The MUTOH iP-220

Desktop Plotter

Maintenance Manual

MUTOH INDUSTRIES LTD.

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MUTOH INDUSTRIES LTD.
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1. Introduction

This manual has been compiled to enable you to keep the iP-220 in top condition and to obtain optimum results from using it.

Plotter output quality depends on the type of pen, ink and paper which are used as well as the way the software is matched to the mechanism. In order to satisfy these conditions and to be able to use your iP-220 under ideal conditions throughout its life, please read the operating instructions which are supplied so that you will fully understand the functions, operations and controls, always use standard spare parts supplied by this company, and follow the care and maintenance procedures explained in this manual concerning maintenance of the iP-220.

Please note that some terms used in this manual may differ from terms used in the operating instructions and parts lists.

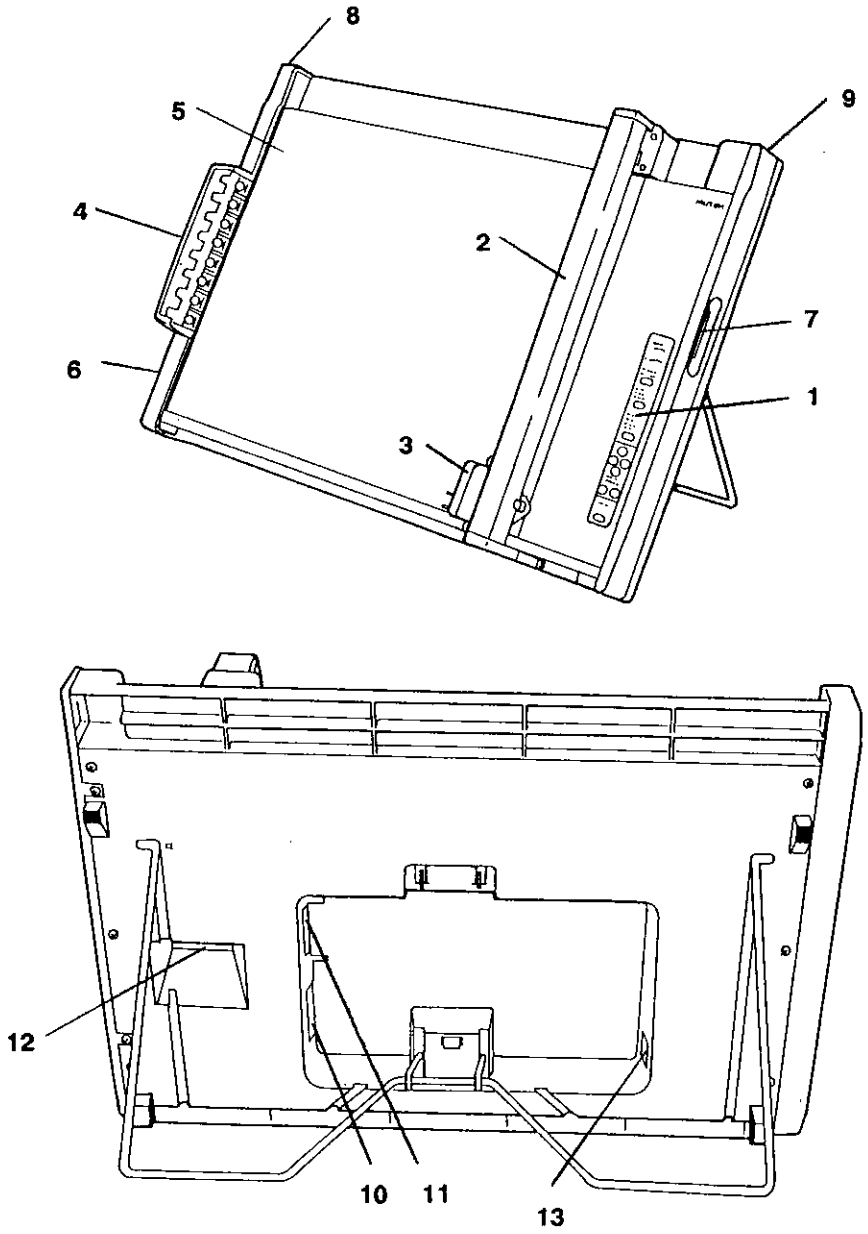
Notes on the use of this manual:

1. When standard spare parts are required, please order from a service centre listed at the end of this manual.
2. The setting values specified in this manual are standard settings for the relevant items. These values should be maintained when assembling and checking adjustments.
3. Specifications and construction may be changed without notice due to improvements, etc.
4. The contents of this manual may not be reproduced in whole or in part without permission.
5. The contents of this manual may be altered in future without notice.

1-1 Specifications

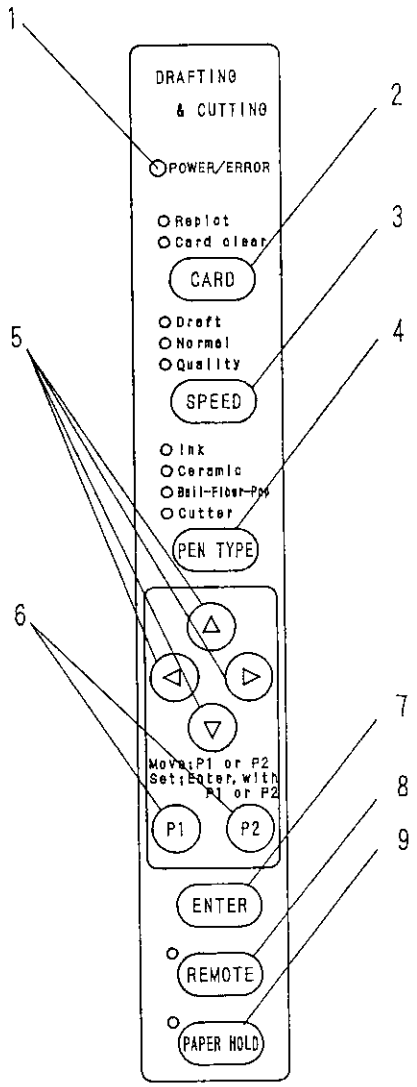
1	Type	Flat bed (60° when used upright)
2	Maximum plotting speed	919 mm/s (650 mm/s in axial direction) 36.2 in/s (25.6 in/s in axial direction)
3	Maximum acceleration	0.4G (0.4G in axial direction)
4	Maximum plotting area	450 mm x 330 mm (17.7 in x 13.0 in)
5	Pen types	Ink pen, Disposable ink pen, Ceramic pen, Water-based fibre pen, Oil-based fibre pen, Water-based ball pen, Water-based thick pen, Cutter pen
	Number of pens	8
6	Interfaces	RS-232C and Centronics
7	Commands	MH-GL (HP-GL/7475A)
9	Input buffer	32 KB
10	Memory card (Option)	128 KB, 256 KB, 512 KB
11	Paper holding	Electrostatic adhesive plate
12	Distance precision	±0.3%
13	Return precision	Same pen ±0.1 mm Different pen ±0.3 mm
14	Angular precision	±0.7/200 mm
15	Running system	2 phase stepping motor
16	Resolution	Mechanical resolution 0.0015625 mm/step Software resolution 0.010/0.025 mm/step
17	Power supply	100/200 V AC, automatic switching
18	Power consumption	30 VA
19	Operating environment	Temperature 10-35°C (50-95°F) Humidity 35-75%, no condensation
20	External dimensions	619.5 (W) x 426.5 (D) x 106.5 (H) mm 24.4 (W) x 16.8 (D) x 4.2 (H) in
21	Weight	6.6 kg 14.6 lbs

1-2 Names of Parts



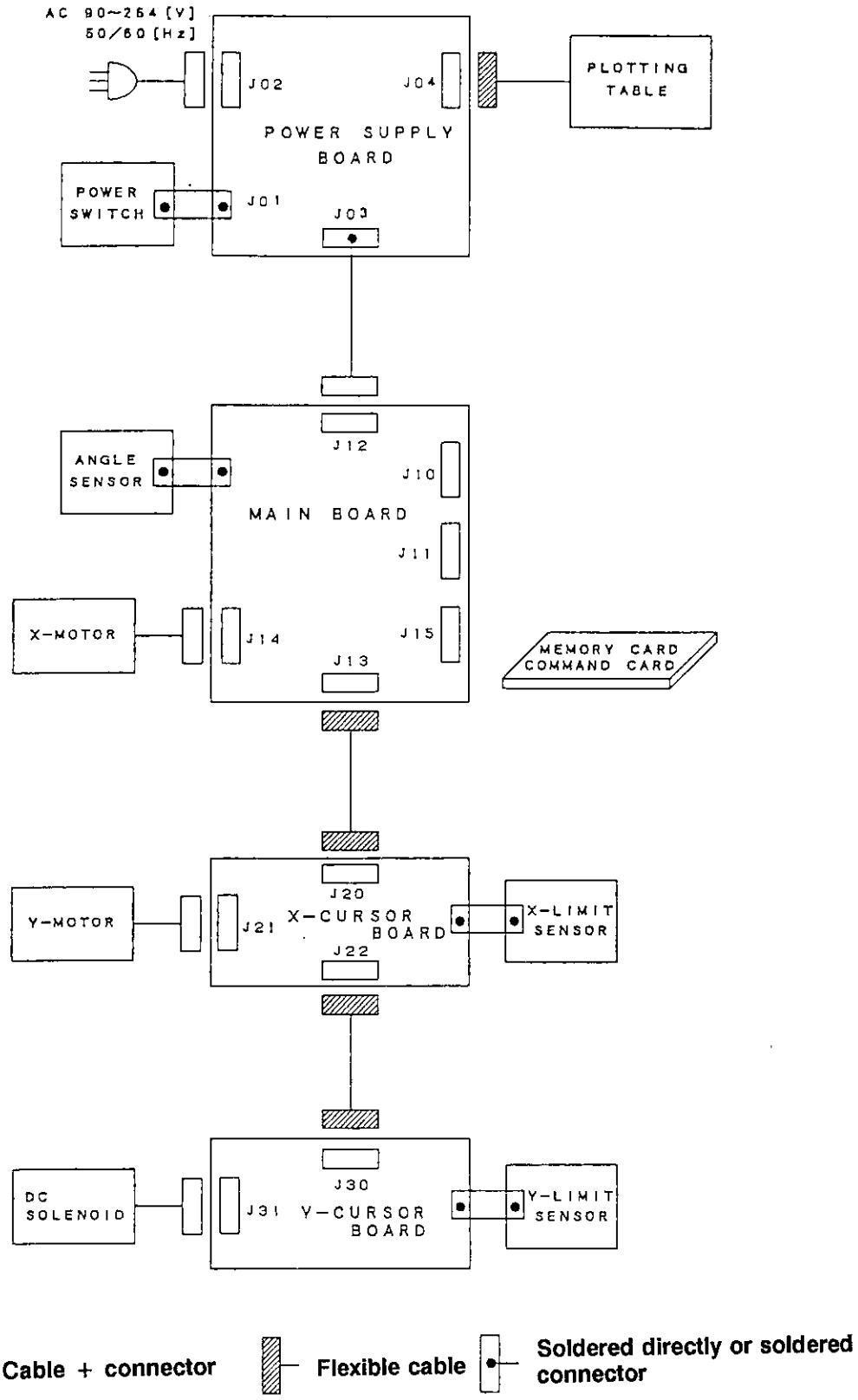
1 Control Panel
2 Y Rail
3 Pen Carriage
4 Pen Line
5 Plotting Table
6 Power Switch
7 Card Slot
8 Pen Line Cover
9 Side Cover
10 Serial Interface (RS-232C) connector
11 Parallel Interface (Centronics) connector
12 DIP switches
13 Power Connector

1-3 Control Panel



1 Power Lamp
2 Card Key
3 Speed Key
4 Pen Type Key
5 Jog Keys
6 P1, P2 Keys
7 Enter Key
8 Remote Key
9 Paper Hold Key (Electrostatic feature)

2. System Block Diagram



3. iP-220
Signal Pin Assign

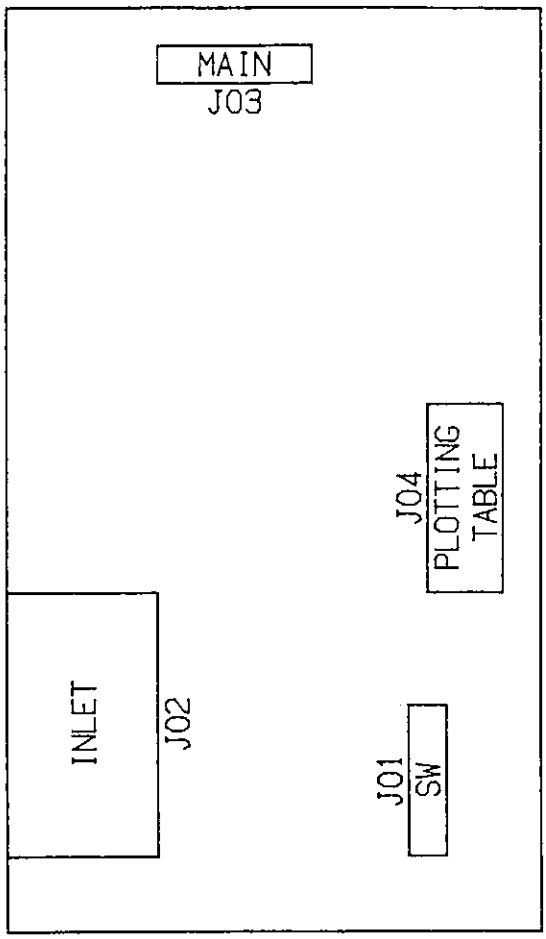
3-1 Power Supply Board

3-2 Main Board

3-3 X-Cursor Board

3-4 Y-Cursor Board

3-1 Power Supply Board

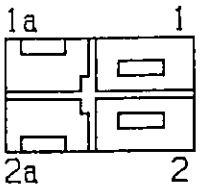


J01 POWER/SW CONNECTION

PIN	SIGNAL	COLOR
1	LIVE	WHITE
1a	LIVE	GRAY
2	NEUTRAL	BLACK
2a	NEUTRAL	ORENGE

CABLE
AWG#18 UL1005

PIN LOCATION



CONNECTOR BOTTOM VIEW

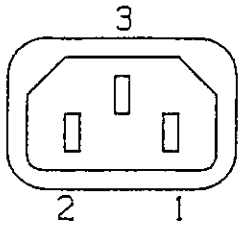
SWITCH
SE-W202A-03BB(ECHO ELECTRIC)
RECEPTACLE
170038-2(AMP)
SLEEVE
235835-U09(SINAGAWA SHOKO)

J02 POWER/INLET CONNECTION

PIN	SIGNAL
1	NEUTRAL
2	LIVE
3	FG

CONNECTOR
AC-P05CP07(ECHO ELECTRIC)

PIN LOCATION



CONNECTOR TOP VIEW

J03 POWER/MAIN CONNECTION

PIN	SIGNAL	COLOR
1	+5V	RED
2	SG	BLACK
3	+24V	YELLOW
4	PG	GREEN
5	PHOLD	BROWN

TERMINAL
5298T(Molex)

