Model 682-XA
X-Y PLOTTER
Operation Manal

Hitachi Denshi, Ltd.

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1. INTRODUCTION

The Model 682 is a new X-Y plotter capable of plotting ISO A4/A3 and A/B size plots.

It has extensive applications for CAD system, business graph, data recording, educational use, etc.

Major Features

(1) High Speed Plotter
Drawing time is largely shortened with a maximum recording speed of 400 mm/s in axial direction (565 mm/s in 45° direction), an acceleration of 1G, and a writing speed of 4 characters per second.

(2) High Quality Plotter
The plotter is usable for a wide variety of applications ranging from business graph to CAD due to a distance accuracy of 0.3 %±0.2 mm, repetitive accuracy of 0.2 mm, and pen changeover accuracy of 0.2 mm.

(3) 64-K byte Communication Buffer Adopted as Standard Component
A 64-K byte communication buffer is adopted as a standard component. This allows the user to curtail the personal computer operating time necessary for plotter output.

(4) Drawing Commands Available in Conformity with HP-GL
56 Kinds of plotter drawing commands (HP-GL) prepared by Hewlett Packard and 12 kinds of davice control commands are stored in the plotter. They allow the user to utilize most of application software without any modification.

(5) Two Kinds of Interfaces Equipped as Standard Components
The GPIB interface and RS-232C (serial) interface are equipped as standard components, which make the plotter connectable with most personal computers.

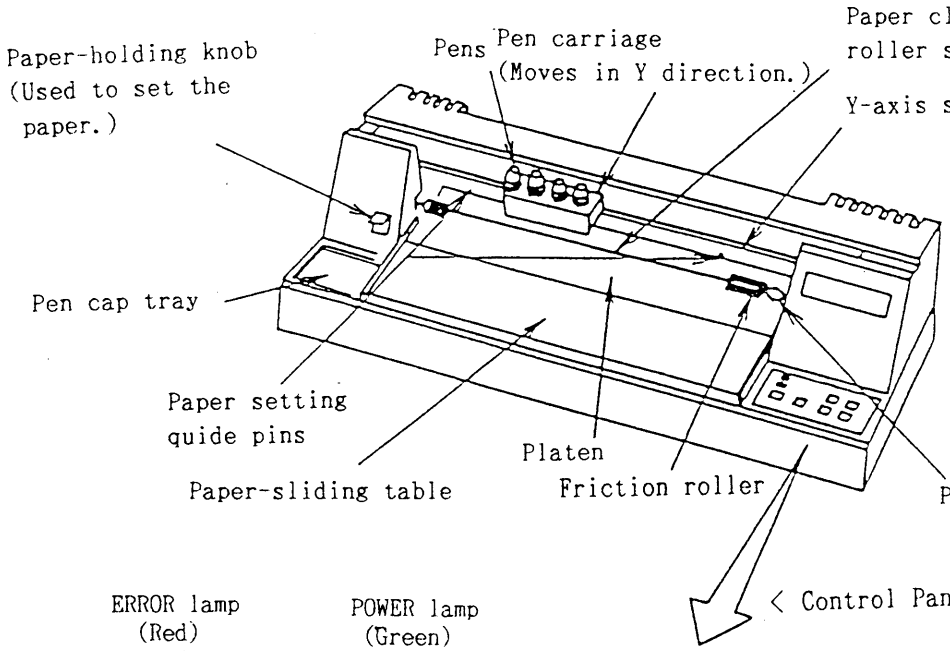
(6) Pen Soft-Landing Function
Hitachi'sunique pen soft-landing system serves to produce little sound, improve picture quality, and prolong the service life of pen.

(7) Auto pen up function
When a pen on paper is not moved for a given time

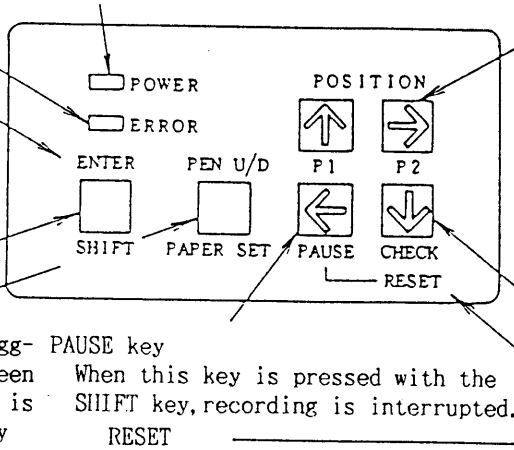
(approx. 2 seconds), the pen is automatically lifted to prevent blotting ink on paper.

(8) Auto pen return function
When a pen on peper is not moved for a given time (approx. 50 seconds), the pen is automatically returned to its home position.

2. OUTLINE AND NAMES OF PARTS



< Control Panel >



ERROR lamp (Red)

POWER lamp (Green)

Arrowhead keys
Each key moves a pen within the effective recording renge in the arrowhead direction of the pressed key.
When the SHIFT key is pressed together, P 1 or P 2 is input.

ENTER key
When this key pressed while this plotter is accepting the DP command, the digitized point is ready to deliver.

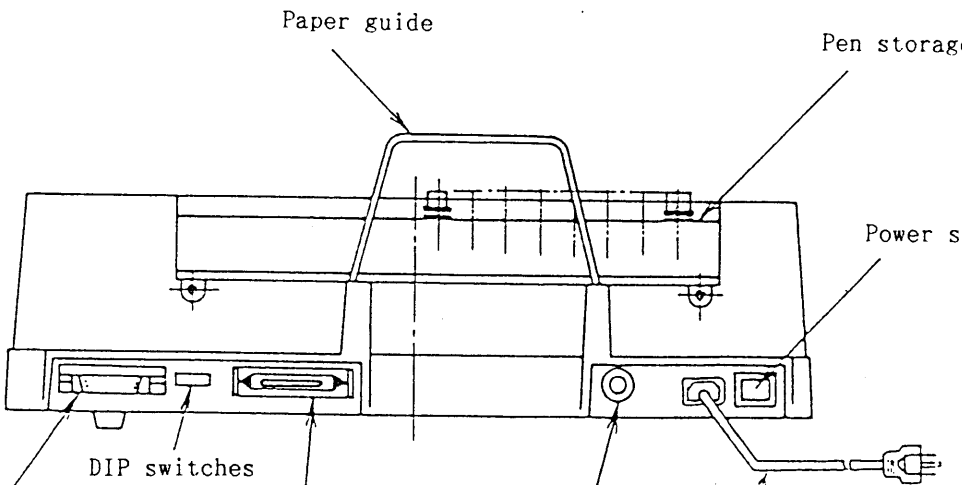
SHIFT key

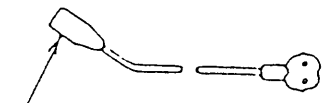
CHECK key
When this key is pressed with the CHECK key and the P 1 or P 2 key, a pen is moved to the currently set P 1 or P 2 position.

PEN UP/Down key
Each pressing this key toggles the pen position between up and down. Wehn this key is pressed with the SHIFT key immediately after paper has been set, the coordinates are reset and paper feed check is performed.

PAUSE key
When this key is pressed with the SHIFT key, recording is interrupted.

RESET
When this key is pressed in the pause mode, this plotter is placed in the state immediately after power on.





Power cable (for 220/240 V AC)

3. PREPARATION FOR DRAWING

3.1 Power Turn-on

Chck that the power switch on the rear is turned off, first, then plug the power plug to a commercial AC outl. Connect the plotter and a computer with an interface cable (GPIB or RS-232-C*). (See 3.5 Connection with computer.)
After setting a pen to the pen carriage (see 3.2 Pen setting), turn on the power. When the power in turned on again, allow one second or more.
When the POWER lamp is lit and the initial operation of the pen carriage is performed, the plotter is morm-al.

*When the RS-232-C interface is used, set the communi-cations, referring to 3.7 DIP switch setting.

3.2 Pen Setting

Set the pen in the following procedure.

(1) Turn OFF the power switch.

(2) Select the desired pen, referring to Table 3-1.

(3) Referring to Fig. 3-2, attach the pen holder to the pens.

(4) Shift the pen carriage to the left end by hand so that the pen lever moves to the righe side of the pen carriage.

(5) Take off the pen caps and insert the pens into the desired position on the carriage.(Refer to Fig.3-1.)

