



9831A Desktop Computing System

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The 9831A Desktop Computer shown with a few of its associated peripherals

9831A Desktop Computer



The HP 9831A is a desktop computer that can be used as either a stand-alone device or with peripherals in an integrated computing system for industrial, commercial and scientific applications.

One of the main features of the 9831A is its programming language, the powerful BASIC (Beginner's All-purpose Symbolic Instruction Code). Because BASIC is a commonly known computer language and is similar to English, it's easy to learn and apply to programming skills.

To increase the 9831A's capabilities, certain commands have been built in to handle alphanumeric string variables, advanced programming techniques, and input/output operations. In addition, you can work with up to 286 simple variables, 26 one- or two-dimensional arrays, and string variables which are limited only by the available memory space. Extra features like these provide you with greater programming flexibility.

To further enhance the 9831A's capability and at the same time simplify programming even more, you are provided with 24 user-definable Special Function keys (12, plus shift) which can be used to represent text, functions, or entire programs. Three line editing keys and 4 character editing keys allow you to insert, change, and delete characters and lines as well as provide other program debugging aids.

Another special feature of the 9831A is the error message. If you make a mistake, such as mistyping a statement while programming, the word ERROR, a specified error number, and the line number in which the error occurred will appear on the light-emitting diode (LED) display. Each error message is also accompanied by a "beep".

Built into the 9831A is a 2-track tape cartridge drive. The storage medium, a high-density rapid-access tape cartridge, records up to 250,000 bytes of information and also features automatic verification after recording.

Other physical features of the 9831A include a 32-character LED display, a typewriter-like keyboard with upper- and lower-case alphanumerics, 3 input/output (I/O) slots for peripheral interfaces, and 4 read-only memory (ROM) slots.

The 9831A comes standard with 7162 bytes of read/write memory all of which are available for your use because the BASIC language interpreter is hardwired into the machine. In addition, the memory can be expanded up to 31,738 bytes.

Because of the previously mentioned features, the 9831A also allows flexible system expansion to meet your application's needs. You can choose from a variety of peripherals and software packs to configure a truly personalized desktop computing system.

Features

- Alphanumeric keyboard
- 32-character LED display
- Built-in tape cartridge drive
- Hardwired BASIC language
- Add-on ROM memory
- Expandable read/write memory
- Up to 12 significant digits
- Full trigonometric capability
- Boolean algebraic capability
- 12-24 Special Function keys (shift included)
- Broad range of peripherals

Specifications

STORAGE

Dynamic range:	+10 ⁹⁹ to +10 ⁹⁹ , 0, -10 ⁹⁹ to -10 ⁹⁹
9831A read/write memory:	7162 bytes
Opt. 001:	15,354 bytes
Opt. 002:	23,546 bytes
Opt. 003:	31,738 bytes
Cartridge memory:	250,000 bytes (varies with file length)
Typical access rate:	14,300 bytes/s
Average access time:	6 s
Search speed (bidirectional):	2286 mm/s (90 in./s)
Read/write speed:	559 mm/s (22 in./s)
Transfer rate:	2750 bytes/s
Typical rewind time:	19 s (end to end)
Typical erase time:	40 s (1 entire track)
Tape length:	42.67 m (140 ft) – 1 track
Number of tracks:	2
Error check:	check sum
File length:	programmable

BUILT-IN STATEMENTS, COMMANDS, AND FUNCTIONS

The following is an exhaustive list of statements, commands, and functions contained in the 9831A Desktop Computer.

Statements

BEEP (audible tone)
CFLAG (clears flag)
COM (common)
DATA (data-with READ)
DEF FN (define function)
DEG (degree units)
DIM (dimension)
DISP (display)
END (end program)
ENTER (enter)
FIND (find file)
FIXED N (fixed point)
FLOAT N (floating point)
FOR (part of FOR-NEXT)
FORMAT (format)
GRAD (grad units)
GOSUB (go subroutine-part of
GOSUB-RETURN)
GOTO (go to line number)
IF (part of IF-THEN)
INPUT (input)
LET (assignment)
LINK (link program)
LOAD (load program)
LOAD BIN (load binary program)
LOAD DATA (load data)
LOAD KEY (load Special Function key)
LOAD MEM (load memory)
MARK (mark files)
MERGE (merge programs)
NEXT (part of FOR-NEXT)
OUTPUT (output)
PRINT (print)
RAD (radian units)
READ (read data-with DATA)
REM (remark)
RESTORE (restore pointer-
with DATA)
RETURN (return-from GOSUB or DEF FN)
REWIND (rewind tape)
SEARCH (search by column, row)
SERROR (set error recovery)
SFLAG (set flag)
SORT (sort by column, row)
STANDARD (set standard number
format)
STDPR (set standard printer select code)
STOP (stop program)
STORE (store program)
STORE DATA (store data)
STORE KEY (store Special Function key)
STORE MEM (store memory)
STRING (string)
TAPE (set tape drive select code)
TRANSFER (transfer string to data or
transfer data to string)
VERIFY (verify)
WAIT (wait)
WRITE (write)

