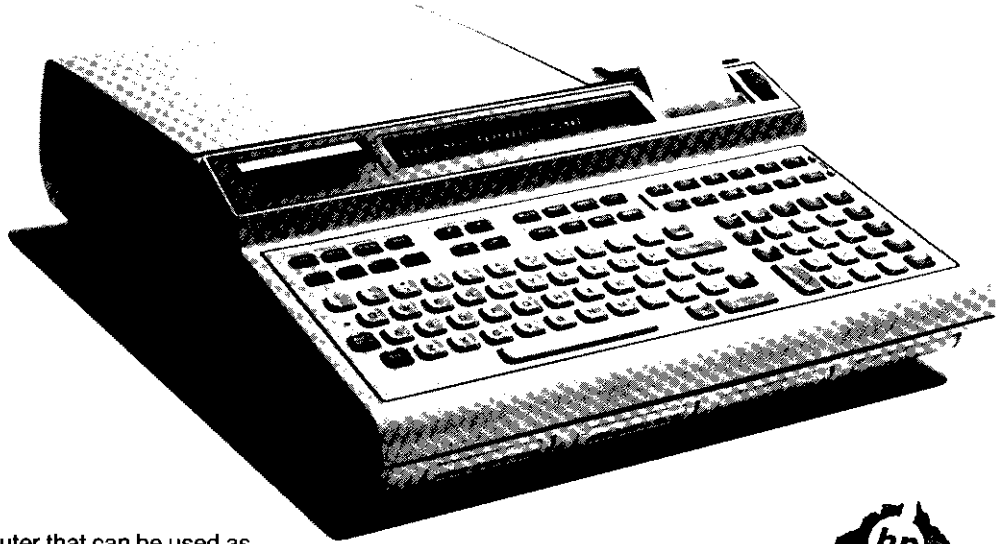# 9825A
Desktop Computer

The HP 9825A is a desktop computer that can be used as a stand-alone device or as a system controller for industrial and scientific applications.

It has a 32-character LED display, 16-character thermal strip printer, and a typewriter-like keyboard that lets you use both upper- and lower-case alphanumerics. In addition, the 9825A has 3 I/O slots, 4 read-only memory (ROM) slots, and a 2-track tape cartridge drive.

A unique feature of the tape cartridge system is the "record memory". This allows you to copy the entire contents of memory including all programs, data, flags, Special Function keys, and internal system information so that the 9825A can be returned to the identical operating environment at a later time.

Another feature of the 9825A is the high-level programming language (HPL) that offers power and efficiency for handling equations and input/output operations, yet it is easy to learn and use.

The live keyboard is another valuable characteristic the 9825A provides. This means you can perform calculations and execute subroutines as well as list the current program and examine or change program variables while a program is running.

The 9825A also has interrupt capability. This means that when given a signal from a peripheral, the 9825 suspends operations to execute a priority program or input more information. The desktop computer then resumes operations at the point of interruption.

In addition to its inherent computing power, the 9825A also allows flexible interfacing with a variety of devices including plotters, digitizers, printers, and flexible disk drives. To complete your system's configuration, you can choose from a range of software packs for engineering, mathematics, and statistics applications.

Features

- Alphanumeric keyboard
- 32-character LED display
- Built-in tape cartridge drive
- High-level programming language (HPL)
- Interrupt capability
- Plug-in read-only memories (ROMs)
- 12 Special Function keys (24, with shift)
- Expandable read/write memory
- 12 significant digits
- Live keyboard
- Direct memory access
- Trigonometric capability
- Boolean algebraic capability

Specifications

STORAGE

Read/write memory:	6844 bytes
Opt. 001	15,036 bytes
Opt. 002	23,228 bytes
Opt. 003	31,420 bytes
	(will not operate with these ROMs— 98210A, 98213A, 98214A, 98215A, and 98216A
Dynamic range:	10^{99} to 10^{-99}, 0, -10^{-99} to -10^{99}
Internal calculation range:	10^{511} to 10^{-511}, 0, -10^{-511} to -10^{511}
Tape cartridge	
Memory capacity:	250,000 bytes
Average access time:	6 s
Read/write speed:	559 mm/s (22 in./s)
Search speed (bidirectional):	2286 mm/s (90 in./s)
Transfer rate:	2750 bytes/s
Typical rewind time:	19 s (end to end)

Typical erase	
time:	40 s (one track)
Tape length:	42,67 m (140 ft)
Size:	63,5 × 82,5 × 12,7 mm
	(2.5 × 3.25 × 0.5 in.)
Verification:	automatic on recording

Printer

Paper width:	57,15 mm (2.25 in.)
Speed:	190 lines/min
Font:	5 × 7 dot matrix; prints all the following characters in upper and lower case; up to 16 characters/line

9825A Character set

BUILT-IN FUNCTIONS

Mathematical and trigonometric functions and operations are included in the following with average execution times.

