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HP 9825 Desktop Computer Quick Reference

Manual Part No. 09825-90012
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HP 9825
Error Messages

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Mainframe Error Messages

An error in a program sets the program line counter to line 0. Pressing the continue key will continue the program from line 0. Execute the continue command with a line number to continue at any desired line (such as: CONT 50).

STOP

- 00 System error.
- 01 Unexpected peripheral interrupt.
- 02* Unterminated text.
- 03* Mnemonic is unknown.
- 04 System is secured.
- 05 Operation not allowed; line cannot be stored (executed with line number).
- 06* Syntax error in number.
- 07* Syntax error in input line.
- 08 Internal representation of the line is too long (gives cursor sometimes).

*These errors give a cursor when the CONT key is pressed, indicating the location of the error in the line.

HPL Syntax

Introduction

The following pages are a compilation of all current 9825 HPL syntax. More information on each operation can be found by referring to the indicated manual and page. The manual titles are abbreviated here:

- D Disc Programming (09825-90220).
- I/O I/O Control Reference.
- M Matrix Programming.
- O&P Operating & Programming Reference.

The HPL programming language utilizes four basic types of syntax constructions: **statements**, **functions**, **operators** and **commands**. Operators, such as + and mod, are used with numbers and variable names to construct **expressions** (like A+5). Expressions can be included in many statements and executed from the keyboard. Each statement can also be preceded by a line number and stored as a program line (like 10: prt A). Most functions can include expressions, and can be executed from the keyboard. Functions can also be treated as expressions when constructing a statement (like prt sinA). Commands are operator aids that can only be executed from the keyboard; they're not programmable.

error

- 09 Gto, gsb, or end statement not allowed in present context.¹
- 10* Gto or gsb statement requires an integer.
- 11 Integer out of range or integer required. Must be between -32768 and +32767.
- 12* Line cannot be stored; can only be executed.
- 13 Enter (ent) statement not allowed in present context.
- 14 Program structure destroyed.
- 15 Printer out of paper or printer failure.
- 16 String Variables ROM not present for the string comparison. Argument in relational comparison not allowed.
- 17 Parameter out of range.
- 18 Incorrect parameter.
- 19 Bad line number.
- 20 Missing ROM or binary program. The second number indicates the missing ROM. In the program mode, the line number is given instead of the ROM number.

Number in Display ROM

- 1 Binary Program
- 4 Systems Programming
- 6 Strings
- 8 Extended I/O
- 9 Advanced Programming
- 10 Matrix
- 11 Plotter (9862A or 9872A)
- 12 General I/O
- 15 9885 Disk

21 Line is too long to store.

22 Improper dimension specification.

23 Simple variable already allocated.

24 Array already dimensioned.

25 Dimensions of array disagree with number of subscripts.

26 Subscript of array element out of bounds.¹

27 Undefined array.

28 Ret statement has no matching gsb statement.

¹See also Advanced Programming ROM Error Messages.

²These errors give a cursor when the [F5] key is pressed, indicating the location of the error in the line.

Operators

The available operators are summarized here. For more details see page 3-19 in your Operating and Programming Reference.

Arithmetic

+	Add
-	Subtract, unary -
*	Multiply
/	Divide
↑	Exponentiate
mod	Modulus

Logical

and	
ior	inclusive OR
xor	exclusive OR
not	

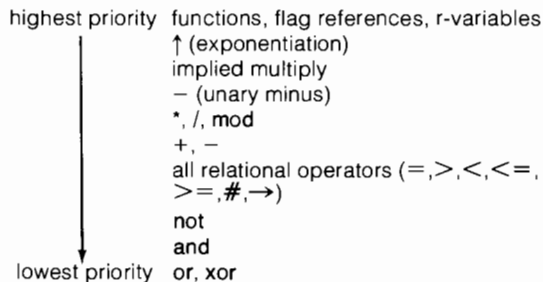
Relational

=	Equal to
←	Assign
>	Greater than
<	Less than
> = or < =	Greater than or equal to
< = or > =	Less than or equal to
# or > or <	Not equal to

String

&	Concatenation
---	---------------

Math Hierarchy



Operators of the same level in an expression are executed from left to right. Any operations within parentheses, however, are performed first. For more details, see page 3-18 in your Operating and Programming Reference.

error

- 29 Cannot execute line because a ROM or binary program is missing.
- 30 Special function key not defined.
- 31 Non-existent program line.
- 32 Improper data type.
- 33 Data types do not match in an assignment statement.
- 34 Display overflow due to pressing a special function key.
- 35 Improper flag reference (no such flag).
- 36 Attempt to delete destination of a qto or gsb statement.
- 37 Display buffer overflow caused by display (dsp) statement.
- 38 Insufficient memory for subroutine return pointer.
- 39 Insufficient memory for variable allocation or binary program.
- 40 Insufficient memory for operation.
- 41 No cartridge in tape transport.

- 42 Tape cartridge is write protected. (Slide record tab to other position for recording.)
- 43 Unexpected Beginning-Of-Tape (BOT) or End-Of-Tape (EOT) marker encountered; or a tape transport failure.
- 44 Verify has failed.
- 45 Attempted execution of idf statement without parameters or mtk statement when tape position is unknown.
- 46 Read error of file body. (See Appendix F.)
- 47 Read error of file head. (See Appendix F.)
- 48 End-Of-Tape (EOT) encountered before specified number of files were marked.
- 49 File too small.
- 50 Ldf statement for a program file must be last statement in the line.
- 51 A ROM is present but was not when the memory was recorded. Remove the ROM indicated by the number to the right of the error number in the display, and re-execute the ldm statement. In the program mode, the line number is given instead of the ROM number. See error 20 for a list of ROM numbers.

Syntax Conventions

These terms and conventions are used in the following listing:

bold type — all key words and characters appearing in bold type must appear exactly as shown. These items are shown in dot matrix in the referenced manuals.

[] — elements enclosed in brackets (not key characters or parentheses) are optional.

... — an ellipsis indicates that the preceding parameter or sequence in the syntax can be repeated.

variable name — a numeric or string variable name (like A or R5 or A\$). Subscripts are allowed (like A [7]).

array name — an array variable name, with or without subscripts.

string variable — a string variable name (like A\$ or B\$ [1,4]).

string — either a string variable or text within quotes ("text").

line number — an expression from 1 through 999 referring to a program line.

line label — a unique name assigned to a program line. It's enclosed in quotes, follows the line number, and is followed by a colon. For example: 5: "print": ...

expression — a logical combination of numeric variable names, constants, operators and functions (including user-defined functions) grouped within parentheses as needed. The evaluated expression yields a numeric result.

constant — a fixed number within the computer's range, like 2.23467.

character — a letter, number or symbol.

item list — a series of constants, expressions and/or strings separated by commas, for example:
prt 5,A,"was",A+7

subscripts — numbers within brackets which are attached to variable names to designate a particular variable element or boundary. For example: A [10,5] or B\$ [1,10]

file number — an expression indicating the tape or disk file.

file name — a string indicating the disk file name.

select code — an expression indicating the device's interface select code setting (an integer from 0 through 16). For example: wrt 6

These select codes are assigned to internal devices:

- 0 Keyboard.
- 1 Tape drive.
- 16 Printer.

device address — a two-digit number appended to the select code, indicating a device's HP-IB address. Device address range is from 01 through 31. For example: wrt 711 outputs to device 11 via the HP-IB interface set to select code 7.

format no. — a number from .1 through .9 appended to the select code to reference a corresponding fmt statement. For example: wrt 7.3 references fmt 3.

return variable — a simple numeric variable name (A or R4) where information is stored after the operation.

flag no. — an expression from 1 through 15 indicating a programmable flag.

error

52 The ROM indicated by the number to the right of the error number was present when the memory was recorded but is now missing. Insert the indicated ROM and re-execute the idm statement. See error 20 for a list of ROM numbers.

53 Negative parameter in cartridge statement.

54 Binary program to be loaded is larger than present binary program and variables have been allocated.

55 Illegal or missing parameter in one of the cartridge statements.

56 Data list is not contiguous in memory for one of the cartridge statements.

57 Improper file type.

58 Invalid parameter in rcf statement: "SE" or "DB" expected.

59 Attempt to record a program or special function keys which do not exist.

60 Attempt to load an empty file or the null file (type=0).

61 The line referenced in an ldf or ldp statement does not exist. If the line containing the ldf or ldp statement has been overlaid by the load operation, the line number in the display may be incorrect.

62 Specified memory space is smaller than cartridge file size.

63 Cartridge load operation would overlay subroutine return address in program; load not executed.

64 Attempt to execute ldk, ldf (program file), or ldp during live keyboard statement.

65 File not found, or file specified in the previous ldf statement does not exist.

66 Default values associated with errors 66 through 77 when you set flag 14 are explained in Chapter 5 of the manual.

67 Division by zero. A mod B, with B equal to zero.

68 Square root of negative number.

69 Tan (n * pi/2 radians).

70 Tan (n * 90 degrees).

71 Tan (n * 100 grads).

72 where n is an odd integer.

73 Ln or log of a negative number.

74 Ln or log of zero.

75 Asn or acs of number less than -1 or greater than +1.

76 Negative base to a non-integer power.

77 Zero to the zero power (0^0).

A

abs expression

Returns the absolute value of the expression. O&P, 3-22.

acs expression

Returns the principal value of the arccosine of the expression in the current angular units. O&P, 3-25.

add (expression , expression)

Returns the sum of the expressions, added in the current numeric mode, decimal (mdec) or octal (mact). I/O, 3-15.

aprt array variable [, array variable [, ...]]

