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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 présents, 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.

- ■ Statement
- O Function
- O Operator
- ■ Keyboard Execution
- O CALC Mode
- ■ IF...THEN...ELSE
- ■ 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 heigth.

Input Parameters

Item	Description	Restrictions
x1, y1, x2, y2	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

2

CSIZE

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

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ Device Operation

CSIZE *heigth* [, *ratio*]

Examples

```
CSIZE 20,0.6
```

Select a 20 graphic units heigth and a 20*0.6=12 graphic units width.

```
CSIZE 10*I
```

Select a 10*I graphic units heigth, and a default 6*I graphic units width.

```
CSIZE 20,1.2
```

Characters will be drawn using a 20 graphic units heigth, and a 20*1.2=24 graphic units width.

Input Parameters

Item	Description	Restrictions
heigth	Numeric expression rounded to an integer.	-32767 to +32767
ratio	Numeric expression. Default : 0.6	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 *heigth* 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 heigth. A small value of ratio yields to a narrow character.

GINIT defaults the parameters to the following values :
- heigth = 20 graphic units
- ratio = 0.6

Related Keywords

LABEL

4

DRAW

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

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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*COS(T),Y+R*SIN(T)
```

Draws a line segment between current point and (x + rcos 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 aroud the plotting area.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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

6

GDUMP

GDUMP (Graphic DUMP)

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	O 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 contains several GDUMP executions. This can be very useful to print intermediate states of plotting.

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

Related Keywords

PLOTTER IS, GINIT

GEND

GEND ends a graphic session started by GINIT.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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

8

GINIT

GINIT (Graphic INITialization) initializes a graphic session.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ Device Operation

```
GINIT "RASTER", dimension
```

Examples

```
GINIT "RASTER",100
```
specifies a 100 graphic units plotting area heigth.

```
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 heigth 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 = heigth 20, width 12
- label origin = 1
- label direction = 0 degrees
- tick length on axes = 4 graphic units

Related Keywords

GEND, PLOTTER IS

10

IDRAW

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

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ 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

12

LABEL

LABEL draws alphanumeric caracters from the current pen position.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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 heigth 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.

Related Keywords

CSIZE, LDIR, LORG, ENDLINE

LDIR

LDIR (Label DIRection) specifies the angle at which labels are drawn relative to x-axis.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ Device Operation

```
LDIR angle
```

Examples

```
LDIR 0
```

Labels are plotted horizontally (default value).

```
LDIR ASIN(.5)
```

The angle between labels and x-axis is 30 degrees.

Input Parameter

Item	Description	Restrictions
angle	Numeric expression interpreted according to the current trigonometric mode	0 to 360 degres, or 0 to 2*PI