CABLE
AWG#18 UL1005

J04 POWER/PLOTTING TABLE CONNECTION

PIN	SIGNAL
1	2KV
2	2KV
3	NC
4	NC
5	2KVRTN
6	2KVRTN

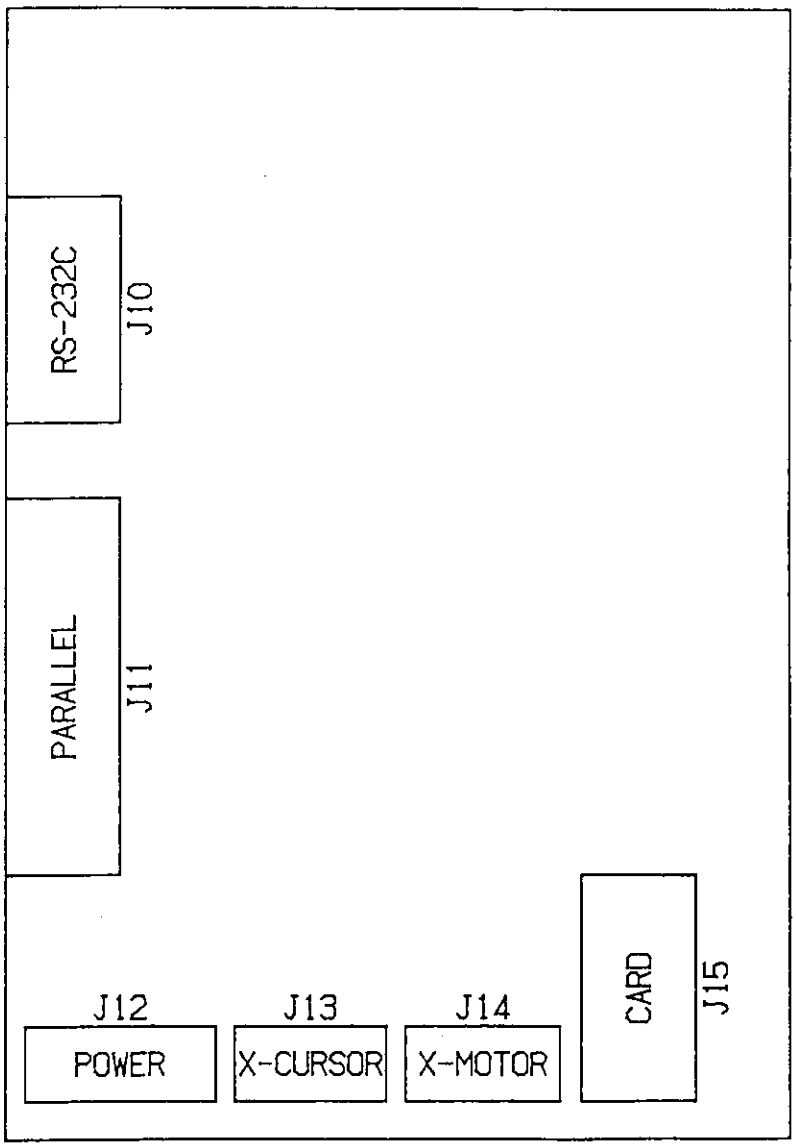
CONNECTOR
HBLB6S-1J(BURNDY)

CABLE
FLAT CABLE

PIN LOCATION

CONNECTOR TOP VIEW

3-2 Main Board



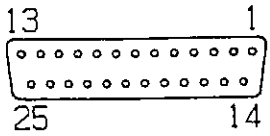
J10 MAIN/RS-232C CONNECTION

PIN	SIGNAL
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
8	CD
9	NC
10	NC
11	NC
12	NC
13	NC

PIN	SIGNAL
14	NC
15	NC
16	NC
17	NC
18	NC
19	NC
20	DTR
21	NC
22	NC
23	NC
24	NC
25	NC

CONNECTOR
57LE-40360-7700(DDK)

PIN LOCATION



CONNECTOR TOP VIEW

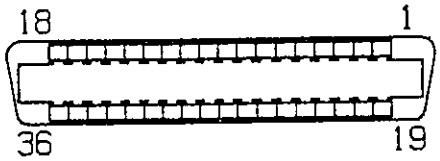
J11 MAIN/PARALLEL CONNECTION

PIN	SIGNAL
1	/STB
2	DATA0
3	DATA1
4	DATA2
5	DATA3
6	DATA4
7	DATA5
8	DATA6
9	DATA7
10	/ACK
11	BUSY
12	PE
13	SELECT
14	NC
15	NC
16	SG
17	FG
18	HIGH

PIN	SIGNAL
19	SG
20	SG
21	SG
22	SG
23	SG
24	SG
25	SG
26	SG
27	SG
28	SG
29	SG
30	SG
31	NC
32	FAULT
33	SG
34	NC
35	NC
36	NC

CONNECTOR
3712-6042uA(3M)

PIN LOCATION

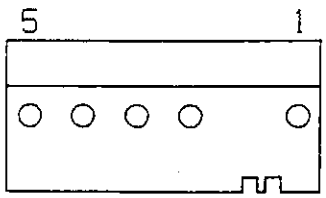


CONNECTOR TOP VIEW

J12 MAIN/POWER CONNECTION

PIN	SIGNAL	COLOR
1	+5V	RED
2	SG	BLACK
3	+24V	YELLOW
4	PG	GREEN
5	PHOLD	BROWN

PIN LOCATION



CONNECTOR TOP VIEW

CONNECTOR

SIDE	PART No.	MAKER
P.C.B	5277-05A	Molex
CABLE	5196-05	
(TERMINAL)	5194PBTL	

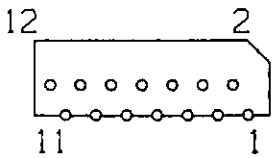
CABLE
AWG#18

J13 MAIN/X-CURSOR CONNECTION

PIN	SIGNAL
1	FG
2	NC
3	+5V
4	X-LMT
5	Y-LMT
6	SG
7	DOWN
8	COM
9	YA
10	/YA
11	YB
12	/YB

CABLE
FLAT CABLE
CONNECTOR
52044-1210(Molex)

PIN LOCATION

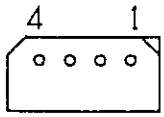


CONNECTOR BOTTOM VIEW

J14 MAIN/X-MOTOR CONNECTION

PIN	SIGNAL	COLOR
1	XA	BLUE
2	/XA	RED
3	XB	WHITE
4	/XB	YELLOW

PIN LOCATION



CONNECTOR TOP VIEW

CONNECTOR

SIDE	PART No.	MAKER
P.C.B	5267-04A-X	Molex
CABLE	5264-04	
(TERMINAL)	5263PBTL	

CABLE
AWG#26

J15 MAIN/CARD CONNECTION

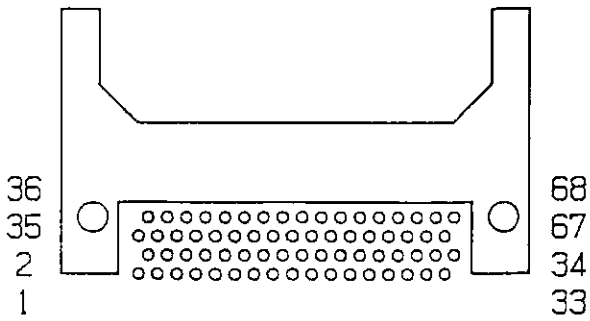
PIN	SIGNAL
1	GND
2	CD3
3	CD4
4	CD5
5	CD6
6	CD7
7	/CE1
8	CA10
9	/OE
10	CA11
11	CA9
12	CA8
13	CA13
14	CA14
15	/WE
16	NC
17	VCC
18	NC
19	CA16
20	CA15
21	CA12
22	CA7
23	CA6

PIN	SIGNAL
24	CA5
25	CA4
26	CA3
27	CA2
28	CA1
29	CA0
30	CD0
31	CD1
32	CD2
33	WP
34	GND
35	GND
36	/CD1
37	CD11
38	CD12
39	CD13
40	CD14
41	CD15
42	/CE2
43	NC
44	NC
45	NC
46	CA17

PIN	SIGNAL
47	CA18
48	CA19
49	CA20
50	NC
51	VCC
52	NC
53	NC
54	NC
55	NC
56	NC
57	NC
58	NC
59	NC
60	NC
61	/REG
62	BVD2
63	BVD1
64	CD8
65	CD9
66	CD10
67	/CD2
68	GND

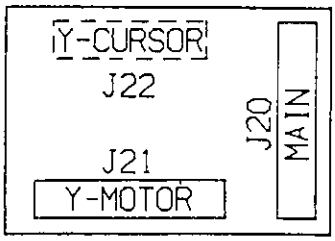
CONNECTOR
53327-6811(Molex)

PIN LOCATION



CONNECTOR BOTTOM VIEW

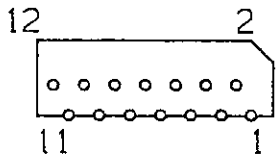
3-3 X-Cursor Board



J20 X-CURSOR/MAIN CONNECTION

PIN	SIGNAL
1	/YB
2	YB
3	/YA
4	YA
5	COM
6	DOWN
7	SG
8	Y-LMT
9	X-LMT
10	+5V
11	NC
12	FG

CABLE
FLAT CABLE
CONNECTOR
52045-1210(Molex)
PIN LOCATION

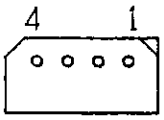


CONNECTOR BOTTOM VIEW

J21 X-CURSOR/Y-MOTOR CONNECTION

PIN	SIGNAL
1	YA
2	/YA
3	YB
4	/YB

PIN LOCATION



CONNECTOR TOP VIEW

CONNECTOR

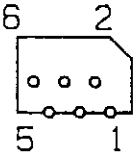
SIDE	PART No.	MAKER
P.C.B	5267-04A	Molex
CABLE	5264-04	
(TERMINAL)	5263PBT	

CABLE
AWG#26

J22 X-CURSOR/Y-CURSOR CONNECTION

PIN	SIGNAL
1	FG
2	+5V
3	Y-LMT
4	SG
5	DOWN
6	COM

PIN LOCATION

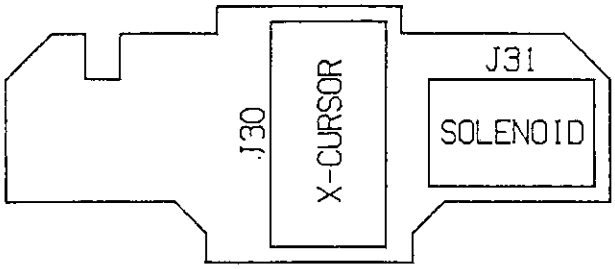


CONNECTOR BOTTOM VIEW

CABLE
FLAT CABLE

CONNECTOR
52045-0610(Molex)

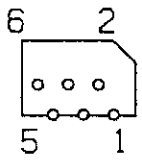
3-4 Y-Cursor Board



J30 Y-CURSOR/Y-CURSOR CONNECTION

PIN	SIGNAL
1	COM
2	DOWN
3	SG
4	Y-LMT
5	+5V
6	FG

PIN LOCATION



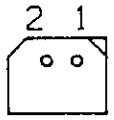
CONNECTOR BOTTOM VIEW

CABLE
FLAT CABLE
CONNECTOR
52045-0610(Molex)

J31 Y-CURSOR/SOLENOID CONNECTION

PIN	SIGNAL
1	DOWN
2	COM

PIN LOCATION



CONNECTOR TOP VIEW

CABLE
AWG#28

CONNECTOR

SIDE	PART No.	MAKER
P.C.B	5267-02A	Molex
CABLE	5264-02	
(TERMINAL)	5263PBT	

4. DIP Switch Settings

4-1 DIP SW1

Settings when shipped ex-factory

7-bit, selected

Even, 1 bit

9600 bps

XON-XOFF

DSW1	1	2	3	4	5	6	7	8
ON								
OFF	●	●	●	●	●	●	●	●

SW1	Data length	ON	8 bits
		OFF	7 bits
SW2	Parity check	ON	Disable
		OFF	Enable
SW3	Parity bit	ON	ODD
		OFF	EVEN
SW4	Stop bits	ON	2 bits
		OFF	1 bit
SW5 SW6	Baud rate		
SW7 SW8	Handshaking		

SW5	SW6	Baud rate
OFF	OFF	9600 bps
ON	OFF	4800 bps
OFF	ON	2400 bps
ON	ON	1200 bps

SW7	SW8	Handshaking
OFF	OFF	XON-XOFF
OFF	ON	ENQ/ACK
ON	ON	Hard wire

4-2 DIP SW2

Settings when shipped ex-factory

Paper size: JISA3

Sort: ALL

DSW1	1	2	3	4	5	6	7	8
ON								
OFF	●	●	●	●	●	●	●	●

<table>
<tr><td>SW1

SW2

SW3</td><td>Paper size</td><td>
<table>
<tr><th>SW1</th><th>SW2</th><th>SW3</th><th>Paper size</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>JIS A3</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>JIS A4</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>ANSI-EB</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>ANSI-EA</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>ANSI-AB</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>ANSI-AA</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>DIN-OVER L3</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>DIN-OVER L4</td></tr>
</table>
</td></tr>
<tr><td>SW4

SW5</td><td>Sort</td><td>
<table>
<tr><th>SW4</th><th>SW5</th><th>Sort</th></tr>
<tr><td>OFF</td><td>OFF</td><td>ALL</td></tr>
<tr><td>OFF</td><td>ON</td><td>PEN</td></tr>
<tr><td>ON</td><td>OFF</td><td>Vector</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td></tr>
</table>
</td></tr>
<tr><td>SW6</td><td colspan="2">NC</td></tr>
<tr><td>SW7</td><td colspan="2">NC</td></tr>
<tr><td>SW8</td><td colspan="2">NC</td></tr>
</table>

5. Error Codes and Main Causes of Malfunction

If a malfunction occurs while the iP-220 is in use, the error condition is indicated by flashing LEDs.

If a malfunction occurs during use, please verify the type of error from the error codes shown below and take appropriate remedial action.

Command errors

Error display: An error is indicated by the flashing of the Power/Error LED on the panel.

Error Code	Error details	Handling method
01	Undefined command detected	Normally, the command which has been issued is ignored and control is transferred to the next operation. Resume operation by returning to REMOTE mode.
02	Wrong number of parameters	
03	Parameter value out of range	
04	Not in use	
05	Selected character set can not be used	
06	Not in use	

I/O errors

Error display: An error is indicated by the flashing of the POWER/ERROR LED on the panel.

Error Code	Error details	Handling method
10	A new data output command has been received while a plot command or escape sequence data output operation is being executed	Initial output command becomes effective
11	The character which follows "ESC" in an escape sequence is undefined	It is taken as the command character
12	An undefined character has been found in an escape sequence parameter	The parameter is taken as being abbreviated already
13	The value of an escape sequence parameter exceeds the valid range	The parameter is taken as being abbreviated already
14	Too many escape sequence parameters	Extra parameters are ignored

I/O errors

Error display: An error is indicated by the flashing of the POWER/ERROR LED on the panel.

Error Code	Error details	Handling method
15	Communication fault (parity error, framing error, over-run error)	Host computer protocol setting may be inappropriate. Please re-check communication conditions on the host computer.
16	Command data buffer overflow	

* For reference, please note that the error code number will be transmitted if "OE" is executed when there is a command error, or "ESC E" in the case of an I/O error.

