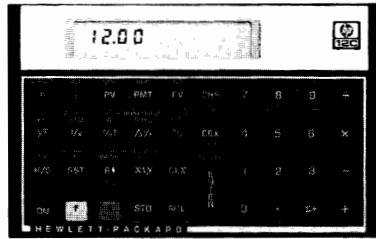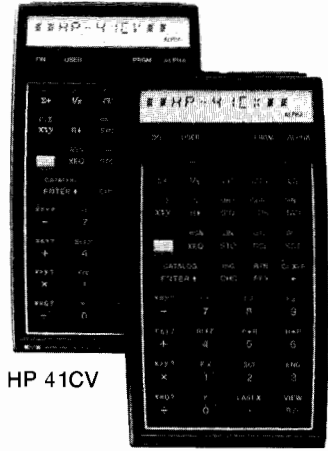# PERSONAL COMPUTERS & CALCULATORS
Personal Computation
Models HP-12C, HP-11C, HP-15C, HP-16C, HP-41CV, HP-41CX

HP 12C

HP 41CV

HP 41CX

What's Right for You?

Whether it's a professional calculator, an advanced calculator, or a handheld computer, Hewlett-Packard products can give you the sense of pride that comes from knowing you own a computational tool that has been designed—in every detail—to be the finest of its kind.

HP Series 10 Professional Calculators meet the needs of professionals in business, engineering, and computer science. Solve problems specific to your field and save time by eliminating unnecessary calculations. Each calculator is programmable and has special functions, Continuous Memory, and a liquid crystal display.

The flexible and powerful HP-41CV and HP-41CX Advanced Calculators perform tasks from arithmetic calculations to data analysis. Both models offer a wide variety of software.

The HP-71 Handheld Computer is a powerful computational tool for engineers and scientists. It is also well suited to manufacturing applications like quality control, portable data acquisition, and test instrument control. Create hardware, software, firmware, and interfaces using complete documentation including HP-71 internal specifications.

The HP-75D Handheld Computer is ideal as a remote data collection and information processing tool, whether operated from the keyboard or used with a bar code wand. Use it in field service and sales reporting, inventory control, tracking work in process, and more.

The HP-41, HP-71, and HP-75 are expandable, portable, and highly customizable. The Custom Products Program provides personalized solutions for your applications. To assemble completely portable systems, as well as to communicate with instruments and computers, use the versatile HP-IL Interface. It connects calculators and handheld computers with controllers, instruments, and peripherals.

Series 10 Professional Calculators

All Series 10 calculators come with long-life disposable batteries, a soft carrying case, and an Owner's Handbook. The HP-12C and HP-11C also come with a Problem-Solving Guide.

Size: All Series 10 calculators measure 12.7 x 8.0 x 1.5 cm (5 x 3 1/8 x 5/8 in).

HP-12C Advanced Financial Programmable

The HP-12C is a powerful financial calculator that is a favorite of business professionals in banking, real estate, and investment. It features basic time and money functions, Net Present Value, Internal Rate of Return, plus a bond function that calculates yield-to-maturity and price. Write your own programs or use HP's prewritten software solutions for specific applications.

HP-11C Advanced Programmable Scientific

Scientists, engineers, and mathematicians find the HP-11C easy to learn and easy to use. Built-in functions include: statistics, a random number generator, trigonometrics, hyperbolics and inverses as well as permutations and combinations. The HP-11C has subroutine and indirect addressing capability plus conditional tests and flags. Insert new instructions, access any part of a program, and easily delete program lines. At the touch of a single key, branch to any one of five independent programs.

HP-15C Advanced Programmable with Matrix Functions

The HP-15C has special functions that help scientists, engineers and mathematicians solve problems involving matrices and complex arithmetic. Use built-in matrix functions to operate on up to five matrices (a maximum of 64 elements). Perform transpositions, determine norms, and find determinants. The HP-15C has two parallel stacks—one for the real, and another for the imaginary, part of a complex number. It also has Solve and Integrate functions. Features include 448 program lines, label addressing, insert/delete editing, 7 subroutine levels, program review, 10 flags, and conditional tests.

HP-16C Programmable for Computer Science

The HP-16C is specifically designed for computer science and digital electronic applications. Number base modes make it easy to convert between binary, octal, decimal, and hexadecimal bases. In addition to calling and editing programs, the HP-16C has extensive bit manipulation capability: shift, rotate, set, test, summation, and mask. Select word size, 1's and 2's complements, and unsigned mode. Emulate instructions of most available processors. The calculator has four Boolean logic operators: AND, OR, XOR, and NOT.

HP-41 Advanced Calculators

The HP-41CV and HP-41CX provide the heart of expandable computational systems. They combine the speed, power, and accuracy of computers with the portability, touch-key simplicity, and low cost of handheld calculators. RPN (Reverse Polish Notation) provides a consistent and efficient logic system.

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 in the HP-41CV.

Alpha capability lets you label programs with easy-to-remember names. Each program is autonomous and each can have up to 100 different local labels for branching within the program. The HP-41 also features up to six levels of subroutines, 10 conditional tests, 56 internal flags, powerful loop control, indirect addressing, and both local and global branching. Functions and programs can be assigned to almost any key.

A complete system of status annunciators indicates mode conditions. Error messages pinpoint calculation errors and ten different tones provide audible feedback. Continuous Memory saves programs and data even when the calculator is turned off.

Dedicated plug-in peripherals are available and, through HP-IL, the HP-41 can transmit and receive data, perform a wide variety of control functions, and communicate with larger computers, peripherals, modems, terminals, and instruments.

Choose from a broad range of HP-written Application Pacs and Solutions Books as well as from Users' Library programs. Hewlett-Packard offers a Custom Products Program for those who require customized software solutions in large quantities. (See page 56 for more information on Custom Products.)

HP-41 Specifications

User memory (bytes): 2,233 (319 registers) built into HP-41CV/CX; 6,433 (919 registers) maximum.

Extended memory (bytes): 868 (124 registers) built into HP-41CX; HP 82180A Extended Functions/Memory Module, 868 (124 registers) optional for HP-41CV.

Extended memory modules (bytes): HP 82181A Extended Memory Module, 1,666 (238 registers) optional for HP-41CX/CV.
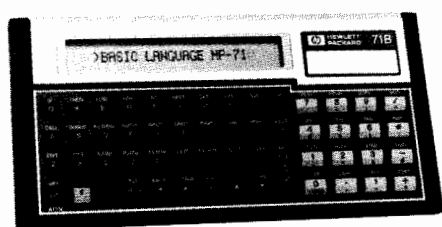
Built-in functions: Over 200 in HP-41CX; over 128 in HP-41CV.

