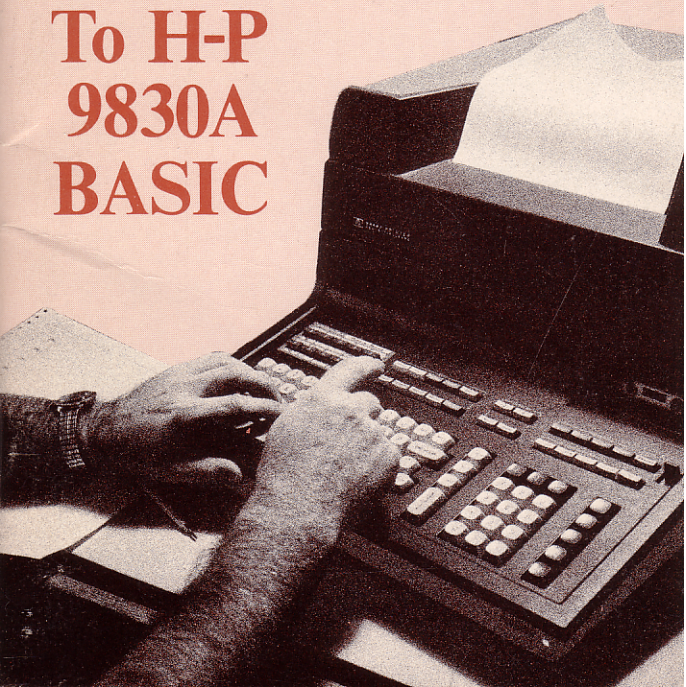
HEWLETT hp PACKARD

Quick Reference To H-P 9830A BASIC



Quick Reference To H-P 9830A BASIC

The BASIC Programming Information in this booklet serves as a handy reference for users of the Hewlett-Packard 9830A Calculator. Use it as a pocket reference or keep it in a place near your calculator.

Turn-On

The 9830 is ready to use when the power is turned ON. This means that all operations available can be executed with no further start-up procedure required.

Memory Size

The total available READ/WRITE memory in the basic calculator is 1760 (16-bit, 2-byte) words. If your calculator has additional memory, consult your 9830A Operating and Programming Manual for the actual READ/WRITE memory available.

To determine the number of words used by a program, subtract the remaining memory from the total memory. (The number of words remaining in memory is displayed when the LIST 9999 command is executed.)

Range

The calculating range of the Model 30 is $-9.99999999999 \times 10^{99}$ through $9.99999999999 \times 10^{99}$ in 1×10^{-99} increments.

Precision

Four words of memory are allocated per data element for full-precision (12-digit) accuracy. Although all calculations are performed with full-precision, split-precision or integer-precision, accuracy can be used when it is necessary to conserve memory storage.

Precision	Words Per Data Element	Accuracy	Range	Indicator In DIM or COM Statement
FULL	4	12 digits	±9.99999999999E±99	None
SPLIT	2	6 digits	±9.99999E±63	S
INTEGER	1	integer	±32767	I

Line Length

Even though only 32 characters can be displayed at any one time, up to 80 characters can be keyed in. After the 72nd character is keyed in, a soft beep informs the user that only eight more characters can be keyed in.

Error Codes

When an error occurs, the calculator makes a soft beeping sound and an error code appears on the display. The error codes are listed on a slide-out card underneath the 9830.

Maintenance

The tape head should be cleaned after every eight hours of cassette operations. Also, the tape cassette transport door should be kept closed whenever possible to prevent accumulation of excess dust.

The fan filter on the rear panel of the calculator should normally be cleaned about every three months.

For more information about cleaning the tape head or the fan filter, consult your 9830A Operating and Programming Manual.

ROMs

Each optional read-only-memory (ROM) is available either as an internal modification to the calculator or as a plug-in block. The plug-in ROM s are installed by the user behind the ROM door on the left side of the calculator. When the internal ROM s are installed, a decal showing the ROM option number is attached to the inside of the ROM door. Once they are installed, internal and plug-in ROM s operate identically.

Legend

Syntax definitions, followed by a code from the table below, require the specified ROM. No additional ROMs are required for the other syntax.

API	Advanced Programming I ROM
APII	Advanced Programming II ROM
BB	Batch Basic ROM
DC1	Data Comm. 1 (Interface Control) ROM
DC2	Data Comm. 2 (Binary Synchronous) ROM
DC3	Data Comm. 3 (Interactive) ROM
IO	Extended I/O ROM
MM	Mass Memory ROM
MO	Matrix Operations ROM
PC	Plotter Control ROM
SV	String Variables ROM
T1	Terminal I ROM

Basic Syntax Conventions

brackets [ ] - items enclosed within brackets are optional.

coloring - colored items must appear as shown.

array name - the letter used to define the array (A through Z).

character - a letter, a number or a symbol.

constant - a number within the range of the calculator.

expression - a constant [like 16.4], a variable [like B or D(6)] or an expression [like 8*A↑2 or A=6].

file - the file number; can be a constant, a variable, or an expression.

file name - the name used to define a specific file, containing up to six characters, with the following restrictions:

- no quotation marks (")
- no commas (,)
- no blanks (i.e., spaces)
- no single asterisk (*).

file number - the number assigned to a file by a FILES statement. It can be any integer (constant, variable or expression) from 1-10.

