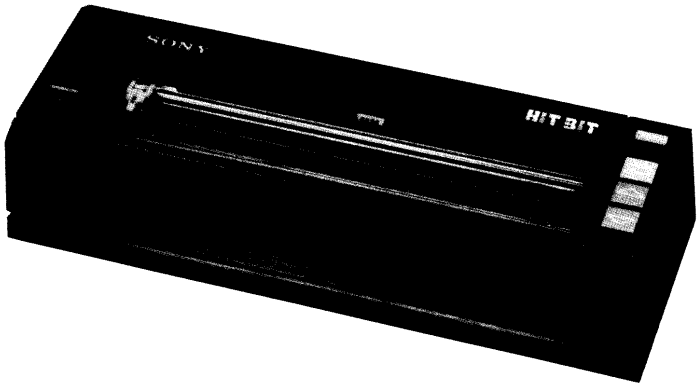
# PRN-C41/C41D

## SERVICE MANUAL

REVISED-1




## COLOR PLOTTER PRINTER

SONY®

*Scanned and converted to PDF by HansO, 2001*
*Original supplied by Bas Kornalijnslijper, MCWF*

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# CHAPTER 1
# OPERATION

## 1-1. FEATURES

The PRN-C41 is a compact and light-weight color plotter printer designed for an MSX computer, such as the Sony home computer HB-75P/B or HB-55P.
Four colors are available for printings and you can use sheets of paper up to A4 (210 × 297 mm, 8¼ × 11¹¹⁄₁₆ inches) size or paper in rolls.
Software cartridges which enable you to print out illustrations or designed characters easily for making Christmas cards, birthday cards, etc. are available.
MSX is a trademark of Microsoft Corp.

## 1-2. NOTICE FOR THE CUSTOMERS IN THE UNITED KINGDOM

**IMPORTANT**

The wires in the mains lead of the supplied ac power adaptor are coloured in accordance with the following code.

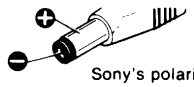
Blue .... Neutral
Brown ... Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:
The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

## PRECAUTIONS

**On safety**

- Operate on 220, or 240V ac by using the supplied ac power adaptor according to your local power supply.
- Use this adaptor only for this plotter printer.
  Polarity of the ac power adaptor plug is as illustrated.



Sony's polarity

- Should any solid object or liquid fall into the cabinet, unplug the unit and have it checked by qualified personnel before operating it any further.
- Disconnect the ac power adaptor from the wall outlet if the set is not to be used for an extended period of time. The POWER switch on the plotter printer does not turn the ac adaptor off.
- To disconnect the ac power cord of the ac power adaptor, pull it out by the plug. Never pull the cord itself.
- Do not place or drop heavy objects on the ac power cord. Use of a damaged cord is dangerous.

**On installation**

- The plotter printer consists of high-precision mechanical parts. Do not drop it or bump it against other objects. Do not place it in a place subject to vibration or on an unstable base.
- Do not install the unit near heat sources such as a radiator or an air duct, or in a place subject to direct sunlight, dust, or moisture.

**On operation**

- Use the specified type of paper. Never attempt printing without paper loaded in the printer.
- Do not touch the mechanical parts inside the printer, or the graphics will not be drawn precisely or other problems may occur.

**On Cleaning**

- Clean the enclosure or surface with a soft, dry cloth or a soft cloth lightly moistened with water or mild detergent solution. Do not use any solvent, such as alcohol or benzine, as it might damage the finish.

## 1-3. SPECIFICATIONS

**Print functions**

| | |
|---|---|
| Print system | Ball point pen print<br>4 colors rotary system |
| Driving system | Hybrid x-y plotter |
| Graphics print speed | x, y: 57 mm/sec.<br>2¼ inches/sec.<br>45° direction: 81 mm/sec.<br>3$^{3}/_{16}$ inches/sec. |

Graphics printing area

| Paper size | 100mm | 114mm | A5 | B5 | A4 |
|---|---|---|---|---|---|
| x-direction | 410<br>(82<br>3$^{15}/_{16}$") | 480<br>(96<br>3$^{25}/_{32}$") | 650<br>(130<br>3⅛") | 820<br>(164<br>6$^{29}/_{64}$") | 960<br>(192<br>7$^{9}/_{16}$") |
| +y-direction | 30<br>(6, ¼") | — | 30<br>(6, ¼") | 30<br>(6, ¼") | 30<br>(6, ¼") |
| −y-direction | 601<br>(120.2,<br>4$^{47}/_{64}$") | — | 919<br>(183.8,<br>7$^{15}/_{64}$") | 1149<br>(229.8,<br>9$^{3}/_{64}$") | 1354<br>(270.8,<br>10$^{21}/_{32}$") |

Unit: step (in parenthesis mm, inches)

| | |
|---|---|
| Resolution | 0.2 mm/step ($^{1}/_{128}$ inches/step) |
| Character types | 252 types |
| Character size | 0.8 × 1.2 mm to 12.8 × 19.2 mm ($^{1}/_{32}$ × $^{3}/_{64}$ inches to ½ × ¾ inches)<br>16 sizes |
| Character print speed | Max. 10 characters/sec. (character height 1.2 mm, $^{3}/_{64}$ inches)<br>Ave. 6 characters/sec. |
| Number of characters to a line | Max. 160 characters (paper size: A4 with minimum character) |
| Character pitch | 2.4 mm ($^{3}/_{32}$ inches) with standard characters |
| Character direction | 4 directions |
| Colors | 4 colors (black, blue, green, red) |
| Sign | MSX specification character code |
| Precision of repeated printing: | less than 0.2 mm ($^{1}/_{128}$ inches) |
| Precision of distance: | less than ±1.0% in x and y axes |

**Paper**

| | |
|---|---|
| Sheet paper | Width: 100 mm to 216 mm (3$^{15}/_{16}$ to 8½ inches)<br>Thickness: 70μm to 300μm |
| Paper in rolls | Outer diameter: less than 70 mm (2¾ inches)<br>Inner diameter: less than 12 mm (½ inches)<br>Width: 114 mm (4½ inches)<br>Thickness: 70 ± 5μm |

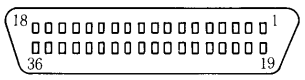
**Ambience**

| | |
|---|---|
| Operating temperature | 5°C to 40°C (41°F to 104°F) |
| Operating humidity | 30% to 80% |
| Power requirement | DC 9.8V using the ac power adaptor supplied |
| Power consumption | 12W |
| Weight | Approx. 1.3 kg, 2 lb 14 oz (main unit only) |
| Dimensions | Approx. 310 × 67 × 108 mm (w/h/d) (12¼ × 2¾ ×4 ⅜ inches) |

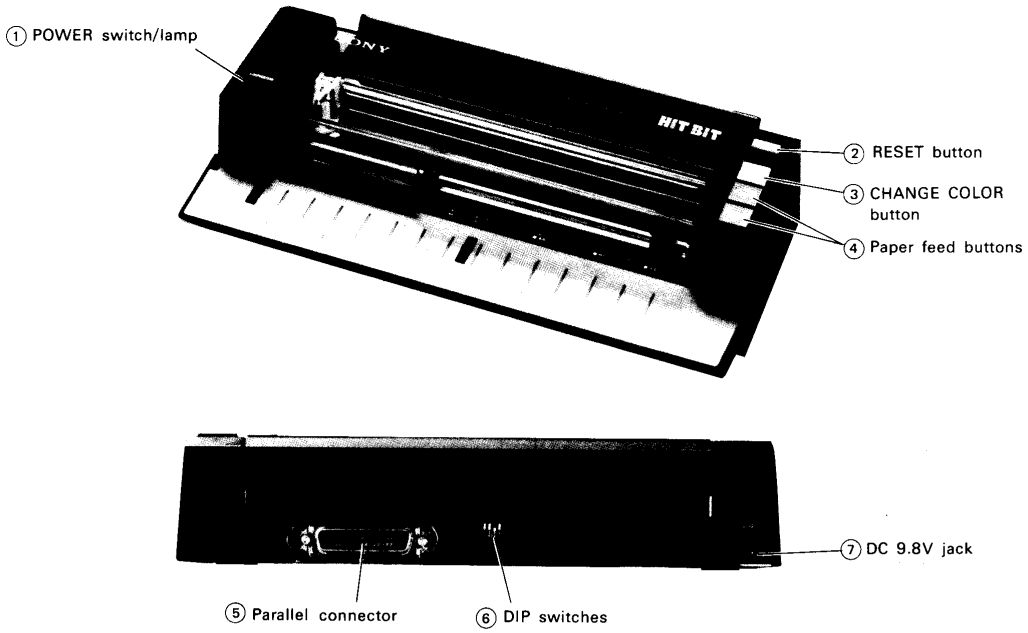
**CONNECTOR PIN CONFIGURATION**

| Pin No. | Signal name | Pin No. | Signal name |
|---|---|---|---|
| 1 | $\overline{STB}$ | 19 | Signal GND |
| 2 | DATA1 | 20 | Signal GND |
| 3 | DATA2 | 21 | Signal GND |
| 4 | DATA3 | 22 | Signal GND |
| 5 | DATA4 | 23 | Signal GND |
| 6 | DATA5 | 24 | Signal GND |
| 7 | DATA6 | 25 | Signal GND |
| 8 | DATA7 | 26 | Signal GND |
| 9 | DATA8 | 27 | Signal GND |
| 10 | $\overline{ACK}$ | 28 | Signal GND |
| 11 | BUSY | 29 | Signal GND |
| 12 | NC | 30 | NC |
| 13 | PULL UP (4.7kΩ) | 31 | NC |
| 14 | Signal GND | 32 | NC |
| 15 | NC | 33 | NC |
| 16 | Signal GND | 34 | NC |
| 17 | Signal GND | 35 | NC |
| 18 | NC | 36 | NC |

rear view of PRN-C41



## 1-4. PARTS IDENTIFICATION




① **POWER switch/lamp**
Press to turn on the power. Press again to turn off.
The green lamp lights when the power is turned on.

- When the POWER switch or the RESET button is pressed, the plotter printer state, the pen position, the pen color and so on, is initialized.
  In this operation, mechanical noise is heard while approximately six seconds.

② **RESET button**
Press to reset the plotter printer into the power on status. This button is useful to reset the plotter printer when the printing operation is interrupted.
Refer to the software's manual for how to interrupt the printing operation.

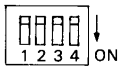
- Pressing the RESET button of the computer does not reset the plotter printer.

③ **CHANGE COLOR button**
Press this button to turn the pen holder and change the printed out characters color.

④ **Paper feed buttons**
Press to feed the paper.
Pressing the △ feeds the paper forwards and pressing the ▽ feeds it backwards.

⑤ **Parallel interface connector**
Connect to the computer using the supplied cable.

⑥ **DIP switches**
The switch 4 selects the function of the carriage return code (0DH) in the plotter printer text mode. When it is set to:
ON: the pen position is set to the beginning of the next line.
OFF: the pen position is set to the beginning of the line.




These switches are preset at the factory as above. Normally use in this status.

- You may have to set the DIP switches according to your software. Refer to the operating instructions of the software.

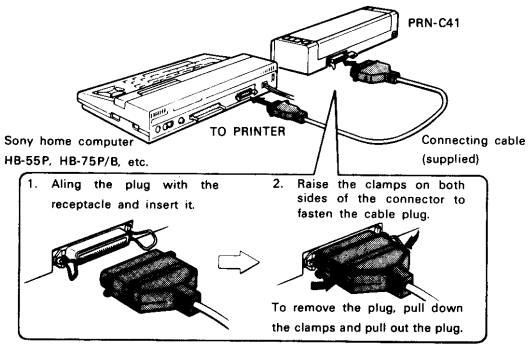
⑦ **DC 9.8V jack**
Connect to the supplied ac power adaptor.

## 1-5. OPERATION

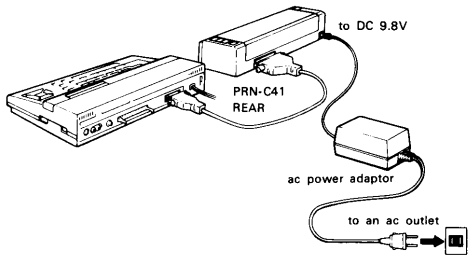
### 1-5-1. Connection

- Before connecting, be sure to turn off the computer and the plotter printer.

**Connection to the computer**



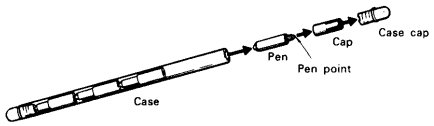

**Connection of the ac power adaptor**




- Use the ac power adaptor supplied. Do not use any other ac power adaptor.

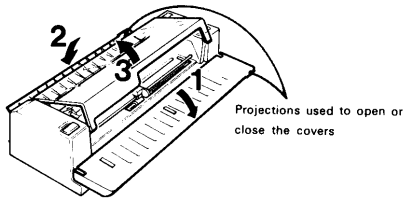
### 1-5-2. Pen Settings

First take out the pens from the pen case.



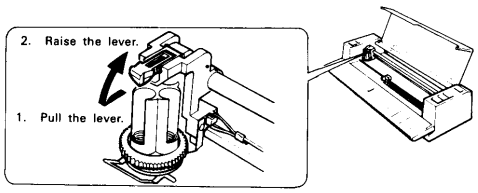

Set the pens as follows:

① Open the front and back covers of the printer, then the top cover.

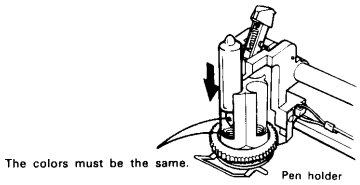



② Turn on the power of the printer.
In this moment, mechanical noise is heard while approximately six seconds.

③ Raise the lever.




④ Set a pen into the pen holder. The color of the pen to be inserted must be the same as the color indicated on the front of the pen holder.




⑤ Press the CHANGE COLOR button on the plotter printer to turn the pen holder. Insert another pen.

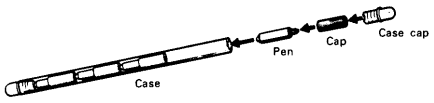
⑥ Repeat step 5 to set all the pens into the holder.

⑦ Replace the lever.

⑧ Close the top cover.

**Notes**

- Set all four pens into the pen holder, or the plotter printer may not operate correctly.
- When the printer is not to be used for a long period of time, remove the pens, cover them with the caps and store them in the case. If the pens are left unused for a long time, the ink will dry up making the pens unusable.



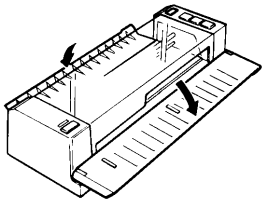

- When you need another set of the pens, be sure to get the PRK-C41 pen set for the PRN-C41 plotter printer.

## 1-5-3. Paper Loading

**Loading a sheet of paper**

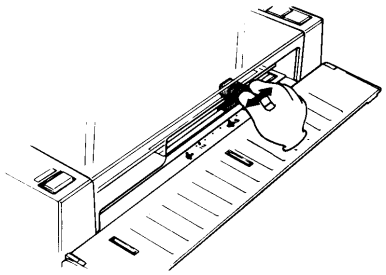
Load as follows:

① Open the front and back covers.

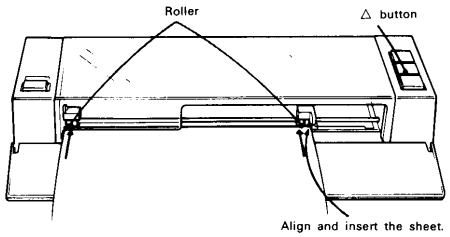


② Turn on the power of the plotter printer.

③ Move the paper select lever to the position of the paper size to be used.

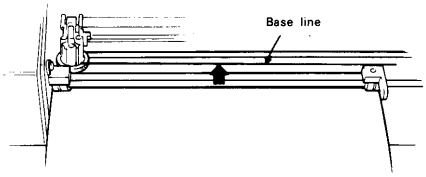


④ Insert the sheet into the rollers, then press the paper feed button (△).




Align and insert the sheet. Placing your hand on the top center part of the sheet makes the paper loading easier.

⑤ Press the paper feed buttons (△/▽) so that the top of the sheet comes to the base line.



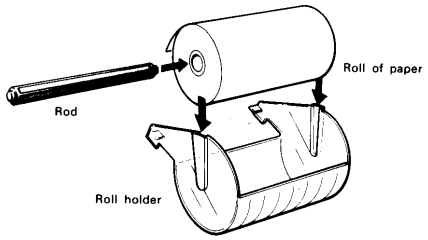

If the sheet is not inserted properly, the plotter printer will not operate correctly. Remove the sheet and insert it again.

- When a thick sheet of paper is loaded, use the plotter printer with the back cover removed.

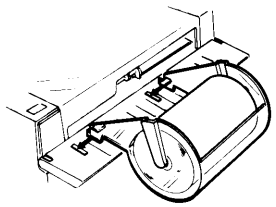
**Loading a roll of paper**

The supplied roll of paper is loaded as follows:

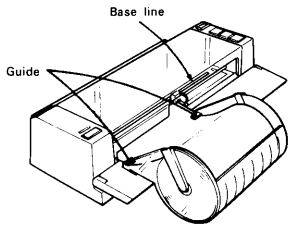
① Insert the rod (supplied) into the roll and set the roll in the roll holder (supplied).
The end of the paper should be cut straight across.



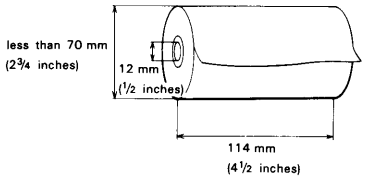
② Place the roll holder on the plotter printer.



③ Insert the paper under the guide of the roll holder and load the paper onto the plotter printer in the same way as for a sheet of paper.




**Replacement roll**
Obtain a roll of paper with the dimensions indicated below:



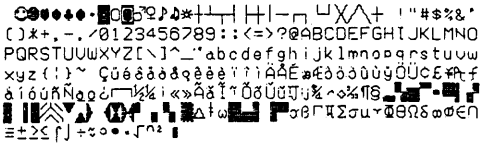

## 1-6. HOW TO PRINT

**Before starting**
Turn on the power of the computer, then the plotter printer. After turning on the power, open the front and back covers of the plotter printer and insert the pens and the paper.
The plotter printer is used with the front and back covers open.

**Printing of the test pattern**
① Press the CHANGE COLOR button and the paper feed button (△ button) simultaneously.
The following patterns will be printed out.

(black) (blue) (green) (red)

② Press the CHANGE COLOR button and the paper feed button ( ▽ button) simultaneously.
The factory set characters will be printed out. The print out color is changed every 16 characters.



If the plotter printer does not operate correctly, press the RESET button and try to print out the test patterns again.

## 1-7. BASIC OPERATION

**Program listing**
To obtain an MSX-BASIC program list printout, use the LLIST command. For example, execution of the following statement will print a program list between line numbers 10 and 100:

```
LLIST 10-100
```

**To print characters in MSX-BASIC programs**
Use the LPPINT command.
For example, execution of the following statement will print characters ABCDE:

```
LPRINT "ABCDE"
```

Execute the following program:

```
10 INPUT A
20 INPUT B
30 LPRINT "A + B ="; A + B
```

If 5 is entered for A, and 8 for B from the keyboard, A + B = 13 will be printed.
In other words, LPRINT is a command which executes a PRINT statement on the printer instead of the display screen.

- To print characters in Sony Disk BASIC programs, use the PRINT @ command.
  ex.) PRINT @ 1, "ABC"

## 1-8. ADVANCED OPERATION

This plotter printer has two modes, the text mode in which characters can be printed out and the graphic mode in which the graphics can be printed out.

**Text mode**
When the power of the plotter printer is turned on, the plotter printer is set in the text mode.
In the text mode, MSX-BASIC LLIST command is used to print out MSX-BASIC program lists and the LPRINT command is used to print out characters.
In this mode, the plotter printer can be controlled by sending codes to the plotter printer from the computer.
The codes and their functions are as follows.

**How to send codes** (in the MSX-BASIC)
Use LPRINT command.
For example, when the characters are to be printed out in red, execute as follows:

```
LPRINT CHR$ (&H1B) + "C" + "3"...Sends a color set code.
```

Then execute

```
LPRINT "ABC"
```

The characters ABC will be printed out in red.