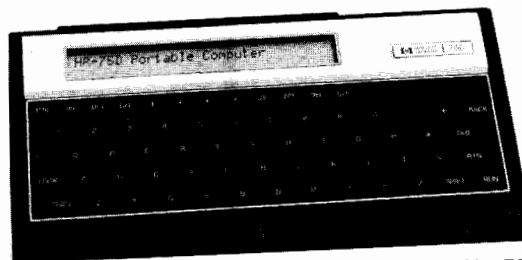**Keyboard:** Redefinable, alphanumeric (HP-41CX/CV).

Display: LCD, 10 digits; 12 alpha characters (scroll to 24) (HP-41CX/CV).

Power requirements: Four 1.5V, size N batteries (HP-41CX/CV).

Size: 3.3 x 7.9 x 14.2 cm (1.3 x 3.1 x 5.7 in) (HP-41CX/CV).

HP-71B

HP-75D

HP-71 Handheld Computer

The HP-71 Handheld Computer bridges the gap between advanced programmable calculators and portable computers. It is a powerful computational tool for individuals and is also well suited to manufacturing applications like quality control, portable data acquisition, and test instrument control. Its full CMOS CPU has a 4-bit intelligent external bus and 64-bit internal registers.

The HP-71 uses a powerful BASIC language that runs nearly as fast as compiled BASIC and allows structured programming techniques. It supports a sophisticated file management system and an advanced calculator mode (CALC). The operating system can be further enhanced by using FORTH or assembler languages.

Powerful CALC mode, combined with a 10-digit key pad, allows quick solutions and fast, easy input of numeric data. 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. Perform computations on up to 15 independent variables using built-in statistics functions. And use a complete set of trig functions to evaluate complex equations.

Over 240 instructions complement the HP-71 BASIC language. Parameters can be passed from main programs to subprograms. Built-in typing aids reduce program and data entry time. And each key on the keyboard (except the blue and gold shift keys) is redefinable.

Use the built-in quartz-crystal clock to create clock/calendar dependent programs that must begin and run when no one will be there to control the process.

Optional HP-IL interfacing provides access to a broad array of accessories, peripherals, instruments and other computers. Four ports accept any combination of memory modules or application software. And applications can be customized through the Custom Products program.

Documented internal specifications allow development of hardware, software, interfaces and firmware. (See the Custom Products and Programming Development Aids on page 56 for publication names and numbers.)

HP-71 Specifications

User memory (bytes): 17.5K built in, 33.5K (129K using 3rd party modules) maximum.

Read only memory (bytes): 64K built in, 320K maximum.

Memory modules (bytes): HP 82420A, 4K (user memory—add a maximum of four); 16K, 32K, 48K, or 64K (read only memory—add a maximum of four).

Transfer rate (bytes/sec): 8K (copying to a loop, no devices on loop); 6.4K (copying in a file); 4.5K (OUTPUT statement, no formatting (USING)); 4K (ENTER statement, no formatting (USING) and version 1B of the HP-IL module).

Programming languages: HP BASIC (built in); FORTH and assembler (optional).

Keyboard: Block QWERTY, redefinable, alphanumeric with separate keypad.

Display: LCD, 22 characters (scroll to 96).

Power requirements: Four 1.5V, size AAA alkaline batteries.

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

HP-75D Handheld Computer

The HP-75D is ideal as a remote data collection and information processing tool whether operated from the keyboard or used with a bar code wand. It has an 8-bit CMOS Series 80 personal computer CPU with built-in HP-IL and Digital Bar Code Wand interfaces. It is a fully-integrated, battery-powered computer.

Data collected with the HP-75D can be processed at remote sites or transferred to another computer using the portable HP 82168A Acoustic Coupler or the HP 82718A Expansion Pod. With HP-IL, up to 30 devices can be connected for mass storage on cassettes or disc drives, printing, plotting, measurement and access to larger systems. HP-IL interface converters also make it possible to connect the HP-75 to HP-IB, RS-232C, and GPIO devices, and to other HP computers.

The built-in 48K-byte ROM BASIC operating system has 167 system commands, including 41 numeric functions. Multiple file structure allows any number of files (up to available memory space) to be in memory at the same time. The built-in text file allows storage of text and basic files. A 256 character set includes both upper- and lower-case ASCII characters with true descenders, as well as several special characters.

Continuous Memory assures that data and programs will be saved even when the computer is turned off. A typewriter-like keyboard allows fast data entry, and more than 190 key combinations can be redefined. Simple keystrokes call up a "hidden" numeric keypad for quick input of numeric data.

The HP-75D becomes a single integrated data communications package when used with the HP 82718A Expansion Pod (which has built-in 3 of 9 Code and Code 11 software, 300-baud modem, electronic disc, and 32K or 64K bytes of RAM). For five more bar code decoders, use the HP 82725A Bar Code Reader Module. (The HP 92267A/B Digital Bar Code Wand is required to read bar code.)

A built-in appointment function provides audio alarm and message options. TIME mode calls up the system clock and allows the execution of time- and date-dependent programs. A built-in card reader allows the use of small, inexpensive magnetic cards for storage of programs, text files, data files, and keyboard redefinitions.

Comes with Owner's Manual, Reference Manual, Owner's Pac, Keyboard Overlay Kit, field case, rechargeable battery pack, recharger/AC adapter, HP-IL cables, and card holder.

HP-75 Specifications

User memory (bytes): 16K built in, 24K maximum (plus 32K or 64K with Expansion Pod).

Read only memory (bytes): 48K built in, 144 maximum.

Memory modules: HP 82700A, 8K (user memory—add a maximum of one); 32K (read only memory—add a maximum of three).

Programming language: HP BASIC

Keyboard: Touch-type QWERTY, redefinable, alphanumeric.

Display: LCD, 32 characters (scroll to 96).

Power requirements: Three rechargeable nickel-cadmium batteries (2 to 3 weeks of normal use between charges, or 20 to 30 hours of continuous use).

