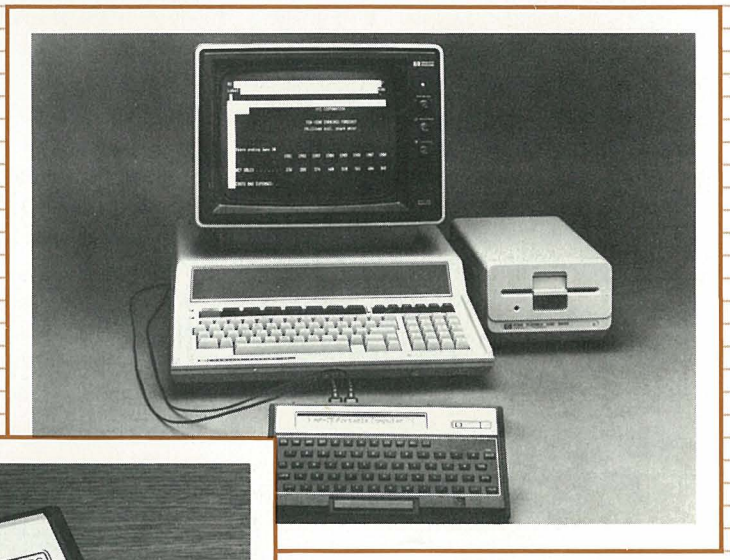
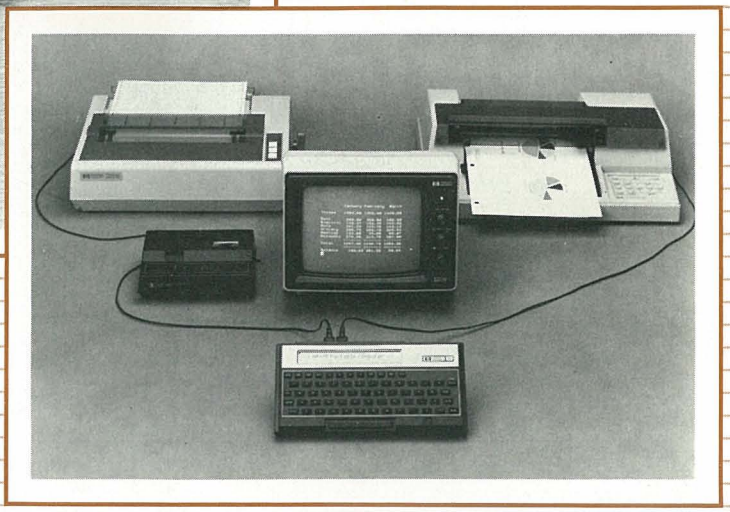
HEWLETT PACKARD

Technical Product Guide

# Series 70 Portable Computers



# Series 70 Portable Computers

## An Answer to a Problem

The Series 70 products offer unique opportunities through their small size and portability. We think you'll find that these products, coupled with HP's unique customization program, will help make your business venture a resounding success.

## A One-Source Solution

Hewlett-Packard offers the widest range of computational products in the world today. From handheld calculators to portable computers, from desktop to large business systems, you have the opportunity to choose the products that are right for you. And, with HP's leadership in interfacing, every HP product is designed to work together and share peripherals and instruments.

## Quality, the HP Hallmark

Every HP machine receives the same careful consideration during design, testing, and use. We take every step to assure a sound and trouble-free product, before it gets to you. Using gold in critical contacts, for example. Adhering to design criteria and serviceability. Subjecting all prototypes to extensive testing, stressing the equipment beyond normal usage limits.

## A Reputation for Integrity

Hewlett-Packard is a well-known and well-respected name among purchasers of our products. HP equipment is recognized as being built with state-of-the-art technology and is famous for its durability. HP is also acknowledged as a manufacturer who stands behind its products, surrounding them with support and service plans that stand at the forefront of the industry offering.

## HP Bears the Cost of R&D

Because HP works on the frontier of technology, we reinvest nearly a tenth of our sales revenue into research and development. We bear the cost of time and money spent for development and production and the many cycles of testing and modification. This enables you to concentrate on your business without focusing resources on extensive product development.

## HP Delivers

With HP as your partner, you can expect delivery of your equipment on the date we promised. The confidence of delivery enables you to fulfill your obligations. Without delays.

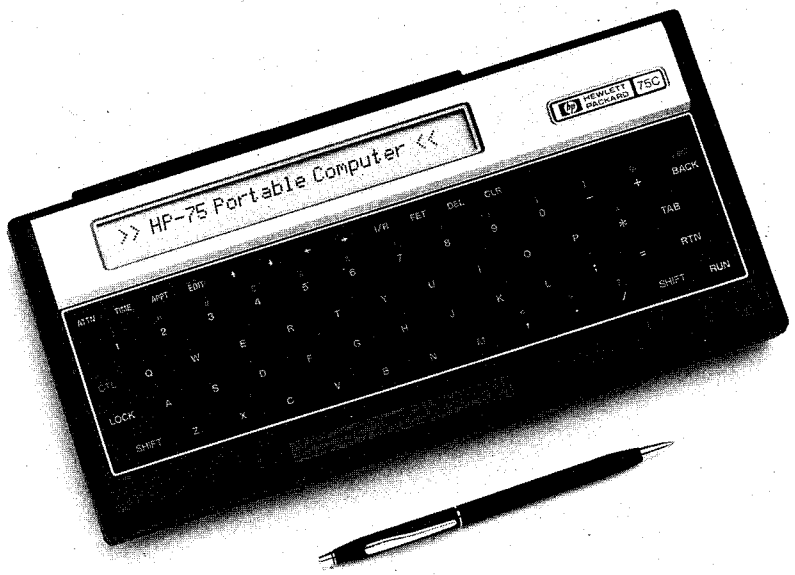
# HP-75C

## Small Enough to Bring to Your Problems; Powerful Enough to Solve Them

Hewlett-Packard didn't build just another computing system. We designed a battery-powered computer that's so small you can use it *anytime, anywhere*. And, we made it so powerful that you can use it every day, in a variety of applications. When you're on the road, with a customer, or back in the office, an HP-75C portable computing system goes with you, providing immediate answers whenever you need them. You'll find the HP-75C is a work partner you'll want to consult frequently throughout the day.