To move the pen to the next line (to feed a line), execute

```
LPRINT CHR$ (&H0A) . . . Sends a line feed code.
```

- Transferring from the text mode to the graphic mode must be done after sending a carriage return code (0DH) or a line feed code (0AH).
  If you want to set the plotter printer into the graphic mode right after the power is turned on, execute

  ```
  LPRINT
  ```

  first, then send the code to set the plotter printer in the graphic mode.

**Graphic mode**
When you want to print out graphics, send the commands from the computer to the plotter printer. By sending commands, you can print out the graphics, change the colors and print out characters and so on.
When the plotter printer is turned on, the text mode is entered.
To set the plotter printer into the graphic mode, execute

```
LPRINT CHR$ (&H1B) + "#"
```

in the text mode.

**Sending commands** (in MSX-BASIC)
To send commands in the graphic mode, LPRINT statement is used.
For example, to draw a line from the current pen position to a point 100 steps (1 step is 0.2 mm) in the horizontal direction and −100 steps in the vertical direction, and then draw a line from that point to a point 50 steps away in the horizontal direction and −100 steps away in the vertical direction from that point, execute

```
LPRINT "J100, −100, 50, −100"
```

**Notes**

- Commands in the graphic mode have to be written in capital letters.
- x and y in commands D and M indicate the position as follows on the sheet set on the printer.

**Timing of mode change**
Mode change and manual switch are performed on the following conditions.

- After reset
- After control code (CR, LF) in the text mode
- When data buffer is empty in the text mode
- When one command is end in the graphic mode

**Note**
When stop the pasocon which is external signal by force and break in the graphic mode, printer each switch may not be effective. At the end CR code had better be output.

When change from graphic mode to text mode, carrige move in printing limit. at the same time the following data break.

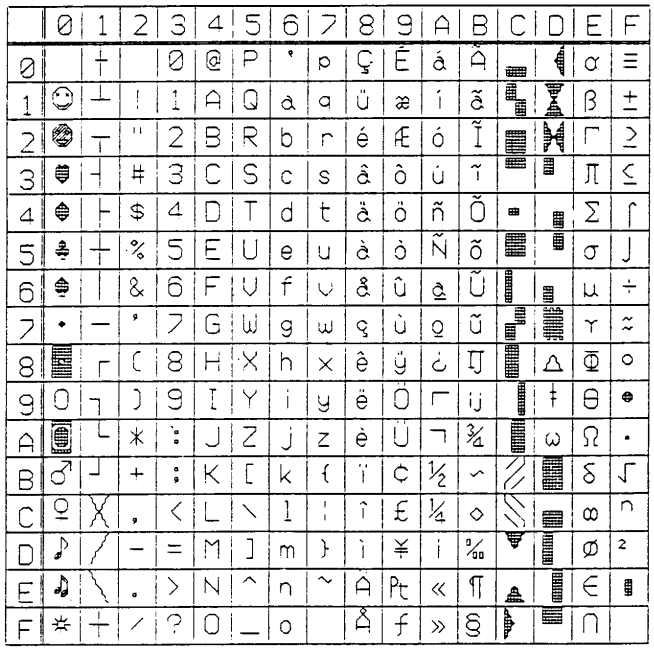
- X,Y ordinate
  Y = 0 home position is left side.
- Character incline
  Q = 0

Line type, color character scale remain settled data.
When send commands to the printer, use "LPRINT".
All below indecate in MSX BASIC.

## 1-9. CODES TABLE

| Name | Code | Functions |
|---|---|---|
| Carriage return | 0DH | When the DIP switch 4 on the rear of the plotter printer is set to:<br>ON: the pen position is moved to the top of the next line.<br>OFF: the pen position is moved to the top of the line. |
| Line feed | 0AH | Feeds a line. |
| Back space | 08H | The pen position is moved one character space back. (When the pen is at the top of the line, this code is ignored) |
| Line up | 0BH | Feeds paper to the previous line. |
| Graphic mode | 1BH+"#" | Sets the plotter printer in the graphic mode. |
| Scale set | 12H+<br>"0"–"15" | Sets the size of the characters to be printed out. Sending "0" specifies the smallest size. |
| Color set | 1BH+"C"<br>+"0"–"3" | Sets the pen color.<br>0: black 1: blue 2: green 3: red |
| Top of form | 0CH | Feeds paper to the position 297 mm (11¾ inches) down from the printing start position. |
| Text mode | 1BH+"$" | Sets the plotter printer in the text mode. |

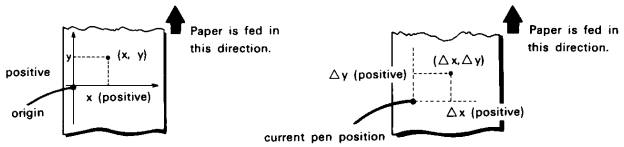
## CHARACTER CODES



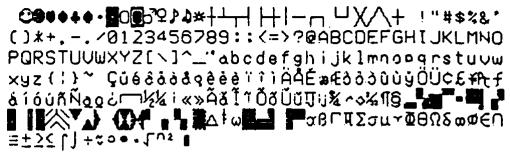
**Graphic Mode Instruction Codes Table**

| | | Command | Function | Remarks, Examples |
|---|---|---|---|---|
| Pen Point Position | All initialize | A | Moves the pen to the left most position, sets the position as the origin, then sets the plotter printer in the text mode. | • Commands I, H, A, and F can be followed by another command without inserting any characters between.<br>LPRINT "HD100,0".<br>Draws a line from the origin to (100,0). |
| | New line | F | Moves the pen to the top of the next line. | |
| | Home | H | Moves the pen to the origin without drawing a line. | |
| | Initialize | I | Sets the current pen position as the origin (the intersection of the x and y axes). | |
| Printing Design | Color change | Cn<br>(n=0–3) | Sets the color<br>0:black 1:blue 2:green 3:red | Commands C,S,Q, and L can be followed by another command by inserting a comma between them.<br>LPRINT "L0, C2, J50, −50, 0, −100"<br>Other commands cannot be followed by another command. To send several commands in sequence, execute appropriate number of LPRINT statements.<br>LPRINT "M50,−50" Move the pen to (50,−50)<br>LPRINT "ID0,−100" Sets the origin at the current pen position and draws a line from the origin to (0,−100).<br>LPRINT "HD100,0" Draws a line from the origin to (100,0)<br>LPRINT "M−10,10" Moves the pen to (−10,10).<br>LPRINT "P0" Prints "0" there. |
| | Line type | Ln<br>(n=0–15) | Selects solid or broken lines to be drawn.<br>n=0,15 Solid line<br>n=1–14 Broken line<br>(The greater the specified value, the rougher the broken line to be drawn) | |
| | Alpha rotate | Qn<br>(n=0–3) | Sets the direction of the characters to be printed cut.<br>0<br>A<br>3 < > 1<br>∀<br>2 | |
| | Scale set | Sn<br>(n=0–15) | Sets the size of the characters to be printed out. | |
| Drawing | Draw | Dx1,y1,x2,y2 . .<br>(−999 ≦ x,y ≦ 999) | Draws a line from the current pen position to (x1,y1), then from (x1,y1) to (x2,y2) . . . | • Any spaces specified after the commands are ignored.<br>LPRINT "D135,−21" Draws a line from the current pen position to (135,−21) |
| | Relative draw | J△x1,△y1,<br>△x2,△y2,. . .<br>(−999 ≦ △x,△y ≦ 999) | Draws a line from the current pen position to △x1 in the horizontal direction and △y1 in the vertical direction, then from that point to △x2 in the horizontal direction and △y2 in the vertical direction, and so on. | • The pen can be moved up to +2047 and −2048 steps in the vertical directions by executing commands J and R.<br>If you try to move the pen more, the plotter printer is reset to the power on status. To move the pen more, reset the origin by command I, then send command J or R. |
| Pen Point Move | Move | Mx,y<br>(−999 ≦ x,y ≦ 999) | Moves the pen to (x,y) | |
| | Relative move | R△x,△y<br>(−999 ≦ △x, △y ≦ 999) | Moves the pen △x in the horizontal direction and △y in the vertical direction. | |
| Character Print | Print | Pchrs. | Prints out characters. | |

△x and △y in commands **J** and **R** indicate the position as follows on the sheet set on the printer.



## ALL CHARACTER PRINTING

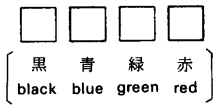


```
300 'All Character Font
310 LPRINT
320  LPRINT CHR$(27);"#"
330  LPRINT "S1":LPRINT"C1"
340  LPRINT "A"
350   FOR J=32 TO 255
360   LPRINT CHR$(1);CHR$(J);
370   NEXT J
380      FOR J=32 TO 255
390      LPRINT CHR$(J);
400      NEXT J
410  LPRINT
```

## 1-10. PRINTING EXAMPLES

グラフィックプリント例

1. 小四角形 **Squares**




```
100 'Initial Square
105 LPRINT
110 LPRINT CHR$(27);"#"
120  FOR I=0 TO 3
130  LPRINT "C";I
140    FOR J=1 TO 2
150    LPRINT "J 0,-30,30,0,0,30,-30,0"
160    NEXT J
170  LPRINT "R42,0"
180  NEXT I
190 LPRINT "R 0,-30":LPRINT"C0"
200 LPRINT "A"
```

2. 縦線 **Vertical Line**



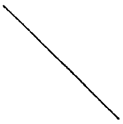
```
1000 'Vertical Line
1005 LPRINT
1010 LPRINT CHR$(27);"#"
1020 LPRINT "D0,-100"
1030 LPRINT"A"
```

3. 横線 **Horizontal Line**



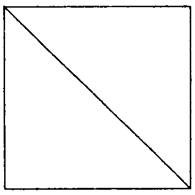
```
2000 'Horizontal Line
2005 LPRINT
2010 LPRINT CHR$(27);"#"
2020 LPRINT "D160,0"
2030 LPRINT "A"
```

4. 斜線 **Oblique Line**



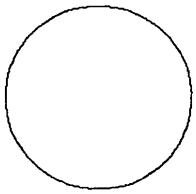
```
3000 'Oblique Line
3005 LPRINT
3010 LPRINT CHR$(27);"#"
3020 LPRINT "D100,-100"
3030 LPRINT "A"
```

5. 四角形と対角線 **Square and Diagonal**



```
4000 'Square & Oblique Line
4005 LPRINT
4010 LPRINT CHR$(27);"#"
4020 LPRINT "J 0,-160,160,0,0,160,-160,0
, 160,-160"
4030 LPRINT "A"
```

6. 円 **Circle**



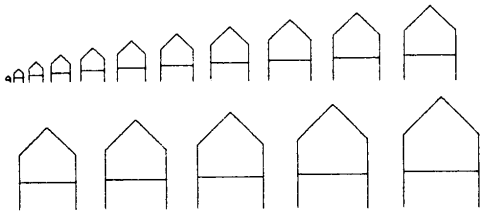
```
5000 'Circle
5005 LPRINT
5010 LPRINT CHR$(27);"#"
5020 LPRINT"R125,-125"
5030 LPRINT "I"
5040 LPRINT"M80,0"
5050 P=3.14159
5060 A=1:B=1
5070  FOR R=0 TO 360 STEP 5
5080   S=R/180*P
5090   SI=INT(SIN(A*S)*80)
5100   CO=INT(COS(B*S)*80)
5110   LPRINT "D";CO;",";SI
5120  NEXT
5130 LPRINT "R 0,-125"
5140 LPRINT "A"
```

7. 点線
**Doted Line**

..... Black
---------- Blue
— — — — — — Green
— — — — — Red

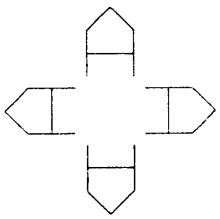
```
7000 'Doted Line
7005 LPRINT
7020 LPRINT CHR$(27);"#"
7030 LPRINT "C0,L1"
7040 LPRINT "J160,0":LPRINT "P Black"
7050 LPRINT "R-232,-20"
7060 LPRINT "C1,L5"
7070 LPRINT "J160,0":LPRINT "P Blue  "
7080 LPRINT "R-232,-20"
7090 LPRINT "C2,L9"
7100 LPRINT "J160,0":LPRINT "P Green "
7110 LPRINT "R-232,-20"
7120 LPRINT "C3,L13"
7130 LPRINT "J160,0":LPRINT "P Red   "
7140 LPRINT "R-232,-20"
7150 LPRINT "C0,L0"
7170 LPRINT "A"
```

8. スケールチェンジ印字
**Scale Change**



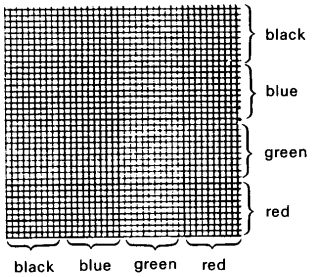
```
8000 'Scale Change
8005 LPRINT
8010 LPRINT CHR$(27);"#"
8020 FOR I=0 TO 10
8030 LPRINT"S";I:LPRINT"PA"
8040 NEXT I
8050 LPRINT "F"
8060 FOR I=11 TO 15
8070 LPRINT "S";I:LPRINT"PA"
8080 NEXT I
8085 LPRINT "S1"
8090 LPRINT "A"
```

9. 回転印字
**Character Rotation**



```
9000 'Alpha Rotate
9005 LPRINT
9010 LPRINT CHR$(27);"#"
9020 LPRINT "S9"
9030 LPRINT "M80,-100"
9040   FOR I=0 TO 3
9050    LPRINT "Q";I
9060    LPRINT "PA"
9070   NEXT I
9075 LPRINT "S1"
9080 LPRINT"A"
```

10. 格子
**Check Pattern**




```
700 'CHECK
710 LPRINT
720 LPRINT CHR$(27)+"#"
730 LPRINT "I":C=0
740 FOR I=1 TO 20
750 LPRINT "C";C
760 IF I MOD 5=0 THEN C=C+1
770 IF C>3 THEN C=0
780 LPRINT"J198,0"
790 LPRINT"R0,-5"
800 LPRINT"J-198,0"
810 LPRINT"R0,-5"
820 NEXT
830 LPRINT"R0,5"
840 FOR I=1 TO 20
850 LPRINT "C";C
860 IF I MOD 5=0 THEN C=C+1
870 IF C>3 THEN C=0
880 LPRINT"J0,198"
890 LPRINT"R5,0"
900 LPRINT"J0,-198"
910 LPRINT"R5,-0"
920 NEXT
930 LPRINT "A"
```

11. HBテストカートリッジ使用例 **Use Test Cartridge J-6200-410-A (J model only)**

HBテストカートリッジを使用すると，プリンターのチェックが可能です。

1. HBテストカートリッジをスロットに差し込む。
2. 電源入れる。
3. MSXのメッセージ表示後，メニュー画面が出力される。（バックは緑色，文字は黒色）
   - K KEY-BOARD
   - T TV-PATTERN
   - J JOY-STICK
   - S SOUND
   - P PRINTER
   - C CASSETTE
   - E EXIT I／O
4. Pをキーインする。
   下記のようにモニター画面と同じキャラクターが印字されれば正常です。

```
 !"#$%&'
()*+,-./
01234567
89:;<=>?
@ABCDEFG
HIJKLMNO
PQRSTUVW
XYZ[¥]
```

5. RETURNキーを押すと，メニュー画面（3.）に戻ります。

Refer to the service manual of HB-series for detail of test cartridge.

Printer check is able by using test cartridge.

1. Insert the test cartridge into the slot.
2. Turn the power to on.
3. Menu occurs on the display.

   - K KEY CHECK
   - J JOY-STICK CHECK
   - C CASSETTE CHECK
   - S SOUND A, B, C
   - P PRINTER CHECK
   - T TV-PATTERN CHECK
   - I I/O CHECK

4. Depress P key.
5. Depress L key. Normally, characters are printed as follow.

```
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[¥]^_
```

6. Depress RETURN Key to return menu.

**12. To draw a sine curve**

12. サインカーブ作画例

プロッタープリンターでサインカーブを描くMSX-BASICのプログラムです。

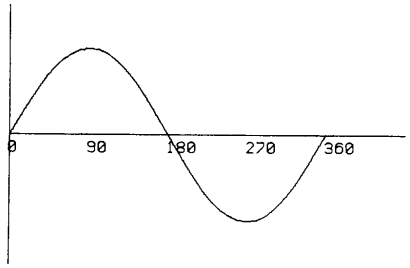
```
10 LPRINT:LPRINT CHR$(&H1B)+"#"  グラフィックモードに移行。
20 LPRINT "S1"                   文字の大きさを"1"に設定。
30 LPRINT "C2"                   ペンの色を"緑"に設定。
40 LPRINT "P*** SIN CURVE ***"   "***SIN CURVE***"を印字。
50 LPRINT "F"                    ペンを次行の先頭に移す。
60 LPRINT "C0"                   ペンの色を黒に変更。
70 LPRINT "R10,0"                ペンの位置を横に10移動。
80 LPRINT "J0,-300"              現在のペンの位置から縦に−300線をひく。
90 LPRINT "R0,150"               ペンの位置を縦に150移動。
100 LPRINT "I"                   そこを原点とする。
110 LPRINT "J450,0"              原点から横に450線を引く。
120 LPRINT "H"                   ペンの位置を原点に戻す。
130 LPRINT "C3"                  ペンの色を赤に変更。
140 FOR J=0 TO 360 STEP 90
150 LPRINT "M";J-15;",";-20      座標に目盛りをふる。
160 LPRINT "P";J
170 NEXT
180 LPRINT "H"                   ペンを原点に戻す。
190 LPRINT "C1"                  ペンの色を青に変更。
200 FOR X=0 TO 360 STEP 10
210 I=X*3.14/180
220 Y=SIN(I)*100                 サインカーブを描く。
230 LPRINT "D";X;",";Y
240 NEXT X
250 LPRINT "H"                   ペンを原点に戻す。
260 LPRINT "A"                   テキストモードに戻す。
270 END
```

A carriage return code is sent, then the plotter printer is set in the graphic mode.
The character size is set to "1".
The green pen is selected.
"*** SIN CURVE ***" is printed out.
The pen is moved to the beginning of the next line.
The black pen is selected.
The pen is moved 10 steps in the horizontal direction.
A line -300 steps from the pen position in the vertical direction is drawn.
The pen is moved 150 steps in the vertical direction.
The origin is reset there.
A line is drawn 450 steps from the origin in horizontal direction.
The pen is moved to the origin.
The red pen is selected.
The graduations are marked on the x axis.
The pen is moved to the origin.
The blue pen is selected.
A sine curve is drawn.
The pen is moved to the origin.
The plotter printer is set in the text mode.

**実行結果**

**Execution result**

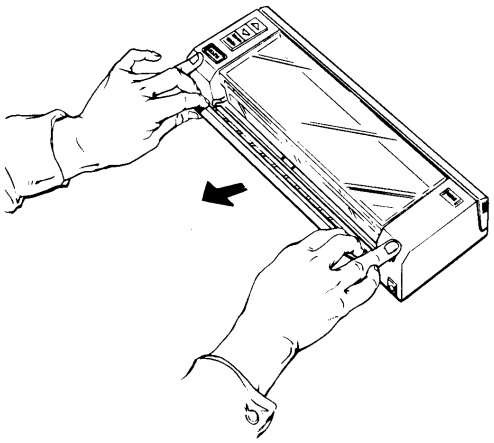
```
*** SIN CURVE ***
```



# 第2章
# サービスインフォメーション
# CHAPTER 2
# SERVICE INFORMATION

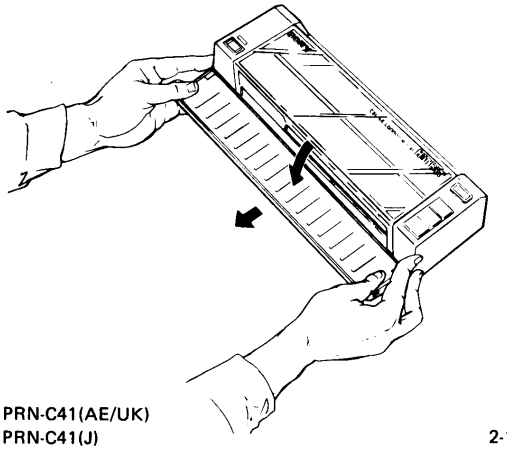
## 2-1. 取り外し方法
### 2-1-1. 前カバー
カバーの両端をつまみ，斜め上方向に左右等しい力で引く。

## 2-1. DISASSEMBLY
### 2-1-1. Front Cover
Pinch the both side of cover, and pull in the oblique-upward way.



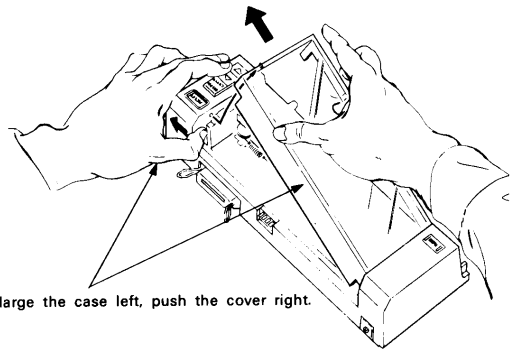
### 2-1-2. 後カバー
カバーを水平（本体と直角）に開く。
カバーの両端をつまみ，左右等しい力で水平に引く。

### 2-1-2. Rear Cover
Open the cover horizontally. Pinch the both side of cover, pull horizontally.



### 2-1-3. 上カバー
透明カバーは，図のように本体のケースを横に広げながら片側を外し，少し持ち上げて横に外す。

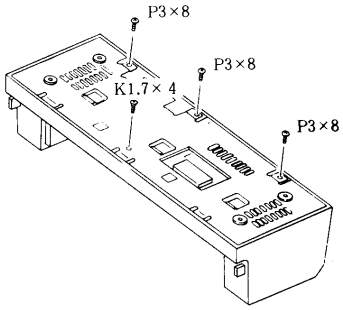
### 2-1-3. Upper Cover
Remove the transparent cover with enlarging the case.