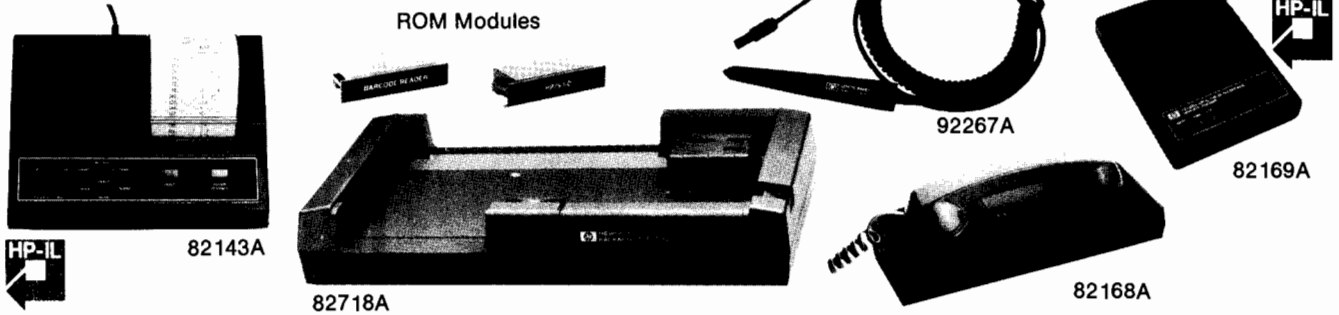**Size:** 12.7 x 25.4 x 3.2 cm (5 x 10 x 1.25 in)

Ordering Information	Price
HP-12C	
HP-11C	
HP-15C	
HP-16C	
HP-41CV	
HP-41CX	
HP-71B	
HP-75D	

PERSONAL COMPUTERS & CALCULATORS
Personal Computation
Enhancements & HP-IL Peripherals

ROM Modules

92267A

82169A

HP-IL

82143A

82718A

82168A

Enhancements and HP-IL Peripherals

HP-41:

HP 82182A Time Module

With this module (built into the HP-41CX), the HP-41CV can become a time-scheduled system controller, an alarm clock, an appointment reminder, a calendar, a timer, even an advanced stopwatch.

HP 82160A HP-IL Interface Module

Plugs into any one of the four ports in the HP-41, connecting it with HP-1L peripherals and instruments. Gives the HP-41 control of up to 30 devices on the loop. Three function sets are supplied: printer, mass storage, and general input/output (I/O).
Size: 2.8 x 1.2 x 0.4 cm (1.1 x 0.5 x 0.2 in)
Cable length: (two attached cables) 80 cm (31 in) each
Data Transfer Rate: 150 bytes/second (typical HP-41 transfer rates)

HP 82183A Extended I/O Module

Provides 59 I/O functions 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 HP-IL loop.

HP 82184A Plotter Module

Provides plotting capability for the HP-41 using the HP 82162A Printer/Plotter. Plotting programs are included in the module for quick and easy generation of high-quality graphics. Develop graphics programs as well as plot and print HP bar code.

HP 82104A Card Reader

Allows programs and data to be saved on magnetic cards which contain 32 registers, 16 per side. Adds over 30 control functions to the HP-41; keeps track of cards as they are read, and prompts for the next card; permits a program to be run, but not reviewed or altered through normal operations; reads HP-67/97 program cards, making all necessary translations into HP-41 code.

HP 82143A Thermal Printer/Plotter

Quietly provides numeric, upper- and lower-case alpha, doublewide characters, high-resolution plotting capabilities, and intensity control. Allows user-defined special characters.

HP 82153A Optical Wand

Easily inputs data or programs into the HP-41 when passed across a printed page of HP bar code. Most HP-41 software is available in HP bar code, including Users' Library programs and Solutions Books.

00041-15042 Automatic Start and Cassette Duplication Module

Lets you write programs that automatically set status, configure memory, access peripherals, or provide prompts. The mass copy feature provides a means of duplicating programs and data from cassette to cassette, cassette to 3½" HP-IL disc, and from disc to disc.

00041-15043 HP-IL 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. Makes it possible to add a second HP-41 to the HP-IL loop to display the mnemonics of HP-IL messages as they travel around the loop.

HP-71:

HP 82401A HP-IL Interface

Allows direct connection to any HP-IL product, and to HP-IB, RS-232C, and GPIO devices using interface converters. Facilitates simultaneous control of up to 30 devices on the loop and, through secondary addressing, up to 930 devices. Allows printer, display, mass storage, and general input/output operations.

HP 82402A Dual HP-IL Adaptor

Allows the HP-71 to have two independent, isolated HP-IL loops simultaneously, using only one port and two HP-IL modules. Control local instruments with one loop while the other is networked to a supervisory computer. Or use one loop for data logging and the other for battery conservation by using peripherals only as needed.

HP 82400A Card Reader

Offers an inexpensive means of storage for programs and data. Cards can be encoded as a private file so they may be copied and executed, but not viewed or edited, to ensure protection from being overwritten. Automatic verification assures accuracy.

HP-75:

HP 82718A Expansion Pod

A 300-baud, direct-connect modem with 32K (Opt. 64 has 64K) bytes of non-volatile electronic disc. Modem and electronic disc commands are built into the pod's 16K-byte ROM software. The direct-connect, serial, asynchronous, full-duplex modem is compatible with Bell 103/113 modems.

Electronic disc uses RAM to emulate a flexible disc as a high-speed disc drive, for fast data transfer and data file access. Create, access and modify files; establish a hierarchical directory structure; and copy files into and out of the electronic disc.

Two bar code decoders are built in—3 of 9 Code and Code 11.

HP 82718A Expansion Pod Opt. E64

Includes 64K bytes of electronic disc memory; the direct-connect modem and all related modem functions are excluded.

HP 82725A Bar Code Reader Module

This 8K-byte ROM module can decode 3-of-9, Interleaved 2-of-5, Industrial 2-of-5, 2-of-7 (Codabar), Code 11, Universal Product (UPC A or E), or European Article Number (EAN 8 or 13) Codes. (Not required to read 3-of-9 Code or Code 11, if you use the HP 82718A Expansion Pod.) Use the module with the HP 92267A or HP 92267B Bar Code Reader wand.

HP 92267A/B Digital Bar Code Wands

Use these wands with the HP-75D and HP 82725A Bar Code Reader Module. The HP 92267A is a high resolution (0.13 mm, or 0.005 in) wand recommended for reading high-density labels that are generally produced on specialized printers. The medium resolution (0.19 cm, or 0.0075 in) HP 92267B is recommended for reading bar code labels produced on good-quality dot matrix printers.

00075-15001 I/O ROM

Enhances the BASIC language capability of the HP-75D with HP-IL controller and advanced programming commands. It can be used with any HP-IL talker or listener device. The major I/O statements provided by the ROM are OUTPUT, ENTER, SENDIO, ENTIO$, and SEND.