## A Briefcase System

An HP-75C Portable Computer is a lightweight 740 g (26 oz), battery-powered problem-solver with trim-line dimensions that make it an ideal traveling companion. Packed into the computer are the tools you need to solve expressions, perform immediate data collection and computation, write memos, create files, and more. With 16K bytes of memory, expandable to 24K, there's plenty of room to store information and appointments, write programs, and set alarms. In addition, the HP-75C has three software module ports that enable you to plug in applications ROM's which expand the operating system. The HP-75C's multiple file structure gives you instant access to your most commonly used programs. The computer's touch-type keyboard is typewriter-like for fast data entry and allows you to redefine over 190 different keys and combinations. And, with the built-in card reader, HP-IL interface and extensive HP BASIC, you'll communicate easily with the HP-75C. You'll want to turn over more and more of your problems to HP's new HP-75C portable computing system, resulting in faster, more informed decisions.




## A System That Adapts to Your Needs

Surrounding the HP-75C is a broad range of hardworking peripherals and enhancements, plus applications software that take the tedium out of problem solving. If you need more space for storing information, simply plug in a memory module or a cassette drive. Add a printer for hard copy output, a plotter for color graphics, even a multimeter for low cost, lab bench applications. Then complement your system with software for solutions in engineering, finance, real estate, and more. And you can write your own BASIC programs. No matter what your computational needs are, the HP-75C can easily adapt.

## As Versatile As You Are

Because an HP-75C provides information quickly, easily and conveniently, you'll find that this portable computer will be your hardest worker and your most valued tool. You may buy an HP-75C for a specific application, but you'll soon discover it has a thousand uses. In fact, the HP-75C may well be the only portable computer you can't afford to be without.

**Physical Specifications**
Length: 12.7 cm (5 in).
Width: 25.4 cm (10 in).
Height: 3.2 cm (1.25 in).
Weight: 740 g (26 oz).

**Power Requirements**
NiCad Battery Pack (HP 82001B).
Battery Current (worst case):
25 mA (RUN mode) providing 20 to 30 hours of RUN mode operation (approximately 2 to 3 weeks between rechargings).
14 mA (STANDBY mode).
20 µA (SLEEP mode).

**Temperature**
Operating: 0° to 45°C (32° to 113°F).
Recharging: 10° to 40°C (50° to 104°F).
Storage: −40° to 55°C (−40° to 131°F).
Humidity: 0 to 95% relative humidity.

**Display**
Liquid-crystal display.
Character font: 5×9 dot-matrix.
Capacity: 96 characters per line.
Window size: 32 characters.
Character set: 256 characters.
Size: 14.0×1.6 cm (5.5×0.6 in).

**Character Range**
A-Z, a-z, 0-9, plus 27 special characters with or without underlining.

**Dynamic Range**
Real precision: −9.99999999999E499 to −1E-499, 0, 1E-499 to 9.99999999999E499.
Short precision: −9.9999E99 to −1E-99, 0, 1E-99 to 9.9999E99.
Integer precision: −99999 to 99999.
Variable types: Numeric, String, Numeric array.

**Clocks & Timers**
Perpetual clock calendar, 12-hour or 24-hour format. Time function returns time to the nearest millisecond.
Accuracy range: 15 second/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 1 to 1600Hz.

**Redefinable Keys:** 194

**Multiple File Structure**
The number of files in HP-75C memory is limited only by the amount of available RAM.

**Language**
Extended HP BASIC (167 instructions).

**ROM/RAM**
Built-in operating system ROM: 48KB.
Three plug-in ROM's (8; 16; 24 or 32KB/each).
Built-in user RAM: 16KB.
Enhancement Memory Module (HP 82700A): 8KB.
Maximum system RAM (with Memory Module): 24KB.

**Interface**
Built-in HP-IL Interface (Hewlett-Packard Interface Loop).

**Off-Line Mass Storage**
Built-in Card Reader, hand pulled.

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

**The HP-75C Portable Computer comes complete with:**
HP-75C Owner's Manual.
Reference Manual.
HP-75C Owner's Pac.
Keyboard Overlay Kit.
Accessory Brochure.
Service Card.
Field Case.
Rechargeable Battery Pack.
AC Adapter/Recharger.
HP-IL Cables.
Card Holder.

**HP-75C Functions List**

**Numeric Functions**
ABS–Absolute value.
ACOS–Arccosine.
ANGLE–Arctangent of y/x.
ASIN–Arcsine.
ATN–Arctangent.
CEIL–Smallest integer ≥ x.
COS–Cosine.
COT–Cotangent.
CSC–Cosecant.
DATE–Date in yyddd format.
DEG–Radian-to-degree conversion.
EPS–Smallest machine number.
ERRL–Line number of most recent error or warning.
ERRN–Identification number of most recent error or warning.
EXP–e(x).
FLOOR–Largest integer ≤ x.
FP–Fractional part.
INF–Largest machine number.
INT–Largest integer ≤ x.
IP–Integer part.
LEN–String length.
LOG–Natural logarithm.
LOG10–Base 10 log.
MAX–If x>y then x, else y.
MEM–Available memory in bytes.
MIN–If x<y then x, else y.
MOD–Modulo.
NUM–Decimal code of the first character in a string.
PI–3.14159265359.
POS–Position of a character in a string.
RAD–Degree-to-radian conversion.
RES–Numeric result.
RMD–Remainder.
RND–Random number.
SEC–Secant.
SGN–Sign of a number (+ or −).
SIN–Sine.
SQR–Positive square root.
TAN–Tangent.
TIME–Number of seconds since midnight.
VAL–Numeric value of a string.