1st line number - the first line number designated.

2nd line number - the second line number designated; it can appear only if the first line number is designated.

length - the files' lengths; can be a constant, variable, or expression.

letter - an alphabetic character from A through Z.

line number - a positive integer from 1 through 9999. When the line number parameter is optional, the statement can be executed either from the keyboard or from a program. Without a line number, the statement can be executed only from the keyboard. Attempting to program such a statement generally results in ERROR 5. With a line number, the statement can be executed only from a program. Attempting to execute such a statement from the keyboard generally results in ERROR 3. The line number must be an integer; no variable or expression is allowed.

list - the characters designated in a PRINT or READ statement. This parameter can consist of alphanumeric or string variables.

local variable - a simple variable defined only in relation to the function.

n - an integer.

number of files - the number of files; can be a constant, variable, or expression.

number of records - the total number of records in a file.

protection code - the combination of characters used to protect a file. Up to six characters, but no quotation marks (") are allowed.

record number - the number that represents the location of a record in a specific file. This number can be any integer which does not exceed the number of records in the associated file.

return variable - the variable in an ASSIGN statement used to determine a file's status. It can be a simple or array variable.

select code - a number from 1 through 15. May be a variable, used to specify a peripheral instrument.

text - a series of characters enclosed within quotation marks.

variable - a simple variable [like B or B7] or an array variable [like F(9)].

These footnotes are referenced throughout this guide.

[1]This parameter can be a string variable. When a string variable is used, the quotation marks (") surrounding it must be removed.

[2]This is a function. As such, it can be used in an expression.

Any peripheral cassette memory can be accessed by specifying a '#' and 'select code' immediately following the tape cassette command. For example, to rewind the tape in the peripheral cassette memory whose select code is 5, execute: Rewind #5.

a

ABS expression[2]
Determines the absolute value of the expression.

[line number] ACKCLR
Clears the odd/even block check accumulators in the TWRITE and TREAD statements. DC2

expression AND expression
Compares two expressions. The result is true only if both expressions are true.

[line number] ASSIGN "file name[1]", file number, return variable [,"protection code[1]"]
Assigns a file name to a position in the previous FILES statement. MM

ATN expression[2]
Determines the arctangent of an expression.

AUTO#
Numbers line numbers consecutively from number 10, in intervals of 10.

AUTO# line number [, spacing interval]
Numbers line numbers consecutively from the line number specified, in intervals of the specified spacing interval. If the spacing interval is not specified, a spacing interval of 10 is assumed.

b

[line number] BATCH select code
Switches the calculator to the BATCH mode. BB

[line number] BEEP
Allows an audible signal to be output by the calculator at specified places in the program. API, APII

[line number] BSCOFF
Turns off the Binary Synchronous line protocol. DC2

[line number] BSCON entry point
Puts the 9830A Calculator in Binary Synchronous mode, and defines the data link entry point. DC2

[line number] BTIMR expression
Sets a maximum time limit for the TREAD statement to start receiving data in Binary Synchronous mode. DC2

[line number] BWRITE (select code, code type) list
Sends binary data (transparent text) while in Binary Synchronous mode. DC2

C

[line number] CARD select code
Switches the calculator into the CARD mode, enabling it to read educational basic cards. BB

CAT
Lists information about every file on the platter. MM

[line number] CFLAG expression
Clears any of flags 0 through 15 to the value 0 (false). APII

[line number] CHAIN "file name1" [1st line number [, 2nd line number]]
Loads a program from the platter to the calculator, retaining current values of variables. MM

[line number] CMD "address1" [[, message], "address1"]...
Sends commands to the -hp- 59405A HP-IB Interface Card. IO

line number COM variable [, variable ..., variable]
Reserves memory for the specified variables and allows data to be transferred from one program to another. Must be both the first statement entered and the lowest numbered statement.

COMP [beginning line number [, ending line number]]
Performs syntax checking on program lines which are stored in the calculator memory, preparing programs for execution. DC3, T1

= CON [(expression [, expression])]
Sets all elements of the matrix equal to 0. A new working size can be specified. MO

CONT
Continues a program that was previously halted; if the program was halted by STOP, the program continues from the line number where it was halted. Otherwise, it continues at the lowest line in memory.

CONT [line number]
Continues execution of a program starting at the line number specified.

[line number] COPY OFF
Cancels the previously executed COPY ON command. BB

COS expression²
Determines the cosine of an expression.

[line number] CPLOT no. of char. spaces wide, no. of char. spaces high
Raises pen and moves it horizontally and vertically by the number of character spaces specified. PC

d

line number DATA constant [, constant..., constant]
Specifies data for READ statement variables.