HP-41, HP-71, and HP-75:

HP 82161A Digital Cassette Drive

Uses a digital-quality mini-cassette to store up to 128K bytes of information. Rewind time is under 30 seconds and it can access over 250 bytes of information per second. STANDBY mode enables an HP-IL controller to turn the drive on or off remotely.
Size: 17.8 x 13.2 x 6.1 cm (7 x 5.2 x 2.4 in)
Data Format
Number of tracks: 2
Density: 335 bits/cm (850 bits/inch)
Format: 256 bytes/record (8 bits/byte)
Formatted capacity: 512 records (131,072 bytes)

PERSONAL COMPUTERS & CALCULATORS
Personal Computation
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55

HP 82162A Thermal Printer/Plotter

Provides numeric upper- and lower-case alpha, doublewide characters, and intensity control.

Two chief features distinguish the HP 82162A from the HP 82143A dedicated Printer/Plotter. It can be used by the HP-71 and HP-75 as well as the HP-41, and it has a 101-character buffer for enhanced graphics capabilities and a FORMAT function which automatically centers or justifies copy to the left and right margins.

STANDBY mode enables any HP-IL controller on the loop to manage its power consumption.

Size: 17.8 x 13.2 x 6.1 cm (7 x 5.2 x 2.4 in)
Cable length: 86 cm (34 in)
Character sets: 96 standard ASCII, 127 modified-expanded ASCII

HP 2225B ThinkJet Personal Printer

Prints bidirectionally at 150 characters/second to produce 80-column pages of graphics or text in the office or field. With sound pressure under 50 decibels, printer noise is minimal.

An inexpensive, disposable cartridge holds the print head and ink reservoir and can print about 500 pages before replacement. It features an 11 x 12 dot-matrix format text mode with a logic-seeking feature, bold mode, and 216 printable characters to meet multilingual printing needs. Uses single sheets or fanfold paper.

Size: 8.9 x 29.2 x 20.6 cm (3.5 x 11.5 x 8.1 in)

HP 9114A Disc Drive

For a detailed description refer to Disc Drives, beginning on page 89.

HP 82168A Acoustic Coupler (modem)

Provides remote communications capabilities over telephone lines through HP-IL. Access "dial-up" computer systems through telephone lines. Data transmission rate is 300 baud. Use anywhere a conventional (G-type) receiver is available.

With the HP-41, use with the Extended I/O Module. The I/O ROM or Utilities Card (available in the HP-75 Solutions Book) is required for HP-75 operation. The Terminal Emulator program, available in the Acoustic Coupler Owner's Manual, is a convenient addition.

Size: 25.7 x 9.7 x 5.7 cm (10.1 x 3.8 x 2.2 in)

Ordering Information	Price
HP-41:	
HP 82180A Extended Functions/Memory Module	$75.00
HP 82181A Extended Memory Module	75.00
HP 82182A Time Module	75.00
HP 82160A HP-IL Interface Module	125.00
HP 82183A Extended I/O Module	75.00
HP 82184A Plotter Module	75.00
HP 82104A Card Reader	195.00
HP 82143A Thermal Printer/Plotter	385.00
HP 82153A Optical Wand	125.00
00041-15042 Automatic Start and Cassette Duplication Module	35.00
00041-15043 HP-IL Development Module	75.00
HP-71:	
HP 82420A 4K Byte Memory Module	75.00
HP 82401A HP-IL Interface	125.00
HP 82402A Dual HP-IL Adapter	TBA
HP 82400A Card Reader	165.00
HP-75:	
HP 82700A 8K Byte Memory Module	195.00
HP 82718A Expansion Pod (32K, modem)	875.00
HP 82718A Opt. 64 (64K, modem)	1,175.00
HP 82718A Opt. E64 (64K, no modem)	1,150.00
HP 82725A Bar Code Reader Module	75.00
HP 92267A Digital Bar Code Wand	160.00
HP 92267B Digital Bar Code Wand	150.00
00075-15001 I/O ROM	95.00
HP-41, HP-71, and HP-75:	
HP 82161A Digital Cassette Drive	550.00
HP 82162A Thermal Printer/Plotter	450.00
HP 2225B ThinkJet Personal Printer	495.00
HP 82168A Acoustic Coupler	495.00
HP 9114A Disc Drive	795.00

HP-IL Instruments and Interfaces

HP-41, HP-71, and HP-75:

Instrument Options

For a detailed description of instruments you can use with the HP-41, HP-71, and HP-75, see numerical index for page numbers. HP 3468A Digital Multimeter; HP 3421A Data Acquisition/Control Unit; HP 5384A/HP 5385A Opt. 003 Frequency Counters; HP 1630A/D/G Logic Analyzers; HP 4945A Transmission Impairment Measuring Set.

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

Translates HP-IL signals into RS-232C signals, and vice versa, for connection of HP-IL systems with RS-232C devices. Provides bit-serial asynchronous data communication. Information can be sent and received (in true half- and full-duplex mode) in EIA RS-232C compatible voltage levels. When a controller is used, it must be an HP-IL device. Comes with one HP-IL cable and AC adapter.

HP 82169A HP-IL/HP-IB Interface

Permits linkage of HP-IL systems with HP-IB (IEEE 488, 1978) computers and lab equipment. Its key feature is its friendly, flexible two-mode (Translator and Mailbox) operation. Responds to most HP-IL and HP-IB commands. When a controller is used, it can be either an HP-IL or HP-IB device. AC adapter included.

HP 82165A HP-IL/GPIO Interface

Allows HP-IL to control equipment operating with parallel bus structures. Contains I/O buffering and a built-in power supply that operates from an HP standard AC adapter that is included.

HP 92198A Mountain Computer HP-IL 80-Column Video Interface (U.S.)

Display data and listings on a standard video monitor. Add an RF modulator and use it with a conventional TV set. View in 24-row-by-80-column or 20-row-by-40-column format. Characters also can be displayed in inverse video.

HP-IL Interfaces for Other Computers
HP 82938A HP-IL/Series 80 Interface

Provides a communication link between portable battery-operable products and larger computers. Gather data in the field, and then access an HP Series 80 personal computer to do more complex analyses. Allows use of the built-in graphics capabilities of Series 80 Personal Computers.

HP 45643A Extended I/O Accessory

Provides a communication link between The PORTABLE and the Touchscreen or Touchscreen MAX computers via the HP-IL interface. Transfer up to two pages of text per second, with 500 words per page. Comes with instructions, plus software on a 3½" disc.

HP 82973A HP-IL Interface Card

Provides a communication link between The PORTABLE and IBM PC/XT computers via HP-IL interfacing. Transfer up to two pages, with 500 words each, of text per second. Comes with instructions, plus software on a 5¼" disc.

HP 82166C HP-IL Interface Kit

A design kit that provides the necessary special components needed to incorporate HP-IL into other devices. After designing HP-IL in, components can be purchased separately from HP. Included in the kit are complete component-level documentation, four complete sets of parts for prototype evaluation, and HP-IL development software.