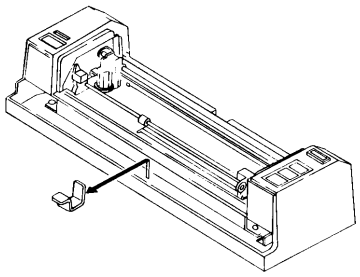
Enlarge the case left, push the cover right.

### 2-1-4. ケース
① ⇐ 印のねじ4本を外す。

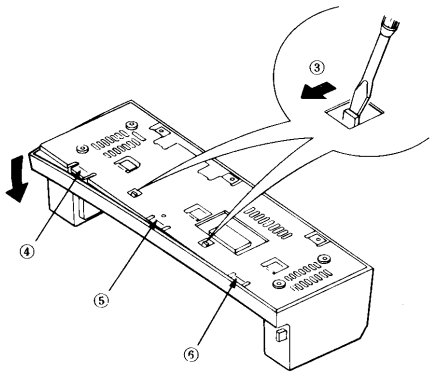
### 2-1-4. Case
Remove the four screws indicated ⇐.



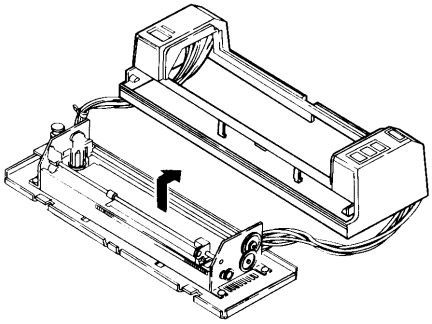
② サポーターを取り除く。
Remove the supporter.



③ あらかじめ㊀ドライバー等でつめを外した状態にしておく。
④—⑥の順にひっかかりを外す。
In advance remove the hook as a figure. 4-6 in turn remove the three hooks.

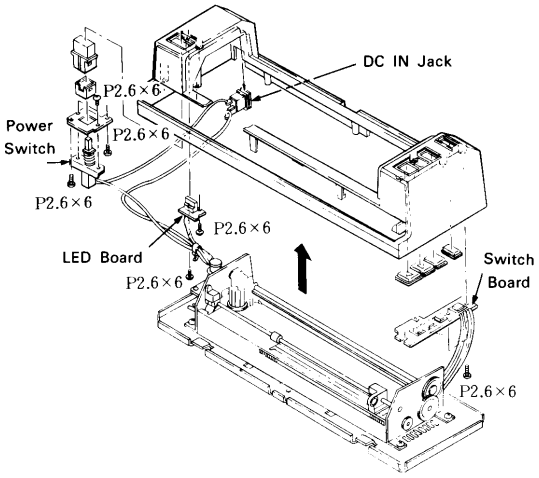



下記の状態のようにカバーがはずれる。
Remove the cover as following.

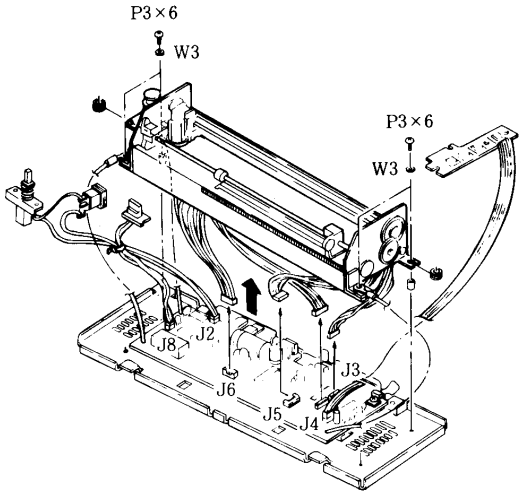


2-1-5. スイッチ基板，LED基板，電源スイッチ，DC INジャック

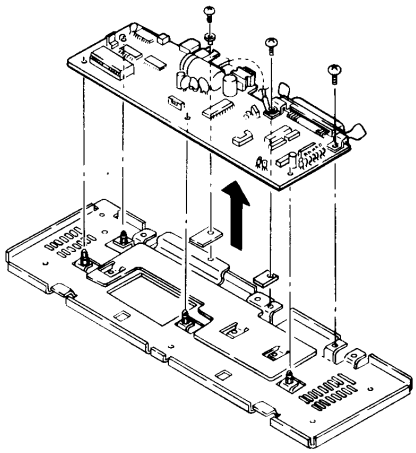
**2-1-5. Switch Board, LED Board, Power Switch, DC IN Jack**



## 2-1-6. 機構部
## 2-1-6. Mechanism Block




## 2-1-7. メイン基板
## 2-1-7. Main Board



## 2-2. REPAIR PARTS

1. Safety Related Components Warning.
   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose part numbers appear in this manual or in service bulletins and service manual supplements published by Sony.

2. Replacement Parts supplied from Sony Parts Center will sometimes have a different shape from the original parts. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
   This manual's exploded views and electrical spare parts list indicate the parts numbers of "the standardized genuine parts at present".
   Regarding engineering parts changes in our engineering department, refer to Sony service bulletins and service manual supplements.

3. Printed Components in Bold-Face type on the exploded views and electrical spare parts list are normally stocked for replacement purposes. The remaining parts are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

4. Abbreviations

| Ref. No. | Description |
|---|---|
| C□□, CV□□ | CAPACITOR |
| CN□□ | CONNECTOR |
| CP□□ | COMBINATION PARTS |
| D□□ | DIODE |
| DL□□ | DELAY LINE |
| F□□ | FUSE |
| FL□□ | FILTER |
| H□□ | HEAD |
| IC□□ | IC |
| L□□, LV□□ | INDUCTOR |
| M□□ | MOTOR |
| ME□□ | METER |
| PL□□ | LAMP |
| PM□□ | SOLENOID |
| Q□□ | TRANSISTOR |
| R□□, RV□□ | RESISTOR |
| RY□□ | RELAY |
| S□□ | SWITCH |
| SB□□ | SOLAR BATTERY |
| T□□ | TRANSFORMER |
| TH□□ | THERMISTOR |
| X□□ | CRYSTAL |

5. Units for Capacitors, Inductors and Resistors
   The following units are assumed in schematic diagrams, electrical parts list and exploded views unless otherwise specified:
   Capacitors: μF
   Inductors: μH
   Resistors: ohm

## 2-2. サービス部品

(1) 安全重要部品
回路図，分解図，電気部品リスト中で ⚠ 印及び ▒ で囲まれた部品は安全性を維持するために重要な部品です。従ってこれらの部品を交換するときには必ず指定の部品と交換してください。

(2) パーツセンタから供給される部品は，実際にセットに使用している部品と形状等が異ることが時々あります。これらは「部品の共通化」等によるものです。

(3) 分解図，電気部品リスト中，太い文字で示されている部品は常時在庫します。その他の部品は交換頻度が低い部品ですので在庫していないことがあり，納期が長くなることがあります。

(4) 次の Ref. No の部品では下記の品名を省略してあります。

| Ref. No. | 品　名 |
|---|---|
| C□□, CV□□ | コンデンサ |
| CN□□ | コネクタ |
| CP□□ | 結合部品 |
| D□□ | ダイオード |
| DL□□ | ディレーライン |
| F□□ | ヒューズ |
| FL□□ | フィルター |
| H□□ | ヘッド |
| IC□□ | IC |
| L□□, LV□□ | インダクタ |
| M□□ | モーター |
| ME□□ | メーター |
| PL□□ | ランプ |
| PM□□ | ソレノイド |
| Q□□ | トランジスタ |
| R□□, RV□□ | 抵抗 |
| RY□□ | リレー |
| S□□ | スイッチ |
| SB□□ | ソーラバッテリー |
| T□□ | トランスフォーマー |
| TH□□ | サーミスタ |
| X□□ | クリスタル |

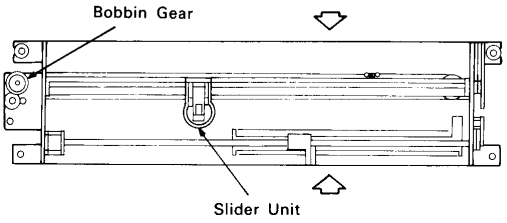
(5) 単位の省略について
コンデンサで単位のないものはμFです。
インダクタで単位のないものはμHです。
抵抗で単位のないものはΩです。

# CHAPTER 3
# MAINTENANCE AND REPAIRS

## 3-1. MAINTENANCE

### 3-1-1. Caution in Handling

1. How to hold the printer
   Handle the printer by gripping it with fingers in the directions shown in Fig. ① below.




2. Areas not to be touched
   ① Slider Unit (not to be touched except when taking pens out) When forced to shift it sideways, slowly turn the bobbin gear.
   ② Shaft should not be touched with bare hands.
   ③ Wires (since they may be dislodged off the roller unit)
3. Others

- Do not drop or otherwise apply mechanical impacts to pens.
- When ink still remains but no writing is possible, that is, when the area of contact between the ball and the capillary ink tube has dried up, and disabling writing (a dropout), try shaking the pen a few times with hand to apply a centrifugal force to the ink, and it will work sometimes.

### 3-1-2. Maintenance

1 Paper fragments, dust, and dirt should preferably be removed.
(Use a vacuum cleaner.)
2 To remove soilage, use either alcohol or benzine. Do not use paint thinner, trichlene, ketone, or a similar organic solvent, because it may damage the plastic area.
3 Areas devoid of, or short in, lubricant, should first be wiped clean of remnants of the old lubricant, and then be lubricated freshly. (Avoid applying grease to unspecified locations or using other than specified lubricants. Refer to the standard lubrication on page 3-18.)

## 3-2. REPAIRS

### 3-2-1. Standard of Repair

Standard A: This standard of repair does not require experience or expert skill but only requires a general knowledge of the theory and structure of the printer and some extent of ability.
Standard B: This standard of repair requires a high knowledge to some extent regarding the theory and structure of the printer and its disassembling, and having the high ability to use the accompanying measurement equipment and jig and tools, as also the experience of repairing.
Standard C: This standard requires a high degree of expert knowledge regarding the theory and structure of the printer, and a high degree of know-how in using the measurement equipment and jig and tools, as also a vast experience in repairing and expert skill.

### 3-2-2. Caution in rendering Repair Services

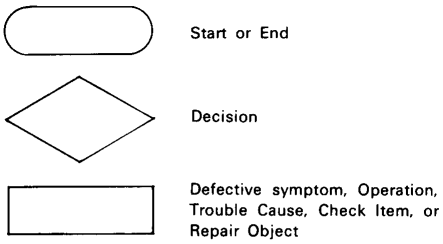
When a trouble has developed, carefully observe the symptoms and other relevant conditions, localize its cause(s) by following a troubleshooting procedure, and check and repair the trouble area(s).
Relative to mechanism troubleshooting:
1 "Symptom" : Pick out a specific symptom(s) from this column.
2 "Conditions" : Compare the trouble conditions with those shown in this column, and see if they coincide with each other.
3 "Cause" : Since this column presents various causes applicable to the trouble conditions, check to verify a cause(s) that is(are) relevant.
4 "Check Point and Procedure" : Since this column presents the approach for checks as to where and how, follow the instructions therein in running the necessary checks for trouble localization.
5 "Repair Procedure" : Follow the instructions in this column, and carry out the necessary repairs.
When even after due repairs, the original symptom(s) and conditions persist, check other items in the "Cause" column and make repairs in accordance therewith.

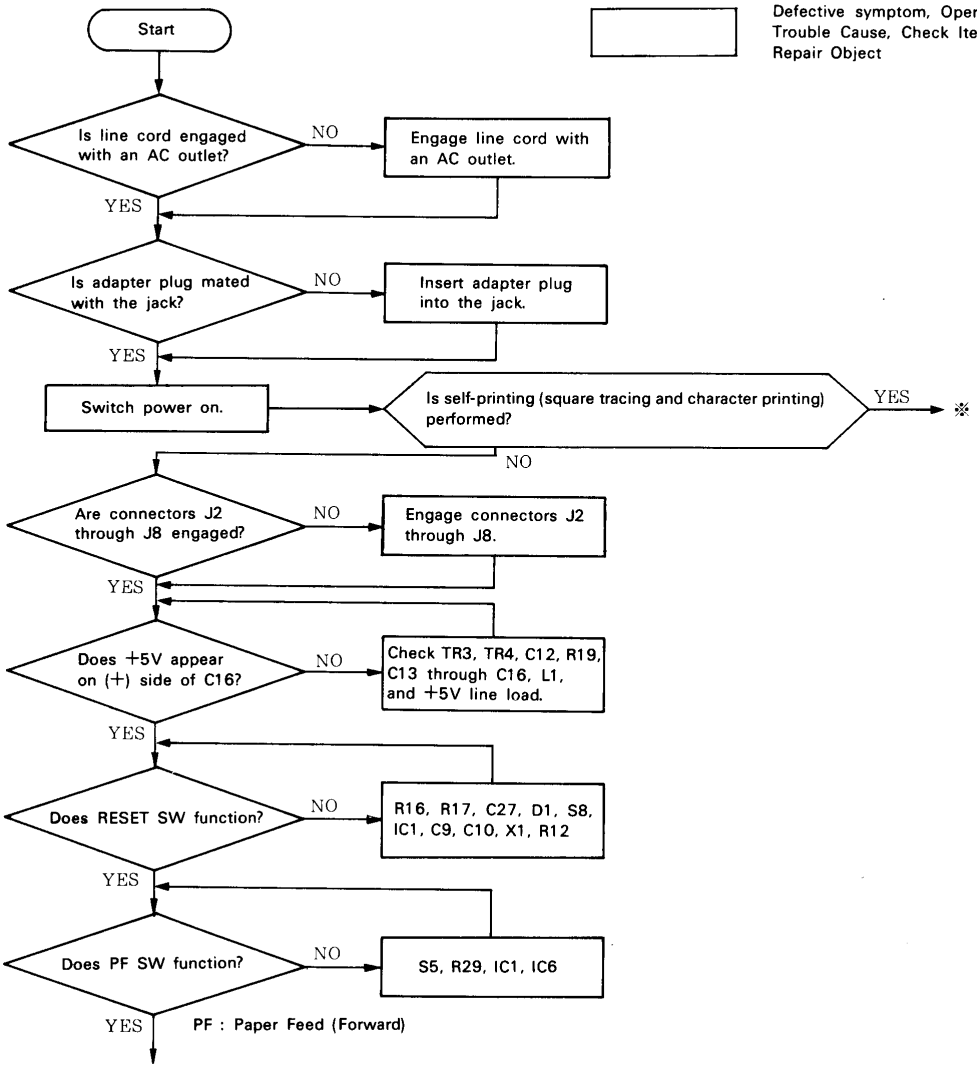
### 3-2-3. Electric Circuit Troubleshooting

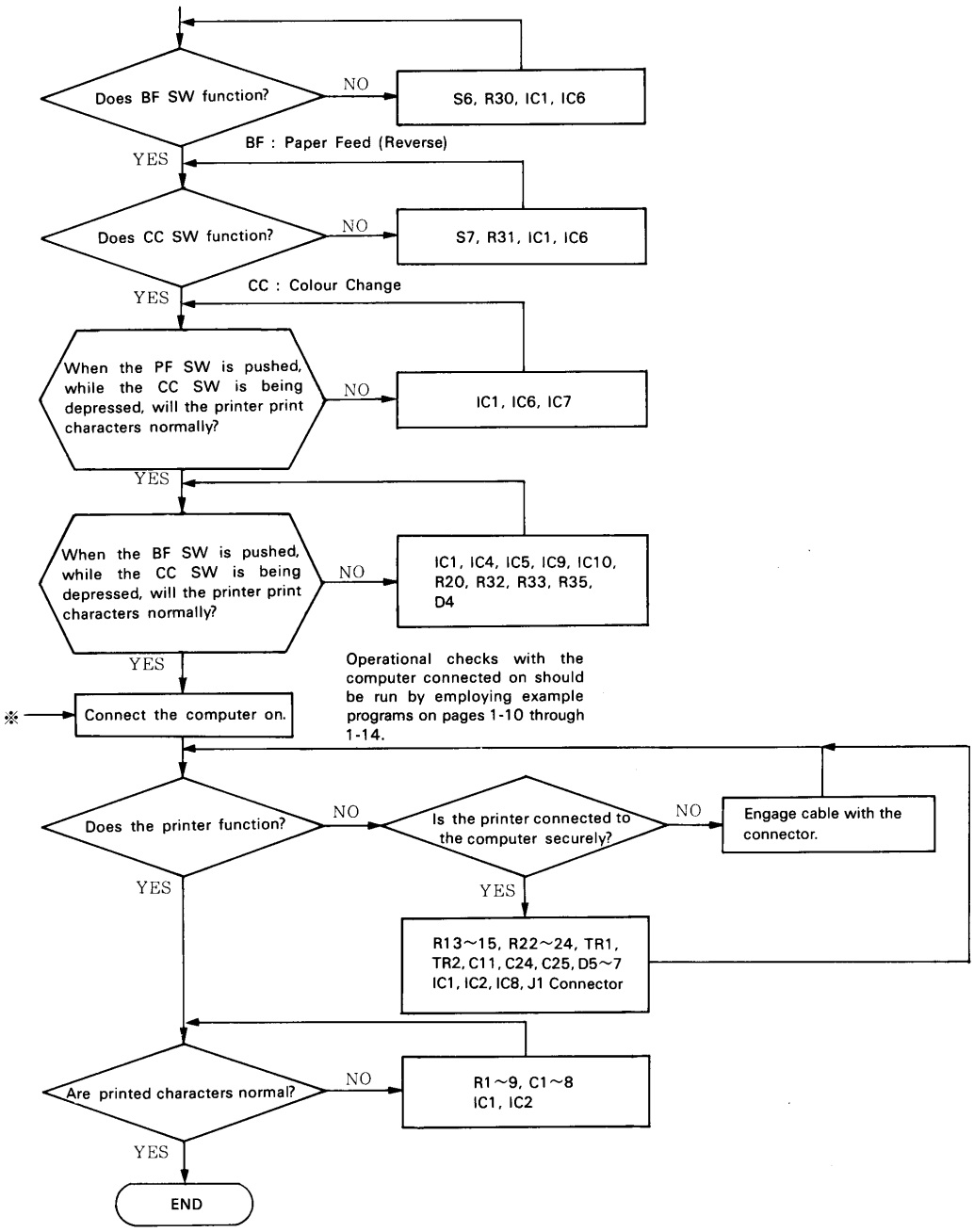
Note 1) When starting to run checks midway in the flowchart, take note of the possibility of earlier trouble items to have been responsible.

Note 2) When a "defective connector" has been found to be responsible, check for a broken connector pin, soilage or rust on pin surfaces, and a faulty connection with the cord. The cord itself should also be checked.

