

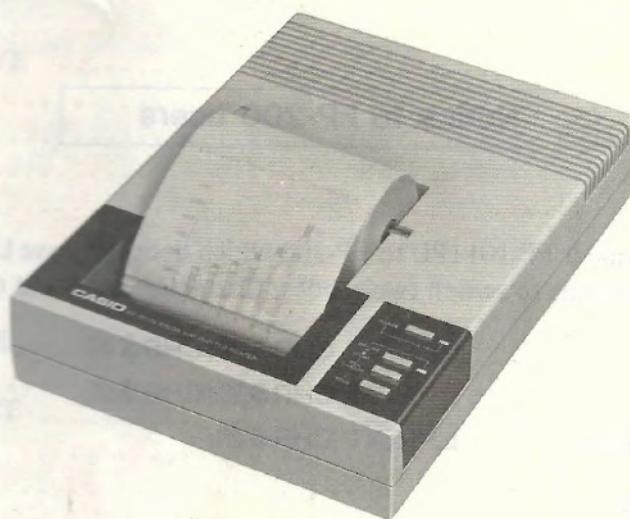


CASIO

PERSONAL COMPUTER

FP-1000 SERIES

FP-1011PL MINI-PLOTTER-PRINTER OPERATING MANUAL



PREFACE

This manual gives the specifications for the FP-1011PL plotter-printer, which provides standard plotting functions through a Centronics-compatible interface. It also describes the commands which are available for the printer, as well as operating instructions.

For information covering the use of the FP-1000/1100 or C82-BASIC, refer to their respective manuals.

Notice to FP-200 users

● LOUT statement

When you want to connect FP-1011PL to FP-200 which does not have **LOUT** command, please use the following commands to switch two modes: Character mode and Graphic mode.

Character Mode LPRINT CHR\$(28);CHR\$(46)

Graphic Mode LPRINT CHR\$(28);CHR\$(37)

Temporary Graphic Mode LPRINT CHR\$(27);

● Range of Parameter

The range of parameter must be between -999.8 and 999.8 and to three places of decimals (more than 0.001). You can not use exponent. In case parameter is specified as a variable, please carefully use **ROUND** function in order not to exceed this range.

Ex.) LPRINT "D,";ROUND(X,-4);",";ROUND(Y,-4)

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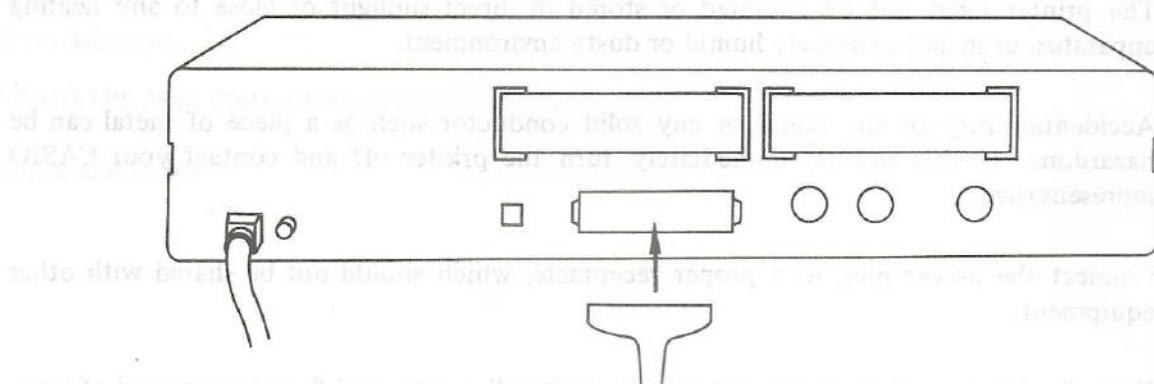
Precautions for Operating the FP-1011PL

- (1) This plotter-printer is built with precision electronic components. It must never be disassembled.
- (2) In order to avoid excessively high temperatures, the printer must not be operated in a poorly ventilated location or with its ventilation slots obstructed. Nor should it be operated or stored in an environment where the temperature may be extremely high or low, or where the temperature may vary abruptly.
- (3) The printer must not be operated or stored in direct sunlight or close to any heating apparatus, or in any extremely humid or dusty environment.
- (4) Accidental entry of any liquid or any solid conductor such as a piece of metal can be hazardous. If this occurs, immediately turn the printer off and contact your CASIO representative.
- (5) Connect the power plug to a proper receptacle, which should not be shared with other equipment.
- (6) Keep the printer off whenever not in use. If it will not be used for a long period of time, the power cord should be unplugged.
- (7) Operating the printer close to a radio or television set may disturb normal reception.
- (8) The printer should be cleaned with a piece of dry cloth or a cloth which is slightly moistened with a neutral detergent. Do not use volatile solvents such as thinner or benzine.
- (9) The printer must not be connected to products from other manufacturers. CASIO will not be responsible for any possible damage due to use in connection with such product.
- (10) Any consumable supplies such as paper rolls and pens must conform to CASIO specifications. CASIO will not be responsible for any damage due to use of improper supplies.

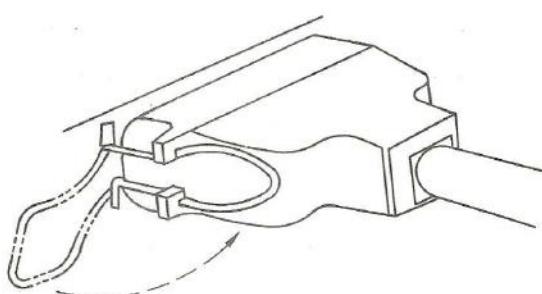
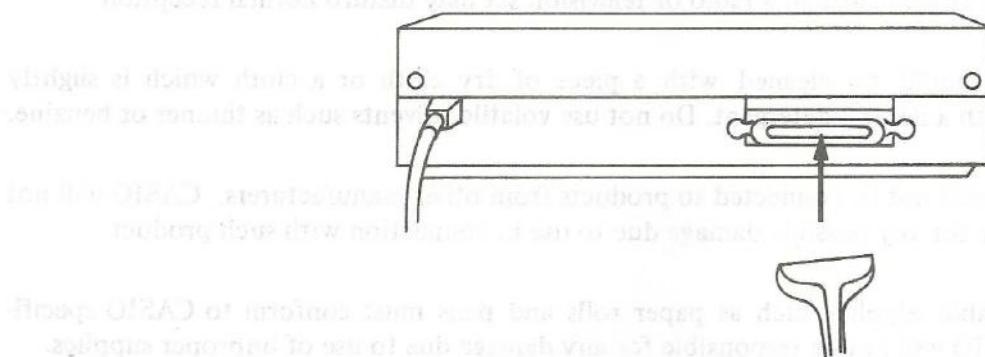
Connecting the FP-1011PL to the FP-1000/1100

Connect the plotter-printer to the FP-1000/1100 with the FP-1085PRC cable, supplied separately. Before connecting it make sure of the following:

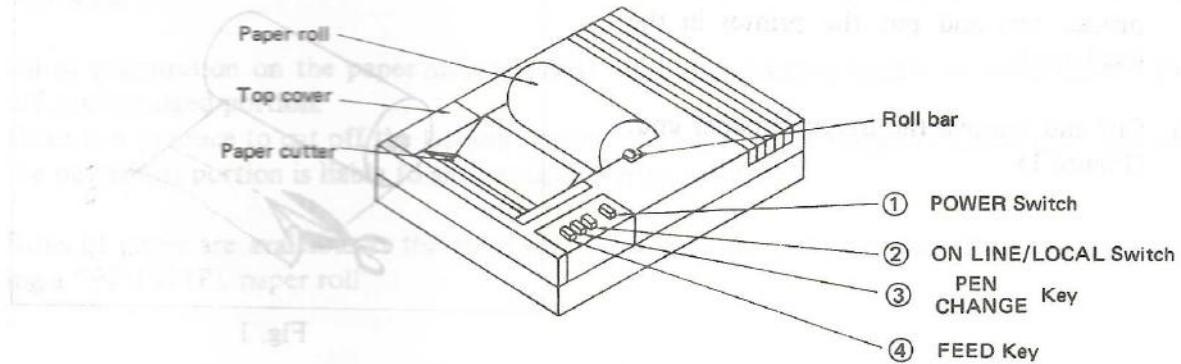
- (1) Make sure that power to the FP-1000/1100 and all other peripheral equipment has been turned off.
- (2) Plug the cable connector into the receptacle at the rear of the FP-1000/1100 as illustrated below.



- (3) Connect and lock the other end of the cable to the printer as shown.



Components and Their Functions



(1) POWER switch

Pressing this switch turns the printer on and pressing it again turns the printer off. When the power is turned on, the pen holder assembly rotates so that the black ink pen comes to the top and the paper advances one line.

(2) ONLINE/LOCAL switch

This switch selects either the on-line or local mode of operation.

In the on-line mode, the printer accepts data from the FP-1000/1100. The printer must be in this mode for normal operation.

In the local mode, the two keys FEED and PEN CHANGE are effective. This mode should be selected when feeding the paper or when replacing the paper roll or pens.

(3) PEN CHANGE key

Pressing this key first moves the pen holder to the right end beyond the normal printing area with the pens raised so that they can be replaced. Each time it is subsequently pressed, a pen comes to the top of the pen holder assembly in the order of black, blue, green, and red.

(4) FEED key

Pressing this key moves the pen holder assembly to the left end beyond the printing area with the pens raised, and advances the paper. If it is pressed when the printer is ready for pen replacement by a previous PEN CHANGE key operation, the pen holder assembly is returned to the home position and the paper is advanced one line.

* Pressing the POWER switch with the FEED key simultaneously held down causes a self-check to occur.

* In an error condition (when the ERROR signal is low), press this key while the printer is in the on-line mode. The error condition will be removed.

Loading Paper

- (1) Press the POWER switch (turn the printer on) and put the printer in the local mode.
- (2) Cut and remove the irregular paper end. (Figure 1)

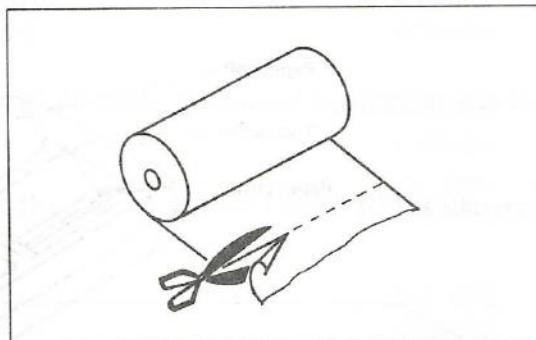


Fig. 1

- (3) Raise the roll bar and put the roll center on it so that the end of the paper comes from the bottom of the roll into the printing area. Raise the pressure plate at the paper insertion slit and insert the paper end of the straight forward into the printing area. (Figure 2)

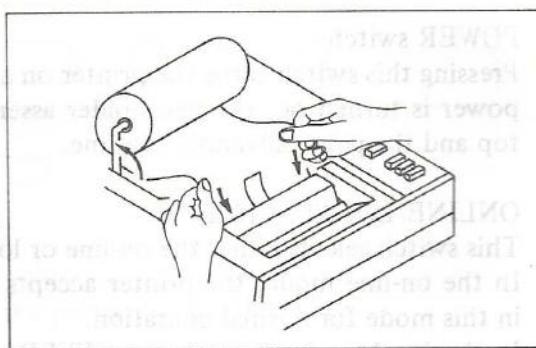


Fig. 2

- (4) Press the FEED key which lightly pushing the paper toward the front. (Figure 3)

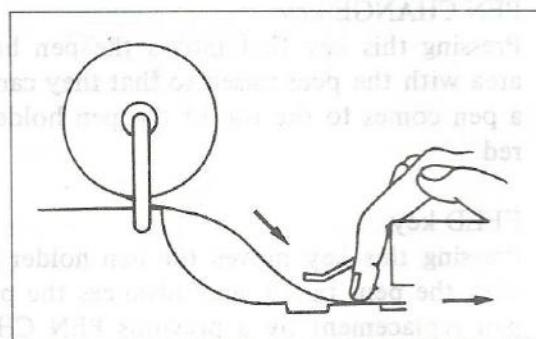


Fig. 3

- (5) When the paper end appears through the cutter, lower the roll bar. The printer is now ready for use. (Figure 4)

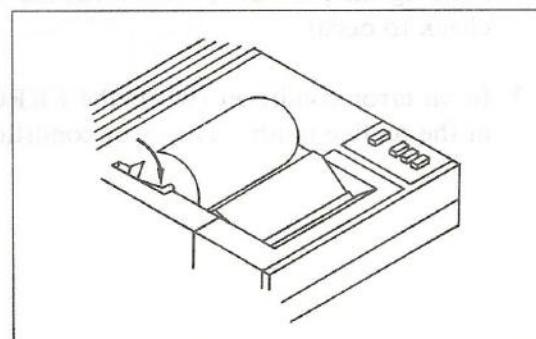


Fig. 4

Precautions:

- To remove the paper roll, first cut the end with the cutter and then pull the paper out straight backward.
 - Oil or perspiration on the paper may adversely affect the printing quality or cause smears. Cut off any smudged portion.
Make it a practice to cut off the leading portion of about 20 cm whenever a new roll is loaded; the outermost portion is liable to get smudged during loading.
 - Rolls of paper are available at the store where you purchased the printer. Order it by specifying a "FP-101PJ paper roll".

Inserting and Removing Pens

Inserting Pens:

- (1) Turn the printer on and put it in the local mode.
- (2) Remove the top cover as shown at the right.
(Figure 1)
- (3) Press PEN CHANGE key to move the pen holder assembly to the right. Then continue to press the key until the pen to be replaced comes to the top.
- (4) Before inserting a new pen, manually test it to see if it works well (Figure 2). For clearer plotting, it is advisable to use trial plotting commands before each actual plotting.

- (5) Put the pen beneath the pen holder plate, insert its tip into the retaining spring ring, and then push it until it comes to a stop while keeping the pen holder assembly from rotating.
(Figure 3)

- * Insert the pen in the correct direction.
- * Check the color mark on the pen holder assembly for the correct pen setting.
(Figure 4)

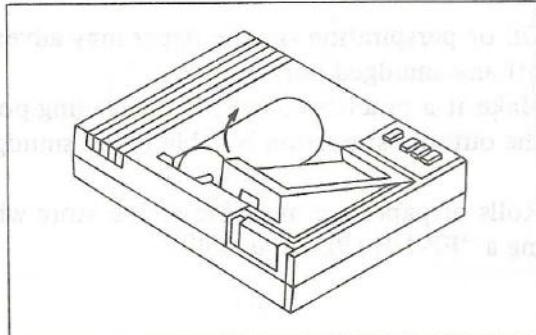


Fig. 1

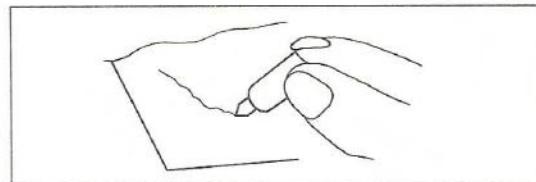


Fig. 2

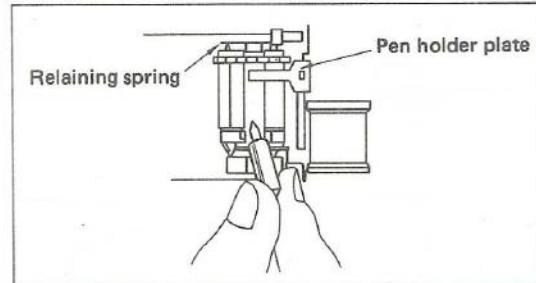


Fig. 3

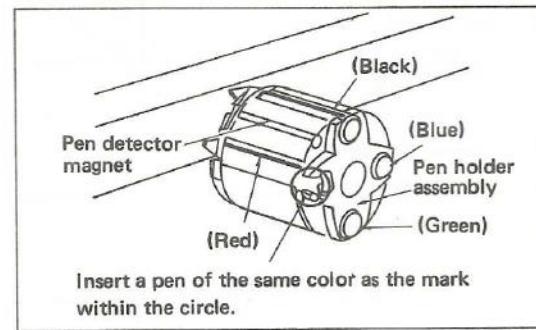


Fig. 4

- (6) Replace the top cover.

- * If the paper end gets underneath the top cover guide, pull the paper backward a little.

- (7) Pressing the FEED key automatically returns the pen holder assembly to the left end, inhibiting further pen replacement.

