Roland DG

ROLAND DG CORPORATION

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DRAFTING PLOTTER

DPX-2000

USER'S MANUAL

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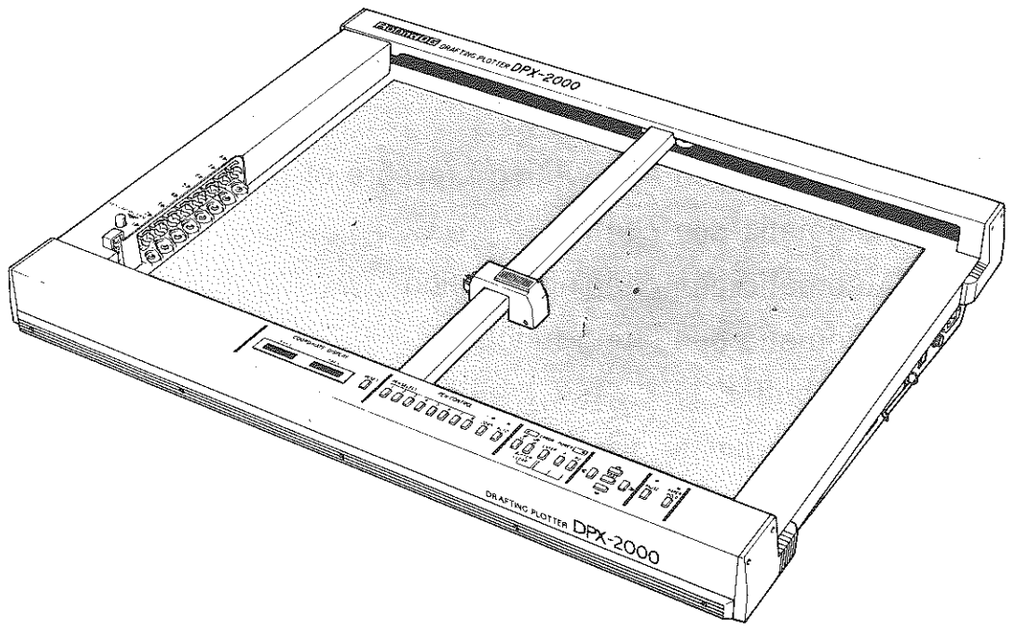


CONTENTS

Congratulations on your purchase of the ROLAND DG Drafting Plotter [DPX-2000].
Please read and understand this manual well before using the DPX-2000.

—— TO THE USER ——

- Do not place objects on the plotter and power cord as this may result in accidents or fires.
- Ensure that the power supply is within ±5% of the rated voltage.
- Locate the plotter in an area with good ventilation and as free as possible from dust and humidity.
- Ensure that the plotter is not subjected to heavy shocks.
- If the panel becomes dirty, wipe it with a cloth dampened with water or neutral detergent. Do not use thinner or alcohol under any circumstances.

1
INTRODUCTION

1. INTRODUCTION

The DPX-2000 has been developed to be used as a computer peripheral device and requires the following system configuration:

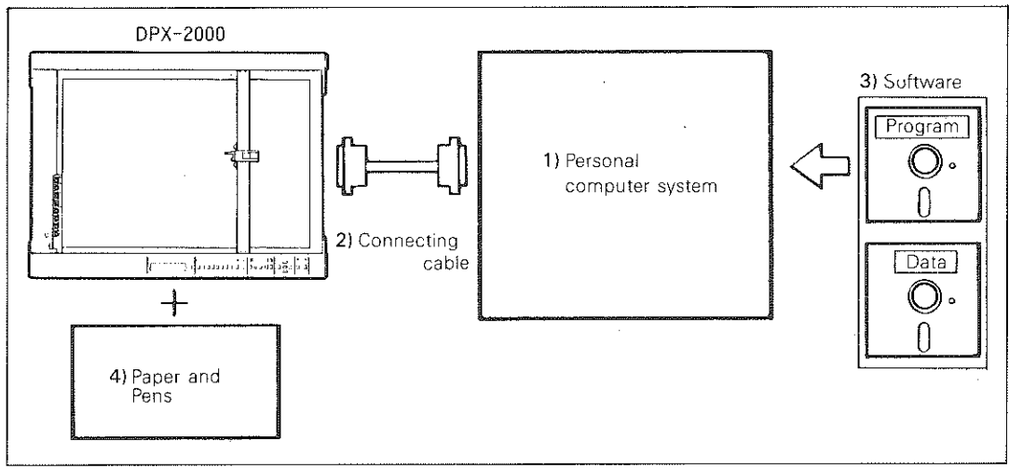
Minimum System Configuration

1) Personal Computer System
The system must have a parallel connector (Centronics interface for a printer) or serial connector (RS-232C interface).

2) Connecting Cable
This cable is used for connecting the computer main unit with the DPX-2000. It must be selected according to the type of interface (parallel or serial) and the connector type of the computer main unit.

3) Software
Both the software describing the operation procedure and the drafting data are needed. Programs can be either created by the user or purchased.

4) Plotting Paper and Pen
The DPX-2000 is provided with accessory pen and paper for checking to see if the plotter functions correctly. Use proper plotting paper and pen according to your drafting need.
***IMPORTANT:**
Please select the proper combination of pens and papers.



● Please read this manual so that you can get the best use from your DPX-2000. If you wish to do your own programming, please refer to the DPX-2000 Command Reference Manual.

If commercially available software is to be used, programming is not necessary and the DPX-2000 can be operated without referring to the Command Reference Manual. Instead, it is required to read the manual which is supplied with the purchased commercial software carefully. As information in this manual will be often necessary in regard to the output to the plotter, be sure to read this manual together with the above software manual.

It is strongly recommended that those who use the DPX-2000 with commercially available software also read through the separate "DPX-2000 Command Reference Manual".

2. OUTLINE AND FEATURES

The DPX-2000 is an ANSI-C/ISO-A2 size, 8 pen, flatbed plotter. Fast, high quality drawings are produced with a maximum speed of 400 mm/second in all directions and a mechanical resolution of 0.0125 mm/step. A wide variety of software can be used since the DPX-2000 is compatible with the IBM PC/XT/AT and with most programs written for HP-7580/7585.

The main features of the DPX-2000 are as follows:

(1) Quick and Accurate
A plotting speed of 40 cm/second in all directions cuts drawing time down to a minimum. A resolution of 12.5 microns (0.0125 mm) step guarantees enhanced clarity and precision of line.

(2) Easy Paper Setting
An electrostatic paper holder ensures fast and secure setting for wrinkle-free operation. Use the "PAPER HOLD" switch on the control panel.

(3) Optimum Setup for Each Drafting Pen (in AUTOMATIC MODE)
The automatic pen controlling function automatically sets the drafting speed and writing pressure to an optimum level depending on the type of pen. If the pen carriage tries to pick up a pen that is missing, it automatically fetches a pen from another pen stock. Conversely if it tries to return a pen to a pen holder that is occupied it automatically looks for an unoccupied pen stock.

(4) Use Ink Pens . . . Noiselessly
The soft landing system allows the landing speed and the writing pressure of pens to be controlled for enhanced clarity and precision of line and remarkably silent operation. The mechanism also allows the writing pressure of pens to be either automatically or manually selected according to the type of pens. The drafting ink pens can also be used.

(5) Prevents Drying of Pen Tips
If the drawing commands are not entered within a certain time period, the pen currently in use returns to the pen stock and is automatically capped. Also, an unused pen is automatically capped when it returns to the pen stock.

(6) Maximum Plotting Area . . . X axis: 594 mm Y axis: 432 mm
DPX-2000 can draft to the edge of ANSI standard C size (559 mm x 432 mm) paper and ISO Standard A2 size (594 mm x 420 mm) paper.

(7) Quality Graphics
The pen lifts automatically from the paper when not in motion, thus preventing blots or uneven discolorations.

(8) Digital Coordinate Display
An LED X-Y coordinate display allows totally accurate manual operation. Preset scaling can be set with ease. Simple and precise windowing and scaling. Invaluable for debugging programs.

(9) Wide Variety of Pen Options
Water-based fiber-tipped pens, ceramic pens, water-based ballpoint pens, oil-based pressurized ballpoint pens and oil-based OHP pens have been developed for the DPX-2000. The DPX-2000 can also use drafting ink pens (for paper and film) specially designed by Staedtler of West Germany. Various colors and thickness of pen tips can also be freely selected.

(10) Built-in 15 K Bytes Data Buffer
The DPX-2000 has a large data buffer capacity of 15 KBytes. The data processed by the computer for controlling the plotter is stored into this data buffer, thus enabling the computer to do other jobs while the plotter is still working.

(11) Near-vertical Angle Operation
The DPS-2 stand allows the DPX-2000 to be operated at a near-vertical angle of 80 degrees. The angle can be easily and continuously changed with two adjusting wheels. Two paper shelves, made of hard metal pipe, are provided. The DPS-2 has casters for easy mobility.

(12) Powerful Command Lines
The DPX-2000 can operate on all programs written for the HP-7580/7585.

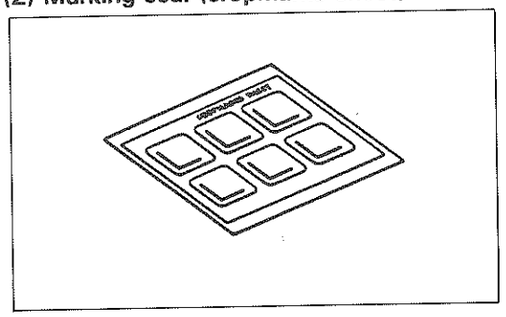
(13) Pen Carriage Automatically Returns
Automatic pen carriage setting system allows the pen carriage to move automatically to the upper right corner of the plotting area when the power is turned on. Then the pen carriage automatically moves to its origin at the lower left corner of the plotting area when the first command is entered.

3. CHECKING CONTENTS OF BOX

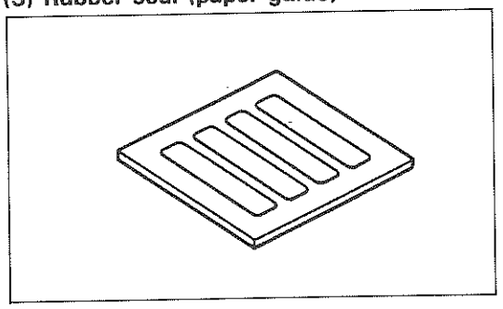
The following accessories are also included in the shipping carton of DPX-2000. Check before use to ensure that they are included.

(1) Original pens . . . 8 in all
0.3 mm water based fiber tipped pen XD-4SPB-WN (black, red, blue, green)
0.2 mm ceramic pen XD-4SPB-CN (black, red, blue, green)

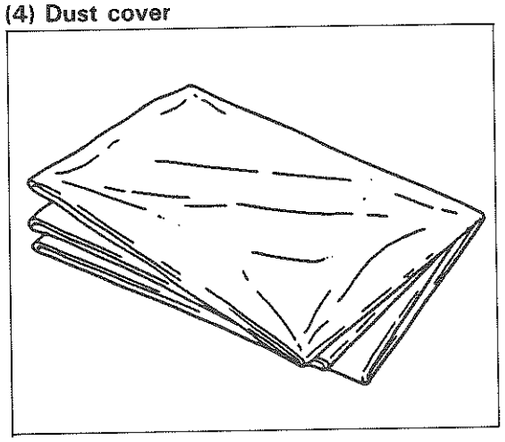
(2) Marking seal (cropmarks sheet)



(3) Rubber seal (paper guide)



(4) Dust cover



(5) AC power cord

(6) User's manual

(7) Command refernce manual

(8) Plotter papers

(9) Silver sticker for Staedtler ink pen (Stick it to the ink pen to be used)

* Those accessories 1 through 7 are in the accessory box under the unit.

4. OPTIONS

The following options are available for the DPX-2000:

Type of pen	Model #	Thickness (mm)	Specifications
Water-based Ink Pens	XD-4SPA-WN	0.3	Black (4)
	XD-4SPB-WN	0.3	Black, Red, Blue, Green (1 ea.)
	XD-4SPC-WN	0.3	Orange, Pink, Brown, Violet (1 ea.)
	XD-4SPA-WW	0.6	Black (4)
	XD-4SPB-WW	0.6	Black, Red, Blue, Green (1 ea.)
	XD-4SPC-WW	0.6	Orange, Pink, Brown, Violet (1 ea.)
OHP Pens (Oil-based)	XD-4SPB-ON	0.3	Black, Red, Blue, Green (1 ea.)
	XD-4SPC-ON	0.3	Yellow, Orange, Brown, Violet (1 ea.)
	XD-4SPB-OW	0.6	Black, Red, Blue, Green (1 ea.)
	XD-4SPC-OW	0.6	Yellow, Orange, Brown, Violet (1 ea.)
Water-based Ballpoints	XD-4SPB-BP	—	Black, Red, Blue, Green (1 ea.)
Ceramic Pens	XD-4SPA-CN	0.2	Black (4)
	XD-4SPB-CN	0.2	Black, Red, Blue, Green (1 ea.)
	XD-4SPA-CM	0.4	Black (4)
	XD-4SPB-CM	0.4	Black, Red, Blue, Green (1 ea.)
	XD-4SPA-CW	0.6	Black (4)
	XD-4SPB-CW	0.6	Black, Red, Blue, Green (1 ea.)
Pressurized Oil-based Ballpoint Pen Holder	XD-BPH	—	Only Pen Holder (Long Type)
Refill for Oil-based Ballpoint Pen	XD-3M-BLK	—	Black (3) for XD-BPH
	XD-3M-RED	—	Red (3) for XD-BPH
	XD-3M-BLU	—	Blue (3) for XD-BPH
	XD-3M-GRN	—	Green (3) for XD-BPH

Explanation of Pen Model No. XD-4SP○-○○

- W : Water based fiber tipped pen
  - N : 0.3mm
  - W : 0.6mm
- O : OHP (Overhead projector) pen
  - N : 0.3mm
  - W : 0.6mm
- C : Ceramic pen
  - N : 0.2mm
  - M : 0.4mm
  - W : 0.6mm
- BP : Water based ball point pen

A : Black
B : Black, blue, red and green assorted
C : Orange, purple, brown and pink assorted
(about OHP pens C : orange, purple, brown and yellow)

ACCESSORIES

XY-TRK	FILM AND PEN SET for OHP
XY-APL	PARALLEL INTERFACE CARD for APPLE II, IIe with CABLE
XY-IPC	PARALLEL CABLE for IBM-PC
XY-RS-11 (length:1.5m)	SERIAL CABLE for APPLE II, IIe
XY-RS-31 (length: 3m)	SERIAL CABLE for APPLE II, IIe
XY-RS-13 (length:1.5m)	SERIAL CABLE for IBM-PC
XY-RS-33 (length: 3m)	SERIAL CABLE for IBM-PC

ORIGINAL STAND—DPS-2 (for DPX-2000)

A special stand allows the DPX-2000 to operate to a near vertical angle (80 degrees), saving valuable desk space. Also included with this stand are two shelves for paper, castors for mobility. The DPS-2 can be adjusted for three height options.

