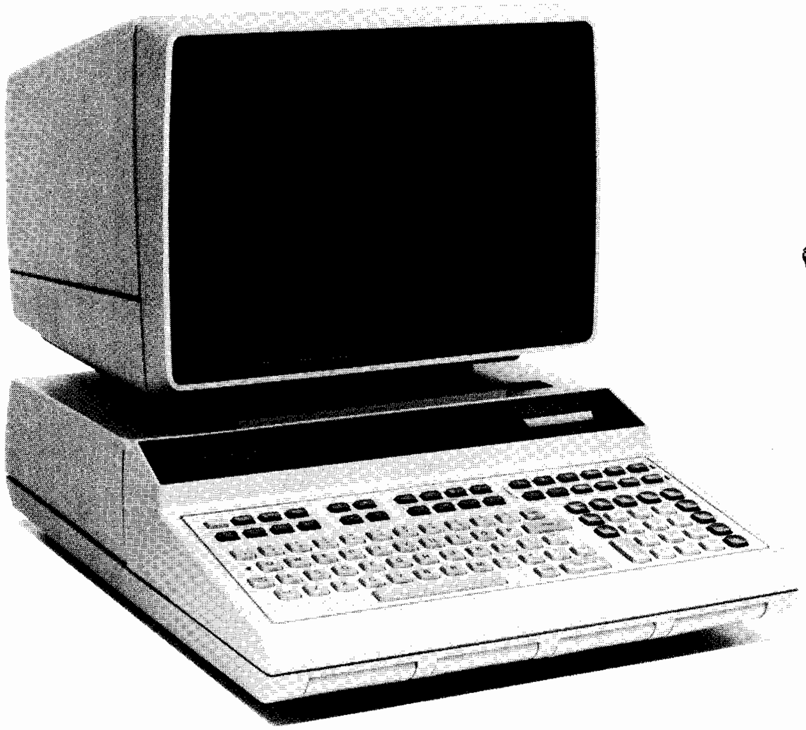
System 35
Desktop Computer

Reference Guide

HEWLETT–PACKARD

Reference Guide



HP 9835A Desktop Computer

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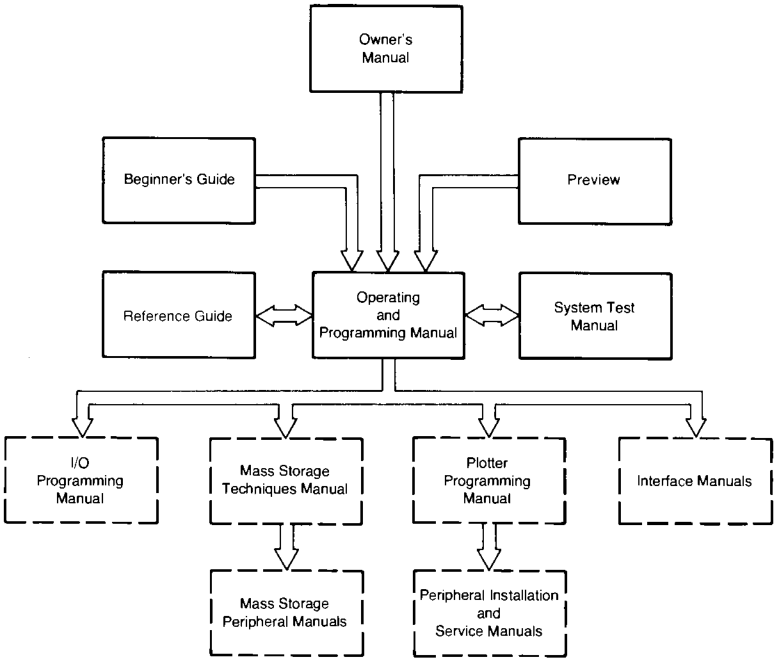
(For World-wide Sales and Service Offices see back of manual.)

System 35 Manual Reference

The following block diagram shows manuals that are included in the System 35 Documentation scheme and suggested progression. Dotted-line borders indicate those manuals available with specific options; solid borders indicate those manuals that are shipped with every System 35.


Owner's Manual
Beginner's Guide
Preview
Reference Guide
Operating and Programming Manual
System Test Manual
I/O Programming Manual
Mass Storage Techniques Manual
Plotter Programming Manual
Interface Manuals
Mass Storage Peripheral Manuals
Peripheral Installation and Service Manuals

Operating and Programming (09835-90000) for all users. All features of the computer and the language are explained.

Beginner's Guide (09835-90001) for the novice programmer. Covers the fundamentals of programming and the BASIC language. The beginner can then progress to the Operating and Programming Manual.

Preview (09835-90002) for the experienced BASIC programmer. A brief "demonstration" of the System 35 to introduce the hardware and extensions of the BASIC language.

Owner's Manual (09835-90005) for System 35 owners. Covers initial set-up, cleaning the computer, ROMs, the tape cartridge, peripherals, and interfaces.

Reference Guide (09835-90010) for all users. A reference to general machine features and all language syntax.

System Test (09835-90040) refer to this manual to test your computer or if there is any doubt that it is operating properly.

Customer Questionnaire

To help us in preparing new manuals, there is a questionnaire in the back of this manual. Your answers to the questions can assist us in producing better, more useful manuals. Your feedback is our only way of knowing the validity of our manuals. Please complete the questionnaire and mail it — postage is already paid in the United States. Thank you.

Table of Contents

General Information

The programming information in this guide serves as a handy memory jogger for those of you who are familiar with the language and basic operation of the HP 9835A or B Desktop Computer.

The purpose of this manual is to describe all 9835A/B BASIC language features (statements, commands, functions, etc.), their purpose, and any restrictions. In most cases, there are examples illustrating different forms the syntax can take. A glossary of syntax guidelines serves as a guide to the syntax. This manual is not intended to teach, but to refresh your memory. Please refer to the Operating and Programming Manual for more complete information.

The syntax are arranged alphabetically (with ROM syntax separate at the end), machine operations are in the front of the manual, and a list of error messages is in the back.

Turn-on

Your desktop computer is ready to use when the power switch on the right hand side is set to the "1" position. Full instructions concerning set up and turn on of your computer can be found in the Owner's Manual.

Memory Size

The standard 9835A has 49 962 bytes of available Read/Write Memory. The standard 9835B has 56 854 bytes. If your computer has additional memory, consult the 9835A/B Owner's Manual for the actual Read/Write Memory available.

Range

The range of values which can be entered or stored is $-9.99999999999 \times 10^{99}$ through -1×10^{-99}, 0, and 1×10^{-99} through $9.99999999999 \times 10^{99}$. However, the range of calculations is $-9.99999999999 \times 10^{511}$ through -1×10^{-511}, 0, and 1×10^{-511} through $9.99999999999 \times 10^{511}$.

Data Precision

Ten bytes of memory are allocated per simple variable for full (12 digit) precision. All calculations are performed with 12 digit precision. Short precision or integer precision can be used when it is necessary to conserve memory space.

Precision	Bytes Per Simple Variable	Accuracy	Range
Full (Real)	10	12 Digits	±9.99999999999E±99
Short	6	6 Digits	±9.99999E±63
Integer	4	Integer	−32768 through 32767

A string requires six bytes plus 1 byte per character rounded up to an even integer.

The CRT (9835A)

The CRT has four areas. Lines 1 through 20 constitute the printout area. Line 22 is the display line. The keyboard entry area, lines 23 and 24, allows 160 characters to be typed in. The system comments line, line 25, is for error messages, other indicators and results of calculations.

CRT brightness is controlled by a knob underneath the lower right hand side of the CRT.

CRT Pull-out Cards

There are four cards under the CRT which serve as a handy reference for operating the 9835A. They are –

- Error Messages
- Statements
- ROM Error Messages
- About the 9835A

The Display (9835B)

The display line of the 9835B is a 32-character dot matrix display. Even though only 32 characters can be displayed at one time, up to 160 can be keyed in. [→] and [←] can be used to view the entire display. Any references in this manual to specific lines of the 9835A CRT shoud be interpreted as the display for 9835B users.

Error Codes

When an error occurs, the machine beeps and displays an error number or message. The meanings of the error numbers are listed in the back of this guide.

ROMs

Plug-in option ROMs (Read Only Memories) expand the language and capabilities of the standard 9835A/B.

Special Keys

In addition to the standard typewriter keys, there are blocks of keys with special functions. Keys with related operations are grouped together in the following sections.

Typing Keys

CONT'L TAB — Sets a tab at the location of the cursor.

CONT'L RECALL — Clears the tab at the location of the cursor.

TAB — Moves the cursor to the next tab setting.

TYPW'R — Sets the keyboard to typewriter mode. Letters are entered in lower case, upper case when shifted. Pressing it again unsets typewriter mode.

CONT'L TYPW'R — Sets the computer to the space dependent mode.

RECALL — Recalls previous keyboard entries from a buffer one at a time on a last-in-first-out basis. When pressed with SHIFT held down, entries are recalled on a first-in-first-out basis.

Program Control Keys

RUN — Runs the program, beginning at the lowest numbered line in memory.

STEP — Steps through a program, executing it one line at a time.

PAUSE — Causes program execution to be suspended at the end of the current line; any I/O operations in progress continue. The next line to be executed is displayed in the system comments line.

CONT — Continues execution of a program from where it was suspended.

STORE — Stores an individual program line displayed in the keyboard entry area into memory.

EXEC — Executes the line or expression displayed in the keyboard entry area.

LIST — Enters the word `LIST`.

EDIT — Enters the word `EDIT`.

DEL LN — Deletes the line being edited. This works in edit line mode only (see the EDIT LINE command).

INS LN — Sets the insert line mode while in edit line mode, allowing lines to be inserted above the current line. Pressing it again cancels the insert line mode.

System Keys

CONT'L — Allows various modes and special ASCII control characters to be entered when held down while another key is pressed. Control functions of certain keys are written above the particular key.

PRT ALL — Sets the computer to the print all mode, providing output of all computations, results, stored lines, and error messages to the print all printer. Pressing it again cancels print all mode.

REWIND — Rewinds the tape in the tape drive.

STOP — Stops a running program at the end of the current line and all I/O.

CONT'L STOP — Resets the computer and returns it to a ready state.

Display Keys

← — On the 9835A, moves the cursor one character position to the left. If the cursor is in the home position, it moves to the end of the line. On the 9835B, moves the displayed line to the left, eight characters at a time.

→ — On the 9835A, moves the cursor one character position to the right. If the cursor is at the end of the line, it moves to the home position. On the 9835B, moves the displayed line to the right, eight characters at a time.

↑ — Moves the lines in the printout area of the CRT up one line (9835A). On the 9835B, when a program is being edited (edit line mode), ↑ accesses the next highest-numbered line.

↓ — Moves lines in the printout area of the CRT down one line (9835A). On the 9835B, when a program is being edited, ↓ accesses the next lowest-numbered line.