Removing Pens:

- (1) Turn the printer on and put it in the local mode.
- (2) Remove the top cover by raising the left end as illustrated in Figure 5.
- (3) Press the PEN CHANGE key to move the pen holder assembly to the right end beyond the plotting area. Then, continued to press the key until the pen to be replaced comes to the top.
- (4) Pull the pen removal lever toward you to release the top pen. Pull the pen toward you while holding it with your index finger and remove it, using the groove in the case as a guide. (Figure 6)

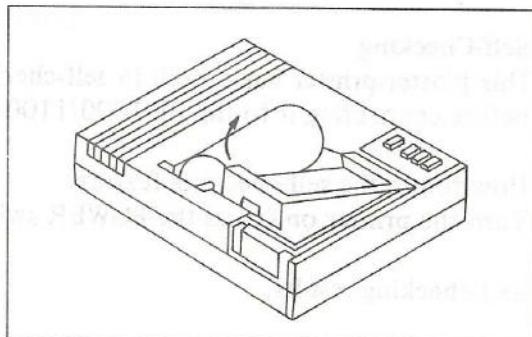


Fig. 5

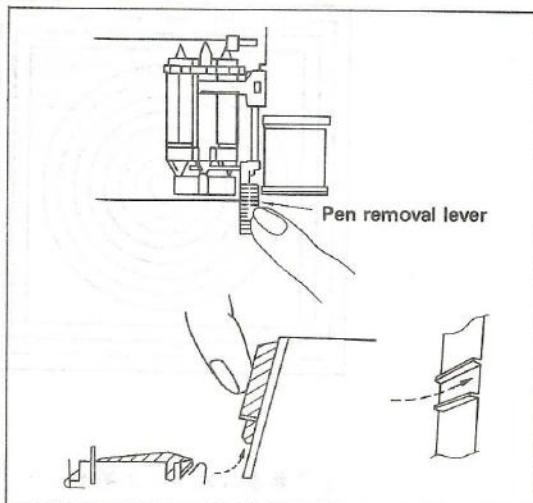


Fig. 6

Precautions:

- Do not force the pen holder and the levers. Applying excessive force to such components may impair the plotting accuracy.
- If a pen drops into the printer, it will come out through an opening at the bottom of the front of the case. Never turn the printer upside down or shake it.
- If the printer is not used for a long period of time, remove all four pens and store them with their caps on. Otherwise their ink may dry up and they may become unusable.
- Pens are available at the store where the printer was purchased. Specify them as "FP-1011 pens" when ordering.

Checking the Functions

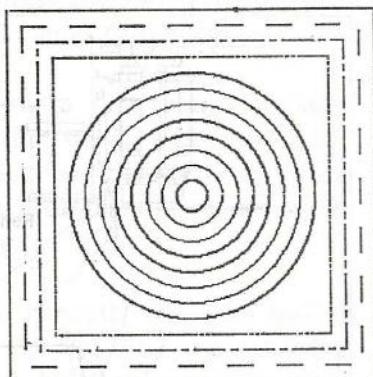
1. Self-Checking

This plotter-printer has a built-in self-checking feature which can be used to test its functions before connecting it to the FP-1000/1100 and before using it for printing.

How to use the self-checking feature:

Turn the printer on (press the POWER switch) while simultaneously pressing the FEED key.

Self-checking results:



ABC
ABC
ABC

2. Key Checking

Turn the POWER on, put the ON-LINE/LOCAL switch in LOCAL mode, and then operate the FEED and PEN CHANGE keys to test for proper functioning.

3. Interface Checking

Put the ON-LINE/LOCAL switch in ON-LINE mode to connect the printer to the FP-1000/1100, and operate the printer from the FP-1000/1100.

Example

Run the following program:

```
10 FOR I=32 TO 254  
20 LPRINT CHR$(I);  
30 NEXT I  
40 LPRINT  
50 END
```

Results: "##%&`()*+-./0123456789;:;<=?@ABCDEEG

HIJKLMNOPQRSTUVWXYZ[¥] ^_` abcdefghijklmno
Pqrstuvwxyz[; ~ _] ||| 田中 勝一郎

Printing Characters and Plotting Graphics

1. Character and Graphic Modes

The plotter printer can operate in two modes: character (or print) mode and graphic mode. Either of these may be selected by a pair of command codes.

- Character mode selection codes: (1CH, 2EH)

Example: LOUT &H1C, &H2E

- Graphic mode selection codes: (1CH, 25H)

Example: LOUT &H1C, &H25

* No terminator (01H-1FH function code) is required to switch operating modes.

2. Functioning in Character and Graphic Modes

(1) Character mode

In the character mode, the printer prints codes sent to it as characters.

When the pair of codes (1CH, 2EH) is received while in the graphic mode, the printer is switched to the character mode. It is also initialized to this mode when it is turned on.

Printing takes place when a function code other than 00H (i.e., 01H to 1FH) is received or the buffer becomes full. When the sequence of function codes CR("0DH"), LF ("0AH") or a CR (in the auto-feed mode) is received, a carriage return takes place, followed by a line feed.

(2) Graphic mode

In this mode, the printer looks upon codes sent to it as graphic commands for plotting graphics.

Each graphic command is terminated with a terminator (a function code from 01H to 1FH), and the command is executed when the terminator is received or the buffer becomes full.

Each command is checked for the correct format. If an error is detected, an error message is printed.

3. Precautions on Switching Modes

Each time the printer is switched from one mode to the other, a carriage return automatically takes place, followed by a line feed. After this occurs, all the printer settings other than COLOR* and FORMAT* are the same as those in effect immediately after it is turned on.

Reference: Initial settings at power-on

Coordinate origin: The initial pen position is the new origin (0, 0).

ORG coordinate origin (O_x, O_y): (0, 0)

Line type: 0 (Solid line)

Line scale: 6.4 mm

Alpha scale: 1

Alpha rotate: 0 (Normal position)

Character space: 2

Line spacing: 6

* FORMAT : 0 (Reset)
* COLOR : 0 (Black) * : not changed by mode switching.

A color detection is performed immediately after power-on in order to move the black pen to the home position.

4. Commands

FP-1000/1100 C82-BASIC provides a total of 29 commands for use with the plotter-printer. The commands include six printer commands, eleven drawing commands, six character symbol commands, four control commands, and two character control commands which can be used only in the character mode.

The printer commands LOUT, LPRINT, LPRINT USING, LIST, LTRON, and LFILES in the C82-BASIC can be used only in the character mode.

In addition, 23 plotter commands are available that can be used with the LPRINT statement as described in this manual.

Each command in this category consists of a command part (one uppercase letter) and a parameter, which is specified by a real number. (However, some commands may have no parameter, or may have a non-numeric parameter.)

Numeric parameters are separated from each other by commas. A function code (except "OOH") is used as a terminator that indicates the end of the command.

A numeric parameter is generally a number with up to three digits to the left of the decimal point and up to one digit to the right of the decimal point. The fractional part must be a multiple of 0.2, which is the minimum increment of length (0.2 mm) or angle (0.2 degrees). Any smaller fractions are ignored. Thus, a numeric parameter can range from -999.8 to 999.8. Any blanks are ignored. For any integer parameter, the fractional part ignored if one is present.

* Using commands in character mode

In character mode, all codes sent to the printer are directly dealt with as characters except a single code immediately following the ESC code (1B) that can be executed as a command to update character size, color, or horizontal and vertical coordinates.

Example:

```
10 LOUT &H1C,&H2E
20 LPRINT "CIRCLE"
30 LOUT &H1B
40 LPRINT "C40,-20,20"
50 END
```



* For details of the commands, see the table on page 70.

References:

Minimum increments for numeric parameters:

Length	0.2 mm
Angle	0.2 degrees

5. Coordinate Systems

Two coordinate systems are available with the plotter-printer; one is an absolute coordinate system and the other is an ORG relative coordinate system that can be defined by using an ORG instruction. To specify an ORG coordinate system, define its origin (0, 0) with absolute coordinates in a similar fashion to the INIT instruction which is used for CRT operations.

This ORG coordinate system is initialized to the absolute coordinate system at power on. It is also reset to the absolute coordinate system any time the operation mode is switched or the HOME command is executed, or after pen replacement. The absolute coordinate origin is defined at the position where the pen is located after a power-on initialization, mode change, error, HOME or TEST command execution, or pen replacement. When the FEED key is pressed or a LINE FEED command is executed, the absolute coordinates on the paper varies by the paper movement. The following table summarizes the above discussions:

	O : Resetting	Δ : Variation	X : No change
Absolute coordinate system			ORG coordinate system
(1) Power on	O		O
(2) Mode switching (including re-specifying mode)	O		O
(3) When an error occurs	O		X
(4) When HOME command is executed.	O		O
(5) When TEST command is executed.	O		X
(6) After a pen has been replaced.	O		O
(7) When the FEED key is pressed or a LINE FEED command is executed.	Δ		X
(8) After a line feed in character mode.	Δ		X

The absolute coordinates range from (-6553.4, -6553.4) to (6553.4, 6553.4). If a specified coordinates is within this range, but out of the paper width, the pen moves up to the edge of the paper toward the specified direction, then stay there without occurring an error until the drawing point comes back on the paper area.

The ORG coordinate origin can be defined at any absolute coordinates between (-999.8, -999.8) and (999.8, 999.8) by using an ORG instruction.

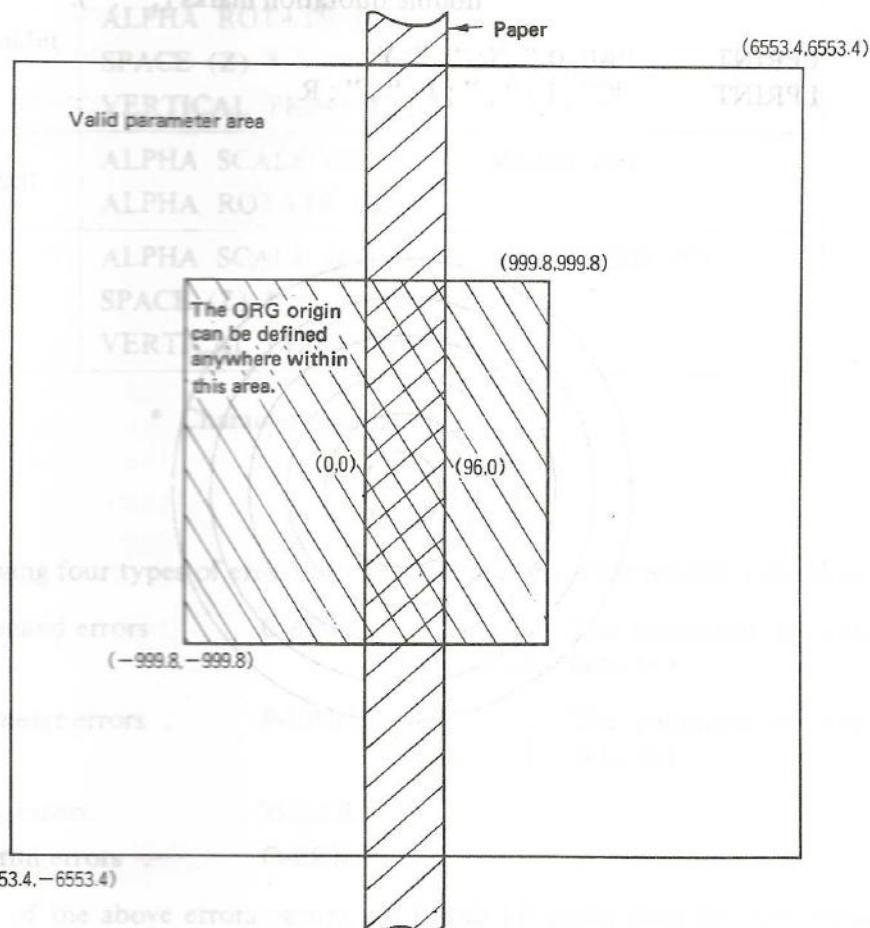
Actual plotting should be confined to an area of 96 mm (horizontal) by 200 mm (vertical) because the printer cannot feed the paper backward (in the +Y direction) more than 200 mm from the foremost drawing point.

Example:

Execute the following program after feeding the paper more than 200 mm to understand how large an area the printer can plot.

```
10 LOUT &H1C,&H25  
20 LPRINT "A0,0,96,200"  
30 LPRINT "A0,10,50,-50"  
40 LPRINT "A0,0,96,200"  
50 END
```

Reference:



* An error occurs if this parameter area is exceeded during the LPRINT command execution.

6. Formats for Commands and Their Parameters

An LPRINT statement is used to issue a plotter command. Commands are enclosed between quotation marks following the word "LPRINT".

Examples: LPRINT "@") in manual execution, or
100 LPRINT "@" in programs.

A parameter may be either a constant or a variable; the command formats are different:

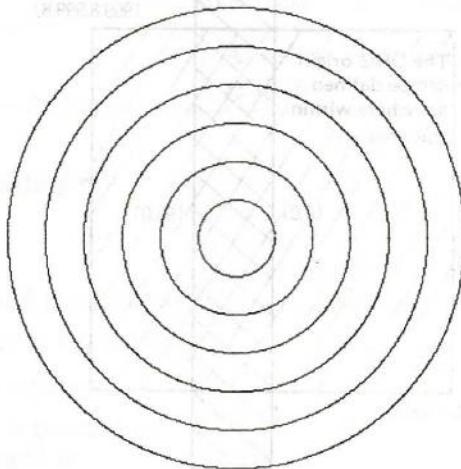
Constant parameters The command and its parameter or parameters are enclosed within quotation marks, separated by commas.

Examples: LPRINT "O0, 0"
LPRINT "D10, 55, 80, 20"

Variable parameters Place a semicolon (;) before each variables.
If a comma is needed between the variables, place a semicolon and a comma enclosed between double quotation marks (" ,").

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

Example:



The following program draws concentric circles on the screen. The program consists of two parts:
1. Initialization part:
10 LOUT&H1C, &H25
20 LPRINT "050,-50"
30 FOR R=5 TO 30 STEP 5
40 LPRINT "C0,0," ;R
50 NEXT R

7. Commands Affected as a Result of Status Modification by Other Commands

Status	Status setting command	Affected command
Co-ordinate	ORIGIN (O)	DRAW (D) MOVE (M) QUAD (A) CIRCLE (C) AXIS (X)
Line	LINE TYPE (L) LINE SCALE (B)	DRAW (D) RELATIVE DRAW (R)
Character	ALPHA SCALE (S) ALPHA ROTATE (Q) SPACE (Z) * VERTICAL PRINT (Y)	PRINT (P)
Symbol	ALPHA SCALE (S) ALPHA ROTATE (Q)	MARK (N)
Line feed	ALPHA SCALE (S) SPACE (Z) * VERTICAL PRINT (Y)	LINE FEED (F)

* Character spacing only.

8. Errors

The following four types of errors can be detected, the error messages are as indicated below.

- (1) Command errors : C-ERR '.....' The command in which the error is detected.
- (2) Parameter errors : P-ERR '.....' The command in which the error is detected.
- (3) Mode errors : M-ERR
- (4) Overrun errors : O-ERR

When any of the above errors occurs, a CR and LF occur after the corresponding message is printed, and the new pen position becomes the new absolute coordinate origin. Such status settings as ALPHA SCALE, etc. retain their previous values after the error.

Whenever an error occurs, the ERROR signal goes low in order to inform the FP-1000/1100 of the error, except for mode and parameter errors caused due to too many or too few parameters specified in a command.

Removing an error condition:

The ERROR signal is restored to the high logic level by pressing the FEED key in the ON-LINE mode. The FP-1000/1100 does not monitor this signal, however, so a function code (01H to 1FH) needs to be used to remove the error condition. Thus, the terminator that is sent after each printing or plotting command is regarded as a code for removing any error condition and is ignored; the next command is executed in sequence and the program keeps running until completed.

Commands

The following notation is used to explain the commands in this manual:

- (1) Block letters indicate words that must be written exactly as shown.
- (2) Brackets “[]” indicate that the parameter or parameters they enclose may be omitted.
- (3) Braces “{ }” indicate that one of the parameters they enclose must be specified.
- (4) An asterisk “*” indicates that the parameter or parameters preceding it may appear more than once.
- (5) The integer part of any parameter may have up to three digits. A “real” parameter value can range from -999.8 to 999.8. However, the decimal fraction must be a multiple of 0.2.
- (6) Blanks are ignored in any command other than the P command.
- (7) The + and - signs are allowed in parameters; the + may be omitted.
- (8) The minimum increments are 0.2 mm for length and degrees for angle.
- (9) (Term) represents a command terminator, which may be any code from 01H to 1FH. CR (0DH) and LF (0AH) are allowable terminators, for example.

ORIGIN

O [absolute X coordinate, absolute Y coordinate] (Term)

Function: Specifies an ORG coordinate system origin.

Parameters: The two parameters are real numbers with an integer part which may have up to three digits.

Explanation: This command defines the point represented by the absolute coordinates (x, y) to be the new ORG coordinate system origin which will apply to all subsequent graphic commands until another ORG origin is defined.

If the coordinate parameters are not specified, the pen position at the time this command is executed becomes the new ORG origin.

DRAW

MACRO DRAWER

D [starting X coordinate, starting Y coordinate] [, X coordinate, Y coordinate] * (Term)

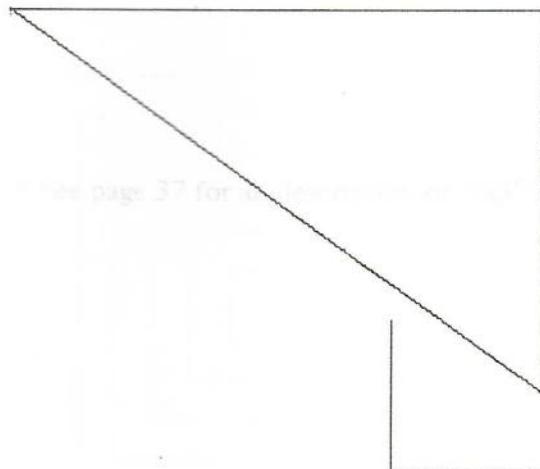
Function: Draws straight line segments between the successive ORG coordinates.

Parameters: The coordinate parameters are real ORG coordinates. Any number of parameter pairs may be specified within a logical line.

Explanation: This command draws straight lines between successive points in ORG coordinates in the order in which they appear. If the starting coordinates are not specified, the first straight line begins from the current pen position. If the starting coordinate parameters are not specified, or if the second coordinate parameters are the same as the starting coordinate parameters and there are no subsequent coordinate parameters specified, the pen only moves to the starting point and does not move down. At least one parameter pair must be specified.

