COMMODORE

MPS 801

Technical Manual

GRAPHIC PRINTER

MPS-801 (GP-500J1X)

SERVICE MANUAL

		Serial number
GP-500J12	USA	XB4080001I ~
GP-500J15	CANADA	XB4020001F ~
		XB4020001Y ~
GP-500J16	EUROPE	
GP-500J18	ENGLAND	XB5057001I ~
		XB5000001F ~
		XB5000001Y ~

OCTOBER, 1984

CONTENTS

[1] SPECIFICATIONS

1. General Specifications

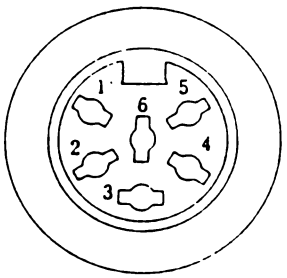
(1)	Print method	Impact dot print (uni-hammer method)
(2)	Character matrix	6×7 dot matrix
(3)	Characters	Upper/lower case characters, numerals, symbols, and PET graphic characters
(4)	Graphics	Dot addressible. 7 vertical dots per column, max 480 columns.
(5)	Character codes	CBM ASCII CODE
(6)	Character size	Height: 7 dots (2.82 mm) Width: 6 dots (2.53 mm)
(7)	Print speed	50 chars/sec (left to right, unidirectional)
(8)	Max. number of columns	80 columns
(9)	Character spacing	10 characters/inch
(10)	Linefeed spacing	6 lines/inch ..... Character mode 9 lines/inch ..... Graphic mode
(11)	Linefeed speed	5 linefeeds/sec ..... Character mode 7.5 linefeeds/sec ..... Graphic mode
(12)	Paper feed	Pin feed
(13)	Paper width	4.5 to 10" width (including tractor feed holes) 8½" width (after tractor hole removed)
(14)	Multiple copies	2 copies including original
(15)	Inked ribbon	Single color, inked roller built-in cassette type
(16)	External dimensions	237D×438W×115H mm
(17)	Weight	Approximately 4.8 kg

2. Operating Environment

(1)	Power requirements	117V (USA), 220~240V (Europe), 100V (Japan) AC±10%, 50/60 Hz
(2)	Power consumption	25 watts max. (character printing), 8 watts (idling)
(3)	Temperature	5°C~40°C
(4)	Humidity	20%~80% (no condensation)

[2] INTERFACE

Pin configuration of the connector

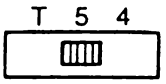


2.1

Pin No.	Signal
1	SERIAL SRQ
2	GND
3	SERIAL ATN
4	SERIAL CLK
5	SERIAL DATA
6	RES

2.2

Device selector switch



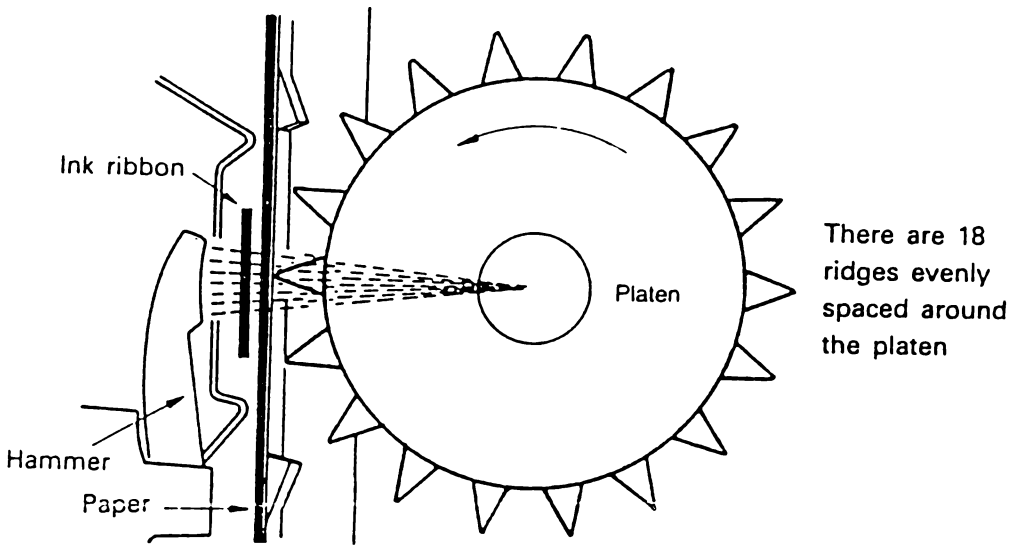
2.3

"T" is the self-diagnostic test position.
"4" is the normal position for one printer.
"5" is the position to use with your second printer.

[3] PRINTING METHOD

Uni-hammer printing method

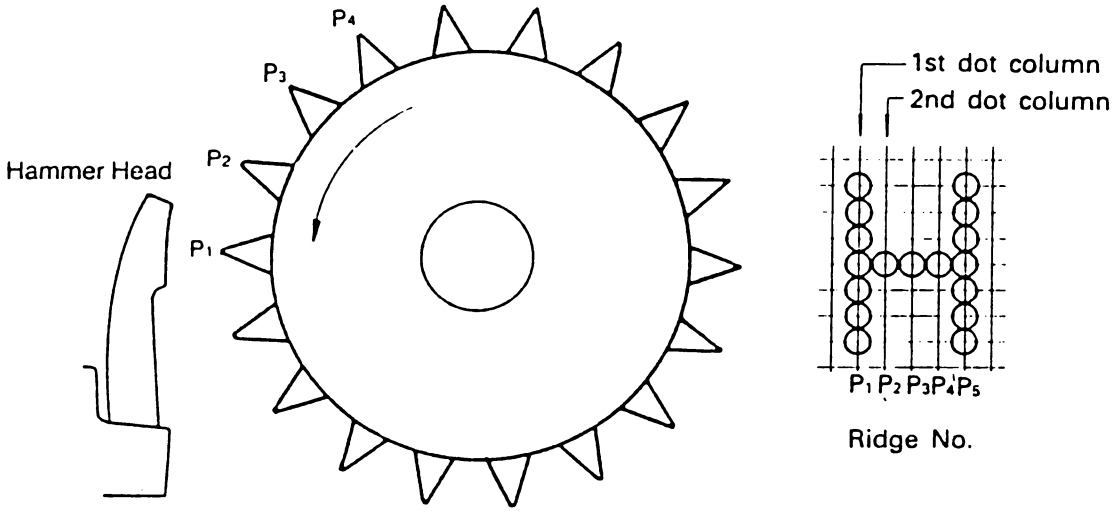
This printer is based on the uni-hammer printing system which is quite different from other impact dot printing systems. In this system one dot is printed when the hammer strikes a raised ridge on a platen.