DAVTP
Restructures availability table. MM

[line number] DBYTE variable, string name
Converts value of specified variable to its binary equivalent character. MM

[line number] DCOPY "1st file name" [, unit number] TO "2nd file name" [, unit number]
Duplicates contents of one data file into another. MM

line number DEF FN letter (local variable) = expression
line number DEF FN letter (local variable)
Defines a function in one line (first syntax) or in several lines (second syntax); in the latter case, a RETURN statement is also needed.

[line number] DEG
Calculates angles in degrees. If not specified, RAD is assumed.

DEL [1st line number [, 2nd line number]]
Erases the lines from memory between first specified line number and second specified line number. If a second line number is not specified, all program lines, following and including the first line are deleted. If no line number parameter is specified, all lines in memory are erased.

DET (matrix name)[2]
Calculates the determinant of a square matrix. MO

[line number] DEXP variable, string name
Converts value of specified variable into a four-digit character string with leading zeros. MM

DFC "any combination of characters" (local variable)
[line number] DFC "any combination of characters" (local variable) = expression
Allows functions to be called by name, so there is no limit to the number of functions that can be in a program; similar to DEF FN statement. API

DFDUMP "file name"
Stores specified data file presently on the platter to the calculator internal cassette(s). MM

DFLOAD "file name"
Loads data presently on calculator internal cassette(s) to a specific file on the platter. MM

[line number] DGET "file name" [0]
Loads source (non-compiled) program into the calculator and checks for syntax errors. MM

[line number] DIAL select code, telephone number [, EON]
Automatically dials the telephone number at the select code specified. DIAL requires an Automatic Calling Unit. DC1

line number DIM variables [$] [, variable [$]. . .]
Reserves memory for the specified variables when the calculator is initialized. Including the optional $ sign reserves storage space for strings longer than one character. SV

line number DIM variable [I] [S] [value ..., value]...
Reserves memory for the specified variables (in integer- or split-precision).

[line number] DISP [any combination of text and expressions]
Allows text and values to be output on the 9830A dis-

play; follows the same rules as the PRINT statement.

[line number] DREN "old file name" TO "new file name" [, "protection code"]
Changes the name of any file. MM

[line number] DUP select code of peripheral cassette [, no. of files to be duplicated]
Duplicates the information on the internal cassette onto a peripheral cassette. When no number of files is specified, the entire tape is duplicated. API

e

[line number] ECHOFF
Turns off echo suppression at the calculator. Turns off a previous ECHON statement. DC3

[line number] ECHON
Turns on echo suppression at the calculator. This causes calculator to wait till echo is received before next character is transmitted. DC3

[line number] END
Terminates program execution and resets the program line counter to the lowest numbered statement in memory. Note: the END key is not the same as the END statement.

ENTER (select code, format or * [, conversion table]) list [FOR parameter]
Allows data to be entered from an external device. Code conversion is optional. IO

[line number] EOL code [, number of characters, character code]
Defines the end of line character(s) which is sent when the SAVE key f_8, the TRANSMIT key, f_9, or the LIST# command is used. DC3

[line number] EOT expression
Sets the end of transmission character to the octal number specified in "expression". DC1

EXIT
Cancels text mode or terminal mode operation and returns the calculator to keyboard mode. DC3, T1

EXP expression^2
Raises the constant, e, to the power of the computed expression.

f

FETCH [line number]
Brings the specified program line to the display. If no line number is specified, the lowest numbered line in memory is displayed.

FETCH special function key
Brings the first line of the specified SF key to the display. Establishes key mode.

[line number] FILES file name or * [, file name or *] [,...]
Declares which files are to be used. MM

[line number] FIND file
Locates a specific tape file.

[line number] FIXED n
Specifies numerical output form for PRINT and DISP statements; if not specified, STANDARD is assumed.

FLAG expression[2]
Allows testing of flags 0 through 15. A 0 indicates false and a 1 indicates true. API

[line number] FLOAT n
Specifies numerical output form for PRINT and DISP statements; if not specified, STANDARD is assumed.

line number FOR simple variable = expression TO expression [STEP expression]
Executes the program lines between FOR and the corresponding NEXT statement a designated number of times; each time the loop is executed, the simple variable is incremented by 1, unless STEP is specified. When specified, STEP increments the simple variable by the value of the STEP expression.

line number FORMAT any combination of text or other specifications
Gives output specifications to the WRITE statement that referenced it; specifications can be: Fw.d (for fixed point format), Ew.d (for exponential format), X (for a character space), / (for a carriage return-line feed), B (for binary); any specification can be repeated (e.g., 6Fw.d); specifications must be separated by commas.

g

[line number] GET "file name ¹" [1st line number [, 2nd line number]]
Loads a program or portions of a program from the platter to the calculator. MM

[line number] GET KEY "file name¹"
Loads Special Function key definitions from a specified file of the platter to the calculator Special Function keys. MM

line number GOSUB line number
Begins executing the subroutine at the specified line number; must have corresponding RETURN statement.

line number GOSUB expression OF line number [, line number ..., line number]
Begins executing the subroutine at the first line number if the expression is rounded to 1, at the second line number if the expression is rounded to 2, etc.; must have corresponding RETURN statment.

line number GOTO line number
Transfers program execution to the specified line number.

line number GOTO expression OF line number [, line number ..., line number]
Transfers program execution to the first line number if the expression is rounded to 1, to the second line number if the expression is rounded to 2, etc.

