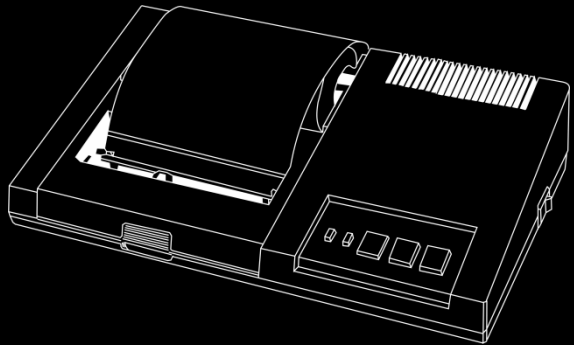


OPERATION MANUAL

DAEWOO 4 COLOR PRINTER / PLOTTER DPL - 400



- PLEASE read Through this manual before operating this device
Please Keep this manual

Thank you for selecting this high-quality and low-cost Daewoo Graphic printer/plotter DPL-400. DPL-400 having interface of MSX can be connected (ASCII code) out into MSX personal computer which has the same interface, DPL-400 not only has a function which can print the English characters, numerics out, also can draw various color models using 4 color water soluble ballpoint-pen. Please read carefully this manual first of all to take sufficient advantage of superb capability of this DPL-400.

Contents

1. Specification	2
2. Setting up.....	3
(1) Undoing the package.....	3
(2) Set up place and warning	3
(3) Names of Sections and operation	4
(4) Connecting method.....	6
(5) Roll Paper loading.....	7
(6) Pen Insertion, Removal	8
(7), Self-Test Function.....	10
3. DPL-400 Code Table.....	11
4. Mode of Operation.....	12
5. Control codes in Text mode	13
6. Graphic mode	14
7. Graphic commands Summary	27
8. Interface	29
9. Timing chart.....	31
10. Input/output signal.....	31

1. Specification

(1) Printing system

- | | |
|---|---|
| 1. Printing Plotting System | : 4 color Ballpoint Pen |
| 2. Plotting Speed Vertical and horizontal Direction | : 52mm/sec |
| 45° Diagonal Direction | : 73mm/sec |
| 3. Printing speed : 12 characters/sec (at 80 CPL) | |
| 4. Resolution | : 0.2mm/STEP |
| 5. Effective X Direction | : 96mm (480 step) |
| Plotting range Y Direction | : no Limit |
| 6. Characters When turn on the power | : 40 characters |
| per Line Programmable | : $INT(80/(n+1))$ |
| | $0 \leq n \leq 63$ |
| 7. Accuracy Repetition | : 0.2mm Max |
| Movement | : 0.3mm Max |
| Distance | : 0.5% Max (X Axis) |
| 1% Max (Y Axis) | |
| 8. Self-Test | : Print the ASCII 96 Characters with 4 colors |

(2) Ballpoint pen

- | | |
|--|----------------------|
| 1. Black, Blue, Green and Red 1 set each | |
| 2. Pen life | : approximately 250m |

(3) Paper Used

- | | |
|---------------------|---|
| 1. Quality of paper | : 45Kg/cm ² white common paper |
| 2. Width of paper : | 114.5 ± 0.2mm |
| 3. Depth | : approximately 70um |
| 4. Length | : approximately 56m |

(4) Interface : MSX PARALLEL

(5) Operating conditions.

- | | |
|---------------------------------------|------------------------|
| 1. Temperature and Humidity Range | : 5°C ~ 35°C, 10 ~ 80% |
| 2. Storage Temperature | : -40°C ~ 71°C |
| 3. Power Supply : AC Adaptor 8V, 1.2A | |

2. Setting up

(1) Undoing the Package

Open the DPL-400 Package, confirm if it has the fittings as follows.

1. Main Part (DPL-400)
2. AC Adaptor
3. Roll Paper
4. Ball-Point pen (4 color set)
5. Roll Paper Holder
6. Operation manual
7. Exclusive interface cable
8. Certification Paper