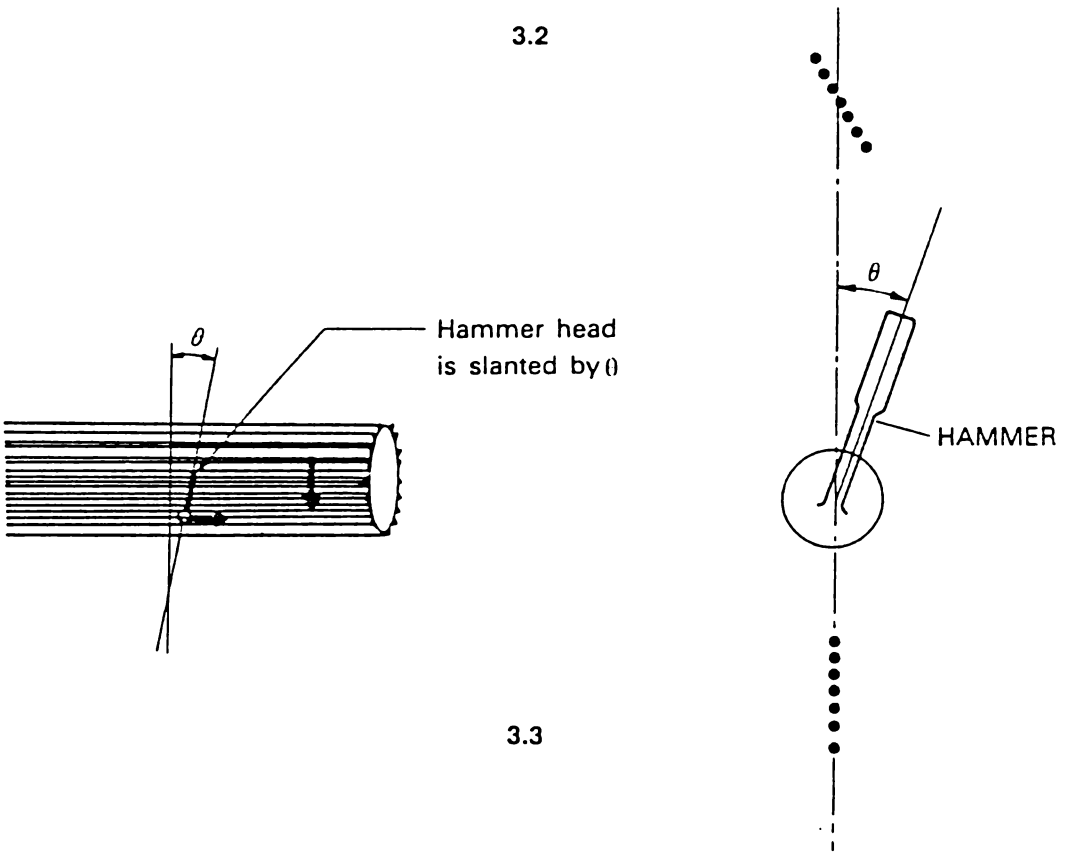
3.1 Printing Mechanism

The timing for the hammer depends upon the dot signals generated by the revolution of the rotation detector which is attached to the motor shaft. The hammer motion, the left to right movement of the hammer, and the revolution of the platen are precisely synchronized.

As the platen rotates, for each ridge seven dot signals are sent to the CPU. The CPU then selects whether or not to activate the print head hammer for the given dot according to the character pattern being printed. The hammer can be activated seven separate times as one ridge passes by the hammer-head. The hammer head is slanted to compensate for the constant left to right motion of the hammer. Each pass of a ridge causes one dot column to be printed.