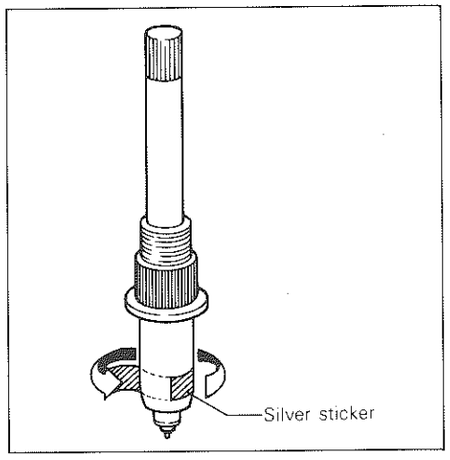
INK PENS

Designed for plotter drafting by STAEDTLER of West Germany, the leading ink pen manufacturer, these pens are simple to assemble and use for precision drafting with non-fade ink. MARS PLOT Series ink pens can be used for the DPX-2000. They are also refillable for extended use.

●MARS PLOT Series from STAEDTLER of West Germany

Option	Model #	Specifications
Ink Pen Holder	75PL07H2	Only Pen Holder
Ink Pen Tips for Paper	750PL2CF 750PL3CF 750PL5CF	0.25 mm for Paper 0.35 mm for Paper 0.50 mm for Paper
Ink for Paper	745R-9	Black for Paper
Ink Pen Tips for Film	757PL2CF 757PL3CF 757PL5CF	0.25 mm for Film 0.35 mm for Film 0.50 mm for Film
Ink for Film	748PFL	Black for Film

Note: Before using a Staedtler ink pen, be sure to stick the silver sticker supplied as an accessory to the specified position on the pen holder (75PL07H2). The DPX-2000 will then auto adjust for proper speed and pressure.



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- IBM PC, PC/XT, PC/AT are trademarks of International Business Machine Corporation.

5. CAUTIONS

(1) Installation

- Place the DPX-2000 on a flat table or install semi-vertically (0° - 80°) using the DPS-2.
- Place the DPX-2000 on a flat table when an ink pen is to be used, otherwise ink may not flow smoothly.
- Avoid direct sunlight and high temperature. Also, keep it away from humidity or dust.
- Some sensors are built into the system to determine the type of pen to be used and to check to see if there is any pen in the pen stock. Place the plotter away from direct sunlight, otherwise the photo sensor may malfunction.
- Do not expose this unit to high levels of vibration or electrical noise.
- Use the unit only in a well ventilated area to ensure good cooling.

(2) On Use

- Immediately after the power is turned on, the arm starts moving. So keep your hands away from the drafting board area.
- Be sure not to scratch the electrostatic board (black board) with a pointed object (such as a pin, knife or screwdriver) since this may prevent the drawing process from being carried out.
- Ensure that the power supply cord and computer input/output cables are installed in such a manner as to prevent accidents or disconnection while in use.
- When initially connecting the DPX-2000 to the computer, be sure to perform a self-test operation to ensure that the plotter is operating normally.
- Do not block the ventilation openings of the plotter, especially the fan motor intake ventilation hole at the bottom.

(3) After Using or When Not Using the DPX-2000

- Remove pens from the pen stocks and the pen carriage and then cap them when the plotter is not used for a long period of time.
- When not using the plotter, always remove the power plug from the outlet.
- When not using the plotter, always cover it with the accessory dust cover.

(4) Others

- Never lubricate any of the mechanical parts.
- Do not place heavy objects on the drawing board or allow it to become scratched.
- Never apply heavy loads to the arm or carriage, and avoid impacts.
- If the drawing board or X-rail cover is dirty, clean it gently with a cloth dampened with a mild detergent.
- Do not move the arm or carriage manually after turning power ON.
- Before using a Staedtler ink pen, be sure to stick the silver sticker supplied as an accessory to the specified position on the pen holder (75PL07H2).

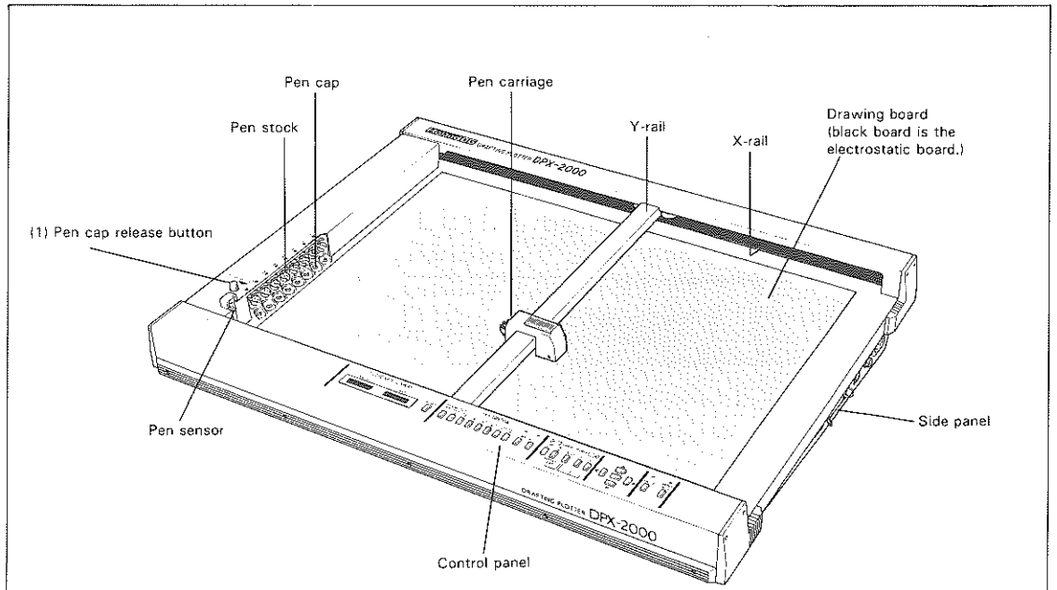
2

DRAWING

1. CONTROLS AND FUNCTIONS

This section explains the correct use of the DPX-2000 in sequence. Check each step in order.

[EXTERNAL VIEW]



(1) Pen Cap Release Button
The pen cap of the pen stock is brought down with a press of this button. This allows a pen to be installed or removed with ease.

(2) X-Y Coordinate Display
Display the position of the pen carriage as X-Y coordinate values in units of 0.1 mm.

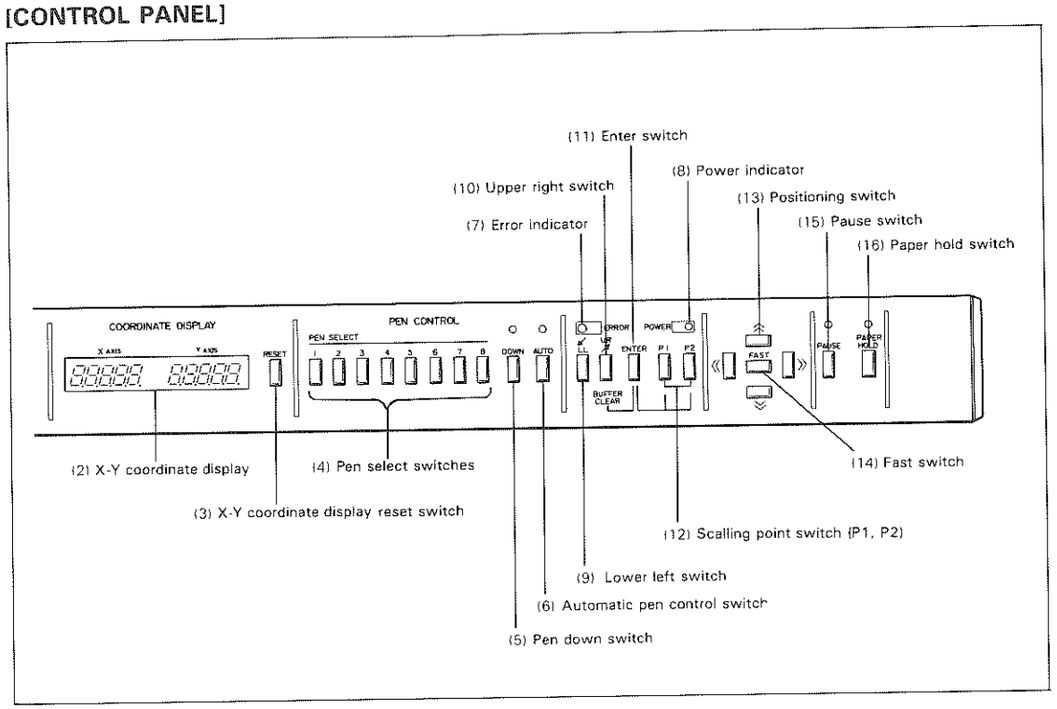
(3) Coordinate Display Reset switch
When this switch is pressed, the X-Y Coordinate Display changes to "000.0" for both the X and Y values of the current pen position. From then on, the display values for the pen carriage position coordinates are relative to this new origin (0.0).

(4) Pen Select switch
When operating manually, this switch is used to set the pen number. This also allows pen speed or pen pressure to be set when it is used in combination with the "ENTER" switch or the "FAST" switch.

(5) Pen Down switch
When this switch is pressed while the plotter is in wait status (no commands are received from the computer or the plotter is in test mode), the Pen Down LED lights and the pen is allowed to go down. If the pen is left down for a specified amount of time, the pen is automatically lifted by the Automatic Pen Up function. Then, the pen is brought down again when it is directed to move by the Positioning switch.

(6) Automatic Pen Control switch
The plotter is initially set to this mode when the power is turned ON. This mode checks to see if there is any pen in the pen stocks and the speed and the writing pressure suitable for the available pen type are set. Press this switch to light off the LED and to cancel the Automatic Pen Control mode. The speed and the writing pressure immediately after this mode is cancelled, are 400 mm/sec and 20 g. They can be modified by programming.

[CONTROL PANEL]



(7) Error indicator
This indicator lights if an error occurs.

(8) Power indicator
When power switch (18) is turned ON, this indicator lights.

(9) Lower Left (LL) switch
Press this switch to return the pen to the pen stock and to move the pen carriage to the lower left corner of the drafting board. At the same time, errors are cancelled.

(10) Upper Right (UR) switch
Press this switch to return the pen to the pen stock once and to move the pen carriage to the upper right corner of the drafting board. This is used to change the paper. The data buffer can be cleared by pressing this switch while pressing the ENTER switch (11) when a drafting operation is suspended temporarily by the PAUSE switch.

(11) Enter switch
Use this switch to manually set the scaling points P1 and P2, to clear the data buffer, and to modify pen speed.

(12) Scaling Point switches (P1, P2)
When the P1 and P2 switches are pressed, the pen is raised and is moved to the scaling point P1 or P2. When the scaling points are set manually, these switches are used in conjunction with the "ENTER" switch (11).

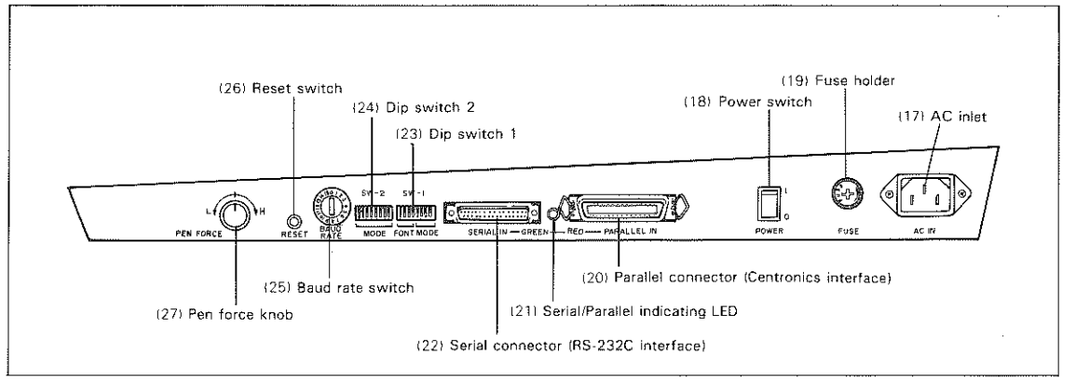
(13) Positioning switch ∧, ∨, ≪, ≫
These switches are used to move the pen manually in any of the four directions indicated on the switches. Pressing two switches simultaneously moves the pen diagonally across the drawing board in the relative direction.

(14) Fast switch
Pressing this switch and a Positioning switch (13) will result in rapid movement of the pen. This switch is also used with Pen Select switch (4) to set the pen pressure.

(15) Pause switch
When this switch is pressed once during program execution, pen carriage movement is temporarily suspended and the PAUSE LED lights. The pause is cleared and the Pause LED goes off by pressing the switch again.

(16) Paper Hold switch
Use this switch to hold the plotting paper on the drafting board (electrostatic board). The paper can be fixed on the board by pressing this switch to light the indicator above this switch.

[SIDE PANEL]



(17) AC inlet
Connect an accessory power cord to this connector.

(18) Power switch
Setting this switch "ON" will light up the power indicator (8) and the X-Y coordinate display (2) will show "000.0" and at the same time, the pen carriage will move to the upper right corner of the axes.

(19) Fuse holder
When a fuse is blown, replacing it with a new one may not be sufficient. The actual cause must be detected and solved. Contact your nearest dealer if the unit can not repaired by replacing the fuse. Use only the fuses specified.

(20) Parallel connector, (21) Serial/Parallel Indicating LED and (22) Serial connector
These connectors are used to connect the DPX-2000 with the computer. Either the Parallel (Centronics) (20) or Serial (RS-232C) (22) interface connector may be used depending on data specifications.
No. 5 of the DIP switch 1 performs the selection between serial and parallel interface. When the parallel connector is used, the Serial/Parallel Indicating LED (21) lights (red). When serial connector is used, the Serial/Parallel Indicating LED lights (green).

(23) SW-1 (DIP switch 1)
This switch is used to select such parameters as the connecting interface (parallel or serial), paper size, and character font.

(24) SW-2 (DIP switch 2)
Use this to set the communication protocol when the serial interface (RS-232C) or the parallel (Centronics) interface is used.