Prints the specified array's elements on the internal printer. M, 8.

ara array variable₁ $\left\{ \begin{smallmatrix} + \\ * \end{smallmatrix} \right\}$ array variable₂] → array variables

Performs the arithmetic operation, element by element, on arrays 1 and 2. The result is stored in array 3. (Example: ara A+B→C). Arithmetic operations can be performed on arrays in place (ara A+B→A), arrays can be copied (ara A→B), and implied multiplication is allowed (ara AB→C). M, 11.

asc expression

Returns the ASCII equivalent of the specified 9825 keycode. O&P, 7-25.

asgn file name, file number [, drive number [, return variable]]

Assigns a number (1 through 10) to an existing disk file name and indicates optional drive number and a return variable (values below). D, 3-5.

- 0 File available and assigned.
- 1 File doesn't exist.
- 2 Program file.
- 3 Special function key file.

(cont'd)

6

4 File not defined by 9825.

5 Memory file.

6 Binary program file.

7 File type not defined.

8 File number out of range.

9 Data file, but logical records not 256 bytes long (98228A ROM only).

asn expression

Returns the principal value of the arcsine of the expression in the current angular units. O&P, 3-26.

expression → variable name₁ [→ variable name₂ [→ ...]]

Assigns the value of the expression to the variable(s). O&P, 3-19.

atn expression

Returns the principal value of the arctangent of the expression in the current angular units. O&P, 3-26.

avd

Disables automatic tape verification. O&P, 5-24.

ave

Enables automatic tape verification (default setting). O&P, 5-25.

avm

Returns the size (bytes) of unused read/write memory. O&P, 4-27.

axe X coordinate , Y coordinate [, X tic [, Y tic]]

Draws axes through the X,Y point, drawing optional tick marks at X tic and Y tic intervals. 9862 Plotter ROM only. I/O, 7-18.

B

band (expression , expression)

Returns the 16-bit result of ANDing the expressions. I/O, 3-12.

beep

Sounds the computer's beeper. O&P, 3-16.

7

Advanced Programming ROM

Error Messages

error

R0 Relational operator in for statement not allowed. No closing apostrophe.

R1 A for statement has no matching next statement.

R2 A next statement encountered without a previous for statement.

R3 Non-numeric parameter passed as a p-number.

R4 No return parameter for a function call.

R5 No functions or subroutines running. Improper p-number reference.

R6 Attempt to allocate local p-numbers from the keyboard.

R7 Wrong number of parameters in its, st, ft, or ft function. st or ft parameter must be a string (not a numeric), st or ft parameter contains too few characters.

R8 Overflow or underflow in its function or overflow in ft function.

R9 String Variables ROM missing for st or ft functions. These mainframe errors have an additional meaning with the AP ROM installed.

R10 Attempt to execute a next statement from keyboard while for/next loop using same variable is executed in program or from program while for/next loop using same variable is executed from keyboard. Attempt to call function or subroutine from keyboard.

R11 P-number reference is negative.

R12 Non-numeric value in for statement or in its or ft function.

R13 Memory overflow during function or subroutine call.

R14 Memory overflow while using for statement or while allocating local p-numbers.

error

74 Storage range overflow.

75 Storage range underflow.

76 Calculation range overflow.

77 Calculation range underflow.

HPL Syntax

bit (expression₁ , expression₂)

Returns the binary value of the bit position in expression 2 indicated by expression 1. I/O, 3-15.

boot

Loads 98217A Disk ROM bootstraps from a disc tape to an initialized disk. D, 4-4.

bred (buffer name)

Returns the contents of the specified, active, interrupt buffer. O&P, 7-10.

buf "name" [, buffer size or string variable , buffer type]

Sets up and names a data buffer of either type read/write (no type specified) or the specified type (see below). I/O, 6-6.

Buffer Type	Word	Byte
interrupt	0	1
fast read/write	2	3
DMA	4	—

C

cap (string)

Returns an equivalent string of uppercase characters. O&P, 6-24.

cat [select code or buffer name]

Prints a catalog of files on the specified disk or default drive. File types listed below. D, 1-16.

- B Binary program file.
- D Data file.
- K Special function keys file.
- M Memory file.
- O Other file (not created via 9825).
- P Program file.

cfg [flag no. [, ...]]

Clears either all 15 program flags or only the specified flags. O&P, 3-29.

chain file name [, 1st line number [, 2nd line number]]

Loads a program from the specified disk file. Same optional line numbers as get. D, 2-7.

char (expression)

Returns the ASCII equivalent character. O&P, 6-20.

cli select code

Sends the abort message to all devices on the HP-IB, I/O, 2-27.

cli 'name' [(variable₁ [, variable₂ [, ...]])]

Calls the subroutine having the specified label, passing the value of any optional variables as pass-parameters. O&P, 4-10.

cln

Returns the current program line number. O&P, 7-28.

clr select code

Sends the clear message, either the all devices or to only a selected device by including the device address in the select code. I/O, 2-17.

cmd select code , "address parameters" [, "string"]

cmd "device name(s)" or select code [, "string"]

Sends the string of data characters to the specified HP-IB device. I/O, 2-31.

cmf [flag no. [, ...]]

Complements either all 15 program flags or only the specified flags. O&P, 3-29.

cmp (expression)

Returns the 16-bit binary one's complement of the expression. I/O, 3-13.

cont [line number or "line label"]

This command continues program execution, either from the current point or from the specified point. O&P, 2-24.

conv [expression₁ , expression₁

[, expression₂ , expression₂] ...]

Sets up a conversion table (up to 10 sets of expressions) referenced by red and wrt statements. Each expression represents an ASCII character. conv (no parameters) cancels any existing table. I/O, 1-23.

Systems Programming ROM

Error Messages

error

- E0 Missing General or Extended I/O ROM.
- E1 Incorrect number of parameters.
- E2 Improper parameter specified.
- E3 Wrong parameter type.
- E4 Illegal buffer type for bred statement.
- E5 Key buffer overflow.
- E6 Too large or wrong sign of parameter.
- E7 Improper execution of store statement.
- E8 Illegal use of kret.
- E9 Missing 98036A Interface card.

Extended I/O ROM Error Messages

error

- E0 General I/O ROM missing.
- E1 HP-IB error under interrupt.
- E2 Wrong number of parameters.
- E3 Improper buffer device or equate table usage.
- E4 Multiple-listeners error.
- E5 Buffer busy.
- E6 Wrong parameter type.
- E7 Timeout error.
- E8 Buffer underflow or overflow.
- E9 Parameter value out of range.
- E0 Parity failure.
- E1 Improper use of iret statement.
- E2 Attempt to DMA with an HP-IB.
- E3 Buffer or select code is busy.
- E4 Illegal HP-IB operation.

HPL Syntax

copy source file [, drive number [, select code]]
destination file [, drive number [, select code]]
Copies a file to another location. D, 4-7.

copy [source drive number [, select code],]
"to" [, destination drive number [, select code]]
Duplicates the contents of the source disk onto the destination disk. D, 4-7.

copy source file number , record number ,
destination file number , record number , records
Copies only the specified number of records, beginning at the specified record numbers. D, 4-10.

cos (expression)
Returns the cosine of the expression. O&P, 3-25.

cpit [character-space widths , character-space heights]
Moves the pen the specified distance away from the current point. I/O, 7-41.

csiz [height [, aspect ratio [, paper ratio
[, angle of rotation]]]]
Specifies the size, shape and lettering direction for lbl statements. Defaults are: height = 1.5% of paper height; aspect ratio = 1; paper ratio = 1; angle = 0 (left to right lettering). I/O, 7-38.

csv
Clears simple variables A through Z. O&P, 3-39.

ctbl [string variable]
Sets up a conversion table; the value of each string character represents ASCII; the character position represents the foreign code + 1. ctbl with no parameters cancels the table. I/O, 4-6.

D

deg
Sets degrees units for angular calculations. O&P, 3-25.

del line number [, 2nd line number [, *]]
This command deletes either the specified program line or all lines through the optional 2nd line number specified. Including the * changes all remaining references to the deleted lines to the next remaining program line, preventing error 36. O&P, 2-25.

dev "name" , select code
Assigns a name for use in place of the select code in I/O operations. I/O 2-9.

dig X , Y [, return variable]
Reads, computes and stores the current pen position in user units. Return variables: 0 = pen up; 1 = pen down. 9872 Plotter ROM only. I/O, 7-48.

dim variable name [, variable name [, ...]]
Reserves memory for specified variables. Use subscripts to indicate size of each variable. O&P, 3-37.

dirc
Copies the spare disk directory (default drive) to the main directory. 98217A ROM only. D, 4-16.

drive unit no. [, select code]
Sets the default unit and, optionally, the select code for disk operations. Default is 0,8 for 9885 and 0,707 for 9895. D, 1-14.

drnd (expression , expression)
Returns the value of the first expression, rounded to the number of digits indicated by the second expression. O&P, 3-22.

dsp item list
Displays the items listed. To display quotes use double quotes within the string
(e.g., 1: dsp "Display""test""in quotes."). O&P, 3-12.

dto (expression)
Returns the octal equivalent of the decimal value expressed. I/O, 3-12.

dtrk [tape file number]
Dumps a bad track during the 98217A error recovery routine. 98217A ROM only. D, 4-15.