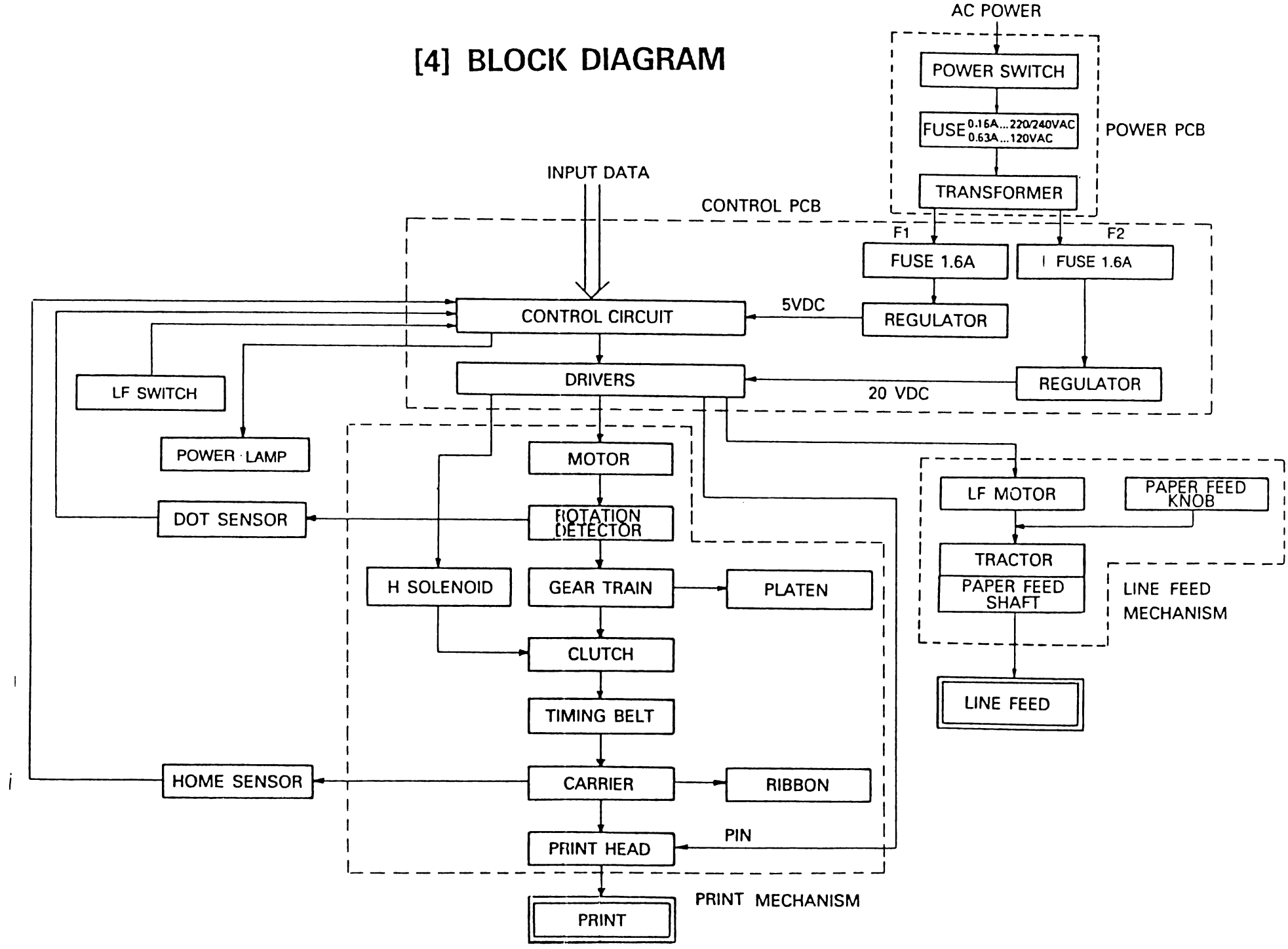


3.2



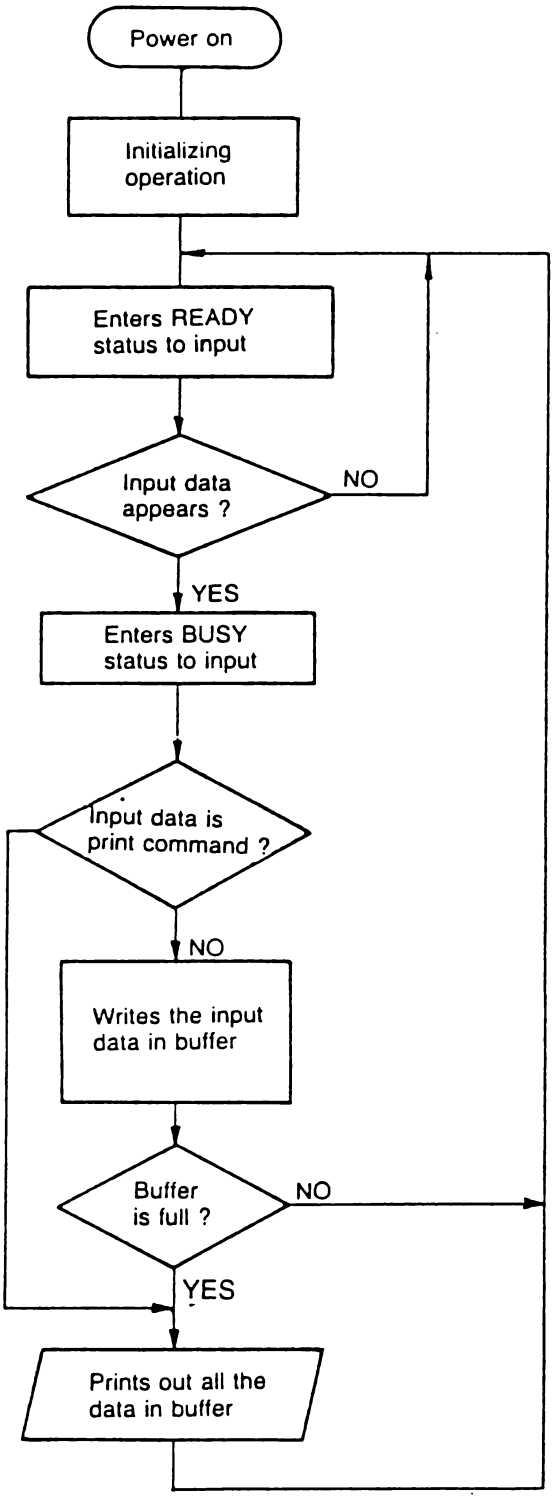
3.3

[4] BLOCK DIAGRAM



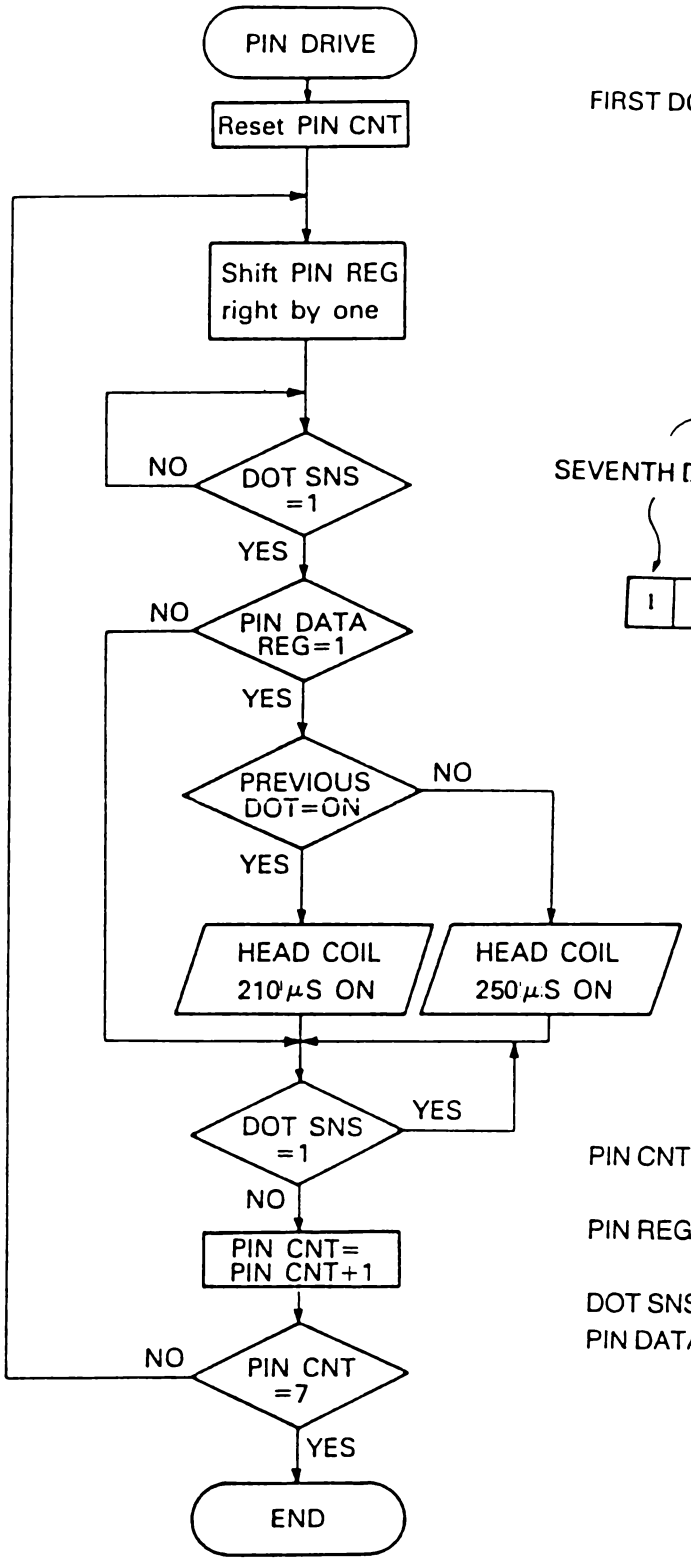
[5] FLOWCHARTS

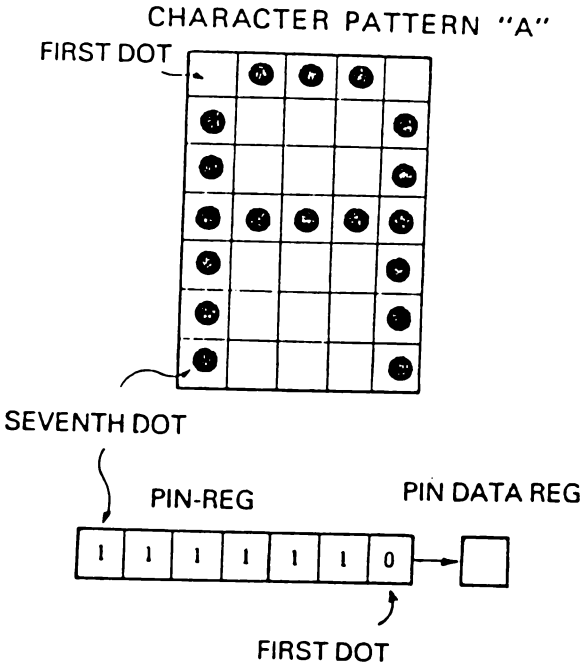
1. Main flowchart



5.1

2. Hammer drive (pin drive) flowchart

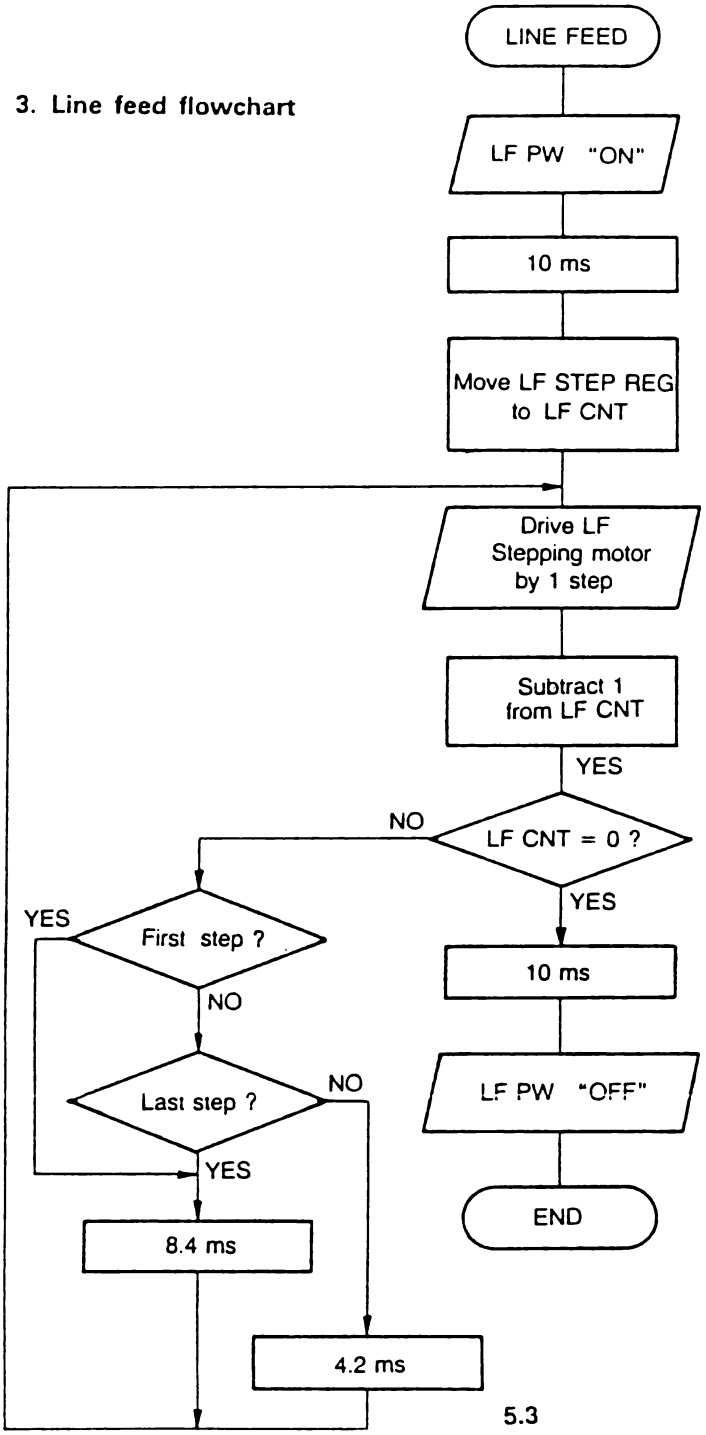




PIN CNT: Counter for 1 column (7 dots) of character pattern
PIN REG: Register storing 1 column (7 dots) of character pattern
DOT SNS: Timing signal for each dot
PIN DATA REG: 1 bit register for a dot to be printed

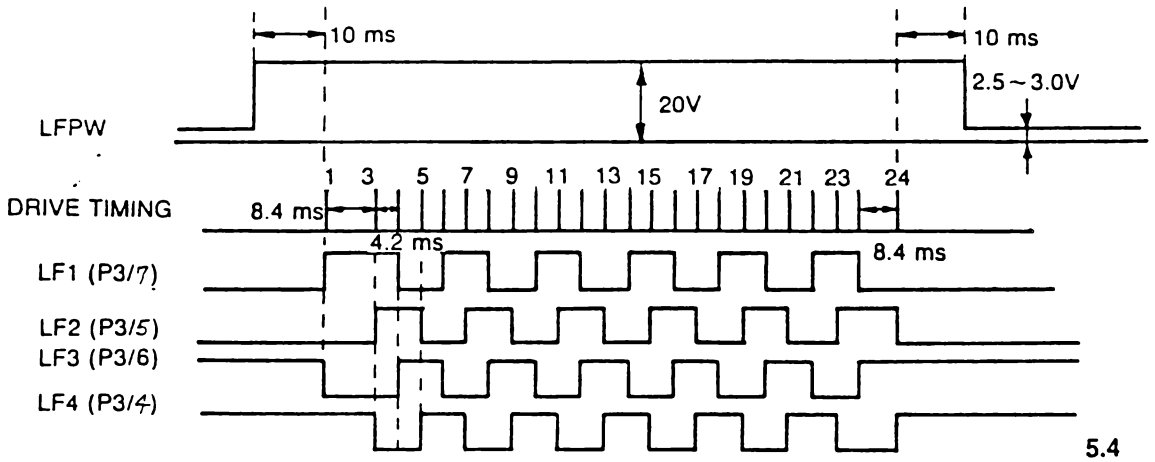
5.2

3. Line feed flowchart



5.3

LF CNT: A step counter for the LF stepping motor
LF STEP REG: A register memorizing the number of steps per line feed.
LF PW: Power for the LF stepping motor.



5.4

1/144 inch is the smallest unit of movement and occurs when the LF stepping motor is driven one step.
24 pulses of the DRIVE TIMING perform a line feed of $24 \times 1/144 = 1/6$ inch.

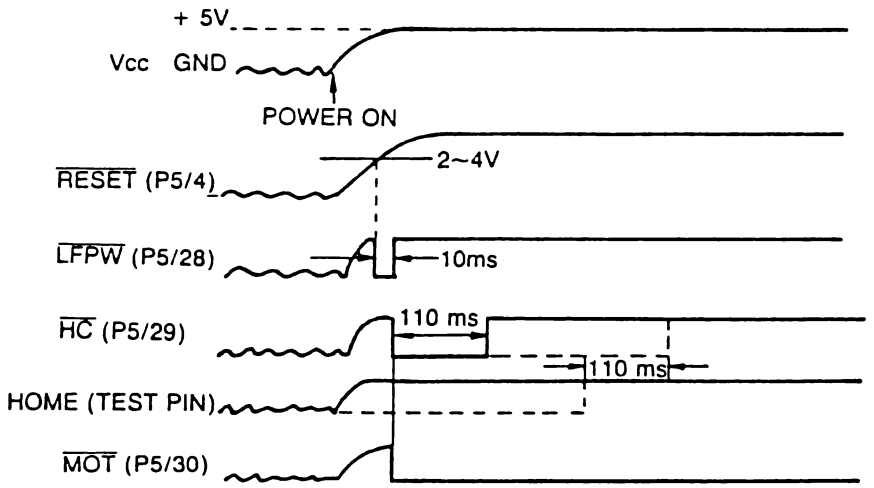
[6] TIMING DIAGRAM

1. Initialization sequence

When power is applied or $\overline{RES}$ signal is input, the printer executes the following initialization.
1. Resets the control circuit.
2. Generates and stores a print start timing value by moving the print head twice.
3. Brings the print head back to the home position.

When power is applied, P 5/4 [Pin 4 of the CPU chip located at P 5] receives the $\overline{RESET}$ signal. The CPU is reset as long as this signal is LOW. The CPU is activated as soon as the $\overline{RESET}$ signal rises from LOW to HIGH.
First, in order to align the phase of the LF stepping motor, the LF1 (P3/7) and LF2 (P3/5) signals are both raised to HIGH and the LF3 (P3/6) and LF4 (P3/4) signals are brought LOW. The drivers (P3/10, 12) go LOW (ON) and the drivers (P3/11, 13) go HIGH (OFF). Then lowering the $\overline{LFPW}$ signal (P5/28) makes the driver (P3/15) go LOW and turns the Q 1 ON so that LFPW rises to + 20V from the standby voltage (2.5V~3.0V). The $\overline{LFPW}$ signal (P5/28) is brought HIGH approximately 10 ms later. Thus the driver (P3/15) goes HIGH to return the $\overline{LFPW}$ to the standby voltage (2.5 ~3.0V).