(25) Baud Rate switch
This switch is used to set the baud rate when the serial (RS-232C) interface is used.

(26) Reset switch
Press this switch to set the DPX-2000 to the initial condition. At the same time, the buffer is also cleared. (This same condition is created by turning OFF the power once, and then turn it ON again.)

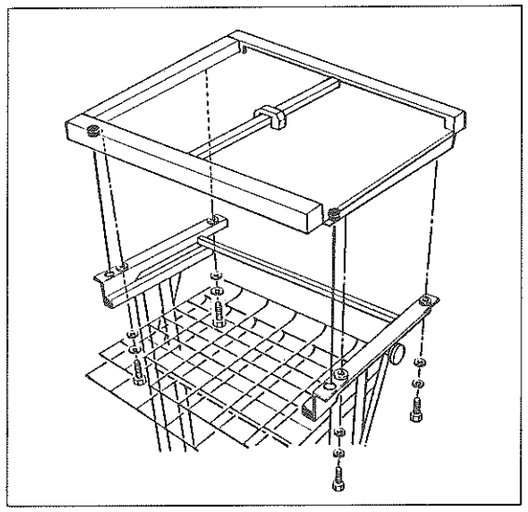
(27) Pen Force knob
This is used to adjust the pen tip pressure (writing pressure of pens) when the pen is allowed to go down.

2. INSTALLATION

An accessory fold-out stand DPS-2 allows the DPX-2000 to be operated at 0° to a near-vertical angle of 80°.
Place the DPX-2000 on a flat board if no accessory stand is to be used. Do not block the air ventilation openings of the plotter, especially the fan motor intake ventilation hole at the bottom. It is recommended to set the DPX-2000 on a flat board when an ink pen is to be used.

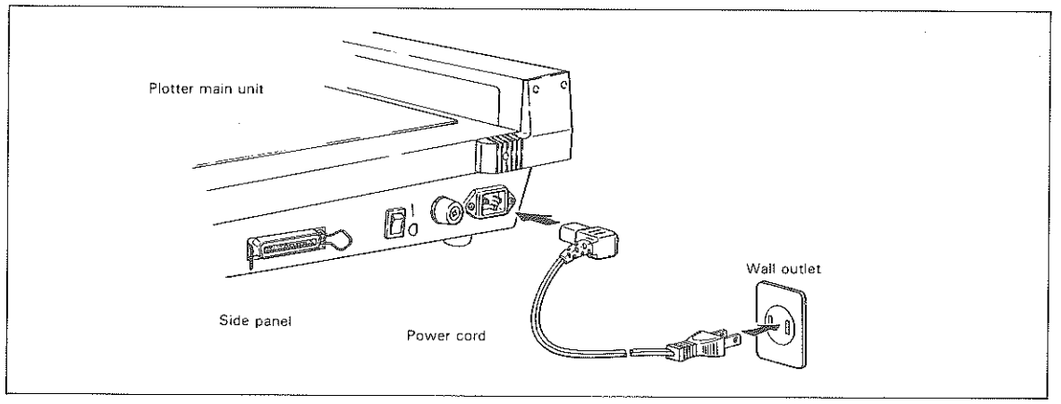
- **Installation of DPS-2**
  Mount the Plotter DPX-2000 on the stand DPS-2 so that the 2 front rubber legs at the bottom of the Plotter DPX-2000 enter the rubber leg insertion holes of the frame.
  Fix the Plotter DPX-2000 to the frame with the machine screws along with the spring washers and plain washers.
  For details, see the assembly manual of the DPS-2.

  Note:
  * Remove the 4 tack screws (silver) at the bottom of the DPX-2000 (the bottom is fastened to the frame with bolts.) Use the accessory screws of the fold-out stand DPS-2.
  * Always follow the assembly instructions when assembling the DPS-2.
    Be sure that proper frame installation positions are selected for installation angle of up to 60° and 80°



3. POWER ON

Connect the power cord of the DPX-2000 to the wall outlet when the power of the DPX-2000 is OFF.



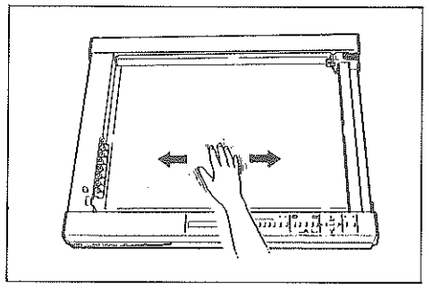
When the power switch is turned ON, the pen carriage moves to the upper right corner of the X-Y axes and the X-Y coordinate values will be displayed as "000.0, 000.0".

Note:
* Disconnect the power cord from the wall outlet if the DPX-2000 is left unused for a long period of time.
* "I" and "O" are marked at the side of the power switch located at the side panel. Set the power switch to "I" side for turning ON the power and to "O" for OFF.
* Never leave your hands or any objects on the drafting board. When the power is turned ON, the arm immediately starts moving.

4. SETTING PLOTTING PAPER

The DPX-2000 uses the Electrostatic Paper Setting method and a maximum paper size of ISO Standard A2 size (594 x 420 mm) or ANSI Standard C size (432 x 559 mm) can be used for the plotting paper.

[Paper Setting]
1) Connect the power cord of the DPX-2000 to the wall outlet when the power of the DPX-2000 is OFF.
2) Turn ON the power switch to enable the DPX-2000 to be ready to operate. The pen carriage automatically moves to the upper right corner of the X-Y axes.
3) Lightly rub the entire area of the paper to take up any slack of paper as in Figure below.



[Removal of Paper (Replacement of Paper)]

1) Press the [UR] switch on the control panel, then the pen carriage returns a pen to the pen stock and moves to the upper right corner. Wait until the pen carriage completely stops.
2) Press the [PAPER HOLD] switch on the control panel to cancel the Paper Hold (the LED at above the switch goes off). Remove the paper after waiting until the electrostatic absorption force is lost.

Perform operation (3) in "PAPER SETTING" in the preceding section for replacing the plotting paper.

[Rubber Seal]

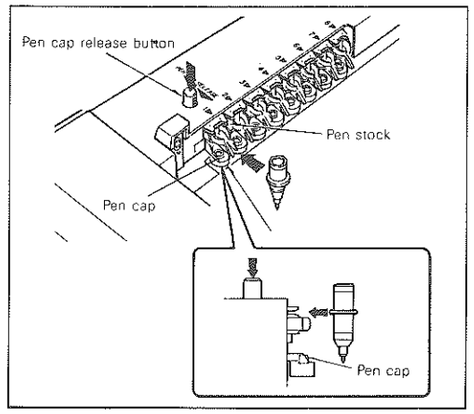
It is convenient to put an accessory rubber seal or marking seal on the position where the paper is to be set.

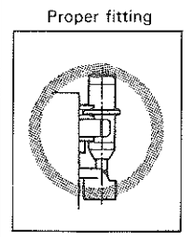
5. FITTING PENS

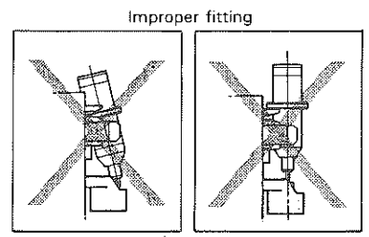
Fit a pen into the pen stock at the left side of the main unit rather than into the pen carriage. The numbers 1 to 8 of the pen stocks correspond to the parameters 1 to 8 of the Pen Change command, so that any color pen can be assigned to any pen stock.
In addition to accessory water-based fiber-tipped pens and ceramic pens, waterbased ballpoint pens, oil-based pressurized ballpoint pens, oil-based OHP pens, and ink pens (for paper and for film) are optionally available.

[How to fit]

Press the Pen Cap Release button to lower the pen cap of the pen stock and to allow the pen to be fitted easily. Remove the caps from the pens. Then, easily press the pen while pressing the Pen Cap Release button so that the disk of the pen can fit into the ditch of the pen stock. For removing the pen, pull the pen out to the side while pressing the Pen Cap Release button. After that, cap the pen.







Drafting can not be performed properly

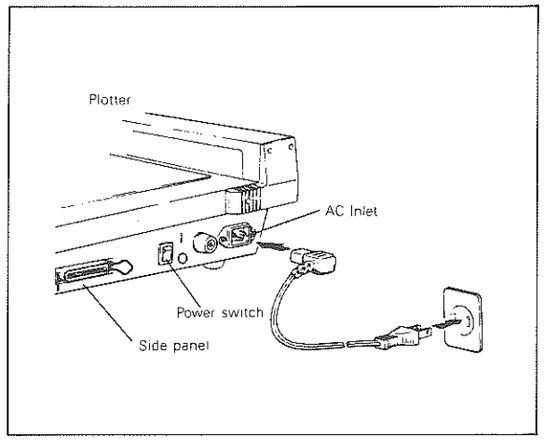
Note:

* Properly fit pens into the pen stock, otherwise drafting may not be performed properly.
* The DXY-series pens can also be used for the DPX-2000, but without the Pen Sensing capability.
* Handle the pen cap with care when fitting or removing it. It is made of rubber.
* Try to match the pen number and the pen color, or the colors get mixed. Always clean the inside of the cap with a wet swab when changing color.
* Do not turn ON the power of the DPX-2000 with a pen in the pen carriage. The plotter starts operating, thinking that no pens are in the pen carriage. Therefore, two pens may clash and be damaged and drafting may not be carried out properly.

6. OPERATION CHECK

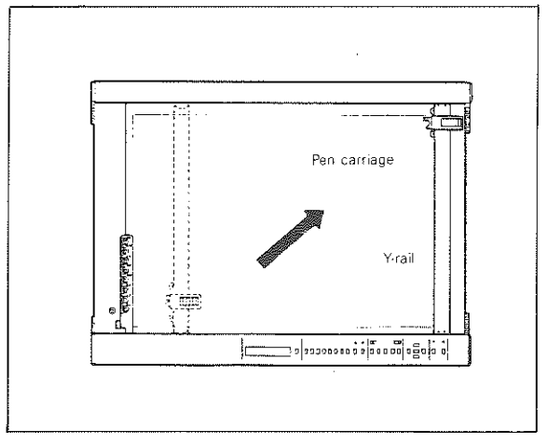
The DPX-2000 is provided with a self-test function. Before connecting it to the computer, make sure that the DPX-2000 operates properly according to the following procedures. Use the paper supplied with the unit for this check.

(1) Place the DPX-2000 on a level table and after having confirmed that the power switch is OFF, connect the AC power cord to the unit.

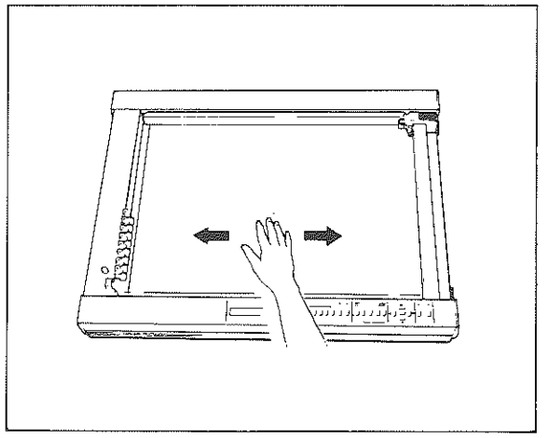


(2) Turn the power switch ON. It has been designed so that the Y-rail and pen carriage can move to the upper right corner at power ON.

NOTE: Do not place your hand or any other obstacles on the drawing board!



(3) After having confirmed that the paper-hold switch is OFF, set the plotter paper on the electrostatic board surface so that it is in the center of the surface and parallel with the unit. Turn the paper-hold switch ON and smooth the paper with hands. If the paper is not straightened, proper drawing will not occur.



(4) Remove the pen caps of the 4 water based fiber tipped pens (gray colored/XD-4SPB-WN), 4 ceramic pens (blue colored/XD-4SPB-CN) and install them in pen holders as follows:

Pen holder No.	1	2	3	4	5	6	7	8
Color	Black	Red	Blue	Green	Black	Red	Blue	Green
Type	Water based fiber tipped pen				Ceramic pen			

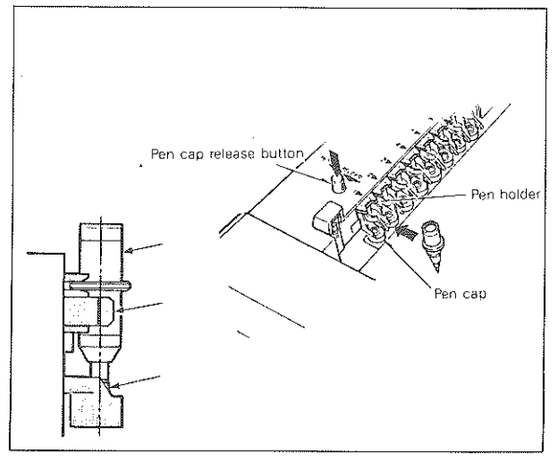
Note:
Be sure to install all water based fiber tipped pens and ceramic pens supplied with the unit, for all eight pens are used in the self-test.

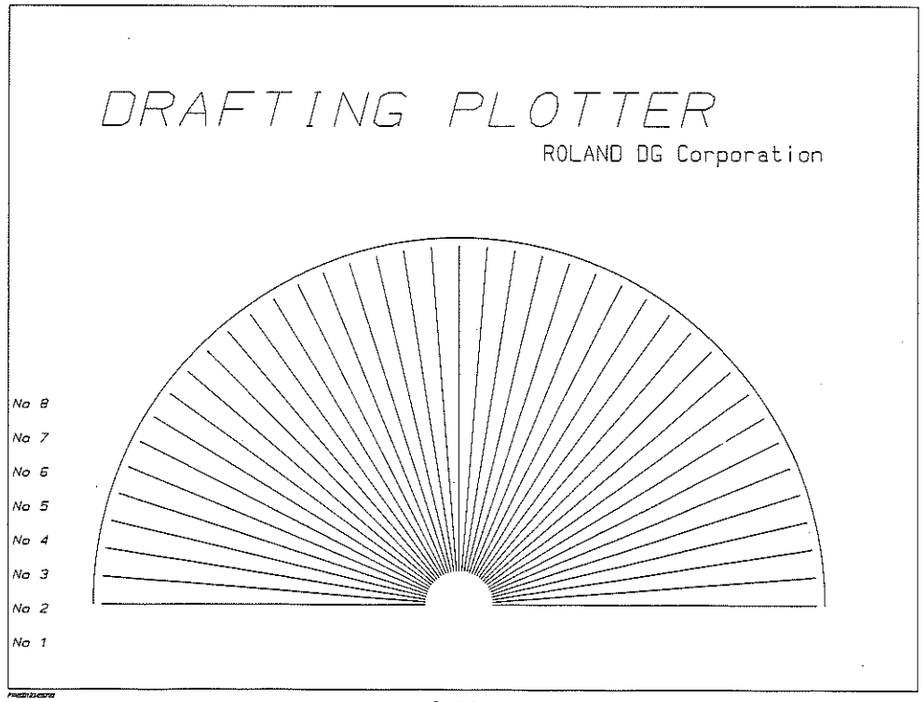
(5) Turn the power switch OFF.