[line number] GRAD
Calculates angles in grads. If not specified, RAD is assumed.

h

[line number] HIGHCASE
Cancels a previously executed LOWCASE command. API

i

= IDN [expression, expression]
Establishes an identity matrix — a square matrix containing all zeros with a principal diagonal of ones. MO

line number IF expression THEN line number
Expression is logically evaluated; if it is evaluated as 'true', program execution is transferred to the specified line number.

line number IF END# file number THEN line number
Sets up an exit procedure which branches the program to a specific line number when an end of file or end of record condition is encountered. MM

line number INPUT variable [$] [, variable [$] ..., variable [$]]
Allows values to be assigned to the variables, from the 9830A keyboard, during program execution, when '?' appears on the display.

INT expression[2]
Gives the expression an integer value less than or equal to the value of the expression.

= INV (Matrix name)
Inverts a square matrix. MO

[line number] IPLOT Xvalue, Yvalue [, pen control]
Moves pen in X-direction and in Y-direction by the amounts specified by the values of Xvalue and Yvalue. (For 'pen control', see PLOT.) PC

k

[line number] KILL "file name[1]" [, "protection code[1]"]
Erases the named file from the platter. MM

l

[line number] LABEL (line number or * [, char. ht. height/width ratio, angle of rotation [, distortion corr.]]) [list]
Establishes size of plotter characters and direction of printout; prints contents of optional list (if included) according to FORMAT statement (if referenced). PC

LEN (string name)[2]
Obtains the length of a string or substring. SV

[line number] LET variable = expression
[line number] variable = expression
Assignment statement; assigns a value to a variable.

[line number] LETTER
Establishes typewriter mode for the plotter. Prints characters of each key pressed. STOP terminates mode. PC

LGT expression²
Determines the logarithm of a positive expression to base 10.

[line number] LINK [file]
[line number] LINK file [, 1st line number [, 2nd line number]]
Works like LOAD but, in addition, retains variables currently in memory.

LIST [# select code] [1st line number [,2nd line number]]
Prints all program lines between the two line numbers specified. If no line number parameters are specified, all program lines currently in calculator memory are printed.

LISTX [# select code] [, 1st line number [, 2nd line number]]
Lists text without line numbers. DC3, T1

[line number] LKEY select code
Disables the RKEY statement and returns calculator keyboard to local control. DC1

[line number] LOAD [file]
[line number] LOAD file [, 1st line number [, 2nd line number]]
Reproduces, into memory, assembly language programs that are on tape.

[line number]LOAD BIN file
Reproduces, into memory, binary programs that are on tape.

[line number] LOAD DATA file [, array]
Reproduces, into memory, data that is on tape via STORE DATA.

[line number] LOAD KEY file
Reproduces, into the Special Function Keys, information that is on tape via STORE KEY.

LOG expression²
Determines the natural logarithm of a positive expression.

[line number] LOWCASE
Establishes a LOWCASE mode in which the printing device has both low-case and high-case capabilities. The 9830A SHIFT key acts as a standard typewriter SHIFT key. API

[line number] LSTOP select code
Returns STOP control to the local 9830A calculator terminal. DC1

m

[line number] MARK number of files, length
Establishes tape files with specified lengths.

[line number] MAT matrix name = matrix name +, – or * matrix name
Performs addition, subtraction or multiplication on the two specified matrices. MO

[line number] MAT (matrix name) = (expression) * (matrix name)
Performs scalar multiplication on the specified matrix. MO

[line number] MAT PRINT matrix name [, matrix name]...
Prints an entire matrix row by row. MO

[line number] MAT PRINT# file number [, record number]; list of matrix variables
Prints an entire matrix onto a specified record or file. MM

[line number] MAT READ matrix name [(expression [, expression])]...
Causes an entire matrix to be read. MO

[line number] MAT READ# file number [, record number]; list of matrix variables
Reads a matrix from a specified record or file. MM

[line number] MERGE [file]
[line number] MERGE file [, 1st line number [, 2nd line number]]
Inserts, between program lines in memory, program lines that are on tape via STORE.

n

line number NEXT simple variable
Marks the end of the corresponding FOR loop.

NORMAL
Cancels a previously executed TRACE command.

NOT expression
Changes the logic value of an expression.

o

OCT octal number[2]
Converts base 8 (octal) numbers to base 10 (decimal) numbers. API

OF
See GOSUB and GOTO statements.