Next, the CPU sets the $\overline{MOT}$ signal (P5/30) and $\overline{HC}$ signal (5/29) LOW which turns the driver (Q 5) ON (LOW). When it is ON, the H solenoid is activated, which allows the recovery spring to return the print head to the home position. The HOME signal (TEST PIN), which is shaped from the output of the home sensor, is HIGH when the print head is at the home position, and LOW when it is away from the home position. After the CPU sets the $\overline{HC}$ signal LOW, it checks the HOME signal to see whether it is HIGH or LOW. If is HIGH, the CPU will go to the next routine after about 110ms; if it is LOW, the CPU waits until it becomes HIGH and then about 110ms later, the CPU will go to the next routine. The next routine is to move the print head twice from the home position to approximately the 15th character column and back to the home position. During both movements, the $\overline{PIN}$ signal and the $\overline{LFPW}$ signal remain inactive. During the second movement, the CPU checks and stores the timing of the falling-edge of the HOME signal relative to the DOT signal (TEST PIN). This timing is used by the CPU to decide when to start printing.
The initialization sequence explained so far will also be executed when a $\overline{RESET}$ signal input.

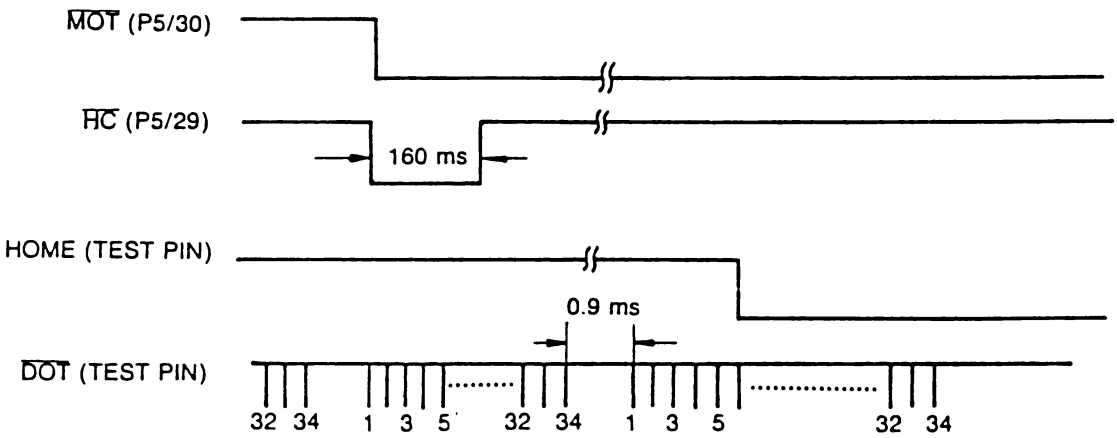


Dotted lines show the case when the print head is away from the home position.

6.1

2. Start of the printing operation

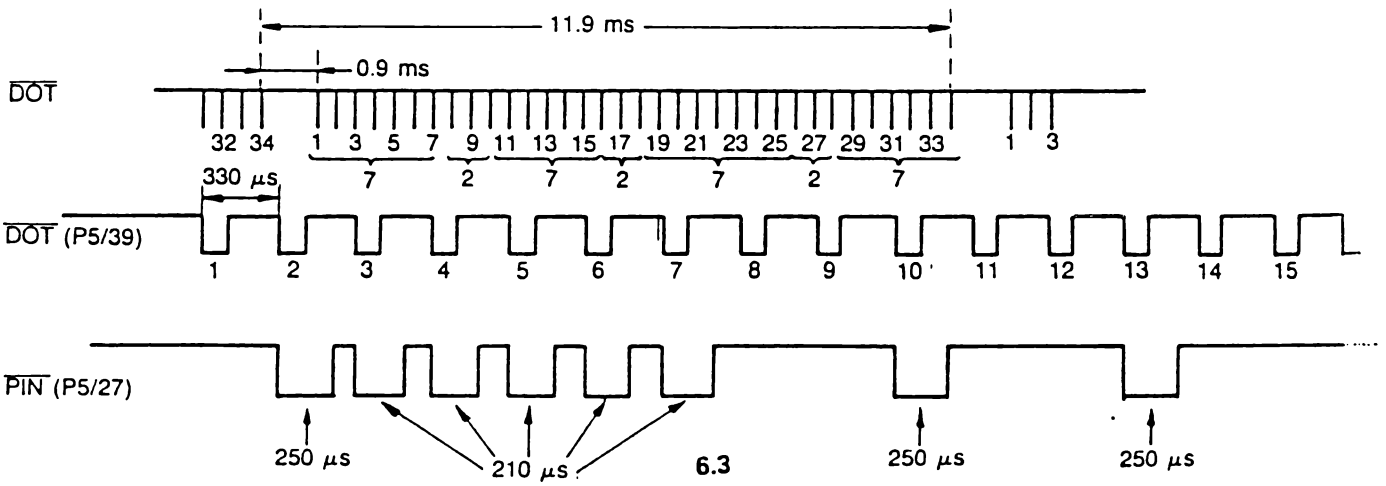
When printing starts, the CPU sets the $\overline{MOT}$ signal (P5/30) and the $\overline{HC}$ signal (P5/29) LOW. When the $\overline{MOT}$ signal goes LOW, the driver Q4 goes LOW (ON) causing the motor to rotate. Since the $\overline{HC}$ signal is LOW, the H solenoid is activated, which disengages the motor shaft from the print head carrier so that the motor can reach a constant speed before any movement of the print head occurs. After approximately 160ms, the $\overline{HC}$ signal is set HIGH, which causes the motor shaft and the print head carrier to engage, and allows the print head to be driven to the right. Next, the CPU waits to see if the print head leaves the home position by sampling the HOME signal. After confirming that the HOME signal has gone LOW, which means the print head carrier has moved out of the home position, the CPU checks the $\overline{DOT}$ signal in order to decide when to start printing. The $\overline{DOT}$ signal is a shaped output signal from the dot sensor and, as shown in the figure below, it comes in groups of 34 sequential pulses. When the HOME signal goes LOW, the CPU starts to count the number of dot pulses until the $\overline{DOT}$ signal stays HIGH for approximately 0.9ms. The CPU then compares this number with the number stored during initialization in order to decide when to start printing.



6.2

3. Printing operation

The CPU synchronizes the $\overline{PIN}$ signal (P5/27) to the $\overline{DOT}$ signal. The $\overline{PIN}$ signal is for driving the print hammer; when it goes LOW, the driver (Q2) goes LOW (ON) to activate a print hammer to print a dot.