The meaning of symbols composing the flowchart follows:



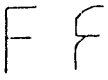




Does BF SW function?
NO
S6, R30, IC1, IC6
BF : Paper Feed (Reverse)
YES
Does CC SW function?
NO
S7, R31, IC1, IC6
CC : Colour Change
YES
When the PF SW is pushed, while the CC SW is being depressed, will the printer print characters normally?
NO
IC1, IC6, IC7
YES
When the BF SW is pushed, while the CC SW is being depressed, will the printer print characters normally?
NO
IC1, IC4, IC5, IC9, IC10, R20, R32, R33, R35, D4
YES
※
Connect the computer on.
Operational checks with the computer connected on should be run by employing example programs on pages 1-10 through 1-14.
Does the printer function?
NO
Is the printer connected to the computer securely?
NO
Engage cable with the connector.
YES
YES
R13~15, R22~24, TR1, TR2, C11, C24, C25, D5~7 IC1, IC2, IC8, J1 Connector
Are printed characters normal?
NO
R1~9, C1~8 IC1, IC2
YES
END

### 3-2-4. Mechanism Troubleshooting

| Symptom | Conditions | Cause | Level | Check Point and Procedure | Repair Procedure |
|---|---|---|---|---|---|
| 1. Will not draw lines. | Although X, Y, and P motor units function normally, will not print. | ① Either a disengaged pen or depleted ink | A | Check to see if the pen has been mounted on properly, and if a good pen with adequate ink supply has been mounted on. | Remount the pen properly. Replace the pen. |
| | | ② Hammer dislodged | A | Check to see if the hammer has been set properly. | Reset the hammer properly. |
| 2. Will not draw horizontal lines. | (1) X motor fails to turn. | ① A broken X motor lead wire | B | Check to see if a normal current is flowing through individual phases of the motor. | Replace the X motor. |
| | | ② Deformed X idling gear | B | Check to see if the X idling gear is normal. | Replace the X idling gear. |
| | | ③ Deformed bobbin gear unit. Misaligned dual teeth. | B | Detach wire unit (A), manually turn the bobbin gear, and check its turning status. | Either replace the bobbin gear, or realign the dual teeth. |
| | | ④ Foreign matter has adulterated the inter-gear space. | B | Manually turn the bobbin gear unit, and localize the adulterated foreign matter. | Remove the foreign matter. |
| | | ⑤ Slider unit fails to slide smoothly over shaft. | B | Disengage wires, and try sliding the slider unit to the right and left with the hand. Slowly turn the bobbin gear by hand to see if the slider unit slides smoothly, and localize an unusual load, if any. | When foreign matter has stucked, remove it. When the slider has been deformed, replace it. |
| | (2) Although X motor rotates, the slider unit will not slide to the right and left. | ① A disengaged wire | A | Check if a wire has been dislodged off the roller base unit. | Restring the wire properly. |
| | | ② A broken wire | B | Check to see if any of the wires have been broken. | Replace the wire unit. |
| | | ③ A chipped gear | A | Check to see if the X idling gear and bobbin gear are normal. | Replace the chipped gear with a normal one. |
| 3. Horizontal shifts are short. | (1) Trouble only in a pen-down mode | ① A level difference exists on the printing paper. | A | Check the printing paper surface conditions. | Use good printing paper. |
| | | ② Deformed push-out plate | B | Check the contact status between the push-out plate and the hammer roller. | Replace the push-out plate unit. |
| | | ③ Specks or foreign matter stuck on the frame | C | Confirm the specks or stuck foreign matter on the frame. | Replace the frame. |
| | (2) Faulty behavior irrespective of a pen- up or-down mode | ① Foreign matter adulteration in the slider unit sliding area | A | Slowly turn the bobbin gear by hand to see if the slider unit slides smoothly in an effective printing area, and check for the presence of abnormalty or unusual load. | Remove the foreign matter. |
| | | ② Dislocation of the wire fastening position on the bobbin | B | Manually turn the bobbin gear unit, and check to see if the slider unit slides smoothly from the left end to the right. | If the wire fastening position is abnormal, restring the wire. |
| | | ③ Poor revolution of the roller base unit pulley | B | Disengage wires from the roller, and see if the pulley revolves smoothly. | Replace the roller base unit. |
| | | ④ The sleeve is in contact with the side plate (left) shaft unit. | B | Check for the presence of deformation or equivalent in the side plate (left) shaft unit and the sleeve. | Replace the sleeve. |
| | | ⑤ Defective X motor unit | B | After detaching the X idling gear, slowly turn the motor gear, and check for the presence of dust or other unusual loads. | Replace the motor. |

| Symptom | Conditions | Cause | Level | Check Point and Procedure | Repair Procedure |
|---|---|---|---|---|---|
| | | ⑥ The slider unit support plate is pressed against printing paper under strong pressure. | | Shift the slider unit and see if the motion scratches the printing paper. | Replace the slider unit. |
| 4. Will plot in single strokes. | (1) The push-out plate pin remains engaged in the cam gear switching area, disabling the cam gear to turn. | ① A broken P motor unit lead wire | B | Check to see if a normal current is flowing through individual phases of the motor. | Replace the P motor. |
| | | ② A deformed cam gear | B | Check to see if the cam gear is normal. | Replace the cam gear. |
| | | ③ Poor movement of the push-out plate | C | Check the push-out plate for warping and, see if it slides smoothly against the slider shaft. | Replace the push-out plate. |
| | | ④ A dislodged push-out spring | A | Check to see if push-out springs have been properly engaged with the side plate. | Remount the spring properly. |
| | (2) The cam gear turns normally. | ① Pin movements are slow. | B | Check the form of pens.<br>Check the holders and for the adulteration of foreign matter. | Replace the pen.<br>Replace the holder.<br>Remove the foreign matter. |
| | | ② A deformed pen tip guide | B | Check conditions of the pen tip guide. | Replace the slider unit. |
| | | ③ A too long pen tip | A | Check to see if the pen length is normal. | Mount a good pen (with 23.3 $^{+0}_{-0.1}$mm length) on. |
| 5. Colours fail to be changed. | (1) The holders will not turn at all. | ① A broken P motor unit lead wire | B | Check to see if a normal current is flowing through individual phases of the motor. | Replace the P motor. |
| | | ② Pen-up modes fail to be engaged. | C | Check the cam gear push-out plate. | Replace the cam gear and the push-out plate. |
| | | ③ Deformation of, or foreign matter adulteration in, the holder gear block | B | Rotate the cam gear, and check to see if it turns normally. | Replace the slider unit.<br>Remove the foreign matter. |
| | | ④ The slider unit paper holder area is too close to the frame. | B | Check to see if the gap with the frame is 0.4mm or less. | Lift the paper holder segment. |
| 6. Will not select normal colours. | (1) Symptom persists even after power has been switched on repeatedly. | ① Unusual pen mounting locations. | A | Check to see if pens have been mounted on in accordance with the colours on holders. | Remount pens in normal locations. |
| | | ② The slider unit fails to slide to the side plate (left). | B | Turn the bobbin gear unit, and see if the slider unit slides normally. | Replace the slider unit. |
| 7. Fails to feed paper. | (1) The Y motor unit fails to rotate. | ① A broken Y motor lead wire | B | Check to see if a normal current is flowing through individual phases of the motor. | Replace the Y motor. |
| | | ② A deformed Y idling gear | B | Check to see if the Y idling gear is normal. | Replace the Y idling gear. |
| | | ③ Faulty revolution of the rubber roller unit | B | Disengage the Y idling gear, and check the rubber roller revolution. | Replace the rubber roller unit. |
| | | ④ Foreign matter has adulterated the inter-gear space. | A | Slowly turn the Y idling gear by hand, and localize the foreign matter adulteration. | Remove the foreign matter. |
| | | ⑤ The paper holder roller movements are not smooth. | B | Try moving the paper holder shaft up and down. | Replace the roller holder (A). |

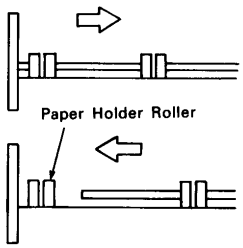
| Symptom | Conditions | Cause | Level | Check Point and Procedure | Repair Procedure |
|---|---|---|---|---|---|
| 8. Y axial shifts are little. | (1) The alignment within a line is poor, and the right end raised higher. | ① The printing paper load is heavy. | A | Check to see if roll paper has been guided smoothly to the printer. | Reposition the roller holder unit properly. |
| | (2) Y axial step errors are generated. | ① A chipped gear in the Y axial drive mechanism | A | Check the Y idling gear, the rubber roller unit gear, and the Y motor unit gear. | Replace the chipped gear. |
| | | ② Insufficient one-tooth slide in the rubber roller unit paper feed gear engagement | A | Check to see if the rubber roller unit dual tooth gears have been engaged, and slid by one tooth. | Set the gears properly and remount them. |
| | | ③ Worn rubber roller unit bearings | B | Move the rubber roller unit gears up and down with the hand, and check for undue backlash. | If wear is found, replace the rubber roller unit.<br>If backlash has developed between bearings and the frame, fasten them together with a cyanoacrylate type bonding agent.<br>Replace the printer. |
| | (3) When Y axially reciprocating movements have been performed for many times, the point of origin will be dislocated. In addition, after printing a large number of characters, the point of origin will be dislocated. | ① A slip between the rubber roller and paper | A | Check to see if the rubber roller has been soiled, or for a deformed needle wheel in the rubber roller unit. | Wipe the soilage off the rubber roller.<br>Replace the rubber roller unit. |
| | | ② Defective guiding of roll paper | A | Check to see if the roll paper rotary shaft center coincides with the printer center. | Repair the roll paper guides. |
| | | ③ The used paper type is not suitable to the printer. | A | Check to see if specified paper is being used. | Use the specified type of paper. |
| | | ④ The rubber roller unit needle wheel and the groove in the paper holder roller are not engaged together. | A | Check the needle wheel location. | Adjust the rubber roller unit wheel location. |
| 9. Excessively disarrayed characters | (1) Character "F" is output as illustrated below. | ① Faulty one-tooth slide engagement of the bobbin gear unit (2-3) | A | Check the gear engagement. | Remount the gears properly. |
| | | ② A backlash is present between the pen tip guide and pen tips. | | Check by manually rotating in pin-down mode the bobbin gear forward and backward by fractional turns. | Replace the slider unit. |
| | | ③ Wire spring fatigue in wire unit (2-4) | B | Check the wire spring slack. | Replace the wire unit.<br>Restring wires. |
| | (2) Character "F" is output as illustrated below.  (Normal) (Faulty) | ① Backlash exists in the slider as a whole. | B | Check the slider X drive system. | Replace the slider |

| Symptom | Conditions | Cause | Level | Check Point and Procedure | Repair Procedure |
|---|---|---|---|---|---|
| | (3) Character "P" is output as illustrated below.<br> <br>(Normal) (Faulty) | ① Faulty one-tooth slide engagement of the rubber roller unit (3-3) paper feed gears | A | Check engagement of gears. | Remount the gears properly. |
| | | ② Excessive backlash in the rubber roller bearings | B | Check the backlash by moving gears up and down. | Replace the rubber roller unit. |
| 10. Printing dropouts, or colour changes during printing | (1)<br> <br>Either character B fails to be printed, or is printed in a wrong colour. | ① An excessive gap between the stopper and the push-out lever | B | In a pen-up mode, the gap between stopper and push-out lever should be 0.6 to 0.7 mm. | Readjust the stopper location. (Refer to Assembly 7.) |
| 11. Excessively broken characters | (1)<br> <br>Characters are broken excessively, as illustrated above. (Breakages 0.3mm wide or narrower will be normal.) | ① Too large pen strokes | B | Check pen strokes. (Strokes 1.3 or greater will be NG.) | Adjust strokes. (Refer to Assembly 7.) |
| 12. Intermixed colours | (1) For example, black ink gets mixed into a red printing. Same applies to other colors as well. | ① Too long pens | A | Measure the pen length ($23.3\ ^{0}_{-0.1}$ mm). | Replace pens. |
| | | ② Deformed shaft support plate | B | The shaft support plate has been deformed upward. | Replace the slider unit. |
| 13. Soiled Printing | <br>(1) Dots are printed within or between characters. | ① Pen strokes are too small. | B | Check pen strokes. | Adjust strokes. (Refer to Assembly 7.) |

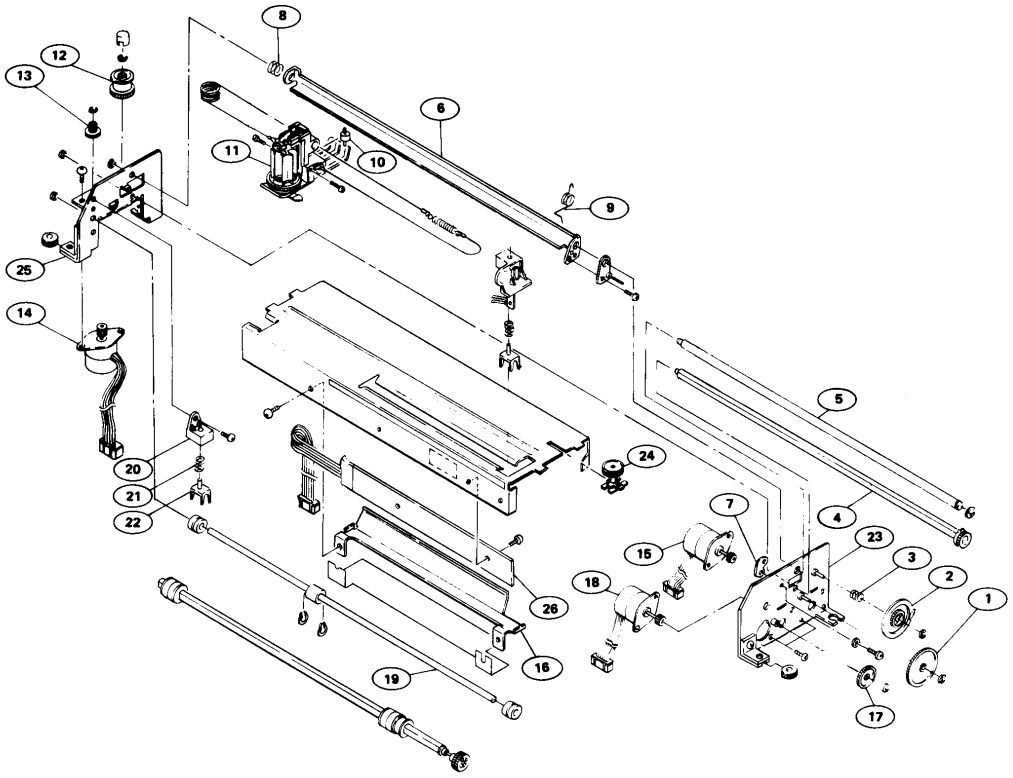
| Symptom | Conditions | Cause | Level | Check Point and Procedure | Repair Procedure |
|---|---|---|---|---|---|
| 14. Scratchy printing | (1) Printings as a whole are too light in density. | ① Ink in pens is in short supply. | | Handwrite with the pen in question. | Replace the pen. |
| | | ② Excessively large pen strokes | B | Check pen strokes. (Strokes 1.3 or greater will be NG.) | Adjust strokes. (Refer to Assembly 7.) |
| 15. Defective paper width sensors | (1) Will print beyond the specified paper width range. | ① Faulty contacts in paper width sensors | B | Check the electroconductivity of paper width sensors.<br>Check against deformations in contactor pieces. | Replace either contactor pieces or the circuit board. |

## 3-3. DISASSEMBLY

Detach individual component parts in the order presented beLow.

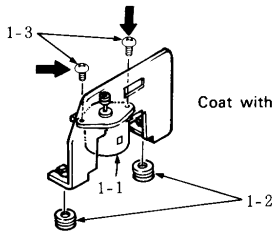
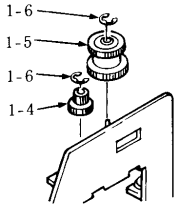
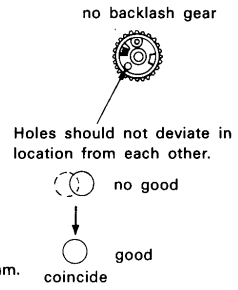
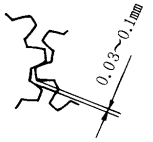
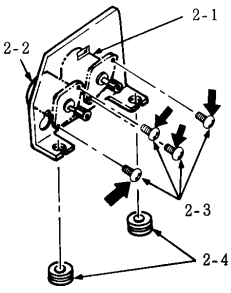
| Disassembling Sequence | Disassembled Part Name | Disassembly Guidelines |
|---|---|---|
| 1. | P Idling Gear | Remove E Stopper ring (E1.5) with a screw driver or equivalent. |
| 2. | Cam Gear | Remove E Stopper ring (E1.5) |
| 3. | Cam Spring | |
| 4. | Color change Shaft Unit | |
| 5. | Slider Shaft | Remove an E Stopper ring (E2) on the X motor side. |
| 6. | Push-Out Plate | Detach the shaft mounting plate unit also, at the same time. |
| 7. | Stopper | Remove a small Philips pan-head screw (P2.3x3). |
| 8. | Damper Spring | |
| 9. | Push-Out Spring | |
| 10. | Hammer Roller | |
| 11. | Slider (11) Unit | |
| 12. | Bobbin Gear Unit | Remove E Stopper ring (E1.5) |
| 13. | X Idling Gear | Remove E Stopper ring (E1.5) |
| 14. | X Motor Unit | Remove two small Philips pan-head screws (P2.3x3). |
| 15. | P Motor Unit | Remove two small Philips pan-head screws (P2.3x3). |
| 16. | Roller Cover | Remove two small Philips flat-head screws (P2.3x4). |
| 17. | Y Idling Gear | Remove E Stopper ring (E1.5). |
| 18. | Y Motor Unit | Remove two small Philips pan-head screws (P2.3x3, black chromate finished). |
| 19. | Paper Holder Shaft | Remove E Stopper ring (E2.0).<br>Shift the shaft to the side plate (right) side. and after it has been disengaged with the paper holder roller, shift it back over to the side plate (left) side. Now the paper holder shaft will be ready for detachment.<br>  <br> |
| 20. | Roller Holder (A) | Remove a small Philips pan-head screw (P2.3x3, black chromate finished) |
| 21. | Roller Holder Spring | |
| 22. | Roller Holder | |
| 23. | Side Plate (Right) Unit | Remove two small Philips pan-head screws (P2.3x3). |
| 24. | Roller Base Unit | |
| 25. | Side Plate (Left) Unit | Remove two small Philips pan-head screws (P2.3x3) |
| 26. | Sensor Unit | |

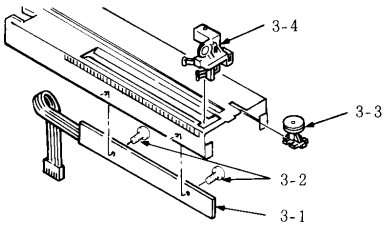
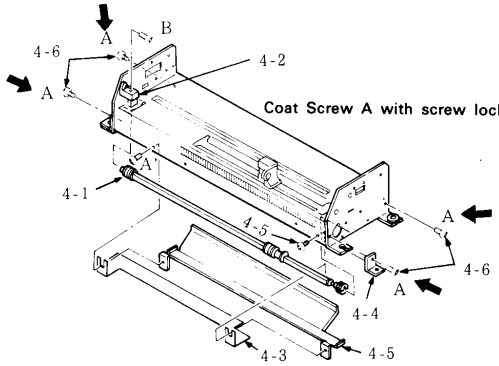
① through ㉖ show the disassembly procedure.