Cursor Keys

BACK Moves the cursor one character position to the left.

FWD Moves the cursor one character position to the right.

SHIFT BACK Moves the cursor to the home position which is the first position in the keyboard entry line.

SHIFT FWD Moves the cursor so that it is positioned immediately following the last character in the line.

DEL CHR Deletes the character at the position of the cursor.

SHIFT DEL CHR Clears the keyboard entry area from the position of the cursor to the end. It also clears the system comments line of everything except any system indicators.

INS CHR Allows characters to be inserted to the left of the cursor. Pressing it again cancels the insert character mode.

Numeric Keys

All keys needed to enter numbers and do simple arithmetic are located in this area.

E Enters an E to indicate that an exponent follows.

RESULT Enters the word RES which signifies the result function.

CLEAR LINE Clears the keyboard entry area and system comments line of everything except any system indicators. When pressed with SHIFT held down, the entire CRT (9835A) is cleared.

Special Function Keys

The special function keys (SFK's) provide various display modes and typing aids. They can also be defined as typing aids; see EDIT KEY.

Language Terms

The 9835 BASIC language consists of **statements**, **functions**, **operators** and **commands**. Operators and functions are used with variables and numbers in creating **expressions**. Expressions and functions can be included in statements and executed from the keyboard. Each statement can also be preceded by a line number and stored as a program line. Some functions and statements can also be separately executed from the keyboard; those that can't are noted. Commands can only be executed from the keyboard; they are not programmable.

Operators

Arithmetic

+	Add
-	Subtract, unary minus
*	Multiply
/	Divide
^ or **	Exponentiate
MOD	Modulo
DIV	Divide-return integer portion

Relational

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

Logical

AND

OR

EXOR

NOT

Truth Table

A	B	A AND B	A OR B	A EXOR B	NOT A	NOT B
T	T	1	1	0	0	0
T	F	0	1	1	0	1
F	T	0	1	1	1	0
F	F	0	0	0	1	1

1 = True 0 = False

String

&	String concatenation

Math Hierarchy

Functions	**Performed First**
^	↓
NOT, unary -	
* / MOD DIV	
+ -	
Relational Operators (=, <, >, <=, >=, <>, or #)	
AND	
OR EXOR	**Performed Last**

The order or execution for operators of the same level is from left to right. However, operations within parentheses are performed first.

BASIC Syntax Guidelines

These terms and conventions are used in the syntax listing.

[ ] – all items enclosed in brackets are optional unless the brackets are in dot matrix.

dot matrix – all items in dot matrix must appear as shown.

... – three dots indicate that the previous item can be duplicated.

| – a vertical line between parameters means "or", only one of the two parameters may be included.

/ – a slash between two parameters means that either or both parameters may be included.

name – a capital letter followed by 0 through 14 lowercase letters, digits or the underscore character. The following parameters can be names –

- variables
- labels
- function names
- subprogram names

line number – an integer from 1 through 9999. In most cases, when a line number specified is not in memory, the next higher line is accessed.

label – a unique name given to a program line. It follows the line number and is followed by a colon.

line identifier – a program line can be identified either by its line number (`GOTO 150`) or its label, if any (`GOTO Routine`).

numeric expression – a logical combination of variables, constants, operators and functions (including user-defined functions) grouped within parentheses as necessary. However, multiple-line user-defined functions can't be used in any I/O statement.

The following parameters can be numeric expressions –

scalar

initial value

final value

increment value (increments dealing with line numbers must be integer constants)

number of (significant) digits

number of repetitions

number of characters per line

number of linefeeds

number of spaces

power-of-ten position

character position

number of milliseconds

redim subscripts

subprogram dimensioning subscripts

key number (in `ON KEY#` statement only)

priority

defined-record number

file number

select code

HP-IB device address

unit code

9885 unit code

controller address

heading suppression

record length

number of defined records

interleave factor

string expression – the forms a string expression can take are –

- text within quotes
- string variable
- substring
- string concatenation operation – &
- string function (including user-defined)

The following parameters can be string expressions –

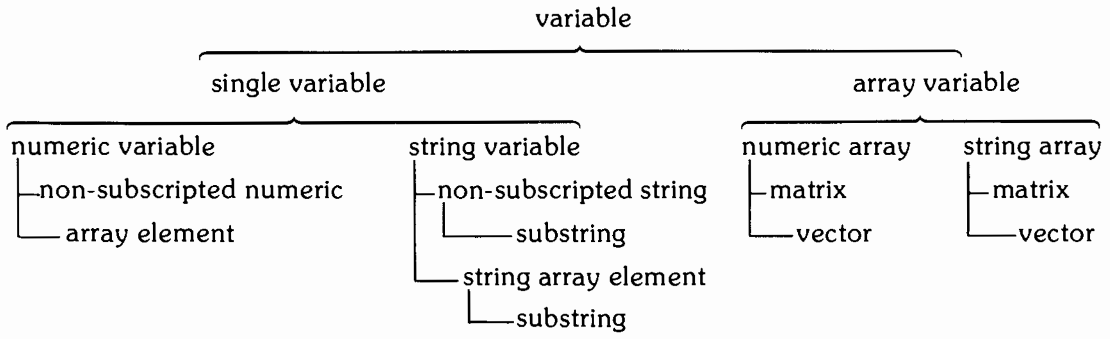
file name
mass storage unit specifier
file specifier
protect code
selective catalog specifier
image format string

constant – a number within the 9835's range, such as 2E12, which can't be altered.

character – a letter, number, symbol or ASCII control code (ASCII control codes can be obtained using the control key); any arbitrary 8-bit byte defined by the CHR$ function.

text – a string of characters, quoted (literal) or unquoted as specified.

variable – a name which is assigned a value and specifies a location in memory; variable types and forms are broken down –



(*) identifies the entire array in an I/O statement

pass parameters – includes variables, array identifiers, expressions and files specified by # file number; any variable can be enclosed in parentheses causing it to be passed by value.

formal parameters – includes non-subscripted variables, array identifiers and files specified by # file number.

redim subscripts – numeric expressions, or pairs of numeric expressions with a colon between each of the two expressions, separated by commas and enclosed in parentheses. The number of dimensions can't change; the total number of elements can't increase over the number originally dimensioned.

Mass Storage

file number – the number assigned to a mass storage data file by an ASSIGN statement. Its range is one through ten.

file name – a one to six ASCII character string with the exception of a quote mark, colon, ASCII NULL or CHR$ (255).

select code – an expression (rounded to an integer) in the range zero through sixteen. The following select codes are reserved by the system and can't be set on an interface –

- 0 Internal thermal printer
- 15 Tape Drive
- 16 CRT(9835A); Optional Printer (9835B)

mass storage unit specifier[1] – a string expression of the form –

: device type [select code [, controller address | 9885 unit code [, unit code]]]

The letters specifying the various device types are –

- T – Tape Cartridge
- F – 9885 Flexible Disk
- Y – 7905 Removable Platter

[1] Mass storage unit specifier is abbreviated msus.

- Z – 7905 Fixed Platter
- C – 7906A Removable Platter
- D – 7906A Fixed Platter
- P – 7920A Disc Pack

Controller address range is zero through seven; 9885 unit code is zero through three; unit code is zero through seven and is ignored if used with 9885 unit code. See the Mass Storage Techniques Manual for further explanation.

file specifier – a string expression of the form: file name [mass storage unit specifier]

protect code – any valid string expression except one with a length of zero. Only the first six characters are recognized as the protect code, however.

Syntax Listing

The examples in this manual are intended to illustrate different forms of the syntax, not to be used together as actual program lines. Therefore, the line numbers in the examples have no real significance

Mainframe

A

ABS numeric expression

The ABS function returns the absolute value of the numeric expression.

```
20    PRINT ABS(X)
30    Y=SQR(ABS(A-B))
```

ACS numeric expression

The ACS function returns the principal value of the arccosine of the numeric expression expressed in the current angular unit mode.

```
50    Angle=ACS(X)
60    PRINT ACS(.5)
```

ASN numeric expression

The ASN function returns the principal value of the arcsine of the numeric expression expressed in the current angular unit mode.

```
80    Sine=ASN(X)
90    IF ASN(A)<90 THEN 220
```

ASSIGN file specifier TO # file number [, return variable [, protect code]]
ASSIGN # file number TO file specifier [, return variable [, protect code]]
ASSIGN * TO # file number
ASSIGN # file number TO *

The ASSIGN statement is used to open a data file by assigning a number to it. It is also used to close a data file by assigning * to the file number. The return variable can be any simple variable. The protect code is required if the file was protected.

Value of Return Variable	Meaning
0	File available
1	No such file found
2	File is protected or of the wrong type

```
110  ASSIGN #1 TO "DATA"              ! ASSIGNS #1 TO DATA
120  ASSIGN "DATA:F8" TO #2,Return    ! Return IS THE RETURN VARIABLE
130  ASSIGN #7 TO "Prog",X,"XYZ"      ! PROTECT CODE ALSO SPECIFIED
140  ASSIGN * TO #2                   ! CLOSES FILE #2
```

ATN numeric expression

The ATN function returns the principal value of the arctangent of the numeric expression expressed in the current angular unit mode.

```
160  Angle=ATN(X)
170  PRINT ATN(1)
```

AUTO [beginning line number [, increment value]]

The AUTO command allows program lines to be numbered automatically as lines are stored. If no parameters are specified, numbering begins with ten and is incremented by ten.

```
AUTO           ! START WITH 10, INCREMENT BY 10
AUTO 50        ! START WITH 50, INCREMENT BY 10
AUTO 10,5      ! START WITH 10, INCREMENT BY 5
```

B

BEEP

The BEEP statement outputs an audible beep.