**String functions**
CAT$–Catalog entry of a file.
CHR$–Character with decimal code MOD(X,256).
DATE$–Date in yy/mm/dd format.
KEY$–Display character of currently depressed key.
STR$–Converts a numeric to a string.
TIME$–Time in hh:mm:ss format, using 24-hour notation.
UPRC$–Converts input string to uppercase letters.
VER$–Six-character string indicating the operating system version.
TAB–Tabulator.

**Time Mode Commands**
ADJST–Displays ADJST template.
EXACT–Sets timing mark.
RESET–Clears EXACT marks and current speed adjustment factor.
SET–Displays set-time template.
STATS–Displays STATS template.

**BASIC Statements**
ASSIGN #–Assigns file number to file name.
BEEP–Causes a tone to sound at specified frequency and duration.
CALL–Calls a program from within another program.
DATA–Numeric or string constants for use by READ.
DEF FN–Defines user-defined function or multiline function.
DIM–Dimensions array.
DISP–Display information.
DISP USING–Displays information according to IMAGE statement.
END–Terminates program.
END DEF–Defines end of multiline user-defined function.
FOR...TO...STEP–Defines beginning of FOR-NEXT loop.
GOSUB–Branches to a series of statements.
GOTO–Unconditionally branches to a line number.
IF...THEN...ELSE–Tests condition and branches.
IMAGE–Specifies the output format for DISP USING and PRINT USING.
INPUT–Allows input of data from the keyboard.
INTEGER–Dimensions and reserves memory for integer precision numeric variables.
LET–Assigns value to one or more variables.
LET FN–Assigns a value to a function.
NEXT–Defines end of FOR-NEXT loop.
OFF ERROR–Disables user-defined error trapping.
OFF TIMER #–Disables a program timer.
ON ERROR–Initiates user-defined error trapping.
ON TIMER #–Sets a program timer.
ON...GOSUB–Computed GOSUB.
ON...GOTO–Computed GOTO.
OPTION BASE–Defines lower bound of all arrays in a program.
POP–Bypasses a pending subroutine return.
PRINT–Prints information.
PRINT #–Stores data items in a data file.
PRINT USING–Prints information according to IMAGE statement.
PUT–Simulates pressing of corresponding key or keystroke combination.
RANDOMIZE–Computes new random number seed.
READ–Assigns values from DATA statements to variables.
READ #–Retrieves data items from a data file.
REAL–Dimensions and reserves memory for real variables.
REM–Program remarks.
RESTORE–Resets data pointer to a DATA statement.
RESTORE #–Resets data pointer to line of data file.
RETURN–Causes program to branch from subroutine to statement following the branching statement that referenced the subroutine.
SHORT–Dimensions and reserves memory for short precision numeric variables.
STOP–Halts program.
WAIT–Interrupts program execution for a specified period of time.

**System Commands**
ALARM OFF–Ignores due appointments.
ALARM ON–Restores normal handling of due appointments.
ASSIGN IO–Assigns device codes to peripherals.
AUTO–Begins automatic line numbering.
BEEP OFF–Disables beeper.
BEEP ON–Restores beeper operation.
BYE–Turns computer off.
CAT–Displays catalog entry of the specified file.
CAT ALL–Accesses complete system catalog.
CAT CARD–Displays catalog information recorded on card track.
CLEAR LOOP–Resets all HP-IL devices to their initial states.
CLEAR VARS–Clears values of variables.
CONT–Continues program execution.
COPY–Copies specified file in memory to specified destination.
DEFAULT OFF–Cancels use of default values for improper mathematical expressions.
DEFAULT ON–Restores use of default values for improper mathematical expressions.
DEF KEY–Redefines key or keystroke combinations.
DELAY–Specifies length of time computer will wait between display lines.
DELETE–Deletes specified line(s).
DISPLAYS IS–Designates specified device as a system display device.
EDIT–Moves file pointer to specified file.
ENDLINE–Redefines the end-of-line.

FETCH–Fetches specified line.
FETCH KEY–Recalls current definition of specified key or keystroke combination.
INITIALIZE–Prepares medium in mass storage device to store information.
LIST–Lists one or more lines of specified file on the display.
LIST IO–Lists device codes of assigned HP-IL devices on the display.
LOCK–Locks computer against use without specified password.
MARGIN–Sets margins.
MERGE–Merges line(s) from specified file into current file.
NAME–Renames current file and creates another workfile.
OFF IO – Suspends HP-IL communication.
OPTION ANGLE DEGREES–Sets trigonometric mode to degrees.
OPTION ANGLE RADIANS–Sets trigonometric mode to radians.
PACK–Packs medium on specified mass storage device.
PLIST–Lists line(s) of specified file on current system printer.
PRINTER IS–Designates specified devices as a printer device.
PROTECT–Protects magnetic card from being overwritten.
PURGE–Erases file from memory.
PWIDTH–Sets line length for PRINT and PLIST instructions.
RENAME... TO–Changes name of specified file in memory.
RENUMBER–Renumbers specified portion of file.
RESTORE IO–Restores HP-IL communication.
RUN–Begins program execution.
STANDBY OFF–Turns computer off after five minutes of inactivity.
STANDBY ON–Sets the computer to stay on indefinitely.
TRACE FLOW–Sets the computer to display source and destination line numbers of branch in program execution.
TRACE VARS–Sets the computer to display line number and variable name.
TRANSFORM–Tranforms one type of file in memory into another.
UNPROTECT–Removes write-protection from magnetic card.
WIDTH–Sets line length for DISP and LIST instructions.