Example:

```
i0 LOUT &H1C,&H25
20 LPRINT "050,-50"
30 LPRINT "D0,10,0,-10"
40 LPRINT "D,20,-10"
50 LPRINT "00,0"
60 LPRINT "D0,0,70,-50,70,0,0,0"
70 END
```



RELATIVE DRAW

REF ID: A-20

I X direction displacement, Y direction displacement

[, X direction displacement, Y direction displacement] * (Term)

Function: Draws straight lines connecting the points defined by the specified displacements.

Parameters: One or more pairs of the X and Y displacements which define the points to be connected. Any number of parameter pairs may be specified within a logical line.

Explanation: Draws lines to points given by the specified displacements in the X and Y directions from the current pen position.

Example:
10 LOUT &H1C,&H25
20 LPRINT "I0,0,20,10,20,-5,20,-10"



MOVE

MOVE [X coordinate], [Y coordinate] (Term)

M [X coordinate], [Y coordinate] (Term)

diagonal X coordinate

Function: Moves the pen holder assembly with the pen up to the point defined by the specified ORG coordinates.

Parameters: An X and/or Y ORG coordinate. Either or both of the parameters are not specified, the coordinates are assumed to be 0.

Explanation: Moves the pen to the point defined by the specified ORG coordinates.

Example:

```
i0 LOUT &H1C,&H25
20 LPRINT "D0,0,5,0"
30 LPRINT "D0,-5,0,5"
40 LPRINT "M20,-20"
50 LPRINT "N3"
```

* See page 37 for an description of "N3".

RELATIVE MOVE

R X direction displacement, Y direction displacement (Term)

Function: Moves the pen holder assembly with the pen up to the point defined by the specified X- and Y- direction displacements.

Parameters: An X and/or Y displacement.

Explanation: Moves the pen holder assembly with the pen up by the specified X and Y displacements from the current pen position.

Example:

```
10 LOUT &H1C,&H25
20 FOR I=1 TO 5
30 LPRINT "R10,0"
40 LPRINT "N3"
50 NEXT I
```

* * * *

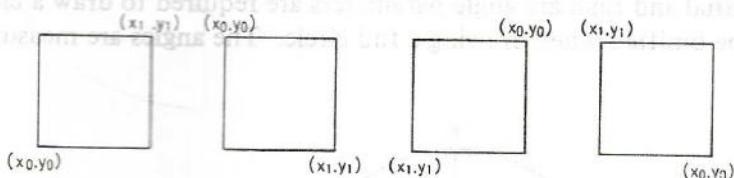
QUADRANGLE

**A starting X coordinate, starting Y coordinate,
diagonal X coordinate, diagonal Y coordinate (Term)**

Function: Draws a quadrangle whose two diagonal points are defined by the two specified pairs of X and Y coordinates and whose sides are parallel to the X and Y axes.

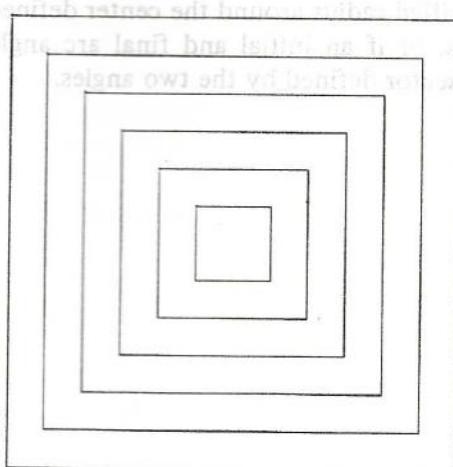
Parameters: All the parameters are ORG coordinates and cannot be omitted.

Explanation: Draws a quadrangle that has the two diagonal points specified by the corresponding pairs of parameters and sides parallel to the X and Y axes. The pen moves from and returns to the starting point.



Example:

```
10 LOUT &h1C,&H25
20 LPRINT "050,-25"
30 FOR I=30 TO 5 STEP -5
40 LPRINT "A";-I;",";I;",";I;",";-I
50 NEXT I
```



CIRCLE

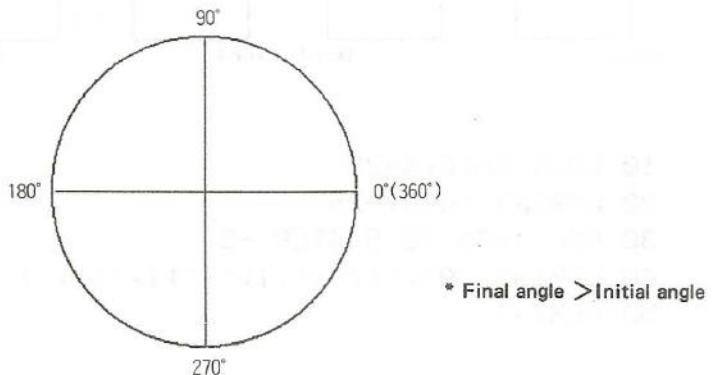
EXPLANATION

C [X center coordinate, Y center coordinate],
radius [, initial arc angle, final arc angle] (Term)

Function: Draws a circle or circular arc that has the center defined by the specified X and Y ORG coordinates, and the specified radius, initial and final arc angles.

Parameters: The X and Y center coordinates may be omitted. If they are omitted, the current pen position is used as the center. The radius parameter is a real number greater than or equal to 0.4 and cannot be omitted.

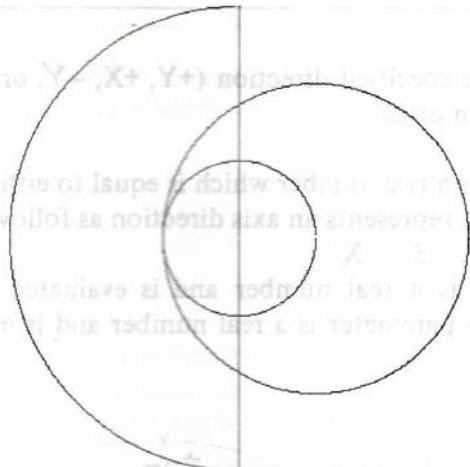
The initial and final arc angle parameters are required to draw a circular arc. They must be omitted when drawing a full circle. The angles are measured as follows:



Explanation: Draws a circle with the specified radius around the center defined by the specified X and Y ORG coordinates, or if an initial and final arc angle are specified, a circular arc that covers the sector defined by the two angles.

Example:

```
10 LOUT &H1C,&H25  
20 LPRINT "C30,-30,10"  
30 LPRINT "C,20"  
40 LPRINT "C30,-30,30,90,270"  
50 LPRINT "I0,60"
```



The following program will draw concentric circles with centers at (30, -30) and radii of 20 and 30.

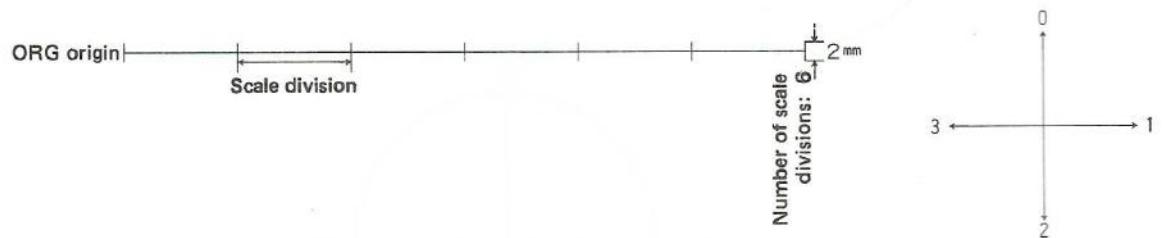
AXIS

X X axis direction, size of scale division, number of scale divisions (Term)

Function: Draws a coordinate axis in the specified direction (+Y, +X, -Y, or -X) from the current ORG coordinate system origin.

Parameters: The axis direction parameter is a real number which is equal to either 0, 1, 2 or 3. It is evaluated as an integer and represents an axis direction as follows:
0: +Y, 1: +X, 2: -Y, 3: -X

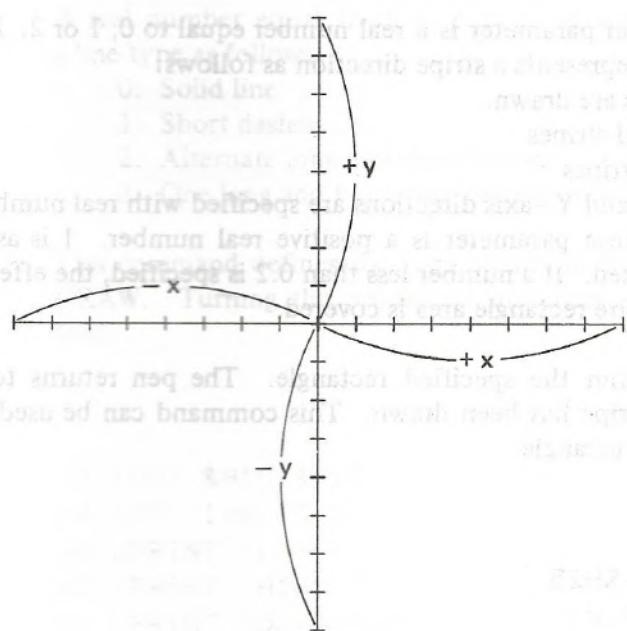
The scale division parameter is a real number and is evaluated as an integer. The number of scale divisions parameter is a real number and is evaluated as an integer.



Explanation: Draws a coordinate axis in the specified direction with the specified number of scale divisions.

Example:

```
10 LOUT &H1C,&H25
20 LPRINT "048,-50"
30 FOR I=0 TO 3
40 LPRINT "X";I;"5,8"
50 NEXT I
```



GRID

**G direction of stripes, range in X axis direction,
range in X axis direction [, stripe separation] (Term)**

Function: Draws horizontal or vertical stripes enclosed within a rectangle, beginning from the current pen position, whose sides are parallel to the X and Y axes.

Parameters: The stripe direction parameter is a real number equal to 0, 1 or 2. It is evaluated as an integer and represents a stripe direction as follows:

0: No stripes are drawn.

1: Horizontal stripes

2: Vertical stripes

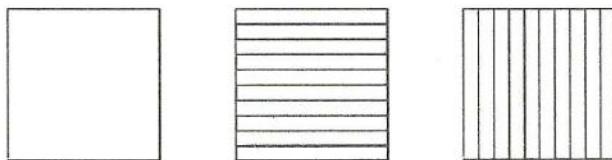
Ranges in the X- and Y-axis directions are specified with real numbers.

The stripe separation parameter is a positive real number. 1 is assumed if this parameter is omitted. If a number less than 0.2 is specified, the effect is the same as 0.2, and the entire rectangle area is covered.

Explanation: Draws stripes within the specified rectangle. The pen returns to the starting point when the stripe has been drawn. This command can be used to draw lines or a grid within a rectangle.

Example:

```
10 LOUT &H1C,&H25
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
```



LINE TYPE

LINE TYPE

L line type (Term)

Function: Specifies the type of line to be drawn by a DRAW (R) or RELATIVE DRAW (R) command.

Parameter: A real number equal to 0, 1, 2 or 3. It is evaluated as an integer and specifies a line type as follows:

- 0: Solid line
- 1: Short dashes
- 2: Alternate long and short dashes
- 3: One long and two short dashes, alternating.

Explanation: This command defines the type of line to be drawn by a DRAW or RELATIVE DRAW. Turning the printer on initializes the line type parameter to 0 (solid line).

Example:

```
10 LOUT &H1C,&H25
20 FOR I=0 TO 3
30 LPRINT "L";I
40 LPRINT "H10"
50 LPRINT "D0,0,96,0"
60 NEXT I
```

Example:

(0)

----- (1)

(2)

(3)

B broken line coarseness parameter (Term)

Function: Specifies a broken line coarseness.

Parameter: A real number greater than or equal to 0 and less than 1000.

Explanation: This command is used in combination with a LINE TYPE (L) command to specify a coarseness for broken lines. Recommended values are 0.4 or larger for dashed lines, 3.2 or larger for alternate long and short dashes, and 6.4 or larger for one long and two short dashes.

Example:

```

10 LOUT &H1C,&H25
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 TO 3
90 LPRINT "L";L
100 LPRINT "D0,0,96,0"
110 LPRINT "H2"
120 NEXT L
130 NEXT I

```

*B= 1.6

*B= 3.2

*B= 4.8

*B= 6.4

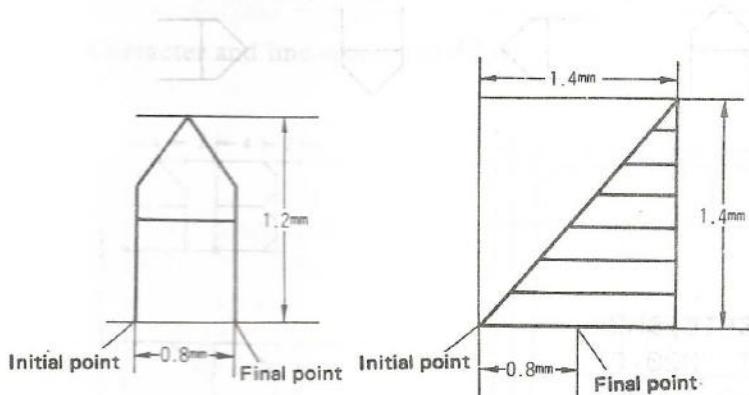
S scale of character (Term)

(ANSI) alpha terminal

Function: Specifies the size of characters and symbols to be printed.

Parameter: The character scale parameter is a real number greater than or equal to 0 and less than 10.

Explanation: This command defines the size of characters and symbols written by a PRINT (P) or MARK (N) statement, or the size of characters printed in the character mode. 0 defines the minimum size, 1 doubles the minimum size, 3 triples it, and so on. The following diagram gives the dimensions for scale size 0.



Normal character

Special character (80H~9FH, E0H~FEH)

Before a special character is written, either a "Z3,1" (establishes the lateral writing mode) or "Z0,3" (establishes the longitudinal writing mode) command must be issued with the SPACE statement, to be described later.

Example:

```

10 LOUT &H1C,&H25
20 FOR I=0 TO 9
30 LPRINT "S";I
40 LPRINT "PA"
50 NEXT I

```

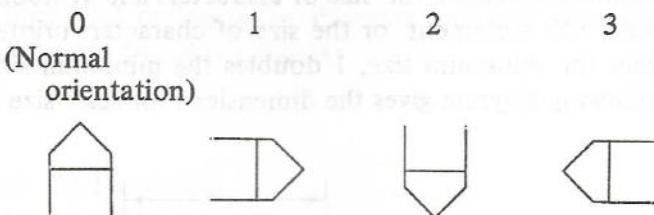
ALPHA ROTATE

Q rotational angle (Term)

Function: Specifies the rotational angle (orientation) of character strings to be printed.

Parameter: A real number equal to 0, 1, 2 or 3 and evaluated as an integer.

Explanation: The parameter specifies the rotational angle of character strings as follows:



Example:

```
i0 LOUT &H1C,&H25  
20 LPRINT "M20,0"  
30 FOR I=0 TO 3  
40 LPRINT "Q";I  
50 LPRINT "PABC"  
60 NEXT I
```

ABC
ABC
ABC

SPACE

Z spacing between current and next characters

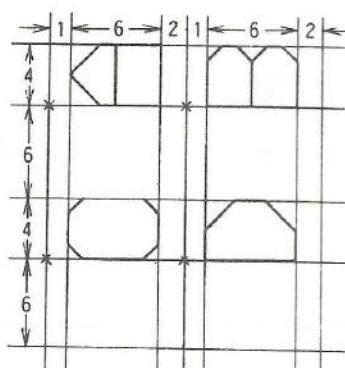
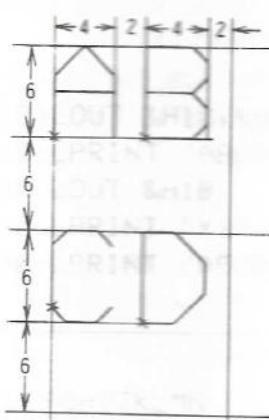
[, spacing between current and next lines] (Term)

Function: Specifies a spacing between the current character and the next character to be printed, and/or a spacing between the current line and the next line to be printed.

Parameters: Both the character and line spacing parameters are integers greater than or equal to 0 and less than 16 and evaluated as integers. The line spacing parameter may be omitted.

Explanation: This command specifies a character spacing and/or line spacing. The spacing values are initialized to "Z2,6" at power on.

Character and line spacing at Z2,6:



X is the starting point.

It should be noted that there is some difference in the spacing between normal (horizontal) and vertical printing. For special characters (80H~9FH, E0H, and E0H~F0H), "Z3,1" is recommended for normal printing, and "Z0,3" for vertical printing.

When the line spacing parameter is omitted, the previous specification (or initial setting) remains in effect.

The line spacing setting also applies to paper feeding in subsequent LINE FEED commands.

Example:

SPACE

```
10 LOUT &H1C,&H2E  
20 FOR I=0 TO 16 STEP 8  
30 LOUT &H1B:LPRINT "Z&I;"  
40 LPRINT "SPACE"  
50 LPRINT "SPACE"  
60 LPRINT "SPACE"  
70 LOUT &H1B:LPRINT "F1"  
80 NEXT I
```

Explanation:
The program prints the word SPACE. It first prints the letter Z, then loops 8 times, printing the character space (ASCII 32) 8 times, then prints the letter F1.

Explanation:
The program prints the word SPACE. It first prints the letter Z, then loops 8 times, printing the character space (ASCII 32) 8 times, then prints the letter F1.