BUFFER# file number

The BUFFER statement attaches a 266 byte, semi-permanent buffer from user Read/Write Memory to the specified file to reduce mass storage device transfers.

```
40    BUFFER #4      ! BUFFERS FILE #4
50    BUFFER #N      ! BUFFERS FILE #N
```

C

CALL subprogram name [(pass parameter list)]

The CALL statement transfers control to a subroutine subprogram.

```
70    CALL Mean(X,Z(*),D(1,4),(C),#4,H$)
80    CALL Price(X*Y,(B$[5]),PI,(D(1,3)),44)    ! PASSING BY VALUE
```

CAT [selective catalog specifier/msus [, heading suppression]]

CAT # select code [, HP-IB device address] [; selective catalog specifier/msus [, heading suppression]]

The CAT (catalog) statement outputs information about user files: file names, types, and physical specifications. The selective catalog specifier is a string expression of 1 through 6 characters; only those files whose names begin with that combination of characters are cataloged. The heading is suppressed if the value of the numeric expression rounds to one. The second syntax directs the catalog output to the specified device.

```
100  CAT ":T"        ! CATALOGS THE TAPE CARTRIDGE
110  CAT "Pr"        ! CATALOGS ALL FILES BEGINNING WITH "Pr"
120  CAT ":F8",1     ! SUPPRESSES THE HEADING
121  CAT #6;":T"     ! TAPE CATALOG OUTPUT AT SELECT CODE 6
122  CAT "T:F8"      ! CATALOGS FILES BEGINNING WITH "T"
```

CHECK READ [# file number]

The CHECK READ statement is used to provide verification that the information being stored on a storage medium is identical to that in memory. This verification may be specified for a certain file only. CHECK READ also forces the output of data if it is not buffered.

```
140  CHECK READ           ! ALL FILES WILL BE VERIFIED
150  CHECK READ #6        ! ONLY FILE #6 WILL BE VERIFIED
```

CHECK READ OFF [# file number]

The CHECK READ OFF statement deactivates a previous corresponding CHECK READ statement, either general or for a specified file.

```
170  CHECK READ OFF        ! ALL CHECK READ DISABLED
180  CHECK READ OFF #6     ! CHECK READ FOR FILE #6 DISABLED
```

CHR$ numeric expression

The CHR$ (character) function converts a numeric value between −32768 and 32767 into a string character. Any number out of the range 0 through 255 is converted MOD 256 to that range.

```
200  PRINT CHR$(27)               ! OUTPUTS AN ESCAPE CODE
210  IF CHR$(N)="A" THEN 100      ! BRANCHING WHEN N=65
```

COL array variable

The COL function returns the number of columns (rightmost subscript) in the working size of the specified numeric or string array.

```
230  A=COL(B)
240  REDIM Matrix(5,COL(Array))   ! USING COL TO REDIM A MATRIX
```

COM item [, item...]

The COM statement dimensions and reserves memory space for simple and array variables – numeric and string – in a "common" memory area, allowing values to be passed to subprograms or to other programs.

The item can be –

simple numeric
numeric array (subscripts)
simple string [[number of characters]]
string array (subscripts) [[number of characters]]

REAL, SHORT or INTEGER can precede one or more numeric variable items to specify precision.

```
260  COM H(3,2),J(1,2,3),K$[56]
270  COM B(3,2),C(1,2,3),D$(2,3)[56],INTEGER E(4,4)
280  COM H(*),REAL I,J(5,4)  ! (*) CAN BE USED IN SUBPROGRAM COM
```

CONT [line identifier]

The CONT (continue) command resumes execution of a program at the specified line, or where it was paused, without altering program conditions and modes.

```
CONT          ! CONTINUE WHERE PAUSED
CONT 270      ! CONTINUE AT LINE 270
CONT Sub      ! CONTINUE AT LINE Sub
```

COPY source file specifier TO destination file specifier [, protect code]

The COPY statement selectively copies a file from one location to a previously undefined file. The protect code is used only if the source file is protected.

```
340  COPY "DATA1:F8" TO "DATA1:T15"    ! DISK TO TAPE
350  COPY "RES-A" TO "RES-B"           ! SAME MEDIUM
```

COS numeric expression

The COS function returns the cosine of the angle which is represented by the numeric expression.

```
370  IF COS(N)=1 THEN 450
380  PRINT COS(Angle)
```

CREATE file specifier, number of defined records [, record length]

The CREATE statement establishes a data file of the specified size (in bytes) and places an EOF mark in the first word of every record.

```
400  CREATE "DATA",7                ! SEVEN 256-BYTE RECORDS
410  CREATE "ACCTS:F8",10,400       ! TEN 400-BYTE RECORDS
```

D

DATA constant or text [, constant or text...]

The DATA statement provides constants and quoted or unquoted text from which READ and MAT READ obtain values for numeric and string variables. It can't be executed from the keyboard.

```
20   DATA 99,92,81,75,100
30   DATA JONES,"SMITH",BROWN      ! TEXT CAN BE QUOTED OR UNQUOTED
40   DATA "G.H.",7,"M.C.",1
```

DEFAULT OFF

The DEFAULT OFF statement cancels any DEFAULT ON statement previously executed.

DEFAULT ON

The DEFAULT ON statement prevents the following math errors from halting program execution by providing default values for out-of-range results which occur in computations or assignments. The default values allow a program to execute completely, using the default values, rather than stopping due to any of these math errors.

The default values are –

Error (Number)	Default Value
Integer precision overflow (20)	32767 or −32768
Short precision overflow (21)	+ or − 9.99999E63
Real precision overflow (22)	+ or − 9.99999999999E99
Intermediate result overflow (23)	+ or −9.99999999999E511
TAN(N*PI/2), N:odd integer (24)	9.99999999999E511
Zero to negative power (26)	9.99999999999E511
LGT or LOG of zero (29)	−9.99999999999E511
Division by zero (31)	+ or −9.99999999999E511
X MOD Y, Y=0 (31)	0

DEF FN subprogram name [(formal parameter list)] = numeric expression

DEF FN subprogram name $ [(formal parameter list)] = string expression

DEF FN subprogram name [(formal parameter list)]

DEF FN subprogram name $ [(formal parameter list)]

The DEF FN statement defines a single-line function (first two syntax), or, with RETURN and FN END, a multiple-line function subprogram (second two syntax).

```
60    DEF FNC$(A$,B$)=A$&B$           ! SINGLE-LINE STRING
70    DEF FNChange=M-FNSlope(M,0)     ! SINGLE-LINE NUMERIC
80    DEF FNShipments(A,B,C)          ! MULTIPLE-LINE NUMERIC
90    DEF FNResults$(X$,Y$,Z$)        ! MULTIPLE-LINE STRING
```

DEG

The DEG statement is used to set degree mode for results and arguments of trigonometric functions. A degree is 1/360th of a circle.

DEL first line identifier [, second line identifier]

The DEL command is used to delete a line or section of a program. If only one line identifier is specified, just that line is deleted. If two line identifiers are specified, the block of lines is deleted. To delete the first line of a subprogram, the entire subprogram must be deleted.

```
DEL 50              ! DELETES LINE 50
DEL Sub,Subend      ! DELETES Sub-Subend
```

DET
DET matrix variable

The DET function returns the determinant of the specified numeric matrix or of the last numeric matrix which was inverted if no matrix is specified.

```
140  IF DET=0 THEN 200  ! CHECKS DETERMINANT OF LAST INVERTED MATRIX
160  PRINT DET(Array)
```

DIM item [, item...]

The DIM statement is used to declare the number of dimensions and the maximum number of elements in each dimension for real precision array variables and initialize all elements to zero. The DIM statement is also used to define the maximum length of simple and array string variables, declare the number of dimensions and maximum number of elements in each dimension and initialize all strings to the null string.

The item can be –

numeric array (subscripts)
simple string [number of characters]
string array (subscripts) [[number of characters]]

```
170  DIM L(2,-2:2,3),N$[100]              ! ARRAY AND SIMPLE STRING
180  DIM A(-2:2),B(5,2,2),C(2,2,2,2)      ! THREE ARRAYS
181  DIM M$(2,2)[50],O$(5)                ! TWO STRING ARRAYS
```

DISABLE

The DISABLE statement deactivates any ON KEY# interrupt declarative so that pressing that key has no effect on current program control, but the interrupt is recorded by the computer.

DISP [display list]

The DISP statement causes the items specified in the display list to be displayed. The items can be variables, expressions, SPA, and TAB, separated by commas or semicolons. Multiple-line user-defined functions can not be specified in the display list.

```
200  DISP "X EQUALS";X,"A EQUALS";A
210  DISP "COMPUTING";            ! NEXT DISPLAY WILL BE APPENDED
220  DISP "PRESS CONT TO PROCEED"
```

DOT (vector name, vector name)

The DOT function returns the inner product of two vectors.

```
240  PRINT DOT(Vector1,Vector2)
250  X=DOT(A,B)
```

DROUND (numeric expression, number of significant digits)

The DROUND (digit round) function returns the numeric expression rounded to the specified number of significant digits.

```
270  X=DROUND(PI,5)       ! PI ROUNDED TO 5 SIGNIFICANT DIGITS
280  PRINT DROUND(N,X)
```

E

EDIT ["prompt",] string variable

The EDIT statement allows the stored value of a string variable of up to 160 characters in length to be altered. EDIT can't be executed from the keyboard.

```
20   EDIT "NEW VALUE FOR A$?",A$
30   EDIT B$[20]          ! EDITING A SUBSTRING
```

EDIT KEY key number

EDIT k_n

The EDIT KEY command allows an SFK to be defined or redefined as a series of keystrokes for use as a typing aid to make it easier to enter a word which is used often.

```
EDIT KEY 12
EDIT KEY 20
```

EDIT [LINE] [line identifier [, increment value]]

The EDIT LINE command accesses the edit line mode which allows program lines to be changed, added or deleted. If no line identifier is specified, the first line in the program is accessed. The increment value is ten if not specified.

```
EDIT            ! ACCESS FIRST LINE
EDIT 100        ! ACCESS LINE 100
EDIT 500,5      ! ACCESS LINE 500, INCREMENT NEW LINES BY 5
```

ENABLE

The ENABLE statement reactivates any ON KEY# interrupt declaratives that were previously deactivated by DISABLE. Any pending interrupts are executed.

END

The END statement is the last (highest numbered) statement in a main program and terminates program execution.

ERRL

The ERRL (error line) function returns the line number in which the most recent program execution error occurred.

```
120  PRINT ERRL          ! PRINTS WHAT LINE THE ERROR WAS IN
130  IF ERRL=150 THEN STOP
```

ERRM$

The ERRM$ (error message string) function returns the most recent program execution error message.

```
150  PRINT ERRM$
160  IF ERRM$="ERROR 31 IN LINE 100" THEN X=5
```

ERRN

The ERRN (error number) function returns the number of the most recent program execution error.

```
180  PRINT ERRN
190  IF ERRN=36 THEN RESTORE   ! REPOSITION POINTER WHEN OUT OF DATA
```

EXP numeric expression

The EXP (exponential) function returns the value of Napierian e (= 2.71828182846 to twelve place accuracy) raised to the power of the computed expression.

```
210  A=EXP(1)
220  X=EXP(N)
```

F

FIXED number of digits

The FIXED statement sets fixed mode for output of numeric values and specifies from zero through twelve digits to the right of the decimal point.

```
240  FIXED 5     ! 5 DIGITS TO RIGHT OF DECIMAL POINT
250  FIXED N     ! VARIABLE NUMBER OF DIGITS
```

FLOAT number of digits

The FLOAT statement sets floating point mode (scientific notation) for output of numeric values and specifies the number of digits to the right of the decimal point in the range zero through eleven.

```
270  FLOAT 7     ! 7 DIGITS - SCIENTIFIC NOTATION
280  FLOAT X     ! VARIABLE NUMBER OF DIGITS
```

FN END

The FN END statement is the last line in a multiple-line function subprogram.