Absolute (abs)	0.19 ms
Fraction (frc)	0.37 ms
Integer (int)	0.47 ms
Maximum (max)	variable
Minimum (min)	variable
Modulus (mod)	3.1 ms
log	8.6 ms
ln	6.7 ms
e^x	5.5 ms
10^x	7.6 ms
Raise to power	15 ms
Random number (rnd)	1.8 ms
Sign (sgn)	0.20 ms
$\sqrt{}$	2.5 ms
Sine (sin)	18 ms
Cosine (cos)	18 ms
Tangent (tan)	13 ms
Arcsine (asn)	22 ms
Arccosine (acs)	22 ms
Arctangent (atn)	15 ms
+	0.32 ms
−	0.37 ms
*	0.88 ms
/	2.5 ms
Power of ten round (prnd)	0.74 ms
Digit round	0.53 ms

Logic operators
AND, NOT, OR, XOR (exclusive or)

Relational operators

= equal to	>= or => greater than or equal to
> greater than	<= or =< less than or equal to
< less than	# or <> not equal to

ENVIRONMENTAL RANGE

Operating	
temperature:	5° C to 40° C ambient
Storage temperature:	−40°C to 65° C
Ambient humidity:	<80%

SIZE/WEIGHT

Height:	129,5 mm (5.1 in.)
Width:	383,5 mm (15.1 in.)
Depth:	495,3 mm (19.5 in.)
Net weight:	11,8 kg (26 lb)
Shipping weight:	19,5 kg (42 lb)
Cube:	0.12 m³ (4 ft³)

POWER REQUIREMENTS

Source:	10 V +5%, −10%	Selected
	120 V +5%, −10%	by rear
	220 V +5%, −10%	panel
	240 V +5%, −10%	switches
Line frequency:	48 to 66 Hz	
Consumption:	100 V/1.7 A	
	120 V/1.5 A	
	220 V/0.8 A	
	240 V/0.75 A	

Accessories Supplied

| Item	HP Part No.
Operating and Programming Manual	09825-90000
Quick Reference Guide (2)	09825-90010
Blank data cartridge	9162-0061
Utility pack	09825-10000
Error booklet	09825-90015
Dust cover	9222-0495
Tape head cleaner	8500-1251
Special Function key overlays- blank (5)	7120-4802
Test cartridge	09825-90035
Test Cartridge Manual	09825-90031
Thermal printer paper (3 rolls)	
Spare fuses	
1A	2110-0001
2A	2110-0002
I/O slot covers (3)	5040-7723
Power cord	depends on origin of sale

Accessories Available

Item	HP Part No.
Vinyl carrying case	98025A
Thermal printer paper (6 rolls)	9270-0479
Blank data cartridge	9162-0061
Software binder	9282-0563
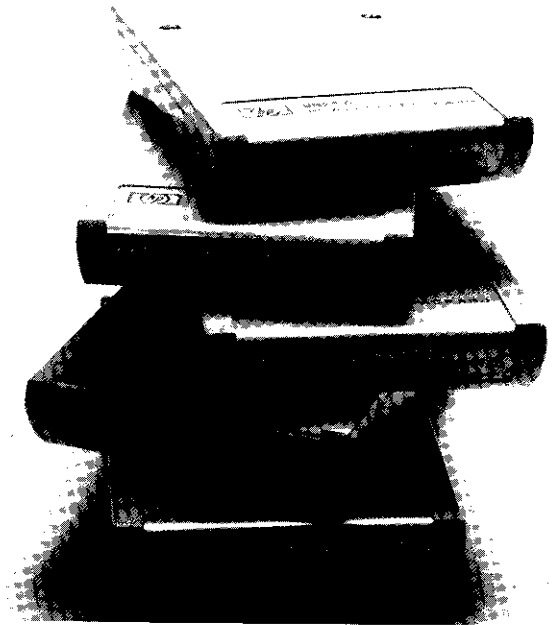
To extend language capabilities and control external devices, several ROMs are available for use with the 9825A. They include the following combinations, with part numbers in parentheses:

- String-Avanced Programming (98210A)
- Matrix (98211A)
- 9862 Plotter-General I/O (98212)
- General I/O-Extended I/O (98213A)
- 9862 Plotter-General I/O-Extended I/O (98214A)
- 9872 Plotter-General I/O (98215A)
- 9872 Plotter-General I/O-Extended I/O (98216A)
- 9885M Flexible Disk Drive (98217A)

Physical Specifications

All ROMs described herein conform to these physical specifications.

POWER
Provided by the 9825A

ENVIRONMENTAL RANGE
5°C to 40°C
< 80% ambient

SIZE/WEIGHT
Width: 71,6 (2.82 in.)
Length: 115,8 mm (4.56 in.)
Depth: 15,5 mm (0.61 in.)

String Capabilities

The string portion of the 98210 allows the 9825 to accept and manipulate alphabetic and numeric information. It provides 26 single string variables or string array variables. Maximum length is 32,767 characters but in practice is limited by the memory size of the 9825.