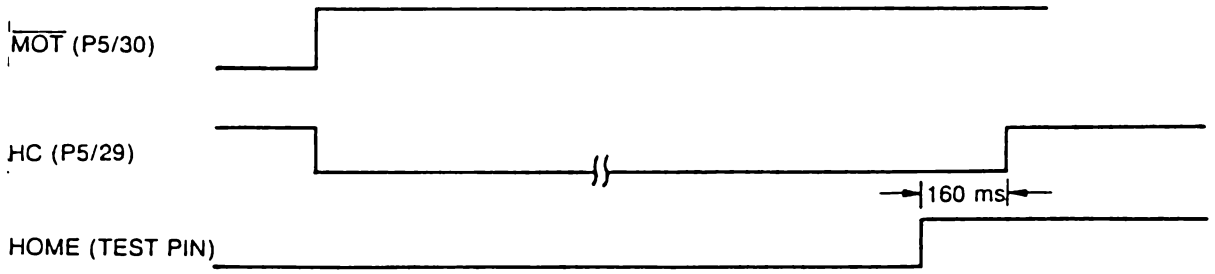


6.3

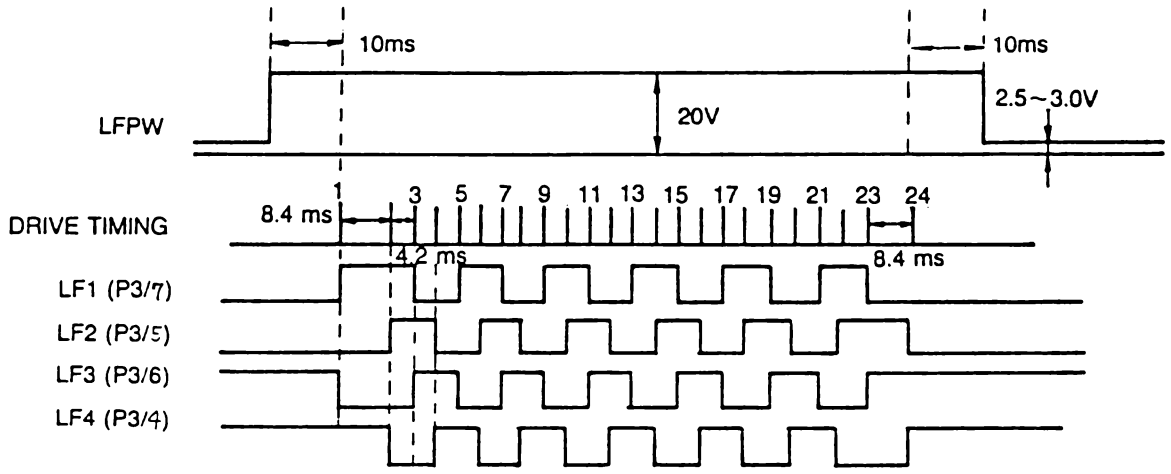
The diagram above shows what happend when character 'A' is printed. Dot pulses 1~7, 10~16, 19~25 and 28~34 are synchronized to activate the $\overline{PIN}$ signal.

4. Carrier return operation

After printing a line, the CPU sets the $\overline{MOT}$ signal (P5/30) HIGH and the $\overline{HC}$ signal (P5/29) LOW. The motor then stops and the print head begins to return to the home position because it is pulled by the recovery spring. If a carrier return operation includes a line feed, the CPU sets the $\overline{LFPW}$ signal (P5/28) LOW and drives the stepping motor about 10ms later. Refer to the linefeed flowchart.
After performing a line feed, the CPU waits until the HOME signal goes HIGH, which means the print head has returned to the home position.
When the HOME signal becomes HIGH, the CPU sets the $\overline{HC}$ signal HIGH about 160ms later, ending the carrier return operation.