FOR loop counter = initial value TO final value [STEP increment value]

The FOR statement is used with the NEXT statement and defines how many times a FOR-NEXT loop is to be executed. The loop counter must be a simple variable. If no increment value is specified, it defaults to one.

```
320   FOR I=1 TO 10
330   FOR X=X-2 TO X+5 STEP X/5   ! COUNTER VARIABLE CAN ALSO BE
                                    USED TO DEFINE VALUES
```

FRACT numeric expression

The FRACT function returns the fractional part of the evaluated expression and is defined by the formula: argument − INT (argument).

```
350   PRINT FRACT(N)
360   X=FRACT(-6.257)
```

G

GET file specifier [, line identifier [, execution line identifier]]

The GET statement loads into memory a program saved with the SAVE statement, or any string data file consisting of valid BASIC statements. When the first line identifier is specified, the program is renumbered so that it begins with the line number of the specified line. The second line identifier specifies where execution is to begin.

```
20    GET "Prog"
30    GET "PAYROL:F8",70  ! RENUMBER TO BEGIN WITH 70
40    GET "ACCTS",100,10  ! RENUMBER TO BEGIN WITH 100, EXECUTE AT 10
```

GOSUB line identifier

The GOSUB statement transfers program control to the subroutine beginning at the specified line in the current program segment.

```
60    GOSUB 100         ! ACCESS SUBROUTINE AT LINE 100
70    GOSUB Output
```

GOTO line identifier

The GOTO statement transfers program control to the specified line in the current program segment.

```
90    GOTO 400
100   GOTO Print
```

GRAD

The GRAD statement is used to set grad mode for all results and arguments of trigonometric functions. A grad is 1/400th of a circle.

I

IF numeric expression THEN line identifier
IF numeric expression THEN executable statement

The IF...THEN statement provides conditional branching. If the numeric expression is evaluated as true, execution is transferred to the specified line or the statement is executed. The following statements can't follow THEN –

COM statement
DATA statement
DEF FN statement
DIM statement
END statement
FN END statement
FOR statement
IF statement
IMAGE statement
INTEGER statement
NEXT statement
OPTION BASE statement
REAL statement
REM statement
SHORT statement
SUB statement
SUBEND statement

```
120   IF X THEN 950                      ! BRANCHING WHEN X<>0
130   IF X+5=Y THEN PRINT "X=Y-5"
140   IF B>78 THEN STOP
150   IF S>99 THEN GOSUB 900
```

IMAGE image format string

The IMAGE statement is used with the PRINT USING statement and specifies output format: numeric and string field specifiers, blanks, and carriage control. The image format string is a list of field specifiers; it is not enclosed in quotes.

Field specifiers must be separated by a comma, @ or slash.

The following is a list of symbols which are combined to make up field specifiers.

D — Specifies a digit position. The fill character is a blank. ND specifies N digit positions.

Z — Specifies a digit position. The fill character is a zero. NZ specifies N digit positions.

* — Specifies a digit position. The fill character is an asterisk. N* specifies N digit positions.

X — Causes a blank to be printed. NX causes N blanks to be printed.

A — Specifies a single string character position. NA specifies N string characters.

. — Indicates placement of a decimal point radix indicator. There may be only one radix indicator per numeric specifier.

R — Indicates placement of a comma radix indicator. There may be only one radix indicator per numeric specifier.

C — Indicates placement of a comma in a numeric specification. It is a conditional character and is output only if there is a non-zero digit to its left.

P — Indicates placement of a period in a numeric specification. It is a conditional character and is output only if there is a non-zero digit to its left.

S — Indicates a sign position for a + or −. The sign floats to the left of the leftmost significant digit if S appears before all digit symbols.

M — Indicates a sign position; + is replaced by a blank. The sign floats to the left of the leftmost significant digit if M appears before all digit symbols.

E — Causes output of an E, sign and two digit exponent. This is used for output of numbers in scientific notation.

K — Specifies an entire string or numeric field. A numeric is output in STANDARD format, except that no leading or trailing blanks are output. The current value of a string is output.

+ — Suppresses the automatic linefeed.

− — Suppresses the automatic carriage return.

— Suppresses the automatic CR-LF.

If control of the normal CR-LF output at the end of the PRINT USING statement is desired, one of these three characters must be the first symbol in the format string.

@ — Outputs a form feed.

/ — Causes a CR-LF to be output. N/ causes N CR-LFs to be output.

( ) — Parentheses allow specifiers to be replicated.

" " — Specifies text.

```
170  IMAGE AAAA,3A,X,2(4A,X)       ! STRING FIELD SPECIFIERS
180  IMAGE 2DC3D.2D,D.DDE,M4D      ! NUMERIC FIELD SPECIFIERS
190  IMAGE ":F"2D,"("4D.2D")"      ! FLOATING SPECIFIERS
200  IMAGE #,5A,X,K,"END OF TEXT" ! CARRIAGE CONTROL
```

INITIALIZE mass storage unit specifier [, interleave factor]

The INITIALIZE statement enables an unused mass storage medium to be used by establishing physical records and main and spare directories. A used medium can also be re-initialized; in the process, it is cleared of all information it contains. The interleave factor, an integer from one through ten, defines number of revolutions per track on the HP 9885 Disk; seven is the default value.

```
220  INITIALIZE ":T"       ! INITIALIZE TAPE
230  INITIALIZE ":F9",4    ! INTERLEAVE FACTOR OF 4
```

INPUT ["prompt" ,] variable name [, ["prompt" ,] variable name ...]

The INPUT statement allows values to be assigned to variables from the keyboard during program execution. INPUT can't be executed from the keyboard.

```
250  INPUT "A AND B",A,B
260  INPUT "VALUE OF X?",X,"VALUE OF Y?",Y
270  INPUT D(*),A$,B$[5]
```

INT numeric expression

The INT function returns the greatest integer which is less than or equal to the evaluated expression.

```
290   X=INT(N)
300   Y=INT(22.369)
```

INTEGER numeric variable [(subscripts)] [, numeric variable [(subscripts)], ...]

The INTEGER statement is used to dimension and reserve storage space for integer precision variables — simple and array.

```
320   INTEGER A(2,2),B          ! INTEGER PRECISION SAVES MEMORY
330   INTEGER C(2,23,5),D,Hours(10)
```

L

LEN string expression

The LEN function returns the current character length of the string expression.

```
30    PRINT LEN(C$)
40    IF LEN(S$)<10 THEN S$=RPT$(S$,2)
```

[LET] numeric variable [= numeric variable...] = numeric expression

[LET] string variable [=string variable...] = string expression

The LET statement is used to assign a value to a variable or variables.

```
70    LET A=B=C=D=E=100         ! MULTIPLE ASSIGNMENTS
80    X=Y^2                     ! IMPLIED ASSIGNMENT
90    A$=C$(2,5)
100   LET X$="PRICES"
```

LGT numeric expression

The LGT (common log) function returns the common logarithm (base 10) of a positive numeric expression.

```
130   X=LGT(Y)
140   PRINT LGT(2)
```

LIN number of line feeds

The LIN function is used with the PRINT statement and causes a carriage return and the specified number of line feeds to be output. The range of the numeric expression specifying the number of line feeds is −32768 through 32767; a negative number suppresses the carriage return.

```
170  PRINT "Name",LIN(10),"Hometown" ! 10 LINEFEEDS
180  PRINT A,LIN(-5),B,LIN(-5),C      ! NO CARRIAGE RETURN
```

LINK file specifier [, line identifier [, execution line identifier]]

The LINK statement loads into memory a program saved with SAVE, or any string data file consisting of valid BASIC statements, without destroying the values of variables. If one line identifier is specified, the loaded program is renumbered so that it begins with the number of the specified line. The second line identifier specifies where execution is to continue.

```
210  LINK "DATA"              ! VARIABLES AREN'T DESTROYED
220  LINK "Res:F8",100        ! RENUMBER TO BEGIN WITH 100
230  LINK "M-N",200,10        ! BEGIN EXECUTION WITH LINE 10
```

LINPUT ["prompt" ,] string variable

The LINPUT statement allows any combination of characters to be assigned to a string variable during program execution. LINPUT can't be executed from the keyboard.

```
260  LINPUT A$[10,20]
270  LINPUT "NEXT NAME",Names$(I)
```

LIST [beginning line identifier [, ending line identifier]]

LIST# select code [, HP-IB device address] [; beginning line identifier[, ending line identifier]]

The LIST command outputs a listing of all or part of a program in memory from lowest numbered to highest numbered line. If one line identifier is specified, the listing begins with that line. If two line identifiers are specified, that block of lines is listed. The second syntax directs the listing to the specified device. After the listing, the amount of available Read / Write memory is displayed.

```
LIST #6         ! OUTPUT LISTING TO SELECT CODE 6
LIST 50         ! START WITH LINE 50
LIST #0;50,150  ! LINES 50-150 TO SELECT CODE 0
```

LIST KEY [key number]

LIST KEY# select code [, HP-IB device address] [; key number]

LIST kn

The LIST KEY command causes the typing aid definitions of one or all SFKs to be listed.

```
LIST KEY          ! LIST ALL KEYS
LIST KEY #6       ! LIST ALL KEYS TO SELECT CODE 6
LIST KEY 8        ! LIST KEY NUMBER 8
LIST KEY #16;8    ! LIST KEY NUMBER 8 TO SELECT CODE 16
```

LOAD file specifier [, execution line identifier]

The LOAD statement puts back into memory a program stored with the STORE statement, destroying any lines in memory. The execution line identifier specifies where execution is to begin.

```
400   LOAD "Prog:F8"
410   LOAD "FILE",50        ! BEGIN EXECUTION WITH LINE 50
```

LOAD ALL file specifier

The LOAD ALL command causes an implied SCRATCH A to be executed, loads a file stored previously with the STORE ALL statement and restores the entire memory to the state it was in when STORE ALL was executed. All files used must be re-assigned, however.

```
LOAD ALL "MEMORY"
LOAD ALL "12:T"
```

LOAD BIN file specifier

The LOAD BIN statement loads the specified binary file into memory without altering any other binary routines already in memory.

```
480   LOAD BIN "ROUTIN"
490   LOAD BIN "Dup:F8"
```

LOAD KEY file specifier

The LOAD KEY statement loads SFK definitions from a file stored with STORE KEY. Program lines in memory aren't affected.

```
520  LOAD KEY "PROG 1"
530  LOAD KEY "PROG 2"
```

LOG numeric expression

The LOG (natural log) function returns the natural logarithm (base *e*) of a positive numeric expression.

```
560  X=LOG(Y)
570  PRINT LOG(55)
```

LWC$ string expression

The LWC$ (lowercase) function returns a string with all uppercase letters converted to lowercase.

```
600  A$=LWC$(A$)
610  PRINT LWC$("ABcdEF#@$")    ! ONLY LETTERS ARE AFFECTED
```

M

MASS STORAGE IS mass storage unit specifier

The MASS STORAGE IS statement specifies the standard (default) mass storage device. Mass storage unit specifier is a string expression of the form –

: device type [select code [, controller address 9885 unit code [, unit code]]]

Unit code is ignored if 9885 unit code is specified.

