CASIO®

MO0701061A Printed in Japan

CASIO FP-100

OPERATION MANUAL

MANUAL DE OPERACION

FC

FOREWORD

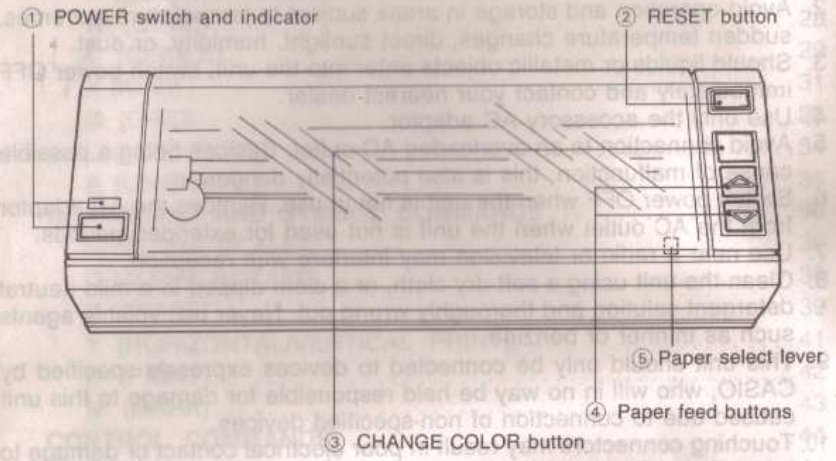
Thank you very much for purchasing the CASIO FP-100 4-color plotter-printer. The FP-100 can be connected to computing devices equipped with Centronics standard interfaces for printing on letter-size paper. Be sure to carefully read the instructions contained in this manual to realize the full potential of this unit.

CONTENTS

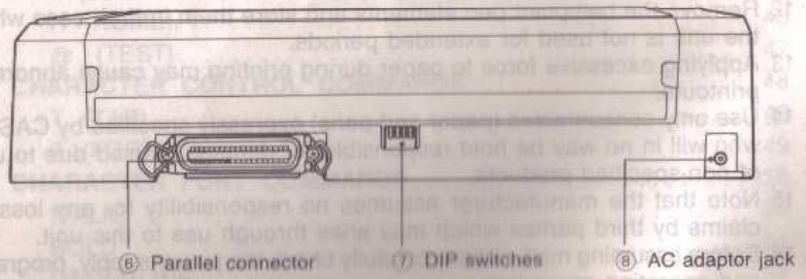
HANDLING PRECAUTIONS

1. This unit consists of precision electronic parts and should never be disassembled.
2. Avoid operation and storage in areas subject to temperature extremes, sudden temperature changes, direct sunlight, humidity, or dust.
3. Should liquids or metallic objects enter into the unit, switch power OFF immediately and contact your nearest dealer.
4. Use only the accessory AC adaptor.
5. Avoid connection to an overloaded AC outlet. Besides being a possible cause of malfunction, this is also potentially dangerous.
6. Switch power OFF when the unit is not in use. Remove the AC adaptor from the AC outlet when the unit is not used for extended periods.
7. Use near a radio or television may interfere with reception.
8. Clean the unit using a soft dry cloth, or a cloth dipped in a mild neutral detergent solution and thoroughly wrung out. Never use volatile agents such as thinner or benzine.
9. This unit should only be connected to devices expressly specified by CASIO, who will in no way be held responsible for damage to this unit caused due to connection of non-specified devices.
10. Touching connectors may result in poor electrical contact or damage to internal circuitry caused by static electricity.
11. Touching moving parts may cause malfunction.
12. Remove the ball-point pen elements and store them in their case when the unit is not used for extended periods.
13. Applying excessive force to paper during printing may cause abnormal printouts.
14. Use only consumables (paper and pens) expressly specified by CASIO, who will in no way be hold responsible for damage caused due to use of non-specified products.
15. Note that the manufacturer assumes no responsibility for any loss or claims by third parties which may arise through use to this unit.
16. Before assuming malfunction, carefully check the power supply, program, and operating procedure.

GENERAL GUIDE



BACK



① POWER switch and indicator
Press to switch power ON and OFF. A green indicator lights when power is ON.

② RESET button
Press to set the unit to its initialized status (same status when power is switched ON).

③ CHANGE COLOR button
Press to change printing to another color (pen).

④ Paper feed buttons
Press to feed the paper. Pressing ▲ feeds the paper forward, while pressing ▼ reverse feeds the paper. Initially feed is slow, but later speeds up. This operation also resets the absolute coordinate, ORG coordinate, and Y-axis (see page 13) scissoring counter.

⑤ Paper select lever
The printing capacity (see page 12) is set by moving the paper select lever to match the width of paper being used.

⑥ Parallel connector
Allows connection to a computer using an optional SB-51 connecting cable.

⑦ DIP switches
The four DIP switches are set as outlined on page 12.

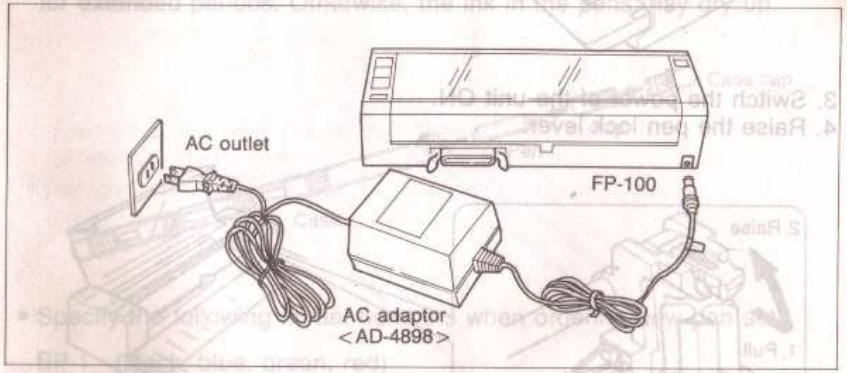
⑧ AC adaptor jack
For connection to an AC power supply using the accessory AC adaptor.

POWER SUPPLY

The unit is connected to a standard AC outlet using the accessory AD-4898 adaptor.

AC Adaptor

Plug the AC adaptor into a standard AC power outlet and connect the adaptor cord to the unit.

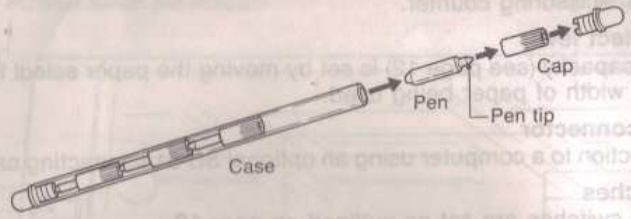


AC Adaptor Precautions

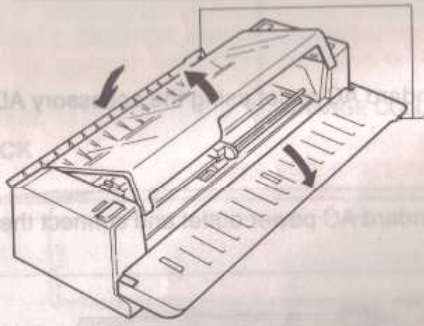
- Use only a genuine CASIO AD-4898 adaptor. Use of another type of adaptor may cause damage to the unit.
- The AC adaptor may become warm during normal use. This is quite normal and is no cause for alarm, but the adaptor should be unplugged when the unit is not in use.

PEN INSTALLATION AND REPLACEMENT

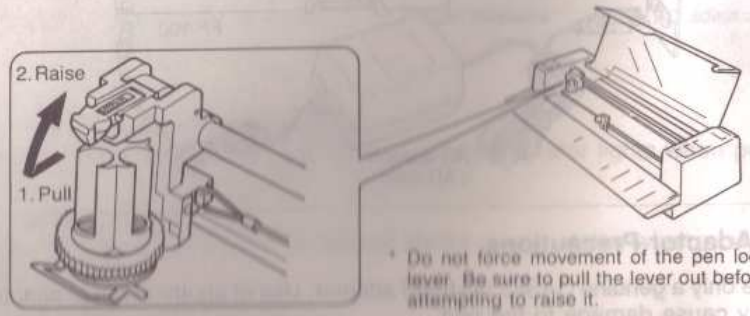
1. Remove the ball-point pens from their case.



2. Open the front and back covers, and then the top cover.

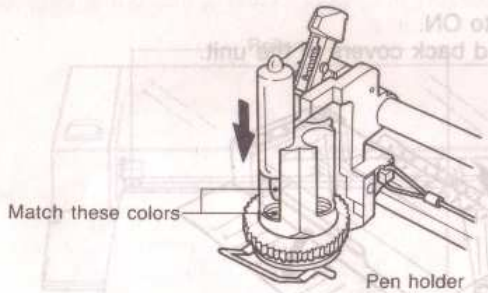


3. Switch the power of the unit ON.
4. Raise the pen lock lever.



* Do not force movement of the pen lock lever. Be sure to pull the lever out before attempting to raise it.

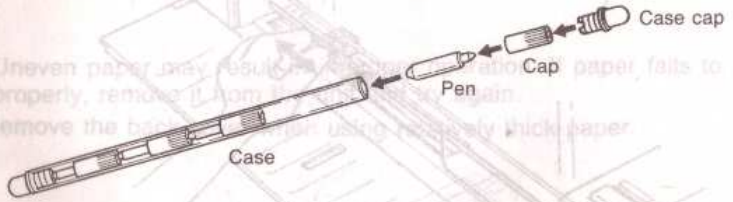
5. Install the pen into slot at the front of the pen holder. Be sure that the color of the pen matches that marked on the slot.



6. Press the CHANGE COLOR button to rotate the pen holder and install the next pen.
7. Repeat step 5 to install the other three pens.
8. Return the pen lock lever to its original position.
9. Close the top cover of the unit.

CAUTION

- Always ensure that all four pens are loaded in the pen holder.
- Remove the pens and store them in their case when the unit is not used for extended periods. Otherwise, the ink in the pens may dry up.



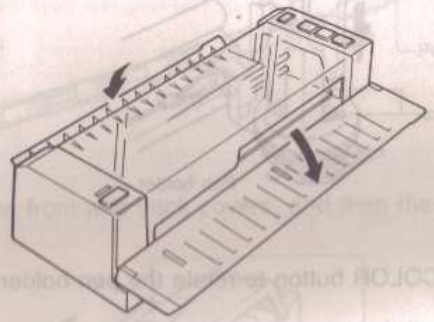
- Specify the following model numbers when ordering new pen sets.