(6) Before removing the pen, turn OFF the power switch. For removal from the position where the pen lever is located, change the pen lever position in the same manner as step (2) above the removed pen shuld be capped immediately.

(7) When the plotter is not used for an extended period of time, remove the pen from the pen carriage and cap the pen.

(8) When the pen carriage is stained with ink, turn off the power and clean the carriage with a cotton-tipped applicator moistened with water.

3. 2. 1 Usable Pen and Their Characteristics

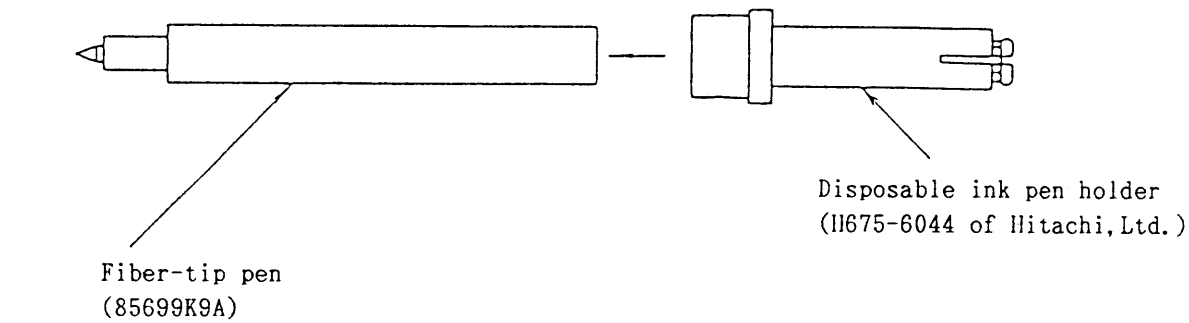
Aqua plastic pens, aqua-ink type ball-point pen, fiber-tip pens and ink pens can be used with the plotter. Table 3-1 lists usable pens.

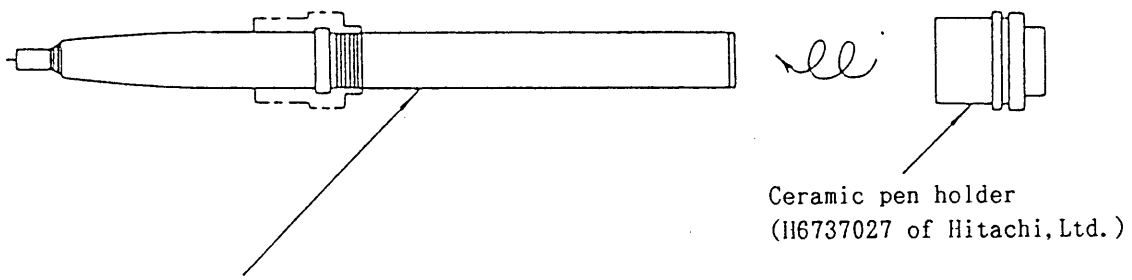
Table 3-1 Usable pens

Pen	Feature	Recommended pen	Maker
Aqua plastic pen	Though the thickness of a line becomes gradually bolder, this pen writes smooth and high speed drawingis possible.	8569949A	Hitachi Denshi
		32B23-9 ↓ Color	STAEDTLER
Aqua-ink type ball-point pen	Permits high speed recording, and suitable for preliminary drawing.	40B26-9 ↓ Color	STAEDTLER
Disposable ink pen	Ceramic type pen which is not liable to dry up, and provides long recording capacity. High speed recording available	CXP35 ↓ Thickness	Pentel
	A low-priced easy-to-use pen which provides constant drawing quality.	720B035-9 ↓ ↓ Thickness Color	STAEDTLER
Cermic pen	Plastic pen with ceramic-reinforced tip. With little variation in recording width and easy to handle. Low-priced disposable pen suitable for ordinary paper as well as standard plotter paper. (pen of 0.3 or 0.4 mm in thickness recommended)	SRM3PP ↓ Thickness	Pentel
Ink pen	Drawing pen developed for a plotter. Ensures drawing of the best quality if handled with utmost care. Suitable for final drawing. At a disadvantage in being difficult to handle and expensive. (pen of 0.3 or 0.4 mm in thickness recommended)	For paper 750PL3CF ↓ Thickness	STAEDTLER
		For film 757PL3CF ↓ Thickness	

3. 2. 2 Installation of pen holder and using considerations Install each pen holder, referring to the respective illustration.

(1) Aqua Fiber-Tip Pen



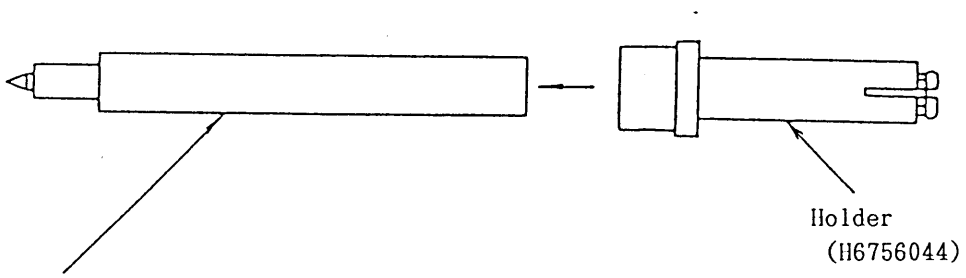


(a) The aqua fiber-tip pen can let ink out smoothly and draw at a relatively high speed.

(b) The proper pen speed is less than 200 mm/sec. When drawing on coated paper, a pen speed of up to 400 mm/sec is allowed.

(c) After use, store the pen with a cap attached.

(1) Aqua-ink type ball-point pen



Aqua-ink type ball-point pen
(40B26)

- The plotter pen speed is less than 1000mm/S.
- Though the pen point is hard to dry up, cap the pen when the pen is not used for an extended period of time.
- Store the pen, facing the pen point downward. In case the pen is stored with the pen point faced upward, recorded lines can be blurred.
- The holder (H6756044) for aqua plastic pens can be used.

(1) Disposable Ink Pen

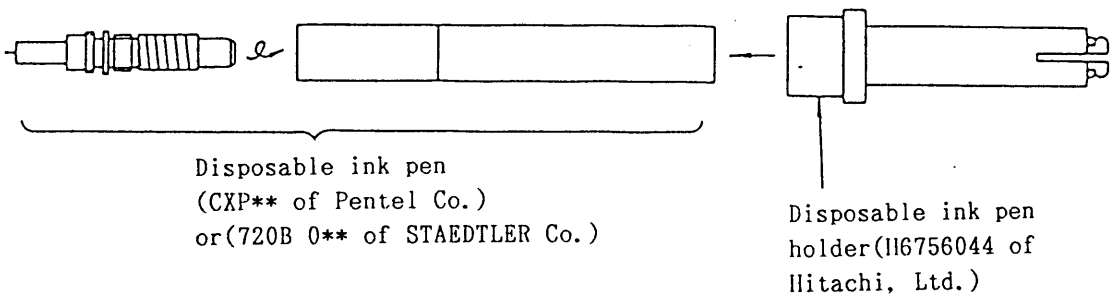


Fig. 3-2 (a)

The following disposable ink pens are available; Pentel CXP type, and STAEDTLER 720B type.

(a) CXP Type

1) The CXP type of disposable ink pen is designed based on the ceramic pen. Having a direct-inking feature, it can let ink out smoothly and draw at a higher speed than the ceramic pen. Furthermore, this type of pen is not apt to blur or dry up.

2) A pen speed of up to 400mm/sec is applicable, though depending on the kind of paper. The opimum plotter pen speed can be set by the VS command.

3) As compared with other pens, this type of pen is advantageous in that the pen tip is not liable to dry up and blot out ink. After use, wipi dust completely off the tip of pen and store it with a cap attached.

4) The common pen holder is usable for CXP and 720B types.

(b) 720B Type

1) The 720B type of displsable ink pen is designed based on the paper-specific ink pen. It can be used for drawing on plotter paper, ordinary paper, and tracing paper. Do not use this type of disposable ink pen for drawing on film sheets, as the pen tip will wear out soon.

2) A thin pen tip is liable to dry up or clog with ink. So, it is advisable to use a pen tip having a thickniss of 0.3 to 0.5 mm.
When using a thin pen tip, take utmost care in handling it.