6. Claim-related Probable Causes and Remedial Action

6-1 Claim-related Probable Causes and Remedial Action

Condition	Details of claim	Category	Diagnosis	Probable cause	Remedial action
During initial operation	Does not start Power LED does not light Panel keys ineffective		Is power cable connected properly? Has the fuse blown? Are all cables connected?	Has a screw, etc. dropped into the circuit board plate? Power supply fault	Remove screw, etc. from circuit board and re-connect power. If still faulty, replace circuit board (See p26) Replace Power Supply Board (See p26)
	Origin not detected Motor does not move after power is connected. Out of step		Is the motor working? Was there a hot smell when it was being used? Does the motor continue to operate?	Faulty motor Faulty CPU board Faulty X,Y flexible cord Abnormal X,Y limit sensor	Replace motor (See p27) Replace CPU Board (See p26) Replace X,Y Relay Board (See p30) (See p32)
Communi-cation	Will not go on-line No movement despite flow of data		Is the interface cable connected properly? Is remote mode selected? Have communications conditions been initialized? Has this interface cable worked previously? Has the command been initialized?	Faulty CPU board	Replace CPU Board (See p26)

Condition	Details of claim	Category	Diagnosis	Probable cause	Remedial action
During plotting	Pen Up/Down fault Pen jumps Pen does not go up/down		Is the Pen Carriage up and down movement smooth? Has the pen pressure value been initialized?	Faulty Pen Carriage Faulty pen pressure adjustment Faulty solenoid Faulty Y relay board Faulty Y flexible cable Faulty X flexible cable Faulty X Relay Board Faulty CPU Board	Replace Y Cursor (See p29) Adjust pen pressure (See p45) Replace Y Relay Board (See p32) Replace X Cursor (See p31) Replace X flexible cable (See p32) Replace X Relay Board (See p32) Replace CPU Board (See p26)
	Faulty pen contact/release Pen does not contact/release Plotted line is mismatched		Are pens mounted correctly? Is Pen Line position correct? Is pen height within the specified value?	Faulty Pen Line position adjustment Faulty pen height adjustment	Adjust Pen Line position (See p46) Adjust pen height (See p40)
	Poor plotting quality		Check plotting speed Check pen type	Faulty X,Y belt tension Pen Carriage play	Adjust belt tension (See p37) (See p38) Adjust Y Cursor (See p29)
	Plot slips		Is the pen tip off centre, or bent? Does it lose step when pen is changed?	Pen off centre Faulty Pen Line position adjustment Loose screw at joint between X Motor and shaft Pen Carriage play	Adjust Pen Line position (See p46) Replace Y Cursor (See p31)
	Plotted line slip		Check pen type Check plotting speed Is the pen height within the specified value? Is the pen pressure within the specified value?	Faulty pen height adjustment Faulty pen pressure adjustment	Adjust pen height (See p40) Adjust pen pressure (See p45)

6-2 Problems and Remedies involving Pen and Paper

Poor quality drawing and abnormal behavior other than plotter problems are almost always caused by pen and paper. The main ones are listed below.

Symptoms	Principal Causes	Remedial Action
Cannot draw lines	1. Out of ink	Replace with a new pen, replenish ink
	2. Dry pen point	Moisten the pen point
	3. Ink blocked	Wash the pen
	4. Pen damaged	Replace the pen
	5. Paper unsuitable	Replace with suitable paper
Line start is blurred	1. Partially dry pen point	Moisten the pen point
	2. Water type ball pen is used	Store pens vertically
Pen jumps and drags	1. Pen point worn unevenly	Replace pen
	2. Paper thickness unsuitable	Select suitable paper
Ink blots form	1. Pen point is dirty	Clean it
	2. Pen cap holder is dirty	Clean it
	3. Faulty pen	Select a suitable pen
Severe pen point wear	1. Dirty paper	Wipe with alcohol, etc.
	2. Unsuitable paper	Select smooth paper
	3. Wrong pen speed selection	Select slow speed
	4. Unsuitable pen force	Select proper pen force
Lines sometimes undulate	1. Pen point bent or eccentric	Replace pen
	2. Plotter bed not level	Install plotter bed correctly
Line thickness irregular	1. Dirty paper	Wipe with alcohol, etc.
	2. Dirty pen point	Clean it
	3. Same pen used with different speeds	Select same speed
Line will not join	1. Eccentric pen point	Replace pen
	2. Dirty paper	Wipe with alcohol, etc.

Note: There are also eccentric pen points, pens which feed ink irregularly, etc. and pens which don't work properly. Even new pens need to be examined carefully.

7. Method of Dismantling and Assembly

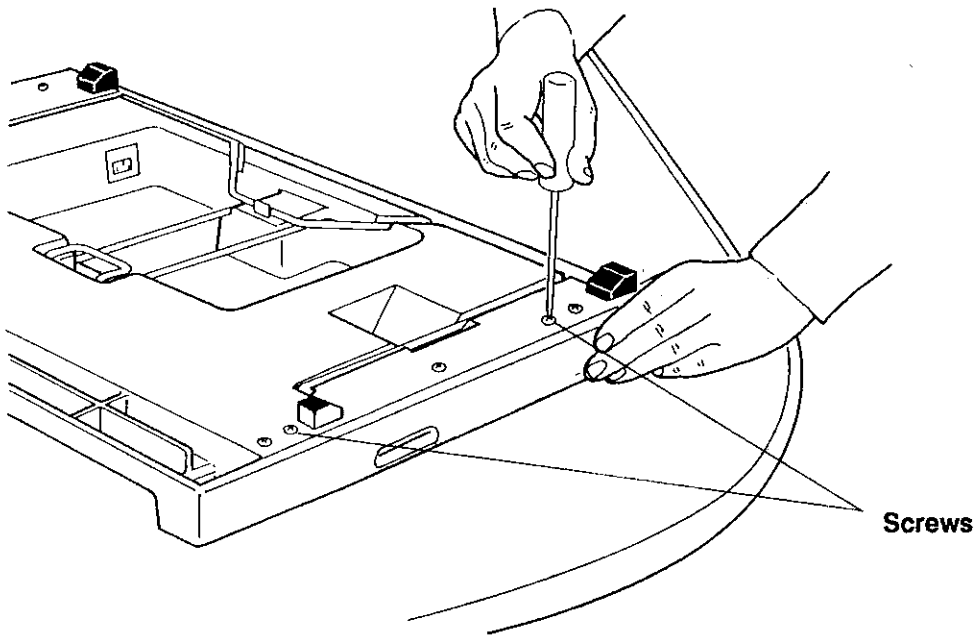
* Be sure to switch the power off and remove the power cord and interface cable before dismantling.

7-1 Remove Side Cover, Pen Line Cover and Bottom Cover

* Place the plotter upside down on a table when removing the side cover and Bottom cover.

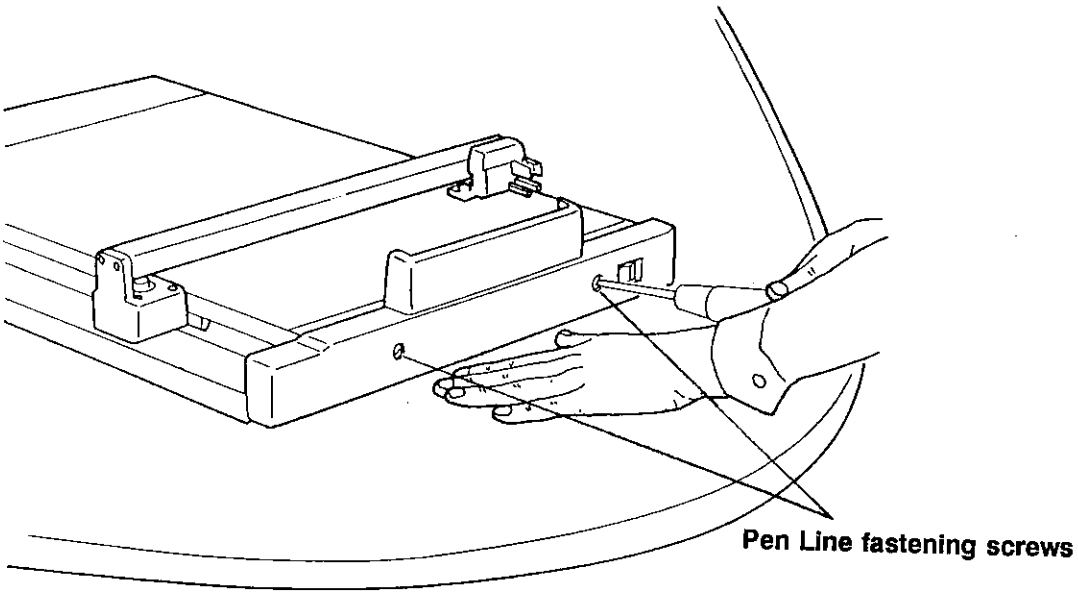
7-1-1 Side Cover

- Remove two screws and remove the side cover.



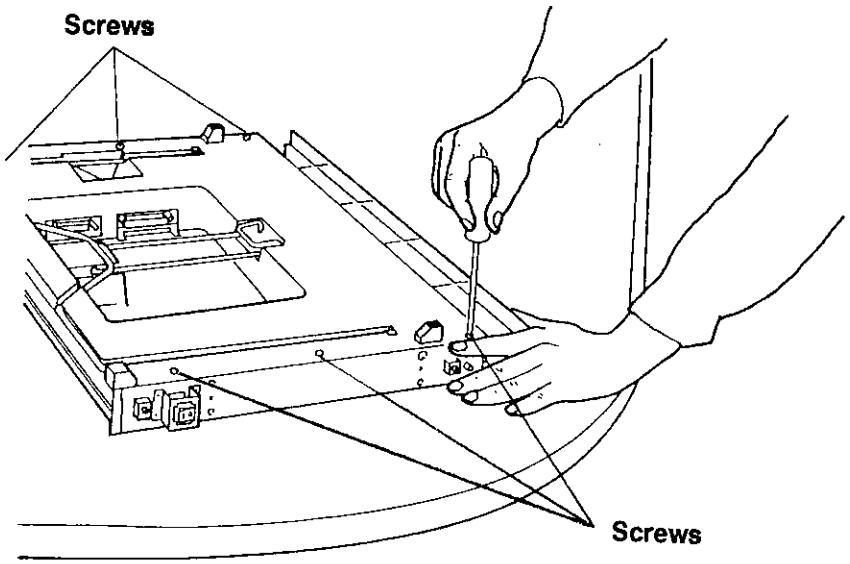
7-1-2 Pen Line Cover

- Remove Pen Line fastening screws (two places) and remove the Pen Line cover



7-1-3 Bottom Cover

- Remove six screws and remove the Bottom cover.



7-2 Replacing CPU Board and Power Supply Board

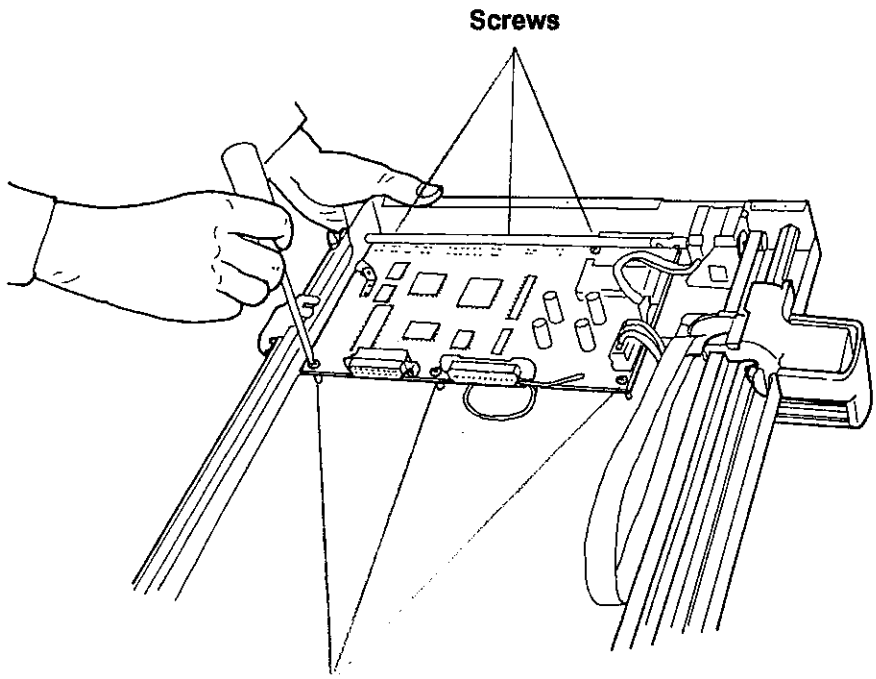
* Some board faults are caused by faulty cable connections. In the case of a board fault, before replacing the board first thoroughly check the cable connections (flexible cables in particular) and be sure there are no abnormalities. If this is not done, the replaced board may be damaged so please give full attention to this point.

Also, after the board has been replaced, be sure to carry out initialization and make all adjustments.

* Remove the Bottom cover (7-1-3) and proceed as follows.

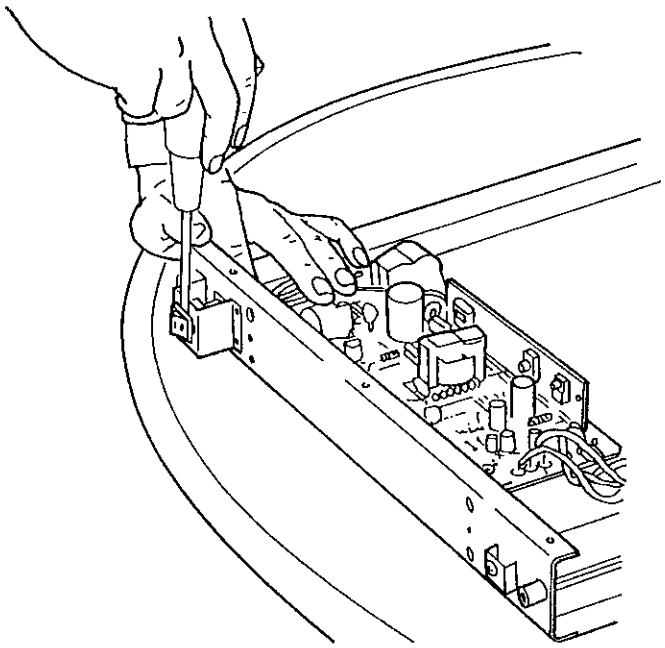
7-2-1 CPU Board

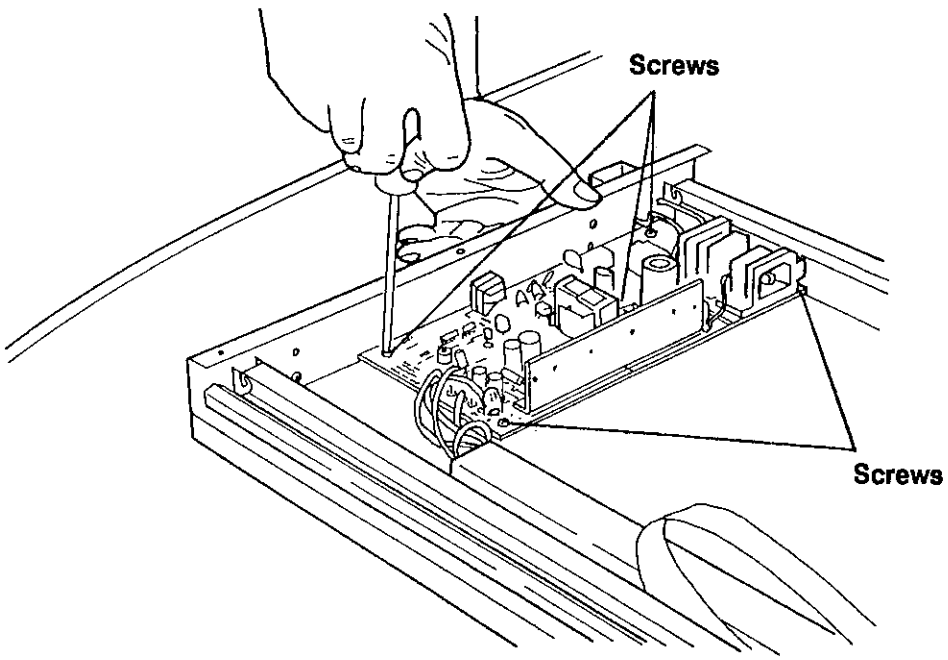
- Remove all connectors and remove the six screws holding the board.
- Transfer the ROM from the old board to the replacement board.