BP-1 (black, blue, green, red)
BP-2 (4 black)

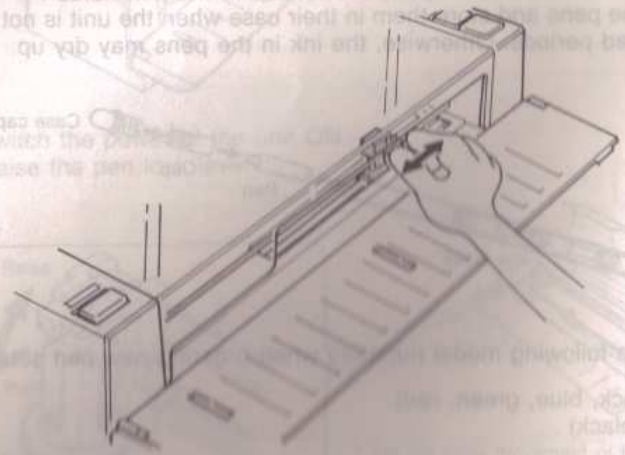
PAPER LOADING

Cut Sheet Paper

1. Set DIP switch 4 to ON.
2. Open the front and back covers of the unit.

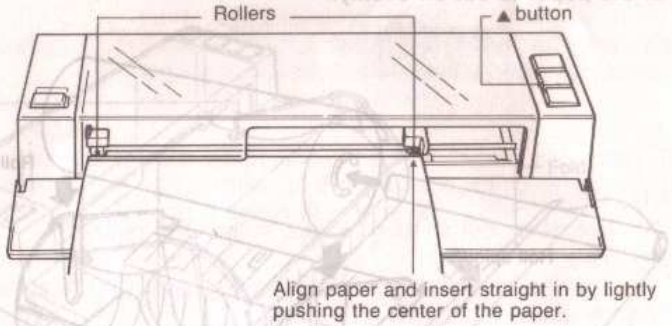


3. Switch the power of the unit ON.
4. Set the paper select lever for the size of paper being used.

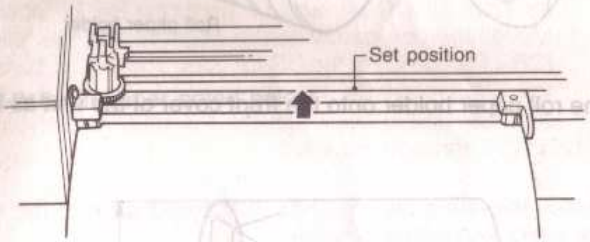


5. Load the paper between the rollers on both sides and press the paper feed ▲ button.

* Insert the paper straight into the feed rollers on the left and right.

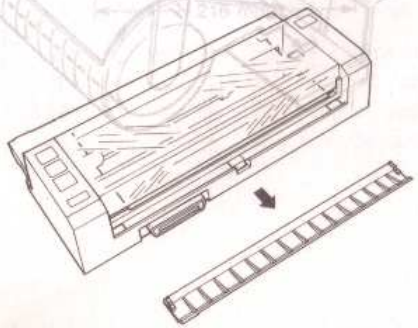


6. Use the paper feed buttons (▲ and ▽) to set the paper into the set position.



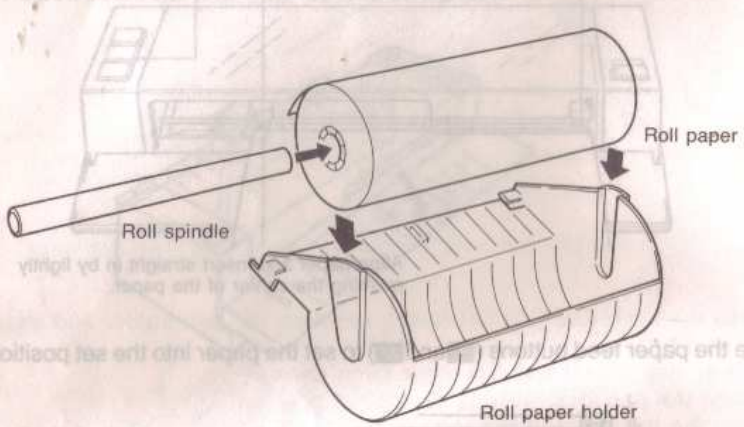
Uneven paper may result in improper operation. If paper fails to align properly, remove it from the unit and try again.

• Remove the back cover when using relatively thick paper.

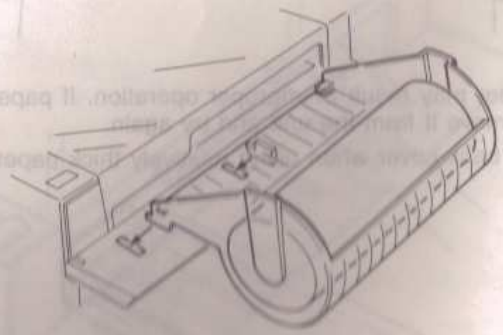


Roll Paper

1. Insert the accessory roll spindle into the roll paper as illustrated, and then lower it into the accessory roll paper holder. Ensure that the leading end of the paper is cut off evenly.

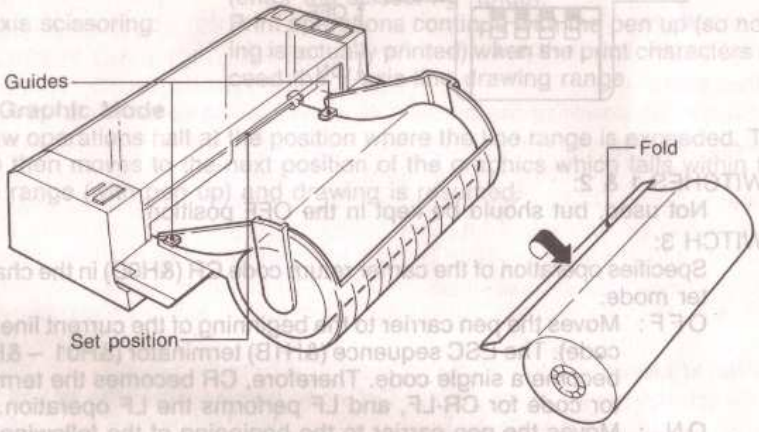


2. Attach the roll paper holder onto the front cover of the unit as illustrated.

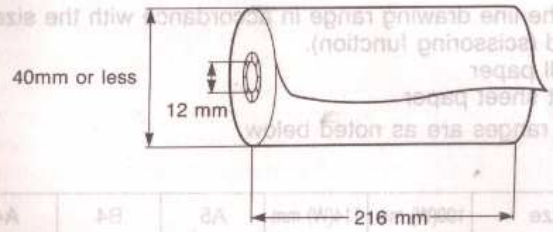


3. Pass the leading end of the paper under the two paper guides and feed the paper into the unit following the same procedures as those outlined for cut sheet paper.

* Fold the leading end of the roll paper if it is curled.

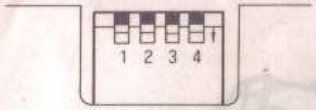


Use PRP-216 roll paper noted below.



DIP SWITCH SETTINGS

Though four DIP switches are equipped on the unit, only switches 3 and 4 are used.



SWITCHES 1 & 2:

Not used, but should be kept in the OFF position.

SWITCH 3:

Specifies operation of the carrier return code CR (&H0D) in the character mode.

OFF: Moves the pen carrier to the beginning of the current line (CR code). The ESC sequence (&H1B) terminator (&H01 ~ &H1F) become a single code. Therefore, CR becomes the terminator code for CR-LF, and LF performs the LF operation.

ON : Moves the pen carrier to the beginning of the following line (CR-LF). The LF of the CR-LF code and the LF code following the ESC sequence are disregarded.

* Set to OFF when the unit is used with the PB-1000 and when used with the PB-700/PB-770 through the FA-4.

SWITCH 4:

Specifies the line drawing range in accordance with the size of the paper used (scissoring function).

OFF: Roll paper

ON : Cut sheet paper

The line drawing ranges are as noted below.

Paper size	100(W) mm	114(W) mm	A5	B4	A4
X-direction (mm)	82	96	130	164	192
+Y-direction (mm)	6	—	6	6	6
−Y-direction (mm)	120.2	—	183.8	229.8	270.8
Print columns (S1, 1)	34	40	54	68	80

★ Scissoring Function

1. Character Mode

X-axis scissoring: CR-LF is automatically performed when the print characters exceed the X-axis line drawing range (enter the scissoring range).

Y-axis scissoring: Print operations continue with the pen up (so nothing is actually printed) when the print characters exceed the Y-axis line drawing range.

2. Graphic Mode

Draw operations halt at the position where the line range is exceeded. The pen then moves to the next position of the graphics which falls within the line range (with pen up) and drawing is resumed.

SELF CHECK FUNCTION

The built-in self check function should be used to test the printer before connection to a computer or before actual printing operations. The print out illustrated below indicates normal operation.

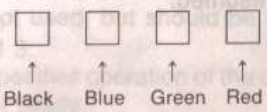
<Procedure>

1. Set paper into the printer and switch power OFF.

<Pen test>

2. Switch the power of the printer ON while holding down the △ key.

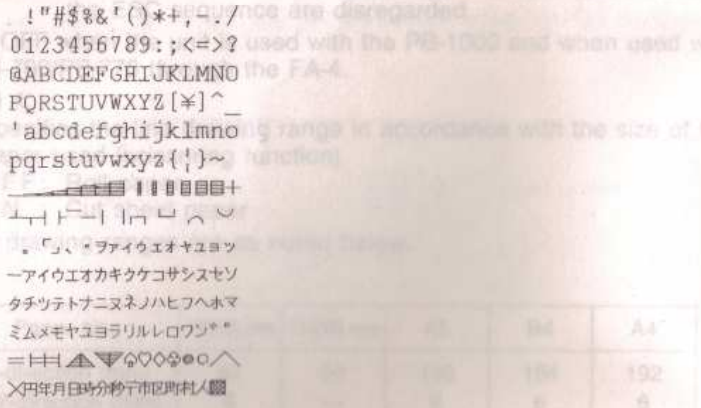
<Print Sample>



<Printer check>

3. Switch the power of the printer ON while holding down the ▽ key.

<Print Sample>



* A different color is used for each 16 characters for the actual printout.

USING THE PLOTTER-PRINTER

1. Character Mode and Graphic Mode

The following codes are used to switch between the character mode and the graphic mode.

- **Character mode (FS.)**

a) **LPRINT CHR$ (28) ; CHR$(46)**
b) **LPRINT CHR$(&H1C) ; CHR$(&H2E)**
c) **LPRINT CHR$(&H1C) ; "."**

Sending any one of the three lines listed above to the printer specifies the character mode. The character mode is also automatically in effect when the power of the printer is switched ON, or when the RESET button is pressed. While in the character mode, all codes received are printed as characters. Printing begins when any function code (CHR$(1) ~ CHR$(31)) besides CHR$(0) is sent, or when the print buffer becomes full. The following lists the valid control codes in this mode, and all other control codes (&H01 ~ &H1F) are disregarded.

