



HP-85 I/O ROM and Interface Specifications

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The HP-85 Desktop Computer, the HP-85 I/O option ROM (Read-Only Memory) and any of the HP-85's four interface cards (HP-IB, serial, GPIO and BCD) form an I/O control system suited to a wide variety of applications. The HP-85 is a complete computer system, including the central processor and all necessary peripherals in a package weighing only 9.1 kg (20 lb.), ideal for the laboratory or the production line. Simply plug in the ROM drawer, with the I/O ROM, and the interface card or cards in any of the four slots in the back of the desktop computer, and it becomes a full-featured I/O controller.

HP-IB (Hewlett-Packard Interface Bus)

The HP-IB interface (Part No. 82937A) is the HP-85's IEEE-488 1978 digital instrument interface. It is an easy-to-use hardware and software interface system that permits bidirectional, asynchronous communication among a wide variety of instruments and peripherals. Up to 15 devices can be interconnected via a simple one-bus system. A unique three-wire handshake allows the bus to communicate at a speed that all listening devices can maintain. (If a slow device is not addressed, it will not hamper the speed of the remaining devices.)

Serial Interface (RS-232-C)

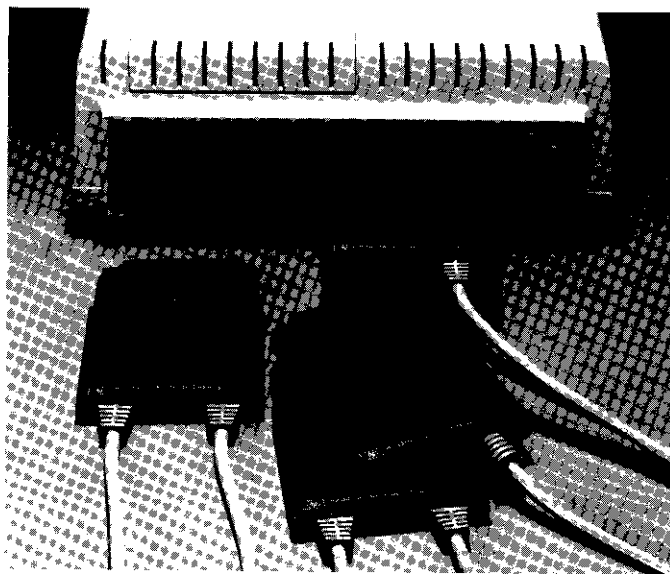
The serial interface (Part No. 82939A) is the RS-232-C compatible interface for the HP-85. It provides bit-serial asynchronous data communication and is a common means of communicating between a computer and peripherals such as terminals and printers. The serial interface is also common in applications where two computers are communicating, such as remote data acquisition. This interface supports operation with the HP-85 acting as the computer or as the peripheral. It also supports current-loop operation — a mode of serial operation used by devices such as mechanical teletypes.

GPIO Interface (Parallel)

The GPIO interface (Part No. 82940A) is a general purpose byte (8-bit) or word (16-bit) oriented interface. It has two output-only, 8-bit ports and two bidirectional 8-bit ports. They can be used as separate 8-bit ports or as 16-bit ports. The parallel interface is commonly used with printers, paper tape readers, paper tape punches, card readers and special instrumentation.

BCD Interface (Binary Coded Decimal)

The BCD interface (Part No. 82941A) supports interfacing with BCD instrumentation. A BCD instrument presents digits on a set of parallel lines. Common instruments with BCD interfaces are voltmeters, multimeters, medical equipment and weighing systems.



The HP-85 as a Powerful Controller

The HP-85 includes 16 384 bytes of read/write memory (14.6K available to the user), expandable to 32 768 bytes (30.7K user-available). It is programmed in BASIC, one of the most widely used and "friendly" computer languages. Automatic syntax checking of all program lines as they are entered simplifies programming, as do the versatile editing features. A "self-test" key will initiate a functional test of the computer and all its internal peripherals.