(6) While pressing the ENTER switch, turn the power switch ON and keep pressing the ENTER switch till the pen carriage starts moving toward the lower left.

(7) The DPX-2000 starts to operate and draws the self-test pattern as shown below. In this state, check the following.

(1) The AUTO LED (red) on the operation panel is lighted ON.
(2) The water based fiber tipped pens and the ceramic pens should draw at different speeds depending on the pen sense function.
(3) The self-test drawing should result in the pattern as shown below:





7. CONNECTION WITH THE COMPUTER

(1) Parallel Connection

Make connections between the DPX-2000 and the computer with the parallel (Centronics) interface using the following method:

(1) DIP switch setting

Make sure that No. 5 of the DIP switch 1 at the right side panel of the DPX-2000 main unit is set to the ON position (white nib is in the UP position). If it is at the OFF position (white nib is in DOWN position), set it to the ON position. (The No. 5 is initially set to the ON position when the DPX-2000 is shipped from the factory.)

(2) Connecting computer with plotter

Connect the printing connector (Centronics) of the computer and the parallel connector of the DPX-2000 with the accessory plotter cable or the printer cable of the computer after ensuring that both the DPX-2000 and the computer are turned OFF.

(2) Serial Connection

Make connections between the DPX-2000 and the computer with serial (RS-232C) interface using the following method:

(1) Interface selection

Change the interface of the DPX-2000 to the RS-232C. Set No. 5 of the DIP switch 1 at the side panel on the right side of the DPX-2000 main unit to the OFF position (white nib is in DOWN position). (The No. 5 is initially set to the ON position when the DPX-2000 is shipped from the factory. Always change this to the OFF position before use.)

(2) Connecting computer with plotter

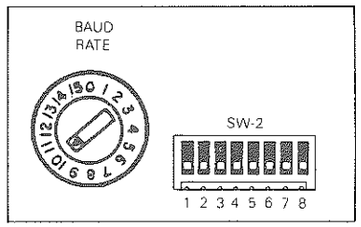
Connect the serial connector (RS-232C) of the computer and that of the DPX-2000 with the RS-232C cable.

(3) Setting communication protocol

When the DPX-2000 is shipped from the factory, the RS-232C communication protocol of the DPX-2000 is initially set as follows:

Initial communication protocol of RS-232C

Transfer rate (baud rate).... 2400 baud
Number of data bits..... 8 bits
Number of stop bits..... 1 bit
Parity check..... None



If serial communication is selected by software, the software may specify the communication protocol of the RS-232C. If the communication protocol specified by the software is different from the initial setup for the DPX-2000 above, modify the setup referring to "3. DIP SWITCH". (Do not forget to modify the communication protocol of the computer to match that of the plotter.) If the software does not specify the communication protocol of the RS-232C, use the DIP switch of the computer to specify the protocol or specify it in the computer programming referring to the computer instructions manual.

Note: Turn OFF the computer and plotter before setting the communication protocol of the RS-232C with the DIP switch. If this setting is made with the power ON, turn OFF the power once and then turn it ON again or press the RESET button while the power is ON. Otherwise, the communication protocol setup can not be updated.

*See the Appendix as for the connection of IBM PC (5150), PC/XT (5160), PC/AT (5170) and APPLE II, IIe.

3

FUNCTIONS

1. PEN SENSING CAPABILITY

The pen sensing capability of the DPX-2000 automatically determines pen types and it also checks to see if the pen is loaded into the pen stock. This leads to the initiation of the "Automatic Pen Controlling Function" to be described in the following sections. The speed and the writing pressure of pens can thus be automatically set according to the type of pens.

(1) How to sense pen type

The matching of the plotting paper and the pen is a crucial factor for determining the quality of the drafting. Increasing the pen speed will result in thin writing, while reducing it will result in blotting. Also, the writing pressure must be kept at an optimum, otherwise both thin writing and blotting may easily occur. Although the optimum speed and writing pressure of pens vary depending on various conditions, the pen type is the most important element among them. The DPX-2000 is capable of automatically determining the pen type.

The pens must be marked differently according to the pen type to effect the pen sensing function. The special pens "XD series" for the DPX-2000 are marked by silver and black marking seals at the upper part except the water-based fiber-tipped pens and ink pens (these can be sensed without markers). The combination of silver and black portions of the marker seal can be read by the sensor located at the lower left corner of the DPX-2000 to determine the pen type. The relationship between the pen type and the marker is described in the following:

Type of pen	Body color	Marker lower	Marker middle	Marker upper	Remarks
Ink pens	Black	(Black)	(Black)	(Black)	Without marker (*)
Ceramic pens	Blue	Silver	Silver	Black	
Oil-based OHP pens	Brown	Silver	Black	Black	
Water-based fiber-tipped pens	Gray	(Silver)	(Silver)	(Silver)	Without marker
Water-based ballpoint pens	Gray	Silver	Black	Silver	
Oil-based pressurized ballpoint pens	Black	Black	Silver	Black	

Note: For the ink pen and water-based fiber-tipped pens, the body color is used for sensing the pen type. Before using a Staedtler ink pen, be sure to stick the silver sticker supplied as an accessory to the specified position on the pen holder (75PL07H2).

Note: If the marker seal on the pen is partially peeled off or contaminated, the pen sensing function will be disturbed.

(2) How to check if pen is in pen stock

With the DPX-2000 in Automatic Pen Control mode, the pen carriage automatically looks for the second pen in pen stock 2 if it fails to find the first pen in pen stock 1. Then, it looks for the third pen in pen stock 3 if it also fails to find the second pen. Thus, the first pen which has been found to be available is used for drafting.

If no pens are found in the pen stocks, an LED lights to indicate an error. Loading a pen in a pen stock will clear this error and the plotter continues to draft. If the pen carriage has a pen and 8 pen stocks are already occupied with pens (there are a total of 9 pens), an LED also lights to indicate an error. Remove a pen from the pen stock to clear the error and to initiate continuation of operation. Do not remove a pen from the pen carriage.

Note: The above operations are effective only when the plotter is in Automatic Pen Control mode. The AUTO LED stays lit while the plotter is in this mode. In the Manual mode, the pen carriage tries to fetch a pen even from an empty pen stock and to store a pen to an already occupied pen stock. The latter case especially causes a serious malfunction. For example, the axes may not be drawn normally or proper replacement of pens may not occur.

Note: The pen carriage may act differently depending on whether the pen is to be replaced by programming or by the PEN SELECT switch on the control panel.

Note: A infrared ray photo sensor is built into the system to determine the type of pen to be used and to check to see if there is any pen in the pen stock. Place the plotter away from direct sunlight, otherwise the photo sensor may malfunction.

Note: The "XY-series" pen and the "75PL07H1" ink pen holder for the A3 size XY plotter "DXY-series" can be used in the DPX-2000. However, they do not have marker seals, so that they will not operate properly with the pen sensing function. If the DPX-2000 is used in auto pen sensing mode, the special XD pens must be used.

2. DRAFTING SPEED AND WRITING PRESSURE OF PENS

(1) Drafting speed

The DPX-2000 is capable for drawing at a maximum speed of 400 mm/sec and this speed is selected at power on. In high-speed drafting like this, a line may become thin and proper drafting can not be guaranteed, due to improper combination of a pen and paper.
The DPX-2000 pen speed can be freely adjusted depending on the type of pen and paper to be used. The following shows two examples:

- **Pen speed adjustment with control panel**
  Press either of the PEN SELECT buttons 1 to 8 while the ENTER switch on the control panel is being pressed to change the pen speed. The pen speed set by each PEN SELECT button is as follows:

Pen No.	1	2	3	4	5	6	7	8
Pen Speed (cm/sec.)	2	4	6	8	10	15	20	40

Note: If no pen is selected at this time, a new pen speed is set for every pen. It is possible to set a new pen speed for the pen only which has been selected.

Note: With the control panel, the pen speed can be selected only to the values set by the Pen Speed Setting commands and the Automatic Pen Control functions. Speed can be set as low as 2 cm/sec.

Using this approach, these settings can all be made by the controls on the plotter without using the computer software. This approach is extremely convenient when the software can not be changed at all by the user. Press the PAUSE switch to temporarily stop plotting and to change the pen speed. Use this approach especially when there is only a small amount of ink left in the pen and the drafting becomes thin.

- **Pen speed adjustment with programming.**
  Use the Pen Speed Setting commands to change the pen speed by programming.
  The pen speed can be modified from 2 cm/sec to 40 cm/sec in steps of 1 cm/sec. If the pen No. is not specified, a new pen speed is set for every pen. It is possible to set a new pen speed only for the pen No. specified. [Example 2]

[Example 1] Setting pen speed to 15cm/sec.
LPRINT "VS15;"
[Example 2] Setting pen speed of only No.3 pen to 8cm/sec.
LPRINT "VS8,3;"

Note: If the DPX-2000 is set to the Automatic Pen Control Mode (AUTO LED stays lit), it is impossible to set the pen speed with this approach. (Pen Speed Setting commands are ignored)

Note: The pen speed number after the commands is in units of cm/sec.

(2) Writing pressure of pens

The DPX-2000 uses a Soft Landing system to allow the landing speed and the writing pressure of ink pens to be controlled for enhanced clarity and precision of line. The optimum writing pressure of pens depends on such conditions as the angle of DPX-2000 installation, pen speed, type and weight of pen, amount of ink, type of paper, ambient temperature and humidity. The writing pressure should be set as low as possible. Too much pressure wastes ink, wears pen tips, and may tear the paper.
In the DPX-2000, the writing pressure of pens is set to the minimum value of 20 g on power on. In the Automatic Pen Control mode, it is automatically set to an optimum according to the type of pens. Set or adjust the writing pressure with the following two methods:

- **Setting writing pressure by programming**
  Use the Pen Writing Pressure Setting commands, to modify the writing pressure of pens in programming. [Example 1].
  The pressure can be set from 20 g to 125 g in 8 steps.
  If the pen No. is not specified, a new pen writing pressure is set for every pen. It is possible to set a new pen writing pressure for the pen whose pen No. is specified only. [Example 2]

Parameter range	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Writing pressure (g)	20	20	35	35	50	50	65	65	80	80	95	95	110	110	125	125

Note: The above pressure values are intended to be used when the plotter is placed on a flat table. These values may differ depending on the situation.

[Example 1] Setting writing pressure to the maximum 16 (125 g)
LPRINT "FS16;"

[Example 2] Setting writing pressure of No. 5 pen only to 50 g.
LPRINT "FS5,5;"

Note: If the DPX-2000 is set to the Automatic Pen Control Mode (AUTO LED stays lit), it is impossible to set the writing pressure with this approach. (Pen Writing Pressure Setting commands are ignored)

- **Fine adjusting writing pressure with PEN FORCE control**
  As described above, the optimum writing pressure of ink pens depends on such conditions as the angle of installation, pen speed, type and weight of pen, amount of ink, type of paper, ambient temperature and humidity. The writing pressure should be fine adjusted according to the actual drafting environment after it is set by programming or by the Automatic Pen Control function.

  Use the PEN FORCE control on the side panel at the right side of the main unit to finely adjust the writing pressure. The adjusting pressure ranges from −15g to +15g. Turn the control clockwise to increase the pressure and counterclockwise to decrease it. The optimum writing pressure is minimum pressure where the writing will not become thin. Readjust the writing pressure every time the installation environment and drafting conditions change. The PEN FORCE control is effective also when the Automatic Pen Control function is selected.

- **Setting writing pressure with control panel**
  Press either of the PEN SELECT buttons 1 to 8 while the FAST switch on the control panel is being pressed to set writing pressure. The writing pressure set by each PEN SELECT buttons is as follows:

Pen No.	1	2	3	4	5	6	7	8
Writing pressure (g)	20	35	50	65	80	95	110	125

Note: If no pen No. is selected at this time, a new pen speed is set for every pen. It is possible to set a new pen speed for the pen only whose No. has been selected.

3. AUTOMATIC PEN CONTROL

The Automatic Pen Control function is initially selected when the DPX-2000 is turned on. The AUTO LED lights to indicate that this function is selected. It has the following four functions:

(1) When this function is selected, the speed and the writing pressure are automatically set to optimum values depending on the type of pen to be used. The relationship between the pen type and the pen speed/writing pressure is shown in the following:

Type	Drafting speed	Writing pressure
Ink pens	15 cm/sec	20 g
Ceramic pens	15 cm/sec	20 g
Oil-based OHP pens	10 cm/sec	20 g
Water-based	40 cm/sec	20 g
Fiber-tipped pens	40 cm/sec	20 g
Water-based ballpoint pens	40 cm/sec	50 g
Oil-based pressurized ballpoint pens	40 cm/sec	110 g

Note: In the Automatic Pen Control mode, the Pen Speed Setting commands and the Pen Writing Pressure Setting commands set by a computer are ignored.

(2) If the pen carriage tries to fetch a pen in the pen stock and there is no pen available in the target pen stock, it will automatically fetch a pen in the next pen stock. Also, if the pen carriage tries to return a pen to a pen stock and there is already a pen at that location, it looks for other available pen stocks.

(3) In the DPX-2000, pen caps are provided at the pen stocks. When the drafting is terminated, the pen currently in use returns to the pen stock and is automatically capped when it returns to the pen stock to prevent drying of pen tips.

(4) If a pen is left at the down position for a long period of time during drafting, ink blots on the paper. To prevent this, the DPX-2000 is provided with an automatic pen lifting capability to automatically lift the pen several minutes after it has been left at the down position for a long period of time.

The Automatic Pen Control functions can be canceled by pressing the AUTO switch on the control panel. Cancelling this lights off the AUTO LED on the AUTO switch to indicate that the Manual mode is currently selected. In the Manual mode, all of the above four functions will be ineffective.

4. AUTOMATIC PEN CAPPING FUNCTION

(Available only when the AUTO LED is ON.)

In the DPX-2000, pen caps are provided at the pen stocks. When the drafting is terminated, the pen currently in use returns to the pen stock and is automatically capped when it returns to the pen stock to prevent drying of pen tips.

***IMPORTANT:**
Firmly press the Pen Cap Release button at the lower left corner of the pen stock to open the pen cap and then to load or unload the pen. If the pen is loaded or unloaded with the pen cap being closed, the pen tip may be damaged. Handle the ceramic and ink pens which have delicate pen tips with special care.