## HP 82700A 8KB Memory Module

The HP 82700A Memory Module provides an additional 8KB of user RAM. This module plugs into a slot located inside the battery compartment in the HP-75C.

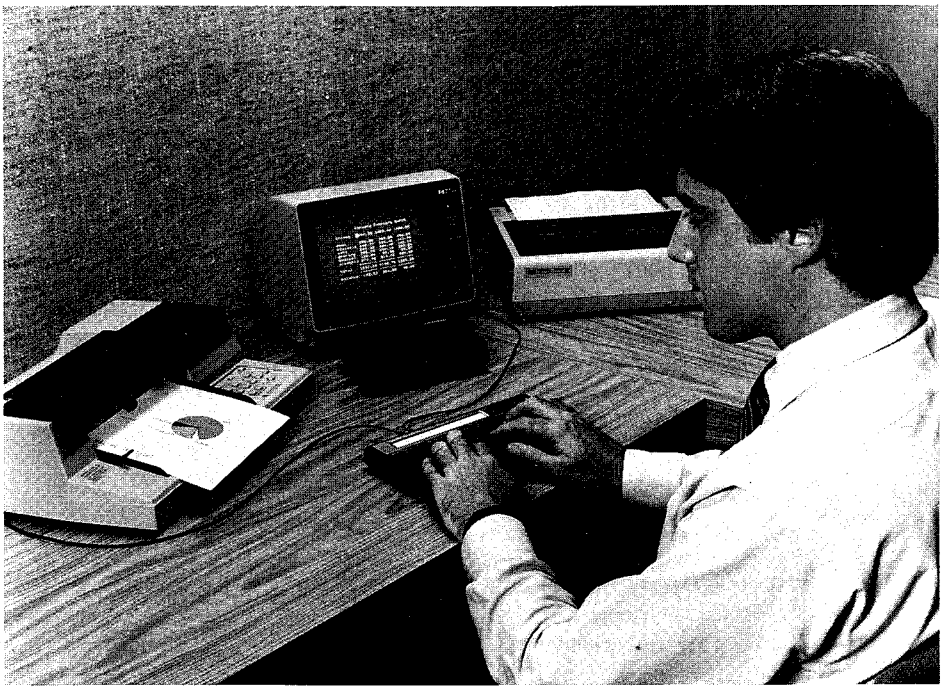
## HP-75C Accessories

| | |
|---|---|
| Owner's Manual | 00075-90001 |
| Reference Manual | 00075-90004 |
| Rechargeable Battery Pack | 82001B |
| Reserve Power Pack | 82004A |
| AC Adapter/Recharger | 82066B |
| AC Adapter/Recharger (U.K.) | 82067B |
| Security Cradle | 82701A |
| Field Case | 82703A |
| 30 Blank Magnetic Card Pac | 82707A |
| 100 Blank Magnetic Card Pac | 82708A |
| Overlay Kit (qty. 5) | 82710A |
| Notebook Card Holder (qty. 5) | 82715A |
| Blank Overlay Kit (qty. 50) | 82717A |

# Hewlett-Packard Interface Loop

The Hewlett-Packard Interface Loop, HP-IL is a bit-serial interface designed for low cost, battery-operable systems. Built-in HP-IL lets you use the HP-75C as system controllers, capable of transmitting and receiving data, and performing a wide variety of information management and instrument control functions.

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.



## Auto Address Assignment

In order to distinguish between devices in the loop, each device must have an address, a number from 1 to 30. The controller uses the address to specify and control the devices on the loop. HP-IL enables the HP-75C 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

Each HP-IL device contains an accessory capability ID number that tells the computer its device type, such as "printer" or "mass storage device". Upon execution of a PRINT command, the computer polls each device on the loop until it finds the device that responds with the appropriate accessory ID number for printers. Device capability identification frees you from having to know the address of each device on the loop. This feature also allows you to run and write software without regard to system orientation, address switches or preassigned addresses.

## Power ON/OFF Control

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 enables you to use an HP-IL system 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.

## Continued Support

HP-IL adds a new dimension to Hewlett-Packard's instrumentation and computing capability. You can look forward to new HP-IL controllers, peripherals and instruments to be added to HP-IL's ongoing product line.

# 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 by name easily 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. 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.

The Drive uses a two-motor system to move the tape past a two-track, magnetic head specially designed to resist data alteration due to externally generated magnetic fields.

**Physical Specifications**
Width: 17.8 cm (7.0 in).
Depth: 13.2 cm (5.2 in).
Height: 6.1 cm (2.4 in).
Weight: 798 g (1.8 lb).

**Power Requirements**
Battery: 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 running).
STANDBY (off)–0 watts maximum (motor off).

**Data Format**
Number of tracks: 2.
Density: 335 bits per centimeter (850 bits/inch).
Format: 256 bytes per record (8 bits per 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.

**Temperature**
Operating: 10° to 40°C (50° to 104°F).
Charging: 15° to 40°C (59° to 104°F).
Storage without tape: −40° to 75°C (−40° to 167°F).
Tape storage: 10° to 45°C.

**Digital Cassette**
Type: Hewlett-Packard Mini-Data Cassette.
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

This HP-IL compatible Printer/Plotter provides you with numeric, upper- and lowercase alpha, doublewide characters, and intensity control for optimum contrast and readability.

The HP 82162A Printer/Plotter 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.

The Printer/Plotter also supports STANDBY mode, so that any HP-IL controller on the loop can manage its power consumption. HP-IL ensures that the HP 82162A will be compatible with future HP-IL devices.

**Physical Specifications**
Width: 17.8 cm (7.0 in).
Depth: 13.2 cm (5.2 in).
Height: 6.1 cm (2.4 in).
Weight: 808 g (1.8 lb) (includes paper and battery).
Cable length: 86 cm (34 in).