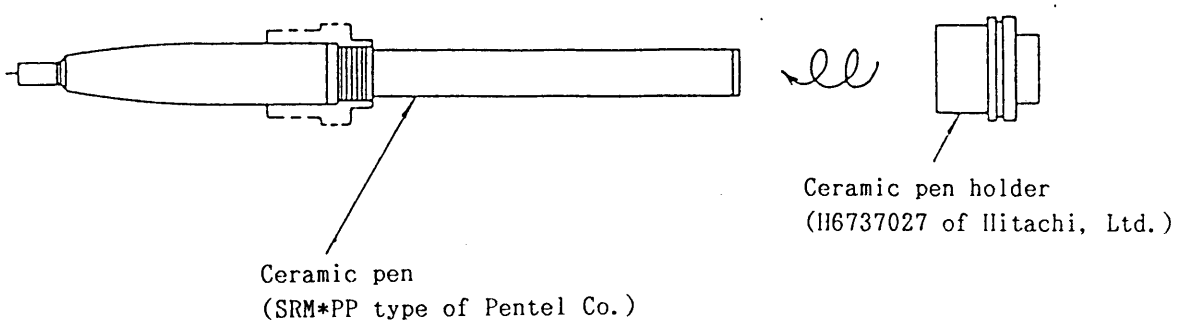
3) The proper pen speed is approx. 100 mm/sec.

4) If the pen is used where temperature varies significantly or the inkwell is held by hand for a long time, blotting of ink may take place. To avoid this, care must be taken in handling it.

5) After use, wipe dust off the tip of pen and then store it with a cap attached.

6) For storage, place the pen with its cap facing up.
When using the pen after storage, swing the pen gently so that ink will go up to its tip.
Try writing bu hand, and then mount the pen on the plotter.

(4) Ceramic Pen



(a) Use the plotting ceramic pen SRM**PP. A handwriting ceramic pen is not applicable.

Three thicknesses of pen tip are available; 0.2, 0.3, and 0.4 mm. And, four colors are available; black, red, blue, and green.

(b) The recommended pen speed is less than 200mm/sec. When the ink nearly runs out, a line becomes faint. In this case, set the plotter pen speed slower by the VS command.

(c) At the end of daily operation, remove the ceramic pens from the plotter and store them with caps attached.
Remember that the ceramic pen having 0.2-mm thickness is ape to dry up.

(d) The ceramic pen holder (H6737027) is also applicable to the ball-point pen of MG*PP type and fiber-tip pen of (H6737602) type.

(5) Ink Pen

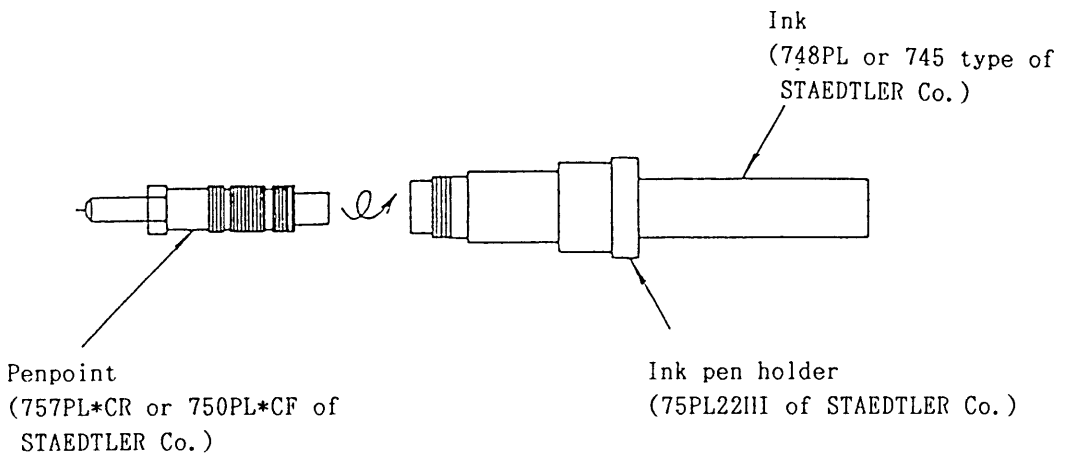


Fig. 3－2 (c)

(a) Two types of pen tips are available; 757PL*CF, and 750PL*CF.
The former type is used for drawing on fil, and the latter type is for drawing on paper. When drawing on film sheets, be sure to use the film-specific pen tip. Never use the paper-specific pen tip for this purpose. If the paper-specific pen tip is used for drawing on film sheets, it will wear out soon.
For writing on plotter paper, ordinary peper and tracing paper, use the paper-specific pen tip. Although the film-specific pen tip is also applicable for these kinds of paper, clogging with ink may result if the surface of paper is fluffy. It is therefore recommended to use the paper-specific pen tip for recording on other than film sheets.

(b) A thin pen tip is liable to dry up or clog with ink.
So, it is advisable to use a pen tip having a thickness of 0.3 to 0.5 mm.
When using a thin pen tip, exercise extreme care in handling it.

(c) The recommended ink is STAEDTLER 748PL or 745. With this ink, high-contrase drawing will be attained.

(d) The proper pen speed is approx. 100 mm/sec, though depending on the kind of ink, pen tip and paper.

(e) If the pen is used where temperature varies significantly or the inkwell is held bu hand for a long time, blotting of ink may take place. To avoid

this, care must be taken in handling it.

(f) Before loading the pen on the plotter, wipe residual ink off its tip.

(g) After use, wipi dust off the tip of pen and then store it with a cap attached.

(h) For storage, place the pen with its cap facing up. When using the pen after storage, swing the pen gently so that ink will go up to its tip. Try writing by hand, and then mount the pen on the plotter.

(i) If the pen will be left unused for more than a few days, extract ink from the pen completely, wash it with water and dry it before storing.
Note that the pen may blot out ink if it is wet with water.

(j) If the pen tip dries up and clogs, immerse it in water containing cleaning solution (e. g. STAEDTLER 746) for 10 to 20 minutes or clean it using an ultrasonic cleaner.
If the clogging with ink cannot be removed yet, consult STAEDTLER. Remomber that the pen tip may become unusable if it is disassembled by the user.

3. 2. 3 Relationship between pens and recording paper

Table 3－2 lists the relationship between pens and recording paper.

If the combination of a pen recording paper is not good, the life of the pen is shortened, and good drawing is not obtained. Use care for their combination.

Table 3-2 Relationship between pens and recording paper

Pen / Recording paper	Record characteristic						
	Aqua plastic pen	Aqua-ink type ball-point pen	Disposable ink pen		Ceramic pen	Ink pen	
			CXP type	720B type		For peper	For film
Plotter paper	○	○	◎	◎	○	◎	○
Ordinary paper	○	○	○	○	○	○	△
Coated paper	◎	○	△	×	△	×	×
Tracing paper	○	△	○	◎	○	◎	○
Polyester film	×	×	○	×	△	×	◎
OHP film(For aqua-type ink pen)	○	×	△	×	△	×	△
OHP film(For oil-type ink pen)	×	×	×	×	×	×	×

◎ : Excellent, ○ : Good, △ : Not good, × : Bad

3. 2. 4 Consumables

Table 3-3 lists the consumables. Wthn placing an order. describe the type designation of the desired item.