If the pen is left for approximately 1 minute while drafting is in process and no commands are sent to the plotter, the pen automatically returns to the pen stock and is capped to prevent drying of pen tips. If some commands are sent to the plotter after the pen has returned, the pen carriage will fetch the pen which has been returned, and then, will return to the original position immediately. Then, it starts drafting again according to the received commands.

Note: Do not leave your hands or any objects on the drafting board even if the pen is not moving if power is ON. The arm (Y rail) moves at an extremely high speed by computer commands.

Note: Automatic pen capping capability is a temporary measure for preventing drying of pens. Always remove a pen from the pen stock and cap each pen cap if the plotter is not to be used for a long period of time. The ink at the tip of the ink pen tends to become hard.

5. AUTOMATIC PEN LIFTING FUNCTION

(Available only when the AUTO LED is ON.)

If a pen is left at the down position for a long period of time during drawing, ink blots on the paper. To prevent this, the DPX-2000 is provided with an automatic pen lifting capability to automatically lift the pen for several minutes after it has been left at the down position for a long period of time.

6. DATA BUFFER

The plotter operates more slowly than the computer does, so that the DPX-2000 is provided with a built-in data buffer of 15 K Bytes to store the data sent from the computer. The computer can finish the job regarding the plotter before the latter finishes its operation, thus reducing the waiting time of the computer. This data buffer helps to shorten the operating time of the computer with the following short comings:

(1) Even if the user tries to suspend the drafting by stopping the program, it takes a certain amount of time before the plotter stops its operation.

[Countermeasure]
First, press the PAUSE switch on the control panel, then the drafting is temporarily suspended. In this situation, some data still remains in the data buffer, so that drawing continues if the PAUSE switch is pressed again. Press the ENTER switch and then the BUFFER CLEAR switch on the control panel if drawing is to be initiated from the beginning again after some corrections have been made. The data, taken into the buffer area by the time the PAUSE switch has been pressed, is cleared. Therefore, pressing the PAUSE switch again to clear the drawing pause will not allow the plotter to start drawing. Edit the program for drawing, change the paper, and then start the drawing procedure from the beginning.

(2) When the user creates his own program for drafting and an error occurs, the causes of the error may be difficult to find, if the DPX-2000 is in buffer mode.

[Countermeasure]
The error may be difficult to find because the plotter will not stop even if the computer stops its operation due to the error. To prevent this situation, the DPX-2000 is provided with the Non-buffer mode. To correct errors in programming, turn on the power switch while pressing the Cursor (≪) switch on the control panel. This will initiate the Non-buffer mode. In this mode, when the computer stops its operation during drafting, the plotter also stops its operation at the same time.

Note: The data buffer can not be expanded to more than 15K Bytes for the DPX-2000.

7. X-Y COORDINATE DISPLAY

The X-Y Coordinate Display indicates the position of the tip of the pen in the pen carriage in X-Y coordinate values in units of 0.1 mm. Decimal fractions are rounded up or down to the first decimal place. Press the X-Y Coordinate RESET button at any place to set that location as an origin (0, 0). From then on, the display values for the pen carriage position coordinates are relative to this new origin (0, 0).

Note: Immediately after the DPX-2000 is turned on, the pen carriage moves to the upper right corner and the X-Y Coordinate Display indicates (0, 0). At this moment, no origin is set in the plotter. Then, when the first drafting command is entered or when [LL] (Lower left) switch is pressed, the display origin returns to the lower left corner and drafting can be initiated. From then on, the display values for the pen carriage position coordinates are relative to any new origin (0, 0).

4

PAPER AND PEN

1. TYPE OF PEN AND FEATURES

In addition to water-based fiber-tipped pens, ceramic pens, water-based ballpoint pens, oil-based pressurized ballpoint pens and oil-based OHP pens developed for the DPX-2000, the DPX-2000 can also use drafting ink pens (for paper and for film) specially designed by Staedtler of West Germany. Use the following notes as an aid in selecting a suitable combination of pens and paper for your need:

Note: Water-based fiber-tipped pens, ceramic pens, water-based ballpoint pens, and oil-based OHP pens are not refillable. Replacement inks are available for oil-based pressurized ballpoint pens. Use special inks exclusively for the ink pens (for paper and for film).

Note: Before using a Staedtler ink pen, be sure to stick the silver sticker supplied as an accessory to the specified position on the pen holder (75PL07H2). Otherwise when the ink pen is set in place, the DPX2000 will not detect it so and plotting with that ink pen will fail.

Note: Although the DPX-2000 is provided with the Automatic Pen Capping capability, it is merely a temporary measure for preventing drying of pens. Always remove pens from the pen stock and cap each pen if the plotter is not to be used for a long period of time. The ink at the tip of the ink pen tends to become hard easily.

Note: The optimum speed and writing pressure of each pen is automatically selected when the pen is selected in the Automatic Pen Control Mode. Refer to the values when using the Pen Speed Setting and the Pen Writing Pressure commands in the Manual mode.

[The water-based fiber-tipped pen]

This pen is good for general use, but the pen tip is made of plastic so that it wears out and the line becomes thick after long use. The ink runs smoothly and high-speed drafting can be achieved. These pens are most suitable for illustrations which requires good color quality. The allowable maximum writing pressure and pen speed are approximately 20 g and 40 cm/sec. respectively.
Eight colors (black, red, blue, green, brown, violet, pink, and orange) and two types of pen tips (0.3, 0.6 mm) are available.

Model #	Thickness (mm)	Specifications
XD-4SPA-WN	0.3	Black (4)
XD-4SPB-WN	0.3	Black, Red, Blue, Green (1 ea.)
XD-4SPC-WN	0.3	Brown, Violet, Pink, Orange (1 ea.)
XD-4SPA-WW	0.6	Black (4)
XD-4SPB-WW	0.6	Black, Red, Blue, Green (1 ea.)
XD-4SPC-WW	0.6	Brown, Violet, Pink, Orange (1 ea.)

[Ceramic pen]

Since the pen tip is protected by ceramic, the ceramic pen can provide constant width of line as well as depth and uniformity of color all the way down to the last drop of ink.
Three types of pen tips (0.2, 0.4, 0.6 mm) are available and can be used for simple drafting. Water-based ink is used for this type of pen.
Never drop the pen tip (especially 0.2 mm ceramic pen) or hit it with an object since it is extremely delicate and may be easily broken.
A writing pressure of approximately 20 g and a pen speed of approximately 15 cm/sec are recommended. Four colors (black, red, blue, green) are available.

Model #	Thickness (mm)	Specifications
XD-4SPA-CN	0.2	Black (4)
XD-4SPB-CN	0.2	Black, Red, Blue, Green (1 ea.)
XD-4SPA-CM	0.4	Black (4)
XD-4SPB-CM	0.4	Black, Red, Blue, Green (1 ea.)
XD-4SPA-CW	0.6	Black (4)
XD-4SPB-CW	0.6	Black, Red, Blue, Green (1 ea.)

[The water-based ballpoint pen]

The water-based ballpoint pen is especially suited for drawing a thin line and for relatively high-speed drafting. The pen tip is strong enough and can be handled with ease, but never drop the pen tip, hit it with an object, or rub it against a hard surface. Do not allow the pen speed to become extremely low, otherwise the ink may not run smoothly. The maximum allowable writing pressure and pens speed are approximately 50 g and 40 cm/sec, respectively. Four colors (black, red, blue, green) are available.

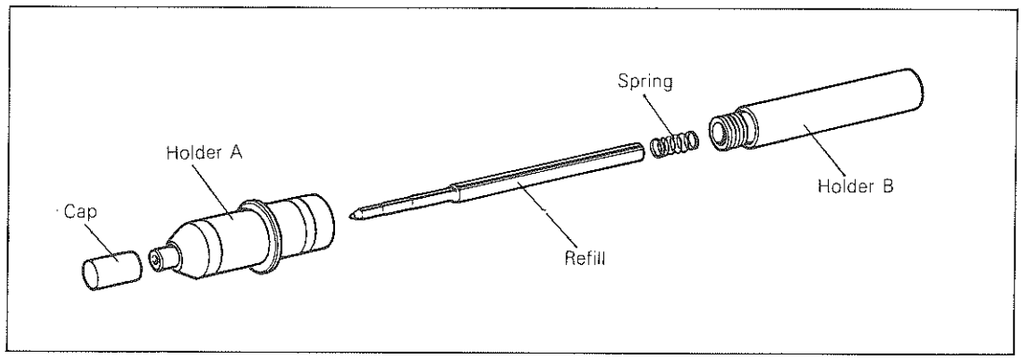
Model #	Specifications
XD-4SPB-BP	(for thin-line drawing) Black, Red, Blue, Green

[Oil-based pressurized ballpoint pens]

Gas is injected into the refill of a ballpoint pen and ink is gradually pushed out of the inside to allow it to be used at a semi-vertical position (80°). This type of pen provides consistent line width and a thin line and is suitable for high-speed drawing. The maximum allowable writing pressure and pen speed are approximately 110 g and 40 cm/sec, respectively. The pen uses an oil-based ink which is available in four colors (black, red, blue, green).

Model #	Specifications
XD-BPH	Pressurized ballpoint pen holder with a black refill
XD-3M-BLK	Black (3) refills
XD-3M-RED	Red (3) refills
XD-3M-BLU	Blue (3) refills
XD-3M-GRN	Green (3) refills

The pressurized ballpoint pen consists of the holder (XD-BPH) and the pen refills (XD-3M-BLK, RED, BLU, GRN).
The pressurized ballpoint pen holder (XD-BPH) is initially equipped with a black refill for trying out the quality or writing.



The inside of the holder is shown in the above Figure. Rotate the holder B counterclockwise to remove it and you can change refills. Do not lose the spring within the holder B.

[The oil-based OHP pen]

This is an oil-based fiber-tipped pen for drafting onto film for OHPs (overhead projectors). There are various types of OHP films. If a proper matching between the OHP film and pens is not made, the ink blots on the film, the adjoining colors become mixed with one another. Also, the color may be uneven in shading. Always choose the proper OHP film for the available pen. It is recommended to use OHP film made for plotters. Eight pen colors (black, red, blue, green, brown, yellow, orange, violet) and two pen tips (0.3 mm, 0.6 mm) are available. For shading, a pen tip of 0.6 mm is recommended. The maximum allowable writing pressure and pen speed are approximately 20 g and 10 cm/sec, respectively.

Model #	Thickness (mm)	Specifications
XD-4SPB-ON	0.3	Black, Red, Blue, Green (1 ea.)
XD-4SPC-ON	0.3	Brown, Yellow, Orange, Violet (1 ea.)
XD-4SPB-OW	0.6	Black, Red, Blue, Green (1 ea.)
XD-4SPC-OW	0.6	Brown, Yellow, Orange, Violet (1 ea.)

[INK Pens]

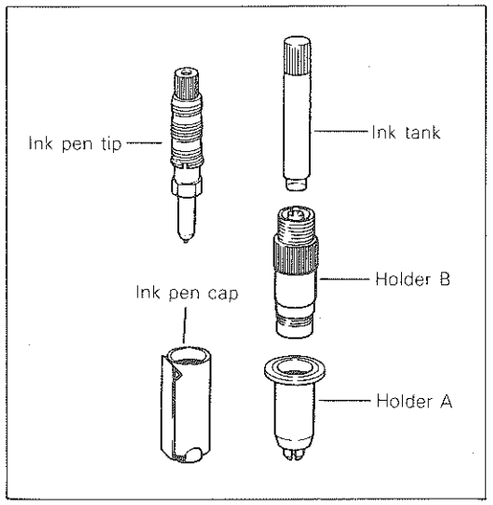
Designed for plotter drafting by STAEDTLER of West Germany, the leading ink pen manufacturer. These pens are simple to assemble and use for precision drafting with non-fade ink. MARS PLOT Series ink pens can be used for the DPX-2000. They are also refillable for extended use.

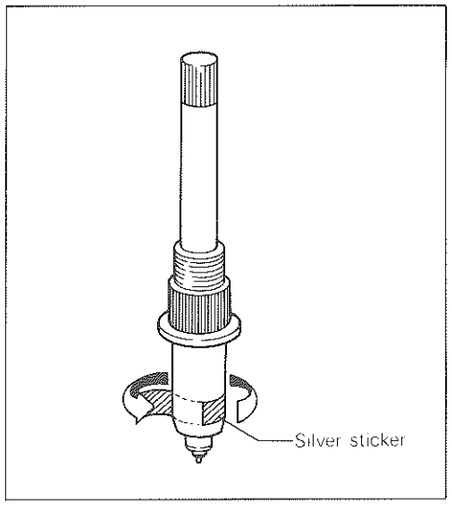
	Model #	Specifiactions
Ink Pen Holder	75PL07H2	Only Pen Holder
Ink Pen Tips for Paper	750PL2CF 750PL3CF 750PL5CF	0.25 for Paper 0.35 for Paper 0.50 for Paper
Ink for Paper	748PL	Black for Paper
Ink Pen Tips for Film	757PL2CF 757PL3CF 757PL5CF	0.25 for Film 0.35 for Film 0.50 for Film
Ink for Film	748PLF	Black for Film

- Note that the short type ink pen holder ST-PH can't be used for DPX-2000 in auto pen sense mode.
- Ink pens are suitable for plotting drawings, data tables and illustrations that require high picture quality. Compared to water-based fiber tipped pens, ink pens draw lines that are sharp and neat. There is no change in line thickness or density even when used over a long period of time. However, the pen structure is so delicate that it requires sufficient knowledge and care in handling and maintenance. To obtain full performance from the ink pens, be sure to read this section before use.
  Less than 150mm/second pen speed and 20g pen pressure are appropriate for them.

(1) Precautions (when using ink type refillable pens)

- When plotting on a general high quality paper or tracing paper, use an ink pen tip and ink for papers, while on an polyester film, be sure to use an ink pen and ink for films. Use of mismatched paper of film, ink pen tip and ink will result not only in poor plotting but also in a damaged ink pen tip.
- Make sure to use special purpose ink only. The special purpose ink is made exclusively for the plotter and therefore, is different from the general purpose ink (e.g. hand-writing ink). Don't use the general purpose ink as it will cause an ink stoppage.
- Don't shake the ink pen too hard, drop it from a high place or subject it to strong impact. Also, use special care for the pen tip.
- Avoid use in places subject to excessive temperature changes as this will lead to ink leakage.
- Don't disassemble the ink pen tip.
- Too high pen speed may cause scratchy lines depending on the type and condition of the paper. For better plotting, it is recommended to use the plotter by setting it to the automatic pen control mode (AUTO LED ON) or to 150mm/second pen speed by means of the command.
- For plotting with an ink pen, set the DPX-2000 as horizontal as possible. The inclined ink tank may restrict the flow of ink.