A CRT display provides 16 lines of 32 characters each, plus full graphics capability. Mass storage of programs and data is handled by the standard DC-100 tape cartridge, offering 200K bytes of on-line storage. The quiet, built-in, thermal printer will print 32-character lines at 2 lines per second. A copy of the graphics display is printed with a single keystroke.

In I/O applications, several other standard features increase flexibility. Four user-defined keys (eight with the shift key) enable program branching to simplify operation with untrained operators. The HP-85 has four timers. Three of these are programmable interrupting timers, capable of causing a program branch at specified intervals to perform sampling or analysis. The other timer is an elapsed time counter, useful for time of day or elapsed time measurements. The HP-85 contains a variable frequency audio oscillator (beeper) that allows an operator to be notified of various conditions without having to constantly examine the CRT.

*Data subject to change.



HP-85 I/O ROM

The HP-85's BASIC language is enhanced with straightforward I/O commands by the I/O ROM (Part No. 00085-15003). The ROM provides all the commands necessary to access the features of each of the interface cards. It plugs into one of the six spaces in a ROM drawer (Part No. 82936A), which in turn fits in one of the four slots in the back of the computer.

The I/O ROM provides basic input and output capabilities including formatted, free-field, and binary ENTERs and OUTPUTs with or without character conversions. The ROM also has card status and control capabilities, interrupt and fast handshake data transfers, HP-IB control, handshake timeouts, and card interrupt control. Other features include bit manipulation, base conversion, keyboard masking and error determination.

Specifications

ROM memory	 adds 8192 bytes of read-only memory to the operating system.
R/W memory	 uses 416 bytes of read/write memory out of the available user memory.
Speeds	 fast handshake up to 26K bytes/second (maximum data rate — actual rates depend on the program, I/O card and peripheral used).

General Statements

The I/O ROM adds a set of general capabilities to the HP-85 that do not deal with interfacing. These capabilities provide for bit manipulation, base conversion, keyboard masking, and error determination.

BINAND	returns the logical AND of two 16-bit values	HTD	returns the decimal value of a hexadecimal string
BINCMP	returns the binary complement of a 16-bit value	OTD	returns the decimal value of an octal string
BINEOR	returns the logical EXCLUSIVE OR of two 16-bit values	Universal I/O Statements	
BINIOR	returns the logical INCLUSIVE OR of two 16-bit values	CONTROL	allows access to I/O card control registers or I/O buffer control registers
BIT	returns the value of a specified bit	CONVERT	sets up input or output conversion tables for ENTER or OUTPUT on a specified select code or an I/O buffer. The conversion can be an indexed table or a pairs lookup table.
BTD	returns the decimal value of a binary string	ENABLE INTR	sets up an I/O card to interrupt on a specified condition
DTB\$	returns a string with a binary representation of a decimal number	ENTER	allows for formatted or free-field entry of data from an I/O card or an I/O buffer
DTH\$	returns a string with a hexadecimal representation of a decimal number	IOBUFFER	turns a string variable into an I/O buffer
DTO\$	returns a string with an octal representation of a decimal number	OFF EOT	turns off the <i>end of transfer</i> end-of-line branch
ENABLE KBD	allows disabling and enabling sections of the keyboard to prevent unintentional keystrokes	OFF INTR	turns off the ENABLE INTR end-of-line branch
ERRSC	returns the select code of the last card that caused an error	OFF TIMEOUT	turns off the SET TIMEOUT end-of-line branch
ERROM	returns the ROM number of the last option ROM that caused an error (I/O is #192)	ON EOT	specifies where to go in the BASIC program on end of transfer
		ON INTR	specifies where to go in the BASIC program when an event interrupt is received
		ON TIMEOUT	specifies where to go in the BASIC program when a handshake timeout occurs
		OUTPUT	allows for formatted or free-field output of data to an I/O card or to an I/O buffer
		RESET	causes a hardware reset of the I/O card
		SET TIMEOUT	causes handshakes to an I/O card to be timed, and when the specified length of time has passed, an end-of-line branch is taken to the ON TIMEOUT service routine
		STATUS	allows access to I/O card status registers or I/O buffer status registers
		TRANSFER	allows for fast handshake (FHS) or interrupt data transfers between an I/O buffer and an I/O card