7-2-2 Power Supply Board

- Remove the Power Switch from the base of the main unit.
- Remove all connectors and remove the five screws holding the board.

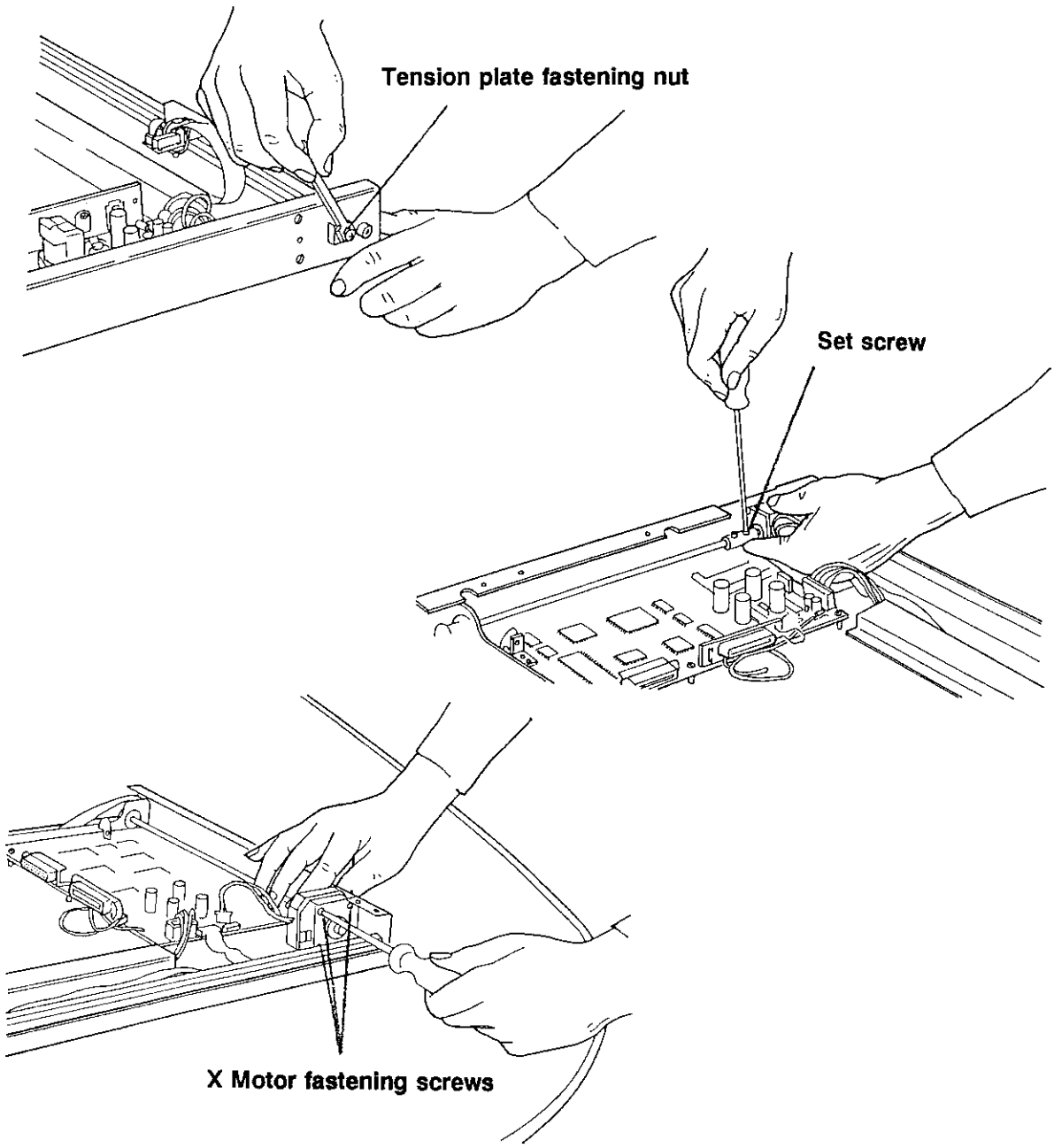




7-3 X Motor

* Place the plotter upside down on a table when removing the X motor.

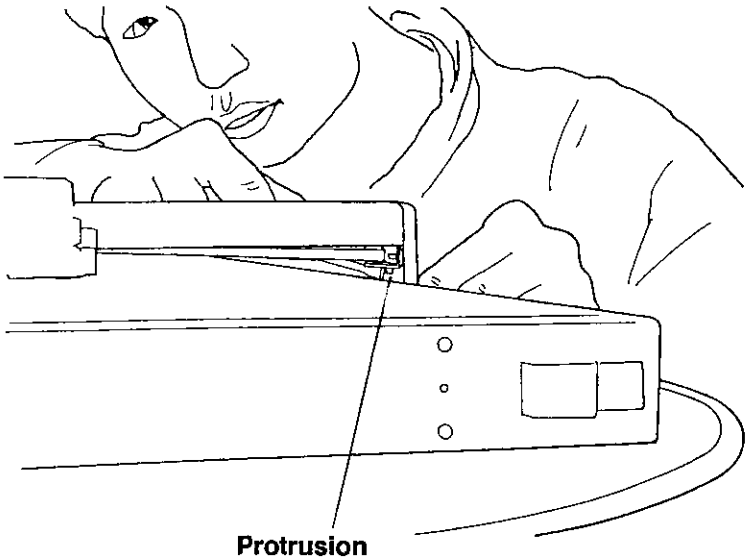
- Remove the Bottom cover (7-1-3).
- Loosen the nut holding the tension plate, loosen the tension adjusting screw and remove the X belt from each roller.
- Loosen the set screw on the joint to free the shaft from the motor.
- Remove the four screws which hold the motor and remove the X Motor.

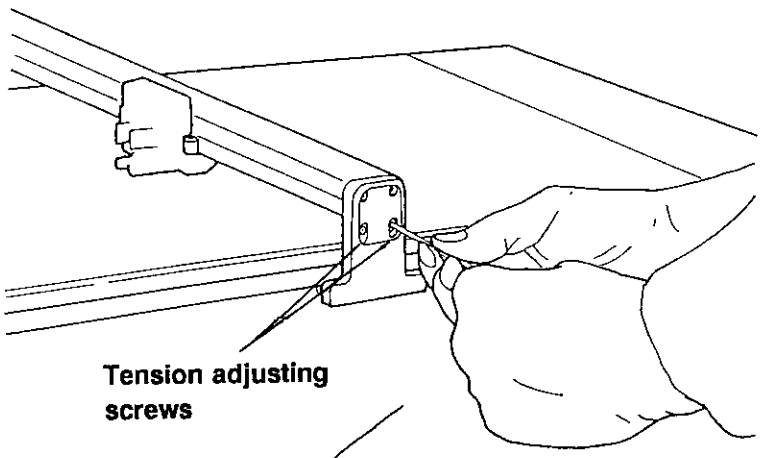


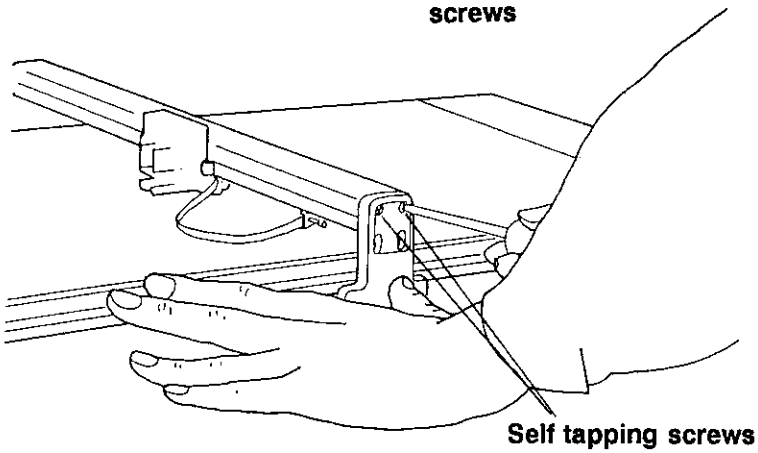
7-4 Y Movement System

7-4-1 Tail Piece Cursor

- Proceed to the stage of removing the X belt.
- Remove the tail piece cover. (It comes off easily when you press the round protrusion below the Y tension plate.)
- Loosen the two Y tension adjusting screws and remove the Tail Piece Cursor.
- Remove the two self-tapping screws holding the Y Rail and remove the Tail Piece Cursor.

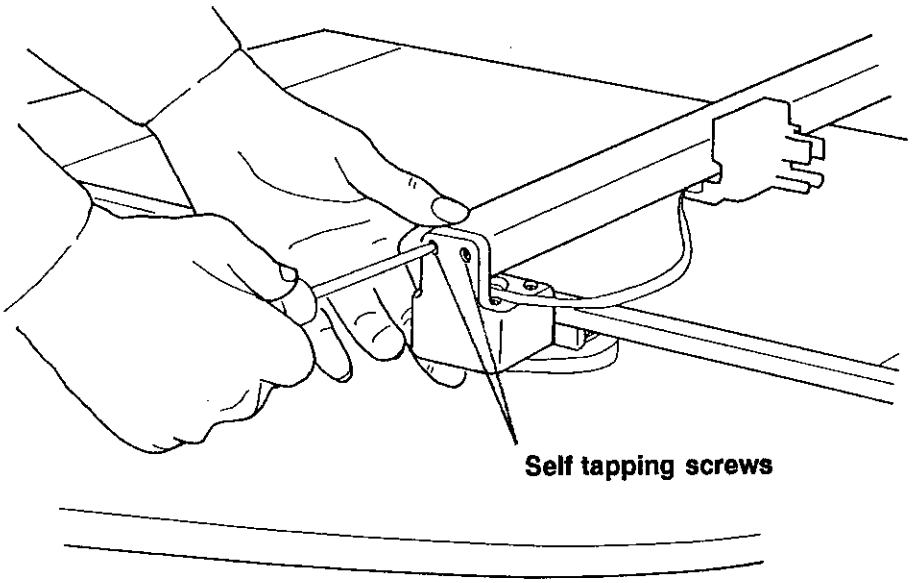


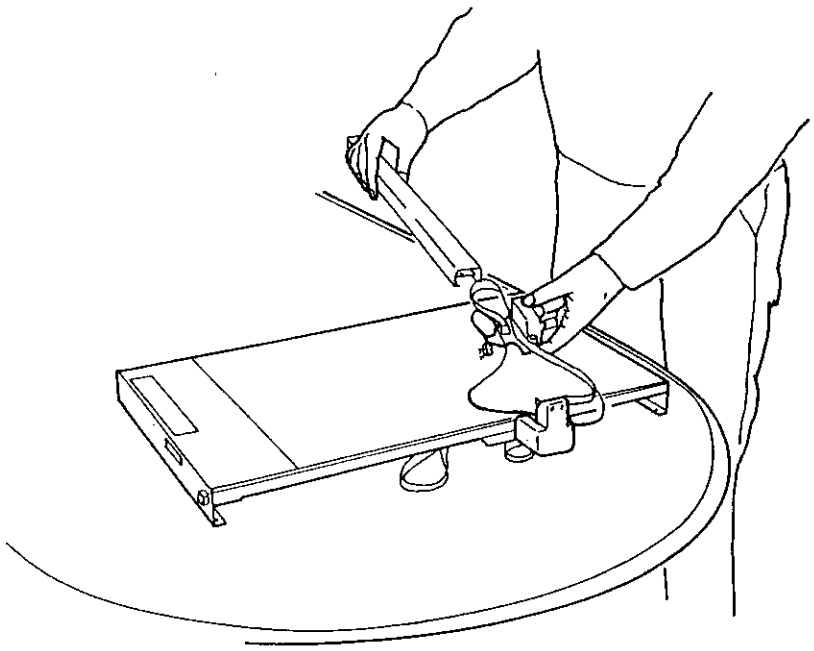




7-4-2 Y Cursor

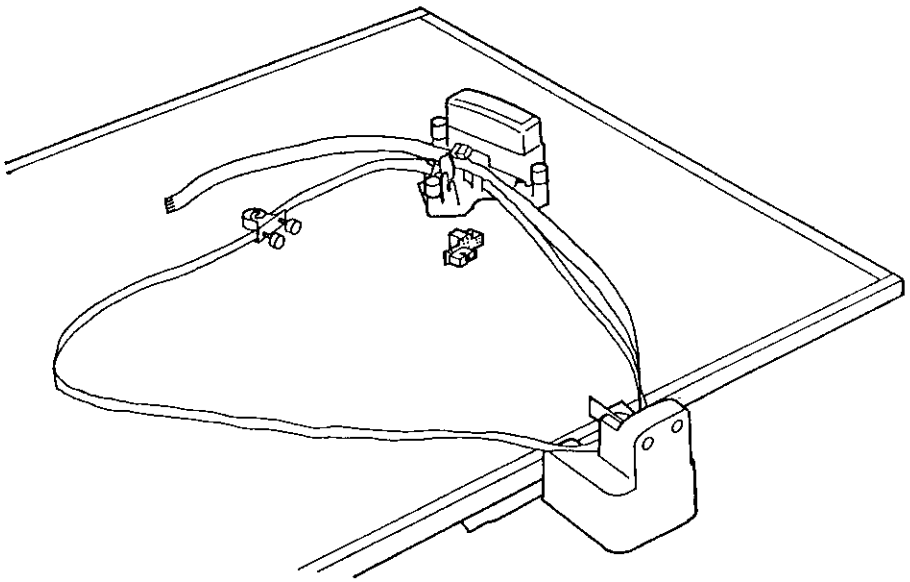
- Proceed to the stage of 7-4-1.
- Remove the two self tapping screws which hold the X Cursor and remove the Y Rail from the X Cursor.
- Remove the Y Cursor from the Y Rail. The Y flexible cable is fastened to the Y Rail with double sided tape and should be peeled off carefully.