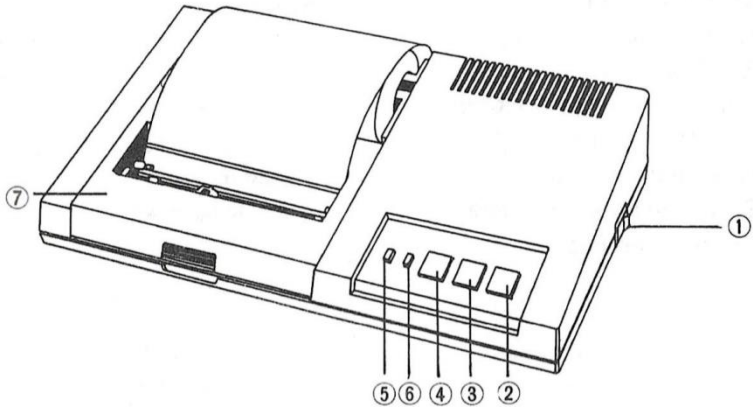
(2) Set-up Place and Warnings

Keep following items when setting up the DPL-400

1. Set up the printer on flat place
(horizontal place as much as possible)
2. Avoid prolonged exposure to the sunlight, and don't operate the printer near a heat radiating source.
3. Don't use it in too high/low Temperature or high oscillation.
4. Don't use it at the high humidity place, and at the place containing oil or iron content.
5. AC Power sources be used devided by the equipment (super motor etc.) that generates noises.

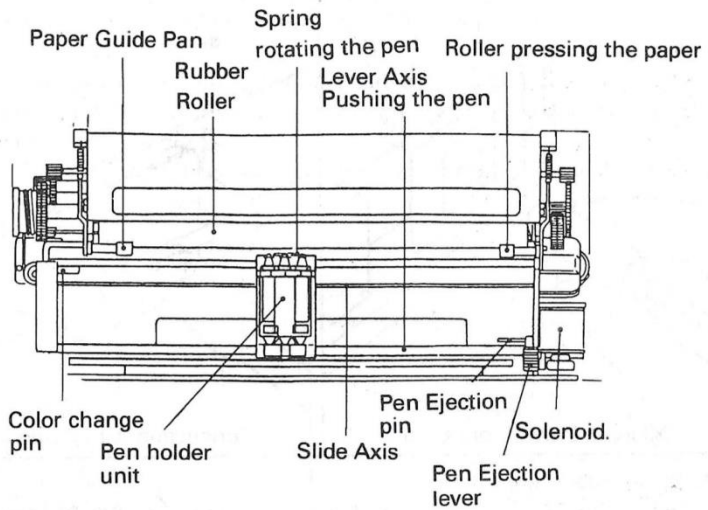
(3) Names of Sections and Operation

DPL-400 Main Part

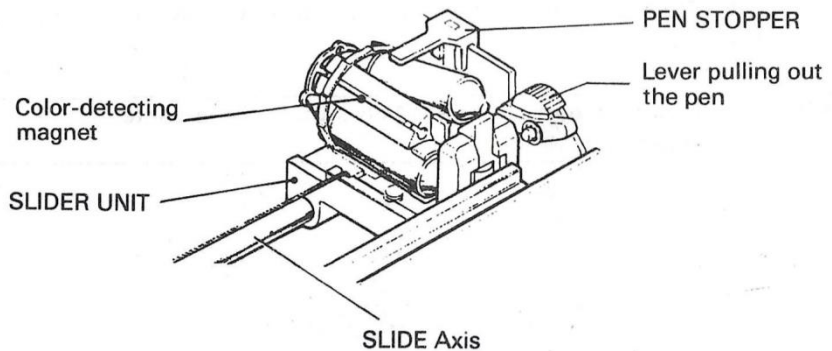


1. Power switch: Turning on this switch, then the Power direction Lamp will be on.
2. Pen change switch: If you press this switch when you insert or remove the pen, pen Holder moves to the right. Then pen change can be possible.
3. Color select switch: On pressing this switch, pen holder rotates to change the color. And on pressing the line feed switch at the same time, this will be operated as a function like "A" command word. And turning on the power pressing this switch, this switch examines the Ink condition of pen by drawing 4 rectangulars on paper in each color.
4. Line feed switch: Pressing this switch make pen Holder move to the left-outside of the print range and papers will be sent out. And turning on the power pressing this switch executes self test.
5. Power indicator: Directs the on-power situation
6. Busy Indicator: Directs the receiving-the-data situation from msx Host computer
7. Top cover: When changing the pen and the paper, change them opening this cover. Close this cover when printing.