**Power Requirements**
Battery: four-cell, 4.4 to 6.0 volts, 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, Graphics, 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.
101-character buffer.

**Printing Speed**
24 characters/sec.

**Temperature**
Operating: 10° to 45°C (50° to 113°F).
Charging: 15° to 40°C (59° to 104°F).
Storage: −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 82905B Impact Printer Opt. 348

The HP 82905B Impact Printer is an 80-column, 9 × 9 dot-matrix printer which is compatible with HP-IL devices. The HP 82905B operates bidirectionally at 80 characters per second. In text mode, a logic-seeking feature finds the shortest route, permitting optimal printing throughput. The 9 × 9 dot-matrix character cells together with the impact printing technique provide fast, legible character formation including descenders (e.g. j, y, g, and q). Programmable line spacings, in increments of 1/72 inch, let you print superscripts and subscripts. A Roman character set allows you to print several languages.

The HP 82905B will print single or multipart forms (up to three parts, each with a maximum thickness of 0.3 mm). Its adjustable tractor feed mechanism can be used with all types of computer forms with widths between 10.2 cm (4 in) and 25.5 cm (10 in). Programmable page length lets you define page size and skip perforations.

**HP 82905B HP-IL Functions List**
R–Receiver.
AH–Acceptor handshake.
SH1–Source handshake.
D–Driver.
L1, 3–Listener. Basic listener, unaddress if MTA.
Le 1, 3–Extended listener. Basic listener, unaddress if MTA.
T 2, 3, 4, 6–Talker. Send status, send device id, send accessory id, unaddress if MLA.
TE 2, 3, 4, 6–Extended talker. Send status, send device id, send accessory id, unaddress if MLA.
CO–Controller.
DC2–Device clear. Universal and addressed device clear commands made available to the user.
DTO–Device trigger.
PP1–Parallel poll.
SR1–Service request.
AA1–Auto address.
AE1–Auto extended address.
AMO–Auto multiple address.
RLO–Remote local.
PDO–Power down.
DDO–Device dependent commands.

**HP-IL ID and Status Information**

**Accessory ID**
33 decimal equivalent.

**Device ID**
ASCII string: HP 82905B CR/LF.

**Status**
First byte: decimal equivalent.
128–All OK, buffer not empty.
161–Ready to receive data, 40-byte buffer empty.
194–Requires manual intervention. OFF-LINE or NO PAPER.

Second byte:

| O | O | PE | OL | BF | BE | BS | O |
|---|---|---|---|---|---|---|---|

where:
PE = 1 when out of paper.
OL = 1 when printer is off-line.
BF = 1 when the 40-character buffer is full.
BE = 1 when the 40-character buffer is empty.
BS = 1 when the printer is busy printing.

**Interface**
Type: HP-IL (Hewlett-Packard Interface).

**Physical Specifications**
Height: 10.7 cm (4.2 in).
Width: 37.4 cm (14.7 in).
Depth: 30.5 cm (12.0 in).
Weight: 5.5 kg (12 lb).

**Temperature**
Operating: 5° to 35°C (41°to 95°F).
Humidity: 10% to 90% non-condensing.

**Power Requirements**
Power source:
Opt. 348: 220 Vac/HP-IL.
Opt. 448: 240 Vac/HP-IL.
Frequency: 50/60 Hz.
Power consumption: 100 VA maximum.

**Print Format**
Technique: dot-matrix impact.
Speed: 80 characters/sec. bidirectional; logic-seeking in text mode.
Text mode character cell structure: 9×9 dot-matrix.
Graphics mode character structure: 72×60 or 72×120 dots/in.
Characters per line: 40, 66, 80, 132.
Line feed rate: 5 lines/sec.

| Print Pitch (CPI) | | Line length (characters) |
|---|---|---|
| 10.00 | normal | 80 |
| 5.00 | normal expanded | 40 |
| 16.50 | compressed | 132 |
| 8.25 | compressed expanded | 66 |
| 10.00 | normal emphasized | 80 |

Character Set: 96 USASCII.
Roman Extension: 46.

**Forms Handling**
Forms tractors.
Programmable page length.
Automatic perforation skip.
Variable vertical line spacing: 1/6 in standard; programmable to various line densities.

**Forms Specifications**
Paper width range:
10.2 cm (4 in) to 25.4 cm (10 in).
Paper thickness: 0.3 mm (0.01 in) maximum.
Multipart forms: original plus 2 copies.

**Print Buffer**
One line, or up to 132 characters.

## HP 7470A Graphics Plotter Opt. 003

The HP 7470A is a low-cost plotter that gives you professional-quality output. Colorful charts and graphs help you spot trends, compare results of several predictions, focus on exceptions, or summarize to get an overview. With special paper-moving technology, the Plotter grips 8½"×11" paper or overhead transparency film and moves it to provide rapid plotting capability. Movement of both paper and pen allows the Plotter to plot lines and characters in seconds. The HP 7470A has two built-in pen stalls which make two-color plotting easy. For plots with more than two colors, the plotter can be halted to install new pens and then started up again quickly. More than 40 HP-GL (Hewlett-Packard Graphics Language) instructions are built in, allowing the Plotter to be programmed in simple commands that perform a variety of complex operations. Five internal character sets (including three European sets) are included. Text can be written in any direction, with or without slant, and in many sizes. Built-in symbol plotting and seven dashedline fonts clarify complex relationships.

**Physical Specifications**
Height: 12.7 cm (5 in).
Width: 43.2 cm (17 in).
Depth: 34.3 cm (13.5 in).
Weight: 6.1 kg (13.5 lb).

**Power Requirements**
Source: 100, 120, 220, 240 Vac, −10%, +5%.
Frequency: 48-66 Hz.
Power consumption: 25 watts maximum.

**Temperature**
Operating: 0° to 55°C (32° to 131°F).
Storage: −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"×11"in (ANSI A); 210×297 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 G's.