HP-85 Interfaces

HP-IB Interface

The HP 82937A Interface implements the IEEE 488-1978 Standard Digital Interface for Programmable Instrumentation. It may communicate with as many as 14 HP-IB compatible instruments per interface, with a total of no more than 20 metres of cable. The HP 82937A uses an interface processor to provide efficient management of the interface bus protocol, and can achieve data transfer rates of up to 26K bytes/second (absolute maximum).

DATA INPUT/OUTPUT

Eight bidirectional data lines provide data input/output.

CONTROL LINES

DAV	}	provide handshake
NRFD		
NDAC		

INTERFACE MANAGEMENT

IFC	}	provide control of the interface system
ATN		
SRQ		
REN		
EOI		

INTERFACE FUNCTIONS

The chart below specifies level of implementation in terms of IEEE 488-1978 mnemonics. The Device Trigger, Device Clear and Remote/Local state responses are achieved by programming the HP-85 for end-of-line interrupts on those conditions.

Source Handshake	.....	SH1
Acceptor Handshake	.....	AH1
Talker	.....	T6
Listener	.....	L4
Service Request	.....	SR1
Remote/Local	.....	RL1
Parallel Poll	.....	PP2
Device Clear	.....	DC1
Device Trigger	.....	DT1
Controller		
System control	.....	C1
IFC & Take charge	....	C2
REN	.....	C3
Respond SRQ	.....	C4
Miscellaneous control	..	C5
Extended talker	.....	TE0 (note 1)
Extended listener	.....	LE0 (note 1)

note 1: The HP-85 HP-IB card allows for interrupts on secondary commands. This allows a user to program the HP-85 to respond to TE4 and LE2 extended talker and listener.

TRANSFER RATES

Maximum data rates for the 82937A HP-IB Interface are as follows:

TYPE	INPUT	OUTPUT
TRANSFER INTR	400 bytes/s	400 bytes/s
ENTER & OUTPUT	1400 bytes/s	3000 bytes/s
TRANSFER FHS	26.2K bytes/s	25.5K bytes/s

ADDRESSING

The I/O ROM allows address information to be sent to all interfaces. The 82937A HP-IB Interface uses this addressing information to configure the addressable devices on its bus. There are a total of 32 valid addresses — 0 through 31. (Electrically, IEEE-488 systems can support only 15 devices including the controller.)

INTERRUPT CAPABILITY

When used with the I/O ROM, the 82937A is capable of responding to any or all of the following interrupt conditions:

- active controller
- active talker
- active listener
- service request (SRQ)
- interface clear (IFC)
- device clear (DCL, SDC)
- device trigger (GET)
- secondary command (SCG)

SWITCH CONFIGURATION

The following switches can be configured by opening the interface card. No switches are accessible from the outside.

Select Code — Allows one of eight possible select codes to be set for the interface card. The select code range is 3 through 10 (1 is internal CRT, 2 is internal printer). The factory select code setting for the 82937A card is 7.

Interface Bus Address — 5-bit talker/listener address. The factory-set bus address for the 82937A is 21 (decimal).

System Controller — Allows the 82937A to act as a system controller or non-system controller. The factory setting is with the 82937A configured as system controller.

JUMPER CONFIGURATION

The 82937A can be configured by a jumper wire to respond to a parallel poll. The designated bit is then asserted in response to a parallel poll when the interface is asserting SRQ. The card is configured with a parallel poll response on bit 0 of the data lines.

ACCESSORIES

The 82937A is shipped with a 2 m (6.6 ft.) interface cable terminated with the standard HP-IB connector and metric fasteners. Additional lengths of interface cables are available and are listed under Ordering Information.