General I/O ROM Error Messages

error

- G1 Incorrect format numbers.
- G2 Referenced format statement has an error.
- G3 Incorrect I/O parameters.
- G4 Incorrect select code.
- G5 Incorrect read parameter.
- G6 Improper conv statement parameters.
- G7 Unacceptable input data.
- G8 Peripheral device down.
- G9 Interface hardware problem.

Matrix ROM Error Messages

error

- M1 Syntax error.
- M2 Improper dimensions. Array dimensions incompatible with each other or incompatible with the stated operation.
- M3 Improper redimension specification. New number of dimensions must equal original number; New size cannot exceed original size.
- M4 Operation not allowed. An array which appears to the left of → cannot also appear on the right.
- M5 Matrix cannot be inverted. Computed determinant = 0.

*These errors give a cursor when the  key is pressed, showing the location of the error in the line.

dtype

Returns a code indicating the type of drive, disk and data format at the default disk address. 98228A ROM only. See page 1-15. Return values are:

- 0 Unable to access default disk controller.
- 1 Drive door is open or drive not present.
- 2 Drive door closed, but door was opened since last disk operation. File pointers are cleared.
- 3 9895 drive, single-sided disk, HP format.
- 4 9895 drive, double-sided disk, HP format.
- 5 9895 drive, single-sided disk, unknown format.
- 6 9895 drive, double-sided disk, unknown format.
- 7 9895 drive, single-sided disk, IBM 3740 format.
- 8 9885 drive, single-sided disk.

dump [file name , tape file name][, expression]

Transfers the contents of the default disk to a tape cartridge. The optional file names indicate to only dump a specified file. The expression can be 1 or 10, indicating the number of disk records to put in each tape file. A positive expression automatically marks the tape. A negative expression suppresses marking the tape. D, 4-12.

E**eir** select code [, byte]

Enables an interrupt from the specified select code. Specifying byte = 0 disables the interrupt. I/O, 5-6.

end

Halts program execution and sets the program counter to 0. O&P, 3-17.

enp ["prompt",] string variable

Enters and prints data entered from the keyboard. O&P, 3-15.

ent ["prompt",] variable name

Enters data from the keyboard. O&P, 3-13.

eol code [, [, ...]][, - delay in milliseconds]

Specifies up to seven optional ASCII characters for an end-of-line sequence for wrt operations (replaces CR/LFs). The optional delay occurs after the last eol

character in the sequence. O&P, 7-12.

eor (expression , expression)

Returns the 16-bit binary result of the exclusive ORing of the expressions. I/O, 3-13.

equ "name₁", "string₁" [, "name₂", "string₂" [, ...]]

Equates the ASCII character string with the name, for use with cmd. I/O, 2-33.

erase [letter or key]

Erases either all programs and variables or the specified areas listed below. O&P, 2-26.

- a Erase entire memory.
- k Erase all special function keys.
- v Erase all variables and flags.
- fn Erase specified key definitions.

ert file number

Erases the current tape track, beginning with the specified file. O&P, 5-15.

exp (expression)

Returns e (2.71828...) raised the expressed power. O&P, 3-24.

F**fdf** file number

Positions the tape at the specified file on the current track. O&P, 5-9.

fetch [line number or key]

Displays the specified program line or special function key definition. O&P, 2-27.

files file name₁ [: unit no.] [, file name₂ [: unit no.] [, ...]

Assigns names up to 10 disk files. Substituting an * for a file name allows an asgn statement to assign a file name via a string variable. D, 3-3.

flg (flag no.)

Returns flag status: 1 = set; 0 = clear. O&P, 3-30.

flt expression

Sets floating point notation; from 0 through 11 places allowed. O&P, 3-10.

9862A Plotter ROM Error Messages**error**

P1 Wrong state. Statements executed out of order. (See Appendix in ROM manual.)

P2 Wrong number of parameters.

P3 Wrong type of parameters. Parameters for a label statement must be expressions, text, or string variables.

P4 Scale out of range. Maximum value is less than or equal to the minimum value.

P5 Integer out of range. Pen control parameter is out of the range -32768 to +32767 or the select code is not 0 nor in the range of 2 through 15.

P6 Character size out of range. Width or Height in letter statement is zero or there is an integer overflow in size calculations or results.

P7 Not used.

P8 Axes origin off-scale. X, Y specified for axis statement doesn't fall on plotter surface.

An explanation of the error message **PLT DOWN** is in the manual.

9872A Plotter ROM Error Messages**error**

P1 Attempt to store into constant. Occurs when one or more parameters in a **dis** instruction are constants rather than variables.

P2 Wrong number of parameters. Occurs on instructions with numeric-only parameter lists (**scil**, **of**, **pl**, **ir**, **cl**, **xx**, **xx**, **lin**, **dis**, **csiz**, **line**, **penh**, and **pscl**). In certain unusual cases where a parameter list contains user-level function calls, an instruction having an incorrect number of parameters may be executed.

P3 Wrong type of parameter or illegal parameter value.

P4 No HP-IB device number specified. Occurs on a **res** instruction when the parameter is between 0 and 14 inclusive and an HP-IB card is at the corresponding select code.

P5 Pen control value not in -32768 thru 32767 range. Occurs on **pl** and **lelt**. May also occur if hardware transmission error occurs between plotter and calculator.

HPL Syntax

fmt [format no. ,] [spec1 [, spec2 ...]]

Sets up a list of format specs for red and wrt operations. Format number can be from 0 through 9. Format specs are listed below. Omitting specs cancels specified format. Omitting format no. sets format 0. A repeat factor can precede each spec. I/O, 1-8.

b Single-character binary output.
cw String character data.
ew.d Exponential format.
fw.d Fixed-point.
fzw.d Fixed point with leading zeros.
x Blank space.
z Suppresses auto CR/LF.
/ Outputs CR/LF.
"text" Outputs text.

w = field width.

d = number of digits to right of decimal point.

for simple variable = initial value **to** value [**by** step value]
 Defines start of a for-next loop. O&P, 4-3.

fr (expression)
 Returns the fractional part of the expression. O&P, 3-22.

fti (expression)
 Rounds and changes the expression to integer precision. The result can be stored in a two-character field. O&P, 4-26.

fts (expression)
 Changes the expression to split precision for storage in a four-character field. O&P, 4-20.

fxd expression
 Sets the fixed-point format; from 0 through 11 places are allowed. O&P, 3-9.

G

get file name [, 1st line no. [, 2nd line no.]]
 Loads the program from the specified disk file. D, 2-4.

getb file name
 Loads the specified disk binary program file. D, 2-11.

getk file name
 Loads the special function keys disk file. D, 2-9.

getm file name
 Loads the specified disk memory file. D, 2-10.

grad
 Sets the grads units for angular calculations. O&P, 3-25.

gsb line number or line label
 Branches program execution to the specified subroutine. O&P, 3-34.

gsb + or - no. of lines
 Branches to the subroutine beginning the number of lines relative to the current line. O&P, 3-34.

gto line number or line label
 Sends program execution to the specified line. O&P, 3-31.

gto + or - no. of lines
 Sends execution to specified line relative to the current line. O&P, 3-31.

idf file number [, file type [, current size [, absolute size [, track]]]]
 Returns info on the current tape file. See tlist for file types. O&P, 5-7.

idn array name [, array name [, ...]]
 Creates identity (square) matrices. All elements are 0 except major diagonal elements which are 1. M, 22.

if expression₁ = expression₂ ;
 If the equation is true, the rest of the line is executed. If false, execution immediately branches to the next line. Any relational operator can be used (< , # , > = , etc.). When both expressions are strings, the characters are compared using ASCII values. O&P, 3-36.

ERROR

P6 No HP-IB card at specified select code. Occurs on RSC instruction when the interface card set to the specified select code is not an HP-IB card.

P7 OXE, IIR instructions executed. Occurs on OXE and IIR instructions because the ROM recognizes these instructions but cannot execute them. This error flags all OXE and IIR instructions for the purpose of converting 9825/9872 programs.

P8 Calculator STOP key cancelled operation. Occurs on any instruction when the calculator fails to respond for 3 seconds after the STOP key has been pressed. This error is most likely to occur when the pen is travelling slowly.

P9 Transmission error. The calculator has received an illegal ASCII input from the plotter.

P1 Instruction not recognized. The plotter has received an illegal character sequence.

P2 Wrong number of parameters. Too many or too few parameters have been sent with an instruction. Bad parameter. The parameters sent to the plotter with an instruction are out of range for that instruction.

P3

P4

P5

P6 Illegal character. The character specified as a parameter is not in the allowable set for that instruction.

P7 Unknown character set. A character set out of the range 0 thru 4 has been designated as either the standard or alternate character set.

P8 Position overflow. An attempt to draw a character or perform a cplot that is located outside of the plotter's numeric limit of -32768 to +32767.

Error messages generated by write (wrt) and read (red) statements will typically be displayed as an error in the next executed plotter ROM statement. This can be avoided by using an output error command (wrt select code, "DE") followed by a read statement (red select code, variable) to check for errors after read or write statements that address the plotter.