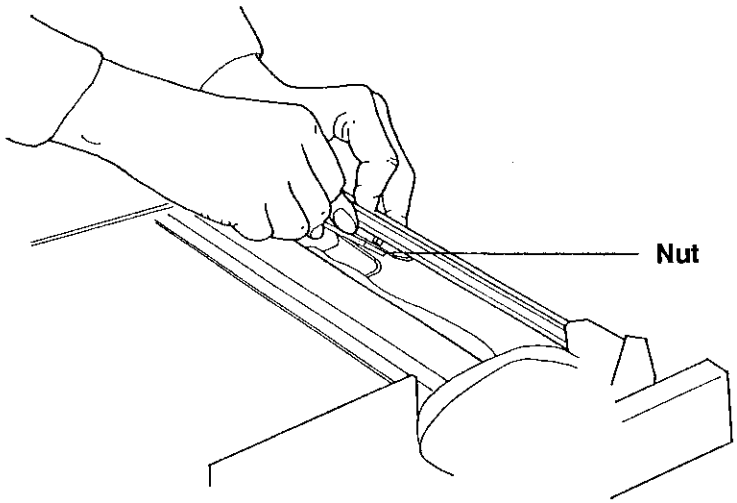
7-4-3 Y Connector Board

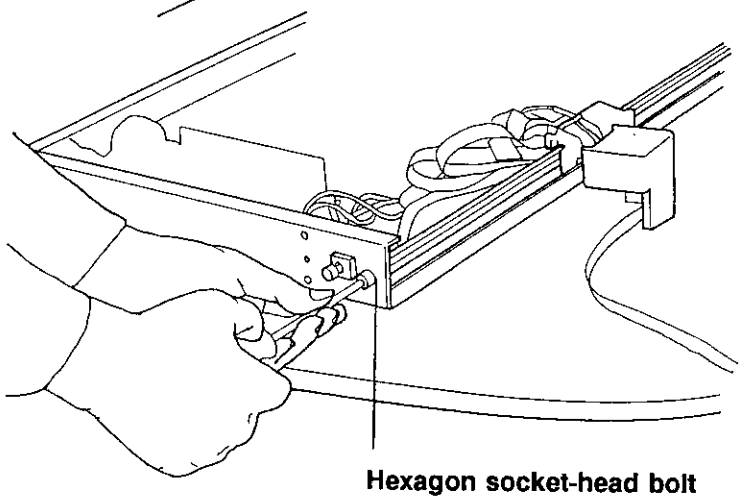
- Proceed to the stage of 7-4-2.
- Remove all connectors.
- Remove the Y Connector Board from the Y Cursor.

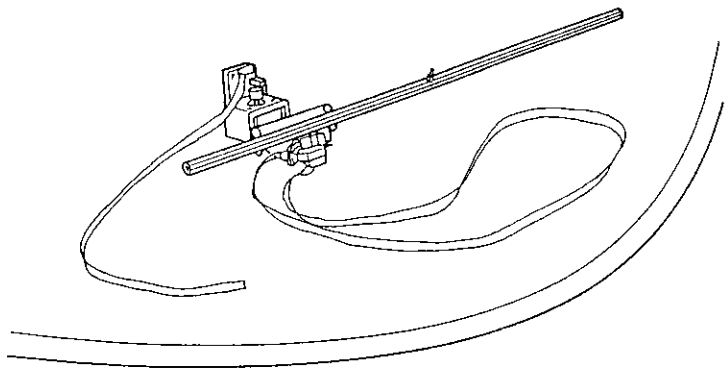


7-4-4 X Cursor

- Proceed to the stage of 7-4-3.
- Place the unit upside down on the table.
- Remove the X flexible cable from the X Connector Board
- Loosen the nut which holds the centre part of the X Rail, remove the two hexagon socket-head bolts from the left and right of the X Rail and remove the X Rail.
- Remove the X Cursor from the X Rail.

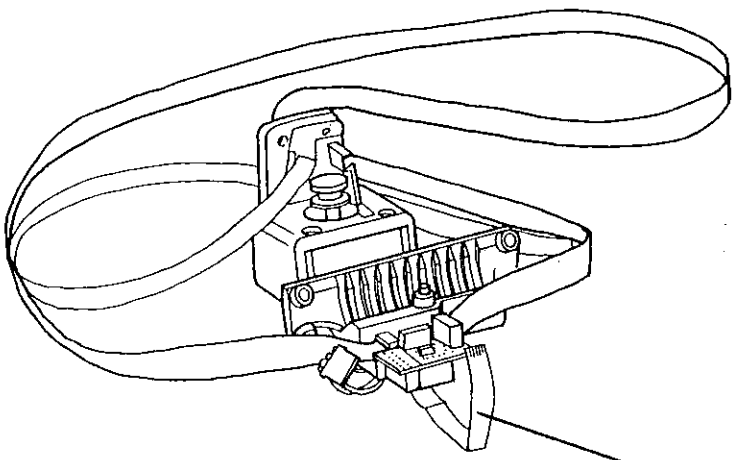


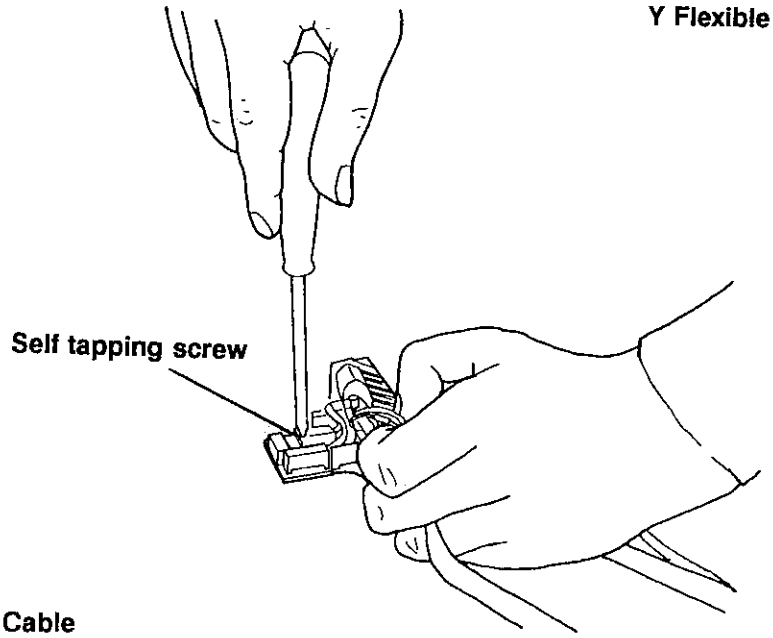




7-4-5 X Connector Board

- Proceed to the stage of 7-4-4.
- Remove the Y flexible cable and its connector.
- Loosen the self tapping screw holding the X Connector Board.
- Remove the X Connector Board from the X Cursor.
- Assembly:
  Carry out the removal procedures in reverse.





7-4-6 X Flexible Cable

- Remove the Bottom cover (7-1-3).
- Remove the X flexible cable from the CPU Board and the X Connector Board.
- Assemply:
  Carry out the removal procedures in reverse.
- The X flexible cable is fastened to the base with double sided tape and should be peeled off carefully.

7-5 ROM Replacement

* The ROM must be replaced when the version is upgraded or when the board is replaced.

Removal

- Remove the Bottom cover (7-1-3).
- Attach the ROM removing tool securely to both ends of the ROM and withdraw it straight up.

* After replacing the ROM, please check the following points.

- Is the ROM oriented correctly?
- Are all the legs of the ROM mounted in the socket?
- Is the ROM inserted firmly with no gap?

If the above points are not observed, it will not operate when the power is connected. Care is needed, since the ROM may also be damaged.

8. Adjusting the Mechanical System

* The unit must be adjusted after parts have been repaired or replaced. Please follow the following directions for adjustments.

1 X Cursor Roller Adjustment

2 Y Cursor Roller Adjustment

3 Tail Piece Cursor Roller Adjustment

4 Belt Tension Adjustment

5 Rail Right Angle Adjustment

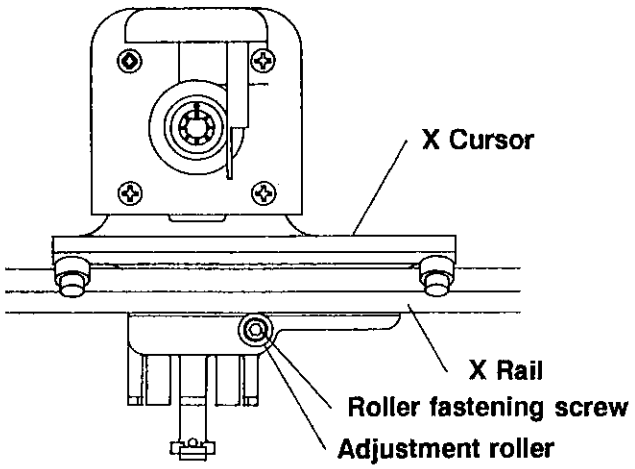
6 Pen Height Adjustment

8-1 X Cursor Roller Adjustment

The X Cursor roller adjustment is made with the X Rail and X Cursor removed in accordance with procedure 7-4-4.

Loosen the screw which holds the adjustment roller and retighten it with the adjustment roller pressed to the X Rail. The adjustment standard is that there shall be no play between the roller and the rail.

After adjustment, please make sure that the five rollers turn evenly.



* With the X Cursor, Tail Piece Cursor and Y Rail attached to the base (and the X Belt removed), set the X starting load to within 50 g.

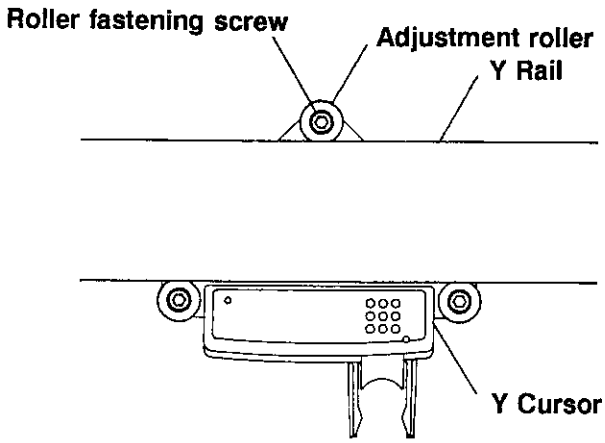
1) The X Cursor roller does not touch the surface because the X rail has turned when it was fastened (when the hexagon socket head bolt was tightened). > > Align the X rail with the roller and fasten.

2) The X Cursor roller is adjusted too closely. > > Adjust X Cursor roller.

8-2 Y Cursor Roller Adjustment

Loosen the screw which holds the adjustment roller and retighten it with the adjustment roller pressed to the Y Rail. The adjustment standard is that there shall be no play between the roller and the rail.

After adjustment, please make sure that the three rollers turn evenly.

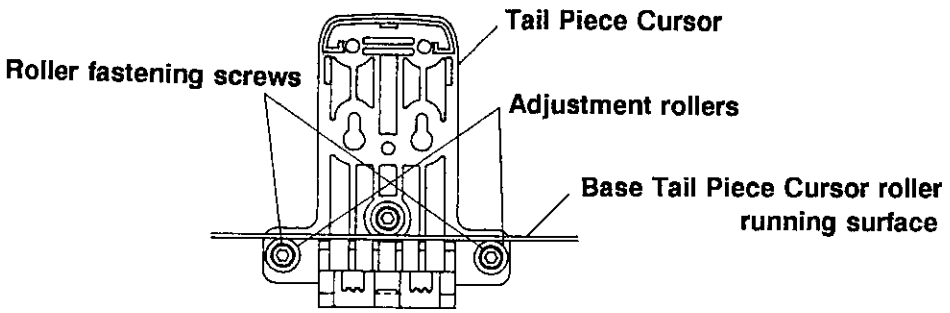


Roller adjustment method changed

8-3 Tail Piece Cursor Roller Adjustment

Loosen the screws which hold the adjustment rollers and retighten it with the adjustment rollers pressed to the roller running surface on the base. The adjustment standard is that there shall be no play between the roller and the rail.

After adjustment, please make sure that the three rollers turn evenly.



8-4 Belt Tension Adjustment

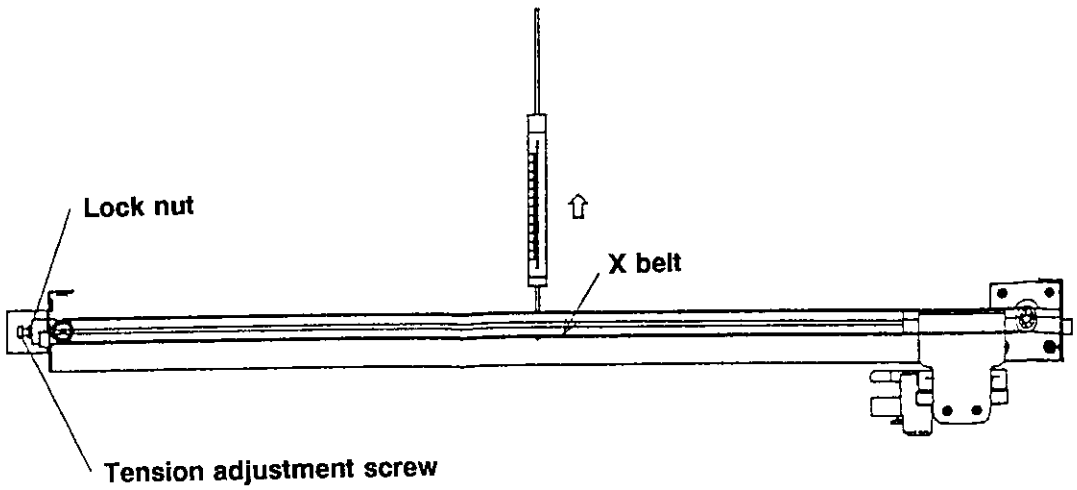
* Right angle must be adjusted after belt tension has been adjusted.

8-4-1 X Belt Tension Adjustment

The X belt tension adjustment is made with the under cover removed.
Belt tension adjustments are made at two locations - on the X Cursor side and the Tail Piece Cursor side. As shown in the diagram below, The Y Rail is moved in the direction of the key panel.
Measurements are made by attaching a cylindrical tension gauge (with range of measurement ### g) at the centre of the belt (indicated by the arrow in the diagram below) and recording the tension at the instant the lower belt touches the upper belt. Standard values are as shown below.

	X Cursor side	Tail Piece Cursor side
Standard value	150 g ± 10 g	150 g ± 10 g

Adjust the tension adjustment screw until the belt tension reaches the standard values on both the X Cursor side and the Tail Piece Cursor side.
When the belt tension values reach the standard values, tighten the nut to secure the tension adjustment screw.