HP-IB INTERFACE STATEMENTS

The I/O ROM adds a set of statements to the HP-85 that accesses capabilities determined by the interface card being used. The following describes how the HP-IB interface card interprets these statements.

ABORTIO	sends Interface Clear if system controller, else sends My Talk Address if active controller, else stops handshaking data.
ASSERT	provides access to bus management lines
CLEAR	sends Selective Device Clear or Device CLeAr
HALT	stops an interrupt type TRANSFER
LOCAL	sends Go To Local or Remote Disable
LOCAL LOCKOUT	sends Local LockOut message
PASS CONTROL	passes active control
PPOLL	returns the value of a parallel poll
REMOTE	Remote ENable
REQUEST	allows the programmer to set service request line and the serial poll response byte
RESUME	drops the attention line (ATN)
SEND	allows sending of arbitrary data/command sequences over HP-IB
SPOLL	returns the value of a serial poll conducted on an HP-IB device
TRIGGER	sends Group Execute Trigger message

CONTROL AND STATUS REGISTERS

The 82937A HP-IB Interface has seven status registers and 12 control registers implemented. The status registers include card switch settings (bus address, system controller), card state (active controller, talker, listener, etc.), received secondary command and direct access to the state of the HP-IB data and control lines. Of the seven status registers, two are common to all cards; they contain the card identification number (which is 1 for HP-IB) and the interrupt cause register.

The 12 control registers provide parity control and direct control of the HP-IB data and control lines. Of these 12, there are nine control registers common to all cards; they contain the interrupt mask, seven end-of-line characters and the end-of-line character count. (The end-of-line sequence is the series of characters sent at the end of each OUTPUT or TRANSFER.)

Serial Interface

The HP 82939A Interface provides bit-serial communication between the HP-85 desktop computer and asynchronous EIA RS-232-C devices such as data terminals and modems. Standard data rates range from 50 to 9600 bits/second (baud) and can be switch-selected or programmed via a CONTROL register. Allowable data formats include 5, 6, 7 or 8 bits/character and 1 or 2 stop bits.

Information can be sent and received (in true full duplex mode) in EIA RS-232-C compatible voltage levels or with 20-ma current loop configurations. Two 20-ma current sources in the interface allow connection to virtually any current loop device. The HP 82939A uses an interface processor to provide efficient management of the serial interface.

DATA RATES AND FORMATS

All signals present at the connector conform electrically to EIA RS-232-C and CCITT V.24 specifications. The interface operates in an asynchronous mode providing 5-, 6-, 7- or 8-bit data formats with 1 or 2 stop bits and odd, even, zero, one and no parity modes.

Standard data rates available are:

50	75	110	134.5
150	200	300	600
1200	1800	2000	2400
3600	4800	7200	9600

In addition to these standard baud rates, the user can select one from a set of 65 533 different baud rates ranging from 1.76 baud to 38 400 baud. The standard baud rates are either switch selectable or programmable. The optional 65 533 baud rates are only programmable.

MODEM CONTROL LINES

RTS — Request To Send
CTS — Clear To Send
DSR — Data Set Ready
DTR — Data Terminal Ready
DCD — Data Carrier Detect
DRS — Data Rate Select

TRANSFER RATES

The 82939A does not support TRANSFER FAST HANDSHAKE. Maximum data rates for the serial interface are as follows:

TYPE	INPUT	OUTPUT
TRANSFER INTR	1000 bytes/s	400 bytes/s
ENTER & OUTPUT	1400 bytes/s	1500 bytes/s
TRANSFER FHS	none	none

These data rates mean that the serial interface can support incoming data rates of 9600 baud (with interrupt mode transfers) and 15000 baud with ENTER (into a string variable).

ADDRESSING

The I/O ROM allows address information to be sent to all interfaces. The 82939A Serial Interface does not use this addressing information and will generate an error if used.