Table 3-3 Consumables

(1. Pen)

Pen	Normal size	Type	Maker	Remark	Holder
Plastic pen (Aqua-ink type)	0.3	8569949A	Hitachi Denshi	4 colors	
		32B23	STAEDTLER	4 colors	
Boll-point pen (Aqua-type pen)	0.3	40B26	STAEDTLER	4 colors	
Disposable ink pen	0.25	CXP25	Pentel	4 colors	
	0.35	CXP35			
	0.5	CXP50			H6756044
	0.7	CXP70			
	0.25	720B025	STAEDTLER	4 colors	
	0.35	720B035			
	0.5	720B050			
	0.7	720B070			
		720B0009		Mix of normal sizes, black	
Ceramic pen	0.2	SRM02PP	Pentel	4 colors	H6737027
	0.3	SRM03PP			
	0.4	SRM04PP			
Ink pen	0.25	757PL2CF	STAEDTLER	For polyester film	75PL22H1
	0.35	757PL3CF			
	0.5	757PL5CF			
	0.25	750PL2CF		For paper	
	0.35	750PL3CF			
	0.5	750PL5CF			

Table 3－3 Consumables (Continued)

(2. Pen holder)

Pen holder	Type	Usable pen	Maker	Remark
Disposable ink pen holder	H6756044	STEADTLER 720B0**	Hitachi Denshi	4 pieces Usable commonly for ball-point pen and plastic pen
		STEADTLER 32B23		
		STEADTLER 40B26		
		Pentel CXP**		
		Pentel RXP06		
Cermaic pen holder	H6737027	Hitachi H6737602	Hitachi Denshi	4 pieces Usable commonly for ball-point pen and fiber-tip pen
		Pentel SRM02PP～02PP		
		Pentel MG6PP, MG8PP		
Ink pen holder	75PL22H1	STEADTLER marsplot	STEADTLER	

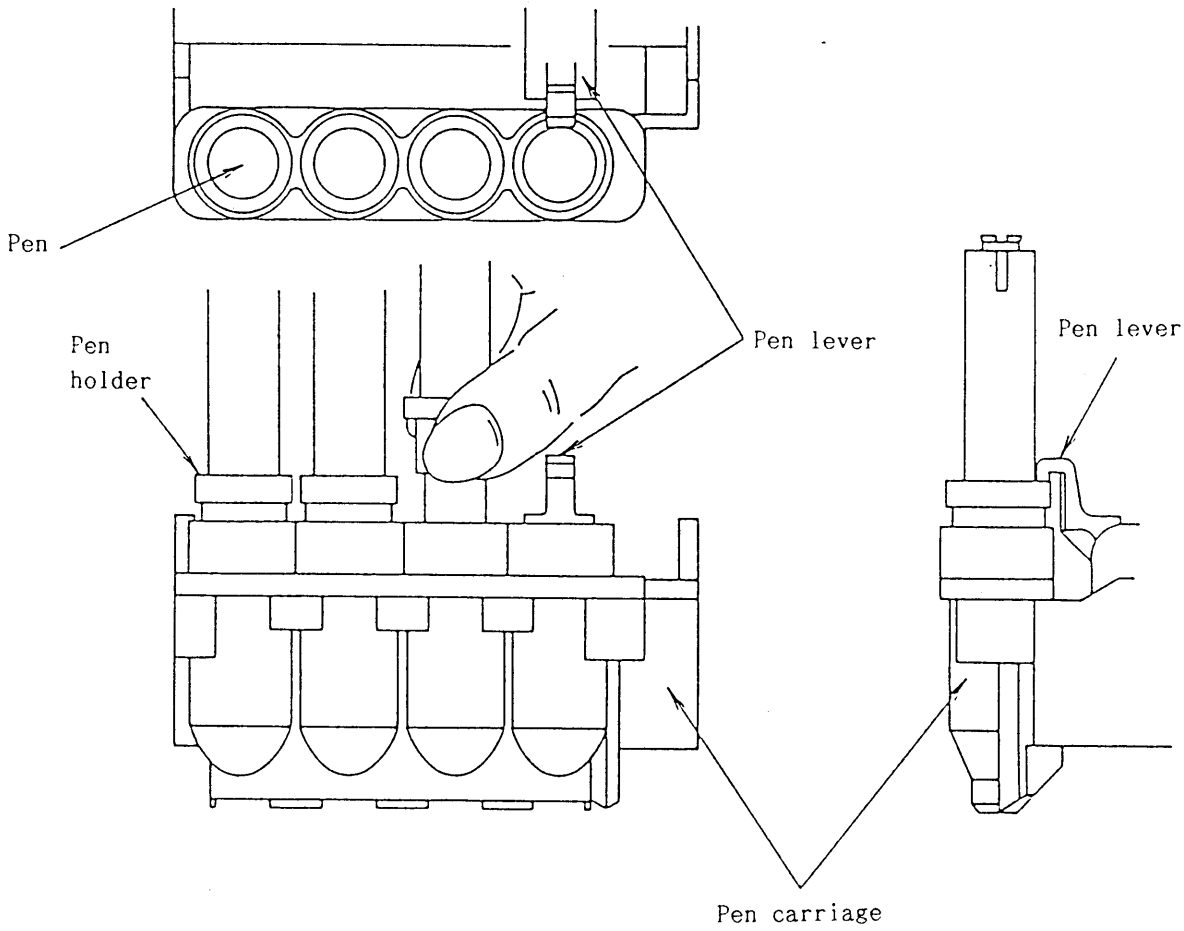


Fig. 3-1 Pen Setting

3. 3 Paper Setting

(1) Setting procedure is different according to the size of paper.

(2) Lift the paper-holding knob to load the paper (Fig. 3-2).

(3) Move the paper clamp roller to the right for ISO A3 or A4 size paper, and to the conter of movable width for ANSI A or B size paper (Fig. 3-3).

(4) Set the paper on the platen by aligning the paper top with the paper setting guide pins. When the paper is A3 of B size, the paper top is the short side. When the paper is A4 or A size, the paper top is the long (Fig. 3-3). Take care that the paper does not wrinkle or loosen.

(5) Push down the paper-holding knob, and the paper is held. The paper setting is completed.

(6) Press the PAPER SET key to initialize the paper.

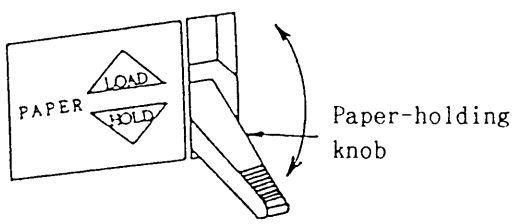
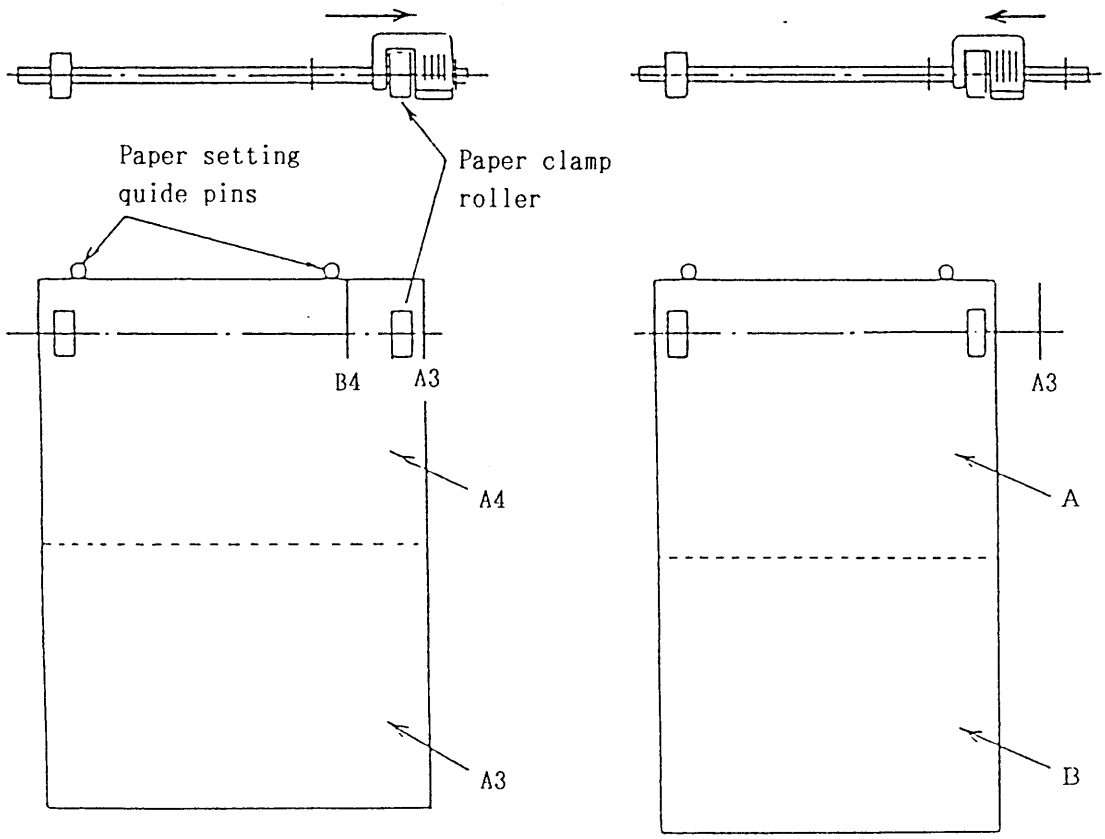


Fig. 3-2 Paper-holding Knob

- Use ordinary paper or paper which is hard to be bluured by ink. Do not use paper whose thickness is 0.5 mm or less or excessively thick.
- Prior to setting unpacked unpacked paper, allow them to be left in the room temperature for more than 20 minutes.
- Use care for humidity, because it is possible that thin paper like tracing paper cannot be fed correctly in highly humid environment.