HPL Syntax

- ina** array variable [: value] [, array variable [: value] ...]
Initializes each element of the array to the specified value (number or variable). Omitting the value initializes each element to 0. M, 8.
- init**
Runs the disk initialization routine and loads bootstraps. 98217A ROM only. D, 4-2.
- init** drive number , select code [, interleave factor]
Initializes disks in either 9885 or 9895 drive. 98228A ROM only. The interleave can be an integer from 1 thru 29. See page 4-3.
- int** (expression)
Returns the integer value of the expression. O&P, 3-22.
- inv** array variable₁ → array variable₂ [, simple variable]
Stores the inverse matrix of array 1 in array 2. If the simple variable is specified, the determinant of array 1 is returned. M, 24.
- iof** select code
Returns interface flag state: 0 if peripheral busy; 1 if ready. I/O, 4-12.
- ior** (expression , expression)
Returns the 16-bit result of the inclusive OR operation on the expression. I/O, 3-13.
- ios** select code
Returns interface status: 0 if in error condition; 1 if operational. I/O, 4-12.
- plt** X increment , Y increment [, expression]
Moves the pen the number of X and Y units from its current position. The expression is for pen control; see plt. I/O, 7-29.
- iret**
Ends an interrupt service routine and returns to main program. I/O, 5-7.
- itf** (string variable)
Returns a full-precision number from the packed, integer-precision number (a two-character string). O&P, 7-26.

16

J

- jmp** expression
Jumps program execution the relative number of lines forward (+ expression) or back (– expression). jmp 0 returns execution to the beginning of the current line. O&P, 3-33.

K

- key**
Returns the earliest, unprocessed keycode in the keyboard buffer. 0 indicates no keycodes in the buffer. O&P, 7-8.

- kill** file name
Purges the specified disk file. D, 1-18.

- killall**
Purges all disk user files. 98217A ROM only. D, 1-18.

- killall** drive number , select code
Purges all user files from the specified disk. 98228A ROM only. See page 1-18.

- kret**
Returns execution to the main program after the key buffer is emptied. O&P, 7-9.

L

- lbl** expression or "string" [, expression or "string" [, ...]]
Prints characters on the plotter. I/O, 7-36.

- lcl** select code
Sends the local message to all HP-IB devices or, if the select code includes a device address, sends a clear lockout/local message. I/O, 2-20.

- ldb** file number
Loads a binary program from the specified tape file. O&P, 5-23.

- ldf** [file number [, line number₁ [, line number₂]]]
Loads the specified tape file into the appropriate area of memory. The optional line numbers indicate where to start loading (line number 1) and continuing (line number 2) a program. Omitting the file number loads file 0. O&P, 5-18.

17

String Variables ROM Error Messages

error

- 80 Invalid set of strings in data list or load file (ldf) statement.
- 81 Improper argument for string function or string variable.
- 82 More parameters than expected for string function or string variable.
- 83 Accessing or assigning to non-contiguous string.
- 84 num function of null string.
- 85 Trying to find the value of non-numeric string or null string. Exponent too large. Exponent format invalid (e.g., 1e + +5).
- 86 Invalid destination type for string assignment.
- 87 Parameter is zero, negative, exceeded dimensioned size. Invalid sequence of parameters for string variable.
- 88 String not yet allocated.
- 89 String previously allocated.
- 90 Maximum string length exceeded; additional string length must be specified in dim statement.

Disk ROM Error Messages

Hardware Errors

error

- 91 Firmware/driver out of synchronization. More than six defective tracks in a row. (Press )
- 92 All drives in system not powered.
- 93 Door opened while disk is being accessed.
- 94 Disk not in drive or no such drive number.
- 95 Write not allowed to protect disk.
- 96 Record header error. (Use Error Recovery Routine.)
- 97 Track not found. (Use Error Recovery Routine.)
- 98 Data Checkword error. (Use Error Recovery Routine.)
- 99 Hardware failure. (Press )
- 99 Verify error due to drive problem. Marginal data. (Reprint data)

HPL Syntax

ldf [file number [, data list]]

Loads data from the specified tape file into the listed variables. O&P, 5-21.

ldk [file number]

Loads the special function key file into memory. Omitting the file number loads tape file 0. O&P, 5-22.

ldp [file number [, line number₁ [, line number₂]]

Loads a program from either file 0 (file number omitted) or the specified file. The optional line numbers indicate where to start loading (line number 1) and where to start running (line number 2). O&P, 5-18.

len (string variable)

Returns the character length of the string. O&P, 6-14.

lim [X lower left, X upper right, Y lower left, Y upper right]

Restricts plotter pen movement to the stated bounds in user units. If bounds are omitted, movement is limited to the mechanical limits. 9872 Plotter ROM only. I/O, 7-34.

line [pattern number [, pattern length]]

Specifies the type of line plotted with plt, iplt, xax and yax. 9872 patterns are listed below. Pattern length is percentage of the total line length; default is 4%, 9872 Plotter ROM only. I/O, 7-32.

1 —
2 —
3 —
4 —
5 —
6 —
omit
number —

list [# select code] [, line number [, line number]]

Lists the entire program on the internal printer (no parameters) or lists the program to the specified select code. The line numbers indicate starting and ending lines for the listing. O&P, 3-39 and I/O, 1-23.

list  or **listk**

Lists the special function key definition (list ) or all definitions (listk). O&P, 3-39.

lkd

Disables live keyboard mode. O&P, 2-32.

lke

Enables live keyboard mode. O&P, 2-32.

llo select code

Sends the local lockout message to all HP-IB devices. I/O, 2-19.

ln (expression)

Returns the natural log (log_e) of the expression. O&P, 3-24.

load [disk file name , tape file number]

Loads files previously dumped to a tape back onto the disk. Omitting all parameters loads the entire dump back onto the disk. Including parameters loads only selected data files back onto the disk. D, 4-13.

log (expression)

Returns the common log (log₁₀) of the expression. O&P, 3-24.

ltr X coordinate , Y coordinate [, HWD]

Moves the 9862 plotter pen to the specified point and specifies dimensions for lettering. H and W can be from 1 through 9. D is lettering direction and can be from 1 through 4. 9862 Plotter ROM only. I/O, 7-47.

ltrk

Returns corrected data to a reinitialized track during disk error-recovery routine. 98217A ROM only. D, 4-15.

M

mat array variable₁ * array variable₂ → array variable₃

Array multiplication (arrays must have correct dimensions). M, 19.

max (expression [, expression [, ...]])

Returns the largest value in the list. O&P, 3-22.

mdec

Sets the decimal mode (default) for binary operations. I/O, 3-11.

Software Errors

error

- D0 Improper argument.
- D1 Argument out of range.
- D2 Improper file size (negative, 0 or >32767).
- D3 Invalid file name.
- D4 File not found.
- D5 Duplicate file name.
- D6 Wrong file type.
- D7 Directory overflow.
- D8 Insufficient storage space on disk.
- D9 Verify error due to cable, calculator or drive problem. Bad data (Reprint data).
- F0 File overflow when read or print executed.
- F1 Bootstraps not found. (Reload bootstraps)
- F2 String read but wrong data type encountered.
- F3 Attempt to read data item but type doesn't match.
- F4 Availability table overflow. (Repack)
- F5 Attempt on end branch from other than running program.
- F6 Unassigned data file pointer.
- F7 Disk is down so line cannot be reconstructed.

- F0 File overflow when read or print executed.
- F1 Bootstraps not found. (Reload bootstraps)
- F2 String read but wrong data type encountered.
- F3 Attempt to read data item but type doesn't match.
- F4 Availability table overflow. (Repack)

HPL Syntax

min (expression [, expression [, ...]])

Returns the smallest value in the list. O&P, 3-22.

moct

Sets the octal mode for binary operations. I/O, 3-11.

mrk number of files , file size [, return variable]

Marks the number of files, beginning at the tape's current position. The last file number marked is returned in the optional return variable. O&P, 5-10.

N

nal

Returns the last program line number plus one; used with store to store strings. O&P, 7-24.

next simple variable

Terminates for-next loop and tests for loop completion. O&P, 4-3.

nor [line number [, line number]]

Clears the master program flag, either while executing all lines (omit all parameters) or only for the specified line numbers. O&P, 3-44.

num ("character" or substring)

Returns the ASCII-decimal value of the character. O&P, 6-21.

O

ofs X coordinate , Y coordinate

Offsets the origin (0,0) to point X,Y. I/O, 7-27.

on end file number , line number or label

Enables a branch to the specified line or label when a disc EOF or EOR mark is encountered during read and write operations. D, 3-19.

on err "line label"

Enables an error-trapping routine. The program branches to the label and the erl, ern and rom functions are assigned values when an error occurs. I/O, 4-4.

on key ["line label" [, flag no.]]

Enables a keyboard interrupt routine. The program branches to the label and optionally sets the flag when the keyboard buffer overflows. Omitting all parameters disables the keyboard interrupt. O&P, 7-6.

oni select code , "label"

References an interrupt service routine associated with the peripheral's select code. I/O, 5-5.

open file name , number of records

Creates a disk data file of the specified size. D, 3-2.

otd (expression)

Returns the decimal equivalent of the octal value expressed. I/O, 3-12.



P

par (expression)

Sets the parity type (listed below) used for I/O checking. I/O, 4-9.

0	Parity disabled.	2	Even parity.
1	Parity = 1.	3	Odd parity.

pclr

Sets default plotter values except scale units, select code, P1, P2, pen location and pen#. 9872 Plotter ROM only. I/O, 7-10.

pct select code

Passes active control to the specified HP-IB device. I/O, 2-26.

pen

Raises the plotter pen. I/O, 7-22.

pen# [expression]

Selects the plotter pen (1 through 4). 9872 Plotter ROM only. I/O, 7-22.

B0	Wrong syntax, argument out of range or variable not properly dimensioned.
B1	More than six defective tracks on the disk.
B2	Verify error. Boots on the disk not identical to boots on the cartridge.
B3	disk or init not allowed because error information lost or error not d5, d6, d7 or d9.
B4	Attempt to access record for error correction which isn't part of data file.
B5	Improper string length (inconsistent with length given in header).
B6	Not enough space in calculator buffer for data item or item can't be placed in this part of buffer.
B7	Missing Disk or String ROM.
B8	Track still bad after init.