INTERRUPT CAPABILITY

When used with the I/O ROM, the 82939A is capable of responding to any or all of the following interrupt conditions:

- BREAK received
- Framing Error
- Parity Error
- Received data available
- Auto disconnect
- change of modem line DCD or RTS
 - Data Carrier Detect (on Opt. 001 interface)
 - Request To Send (on standard interface)
- change of modem line DSR or DRS
 - Data Set Ready (on Opt. 001 interface)
 - Data Rate Select (on standard interface)
- change of modem line CTS or DTR
 - Clear To Send (on Opt. 001 interface)
 - Data Terminal Ready (on standard interface)

SWITCH CONFIGURATION

The following switches can be configured by opening the interface card. No switches are accessible from the outside.

Select Code — The factory-set select code for the 82939A is 10.

Baud Rate — A 4-bit switch selects standard baud rates from 50 to 9600. The factory set baud rate is 300 baud.

Line characteristics — A 3-bit switch selects 5, 6, 7 or 8 bits/character and 1 or 2 stop bits. The factory setting is 7 bits/character with 1 stop bit.

Parity — A 3-bit switch selects even, odd, one, zero or no parity. The factory setting is odd parity.

Auto handshake — A 1-bit switch enables or disables automatic handshaking on the modem control lines. The factory setting disables auto handshaking.

OPTIONS

The 82939A is shipped with a 2 m (6.6 ft) interface cable terminated with the standard RS-232-C female (DCE) connector. The 82939A Option 001 is shipped with a 2 m (6.6 ft) interface cable terminated with a RS-232-C male (DTE) connector. The 82939A Option 002 is shipped with a 4 m (13.1 ft) unterminated interface cable for current loop operation.

SERIAL INTERFACE STATEMENTS

The I/O ROM adds a set of statements to the HP-85 that accesses capabilities determined by the interface card being used. The following describes how the serial interface card interprets these statements.

ABORTIO	abort all TRANSFERs in progress (to the specified card) and drop all modem lines
ASSERT	write to modem control register
HALT	abort all TRANSFERs in progress (to the specified card) but leave all modem lines unchanged
REQUEST	send a BREAK using the parameter to determine the length of the BREAK

RESUME

enable the transmitter

SEND

allows sending of arbitrary data sequences over the serial interface

CONTROL AND STATUS REGISTERS

The 82939A Serial Interface card has 12 status registers and 22 control registers implemented. The status registers include direct state of the modem control lines, cable type, line characteristics (parity, # bits/character, # stop bits), current 16-bit baud rate divisor and reason for termination of ENTER or TRANSFER. Of the 12, there are also two status registers common to all cards; they contain the card identification number (which is 2 for serial) and the interrupt cause register.

The 22 control registers consist of standard baud rate selection, line characteristics selection, 16-bit baud rate divisor selection (for non-standard baud rates), direct control over the modem lines and termination character selection for up to four different characters. One of the registers allows for a replacement character to be sent to the HP-85 when an incoming character has a parity or framing error. Of the control registers, there are nine common to all cards that contain the interrupt mask, seven end-of-line characters and the end-of-line character count. (The end-of-line sequence is the series of characters sent at the end of each OUTPUT or TRANSFER.)

GPIO Interface

The HP 82940A Interface provides the HP-85 with 16 bits of latched output data and 16 bits of bidirectional data (latched output, non-latched input). The HP 82940A uses an interface processor for efficient management of the interface. The HP 82940A Interface can achieve data transfer rates of up to 19K bytes/second (absolute maximum).

DATA INPUT/OUTPUT

There are 16 bidirectional data lines and 16 output-only data lines. The output-only lines provide high current capability, using open-collector transistors.