[line number] OFFSET Xvalue, Yvalue
Redefines specified point (X,Y) to be the temporary origin (0,0) of the coordinate system. PC

[line number] OPEN "file name[1]", number of records
Creates a data file with a specified number of physical records and assigns it a name. MM

expression OR expression
Compares two expressions. The result is true if one or both of the expressions is true.

[line number] OUTPUT (select code or string name, format [, conversion table]) list
Sends data or coded commands to an external device. Conversion from ASCII to a non-ASCII code may be effected by the use of the optional conversion table parameter. IO

p

[line number] PAGE
Advances the peripheral printing device 10 lines. BB

[line number] PARITY expression
Permits the calculator to match the time-share system requirements for parity and for line-terminating characters. T1

[line number] PEN
Raises pen of the plotter. PC

[line number] PLOT Xvalue, Yvalue [, pen control]
Moves pen to specified point (X,Y).
Plotter pen control:

- no parameters - leaves pen down or lowers pen after movement
- positive - pen control before movement
- negative - pen control after movement
- odd - raises pen
- even - lowers pen
- zero - pen status unchanged. PC

POS (string name, string)²
Determines the position of a substring within a string. SV

[line number] PRINT [any combination of text and expressions]
Allows text and values to be output on the primary printer; successive expressions must be separated either by commas (for maximum spacing between successive outputs) or by semicoloms (for minimum spacing between successive outputs); if no parameters follow PRINT, the printer performs a carriage return-line feed; parameters can also include: TAB expression - so that the following parameter is output beginning at the absolute character position (from 0 through 71) specified by TAB.

[line number] (Random) PRINT# file number, record number; list [, END]
[line number] PRINT# file number, record number [; END]
Prints data on a file from the beginning of a specified physical record. MM

[line number] (Serial) PRINT# file number; list [, END]

[line number] PRINT# file number; END
Prints data on a file after the last item previously read or printed or at the beginning of the file. MM

[line number] PRM expression
Defines the 9830A Calculator terminal as a primary (PRM 1) or secondary (PRM 0) terminal. DC2

PRO "file name[1]", "protection code"
Assigns a protection code to a specific file. MM

PTA# select code
PTAPE# select code
Allows the calculator to read in program statements from a specified input device, ASCII character by ASCII character.

r

[line number] RAD
Calculates angles in radians. If not specified, RAD is assumed.

RBYTE select code[2]
Reads one byte of data from the device specified, regardless of the data structure. IO

line number READ variable [, variable..., variable]
Reads, from the DATA statement (beginning at the current data pointer position), values for the specified variables.

[line number] (Random) READ# file number, record number [, list]
Reads data from a specified record in a file. MM

[line number] (Serial) READ# file number; list
Reads data from a specified file, starting after the last item printed or read. MM

line number REDIM (expression [, expression])
Specifies a new working size for a matrix. MO

line number REM [any combination of characters]
Inserts non-executable remarks in a program.

REN
Renumbers program lines from line number 10, in intervals of 10.

REN line number [, spacing interval]
Renumbers program lines from the line number by the specified interval. If the spacing interval is not specified, a spacing interval of 10 is assumed.

[line number] RESTORE [line number]
Resets data pointer (see READ and DATA) to the first constant in the lowest numbered DATA statement if the line number is not specified; or resets the data pointer to the first constant in the DATA statement with the specified line number.

line number RETURN [expression]
With no expression specified, RETURN is the subroutine exit, transferring program execution to the line following the GOSUB statement; if an expression is specified, RETURN is the multiple-line function exit, transferring the value of the function to the statement that called it (see DEF FN).

[line number] REWIND
Rewinds the tape to clear-leader.

[line number] RKEY select code
Allows the calculator keyboard to be accessed from a remote calculator or computer in asynchronous mode. DC1

RND expression[2]
Gives a random number between 0-1; the express ion is a dummy argument.

ROT (expression 1, expression 2)[2]
Performs right rotation on the binary equivalent of expression 1, the number of positions represented by expression 2. IO

[line number] RSTOP select code
Makes it possible to stop the calculator from a remote calculator or computer at the select code specified when the stop code is received. DC1

[line number] RTIM expression
Sets a time limit for a TREAD statement to start receiving data in non-Binary Synchronous mode. DC1

RUN
Runs a program from the lowest numbered line in memory.

RUN [line number]
Runs a program starting at the specified line number.

RVI expression[2]
Used after a TWRITE to determine if a reverse interrupt code was received. Its value is 0 unless an RVI is received, then it is 1. Expression is a dummy variable. DC2

S

[line number] SAVE "file name[1]" [, 1st line number [, 2nd line number]]
Stores an entire program or parts of it onto a specified file of the platter. MM

[line number] SAVE KEY "file name[1]"
Prints Special Function key definitions onto a specified file of the platter. MM

[line number] SCALE Xmin, Xmax, Ymin, Ymax
Scales plotting area to user units and establishes the origin (0,0) of the coordinate system. PC

SCRATCH
Erases all variables from memory and program lines from mainline memory.

SCRATCH A
Erases all memory; nearly the same as turning the calculator OFF and then ON again.