The letters specifying the various mass storage device types are –

Letter	Device
T	Tape cartridge
F	9885 Flexible Disk
Y	7905 Removable Platter
Z	7905 Fixed Platter
C	7906A Removable Platter
D	7906A Fixed Platter
P	7920A Disc Pack

```
20    MASS STORAGE IS ":T"       ! 15 IS DEFAULT SELECT CODE
30    MASS STORAGE IS A$         ! MSUS CAN BE STRING VARIABLE
40    MASS STORAGE IS ":F8,3"
```

MAT array variable = CON [(redim subscripts)]

The MAT...CON statement assigns the value 1 to every element in a numeric array. A new working size can be specified.

```
60    MAT A=CON             ! ALL ELEMENTS BECOME 1
70    MAT C=CON(4,4)        ! REDIMENSION ARRAY C
```

MAT result array = operand array

The MAT-copy statement copies the value of each element in a numeric array into a second numeric array.

```
90    MAT Data1=Data2
100   MAT X=Y
```

MAT result vector = CSUM operand matrix

The MAT...CSUM statement finds the sums of the elements of the columns of a numeric matrix and stores them in a vector.

```
120   MAT Vector=CSUM(Array)
130   MAT X=CSUM(Y)
```

MAT result array = function   operand array

The MAT-function statement causes each element in the operand numeric array to be evaluated by the specified system function; the result becomes the value of the corresponding element in the result array. The function can be any single-argument system function.

```
150   MAT Pay=INT(Base)   ! USE ANY SINGLE-ARGUMENT SYSTEM FUNCTION
160   MAT A=SIN(B)
```

MAT matrix name = IDN [(redim subscripts)]

The MAT...IDN statement establishes an identity matrix: all elements equal zero except the main diagonal (upper left to lower right) which all equal one. A new working size can be specified; it must have two dimensions.

```
180   MAT I=IDN               ! I BECOMES IDENTITY MATRIX
190   MAT Test=IDN(4,4)       ! REDIMENSION MATRIX
```

MAT array variable = (numeric expression)

The MAT-initialize statement assigns the value of the expression to every element in a numeric array.

```
210   MAT C=(4)           ! ASSIGN 4 TO EACH ELEMENT
220   MAT X=(N^2)         ! ASSIGN N^2 TO EACH ELEMENT
```

MAT INPUT array variable [(redim subscripts)] [, array variable [(redim subscripts)], ...]

The MAT INPUT statement allows values to be assigned from the keyboard to the elements of an array during program execution. A new working size can be specified for any array.

```
240   MAT INPUT A(2,2),B    ! REDIMENSIONS ARRAY A
250   MAT INPUT Data
```

MAT result matrix = INV operand matrix

The MAT...INV statement establishes a square matrix as the inverse of the specified square matrix. A matrix doesn't have an inverse if its determinant is zero.

```
270   MAT A=INV(A)
280   MAT C=INV(D)
```

MAT result matrix = operand matrix1 * operand matrix2

The matrix multiplication statement multiplies two numeric matrices together. The number of columns of the first operand must equal the number of rows of the second.

```
300   MAT Pay=Hours*Rate    ! MATRIX MULTIPLICATION
310   MAT A=B*C
```

MAT result array = operand array   operator   operand array

The Mat-operation statement allows an arithmetic or relational operation to be performed on corresponding elements of two numeric arrays; the result becomes the value of the corresponding element in the result array.

The following operators are allowed –

+

–

. (multiply)

/

=

< > or #

>

<

>=

<=

```
330   MAT X=A.B             ! ELEMENT MULTIPLICATION
340   MAT Total=Pay+Overtime
```

MAT PRINT array variable [, or ; [array variable...]]

The MAT PRINT statement causes the specified arrays to be printed on the standard printer.

```
360   MAT PRINT A;        ! TIGHT SPACING BETWEEN ELEMENTS
370   MAT PRINT C;D
380   MAT PRINT X         ! 20 CHARACTER FIELDS
```

MAT PRINT# file number [, defined-record number] ; array variable [, array variable, ...] [, END]

The MAT PRINT# statement is used to record all of the elements of the specified arrays onto a mass storage medium. END causes an EOF to be printed after the data.

```
400   MAT PRINT #1;A,B      ! SERIAL PRINT
410   MAT PRINT #3,4;X      ! RANDOM PRINT
```

MAT READ array variable [(redim subscripts)] [, array variable [(redim subscripts)], ...]

The MAT READ statement specifies that values for all the elements in an array or arrays are to be read from a DATA statement or statements which specify the values. A new working size can be specified for any of the arrays.

```
430   MAT READ H(4,4),J        ! REDIMENSION H
440   MAT READ A
```

MAT READ# file number [, defined record number] ; array variable [(redim subscripts)] [, array variable [(redim subscripts)] , ...]

The MAT READ# statement reads values for the elements of the specified arrays from a mass storage medium. A new working size can be specified for any of the arrays.

```
460   MAT READ #2;B
470   MAT READ #4,6;A,C(2,3)     ! REDIMENSION C
```

MAT result vector = RSUM operand matrix

The MAT...RSUM statement finds the sums of the elements of the rows of a numeric matrix and stores the sums in a vector.

```
490   MAT A=RSUM(B)
500   MAT Totals=RSUM(Data)
```

MAT result array = operand array   operator (scalar)

MAT result array = (scalar) operator   operand array

The MAT-scalar operation statement allows an arithmetic or relational operation to be performed on each element of a numeric array using a constant scalar (numeric expression); the result becomes the value of the corresponding element of the result array.

The following operators are allowed –

+	< >or#
–	>
*	<
/	>=
=	<=

```
520   MAT A=(3)+B          ! ADD 3 TO EACH ELEMENT
530   MAT Rate=Pay/(40)    ! DIVIDE EACH ELEMENT BY 40
540   MAT X=(5)>=Y         ! 1's OR 0's IN ARRAY X
```

MAT result matrix = TRN operand matrix

The MAT...TRN statement establishes a matrix as the transpose of a specified matrix (rows become columns, columns become rows). A matrix can't be transposed into itself.

```
560   MAT Rows=TRN(Columns)
570   MAT C=TRN(D)     ! CAN'T TRANSPOSE A MATRIX INTO ITSELF
```

MAT array variable = ZER [(redim subscripts)]

The MAT...ZER statement sets all elements in a numeric array to zero. The array can be redimensioned.

```
590   MAT Zero=ZER              ! ALL ELEMENTS EQUAL 0
600   MAT Blank=ZER(4,5,2)      ! REDIMENSION Blank
```

MAX (list of numeric expressions)

The MAX (maximum) function returns the greatest value in the list. The numeric expressions must be separated by commas.

```
620   X=MAX(A,B,C,D,PI,40)
630   PRINT MAX(20,X,Y,X+Y)
```

MIN (list of numeric expressions)

The MIN (minimum) function returns the smallest value in the list. The numeric expressions must be separated by commas.

```
650   Minimum=MIN(A(1),A(2),A(3),A(4))
660   PRINT MIN(M,N,O)
```

N

NEXT loop counter

The NEXT statement is used with the FOR statement, defines the last statement of a FOR-NEXT loop and causes the loop counter to be incremented and tested.

```
20   NEXT I
30   NEXT Value
```

NORMAL

The NORMAL statement cancels all tracing operations.

NUM string expression

The NUM (numeric) function returns the decimal equivalent of the 8-bit binary value of the first character of the string expression.

```
50   X=NUM(A$[20])
60   IF NUM(C$)=14 THEN 200
```

O

OFF END# file number

The OFF END# statement deactivates a corresponding ON END # statement.

```
80   OFF END #6        ! ON END #6 DISABLED
90   OFF END #N
```

OFF ERROR

The OFF ERROR statement cancels any ON ERROR condition currently active.

OFF KEY# key number

The OFF KEY# statement deactivates a corresponding ON KEY# statement; pressing the key then has no effect on program control.

```
110  OFF KEY #5        ! ON KEY #5 DISABLED
120  OFF KEY #22
```

ON END# file number GOTO line identifier
ON END# file number GOSUB line identifier
ON END# file number CALL subprogram name

The ON END# statement declares a branching that is to occur when an EOR or EOF mark is encountered during a READ# or PRINT# operation to that file so that the condition can be serviced. It also forces serial mode I/O for that file. No parameters can be passed to the subprogram when CALL is used.

```
130   ON END #5 GOTO 200
140   ON END #3 GOSUB Openfile
150   ON END #8 CALL Data3      ! CAN'T PASS PARAMETERS
```

ON ERROR GOTO line identifier
ON ERROR GOSUB line identifier
ON ERROR CALL subprogram name

The ON ERROR statement is used to prevent some recoverable program execution errors from halting execution by causing branching when an error occurs and suppressing the normal error process. No parameters can be passed to the subprogram when CALL is used.

```
170   ON ERROR GOTO Next
180   ON ERROR GOSUB 250
190   ON ERROR CALL Sub      ! CAN'T PASS PARAMETERS
```

ON numeric expression GOSUB line identifier list

The ON...GOSUB (computed GOSUB) statement allows any one of one or more subroutines in the current program segment to be accessed based on the value of the numeric expression. A value of one corresponds to the first line identifier in the list, two to the second, etc.

```
210   ON X GOSUB 120,Print,450
220   ON Average+3 GOSUB 100,Mean,Stddev
```

ON numeric expression GOTO line identifier list

The ON...GOTO (computed GOTO) statement allows program control to be transferred to one of one or more statements in the current program segment based on the value of the numeric expression. A value of one corresponds to the first line identifier in the list, two to the second, etc.

```
240   ON Time GOTO First,Second,Third
250   ON H GOTO 100,200,300
```

ON KEY# key number [, priority] GOTO line identifier
ON KEY# key number [, priority] GOSUB line identifier
ON KEY# key number [, priority] CALL subprogram name

The ON KEY# statement allows any SFK to be used for program control. When an SFK is pressed during a program and an ON KEY# statement has been declared for it, the specified branching occurs if the specified priority is higher than the current system priority. The range of priority is 1 through 15.

```
270   ON KEY #18 GOTO 200
280   ON KEY #1,3 GOSUB 900      ! PRIORITY IS 3
290   ON KEY #8 CALL Output      ! CAN'T PASS PARAMETERS
```

OPTION BASE 1 or 0

The OPTION BASE statement allows the default lower bound of arrays to be specified as one rather than zero. OPTION BASE 0 can be declared for documentation purposes since it is default at power on. The OPTION BASE statement must be before any DIM, COM, REAL, SHORT, and INTEGER statements.

OVERLAP

The OVERLAP statement sets the computer to the overlapped processing mode allowing computation and multiple I/O operations to occur simultaneously.