(a) ISO A3 or A4
Size Paper

(b) ANSI A or B
Size Paper

Fig. 3－3 Paper Setting

3. 4 Self-Test

Next, Self-test patterns must be drawn for an operational check of drawing commands. Turn the power OFF first and then make sure the chart is set, and pens (4 pcs) are provided.

Then, turn the power ON while depressing position switches [←] and [→] (Fig. 3-6) followed by depressing position switches for about 5 seconds, and the plotter draw self-test patterns shown in Fig. 3-7.

Drawings are not made by depressing the position switch after turning the power ON.

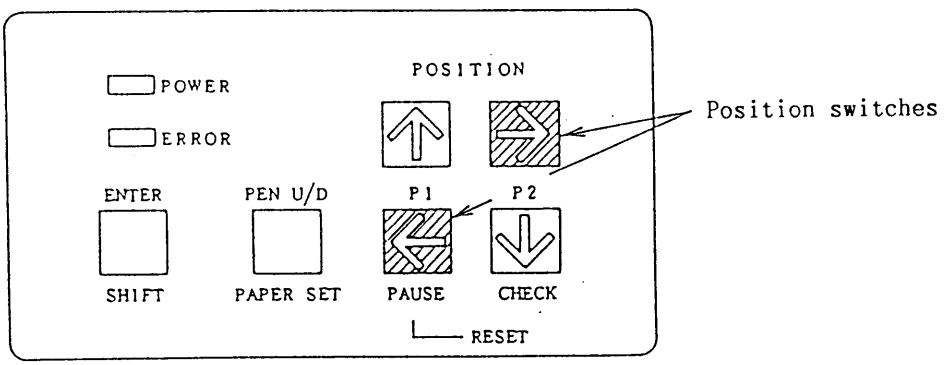


Fig. 3-6 Control Panel

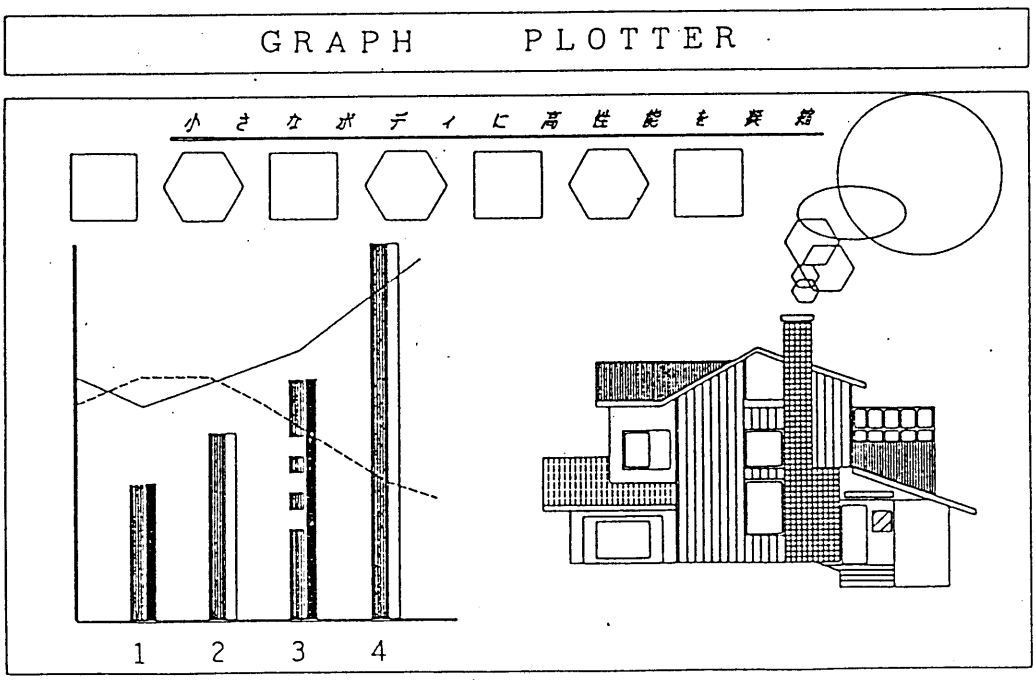


Fig. 3-7 Self-Test Patterns

3.5 Connection with Computer

The plotter shuld be connected with a computer through the RS-232C (serial) interface or the Centronix (8-bit parallel) interface.

Here, explanation will be made on how to connect the plotter with the IBM personal computer PC/AT series.

3.5.1 RS-232C Interface

(1) Turn ON the power switch of the computer to put on the MS-DOS, and then activate the BASIC.

(2) Turn ON the power switch of the plotter.

(3) Enter and then execute the following program.

```
10 OPEN "COM1:4800, N8, 2, CS65535, DS65535" AS #1
20 PRINT #1, "SP1:PU;PA1000, 1000;CI1000;" :
30 CLOSE : END
```

The plotter is connected normally with the computer if a circle with a radius of 2.5 cm is draw at the left bottom of paper.
For details of the OPEN command, refer to the instruction manual prepared for BASIC.

3.5.2 GPIB interface

(1) Turn on the computer, and activate the BASIC after activating MS-DOS.

(2) Turn on the plotter.

(3) Input the following programs, and execute them.

```
10 GPA=5 :NDELM=0
20 ISET IFC
30 FOR I=0 TO 10 :NEXT I
40 CMD DELIM=NDELM
50 PRINT@ GPA; "SP1;PU;PA1000, 1000;CI1000;"
60 END
```

Confirmation of connection ends when a circle having a diameter of 5cm is drawn at the bottom left of the paper.

Note: The above programs are examples of the BASIC for PC-9801.

3. 6 Function of Control Panel

Figure 3-6 shows the control panel.

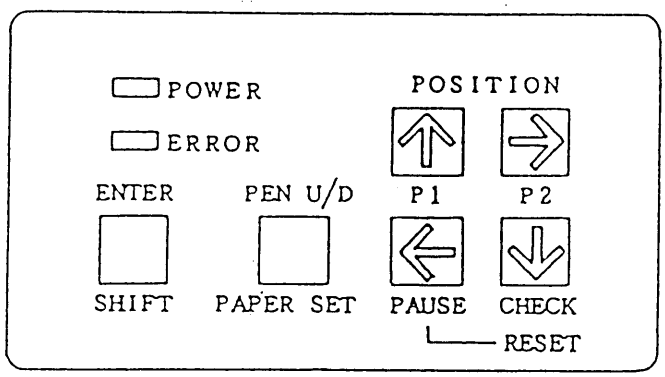


Fig. 3-6 Control Panel

(1) Control Keys

The control panel is provided with six keys. Each Key has functions which are selected by operating it with the [SHIFT] key pressed.

Position Keys

[↑], [→], [↓], [←] ..... Moves the pen in the arrow direction versus the paper.

[PEN U/D] ..... Moves the pen up or down. (The pen automatically move up after about 2 seconds to prevent blurring on the paper.)

[ENTER] ..... Used for setting of P1 and P2 and for coordinate input when degitizing. (Refer to the description of the DP command.)

[ENTER] + [P1], [P2] ..... Sets the present pen position as the new P1 or P2 point.

[SHIFT] + [CHECK] +

[P1], [P2] ..... By pressing the [P1] or [P2] key following the [SHIFT] and [CHECK] key, the pen shifts to the set P1 or P2 point to indicate its coordinate position.

PAUSE

(SHIFT + ←) ..... Used for temporarily interrupting the drawing. By pressing this key, the paper is fed toward you and stops. Even in this status, the plotter accepts input data until the buffer memor is full. By pressing the PAUSE key again, drawing restarts.

PAPER SET

(SHIFT + PEN U/D) ..... By pressing this key with a paper newly set, origin initialization is performed for the paper. When the key is pressed in the PAUSE status, the pen is moved to the coordinates before the abovementioned status and drawing is continued after the above initialization.

RESET ..... Returns the plotter settings and parameters to the status when power in turned on. (After setting the PAUSE stutus, press the position key ↓ .)