Ordering Information	Price
HP-41, HP-71, and HP-75:	
HP 82164A HP-IL/RS-232C Interface	295.00
HP 82169A HP-IL/HP-IB Interface	395.00
HP 82165A HP-IL/GPIO Interface	295.00
HP 92198A Mountain Computer HP-IL 80-Column Video Interface (U.S.)	325.00
HP 82938A HP-IL/Series 80 Interface	295.00
HP 45643A Extended I/O Accessory	175.00
HP 82973A HP-IL Interface Card	150.00
HP 82166C HP-IL Interface Kit	395.00

Accessories

Series 10, HP-41, HP-71, and HP-75:

Accessories such as owner's manuals, programming pads, magnetic cards, thermal paper, battery packs, rechargers, and software manuals are readily available for all types of HP calculators.

Custom Products and Programming Development Aids

Through customization, the powerful HP-41, HP-71, and HP-75 can be tailored with your own software to perform the functions that will increase performance productivity.

Using customer- or third-party written programs, the HP-41, HP-71, or HP-75 can be customized using Custom ROMs, EPROMs, Magnetic Cards, and Keyboard Overlays. The HP-41 can also be customized with Custom Keyboard Touchpads and Bar Code.

The services of Independent Custom Consultants (ICCs) make the customization process easy. (A list of ICCs is available from your HP Sales Representative.) ICCs are application-oriented software houses with in-depth training on HP products and system integration. They convert software to finished Custom Products and can write and field test software, package the system, write user's manuals, and more. Choose and contact an ICC to help you decide if customized HP products can be used to help meet your needs.

HP-41:

HP-41CV or HP-41CX Opt. 001 Custom Calculator

The trigonometric function labels are removed from the keys, eliminating unnecessary and possibly distracting nomenclature. Label the keys to precisely fit your application to minimize potential error. Custom Keyboard Overlays and Keyboard Touchpads label keys to improve ease of use.

HP 82504A Custom Keyboard Touchpads

Relabel the HP-41 keyboard with special functions assigned to each key. Available in a variety of background and printing colors.

HP Bar Code

Provides cost-efficient storage on paper that's easy to use, duplicate and distribute. It can represent any operation performed from the keyboard and preserves special key assignments, programs, and data. Reproduce it using the HP 82184A Plotter Module.

HP-71:

HP 82440A Software Development Utility

Allows development of HP-71 BASIC, FORTH, or assembler language source files using a personal computer. Listings of typical programs for Series 80 and IBM PC computers, as well as instructions for setting up other PCs are included. An HP-IL/HP-IB or HP-IL/RS-232C Interface is required. Software comes on mini cassette.

HP 82441A FORTH/Assembler

Provides an extended software development environment for your HP-71. The FORTH operating system is a very effective language for instrument control applications. It allows routines to be called from BASIC and vice versa.

Create FORTH primitives, HP-71 binary files, or language extension (LEX) files to extend the BASIC language. Create and edit text files for use as source files for BASIC, FORTH, or assembler language programs, as well as non-programming related purposes. Use any terminal device connected to your HP-71 through an interface as an external keyboard and display for the HP-71.

Plug-In Module Simulation Procedure (PMSP)

Simulate any Custom ROM Module developed for the HP-71 through one of its memory ports. Insert the FORTH/Assembler ROM to use the larger keyboard and display of the HP 150, Series 80, or other personal computers in software program development. This sheet explains the procedure (available through an HP Sales Representative or Independent Custom Consultant).

HP-71 Internal Design Specifications (IDS) Documents

00071-90068 Volume I: Detailed Design Description
Provides details on the internal operation of the HP-71.

00071-90069 Volume II: Entry Point and Poll Interfaces
Provides details on over 700 operating system entry points.

00071-90070 Volume III: Operating System Source Listings
Provides details on source code listings.

82401-90023 HP-IL
Provides details on the HP-IL interface, including entry points and source code listing.

00071-90071 Hardware Design Specification
Provides details on hardware bus specifications.

HP-75:

HP 82713A Plug-In Module Simulator (PMS)

Provides ROM simulation capability for the HP-75. Store programs or files on the simulator or use it for software evaluations when developing a Custom ROM Module. Three simulators may be used.

HP-41, HP-71, and HP-75 Custom ROM Modules

HP-41: HP 82508A/B, HP 82509A/B
Provide 4K or 8K bytes of memory with each module, or nearly 21,000 program lines with up to four 8K byte modules.

HP-71: HP 82491A/B, HP 82492A/B, HP 82493A/B, HP 82494A/B
Provide 16K, 32K, 48K, or 64K bytes of program storage in a plug-in module. May be used in quantities of one to four for a maximum capacity of 256K ROM. (Minimum order: 100 modules.)

HP-75: HP 82726A/B, HP 82727A/B, HP 82728A/B, HP 82729A/B
Provide 8K, 16K, 24K, or 32K bytes of program storage in a plug-in module. May be used in quantities of one to three for a maximum capacity of 96K ROM. (Minimum order: 100 modules.)

HP-41, HP-71, and HP-75 Custom Magnetic Cards

HP-41: HP 82502A
Cards used with the HP-41 and HP-67/97 can be customized to load up to 225 bytes each.

HP-71 and HP-75: HP 82722A
Cards used with the HP-71 or HP-75 can be customized to load up to 1.3K bytes each.

HP-41, HP-71, and HP-75 Custom Keyboard Overlays

HP-41: HP 82501A
HP-71: HP 82487A
HP-75: HP 82721A
Relabel the keyboard with special user-defined functions assigned to each key. Available in a variety of colors.

Ordering Information	Price
HP-41:	
HP-41CV Opt. 001 Custom Calculator	$225.00
HP-41CX Opt. 001 Custom Calculator	325.00
HP-71:	
HP 82440A Software Development Utility	35.00
HP 82441A FORTH/Assembler ROM	150.00
00071-90068 Volume 1: Detailed Design Description	50.00
00071-90069 Volume II: Entry Point and Poll Interfaces	50.00
00071-90070 Volume III: Operating System Source Listings	200.00
82401-90023 HP-IL	50.00
00071-90071 Hardware Design Specification	200.00
HP-75:	
HP 82713A Plug-In Module Simulator	495.00

NOTE: Please contact an ICC for Custom Products prices.

HP Users' Library

The Users' Library is a source of programs written and submitted by users of HP-41, HP-71, and HP-75 calculators and handheld computers. Programs cover a wide variety of applications. Documentation includes instructions and program listings. Software is also available prerecorded on magnetic cards, mini-cassettes, or HP-IL 3½" discs. A custom cassette/disc duplication service is available. Subscribers receive a complete list of programs, plus notification of special discounts, contests, and special promotions. For more information, contact the Users' Library, Dept. 39UL, 1000 N.E. Circle Blvd., Corvallis, OR 97330.