SCRATCH V
Erases the values of all variables.

SCRATCH K
Erases all Special Function keys.

SCRATCH special function Key
Erases the particular Special Function key that is pressed.

[line number] SCROLL L
[line number] SCROLL R
Displays up to 72-character line, character by character. API

[line number] SEARCH array name, R, row number, match variable, return variable
[line number] SEARCH array name, C, column number, match variable, return variable
Provides a fast way to locate a specific element in any row or column of a numeric array. APII

SEC [1st line number [, 2nd line number]]
Secures specified program lines. If no line number parameters are specified, all program lines in memory are secured.

line number SERROR variable, line number
Provides the calculator with automatic error recovery from most calculator errors. APII, DC2

[line number] SET select code, octal number
Defines the logic state of the data communications interface (11284A) at the select code specified. See Data Comm. manual for valid octal numbers. DC1

[line number] SFLAG expression
Used to set any of flags 0 through 15 to the value 1 (true). APII

SGN expression²
Returns a 1 if the expression is greater than zero; returns a 0 if the expression equals zero; returns a -1 if the expression is less than zero.

SIN expression²
Determines the sine of an expression.

[line number] SORT array name, R, row number [, secondary row numbers]
[line number] SORT array name, C, column number [, secondary column numbers]
Numeric arrays are sorted quickly by row or by column in ascending order. Using the String Variables ROM and the TRANSFER statement, strings can be sorted.

SPA expression²
Advances printing device carriage the specified number of spaces. IO

SQR expression²
Computes the square root of any non-negative expression, which is greater than or equal to zero.

[line number] STANDARD
Specifies numerical output form for PRINT and DISP statements.

STAT select code
Returns a four-bit code of operational status (on, off, wait, etc.). IO

STEP
See FOR statement.

[line number] STOP
Terminates program execution but, unlike END, it retains the current position of the program line counter.

[line number] STORE [file [, 1st line number[, 2nd line number]]]
Reproduces, onto tape, the program that is in memory.

[line number] STORE DATA file [, array]
Reproduces, onto tape, data that is in memory.

[line number] STORE KEY file
Reproduces, onto tape, information that is on the Special Function keys.

[line number] STRING numeric, string name, number of decimal places
Places numbers in a formatted string to output money values in any currency format. APII

[line number] SYNC select code, expression
Defines the octal sync code for synchronous transmission at the select code specified. DC1

[line number] SYSTEM select code, data transmission rate, bits per character, parity, transmission method, mode
Programs the data communications interface (11284A) for the correct data format between the calculator and the interface at the select code specified. DC1

t

TAN expression²
Determines the tangent of an expression.

[line number] TBATCH select code [, starting line number]
Allows free text or BASIC language program lines to be received by the calculator from the select code specified. Line numbers are automatically added if the starting line number is specified. DC3

TEOT expression²
Used after the TWRITE statement to test if an EOT, ETX, or ETB were encountered in the last data block received. Expression is a dummy variable. DC2
0 = ETX, EOT received
1 = ETB, EOT received
2 = ETX received, no EOT
3 = ETB received, no EOT

[line number] TERM [select code [, baud rate]]
Establishes the terminal, or free text, mode. Cancelled by the EXIT command. T1

TEXT
Places the 9830A in the free text mode. Non-BASIC language text can be stored and edited in text mode. The Special Function keys, f_5, f_6, f_8, and f_9, are redefined. (See Data Communications Manual for definition of keys). DC3

[line number] TOFF select code
Turns off "data terminal ready" signal to the modem at the select code specified to drop the communication line. DC1

[line number] TON select code
Turns on "data terminal ready" signal to the modem at the select code specified indicating that the calculator is ready for data. DC1

[line number] TLIST
Prints information about each tape file.

TRACE [1st line number [, 2nd line number]]
Establishes a calculator mode in which line numbers of a program are printed in the order in which they are accessed. By specifying line numbers, lines between the first and second line numbers are printed as they are accessed.

[line number] TRANSFER string name [subscripts] TO numeric array (subscripts)
[line number] TRANSFER numeric array (subscripts) TO string name [subscripts]
Allows strings to be converted to numeric data and vice versa, simplifying multiple string storage. APII, APIII

[line number] TREAD (select code, code type) variable [,]
Allows the 9830A Calculator to receive data into a string or numeric array. DC1

= TRN (matrix name)
Transposes a matrix. MO

[line number] TWRITE (select code, data type) list [,]
Transmits strings, numeric arrays, string variables, or octal character codes via the select code specified. DC1

TYP file number²
TYP (-file number)²
Identifies the type of the next item in a specified file. MM

[line number] TYPE
Returns control from a peripheral device to the calculator keyboard. BB

U

[line number] UNIT unit number
Specifies the platter to be used for the subsequent commands. MM

V

VAL (string name)²
Allows the numerical value of a string of digits to be used in computations. SV

W

line number WAIT expression
Causes the calculator to halt the specified number of milliseconds; the delay can vary between 0 and 32767 milliseconds.