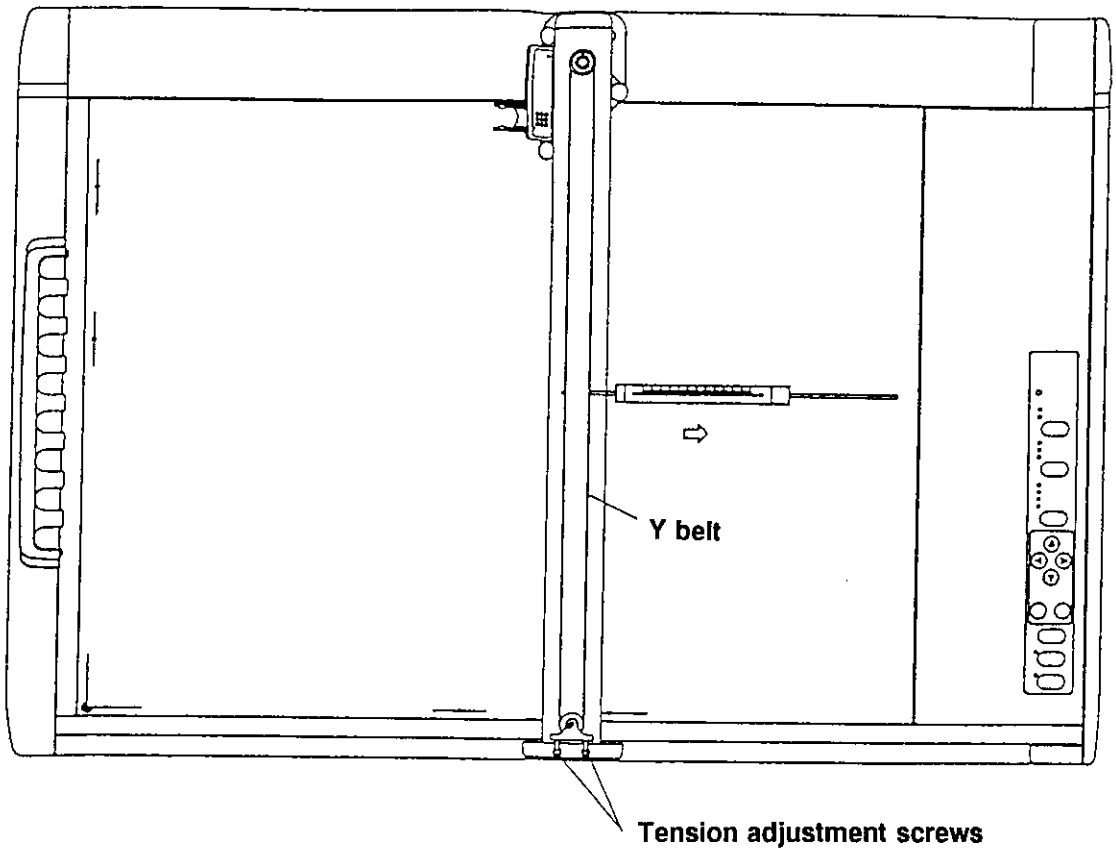
Tension specification value altered

8-4-2 Y Belt Tension Adjustment

The Y belt tension adjustment is made with the tail piece cover removed.
As shown in the diagram below, measurements are made with a cylindrical tension gauge with the Y Cursor moved to the bottom end of the Y Rail. Measurements are made by hooking on to the left side of the belt at the centre of the Y Rail (shown by the arrow in the diagram below) and pulling to the right. The value is measured at the instant the left belt touches the right belt. The standard value is shown below.

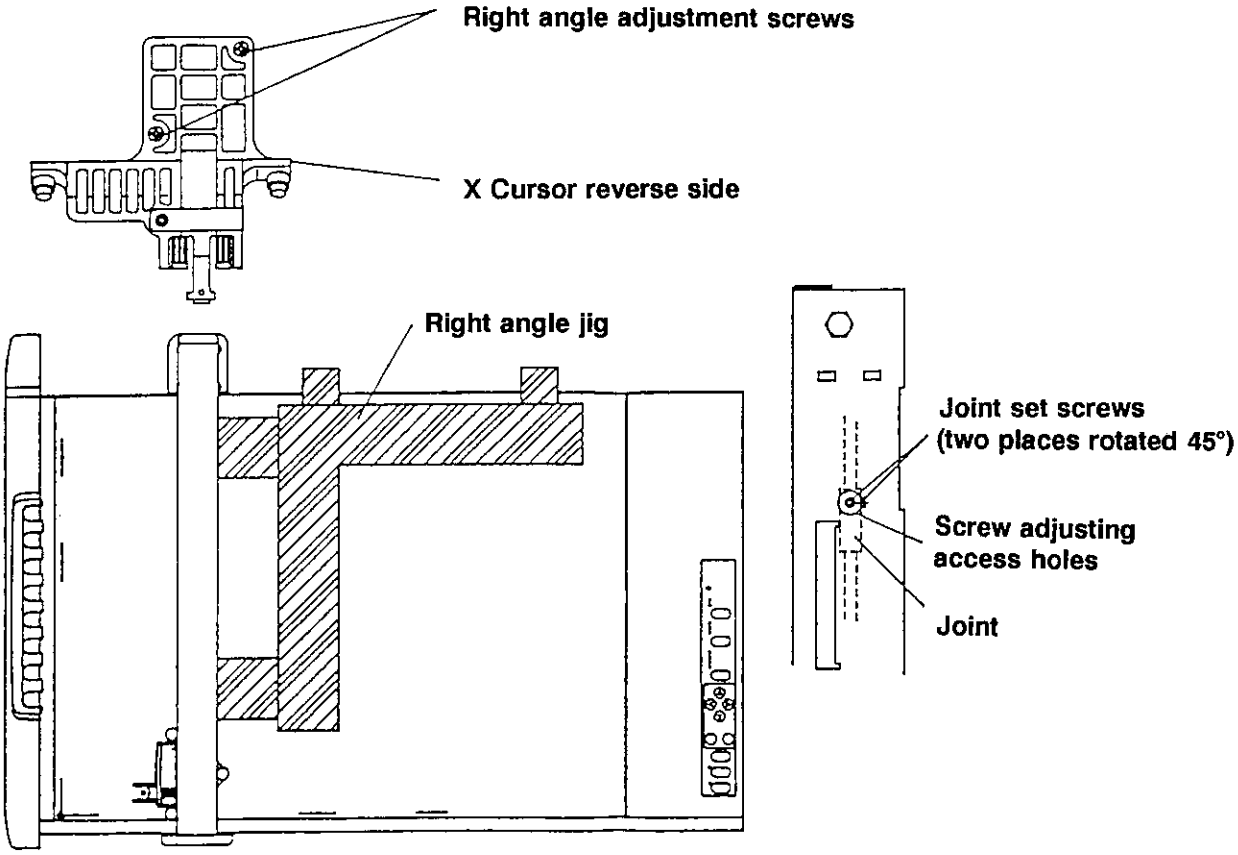
	Y tension
Standard value	120 g ± 10 g

Adjust the two tension adjustment screws on the Tail Piece Cursor side so that the belt tension equals the standard value.



8-5 Rail Right Angle Adjustment

- Loosen the two set screws on the joint.
- Loosen the two right angle adjustment screws on the bottom of the X Cursor.
- Move the Y Cursor to the bottom as shown in the diagram and align the right angle adjustment jig with the X Rail and fasten it on the plotting table.
- Adjust the Y Rail so that the reading on dial gauge A of the right angle adjustment jig is within 0-0.15 mm of the reading on dial gauge B.
- Tighten the set screw on the joint and tighten the right angle adjustment screw.
- After tightening the screws, check again to make sure the adjustment is within the range.

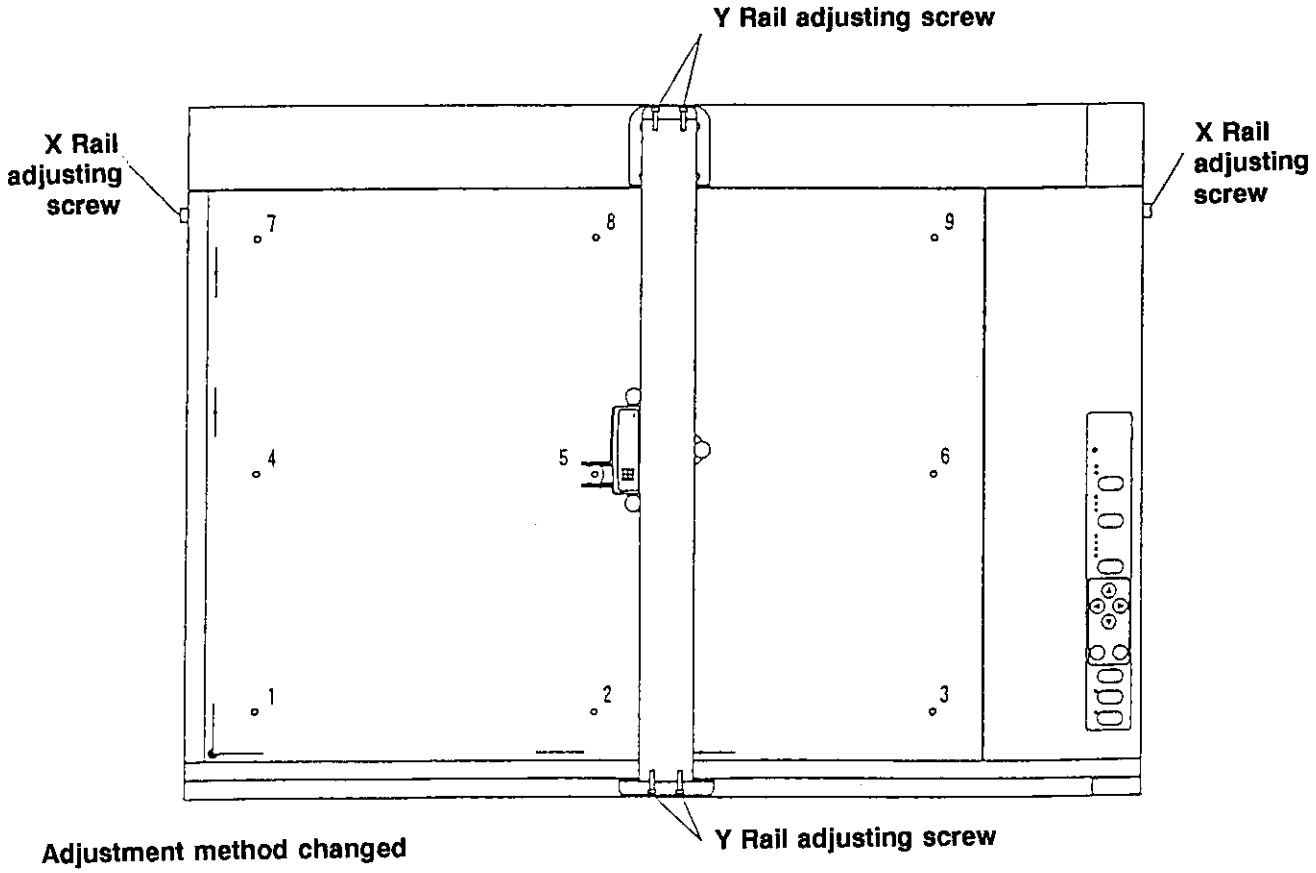


8-6 Pen Height Adjustment

* Pen height (the space between the tip of the pen and the plotting table when the pen is up) has a large influence on pen pressure. After repairs or parts replacement, the pen height must be measured (see 4.3) to make sure that it conforms to the standard value.

The standard value is between 1.2 and 1.8 mm.

- Mount the standard pen in the pen carriage.
- Adjust the space between the standard pen and the plotting table to lie within the standard value.
- Adjustment method:
  Loosen the four screws which hold the Y Rail and adjust the Y Rail position until the height lies within the standard value. If adjusting the Y Rail only fails to bring the height within the standard value, remove the side cover and pen line cover, loosen the X Rail fastening screw and adjust the X Rail also.
- X Rail Adjustment:
  If the height at 7 in the diagram below is abnormal, loosen the X Rail fastening screw on the left side and adjust the X Rail up or down.
  If the height at 9 in the diagram below is abnormal, loosen the X Rail fastening screw on the right side and adjust the X Rail up or down.
  If the height at 8 in the diagram below is abnormal, remove the Bottom Cover and make the adjustment with the fastening nut at the center of the X Rail.
- To measure the height, insert the pen height adjustment jig between the standard pen and the plotting table and proceed so that the 1.2 mm side enters but the 1.8 mm side catches.



Adjustment method changed

9. Self-Diagnostic Function

Please use the self diagnostic function for adjustment and verification after exchanging or repairing parts.

1 EEPROM Initialization

2 Home Position Adjustment

3 Pen Height Measurement

4 Pen Line Position Adjustment

5 Pen Pressure Adjustment

6 Panel Test

7 Sensor Tests

8 Motor Operation Test

9-1 EEPROM Initialization

Initialization must be carried out when the CPU Board is replaced.
Since initialization cancels all previously entered settings, each of the following adjustments must be made after initialization.

Method

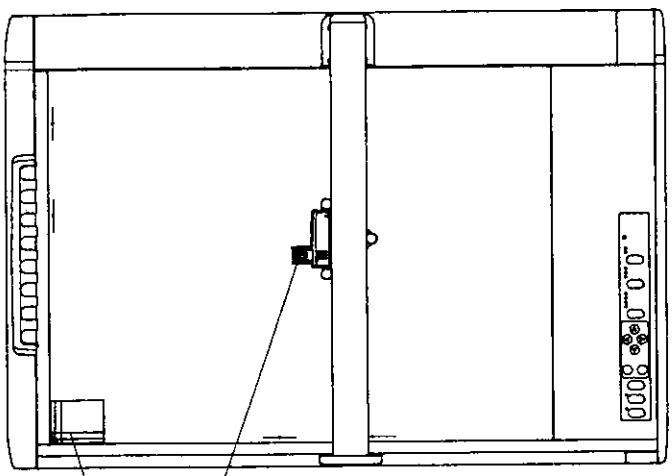
- Switch on power while holding down the three CARD, SPEED and PEN TYPE Keys.
- Use the JOG Keys (△,▽) to cause the REMOTE LED to flash and press the ENTER Key twice.

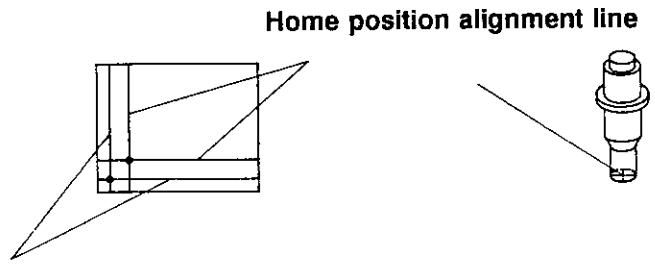
9-2 Home Position Adjustment

Home position errors are caused by variations in positioning the X,Y Limit Sensor, and by the accuracy of the parts and their fitting down to the tip of the pen. These errors can be adjusted.

Method

- Mount Home Position Detection Jig A in the pen carriage.
- Place Home Position Detection Jig B so that its alignment silk line overlaps the silk line on the plotting table.
- Switch on power while holding down the three CARD, SPEED and PEN TYPE Keys.
- Since the POWER/ERROR LED is flashing, press the ENTER Key.
- Since the pen carriage will move to a position near to the home position, watch Home Position Detection Jig A and move the pen carriage so that it overlaps the home position alignment line of Home Position Detection Jig B.
  (Use JOG keys for the fine adjustment.)
- When the ENTER Key is pressed again, the pen carriage will move to the view position and return again to the home position. Please check this.
- If the REMOTE Key is pressed, other adjustments and measurements can be made.