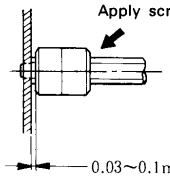
## 3-4. ASSEMBLY

(SERVICE TOOL: Thickness Gauge 9-911-053-00)

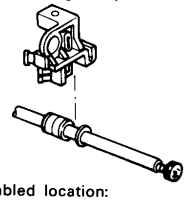
| Assembly Sequence | Part Name | Assembly Guidelines |
|---|---|---|
| **1.**<br>1-1<br>1-2<br>1-3 | **Side Plate (Left) Shaft Unit**<br>X Motor Unit<br>Rubber Bushing<br>Small Philips Pan-Head Screw (P2.3x3) | • Assembly of X Motor Unit and Rubber Bushings<br>  <br><br>Coat with screw locktite ( ⬅ ). |
| 1-4<br>1-5<br>1-6 | X Idling Gear<br>Bobbin Gear Unit<br>E Stopper Ring (E1.5) | • Assembly of X Idling Gear and Bobbin Gear Unit<br>• Bobbin Gear Unit will be engaged with X Idling Gear, with its dual teeth slid by one tooth.<br>  <br><br>  <br><br>• Inter-Gear Pitch<br>Inter-gear backlash shall be 0.03 to 0.1 mm.<br>  <br> |
| **2.**<br>2-1<br>2-2<br>2-3<br>2-4 | **Side Plate (Right) Shaft Unit**<br>P Motor Unit<br>Y Motor Unit<br>Small Philips Pan-Head Screw (P2.3x3)<br>Rubber Bushing | • Assembly of P Motor Unit, Y Motor Unit, and Rubber Bushings<br>  <br><br>Coat with screw locktite (⬅). |

| Assembly Sequence | Part Name | Assembly Guidelines |
|---|---|---|
| **3.**<br>3-1<br>3-2<br><br>3-3<br>3-4 | **Frame**<br>Sensor Unit<br>Small Philips Pan-Head Screw (P2.3x3)<br>Roller Base Unit<br>Roller Holder (B) Unit |  |
| **4.**<br><br><br><br><br>4-1<br>4-2<br>4-3<br>4-4<br>4-5<br><br>4-6 | **Frame Unit**<br>(assembled by Assembly Sequence 3)<br>Side Plate (Left) Unit<br>(assembled by Assembly Sequence 1)<br>Side Plate (Right) Unit<br>(assembled by Assembly Sequence 2)<br>Rubber Roller Unit<br>Roller Holder (A)<br>Frame Seat<br>Angle<br>Small Philips Pan-Head Screw (P2.3x3)<br>Small Philips Pan-Head Screw (P2.3x5) | • Assembly of Side Plate (Left), (Right), and Roller Cover<br>  |

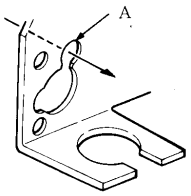
• Side Plate (Left) Unit and Wheel (Left) Unit assembled locations:
When the rubber roller shaft has been shifted to the side plate (left), a 0.03 to 0.1 mm gap shall remain between the wheel and the side plate.



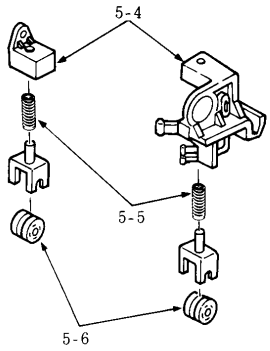

• Wheel (Right) and Roller Holder (B) Unit assembled locations:
Assembly shall be so made as to allow the roller holder (B) unit to be inserted into the receiving receptacle of the wheel (right) unit.



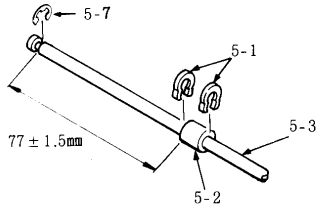
• Rubber Roller Bearing assembled location:
The bearing shall be assembled in area A of the hole.



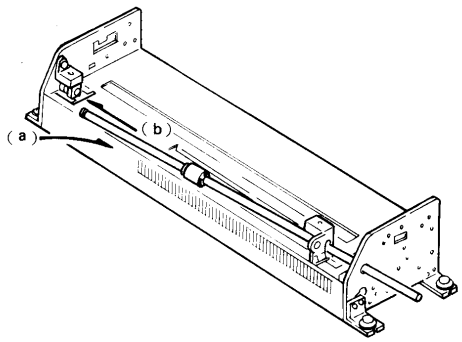
| Assembly Sequence | Part Name | Assembly Guidelines |
|---|---|---|
| **5.**<br>5-1<br>5-2<br>5-3<br>5-4<br>5-5<br>5-6<br>5-7 | **Paper Holder**<br>Grip Ring (G3)<br>Small Roller<br>Paper Holder Shaft<br>Roller Holder<br>Roller Holder Spring<br>Paper Holder Roller<br>E Stopper Ring (E2) | • Roller Holders and Roller Holder Springs Assembling Procedure |



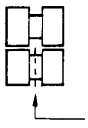

• Grip Ring Assembled Location



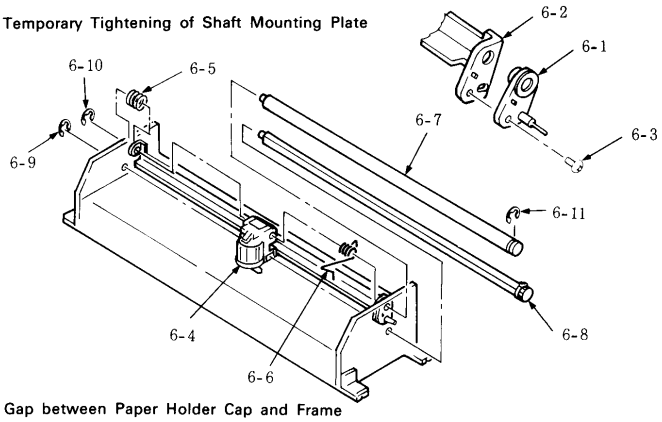
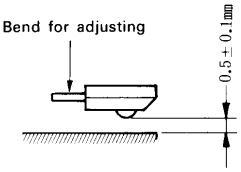
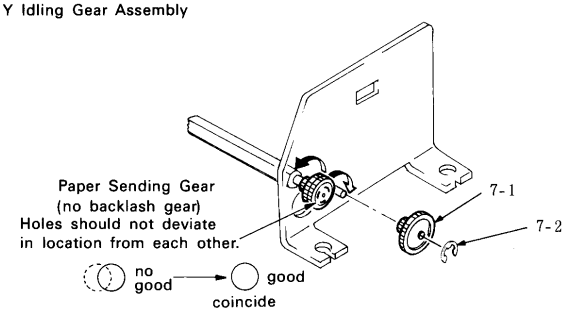
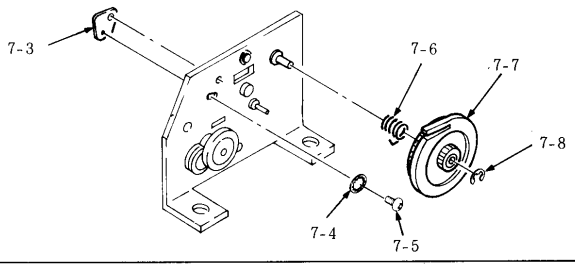

• Paper Holder Inserting Procedure
Pass the paper holder shaft from direction (a) into the roller holder (B) unit, and then back in direction (b) into the roller holder (A) unit.



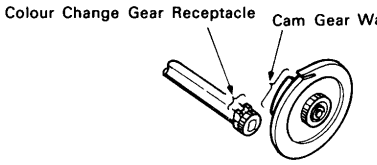

• Checking



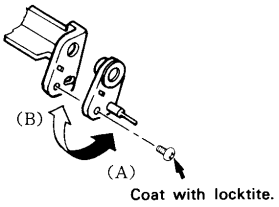
Pins of roller must be in place center.

| Assembly Sequence | Part Name | Assembly Guidelines |
|---|---|---|
| **6.** | **Slider** | • Temporary Tightening of Shaft Mounting Plate   • Gap between Paper Holder Cap and Frame   |
| 6-1 | Shaft Mounting Plate Unit | |
| 6-2 | Push-Out Plate | |
| 6-3 | Small Philips Pan-Head Screw (P1.7x2) intended for High Precision Equipment | |
| 6-4 | Slider Unit | |
| 6-5 | Damper Spring | |
| 6-6 | Push-Out Spring | |
| 6-7 | Slider Shaft | |
| 6-8 | Colour Change Shaft | |
| 6-9 | E Stopper Ring (E1.5) | |
| 6-10 | E Stopper Ring (E2) | |
| 6-11 | E Stopper Ring (E3) | |
| **7.** | **Side Plate (Right) Gear** | • Y Idling Gear Assembly   When assembling the Y idling gear, the dual paper feed gear teeth should be slid by one tooth. |
| 7-1 | Y Idling Gear | |
| 7-2 | E Stopper Ring (E1.5) | |
| 7-3 | Stopper |   |
| 7-4 | Toothed Washer (LW2) | |
| 7-5 | Small Philips Pan-Head Screw (P2.3x3) | |
| 7-6 | Cam Spring | |
| 7-7 | Cam Gear | |
| 7-8 | E Stopper Ring (E1.5) | |

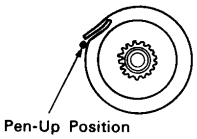
- Cam Gear Assembly
  Assemble the cam gear to have the colour change gear receptacle and the cam gear wall directly face each other.

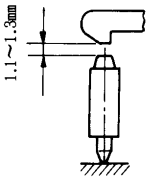



- Pen Stroke Adjustment
  When referenced to the push-out plate, the shaft mounting plate is turned in direction (A), and the pen stroke will be made larger, and when it is turned in direction (B), the stroke will be made smaller.
  Use screw locktite after adjustment.

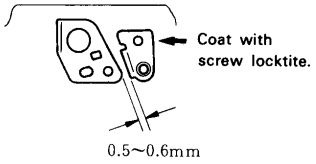



Pen stroke is the gap between the hammer and pen when the pen has been pushed down on the frame by the push-out shaft located at the pen-up position on the cam gear.

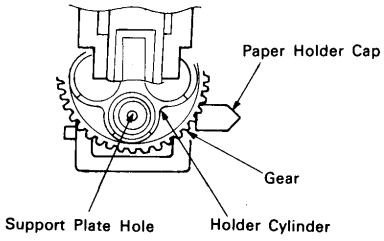


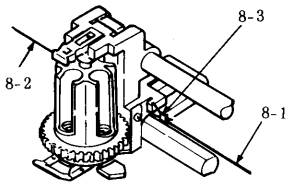

- Stopper Locational Adjustment




- Holder Positional Alignment
  When the push-out shaft has been set at the pen-down position, the holder cylinder and the support plate hole center shall coincide with each other.
  Support plate hole must be coincide by depressing paper holder cap slightly and rotating holder cylinder gear.

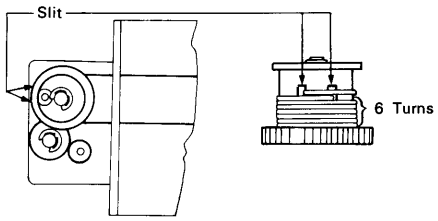


| Assembly Sequence | Part Name | Assembly Guidelines |
|---|---|---|
| **8.** | **Wires** | • Wire Hooking<br>As illustrated below, pass wire unit (A) over a hook on the right side of the rider unit. Pass wire unit (B) similarly on a hook on the left side. |
| 8-1 | Wire Unit (A) | |
| 8-2 | Wire Unit (B) | |
| 8-3 | Sleeve | |
| 8-4 | Bobbin Case. | |

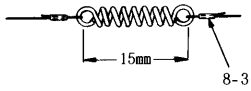


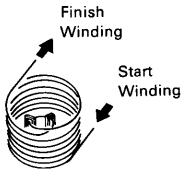

• How to wind Wires

1. Orient the bobbin unit slit outward, and slide the slider unit to the left end.
2. Wind a wire for 6 turns around the bobbin unit starting at the bottom, and pass it through slits as illustrated. (Wind the wire for a total of 6.5 turns.)

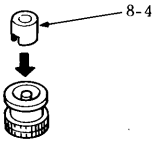



3. Pull the wire until the spring elongates to a 15mm length, and then crimp the sleeve to fasten it in position.

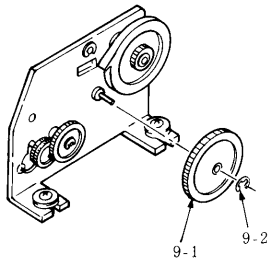



4. Force the bobbin case in under pressure.

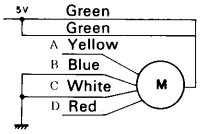



| Assembly Sequence | Part Name | Assembly Guidelines |
|---|---|---|
| **9.** | **P Idling Gear** | • Pen-up Position<br>1. Pass current to P motor as shown in Fig. A.<br>2. Set the pin of pen extruding shaft and the cam gear in the positional relations as shown in Fig. B.<br>3. Secure P idling gear. |
| 9-1 | P Idling Gear | |
| 9-2 | E Stopper Ring (E1.5) | |




Pen-Up (phases B and C energized)

Fig. A



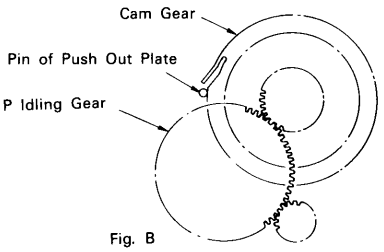



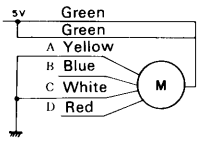

Fig. B

• Confirmation of Pen-down Position

1. Pass current to P motor as shown in Fig. C.
2. Turn the P idling gear in the direction of arrow manually, and turn until the pin hits the groove of the cam gear.
3. The gear returns a little, and should be positioned in the parallel part as shown in Fig. D. When there is no leeway in returning the gear, shift the gear of the P idling gear and secure again, and carry out confirmation of the positions of pen-up and pen-down.

Pen-Down (phases A and C energized)

Fig. C



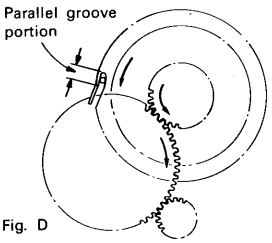
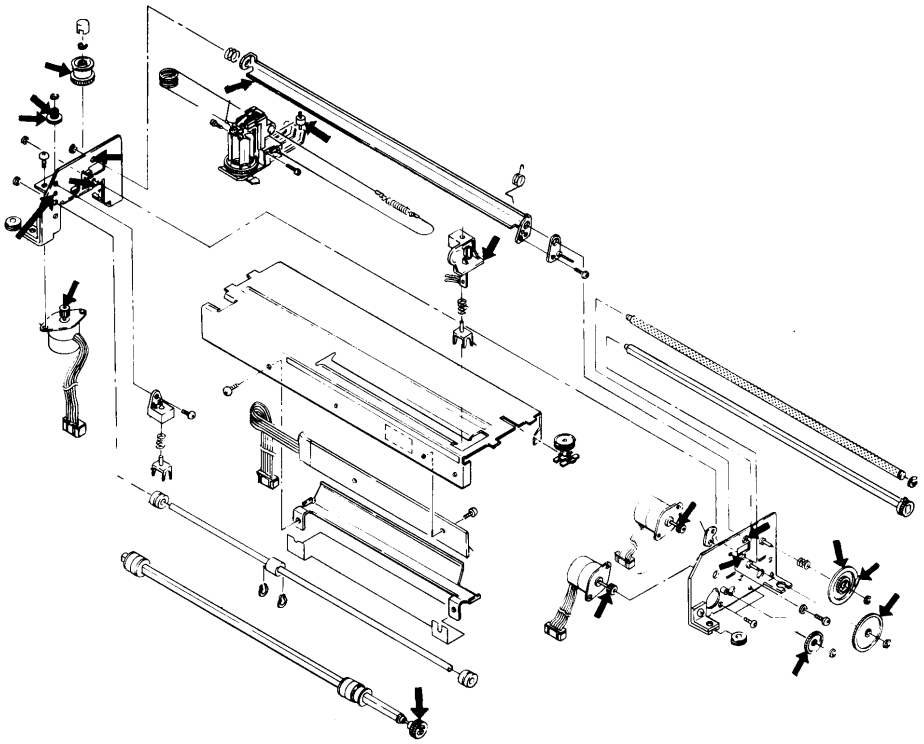




Fig. D

## 3-5. LUBRICATION

- Lubricate specified areas after thoroughly cleaning dust and soilage off.
- To lubricate flat areas, apply lubricant by wiping them with a piece of lubricant soaked gauze or equivalent.
- Wipe off excess lubricant after due lubrication.

Standard Lubrication
{Use 7-661-018-01 Diamond Oil for ➡ marked areas.
\Use 7-661-007-02 Motor Oil No.40 for ▒ marked areas.

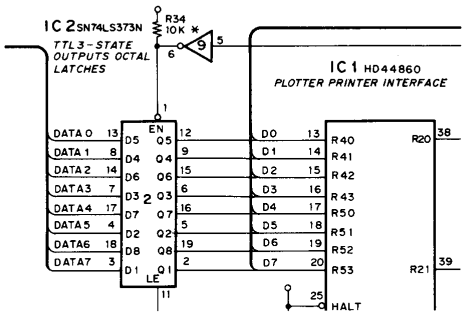


# CHAPTER 4
# THEORY OF OPERATION

## 4-1. CIRCUIT

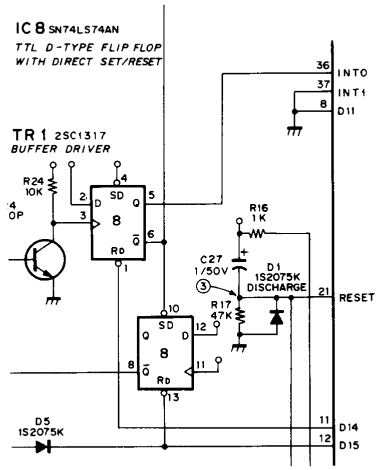
### 4-1-1. Data Latch (IC2)

When an 8 bit-data is input to the terminals D1 through D8 and the ENABLE signal to the ENABLE terminal (EN) from the Q terminal of IC8, the data is latched and output from the terminals Q1 through Q8.




### 4-1-2. Flip-Flop (IC8)

When the $\overline{STB}$ signal is input to the $\overline{STB}$ terminal, the BUSY signal from the $\overline{Q}$ terminal is output to the BUSY terminal and the ENABLE signal is output from the Q terminal.




### 4-1-3. Reset

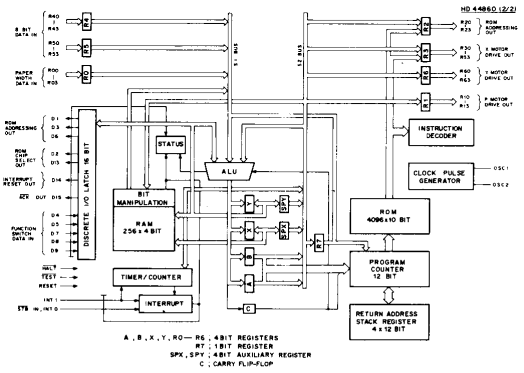
The power-on reset or external reset provides the following processes:

- The I/O terminals are once set to "1".
- After resetting, only the terminals STR (Strobe Latch F/F Reset) and BSR (Busy Latch F/F Reset) are set to 0.

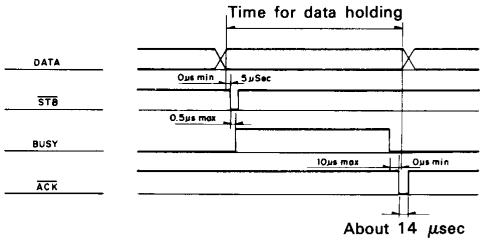
Note: F/F is kept reset when the reset terminal is set to 1. Thus, the externally input data does not produce the Busy State and the data is disregarded. When reset is activated in the program, some time is needed for performing an operation. However, when reset is produced manually or by power-on, this problem does not occur.

### 4-1-4. MPU (IC1, 4-bit 1 chip microprocesser)

When a signal is input into the INT0 terminal, data at R40-R43 and R50-R53 is read. According to the contents of the data, a signal is sent to the ROM select, and data output from R20-R23 is read from R40-R43 and R50-R53, and a signal is output to R10-R14, R30-R33, and R60-R63.




MPU Timing



1. Switching of mode
   The system has two modes: one is the text mode under which the system functions as a normal printer, and the other is the graphic mode under which the system operates as a plotter.
   The modes are switched as follows:
   - When reset, the text mode is set.
   - Transition from the graphic to text mode is performed through the input of ESC+$ or the execution of the "A" command.
   - The transition from the text mode to the graphic mode is performed by inputting ESC+#.