This ROM allows comparison of strings or substrings. All the relational operations allowed in numerical comparisons apply to string computations. In addition to the standard characters, the 98210 permits these special characters to be displayed and printed on the internal printer:

Å à Ä ä Ö ö Ü Ü Æ æ Ñ ñ ¿ α θ Γ
å Δ θ λ μ σ Σ τ ∮ Ω Ξ ² £ ' ⊢ ◄ ▓

STRING FUNCTIONS
ent	- Enter statement for strings and substrings.
dim	- Reserves storage space for strings or string arrays.
len	- Obtains the length of a string or substring.

pos	- Determines the position of a substring within a single string.
val	- Allows the numerical value of a string of digits to be used in computations; fixed point and floating point notations are allowed.
num	- Gives the decimal value of an ASCII or non-ASCII character.
str	- Converts a numeric value into a string based on the current fxd/flt setting; the inverse of val.
char	- Generates ASCII or non-ASCII characters; the inverse of num.
&	- Joins strings without modifying any of the original strings (concatenation).
cap	- Converts lower-case alphabetic characters to upper case without modifying the original string.

SPECIFICATIONS
Memory: uses 52 bytes of read/write memory

Advanced Programming Capabilities

The advanced programming portion of the 98210 provides parameter-passing functions and subroutines with local variables. It includes for...next statements and a cross-reference operator. Numbers can be packed with split or integer precision.

FUNCTIONS
'name'	- Calls a function which is labeled by "name"; any number of parameters can be passed and local variables may be used within the function.
ret	- Causes a single value to be returned to the statement which called the function.

SUBROUTINES
cll	- Calls a subroutine; any number of parameters can be passed, and local variables may be used within the subroutine.

ret	- Causes the program to return to the statement following the call.

LOOPING

for...next	- Allows the controlled repetition of a group of statements within a program.

SPLIT AND INTEGER PRECISION STORAGE

The 98210 allows the storage of numbers in 2 compact formats:

fts	- Split precision: 6 digits, mantissa sign and exponent (-63 to 63) packing density of 2:1 over floating point.
fti	- Integer precision: numbers in the range of -32768 to $+32767$; a 4:1 density over floating point.
stf	- Unpacks split precision to floating point.
itf	- Unpacks integer precision to floating point.

CROSS REFERENCE

xref	- Gives an alphabetical list of variables used in a program along with the line numbers in which they are referenced.

SPECIFICATIONS

Memory: uses 4 bytes of read/write memory.

Matrix Capabilities

The HP 98211A Matrix ROM provides matrix and array operations to augment the multidimensional array capability of the 9825A.

MATRIX OPERATIONS

inv	- Matrix inversion and determinant.
mat	- Matrix multiplication.
trn	- Matrix transposition.
idn	- Establishes an identity matrix.

The matrix inversion technique employs a modified Gauss-Jordan reduction using the maximum pivot strategy. This method is superior to the standard Gauss-Jordan elimination or the diagonal pivot strategy because it will successfully invert all but singular or near-singular matrices. Pivoting on the maximum elements maximizes the accuracy of the results.

ARRAY OPERATIONS

The number of dimensions can be anything specified by valid dimension (dim) statements.

ara	- Performs addition, subtraction, multiplication, division, and copying; this statement performs the indicated operation on the corresponding elements from each array in succession.
smpy	- Scalar multiplication; the scalar may be a simple variable or a number.
ina	- Sets all elements of an array to a value; the value may be a simple variable or a number.
aprt	- Prints the elements of arrays on the strip printer.
rdm	- Redimensions arrays.

SPECIFICATIONS

Memory: uses no read/write memory, except during matrix inversion.

Speed: 20×20 matrix inversion -10 s

Plotter Capabilities

The HP 9862A Plotter portion of the 98212 and 98214 provides the statements necessary for the 9825A to control the 9862. These commands are designed to simplify the task of producing graphic representation of data.

scl	- Sets the range of X and Y in user units.
axe	- Draws the X and Y axes with optional tic marks.
ofs	- Temporarily shifts the origin to a new location.
pen	- Raises the pen without moving to a new position.
plt	- Moves the pen to the point X,Y; the pen may be raised or lowered before or after the pen movement.
iplt	- Same as plot, except that the pen is moved relative to the current pen position instead of relative to the origin.
psc	- Permits the plotter select code to be changed, permits a plotting program to run without a plotter, and permits using multiple plotters.
cplt	- Allows plotted characters to be centered over a particular point by moving the pen in units of "character size".
lbl	- Prints (on the plotter) using standard format.
ltr	- Sets the starting point, size, and direction of the lettering.
csiz	- Specifies the character height, width, and direction.
ptyp	- Permits characters to be printed on the plotter directly from the 9825A's keyboard.

SPECIFICATIONS

Memory: uses 70 bytes of read/write memory.