Electrical Characteristics for Bidirectional Lines (Input characteristics also apply to FLG and ST lines)

Parameter	Min.	Max.	Units
Input Low Voltage	0.0	0.8	V
Input High Voltage	2.0	5.0	V
Input Low Current		0.6	mA
Output Low Voltage @ 4.5 mA		0.45	V
Output High Voltage @ -450 μ A	2.4		V
Output Low Current		4.5	mA
Output High Current		-450	μ A

Electrical Characteristics for Output-Only, CTL, $\overline{\text{OUT}}$, and $\overline{\text{RES}}$ Lines

Parameter	Min.	Max.	Units
Output Low Voltage @ 20 mA		0.5	V
Output High Voltage (open collector)		5.0	V
Output Low Current		20	mA
Output Leakage Current		40	μ A

CONTROL LINES

Twelve lines provide control information between the peripheral and the computer. The outgoing lines are electrically equivalent to the open-collector, output-only data lines. The incoming lines are electrically equivalent to the bidirectional data lines. The control lines and their meanings are:

$\overline{\text{OUTA}}, \overline{\text{OUTB}}$	Indicates the direction of the data transfer on ports A and B.
CTLA, CTLB	Indicates that the computer is ready for input or that data is ready for output.
FLGA, FLGB	Indicates that the peripheral has completed its operation.
CTL0, CTL1	Indicates that the computer is ready for input or that data is ready for output.
ST0, ST1	Indicates that the peripheral has completed its operation.
$\overline{\text{RESA}}, \overline{\text{RESB}}$	Used to reset peripherals under program control.

TRANSFER RATES

The maximum data rates for the 82940A Interface are as follows:

TYPE	INPUT	OUTPUT
TRANSFER INTR	400 bytes/s	400 bytes/s
ENTER & OUTPUT	1400 bytes/s	3000 bytes/s
TRANSFER FHS	18.0Kbytes/s	19.0Kbytes/s

ADDRESSING

The I/O ROM allows address information to be sent to all interfaces. The 82940A GPIO Interface uses this addressing information to select which port is being used for the data transfer, the width of the data path (8 or 16 bits), and which handshake lines are to be used. There are a total of 16 valid addresses — 0 through 15.

INTERRUPT CAPABILITY

When used with the I/O ROM, the 82940A is capable of responding to any or all of the following interrupt conditions:

- FLGA
- FLGB
- ST0
- ST1
- Received parity error

SWITCH CONFIGURATION

The following switches can be configured by opening the interface card. No switches are accessible from the outside.

Select Code — The factory select code setting for the 82940A card is 4.

Data line sense — A 1-bit switch allows the data lines to use either positive-true (factory setting) or negative-true logic.

Flag line sense — A 1-bit switch allows the flag lines to use either positive-true (factory setting) or negative-true logic.

Control line sense — A 1-bit switch allows the control lines to use either positive-true (factory setting) or negative-true logic.

Handshake mode — A 1-bit switch allows selection of complete or partial handshake mode. The factory setting is complete handshake.

Output enable — A 1-bit switch allows the programmer to enable for output. The factory setting is output disabled.

Address — A 3-bit switch allows the interface to power up with its address (which determines the handshake lines and data port configuration) set to 0 through 7 (note that 0 through 15 are allowed under program control). The factory setting is address 6.

GPIO INTERFACE STATEMENTS

The I/O ROM adds a set of statements to the HP-85 that accesses capabilities determined by the interface card being used. The following describes how the GPIO interface card interprets these statements.

ABORTIO	aborts the current TRANSFER and returns the handshake lines to their idle state
ASSERT	allows access to control lines
CLEAR	sets RESET-A or RESET-B line depending on whether the device address was even or odd.
HALT	stops an interrupt type TRANSFER and leaves the handshake and data lines in an undefined state
SEND	allows sending of arbitrary data sequences over the GPIO interface

CONTROL AND STATUS REGISTERS

The 82940A GPIO Interface has ten status registers and 18 control registers implemented. The status registers allow for reading back the values of control registers. There are also two status registers common to all cards that contain the card identification number (which is 4 for parallel) and the interrupt cause register.