SPACE
SPACE

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



Explanation:
The program prints the word SPACE. It first prints the letter Z, then loops 8 times, printing the character space (ASCII 32) 8 times, then prints the letter F1.

Explanation:
The program prints the word SPACE. It first prints the letter Z, then loops 8 times, printing the character space (ASCII 32) 8 times, then prints the letter F1.

Explanation:
The program prints the word SPACE. It first prints the letter Z, then loops 8 times, printing the character space (ASCII 32) 8 times, then prints the letter F1.

VERTICAL PRINT

PRINT

Y horizontal/vertical selection (Term)

(PRINT) vertical writing

Function: Specifies whether the subsequent character strings are to be printed horizontally or vertically.

Parameter: A real number equal to or greater than 0 and less than 2 and evaluated as an integer. It selects horizontal or vertical writing as follows:

0: Horizontal

1: Vertical

Explanation: When vertical printing is selected, the characters are printed in the orientation defined by the command ALPHA ROTATE (Q) 3, and lowercase characters, punctuation marks, and brackets, etc. are handled in ways specific to vertical printing.

Example:

```
10 LOUT &H1C, &H2E
20 LPRINT "ABCDEFGHIJKLMN"
30 LOUT &H1B
40 LPRINT "Y1"
50 LPRINT "ABCDEFGHIJKLMN"
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ

PRINT

TECHNICAL REFERENCE

P character string (Term)

Function: Prints the specified character string or other data.

Parameter: A string of characters or codes other than function codes; codes from 20H to FFH are allowed.

Explanation: This command is used to print the character string or data represented in a string of digits following the command code P, or to convert to a string of letters or digits and then print the given string of hexadecimal or decimal codes. Codes 7FH to FFH are undefined and ignored.

The command is provided to allow printing of characters and various data which cannot be directly printed in the graphic mode.

The size, orientation, character and line spacing, and normal or vertical printing selection are respectively defined by the previous ALPHA SCALE (S), ALPHA ROTATE (Q), SPACE (Z), and VERTICAL PRINT (Y).

Since no automatic line feed takes place when this command is used, a LINE FEED command must be used when a carriage return and line feed is required.

Example:

```
10 LOUT &H1C,&H25  
20 LPRINT "P ** FP-1011 PL **"
```

** FP-1011 PL **

N mark (Term)

Function: Prints the specified mark centered at the current position.

Parameter: A real number greater than or equal to 0 and less than 10. It is evaluated as an integer and selects one of the following ten marks:

Explanation:

The size and orientation of the mark are defined by the previous ALPHA (S) and ALPHA ROTATE (Q) commands. These marks are useful in drawing broken line graphs. The marks are selected by this command as follows: 0: No printing 1: + 2: X 3: * 4: □ 5: ◇ 6: ○ 7: ▲ 8: △ 9: H

Example:

Explanation: This command prints the one selected from among the above ten marks, centered at the current pen position, and then returns the pen to the same position. The pen must be moved when another character, symbol or mark is to be printed next.

The size and orientation of the mark are defined by the previous ALPHA (S) and ALPHA ROTATE (Q) commands. These marks are useful in drawing broken line graphs.

Example:

```
10 LOUT &H1C,&H25
20 FOR I=0 TO 9
30 LPRINT "M";6+I*9;",";-10"
40 LPRINT "N";I
50 NEXT I
```

+ * * □ ◇ ○ ▲ △ □

NEW PEN

MARK

J pencolor (Term)

(Term) M

Function: Selects a pen color.

Parameter: A real number equal to 0, 1, 2 or 3. It is evaluated as an integer and selects one of the following four colors:

0: Black 1: Blue 2: Green 3: Red

Explanation: This command sets the pen color to the character string or data represented in memory.

Explanation: The numbers are assigned to the pens on the holder assembly clockwise as viewed from the rear, beginning with the one that comes to the top at power on. The pen colors are normally arranged as shown above.

Example: The command is provided for the printing of characters and various data which cannot be printed directly.

The size, orientation, characters and line spacing, and normal or vertical printing selection are defined by the previous ALPHA SCALE (S), ALPHA (2), LINE (L), and VERTICAL PRINT (Y).

```
i0 LOUT &H1C,&H25
10 FOR I=0 TO 3
20 LPRINT "H10"
30 LPRINT "I"; I
40 LPRINT "J"; I
50 LPRINT "PABCD"
60 NEXT I
```

Example: To axis and orientation of the pens is defined by the previous ALPHA (2) and ALPHA ROTATE (O) commands. The pen must be moved when this command is used.

```
20 LPRINT "P" # FP-1011 PL **
```

ABCD Black

ABCD Blue

ABCD Green

ABCD Red

Example:

```
10 LOUT &H1C,&H25
20 FOR I=0 TO 3
30 LPRINT "I"; I
40 LPRINT "N"; I
50 NEXT I
```

.....

F

number of lines (Term)

(distance from foremost drawing-point)(Term) **H**

Function: Feeds the paper by the specified number of lines.

Parameter: A real number whose integer part may have up to three digits.

Explanation: The line spacing applied to forward or backward line feeding by this command is defined by the previous SPACE (Z), ALPHA SCALE (S), and VERTICAL PRINT (Y) commands.

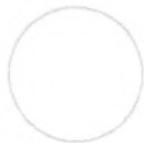
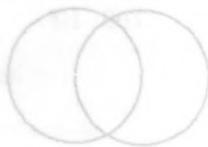
When the parameter is positive, the paper is fed forward. When negative, the paper is fed backward. However, the paper cannot be physically moved backward beyond 200 mm from the foremost point that the pen has reached.

It should be noted that, after this command is executed, the printer is displaced in the absolute coordinate system by the specified amount.

Example:

```
10 LOUT &H1C,&H25
20 FOR I=-2 TO 2'
30 LPRINT "PL/F"; I
40 LPRINT "F"; I
50 NEXT I
60 LOUT &H1C,&H25
70 LPRINT "030,-28"
80 LPRINT "C0,0,18"
90 LPRINT "H"
100 LPRINT "C10,8,18"
110 LPRINT "H2"
120 LPRINT "030,-28"
130 LPRINT "C0,0,18"
```

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



H [distance from foremost drawing-point](Term)

distance of pen (Term)

Function: Used to remove the pen from the plotted area for operator inspection, or to redefine the home position (absolute coordinate system origin).

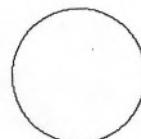
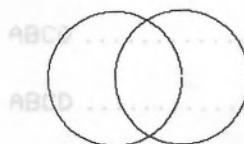
Parameter: A positive real number or 0; may be omitted.

Explanation: If the parameter is specified, the paper is fed the specified distance from the current foremost drawing point, and then the pen is moved to the left end. This pen position becomes the new absolute coordinate system origin.

Explanation: When the parameter is omitted, the paper is fed to the current foremost drawing point and the pen is returned to the left end. The absolute coordinate system is not changed and can continue to be used for subsequent plotting or printing.

Example:

```
10 LOUT &H1C,&H25
20 FOR I=1 TO 5
30 LPRINT "030,-20"
40 LPRINT "H"
50 LPRINT "C10,0,10"
60 LPRINT "H5"
70 LPRINT "030,-20"
80 LPRINT "C0,0,10"
```



TEST

Parameter	Description	Default
@ (term) (Term)	Number of columns (Term)	T

Function: Provides means of checking the pens for proper inking and correct color arrangement, and of trial printing.

Parameter: No parameter is used.

Explanation: The pens tips may dry and fail to properly print if the pens are left uncapped for a long period of time, because they use water-soluble ink. When this occurs, the TEST command can be used to check the pens. The command is also useful for trial printing or to check on color arrangement.

Example:

```
i0 LOUT &H1C,&H25
20 LPRINT "e"
30 LPRINT "***** FORMAT COMMAND R
ESET *****"
40 LPRINT CHR$(10)
50 LLIST
 Black
 Blue
 Green
 Red
60 LPRINT TAB 10
70 LPRINT "T10"
80 LPRINT "T10"
90 LPRINT TAB 10
```

Example:

```
10 LOUT &H1C,&H2E,&H1B
20 LPRINT "#78"
30 LPRINT "***** FORMAT COMMAND R
ESET *****"
40 LPRINT CHR$(10)
50 LLIST
```

T [number of columns (Term)]

Function: Moves the pen to the right from the left end by the specified number of print columns.

Parameter: A real number whose integer part is three or fewer digits. It is evaluated as an integer.

Explanation: This command is effective only in the character mode and tabulates from the left end by the specified number of print positions.

If the parameter value exceeds the number of print columns comprising one line, the pen is moved to the beginning of the next line.

Example:

Example:

```

10 LOUT &H1C,&H2E
10 FOR I=1 TO 4
20 LPRINT "1234567890";
30 NEXT I
40 LOUT &H0D,&H1B
50 LPRINT "T10"
60 LPRINT "TAB 10"
70 LPRINT "030,-20"
80 LPRINT "C8,8,10"

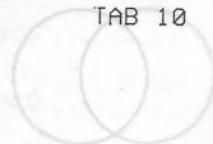
```

10 LOUT &H1C,&H2E
"5"
50 LPRINT



1234567890123456789012345678901234567890

TAB 10



FORMAT

specifications

The FP1011PL plotter printer uses an 8-bit interface that conforms to the Centronics standards. Information on this interface is summarized here.

1. Interface
? { 0 } (Term)

Signal name	Signal No.	Return line No.	Originating from	Function
-------------	------------	-----------------	------------------	----------

DATA 1 Function: Provides a 6-column blank area at the left end after each automatic line feed other than CR or LF.

Parameter: 0 or 1, 1 puts this line formatting function in effect, and 0 terminates the function.

Explanation: This command is useful to align the beginnings of program listing lines. The LLIST command that provides a program listing can be used only in the character mode.

Example 1:

BUSY	10 LOUT &H1C, &H2E, &H1B 20 LPRINT "?0" 30 LPRINT "***** FORMAT COMMAND R ESET *****" 40 LPRINT CHR\$(10) 50 LLIST	When high, this signal indicates that the printer cannot accept data from the host computer. It is high: (1) During data entry. (2) When the pen is in motion. (3) When the printer is offline (LOCAL).
ACKNLD	10 28 Plotter	Data transfer is allowed when this signal goes from high to low
ERROR	***** FORMAT COMMAND RESET *****	This signal indicates that the printer is in an error condition.
INIT	10 LOUT &H1C, &H2E, &H1B 20 LPRINT "?0" 30 LPRINT "***** FORMAT COMMAND R ESET *****"	When going low, this signal initializes the printer and clears the printer buffer memory. It has a negative-going duration of 50μs or more.
GND	40 LPRINT CHR\$(10) 50 LLIST	Ground; the twisted-pair return signals.
GND	16	Logic ground; connected to the V _{SS} line for the ICs in the printer.
CHASSIS GND	17	Printer chassis ground.

Example 2:

```
10 LOUT &H1C,&H2E,&H1B
20 LPRINT "?1"
30 LPRINT "***** FORMAT COMMAND S
*****"
40 LPRINT CHR$(10)
50 LLIST
```

***** FORMAT COMMAND SET *****

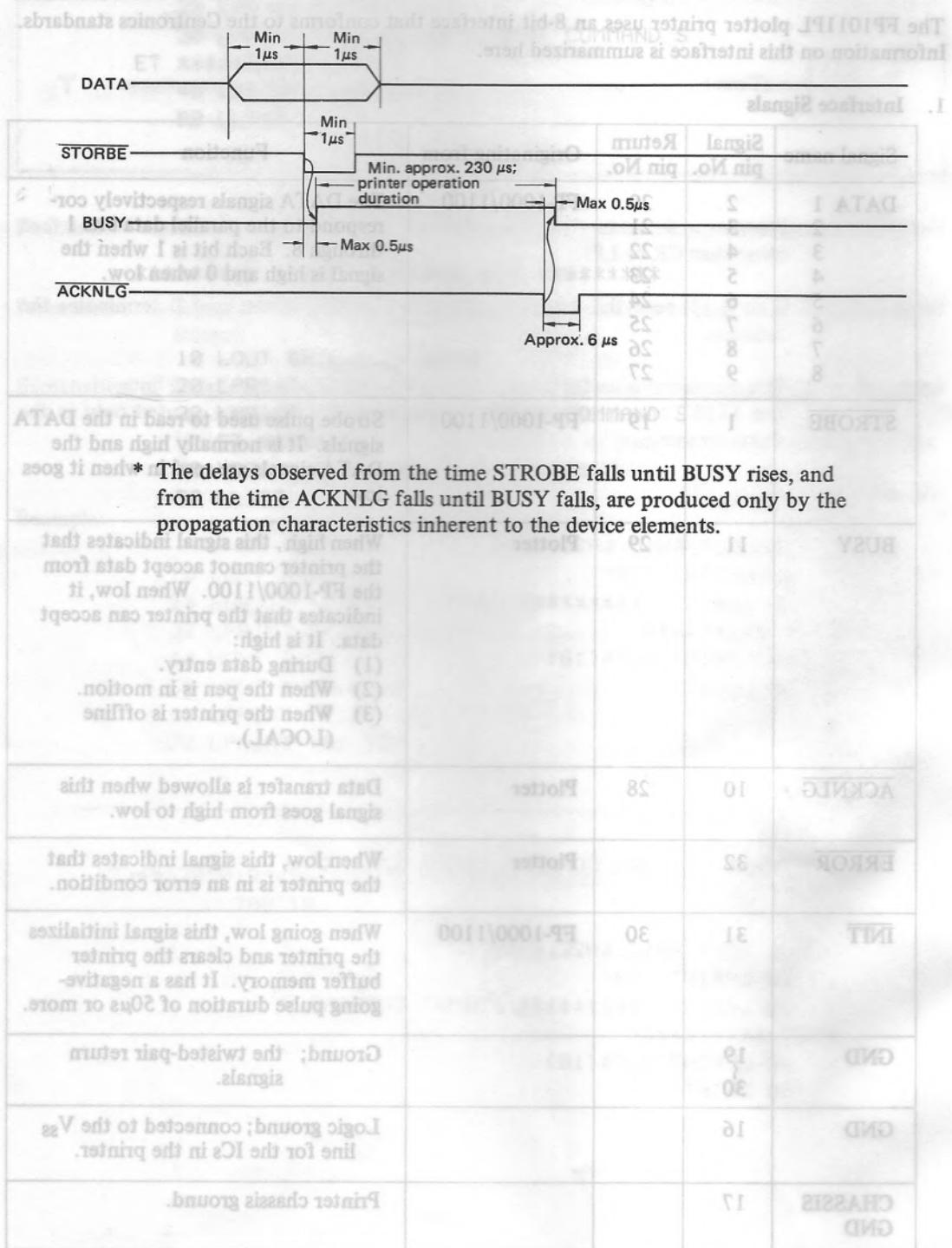
```
Path statement: 0. but you can't print multi-line effects  
in one.  
Explanation: The following code will print:  
    10 LOUT &H1C,&H2E,&H1B  
    20 LPRINT "?1"  
    30 LPRINT "*****" FORMAT COMMAND  
        ET *****"  
    40 LPRINT CHR$(10)  
    50 LLIST
```

The FP1011PL plotter printer uses an 8-bit interface that conforms to the Centronics standards. Information on this interface is summarized here.

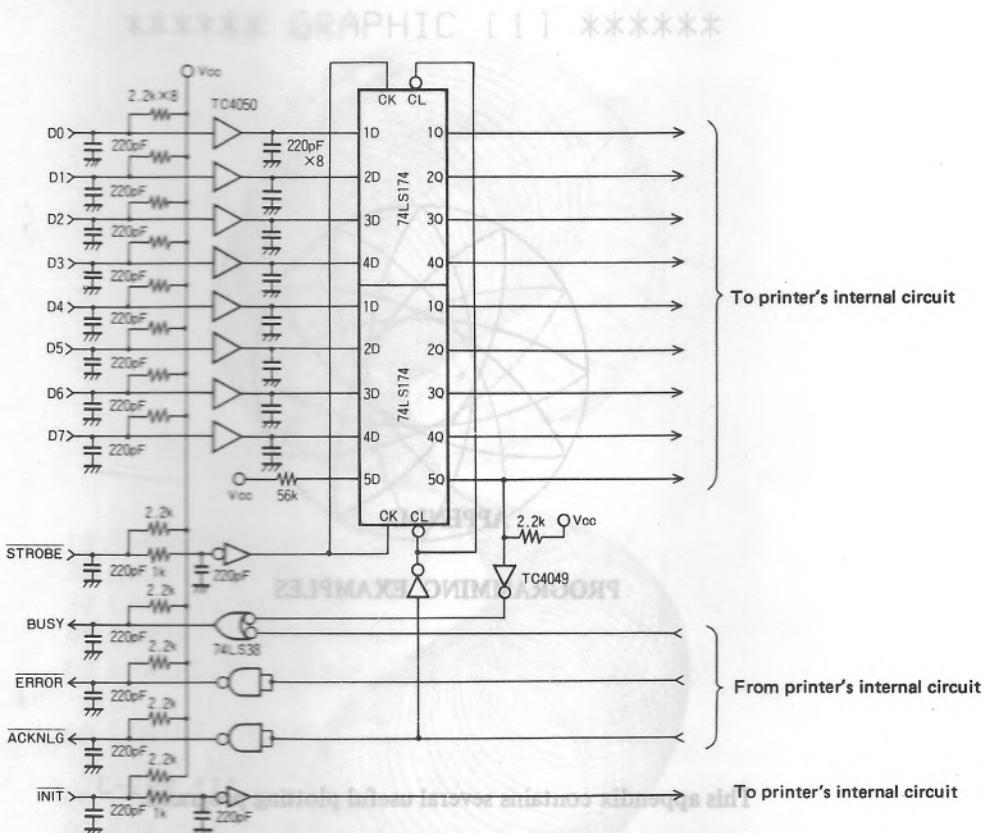
1. Interface Signals

Signal name	Signal pin No.	Return pin No.	Originating from	Function
DATA 1	2	20	FP-1000/1100	The DATA signals respectively correspond to the parallel data bits 1 through 8. Each bit is 1 when the signal is high and 0 when low.
2	3	21		
3	4	22		
4	5	23		
5	6	24		
6	7	25		
7	8	26		
8	9	27		
STROBE	1	19	FP-1000/1100	Strobe pulse used to read in the DATA signals. It is normally high and the DATA signals are read in when it goes low.
BUSY	11	29	Plotter	When high, this signal indicates that the printer cannot accept data from the FP-1000/1100. When low, it indicates that the printer can accept data. It is high: (1) During data entry. (2) When the pen is in motion. (3) When the printer is offline (LOCAL).
ACKNLG	10	28	Plotter	Data transfer is allowed when this signal goes from high to low.
ERROR	32		Plotter	When low, this signal indicates that the printer is in an error condition.
INIT	31	30	FP-1000/1100	When going low, this signal initializes the printer and clears the printer buffer memory. It has a negative-going pulse duration of $50\mu s$ or more.
GND	19 30			Ground; the twisted-pair return signals.
GND	16			Logic ground; connected to the V_{SS} line for the ICs in the printer.
CHASSIS GND	17			Printer chassis ground.

2. Interface Timing



3. The Interface Circuit (from GRAPHIC 1 to GRAPHIC 4) produce simple graphic patterns.



38 LPRINT "GRAPHIC No. 1" *****

39 F1=1000: T=0 TO 330 STEP 30

40 X=35*COS(I)+48

41 Y=35*SIN(I)-40

42 LPRINT "J"; J

43 LPRINT "C";X;,";Y;"43;"0144.4+I;

44 I=I+1

45 IF J=4 THEN J=1

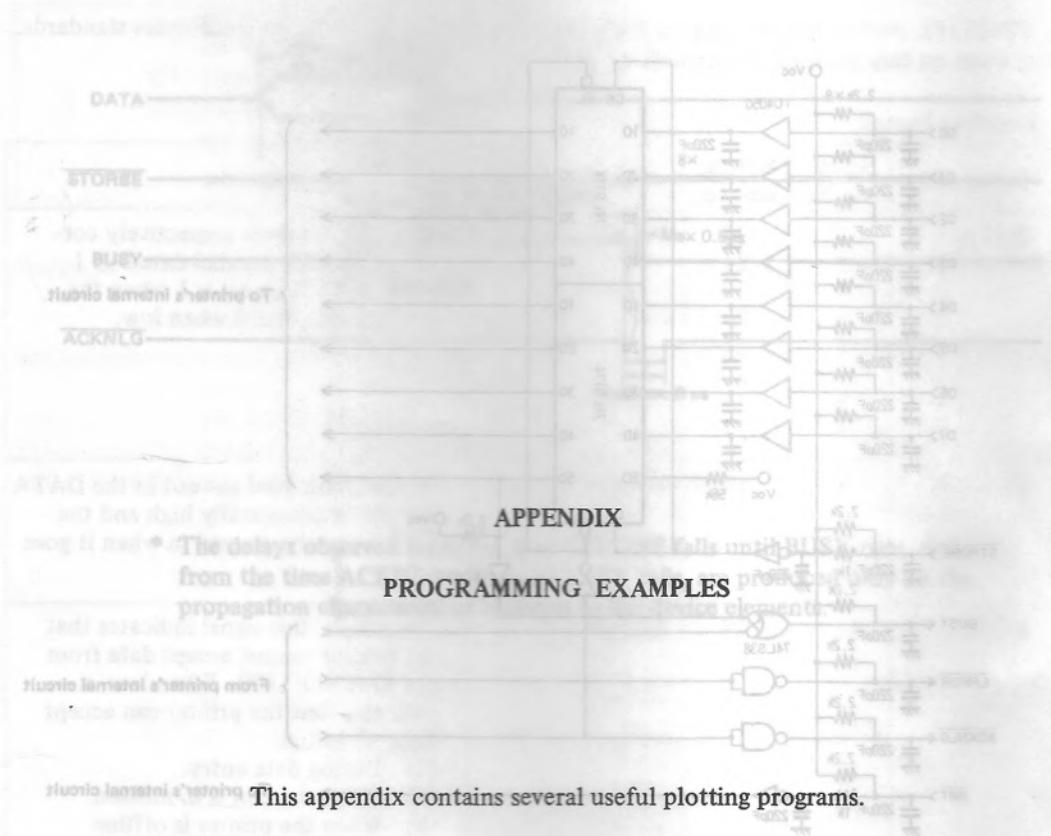
46 NEXT I

47 LPRINT "J0"

48 LPRINT "C48,-40,25"

49 LPRINT "H20"

50 LPRINT "GRAPHIC [1]" *****



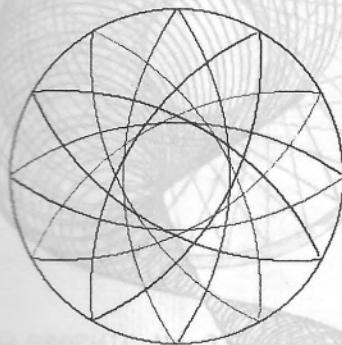
APPENDIX

PROGRAMMING EXAMPLES

This appendix contains several useful plotting programs.

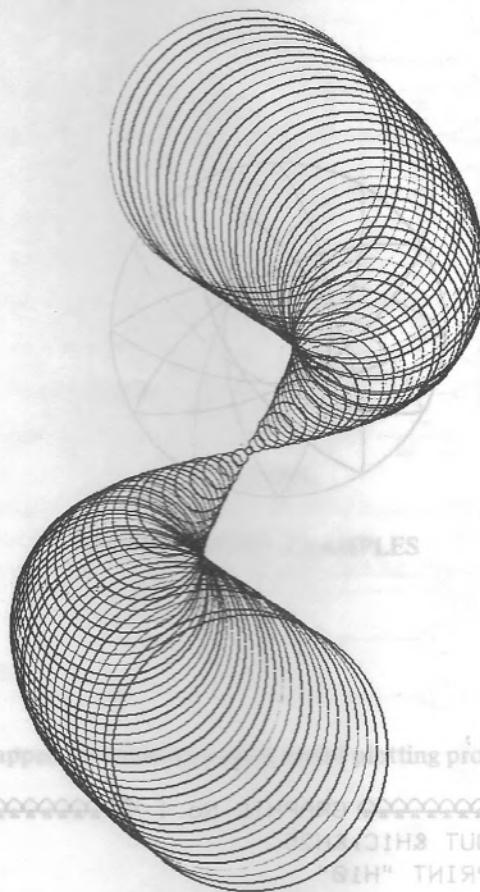
The following programs (GRAPHIC 1 to GRAPHIC 4) produce simple graphic patterns.

***** GRAPHIC [1] *****



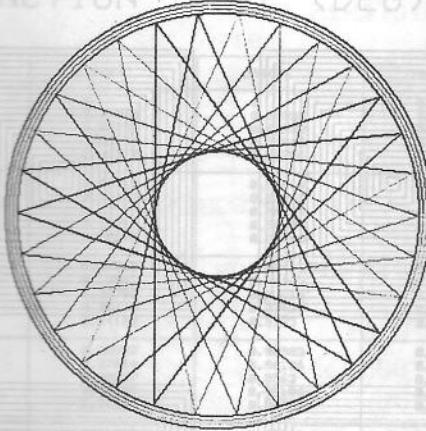
```
10 *GRAPHIC 1
20 LOUT &H1C,&H25
30 LPRINT "H10"
40 LPRINT "J0";LPRINT "S1"
50 LPRINT "P ***** GRAPHIC [ 1 ] *****"
*
60 LPRINT "H10"
70 C-ERR '1'
80 FOR I=0 TO 330 STEP 30
90 X=35*COS(I)+48
100 Y=35*SIN(I)-40
110 LPRINT "J";J
120 LPRINT "C";X;"(";Y;"",43,";144.4+I;
130 ",;215.6+I
140 J=J+1
140 IF J=4 THEN J=1
150 NEXT I
160 LPRINT "J0"
170 LPRINT "C48,-40,25"
180 LPRINT "H20"
190 LPRINT "H20"
200 LPRINT "H20"
210 LPRINT "H20"
220 LPRINT "H20"
230 LPRINT "H20"
240 LPRINT "H20"
250 LPRINT "H20"
260 LPRINT "H20"
270 LPRINT "H20"
280 LPRINT "H20"
290 LPRINT "H20"
300 LPRINT "H20"
```

***** GRAPHIC [2] *****



```
10 ,***** GRAPHIC No. 2 *****
20 LOUT &H1C,&H25
30 LPRINT "H10"
40 LPRINT "J0":LPRINT "S2"
50 LPRINT "P ***** GRAPHIC [2] *****"
60 LPRINT "H30"
70 Y=0: J=2
80 FOR I=0 TO 360 STEP 4
90 LPRINT "J"; J
100 X=20*SIN(I)+48
110 Y=Y-1.0
120 R=ABS(20*COS(I/2))+0.6
130 LPRINT "C";X;" ";"Y ";" ";"R
140 J=J+1
150 IF J=4 THEN J=0
160 NEXT I
170 LPRINT "H20"
```

***** GRAPHIC [3] *****
 *** TRIGONOMETRIC ***
 ** FUNCTION TABLE (DEG) **



```

10 *----- GRAPHIC No. 3 -----
20 LOUT &H1C,&H25
30 LPRINT "H10"
40 LPRINT "J0":LPRINT "S2"
50 LPRINT "P ***** GRAPHIC [3] *****
```

*

This program prints a trigonometric function table for angles from 0 to 29 degrees in increments of 1 degree. The values are calculated down to the fifth digit after the decimal point.

First, lines 100 through 140 set up the table frame and then the subsequent statements print the values properly.

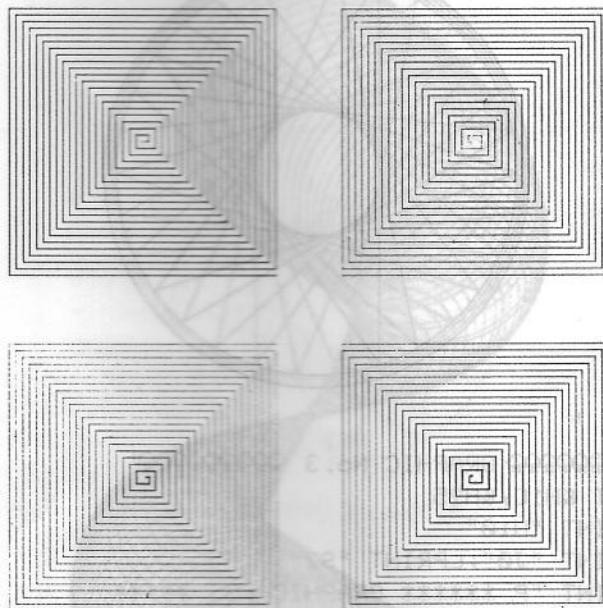
The function values are printed to the right of the decimal point in line 230 and then the value is printed to the left in line 240.

130 NEXT K
 140 NEXT I
 This example prints the values from degrees to radians by one degree. It may also be a good exercise to vary the increment of the angle.

```

150 FOR J=0 TO 3
160 R=31.8-J*0.6
170 LPRINT "J";J
180 LPRINT "C48,-30,";R
190 NEXT J
200 J=1
210 FOR I=0 TO 5
220 LPRINT "J";J
230 LPRINT "M";X(0,I);";";Y(0,I)
240 FOR K=1 TO 5
250 LPRINT "D,";X(K,I);";";Y(K,I)
260 NEXT K
270 J=J+1
280 IF J=4 THEN J=0
290 NEXT I
300 LPRINT "H20"
```

***** GRAPHIC [4] *****



```

10 ,***** GRAPHIC No. 4 *****
20 LOUT &H1C,&H25
30 LPRINT "H10"
40 LPRINT "J0":LPRINT "S2"
50 LPRINT "P ***** GRAPHIC [4] *****
* 20 LOUT &H1C,&H25
60 LPRINT "H10"
70 LPRINT "048,-50"
80 DIM X(3),Y(3)*** GRAPHIC [2]
90 X(0)=1:X(1)=-1:X(2)=1:X(3)=-1
100 Y(0)=1:Y(1)=1:Y(2)=-1:Y(3)=-1
110 FOR I=0 TO 3
120 LPRINT "J";I:60 STEP 4
130 LPRINT "M";-25*X(I);";";25*Y(I);1:25 LPRINT "M";X(0):Y(0)
140 FOR J=1 TO 40
150 LPRINT "I";(-1)^(J+1)*J*X(I);";0
160 LPRINT "D";";(1)Y(I);(1)X(I);";0
170 NEXT J
180 LPRINT "I";40*X(I);";0"
190 NEXT I THEN J=0
200 LPRINT "J0"
210 LPRINT "H10"
220 I=1+1
230 IF I=4 THEN I=8
240 NEXT I
250 LPRINT "H20"

```

*** TRIGONOMETRIC ***
** FUNCTION TABLE (DEG) **

X	$\sin(x)$	$\cos(x)$	$\tan(x)$
0 0.1 0.2 0.3 0.4	0	1	0
	0.01745	0.99985	0.01746
	0.0343	0.99393	0.03482
	0.05234	0.98963	0.05241
	0.06976	0.97956	0.06993
0.5 0.6 0.7 0.8 0.9 1.0	0.08716	0.99619	0.08749
	0.10453	0.99452	0.1051
	0.12187	0.99255	0.12278
	0.13917	0.98927	0.14054
	0.15643	0.98769	0.15838
1.1 1.2 1.3 1.4 1.5 1.6	0.17365	0.99481	0.17633
	0.19081	0.98163	0.19438
	0.20791	0.97815	0.21256
	0.22495	0.97437	0.23087
	0.24192	0.9703	0.24933
1.7 1.8 1.9 2.0 2.1 2.2	0.25882	0.96593	0.26795
	0.27564	0.96126	0.28675
	0.29237	0.9563	0.30573
	0.30892	0.95106	0.32492
	0.32557	0.94552	0.34433
2.3 2.4 2.5 2.6 2.7 2.8	0.34202	0.93369	0.36387
	0.35837	0.93358	0.38386
	0.37461	0.92718	0.40403
	0.39073	0.9205	0.42447
	0.40674	0.91355	0.44523
2.9 3.0 3.1 3.2 3.3 3.4	0.42262	0.90631	0.46631
	0.43897	0.88979	0.48773
	0.45539	0.88181	0.50903
	0.46947	0.88295	0.53171
	0.48481	0.87462	0.55431

This program generates a trigonometric function table for angles from 0 to 29 degrees in increments of 1 degree. The function values are calculated down to the fifth digit after the decimal point.

First, lines 110 to 150 draws the table frame and then the subsequent statements print the values properly placed within the appropriate boxes.

The function values are rounded off to the fifth digit to the right of the decimal point in line 230 and then the results are printed in lines 240 to 270.

This example increments the angles by one degree. It may also be a good exercise to vary the increment or change the unit of angles from degrees/radians.