Commands

AUTO (automatic line numbering)
CONT (continue program)
DEL (delete line or lines)
ERASE (erase memory)

FETCH (fetch line)
LIST (list program)
REN (renumber)
RUN (run program)
SEC (secure program memory)
TLIST (tape list)
TRACE (trace)

Functions

ABS (absolute value)
ATN (arctangent)
BIAND (binary AND)
COS (cosine)
EXP (exponential)
FLAG (test flag)
INOR (inclusive OR)
INT (integer)
LEN (length of string)
LGT (\log_{10} - common log)
LGT (\log_e - natural log)
POS (character position)
RBYTE (read byte)
RND (random number)
ROT (rotate - right)
SGN (sign)
SIN (sine)
SQR (square root)
TAN (tangent)
VAL (value of numerics in string)

Miscellaneous

PI ($\pi - 3.14159265$)
SPECIAL PRINT FUNCTIONS
LIN (line feed)
SPA (space)
TAB (tabulation)
WBYTE (write byte)

Relational Operators

= (equality)
< (less than)
or <> (inequality)
>= (greater than or equal to)
> (greater than)
<= (less than or equal to)

Logical Operators

AND (logical operator - compares 2 functions)
NOT (logical NOT)
OR (logical OR)

Average Execution Times

+	0.47 ms
-	0.52 ms
*	0.82 ms
/	2.1 ms
↑	14.8 ms
SQR	3.1 ms
SIN	13.8 ms
COS	14.4 ms
TAN	9.3 ms
LOG	6.5 ms
LGT	8.0 ms
EXP	7.2 ms

SIZE/WEIGHT

Height: 129,5 mm (5.1 in.)
Depth: 495,3 mm (19.5 in.)
Width: 383,5 mm (15.1 in.)
Net weight: 11,8 kg (26 lb)
Shipping weight: 19,5 kg (43 lb)
Cube: 0,13 m³ (4.47 ft³)

POWER REQUIREMENTS

Source: 100 V +5%, -10% }
120 V +5%, -10% } switch
220 V +5%, -10% } selectable
240 V +5%, -10% }
Line frequency: 48-66 Hz
Power consumption: 100 V @ 1.7 A
120 V @ 1.5 A
220 V @ 0.8 A
240 V @ 0.75 A

ENVIRONMENTAL RANGE

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

Accessories Supplied

Item	HP Part No.
Operator's Manual	09831-90000
ac power cord	depends on origin of sale
System Test Booklet	09831-90031
BASIC Reference Book	09831-90010
Test cartridge	09831-90035
Peripheral Control Manual	09831-90020
Blank tape cartridge	9162-0061
Utility pack	09831-10000
Dust cover	9222-0495
Tape head cleaner	8500-1251
Special Function key overlays (5)	7120-4802
Spare fuses	
1A (SB)	2110-0001
2A (SB)	2110-0002
Spare fuse cap	2110-0544

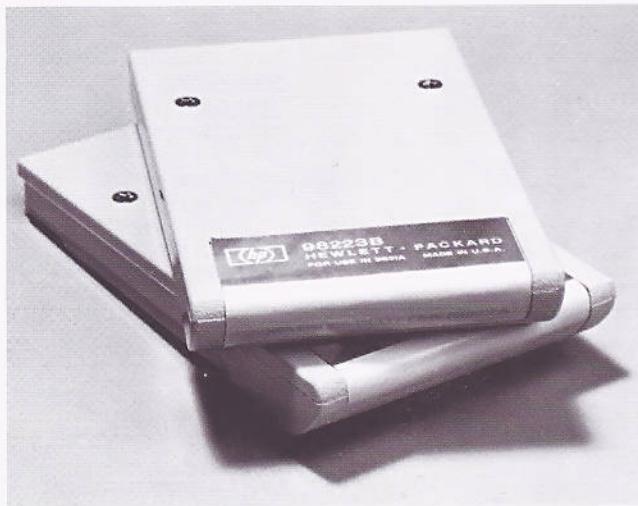
Option Available

Item	HP Part No.
Interface card - transfers information between 9831A and 9830A/B Desktop Computers	98032A- Opt. 030

Accessories Available

Item	HP Part No.
Vinyl carrying case	98025A
Blank data cartridge	9162-0061
Software binder	9282-0563

9831A Read-Only Memories (ROMs)



To increase its fundamental capabilities, specific commands have been built into the 9831A, as previously mentioned. But, to extend language capability and peripheral control even further, 2 plug-in ROMs have been designed for use with the 9831A—the 98218A Flexible Disk ROM and the 98223A/B Matrix/Plotter ROM.