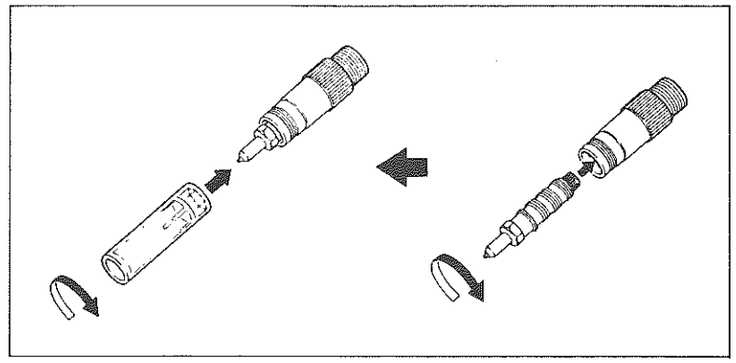




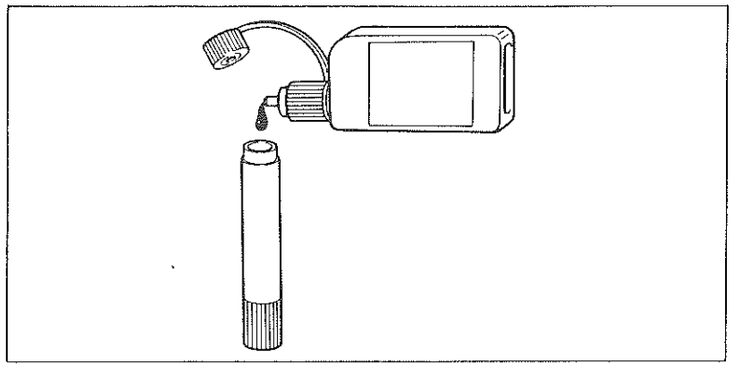
Note: Before using a Staedtler ink pen, be sure to stick the silver sticker supplied as an accessory to the specified position on the pen holder (75PL07H2), otherwise the DPX-2000 will not detect the pen and plotting will fail.

(2) Assembly and ink filling

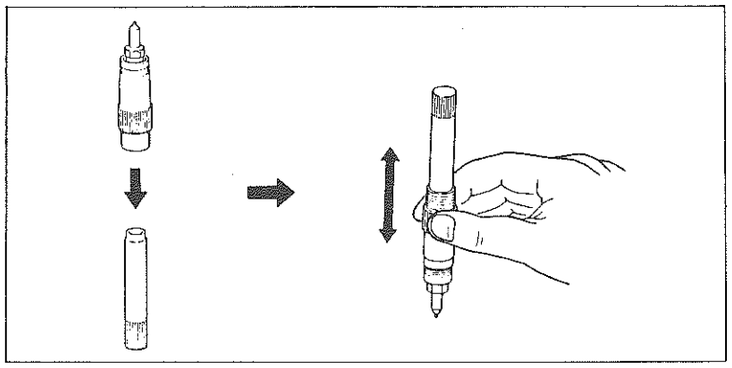
In the ink pen holder "75PL07HL2" (not included with plotter), the parts as shown in the figure are assembled. Disassemble and check each part but don't disassembly the ink pen tip.
Take out the pen tip from the plastic case and screw it into the holder B. One side of the pen tip plastic case can be used as a hexagonal spanner.
Tighten the pen tip securely with it.



Pour the ink into the ink tank. overfilling will cause overflow when assembling. Don't fill higher than the step on hte ink tank.



Slowly push the holder B into the tank. With the pen tip directed downward, shake up and down slowly. Be careful not to shake it too hard, or ink may come out and hands and other objects may get stained.

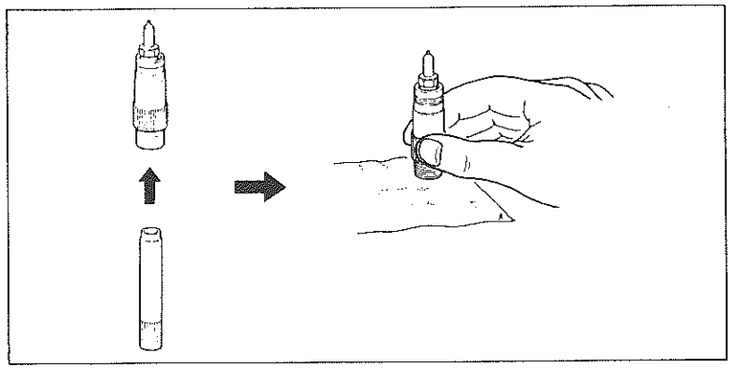


Try the pen on a piece of paper or film to check for ink flow. If it doesn't write, shake it again. After confirming proper ink flow, screw the holder B with the pen tip and ink tank into the holder A securely.
This completes the preparation of the pen.
Before setting the ink pen in the pen stock, always check to make sure that ink flows.

NOTE: After use, if it will not be used for a long while, wash it in the water and dry it with a cloth thoroughly for storage. Note that the ink may get dried at the pen tip if left in the ink tank. Also, to protect the pen tip during storage, be sure to fit the ink pen cap instead of the holder A.

(3) Ink refilling

Refill the ink before it runs out. When the ink level lowers, the air in the ink tank will tend to expand and cause the ink to leak.
Remove the pen from the pen stock.
With the pen tip directed upward, remove the holders A and B from the ink tank gradually.
Lightly tap the holders A and B on a piece of soft paper or cloth to let out the remaining ink.
Fill ink tank. Be careful not to overfill, or ink will overflow when installing holders A and B.
Install holders A and B gradually. Pushing them forcibly will cause a sudden change in the pressure in the holder, resulting in ink leakage from the side of the pen tip.



(4) Pen storage

- When starting plotting within about an hour,
  The pen may be left set in the pen stock. But be sure to test the pen before plotting.
- When reusing the next day,
  Take out the ink pen from the pen stock, remove the holder A and with the ink pen cap fitted instead, place the pen with its pen tip directed upward. When starting plotting, shake it slowly, and it will be ready.
- When keeping unused for a longer time,
  The pen tip is very expensive. To prevent it from being blocked, remove the pen tip from the holder and wash it in water.

(5) Washing

The washing method differs depending on the kind of ink being used. The following description applies to the case in which our special purpose ink ST-INK, INKF is used. (Take note that some inks other than ours can not be washed off in the water.)

- By reversing the procedure of assembly, remove the pen tip from the holder and discard the ink in the ink tank.
- Wash the pen tip, holder and ink tank under running water by shaking. When no more ink comes out, washing is completed. Dry each of them for storage.

(6) Should ink pen become blocked

Do not shake the ink pen unreasonably or move the inside needle. The inside needle of the ink pen uses ultra-fine wire and shaking the pen forcibly may break this wire. Don't attempt disassembly, but immerse the ink pen as it is into the cleaner below for one or two days, and the insdie needle will move easily. Then follow the washing procedure as outlined above.
Pen cleaner (available at a stationery store or drawing goods store)
Manufacturer: STAEDTLER
Product name: Mars water based ink pen cleaner
Product No.: 100cc 74600
250cc 74625

(7) Causes of ink blockage

- When the pen is left with ink filled,
  Refer to the previous section (4) Pen storage and follow the appropriate procedure.
- When dust or fiber on the plotting surface has entered the pen tip during plotting,
  The line becomes scratchly. In this case, stop the plotter and wash the pen referring to (5) Washing.
- When the ink pen tip and ink are in mismatched,
  Use the special purpose ink ST-INK, INKF.

2. TYPE OF PAPER AND FEATURES

High-quality paper, coated paper, tracing paper, polyester film and OHP film are available for the DPX-2000. Always select the proper combination of pens and paper.
Ink should stay long enough on the paper and the written line should not become thin at a specified writing speed. Ink should not blot on the paper and should dry quickly. Also, the colors that appear on the paper are largely influenced by the nature of the paper.

Note: When using the ISO standard A2 size paper, ensure that the dip switch 1-7 located at the side panel is at the OFF position (white nibs must be at lower side). When using the ANSI standard C size paper, always set the dip switch 1-7 at the side panel to the ON position (white nibs must be at upper side). If these settings are not properly made, the pen carriage may reach beyond the paper area or it may not reach certain parts of the paper.

[High-quality paper]

Can be used for plotting. It is economical but tends to stretch or shrink with variations in humidity. Also ink tends to blot easily on this paper. It is not suitable for drafting which requires high precision.

[Coated paper]

The surface is smooth with surface coating and it has appropriate ink absorption properties. Also, it colors well and shows lines and characters clearly but slightly stretches or shrinks with variations in humidity. When it is used for ceramic pens or ink pens, the coating on the surface is removed and there are instances where fiber blocks the tip of the pen. Use of coated paper is not recommended with ceramic pens and ink pens.

[Tracing paper]

Generally it is suitable for drafting and is optimum for positive printing of original drawings. It may stretch or shrink with variations in humidity to some extent. Also, it lacks in sufficient electrostatic force.

[Drafting film]

Made of polyester film, it stretches or shrinks little with variations in humidity so that it is best suited for drafting which requires high precision. Always use an ink pen for this drafting film (use an ink pen and ink exclusively for film).

[OHP film]

This is a transparent film used exclusively for overhead projectors. It comes only in A4 size.
If a proper match between the OHP film and pens is not made, the ink blots on the film, the adjoining colors become mixed with one another.
The matching between pens and papers depends on such factors as the required quality of drafting, installation angle, ambient temperature and humidity, speed and writing pressure of pens, and amount of ink.

3. COMPATIBILITY OF PEN AND PAPER

Type of Pen \ Type of Paper	High-quality paper	Coated paper	Tracing paper	Polyester film	OHP film	Pen Speed (cm/sec.)	Pen pressure (g)	Features
Water-based fiber-tipped pens	◎	◎	○	×	×	40	20	economical bright colors
Ceramic Pens	○	×	○	×	×	15	20	stable line width simple to use
Water-based Ball-point pens	○	○	○	×	×	40	50	easy to use high speed drawing
Oil-based Pressurized Ball-point Pens	○	◎	◎	×	×	40	110	high speed drawing narrow line
Oil based OHP pens	×	×	×	×	◎	10	20	exclusive use for OHP
Ink pens	○	×	◎	×	×	15	20	stable line width for paper only
Ink pens for Film	×	×	×	○	×	15	20	stable line with for Polyester film only
Features	economical	takes good notation in ink	Blue copy OK	for minute drawings	for OHP			

◎ Well Suited ○ Usable × Not Suited

5

APPENDIX

1. CONNECTION WITH PRIMARY PERSONAL COMPUTERS

IBM PC (5150), PC XT (5160), PC AT (5170)

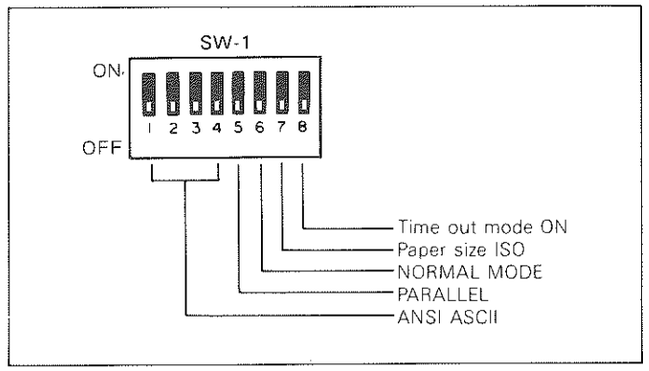
(1) Parallel connection

① An interface card is required. Use a parallel printer adaptor or a monochrome display and parallel printer adaptor.
See the operating manual of the interface card for details of installation.

② Connecting Cable: Use the IBM printer cable or Roland DG XY-IPC.

③ Make sure that the DPX-2000 power is OFF, and then set DIP switch 1 as shown below.

Fig. 1



④ Connect the printer cable to the PARALLEL IN on the side panel of DPX-2000.

(2) Serial connection

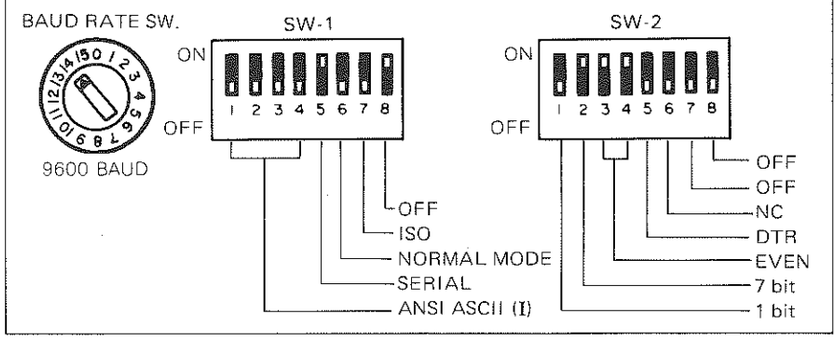
① An Interface card is required. Use either:
- IBM asynchronous communications adaptor
- Comboplus card, AST Research Inc.

See the operating manual of the interface card for details of installation etc.

② Connecting cable: Use the Roland DG XY-RS-13 or Roland DG XY-RS-33 for IBM-PC or IBM-PC/XT. See next page for IBM-PC/AT.