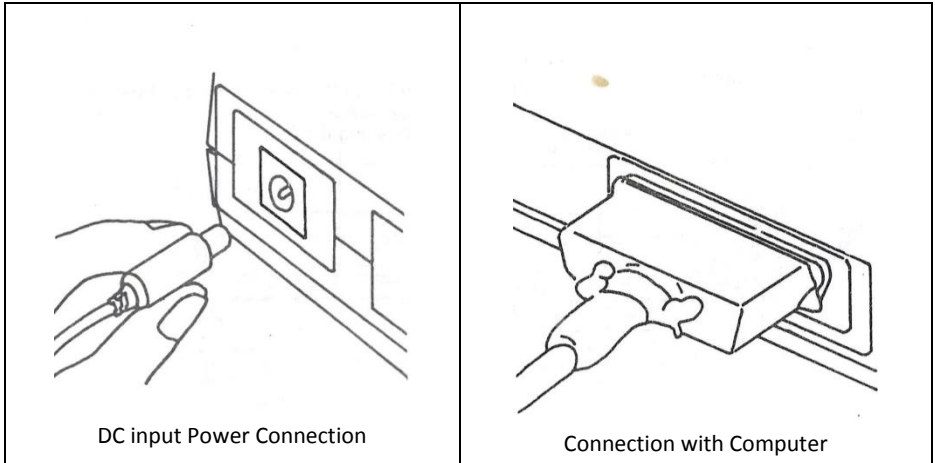
MECANISM UNIT



PEN HOLDER UNIT



(4) Connecting Method

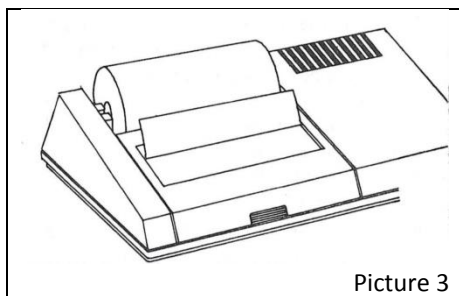
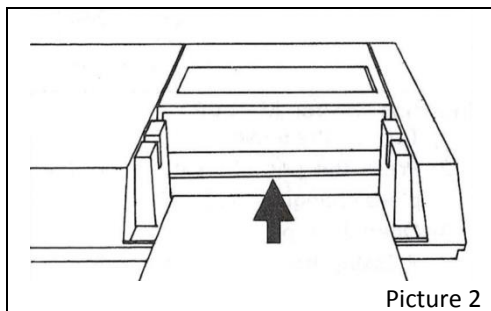
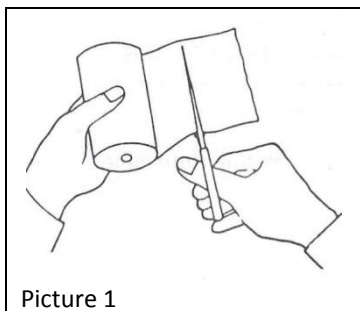


1. Power cable connection.
Insert the DC power output plug of AC adaptor to the DC power input Jack on the rear of DPL-400.
2. Connection with MSX computer.
Connect the exclusive interface cable to the interface connector on the rear of DPL-400, and the other side should be connected to the MSX computer.

Warning : Be sure to turn off the POWER switch of the printer before connection.

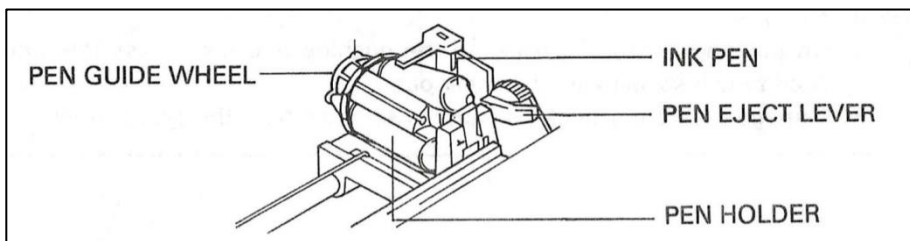
(5) Roll Paper loading

1. Exclusive Roll Paper should be used.
Size : Width of paper 114.5mm, Roll Paper Diameter : below 70mm
Quality of Paper : Common Paper, appx. 70um depth
2. Loading Order.
 - 1) With scissors, cut the end of the paper square (Cf. picture 1)
 - 2) Insert the End of the Roll Paper into the slot in the bottom of the Printer.
(Cf. picture 2)
 - 3) Insert the shaft into the roll paper and place the roll of paper into paper compartment.
 - 4) Turn Power on.
 - 5) On pushing gently the paper to the pushing direction, press the Line Feed switch so as to get the paper out.
 - 6) Manage the front side of the paper to set it out from the paper cutter.



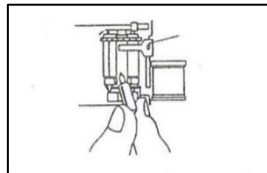
(6) Pen Insertion, Removal.

1. Use the exclusive pen.
2. Keep the Ballpoint pen covering the cap to avoid dryness when not used a long time after removing from the pen holder unit.
3. In case that characters are not well written because of dryness of pen, water the pen-end removing from the penholder unit to dissolve the pen-end dried ink, then it will be good in some extent.
4. Be careful when installing the pen to penholder.
Don't move the penholder left and right or rotate it with hand's, for the penholder is delicately made.