The control registers allow direct access to CTL and RESET lines, logic sense (for FLG, CTL, data lines) and handshake mode. Control registers also allow skipping incoming characters until a character meets a relation (<, =, >, or some combination of conditions) with a trigger character. Out of the 18 control registers, there are nine common to all cards that contain the interrupt mask, seven end-of-line characters and the end-of-line character count. (The end-of-line sequence is the series of characters sent at the end of each OUTPUT or TRANSFER.)

Binary Coded Decimal Interface

The HP 82941A Interface provides the HP-85 with 11 digits of 4-bit BCD input or output data plus four sign bits for one or two channels. The HP 82941A uses an interface processor to provide efficient management of the interface. The HP 82941A Interface can achieve data transfer rates of up to 1.4K readings/second (absolute maximum).

DATA INPUT/OUTPUT

Twelve bidirectional ports, of four lines each, provide data input and output.

Electrical Characteristics for Data Lines

Parameter	Min.	Max.	Units
Input Low Voltage	0.0	0.8	V
Input High Voltage	2.0	5.0	V
Input Low Current		0.6	mA
Output Low Voltage @ 4.5 mA		0.45	V
Output High Voltage @ -450 μ A	2.4		V
Output Low Current		4.5	mA
Output High Current		-450	μ A

CONTROL LINES

Six lines allow for control information to be passed between the peripherals and the computer. The output control lines are implemented with standard TTL gate 7405 open-collector drivers. The control lines and their meanings are:

I/OA, I/OB	Indicates the direction of the data transfer on channels A and B.
CTLA, CTLB	Indicates that the computer is ready for input or that data is ready for output
FLGA, FLGB	Indicates that the peripheral has completed its operation.

Electrical Characteristics for CTL and I/O Direction Lines

Parameter	Min.	Max.	Units
Output Low Voltage @ 13 mA		0.4	V
Output High Voltage @ -1.0 mA	2.4		V
Output Low Current		13	mA
Output High Current		-1.0	mA

Electrical Characteristics for FLG Lines

Parameter	Min.	Max.	Units
Input Low Voltage	0.0	0.8	V
Input High Voltage	2.0	5.0	V
Input Low Current		4.0	mA

DATA FORMATS

The 82941A supports two pre-defined data formats and a wide variety of user-configurable data formats. The two pre-defined formats are:

Single channel	8-digit signed mantissa with 1-digit signed exponent and a 1-digit function code.
Dual channel	Each channel consists of a 4-digit signed mantissa and a 1-digit function code.

TRANSFER RATES

The maximum data rates for the 82941A BCD Interface are as follows:

TYPE	INPUT	OUTPUT
TRANSFER INTR	400 bytes/s	400 bytes/s
ENTER & OUTPUT	1400 bytes/s	3000 bytes/s
TRANSFER FHS	20K bytes/s	22K bytes/s

ADDRESSING

The I/O ROM allows address information to be sent to all interfaces. The 82941A BCD Interface uses this addressing information to select which channel is being used for the data transfer and which of the fields are being read — numeric data (mantissa, exponent and sign information) or function code. There are a total of seven valid addresses — 0 through 6.

INTERRUPT CAPABILITY

When used with the I/O ROM, the 82941A is capable of responding to any or all of the following interrupt conditions:

- channel A most significant function digit, bit 0
- channel A most significant function digit, bit 1
- channel A most significant function digit, bit 2
- channel A most significant function digit, bit 3
- channel B most significant function digit, bit 0
- channel B most significant function digit, bit 1
- channel B most significant function digit, bit 2
- channel B most significant function digit, bit 3

DEVICE CONTROL

The 82941A Interface allows the user to control his BCD device via one of the BCD digits. To OUTPUT control information to the device would require opening the card and reconfiguring it by setting a switch. To avoid this, Port 10, accessed via ASSERT, allows the user to control his device without this reconfiguration.

SWITCH CONFIGURATION

The following switches can be set by opening the interface card. No switches are accessible from the outside.