&H0D:	Carrier return (CR) or carrier return and line feed (CR-LF)
&H0A:	Line feed (LF)
&H08:	Backspace (BS)
&H0B:	Back feed (BF)
&H1C + %:	Graphic mode
&H1B:	ESC sequence

- **Graphic mode (FS %)**

a) **LPRINT CHR$(28) ; CHR$(37)**
b) **LPRINT CHR$(&H1C) ; CHR$(&H25)**
c) **LPRINT CHR$(&H1C) ; "%"**

Sending any one of the three lines listed above to the printer specifies the graphic mode. While in the graphic mode, all codes are handled as graphic commands. Each command is ended by a terminator (CHR$(1) ~ CHR$(31)), and commands are executed when the terminator is sent. However, DRAW, RELATIVE DRAW, and PRINT are of unlimited length, so such commands are executed when the buffer becomes full. A command format check prints an error message when an error is generated (see page 22).

2. Mode Switching Precautions

A carrier return, line feed is executed and all settings except color*, FORMAT* and character font are assigned their initial settings when modes are switched or when the current mode is reset.

<Power ON Initial Settings>

Character mode	
Absolute coordinate origin:	(0, 0)
ORG coordinate origin:	(0, 0)
LINE TYPE:	0 (solid line)
LINE SCALE:	6.4mm
ALPHA SCALE:	1, 1
ALPHA ROTATE:	0 (normal position)
HORIZONTAL SPACE: (column spacing)	1
VERTICAL SPACE: (line spacing)	6
Horizontal printing	
* FORMAT:	0 (RESET)
* COLOR:	0 (black) · No change when mode is switched
Y-axis scissoring counter: (paper length counter)	0
Italic:	Canceled
Bold:	Canceled
Underline:	Canceled

* Color detect operations are performed and the black pen is set to the home position when power is switched ON.

3. Character Fonts

The initialization procedure sets the character font to Courier, but Italic, bold, and underline can be specified using the ESC sequence (&H1B).

CASIO FP-100 ········ Courier
CASIO FP-100 ········ Italic
CASIO FP-100 ········ Italic + bold
CASIO FP-100 ········ Italic + bold + underline

See page 50 for details on the use of these character fonts.

4. Commands

Besides the standard BASIC printer commands (LPRINT, LPRINT USING, LLIST), 11 graphic commands, 6 character and symbol commands, 4 control commands, as well as 2 character control commands and 3 character font commands (used only in the character mode) are used for printer applications.

The three standard BASIC printer commands can only be used in the character mode. Plotter commands are composed of a command (one upper case alphabetic character) and a parameter which is defined by numeric data (some commands, however, do not require parameters).

Example

```
LPRINT CHR$(28); CHR$(37)
LPRINT "D0, 0, 50, -30"
        Command  Parameters

LPRINT "S1", "J2"
```

Note that the P command (PRINT statement) only can use characters outside of the function codes (CHR$(1) ~ CHR$(31)) as parameters. Parameters (numeric data) in all cases are delimited by commas.
Numeric parameters are values with an integer part of three digits or fewer (−999.8 ~ 999.8). Length specifications can vary by units of 0.2mm, angle specifications by 0.2 degrees, and movement specifications by 0.1mm. Fractional values smaller than those noted above are discarded. All spaces are disregarded, and fractions are truncated when an integer value is required as a parameter.

<Reference>
Numeric parameter units
Length: −999.8 ~ 999.8mm
Angles: −999 ~ 999 degrees

★ Using Character Mode Commands

Character codes sent to the printer in the character mode are directly printed as characters. Plotter commands, however, cannot be directly executed. Each plotter command must be immediately preceded by the ESC code (CHR$(27) or CHR$(&H1B)). The ESC code is used to execute commands which control the size, color and horizontal/vertical coordinates.

Example 1 Prints out a program list in 160-character print mode.

```
LPRINT CHR$(28); CHR$(46) EXE (or ↵)
LPRINT CHR(27); "S0, 0"? EXE (or ↵)
LLIST EXE (or ↵)
```

Example 2

```
10 LPRINT CHR$(28);CHR$(46)
20 LPRINT "CIRCLE"
30 LPRINT CHR$(27);
40 LPRINT "C40,-40,20"
```

```
CIRCLE
```

5. Coordinate Systems

Both absolute (fixed) coordinates and ORG coordinates are available. The O command uses the absolute coordinates to specify an origin (0, 0) for the ORG coordinates.

The ORG coordinates are initialized to the absolute coordinates when the power of the printer is switched ON. Once an ORG coordinate origin is specified, it is reset to the initial (power ON) setting by switching modes, the HOME command, or when pens are replaced.

The absolute coordinate origin is set as the current pen position after initialization by switching power ON, generation of an error, the HOME command, the TEST command, or when pens are replaced. The positions of the absolute coordinates are shifted by the amount of paper movement when the FEED key is pressed or when a LINE FEED command is executed.

	Absolute Coordinates	ORG Coordinates	Y-axis Scissoring
1. Power ON (RESET)	○	○	○
2. TEST command	○	×	×
3. HOME command			
(with parameters)	○	○	○
(without parameters)	×	×	×
4. Paper feed	○	○	○
5. Character mode line feed			
DIP switch OFF	○	○	○
DIP switch ON	×	×	×
6. Error	○	○	○
7. Mode switching			
DIP switch OFF	○	○	○
DIP switch ON	○	○	×

○: Reset ×: No change

The range of the absolute coordinates is (−3276.8mm, −3276.8mm) ~ (3276.6mm, 3276.6mm). The range of the ORG coordinate origin set by the O command is (−999.8mm, −999.8mm) ~ (999.8mm, 999.8mm).

Movement in the direction of the Y-coordinate differs according to the setting of DIP switch #4. Setting switch #4 ON restricts graphics drawing to the size of the cut sheet paper being used. Setting switch #4 to OFF causes the paper to be treated as roll paper, with movement being restricted to the ORG coordinate range.

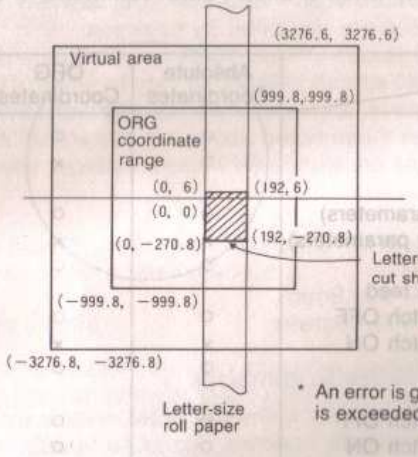
* See page 12 for details on DIP switch settings.

Example Graphics Range Confirmation

Execute the following program using letter-size paper with DIP switch #4 set to ON.

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "O0,-270.8"
30 LPRINT "A0,0,192,270.8"
40 LPRINT "A0,10,50,-50"
50 END
```

<Reference>



* An error is generated when the virtual area is exceeded during command execution.

6. Command and Parameter Format

Plotter commands are used within the LPRINT command. Commands which do not require parameters are enclosed in quotation marks.

Example

Manual execution: **LPRINT "H"**
Program execution: **100 LPRINT "H"**

The format for commands which require parameters differs according to whether the parameters are constants or variables. Constants used as parameters are enclosed along with the command within quotation marks.

Example

```
LPRINT "O0, 0"
LPRINT "D10, 55, 80, 20"
```


When variables are used for parameter specification, the commands are enclosed within quotation marks while the variable parameters are outside. The variables are always preceded by semicolons, and are followed by semicolons unless they are the last element in the series. Commas (also enclosed in quotation marks) are used as delimiters of variable parameters.

Example

```
LPRINT "A0, 0, "; X; ", "; Y
LPRINT "C"; I; ","; J; ","; R
```

Sample program

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "O50,-50"
30 FOR R=5 TO 30 STEP 5
40 LPRINT "C0,0,";R
50 NEXT R
60 END
```

7. Commands Affecting Status Settings of Other Commands

	Command	Affected Command
Coordinates	O (ORIGIN)	D (DRAW) M (MOVE) A (QUAD) C (CIRCLE) X (AXIS)
Lines	L (LINE TYPE) B (LINE SCALE)	D (DRAW) R (RELATIVE DRAW)
Characters	S (ALPHA SCALE) Q (ALPHA ROTATE) Z (SPACE) *1 Y (HORZ/VERT PRINT)	P (PRINT)
Symbols	S (ALPHA SCALE) Q (ALPHA ROTATE)	N (MARK)
Line feed	S (ALPHA SCALE) Z (SPACE) *2 Y (HORZ/VERT PRINT)	F (LINE FEED)

*1: Column spacing only
*2: Line spacing only

8. Errors

The following messages are printed out when the corresponding errors are generated.

a) Command error C-ERR "command containing error"
b) Parameter error P-ERR "command containing error"
c) Mode error M-ERR
d) Out of range error O-ERR

A CR/LF is executed after the error message is printed, and the current pen position becomes the origin for the absolute coordinates. See page 64 for details on the meaning of each type of error.

9. PB-700/PB-770 Compatibility

a) DIP switch #3 should be set to ON and switch #4 to OFF when this unit is used with the PB-700 or PB-770 (in combination with the FA-4 interface unit).
b) DIP switch #3 should be set to ON and switch #4 to OFF when executing a PB-700/PB-770 plotter program on the PB-1000. In this case, commands within the program should be modified as follows.
   • DIM statement
   Delete ∗n from A$( )∗n
   • Single precision variables
   Delete! from A!
   • LPRINT statement
   Convert LPRINT A, B to LPRINT A: LPRINT B
   • LPRINT USING statement
   Convert "&&&&" to "& ␣␣ &" (␣ indicates a space.)
   Convert "&" to "!"
   Convert "# ^ " to "# ^^^^ "

All of the above are only meant to be general examples of the conversions required. Actual statements and variables used in programs will differ slightly.

COMMAND REFERENCE

The following formats and symbols are used throughout the printer command reference.

a) Boldface printing indicates commands which must be input exactly as shown.
b) Brackets indicate parameters which may be omitted.
c) Braces indicate at least one of the parameters noted must be included.
d) An asterisk indicates that the parameters preceding it may be repeated.
e) The integer part of a parameter can be up to three digits long. The range of the real numbers specified in the PARAMETER section is −999.8 ~ 999.8.
f) All spaces are ignored except by the PRINT command.
g) The unit for length is 0.2mm, and for angles is 0.1 degrees.
h) Terminators may be any function code from CHR$(1) through CHR$(31).