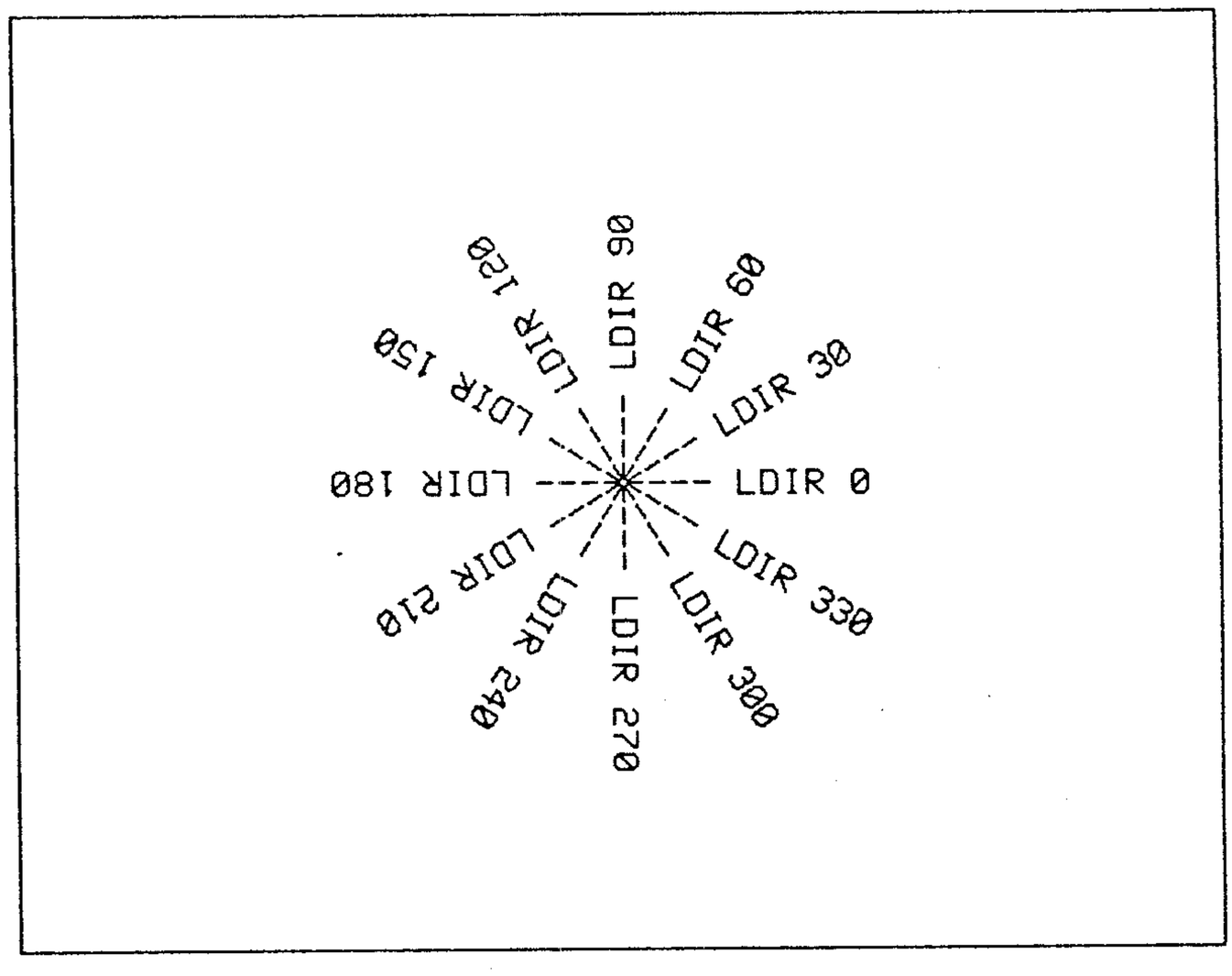
Operation

The statement LDIR defines the rotation angle for label printing. The angle is interpreted according to the current trigonometric mode (DEGREES or RADIANS).

This angle measures the counterclockwise rotation between x-axis (horizontal) and the label direction.

Executing GINIT initializes this angle to 0.

LDIR (continued)



Related Keywords

DEGREES, RADIANS, LABEL

16

LINETYPE

LINETYPE selects the type and pattern length for line drawing, axes and boxes.

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

```
LINETYPE type [, pattern length ]
```

Examples

```
LINETYPE 1
```
Defines solid line as line type

```
LINETYPE 6,48
```
Specifies pattern 6 and a 48 graphic units pattern length.

