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**GRAPH-LEX 71  
GRAPHIC MODULE**

**FOR THE HP-71 B**

**and Thinkjet Printer**

## FOREWORD

This Graphic Module has been conceived and developed to give the HP-71 B users all possibilities to program graphics which simple and well known functions.

In the same aim to make work easier, this manual presents, by alphabetical order, the whole of different keywords and explain them clearly, in the same appearance as for the HP-71 Reference Manual.

**BOX**

BOX draws a box.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

BOX *x1, y1, x2, y2*

**Examples**

BOX 10,20,50,70

Draws a rectangle between the two positions specified by coordinates (10,20) and (50,70).

BOX X,Y,X+L,Y+H

Draws a rectangle starting from point (X,Y) with L graphic units width and H graphic units height.

**Input Parameters**

Item	Description	Restrictions
<i>x1, y1, x2, y2</i>	Numeric expressions rounded to integers.	-32767 to +32767

**Operation**

BOX draws the rectangle specified by points (*x1,y1*) et (*x2,y2*).

The rectangle is drawn using the current LINETYPE setting.

**Related Keywords**

FRAME, LINETYPE

## CSIZE

CSIZE (Character SIZE) specifies the height and aspect ratio (width / height) of label characters.

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Statement</li> <li><input type="checkbox"/> Function</li> <li><input type="checkbox"/> Operator</li> </ul> | <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Keyboard Execution</li> <li><input type="checkbox"/> CALC Mode</li> <li><input checked="" type="checkbox"/> IF...THEN...ELSE</li> <li><input checked="" type="checkbox"/> Device Operation</li> </ul> |
|---|--|

CSIZE *height* [, *ratio* ]

### Examples

CSIZE 20,0.6

Select a 20 graphic units height and a  $20 \times 0.6 = 12$  graphic units width.

CSIZE 10\*I

Select a  $10 \times I$  graphic units height, and a default  $6 \times I$  graphic units width.

CSIZE 20,1.2

Characters will be drawn using a 20 graphic units height, and a  $20 \times 1.2 = 24$  graphic units width.

### Input Parameters

Item	Description	Restrictions
height ratio	Numeric expression rounded to an integer. Numeric expression. Default : 0.6	-32767 to +32767 None

### Operation

The characters printed by the LABEL statement are defined by parameters specifying their actual shape and size. Each character is composed of a symbol and a space around it to separate it from other characters.

The *height* parameter is the total character size, in graphic units, including the extra space.

The *ratio* parameter is the ratio of the width of the character to the height. A small value of ratio yields to a narrow character.

GINIT defaults the parameters to the following values :

- height = 20 graphic units
- ratio = 0.6

**Related Keywords**

LABEL

## DRAW

DRAW draws a line between the current pen position and x-, y- coordinate position.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

DRAW  $x, y$

### Examples

DRAW 10,20

Draws a line between the current pen position and the point with coordinates (10,20).

DRAW  $X+R*\text{COS}(T), Y+R*\text{SIN}(T)$

Draws a line segment between current point and  $(x + r \cos t, y + r \sin t)$ .

### Input Parameters

Item	Description	Restrictions
x, y	Numeric expressions rounded to integers.	-32767 to +32767

### Operation

DRAW draws a line between the current pen position and the specified point.

This line is drawn using the current LINETYPE settings.

If the specified point is out of the plotting area, the line is drawn from the current point in the direction of the specified point, but stops when reaching the limits of the area. If the target point of the next drawing is within the plotting area, the pen moves to the point where the line would intercept the plotting limit, and draws to the target point. If both ends are outside of the plotting area, the line will be drawn only within the current plotting area.

### Related Keywords

LINETYPE, IDRAW, MOVE

## FRAME

The FRAME statement draws a frame around the plotting area.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

FRAME

### Example

```
IF F THEN FRAME
```

### Operation

After the frame is drawn, the pen is up and positioned at the lower left corner.

The frame is drawn using the current LINETYPE setting.