Inserting the pen Method

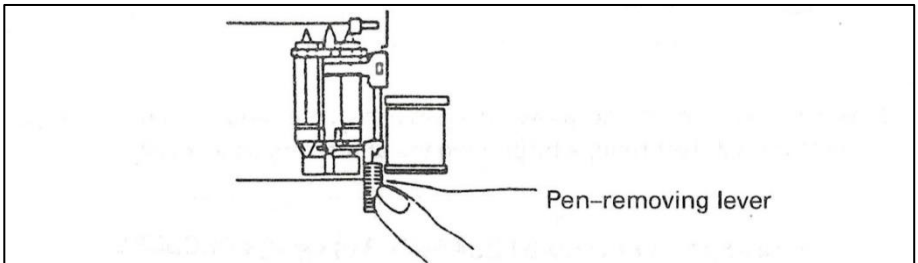
- 1) Turn on the power
- 2) Press the pen change switch, (Penholder move to the right side of the place changing the pen.)
- 3) Open the top cover.
- 4) Pressing the color select switch, accord Ballpoint pen color to insert with the color location marked on the penholder.
- 5) Now insert the pen. This time, after inserting the pen end to the roll of pen-guide-foil as picture below, push the backside of pen downwards.
- 6) In case of inserting the next pen continuously, If pressing the color select switch, penholder rotate to search for the next color location, and after that, it returns to the pen-change-location.
- 7) Close the top cover
- 8) If pressing the Line feed switch, penholder returned to the left zero-point, then the pen change situation will be released.



* Before installing a new pen, take a look at if the ink gets out well or not by rubbing the pen several times on a piece of paper.

<< Pen-removing method >>

- 1) Keep electric power on.
- 2) Remove the pen to the right pen-change-location by pressing the pen change switch.
- 3) Raise the top cover
- 4) Make the selected color to be placed upside of pen by pressing color select switch.
- 5) As a picture below, if pressing the pen-removing lever slightly, pen can be pulled out, for the backside of pen is moved up.



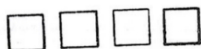
- * When inserting or pulling out a pen, don't press the penholder or pen-removing lever giving excessive power than is necessary. Excessive power can cause an error when drawing a figure.

(7) Self-Test function.

DPL-400 has the self-Test function. So you can inspect the function of a printer by practicing this function before connecting with computer.

Self-Test function has 3 types as follows.

1. When you turn on the power pressing the color select switch, printer examines the function of a printer and sufficiency of ink of a pen by drawing 4 rectangulars in each color.



2. When you turn on the power pressing the Line feed switch, the printer contains self-Test routine by printing the characters as follows.

I"#\$%&'()*+,-./0123456789:;<=>?@ABCDEFGH
IJKLMNOPQRSTUVWXYZ

3. When you turn on the power pressing the color select switch and the Line feed switch simultaneously, printer examines above two functions together. The result is as follows.



I"#\$%&'()*+,-./0123456789:;<=>?@ABCDEFGH
IJKLMNOPQRSTUVWXYZ[\] ^ _ ` a b c d e f g h i j k l m n o
p q r s t u v w x y z { | } ~

3. DPL-400 Code Table.

DPL-400, as follows, has a code Table perfectly identified with MSX Code

MSX CHARACTER SET

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		π		0	@	P	°	p	Q							
1		±	1	A	Q	a	q	♡								
2		τ	"	2	B	R	b	r	♠							
3		†	#	3	C	S	c	s	♢							
4		†	\$	4	D	T	d	t	o							
5		+	%	5	E	U	e	u	⊖							
6		†	&	6	F	V	f	v								
7		—	'	7	G	W	g	w								
8	BS	†	(	8	H	X	h	x								
9		†	)	9	I	Y	i	y								
A	LF	†	*	:	J	Z	j	z								
B	LU	†	+	;	K	[	k	{								
C		×	?	<	L	†	l	†								
D	CR	N	C	—	=	M	]	m	}							
E			°	>	N	^	n	~								
F			/	?	0		o									

BS : BACK SPACE

LF : LINE FEED

LU : REVERSE LINE FEED

DC1 : DEVICE CONTROL 1 (Text Mode)

DC2 : DEVICE CONTROL 2 (Graphic Mode)

N C : NEXT COLOR

CR : CARRIAGE RETURN

4. Mode of Operation

This printer has two modes of operation:

TEXT MODE for word processing, note writing, program listings and program output.

GRAPHIC MODE for generating graphs, pictures and other visual creations.

On initial power-up, the printer is in Text Mode.

If you want to put the printer in Graphic Mode, send a control code as follows:

LPRINT CHR\$(18) RETURN

When in Graphic Mode, to return to Text Mode, send a control code as follows:

LPRINT CHR\$(17) RETURN

5. Control Codes in TEXT MODE

BS Backspace

Code (08)H or (8)10

Function This command backspaces the pen one character at a time. This code is very useful when you need to underline.