③ Make sure that the DPX-2000 power is OFF, and then set DIP switch 1 and 2 and Baud rate switch as follows:

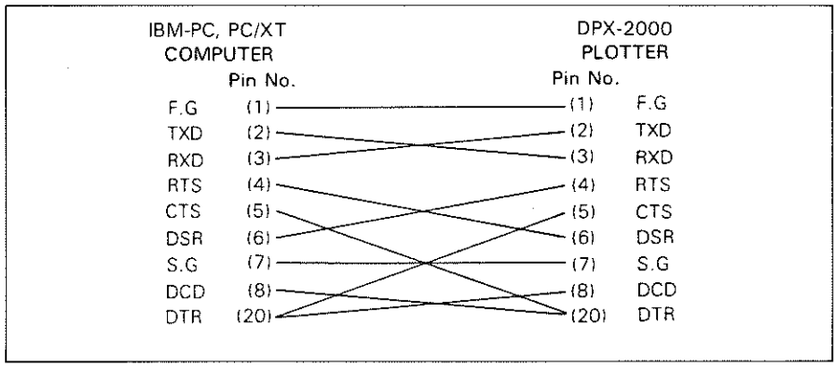
Fig. 2



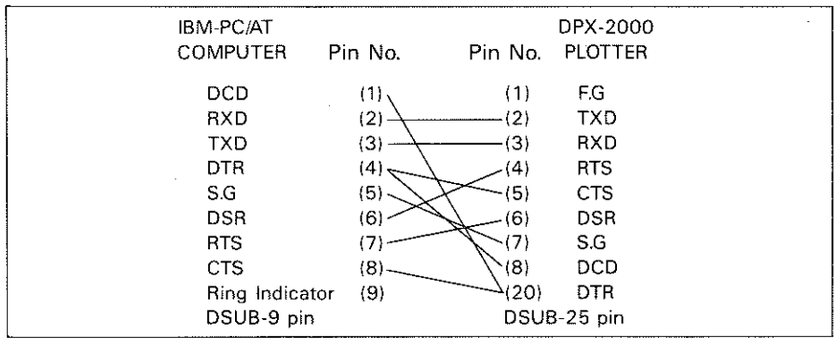
④ Connect the Roland DG XY-RS-13 cable or Roland DG XY-RS-33 cable to the SERIAL IN on the side panel of DPX-2000. (For IBM-PC or IBM-PC/XT)

The internal wiring connections of the Roland DG XY-RS-13 cable (or Roland DG XY-RS-33 cable) are as shown below:

Fig. 3



*When using the DPX-2000 in the serial connection by loading the serial/ Parallel Adapter card in the IBM-PC/AT, make sure to use the following RS-232C cables.



Note) If a device time out error occurs on the IBM-PC/AT, set DIP switch 1 ⑧ of the DPX-2000 to the ON position.

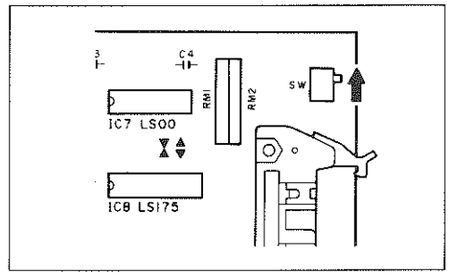
APPLE II, IIe

(1) Parallel connection

① An interface card is required. Use the Roland DG XY-APL card. See the manual supplied with the XY-APL for details of installation etc.

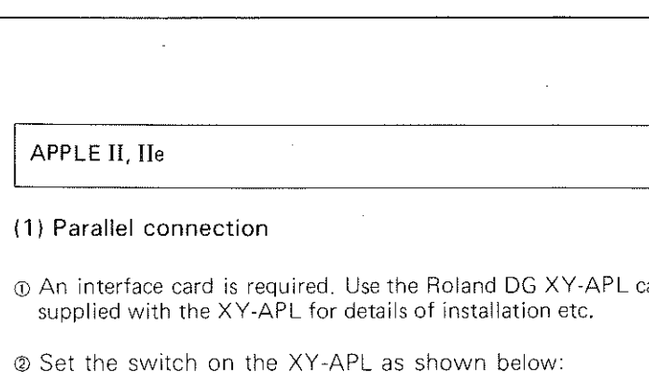
② Set the switch on the XY-APL as shown below:

Fig. 4



③ Make sure that the DPX-2000 power is OFF, and then set DIP switch 1 as shown below:

Fig. 5



④ Connect the cable from the Roland DG XY-APL to the PARALLEL IN on the side panel of DPX-2000.

This completes connection. See the Roland DG XY-APL manual for details of the interface card. Use the cable supplied with the Roland DG XY-APL.

Note:
If a parallel printer card and cable other than the XY-APL is used, the DPX-2000 will not operate unless bit 7 (MSB) is set to LOW or modified.

(2) Serial connection

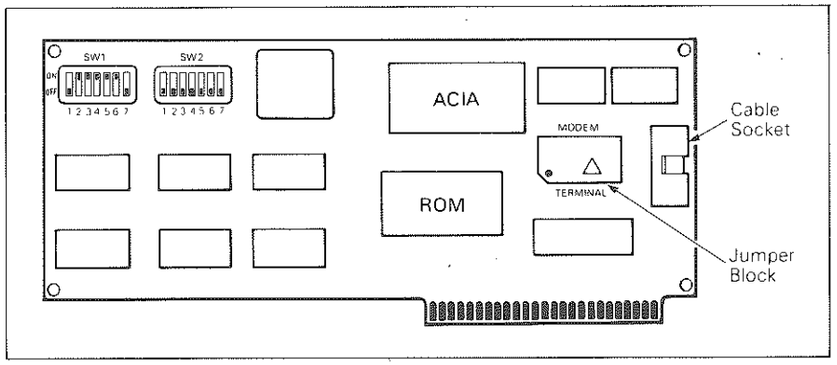
① An interface card is required. Use the APPLE II Super Serial Card.

② The following example shows the case of connection at 1200 baud, even parity, stop bit 2, and data bits 7.

③ Set DIP switches 1 and 2 on the Super Serial Card as shown in Fig. 6.

④ Set the jumper block so that the triangle is as shown in Fig. 6. (ie. set to the communication mode).

Fig. 6

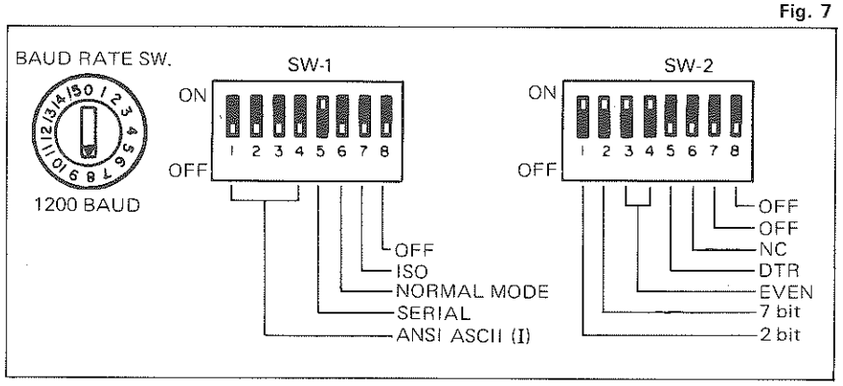


⑤ Switch the APPLE power OFF, remove the top cover and plug the Super Serial Card into slot # 2. See the Super Serial Card manual for details.

⑥ Connect the Roland DG XY-RS-11 cable or Roland DG XY-RS-31 cable to the 25-pin connector on the Super Serial Card.

⑦ Make sure that the DPX-2000 power is OFF, and then set DIP switches 1 and 2 and Baud rate swtich as shown below:

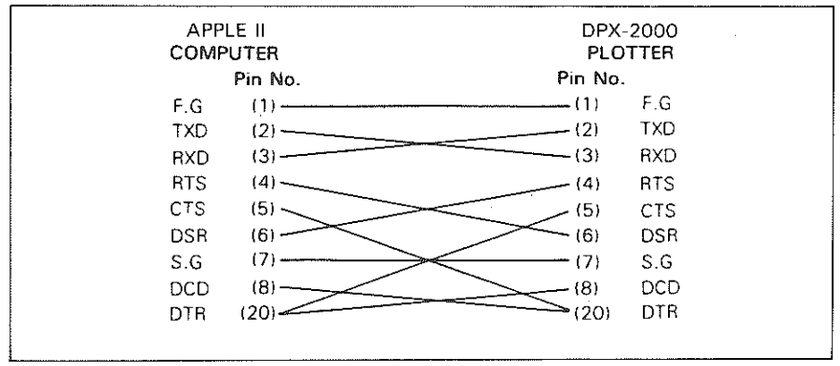
Fig. 7



⑧ Connect the Roland DG XY-RS-11 cable or XY-RS-31 cable to the SERIAL IN on the side panel of DPX-2000.

This completes connection. See the Super Serial Card manual for details of baud rate and parity checking.
The internal wiring connections of the Roland DG XY-RS-11 cable (or Roland DG XY-RS-31 cable) are as shown below:

Fig. 8



2. COMMANDS FROM THE COMPUTER

IBM PC (5150), PC XT (5160), PC AT (5170)

When DOS is started up, execute the following program, and it can prevent DEVICE TIME OUT. However MODE COM is required for System Disk.

On parallel connection: A > MODE LPT 1: , ,P
On serial connection: A > MODE COM 1:12, , , ,P

(1) Parallel connection

```
10 ' *** SAMPLE FOR IBM-PC ***
20 '         by Parallel
30 LPRINT "SP1;PA;PU-10500,-7800;"
40 LPRINT "PD-10500,7800,10500,7800,10500,-7800,-10500,7800;"
50 LPRINT "PU;"
```

(2) Serial connection

```
10 ' *** SAMPLE FOR IBM-PC ***
20 '         by Serial
30 OPEN "COM1:9600,E,7,1,CS65535" AS #1
40 PRINT #1,"SP1;PA;PU-10500,-7800;"
50 PRINT #1,"PD-10500,7800,10500,7800,10500,-7800,-10500,7800;"
60 PRINT #1,"PU;"
70 CLOSE
80 END
```


APPLE II, IIe

The same commands are sent from the APPLE II, IIe to the DPX-2000 with serial and parallel connection.

Example: Plotting a rectangle

```
10 REM *** SAMPLE ***
20 PR#2
30 PRINT "SP1;PA;PU-10500,-7800;"
40 PRINT "PD-10500,7800,10500,7800,10500,-7800,-10500,7800;"
50 PRINT "PU;"
60 PR#0
```

Note:

- With both serial and parallel connection, if PR #0 is not executed at the end of the program, all data input from the keyboard will be sent to the **DPX-2000** at the end of the program.

- With serial connection, the following cautions are required when output from the plotter is received with the APPLE II.
  IN #2 and PR #0 must be executed before receiving data with the INPUT statement. If IN #2 is not executed, output from the plotter cannot be received, and if PR #0 is not executed excess codes are sent to the plotter when output is received and an error occurs.

Example: Receiving plotter output with serial connection

```
10 REM *** SAMPLE ***
20 PR#2:IN#2
30 PRINT CHR$(27);".E";
40 PR#0:INPUT E
50 PR#2
60 PRINT "OE";
70 PR#0:INPUT OE
80 IN#0
90 PRINT "SERIAL ERROR:";E
100 PRINT "RD-GL ERROR:";OE
```

3. PLOTTER CONTROL

- **Connection types**

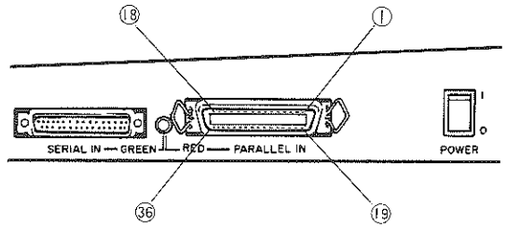
a. Parallel connection

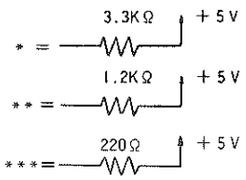
The input connector of DPX-2000 is compatible with Centronics Standard and can be connected to printer ports of most computers, using a printer cable. For methods of connection with various computers, refer to chapter 5 "1. Connection with Primary Personal Computers".

- **Connector**

Use DDK 57-30360, AMP 552235-1 or equivalent. The plotter is provided with HRS RC10-36R3-LW or equivalent.

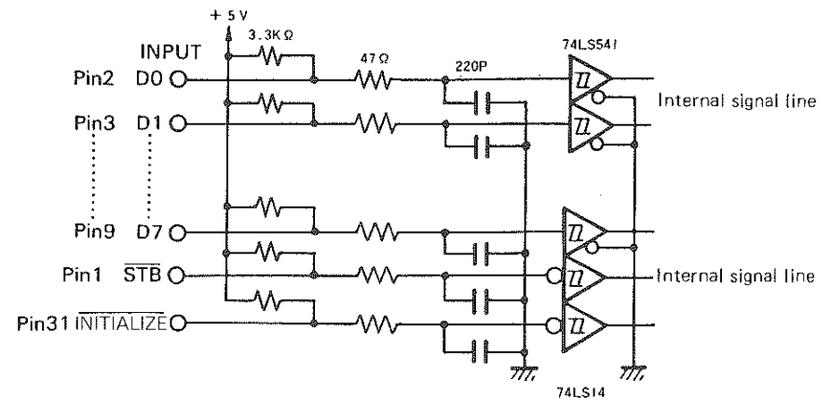
NC	36	18	HIGH ***
HIGH *	35	17	GND
NC	34	16	"
GND	33	15	NC
$\overline{\text{ERROR}}$	32	14	NC
$\overline{\text{INITIALIZE}}$	31	13	HIGH **
GND	30	12	LOW
"	29	11	BUSY
"	28	10	$\overline{\text{ACK}}$
"	27	9	D 7
"	26	8	D 6
"	25	7	D 5
"	24	6	D 4
"	23	5	D 3
"	22	4	D 2
"	21	3	D 1
"	20	2	D 0
"	19	1	$\overline{\text{STROBE}}$

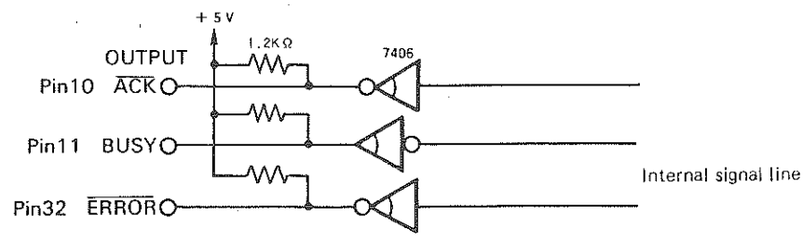


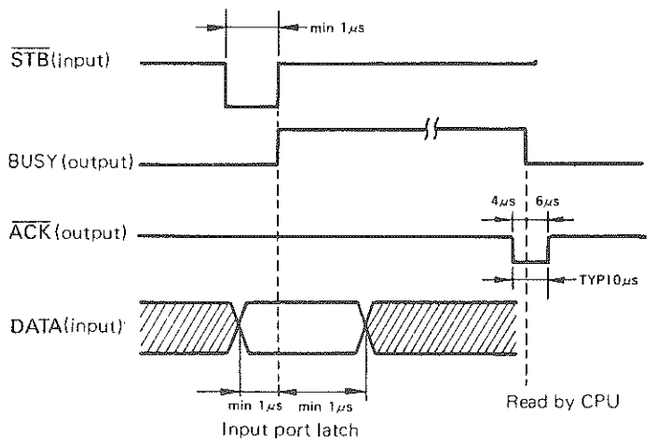


- Input/output signal lines

Input/output signals of individual connectors are as follows:







b. Serial connection

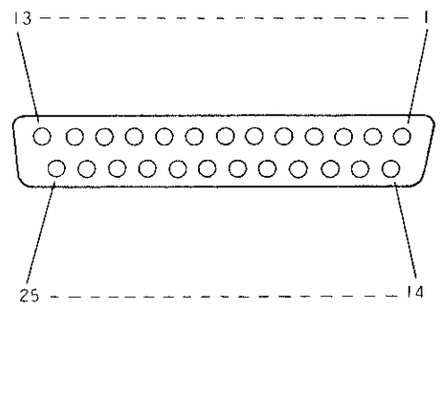
For serial (RS-232C) connection with various computers, refer to Chapter 5 "1. Connection with Primary Personal Computers"

For other computers or conditions, refer to the following:

- **Connector**

Use JAE DB-25PA-XX or equivalent. The plotter is provided with DBLC-25AF or equivalent.