### Related Keywords

LINETYPE, BOX

## GDUMP

GDUMP (Graphic DUMP)

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input type="checkbox"/> Device Operation              |

GDUMP

### Example

```
IF UPRC$(R$)="O" THEN GDUMP
```

### Operation

GDUMP prints the contents of the file GRAPHILE on the device specified by the PLOTTER IS statement.

This device must recognize the graphic commands defined by the Printer Control Language (PCL) from Hewlett-Packard. The ThinkJet, QuietJet and LaserJet printers support GDUMP.

The file GRAPHILE is not modified by GDUMP. This means that one graphic session may contain several GDUMP executions. This can be very useful to print intermediate states of plotting.

If PLOTTER IS has not been executed, GDUMP produces the error : "Plotter not reachable".

### Related Keywords

PLOTTER IS, GINIT



## GEND

GEND ends a graphic session started by GINIT.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

GEND

### Example

```
100 GEND
```

### Operation

GEND ends a graphic session opened by the GINIT statement. The file GRAPHILE is purged from the memory as well as areas needed to store status informations.

GEND does not change the PLOTTER IS device specification.

After GEND only PLOTTER IS and GINIT are allowed. Executing a graphic function give the error :

Graph not initialized

### Related Keywords

GINIT, PLOTTER IS

## GINIT

GINIT (Graphic INITIALization) initializes a graphic session.

<ul style="list-style-type: none"> <li>■ Statement</li> <li>○ Function</li> <li>○ Operator</li> </ul>	<ul style="list-style-type: none"> <li>■ Keyboard Execution</li> <li>○ CALC Mode</li> <li>■ IF...THEN...ELSE</li> <li>■ Device Operation</li> </ul>
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GINIT "RASTER", *dimension*

### Examples

GINIT "RASTER", 100

specifies a 100 graphic units plotting area heighth.

GINIT "RASTER", H

### Input Parameter

Item	Description	Restrictions
dimension	Numeric expression rounded to an integer.	1 to 1048575

### Operation

GINIT begins a graphic session. All graphic commands are enabled.

The dimension parameter specifies the heighth of the plotting area. Coordinates on the x axes are limited to 0 to 639, coordinates on the y axes are limited to 0 through *dimension-1*.

GINIT allocates a GRAPHILE file to store an image of the plotting area. It also reserves memory for status informations such as pen position, current line type setting, character size, etc.

The memory occupied by the file GRAPHILE is defined by :

$memory = 19 + dimension * 80$  bytes

Default plotting settings are :

- initial pen position = (0,0)
- line type = solid line
- character size = heighth 20, width 12
- label origin = 1
- label direction = 0 degrees
- tick length on axes = 4 graphic units

**Related Keywords**

GEND, PLOTTER IS

## IDRAW

IDRAW (Incremental DRAWing) draws a line from the current pen position to a position specified by x- and y-increments.

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|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

IDRAW *x-increment, y-increment*

### Example

IDRAW 10,20

draws a (10,20) vector from the current pen position.

### Input Parameters

Item	Description	Restrictions
x-increment, y-increment	Numeric expressions rounded to integers.	-32767 to +32767

### Operation

IDRAW is similar to DRAW, but parameters are increments and not absolute positions. The origin is the latest pen position.

As with DRAW, no line can be plotted outside of the plotting area. If a line goes outside of these limits, the theoretical pen position will be changed, but the drawing will stop on the area border.

The line is drawn using the current line type.

### Related Keywords

DRAW, IMOVE, LINETYPE

**IMOVE**

**IMOVE** (Incremental MOVE) moves the pen from the current position to the position specified by x- and y-increments.

- Statement
- Function
- Operator

- Keyboard Execution
- CALC Mode
- IF...THEN...ELSE
- Device Operation

**IMOVE** *x-increment, y-increment*

**Example**

**IMOVE** 30,40

moves the pen from 30 graphic units on the x-axis and 40 graphic units on the y-axis.

**Input Parameters**

Item	Description	Restrictions
x-increment, y-increment	Numeric expressions rounded to integers.	-32767 to +32767

**Operation**

**IMOVE** is similar to **MOVE**, but parameters are increments and not absolute positions.

If an **IMOVE** statement moves the pen out of the plotting limits, the next line will begin only inside the plotting area border.