**Example
Program**

```
10 LPRINT "A";  
20 LPRINT CHR$(8);  
30 LPRINT CHR$(95)
```

Result A

LU Reverse Line Feed

Code (0B)H or (11)10

Function This code moves the paper backwards (reverse) on line at a time. This is often used for superscripts.

**Example
Program**

```
10 LPRINT "2";  
20 LPRINT CHR$(11);  
30 LPRINT "2"
```

Result

```
  2  
2
```

NC Next Colour (Rotate Pen Holder)

Code (1D)H or (29)10

Function This command advances the Pen Holder one colour. CHR\$(29) is used to change colour from Text Mode and you must keep track of what colour is next. If you want a colour beyond the next Position, you may use the command more than once.

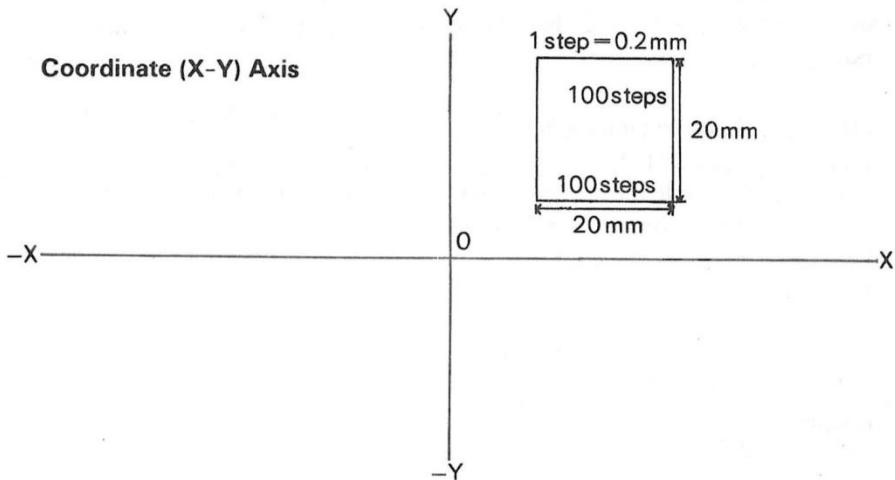
**Example
Program**

```
10 LPRINT CHR$(29)
```


6. GRAPHIC MODE AND COMMANDS

In Graphic Mode, you can move the Pen to any point on the paper and draw a line to any other point.

Think of the Pen as being on a Cartesian coordinate plane, with the X-axis running left and right (horizontal) and the Y-axis going up and down (vertical). Positive is up and to the right, negative is to the left and down the paper. See Figure below. The origin may be set anywhere on the paper. When first entering the Graphic Mode, the origin is at the left margin and under the Pen.



Generally speaking, you can tell the Pen to do two things:

MOVE (with the Pen up)

DRAW (with the Pen down)

The Pen can move (or draw) two different ways:

RELATIVE Movement (from the current Pen position to a point relative to the pen location)

ABSOLUTE Movement (from the current Pen position to a point relative to the Origin.)

There are times when a specific method will be more convenient to use.

In both horizontal and vertical directions, Pen movement is measured in "steps." Each step is 0.2mm long (about the size of a period), and there are 480 steps across the paper.

A Return to Text Mode (Reset)

A

This command moves the Pen Holder to the left margin (without drawing a line and without vertical movement) and returns the Printer to text Mode. In this case, the Origin is also re-defined (reset) as the left margin.

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "A BCDEFGHI"  
30 END
```

Result

BCDEFGHI

C Change Colour

C colour

colour is numeric expression from 0 to 3 colour is optional; if omitted, 0 is used.

If you installed the Pens according to the suggested sequence earlier, then 0 = Black, 1 = Red, 2 = Green, and 3 = Blue.

If not, then the Pen you installed in Pen Position #1 will determine the colour when you send the Colour command to the printer.

Example program

Result

10 LPRINT CHR\$(18); "C0"	BLACK
20 LPRINT "ABLACK"	
30 LPRINT CHR\$(18); "C1"	BLUE
40 LPRINT "ABLUE"	
50 LPRINT CHR\$(18); "C2"	GREEN
60 LPRINT "AGREEN"	
70 LPRINT CHR\$(18); "C3"	RED
80 LPRINT "ARED"	
90 END	

D Draw (Absolute)

D destination...

destination specifies the endpoint of the point you wish and is a X-Y coordinate. (The start point of the line is the current Pen position)
destination may be repeated to draw more than one line.

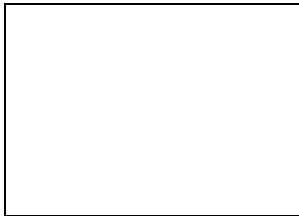
D draws a line from the current pen position to a destination point. The destination point (e.g., the point where the line ends) is in the form x,y where X and Y are a coordinate pair with respect to the Origin.

If more than one pair of coordinates are specified then the line will be continued to the second point, then to the third point, etc. X and Y are values between -999 and 999.

Example Program