P

PAGE

The PAGE function is used with the PRINT statement and causes a form feed to be output. If directed to the CRT, the printout area is cleared.

```
30    PRINT A(*),PAGE,B(*)
40    PRINT PAGE,Title$
```

PAUSE

The PAUSE statement suspends program execution. The PAUSE statement can't be executed from the keyboard.

PI

The PI function returns the value of PI (π). It equals 3.1415926536 to eleven place accuracy.

```
60    Area=PI*Radius^2
70    Circumference=2*PI*Radius
```

POS (in string expression, of string expression)

The POS function determines the position of a substring within a string and returns the character position of the first character of the second string within the first or 0 if it is not present.

```
90    IF POS(A$,B$)<20 THEN 400
100   PRINT POS("SMALL CHANGE","CHANGE")
```

PRINT [print list]

The PRINT statement causes the items specified in the print list to be output on the standard printer. The items can be variables, array identifiers, expressions (excluding multiple line user-defined functions), TAB, SPA, LIN, and PAGE, separated by commas or semicolons. Two commas in a row cause a field to be skipped. A CR-LF is output if no print list is included. A comma or semicolon at the end of the list suppresses the normal CR-LF.

```
120   PRINT "A =";A,LIN(3),"B =";B      ! USING OUTPUT FUNCTION
130   PRINT A;TAB(10),B;TAB(25),C;      ! NEXT PRINT APPENDED
140   PRINT X$,Y$,Z$
150   PRINT Array(*)                    ! USING AN ARRAY IDENTIFIER
```

PRINT ALL IS select code [, HP-IB device address]

The PRINT ALL IS statement defines the standard print all device used when print all mode is set.

```
260   PRINT ALL IS 6     ! PRINTER AT SELECT CODE 6
270   PRINT ALL IS 2,5
```

PRINT# file number; data list [, END]

PRINT# file number ; END

PRINT# file number, defined-record number [; data list [, END]]

PRINT# file number, defined–record number; END

The PRINT# statement is used to record values onto the specified file. In serial access mode, recording starts at the beginning of the file or after the last data item accessed. In random access mode, with the defined record number specified, recording starts at the beginning of a defined record. The data list can include variables, constants and literals, separated by commas. END causes an EOF to be printed after the data. When the data list is omitted in random mode (4th syntax) an EOR is printed in that record.

```
170  PRINT #1;A,B(*),C$          ! SERIAL PRINT
180  PRINT #2,6;Data(I),END      ! RANDOM PRINT - PRINT EOF
190  PRINT #5,11                 ! PRINT EOR
200  PRINT #3;END                ! SERIAL MODE - PRINT EOF
```

PRINT USING line identifier [; print using list]

PRINT USING image format string expression [; print using list]

The PRINT USING statement allows the exact form of printed output to be determined by the image format string. The print using list can contain variables, array identifiers and expressions, separated by commas or semicolons; each item must correspond to an appropriate field specifier in the image format string. The line identifier must refer to an IMAGE statement.

```
220  PRINT USING 110;J,K,L,C$         ! IMAGE AT LINE 100
230  PRINT USING A$;C(*)              ! A$ CONTAINS FORMAT STRING
240  PRINT USING "K,X,DDD.DD,K";"EARNED",X,"DOLLARS"
```

PRINTER IS select code [, HP-IB device address] [, WIDTH number of characters per line]

The PRINTER IS statement is used to define the standard printer for the system. The range of the WIDTH is 16 through 260 characters; 80 is default unless the internal printer is specified in which case it is 16.

```
290  PRINTER IS 7,WIDTH(120)
300  PRINTER IS 6
310  PRINTER IS 8,2,WIDTH(160)
```

PROTECT file specifier, protect code

The PROTECT statement is used to guard a file against accidental erasure. The protect code is any valid string expression except one with a length of zero; only the first six characters are recognized, however.

```
330   PROTECT "WAGES",C$
340   PROTECT "DATA:F8","XXX"
```

PROUND (numeric expression, power-of-ten position)

The PROUND (power-of-ten position round) function returns the numeric expression rounded to the specified power-of-ten position.

```
360   X=PROUND(Y,6)
370   PRINT PROUND(Wages,-2)    ! ROUND TO SECOND DECIMAL PLACE
```

PURGE file specifier [, protect code]

The PURGE statement erases the specified file from the storage medium. The protect code is allowed only if the file was previously protected.

```
390   PURGE "1/2/77"
400   PURGE "X:F8","Key"        ! PROTECTED FILE
```

R

RAD

The RAD statement is used to set radian mode for all results and arguments of trigonometric functions. There are 2π radians in a circle.

RANDOMIZE [numeric expression]

The RANDOMIZE statement re-evaluates the random number seed. An integer value returns a zero when RND is used.

```
30    RANDOMIZE             ! SEED SELECTED BY COMPUTER
40    RANDOMIZE PI          ! SEED IS FRACTIONAL PART OF PI
```

READ variable name [, variable name , ...]

The READ statement specifies variables for which values are to be assigned from a DATA statement. It can't be executed from the keyboard.

```
60    READ A,B,C(*),D(1,2),E$[5]
70    READ X,Y,Z(5,3,2),C$,D$(1,2)
```

READ# file number; variable list

READ# file number, defined-record number [; variable list]

The READ# statement retrieves values for variables from the specified file. In serial access mode, reading starts at the beginning of the file or after the last data item accessed. In random access mode, with the defined record number specified, reading starts at the beginning of the defined record. READ# can also be used to reposition the data pointer by omitting the variable list in random mode. The variables in the variable list must be separated by commas.

```
90    READ #3;A,B(*),C(1,2),D$[5]        ! SERIAL READ
100   READ #4,7;X,Y,Z(*),J$              ! RANDOM READ
110   READ #4,5                          ! REPOSITION POINTER
```

READY# select code

The READY# command is used to allow I/O to a device to resume after it was suspended because of an I/O error at that select code. The select code must be an integer.

```
READY #6          ! SELECT CODE MUST BE AN INTEGER
READY #0
```

REAL numeric variable [(subscripts)] [, numeric variable [(subscripts)], ...]

The REAL statement is used to dimension and reserve storage space for non-subscripted and array variables and declare them as full precision.

```
160   REAL Angle(-4:4),B,Data(4,4)    ! USE REAL FOR DOCUMENTATION
170   REAL X,Y(2,2,5),Z
```

REDIM array variable (subscripts) [, array variable (subscripts), ...]

The REDIM statement allows a new working size for an array to be defined. The total number of elements can't exceed that originally declared. The number of dimensions can't change.

```
190   REDIM Array(5,X,Y)     ! SUBSCRIPTS CAN BE EXPRESSIONS
200   REDIM X(-2:2),Y$(5,5)
```

REM [any combination of characters]

The REM statement allows insertion of non-executable remarks into the listing of a program to provide documentation and make the program easier to follow.

```
220 Remark:  REM  Anything can go in a remark statement #$(*^(
230  REM
240  REM  This part of the program outputs the data
```

REN [beginning line number [, increment value]]

The REN command allows the program in memory to be renumbered. If no parameters are specified, numbering begins with ten and is incremented by ten.

```
REN              ! START WITH 10, INCREMENT BY 10
REN 50           ! START WITH 50, INCREMENT BY 10
REN 20,5         ! START WITH 20, INCREMENT BY 5
```

RENAME old file specifier TO new file name [, protect code]

The RENAME statement allows any file to be given a new name. The protect code is used only if the file was previously protected.

```
300  RENAME "JUNE 1" TO "JUNE 2"
310  RENAME "DATA 1:F8" TO "DATA 3"
```

RES

The RES function returns the result of the last numeric computation that was executed from the keyboard.

```
330  Y=RES^2                   ! USES LAST KEYBOARD COMPUTATION
340  IF RES>5 THEN 490
```

RE-SAVE file specifier [, protect code] [, beginning line identifier [, ending line identifier]]

The RE-SAVE statement allows a program to be written into a file that had been created with SAVE without purging the file first. The protect code is used only if the file was previously protected. When no line identifiers are specified, the entire program is saved. When one line identifier is specified, the program is saved from that line to the end. When two line identifiers are specified, that block of lines is saved.

```
RE-SAVE "PROG1"
RE-SAVE "PROG2","X",99  ! PROTECTED FILE;START WITH LINE 99
RE-SAVE "EXAMPL",90,400 ! SAVES LINES 90 - 400
```

RE-STORE file specifier [, protect code]

The RE-STORE statement allows a program to be written into a file that had been created with STORE without purging the file first.

```
400  RE-STORE "CHRDEF:F8"
410  RE-STORE "DATA","XXX"       ! PROTECTED FILE
```

RESTORE [line identifier]

The RESTORE statement repositions the DATA pointer to the beginning of the specified DATA statement, or at the lowest numbered DATA statement in the current program segment if one isn't specified, so that the values can be reused. If the line specified isn't a DATA statement, the pointer is positioned at the first DATA statement following that line. It can't be executed from the keyboard.

```
430  RESTORE             ! POSITION POINTER AT FIRST DATA STATEMENT
440  RESTORE Data1       ! POSITION POINTER AT Data1
```

RESUME INTERACTIVE

The RESUME INTERACTIVE statement re-enables live keyboard capability previously disabled with SUSPEND INTERACTIVE.

RETURN
RETURN numeric expression
RETURN string expression

The RETURN statement with no expression is the last line in a subroutine and transfers control back to the line following the GOSUB statement. RETURN is also used with DEF FN to specify the value to be returned to the calling program and transfer control back to the statement which referenced the subprogram.

```
460  RETURN              ! LAST LINE OF GOSUB SUBROUTINE
470  RETURN X^Y+Z        ! MULTIPLE-LINE DEF FN - NUMERIC
480  RETURN A$&B$        ! MULTIPLE-LINE DEF FN - STRING
```

REV$ string expression

The REV$ (reverse) function returns a string whose value is the value of the specified string with the order of the characters reversed.

```
500  PRINT POS(REV$(A$),CHR$(46))   ! LOOKS FOR LAST PERIOD IN A$
510  A$=REV$(B$)
```

REWIND [mass storage unit specifier]

The REWIND statement rewinds the tape to its beginning. It is ignored if the mass storage unit specifier does not specify a tape cartridge.

```
530  REWIND
540  A$=":F8"
550  REWIND A$  ! THIS WOULD BE IGNORED
```

RND

The RND function generates a pseudo random number greater than or equal to zero and less than one.

```
570  PRINT RND      ! PRINTS A RANDOM NUMBER
580  Y=RND*RND
```

ROW array variable

The ROW function returns the number of rows (second subscript from right) in the working size of the specified numeric or string array.

```
600  IF ROW(Array)>5 THEN REDIM B(6,6)
610  PRINT ROW(X)
```

RPT$ (string expression, number of repetitions)

The RPT$ function causes the specified string expression to be repeated the specified number of times. The range of repetitions is 0 through 32767.

```
630  C$=RPT$(B$,5)       ! 5 REPETITIONS OF B$
640  PRINT LEN(RPT$(X$,N))
```

RUN [line identifier]

The RUN command is used to begin execution of a program at either the specified line or the lowest numbered line in memory. The specified line must be in the main program.

```
RUN            ! START AT LOWEST-NUMBERED LINE
RUN 200        ! START AT LINE 200
```

S

SAVE file specifier [, beginning line identifier [, ending line identifier]]

The SAVE statement lists and records all or some of program lines in memory into a data file. If one line identifier is specified, the program is saved from that line to the end. When two line identifiers are specified, that block of lines is saved.

```
20   SAVE "STRTRK"            ! SAVES ENTIRE PROGRAM
30   SAVE "X:F8",200          ! SAVES LINE 200 ON
40   SAVE "ROUTIN",100,400    ! SAVES LINES 100 - 400
```

SCRATCH

Erases program lines and DATA pointers from memory.