These errors may result during the binary initialization and Error Recovery Routines.

ERROR

SPARE DIR.

is printed when the spare directory in the backup track automatically replaces the main directory.

DISK IS DOWN

is displayed when running a program that uses a drive number of a drive that is not connected to the system, not powered or whose door is opened.

error

F5	Attempt on end branch from other than running program.
F6	Unassigned data file pointer.
F7	Disk is down so line cannot be reconstructed.
F8	Disk is down and (M) pressed.
F9	System error. (Save files individually and initialize.)

HPL Syntax

% string [:]

The % free-text prefix allows storing text without syntax checking. Free text is terminated with a semicolon or end of line. O&P, 7-25.

plt X coordinate , Y coordinate [, expression]

Move plotter pen to specified X,Y point. Optional expression controls pen (see below). I/O, 7-22.

even	lowers pen.
odd	raise pen.
positive	action before plotting.
negative	action after plotting.

pol select code

Conducts a parallel poll on the HP-IB. I/O, 2-25.

polc select code , byte

Sets parallel poll bits on the specified HP-IB device. I/O, 2-26.

polu select code

Clears parallel poll bits on the specified device. I/O, 2-26.

pos (string₁ , string₂)

Returns the character position of the second string within the first. O&P, 6-16.

prnd (expression , expression)

Returns the first expression rounded to the power of ten indicated by the second expression. O&P, 3-22.

prt expression or string [, expression or string [, ...]]

Prints the list of items on the internal printer. To print quotes (e.g., 3: prt "print""text""in quotes."). O&P, 3-12

psc select code

Sets the select code for all plotter ROM operations. psc 0 causes either the program to ignore all plotter operations (9872 ROM) or the computer to suppress output to plotter (9862 ROM). I/O, 7-5.

ptyp

Sets a plotter lettering mode. Press STOP key to terminate mode. I/O, 7-45.

R

rad

Sets radians units for angular calculations. O&P, 3-25.

√ (expression)

Returns the square root of the expression. O&P, 3-22.

rcf [file number [, line number

[, line number]] [, "SE" or "DB"]]

Records either all program lines onto the specified tape file (no line numbers) or only the specified block of lines. Including SE prevents the program from being listed or displayed when reloaded. Including DB records all trace and stop flags with the program for debugging. O&P, 5-16.

rcf file number , variable list

Records the listed variables onto the tape file. O&P, 5-16.

rck file number

Records the special function key definitions on the tape file. O&P, 5-22.

rcm file number

Records the entire computer memory on the specified tape file. O&P, 5-22.

rdb (select code)

Returns one 16-bit binary character code from the specified device. I/O, 3-4.

rdi (register number)

Returns a status byte from the interface specified by wti 0. I/O, 4-12.

These mainframe errors take on additional meaning when the Disk ROM is installed.

ERROR

00	Mnemonic not found because disk may be down.
01	Line can't be executed because ROM (usually String) is missing.
02	Line not found.
03	Get or chain should be last statement in a line.
04	ROM now installed which wasn't when saved was executed.
05	ROM now missing which wasn't when saved was executed.
06	Disk load operation would overlay gsb return address so load not executed.
07	Get, chain or getk not allowed from live keyboard mode or during an ent statement.

HPL Syntax

rdm array variable [, array variable [, ...]]
Redimensions the array(s) to the specified dimensions. M, 16.

rds (select code)
Returns the current status word from the specified interface. I/O, 3-5.

red select code [. format no.] , variable list
Reads and stores data from the specified device. I/O, 1-5.

rem select code
Sends the remote message to either all HP-IB devices or only one device when its address is included in the select code. I/O, 2-18.

renm old file name , new file name
Renames a disk file. D, 28.

repk
Repacks user files on the default disk. D, 4-5.

res
Returns the result of the last keyboard operation not stored in a variable. O&P, 2-20.

resave file name [, 1st line number [, 2nd line number]]
Stores a program (or only the specified lines) in an existing disk file. D, 2-9.

ret
Ends a subroutine and returns program execution to the main program (line after gsb). O&P, 3-34.

rew
Rewinds the tape. O&P, 5-6.

rkbd select code [, expression]
Enables a remote keyboard to control the computer. The expression indicates the keycode interpretation: 0 = ASCII (default) or 1 = 9825 keycodes. O&P, 7-24.

rnd (expression)
Returns a pseudo-random number from 0 to (less than) 1. A negative expression is used as a new seed. O&P, 3-22.

rot (expression₁ , expression₂)
Returns the result of binary rotation of the 16-bit equivalent of expression 1, rotated the number of bits indicated by expression 2. I/O, 3-13.

rprr file number , record number [, data list]
[, "end" or "ens"]
Prints the list of data items on the disk file, starting at the specified record. Including "end" prints an EOF mark after the data. Including "ens" suppresses the automatic EOR mark printed after data. D, 3-12.

rqs select code , byte
Requests service from the HP-IB system controller and sends the serial status byte upon response to a serial poll. I/O, 2-21.

rread file number , record number [, variable list]
Reads data from the disk file, starting at the specified record. D, 3-15.

rss (select code)
Returns the 98036 Interface status register byte. O&P, 7-16.

run [line number or "label"]
Begins program execution, either at line 0 or at the specified line. O&P, 2-9.

S

save file name [, 1st line number [, 2nd line number]]
Stores either the entire program on the disk file or only the specified block of lines. D, 2-2.

savek file name
Stores all special function key definitions on the disk file. D, 2-9.

HPL Syntax

savem file name

Stores the entire read/write memory on the disk file. D, 2-10.

scl Xp1, Xp2, Yp1, Yp2

Locates the origin and specifies user units for plotting operations. I/O, 7-7.

sfg [flag no. [, flag no. [, ...]]]

Sets either all 15 program flags to 1 or only the specified flags. O&P, 3-28.

sgn (expression)

Returns sign of expression: 0 = zero; 1 = positive; -1 = negative. O&P, 3-22.

shf (expression₁, expression₂)

Returns the result of right-shifting the 16-bit binary equivalent of expression 1, the number of places indicated by expression 2. A negative expression 2 shifts the byte to the left. I/O, 3-14.

sin (expression)

Returns the sine of the expression. O&P, 3-2.

smpy number or simple variable

[*] array variable₁ → array variable₂

Multiplies each element of array 1 by the scalar number. The * can be omitted. M, 13.

spc [expression]

Outputs the expressed number of line feeds on the internal printer. O&P, 3-16.

sprt file number, data list [, "end" or "ens"]

Prints the list of data items on the disk file. Including "end" prints an EOF mark after the data. Including "ens" suppresses the automatic EOR mark printed after data. D, 3-7.

sread file number, variable list

Reads data from the disk file. D, 3-10.

stf (string variable)

Unpacks and returns a split-precision number from its four-character string. O&P, 4-20.

store string name or "string" [, line number]

Stores program lines from an executing program. O&P, 7-21.

stp [line number₁ [, line number₂]]

Stops program execution either immediately or, optionally, at the specified line (line 1). Specifying both line numbers indicates a block of lines to stop at. O&P, 3-17.

str (expression)

Returns the ASCII character equivalent to the expression. O&P, 6-19.

T

tan (expression)

Returns the tangent of the expression. O&P, 3-25.

tfr source name, destination name

[, expression [, last character]]

Transfers data between an I/O buffer and a peripheral device. Optional expression indicates the total number of bytes to transfer. Optional last character expression is the decimal value of the character to terminate the transfer. I/O, 6-8.

time (expression)

Causes an I/O operation to wait for a device to become ready for the specified number of milliseconds. I/O, 4-4.

tinit

Reinitializes a bad track during 9885 error recovery. 98217A ROM only. D, 4-15.

HPL Syntax

tlst

Catalogs tape files on the internal printer (file types below). O&P, 5-9.

- 0 Null file.
- 1 Binary program.
- 2 Numeric data file.
- 3 String or string /data.
- 4 Memory file.
- 5 Special function key file.
- 6 Program file.

tn↑ (expression)

Returns 10 raised to the specified power. O&P, 3-24.

trc [1st line number [, last line number]]

Sets the master flag and, optionally, trace flags for specified program lines. O&P, 3-44.

trg select code

Sends the trigger message to the specified HP-IB device. I/O, 2-17.

trk expression

Specifies the tape track (0 or 1) for successive operations. O&P, 5-6.

trn array name → array name

Transposes rows and columns between arrays. M, 23.

type ([-] expression)

Returns the next item-type (types listed below) in a disk data file. A negative expression indicates a search for an EOR mark. D, 3-20.

- 0 Unidentified type.
- 1 Full-precision number.
- 2 String (within record).
- 3 EOF mark or physical end of file.
- 4 EOR mark.

(continued)

Indicates string overlapping record boundaries:

- 2.1 Start of string.
- 2.2 Middle of string.
- 2.3 End of string.

U

units

Returns the currently-set angular units. O&P, 3-25.

V

val (string)

Returns the numeric value of the string. O&P, 6-17.

vfy [return variable]

Verifies the contents of a tape file with the original in memory. Return variable: 0 = no error; 1 = error. O&P, 5-25.

vfyb

Verifies disk bootstraps. 98217A ROM only. D, 4-15.

voff

Disables disk data verification. D, 4-6.

von

Enables disk data verification (default). D, 4-6.