GRAPHIC COMMANDS

O (ORIGIN)

O [absolute X-coordinate, absolute Y-coordinate] (terminator)

PURPOSE: Specifies the origin of the ORG coordinates.

PARAMETERS: Real numbers in the range of −999.8 ~ 999.8.

EXPLANATION: Any point which can be expressed as an absolute coordinate (x, y) may be used as the origin of the ORG coordinates. All subsequent graphics commands are executed in accordance with the specified ORG coordinates until a new specification is made. The current pen position is the default option when the parameters are omitted.

D (DRAW)

D [start point X-coordinate, start point Y-coordinate]
[,X-coordinate, Y-coordinate]* (terminator)

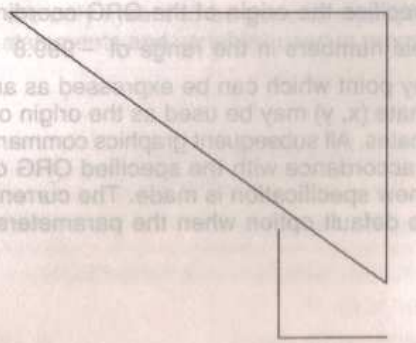
PURPOSE: Connects points with a straight line.

PARAMETERS: Real numbers within the range of −999.8 ~ 999.8 specifying an ORG coordinate value. Any number of parameters can be specified within a logical line.

EXPLANATION: This command draws straight lines between the specified ORG coordinates. If only a start point is specified or if subsequent coordinates are identical to the start point coordinate, the printhead moves to the specified start point without drawing a line. At least one set of coordinates must be specified as a parameter.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "O50,-50"
30 LPRINT "D0,10,0,-10"
40 LPRINT "D,20,-10"
50 LPRINT "O0,0"
60 LPRINT "D0,0,70,-50,70,0,0,0"
70 END
```



I (RELATIVE DRAW)

I X-axis displacement, Y-axis displacement
[, X-axis displacement, Y-axis displacement]* (terminator)

PURPOSE: Draws a line to the point specified by the displacement.

PARAMETERS: Any number of parameters can be specified within a logical line.

EXPLANATION: This command sequentially draws straight lines between points starting from the current pen position. Subsequent points to be connected are determined by adding the specified displacement value to the coordinates of each pen position.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "I0,0,20,10,20,-5,20,-10"
30 END
```

M (MOVE)

M [X-coordinate], [Y-coordinate] (terminator)

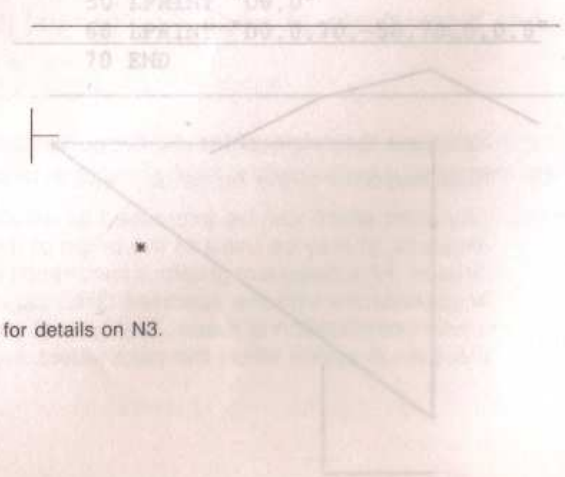
PURPOSE: Moves the printhead to the specified point without drawing a line.

PARAMETERS: ORG coordinates. Default value is 0 when omitted.

EXPLANATION: This command moves printhead from its present point to the specified point without drawing a line.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "D-5,0,5,0"
30 LPRINT "D0,-5,0,5"
40 LPRINT "M20,-20"
50 LPRINT "N3"
60 END
```



* See page 43 for details on N3.

R (RELATIVE MOVE)

R X-axis displacement, Y-axis displacement (terminator)

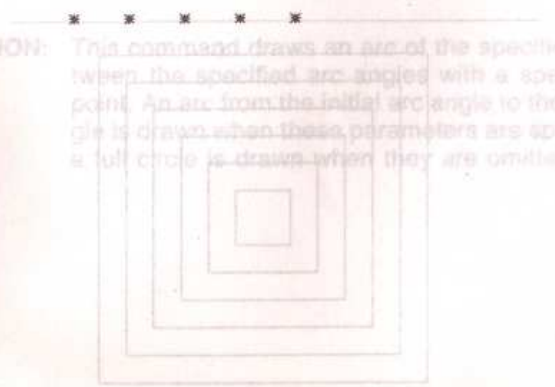
PURPOSE: Moves the printhead to the point specified by the displacement without drawing a line.

PARAMETERS: Specify the displacement to be applied.

EXPLANATION: This command moves printhead from its present position to the position determined by adding the specified displacement to the coordinates of the current printhead position. The printhead is moved without drawing a line.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 FOR I=1 TO 5
30 LPRINT "R10,0"
40 LPRINT "N3"
50 NEXT I
60 END
```



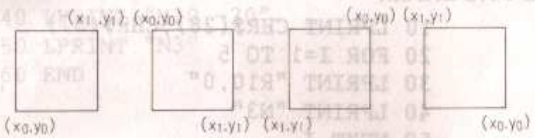
A (QUAD)

A start point X-coordinate, start point Y-coordinate, diagonal X-coordinate, diagonal Y-coordinate (terminator)

PURPOSE: Draws a quadrangle whose opposite diagonal corners are at the points specified and whose respective sides are parallel to the x and y axes.

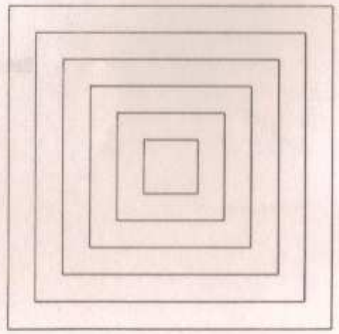
PARAMETERS: All parameters are within the range of ORG coordinates and cannot be omitted.

EXPLANATION: This command draws a quadrangle whose opposite diagonal corners are located at the points specified by the start point coordinates and the diagonal coordinates. The sides of the quadrangle are parallel to the x and y axes. Any two points which are opposite diagonals of the start points can be specified.



SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "O50,-25"
30 FOR I=30 TO 5 STEP -5
40 LPRINT "A";-I;",";I;",";I;",";-I
50 NEXT I
60 END
```

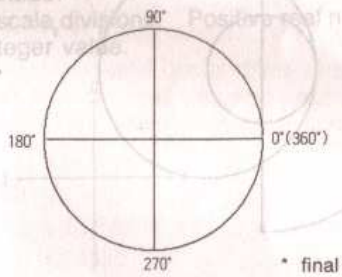


C (CIRCLE)

C [center point X-coordinate, center point Y-coordinate], radius [, initial arc angle, final arc angle] (terminator)

PURPOSE: Draws an arc of the specified radius between the specified arc angles with a specified center point.

PARAMETERS: The default option for the center point is the current pen position.
radius: Real number with a minimum value of 0.4 which cannot be omitted.
initial/final arc angles: Omitted when a full circle is drawn. The following illustration shows the relative positions of the arc angles.

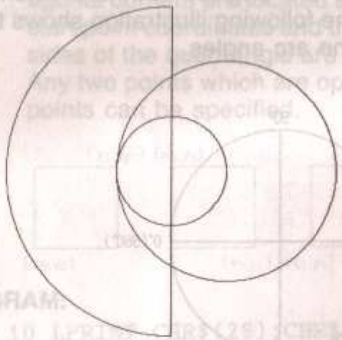


* final arc angle > initial arc angle

EXPLANATION: This command draws an arc of the specified radius between the specified arc angles with a specified center point. An arc from the initial arc angle to the final arc angle is drawn when these parameters are specified, while a full circle is drawn when they are omitted.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "C30,-30,10"
30 LPRINT "C,20"
40 LPRINT "C30,-30,30,90,270"
50 LPRINT "I0,60"
60 END
```



X (AXIS)

X axis direction, scale pitch, scale divisions (terminator)

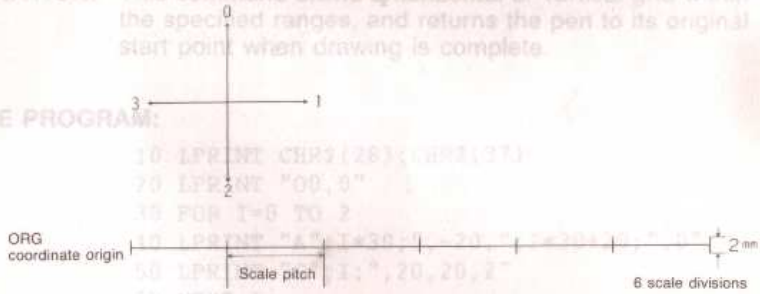
PURPOSE: Draws a coordinate axis in the direction (+x, +y, −x, −y) starting at the ORG coordinate origin.

PARAMETERS: axis: Integer value in the range of 0 ≦ direction < 4. Each value has the following meaning.

0 : +y direction
1 : +x direction
2 : −y direction
3 : −x direction

scale pitch: Positive real number truncated to an integer value.

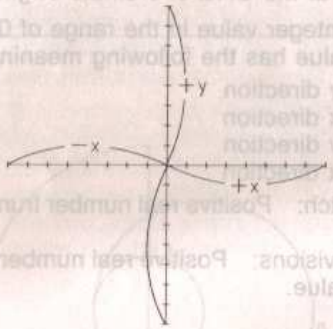
scale divisions: Positive real number truncated to an integer value.



EXPLANATION: This command draws a coordinate axis in the specified direction, starting at the ORG coordinate origin. The pitch and number of the scale divisions are drawn as specified. The coordinate axis length is determined by the pitch and number of scale divisions.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "048,-50"
30 FOR I=0 TO 3
40 LPRINT "X";I;",5,8"
50 NEXT I
60 END
```



G (GRID)

G direction, X-axis range, Y-axis range [, pitch] (terminator)

PURPOSE: Draws a horizontal or vertical grid within a quadrangle drawn starting from the current pen position. The respective sides of the quadrangle are parallel to the x and y axes.

PARAMETERS: direction: Integer value in the range of 0 through 2. Each value has the following meaning.

0 : No grid
1 : Horizontal grid
2 : Vertical grid

X-axis range/Y-axis range: Real number

pitch: Positive real number. Specification of 0.2 or lower results in a fully painted in rectangle. Default value = 1.

EXPLANATION: This command draws a horizontal or vertical grid within the specified ranges, and returns the pen to its original start point when drawing is complete.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "00,0"
30 FOR I=0 TO 2
40 LPRINT "A";I*30;",-20,";I*30+20;",0"
50 LPRINT "G";I;",20,20,2"
60 NEXT I
70 END
```

L (LINE TYPE)

L line type (terminator)

PURPOSE: Specifies the type of line to be drawn by DRAW(D), or RELATIVE DRAW (I) command.