Statements for the 9872 Plotter are contained in the 98215 and 98216 ROMs and are listed here. These mnemonics enable the 9825 to control the 9872 and, like the previous 9862 Plotter statements, simplify production of output.

psc	- Allows several plotters to be addressed via 1 plotter ROM.
scl	- Sets a range of X and Y in user units.
xax	- Draws an X axis with optional tic marks and tic mark labels.
yax	- Draws a Y axis with optional tic marks and tic mark labels.
ofs	- Shifts scale origin to a new location.
pen	- Raises pen without moving to a new location.
plt	- Moves pen to point X, Y; pen may be raised or lowered before or after moving.
iplt	- Same as plt except that movement is relative to current pen position instead of scale origin.
pen #	- Allows programmed selection of pen to be used for plotting or lettering.
line	- Selects 1 of 8 line types to be used for plotting.
limit	- Restricts programmed pen motion to specific rectangular area on the platen.
cplt	- Allows incremental plotting in units of character spaces.
lbl	- Prints characters, numbers, and symbols on plotter from a program.
ptyp	- Sets a manual lettering mode from 9825 keyboard.
csiz	- Specifies character height and width as well as direction of lettering.
dig	- Enables digitizer mode between 9825 and plotter to return scaled coordinates from plotter to 9825.
pclr	- Clears plotter of previously programmed plotting or lettering specifications and selects 9825 character set.
wrt	- General I/O write statement can be used to send all HP-GL (Hewlett-Packard Graphics Language) commands to plotter, e.g., SM (symbol mode), SL (character slant), and VS (select velocity).

SPECIFICATIONS

Memory: uses 104 bytes of read/write memory.

☐ General I/O Capabilities

The General I/O portion of the 98212, 98213, or 98214 provides basic input/output capabilities including read/write with format control, binary read/write, status testing, and code conversion. Any of these ROMs can list programs on a peripheral. The General I/O portion provides fundamental input/output operations with HP-IB (conforms to IEEE Specification 488-1975) peripherals. These special characters can be displayed and printed on the internal printer:

Ä ä Å å Ö ö Ü ü Æ æ Ñ ñ ¿ ¤ ß Γ å
Δ Θ λ μ σ Σ τ ∮ Ω ≠ ≥ ≤ ′ ⊢ ∢ ▤

In addition to controlling external devices, this ROM can address the 9825A's printer, display, and keyboard.

GENERAL I/O COMMANDS

fmt	- Establishes the format for the read and write statements; format specifications can include fixed point, fixed point with leading zeros, floating point, binary, strings, literals, spaces, carriage return/line feed, and CR/LF suppression with repeat functions for each specification.
red	- Inputs data from a peripheral to the 9825.
wrt	- Outputs data from the 9825 to the peripheral.
wtb	- Outputs a single byte (8 bits) or word (16 bits).
rdb	- Inputs a single byte (8 bits) or word (16 bits).
wtc	- Outputs control bits to a peripheral.
rds	- Inputs the status of a peripheral.
conv	- Specifies the conversion of up to 10 ASCII characters to other ASCII characters during I/O operations.
list #	- Extends listing capability to peripheral devices.

SPECIFICATIONS

Memory: uses 56 bytes of read/write memory
Speed : up to 16k bytes/s depending on the format, program, and peripheral

☐ Extended I/O Capabilities

The Extended I/O portion of the 98213 or 98214 has complete HP-IB control, plus vectored interrupt, buffered I/O, burst read/write, and Direct Memory Access (DMA). It provides bit manipulation and testing, code conversion, error trapping, time out, and auto restart.

HP-IB FUNCTIONS

dev	- Associates user-defined names with peripheral devices for use in select code specifications.
equ	- Associates user-defined names with setup functions for HP-IB devices.
cmd	- Statement used to address the HP-IB directly.
tfr	- Transfers information between peripherals and internal buffers.
trg	- Group execute trigger.
clr	- Selective device clear, general device clear.
rem	- Remote enable/disable.
loc	- Go to local.
llo	- Local lockout.
polc	- Parallel poll configure.
polu	- Parallel poll unconfigure.
pol	- Used to conduct a parallel poll.
pct	- Pass active control to a specified peripheral.
rqs	- Used to set the service request line when the 9825 is acting as a peripheral on the bus.
rds	- Extends rds function of the General I/O ROM to input multiple status bytes from HP-IB and to conduct a serial poll.

INTERRUPT FUNCTIONS

The Extended I/O allows for user-written, keyboard language interrupt service routines. When devices interrupt, program control is passed to a service routine at the end of the current program line. After service, your program executes a special return statement which polls for other interrupt requests. Control is then returned to the next line of the main program. Select codes 8 through 15 have priority over select codes 0 through 7 with provisions for abortive interruptions for emergencies.

oni	- On interrupt; specifies the location of your keyboard language service routine for a given select code.
eir	- Enables a peripheral to interrupt.
iret	- Interrupt return; terminates a service routine.

BUFFERED I/O, BURST READ/WRITE, DMA

In addition to the "fmt, red, and wrt" statements of the General I/O, the Extended I/O has mnemonics to handle data transfers of slow and/or random time devices and very fast devices.

buf	- Specifies a dimensioned array that is to be used as an I/O buffer; the user can set the size of the buffer and the type (buffer, burst, or DMA).