W

wait expression

The program waits for the specified time in milliseconds (from 1 to 32767). O&P, 3-16.

wrt select code [. format no.] [, item list]

Outputs the items to the specified device. I/O, 1-3.

HPL Syntax

- wsc** select code , expression
Outputs a control word (expression) to the specified interface. O&P, 7-14.
- wsm** select code , expression [, expression]
Outputs a mode word and, optionally a control word (second expression) to the specified 98036 Interface. O&P, 7-15.
- wtb** select code , expression [, expression [, ...]]
Outputs the byte representing each number or character to the specified device. I/O, 3-3.
- wtc** select code , expression
Outputs a control byte to the specified interface. I/O, 3-9.
- wti** select code
Specifies an interface for successive wti or rdi operations. I/O, 4-11.
- wti** expression₁ , expression₂
Outputs a control byte (expression 2) to a specified interface register (expression 1). I/O, 4-11.

X

- xax** Xoffset [, tic interval [, start [, end [, no. of tics/label]]]]
Draws an X axis with optional tic marks and labels. 9872 Plotter ROM only. I/O, 7-11.
- xref**
Prints a cross reference of program variables and line numbers, using the current program in memory. O&P, 4-32.

Y

- yax** Xoffset [, tic interval [, start [, end [, no. of tics/label]]]]
Draws a Y axis with optional tic marks and labels. 9872 Plotter ROM only. I/O, 7-11.

Error Codes

An error in a program sets the program line counter to line 0. Press the continue key to continue the program from line 0. Execute the continue command with a line number to continue at any desired line (such as: cont 50).

- | | |
|-----------------|---|
| 00 | System error. |
| 01 | Unexpected peripheral interrupt. |
| 02 ¹ | Unterminated text. |
| 03 ¹ | Mnemonic is unknown.
Mnemonic not found because disk may be down. |
| 04 | System is secured. |
| 05 | Operation not allowed; line cannot be stored or executed with line number. |
| 06 ¹ | Syntax error in number. |
| 07 ¹ | Syntax error in input line. |
| 08 | Internal representation of the line is too long (gives cursor sometimes). |
| 09 | goto, gsb, or end statement not allowed in present context.
Attempt to execute a next statement either from keyboard while for/next loop using same variable is executed in program or from program while for/next loop using same variable is executed from keyboard. Attempt to call function or subroutine from keyboard. |
| 10 ¹ | goto or gsb statement requires an integer. |
| 11 | Integer out of range or integer required; must be from -32768 thru +32767. |
| 12 ¹ | Line cannot be stored; can only be executed. |
| 13 | ent statement not allowed in present context. |
| 14 | Program structure destroyed. |

¹ Press the **RECALL** key to position the cursor at the location of the error.

Error Codes

- 15 Printer out of paper or printer failure.
- 16 String Variables ROM not present for the string comparison. Argument in relational comparison not allowed.
- 17 Parameter out of range.
- 18 Incorrect parameter.
- 19 Bad line number.
- 20 Missing ROM or binary program. The second number indicates the missing ROM. In the program mode, the line number is given instead of the ROM number. Displayed number and missing item:
- 1 Binary Program
 - 4 Systems Programming ROM
 - 6 Strings ROM
 - 8 Extended I/O ROM
 - 9 Advanced Programming ROM
 - 10 Matrix ROM
 - 11 Plotter ROM
 - 12 General I/O ROM
 - 17 Disk ROM
- 21 Line is too long to store.
- 22 Improper dimension specification.
- 23 Simple variable already allocated.
- 24 Array already dimensioned.
- 25 Dimensions of array disagree with number of subscripts.
- 26 Subscript of array element out of bounds. P-number reference is negative.
- 27 Undefined array.
- 28 ret statement has no matching gsb statement.
- 29 Cannot execute line because a ROM or binary program is missing.
- 30 Special function key not defined.

- 31 Non-existent program line.
- 32 Improper data type.
Non-numeric value in for statement or in fts or fti function.
- 33 Data types do not match in an assignment statement.
- 34 Display overflow due to pressing a special function key.
- 35 Improper flag reference (no such flag).
- 36 Attempt to delete destination of a gto or gsb statement.
- 37 Display buffer overflow caused by dsp statement.
- 38 Insufficient memory for subroutine return pointer. Memory overflow during function or subroutine call.
- 39 Insufficient memory for variable allocation or binary program.
- 40 Insufficient memory for operation.
Memory overflow while using for statement or while allocating local p-numbers.
- 41 No cartridge in tape transport.
- 42 Tape cartridge is write protected. (Slide record tab to other position for recording.)
- 43 Unexpected Beginning-Of-Tape (BOT) or End-Of-Tape (EOT) marker encountered.
Tape transport failure.
- 44 Verify has failed.
- 45 Attempted execution of idf statement without parameters or mrk statement when tape position is unknown.
- 46 Read error in file body.
- 47 Read error in file head.
- 48 End-Of-Tape (EOT) encountered before specified number of files were marked.

Error Codes

- 49 File too small.
- 50 ldf statement for a program file must be last statement in the line. get or chain statement should be the last statement in a line.
- 51 or 52 Memory configuration error for attempted ldm statement. For example, a ROM present when memory was recorded is now not present (see error 20), or attempting to load a memory file recorded on a 9825A into a 9825B.
- Memory files are not compatible between the 9825A and 9825B. Only the program portion can be recovered by loading the memory file into the original machine and doing a rcf. This program file can then be loaded into any 9825 with the ldf statement.
- 53 Negative parameter in cartridge statement.
- 54 Binary program to be loaded is larger than present binary program and variables have been allocated.
- 55 Illegal or missing parameter in a cartridge statement.
- 56 Data list is contiguous in memory for a cartridge statement.
- 57 Improper file type.
- 58 Invalid parameter in rcf statement; "SE" or "DB" expected.
- 59 Attempt to record a program or special function keys which do not exist.
- 60 Attempt to load an empty file or the null file (type = 0).
- 61 The line referenced in an ldf or ldp statement does not exist. If the line containing the ldf or ldp statement has been overlaid by the load operation, the line number in the display may be incorrect.

- 62 Specified memory space is smaller than cartridge file size.
- 63 Cartridge load operation would overlay subroutine return address in program; load not executed.
- Disk load operation would overlay gsb return address; load not executed.
- 64 Attempt to execute ldk, ldf (program file), or ldp during live keyboard statement.
- get, chain or getk not allowed from live keyboard mode or during an ent statement.
- 65 File not found.
- File specified in the previous fdf statement does not exist.
- Default values associated with errors 66 thru 77 when flag 14 is set are explained in the programming chapter of the operating and programming manual.
- 66 Division by zero.
- A mod B, with B equal to zero.
- 67 Square root of negative number.
- 68 $\tan(n \cdot \pi/2 \text{ radians})$.
- $\tan(n \cdot 90 \text{ degrees})$.
- $\tan(n \cdot 100 \text{ grads})$.
- where n is an odd integer.
- 69 ln or log of a negative number.
- 70 ln or log of zero.
- 71 asn or acs of number less than -1 or greater than +1.
- 72 Negative base to non-integer power.
- 73 Zero to the zero power ($0 \uparrow 0$).
- 74 Storage range overflow.
- 75 Storage range underflow.
- 76 Calculation range overflow.

Error Codes

77	Calculation range underflow.
A0	Relational operator in for statement not allowed. No closing apostrophe.
A1	A for statement has no matching next statement.
A2	A next statement encountered without a previous for statement.
A3	Non-numeric parameter passed as a p-number.
A4	No return parameter for a function call.
A5	No functions or subroutines running. Improper p-number.
A6	Attempt to allocate local p-numbers from the keyboard.
A7	Wrong number of parameters in fts, stf, fti, or itf function. stf or itf parameter must be a string (not a numeric). stf or itf parameter contains too few characters.
A8	Overflow or underflow in fts function. Overflow in fti function.
A9	String Variables ROM missing for stf or itf functions.

Errors B0 thru B8 may result during the binary disk initialization and disk error recovery routines.

B0	Wrong syntax, argument out of range or variable not properly dimensioned.
B1	More than six defective tracks on the disk.
B2	Verify error. Boots on the disk not identical to boots on the cartridge.
B3	dtkr or tinit not allowed because error information lost or error not d5, d6, d7 or d9.

B4	Attempt to access record for error correction which isn't part of data file.
B5	Improper string length (inconsistent with length given in header).
B6	Not enough space in computer buffer for data item. Item can't be placed in this part of buffer.
B7	Missing Disk or String ROM.
B8	Track still bad after tinit.
C0	Missing General I/O or Extended I/O ROM.
C1	Incorrect number of parameters.
C2	Improper parameter specified.
C3	Wrong parameter type.
C4	Illegal buffer type for bred statement.
C5	Key buffer overflow.
C6	Too large or wrong sign of parameter.
C7	Improper execution of store statement.
C8	Illegal use of kret.
C9	Missing 98036A Interface card.
D0	Improper argument in disk statement.
D1	Disk argument out of range.
D2	Improper file size (must be from 1 thru 32767). No lines to store for save or savek.
D3	Invalid file name.
D4	File not found.
D5	Duplicate file name. Attempting to copy a non-data file to an existing file.
D6	Wrong file type.
D7	Directory overflow.