## HP 3468A Digital Multimeter

The battery-operable HP 3468A is an autoranging, 3½-to 5½-digit, five function digital multimeter with 1 μV sensitivity to solve most precise bench applications. The multimeter can be completely calibrated electronically without mechanical adjustment. The HP-IL compatible multimeter can be controlled with an HP-75C Portable Computer.

For detailed specifications on the HP 3468A Multimeter, contact your local HP sales office.

# Interfaces

## HP 82163B Video Interface

The HP 82163B Video Interface provides video dispay capabilities for Series 70 systems. This HP-IL compatible interface supports a 32-characters, 16-line video character display, enabling you to interface with a VHF TV set or TV monitor. Power for the interface is provided by the accompanying ac adapter. Characters can be displayed in inverse video (black character on white background). The display memory, consisting of 992 bytes, will hold 31 lines of up to 32 characters. Sixteen lines may be viewed in the display at one time. Any remaining lines may be displayed by scrolling them onto the screen. Use your HP-IL video system as an aid to program development or for making presentations to groups.


**Physical Specifications**
Length: 16.0 cm (6.3 in).
Width: 11.9 cm (4.7 in).
Height: 2.8 cm (1.1 in).
Weight: 303.5 g (10.7 oz).

**Power Requirements**
Primary source: ac adapter.
Usage: 3 watts.
HP 82163B: operates at 62.25 MHz, equivalent to channel E-4 in Europe, with a refresh rate of 50 Hz and 625 lines.

**Display Characteristics**
Line length: 32 standard characters.
Number of lines displayed: 16.
Display memory: 31 lines (992 one-byte cells).
Character set: 95 ASCII display characters and 4 control characters.

**Interface**
Type: HP-IL (Hewlett-Packard Interface Loop).
Startup condition: inactive.
Default address: 3.

**Temperature**
Operating: −20° to 55°C (−4° to 131°F).
Storage: −40° to 75°C (−40° to 167°F).

**Video Interface/HP-75C Operation**
When connected to the HP-75C, the video interface can be designated as the display device by the DISPLAY IS command. Once so designated, the video display will display anything that would normally be sent to the 32-character HP-75C display. This includes error messages, user prompts, catalog listings, and output from DISP commands. In addition, display lines longer than 32 characters will wrap around on the video display so that the entire line is visible without scrolling.

The video display can also be designated as a printer device by the PRINTER IS command. In this case, the output created by any PRINT commands will be sent to the video display as well as to any other printer devices. The video display can be scrolled up or down by the CTL ↑ and CTL ↓ keystrokes.

In addition, the following escape code sequences can be used to modify and control the video display:
ESC C–Moves cursor one position to the right.
ESC D–Moves cursor one position to the left.
ESC E–Moves cursor to column 0 and clears display.
ESC G–Moves cursor to column 0.
ESC J and ESC K–Clears the display from the cursor location.
ESC O and ESC P–Deletes the character at the current cursor locations and left shifts all trailing characters.
ESC <–Turns off the cursor.
ESC >–Turns the cursor on.
ESC % cr–Moves the cursor to the specified column where c is a character corresponding to the decimal code of the column, and r is the decimal code of the row.
In TIME mode and DISPLAY IS ":TV", the screen will act as a clock. Appointments will also be shown as they come due.

## HP 82165A GPIO Interface

The GPIO Interface will enable you to use your HP-IL system to control equipment operating with parallel bus structures. This device contains the port buffering and a built-in power supply that operates from an HP standard ac adapter, (included with the HP 82165A). Potential applications for the HP 82165A include interfacing to computers for data collection, interfacing to specialized devices in production or lab environments, and interfacing to devices such as printers with parallel interfaces.

**GPIO Interface and HP-75C Functions List**
The GPIO Interface is a general purpose I/O device. To fully utilize this device with the HP-75C, refer to the I/O Utilities Solutions Book.

# HP 82938A HP-IL Series 80 Interface

The HP 82938A Interface provides a communication link between the portable world of small, battery-operable products and the world of larger computers. Use your Series 70 computer to gather data in the field and then access an HP Series 80 personal computer to do more complex analyses. With the built-in graphics capabilities of a Series 80 Personal Computer, you can display your data in easy-to-understand graphs and charts, or pass it on to an even larger computer using Series 80 data communications products.

### Specifications

**Transfer Rates (maximum)**

| Type | Input (bytes/sec.) | Output (bytes/sec.) |
|---|---|---|
| Transfer Intr | 400 | 400 |
| Enter & Output | 1K | 1K |
| Transfer FHS | 3K | 5K |

**Addressing**
There are 32 valid addresses, 0 through 31. The controller assumes address 0 and assigns addresses to devices in the loop.

**Interrupt Capability (with I/O ROM)**
Active controller.
Active talker.
Active listener.
Service request (SRQ).
Interface clear (IFC).
Device clear (DCL, SDC).
Device trigger (GET).
Device dependent command (DDC).

**Switch Configuration**
The following switches can be configured by opening the interface:
Select code.
System controller.

**Accessories**
The HP 82938A is shipped with a 1-m (3.3-ft) interface cable terminated with the standard HP-IL connectors. Additional lengths of interface cables can be purchased.

**HP-IL Interface Statements**
The Series 80 I/O ROM adds a set of statements to the mainframe that accesses capabilities determined by the interface being used. The following describes how the HP-IL interface interprets these statements.

ABORTIO–Sends Interface Clear if active controller, else stops handshaking data.
ASSERT–Provides direct access to loop.
CLEAR–Sends Selective Device Clear or Device Clear.
HALT–Stops a loop data transfer.
LOCAL–Sends Go To Local or Not Remote Enable.
LOCAL LOCKOUT–Sends Local Lockout message.
PASS CONTROL–Passes active control.
PPOLL–Returns the value of a parallel poll.
REMOTE–Sends Remote Enable.
REQUEST–Allows the programmer to set service request line and the serial poll response byte.
RESUME–Sends the Send Data (SDA) message.
SEND–Allows sending of arbitrary data/command sequences.
SPOLL–Returns the value of a serial poll.
TRIGGER–Sends Group Execute Trigger.