<Special Functions>

(a) ↓ + Power ON ..... Upon turning on power while pressing the position key ↓ , the pen spped is set to 10 cm/sec.

(b) ← + Power ON ..... Upon turning on power while pressing the position key ← , the coordinate axes are rotated as much as 90°. (The X and Y axes are transposed. The same function is obtained by executing the RO90;IP;IW; command.)

(c) [↓] + [←] +

Power ON ..... Upon turning on power while pressing the position key ↓ and ←, the pen speed is set to 10 cm/sec and the coordinate system is rotated as much as 90°.

(2) Indicator Lamps

[POWER] (green) ..... Lights up when power is turned on.

[ERROR] (red) ..... Lights up upon the occurrence of a command error, hardware error in the plotter or communication error (discrepancy in baud rate and other conditions).
(Execution of the OE, [ESC]. Eor IN command causes this lamp to go off.)
Flashes upon execution of the DP command to indicate that the digitized point input mode has been established.

3. 7 DIP switch setting

Paper size, interface conditions, and rotation mode of coordinates can be set by the DIP switch on the rear. After setting the DIP switchi, turn on the power again or reset the plotter from the panel.

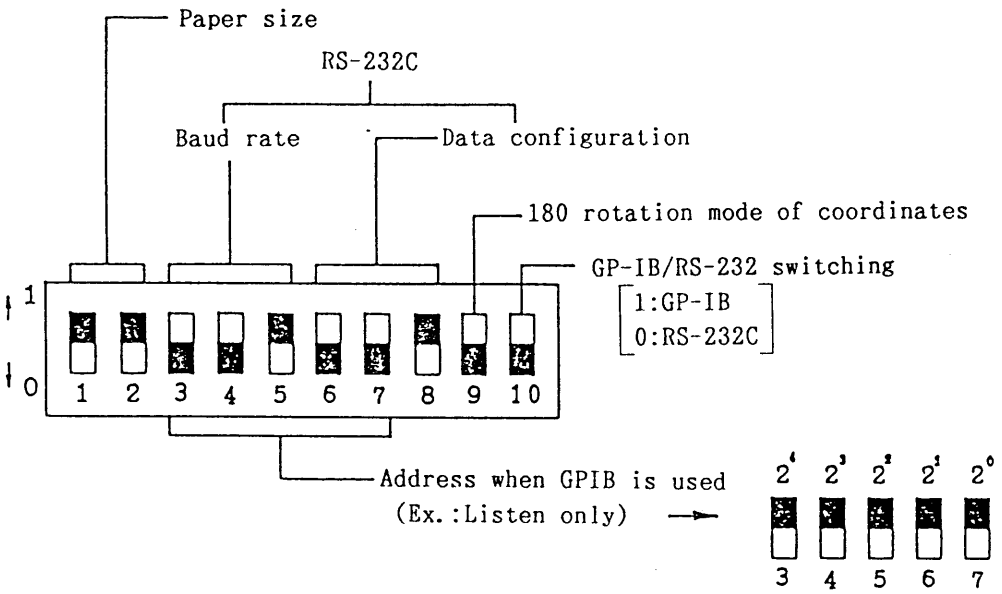


Fig. 3— DIP switch

(1) Paper Size Selection

Paper size is selected by DIP switch no.1 and no.2.

Switch		Paper Size	Coordinate Range		P1	P2
No. 1	No. 2		X Axis	Y Axis	p_1x, p_1y	p_2x, p_2y
0	0	ANSI A (279.4×215.9 mm)	0～10376 (259.4 mm)	0～7996 (199.9 mm)	250, 596	10250, 7796
1	0	ANSI B (431.8×279.4 mm)	0～16640 (416 mm)	0～10376 (259.4 mm)	522, 259	15722, 10259
0	1	ISO A4 (297×210 mm)	0～11080 (277 mm)	0～7760 (194 mm)	603, 521	10603, 7721
1	1	ISO A3 (420×297 mm)	0～16160 (404 mm)	0～11080 (277 mm)	170, 602	15370, 10602

(Note) 1plotter unit=0.025 mm

(2) Baud Rate Selection (only for RS-232C)

Baud rate is selected on the basis of the RS-232C serial interface by DIP switch no. 3 through no. 5.

NO. 3	NO. 4	NO. 5	Baud Rate
0	0	0	300 bauds
1	0	0	600 bauds
0	1	0	1200 bauds
1	1	0	2400 bauds
0	0	1	4800 bauds
1	0	1	9600 bauds

(3) Data Format Selection (only for RS-232C)

Data format is selected on the basis of the RS-232C serial interface by DIP switch no. 6 through no. 8.

NO. 6	NO. 7	NO. 8	Start Bit	Data Bit	Parity Bit	Stop Bit
0	0	0	1	7	Even	2
1	0	0	1	7	Odd	2
0	1	0	1	7	Even	1
1	1	0	1	7	Odd	1
0	0	1	1	8	None	2
1	0	1	1	8	None	1
0	1	1	1	8	Even	1
1	1	1	1	8	Odd	1

(4) GIPB interface

(a) Address setting

Set the address of the plotter corresponding to the address set at the host.

Set the DIP switchi, referring to Table 3-7.

Table 3-7 Address when GPIB is used

DIP switch					Address
No.3	No.4	No.5	No.6	No.7	
0	0	0	0	0	0
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	10
0	1	0	1	1	11
0	1	1	0	0	12
0	1	1	0	1	13
0	1	1	1	0	14
0	1	1	1	1	15
1	0	0	0	0	16
1	0	0	0	1	17
1	0	0	1	0	18
1	0	0	1	1	19
1	0	1	0	0	20
1	0	1	0	1	21
1	0	1	1	0	22
1	0	1	1	1	23
1	1	0	0	0	24
1	1	0	0	1	25
1	1	0	1	0	26
1	1	0	1	1	27
1	1	1	0	0	28
1	1	1	0	1	29
1	1	1	1	0	30
1	1	1	1	1	Listen only

(5) Rotation Mode Selection

When drawiing a diagram of maximum plotting size without rotating the coordinaates, the binding margin of the paper may come to the right side when using ISO A3 or ANSI B size paper. In such case, the binding margin can be brought to the left side by rotating the coordinates 180°.

DIP Switch No. 9	Coordinates 180° Rotation Mode
0	Invalid
1	Valid

(6) Interface setting

Set the communication interface. At first, select RS-232-C or GPIB.

Table 3-9 Communication interface setting

DIP switchi No. 10	Communication interface
0	RS-232-C
1	GP-IB

(7) DIP switch setting at factory

The DIP switch is set at factory as shown in Fig. 3-8.

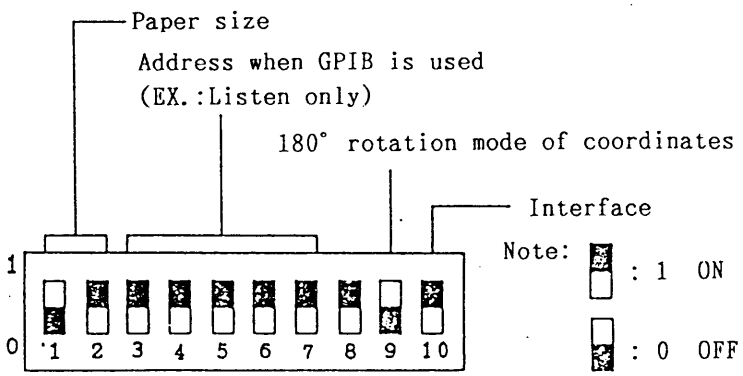


Fig. 3-8 DIP swicth

Paper size: JIS A4
GPIB setting: Listen only
180° rotation of coordinates: Invalid
Interface: GPIB

3. 8 Print Mode

(1) Print Mode Setting

Set the plotter into a print mode in the following manner. First, set the chart and pen 1 (with the print mode, only pen no. 1 is used).
Next, make sure that the power is OFF, and then turn the power switch ON while depressing the position switches (for X-axis direction), [↑] and [↓] (Fig. 3-9). Then the pen carriage moves up to the top position and stops there.