```

10 * TRIGONOMETRIC FUNCTION *
20 LOUT &H1C,&H25
30 ANGLE 0
40 LPRINT "J0"
50 LPRINT "H10": J=1
60 'LPRINT "M8,0"
70 LPRINT "S2"
80 LPRINT "P *** TRIGONOMETRIC ***"
90 LPRINT "H5"
100 LPRINT "P** FUNCTION TABLE (DEG) *"
*"
110 LPRINT "H10"
120 LPRINT "S0"
130 LPRINT "D8,3,98,3":LPRINT "D8,-2,9
8,-2"
140 FOR I=1 TO 6:LPRINT "D8,";-I*12.4-
2;",";98;";"-I*12.4-2:NEXT I
150 LPRINT "D8,3,8,-76.4"
160 LPRINT "D23,3,23,-76.4":LPRINT "D4
8,3,48,-76.4"
170 LPRINT "D73,3,73,-76.4":LPRINT "D9
8,3,98,-76.4"
180 LPRINT "J";1
190 LPRINT "M15,0":LPRINT "PX"
200 LPRINT "M30,0":LPRINT "PSIN(X)"
210 LPRINT "M55,0":LPRINT "PCOS(X)"
220 LPRINT "M80,0":LPRINT "PTAN(X)"
230 FOR I=0 TO 29
240 IF (I MOD 5)=0 THEN LPRINT "F1"
250 S=ROUND(SIN(I),-6):C=ROUND(COS(I),
-6):T=ROUND(TAN(I),-6)
260 LPRINT "M14,-J*2:LPRINT "P";I
270 LPRINT "M30,-J*2:LPRINT "P";S
280 LPRINT "M55,-J*2:LPRINT "P";C
290 LPRINT "M80,-J*2:LPRINT "P";T
300 J=J+1
310 NEXT I
320 LPRINT "H20"
330 LPRINT "J0"
340 LPRINT "H10-25*X/I":LPRINT "H(Y(I))
350 FOR J=1 TO 40
360 LPRINT "I":(-1)^J*2^(J-1):LPRINT "X
370 LPRINT "10":LPRINT "Y":LPRINT "H(Y(I))
380 NEXT J
390 LPRINT "I":40:NEXT I
400 LPRINT "J0"
410 LPRINT "H10"

```

***** Pie Chart *****

Explanation:

1001 400 PLOT *****

This program draws a simple pie chart.

110 LOUT SH10:SH25

120 READ DATA statements 10 read data from DATA statement 11 this entry is desired from the keyboard, change the READ statement to INPUT statement.

130 FOR I=1 TO 10 read data section 10 read data section 11 this entry is desired from the keyboard, change the READ statement to INPUT statement.

140 LPRINT ***** 150 draw concentric circles to the total sum of the data values.

160 FOR I=1 TO 9 read data values of the data values.

170 LPRINT ***** 180 draw concentric circles to the total sum of the data values.

190 FOR I=1 TO 8 read data values of the data values.

200 LPRINT ***** 210 draw concentric circles to the total sum of the data values.

220 FOR I=1 TO 7 read data values of the data values.

230 LPRINT ***** 240 draw concentric circles to the total sum of the data values.

250 FOR I=1 TO 6 read data values of the data values.

260 LPRINT ***** 270 draw concentric circles to the total sum of the data values.

280 FOR I=1 TO 5 read data values of the data values.

290 LPRINT ***** 300 draw concentric circles to the total sum of the data values.

310 FOR I=1 TO 4 read data values of the data values.

320 LPRINT ***** 330 draw concentric circles to the total sum of the data values.

340 FOR I=1 TO 3 read data values of the data values.

350 LPRINT ***** 360 draw concentric circles to the total sum of the data values.

370 FOR I=1 TO 2 read data values of the data values.

380 LPRINT ***** 390 draw concentric circles to the total sum of the data values.

400 FOR I=1 TO 1 read data values of the data values.

410 LPRINT ***** 420 draw concentric circles to the total sum of the data values.

430 FOR I=1 TO 1 read data values of the data values.

440 LPRINT ***** 450 draw concentric circles to the total sum of the data values.

460 FOR I=1 TO 1 read data values of the data values.

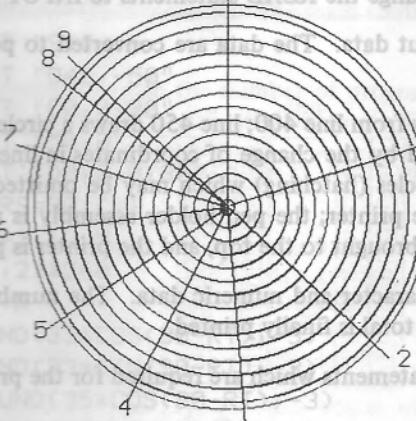
470 LPRINT ***** 480 draw concentric circles to the total sum of the data values.

490 FOR I=1 TO 1 read data values of the data values.

500 LPRINT ***** 510 draw concentric circles to the total sum of the data values.

520 FOR I=1 TO 1 read data values of the data values.

530 LPRINT ***** 540 draw concentric circles to the total sum of the data values.



```

1001 400 PLOT *****
110 LOUT SH10:SH25
120 READ DATA statements 10 read data from DATA statement 11 this entry is desired from the keyboard, change the READ statement to INPUT statement.
130 FOR I=1 TO 10 read data section 10 read data section 11 this entry is desired from the keyboard, change the READ statement to INPUT statement.
140 LPRINT *****
150 draw concentric circles to the total sum of the data values.
160 FOR I=1 TO 9 read data values of the data values.
170 LPRINT *****
180 draw concentric circles to the total sum of the data values.
190 FOR I=1 TO 8 read data values of the data values.
200 LPRINT *****
210 draw concentric circles to the total sum of the data values.
220 FOR I=1 TO 7 read data values of the data values.
230 LPRINT *****
240 draw concentric circles to the total sum of the data values.
250 FOR I=1 TO 6 read data values of the data values.
260 LPRINT *****
270 draw concentric circles to the total sum of the data values.
280 FOR I=1 TO 5 read data values of the data values.
290 LPRINT *****
300 draw concentric circles to the total sum of the data values.
310 FOR I=1 TO 4 read data values of the data values.
320 LPRINT *****
330 draw concentric circles to the total sum of the data values.
340 FOR I=1 TO 3 read data values of the data values.
350 LPRINT *****
360 draw concentric circles to the total sum of the data values.
370 FOR I=1 TO 2 read data values of the data values.
380 LPRINT *****
390 draw concentric circles to the total sum of the data values.
400 FOR I=1 TO 1 read data values of the data values.
410 LPRINT *****
420 draw concentric circles to the total sum of the data values.
430 FOR I=1 TO 1 read data values of the data values.
440 LPRINT *****
450 draw concentric circles to the total sum of the data values.
460 FOR I=1 TO 1 read data values of the data values.
470 LPRINT *****
480 draw concentric circles to the total sum of the data values.
490 FOR I=1 TO 1 read data values of the data values.
500 LPRINT *****
510 draw concentric circles to the total sum of the data values.
520 FOR I=1 TO 1 read data values of the data values.
530 LPRINT *****
540 draw concentric circles to the total sum of the data values.
      
```

Explanation:

This program draws a simple pie chart.

Lines 30 to 130 are the data entry section and read data from DATA statements. If data entry is desired from the keyboard, change the READ statements to INPUT statements.

Lines 200 to 290 sort the input data. The data are converted to percentages of the total and are arranged in ascending order.

The output to the printer begins from line 400; line 450 draws a circle. Then the circle is divided according to the values obtained by the change of coordinates in lines 520 to 550. Lines 590 to 620 draw smaller concentric circles (hatching) which may be omitted if no hatching is required. Lines 660 and 670 initialize the printer; the pen holder assembly is moved to the foremost line of the diagram, the black pen is brought to the top, and the printer is put in the character mode.

Lines 690 and beyond print character and numeric data. The numbers, names, quantities, and percentages are printed, and the total is finally printed.

Lines 900 and 910 are DATA statements which are required for the preceding READ statements.

```
10 '***** Pie Chart *****
20 ANGLE 0
30 READ N
40 DIM D(N,2),D$(N)
50 TA=0
60 FOR I=1 TO N
70 READ D(I,1)
80 TA=TA+D(I,1)
90 NEXT I
100 FOR I=1 TO N
110 READ D$(I)
120 D(I,2)=D(I,1)/TA
130 NEXT I
200 '***** SORT *****
210 FOR I=1 TO N-1
220 MAX=-9E99
230 FOR J=I TO N-1
240 IF D(J,2)>MAX THEN MAX=D(J,2);M=J
250 NEXT J
260 SWAP D(I,1),D(M,1)
270 SWAP D(I,2),D(M,2)
280 SWAP D$(I),D$(M)
290 NEXT I
```

This program draws a PC board with components which comprise the FP-1031 "EP-ROM". The board consists of considerable use.

The program
410 LOUT &H1C, &H25
420 LPRINT "S2":LPRINT "P ***** Pie Components with RELATIVE
MOVE (R) *****"
430 LPRINT "S1"
440 LPRINT "046,-50"

Such programs require the number of program steps. However, the overall
program flow is simple. Modification is simple if other components are added.

It would be a good idea to draw the PC board pattern.

```
450 LPRINT "C0,0,30"  
460 LPRINT "M0,0"  
470 LPRINT "D0,0,0,30"  
480 RT=0:RS=90:C=1  
490 FOR I=1 TO N  
500 R=D(I,2)*360  
510 RT=RT+R  
520 X=ROUND(33*COS(90-RT),-3)  
530 Y=ROUND(33*SIN(90-RT),-3)  
540 X1=ROUND(35*COS(90-RT),-3)  
550 Y1=ROUND(35*SIN(90-RT),-3)  
560 LPRINT "J0"  
570 LPRINT "D0,0,";X;",";Y  
580 LPRINT "M";X1;",";Y1:LPRINT "P";MI  
590 LPRINT "J";C  
600 FOR J=1 TO 30 STEP 2  
610 LPRINT "C0,0,";30-J;",";90-RT;",";  
620 GOSUB 5900  
630 RS=90-RT  
640 C=C+1:IF C>3 THEN C=1  
650 NEXT I  
660 LPRINT "S1":LPRINT "J0"  
670 LPRINT "H"  
680 LOUT &H1C, &H2E  
690 FOR I=1 TO N  
700 LPRINT USING "[##] ; ";I;  
710 LPRINT D$(I);TAB(16);  
720 LPRINT USING "#,###.k";D(I,1);  
730 LPRINT USING "      ##.##%";D(I,2);  
740 NEXT I  
750 LPRINT TAB(8);"TOTAL";TAB(15);"P10k"  
760 LPRINT USING "##,##%.k";TA  
770 END  
900 DATA 10,568,467,108,1265,421,361,1  
065,498,742,824  
910 DATA DDD,FFF,III,AAA,GGG,HHH,BBB,E  
EE,CCC,OTHERS
```

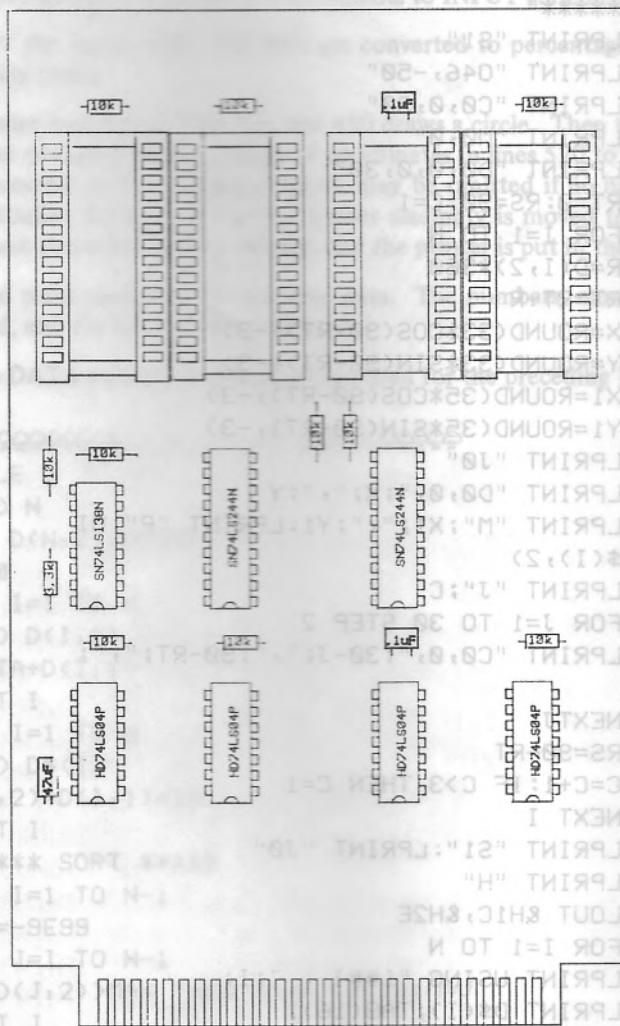
***** PC BOARD *****

Lines 200 to 290
are arranged in sec-

The output to the
according to the
620 draw smaller
Lines 660 and 670
of the diagram, the

Lines 690 and beyond
percentages are printed

Lines 900 and 910 are



This program draws a PC board layout. The PC board is one of those which comprise the FP-1031 "EP-ROM pack". This kind of program is of considerable use.

The program uses separate subroutines for drawing specific components such as resistors, capacitors, ICs, and LSI sockets. The subroutines draw the respective components with RELATIVE MOVE (R) and RELATIVE DRAW (I) commands. The main routine defines a coordinate system and calls the subroutines in turn.

Such programming may somewhat increase the number of program steps. However, the overall program flow is easy to read and program modification is simple if other components are added.

It would be a useful exercise to draw the wiring on the PC board pattern.

```
10 ,***** PC BOARD *****
20 LOUT &H1C,&H25
30 LPRINT "J0"
40 LPRINT "S2"
50 LPRINT "P ***** PC BOARD *****"
60 LPRINT "02,-20"
70 LPRINT "D0,0,92,0,92,-142,82,-142,
82,-151,10,-151,10,-142,0,-142,0,0
80 LPRINT "M13,-151"
90 FOR I=1 TO 28
100 LPRINT "I0,7,1.4,0,0,-7"
110 LPRINT "R1,0"
120 NEXT I
200 '***** LSI *****
210 LPRINT "J1"
220 LPRINT "M4,-55"
230 GOSUB 5000
240 LPRINT "M24.2,-55"
250 GOSUB 5000
260 LPRINT "M47.8,-55"
270 GOSUB 5000
280 LPRINT "M68,-55"
290 GOSUB 5000
300 LPRINT "M10,-89"
310 GOSUB 5400
320 LPRINT "M30,-89"
330 GOSUB 5200
340 LPRINT "M55,-89"
350 GOSUB 5200
360 LPRINT "M10,-118"
370 GOSUB 5600
380 LPRINT "M30,-118"
390 GOSUB 5600
400 LPRINT "M55,-118"
410 GOSUB 5600
420 LPRINT "M75,-118"
430 GOSUB 5600
440 LPRINT "R0,0,92,0,92,-142,82,-142,0,0
450 LPRINT "P10k"
460 LPRINT "M12,-15"
470 LPRINT "M32,-15"
480 LPRINT "R1,-15"
490 LPRINT "M77,-15"
500 ***** REGISTER *****
510 LPRINT "J2"
520 LPRINT "M12,-15"
530 GOSUB 5800
540 LPRINT "P10k"
550 LPRINT "M32,-15"
560 GOSUB 5800
570 LPRINT "P10k"
580 LPRINT "M77,-15"
590 GOSUB 5800
600 LPRINT "P10k"
610 LPRINT "M12,-67"
620 GOSUB 5800
630 LPRINT "P10k"
640 LPRINT "M12,-66":LPRINT "I2,-1"
650 LPRINT "M17,-66":LPRINT "I2,0"
660 LPRINT "M12,-95"
670 GOSUB 5800
680 LPRINT "P10k"
690 LPRINT "M32,-95"
700 GOSUB 5800
710 LPRINT "P10k"
720 LPRINT "M77,-95"
730 GOSUB 5800
740 LPRINT "P10k"
750 LPRINT "M5,-70"
760 GOSUB 5900
770 LPRINT "P10k"
780 LPRINT "M5,-87"
790 GOSUB 5900
800 LPRINT "R0,-0.4"
810 LPRINT "P3.3k"
820 LPRINT "M45,-65"
830 GOSUB 5900
840 LPRINT "P10k"
850 LPRINT "M50,-65"
860 GOSUB 5900
870 LPRINT "P10k"
880 LPRINT "R3,0,I"
890 LPRINT "R4,0,I"
900 LPRINT "R3,0,I"
910 LPRINT "R4,0,I"
920 LPRINT "R3,0,I"
930 LPRINT "R4,0,I"
940 LPRINT "R3,0,I"
950 LPRINT "R4,0,I"
960 LPRINT "R3,0,I"
970 LPRINT "R4,0,I"
980 LPRINT "R3,0,I"
990 LPRINT "R4,0,I"
1000 LPRINT "R3,0,I"
1010 LPRINT "R4,0,I"
1020 LPRINT "R3,0,I"
1030 LPRINT "R4,0,I"
1040 LPRINT "R3,0,I"
1050 LPRINT "R4,0,I"
1060 LPRINT "R3,0,I"
1070 LPRINT "R4,0,I"
1080 LPRINT "R3,0,I"
1090 LPRINT "R4,0,I"
1100 LPRINT "R3,0,I"
1110 LPRINT "R4,0,I"
1120 LPRINT "R3,0,I"
1130 END
1140 *****
```