2. Timing for mode switching
   The following conditions determine when to switch a mode and operate a manual switch:
   - Immediately after resetting (and before data is input).
   - After control codes (CR, LF) under the text mode.
   - When there is no data in the buffer under the text mode.
   - When a command is completed under the graphic mode. (For a single-character-type command, the switching of mode is determined based on the immediately following character.)
     Note: The switches of the printer may not operate in the following cases: When the brake key forcibly stops a personal computer (external signal source) during RUN, and when the brake is activated under the graphic mode. Thus, it is desirable to output the CR code at the end.

3. Data destruction by switching mode
   When the graphic mode is switched to the text mode, the carriage moves to the left end within the range where printing is possible, while the data below is destroyed simultaneously.
   - Points of X and Y coordinates
     Y is set to 0. The origin will be at the leftmost point.
   - Tilt of character
     Q is set to 0.
   - For line type, color position and character scale, the originally specified data is held.

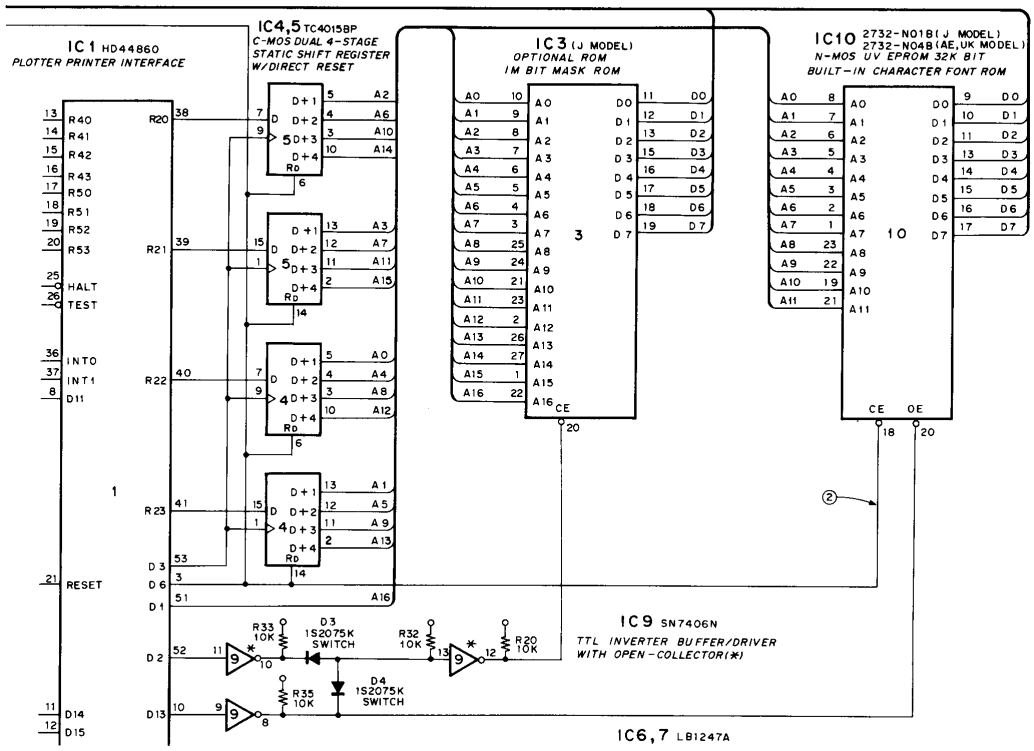
### 4-1-5. Operation of Switches

1. DIP switch
   - Selection of CR and CR/LF (S1-4)
     This switch determines an operation when the CR code ($0D) is externally input under the text mode. Only CR is performed when the switch is OFF; both CR/LF are performed out for ON. (This switching can be performed during operation.)

2. Manual switch
   1) Paper Feed switch
      After fed by 32 steps (6.4 mm or 1.12 sec) at 1/10 of the normal speed with the paperfeed switch, the paper is fed at the normal speed.
      If switched off once and then turned on during feeding, the printer resumes feeding the paper at 1/10 of the normal speed again.
      The Y-axis scissoring is set to 0 (not applicable to 114 mm paper).
      The home feed counter is set to 0.
   2) Reverse Feed switch
      After fed after by 32 steps (6.4 mm or 1.12 sec) at 1/10 of the normal speed with the backfeed switch, the paper is fed back at the normal speed. If switched off once and then turned on during feeding back, the printer resumes feeding back the paper at 1/10 of the normal speed.
      The Y-axis scissoring is set to 0 (not applicable to 114 mm paper). The home feed counter is set to 0.
   3) Color Change switch
      Changes the present pen to the one in the next color position. When pushed together with the Paper Feed switch, This is continued while the two switches are being pushed, while When pushed simultaneously with the Reverse Feed switch 256 alphanumeric characters are printed while changing the color with every 16 characters.
   4) Paper Size Select switch
      After performing one CR, the number of scissoring steps on the X- and Y-axes are changed according to a selected size of paper (excluding 114 mm paper).
      The internal counter for scissoring* on the Y-axis is not changed, but is set to 0 through the Paper Feed and Back Feed switches.
      (*Scissoring: No printing is performed, but printing is gestured.)

### 4-1-6. Selection of ROM (IC3 or IC10)

This is performed by sending a signal to the CE terminal of IC3 and the OE terminal of IC10, and the IC3 or IC10 is activated (selected). IC3 is a chinese character fonts ROM only for Japan.



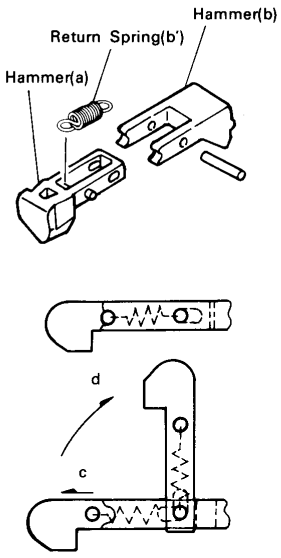

### 4-1-7. Address Decoder (IC4 and IC5)

A 6-bit address data from the MPU is decoded by IC4 and IC5 into a 16-bit address data, which is output to IC3 and IC10.

## 4-2. MECHANISM

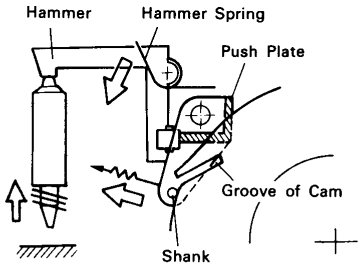
### 4-2-1. Pen Extracting Mechanism

This mechanism in the slider unit consists of a hammer(a), hammer(b) and return spring.
The boss part of the hammer(a) is normally fixed to the holder of the hammer(b) with the return spring. When the hammer(a) is pulled toward c it becomes mobile, and the hammer is raised toward.
Then, the pen is extracted upward.

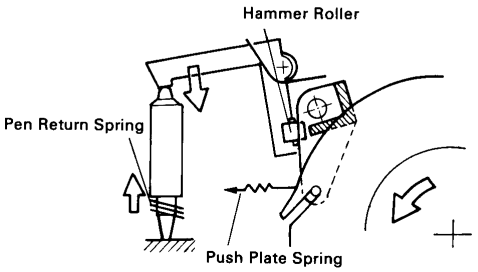



### 4-2-2. Pen Driving Mechanism

This is composed of the extracting mechanism, a push plate unit, a hammer unit and ball-point pen in the slider unit. The operation of this mechanism is as follows:
Pen-up operation: Since the shank, fixed to the push plate unit, is in contact with the outer periphery of the cam, the push plate raises the hammer, causing the pen to separate from the platen by the pen-return-spring pressure.
The hammer spring pushes the hammer down, while the push plate spring raises the hammer. The pressure of the hammer spring is designed to be greater than that of the push plate spring, so that the shank contacts with the outer periphery of the cam.




Pen-up operation



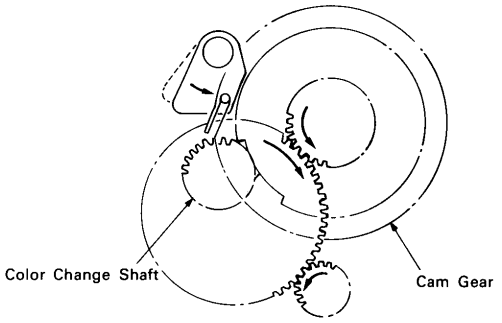

Pen-down operation

Pen-down operation: Since the shank is more forcibly pulled by the groove of the cam, the push plate becomes out of contact with the hammer roller, and the hammer goes down to press down the pen. As the hammer roller does not come into contact with the push plate, the load applied to the pen is obtained by subtracting the pressure of the pen return spring from that of the hammer spring.

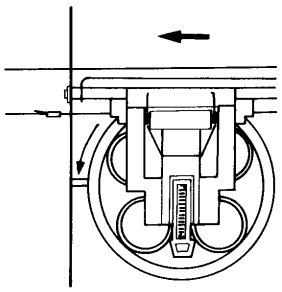
### 4-2-3. Reset of Mechanism

The printer initializes the pen position and pen color when the power is turned on or RESET is performed as follows:

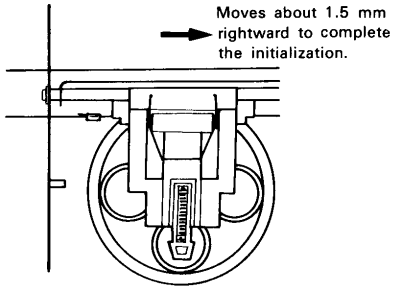
1) Initializes the relationship between the cam gear and color change shaft. The cam gear is rotated and obtains the position corresponding to the color change shaft as shown below.




2) Raises the pen.
3) Runs the X-motor to move and press the slider unit to the leftmost.
4) Rotates the slider unit as shown below to push the projecting part of the slider unit against the projection part of the chassis.



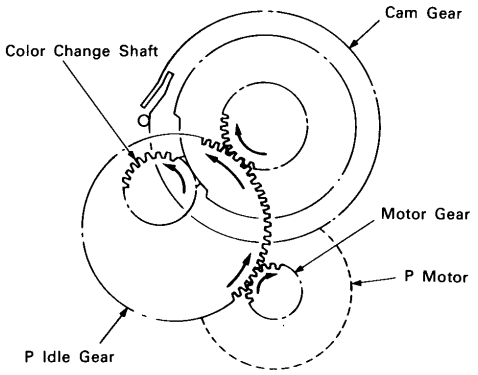
5) Sets the initial color of black by turning the slider unit one-eighth revolution in the opposite direction from the above 4) position.
6) Completes the initialization by moving back the slider unit about 1.5 mm rightward from the left end.




### 4-2-4. Color Change

A cycle of color change is as follows:

1) The motor gear turns twice.
2) The P idle gear makes two-fifth revolution.
3) The cam gear turns once.
4) The color change shaft makes three revolutions.
5) The three revolutions of the color change shaft gives the slider unit one-fourth revolution through the worm gears on the same shaft.

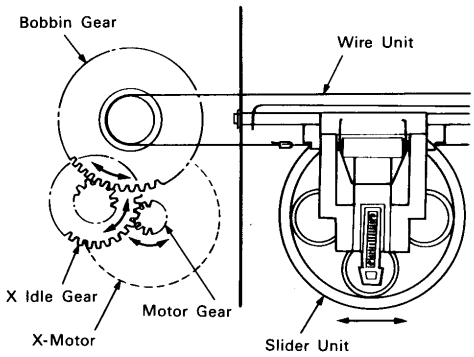



**Cam gear's standard position after a color change.**

(After RESET, the gear's positions must be as shown above. Adjustment for P Idling Gear Position on page 3-17 is needed.)

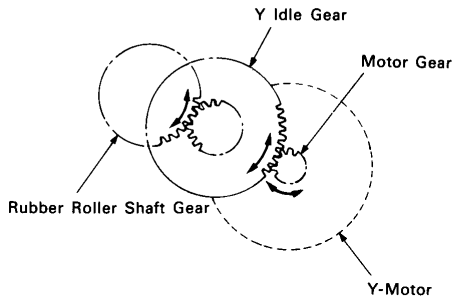
### 4-2-5. Operation of Slider Unit (X-Axis)

The position of the slider unit is determined horizontally with the revolution of the X-motor which drives the wire unit right and left and obtains the right and left positions.



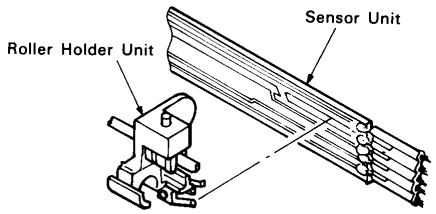
### 4-2-6. Paper Feeding (Y-Axis)

The sheet form can be moved back and forth with the Y-motor which turns the rubber roller shaft as shown below.



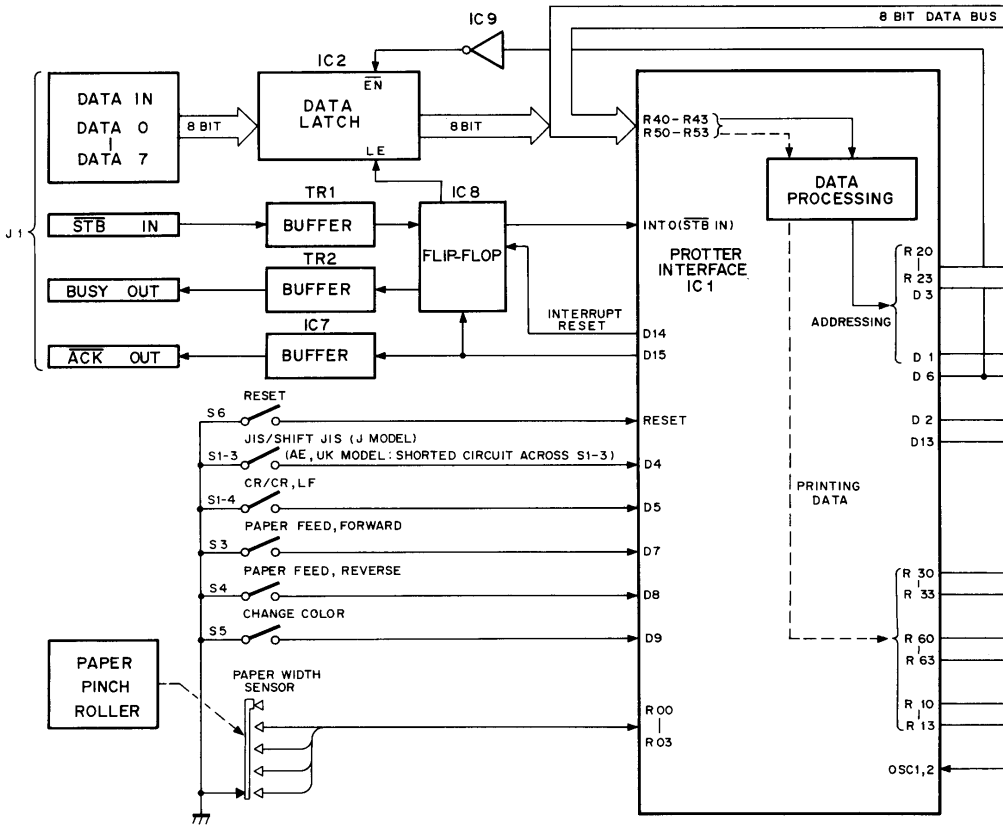

### 4-2-7. Paper Size Sensing Mechanism

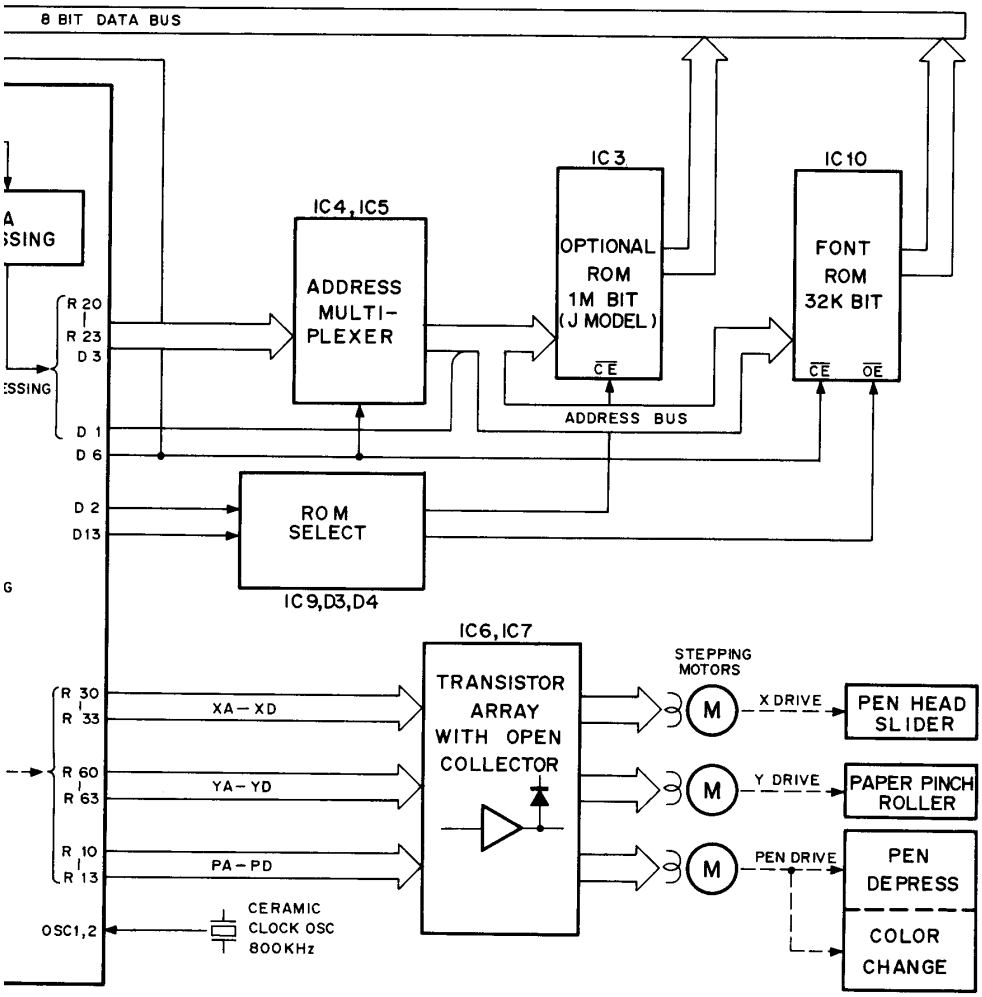
This mechanism consists of a roller holder(B) unit and sensor board. The roller holder(B) unit has an armature which slides on the sensor board. When a paper size is changed (that is, the roller holder(B) unit moves), the armature slides on the sensor board, so that the size can be sensed.