When you write to a device, data is placed in the buffer, and the device can interrupt when it is ready for more. If the peripheral is an input device, the buffer is filled under interrupt, and when completed, data is taken from the buffer.

For burst read/write, the ROM buffers data until a termination condition is met.

For DMA, the ROM requests the DMA channel and then does a DMA transfer.

DIRECT REGISTER ACCESS

You may directly access the interface card to alter the normal I/O sequence for special applications.

rdi	- Allows you direct access to the registers used for direct communication with a peripheral interface.
wti	- Write 1 byte/word of data directly to a designated interface register.
iof	- Provides direct testing of the I/O interface flag.
ios	- Provides direct testing of the I/O status line.

BIT MANIPULATION AND TESTING

These functions permit you to operate on 16-bit binary values in order to form special bit patterns for input/output operations.

ior	- Returns the inclusive OR of 2 values.
eor	- Returns the exclusive OR of 2 values.
band	- Returns the AND of 2 values.
cmp	- Returns the 1's-complement of a value.
rot	- Performs a left/right rotate on a value by a specified number of bits.
shf	- Performs a left/right shift on a value by a specified number of bits.
add	- Performs octal addition when 9825A is in the octal mode.
bit	- Tests the specified bit(s) of a value and returns a true/false indication.

CODE CONVERSION

ctbl   - Allows you to specify a string as a complete conversion table between ASCII code and a different code.

par   - Specifies the parity bit of input/output data.

OCTAL MODE

moct   - Sets a mode where all binary references are interpreted in octal instead of decimal.

mdec   - Cancels the octal mode and returns to the decimal mode.

Functions for direct decimal/octal conversion are also provided.

ERROR TRAPPING

on err   - When an error is made, the program goes to a labeled routine to allow the program to take alternative action; the error number and line are available.

TIME OUT

Lets you specify alternative actions when a peripheral does not respond in a specified time

AUTO RESTART

Automatically loads and runs file Ø when the 9825A's power comes on

SPECIFICATIONS

Memory: uses 94 bytes of read/write memory
Speeds:†   burst read/write up to 90k transfers/s;
DMA input rates of up to 400k transfers/s
output rates of up to 225k transfers/s
16-bit word or one 8-bit byte

†Speeds are dependent on the program, I/O card, and peripheral used.

Flexible Disk Capabilities

The 9885M software system includes the 98217A ROM and "bootstraps" that are supplied on a data cartridge. These bootstraps are moved to the disk when it is initialized.

The system requires 1140 bytes of the 9825A's read/write memory for data buffer, bootstrap area, pointers, and status words.

The 98217A ROM contains statements, listed in the following, that are programmable and are organized in a file-by-name directory that maintains user files and available space.

open   - Creates a data file with a specified number of physical records and assigns it a name.

save   - Stores an entire program or parts of it in a specified file.

save keys   - Stores Special Function key definitions in a named file.

get   - Loads a program from the disk to the 9825.

get keys   - Loads Special Function key definitions from the disk to the 9825.

drive   - Specifies the drive to be used.

on end   - Sets a branching condition that changes the program flow to a new location when an end condition is encountered.

kill   - Erases the named file from the disk and adds the file space to the availability table.

files   - Declares which files are to be used.

assign   - Allows the declared files to be changed and allows a string variable to declare a file to be used.

catalogue   - Lists information about every user file on the disk.

chain   - Loads a program from the disk to the 9825, retaining variable values.

copy   - Duplicates the contents of one file into another file or drive.

DATA FILE STATEMENTS

serial print   - Prints data into a file after the last item previously read or printed, or at the beginning of the file.

random print - Prints data into a file from the beginning of a specified record.

serial read   - Reads data from a file starting after the last item printed or read.

random read - Reads data from a file starting at a specified record.

SUPPORTING COMMANDS

rename	repack
file dump	resave
file load	get binary
type	verify

ROM Ordering Information

The ROMs are packaged in the following combinations:

ROM	HP Part No.
String-Advanced Programming†	98210A
Matrix	98211A
9862 Plotter-General I/O	98212A
General I/O-Extended I/O†	98213A
9862 Plotter-General I/O-Extended I/O†	98214A
9872 Plotter-General I/O	98215A
9872 Plotter-General I/O-Extended I/O†	98216A
9885M Flexible Disk	98217A

†Will not operate with 31,420 total bytes of memory.

ROM Manuals Available

Every ROM package includes a manual for each segment:

Manual	HP Part No.
String	09825-90020
Advanced Programming	09825-90021
Matrix	09825-90022
9862 Plotter	09825-09923
General I/O	09825-90024
Extended I/O	09825-90025
9872 Plotter	09825-90026
9885M Flexible Disk	09885-90000

9825A Interfaces

There are 4 interface cards specifically designed for use with the 9825A and are listed in the following with their respective part numbers.

16-Bit Parallel I/O (98032A)
BCD Input (98033A)
HP-IB† (98034A)
Serial I/O (98036A)

†Conforms to IEEE Specification 488-1975

Physical Specifications

The preceding interfaces conform to these specifications.