Error Codes

D8	Insufficient storage space on disk.
D9	Verify error due to cable, computer or drive problem. Bad data (reprint data).
DISK IS DOWN (98217A ROM)	
UNABLE TO ACCESS DISK CONTROLLER (98228A ROM)	
Computer cannot access the disk controller.	
d0	Firmware/driver out of synchronization. More than six defective tracks in a row (Press RESET) or too many defective tracks with 98228A init.
d1	All drives in system not powered on.
d2	Door opened while disk being accessed.
d3	Disk not in drive or drive not present.
d4	Write not allowed to protected disk.
d5	Record header error (error recovery routine.)
d6	Track not found (use error recovery routine.)
d7	Data checkword error. (use error recovery routine.)
d8	Hardware failure (Press RESET).
d9	Verify error. Data not readable under reduced margins (reprint data).
E0	General I/O ROM missing. HP-IB error under interrupt.
E1	Wrong number of parameters.
E2	Improper buffer device or equate table usage. Multiple-listeners error. Buffer busy.
E3	Wrong parameter type.
E4	Timeout error.
E5	Buffer underflow or overflow.
E6	Parameter value out of range.
E7	Parity failure.

E8	Improper use of irect statement. Attempt to DMA with HP-IB. Buffer or select code is busy.
E9	Illegal HP-IB operation.
F0	File overflow when read or print executed.
F1	98217A bootstraps not found (reload bootstraps). Wrong memory configuration for 98228A ROM.
F2	String read but wrong data type encountered.
F3	Attempt to read data item but type doesn't match.
F4	Availability table overflow (repack).
F5	Attempt on end branch from other than running program.
F6	Unassigned data file pointer.
F7	Disk is down; line cannot be reconstructed. (98217A ROM only).
F8	Disk is down and STOP pressed.
F9	System error (save files individually and reinitialize).
G1	Incorrect format numbers.
G2	Referenced format statement has an error.
G3	Incorrect I/O parameters.
G4	Incorrect select code.
G5	Incorrect read parameter.
G6	Improper conv statement parameters.
G7	Unacceptable input data.
G8	Peripheral device down.
G9	Interface hardware problem.
M1 ¹	Syntax error.

¹ Press the **RECALL** key to position the cursor at the location of the error.

Error Codes

- M2** Improper dimensions. Array dimensions incompatible with each other or incompatible with the stated operation.
- M3** Improper redimension specification. New number of dimensions must equal original number; new size cannot exceed original size.
- M4¹** Operation not allowed. An array which appears to the left of $\rightarrow$ cannot also appear on the right.
- M5** Matrix cannot be inverted. Computed determinant = 0.

9862A Plotter ROM Error Codes

- P1** Wrong state.
Statements executed out of order.
- P2** Wrong number of parameters.
- P3** Wrong type of parameters. Parameters for a label statement must be expressions, text, or string variables.
- P4** Scale out of range. Maximum value is less than or equal to the minimum value.
- P5** Integer out of range. Pen control parameter is out of the range -32768 thru $+32767$ or the select code is not 0 or in the range 2 thru 15.
- P6** Character size out of range. Width or height in letter statement is zero or there is an integer overflow in csize calculations or results.
- P7** Not used.
- P8** Axes origin off-scale. X, Y specified for axis statement doesn't fall on plotter surface.
- PLT DOWN** Check interface connection and select code setting; be sure LINE and CHART HOLD are on.

¹ Press the **RECALL** key to position the cursor at the location of the error.

9872A Plotter ROM (HP-GL) Error Codes

- P1** Attempt to store into constant. Occurs when one or more parameters in a dig statement are constants rather than variables.
- P2** Wrong number of parameters. Occurs on instructions with numeric-only parameter lists (scl, ofs, plt, iptl, cplt, xax, yax, lim, dig, csiz, line, pen#, and psc). In certain unusual cases where a parameter list contains user-level function calls, an instruction having an incorrect number of parameters may be executed.
- P3** Wrong type of parameter or illegal parameter value.
- P4** No HP-IB device number specified. Occurs when psc parameter is from 0 thru 14 and an HP-IB card is at the corresponding select code.
- P5** Pen control value not from -32768 thru 32767 . Hardware transmission error occurs between plotter and computer.
- P6** No HP-IB card at specified select code.
- P7** axe or ltr statement encountered; 9822 ROM cannot execute them.
- P8** Computer **STOP** key cancelled operation. Occurs when the plotter fails to respond for three seconds after the **STOP** key has been pressed.
- p0** Transmission error. The calculator has received an illegal ASCII input from the plotter.
- p1** Instruction not recognized. The plotter has received an illegal character sequence.
- p2** Wrong number of parameters. Too many or too few parameters have been sent with an instruction.
- p3** Bad parameter. The parameters sent to the plotter with an instruction are out of range for that instruction.

Error Codes

Errors generated by write (wrt) and read (red) statements will typically be displayed in the next executed plotter ROM statement. This can be avoided by using an output error command (wrt select code, "OE";) followed by a read statement (red select code, variable) to check for errors after read or write statements that address the plotter.

S0	Invalid set of strings in data list of ldf statement.
S1	Improper argument for string function or string variable.
S2	More parameters than expected for string function or string variable.
S3	Accessing or assigning to non-contiguous string, num function of null string.
S4	Trying to find the value of non-numeric string or null string. Exponent too large. Exponent format invalid (e.g., 1e+ +).
S5	Invalid destination type for string assignment.
S6	Parameter is zero, or negative, exceeded dimensioned size. Invalid sequence of parameters for string variable.
S7	String not yet allocated.
S8	String previously allocated.
S9	Maximum string length exceeded; additional string length must be specified in dim statement.
SPARE DIR.	Printed when the spare disk directory (backup track) automatically replaces the main directory.

Option ROM Syntax and Errors

The following syntax and error messages require the appropriate option ROM be plugged into your Desktop Computer. See the alphabetical listing for syntax and error descriptions.

Advanced Programming ROM

Syntax: cll, for, fti, fts, itf, next, stf, xref
Errors: A0 through A9

98217A Disk ROM

Syntax: asgn, boot, cat, chain, copy, dirc, drive, dtrk, dump, files, get, getb, getk, getm, init, kill, killall, load, ltrk, on end, open, renm, repk, resave, rprr, rread, save, savek, savem, sprr, sread, tinit, type, vfyb, voff, von
Errors: B0 through B8, D0 through D9, F0 through F9, d0 through d9

98228A Disk ROM:

Syntax: asgn, cat, chain, copy, drive, dtype dump, files, get, getb, getk, getm, init, kill, killall, load, on end, open, renm, repk, resave, rprr, rread, save, savek, savem, sprr, sread, type, von, voff.
Errors: D0 thru D9, d0 thru d9, F0 thru F9.

Extended I/O ROM

Syntax: add, band, bit, buf, cli, clr, cmd, cmp, ctbl, dev, dto, eir, eor, equ, iof, ior, ios, iret, lcl, llo, mdec, moct, on err, oni, otd, par, pct, pol, polc, polu, rdi, rds, rem, rot, rqs, shf, tfr, time trg, wti
Errors: E0 through E9

General I/O ROM

Syntax: conv, fnt, list#, rdb, rds, red, wrt, wtb, wtc
Errors: G1 through G9

Matrix ROM

Syntax: aprt, ara, dim, idn, ina, inv, ldf, mat, rcf, rdm, smpy, trn
Errors: M1 through M5

Option ROM

9862A Plotter ROM

Syntax: axe, cplt, csiz, iplt, lbl, ltr, ofs, pen, plt, psc, ptyp, scl

Errors: P1 through P8

9872A Plotter ROM

Syntax: cplt, csiz, dig, iplt, lbl, lim, line, ofs, pclr, pen, pen#, plt, psc, ptyp, scl, xax, yax

Error: P1 through P8, p0 through p6

String Programming ROM

Syntax: cap, char, dim, dsp, enp, ent, if, ldf, len, num, pos, prt, rcf, str, val

Errors: S0 through S9

Systems Programming ROM

Syntax: asc, bred, eol, key, kret, nal, on key, rkbd, rss, store, wsc, wsm

Errors: C0 through C9

Interface Card Registers

This section describes the register bit maps for the various interface cards that are available for the 9825. See the associated Installation and Service Manual for a complete description of a specific interface.

98032A Register Map

	IN	OUT
R4	DATA IN	DATA OUT
R5	STATUS	CONTROL
R6	HIGH BYTE DATA	HIGH BYTE DATA
R7	(not used)	TRIGGER

R4-IN: Read 16 bits (lower 8 bits if jumper B is not installed) of data from the input data latches. Sets I/O line to input.

R4-OUT: Write 16 bits (lower 8 bits if jumper F is not installed) of data to the output data latches. Sets I/O line to output.

R5-IN: Read 98032A interface status byte.

R5 Status (R5-IN)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
INT	DMA	1	0	IID	IOD	STI1	STI0

R5-OUT: Write 98032A interface control byte.

R5 Control (R5-OUT)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
INT	DMA	RESET	AH	—	—	CTL1	CTL0

R6-IN: Read 16 bits (upper 8 bits if jumper B is not installed) of data from the input data latches. Does not affect I/O line.

R6-OUT: Write 16 bits (upper 8 bits if jumper F is not installed) of data to the output data latches. Does not affect I/O line.

R7-OUT: Sets PCTL to initiate an input/output handshake, depending on the state of the I/O line from the last R4 access.

98033A Register Map

	IN	OUT
R4	DATA IN	(not used)
R5	STATUS	CONTROL
R6	(not used)	(not used)
R7	(not used)	TRIGGER

R4-IN: Read one 8-bit ASCII character from the 98033A BCD-to-ASCII translator.

R5-IN: Read 98033A interface status byte.