RS-232C connector

Terminal No.	Signal	Pin connection
1	FG	
2	TXD	
3	RXD	
4	RTS	
5	CTS	
6	DSR	
7	SG	
8	NC	
9	NC	
10	NC	
11	NC	
12	NC	
13	NC	
14	S. TXD	
15	NC	
16	S. RXD	
17	NC	
18	NC	
19	NC	
20	DTR	
21	NC	
22	NC	
23	NC	
24	NC	
25	NC	

- **Signal lines**

Pin No.	Abbrev.	Description	I/O
1	FG	Security line which is normally connected with the computer frame. Connected to the plotter frame.	[Com]
2	TXD	Transmit data: Data output from the plotter to the computer. Connected to the receive data line of the computer. SPACE = "0" = +12V MARK = "1" = −12V	[Output]
3	RXD	Receive data: Data receive line of the plotter from the computer. Connected to the transmit data line of the computer. SPACE = "0" = +3V to +25V MARK = "1" = −3V to −25V	[Input]
4	RTS	Request to send. Output from the plotter to the computer. Always ON (+12V) is output.	[Output]
5	CTS	Clear to send: Input from the computer to the plotter. When the signal line is ON (+3V to +25V), the plotter is ready to output data, or when the line is OFF (−3V to −25V), no data will be output. When unconnected, the plotter operates with its always ON status.	[Input]
6	DSR	Data set ready: Normally this line is connected with a line to indicate ready-to-operate status of a modem. Input from the computer to the plotter. Same as for CTS when unconnected, with no problem normal operation of the plotter.	[Input]
7	SG	Signal ground connected with the internal ground line in the plotter.	[Com]
14	S.TXD	Normally, do not connect.	
16	S.RXD	Normally, do not connect.	
20	DTR	Data terminal ready: signal to indicate that the system is ready to communicate. As in RTS, with DIP SW-1-5 set to ON (to serial). The plotter outputs ON (+12V). When hardware handshake is enabled by the ESC.@, the plotter controls DTR ON (+12V) or DTR OFF (−12V) according to the remaining capacity of the buffer. When hardware handshake is set to disable by the ESC.@ command, DTR is always +12V. DTR can be connected with CTS, DSR or DCD of the computer for handshaking, provided that the computer should have a function to monitor the above signal line and stop the data output.	[Output]

4. MODE EXPLANATION

[Self-test mode]

- **Function**
  This mode allows a check of operation before the DPX-2000 is connected to the computer. Use this mode when operating the DPX-2000 for the first time or to identify whether a malfunction is occurring on the computer side or the plotter side.

- **How to set (cancel)**
  Turn ON the power switch while pressing the "ENTER" switch on the control panel. (After the self-test run, the plotter will automatically enter the normal mode.)

[Non-buffer mode]

- **Function**
  This mode sets the DPX-2000 to its non-buffer state. It is extremely convenient for program debugging.
  The DPX-2000 is provided with a built-in 15 K Bytes buffer memory to store the data sent from the computer while continuing drafting. This drastically reduces the waiting time on the computer side, thus the time required for data processing is greatly reduced. If a program is executed in this mode during program debugging, the plotter will stop nearly synchronously with the computer when an error occurs. This enables the location of the address at which the error occurred to be easily determined.

- **How to set (cancel)**
  Turn ON the power switch while pressing the " « " switch on the control panel. (Turn the power switch OFF and then ON.)

[Monitor mode (Y mode)]

- Function
  When the DPX-2000 is connected serially (RS-232C) between the computer and the terminal (Y connection), it will ignore and pass all data until the ESC. Y or ESC. (command is specified.

- How to set (cancel)
  Set No. 6 DIP switch 1 at the side panel to ON and turn ON the power switch. (Reset the DIP switch and turn the power switch ON again.)

[Automatic Pen Control mode]

- **Function**
  The plotter checks to see if there is any pen in the pen stock or in the pen carriage and also finds what type of pen is set in the pen carriage. It automatically sets the speed and writing pressure of pens best suited for the type of pen. In this mode, the Drafting Speed Setting commands and the Pen Writing Pressure Setting commands sent by the computer are ignored by the plotter. In this mode, automatic pen capping function and automatic pen lifting function are available.

- How to set (cancel)
  Press the AUTO switch on the control panel to light the AUTO LED (red). (Press the AUTO switch on the control panel to switch off the AUTO LED (red).)

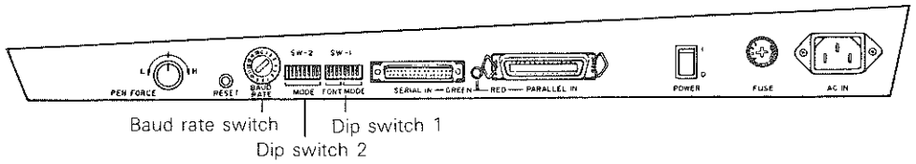
[Time Out mode]

- **Function**
  The DPX-2000 has a large data buffer but it takes a lot of time to process large amounts of data taken in at one time. The computer must wait until the plotter finishes processing this data. However, this waiting time on the part of the computer varies from computer to computer. For example, in the case of the IBM-PC/XT/AT, the computer thinks that the plotter is disconnected and displays an error message, suspending the current program. The Time Out mode solves this type of problem. If the Time Out mode is turned on, the plotter receives data, one Byte each time, at regular intervals when the remaining buffer size is not more than 256 Bytes. On the other hand, if the Time Out mode is turned off, the plotter will not receive any data unless the remaining buffer size exceeds 512 Bytes.

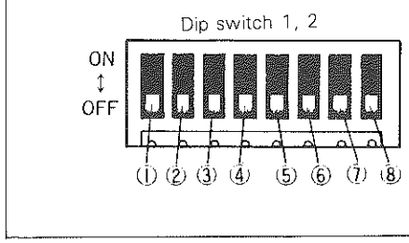
- How to set (cancel)
  Set No. 8 of DIP switch 1 at the side panel to ON and turn ON the power switch. (Set No. 8 of DIP switch 1 at the side panel to OFF and turn ON the power switch.)

5. DIP SWITCH

The DPX-2000 is provided with two DIP switches with 8 ON/OFF switches each and one rotary switch at the side panel on the right of the main unit for setting the type of paper to be used, whether the computer interface is parallel or serial, and the communication protocol for serial (RS-232C) interface.



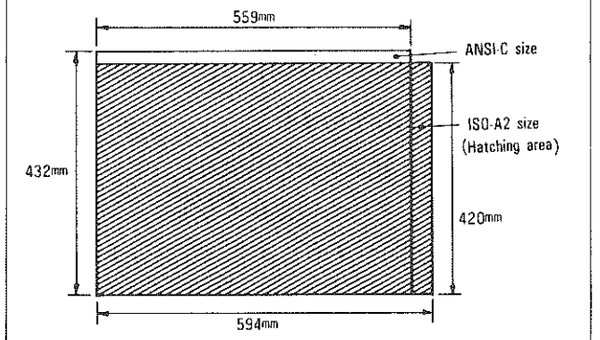
Set the white nib of each DIP switch to the UP position to turn it ON and DOWN to OFF. The white nibs are numbered 1 to 8 from right to left.



[DIP switch 1]

DIP switch 1 has 8 (No. 1-8) white nibs which are used for the following setup:

- **No. 1-4** set the initial font settings for the characters of the various languages.
- **No. 5** sets whether the connection between the DPX-2000 and the computer is parallel (Centronics) or serial (RS-232C).
- **No. 6** sets the connection mode when the serial (RS-232C) interface is selected by No. 5 above. Normally set it to the OFF position since the Y mode is a special usage. This has no meaning when the parallel (Centronics) interface is selected in No. 5 above.
- **No. 7** sets the paper size. The DPX-2000 can draft to the edge of ANSI Standard C size paper as well as ISO Standard A2 size. Always set this DIP switch to meet the paper size to be used. Otherwise, the pen may reach beyond the paper area or may not cover the whole paper area.



ANSI : AMERICAN NATIONAL STANDARDS INSTITUTE
ISO : INTERNATIONAL STANDARDIZATION ORGANIZATION

● **No. 8**
The DPX-2000 is provided with a large data buffer but it takes a lot of time to process a great deal of data taken in at one time. The computer must wait until the plotter finishes processing this data. However, this waiting time on the part of the computer varies from computer to computer. For example, in the case of the IBM-PC/XT/AT, the computer thinks that the plotter is disconnected and displays an error message, suspending the current program. The Time Out mode solves this type of problem. If the Time Out mode is turned on, the plotter receives data, one Byte each time, at regular intervals when the remaining buffer size is not more than 256 Bytes. On the other hand, if the Time Out mode is turned off, the plotter will not receive any data unless the remaining buffer size exceeds 512 Bytes.

The Dip switches are set as marked with an asterisk (*) when the plotter is delivered from the factory.

DIP SW-1	①	②	③	④	INTERNATIONAL FONT	Set No.
O N / OFF					ANSI ASCII (I)	0
O N / OFF					ANSI ASCII (II)	1
O N / OFF					French German	2
O N / OFF					Scandinavian	3
O N / OFF					Spanish Latin American	4
O N / OFF					Swedish	31
O N / OFF					Danish, Norwegian	32

DIP SW-1	White nibs	ON	OFF
⑤		Serial	* Parallel
⑥	Connected mode (RS-232C)	Y mode	* Normal
⑦	Paper standard	ANSI	* ISO
⑧	Time out mode	ON	* OFF

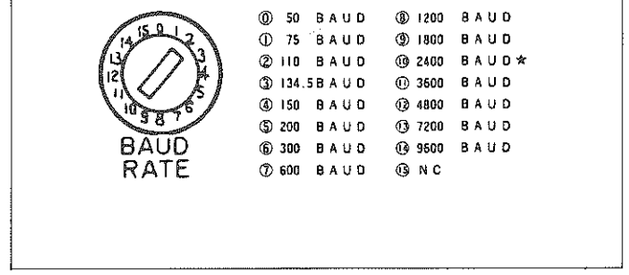
[DIP switch 2]
DIP switch 2 has 8 (No. 1-8) white nibs which are used for setting the data format when the serial interface is used as in the following:

The Dip switches are set as marked with an asterisk (*) when the plotter is delivered from the factory.

DIP SW-2	White nibs	ON	OFF
①	Stop bit	2 bit	* 1 bit
②	Data bit	7 bit	* 8 bit
③	Parity check	EVEN	* ODD
④	Parity check	ENABLE	* DISABLE
⑤	Handshake	X ON/OFF	* DTR ON/OFF
⑥	Unused	NC	* NC
⑦	Initialize	ON	* OFF
⑧	Error	ON	* OFF

● **No. 5** is used to set the Handshaking mode in serial (RS-232C) communication. Set this to the OFF position to select handshaking with the DTR ON/OFF and to the ON position to select handshaking with the X ON/OFF. These setups can be changed with software regardless of the ON/OFF of the DIP switch.
● **No. 6** is not used.
● **No. 7** is used to determine if it allows pin 31 to accept the initialization signal sent from the computer when the parallel (Centronics) interface is selected. Set this to the ON position to accept the initialization signal sent from the computer and to initialize the plotter. Normally, the initialization signal sent from the computer is in high level. When the computer commands the plotter to initialize itself, this signal becomes temporarily low. If No. 7 is set to the OFF position, the plotter will not initialize itself even if the initialization signal arrives from the computer. Normally, set this to the OFF position.
● **No. 8** is used to determine if it allows pin 32 to output the error status signal from the plotter when the parallel (Centronics) interface is selected. Set this to the OFF position to disable the error signal output. Set this to the ON position to select low level in pin 32 for telling the computer that an error has occurred in the plotter. If no errors occur in the plotter or No. 8 is set to the OFF position, pin 32 is in high level.

[Baud Rate Switch]
This switch is used to set the baud rate when the serial (RS-232C) interface is selected. No. 15 pin is not connected. This switch has no meaning when the parallel (Centronics) interface is selected.



6. DPX-2000 SPECIFICATIONS

Plotting area	X axis: 594 mm, Y axis: 432 mm (ANSI C/ISO A2 size)
Plotting speed	400 mm/sec. in all directions
Pen up/down speed	20 times/sec.
Mechanical resolution	0.0125 mm (12.5μ)/step
Software resolution (position where command enables stop)	0.025 mm
Distance accuracy	± 0.2% ± 0.05mm or less of traveling distance This value is possible to revise until ± 0.025mm.
Repeatability	± 0.05mm or less
Switches	X-Y COORDINATE RESET, PEN SELECT 1-8, PEN DOWN, AUTO, LL, UR, ENTER, P1, P2, <, >, ∧, ∨, FAST, PAUSE, PAPER HOLD, PEN FORCE, SYSTEM RESET, BAUD RATE, DIP SW1, DIP SW2, POWER
LED indicators	ERROR, POWER, AUTO, PEN DOWN, PAUSE, PAPER HOLD, PARALLEL/SERIAL, COORDINATE DISPLAY
Interfaces	Parallel (Centronics) Serial (RS-232C)
Number of pens	8
Paper setting	Electrostatic paper holder
Power consumption	120W
Dimensions	30-8/9''(W) × 5-1/2''(H) × 23-2/9'' (D) (785 × 140 × 590 mm)
Weight	38 lbs 93 oz (17.5 kg) (main unit only)
Operating temperature	0°C to 40°C
Operating humidity	20 to 80% (no dew forming)
Input/output signals	
Parallel	Centronics STROBE (1 bit), DATA (8 bits) BUSY (1 bit), ACK (1 bit) TTL level, asynchronous
Serial	RS-232C Transfer system: asynchronous, half-duplex data communication Baud rate: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600 (selected by Baud rate switch) Stop bit: 1 or 2 bits (selected by DIP switch) Parity check: odd, even, none (selected by DIP switch) Data bits: 7 or 8 bits (selected by DIP switch) Connector: DB-25S

* Specifications are subject to change without notice.

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