**Related Keywords**

**MOVE, IDRAW, LINETYPE**

## LABEL

LABEL draws alphanumeric characters from the current pen position.

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|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

LABEL *alphanumeric string* [;]

### Examples

LABEL "EXEMPLE DE TRACE";

Draws the string "EXEMPLE DE TRACE" inside the plotting area. The pen will be left after the last letter.

LABEL A\$&STR\$(I)

Write the specified string inside the plotting area, after the pen will be moved to a position underneath the first character of the label.

### Input Parameter

Item	Description	Restrictions
Alphanumeric string	Alphanumeric expression.	None.

### Operation

Titles and labels can be printed everywhere inside the plotting area.

LABEL write them from the current pen position using line type 1 (solid line).

An end-of-line sequence is sent after the last character printed. The EOL sequence is suppressed if a semicolon is included after the string.

#### Label attributes :

The statement CSIZE specifies the height and aspect ratio of characters.

The statement LORG specifies the position of the label, relative to the current pen position during the execution of LABEL.

The statement LDIR specifies the angle at which labels are drawn.

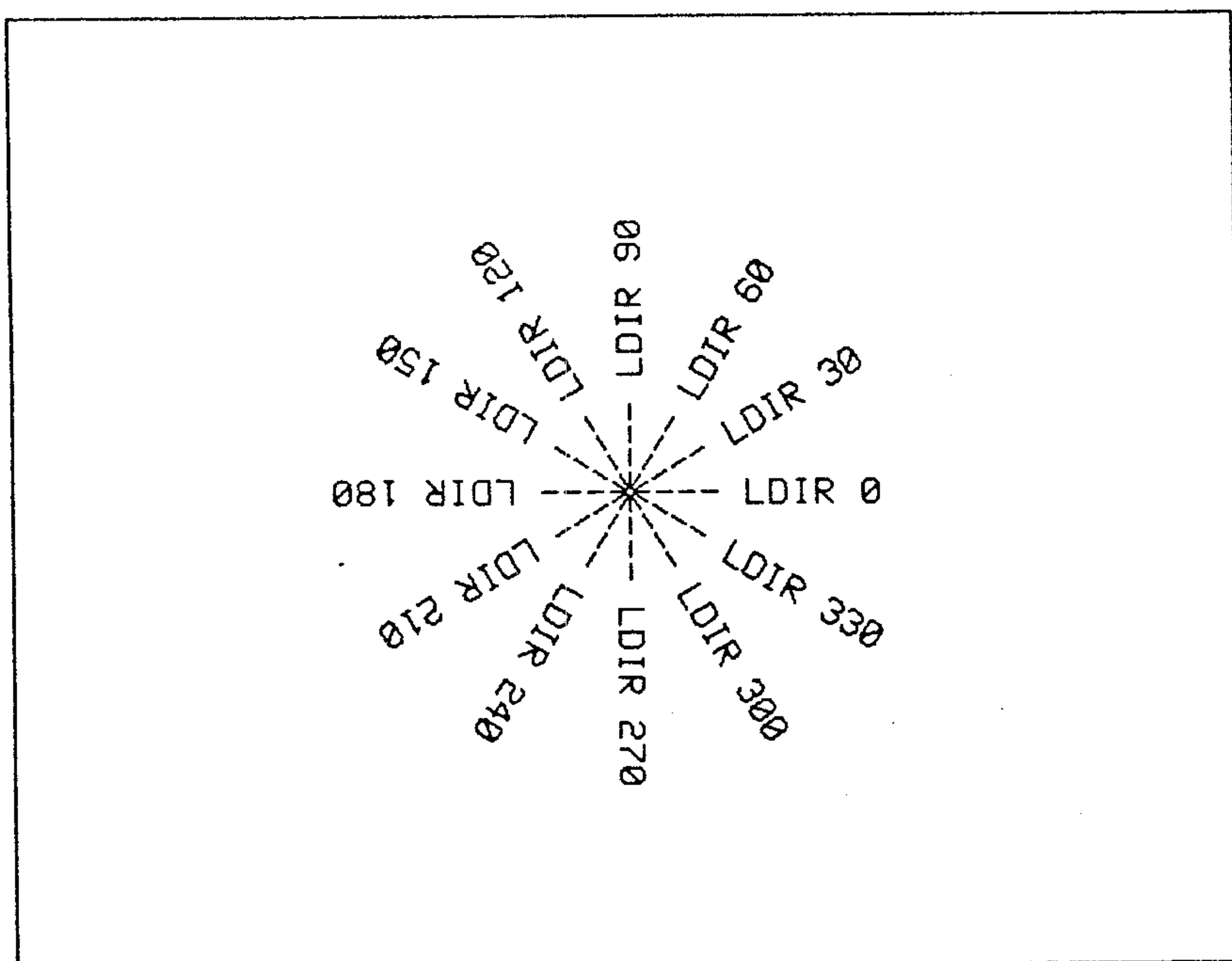
The character set is Roman8.