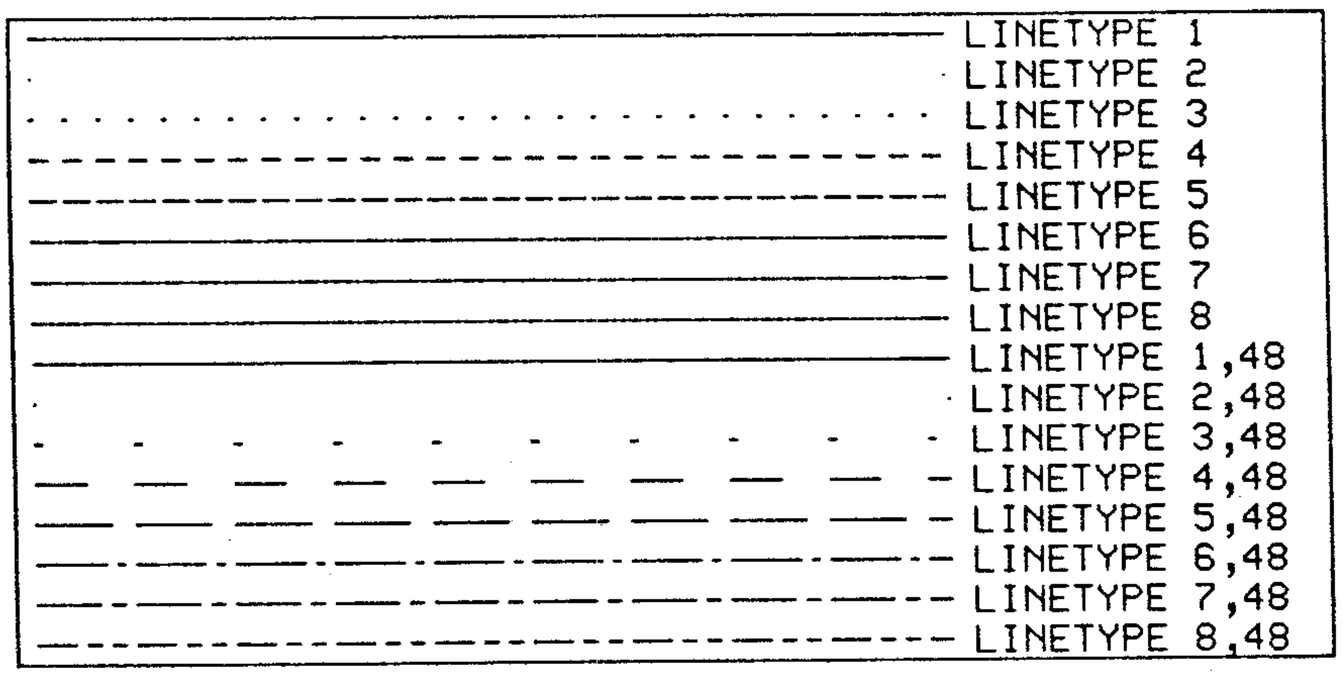
Input Parameters

Item	Description	Restrictions
type	Numeric expression rouded to an integer.	0 to +32767
pattern length	Numeric expression rouded to an integer. Default : 16	0 to +32767

Operation

LINETYPE selects a line type among 8 according to the parameter *type*. 0 selects solid line.

The pattern length is expressed in graphic units for the whole pattern. Default value is 16 graphic units.



Related Keywords

DRAW, IDRAW, BOX, FRAME, XAXIS, YAXIS

LORG

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

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

LORG *position*

Examples

LORG 5

Labels are centered relative to the current pen position.