The 98218A ROM contains statements and functions to fully regulate the 9885M Flexible Disk Drive. The 98223A/B ROM provides statements for matrix and array operations and for graphic output.

The A version of the 98223 contains statements necessary to control the 9862A Plotter, whereas the B version of the 98223 includes statements for the 9872A Plotter.

Specifications

Both of the 98218A and 98223A/B ROMs conform to the following physical specifications.

POWER

Supplied by the 9831A

TEMPERATURE

5°C to 40°C ambient
≤ 80% ambient humidity

SIZE/WEIGHT

Height:	15,5 mm (0.61 in.)
Width:	71,6 mm (2.82 in.)
Length:	115,8 mm (4.56 in.)
Weight:	567 g (20 oz)

LANGUAGE/PERIPHERAL ROMs



Flexible Disk ROM (98218A)

FLEXIBLE DISK OPERATIONS

The HP 9885M Flexible Disk Drive provides you with a convenient, reliable, and low-cost method of transferring programs to and from the 9831A at high speeds.

Available with the 9885M is the Opt. 031 package which includes the appropriate interface cable and the 98218A Flexible Disk ROM. The 98218, using only 100 bytes of the 9831A's read/write memory, adds the statements and commands necessary to control the 9885M.

The following is a complete listing of the statements and functions contained in this ROM and also includes a brief description of each mnemonic.

Statements

ASSIGN	- Assigns file name to any file position regardless of any previous FILES statement.
CAT	- Catalogs contents of disk.
CERROR	- Clears effect of SERROR.
CHAIN	- Links a previously stored program without changing variables.
DBYTE	- Converts expression to ASCII equivalent character and stores it in specified string.
DCOPY	- Duplicates the contents of one file into another.
DEXP	- Converts expression to a 4-digit result with leading zeros.
DGET	- Gets a source program from a data file.
DREN	- Renames a file.
DSAVE	- Saves a program as source in a set of strings.
FILES	- Declares which files are to be used.
GET	- Loads a program from a disk.
GET BIN	- Loads a binary program from a disk.
GET KEY	- Loads user-definable keys from a disk.
GET MEM	- Loads memory file from a disk.
IF END #	- Provides easy end of file routines.
KILL	- Erases file from disk.
MAT CON	- Sets array(s) to value of expression.
MAT PRINT #	- Prints an entire matrix onto a record or file.
MAT READ #	- Reads an entire matrix from a record or file.
MAT ZERO	- Optionally redimensions array(s), then fills with zeros.
OPEN	- Creates data files.
PRINT #	- Permits sequential and random data access.
PRINT	-
LABEL	- Permits labeling of drive.
READ #	- Permits sequential and random data access.
READ	-
LABEL	- Reads label from disk.
REDIM	- Changes working dimensions of an array.
RESAVE	- Saves current program in existing program file.
SAVE	- Stores current program in new file.
SAVE KEY	- Stores contents of Special Function keys in a file.
SAVE MEM	- Stores entire contents of memory in a file.
UCASE	- Converts letters in specified string or sub-string to upper case.
UNIT	- Provides access to different drives.
WCTL	- Outputs control bits to a peripheral.

Functions

AVAIL	- Returns total number of available records on specified drive.
FIL	- Returns size of largest file that may be OPENed on specified drive.
FRAC	- Returns fractional part of value of expression.
LEX	- Does a lexical comparison of 2 strings by comparing ASCII value of their characters.
NUM	- Returns ASCII value of the first character of specified string of substring.
REC	- Returns value of record pointer for file.
SIZE	- Returns size in records of file.
SLEN	- Returns byte count if next item on file is a string.
STD	- Returns standard printer select code.
Typ	- Identifies the type of next item in a file.
UPOS	- Compares upper case versions of strings.
WRD	- Returns current value of word pointer for file.



Matrix/Plotter ROM (98223A/B)

Matrix operations are valuable in such applications as solving a set of simultaneous equations and performing determinant operations or any other applications dealing with large quantities of numbers. Plotter commands allow you to easily output results in graphic form on the 9862A and 9872A Plotters.

The matrix inversion technique, incorporated into this ROM, 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.

The following mnemonic lists are separated into matrix statements and plotter statements. The plotter statements are further classified by those used with the 9862A and the 9872A and those used exclusively with the 9872A. It should be noted that the A version of the ROM will not drive the 9872A, and the B version will not drive the 9862A.