Software

Hewlett-Packard offers a wide range of software packages as application pacs and solutions books. Each application pac comes with a comprehensive manual, a plug-in application module, and when applicable, prerecorded magnetic cards, a keyboard overlay, and quick reference card. Solutions books come with complete documentation. Magnetic cards, mini data cassettes, or HP-IL 3½" discs are also available. Both application pacs and solutions books are available from dealers and HP Representatives.

Series 10:

	Price
00011-90009 HP-11C Solutions Handbook	$15.00
00012-90021 HP-12C Leasing Applications Handbook	15.00
00012-90015 HP-12C Real Estate Applications Handbook	15.00
00012-90009 HP-12C Solutions Handbook	15.00
00012-90022 HP-12C Training Guide	15.00
00015-90011 HP-15C Advanced Functions Handbook	15.00

HP-41:

Application Pacs

00041-15055 HP-41 Advantage	$49.00
00041-15018 Aviation (for pre-flight use)	35.00
00041-15024 Clinical Lab & Nuclear Medicine	35.00
00041-15006 Circuit Analysis	35.00
00041-15004 Financial Decisions	35.00
00041-15049 Math/Statistics	45.00
00041-15022 Games	35.00
00041-15023 Home Management	35.00
00041-15016 Real Estate	45.00
00041-15019 Thermal & Transport Science	35.00
00041-15039 Petroleum Fluids	75.00
00041-15026 Securities	35.00
00041-15001 Standard Applications	35.00
00041-15002 Statistics	35.00
00041-15027 Stress Analysis-Mechanical Engineering	35.00
00041-15021 Structural Analysis-Civil Engineering	45.00
00041-15005 Surveying	35.00
00041-15020 Machine Design	35.00
00041-15017 Navigation	45.00
00041-15042 Auto/Start Duplication ROM	35.00
00041-15043 HP-41 HP-IL Development Module	75.00

Solutions Books

Business:

00041-90094 Business Statistics/Marketing/Sales	15.00
00041-90096 Home Construction Estimating	15.00
00041-90086 Lending, Savings, & Leasing	15.00
00041-90136 Real Estate	15.00
00041-90137 Small Business	15.00

Engineering:

00041-90093 Antennas	15.00
00041-90100 Chemical Engineering	15.00
00041-90089 Civil Engineering	15.00
00041-90092 Control Systems	15.00
00041-90088 Electrical Engineering	15.00
00041-90139 Fluid Dynamics & Hydraulics	15.00
00041-90140 Heating, Ventilating & Air	15.00

AMPI (TM) Statistics is a trademark of American Micro Products, Inc.

Conditioning

00041-90090 Mechanical Engineering	
00041-90138 Solar Engineering	
00041-90441 Structural Design (cassette based)	

Computation:

00041-90084 Geometry	
00041-90083 High-Level Math	
00041-90082 Test Statistics	

Other:

00041-90145 Calendars	
00041-90102 Chemistry	
00041-90099 Games I	
00041-90443 Games II	
00041-90143 Optometry I (General)	
00041-90144 Optometry II (Contact Lenses)	
00041-90142 Physics	
00041-90141 Surveying	
00041-90543 1984 Taxes	
00041-90395 Time Module Solutions I	

HP-71:

Application Pacs

HP 82481A AC Steady State Circuit Analysis	
HP 82484A Curve Fitting	
HP 82479A Data Acquisition	
HP 82488A Data Communications	
HP 82482A Finance	
HP 82441A FORTH/Assembler	
HP 82480A Math	
HP 82440A Software Development Utility (with minicassette)	
HP 82489A AMPI (TM) Statistics	
HP 82483A Surveying	
HP 82485A Text Editor	
HP 82490A HP-41 Translator	

Solutions Books

00071-90065 Games	
00071-90066 General Utilities	
00071-90064 Math	

HP-75:

Application Pacs

00075-15035 Data Communications	
00075-15001 I/O ROM	
00075-15015 Math	
00075-15012 Surveying	
00075-15019 Text Formatter	
00075-15014 VisiCalc (R)	

Solutions Books

|	
00075-13008 Electronics	
00075-13009 Finance	
00075-13006 Games I	
00075-13007 Games II	
00075-13016 Graphics	
00075-13013 I/O Utilities	
00075-13015 Mass Media Duplication/Privacy	
00075-13003 Math I	
00075-13004 Math II	
00075-13005 Math III	
00075-13010 Real Estate	
00075-13011 Statistics	
00075-13012 Test Statistics	

For additional information or a demonstration of Hewlett-Packard professional calculators and handheld computers, visit your nearest HP sales representative or HP dealer. For the location and number of the one nearest you, call toll-free 1-800-FOR-HPPC (1-800-367-4772).

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PERSONAL COMPUTERS & CALCULATORS
Hewlett-Packard Interface Loop
Low Cost Interface for Battery-Operable Systems

Hewlett-Packard Interface Loop (HP-IL)

The Hewlett-Packard Interface Loop, HP-IL, is a bit-serial interface designed for low cost battery-operable systems. HP-IL allows HP-41 calculators and HP-71, HP-75, The PORTABLE, HP 150 and other computers to be used as system controllers, capable of transmitting and receiving data, and performing a wide variety of information management functions. In addition, HP-IL allows the HP-41, HP-71, and HP-75 to be used for instrument control.

In HP-IL systems, 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.
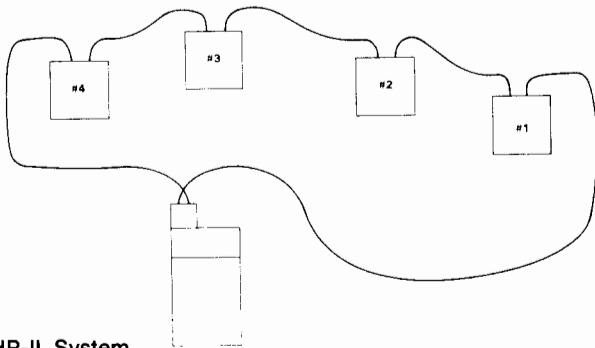
HP-IL System

Auto Address Assignment

In order to distinguish between devices on the loop, each device must have an address, a number from 1 to 30. An HP-41, HP-71, HP-75, or other mainframe, as the controller, uses the address to specify and control the devices on the loop. HP-IL enables the controller to assign addresses automatically, starting with the address 1 for the device next to the controller in the direction of the information transfer.