LORG X

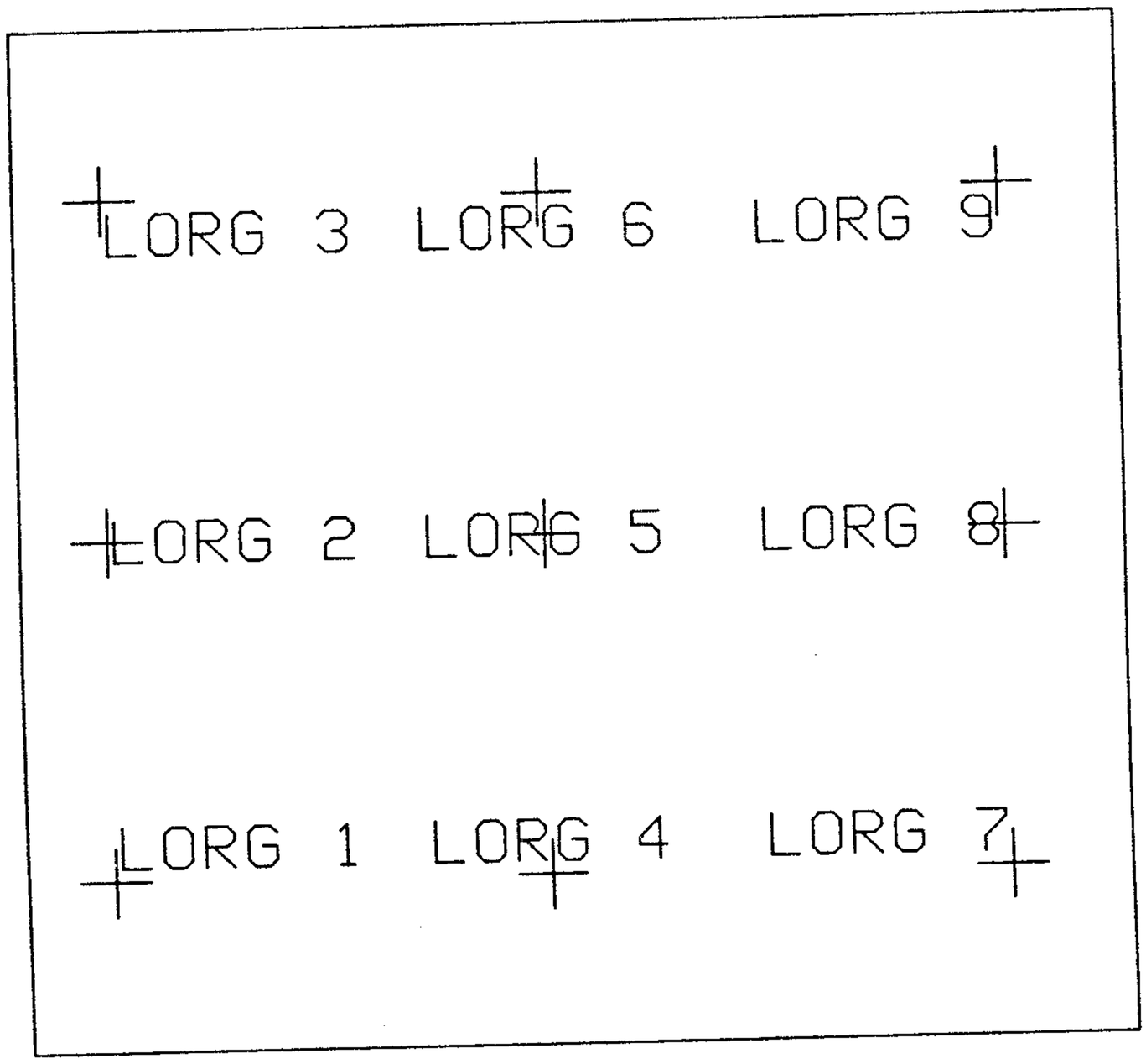
Input Parameter

Item	Description	Restrictions
position	Numeric expression rouded 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)



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

20

MOVE

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

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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
x, y	Numeric expression rouded 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	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ 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

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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

PEN selects a pen.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ Device Operation

```
PEN pen number
```

Examples

```
PEN 2
```
Selects pen 2

```
PEN X
```
Selects pen X

Input Parameter

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

Operation

PEN selects a pen on the current PLOTTER IS device. Unused with "raster" graphics.

Related Keywords

PLOTTER IS

PLOTTER IS

PLOTTER IS designates a device as graphic unit.

■ Statement	■ Keyboard Execution
○ Function	○ CALC Mode
○ Operator	■ IF...THEN...ELSE
	■ 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

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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.

■ Statement	■ Keyboard Execution
O Function	O CALC Mode
O Operator	■ IF...THEN...ELSE
	■ 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
O Function	O CALC Mode
O 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