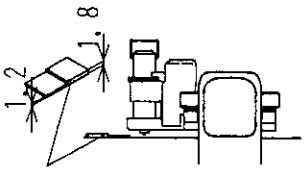


9-3 Pen Height Measurement

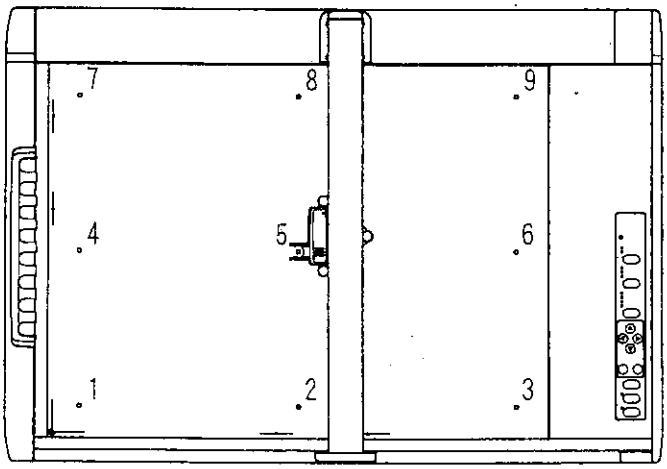
To measure pen height errors caused by variations in the quality of parts after replacement of parts or repairs.

Method

- **Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.**
- **Use JOG keys (△,▽) to make the Replot LED flash then press the ENTER key. The pen carriage will move to Position 1 on the diagram below when the ENTER key is pressed.**
- **Move the pen carriage in accordance with the JOG keys (△,▽,◁,▷) to the 9 positions on the plotting table and verify that the pen heights at all positions are within the standard value.**
- **If the REMOTE Key is pressed, other adjustments and measurements can be made.**
- **To measure the height, insert the pen height adjustment jig between the standard pen and the plotting table and proceed so that the 1.2 mm side enters but the 1.8 mm side catches.**



Pen height adjustment jig



9-4 Pen Pressure Adjustment

To make pen pressure measurements and adjustments for all four pen types with the plotting table flat.

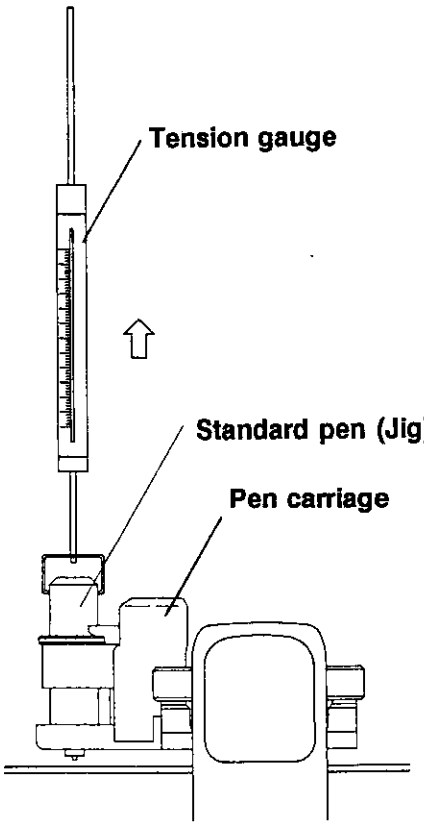
- Mount the standard pen in the pen carriage.
- Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.
- Use the JOG keys (△,▽) to make the Card clear LED flash. When the ENTER key is pressed the pen carriage will move to the centre of the plotting table but the pen carriage should be moved to a place where there is a gap of 1.5 mm between the pen tip and the plotting table. After selecting the type of pen with the JOG keys, press the ENTER key to put the pen down. In this condition, the pen pressure can now be adjusted with the JOG keys (△,▽) and set with the ENTER key. There are seven steps each, up and down, which can be selected for one setting but, if the value can not be made to agree with the standard value, set the pen pressure to the maximum value and repeat the pen pressure adjustment procedure. (Cancel with the REMOTE key and select the pen type again.)
  Example: When adjusting the Cutter pen force, if the value does not reach 60 g after the JOG key (▽) has been pressed seven times, press the ENTER key to set the current value. Then press the ENTER key again and adjust the force to 60 g with the JOG key (▽).
- Pen pressure is measured by attaching a cylindrical tension gauge (50g or 100g) to the standard pen and pulling directly away from the plotting table. The value is read at the time the pen carriage moves up. Make the adjustment so that this value agrees with the standard value. Pen pressures for each type are as shown below.
- If the REMOTE Key is pressed, other adjustments and measurements can be made.

With the plotting table upright, to make pen pressure measurements and adjustments for the three pen types other than the Cutter.

To make adjustments, switch on power with the plotting table upright position while holding down the three CARD, SPEED and PEN TYPE keys. The procedure is then the same as for making adjustments with the plotting table flat.

	Flat position	Upright position
Ink	20 g ± 5 g	20 g ± 5 g
Ceramic	30 g ± 5 g	30 g ± 5 g
Ball-Fiber-Pop	40 g ± 5 g	40 g ± 5 g
Cutter	60 g ± 5 g	

* Cutter pen pressure : The value is about 80 g when the cutter holder is mounted.



Changes to pen pressure

9-5 Pen Line Position Adjustment

To adjust the position of the pen line so that pen changes operate properly.

Method

- Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.
- Use the JOG keys (△,▽) to make the Draft LED flash and press the ENTER key.
- Use the JOG keys (△,▽) to make the Card clear LED flash. When the ENTER key is pressed the pen carriage will move to position A, Figure 1. Move the pen carriage by hand to position A, Figure 2 and, after making fine adjustments, press the ENTER key. (Press the REMOTE key to cancel)
- Use the JOG keys (△,▽) to make the Replot LED flash. When the ENTER key is pressed the pen carriage will move to position B, Figure 1. Move the pen carriage by hand to position B, Figure 2 and, after making fine adjustments, press the ENTER key. (Press the REMOTE key to cancel.)
- Adjustment criteria:
  Make the setting in the Y direction so that the gaps L between the pen flange and the pen line clamps are equal, as shown in Figure 3.
  Make the setting in the X direction at the instant that the pen separates from the pen carriage (the instant that point C separates in the direction of the arrow shown in Figure 4 when JOG key (▷) is pressed).
  Make fine adjustments with the JOG keys.
- If the REMOTE Key is pressed, other adjustments and measurements can be made.

* Use the JOG keys (△,▽) to make the POWER/ERROR LED flash. Since a pen change operation is executed when the ENTER key is pressed, when the adjustments have been made, they should be verified by operate pen changes from Pen 1 through Pen 8. (The operation is terminated by the REMOTE key)

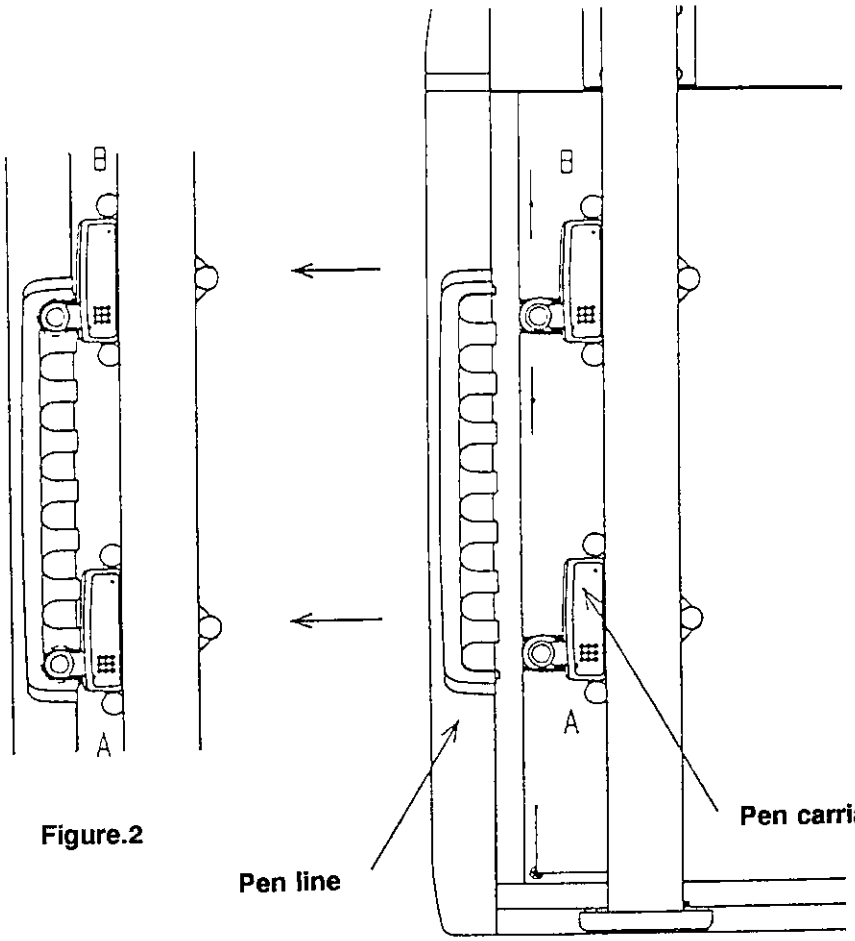


Figure.2

Figure.1

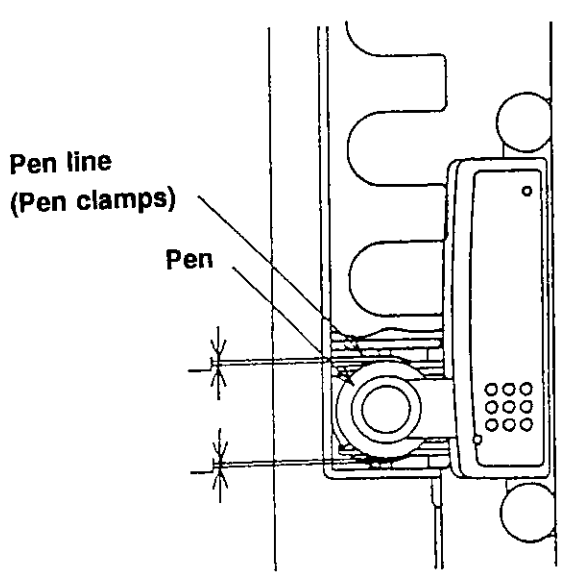


Figure 3 : Y direction adjustment criterion

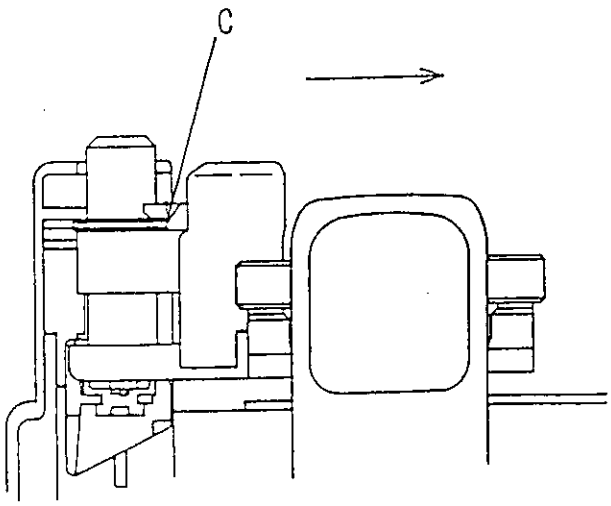


Figure 4 : X direction adjustment criterion

9-6 Panel Test

9-6-1 LED Checks

To check whether the LEDs light up.

Method

- Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.
- Use the JOG keys (△,▽) to make the Normal LED flash and press the ENTER key.
  Use the JOG keys (△,▽) to confirm that all the LEDs light up.
- If the REMOTE Key is pressed, other adjustments and measurements can be made.

9-6-2 Panel Key Checks

To confirm whether the panel keys are operating correctly. If the panel keys are operating correctly, the LED which corresponds to the key will light up. The correspondence table is as follows.

Panel key		Corresponding LED
CARD		Draft
SPEED		Normal
PEN TYPE		Quality
JOG	△	Ink
	◁	Ceramic
	▷	Ball-Fiber-Thick
	▽	Cutter
P1		Replot
P2		Card clear
ENTER		POWER/ERROR
REMOTE		REMOTE
PAPER HOLD		PAPER HOLD

Method

- Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.
- Use the JOG keys (△,▽) to make the Quality LED flash and press the ENTER key.
- Use the panel keys to confirm that the LEDs light up in accordance with the correspondence table.
- If the REMOTE Key is pressed, other adjustments and measurements can be made.

9-7 Sensor Tests

To verify the following conditions: X,Y limit switches on/off, angle sensor on/off, whether a card is mounted, write protection on/off, whether card battery needs replacement. The LED which corresponds to each sensor lights up. The correspondence table is as follows.

Sensor and card conditions			Corresponding LED conditions	
Sensor	X limit sensor	ON	ON	Replot
		OFF	OFF	
	Y limit sensor	ON	ON	Card clear
		OFF	OFF	
	Angle sensor	Upright	ON	POWER/ERROR
		Flat	OFF	
Card	Card	Mounted	ON	Draft
		Not mounted	OFF	
	Write protection	ON	ON	Normal
		OFF	OFF	
	Card battery	Replacement not needed	ON	Quality
		Replacement needed	OFF	

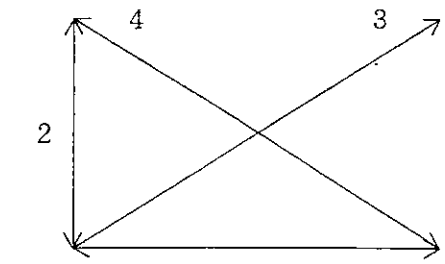
Method

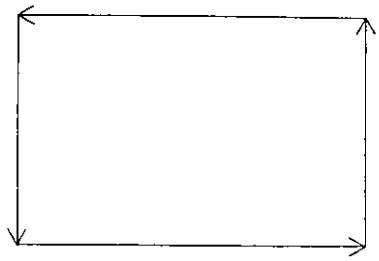
- Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.
- Use the JOG keys (△,▽) to make the Ink LED flash and press the ENTER key.
- Confirm that the LEDs light up in accordance with the correspondence table if the sensors are working normally.
- If the REMOTE Key is pressed, other adjustments and measurements can be made.

* Don't insert or remove the card after the power is on.
  Card conditions apply when power is switched on. The LEDs will not change if card conditions are changed after the power has been switched on.

9-8 Motor Operation Test

To verify the operation of the X,Y motors. Operating patterns and corresponding LEDs are as shown below.





Operating pattern	Corresponding LED
1	POWER/ERROR
2	Replot
3	Card clear
4	Draft
5	Normal

* The operating patterns correspond to the directions shown.

Method

- Switch on power while holding down the three CARD, SPEED and PEN TYPE keys.
- Use the JOG keys (△,▽) to make the Ceramic LED light up and press the ENTER key.
- Select the desired pattern with the JOG keys (△,▽). When the ENTER key is pressed the pattern will start.
- If the REMOTE Key is pressed, operation will cease and another pattern can be selected. If the REMOTE Key is pressed in this condition, other adjustments and measurements can be made.