PARAMETERS: line type: Integer value in the range of 0 through 3. Each value has the following meaning.

0 : Solid line
1 : Broken line
2 : 1-dot chained line
3 : 2-dot chained line

The initial value is 0 when power is switched ON.

EXPLANATION: This command specifies the type of line to be drawn by the DRAW (D) or RELATIVE DRAW (I) command.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 FOR I=0 TO 3
30 LPRINT "L";I
40 LPRINT "H10"
50 LPRINT "D0,0,96,0"
60 NEXT I
70 END
```

B (LINE SCALE)

B line pitch (terminator)

PURPOSE: Specifies the pitch (spacing) for dashed lines, 1-dot chained lines, and 2-dot chained lines.

PARAMETERS: 0 ≦ pitch < 1000

EXPLANATION: Used in combination with the LINE TYPE (L) command to specify the pitch of the line drawn. Specifications for each type of line are best kept above the following values.
Dashed line: 0.4
1-dot chained line: 3.2
2-dot chained line: 6.4

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 FOR I=1 TO 4
30 B=1.6*I
40 LPRINT "H5"
50 LPRINT "P *B=";B
60 LPRINT "H2"
70 LPRINT "B";B
80 FOR L=0 TO3
90 LPRINT "L";L
100 LPRINT "D0,0,96,0"
110 LPRINT "H2"
120 NEXT L
130 NEXT I
140 END
```

S (ALPHA SCALE)

S horizontal scale [, vertical scale] (terminator)

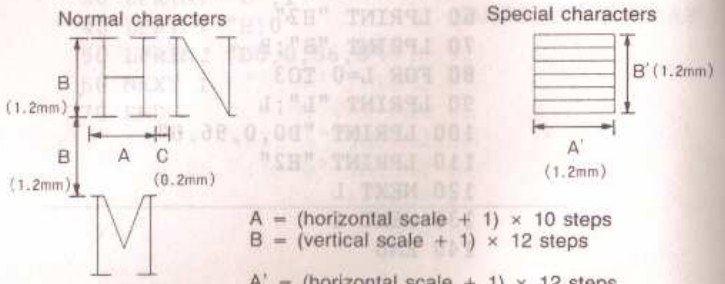
PURPOSE: Specifies the horizontal and vertical size of printed characters and symbols.

PARAMETERS: Values in the range of 0 ≦ scale < 16 truncated to integers.

* The default value for the vertical scale is the same value specified for the horizontal scale.

EXPLANATION: This command specifies the size of characters and symbols printed by the PRINT (P) and MARK (N) statements, as well as those printed in the character mode. The smallest size is specified by 0, and the largest is specified by 15.

Horizontal/vertical scale = 0



A = (horizontal scale + 1) × 10 steps
B = (vertical scale + 1) × 12 steps

A' = (horizontal scale + 1) × 12 steps
B' = (vertical scale + 1) × 12 steps

* 1 step = 0.1mm

C and D are column spacing and line spacing specifications which are calculated as follows.

C = (horizontal scale + 1) × column spacing × 2 steps
D = (vertical scale + 1) × line spacing × 2 steps

For special characters, C is calculated as follows.

C = (horizontal scale + 1) × (column spacing − 1) × 2 steps

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "M0,-20"
30 FOR I=0 TO 15 STEP 2
40 LPRINT "S";I;",";I
50 LPRINT "PX"
60 NEXT I
70 END
```

Q (ALPHA ROTATE)

Q rotation direction (terminator)

PURPOSE: Specifies the rotation direction of strings.

PARAMETERS: 0 ≦ rotation direction < 4, truncated to an integer

EXPLANATION: This command specifies the rotation of a string to the position of 90°, 180°, or 270° clockwise from the standard position.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "M20,0"
30 FOR I=0 TO 3
40 LPRINT "Q";I
50 LPRINT "PABC"
60 NEXT I
70 END
```

Z (SPACE)

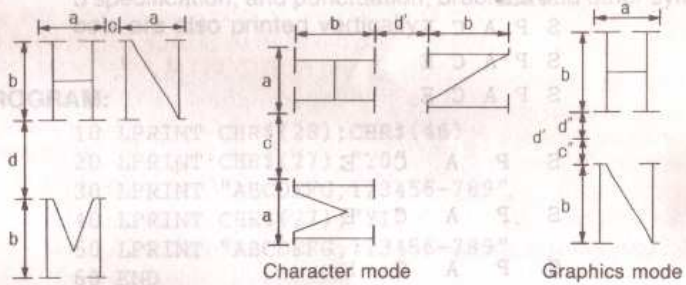
Z column spacing [, line spacing] (terminator)

PURPOSE: Specifies column spacing and line spacing.

PARAMETERS: column spacing: $-128 \leqq$ column spacing < 128, truncated to an integer
line spacing: $-128 \leqq$ line spacing < 128, truncated to an integer (may be omitted)

EXPLANATION: This command specifies column and line spacing. The initial value when power is switched ON is Z1, 6.

(Z1, 6)



c = (horizontal scale + 1) × column spacing × 2 steps
d = (vertical scale + 1) × line spacing × 2 steps
c' = (vertical scale + 1) × (line spacing − 1) × 2 steps
d' = (horizontal scale + 1) × (column spacing + 3) × 2 steps
c'' = (vertical scale + 1) × 3 steps
d'' = (horizontal scale + 1) × (column spacing + 3) × 2 steps − (line spacing − 1) × 3 steps
d' = c'' + d''

* 1 step = 0.1mm

The previously specified (or initial) line spacing is the default option when the line spacing parameter is omitted. The paper is fed in accordance with the line spacing specification when a line feed is executed.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(46)
20 FOR I=0 TO 16 STEP 8
30 LPRINT CHR$(27);"Z";I;",";I
40 FOR J=1 TO 3
50 LPRINT "SPACE"
60 NEXT J
70 LPRINT CHR$(27);"F1"
80 NEXT I
90 END
```

```
SPACE
SPACE
SPACE
S P A C E
S P A C E
S P A C E

S  P  A  C  E

S  P  A  C  E

S  P  A  C  E
```


Y (HORIZONTAL/VERTICAL PRINT)

Y horizontal/vertical specification (terminator)

PURPOSE: Specifies horizontal or vertical printing of strings.

PARAMETERS: 0 ≦ horizontal/vertical specification < 2, truncated to an integer

0 : Horizontal
1 : Vertical

EXPLANATION: This command specifies horizontal or vertical printing for strings. Specifying vertical printing results in characters printed in the same direction as the ALPHA ROTATE (Q) 3 specification, and punctuation, brackets and other symbols are also printed vertically.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(46)
20 LPRINT CHR$(27);"Y0"
30 LPRINT "ABCDEFG,123456-789"
40 LPRINT CHR$(27);"Y1"
50 LPRINT "ABCDEFG,123456-789"
60 END
```

```
ABCDEFG,123456-789
A
B
C
D
E
F
G
,
1
2
3
4
5
6
-
7
8
9
```

P (PRINT)

P string (terminator)

PURPOSE: Prints the strings and data.

PARAMETERS: Characters or codes other than function codes. Codes in the range of CHR$(32) through CHR$(255) can be specified.

EXPLANATION: This command is only used in the graphic mode to print the string, data or codes (converted to characters) following the P command. Character codes CHR$(96), CHR$(127) and CHR$(255) are undefined, and so are disregarded when specified in this command. Actual printing is performed in accordance with the specifications made using the ALPHA SCALE (S), ALPHA ROTATE (Q), SPACE (Z) and HORIZONTAL/VERTICAL PRINT (Y) commands. Printing performed using this command does not automatically include a carrier return/line feed at the end of each line, so a LINE FEED (F) command must be included where a carrier return/line feed is required.

SAMPLE PROGRAM:

```
10 LPRINTCHR$(28);CHR$(37)
20 LPRINT"PPOCKET "
30 LPRINT"PCOMPUTER"
40 LPRINT"H"
50 LPRINT"F1"
60 LPRINT"PPLOTTER PRINTER"
70 END
```

```
POCKET COMPUTER
PLOTTER PRINTER
```


N (MARK)

N mark type (terminator)

PURPOSE: Prints the specified mark centered at the current pen position.

PARAMETERS: 0 ≦ mark type < 10, truncated to an integer

0: No print 1: + 2: × 3: ✳ 4: □

5: ◇ 6: ⬠ 7: ⌂ 8: ⧖ 9: ⊠

EXPLANATION: This command prints the specified graphic mark centered at the current pen position. The pen returns to its original position once printing is complete, so the pen position must first be changed before printing another character or symbol at a different position. The printing of the marks is controlled using the ALPHA SCALE (S) and ALPHA ROTATE (Q) commands. The marks available can easily be adopted for line graphs.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 FOR I=0 TO 9
30 LPRINT "M";6+I*9;",-10"
40 LPRINT "N";I
50 NEXT I
60 END
```

+ × ✳ □ ◇ ⬠ ⌂ ⧖ ⊠

J (NEW PEN)

J pen color (terminator)

PURPOSE: Selects the pen color.

PARAMETERS: 0 ≦ pen color < 4, truncated to an integer
0 : black 1 : blue 2 : green 3 : red

EXPLANATION: This command is used to select the color of the pen used for printing. The initial setting is 0 when power is switched ON, and increasing the specification rotates the pen holder one step to the right. The colors shown for the pen color specifications above is for the normal pen arrangement, but actual colors may differ according to the colors of the pens loaded.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 FOR I=0 TO 3
30 LPRINT "H10"
40 LPRINT "J";I
50 LPRINT "PABCD"
60 NEXT I
70 END
```

```
ABCD.....Black

ABCD.....Blue

ABCD.....Greeen

ABCD.....Red
```


F (LINE FEED)

F number of lines (terminator)

PURPOSE: Feeds the paper the specified number of lines.