# 第5章
# ブロックダイヤグラム
# CHAPTER 5
# BLOCK DIAGRAM

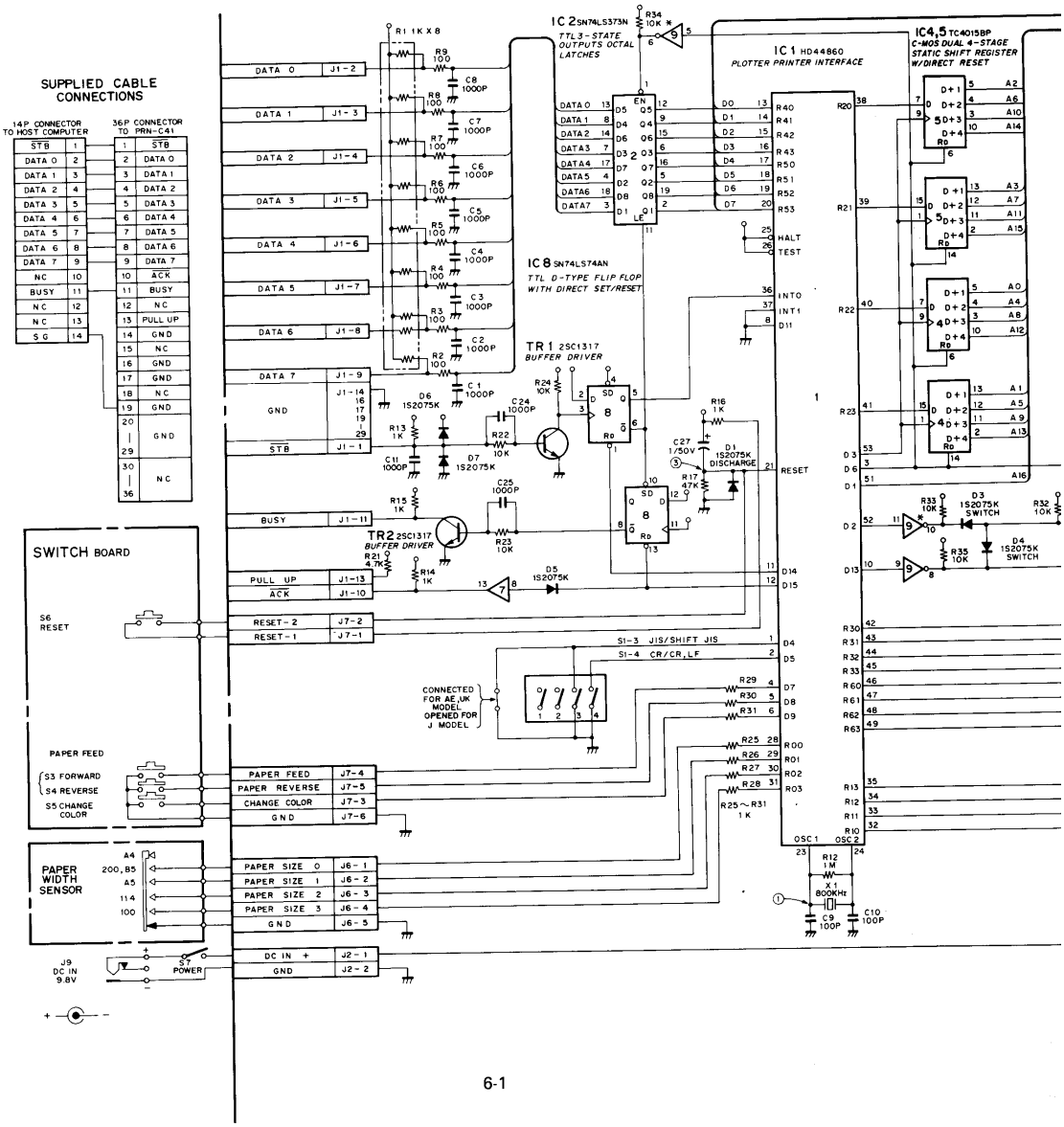
## オーバーオール
## OVERALL

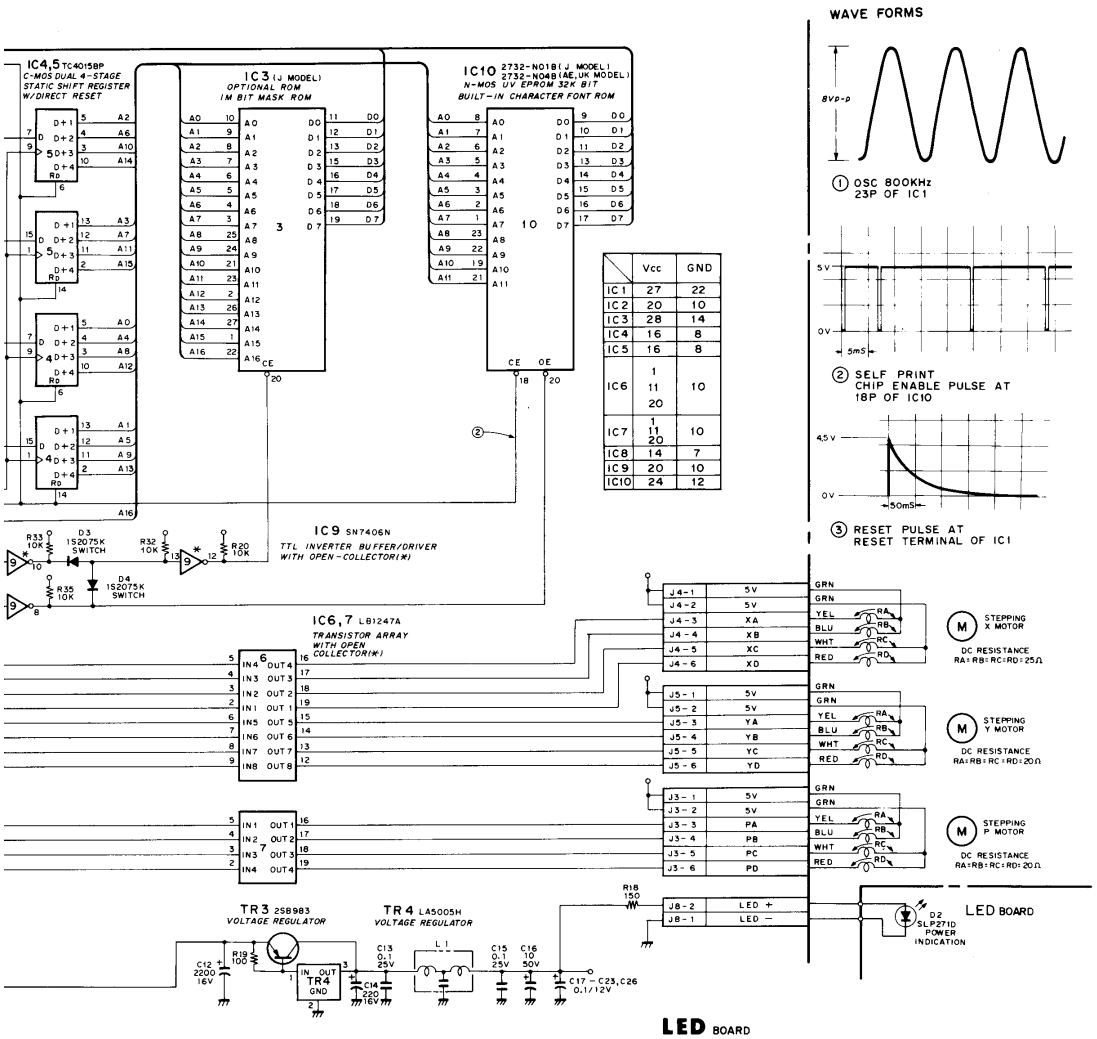



8 BIT DATA BUS
IC 3
IC10
IC4, IC5
OPTIONAL ROM 1M BIT (J MODEL)
FONT ROM 32K BIT
ADDRESS MULTI-PLEXER
CE
CE
OE
ADDRESS BUS
R 20
R 23
D 3
D 1
D 6
D 2
D13
ROM SELECT
IC 9,D3,D4
IC6, IC7
TRANSISTOR ARRAY WITH OPEN COLLECTOR
STEPPING MOTORS
R 30
R 33
XA – XD
R 60
R 63
YA – YD
R 10
R 13
PA – PD
X DRIVE
Y DRIVE
PEN DRIVE
PEN HEAD SLIDER
PAPER PINCH ROLLER
PEN DEPRESS
COLOR CHANGE
M
OSC1,2
CERAMIC CLOCK OSC 800KHz

# 第 6 章
# 回路図・マウント図
# CHAPTER 6
# SCHEMATIC DIAGRAM AND PRINTED CIRCUIT BOARD

## 6-1. 回路図
## 6-1. SCHEMATIC DIAGRAM






| | Vcc | GND |
|---|---|---|
| IC1 | 27 | 22 |
| IC2 | 20 | 10 |
| IC3 | 28 | 14 |
| IC4 | 16 | 8 |
| IC5 | 16 | 8 |
| IC6 | 1<br>11<br>20 | 10 |
| IC7 | 1<br>11<br>20 | 10 |
| IC8 | 14 | 7 |
| IC9 | 20 | 10 |
| IC10 | 24 | 12 |

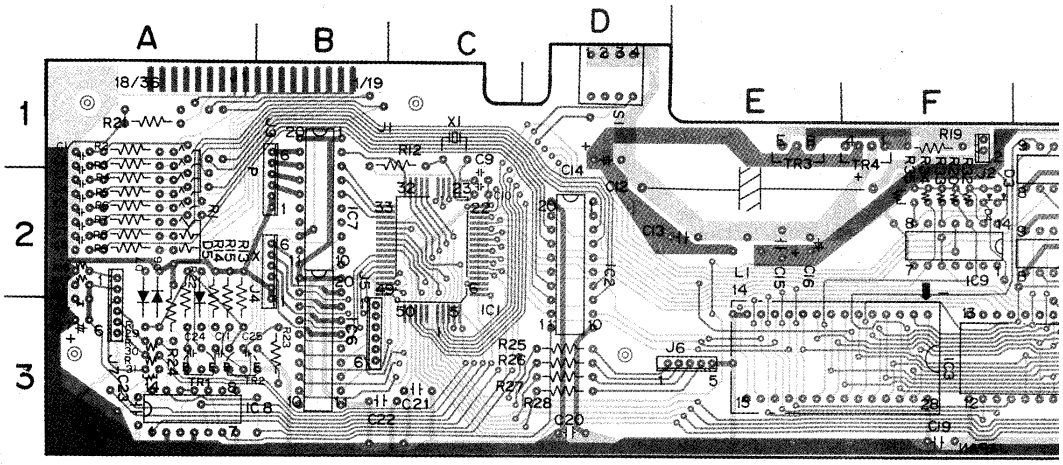
**LED** BOARD
**MAIN** BOARD
**SWITCH** BOARD
PRN-C41(J,AE,UK)



PRN-C41(AE/UK)
PRN-C41(J)

6-2. マウント図
## 6-2. PRINTED CIRCUIT BOARD

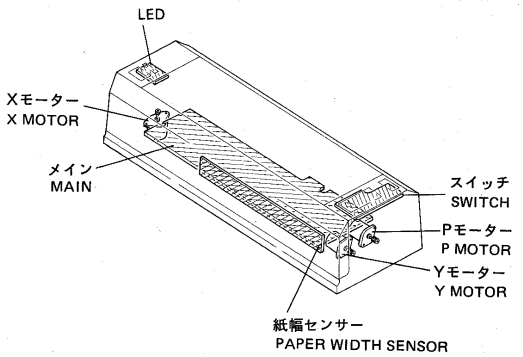
メイン基板
（セット底面から見た図）
**MAIN BOARD**
**(BOTTOM SIDE VIEW)**

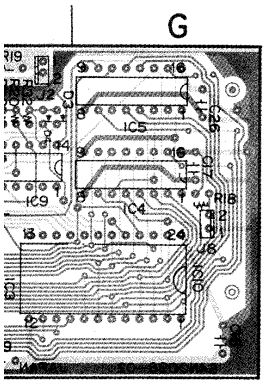



M

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C1 | A - 1 | C21 | C - 3 | IC1 | C - 3 | R1 | A - 2 | R25 | D - 3 |
| C2 | A - 1 | C22 | B - 3 | IC2 | D - 2 | R2 | A - 1 | R26 | D - 3 |
| C3 | A - 2 | C23 | A - 3 | IC3 | F - 3 | R3 | A - 1 | R27 | D - 3 |
| C4 | A - 2 | C24 | A - 3 | IC4 | G - 2 | R4 | A - 2 | R28 | D - 3 |
| C5 | A - 2 | C25 | A - 3 | IC5 | G - 2 | R5 | A - 2 | R29 | A - 3 |
| C6 | A - 2 | C26 | G - 2 | IC6 | B - 3 | R6 | A - 2 | R30 | A - 3 |
| C7 | A - 2 | C27 | A - 3 | IC7 | B - 2 | R7 | A - 2 | R31 | A - 3 |
| C8 | A - 2 | | | IC8 | A - 3 | R8 | A - 2 | R32 | F - 2 |
| C9 | C - 1 | D1 | A - 2 | IC9 | F - 2 | R9 | A - 2 | R33 | F - 2 |
| C10 | C - 2 | D3 | F - 2 | IC10 | G - 3 | R12 | C - 1 | R34 | F - 2 |
| C11 | A - 3 | D4 | F - 2 | | | R13 | A - 2 | R35 | F - 2 |
| C12 | D - 2 | D5 | A - 2 | J1 | B - 1 | R14 | A - 2 | | |
| C13 | D - 2 | D6 | A - 2 | J2 | F - 1 | R15 | A - 2 | S1 | D - 1 |
| C14 | D - 1 | D7 | A - 2 | J3 | B - 1 | R16 | A - 2 | | |
| C15 | E - 2 | | | J4 | B - 2 | R17 | A - 2 | TR1 | A - 3 |
| C16 | E - 2 | | | J5 | B - 2 | R18 | G - 2 | TR2 | A - 3 |
| C17 | G - 2 | | | J6 | E - 3 | R19 | F - 1 | TR3 | E - 1 |
| C18 | G - 3 | | | J7 | A - 3 | R20 | F - 2 | TR4 | F - 1 |
| C19 | F - 3 | | | J8 | G - 3 | R21 | A - 1 | | |
| C20 | D - 3 | | | | | R22 | A - 2 | X1 | C - 1 |
| | | | | L1 | E - 2 | R23 | B - 3 | | |
| | | | | | | R24 | A - 3 | | |

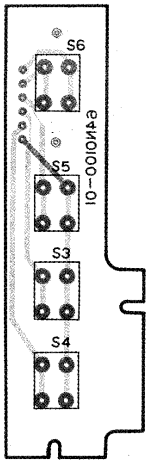
主要電気部品ロケーション
TYPICAL ELECTRICAL PARTS LOCATION



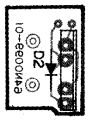

MAIN BOARD

スイッチ基板




SWITCH BOARD

LED基板

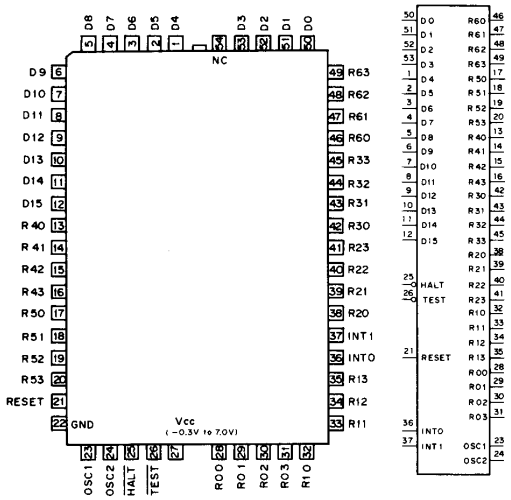



LED BOARD

## 6-3. 半導体一覧表

## 6-3. SEMICONDUCTORS

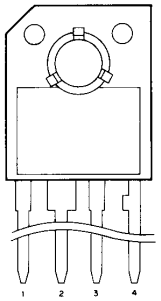
HD44860 (HITACHI) FLAT PACKAGE
PLOTTER PRINTER INTERFACE
— TOP VIEW —

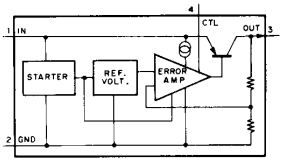



D0; NO CONNECTION
D1, 3, 6; ROM ADDRESSING OUT
D2, 13; ROM CHIP SELECT OUT
D4, 5, 7–9; FUNCTION SWITCH DATA IN
D11; GROUND
D14; INTERRUPT RESET OUT
D15; $\overline{ACK}$ OUT
D10, 12; NO CONNECTION
GND; GROUND
$\overline{HALT}$; HALT IN
INT0, INT1; INTERRUPT IN

NC; NO CONNECTION
OSC1, OSC2; OSCILLATOR
R00–03; PAPER WIDTH DATA IN
R10–13; P MOTOR DRIVE OUT
R20–23; ROM ADDRESSING OUT
R30–33; X MOTOR DRIVE OUT
R40–R43, R50–R53; 8 BIT DATA IN
R60–63; Y MOTOR DRIVE OUT
$\overline{RESET}$; RESET IN
$\overline{TEST}$; TEST IN

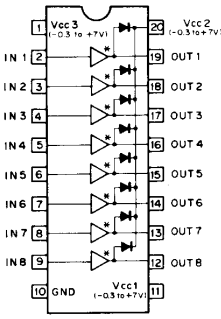
LA5005H (SANYO)
VOLTAGE REGULATOR
— SIDE VIEW —

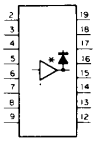


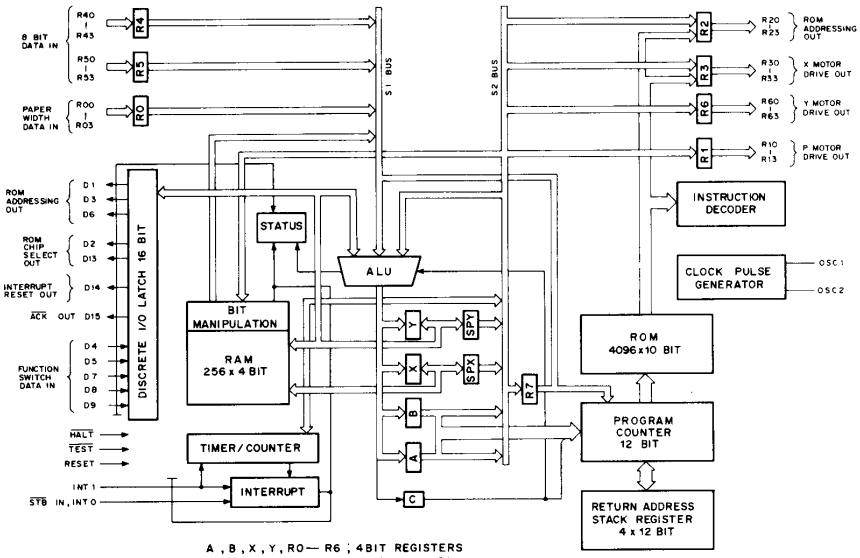

CTL; CONTROL

LB1247A (SANYO)
TRANSISTOR ARRAY WITH OPEN COLLECTOR
— TOP VIEW —



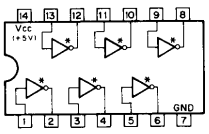



* ; OPEN COLLECTOR




A, B, X, Y, R0— R6; 4 BIT REGISTERS
R7; 1 BIT REGISTER
SPX, SPY; 4 BIT AUXILIARY REGISTER
C; CARRY FLIP-FLOP

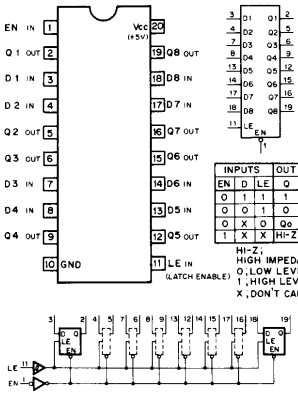
SN7406N (TI)
TTL INVERTER BUFFER/DRIVER WITH OPEN-COLLECTOR
— TOP VIEW —




| A | Y |
|---|---|
| 0 | 1 |
| 1 | 0 |

0 ; LOW LEVEL
1 ; HIGH LEVEL
* ; OPEN COLLECTOR

SN74LS373N (TI)
TTL 3-STATE OUTPUTS OCTAL LATCHES
— TOP VIEW —

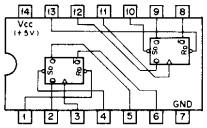



| INPUTS | | | OUT |
|---|---|---|---|
| EN | D | LE | Q |
| 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | X | 0 | Qo |
| 1 | X | X | HI-Z |

HI-Z ; HIGH IMPEDANCE
0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE



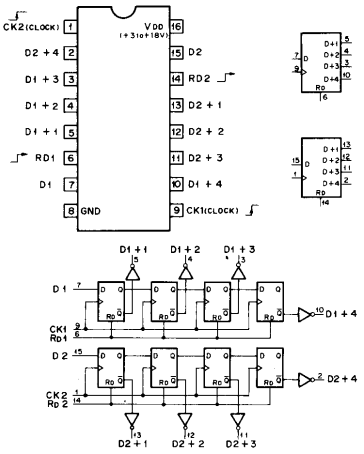

SN74LS74AN (TI)
TTL D-TYPE FLIP FLOP WITH DIRECT SET/RESET
— TOP VIEW —



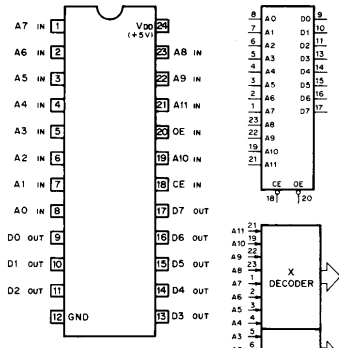

| INPUTS | | | | OUTPUTS | |
|---|---|---|---|---|---|
| So | Ro | CK | D | Qn+1 | Qn+1 |
| 0 | 1 | X | X | 1 | 0 |
| 1 | 0 | X | X | 0 | 1 |
| 0 | 0 | X | X | 1* | 1* |
| 1 | 1 | ↓ | 1 | 1 | 0 |
| 1 | 1 | ↓ | 0 | 0 | 1 |
| 1 | 1 | 0 | X | Qn | Qn |