Select Code — The factory select code setting for the 82941A card is 3.

Format — A 1-bit switch selects standard (1 channel) or optional (2 channel) data format. The factory setting is standard.

Handshake — A 1-bit switch selects handshake on the leading or trailing edge of the handshake lines. The factory setting is trailing edge.

Data line sense — A 1-bit switch allows the data lines to use either positive-true (factory setting) or negative-true logic.

Sign bits sense — A 1-bit switch allows the sign bits to use either positive-true (factory setting) or negative-true logic.

Control line sense — A 1-bit switch allows the control lines to use either positive-true (factory setting) or negative-true logic.

Flag line sense — A 1-bit switch allows the flag lines to use either positive-true (factory setting) or negative-true logic.

Output Enable — A 1-bit switch disables (factory setting) or enables data ports for output. It does not affect output via Port 10.



BCD INTERFACE STATEMENTS

The I/O ROM adds a set of statements to the HP-85 that accesses capabilities determined by the interface card being used. The following describes how the BCD interface card interprets these statements.

ABORTIO	aborts the current TRANSFER and returns the interface lines to a "tri-state" high impedance state
ASSERT	allows access to control lines and Port 10
HALT	stops any TRANSFER (on the specified card) and leaves the handshake and data lines unchanged
SEND	allows sending of arbitrary data sequences over the parallel interface

CONTROL AND STATUS REGISTERS

The 82941A BCD Interface has 11 status registers and ten control registers implemented. The status and control registers allow a user to set and examine the logic sense for the handshake, data digit, function digit and sign bit lines. The registers also allow access to the number of digits allocated to channels A and B for the mantissa, exponent and function. There are also two status registers common to all cards that contain the card identification number (which is 3 for BCD) and the interrupt cause register. The common end-of-line count and character registers, and the interrupt mask register, are not implemented on the BCD card.

Ordering Information

ROM AND ROM DRAWER

ROM drawer	82936A
I/O ROM and Manuals	00085-15003

INTERFACES

HP-IB Interface	82937A
Serial Interface (DCE - female)	82939A
Serial Interface (DTE - male)	82939A Opt. 001
Serial Interface (current loop)	82939A Opt. 002
(unterminated - no connector)	
GPIO Interface	82940A
(unterminated - no connector)	
BCD Interface	82941A
(unterminated - no connector)	

ACCESSORIES

1 metre HP-IB cable	10833A
2 metre HP-IB cable	10833B
4 metre HP-IB cable	10833C
0.5 metre HP-IB cable	10833D
Metric Conversion Kit (HP-IB)	5060-0138

Additional 4 meter GPIO interface cable	8120-3190
Additional 4 meter BCD interface cable	8120-3192

I/O Programming Guide	00085-90142
HP-IB Installation and Theory of Operation Manual (standard with HP-IB interface)	82937-90007
Peripheral Installation Instructions (for HP-IB peripherals)	82937-90001
RS-232 (Serial) Installation and Theory of Operation Manual (standard with serial interface)	82939-90001
GPIO Installation and Theory of Operation Manual (standard with GPIO interface)	82940-90001
BCD Installation and Theory of Operation Manual (standard with BCD interface)	82941-90001

For further information call the Hewlett-Packard dealer or HP office nearest you. Or write to Hewlett-Packard, 1000 N. E. Circle Blvd., Corvallis, Oregon 97330; in Europe, Hewlett-Packard S.A. 7, rue du Bois-du-Lan, P.O. Box CH-1217 Meyrin 2, Geneva, Switzerland; in Canada, Hewlett-Packard (Canada) Ltd., 6877 Goreway Drive, Mississauga, Ontario L4V1M8; in Japan, Yokogawa Hewlett-Packard Ltd. 29-21, Takaido-higashi 3-Chome, Suginami-ku, Tokyo 168; elsewhere in the world, Hewlett-Packard Intercontinental, 3495 Deer Creek Road, Palo Alto, California 94304.



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