```
10 LPRINT CHR$(18); "C0"  
20 LPRINT "D0,150,200,150, 200,0,0,0"  
30 LPRINT "A"  
40 END
```

Result



H Return to Origin (Home)

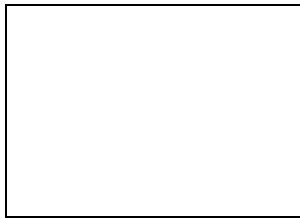
H

The H command will move the Pen to the Origin without drawing a line.

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "D0, 150,200,150"  
30 LPRINT "H";  
40 LPRINT "D200,0"  
50 LPRINT "A"  
60 END
```

Result



I Set Origin (Initialize)

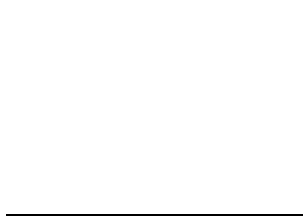
I

This command resets the Origin to the current location of the Pen point.

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "D240,0"  
30 LPRINT "I"  
40 LPRINT "D0,150"  
50 LPRINT "A";  
60 END
```

Result



J Draw (Relative)

J destination...

destination specifies the endpoint of the point you wish to draw to and is a X-Y coordinate. (The startpoint of the line is the current Pen position)
destination may be repeated to draw more than one line.

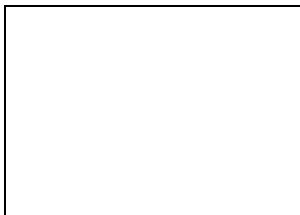
The J command draws a line from the current Pen position to an end point. The end point is determined by measuring up X units and right Y units. (or left and down if X and Y are negative).

Once the Pen is at this new position, the line can be continued to another point by supplying another pair of X-Y values. The new point is measured from the previous point, and not from the original pen position. X and Y must be in the range -999 to 999.

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "J0,150,200,0,0,-150,-200,0"  
30 LPRINT "A"  
40 END
```

Result



M Move (Absolute)

Mx,y

x specifies a position on the X-axis and is a numeric expression between-999 and 999.

y specifies a position on the Y-axis and is a numeric expression between-999 and 999.

The M command moves the Pen from its present location to the point specified by x,y without drawing a line. X and Y must be in the range-999 to 999.

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "D240,0"  
30 LPRINT "M0,-120"  
40 LPRINT "J240,0"  
50 LPRINT "A"  
60 END
```

Result

L Line Type

L type

type specifies the “type” of line you wish to draw and is numeric expression from 0 to 15. type is optional, if omitted, 0 is used. 0 is a solid line.

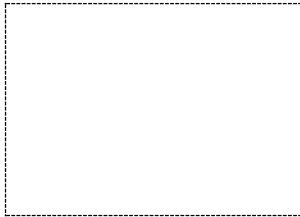
1 through 15 generate different types of dash lines, the greater the number, the farther apart the dashes are.

The L command lets you specify different line types. You can specify a solid line or 15 different types of dashed (or dotted) lines. The following table illustrates the line types available:

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "L6"  
30 LPRINT "D0, 150,200,150,200,0,0,0"  
40 LPRINT "A";  
50 END
```

Result



P Printing Text Characters

P characters

characters is either a alpha-character (A-Z) or a numeric-character.

The P command lets you print either alpha-or numeric-characters while in Graphic Mode without first returning to Text Mode.

Characters may any string of letters or numerals.

After the command is executed, the Printer will still be in Graphic Mode.

Example Program

```
10 LPRINT CHR$(18); "L0"  
20 LPRINT "D0,150,200,150,200,0,0,0"  
30 LPRINT "M60, 60"  
40 LPRINT "PGRAPHIC"  
50 LPRINT "A"  
60 END
```

Result



GRAPHIC

S Character Size

S size

size specifies the size of the printed characters and is a numeric expression between 0-63. size is optional; if omitted, 0 is used.

The S command lets you specify the size of the character drawn with the P command. Size may be a numeric expression between -63; 0 draws the smallest characters size (80 characters per line), 63 the largest (1 character per line).

Use this formula to determine the size of printed character in relation to the numeric value you specify:

$$cpl = 80 / (\text{size} + 1)$$

where cpl is the number of characters per line and size is the numeric value you specify with the S command.