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
t* ; NONSTABLE

TC4015BP (TOSHIBA)
C-MOS DUAL 4-STAGE STATIC SHIFT REGISTER WITH DIRECT RESET
— TOP VIEW —



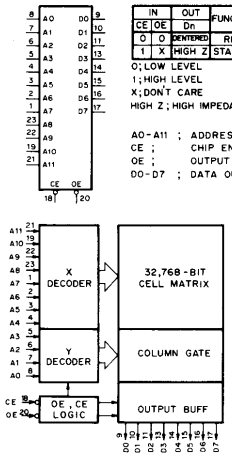

uPD2732D (NEC)
N-MOS 32K (4Kx8) UV EPROM
— TOP VIEW —

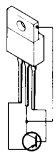



| IN | | OUT | FUNCTION |
|---|---|---|---|
| CE | OE | On | |
| 0 | 0 | DENTERED | READ |
| 1 | X | HIGH Z | STANDBY |

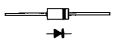
0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
HIGH Z ; HIGH IMPEDANCE

A0 - A11 ; ADDRESS
CE ; CHIP ENABLE
OE ; OUTPUT ENABLE
D0 - D7 ; DATA OUTPUTS



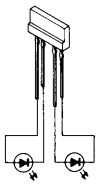



2SB983



1S2075

2SC1317



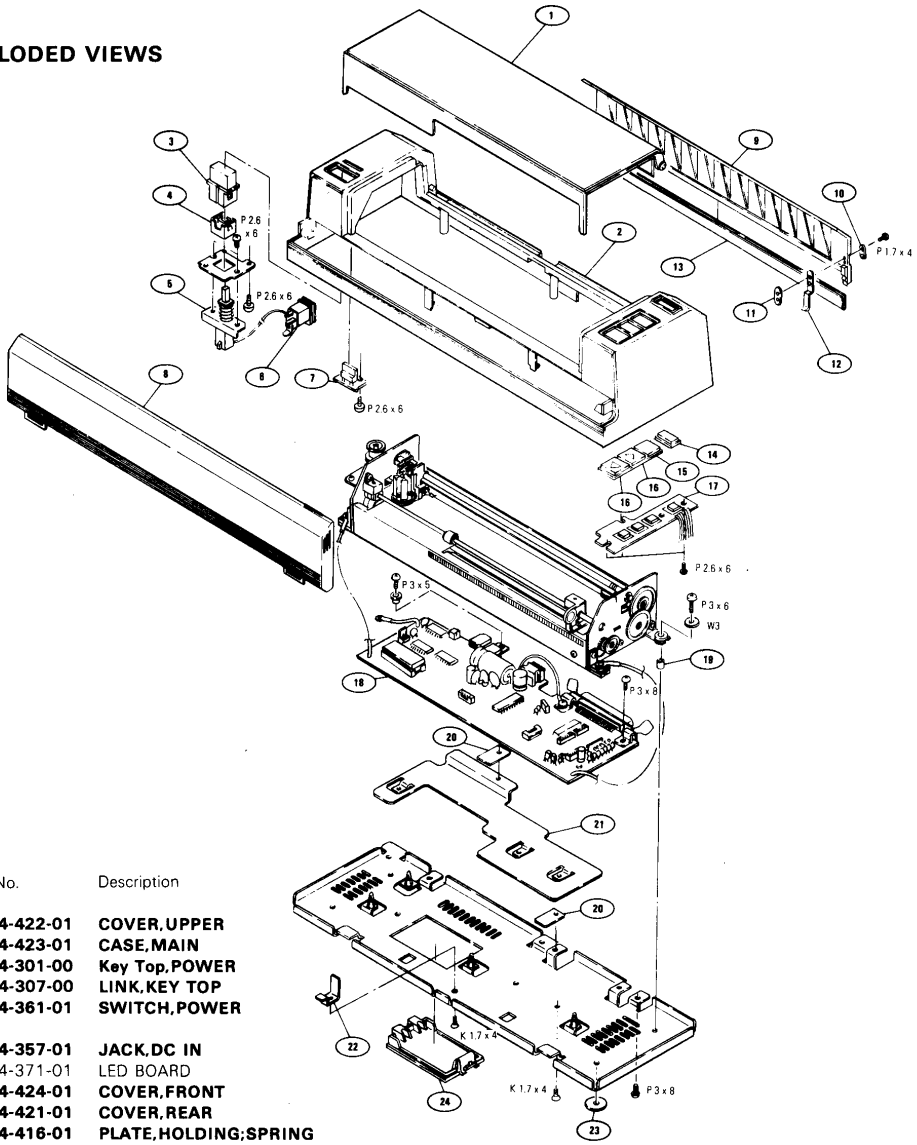
SLP-271D; GREEN



PRN-C41(AE/UK)
PRN-C41(J)

# CHAPTER 7
# REPAIR PARTS

## 7-1. EXPLODED VIEWS




| No. | Part No. | Description |
|---|---|---|
| **1** | **9-984-422-01** | **COVER,UPPER** |
| **2** | **9-984-423-01** | **CASE,MAIN** |
| **3** | **4-604-301-00** | **Key Top,POWER** |
| **4** | **4-864-307-00** | **LINK,KEY TOP** |
| **5** | **9-984-361-01** | **SWITCH,POWER** |
| **6** | **9-984-357-01** | **JACK,DC IN** |
| 7 | 9-984-371-01 | LED BOARD |
| **8** | **9-984-424-01** | **COVER,FRONT** |
| **9** | **9-984-421-01** | **COVER,REAR** |
| **10** | **9-984-416-01** | **PLATE,HOLDING;SPRING** |
| **11** | **9-984-431-01** | **NUT,PLATE** |
| **12** | **9-984-426-01** | **SPRING,PLATE** |
| **13** | **9-984-417-01** | **PLATE,REINFORCEMENT; REAR COVER** |
| **14** | **9-984-418-01** | **Key Top(A)** |
| **15** | **9-984-419-01** | **Key Top(B),CHANGE COLOR** |
| **16** | **9-984-420-01** | **Key Top(B),PAPER FEED** |
| 17 | 9-984-372-01 | SWITCH BOARD |
| 18 | 9-984-370-01 | MAIN BOARD |
| 19 | 9-984-428-01 | SPACER |
| 20 | 4-026-251-00 | SPACER INSULATING |
| 21 | 9-984-429-01 | HEAT SINK |
| 22 | 9-984-430-01 | CLAMP |
| **23** | **9-984-427-01** | **FOOT,RUBBER** |
| **24** | **9-984-425-01** | **COVER,BOTTOM** |

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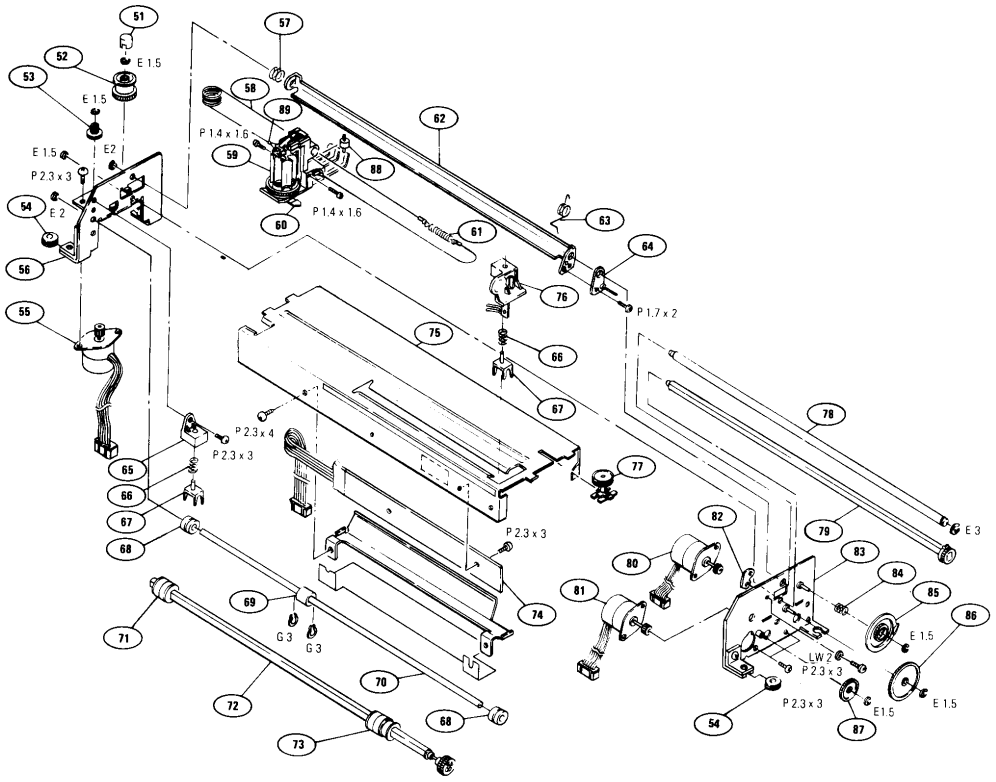
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.




| No. | Part No. | Description |
|---|---|---|
| **51** | **9-984-388-01** | **COVER,BOBBIN** |
| **52** | **9-984-381-01** | **GEAR ASS'Y,WIRE BOBBIN** |
| **53** | **9-984-380-01** | **GEAR,X IDLE** |
| 54 | 9-984-415-01 | BUSHING,RUBBER |
| **55** | **9-984-379-01** | **X MOTOR ASS'Y** |
| 56 | 9-984-377-01 | SIDE PLATE ASS'Y,LEFT |
| **57** | **9-984-411-01** | **SPRING,DAMPER** |
| **58** | **9-984-383-01** | **WIRE ASS'Y(B)** |
| **59** | **9-984-407-01** | **SLIDER ASS'Y** |
| **60** | **9-984-410-01** | **CAP,PAPER HOLDING** |
| **61** | **9-984-382-01** | **WIRE ASS'Y(A)** |
| **62** | **9-984-405-01** | **PLATE,PEN STRIKING** |
| **63** | **9-984-408-01** | **SPRING,PEN STRIKING** |
| 64 | 9-984-413-01 | PLATE ASS'Y,PEN STRIKING |
| **65** | **9-984-398-01** | **HOLDER(A),ROLLER HOLDER** |
| **66** | **9-984-397-01** | **SPRING,ROLLER HOLDER** |
| **67** | **9-984-396-01** | **HOLDER,ROLLER** |
| **68** | **9-984-395-01** | **ROLLER,PAPER HOLDING** |
| **69** | **9-984-401-01** | **ROLLER,PAPER HOLDING** |
| 70 | 9-984-400-01 | SHAFT,PAPER HOLDING |
| **71** | **9-984-394-01** | **ROLLER ASS'Y(L)** |
| **72** | **9-984-392-01** | **SHAFT ASS'Y,PAPER HOLDING ROLLER** |
| **73** | **9-984-393-01** | **ROLLER ASS'Y(R)** |
| **74** | **9-984-378-01** | **SENSOR ASS'Y** |
| 75 | 9-984-375-01 | FRAME |
| **76** | **9-984-399-01** | **HOLDER (B) ASS'Y,ROLLER HOLDER** |
| **77** | **9-984-385-01** | **ROLLER BASE ASS'Y** |
| 78 | 9-984-386-01 | SHAFT,SLIDER |
| 79 | 9-984-406-01 | SHAFT ASS'Y,CHANGE COLOR |
| **80** | **9-984-402-01** | **P MOTOR ASS'Y** |
| **81** | **9-984-389-01** | **Y MOTOR ASS'Y** |
| 82 | 9-984-414-01 | STOPPER |
| 83 | 9-984-376-01 | SIDE PLATE ASS'Y,RIGHT |
| **84** | **9-984-412-01** | **SPRING,CAM GEAR** |
| **85** | **9-984-404-01** | **GEAR,CAM** |
| **86** | **9-984-403-01** | **GEAR,P IDLE** |
| **87** | **9-984-390-01** | **GEAR,Y IDLE** |
| **88** | **9-984-409-01** | **ROLLER,HAMMER** |
| **89** | **9-984-384-01** | **SLEEVE** |

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## 7-2. ELECTRICAL PARTS LIST

| Ref.No. | Parts No. | Description |
|---|---|---|
| **MAIN BOARD** | | |
| | 9-984-370-01 | MAIN BOARD |
| C1 | 1-102-074-00 | CERAMIC 1000P 50V |
| C2 | 1-102-074-00 | CERAMIC 1000P 50V |
| C3 | 1-102-074-00 | CERAMIC 1000P 50V |
| C4 | 1-102-074-00 | CERAMIC 1000P 50V |
| C5 | 1-102-074-00 | CERAMIC 1000P 50V |
| C6 | 1-102-074-00 | CERAMIC 1000P 50V |
| C7 | 1-102-074-00 | CERAMIC 1000P 50V |
| C8 | 1-102-074-00 | CERAMIC 1000P 50V |
| C9 | 1-102-106-00 | CERAMIC 100P 50V |
| C10 | 1-102-106-00 | CERAMIC 100P 50V |
| C11 | 1-102-074-00 | CERAMIC 1000P 50V |
| C12 | 1-119-140-00 | ELECT 2200 16V |
| C13 | 1-161-063-00 | CERAMIC 0.1 50V |
| C14 | 1-123-321-00 | ELECT 220 16V |
| C15 | 1-161-063-00 | CERAMIC 0.1 50V |
| C16 | 1-123-356-00 | ELECT 10 50V |
| C17 | 1-161-025-00 | CERAMIC 0.1 25V |
| C18 | 1-161-025-00 | CERAMIC 0.1 25V |
| C19 | 1-161-025-00 | CERAMIC 0.1 25V |
| C20 | 1-161-025-00 | CERAMIC 0.1 25V |
| C21 | 1-161-025-00 | CERAMIC 0.1 25V |
| C22 | 1-161-025-00 | CERAMIC 0.1 25V |
| C23 | 1-161-025-00 | CERAMIC 0.1 25V |
| C24 | 1-102-074-00 | CERAMIC 1000P 50V |
| C25 | 1-102-074-00 | CERAMIC 1000P 50V |
| C26 | 1-161-025-00 | CERAMIC 0.1 25V |
| C27 | 1-121-352-11 | ELECT 1 50V |
| D1 | 9-984-364-01 | 1S2075K |
| D3 | 9-984-364-01 | 1S2075K |
| D4 | 9-984-364-01 | 1S2075K |
| D5 | 9-984-364-01 | 1S2075K |
| D6 | 9-984-364-01 | 1S2075K |
| D7 | 9-984-364-01 | 1S2075K |

| Ref.No. | Parts No. | Description |
|---|---|---|
| IC1 | 9-984-342-01 | HD44860 |
| IC2 | 8-759-903-73 | SN74LS373N |
| IC4 | 8-759-240-15 | TC4015BP |
| IC5 | 8-759-240-15 | TC4015BP |
| IC6 | 9-984-344-01 | LB1247 |
| IC7 | 9-984-344-01 | LB1247 |
| IC8 | 8-759-900-74 | SN74LS74AN |
| IC9 | 8-759-974-06 | SN7406N |
| IC10 | 9-984-374-01 | 2732-N04B |
| J1 | 9-984-351-01 | CONNECTOR,DATA IN |
| L1 | 9-984-363-01 | FILTER |
| R1 | 9-984-350-01 | RESISTOR ARRAY 1K X8 |
| R2 | 1-246-771-00 | CARBON 100 1/8W |
| R3 | 1-246-771-00 | CARBON 100 1/8W |
| R4 | 1-246-771-00 | CARBON 100 1/8W |
| R5 | 1-246-771-00 | CARBON 100 1/8W |
| R6 | 1-246-771-00 | CARBON 100 1/8W |
| R7 | 1-246-771-00 | CARBON 100 1/8W |
| R8 | 1-246-771-00 | CARBON 100 1/8W |
| R9 | 1-246-771-00 | CARBON 100 1/8W |
| R12 | 1-246-545-00 | CARBON 1M 1/4W |
| R13 | 1-246-783-00 | CARBON 1K 1/8W |
| R14 | 1-246-783-00 | CARBON 1K 1/8W |
| R15 | 1-246-783-00 | CARBON 1K 1/8W |
| R16 | 1-246-783-00 | CARBON 1K 1/8W |
| R17 | 1-247-871-00 | CARBON 47K 1/6W |
| R18 | 1-247-811-00 | CARBON 150 1/6W |
| R19 | 1-246-771-00 | CARBON 100 1/8W |
| R20 | 1-246-795-00 | CARBON 10K 1/8W |
| R21 | 1-247-847-00 | CARBON 4.7K 1/8W |
| R22 | 1-246-795-00 | CARBON 10K 1/8W |
| R23 | 1-246-795-00 | ARBON 10K 1/4W |
| R24 | 1-246-795-00 | CARBON 10K 1/8W |
| R25 | 1-246-783-00 | CARBON 1K 1/8W |
| R26 | 1-246-783-00 | CARBON 1K 1/8W |
| R27 | 1-246-783-00 | CARBON 1K 1/8W |

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| Ref.No. | Parts No. | Description |
|---|---|---|
| **R28** | **1-246-783-00** | **CARBON 1K 1/8W** |
| **R29** | **1-246-783-00** | **CARBON 1K 1/8W** |
| **R30** | **1-246-783-00** | **CARBON 1K 1/8W** |
| **R31** | **1-246-783-00** | **CARBON 1K 1/8W** |
| **R32** | **1-246-795-00** | **CARBON 10K 1/8W** |
| **R33** | **1-246-795-00** | **CARBON 10K 1/8W** |
| **R34** | **1-246-795-00** | **CARBON 10K 1/8W** |
| **R35** | **1-246-795-00** | **CARBON 10K 1/8W** |
| **S1** | **9-984-358-01** | **DIP** |
| **TR1** | **9-919-419-00** | **2SC1317** |
| **TR2** | **9-919-419-00** | **2SC1317** |
| **TR3** | **9-984-348-01** | **2SB983** |
| **TR4** | **9-984-349-01** | **LA5005H** |
| **X1** | **9-984-362-01** | **OSCILLATOR,CERAMIC 800kHz** |

**LED BOARD**

| | | |
|---|---|---|
| | 9-984-371-01 | LED BOARD |
| **D2** | **9-984-366-01** | **SLP271D** |

**SWITCH BOARD**

| | | |
|---|---|---|
| | 9-984-372-01 | SWITCH BOARD |
| **S3** | **9-984-359-01** | **TACT,PAPER FEED** |
| **S4** | **9-984-359-01** | **TACT,REVERSE FEED** |
| **S5** | **9-984-359-01** | **TACT,CHANGE COLOR** |
| **S6** | **9-984-360-01** | **TACT,RESET** |

| Ref.No. | Parts No. | Description |
|---|---|---|
| **FRAME** | | |
| **J9** | **9-984-357-01** | **JACK,DC IN** |
| **S7** | **9-984-361-01** | **POWER** |

## 7-3. PACKING MATERIALS AND ACCESSORIES

| Ref.No. | Parts No. | Description |
|---|---|---|
| ⚠ | **1-463-562-12** | **AC-C41;FOR UK** |
| ⚠ | **1-463-563-12** | **AC-C41;FOR AE/AE4** |
| | **1-557-409-11** | **CABLE,CONNECTION; WITH CONNECTORS; FOR AE/UK** |
| | **1-557-889-11** | **CABLE,CONNECTION; WITH CONNECTORS; FOR AE4** |
| | 3-773-966-11 | MANUAL,INSTRUCTION; FOR AE/UK |
| | 3-773-966-42 | MANUAL,INSTRUCTION; FOR AE/AE4 |
| | 9-984-432-01 | CUSHION,UPPER |
| | 9-984-433-01 | CUSHION,LOWER |
| | **9-984-435-01** | **AXIS,HOLDER;ROLL PAPER** |
| | **9-984-436-01** | **HOLDER,ROLL PAPER** |
| | 9-985-749-01 | CARTON,INDIVIDUAL;FOR AE/UK |
| | 9-985-750-01 | CARTON,INDIVIDUAL;FOR AE4 |

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