POWER
Provided by the 9825A

ENVIRONMENTAL RANGE
0°C to 55°C ambient

SIZE/WEIGHT
Length:	163 mm (6.4 in.)
Width:	89 mm (3.5 in.)
Depth:	38 mm (1.5 in.)
Shipping weight:	2,3 kg (5 lb)

16-Bit Parallel I/O (HP 98032A)

This interface provides the 9825A with a latched 16-bit input data bus and a latched 16-bit output data bus for bidirectional transfer of information. Operation of the 98032A requires the General I/O ROM for typical read/write functions and the Extended I/O ROM for advanced capabilities such as vectored interrupt, buffered I/O and DMA.

Input/output transfers can be in a 16-bit word format or in 2 independent 8-bit bytes. DMA transfers are word oriented with rates up to 400k 16-bit words/s. Enabling/disabling and interrupt priority are controlled by select code settings and software commands.

Extended control and status lines are available for applications that require more than one signal from the 9825A. These signals, combined with full-word or byte-data transfer modes, allow interfacing to a variety of equipment.

SPECIFICATIONS

Logic Configuration

Fifteen jumpers are provided within a removable cable boot to control the logic of I/O data, control signals, flag information, and peripheral status information. Such operating modes as handshake operation, DMA, and word/byte data are also controlled by these jumpers.

Data Input/Output

Sixteen input lines with 3k Ω to 5 V and 6.2k Ω to ground terminations accept standard TTL signal levels.

Sixteen output lines have high voltage/current (30 V, 40 mA) open-collector transistor drivers.
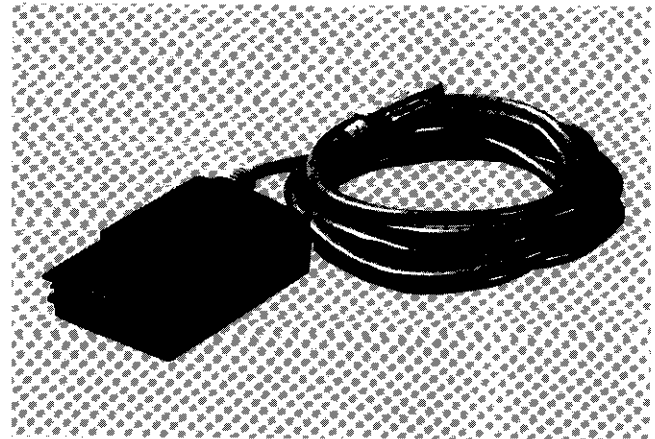
Control Lines

PCTL Peripheral Control—indicates to the peripheral that data is ready for output or 9825A is ready for input; PCTL is reset by a ready-to-busy transition on PFLG.

PFLG Peripheral Flag—indicates to the 9825A completion of a data transfer; also used to request peripheral interrupt when enabled.

PSTS Peripheral Status (optional)—indicates to the 9825A the readiness of the I/O device (paper out, power off, etc.); PSTS is sampled by the 9825A whenever communication with the peripheral is requested.

STI∅,STI1 Extended Status (optional)—examined by reading the 98032A I/O status register.

CTL∅,CTL1 Extended Control—setting or clearing these signals can be accomplished by writing into the 98032A I/O control register.

I/O Direction—indicates to the peripheral the direction of the current data transfer; valid when PCTL is valid.

PRST Peripheral Reset—used to initialize a peripheral. PRST is pulsed low when the 9825A is turned on, when the RESET key is pressed, or when software requests a device to be reset.

EIR External Interrupt Request—used only during DMA when EIR can be used to abort the transfer prior to completion; normal interrupt requests use the PFLG line.

Select Code Settings

Choose any one of 14 select codes via an externally accessible rotary switch. Select codes 2-7 have low interrupt priority, whereas 8-15 have high interrupt priority. The Extended I/O ROM is required to operate the 98032A under interrupt control.

Accessories

The standard 98032A Interface is shipped with a 4,5-m (15-ft) open-ended cable but is also available with a 2-m (6.5-ft) cable terminated with a specific option. A 98241-67932 Test Connector is available to verify hardware operation of the interface.

BCD Input Interface (HP 98033A)

This interface connects the 9825A with bit-parallel, digit-parallel binary coded decimal devices for data input. Up to 10 BCD digits, with overload and sign information, can be input using the General I/O ROM with transfer rates to 250 readings/s.

An input format is selectable which allows 2 instruments to be read from a single interface card. The speed of the slowest device dictates the overall transfer rate.

The Extended I/O ROM can extend transfer rates to 3125 readings/s and also provides buffered I/O with peripheral interrupt for communication with slow devices.

SPECIFICATIONS

Data Formats

Data is serialized into the 9825A in a 16-character sequence. Two data formats are switch selectable on the interface card:

8-digit signed mantissa with 1-digit signed exponent
1-digit function code and overload indication
or
4-digit signed mantissa
5-digit signed mantissa with positive exponent

Additional data formatting can be accomplished via formatted read statements in the software.