MATRIX OPERATIONS

Matrix Statements

CON	- Initializes an array to all 1's.
DET	- Calculates determinant of a square matrix.
IDN	- Initializes a square array to an identity array.
INV	- Matrix inversion.
MAT A=B	- Assigns B to A.
MAT A=B±C	- Performs indicated addition or subtraction.
MAT A=B*C	- Performs indicated multiplication.

MAT A=

(EXP) *B	- Performs indicated scalar multiply.
MAT PRINT	- Prints an entire matrix row by row.
MAT READ	- Reads an entire matrix from data statements.
REDIM	- Changes working dimensions of a matrix.
TRN	- Matrix transposition.
ZER	- Initializes an array to all zeros.

Miscellaneous

XREF	- Provides cross-reference list of all variables used in program, with respective line numbers.
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PLOTTER OPERATIONS

Plotter Statements

(for both the 98223A/B ROMs)

CPLOT	- Allows plotted characters to be centered over a particular point by moving pen in units of "character size".
IPLOT	- Moves pen in X-direction and Y-direction by amounts specified by values of X and Y.
LABEL	- Prints on plotter using specified format.
LETTER	- Sets starting point, size, and direction for lettering.
OFFSET	- Temporarily shifts origin to new location.
PEN	- Raises pen without moving it to a new position.
PLOT	- Moves pen to point X, Y; pen may be raised or lowered before or after pen movement.
STDPLT	- Sets select code of plotter.
SCALE	- Scales plotting area to user units and establishes origin(0,0) of coordinate system.
XAXIS	- Draws an X axis through point Y, with tic marks at user-defined intervals.
YAXIS	- Similar to XAXIS.

Plotter Statements (for the 98223B only)

DIG	- Turns on plotter's enter light that signals you to position pen tip; lets you read X, Y position of pen tip in user-defined units.
LINE	- Sets type-of-line mode for use with PLOT, IPLOT, XAXIS, and YAXIS; pattern identification selects 1 of 7 predefined line types.
MAP	- Allows you to output to plotter absolute coordinates of P_1 and P_2 .
SLANT	- Allows automatic slant of characters for emphasis.
SPEN	- Allows pen selection.
VEL	- Sets pen speed from 10 to 360 mm/s (1.4 in./s).
WINDOW	- Restricts pen motion to specified rectangular area.

Supplementary Information

PERIPHERALS AVAILABLE

Hewlett-Packard offers these peripherals for use with the 9831A. To determine which device or card to order, consult the following list. The only peripherals requiring plug-in ROMs are the 9862A Plotter and the 9885M Flexible Disk Drive.

Description	To purchase peripheral order:	If peripheral owned, order interface card number:
Plotter †	9862A, Opt. 031	98032A, ‡Opt. 162
Paper Tape Reader	9863A, Opt. 031	98032A, Opt. 163
Digitizer	9864A, Opt. 031	98032A, Opt. 164
Thermal Line Printer	9866B, Opt. 031	98032A, Opt. 166
Hopper Card Reader	9869A, Opt. 031	98032A, Opt. 169
Character Impact Printer	9871A, Opt. 031	98032A, Opt. 171
Character Impact Printer (HP-IB)	9871A, Opt. 001	98034A § (also requires the 98034A Interface)
Plotter **	9872A, Opt. 031	98034A (also requires the 98034A Interface)
External Tape Memory	9877A, Opt. 031	98032A, Opt. 177
I/O Expander	9878A, Opt. 031	98032A, Opt. 178
Line Printer	9881A, Opt. 031	98032A, Opt. 181
High Speed Tape Reader	9883A, Opt. 031	98032A, Opt. 184
Tape Punch	9884A, Opt. 031	98032A, Opt. 184
Flexible Disk Drive	9885M, Opt. 031 (the 98218A ROM and 98032A, Opt. 185 interface are both included in this package)	

† The 98223A Matrix/Plotter ROM is required for driving the 9862A Plotter.

‡ Standard 98032A Interface is shipped with a 4.5-m (15-ft) open-ended cable.

§ The 98034A is shipped with a 4-m (13-ft) cable terminated with a standard HP-IB connector with metric fasteners.

** The 98223B Matrix/Plotter ROM is highly recommended for use with the 9872A Plotter.

9831A SOFTWARE

Hewlett-Packard offers you a wide range of software packs for both commercial and scientific applications. A list of descriptions and prices may be obtained by contacting your local HP Sales and Service Office.

PURCHASE PLANS

Contact one of the Hewlett-Packard worldwide sales and service offices for specific prices and plans in your area.