**Frames Sent**
Data or End–Sends or transfers data message.
Commands–Perform interface functions such as Device Clear or Trigger.
Ready frames–Perform interface management such as starting and ending data transfers.
Identify–Aids parallel polling and helps to detect service request.

**Status Registers–8**
One each for interrupt cause register,* received frame control bits, received frame data bits, loop address, interface state, received device dependent command, device count register, and interface identification.*

**Control Registers–13**
One each for interrupt mask,* control bits, data bits, loop address, asynchronous request enable, end-of-line count,* and seven registers for end-of-line characters (end-of-line sequence is sent at end of each OUTPUT or TRANSFER).

* Common to all Series 80 I/O interfaces.

# HP Solution Books

**HP-75C Solutions Books**
(with magnetic cards set only)

**Math I** (00075-13003)
- Simultaneous Linear Equations
- Quadratic Equation
- Parabolic Equations
- Roots of Polynomials
- Triangle Solutions
- Polygon Area
- Hyperbolic Functions
- Complex Trigonometric Functions
- Prime Factorization

**Math II** (00075-13004)
- Midpoint Rule for Integration
- Trapezoidal Rule for Integration
- Romberg Rule for Integration
- Simpson's Rule for Integration
- Newton-Cotes Rule for Integration
- Euler's Method
- Newton's Method
- Trapezoidal Rule for Ordinary Differential Equations
- Runge-Kutta
- Contraction Mapping

**Math III** (00075-13005)
- Fast Fourier Transform
- Fast Fourier Series/Trigonometric interpolation
- Attenuated Fourier Series
- Spherical Harmonics
- Elliptic Integrals
- Bessel Functions: Asymptotic Expansion
- Bessel Functions: Backward Recurrence
- Gamma Function
- Error Function
- Legendre Polynomials

**Electronics** (00075-13008)
- Transistor Amp Evaluation
- Common Components for 555 & 567 IC's
- Ohm's Law with dBm Conversion
- Impedance Conversion
- Smith Chart Conversion
- Mismatch
- dB to % to dB Conversion
- Butterworth Filter Design
- Active Filter Design
- Low Pass Filter Design
- Coil Design

**Finance** (00075-13009)
- Breakeven Analysis
- Securities Earnings
- Notes
- Bond Price and Yield
- Depreciation Calculator
- Lease vs. Purchase
- Present Value of a Geometric Series
- Present Value of an Arithmetic Gradient Series

**Real Estate** (00075-13010)
- Income Property Analysis
- Estimate of Buyer's Cost
- Seller's Costs and Net Equity
- Internal Rate of Return
- Rent vs. Buy
- Variable Payment Mortgage Amortization Tables
- Variable Interest Rate Mortgage
- Loan Schedule

**Games I** (00075-13006)
- Adventure
- Echo
- Blackjack
- Word Scramble
- Rocket Lander

**Games II** (00075-13007)
- Football
- Golf
- Hamurabi
- Reverse
- Slot Machine
- Breakout

**Test Statistics** (00075-13012)
- One-Sample Test Statistics for the Mean
- Kendall's Coefficient of Concordance
- Correlation Coefficient Test
- Intraclass Correlation Coefficient
- Kurskal-Wallis Statistic
- Mann-Whitney U-test
- Fisher's Exact Probability
- Two-Factor Analysis of Variance
- Bartlett's Chi-Square Statistic
- Difference Among Proportions
- Data Transformations

**I/O Utilities** (00075-13013)*
- HP-IL Commands

**Statistics** (00075-13011)
- Basic One Variable Statistics
- Coefficient of Correlation
- Probability of Normal, F, t, & Chi-Square Distributions
- Dependent (Paired)t-Test
- t-Test for 2 Unequal Sized Samples
- Chi-Square Test
- One-Way Analysis of Variance
- Simple Linear Regression
- Permutations and Combinations

* Requires an understanding of frame level HP-IL protocol.

# Software/Custom services

## Users' Library Software

The Users Library is yet another source of software solutions.

The Users' Library program is being extended to include Series 70 Portable Computers. Programs that are already available cover such subjects as math, real estate, finance and electronics. Each program has been reviewed by the Library's technical staff and is accompanied by thorough documentation, ensuring you of any immediate software solution.

Series 70 documentation includes individual program listings and is available with magnetic cards. You can also purchase programs for Series 70 on minicassettes for the HP-IL Digital Cassette Drive.
For a complete list of Users' Library programs, see the *Users' Library Catalog of Contributed Programs.*

## Custom Products Provide Custom Solutions

When you need customized software solutions in large quantities, take advantage of HP's Custom Products. HP can help you customize a Series 70 computer, making it the problem-solving system to meet your unique needs. Use custom modules, magnetic cards or cassettes for program storage and custom overlays for keyboard personalization. Custom Products give you the convenience of immediate and precise answers, accessible from the palm of your hand.

## Custom Cassettes

Replicate your Series 70 solutions quickly at your site with cassette duplication software, and several HP 82161A Digital Cassette Drives. After you've recorded your software, distribute tapes to your employees at remote sites. Once the taped information has been loaded from cassettes into the computers at these remote sites, Continuous Memory will retain programs and data for as long as needed.

Custom cassettes can be easily changed and duplicated, providing you with a quick and easy method of mass producing your customized software.

## Custom Application Modules

These easy-to-use application modules simply plug into a Series 70 computer. They provide you with up to 8, 16, 24 or 32K bytes of program instructions, those you've written precisely to your own specifications.