Codes

Data—8421 binary coded decimal weighting with codes Ø-9 representing digits Ø-9 and other codes as follows:

1010	(L.F.) line feed
1011	(+) plus sign
1100	(,) comma
1101	(−) minus sign
1110	(E) character "E"
1111	(.) decimal point

Additional Input Information

Exponent ⎱ Function ⎰	8421 binary coded decimal weighting: codes Ø-9 only
Mantissa sign ⎫ Exponent sign ⎬ Overload ⎭	1 binary bit: logic sense is selectable

Logic Configuration

Switches are provided inside the interface to select the logic sense of the following signals: FLGA, FLGB, CTLA, CTLB, SGN1, SGN2, OVLD, and interface DATA. Selection of optional data format (2 devices) and pulsed operation of CTLA or CTLB (or both) is also accomplished via these switches.

Data Input

Forty-three data input lines (10 BCD digits, mantissa sign, exponent sign, and overload) have low-power Schottky TTL receivers with V max. of 7 V. External device must sink 0.4 mA to produce a low-level input. Data is not latched and, therefore, must be held stable while the 9825A is reading.

Control Lines

CTLA, CTLB Peripheral Control A and B—CTLA and CTLB are open collector TTL inverts with 2.2k Ω pull-up resistors. V max. is 15 V and current sinking capability is 14 mA. CTLA (B) can be reset by either edge (ready-to-busy or busy-to-ready) of FLGA (B), with the ready-to-busy option providing the pulsed mode of operation.

FLGA, FLGB Peripheral Flag A and B—FLGA and FLGB receiver circuits are low-power Schottky TTL Schmitt triggers whose inputs have 2.2k Ω to +5 V, 0.01 μF capacitors to ground, and 47 Ω in series with the driver. Either FLG in a busy state will indicate busy to the 9825.

Select Codes

One of 14 select codes may be chosen via an externally accessible rotary switch. Select codes 2-7 have low interrupt priority, codes 8-15 have high priority. The Extended I/O ROM is required to operate the 98033A under interrupt control.

Accessories

A 98241-67933 Test Connector is available to verify hardware operation of the 98033A Interface. This interface has no options; it is shipped with 4.5-m (15-ft) open-ended cable.

☐ HP-IB (HP 98034A)

This interface allows the HP 9825A to communicate via the HP-IB to as many as 14 compatible instruments per interface. The 98034A utilizes a controlling processor to provide efficient management of interface bus protocol.

The General I/O ROM and the Extended I/O ROM access all the capabilities of the 98034A. For example, with these ROMs, the 98034A provides such capabilities as peripheral interrupt for service requests and data transfer at rates up to 45k bytes/s.

SPECIFICATIONS

The following specifications conform to the IEEE Standard Digital Interface for Programmable Instrumentation (IEEE 488-1975).

Data Input/Output

Eight bidirectional data lines provide data input/output.

Control Lines

DAV ⎫ NRFD ⎬ NDAC ⎭	provide handshake

Interface Management

IFC ⎫ ATN ⎪ SRQ ⎬ REN ⎪ EOI ⎭	provide control of the interface system

Interface Functions

SH1	source handshake
AH1	acceptor handshake
T5	talker
L3	listener
SR1	service request
RLØ	remote local
PP2	parallel poll
DC1	device clear
DTØ	device trigger
C1,2,3,4,5	controller

Interrupt Capability

When used with the Extended I/O ROM, the 98034A is capable of responding to any or all of the following interrupt requests:

take active controller status,
take active talker status,
take active listener status,
respond to service request,
input buffer full,
output buffer empty.

Switch Configuration

Select Code Setting—switch is externally accessible and allows one of 14 possible select codes to be set for the interface cards; bus interface addresses then select the specified device.

Interface Bus Address—5-bit talker/listener address pair.

System Controller—switch allows the 98034A to act as a system controller; if not selected, the 98034A assumes the function given to it by the system controller if that status exists in the previous table of interface functions.

Parallel Poll Bit—select any one of the 8 data bits for response purposes.

Parallel Poll Bit Sense—selected parallel poll bit logical sense controlled with this switch.

Accessories

The 98034A is shipped with a 4-m (13-ft) interface cable terminated with the standard HP-IB connector and metric fasteners. Additional lengths of interface cables available are:

Item	HP Part No.
1 m (3 ft)	10631A
2 m (6.6 ft)	10631B
4 m (13 ft)	10631C

A 59405-66503 Test Connector is available to verify hardware operation of the 98034A Interface.

Serial I/O Interface (HP 98036A)

The 98036A Interface provides bit serial communication between the 9825A Desktop Computer and asynchronous EIA RS-232-C devices such as data terminals and modems. Data rates range from 75 to 9600 bits/second (baud) and are set via an externally accessible rotary switch. Allowable data formats include 5-, 6-, 7-, or 8 bits/character with 1-, 1.5-, or 2 stop bits.