WBYTE expression²
Outputs the eight-bit binary equivalent of an expression. IO

[line number] WRITE (select code, [*] or [line number]) [any combination of text and expressions]
With the '*' specification, WRITE is like the PRINT statement except that any printer can be specified by select code; with the line number specification, the parameters are output according to the specifications in the corresponding FORMAT statement.

[line number] WRITE (select code, *) "A"
Aborts the data on a card. IO

[line number] WRITE (select code, *) "B"
The BELL function - used to ring the bell of the 9869A Calculator Card Reader. BB

[line number] WRITE (select code, *) "C"
Switches the card reader to the CONTINUOUS mode. IO

[line number] WRITE (select code, *) "D"
Switches the card reader to the DEMEND mode. IO

[line number] WRITE (select code, *) "I"
Switches the card reader to the IMAGE mode. IO

[line number] WRITE (select code, *) "J"
Used to sort cards with the card reader. IO

[line number] WRITE (select code, *) "N"
Switches the card reader to the NORMAL mode. IO

[line number] WRITE (select code, *) "S"
Deactivates the card reader. IO

[line number] WRITE (select code, *) "T"
Retransmits the data on one card. IO

X

[line number] XAXIS Y-offset [, + / - tic [, start point, end point]]
Draws a horizontal line from Xmin to Xmax; crosses Y-axis at point defined by Y-offset. Tic specifies spacing between tic marks; first tic at start of axis. If start point, and end point parameters are specified, the horizontal line is drawn between those points, rather that Xmin and Xmax. PC

XREF
Lists each variable in a program along with the line numbers in which it appears. API

Y

[line number] YAXIS X-offset [, + / - tic [, start point, end point]]
Draws vertical line from Ymin to Ymax; crosses X-axis at point defined by X-offset. Tic specifies spacing between tic marks; first tic at start of axis. If start point, and end point parameters are specified, the vertical line is drawn between those points, rather than Ymin and Ymax. PC

Z

= ZER [(expression [, expression])]
Sets all elements of a matrix equal to zero. A new working size can be specified. MO

Special Keys

CLEAR — Clears the display.

DELETE LINE — Deletes the program line which is currently displayed.

END — Terminates key mode or program execution.

STOP — Stops execution of a program or a command.

INIT — Initializes or allocates storage space in memory for array variables.

PRT ALL — Causes all messages and commands which are normally displayed to be printed.

RECALL — Displays the last command executed.

STEP — Executes the next program line, and stops.

BACK FORWARD INSERT — These keys are used together to change the line currently in the display.

END OF LINE — Stores the program line in memory.

DISPLAY ↓ ↑ ← → — These keys are used together to view the program lines in memory.

TRACE NORMAL — These keys are used together during program execution. TRACE causes all program line numbers to be printed as they are executed; NORMAL cancels trace mode.

9830 NON–RECOVERABLE ERRORS

1 Memory configuration error
2 Memory overflow
3 Statement is not allowed in keyboard mode
4 Missing line number or integer, or integer out of range
5 No statement or command recognized
6 Improper arithmetic expression, missing number or expression
7 Characters follow statement's logical end
8 Missing punctuation in program statement
9 Invalid command unless in KEY mode
10 User KEY is undefined
11 Exponent is out of range
12 Two decimal points in number
13 Sign given without number
14 Missing comma
15 Missing left parenthesis
16 Missing right parenthesis
17 Missing subscript
18 String not permitted
19 No opening quote or missing string variable
20 No closing quote
21 Missing or improper function identifier
22 Missing function parameter
23 Missing or incorrect DATA item
24 Improper IF. . . . THEN statement
25 Missing OF in conditional GO TO statement
26 Missing variable
27 Missing or improper FOR variable
28 Missing TO in FOR statement
29 Missing STEP or illegal characters following FOR statement
30 Missing assignment operator
31 Missing or improper assignment
32 Improper FORMAT specification
33 COM statement rules not followed
34 Improper common declaration
35 Array is doubly defined
36 Precision of variable is doubly defined
37 Inconsistent dimensions are given
38 Array has unknown dimensions
39 Dimensions are too large
40 Variable or function is undefined

Non-Recoverable Errors

41 Array or string has not been initialized
42 Subscript exceeds bounds
43 Select code exceeds bounds
44 Line not found
45 Improper statement type referenced
46 Improper statement nesting in multiline function
47 Improper RETURN
48 FOR statement has no matching NEXT or incorrect FOR nesting
49 Out of DATA
50 Last statement is not END
51 LOG or LGT of negative number
52 SQR of negative number
53 Zero to zero power
54 Non integer power of negative number
55 Cassette operation statement syntax error
56 Wrong file or file not found
57 Improper operation on SECURE program
58 Cassette status error
   a. Door open
   b. Clear leader
   c. Write not permitted
   d. Cassette power off
   e. STOP given during a write operation
59 Check sum error
60 Improper file size
61 Improper precision or data type
62 Improper file type
63 Program overlay