Device Capability Identification

Most HP-IL devices contain an accessory identification number that tells the system controller its device type, such as "printer" or "mass storage device". Upon execution of a PRINT command, the controller polls each device on the loop until it finds the device that responds with the appropriate accessory ID number for printers. Device identification frees the user from having to know the address of each device on the loop. This feature also allows software to be run and written without regard to system orientation, address switches or preassigned addresses, making HP-IL a truly user-friendly interface.

Power ON/OFF Control

Several HP-IL peripherals support STANDBY mode. Peripherals can be powered on or off, under program control, to conserve battery life. The ON/OFF feature allows an HP-IL system to be used for remote applications.

Automatic Error Checking

HP-IL allows for automatic error checking of any data being transmitted on the loop. Because each character must return to the device that originally sent it, the device compares the returning character with a copy of the one that was sent. If the two do not match, an error message is generated.

Hold-Until-Ready Protocol

HP-IL provides a simple means of coordinating the transfer of data. Some devices send and receive data at high rates while other devices work at a slower pace. In the HP-IL system, devices hold each piece of information until they are ready to receive another. When ready, they pass the information to the next device. By the time a piece of information makes a complete loop, all devices are ready to accept new information. This "hold-until-ready protocol" assures that fast and slow devices can operate in the same HP-IL system.

The Versatility of HP-IL

HP-IL is an ideal, low cost interface option for those applications requiring low power and maximum portability. HP-IL also provides a link between battery-powered devices and more powerful computational products. Through HP-IL interface converters, an HP-41 calculator, HP-71, HP-75, or other computer can pass information to desktop computers, modems, terminals, instruments and peripherals. With the HP-IL Interface Kit, an HP-IL interface can be built into microprocessor-based products, making them into HP-IL devices.

HP-IB and HP-IL

HP-IL is not intended as a replacement for HP-IB, but rather as a low-cost, low-power alternative below HP-IB in price and performance.

Although HP-IB and HP-IL serve the same basic function—interfacing controllers, instruments and peripherals—they differ in many respects.

1. Because of HP-IL's lower power consumption, it is usable with portable, battery-powered systems. Generally, HP-IB is not.

2. HP-IL system components will generally be low cost and have moderate performance; HP-IB system components are medium- to high-performance and generally cost more.

3. HP-IL systems work at relatively low data rates compared to HP-IB, and relatively high data rates compared to RS-232C. For example, the HP-71 and The PORTABLE can transmit at speeds of 5K to 6K bytes per second (50,000 to 60,000 baud on RS-232C). HP-IL maximum data rate at a 100 metre distance is 20K bytes per second; this rate is not dependent on HP-IL cable length.

4. HP-IL allows device separations of up to 100 metres with shielded, twisted pairs (10 metres with zip cord). HP-IB requires extender hardware for long distance connections.

The HP-IL Logo

Just as the HP-IB interface is designated by the HP-IB symbol, Hewlett-Packard identifies the HP-IL interface with its own symbol. Wherever this logo appears, it indicates that that mainframe, peripheral, instrument, etc., is HP-IL compatible.

HP-IL Products and Applications Summary

Model	Application	See Page
HP-41 Advanced Calculator (with HP 82160A HP-IL Interface Module)	Control: HP-IL bench/field controller Computation: Field data collection	52
HP-71 Handheld Computer (with HP 82401A HP-IL Interface)	Control: HP-IL bench/field controller Computation: Data acquisition, field analysis	53
HP-75 Handheld Computer (with HP-IL built-in)	Control: HP-IL bench/field controller Computation: Data collection, field analysis Remote transaction processing	53
Series 80 Personal Computers (with HP 82938A Interface)	HP-IL bench controller; field data analysis control	46
The PORTABLE (with HP-IL built in)	Computation and field analysis Remote transaction processing Battery or AC operation	44
The PORTABLE PLUS (with HP-IL built in)	Computation and field analysis Remote transaction processing Battery or AC operation	44
The Integral PC (with HP 82924A HP-IL Interface)	HP-IL bench controller; field data analysis control	78
HP 82402A Dual HP-IL Adapter	Allows two HP 82401A HP-IL modules to be plugged into the HP-71 simultaneously.	54
HP 82169A HP-IB Interface	Bench conversion from HP-IL to IEEE-488 computers, peripherals and instruments	55
HP 82164A RS-232C Interface	Bench conversion between HP-IL and RS-232C signals for terminals, modems, computers and peripherals	55
HP 82165A GPIO Interface	Bench conversion between HP-IL and parallel devices Digital data acquisition interface from HP-IL to most computers	55
HP 82938A Series 80 Interface	Bench conversion from HP-IL to Series 80 Personal Computers	55
HP 82166C HP-IL Interface Kit	Components that can be built into a device, providing HP-IL capability	55
HP 45643A Extended I/O Accessory	Driving HP-IL peripherals, including ThinkJet, plus parallel printers Allows communication between The PORTABLE and Touchscreen, and Touchscreen MAX	55
HP 82973A HP-IL Interface Card	Allows communication, using HP-IL, between The PORTABLE and the IBM PC/XT. Driving HP-IL peripherals	55
HP 82161A Digital Cassette Drive	Bench/field program storage Bench/field data storage Bench/field data logging Field data collection	54
HP 82162A Thermal Printer/Plotter	Bench/field hard copy Data logging Simple plotting Computational hard copy	55
ThinkJet Printer (HP-IL option)	Bench/field full-page, hard-copy output Low noise environments High-resolution graphics and text Battery operation	273

Model	Application	See Page
HP 9114A 3½" Flexible Disc Drive (with HP-IL built in)	Bench/field program storage Bench/field data storage Bench/field data logging Bench/field data collection Bench/field data exchange with Series 80 and Series 200 personal computers Battery or AC operation	89
HP 82168A Acoustic Coupler (Modem)	Remote communications capability Telephone data access	55
HP 1630A/D/G Logic Analyzer	Bench logic design, development, and testing Digital diagnosis and debugging Timing analysis, state analysis, performance analysis, and interactive state/timing analysis	414
HP 3421A Data Acquisition/Control Unit	Bench/field automated measurement, channel selections and control Lab bench experimentation and control Portable experimentation and data collection	290
HP 3468A Digital Multimeter	Bench/field automated measurement Scientific experimentation Lab bench experimentation & trouble shooting Bench/field automated service & diagnostic tool	208
HP 4945A Transmission Impairment Measuring Set (TIMS)	Bench testing of voice grade data channels, program channels, and high speed digital channels Master/slave capability for end-to-end testing Automatic gain slope measurement Programmable sweep	139
HP 5384A/HP 5385A Opt. 003 Frequency Counters	Bench, systems, field-automated measurement	235