Information can be sent and received in either EIA RS-232-C voltage specification or 20-mA current loop configuration. Receive-only capability in 60-mA current loop is also possible.

Normal input/output operations require the General I/O ROM. The Extended I/O ROM is required for interrupt, buffered input/output operations, and extended RS-232-C control/status capability.

SPECIFICATIONS

Two cables are available for use with the 98036A. The standard cable is suitable for connection to data terminal equipment, whereas the optional cable is used for connection to data set equipment. The standard 98036A is shipped with a 2-m (6.5-ft) cable terminated with a standard female EIA 25-pin connector with the following signals present.

(Note: A ← indicates a signal sent from the device to the 98036A, and a → indicates a signal sent from the 98036A to a device.)

98036A Standard
(Female Connector)

Pin No.	Signal Present	Signal Direction
1	Protective ground	⟷
2	Transmitted data	←
3	Received data	→
4	Request to send	←
5	Clear to send	→
6	Data set ready	→
7	Signal ground	⟷
8	Received line signal detector	→
9	Unused	
10	Unused	
11	Unused	
12	Secondary received line signal detector	→
13	Unused	
14	Unused	
15	Unused	
16	Unused	
17	Unused	
18	Unused	
19	Secondary request to send	←
20	Data terminal ready	←
21	Signal quality detector	→
22	Ring indicator	→
23	Data signal rate selector	←
24	Transmit signal element timing	←
25	Unused	

When Opt. 001 is ordered, the 98036A is shipped with a male connector terminated as shown in the following.

98036A Opt. 001
Male Connector)

Pin No.	Signal Present	Signal Direction
1	Protective ground	⟷
2	Transmitted data	→
3	Received data	←
4	Request to send	→
5	Clear to send	←
6	Data set ready	←
7	Signal ground	⟷
8	Received line signal detector	←
9	Unused	
10	Unused	
11	Special purpose (user-controlled)	→
12	Secondary received line signal detector	←
13	Unused	
14	Unused	
15	Transmitter signal element timing	←
16	Unused	
17	Receiver signal element timing	→
18	Unused	
19	Secondary request to send	→
20	Data terminal ready	→
21	Unused	
22	Ring indicator	←
23	Data rate selector	→
24	Unused	
25	Special test	→

Data

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 formatting with 1-, 1.5-, or 2 stop bits and odd, even, or no parity. Additionally, the interface will detect framing errors (invalid stop bit), parity errors, and overrun errors; these errors will be indicated in a status word.

Data rates available are 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, and 9600 baud. Data-rate selection is via an externally accessible rotary switch. Under programmable control of the 9825A, the switch selected data rate can be reduced to one half of its set value.

Additional Operating Information

The transmitter and receiver sections of the 98036A both have a separate 1-character buffer. The status of these buffers can be interrogated by the 9825A.

The interface can be programmed by the 9825A to interrupt when either the input buffer is full or the output buffer is empty. This interrupt capability allows the interface to operate in a full duplex fashion in that information can be input under interrupt control while information is being output by standard 9825A write commands.

The Extended I/O ROM is required to operate under interrupt control.

Options

The standard 98036A is shipped with 2-m (6.5-ft) cable terminated with a standard EIA 25-pin female connector. If Opt. 001 is ordered, the cable is terminated with a similar male-type connector. A 98241-67936 Test Connector is supplied with each 98036A Interface.

Interface Ordering Information

Each 9825 interface is shipped with a manual and test connector according to the following:

Interface Part No.	Manual Part No.	Test Connector Part No.
98032A	98032-90000	98241-67932
98033A	98033-90000	98241-67933
98034A	98034-90000	59405-66503
98036A	98036-90000	98241-67936

Supplementary Ordering Information

9825 PERIPHERALS

Description	To purchase the peripheral, order peripheral number:	If peripheral is owned, order card number:	Required ROMs
Plotter	9862A, Opt. 025	98032A, Opt. 062	9862A Plotter
Paper Tape Reader	9863A, Opt. 025	98032A Opt. 063	General I/O
Digitizer	9864A, Opt. 025	98032A Opt. 064	General I/O
Thermal Line Printer	9866B, Opt. 025	98032A Opt. 066	General I/O
Hopper Card Reader	9869A, Opt. 025	98032A, Opt. 069	General I/O
Impact Printer	9871, Opt. 025	98032A, Opt. 071	General I/O
Impact Printer (HP-IB)	9871A Opt. 001 (also requires 98034A Interface)	98034A	General I/O
Plotter	9872A, Opt. 025 (also requires 98034A Interface)	98034A	9872A Plotter
External Tape Memory	9877A, Opt. 025	not applicable	none
I/O Expander	9878A, Opt. 025	not applicable	none
Line Printer	9881A, Opt. 025	98032A, Opt. 081	General I/O
High Speed Tape Reader	9883A, Opt. 025	98032A, Opt. 083	General I/O
Tape Punch	9884A, Opt. 025	98032A, Opt. 084	General I/O
Flexible Disk Drive	9885M, Opt. 025	98032A, Opt. 085	Supplied with Opt. 085

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