```

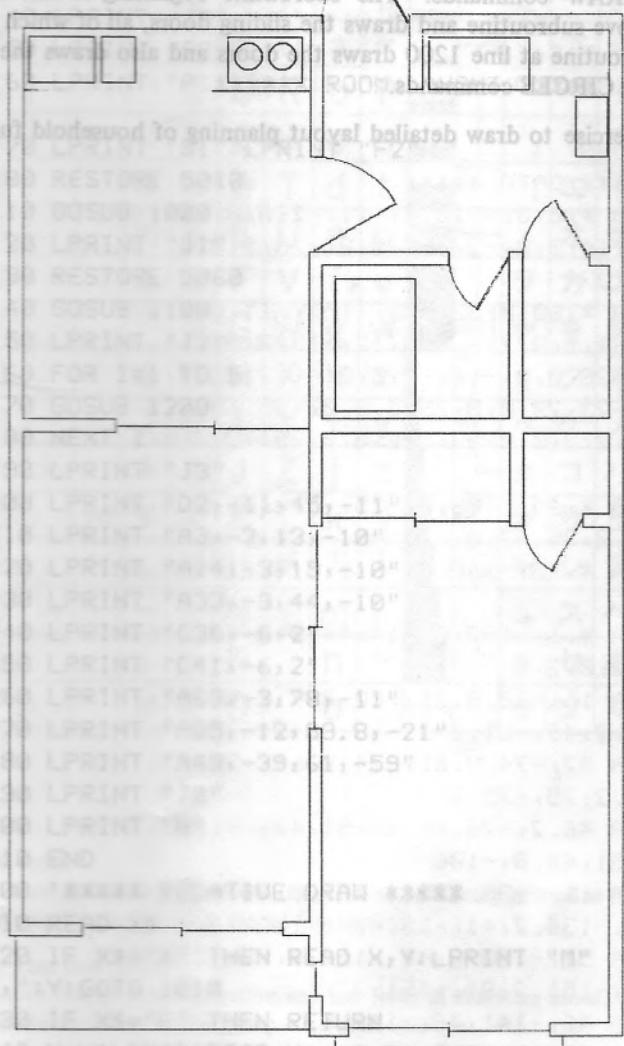
900 ***** CONDENSER *****
910 LPRINT "J3"
920 LPRINT "M4,-117"
930 GOSUB 6000
940 LPRINT "P42uF"
950 LPRINT "M56,-15"
960 GOSUB 6100
970 LPRINT "P.1uF"
980 LPRINT "M56,-95"
990 GOSUB 6100
1000 LPRINT "P.1uF"
1100 LPRINT "S1"
1110 LPRINT "J0"
1120 LPRINT "H"
1130 END
5000 ***** LSI *****
5010 LPRINT "I5,0,0,1,10,0,0,-1.5,0,0,3
7,-20,0,0,-37"
5020 LPRINT "R5,0":LPRINT "I0,37"
5030 LPRINT "R10,0":LPRINT "I0,-37"
5040 LPRINT "R0,3":LPRINT "I-10,0"
5050 LPRINT "R0,32":LPRINT "I10,0"
5060 LPRINT "R1,-1"
5070 FOR K=1 TO 14
5080 LPRINT "I3,0,0,1.5,-3,0,0,-1.5"
5090 LPRINT "R0,-2.5"
5100 NEXT K
5110 LPRINT "R-15,2.5"
5120 FOR K=1 TO 14
5130 LPRINT "I3,0,0,1.5,-3,0,0,-1.5"
5140 LPRINT "R0,2.5"
5150 NEXT K
5160 RETURN
5200 ***** IC-1 *****
5210 LPRINT "I6,0,0,24,-6,0,0,-24"
5220 LPRINT "R3,0":LPRINT "C,1,0,180"
5230 LPRINT "R4,0.5"
5240 FOR K=1 TO 10
5250 LPRINT "I1,0,0,1.4,-1,0"
5260 LPRINT "R0,1"
5270 NEXT K
5280 LPRINT "R-6,-1"
5290 FOR K=1 TO 10
5300 LPRINT "I-1,0,0,-1.4,1,0"
5310 LPRINT "R0,-1"
5320 NEXT K
5330 LPRINT "R4,7"
5340 LPRINT "S0":LPRINT "Q3":LPRINT "PS
N74LS244N"
5350 RETURN
5400 ***** IC-2 *****
5410 LPRINT "I6,0,0,19,-6,0,0,-19"
5420 LPRINT "R3,0":LPRINT "C,1,0,180"
5430 LPRINT "R4,0.4"
5440 FOR K=1 TO 8
5450 LPRINT "I1,0,0,1.4,-1,0"
5460 LPRINT "R0,1"
5470 NEXT K
5480 LPRINT "R-6,-1"
5490 FOR K=1 TO 8
5500 LPRINT "I-1,0,0,-1.4,1,0"
5510 LPRINT "R0,-1"
5520 NEXT K
5530 LPRINT "R4,5"
5540 LPRINT "S0":LPRINT "Q3":LPRINT "PS
N74LS138N"
5550 RETURN
5600 ***** IC-3 *****
5610 LPRINT "I6,0,0,18.2,-6,0,0,-18.2"
5620 LPRINT "R3,0":LPRINT "C,1,0,180"
5630 LPRINT "R4,1.2"
5640 FOR K=1 TO 7
5650 LPRINT "I1,0,0,1.4,-1,0"
5660 LPRINT "R0,1"
5670 NEXT K
5680 LPRINT "R-6,-1"
5690 FOR K=1 TO 7
5700 LPRINT "I-1,0,0,-1.4,1,0"
5710 LPRINT "R0,-1"
5720 NEXT K
5730 LPRINT "R4,4"
5740 LPRINT "S0":LPRINT "Q3":LPRINT "PS
D74LS04P"
5750 RETURN
5800 ***** RESISTOR-1 *****
5810 LPRINT "I5,0,0,2,-5,0,0,-2"
5820 LPRINT "I0,1,-1,0"
5830 LPRINT "R6,0"
5840 LPRINT "I1,0"
5850 LPRINT "R-5.4,-0.4"
5860 LPRINT "Q0":LPRINT "S0"
5870 RETURN
5900 ***** RESISTOR-2 *****
5910 LPRINT "I2,0,0,5,-2,0,0,-5"
5920 LPRINT "I1,0,0,-2"
5930 LPRINT "R0,7"
5940 LPRINT "I0,2"
5950 LPRINT "R0.4,-6.4"
5960 LPRINT "Q3":LPRINT "S0"
5970 RETURN
6000 ***** CONDENSER-1 *****
6010 LPRINT "I3,0,0,6,-3,0,0,-6"
6020 LPRINT "I1,0,0,-1"
6030 LPRINT "R1,0"
6040 LPRINT "I0,1"
6050 LPRINT "R0,0.4"
6060 LPRINT "Q3":LPRINT "S0"
6070 RETURN
6100 ***** CONDENSER-2 *****
6110 LPRINT "I5,0,0,3,-5,0,0,-3"
6120 LPRINT "I1,0,0,-1"
6130 LPRINT "R3,0"
6140 LPRINT "I0,1"
6150 LPRINT "R-3.8,0.6"
6160 LPRINT "Q0":LPRINT "S0"
6170 RETURN

```

***** ROOM LAYOUT *****

This program draws the outside and inside walls, doors, and windows. Type DATA statements starting at line 2000 to define the positions of the rectangles to be drawn. Lines 1000 draw the floor which defines the position of the rectangles to be drawn. Lines 1100 will write the room sections written as subroutines beginning at line 1000 at the same table size. The subroutine at line 1200 draws lines relative DRAW commands independently of the size of the room. This routine is used to draw the same size lines as the main DRAW command.

It would be a useful exercise to develop programs to draw rectangles of different sizes and shapes.



```

100 RESTORE 5010
110 GOSUB 1000
120 LPRINT "I"
130 RESTORE 2000
140 GOSUB 1000
150 LPRINT "J"
160 FOR I=10 TO 100
170 GOSUB 1200
180 LPRINT "J3"
190 LPRINT "F2,-10,-11"
200 LPRINT "F3,-2,-12,-10"
210 LPRINT "F4,-15,-15,-18"
220 LPRINT "F3,-3,-4,-10"
230 LPRINT "C3,-6,-2"
240 LPRINT "D4,-6,-2"
250 LPRINT "E5,-3,-78,-11"
260 LPRINT "F5,-12,-8,-8,-21"
270 LPRINT "G4,-39,-1,-59"
280 LPRINT "H4"
290 LPRINT "I"
300 LPRINT "J"
310 END
320 REM "XXXXX DRAW *****"
330 IF X>Y THEN READ X,Y:LPRINT "I"
340 IF X<Y THEN READ Y,X:LPRINT "J"
350 IF X=Y THEN RETURN
360 READ X$:READ Y,X1+Y1
370 LPRINT "D"2X,"Y"2Y,"M"X1"Y1"2X,"R"2Y
380 GOTO 1110

```

Note 2: In line 300, X and Y are represented by just one character each.

Line 300 goes from (0,0) to (-1,1) and back to (0,0) to

form a rectangle. Line 310 goes from (0,0) to (1,1) and back to (0,0).

The original version of this program was written in 1971 and updated to 1984. It is now in its third edition. In other words, it has been around for quite some time.

This program draws the house plans. The above drawing example contains only the outside and inside walls, doors, and windows. The DATA statements starting at line 5000 are central to the program which define the positions of the respective areas and components. Lines are drawn by program sections written as subroutines. The subroutine beginning at line 1000 draws lines by RELATIVE DRAW commands. The subroutine beginning at line 1100 is written independently of the above subroutine and draws the sliding doors, all of which are of the same type and size. The subroutine at line 1200 draws the doors and also draws the arcs indicating their swing areas by using CIRCLE commands.

It would be a useful exercise to draw detailed layout planning of household furniture, etc., in addition.

```

INT "S1"
1118 LPRINT "J8"
1128 LPRINT "H"
1138 END
5000 **** IC-1 ****
5010 LPRINT "15,0,0,-37"
7,-20,0,0,-37"
5020 LPRINT "R0,0" 1
5030 LPRINT "R10,0" 1
5040 LPRINT "R0,3" 1
5050 LPRINT "R0,32" 1
5060 LPRINT "R1,-1"
5070 FOR K=1 TO 14
5080 LPRINT "13,0,0,1"
5090 LPRINT "R0,-2.5"
5100 NEXT K
5110 LPRINT "R-15,2.5"
5120 FOR K=1 TO 14
5130 LPRINT "13,0,0,1"
5140 LPRINT "R0,2.5"
5150 NEXT K
5160 RETURN
5200 **** IC-1 ****
5210 LPRINT "16,0,0,24+6,04"
5220 LPRINT "R0,0":LPRINT "Q1"
5230 LPRINT "R4,0.5"
5240 FOR K=1 TO 18
5250 LPRINT "11,0,0,1.4+-1.0"
5260 LPRINT "R0,1"
5270 NEXT K
5280 LPRINT "R-6,-1"
5290 FOR K=1 TO 18
5300 LPRINT "1-1,0,0,-1.4+-1.0"
5310 LPRINT "R0,-1"
5320 NEXT K
5330 LPRINT "R4,7"
5340 LPRINT "S0":LPRINT "Q3":LPRINT "H"
N24LS244N"
5350 RETURN
5400 **** IC-2 ****
5410 LPRINT "16,0,0,19,46+0,0,-19"
5420 LPRINT "R3,0":LPRINT "C13,0,100"
5430 LPRINT "R4,0,4"
5440 FOR K=1 TO 8
5450 LPRINT "11,0,0,1.4,-1.0"
5460 LPRINT "R0,1"
5470 NEXT K
5480 LPRINT "R-6,-1"
INT "P4,1,2"
FOR K=1 TO 2
LPRINT "11,0,0,1.4
LPRINT "R0,1"
NEXT K
LPRINT "R-6,-1"
FOR K=1 TO 2
LPRINT "1-1,0,0,-1
LPRINT "R0,-1"
NEXT K
LPRINT "R4,4"
LPRINT "S0":LPRINT "H
RETURN
**** RESISTOR-1 ****
LPRINT "15,0,0,2,-5"
LPRINT "10,1,-1,0"
LPRINT "R6,0"
LPRINT "11,0"
LPRINT "R-5,4,-8,4
LPRINT "Q8":LPRINT "H
RETURN
**** RESISTOR-2 ****
LPRINT "12,0,0,5,-2"
LPRINT "11,0,0,-2"
LPRINT "R0,2"
LPRINT "10,2"
LPRINT "R0,4,-6,4"
LPRINT "Q3":LPRINT "H
RETURN
**** CONDENSER-1 ****
LPRINT "13,0,0,6,-5"
LPRINT "11,0,0,-1
LPRINT "R1,0"
LPRINT "18,1"
LPRINT "R0,0,4"
LPRINT "Q3":LPRINT "H
RETURN
**** CONDENSER-2 ****
LPRINT "15,0,0,3,-9,6
LPRINT "11,0,0,-1
LPRINT "R3,0"
LPRINT "18,1"
LPRINT "R-3,6,0,6"
LPRINT "Q8":LPRINT "H
RETURN

```

Character Code Table

```

10 '***** ROOM LAYOUT *****
20 LOUT &H1C,&H25
30 LPRINT "00,-10"
40 LPRINT "J0"
50 LPRINT "S2"
60 LPRINT "P ***** ROOM LAYOUT *****

*:
70 LPRINT "S1";LPRINT "F2"
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 "D2,-11,45,-11"
210 LPRINT "A3,-3,13,-10"
220 LPRINT "A14,-3,19,-10"
230 LPRINT "A33,-3,44,-10"
240 LPRINT "C36,-6,2"
250 LPRINT "C41,-6,2"
260 LPRINT "A63,-3,78,-11"
270 LPRINT "A85,-12,89.8,-21"
280 LPRINT "A49,-39,61,-59"
290 LPRINT "J0"
300 LPRINT "H"
310 END

```

Note 1: Put the following code at the beginning of your program.

```

1000 '***** RELATIVE DRAW *****
1010 READ X$
1020 IF X$="*" THEN READ X,Y;LPRINT "M" ATAQ DATA 0000
X;",";Y:GOTO 1010
1030 IF X$="E" THEN RETURN
1040 X=VAL(X$);READ Y
1050 LPRINT "I";X;"";Y
1060 GOTO 1010
1100 '***** DRAW *****
1110 READ X$
1120 IF X$="E" THEN RETURN
1130 X=VAL(X$);READ Y,X1,Y1
1140 LPRINT "D";X;"";Y;"";X1;"";Y1
1150 GOTO 1110

```

Note 2: When the graphic characters are represented in 4x6 proportions, "~~" symbol is in 5x6 proportions and the graphic characters (80H to 9FH and E0H to FEH) are in 7x7 proportions. This should be kept in mind to ensure a proper separation between various characters.

- * The graphic characters (80H to 9FH and E0H to FEH) appear slightly different from those which are printed in this manual. For their true fonts, see the character samples on the following pages.

This program draws the house plan. The above drawing example contains only the outside and inside walls, doors, and windows. The statements starting at line 5000 are central to the program which defines the door and components. Lines are drawn by program statements starting at line 1000 down lines by READ statements. Line 1200 LPRINT "D"; X; ", "; Y; ", "; X1; ", "; Y1; " is a line independent of the others. Line 1220 LPRINT "R"; X; ", "; Y; ", "; X1-0.2; ", "; Y1; ", "; X-0.2; ", "; Y1; " is a line independent of the others. Line 1230 READ R,S,E is a line independent of the others. Line 1240 LPRINT "C"; X; ", "; Y; ", "; R; ", "; S; ", " is a line independent of the others. Line 1250 RETURN is a line independent of the others.

It would be good to have a program for planning of household furniture, etc., in addition.