Comparison Chart

	Calculators					Handheld Computer
	Financial	Scientific		Computer Science	Advanced	
	HP-12C	HP-11C	HP-15C	HP-16C	HP-41CV/CX	HP-71B
Operating Features						
Continuous Memory	●	●	●	●	●	●
RPN logic system	●	●	●	●	●	S
Algebraic system						●
BASIC language						●
FORTH/Assembler languages						S
Error recovery (last x)	●	●	●	●	●	●
Maximum number of storage registers	20	21	67	101R	319*	*
Maximum number of digits displayed	10	10	10	10F	10	12
Number of digits used in computation	10	10	10	10D	10	12
Rechargeable batteries/AC recharger					●	
Long-life disposable batteries	●	●	●	●	●	●
AC Adapter						●
Software Support						
Application Pacs (with modules)					●	●
Solution Books/Handbooks	●	●	●		●	●
Users' Library programs					●	●
Accessory Support						
Memory Modules					●+	●
Extended Memory Modules					●	
Enhancement Modules					●	●
Multipurpose rechargeable battery pack					●	
AC Adapter					●	●
General Features						
One-year limited warranty	●	●	●	●	●	●
Display separates thousands (in BASIC on HP-71B, by program control)	●	●	●	●F	●	●
Diagnostic self-check	●	●	●	●		
Error codes/messages	●	●	●	●	●	●
Redefinable keys			●		●	●
Alpha mode/display/keyboard					●	●
Status annunciators	●	●	●	●	●	●
Automatic power off	●	●	●	●	●	●
Audible tones					●	●
Programming Features						
Maximum number of program lines	99	203	448	203	6,433*	*
Shared program/storage memory	●	●	●	●	●	●
Alpha program labels					●	●
Single-character program labels		5	5	6	56	‡
Numeric program labels		10	20	10	100	‡
Program review (single- and backstep)	●	●	●	●	●	●
Insert/delete editing		●	●	●	●	●
GO TO	●	●	●	●	●	●
Levels of subroutines		4	7	4	6	6*
Conditional tests	2	8	12	8	10	Unlimited
Flags		2	10	6	56	128
Pause	●	●	●	●	●	●
Indexed looping (DSE, ISG)		●	●		●	●B
Indirect control of:						
Data storage/recall		●	●	●	●	●B
Storage register arithmetic		●	●		●	●B
Branching		●	●	●	●	●B
Looping			●		●	●B
Display format			●		●	●B
Flags			●		●	●B
Integer/fraction truncation	●	●	●	●F	●	●B
Alpha string manipulation					●	●B
Dedicated Input/Output Devices						
Card Reader					P	P
Printer/Plotter					P	P
Optical wand					P	
HP-IL Interface					P	P
HP-IL Peripherals						
Digital Cassette Drive					P	P
Thermal Printer/Plotter					P	P
ThinkJet Printer					P	P
Disc Drive					P	P

	Calculators					Handheld Computer
	Financial	Scientific		Computer Science	Advanced	
	HP-12C	HP-11C	HP-15C	HP-16C	HP-41CV/CX	HP-71B
HP-IL Interfaces:						
HP-IB					P	P
RS-232C					P	P
GPIO					P	P
Series 80					P	P
General Arithmetic Features						
+, −, X, /, √x, 1/x, CHS	●	●	●	●	●	●
Ln x, e^x	●	●	●		●	●
y^x, Log x, 10^x, x², π		●	●		●	●
Absolute value		●	●		●	●
Storage register arithmetic	●	●	●		●	●
Business Features						
Maximum number of dedicated financial registers	5					
Solves for: Number of periods (n), compound interest (i), present value (PV), payment (PMT), future value (FV)	●	S	S		S	S
Simple interest	●	S			S	S
Amortization (accumulated interest/remaining balance)	●	S			S	S
Net present value (NPV) and internal rate of return (IRR)	●		S		S	S
Beginning/end of period selection	●	S	S		S	S
Calendar functions	●				S	●
Clock						●
Bond: Yield-to-maturity	●				S	
Price	●				S	
Depreciation (SL, DB, SOYD)	●	S			S	
Scientific Features						
Solve (root finder)		S	●		S	S
Integrate (numerical integration)		S	●		S	S
Math Exceptions						●
Matrix operations			●		S	S
Complex functions		S	●		S	S
Bit manipulation				●	S	S
Boolean operators (NOT, OR, AND, XOR)				●	S	S
Complement modes (1's, 2's, unsigned)				●		
Number base arithmetic (binary, octal decimal, hexadecimal)				●	●S	S
Metric conversions					S	S
Trigonometric functions: Modes (degrees, radians) (grads)		●	●		●	●
Sin, Sin⁻¹, Cos, Cos⁻¹, Tan, Tan⁻¹		●	●		●	●
Hyperbolics and inverses		●	●		S	●
Rectangular ↔ polar coordinates		●	●		●	S
Decimal angle ↔ angle in degrees (hrs)/min/sec.		●	●		●	●
Degrees ↔ radians		●	●		●G	S
Fixed and scientific notation	●	●	●	●F	●	●
Engineering notation		●	●		●	●
Automatic under/over flow into scientific	●	●	●	●F	●	●
Statistical Functions						
Percent	●	●	●		●	●
Percent change	●	●	●		●	●
Percent total	●					
Mean/standard deviation (1- or 2-variable; up to 15 variables on HP-71)	●	●	●		●	●
n, Σx, Σx², Σy, Σy², Σxy	●	●	●		●	●
Weighted mean	●				S	●
Linear regression or estimate	●	●	●		S	●
Correlation coefficient	●	●	●		S	
Normal distribution	S	S	S		S	S
Factorial function	●	●	●		●	●
Gamma function		●	●		S	S
Random number generator	S	●	●		S	●
IEEE Floating-Point math standard						●

Symbols
● Built-in feature or function.
+ To be used with the HP-41C only.
* The HP-41CV has 319 registers or 2,233 bytes built in, (expandable to 919 registers or 6,454 bytes).
The HP-41CX has 443 registers or 3,105 bytes of main and extended memory built in (expandable to 919 registers or 6,454 bytes).
The HP-71 is limited only by available memory (expandable to 33.5K; 129K using 3rd party modules).

‡ With the HP-71, any BASIC program can be labeled with up to eight alpha characters.
B BASIC.
D Ten digits are used in computation when in Floating-Point Decimal Mode. Word size is user-specifiable in other modes, up to 64 bits.
F Using Floating-Point Decimal Mode.
P Peripheral available.
R 16-bit registers.
S Available in software form. (Programs written for HP-11C can also be used on the HP-15C.)