PARAMETERS: Real number in the range of −999.8 through 999.8, truncated to an integer

EXPLANATION: This command performs line feed or reverse line feed the specified number of lines, in accordance with the SPACE (Z), ALPHA SCALE (S) and HORIZONTAL/VERTICAL PRINT (Y) specifications. A positive parameter produces a line feed, while a negative parameter results in a reverse line feed. Note that the absolute coordinates are shifted by the amount of the line feed when this command is executed.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "M0,-10"
30 FOR I=-2 TO 2
40 LPRINT "PL/F";I
50 LPRINT "F";I
60 NEXT I
70 END
```

```
                    L/F 0 L/F 1
          L/F-1                 L/F 2

L/F-2
```

H (HOME)

H [distance] (terminator)

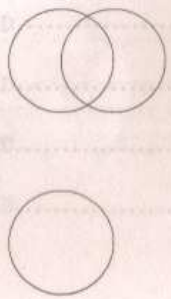
PURPOSE: Moves the pen to a position for easy viewing of graphics, and respecifies the home position (absolute coordinate origin).

PARAMETERS: Positive real number or 0 (may be omitted)

EXPLANATION: Specifying a parameter feeds the paper the specified distance from the bottom of the most recent graphics drawing and moves the pen to the far left side. At this time, the pen position becomes the new absolute coordinate origin. When the parameter is omitted, the paper is fed to the bottom of the most recent graphics drawing and the pen is moved to the far left side. In this case, the absolute coordinates do not change, so further drawing can be performed using the same coordinates.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "O30,-20"
30 LPRINT "C0,0,10"
40 LPRINT "H"
50 LPRINT "C10,0,10"
60 LPRINT "H5"
70 LPRINT "O30,-20"
80 LPRINT "C0,0,10"
90 END
```



@ (TEST)

@ (terminator)

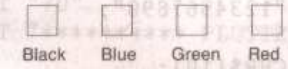
PURPOSE: Checks the printing capability and color arrangement of the pens.

PARAMETERS: None

EXPLANATION: The water based ink used in the pens may dry up if they are stored for long periods without their covers. This command makes it possible to check the current condition of each pen by subjecting it to a printing test. This command can also be used after pen replacements to check for proper arrangement of the pen colors.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(37)
20 LPRINT "@"
30 END
```



T (TAB)

T number of columns (terminator)

PURPOSE: Moves the pen the specified number of columns from the left side to the right.

PARAMETERS: Real number in the range of −999.8 through 999.8, truncated to an integer

EXPLANATION: This command can only be used in the character mode to move the pen the specified number of columns from the left side to the right (tab operation). The pen is moved to the beginning of the next line if the specified number of columns exceeds the range of a single line.

SAMPLE PROGRAM:

```
10 LPRINT CHR$(28);CHR$(46)
20 FOR I=1 TO 4
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(10);
60 LPRINT CHR$(27);"T10"
70 LPRINT "TAB 10"
80 END
```

```
12345678901234567890123456789012345678901234567890
          TAB 10
```


? (FORMAT)

? { 0 / 1 } (terminator)

PURPOSE: Inserts six spaces to the left of a line when an automatic carrier return/line feed operation is performed.

PARAMETERS: 1: Sets FORMAT
0: Cancels FORMAT

EXPLANATION: This command inserts six spaces at the beginning of a line after an automatic carrier return/line feed operation. Automatic carrier return/line feed is defined as any such operation not performed as the result of a CR or LF command.

SAMPLE PROGRAMS:

Example 1

```
********** PLOTTER PRINTER **********

10 LPRINT CHR$(28);CHR$(46),CHR$(27);
20 LPRINT "?0"
30 LPRINT "********** PLOTTER PRINTER **********"
40 END
```

Example 2

```
********** PLOTTER PRINTER **********

10 LPRINT CHR$(28);CHR$(46),CHR$(27);
20 LPRINT "?1"
30 LPRINT "********** PLOTTER PRINTER **********"
40 END
```

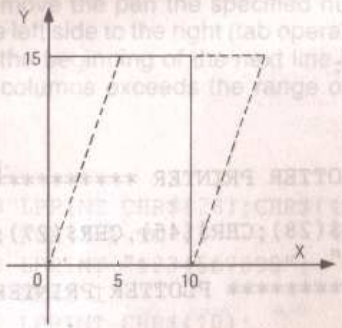
CHARACTER FONT COMMANDS

ITALIC

ESC + V	(terminator)
ESC + v	(terminator)

PURPOSE: Sets and cancels italic printing

EXPLANATION: ESC + V specifies italic printing, while ESC + v cancels italic printing and returns to courier. The offset of the x-axis in relation to the y-axis is x : y = 1 : 3 (5 : 15) during italic printing.



Solid line: Courier
Dotted line: Italic

SAMPLE PROGRAM:

```
10 LPRINTCHR$(27);"V"
20 LPRINT"ITALIC :ABCDEFG"
30 LPRINTCHR$(27);"v"
40 LPRINT"COURIER:ABCDEFG"
50 END
```

ITALIC :ABCDEFG

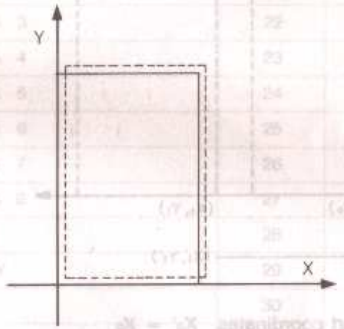
COURIER:ABCDEFG

BOLD

ESC + E	(terminator)
ESC + e	(terminator)

PURPOSE: Sets and cancels bold printing

EXPLANATION: ESC + E specifies bold printing, while ESC + e cancels bold printing. Bold printing is accomplished by overprinting a character, with the second printing being displaced by 0.1mm on both the x and y-axes (scissoring range is also discpaced 0.1mm).



SAMPLE PROGRAM:

```
10 LPRINTCHR$(27);"V"
20 LPRINT"ITALIC NORMAL"
30 LPRINTCHR$(27);"E"
40 LPRINT"ITALIC BOLD"
50 LPRINTCHR$(27);"v"
60 LPRINT"COURIER BOLD"
70 LPRINTCHR$(27);"e"
80 LPRINT"COURIER NORMAL"
90 END
```

ITALIC NORMAL

ITALIC BOLD

COURIER BOLD

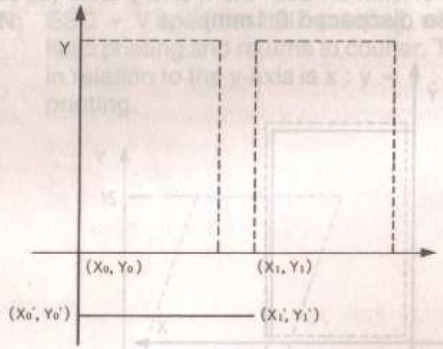
COURIER NORMAL

UNDERLINE

ESC + W (terminator)
ESC + w (terminator)

PURPOSE: Sets and cancels underline printing

EXPLANATION: ESC + W specifies underline printing, while ESC + w cancels underline printing. Characters are underlined in accordance with the specified vertical scale.



Start coordinates $X_0' = X_0$
$Y_0' = Y_0 - 5 \times X_0 \times$ (vertical scale + 1)
End coordinates $X_1' = X_1$
$Y_1' = Y_1 - 5 \times X_0 \times$ (vertical scale + 1)

SAMPLE PROGRAM:

```
10 LPRINTCHR$(27);"W"
20 LPRINT"UNDERLINE ABCDEFG"
30 LPRINTCHR$(27);"w"
40 END
```

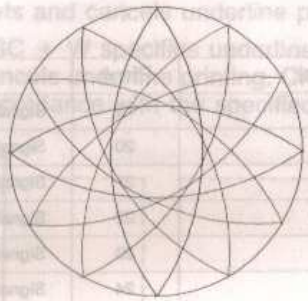
UNDERLINE ABCDEFG

CONNECTOR PIN CONFIGURATION

Pin #	Signal	Pin #	Signal
1	$\overline{STB}$	19	Signal GND
2	DATA 1	20	Signal GND
3	DATA 2	21	Signal GND
4	DATA 3	22	Signal GND
5	DATA 4	23	Signal GND
6	DATA 5	24	Signal GND
7	DATA 6	25	Signal GND
8	DATA 7	26	Signal GND
9	DATA 8	27	Signal GND
10	$\overline{ACK}$	28	Signal GND
11	BUSY	29	Signal GND
12	NC	30	N C
13	NC	31	$\overline{INIT}$
14	NC	32	Pull up(3.3k Ω)
15	NC	33	Signal GND
16	Signal GND	34	NC
17	(FG)	35	NC
18	Signal GND	36	NC

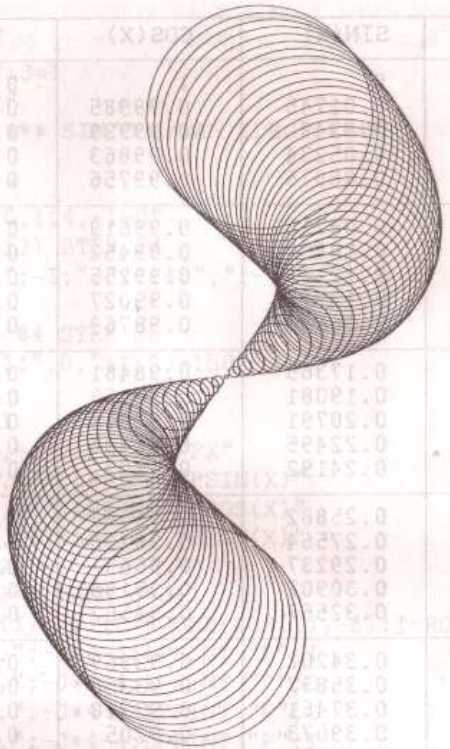
SAMPLE PROGRAMS

******* GRAPHIC 1 *******



```
10 REM *** GRAPHIC 1 ***
20 LPRINT CHR$(28);CHR$(37)
30 LPRINT "H10"
40 LPRINT "J0":LPRINT"S2"
50 LPRINT "P ******* GRAPHIC 1 *******"
60 LPRINT "H10"
70 J=1
80 FOR I=0 TO 330 STEP 30
90 X=35*COS I+48
100 Y=35*SIN I-40
110 LPRINT "J";J
120 LPRINT "C";X;",";Y;",43,";144.4+I;",";215.6+I
130 J=J+1
140 IF J=4 THEN J=1
150 NEXT I
160 LPRINT "J0"
170 LPRINT "C48,-40,25"
180 LPRINT "H20"
190 END
```


******** GRAPHIC 2 ********