## Custom Magnetic Cards

Each convenient, magnetic card can be custom programmed to load instructions into the computer. Because data or program instructions can be easily stored on these magnetic cards, this custom medium is the ideal option for applications where the data changes frequently.

## Custom Overlays and Custom Keyboards

With the help of custom overlays you can quickly relabel all keys with custom functions. Custom overlays fit easily around the keys, relabeling the keys according to your requirements. The custom overlay is easy to install, easy to remove, and every function that is pertinent to your own needs is clearly marked.

## Series 70 Software Development Tools HP 82713A Plug-In Module Simulator

To help you develop software for your Series 70 system, HP offers the Plug-In Module Simulator (PMS). The Simulator provides ROM-based software developers with the ability to develop and field test software prior to manufacture of a ROM. PMS consists of a hardware device, which simulates a plug-in ROM module, and a set of Series 70 BASIC commands necessary for software development.

An assembly language programming system is currently under development and should be available by late Spring, 1983. CDS, or Cross Development System, will provide a host environment for writing, testing, and debugging assembly language programs.

## How to Customize

Your first step towards customization begins by generating your own software and then selecting the software media. Some factors to consider are: frequency of code alterations, desired program capacity, frequency of changes in data variables, required amount of privacy, and your initial investment. For assistance in choosing the best custom solution, see your HP sales representative.

## Availability of Custom Products

Hewlett-Packard can provide custom modules within 14 weeks of order placement.* Evaluation samples will be supplied within 6 weeks; upon evaluation and approval; final production modules will follow in eight weeks.

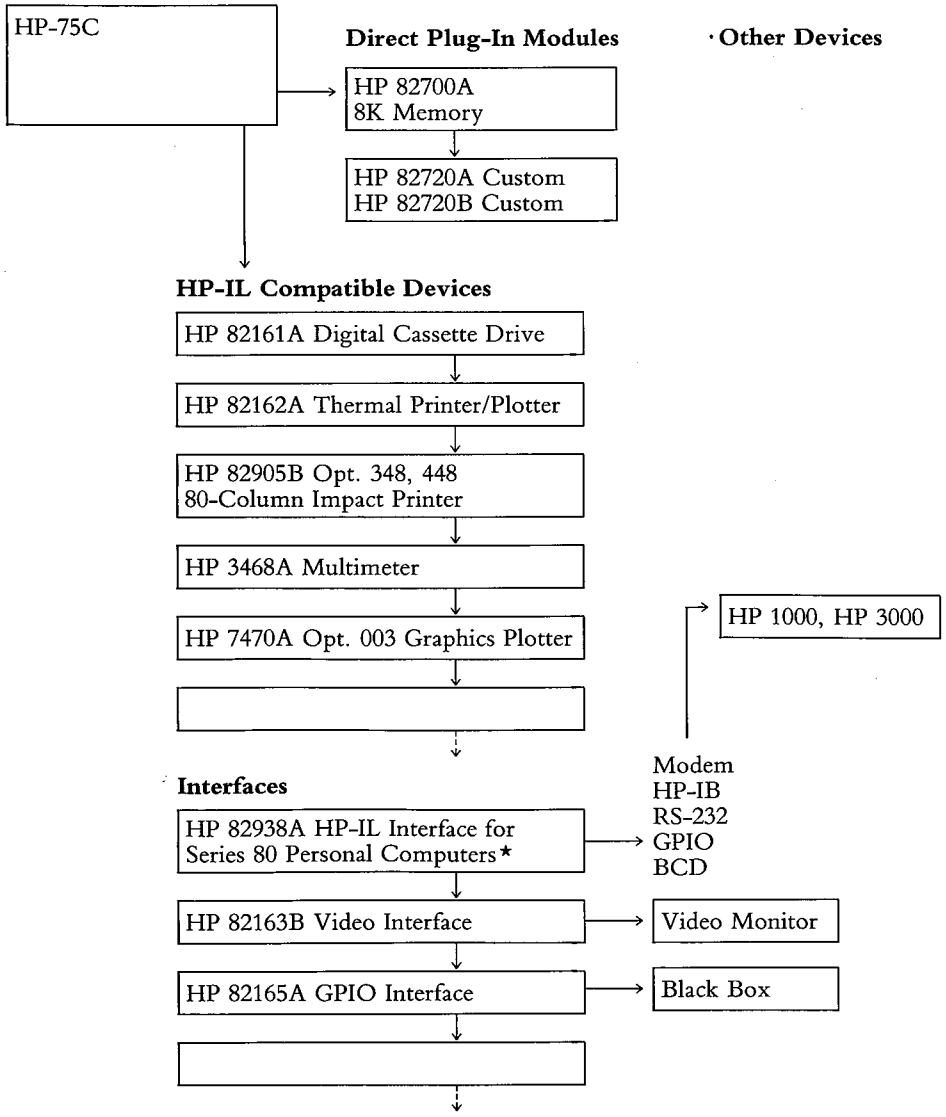
Hewlett-Packard can supply custom magnetic cards and overlays within 10 weeks.

* Ask your HP sales representative about the 10-week Fast Track option.

## HP PLUS

The HP PLUS Program adds to the growing number of programs for the Series 70 Portable Computers. This program helps third-party software professionals develop software. These independent professionals develop, document and support their software. HP will then advise them on distribution. If your software-development resources are limited, HP can help you contact an independent software developer to produce custom programs. If you are interested in the independent software offering, or would like to place your professional services with the HP PLUS Program, contact your HP sales representative.

## Series 70 Configuration Guide




* Requires HP 82936A ROM Drawer and 00085/87-15003 I/O ROM.

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**Warranty**
Warranty is supplied with the product and is available on request.

Hewlett-Packard reserves the right to make changes in materials, specifications or accessories without notices.

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5952-9750E-32K-4.83-R

Printed in Switzerland