R5 Status (R5-IN)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
INT	0	1	0	0	0	0	0

98033A Registers

R5-OUT: Write 98033A interface control byte.

R5 Control (R5-OUT)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
INT	—	RESET	—	—	—	—	—

R7-OUT: An output to R7 (actual value output is a "don't care") causes the 98033A to place the next ASCII character in the sequence representing the reading into the R4-IN register. After 16 characters have been so placed, the next R7-OUT causes a new reading to be taken (i.e., the card sets CTLA and CTLB to start a data handshake with the BCD device) and places the first character of that reading in the R4-IN register.

98034A Register Map

	ON	OUT
R4	DATA IN	DATA OUT
R5	STATUS	CONTROL
R6	STATUS/DATA	COMMANDS
R7	PARALLEL POLL	DIRECT BUS CONTROL

R4-IN: Initiates a data byte input sequence.

R4-OUT: Transfers one byte of data to the bus.

R5-IN: Initiates a status read sequence.

R5-OUT: Outputs a control byte to enable the 98034A for various interrupt conditions.

R5 Control (R5-OUT)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SRQ	ACT	TLK	LST	IRF	ORE	OTHER	SEE NOTE

Note: Bit 0, when set, causes the STS line to be cleared when EOI is received.

R6-IN: Completes a data byte input sequence.
Clears ATN.

Delivers 98034A status bytes.

Completes a parallel poll input sequence.

R6-OUT: Sets the ATN line true and outputs a byte of command or addressing information.

R7-IN: Initiates a parallel poll byte request.

R7-OUT: Direct¹ bus control.

R7 Out, Bit 7 Set

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	0	EOI	IFC	ATN	REN	SRQ

R7 Out, Bit 7 Clear

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	SRQ	X	X	X	X	X	X

R7-OUT: Service Request control and serial-poll response byte.

X = user definable.

98034A Read Status Sequence

1. R5-IN: Initiate status read sequence. In the byte received, bits 4 and 5 are ones, indicating an HP-IB interface type. No other bits are meaningful.

2. R6-IN: Get status byte 1.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	DCL	0	ERROR

¹ After executing this R7-OUT instruction, the 98034A will clear the STS line if an illegal operation (e.g., specifying ATN if the 98034A is not active controller) is indicated.

98034A Read Status

3. R6-IN: Get status byte 2.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	1	0	A ₅	A ₄	A ₃	A ₂	A ₁

4. R6-IN: Get status byte 3.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
EOI	REN	SRQ	ATN	IFC	NDAC	NRFD	DAV

5. R6-IN: Get status byte 4.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SRQ	ACT	TLK	LST	SAC	1	SPL	EOR

98036A Register Map

	IN	OUT
R4	DATA IN, R4E	DATA OUT, R4C, R4D
R5	STATUS	CONTROL
R6	LINE STATUS	LINE CONTROL
R7	(not used)	TRIGGER

Registers are on the following pages.

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R4C Mode Word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Number of Stop Bits 00=not valid 01=1 bit 10=1.5 bits 11=2 bits	Parity Enable 0=Disable 1=Enable	Parity Type 0=Odd 1=Even	Character Length 00=5 bits 01=6 bits 10=7 bits 11=8 bits	Bit Rate Factor 00=not used 01=1 X bit rate clock 10=1/16 X bit rate clock 11=1/64 X bit rate clock			

R4D USART Control Word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Always 0	USART Reset	Clear To Send Pin 5 (Standard) Request To Send Pin 4 (Option 001)	Reset Status Bits of USART Status Word	Send Break Character	Enable Data Receiver	Data Set Ready Pin 6 (Standard) Data Terminal Ready Pin 20 (Option 001)	Data Enable Transmitter

R4E USART Status Word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Always 0	Framing Error	Overrun Error	Parity Error	Transmitter Empty	Receiver Ready	Transmitter Ready

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R5 OUT Register

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Interface Interrupt Enable		Programmed Interface Reset			Interrupt Control 2 Receiver Control	Interrupt Control 2 Transmitted Control	R4 Control 0=Data IN/ OUT 1=Control/ Status

R5 IN Register

Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Peripheral Status 1 Mode	Interface Interrupt Enable Status	0	Interface I.D. 0	Interface I.D. 1	0	0	Control Status 2 Receiver	Control Status 1 Transmitter Mode

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R6 OUT Register (standard cable)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
			Half/Full Speed Control (Interface)	Ring Indicator Pin 22	Signal Quality Detect Pin 21	Secondary Line Signal Detect Pin 12	Line Signal Detect Pin 8

R6 IN Register (standard cable)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Always 1	Always 1	Always 1	Always 1	Always 1	Always 0	Data Signal Rate Select Pin 23	Secondary Request To Send Pin 19

R6 OUT Register (option 001 cable)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
			Half/Full Speed Control	Special Purpose Pin 25	Data Signal Rate Select (U.K.) Pin 11	Data Signal Rate Select Pin 23	Secondary Request To Send Pin 19

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R6 IN Register (option 001 cable)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Always 1	Always 1	Always 1	Always 1	Always 1	Secondary Line Signal Detect Pin 12	Ring Indicator Pin 22	Line Signal Detect Pin 8

ASCII TABLE

ASCII Char.	EQUIVALENT FORMS				ASCII Char.	EQUIVALENT FORMS			
	Binary	Oct	Hex	Dec		Binary	Oct	Hex	Dec
NUL	00000000	000	00	0	space	00100000	040	20	32
SOH	00000001	001	01	1	!	00100001	041	21	33
STX	00000010	002	02	2	"	00100010	042	22	34
ETX	00000011	003	03	3	#	00100011	043	23	35
EOT	00000100	004	04	4	\$	00100100	044	24	36
ENQ	00000101	005	05	5	%	00100101	045	25	37
ACK	00000110	006	06	6	&	00100110	046	26	38
BEL	00000111	007	07	7	'	00100111	047	27	39
BS	00001000	010	08	8	(	00101000	050	28	40
HT	00001001	011	09	9	)	00101001	051	29	41
LF	00001010	012	0A	10	*	00101010	052	2A	42
VT	00001011	013	0B	11	+	00101011	053	2B	43
FF	00001100	014	0C	12	,	00101100	054	2C	44
CR	00001101	015	0D	13	-	00101101	055	2D	45
SO	00001110	016	0E	14	.	00101110	056	2E	46
SI	00001111	017	0F	15	/	00101111	057	2F	47
DLE	00010000	020	10	16	0	00110000	060	30	48
DC1	00010001	021	11	17	1	00110001	061	31	49
DC2	00010010	022	12	18	2	00110010	062	32	50
DC3	00010011	023	13	19	3	00110011	063	33	51
DC4	00010100	024	14	20	4	00110100	064	34	52
NAK	00010101	025	15	21	5	00110101	065	35	53
SYN	00010110	026	16	22	6	00110110	066	36	54
ETB	00010111	027	17	23	7	00110111	067	37	55
CAN	00011000	030	18	24	8	00111000	070	38	56
EM	00011001	031	19	25	9	00111001	071	39	57
SUB	00011010	032	1A	26	:	00111010	072	3A	58
ESC	00011011	033	1B	27	;	00111011	073	3B	59
FS	00011100	034	1C	28	<	00111100	074	3C	60
GS	00011101	035	1D	29	=	00111101	075	3D	61
RS	00011110	036	1E	30	>	00111110	076	3E	62
US	00011111	037	1F	31	?	00111111	077	3F	63

ASCII Char.	EQUIVALENT FORMS			
	Binary	Oct	Hex	Dec
@	01000000	100	40	64
A	01000001	101	41	65
B	01000010	102	42	66
C	01000011	103	43	67
D	01000100	104	44	68
E	01000101	105	45	69
F	01000110	106	46	70
G	01000111	107	47	71
H	01001000	110	48	72
I	01001001	111	49	73
J	01001010	112	4A	74
K	01001011	113	4B	75
L	01001100	114	4C	76
M	01001101	115	4D	77
N	01001110	116	4E	78
O	01001111	117	4F	79
P	01010000	120	50	80
Q	01010001	121	51	81
R	01010010	122	52	82
S	01010011	123	53	83
T	01010100	124	54	84
U	01010101	125	55	85
V	01010110	126	56	86
W	01010111	127	57	87
X	01011000	130	58	88
Y	01011001	131	59	89
Z	01011010	132	5A	90
[	01011011	133	5B	91
\	01011100	134	5C	92
]	01011101	135	5D	93
^	01011110	136	5E	94
_	01011111	137	5F	95

ASCII Char.	EQUIVALENT FORMS			
	Binary	Oct	Hex	Dec
`	01100000	140	60	96
a	01100001	141	61	97
b	01100010	142	62	98
c	01100011	143	63	99
d	01100100	144	64	100
e	01100101	145	65	101
f	01100110	146	66	102
g	01100111	147	67	103
h	01101000	150	68	104
i	01101001	151	69	105
j	01101010	152	6A	106
k	01101011	153	6B	107
l	01101100	154	6C	108
m	01101101	155	6D	109
n	01101110	156	6E	110
o	01101111	157	6F	111
p	01110000	160	70	112
q	01110001	161	71	113
r	01110010	162	72	114
s	01110011	163	73	115
t	01110100	164	74	116
u	01110101	165	75	117
v	01110110	166	76	118
w	01110111	167	77	119
x	01111000	170	78	120
y	01111001	171	79	121
z	01111010	172	7A	122
{	01111011	173	7B	123
	01111100	174	7C	124
}	01111101	175	7D	125
~	01111110	176	7E	126
DEL	01111111	177	7F	127



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