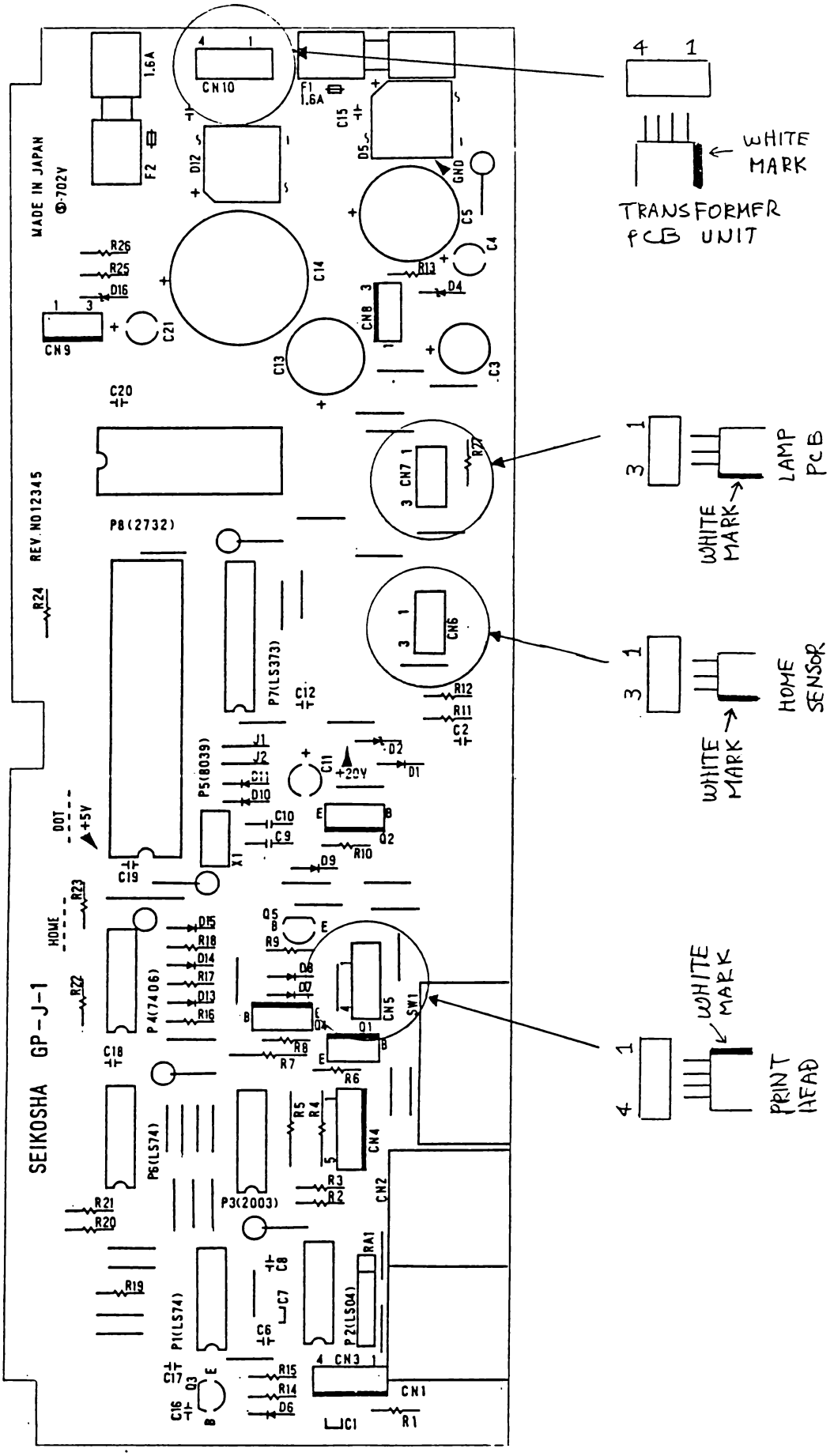
6.4

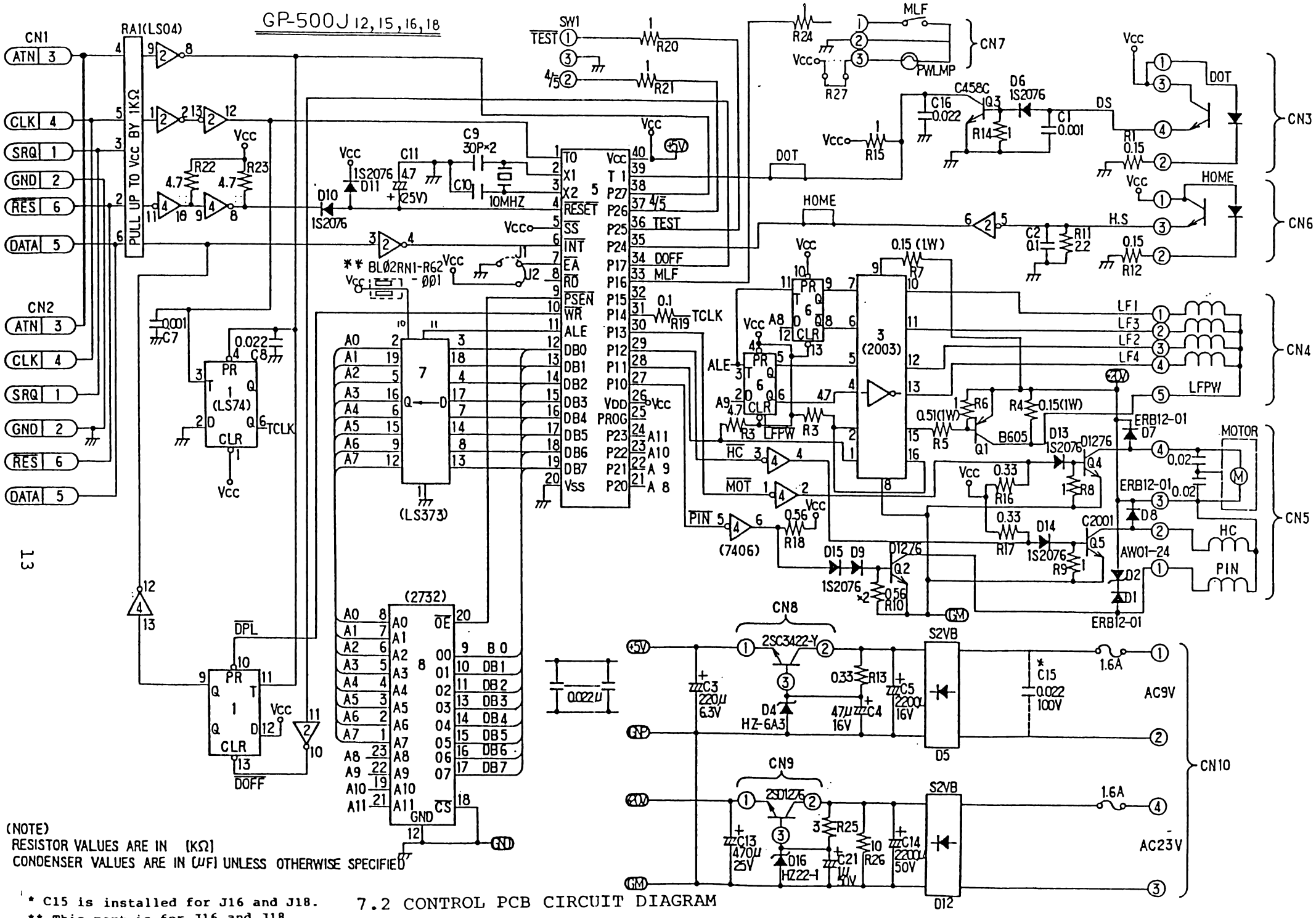


6.5

1/144 inch is the smallest unit of movement and occurs when the LF stepping motor is driven one step. 24 pulses of the DRIVE TIMING perform a line feed of 24×1/144 = 1/6 inch.