Example Program

```
10 LPRINT CHR$(18);  
20 FOR I=0 TO 11  
30 LPRINT "S"+STR$(I)  
40 LPRINT "PA"  
50 NEXT I  
60 END
```

Result



Q Rotate Print Direction

Q direction

direction specifies which direction you wish printing to be and is a numeric expression from 0 to 3. direction is optional; if omitted, 0 is used.

On power-up (in Text Mode), Q0 is used.

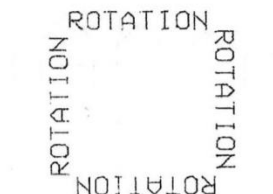
However, when you enter Graphic Mode, you can specify one of four directions for character printing. See Table below.

Direction specified	Print Direction
0	Left-to-Right
1	Top-to-Bottom
2	Right-to-Left (Upside down)
3	Bottom-to-Top

Example Program

```
10 LPRINT CHR$(18); "S1"  
20 LPRINT "M200, 0"  
30 FOR I=0 TO 3  
40 LPRINT "Q";STR$(I)  
50 LPRINT "ROTATION"  
60 NEXT I  
70 LPRINT "A"  
80 END
```

Result



R Move (Relative)

R x,y

x specifies a point on the X-axis and is a numeric expression between -999 and 999.

y specifies a point on the Y-axis and is numeric expression between -999 and 999.

This command moves the Pen from the current location to the point that is x steps away to the right (or left if x is negative) and y steps up (down if y is negative).

Example Program

```
10 LPRINT CHR$(18);  
20 LPRINT "R120,0"  
30 LPRINT "J0,-120"  
40 LPRINT "R120,0"  
50 LPRINT "J0; 120"  
60 LPRINT "A"  
70 END
```

Result



X Draw X-Y Axis

X axis, step, interval

axis specifies axis to be drawn and is numeric expression of either 1 (X-axis) or 0 (Y-axis).

step specifies the graduation (distance) between measurement marks on the axis and is a numeric expression between -999 and 999.

interval specifies the number of times the step is to be repeated and is a numeric expression between 1 and 255.

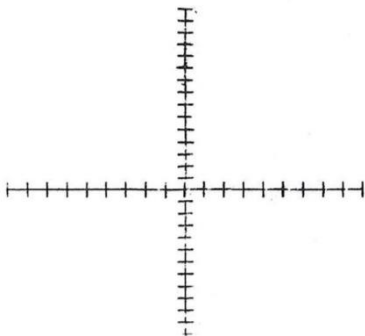
The X command lets you draw Coordinate (X-Y) Axis, divide the axis into specified units of measurements (graduations), and designate how many units of measurements are to be drawn on the axis.

If axis is 0, a vertical (Y) axis will be drawn. If axis is 1, a horizontal (X) axis will be drawn.

The axis can also be divided into segments. Since each step is 0.2mm, the exact distance between segment marks can be easily set. You may have 1 to 255 intervals, each one 1 to 999 steps long. If interval is negative, the axis will be drawn from the left, or down depending on the choice for-axis.

Example Program	Result
-----------------	--------

```
10 LPRINT CHR$(18);  
20 LPRINT "M150, -150"  
30 LPRINT "I"  
40 LPRINT "X0,13,9"  
50 LPRINT "H"  
60 LPRINT "X0, -13,9"  
70 LPRINT "H"  
80 LPRINT "X1,8, 15"  
90 LPRINT "H"  
100 LPRINT "X1, -8,15"  
110 LPRINT "H"  
120 LPRINT "A"  
130 END
```



7. Graphic Commands Summary

COMMAND	PARAMETER	FUNCTION
LINE TYPE	Lp (p=0 to 15)	Change line type from 0 to 15. p=0 : solid line p=1 - 15: dotted (dashed) line
ALL INITIALIZE	A	Reset Pen moves to left margin (without drawing) and returns to Text Mode.
HOME	H	Moves Pen to current origin without drawing line.
INITIALIZE	I	Sets new Origin (i.e., the current Pen location).
DRAW	Dx,y...xn,yn (-999 ≤ x,y ≤ 999)	Draw from current coordinate to specified destination. If there is more than one point the line continues to the second point, etc. Current Origin is used.
RELATIVE DRAW	J Δx, Δy... Δxn, Δyn (-999 ≤ Δx, Δy ≤ 999)	Draws a line from current pen location X steps to the right and Y steps up.
MOVE	-- Mx,y (-999 ≤ x,y ≤ 999)	Move (Absolute). Move without drawing to location X steps right (left) and Y steps up (down) from the present origin.
RELATIVE MOVE	RΔx,Δy (-999 ≤ Δx, Δy ≤ 999)	Move (Relative). Move without drawing from present location to location X steps to the right (left) and Y steps up (down)