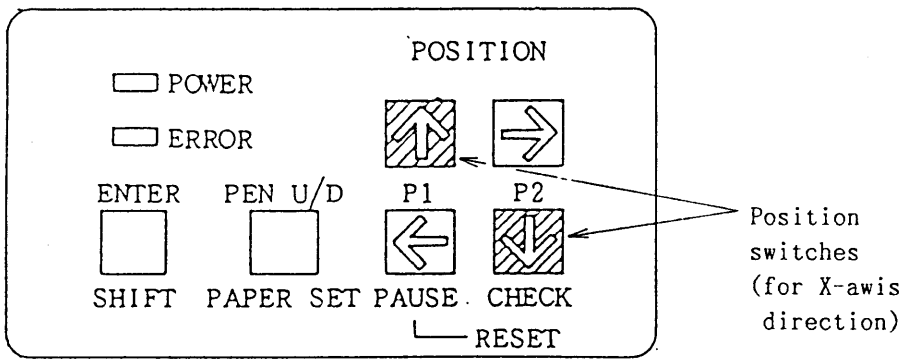


Fig. 3-9 Control Panel

(2) Print Mode Definitions

As the ASCII code is keyed in, the pen begins printing the keyed-in characters from the top left in the effective drawing area. Ehen any code not contained in the ASCII code table is keyed in, it is ignored. A new line is started when a terminator LF (line feed) is keyed in and the print is continued. If the next data are not keyed in within 2 seconds after the line feed, however, the pen carriage goes back to its original position. Afterwards when a character code is keyed in, the pen resumes printing from the position of the new line.
The size of printed characters is 1.75 mm wide by 2.55 high. And the direction of character printing is parallel with the paper moving direction.
When the paper size set with the DIP switch at the rear of the plotter is A of B, up to 48 lines of characters, with 68 characters per line, can be printed. When A4 or A3 size is set, up to 52 lines containing 64 characters each can be printed. When the printing

of the 48 or 52 lines is frnished, the A or A4 size paper in fed one page and then the pen goes to the top right and stops.
So, with the A or A4 size the paper comes out at the top, and it is necessary to set the next paper in place. But with B or A3 size the pen waits for writing at the lower half of the remaining blank space of the paper. If it is necessary to keep on printing further, depress any one of position switches ← → ↑ ↓ and the pen carriage once again begins printing from the top of the page.

Table 3-3 gives the number of pages and characters per page for each paper size.

Table 3-3 Number of Characters Printed

Paper Size	No. of Paages	Characters/Page
ANSI A	1	68 characters×48 lines
ANSI B	2	
ISO A4	1	64 characters×52 lines
ISO A3	2	

In the print mode, inputs from position switches, shift switch and pen up/down switch are ignored.
To cancel the print mode, turn the power switch off.

3.9 Digitize Point

The degitize point is at the inverted triangle's apex located on the right and of pen carriage as indicated in Fig. 3-9.

Using the manual control keys [←] [↑] [→] [↓], the digitize point can be moved to an arbitrary point.

For the digitizing procedure, refer to the descriptions of the DP command (digitize mode setting) and the DC command (digitize mode clearing).

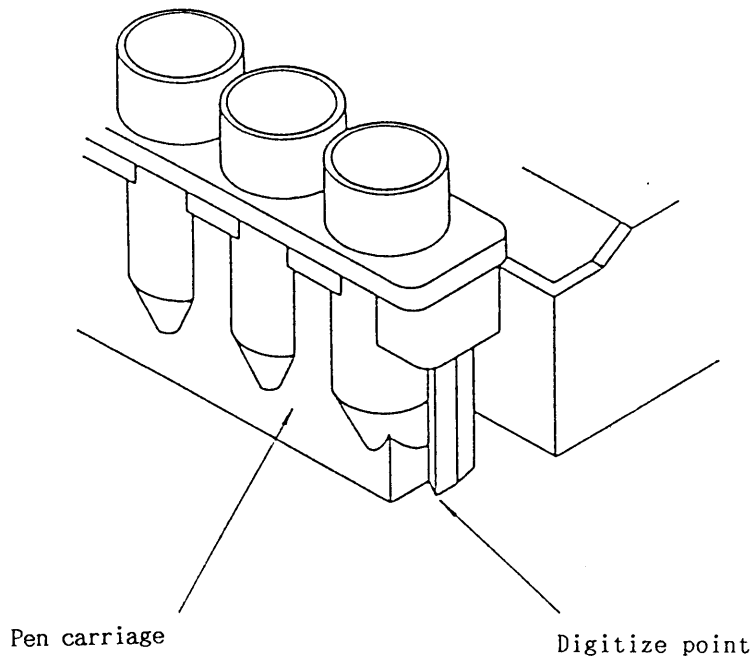


Fig. 3-9 Digitize Point

4. INTERFACE SPECIFICATIONS

4.1 RS-232C Interface

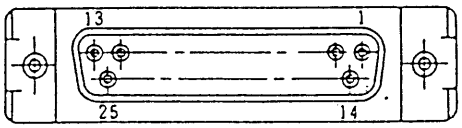


Fig. 4-1 Pin Arrangement in RS-232C Interface Connector
Type RDBD-25SE-LN (made by Hirose Denki) or equivalent

(Note) Connector Appropriate for Connecting Cable:
Type DB-25P or equivalent

Table 4-1 Terminals of RS-232C Interface Connector

Signal Name	Signal Direction (IN/OUT)	Pin No.		Signal Direction (IN/OUT)	Signal Name
CHASSIS GND		1	14		N C
TXD	OUT	2	15		N C
RXD	IN	3	16		N C
RTS	OUT*	4	17		N C
N C		5	18		N C
N C		6	19		N C
SIGNAL GND		7	20	OUT	DTR
N C		8	21		N C
N C		9	22		N C
N C		10	23		N C
N C		11	24		N C
N C		12	25		N C
N C		13			

(Note *) ON output status in Table4-3

$\overline{RXD}$ ..... Receiving data
$\overline{DTR}$ ..... Data terminal ready
$\overline{TXD}$ ..... Transferring data
RTS ..... Request to send

The RS-232C interface is used for drawing through serial data transmission.

This plotter is provided with an RS-232C interface connector on the rear left (refer to Fig. 2-1). For its pin arrangement and terminals, refer to Fig. 4-1 and Table 4-1 respectively.

Figure 4-2 shows the timing chart of input/output signals.

<Procedure>

① As soon as the plotter becomes ready for reception, it turns DTR signal to ON and transmits the signal to the computer.

② After confirming that DTR signal is ON, the computer transmits command signal or command and data signals through the $\overline{\text{RXD}}$ line to operate the plotter.

(Note) External connection must be provided according to the DTE (Data Terminal Equipment) specifications.

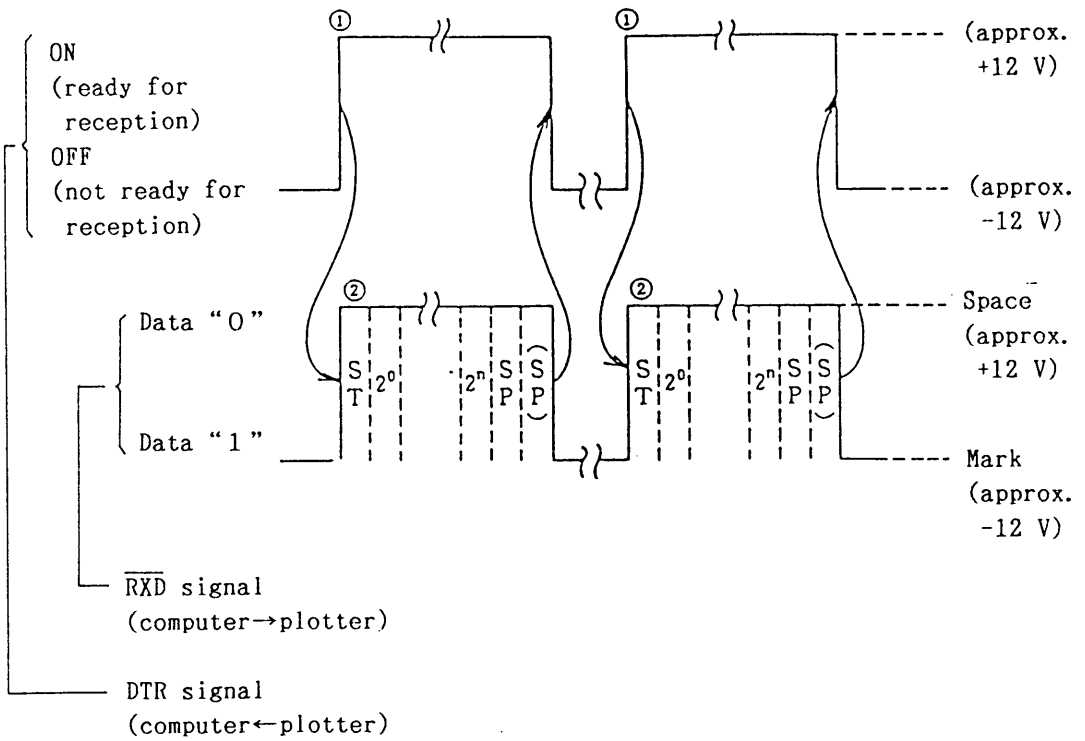


Fig. 4-2 Timing Chart

The signal input/output levels and circuits are as shown in Table 4-2 and Fig. 4-3 respectively.