```
10 REM *** GRAPHIC 2 ***
20 LPRINT CHR$(28);CHR$(37)
30 LPRINT "H10"
40 LPRINT "J0":LPRINT "S2"
50 LPRINT "P        ******** GRAPHIC 2 ********"
60 Y=-40:J=2
70 FOR I=0 TO 360 STEP 4
80 LPRINT "J";J
90 X=30*SIN(I)+78
100 Y=Y-1.6
110 R=ABS(30*COS(I/2))+0.6
120 LPRINT "C";X;",";Y;",";R
130 J=J+1
140 IF J=4 THEN J=0
150 NEXT I
160 LPRINT "H20"
170 END
```

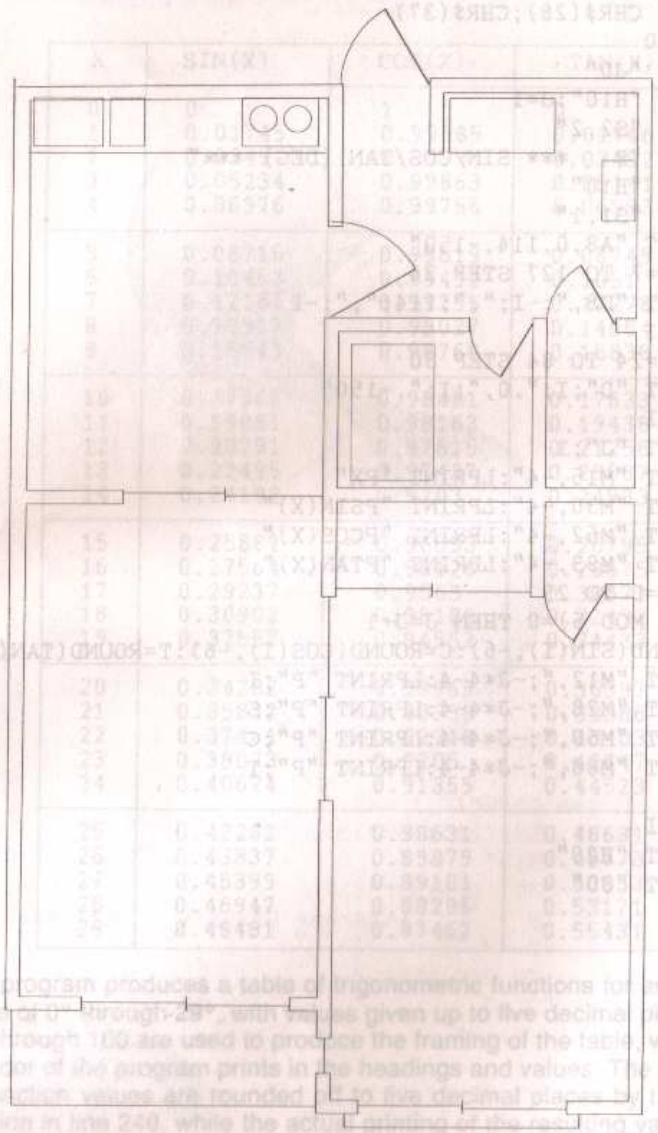
*** SIN/COS/TAN (DEG) ***

X	SIN(X)	COS(X)	TAN(X)
0	0	1	0
1	0.01745	0.99985	0.01746
2	0.0349	0.99939	0.03492
3	0.05234	0.99863	0.05241
4	0.06976	0.99756	0.06993
5	0.08716	0.99619	0.08749
6	0.10453	0.99452	0.1051
7	0.12187	0.99255	0.12278
8	0.13917	0.99027	0.14054
9	0.15643	0.98769	0.15838
10	0.17365	0.98481	0.17633
11	0.19081	0.98163	0.19438
12	0.20791	0.97815	0.21256
13	0.22495	0.97437	0.23087
14	0.24192	0.9703	0.24933
15	0.25882	0.96593	0.26795
16	0.27564	0.96126	0.28675
17	0.29237	0.9563	0.30573
18	0.30902	0.95106	0.32492
19	0.32557	0.94552	0.34433
20	0.34202	0.93969	0.36397
21	0.35837	0.93358	0.38386
22	0.37461	0.92718	0.40403
23	0.39073	0.9205	0.42447
24	0.40674	0.91355	0.44523
25	0.42262	0.90631	0.46631
26	0.43837	0.89879	0.48773
27	0.45399	0.89101	0.50953
28	0.46947	0.88295	0.53171
29	0.48481	0.87462	0.55431

This program produces a table of trigonometric functions for angles in the range of 0° through 29°, with values given up to five decimal places. Lines 100 through 160 are used to produce the framing of the table, while the remainder of the program prints in the headings and values. The trigonometric function values are rounded off to five decimal places by the ROUND function in line 240, while the actual printing of the resulting values is performed by lines 250 through 280. The sample program as it is written here computes values for each one-degree increment, but the increment or the unit of angular measurement (degrees, radians, grads) can be changed to produce the desired result.


```
10 REM *** SIN/COS/TAN ***
20 LPRINT CHR$(28);CHR$(37)
30 ANGLE 0
40 LPRINT "J0"
50 LPRINT "H10":J=1
60 LPRINT "S2,2"
70 LPRINT "P    *** SIN/COS/TAN (DEG) ***"
80 LPRINT "H10"
90 LPRINT "S1,1"
100 LPRINT "A8,0,114,-150"
110 FOR I=7 TO 127 STEP 24
120 LPRINT "D8,";-I;",";114;",";-I
130 NEXT I
140 FOR I=24 TO 84 STEP 30
150 LPRINT "D";I;",0,";I;",-150"
160 NEXT I
170 LPRINT "J";1
180 LPRINT "M15,-4":LPRINT "PX"
190 LPRINT "M30,-4":LPRINT "PSIN(X)"
200 LPRINT "M62,-4":LPRINT "PCOS(X)"
210 LPRINT "M93,-4":LPRINT "PTAN(X)"
220 FOR I=0 TO 29
230 IF (I MOD 5)=0 THEN J=J+1
240 S=ROUND(SIN(I),-6):C=ROUND(COS(I),-6):T=ROUND(TAN(I),-6)
250 LPRINT "M12,";-J*4-4:LPRINT "P";I
260 LPRINT "M28,";-J*4-4:LPRINT "P";S
270 LPRINT "M60,";-J*4-4:LPRINT "P";C
280 LPRINT "M88,";-J*4-4:LPRINT "P";T
290 J=J+1
300 NEXT I
310 LPRINT "H20"
320 LPRINT "J0"
330 END
```

******* HOUSE LAYOUT ******



This program produces the floor plan of a house, including outer walls, inner walls, doors, and windows. The data included from line 5000 specify the positions of each component of the floor plan. Lines are drawn using the following subroutines which start with the program lines noted.

1000 Walls, using RELATIVE DRAW
1100 Sliding doors
1200 Swinging doors

```
 10 REM *** HOUSE LAYOUT ***
 20 LPRINT CHR$(28);CHR$(37)
 30 LPRINT "O0,-10"
 40 LPRINT "J0"
 50 LPRINT "S2"
 60 LPRINT "P ******* HOUSE LAYOUT ******"
 70 LPRINT "S1":LPRINT "O0,-20"
100 RESTORE 5010
110 GOSUB 1000
120 LPRINT "J1"
130 RESTORE 5060
140 GOSUB 1100
150 LPRINT "J2"
160 FOR I=1 TO 5
170 GOSUB 1200
180 NEXT I
190 LPRINT "J3"
200 LPRINT "D3,-16.4,67.4,-16.4"
210 LPRINT "A4.4,-4.4,19.4,-15"
220 LPRINT "A21,-4.4,28.4,-15"
230 LPRINT "A49.4,-4.4,66,-15"
240 LPRINT "C54,-9,3"
250 LPRINT "C61.4,-9,3"
260 LPRINT "A94.4,-4.4,117,-16.4"
270 LPRINT "A127.4,-18,134.6,-31.4"
280 LPRINT "A73.4,-58.4,91.4,-88.4"
290 LPRINT "J0"
300 LPRINT "H"
310 END
1000 REM ** RELATIVE DRAW **
1010 READ X$
1020 IF X$="*" THEN READ X,Y:LPRINT "M";X;",";Y:GOTO 1
     010
1030 IF X$="E" THEN RETURN
1040 X=VAL(X$):READ Y
1050 LPRINT "I";X;",";Y
1060 GOTO 1010
1100 REM ** DRAW **
1110 READ X$
1120 IF X$="E" THEN RETURN
1130 X=VAL(X$):READ Y,X1,Y1
1140 LPRINT "D";X;",";Y;",";X1;",";Y1
1150 GOTO 1110
1200 REM ** DOOR **
1210 READ X,Y,X1,Y1
1220 LPRINT "D";X;",";Y;",";X1;",";Y1;",";X1-0.2;",";Y
     1;",";X-0.2;",";Y
```