9830 RECOVERABLE ERRORS

100 Numeric overflow (assumes + or - ∞)
101 Numeric underflow (assumes 0)
102 LOG or LGT of zero (assumes -∞)
103 Division by zero (assumes + or - ∞)
104 Zero to negative power (assumes + ∞)
106 Split variable overflow (assumes + or -9.99999E+63)
107 Split variable underflow (assumes 0)
105 Integer variable overflow (assumes + or -32767)

ROM-RELATED ERROR MESSAGES

Matrix Operations ROM

66 Matrix must be square for attempted operation.
67 New dimensions exceed existing DIM specifications.
68 Matrix has no inverse. The data contained in the matrix does not have a solution.
69 Incompatible dimensions.

String Variables ROM

70 Incomplete IF statement
71 Improper string function syntax.
72 Logical string length exceeded.
73 Operation is non-contiguous string. Substring requested is beyond the logical boundary for the string and is undefined.
74 Maximum string length exceeded.
75 DATA encountered during READ statement execution. Character data found; numeric data expected.
76 VAL function argument non-numeric.
77 Illegal characters entered during INPUT statement execution. Character data found, numeric data expected.

Terminal I ROM

78 The TERM command contains improper select code or baud rate specification.
79 The RUN command is non-executable because untranslated program lines are stored in the calculator memory.

Plotter Control ROM

80 Attempt to execute an AXIS, OFFSET, PLOT or IPLOT statement before executing a SCALE statement.

81 – 'Character height' specification in a LABEL statement greater than 18.4% of the height of the plotting area.

– 'Aspect ratio' in a LABEL statement specifies a character width greater than 18.4% of the height of the plotting area.

– The X or Y parameter in a CPLOT statement requires a pen movement greater than 18.4% of the height of the plotting area.

82 Attempt to execute an AXIS statement

a. with the 'start point' specified to be out of the plotting area, or

b. with the tic mark spacing too small

Extended I/O ROM

83 End of data reached or data contains more than ten blanks in a row.

84 Invalid format specification.

85 Numeric input has syntax error: multiple decimal points, more than one E, or other non-numerical input.

86 Conversion table or code not found. Check for integer initialization in DIM statement.

Advanced Programming I ROM

87 First file on master tape is not file 0; negative file count specified in DUP command; or files on master tape are not sequential.

88 File size on master tape is larger than available memory.

89 End of tape (clear-leader) reached before DUP command is completed.

90 Mass Memory power OFF; Controller power OFF; Mass Memory fault or drive not ready; Specified UNIT does not exist; Check word or address error; Hardware write protect (write not permitted).

91 File name or protection code greater than six characters or of zero length.

92 Protected file accessed in FILES statement; Incorrect protection code; Protection code is not given for protected file; Protection code is given for an unprotected file; File already protected.

93 Syntax not valid.

94 File not found; File number reference not valid; Record number reference not valid; Unit number not valid; File not assigned.

95 Available storage space exceeded; Availability table full; Directory full.

96 File size not valid; Null program.

97 File already exists.

98 Improper file type; Improper precision data type; Numeric overflow on data type conversion.

99 End of file marker reached; End of record marker reached.

Data Communications ROMs

79 The RUN command cannot be executed because untranslated program lines are stored in the calculator memory. If the stored program lines are valid BASIC language instruction, execute the COMP command and then execute the RUN command.

300 The Binary Synchronous ROM is not plugged into the calculator.
The TBATCH statement was executed while in Binary Synchronous mode.

301 The STOP key was pressed during the DIAL sequence.
Seven DIAL attempts were completed without an answer (this includes a busy line or no answer).

302 TBATCH was executed out of TEXT mode.

303 BIN code in a TREAD or TWRITE is not allowed in Binary Synchronous mode. Use BWRITE statement.

304 The Data Comm. 1 ROM is not plugged into the calculator.

305 An ENQ is received in response to an ENQ. ACKCLR is executed automatically.

306 ACKs are out of step during a message in the TWRITE statement. ACKCLR is executed automatically and an EOT is automatically sent.

307 TWRITE note: 15 ENQs transmitted without response, or bad data was received in response to a message block or ENQ. An acknowledgment was expected but not received. ACKCLR is automatically executed and an EOT is sent automatically.

308 TWRITE note: Received 15 NAKs to a block of text. ACKCLR is executed automatically and an EOT is transmitted automatically.

309 An EOT was received as a response after a TWRITE. This indicates one of the following:
1. Receiver has I/O problems and cannot continue current reception.
2. Receiver is unable to accept a message at this time.
ACKCLR is executed automatically.

310 TWRITE note: A NAK was received in response to an ENQ. ACKCLR is executed automatically.

311 BTIMR has expired without any line activity in the TREAD statement. ACKCLR is executed automatically.

HEWLETT hp PACKARD

Part No. 09830-90039
Microfiche No. 09830-99039

Printed in U.S.A.
July 1, 1975