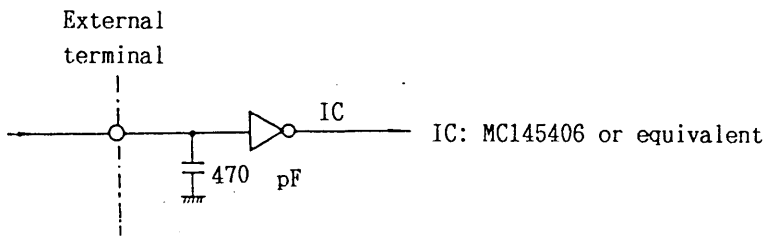
Note that a connecting cable for the RS-232C interface is available on separate order.

Table 4-2 Input/Output Levels

	Signal	Input Level	Remarks
Received data (RXD)	1 (mark)	-4 to -12 V	Logic "1"
	0 (space)	+4 to +12 V	Logic "0"

	Signal	Output Level	Remarks
Data terminal ready (DTR)	ON	(Type) +6 to +12 V	Plotter is ready for reception.
	OFF	(Type) -6 to -12 V	Plotter is not ready for reception.

(1) Input



(2) Output

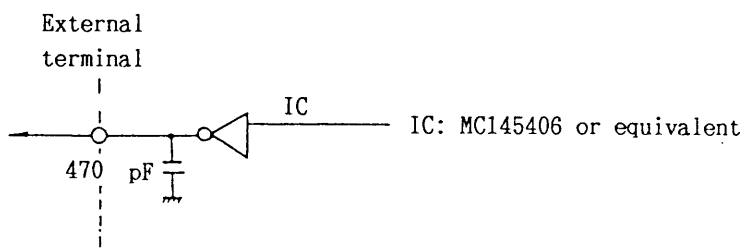


Fig. 4-3 Input/Output Circuits

4. 2 GPIB interface

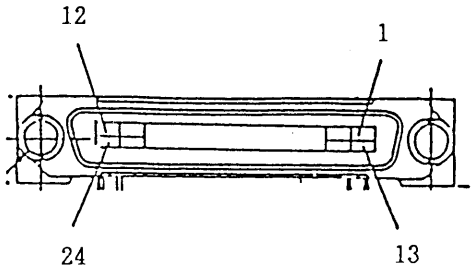


Fig. 4-3 Pin arrangement of GIPB connector
57LE-20240-7300D35G
(By Dai-ichi Denshi Kogyo)
or equivalent
Note: Connector conforming to connecting cable
408JE-1XX (By Dai-ichi Denshi Kogyo)
or equivalent

Table 4-2 Pins of GPIB connector

Signal name	Pin No.		Signal name
DI01	1	13	DI05
DI02	2	14	DI06
DI03	3	15	DI07
DI04	4	16	DI08
E01	5	17	REN
DAV	6	18	GND
NRFD	7	19	GND
NDAC	8	20	GND
IFC	9	21	GND
SRQ	10	22	GND
ATN	11	23	GND
Shield	12	24	GND

(1) GPIB connector
For the pin arrangement and pins, see Fig. 4-3 and Table 4-2.

(2) Interface function
The GPIB (IEEE-488) prescribes 10 kinds of interface functions including up to 28 subsets. It is not necessary to satisfy all the functions, and only the required functions can be used. Table 4-3 lists the interface functions used for the plotter.

Table 4－3 Interface functions

No	Interface	Function	682-XA's function
1	SII (Source handshake)	Transmits date over data bus.	SII 1 : Comlete capability
2	AII (Acceptor handshake)	Receives data over data bus.	AII 1 : Comlete capability
3	T (Talker)	Transmits data to other davice via data bus.	T 6 : Basic talker, Serial poll, Talker address reset by MLA(*1)
4	L (Listener)	Receives data from other davice via data bus.	L 3 : Basic listener, Listen only mode, Listener address reset by MAT(*2)
5	SR (Service request)	Transmmits service request to controller asynchronously.	SR 1 : Comlete capability
6	RL (Remote/Local)	Responds to remote/local request from controller	RL 0 : No capability
7	PR (Paraller poll)	Outputs 1-bit status to controller without being specified to talker.	PR 2 : Address < 8 No capability for other adress
8	DC (Device clear)	Clears(initializes) individual device or a group of devices.	DC 1 : Comlete capability
9	DT (Device trigger)	Operates the device addressed to listener.	DT 0 : No capability
10	C (Controller)	Transmits device address, universal command and address command to other device via data bus.	C 0 : No capability

＊1 MLA : My listener address
＊2 MTA : My talker address

(3) Service request

Service request is used to requst asynchronous processing to the controller, and two kinds of service request are available: serial poll and paraller poll.

1) Serial poll

The plotter transmits the interruption request by setting the bit of the RQS (ReQuest Service) register (8 bits) to 6 to request asynchronous interruption to the controller.

When plural devices are connected to one controller, the controller requests status information to each device to identify the device which has transmitted the request.

Though the plotter transmits the status byte for the OS command (status output command), the transmission condition of the service request can be specified in advance by the mask value of the IM command. The plotter can thus transmit the interruption request when the transmission conditions are satisfied.

2) Paraller poll

Paraller poll in valid only when the addresses from 0 to 7 are specified to plotters. Each plotter responds to the paraller poll when the condition of the P mask value by the IM command is satisfied.

Each plotter does not respond to the paraller poll unless the bit value of the P mask value is changed from zero.

Each plotter does not respond to the paraller poll in the listen only mode.

(4) Response to DCL, SDC and IFC

When the plotter receives DCL(device clear command), SDC (device selection command), or IFC (interface clear command), it disables its output to receice a new command, and resets the I/O port.

The commands and parameters of the HP-GL which are sent at this time are cleared.

Unlike the DF and IF commands of the HP-GL, DCL and IFC do not perform the initial setting of each parameter of the plotter.

5. SPECIFICATIONS

5.1 Standard Specifications

(1) Drive principle	Friction roller paper drive with stepping motor
(2) Effective drawing area	404×277mm
(3) Paper	Ordinary paper or polyster film of ISO A4/A3 or ANSI A/B size
(4) Kind of pen	Ceramic pen (roller ball pen, ink pen, throwaway ink pen, fiber-tip pen)
(5) Number of pens	4
(6) Drawing speed	Max. 400 mm/sec in axial direction (565 mm/sec in 45 degree direction) Acceleration 1G
(7) Character writing	Approx. 4cps
(8) Character set	19 kinds of character sets
(9) Incremental step	0.025 mm (movement step 0,05 mm)
(10) Distance accuracy	0.3 % of shift distance ±0.2 mm
(11) Repeatability	0.2 mm
(12) Pen exchange accuracy	0.2 mm
(13) Drawing mode	Plotter mode/self-test mode/print mode
(14) Drawing command	56 kinds of HP-GL based commands
(15) Interface	GPIB and RS-232C interface (hardwire, Xon-Xoff, ENQ-ACK and software-controlled handshaking)
(16) Buffer memory	64K bytes
(17) Power supply	100, 120, 220 or 240 V AC, 50/60 Hz
(18) External dimensions	480 (W) × 219 (D) × 135 (H) mm
(19) Weight	Approx. 6.5 Kg

5. 2 Standard accessories

In addition to the plotter, following standard accessories are contained in the carton.
When the carton is unpacked, confirm the accessories.

Item	Type	Q'ty
Aqua plastic pen	32B23FN	4
Pen holder	116756044	4
Chart guide		1
Paper, A4		20
Power core(with 2-pin adaptor)		1
Ooeration manual		1