**LABEL** (continued)**Related Keywords**

CSIZE, LDIR, LORG, ENDLINE







### Related Keywords

DEGREES, RADIANS, LABEL



**LINETYPE** (continued)**Related Keywords**

DRAW, IDRAW, BOX, FRAME, XAXIS, YAXIS

## LORG

LORG (Label ORiGin) defines label position relative to the current pen position.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

*LORG position*

### Examples

LORG 5

Labels are centered relative to the current pen position.

LORG X

### Input Parameter

Item	Description	Restrictions
position	Numeric expression rounded to an integer.	-32767 to +32767

### Operation

LORG defines the label origin position. It determines label position relative to the current pen position. The position parameter must be between 1 and 9 and is interpreted as shown in the following illustration (cross center represents current pen position).

**LORG (continued)**

<pre> +LORG 3  LORG 6  LORG 9+ </pre>
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<pre> +LORG 2  LORG 5  LORG 8+ </pre>
---------------------------------------

<pre> +LORG 1  LORG 4  LORG 7+ </pre>
---------------------------------------

The statement LORG uses the absolute value of the integer part of the argument. If this number is greater than 9, it will be taken modulo 10. If the parameter is 0 then LORG uses 1, default value defined by GINIT.

Note : when introducing LORG with a constant argument. The space before the number is mandatory, otherwise the HP71 will interpret LORG5 as :  
 DISP L OR G5  
 which is not what is expected.

**Related Keywords**

LABEL, MOVE

## MOVE

MOVE lifts the pen and moves it to the point specified by the coordinates.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

MOVE *x, y*

### Examples

MOVE 0,0

Moves the pen to the origin of the graphic

MOVE X,Y

Moves the pen to the point (X,Y)

### Input Parameters

Item	Description	Restrictions
<i>x, y</i>	Numeric expression rounded to an integer.	-32767 to +32767

### Operation

MOVE moves the pen without drawing to the specified position. If this position is out of the plotting area, the next line will start from the area border.

### Related Keywords

DRAW, IMOVE

## PENDOWN

PENDOWN lowers the pen and prints a dot at current pen position.

- Statement
- Function
- Operator

- Keyboard Execution
- CALC Mode
- IF...THEN...ELSE
- Device Operation

PENDOWN

### Example

IF X THEN PENDOWN

Lowers the pen if X is not 0.

### Operation

PENDOWN lowers the pen. This results in printing a dot at current pen position.

### Related Keywords

PENUP, PEN, MOVE, DRAW

## PENUP

PENUP lifts the pen

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

PENUP

### Example

IF NOT X THEN PENUP

Lifts the pen if X is 0.

### Operation

PENUP lifts the pen. This command has no effect for "raster" graphics.

### Related Keywords

PEN, PENDOWN





## PLOTTER IS

PLOTTER IS designates a device as graphic unit.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

PLOTTER IS *device specifier*

### Examples

PLOTTER IS PRINTER(2)	defines the second printer in the loop as graphic unit
PLOTTER IS :RS232	Declares the HP-IL / RS232 interface as graphic unit
PLOTTER IS *	Cancel current declaration.

### Input Parameter

Item	Description	Restrictions
device specifier	see standard HP-IL definitions.	None.

### Operation

The statement PLOTTER IS declares an HPIL device as the graphic unit.