COMMAND	PARAMETER	FUNCTION
COLOUR CHANGE	Cn (=0 to 3)	Change colour to specified Pen.
SCALE SET	Sn (n=0 to 63)	Specify the size of the character.
ALPHA ROTATE	Qn (=0 to 3)	Change print direction. n=0 : left-to-right (normal) n=1 : top-to-bottom n=2 : upside down n=3 : bottom-to-top
PRINT	pc1c2c3...cn (n=° °)	Print characters in Graphic Mode.
AXIS	Xp,q,r (p=0 or 1) (q=-999 to 999) (r=1 to 255)	Draw a coordinate axis from present location in direction p=0 : Y-axis p=1 : X-axis q=measurement marks on axis r=interval

8. INTERFACE

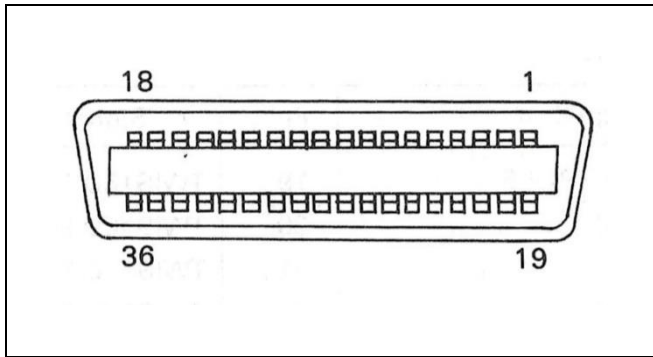
Centronics Parallel Interface

Connector signal code

Pin	Signal	Pin	Signal
1	DATA STROBE	19	TWISTED PAIR GND
2	DATA 0	20	TWISTED PAIR GND
3	DATA 1	21	TWISTED PAID GND
4	DATA 2	22	TWISTED PAID GND
5	DATA 3	23	TWISTED PAID GND
6	DATA 4	24	TWISTED PAID GND
7	DATA 5	25	TWISTED PAID GND
8	DATA 6	26	TWISTED PAID GND
9	DATA 7	27	TWISTED PAID GND
10	ACK	28	TWISTED PAID GND
11	BUSY	29	TWISTED PAID GND
12	GND	30	TWISTED PAID GND
13	NC	31	NC
14	NC	32	NC
15	NC	33	GND
16	GND	34	NC
17	NC	35	NC
18	+5V	36	NC

NC stands for No Connection

Connector pin assignment

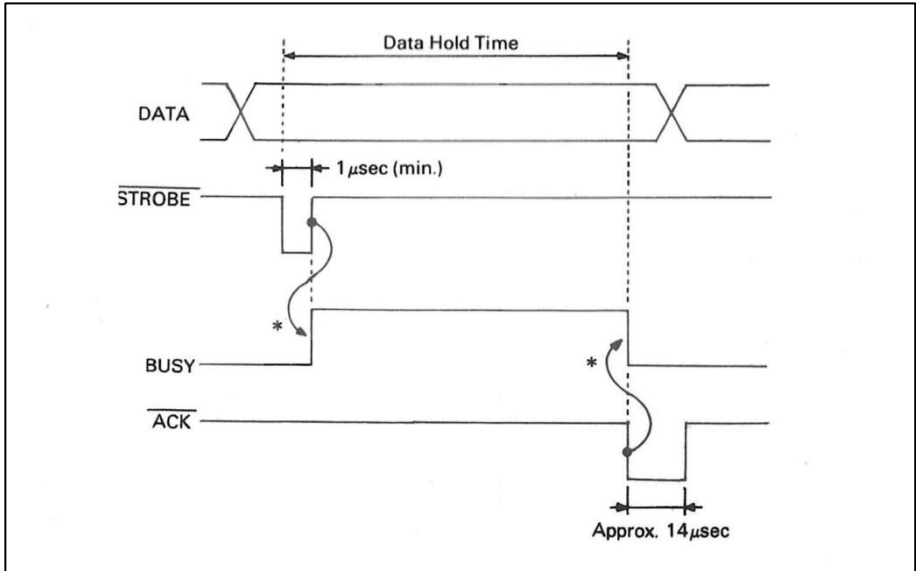


Printer side : 57LE-40360

Cable side : 57-30360

* A twisted pair cable should be used to reduce electrical noise.

9. Timing Chart



* Propagation Delay Time less than 200 usec.

Interface Levels TTL level

10. Input/Output Signal

° DATA (DO-D7)

8 bit data input signals, 'High' represents logic '1'

° STROBE

The strobe input signal is used to read in 8 bits of data. Data is read in when the signal goes 'LOW'.

° BUSY

This output signal indicates that the printer is busy and it will not accept data when it goes 'High'.

° ACKNOWLEDGE

This output 'low' signal indicates the printer can accept next data input.