```

1200 **** DOOR ****
1210 READ X,Y,X1,Y1
1220 LPRINT "D"; X; ", "; Y; ", "; X1; ", "; Y1; "
1230 READ R,S,E
1240 LPRINT "C"; X; ", "; Y; ", "; R; ", "; S; ", "
1250 RETURN
5000 ***** DATA *****
5010 DATA *,0,0,47,0,0,-21,-2,0,0,19,+4
5020 DATA 3,0,0,-58,14,0,0,-2,-14,0,0,-73,9,0,0,-2
5030 DATA ,11,0,0,137
5040 DATA 5020 DATA *,60,0,32,0,0,-152,-11,0,0,2,8
5050 DATA 9,0,0,74,-4,0,0,2,4,0,0,12,-13,0,0,-14,
5060 DATA 2,0,0,14,-28,0,0,-14,-2,0,0,41,21,0,0,+2
5070 DATA ,19,0,0,-23,28,0,0,25,2,0,0,-25,13,0,0
5080 DATA 23,-3,0,0,2,3,0,0,33,-28,0,0,-9,-2,0,0,1
5090 DATA 1
5100 DATA 5030 DATA *,45,-106,0,-29,-4,0,0,-2,4,0
5110 DATA ,0,-4,2,0,0,35,-2,0
5120 DATA 5040 DATA *,45,-146,0,-6,6,0,0,2,+4,0,0
5130 DATA ,4,-2,0
5140 DATA 5050 DATA *,1,-137,0,-14,44,0,*,-49,-152
5150 DATA ,0,-2,34,0,0,2,E
5160 DATA 5060 DATA 16,-60.8,31,-60.8,31,-60,31,
5170 DATA 62,31,-61.2,45,-61.2
5180 DATA 5070 DATA 47,-74.8,61,-74.8,61,-74,61,
5190 DATA 26,61,-75.2,25,-75.2
5200 DATA 5080 DATA 46.2,-76,46.2,-91,47,-91,45,
5210 DATA 91,45.8,-91,45.8,-106
5220 DATA 5090 DATA 11,-135.8,26,-135.8,26,-135,2
5230 DATA 6,-137,26,-136.2,41,-136.2
5240 DATA 5100 DATA 51,-150.8,66,-150.8,66,+150,6
5250 DATA 6,-152,66,-151.2,81,-151.2
5260 DATA 5110 DATA 46,-141,46,-146,E
5270 DATA 5120 DATA 60,-1,53.5,10.2,13,120,180,87
5280 DATA ,36,82,-27.4,10,120,180,46,-35,58,-28,1
5290 DATA 4,30,90,75,-36,70.5,-43.8,9,180,240,86
5300 DATA 75,81.5,-82.8,9,180,240
5310 ***** DRAW *****
5320 READ X
5330 IF X="E" THEN RETURN
5340 X=VAL(X$):READ A$:X1$:
5350 LPRINT "D"; X; ", "; Y; ", "; X1; ", ";
5360 GOTO 5310

```

Character Code Table

Character Samples

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		(SP)	O	@	P	'	p			(SP)	一	タ	ミ	二	X	
1		!	1	A	Q	a	q		.		ア	チ	ム	ヒ	円	
2		"	2	B	R	b	r			「	イ	ツ	メ	丰	年	
3		#	3	C	S	c	s			」	ウ	テ	モ	ニ	月	
4		\$	4	D	T	d	t			,	エ	ト	ヤ	△	日	
5		%	5	E	U	e	u			・	オ	ナ	ユ	◀	時	
6		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	◀	分	
7		'	7	G	W	g	w			ア	キ	ヌ	ラ	◀	秒	
8		(8	H	X	h	x			イ	ク	ネ	リ	♠	〒	
9)	9	I	Y	i	y			ウ	ケ	ノ	ル	♥	市	
A	(LF)	*	:	J	Z	j	z			エ	コ	ハ	レ	◆	区	
B	(ESC)	+	;	K	[k	{			オ	サ	ヒ	ロ	♣	町	
C	(FS)	,	<	L	¥	l				ヤ	シ	フ	ワ	●	村	
D	(CR)	-	=	M]	m	}			ユ	ス	ヘ	ン	○	人	
E		.	>	N	^	n	~			ヨ	セ	ホ	.	/		
F		/	?	O	_	o				ツ	ソ	マ	.	/		

Note 1: Function codes

Any function codes other than 00H (i.e., 01H to 1FH) may be used as terminators. However, four of them are assigned the following special functions:

- (1) LF: Line feed (0AH)
Causes a CR/LF (carriage return and line feed) in character mode. This code is ignored when it immediately follows a CR (0DH).
- (2) CR: Carriage return (0DH)
Causes a CR/LF (carriage return and line feed) in character mode.
- (3) ESC: Escape (1BH)
A character mode command indicator. This code is issued immediately before each character mode command in the graphic mode.
- (4) FS: File separator (1CH)
Causes switching between the character and graphic modes.

Note 2: Whereas the normal characters are represented in 4x6 proportions, “~” symbol is in 5x6 proportions and the graphic characters (80H to 9FH and E0H to FEH) are in 7x7 proportions. This should be kept in mind to ensure a proper separation between various characters.

- * The graphic characters (80H to 9FH and E0H to FEH) appear slightly different from those which are printed in this manual. For their true fonts, see the character samples on the following pages.

Character Samples

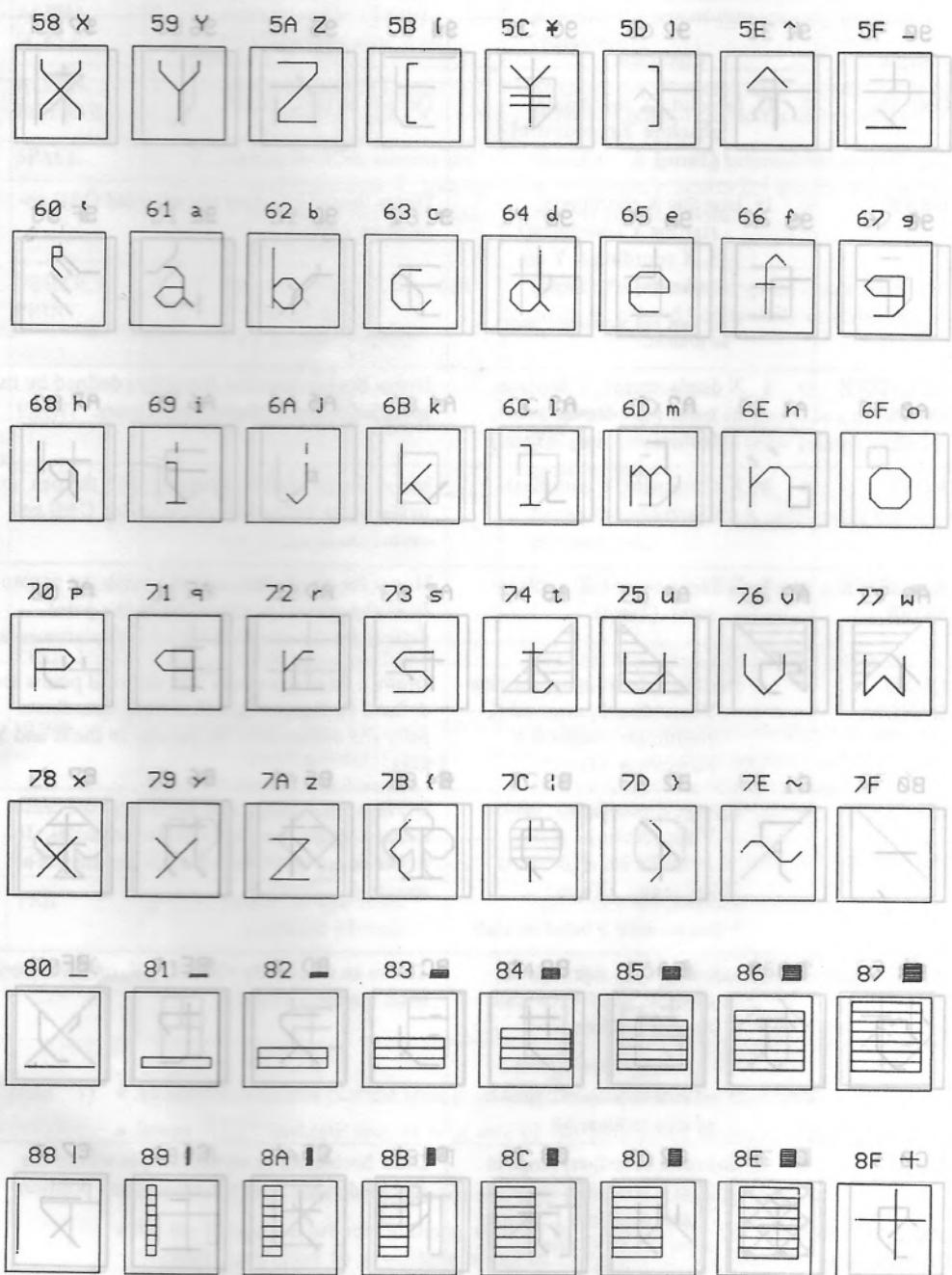
Character Codes Table

20	21 !	22 "	23 #	24 \$	25 %	26 &	27 ,
28 <	29 >	2A *	2B +	2C ,	2D -	2E .	2F /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7
38 8	39 9	3A :	3B ;	3C <	3D =	3E >	3F ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G
48 H	49 I	4A J	4B K	4C L	4D M	4E N	4F O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W

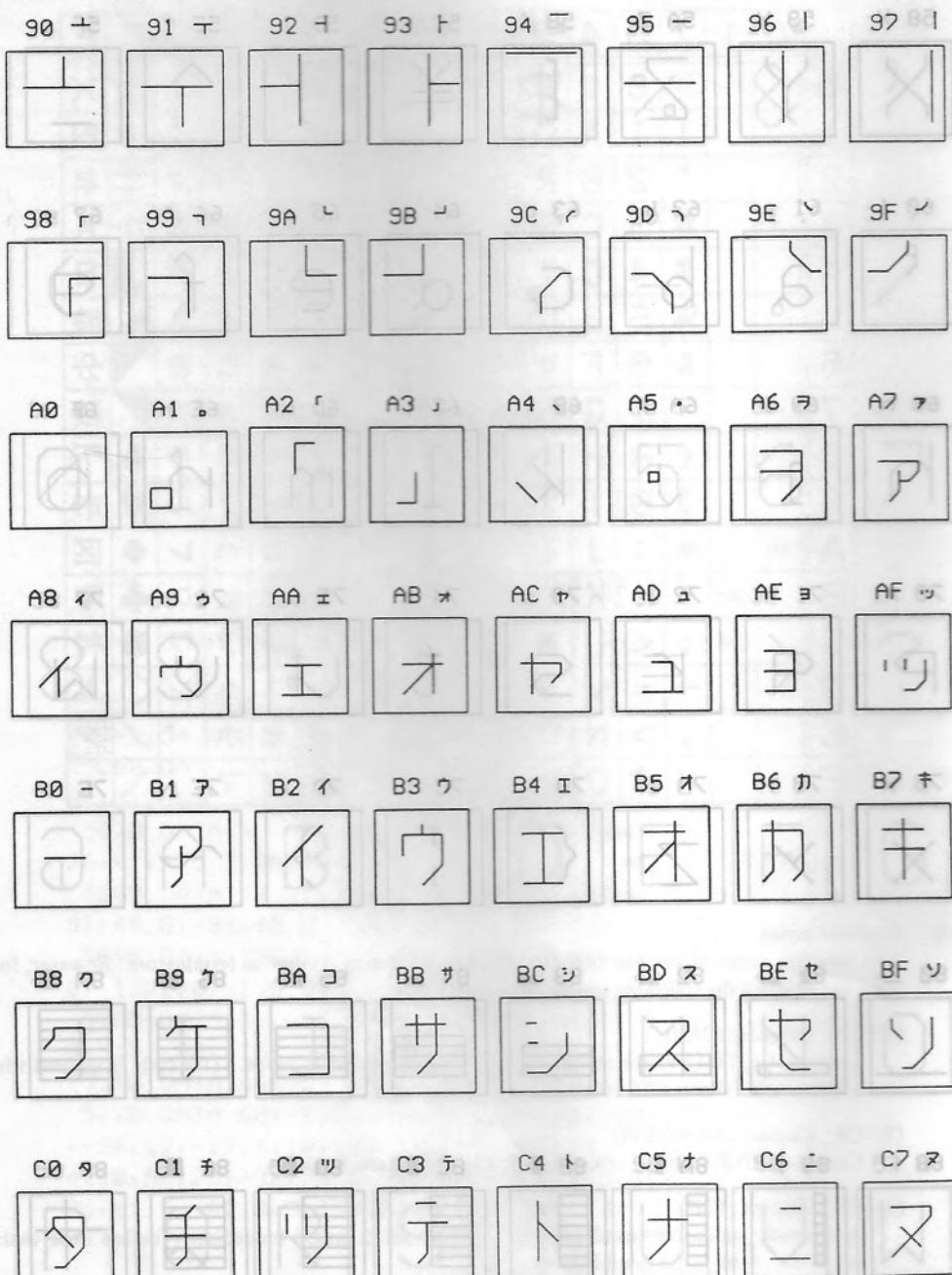
(a) RS: 160 separator (ICH)
Character mapping between the graphics and graphic mode.

Note 5: When the double character code is less than or equal to 160, symbol is in graphic mode and the graphic character (80H to FEH and FOH to FEH) is in 160 separator. This symbol is to be mapped to code 160 to ensure a better separation between antiscript characters.

* Type graphic characters (80H to 3FH and FOH to FEH) slightly different from those which are printed in this manual. For their true look, see the samples on the following pages.



Character Samples



Name	Composed				Function		Command Type	
C8 *	C9 J	CA II	CB E	CC F	CD H	CE K	CF R	
SPACE								
D0 ≈	D1 L	D2 X	D3 E	D4 4	D5 I	D6 E	D7 L	
D8 リ	D9 ル	DA ヲ	DB ロ	DC ハ	DD ナ	DE ノ	DF モ	
E0 =	E1 F	E2 ♯	E3 ♭	E4 ▲	E5 ▼	E6 ▶	E7 ▷	
E8 ♠	E9 ♥	EA ♦	EB ♣	EC ●	ED ○	EE /	EF \	
F0 X	F1 冂	F2 年	F3 月	F4 日	F5 時	F6 分	F7 秒	
F8 〒	F9 市	FA 区	FB 町	FC 村	FD 人	FE 网		

Command Table

	Name	Command	Function	
Drawing commands	ORIGIN	○ O [absolute X coordinate, absolute Y coordinate] (Term)	Defines an ORG origin.	
	DRAW	○ D [starting X coordinate, starting Y coordinate] [, X coordinate, Y coordinate] * (Term) * At least one parameter must be present.	Draws lines connecting the specified ORG coordinate pairs.	
	RELATIVE DRAW	○ I X displacement, Y displacement [, X displacement, Y displacement]* (Term)	Draws lines connecting the points defined by the specified X and Y displacement pairs.	
	MOVE	○ M X coordinate, Y coordinate (Term)	Moves the pen holder assembly with the pen up to the point defined by the specified ORG coordinates.	
	RELATIVE MOVE	○ R X displacement, Y displacement (Term)	Moves the pen holder assembly with the pen up from the current pen position to the point defined by the specified X and Y displacements.	
	QUAD-RANGLE	○ A starting X coordinate, starting Y coordinate, diagonal X coordinate, diagonal Y coordinate (Term)	Draws a rectangle whose two diagonal points are defined by the two specified ORG coordinate pairs and whose sides are parallel to the X and Y axes.	
	CIRCLE	○ C [center X coordinate, center Y coordinate] , radius [, initial arc angle, final arc angle] (Term) * final arc angle > initial arc angle	Draws a circle or circular arc around the center defined by the specified ORG coordinates. It draws an arc when the arc angle parameters are specified.	
	AXIS	○ X axis direction, size of scale division, number of scale divisions (Term) * $0 \leq \text{axis direction} < 3$ $\leqq \text{size of scale division} > 0$, number of scale divisions > 0	Draws an axis in the +Y, +X, -Y, or -X direction from the ORG origin.	
	GRID	○ G direction of stripes, range in X axis direction, range in Y axis direction [, stripe separation] (Term) * $0 \leq \text{direction of stripes} < 3$, stripe separation > 0	Draw horizontal or vertical stripes within the specified range from the current pen position.	
	LINE TYPE	○ L line type (Term) * $0 \leqq \text{line type} < 4$	Specifies the line type which is to be used by subsequent drawing commands.	
	LINE SCALE	○ B broken line coarseness (Term) * broken line coarseness $\geqq 0$	Specifies coarseness of the various broken lines.	

	Name	Command	Function	
Character and symbol printing commands	ALPHA SCALE	○ S character scale (Term) * $0 \leq$ character scale < 10	Specifies the size of subsequently printed characters.	
	ALPHA ROTATE	□ Q rotational angle (Term) * $0 \leq$ rotational angle < 4	Specifies the rotational angle orientation of subsequently printed characters and symbols.	
	SPACE	○ Z spacing between current and next characters [, spacing between current and next lines] (Term)	Specifies the spacing between the current and next characters and/or the spacing between the current and next lines.	
	VERTICAL PRINT	○ Y horizontal/vertical selection (Term) * $0 \leq$ horizontal/vertical selection < 2	Specifies whether subsequent character strings are to be printed horizontally or vertically.	
	PRINT	□ P character string (Term)	Allows the specified data such as a character string or numeric value to be printed while in graphic mode.	
	MARK	○ N mark number (Term) * $0 \leq$ mark number < 10	Draws the specified mark centered at the current pen position.	
Control commands	NEW PEN	○ J color of pen (Term) * $0 \leq$ color of pen < 4	Specifies the color of pen to be used subsequently.	
	LINE FEED	○ F number of lines (Term)	Specifies the number of lines by which the paper is to be fed.	
	HOME	○ H [distance from foremost drawing point](Term) * distance from foremost drawing point ≥ 0	Redefines the absolute coordinate system, or moves the pen holder assembly out of the drawn area for inspection of the drawing.	
	TEST	○ @ (Term)	Allows trial drawing or a check for proper inking.	
Character control commands	TAB	△ T number of character positions (Term)	Specifies a tab position.	
	FORMAT	△ ? { } (Term) 1	Specifies a formatted program listing.	

Note 1) • An asterisk indicates that the term preceding it may appear more than once.

Dimensions: • Braces “{ }” indicate that at least one of the parameters enclosed within them must be specified.

Weight: • Brackets indicate that the parameters enclosed within them may be omitted.

Supplied with: • All the parameters are real numbers with up to 3 digits to the left of the decimal point; any fractional part must be a multiple of 0.2 unless otherwise specified. I.e., the range is from -999.8 to 999.8.

Note 2) • A “○” mark indicates that the command is effective in both the character and graphic modes.

• A “△” mark indicates that the command is effective only in the character mode.

• A “□” mark indicates that the command is effective only in the graphic mode.

WARNING

FP-1011PL Mini Plotter-Printer Specifications

Printing method:	Rotary-selectable 4-colored (black, blue, green, and red) ball-point pen.
Drive mechanism:	A X-Y drum plotter
Character set:	128 JIS characters 31 ASCII lowercase characters 64 graphic characters Total: 222 characters
Number of printed Characters per line:	Max. 80 (ALPHA SCALE 0) Normal 40 (ALPHA SCALE 1) Min. 8 (ALPHA SCALE 9)
Character size:	10 different program-selectable sizes
Print speed:	Avg. 11 characters/sec. (ALPHA SCALE 1)
Drawing rate in steps:	260 steps/sec.
Step size:	X axis: - 0.2 mm, Y axis: - 0.2 mm
Plottable range:	X-axis directions: 96 mm, 480 steps Y-axis directions: Negative direction : Unlimited Positive direction : 200 mm
Paper:	Width 114.5 mm \pm 0.2 mm Max. roll diameter 70 mm Thickness 0.07 mm \pm 0.005 mm (high quality)
Ball-point pen Specifications:	Water-soluble typeink. Size 5 mm dia. x 23.3 mm Capacity 250 m. per pen Colors 4 colors: black, blue, green, red
Input power:	AC 117V, 220V, 240V \pm 10V 50 or 60 Hz
Environmental Requirements (operating):	Ambient temperature 0 ~ 40 °C Relative humidity 20 ~ 85 %
Dimensions:	225 mm (width) x 310 mm (depth) x 70 mm (height)
Weight:	2.7 kg
Supplied with:	Ball-point pens 1 each of black, blue, green, and red Paper 1 roll (50 mm dia.)
Supplies available separately:	Ball-point pen set (4 colors; BP-1) Paper roll (PRP-70) Connecting cable assembly (FP-1085PRC)

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LINE SCALE (B)	Color print specification.	30

WARNING

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (Computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with noncertified peripherals is likely to result in interference to radio and TV reception.

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." This statement will be applied only in the U.S.A.

ALPHA SCALE (S)

AXIS LINE (A)

CIRCLE (C)

DRAWING (D) 10.21 INCH IN A CIRCLE OF ONE INCH AND EIGHT HUNDRED EIGHTY-EIGHT THOUSANDTHIRTY-FOUR MILLIONTHREEHUNDREDNINETEEN INCHES ADD TO THE LENGTH OF ONE INCH.

HOME (H)

LINE FEED (P)

LIN TYPE (L)

MARK (M)

MOVE (M)

NEW (N)

ORIGIN (O)

PATENT (P)

QUADRANGLE (Q)

RELATIVE DRAW (R)

RELATIVE MOVE (R)

SPACE (S)

TAB (T)

TEST (T)

VERTICAL POINT (V)

LINE SCALE (W)

CASIO