SCRATCH A

Erases the entire memory.

SCRATCH C

Erases the values of all variables including those in common.

SCRATCH KEY [key number]

Erases one or all SFK typing aid definitions including pre-defined definitions.

SCRATCH P

Erases program, binary routines, variables and the files table from memory.

SCRATCH V

Erases the values of all variables except those in common.

SCRATCH [Kn]

Erases the typing aid definition of the SFK that is pressed.

SECURE [line identifier [, line identifier]]

The SECURE statement prevents selected lines or an entire program from being listed; an asterisk appears after the line number replacing the line in the listing. If one line identifier is specified only that line is secured. If two line identifiers are specified, that block of lines is secured.

```
SECURE          ! SECURES ENTIRE PROGRAM
SECURE 700      ! SECURES LINE 700
SECURE 90,190   ! SECURES LINES 90 - 190
```

SERIAL

The SERIAL statement cancels the effect of any previous OVERLAP statement and sets the computer to the serial processing mode. Computation and I/O do not occur simultaneously. Serial mode is default at power on.

SGN numeric expression

The SGN (sign) function returns a 1 if the expression is positive, 0 if it is zero and −1 if it is negative.

```
100  IF SGN(A)=-1 THEN X=SQR(ABS(A))
110  PRINT SGN(G)
```

SHORT numeric variable [(subscripts)] [, numeric variable [(subscripts)], ...]

The SHORT statement is used to dimension and reserve storage space for simple and array variables and declare them as short precision.

```
130  SHORT H,J(5,2),K(2,2,2),L
140  SHORT A,B,C(2,2)
```

SIN numeric expression

The SIN function returns the sine of the angle which is represented by the numeric expression.

```
160  PRINT SIN(X)
170  A=SQR(1-SIN(X)^2)
```

SPA number of spaces

The SPA function is used with PRINT and DISP to output a specified number of blank spaces up to the end of the current line. The number of spaces is a positive numeric expression rounded to an integer.

```
190  PRINT A;SPA(6),B
200  DISP "OUTPUT COMPLETE";SPA(8),"WAITING FOR DATA"
```

SQR numeric expression

The SQR function returns the square root of a non-negative expression.

```
220  PRINT SQR(A(I,J))
230  Z=SQR(X+Y)
```

STANDARD

The STANDARD statement sets standard mode for output of numeric values.

STOP

The STOP statement terminates program execution and sets the program pointer to the lowest numbered line. It can't be executed from the keyboard.

STORE file specifier

The STORE statement is used to store all program lines and binary routines in memory into a program file on the specified mass storage device.

```
250  STORE "PAYROL"
260  STORE "FILE:F8"
```

STORE ALL file specifier

The STORE ALL statement stores into a special file the entire contents of user Read/Write Memory with the exception of the files table. It can't be executed from within a subprogram.

```
280  STORE ALL "MEMORY"
290  STORE ALL "2/3/77:F8"
```

STORE BIN file specifier

The STORE BIN statement stores into a special file all user binary programs in memory.

```
310  STORE BIN "ROUTIN"
320  STORE BIN "2"
```

STORE KEY file specifier

The STORE KEY statement stores all SFK typing aid definitions into a special key file.

```
340  STORE KEY "PROG1"
350  STORE KEY "AIDS:T"
```

SUB subprogram name [(formal parameter list)]

The SUB statement is the first line of a subroutine subprogram.

```
370  SUB Mean(Total,Data(*),INTEGER X,SHORT G,#6,L$)
380  SUB Price(A,B$,C,D,E)
```

SUB END

The SUB END statement is the last line in a subroutine subprogram and transfers control back to the calling program.

SUB EXIT

The SUB EXIT statement is used to transfer control from a subroutine subprogram back to the calling program before SUB END is executed.

```
400  SUBEXIT
410  IF X>Y THEN SUBEXIT
```

SUM array name

The SUM function returns the sum of all the elements in a numeric array.

```
430  Total=SUM(Data)
440  PRINT SUM(A)
```

SUSPEND INTERACTIVE

The SUSPEND INTERACTIVE statement disables live, interactive keyboard operations while a program is running.

T

TAB character position

The TAB function is used with PRINT and DISP and causes the next item to be output beginning in the specified character position. The character position is a non-negative numeric expression and is rounded to an integer. If the value exceeds the number of columns in the standard printer, it is reduced by the formula: character position MOD N, N being the number of columns specified as standard printer width. The item is output in the last column if the specified position is a multiple of the width and is reduced to 0 with the formula. If the specified position is already filled, a new line is generated and the item output in the specified character position.

```
20   PRINT C$;TAB(25),D$    ! TAB TO 25th COLUMN
30   DISP X;TAB(10),Y       ! TAB TO 10th COLUMN
```

TAN numeric expression

The TAN function returns the tangent of the angle which is represented by the expression.

```
50   Tangent=TAN(X+Y)
60   PRINT TAN(45)
```

TRACE [beginning line identifier [, ending line identifier]]

The TRACE statement is used to trace program logic flow, in all or part of a program; any branching causes a trace output to be displayed which designates where the branching was from, and which line it was to. When one line identifier is specified, tracing begins after that line is executed. An ending line identifier causes tracing to stop after that line is executed.

```
TRACE             ! ALL LINES TRACED
TRACE 100         ! TRACE AFTER LINE 100
TRACE 100,250     ! TRACE BETWEEN 100 AND 250
```

TRACE ALL

The TRACE ALL statement traces all program logic flow and variable asssignments. It is like executing both TRACE and TRACE ALL VARIABLES.

TRACE ALL VARIABLES [beginning line identifier [, ending line identifier]]

The TRACE ALL VARIABLES statement is used to monitor value changes of all variables in a specified program segment, or throughout the entire program. When one line identifier is specified, tracing begins after that line is executed. An ending line identifier causes tracing to stop after that line is executed.

```
TRACE ALL VARIABLES          ! TRACE DURING WHOLE PROGRAM
TRACE ALL VARIABLES 150      ! TRACE AFTER LINE 150
TRACE ALL VARIABLES 200,500  ! TRACE BETWEEN 200 AND 250
```

TRACE PAUSE [line identifier [, numeric expression]]

The TRACE PAUSE statement is used as a breakpoint, causing execution to halt before a specified line is executed a certain number of times. If no parameters are specified, execution stops after the TRACE PAUSE statement and the next line to be executed is displayed. If just the line identifier is specified, execution stops just before that line is executed. If the numeric expression is specified, it is rounded to an integer N. Execution stops at the line before it is executed the Nth time.

```
TRACE PAUSE          ! PAUSE HERE; DISPLAY NEXT LINE
TRACE PAUSE 150      ! PAUSE AT LINE 150
TRACE PAUSE Print,6  ! PAUSE AT LINE Print THE 6TH TIME
```

TRACE VARIABLES variable list

The TRACE VARIABLES statement is used to monitor value changes of selected variables; the trace output indicates the new value of the variable and in what line the assignment occurred. The variable list can contain 1-5 variables and array identifiers separated by commas.

```
TRACE VARIABLES A,B(*),C$
TRACE VARIABLES X,Y,H,J
```

TRACE WAIT number of milliseconds

The TRACE WAIT statement can be used with any selective TRACE statement, or TRACE ALL, and causes the computer to wait the specified amount of time after each line which causes a trace printout. The range of the numeric expression is −32768 through 32767; a negative number defaults to zero.

```
220  TRACE WAIT 2000      ! WAIT 2 SECONDS AFTER EACH TRACE
230  TRACE WAIT N
```

TRIM$ string expression

The TRIM$ function deletes any leading or trailing blanks from the string expression.

```
250  A$=TRIM$(A$)
260  C$=TRIM$(H$)
```

TYP ([−]file number)

The TYP function returns a value which indicates what type of data will be accessed next in the specified file. A positive value allows the data pointer to advance until it is positioned on something other than an EOR mark.

Value	Meaning
0	Option ROM missing or file pointer lost.
1	Full precision number
2	Total string
3	End-of-file mark
4	End-of-record mark
5	Integer precision number
6	Short precision number
7	Unused
8	First part of a string
9	Middle part of a string
10	Last part of a string

```
280  IF TYP(5)=6 THEN 400    ! BRANCH ON INTEGER PRECISION
290  PRINT TYP(4)
```

TYPEWRITER OFF

The TYPEWRITER OFF statement disables a previous TYPEWRITER ON statement and returns the keyboard to normal mode.

TYPEWRITER ON

The TYPEWRITER ON statement allows TYPW'R to be "pressed" from within a program and puts the keyboard into typewriter mode.

U

UPC$ string expression

The UPC$ (uppercase) function returns a string with all lowercase letters converted to uppercase.

```
301   A$=UPC$(B$)
302   PRINT UPC$(C$&"names")
```

V

VAL string expression

The VAL (value) function returns the numeric value, including any exponent, of a string of digits so that the value can be used in calculations.

```
310   A=VAL(A$)
320   X=VAL(X$)^2
```

VAL$ numeric expression

The VAL$ function returns a string representing the numeric expression in current output mode.

```
330   A$=VAL$(120)
340   PRINT VAL$(X)
```

W

WAIT number of millseconds

The WAIT statement causes program execution to be delayed the approximate number of milliseconds before it continues. The range of the numeric expression is −32768 through 32767; a negative number defaults to zero.

```
360   WAIT 2000         ! WAIT 2 SECONDS
370   WAIT X
```

Mass Storage ROM

Most of the Mass Storage statements and commands are included in the mainframe. Additional statements that are enabled by the Mass Storage ROM are listed here.

FCREATE file specifier, number of records

The FCREATE statement creates a binary data file of the specified length.

FPRINT file specifier [, protect code] integer array identifier

The FPRINT statement stores the numeric or string array into the specified binary data file at DMA speed.

FREAD file specifier [, protect code] integer array identifier

The FREAD statement reads the specified array from a binary data file at DMA speeds.

Plotter ROM

AXES [Xtic spacing, Ytic spacing [, Xintersection, Yintersection [, Xmajor count, Ymajor count [, major-tic size]]]]

The AXES statement draws a pair of axes with optional (linearly spaced) tic marks.