PLOTTER IS and GINIT are the only commands authorized outside of a graphic session.

### Related Keywords

GINIT, GDUMP

**TICLEN**

TICLEN (TICK LENgth) defines the tick size

<input checked="" type="checkbox"/> Statement	<input checked="" type="checkbox"/> Keyboard Execution
<input type="checkbox"/> Function	<input type="checkbox"/> CALC Mode
<input type="checkbox"/> Operator	<input checked="" type="checkbox"/> IF...THEN...ELSE
	<input checked="" type="checkbox"/> Device Operation

TICLEN *tick size*

**Example**

TICLEN 10 defines 10 graphic units tick size.

**Input Parameter**

Item	Description	Restrictions
tick length	Numeric expression rounded to an integer.	-32767 to +32767

**Operation**

The length of tick marks is expressed in graphic units.

The ticks are drawn on both sides of the axis. TICLEN specifies the total length.

**Related Keywords**

XAXIS, YAXIS

## XAXIS

XAXIS draws a horizontal axis, with optional tick marks, at the specified y-intercept.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Statement | <input checked="" type="checkbox"/> Keyboard Execution |
| <input type="checkbox"/> Function             | <input type="checkbox"/> CALC Mode                     |
| <input type="checkbox"/> Operator             | <input checked="" type="checkbox"/> IF...THEN...ELSE   |
|   | <input checked="" type="checkbox"/> Device Operation   |

XAXIS *y-intercept*  
 XAXIS *y-intercept, spacing*  
 XAXIS *y-intercept, spacing, xmin, xmax*

### Examples

XAXIS 10 draws an axis at  $y = 10$

XAXIS (Y2-Y1)/2,-5 Draws an axis and tick marks with 5 graphic units spacing, beginning from the right.

### Input Parameters

Item	Description	Restrictions
y-intercept	Numeric expression rounded to an integer.	-32767 to +32767
spacing	Numeric expression rounded to an integer. Default : 0, no mark	-32767 to +32767
xmin	Numeric expression rounded to an integer. Default : 0	-32767 to +32767
xmax	Numeric expression rounded to an integer. Default : 639	-32767 to +32767

### Operation

XAXIS draws a horizontal axis, at *y-intercept*, from *xmin* to *xmax*.

If *spacing* is specified and different from 0, marks are drawn every *spacing* graphic units, beginning with *xmin* if *spacing* is positive, with *xmax* if *spacing* is negative.

Tick length is defined by TICLEN. After GINIT it defaults to 4.

### Related Keywords

LINETYPE, TICLEN, YAXIS

## YAXIS

YAXIS draws a vertical axis, with optional tick marks, at the specified x-intercept.

- |             |                      |
|-------------|----------------------|
| ■ Statement | ■ Keyboard Execution |
| ○ Function  | ○ CALC Mode          |
| ○ Operator  | ■ IF...THEN...ELSE   |
|             | ■ Device Operation   |

YAXIS *x-intercept*  
 YAXIS *x-intercept, spacing*  
 YAXIS *x-intercept, spacing, ymin, ymax*

## Examples

YAXIS 20

Draws an axis at x-intercept 20

YAXIS (X2-X1)/2, -5

Draws an axis with 5 graphic units spacing tick marks, beginning from the bottom.

## Input Parameters

Item	Description	Restrictions
x-intercept	Numeric expression rounded to an integer.	-32767 to +32767
spacing	Numeric expression rounded to an integer. Default : 0, no mark	-32767 to +32767
ymin	Numeric expression rounded to an integer. Default : 0	-32767 to +32767
ymax	Numeric expression rounded to an integer. Default : maximum heigth defined by GINIT.	-32767 to +32767

## Operation

YAXIS draws a vertical axis at *x-intercept*, from *ymin* to *ymax*.

If *spacing* is specified and different from 0, marks are drawn every *spacing* graphic units, beginning with *ymin* if *spacing* is positive, with *ymax* if *spacing* is negative.

Tick length are defined by TICLEN. After GINIT, they default to 4.

## Related Keywords

LINETYPE, TICLEN, XAXIS