10. Lubrication Points

NO	Lubrication point	Maker and name	Lubrication period
1	X Rail (X Cursor roller running surface)	Sumiko Lubricants KK Sumi Grease Spray	When X Cursor is replaced
2	Base (Tail Piece Cursor roller running surface)	Sumiko Lubricants KK Sumi Grease Spray	When Tail Piece Cursor is replaced

11. Tools and Jigs

Tools required for dismantling, assembly, adjustment, etc. are as shown below.

No	Name	Notes	Reference
1	Phillips screwdriver	No 1 100 mm long	Commercially available item
2	Phillips screwdriver	No 2 100 mm long	
3	Screwdriver	Nominal 6, 100 mm long	Commercially available item
4	Hexagonal wrench	2 mm	Commercially available item
5	Hexagonal wrench	5 mm	Commercially available item
6	Spanner	Nominal 7	Commercially available item
7	Bar tension gauge	Measuring range 50 g	Commercially available item
8	Bar tension gauge	Measuring range 100 g	Commercially available item
9	Bar tension gauge	Measuring range 300 g	Commercially available item
10	Standard pen	Special tool	JD-41440
11	Pen height adjusting jig	Special tool	JD-41514
12	Home position detecting jig A	Special tool	DE-30352 (DS-1
13	Home position detecting jig B	Special tool	(
14	Right angle jig	Special tool	
15			
16			
17			
18			
19			
20			

12. Maintenance Parts

- Pen Line Assembly
- CPU Board
- Power Supply Board
- X Motor Assembly
- X Cursor Assembly
- Y Cursor Assembly
- Tail Piece Cursor Assembly
- X Flexible Cable
- X Connector Board
- Y Connector Board

12-1 List of Maintenance Parts

Part Name	Part Number
CPU Board Assembly	DE-46236
Power Supply Board Assembly (Magnet)	DE-46237
Power Supply Board Assembly (Electrostatic)	DE-46250
X Connector Board Assembly	DE-46238
Y Connector Board Assembly	DE-46239
X Flexible Cable Assembly	DE-46240
X Motor Assembly	DE-46241
X Cursor Assembly	DE-46242
Y Cursor Assembly	DE-46243
Tail Piece Cursor Assembly	DE-46244
Bottom Cover Assembly	DE-46245
Pen Line Assembly	DE-46246
Continuous Shaft Assembly	DE-46247
X Tension Plate Assembly	DE-46248
Y Tension Plate Assembly	DE-46249
Plotting Board (Electrostatic Board) Assembly	DE-46267
Plotting Board (Magnetic Board) Assembly	DE-46268
Y Flexible Cable Assembly	DE-46271
Pen Carriage Assembly	DE-46272

12-2 List of Screws

Part Number	Type	Size
DR-1105-41703	Small pan head screw	M3 x 4
DR-4001-41428	Small pan head screw	M3 x 6
DR-4001-41195	Small pan head screw	M3 x 16
DR-4001-43329	Small pan head screw (spring washer and flat washer)	M3 x 8
DR-4005-44294	Small binding screw	M4 x 14
DR-4007-44791	Hex. socket head bolt	M2.5 x 4
DR-4007-44789	Hex. socket head bolt	M2.5 x 8
DR-3097-41964	Hex. socket head bolt	M6 x 10
DR-4007-44786	Set screw (concave end)	M4 x 4
DR-4019-44790	P tight screw	M2 x 6
DR-4019-44792	P tight screw	M3 x 16
DR-4010-43326	Hex. nut (3 types)	M3
DR-4010-41787	Hex. nut (1 type)	M4
DS-4104-40904	E type set pin	E4

13. Parts List

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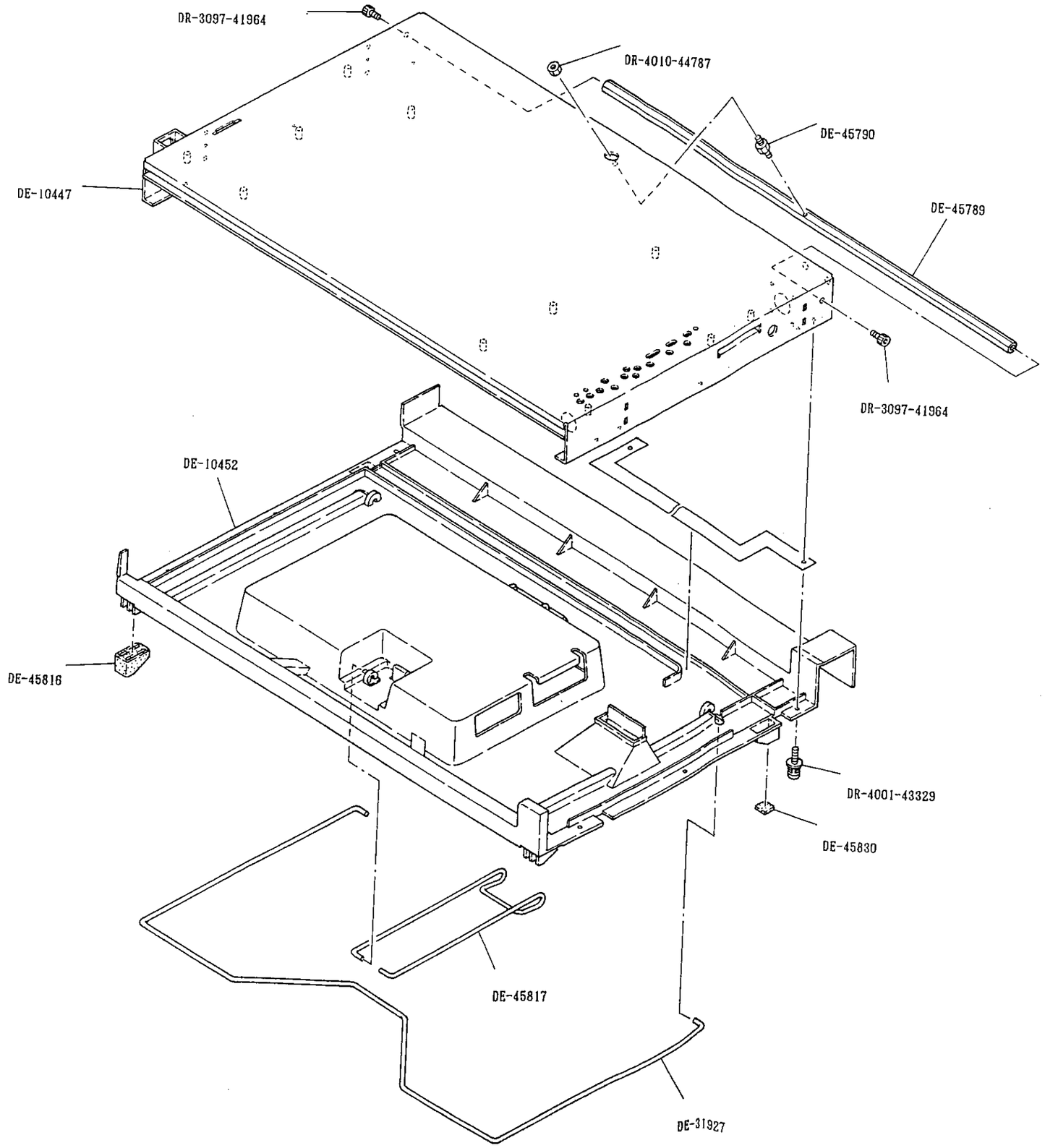
13-1 Base

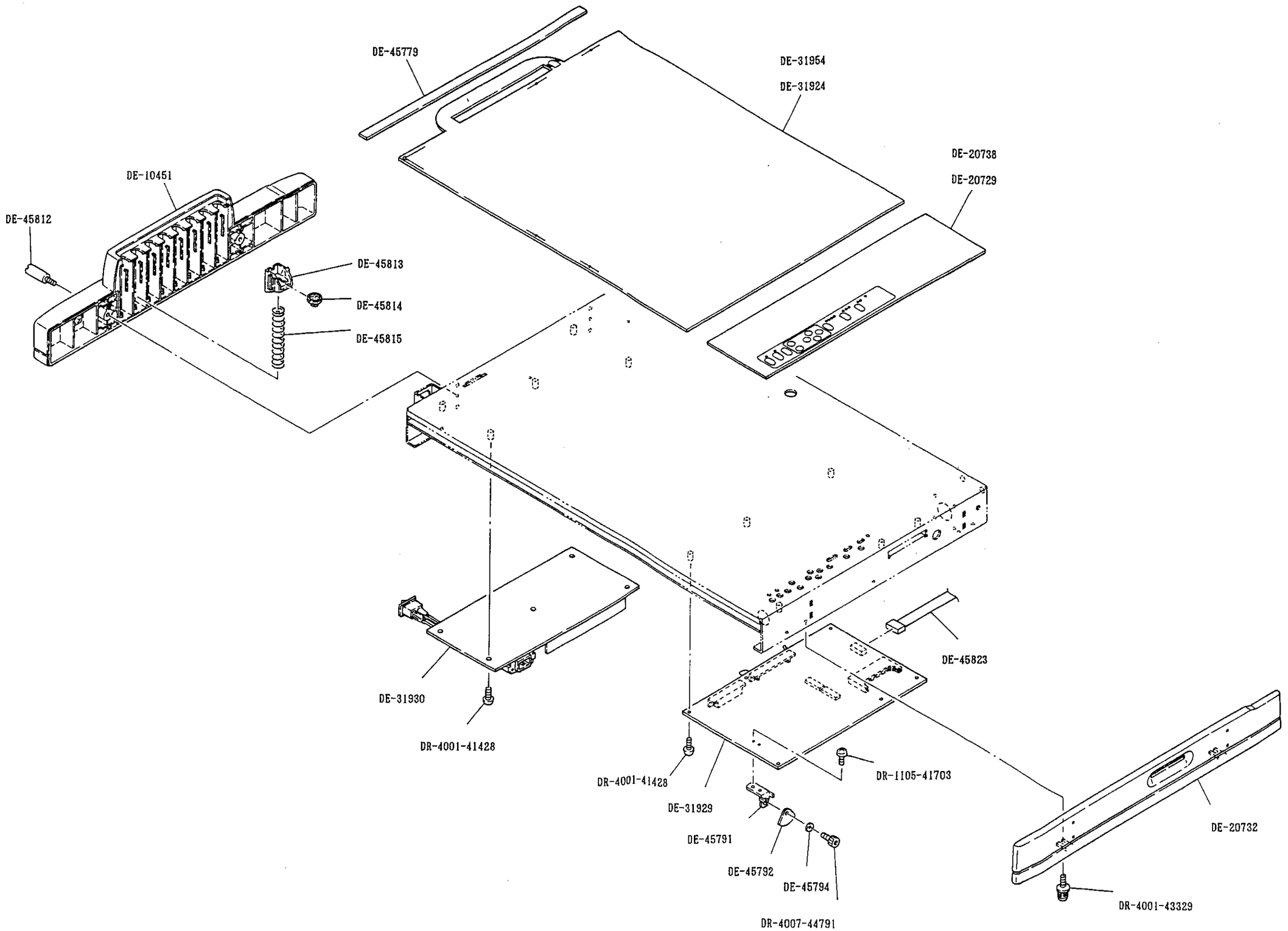


13-1 Base

DE-10453
DE-43825
DE-45818
DE-43461
DE-43860
DE-45819
DE-45119
DE-30986
DE-30235
DE-40056
DE-31227
DE-31257
DE-43087
DE-43183

13-2 Main Board and Cover

13-2 Main Board and Cover



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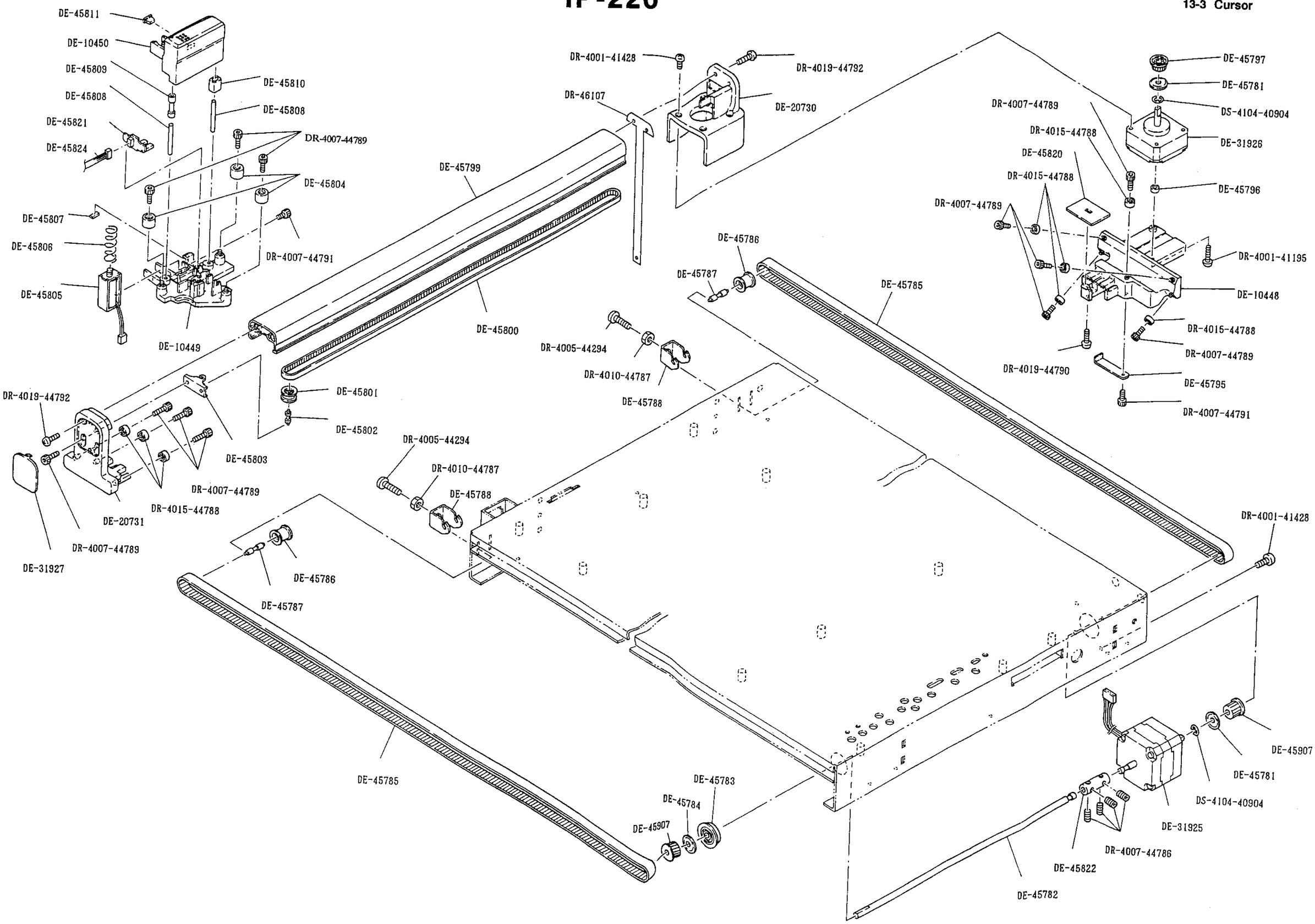
13-3 Cursor



The MUTOH iP-220
Desktop Plotter
Maintenance Manual

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