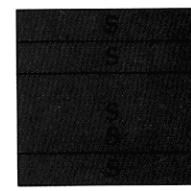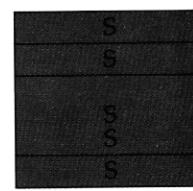
Scientific Features
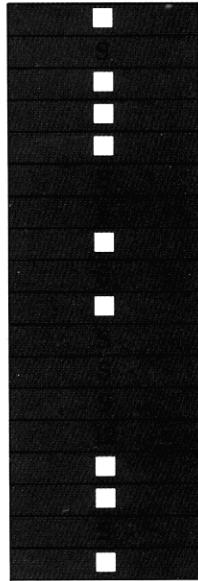
Feature	HP-41CV	HP-41CX	HP-71B
Boolean operators (NOT, OR, AND, XOR)	S	S	■
Complex functions	S	S	S
Decimal angle ↔ angle in degrees (hrs/min/sec)	■	■	■
Degrees ↔ radians	■	■	■
Engineering notation	■	■	■
Finite Fourier Transform	S	S	
Hyperbolics and inverses	S	S	■
IEEE Floating Point Math Standard			■
Integrate (numerical integration)	S	S	■
Math exceptions			■
Matrix variables (arrays)			
Matrix operations	S	S	
Number base arithmetic (binary, octal, decimal, hexadecimal)	S	S	
Precision of numeric variables (digits)	10	10	
Rectangular ↔ polar coordinates	■	■	■
Scientific notation	■	■	■
Solve (root finder)	S	S	
Trigonometric functions	■	■	■

Statistical Features

Feature	HP-41CV	HP-41CX	HP-71B
Correlation coefficient	S	S	■
Factorial function, max, min	■	■	■
Gamma function	S	S	S
Linear regression or estimate	S	S	■
Mean/standard deviation (number of variables)	1 or 2	1 or 2	15
Percent	■	■	■
Percent change	■	■	■
Permutations and combinations	S	S	■
Random number generator	S	S	■
Weighted mean	S	S	■
n, Σx, Σx², Σy, Σy², Σxy	■	■	■
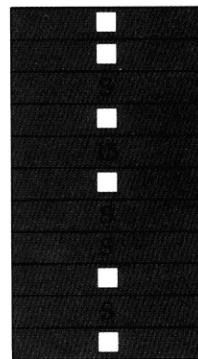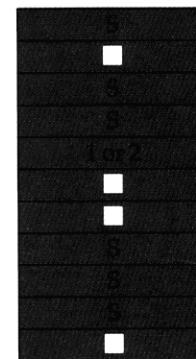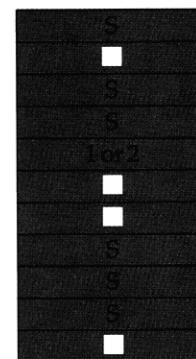
General Arithmetic Features

Feature	HP-41CV	HP-41CX	HP-71B
Absolute value	■	■	■
Decimal-hexadecimal conversions	S	S	■
Storage register arithmetic	■	■	■
+, −, /, x, √x, 1/x, CHS	S	S	■
Ln x, e^x	■	■	■
y^x, Log x, 10^x, x², π	■	■	■

HEWLETT
PACKARD