```
1230 READ R,S,E
1240 LPRINT "G";X;",";Y;",";R;",";S;",";E
1250 RETURN
5000 REM ** DATA **
5010 DATA *,9,0,70.4,0,0,-31.4,-3,0,0,28.4,-64.4,0,0,-
     87,21,0,0,-3,-21,0,0,-109.4,13.4,0,0,-3,-16.4,0,
     0,205.4
5020 DATA *,90,0,48,0,0,-228,-16.4,0,0,3,13.4,0,0,111,
     -6,0,0,3,6,0,0,18,-19.4,0,0,-21,-3,0,0,21,-42,0,
     0,-21,-3,0,0,61.4,31.4,0,0,-3,-28.4,0,0,-34.4,42
     ,0,0,37.4,3,0,0,-37.4,19.4,0,0,34.4,-4.4,0,0,3,4
     .4,0,0,49.4,-42,0,0,-13.4,-3,0,0,16.4
5030 DATA *,67.4,-159,0,-43.4,-6,0,0,-3,6,0,0,-6,3,0,0
     ,52.4,-3,0
5040 DATA *,67.4,-219,0,-9,9,0,0,3,-6,0,0,6,-3,0
5050 DATA *,1.4,-205.4,0,-21,66,0,*,73.4,-228,0,-3,51,
     0,0,3,E
5060 DATA 24,-91.2,46.4,-91.2,46.4,-90,46.4,-93,46.4,-
     91.8,67.4,-91.8
5070 DATA 70.4,-112.2,91.4,-112.2,91.4,-111,91.4,-114,
     91.4,-112.8,112.4,-112.8
5080 DATA 69.2,-114,69.2,-136.4,70.4,-136.4,67.4,-136.
     4,68.6,-136.4,68.6,-159
5090 DATA 16.4,-203.6,39,-203.6,39,-202.4,39,-205.4,39
     ,-204.2,61.4,-204.2
5100 DATA 76.4,-226.2,99,-226.2,99,-225,99,-228,99,-22
     6.8,121.4,-226.8
5110 DATA 69,-211.4,69,-219,E
5120 DATA 90,-1.4,80.3,15.2,19.4,120,180,130.4,-54,123
     ,-41,15,120,180,69,-52.4,87,-42,21,30,90,112.4,-
     54,105.8,-65.6,13.5,180,240,129,-112.4,122,-124.
     2,13.4,180,240
```


CHARACTER CODE TABLE

Upper bit ⟶

Lower bit ⟶

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	16	SPACE 32	0 48	@ 64	P 80	` 96	p 112	▬ 128	144	SPACE 160	ー 176	タ 192	ミ 208	二 224	× 240
1	1	17	! 33	1 49	A 65	Q 81	a 97	q 113	▬ 129	┌ 145	｡ 161	ア 177	チ 193	ム 209	上 225	円 241
2	2	18	" 34	2 50	B 66	R 82	b 98	r 114	▬ 130	┘ 146	「 162	イ 178	ツ 194	メ 210	十 226	年 242
3	3	19	# 35	3 51	C 67	S 83	c 99	s 115	▬ 131	└ 147	」 163	ウ 179	テ 195	モ 211	下 227	月 243
4	4	20	$ 36	4 52	D 68	T 84	d 100	t 116	▬ 132	┴ 148	、 164	エ 180	ト 196	ヤ 212	◢ 228	日 244
5	5	21	% 37	5 53	E 69	U 85	e 101	u 117	▬ 133	┐ 149	・ 165	オ 181	ナ 197	ユ 213	◣ 229	時 245
6	6	22	& 38	6 54	F 70	V 86	f 102	v 118	▬ 134	├ 150	ヲ 166	カ 182	ニ 198	ヨ 214	◥ 230	分 246
7	7	23	' 39	7 55	G 71	W 87	g 103	w 119	▬ 135	┤ 151	ァ 167	キ 183	ヌ 199	ラ 215	◤ 231	秒 247
8	BS 8	24	(40	8 56	H 72	X 88	h 104	x 120	▬ 136	┬ 152	ィ 168	ク 184	ネ 200	リ 216	♠ 232	〒 248
9	9	25	) 41	9 57	I 73	Y 89	i 105	y 121	▬ 137	┼ 153	ゥ 169	ケ 185	ノ 201	ル 217	♥ 233	市 249
A	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	▬ 138	═ 154	ェ 170	コ 186	ハ 202	レ 218	◆ 234	区 250
B	BF 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	▬ 139	╒ 155	ォ 171	サ 187	ヒ 203	ロ 219	♣ 235	町 251
C	12	FS 28	, 44	< 60	L 76	¥ 92	l 108	| 124	▬ 140	╘ 156	ャ 172	シ 188	フ 204	ワ 220	● 236	村 252
D	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	▬ 141	╓ 157	ュ 173	ス 189	ヘ 205	ン 221	○ 237	人 253
E	14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	▬ 142	╙ 158	ョ 174	セ 190	ホ 206	゜ 222	／ 238	▒ 254
F	15	31	/ 47	? 63	O 79	_ 95	o 111	▬ 127	▬ 143	╜ 159	ッ 175	ソ 191	マ 207	゛ 223	／ 239	255

Function codes

The five following special functions are specified for functions codes.

1. LF <CHR$(10)> LINE FEED

Performs carrier return/line feed in the character mode. This code is disregarded immediately following the CR <CHR$(13)> code.

2. BF <CHR$(11)> BACK FEED

Reverse feeds the paper by one line in the character mode.

3. CR <CHR$(13)> CARRIER RETURN

Performs carrier return/line feed in the character mode.

4. ESC <CHR$(27)> ESCAPE

This command is sent immediately preceding a graphic mode command in the character mode.

5. FS <CHR$(28)> FILE SEPARATOR

Switches between the character mode and graphic mode.

PLOTTER-PRINTER COMMAND TABLE

	Name	Command	Meaning	Page
Graphic commands	○ ORIGIN	**O** [absolute X-coordinate, absolute Y-coordinate] (terminator)	Specifies origin of ORG coordinates.	23
	○ DRAW	**D** [start point X-coordinate, start point Y-coordinate] [,X-coordinate, Y-coordinate]* (terminator) * At least one of the parameters must be specified.	Connects specified points with straight line.	24
	○ RELATIVE DRAW	**I** X-axis displacement, Y-axis displacement [, X-axis displacement, Y-axis displacement]* (terminator)	Draws line from current pen position to point specified by displacement.	25
	○ MOVE	**M** [X-coordinate], [Y-coordinate] (terminator)	Moves printhead to the specified point without drawing line.	26
	○ RELATIVE MOVE	**R** X-axis displacement, Y-axis displacement (terminator)	Moves printhead to point specified by displacement without drawing line.	27
	○ QUAD	**A** start point X-coordinate, start point Y-coordinate, diagonal X-coordinate, diagonal Y-coordinate (terminator)	Draws quadrangle whose opposite diagonal corners are at points specified and whose respective sides are parallel to x and y axes.	28
	○ CIRCLE	**C** [center point X-coordinate, center point Y-coordinate], radius [, initial arc angle, final arc angle] (terminator) * final arc angle > initial arc angle	Draws arc of specified radius between specified arc angles with center point located at specified ORG coordinates. Draws circle when arc angles are not specified.	29
	○ AXIS	**X** axis direction, scale pitch, scale divisions (terminator) * $0 \leqq$ axis direction < 4, $0 <$ scale pitch, $0 <$ scale divisions	Draws coordinate axis in direction (+X, +Y, −X, −Y) specified by assigned value.	31
	○ GRID	**G** direction, X-axis range, Y-axis range [, pitch] (terminator) * $0 \leqq$ direction < 3, $0 <$ pitch	Draws horizontal or vertical grid within quadrangle drawn starting from current pen position.	33
	○ LINE TYPE	**L** line type (terminator) * $0 \leqq$ direction < 4	Specifies solid line, broken line, 1-dot chained line, or 2-dot chained line.	34
	○ LINE SCALE	**B** line pitch (terminator) * $0 \leqq$ pitch	Specifies pitch (spacing) for broken lines, 1-dot chained lines, and 2-dot chained lines.	35

	Name	Command	Meaning	Page
Character/symbol commands	○ ALPHA SCALE	**S** horizontal scale [, vertical scale] (terminator) * $0 \leqq$ scale < 16	Specifies size of printed characters and symbols.	36
	□ ALPHA ROTATE	**Q** rotation direction (terminator) * $0 \leqq$ rotation direction < 4	Specifies rotation direction of strings.	38
	○ SPACE	**Z** column spacing [, line spacing] (terminator)	Specifies column and line spacing.	39
	○ HORZ/VERT PRINT	**Y** horizontal/vertical specification (terminator) * $0 \leqq$ specification < 2	Specifies horizontal or vertical printing of strings.	41
	□ PRINT	**P** string (terminator)	Prints strings and data in the graphic mode.	42
	○ MARK	**N** mark type (terminator) * $0 \leqq$ mark type < 10	Prints specified mark centered at current pen position.	43
Control commands	○ NEW PEN	**J** pen color (terminator) * $0 \leqq$ pen color < 4	Selects pen color.	44
	○ LINE FEED	**F** number of lines (terminator)	Feeds paper specified number of lines.	45
	○ HOME	**H** [distance] (terminator) * $0 \leqq$ distance	Moves pen to a position for easy viewing of graphics, and respecifies absolute coordinate origin.	46
	○ TEST	@ (terminator)	Checks printing capability and color arrangement of pens.	47
Character control commands	△ TAB	**T** number of columns (terminator)	Specifies tabulation.	48
	△ FORMAT	? { 0 / 1 } (terminator)	Specifies program list format.	49
Character font commands	ITALIC	ESC + V (terminator) ESC + v (terminator)	Set and cancel italic printing	50
	BOLD	ESC + E (terminator) ESC + e (terminator)	Set and cancel bold printing	51
	UNDER-LINE	ESC + W (terminator) ESC + w (terminator)	Set and cancel underline printing Graphic commands	52

NOTES:

- Indicates terms may be repeated.
- { } indicate at least one enclosed parameter must be specified.
- [ ] indicate enclosed parameters may be omitted.
- All parameters are real numbers in the range of −999.8 to 999.8 with 3-digit integers, unless otherwise specified.
- "○" indicates commands that can be used in both the character and graphic modes.
- "△" indicates commands that can be used only in the character mode.
- "□" indicates commands that can be used only in the graphic mode.

PLOTTER-PRINTER ERROR MESSAGE TABLE

Message	Type	Meaning
C-ERR	Command error	Undefined command. Indicates an error in command syntax or use.
P-ERR	Parameter error	Mismatched number of parameters. Error in parameter syntax. Parameter out of range.
M-ERR	Mode error	A code other than CHR$(46) or CHR$ (37) sent following CHR$(28) (excluding CHR$(0) ~ CHR$(31)). Error in mode specification.
O-ERR	Out of range error	Absolute coordinate area (−6553.4, −6553.4) ~ (6553.4, 6553.4) exceeded during program execution, or reverse paper feed more than 6553.4 from bottom of graphics.

* The name of the command that contains the error is included in the quotation marks of the command error and parameter error.
* Improper format is often the cause of the errors listed above. Carefully check the program list anytime such errors are generated.

SPECIFICATIONS

Printing method: Ball-point pens. 4 colors in rotary holder (black, blue, green, red)
Drive: Hybrid type X-Y plotter
Character types: 222 (159 characters, 63 graphic characters)
Print capacity: 160 characters per line (letter-size paper, minimum character size)
Character size: (S0, 0) ~ (S15, 15), 256 types
Print speed: 10 characters/sec (ALPHA SCALE 0)
Step speed: 57mm/sec
Step size: x-axis: 0.2mm, y-axis: 0.2mm
Plot range:

Paper size	100(W) mm	114(W) mm	A5	B4	A4
X-direction (mm)	82	96	130	164	192
+Y-direction (mm)	6	—	6	6	6
−Y-direction (mm)	120.2	—	183.8	229.8	270.8
Print columns (S1, 1)	34	40	54	68	80

Paper: Width: 100 ~ 216mm
Thickness: 0.07 ~ 0.3mm
Roll paper: Outside diameter: 40mm max.
Inside diameter: 12mm min.
Ball-point pens: 5ϕ × 23.3mm Ink: Water base
Capacity: Approximately 250m
Colors: Black, blue, green, red
Power supply: AC adaptor (AD-4898)
Power Consumption: Max. 8.6W
Dimensions: Folded: 67 (H) × 310 (W) × 129 (D) mm ($2^5/_8$'' (H) × $12^1/_4$'' (W) × $5^1/_8$'' (D))
Unfolded: 67 (H) × 310 (W) × 236 (D) mm ($2^5/_8$'' (H) × $12^1/_4$'' (W) × $9^1/_4$'' (D))
(including roll holder)
Weight: 1.6kg (3.5 lbs) including roll holder

GUIDELINES LAID DOWN BY FCC RULES FOR USE OF THE UNIT IN THE U.S.A. (not applicable to other areas).

WARNING: This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

. . . . reorient the receiving antenna
. . . . relocate the computer with respect to the receiver
. . . . move the computer away from the receiver
. . . . plug the computer into a different outlet so that computer and receiver are on
different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the US Government Printing Office, Washington D.C., 20402, Stock No.004-000-00345-4.

Date : December 2013

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