CLIP [Xmin, Xmax, Ymin, Ymax]

The CLIP statement defines the soft clip limits. Omitting the parameters allows any two diagonal corners to be digitized.

CSIZE height [, aspect ratio]

The CSIZE (character size) statement is used to specify the size and aspect ratio of characters used in labels. The height defaults to approximately 3.3 GDU's (15/4.54). The aspect ratio (width/height) defaults to 9/15.

CURSOR Xvariable, Yvariable [, Z pen status string variable]

The CURSOR statement returns values to the specified variables indicating the coordinate values of the cursor's location and the pen status. For the pen status, ''0'' indicates ''up'', ''1'' indicates down.

DIGITIZE Xvariable, Yvariable [, pen status string variable]

The DIGITIZE statement pauses program execution and allows you to reposition the cursor; execution is resumed by pressing the CONTINUE key, any SFK or the STEP key. The values of the cursor coordinates are assigned to the variables. Pen status is assigned to a string variable; "1" for down, "0" for up.

DRAW Xco-ordinate, Yco-ordinate

The DRAW statement drops the pen and moves it to the absolute X,Y coordinate position which is specified.

FRAME

The FRAME statement draws a box around the current clipping area.

GCLEAR [distance]

The GCLEAR statement clears the incremental plotter by advancing the paper. The distance value specifies how many millimetres of paper to eject on certain printers; it has no effect on the 9872A.

GRID [Xtic spacing, Ytic spacing [, Xintersection, Yintersection [, Xmajor count, Ymajor count [, tic size]]]]

The GRID statement can be used as an alternative to the AXES statement and is used to draw a full screen grid.

IPLOT Xincrement, Yincrement [, pen control]

The IPLOT statement allows incremental plotting from the last plotted point. The pen control is the same as for the PLOT statement.

LABEL list

The LABEL statement is used like the PRINT statement, and draws labels on the plotter. The label is terminated on CHR$(3)

LABEL USING image specifier; list

The LABEL USING statement is used like the PRINT USING statement and draws formatted labels on the plotter.

LDIR angle
LDIR Xcomponent, Ycomponent

The LDIR statement specifies the angle at which subsequent labels will be drawn. The angle specifies counter-clockwise rotation of the label from the positive X-axis in current angular units. The angle specified by the second syntax is a vector plotted such that the Xcomponent equals the run and the Ycomponent equals the rise.

LETTER

The LETTER statement allows you to draw all keyboard alphanumerics and symbols by typing them in on the keyboard.

LIMIT [Xmin, Xmax, Ymin, Ymax]

The LIMIT statement defines the hard clip limits. The units are expressed in millimetres with the origin at the lower left physical limit. When the parameters aren't included, the lower left and upper right corner points can be digitized.

LINETYPE id number [, length]

The LINETYPE statement selects one of several solid or dashed line types. The range of the id number is 1 through 10; 4 is the default length.

LOCATE [Xmin, Xmax, Ymin, Ymax]

The LOCATE statement sets the area that SHOW will fill or SCALE will map to. The units are expressed in GDU's. The lower left and upper right corner points can be digitized if the parameters are not included. LOCATE also invokes soft clipping at its boundary.

LORG origin position

The LORG (label origin) statement sets the label origin position which determines where any subsequent labels are drawn relative to the current pen location. The range of the origin position is 1 through 9.

MOVE Xco-ordinate, Yco-ordinate

The MOVE statement lifts the pen and moves it to the absolute X,Y coordinate position which is specified.

MSCALE X, Y

The MSCALE statement sets millimetres as user units and defines the origin. The origin is offset from the lower left LOCATE point (Xmin,Ymin) by the specified amounts.

PDIR angle
PDIR Xcomponent, Ycomponent

The PDIR statement sets the angle of rotation for relative and incremental plotting. The first syntax specifies counter-clockwise rotation from the positive X-axis in current angular units. The second syntax indicates the angle by specifying a vector in which the Xcomponent equals the run and the Ycomponent equals the rise.

PEN pen number

The PEN statement specifies the pen to be used. 0 (zero) specifies return all pens to their holders on the 9872A.

PENUP

The PENUP statement lifts the pen.

PLOT Xco-ordinate, Yco-ordinate [, pen control]

The PLOT statement provides absolute data plotting and pen control. The pen control defaults to one and operates by the following conditions:

odd	drop pen
even	lift pen
positive	pen change after motion
negative	pen change before motion

PLOTTER IS [select code[, HP-IB device address],] plotter id string [, step size [, number of pens [, pen offset [, pen select id]]]]

The PLOTTER IS statement defines where all plotter operations will be directed. The allowable plotter id strings and their default select codes are –

"9872A" (7,5)
"INCREMENTAL"(5)

PLOTTER select code [, HP-IB device address] IS OFF

The PLOTTER IS OFF statement sets the specified device to an inactive state. All plotting statements are executed but the specified plotter doesn't respond.

PLOTTER select code [, HP-IB device address] IS ON

THE PLOTTER IS ON statement declares the specified device to be the active plotter.

POINTER Xcoordinate value, Ycoordinate value [, cursor type]

The POINTER statement moves the cursor to the specified absolute position The cursor type is allowed for compatibility with graphics on the HP System 45.

RATIO

The RATIO function returns a value equal to the ratio of the physical dimensions of the hard clip limits. That is, the X dimension divided by the Y dimension.

RPLOT Xrelative co-ordinate, Yrelative co-ordinate [, pen control]

The RPLOT statement allows relative plotting from the last absolute plotted point which is used as the origin. The pen control is the same as for the PLOT statement.

SCALE Xmin, Xmax, Ymin, Ymax

The SCALE statement sets user definable units which are mapped onto the LOCATE rectangle.

SETGU

The SETGU statement sets graphic display units (GDU's) as the current units.

SETUU

The SETUU statement sets user defined units (UDU's) as the current units.

SHOW Xmin, Xmax, Ymin, Ymax

The SHOW statement defines an area that is stretched or shrunk equally in X,Y directions to fit into the plotting area defined by the LOCATE statement or by the default (LIMIT).

UNCLIP

The UNCLIP statement sets the soft clip limits equal to the hard clip limits.

WHERE Xvariable, Yvariable [, $ pen status string variable]

The WHERE statement returns the coordinate values of the last plotted or moved-to point.

Mainframe Errors

1 Missing ROM or configuration error

2 Memory overflow; subprogram larger than block of memory.

3 Line not found or not in current program segment

4 Improper return

5 Abnormal program termination; no END or STOP statement.

6 Improper FOR/NEXT matching

7 Undefined function or subroutine

8 Improper parameter matching

9 Improper number of parameters

10 String value required

11 Numeric value required

12 Attempt to redeclare variable

13 Array dimensions not specified

14 Multiple OPTION BASE statements or OPTION BASE statement preceded by variable declarative statement

15 Invalid bounds on array dimension or string length in memory allocation statement

16 Dimensions are improper or inconsistent; more than 32 767 elements in an array

17 Subscript out of range

18 Substring out of range or string too long

19 Improper value

20 Integer precision overflow

21 Short precision overflow

22 Real precision overflow

23 Intermediate result overflow

24 TAN (N*π/2), when N is odd

25 Magnitude of argument of ASN or ACS is greater than 1

26 Zero to negative power

27 Negative base to non-integer power

28 LOG or LGT of negative number

29 LOG or LGT of zero

30 SQR of negative number

31 Division by zero; X MOD Y with Y = 0

32 String does not represent valid number or string response when numeric data required

33 Improper argument for NUM, CHR$, or RPT$ function

34 Referenced line is not IMAGE statement

35 Improper format string

36 Out of DATA

37 EDIT string longer than 160 characters

38 I/O function not allowed

39 Function subprogram not allowed

40 Improper replace, delete or REN command

41 First line number greater than second

42 Attempt to replace or delete a busy line or subprogram

43 Matrix not square

44 Illegal operand in matrix transpose or matrix multiply

45 Nested keyboard entry statements

46 No binary in memory for STORE BIN or no program in memory for SAVE

47 Subprogram COM declaration is not consistent with main program

48 Recursion in single-line function

49 Line specified in ON declaration not found

50	File number less than 1 or greater than 10
51	File not currently assigned
52	Improper mass storage unit specifier
53	Improper file name
54	Duplicate file name
55	Directory overflow
56	File name is undefined
57	Mass Storage ROM is missing
58	Improper file type
59	Physical or logical end-of-file found
60	Physical or logical end-of-record found in random mode
61	Defined record size is too small for data item
62	File is protected or wrong protect code specified
63	The number of physical records is greater than 32767
64	Medium overflow (out of user storage space)
65	Incorrect data type
66	Excessive rejected tracks during a mass storage initialization
67	Mass storage parameter less than or equal to 0
68	Invalid line number in GET or LINK operation
69 – 79	See Mass Storage ROM errors
80	Cartridge out or door open
81	Mass storage device failure
82	Mass storage device not present
83	Write protected
84	Record not found
85	Mass storage medium is not initialized
86	Not a compatible tape cartridge

87	Record address error; information can't be read
88	Read data error
89	Check read error
90	Mass storage system error
91 – 99	See Mass Storage ROM errors
100	Item in print using list is string but image specifier is numeric
101	Item in print using list is numeric but image specifier is string
102	Numeric field specifier wider than printer width
103	Item in print using list has no corresponding image specifier
104 – 109	Unused
110 – 113	See Plotter ROM errors

System Error octal number:octal number

This error indicates an error in the machine's firmware system; it is a fatal error. If reset does not bring control back, the machine must be turned off, then on again. If the problem persists, contact your Sales and Service Office.

I/O Device Errors

Two error messages can occur when attempting to direct an operation to an I/O device that is not ready for use. A printer which is out of paper is an example. The first message that appears is –

I/O ERROR ON SELECT CODE select code

If the condition is not corrected, the machine beeps intermittently and the following message replaces the first –

I/O TIMEOUT ON SELECT CODE select code

The I/O device can be made usable by correcting the error (loading paper for example), then executing the READY# command –

READY# select code

This command readies the I/O device and the operation which was attempted is attempted again. The select code must be an integer.

In some cases, such as an interface which is not connected, for that select code may not solve the I/O error. In this case, STOP should be pressed to regain control of the computer. Be sure to turn the power off before inserting an interface. After the problem is remedied, the operation or program can be tried again.

Mass Storage ROM Errors

69	Format switch off
70	Not a disc interface
71	Disc interface power off
72	Incorrect controller address, or controller power off
73	Incorrect device type in mass storage unit specifer
74	Drive missing or power off
75	Disc system error
76	Incorrect unit code in mass storage unit specifier
77-79	Unused
91-99	Unused

Plotter ROM Errors

110	Plotter specifications not recognized.
111	Plotter not previously specified.
113	LIMIT specifications out of range.
114-119	Unused

HEWLETT hp PACKARD

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