7.1 WIRING CONNECTIONS

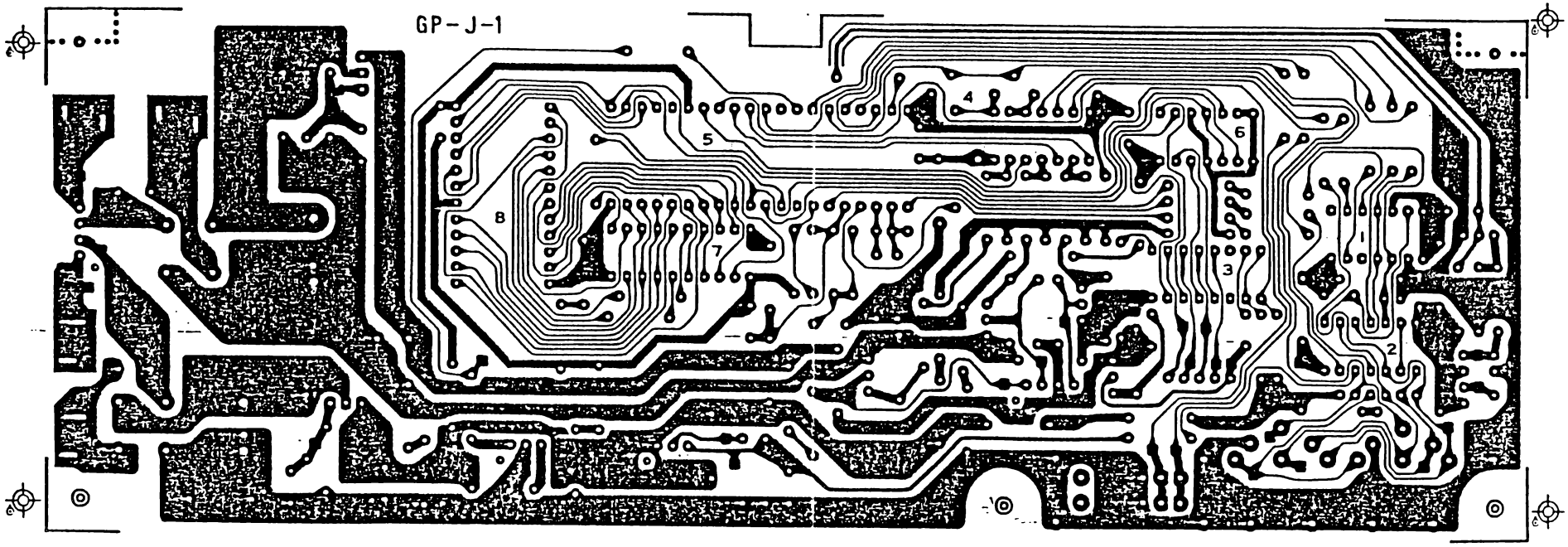




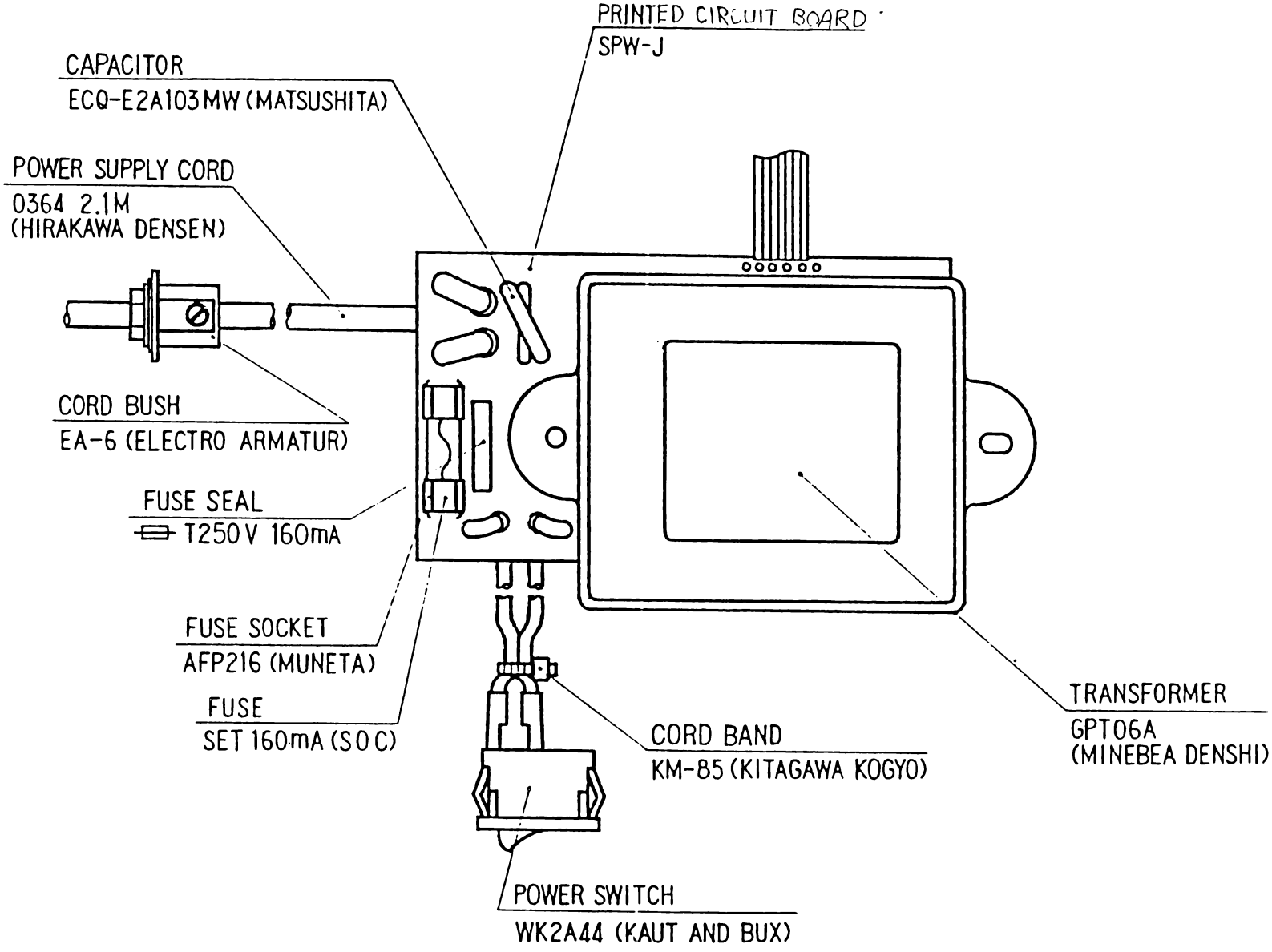
(NOTE)
RESISTOR VALUES ARE IN [KΩ]
CONDENSER VALUES ARE IN [μF] UNLESS OTHERWISE SPECIFIED

* C15 is installed for J16 and J18.
** This part is for J16 and J18.

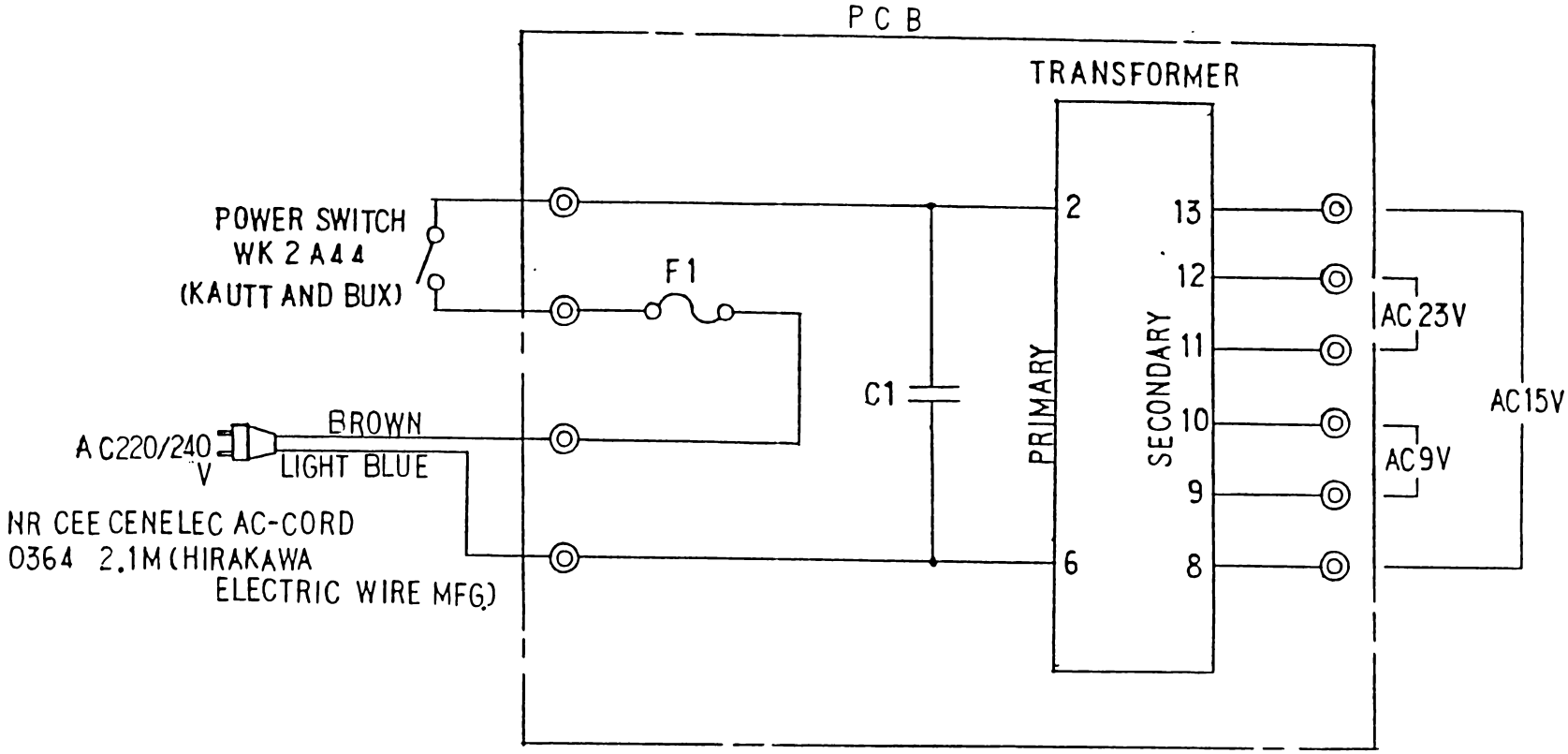
7.2 CONTROL PCB CIRCUIT DIAGRAM



7.3 CONTROL PCB PATTERN SCREEN

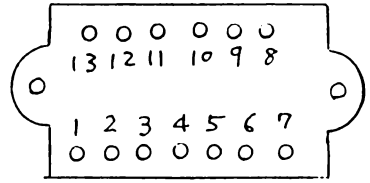


8.1 TRANSFORMER PCB UNIT TOP VIEW
GP-500J16 FOR EUROPE



C1 : ECQ-E2A103MW (MATSUSHITA)
OR ECQ-U2A103MF (MATSUSHITA)
F1 : SET 250V, 160mA (SANO)

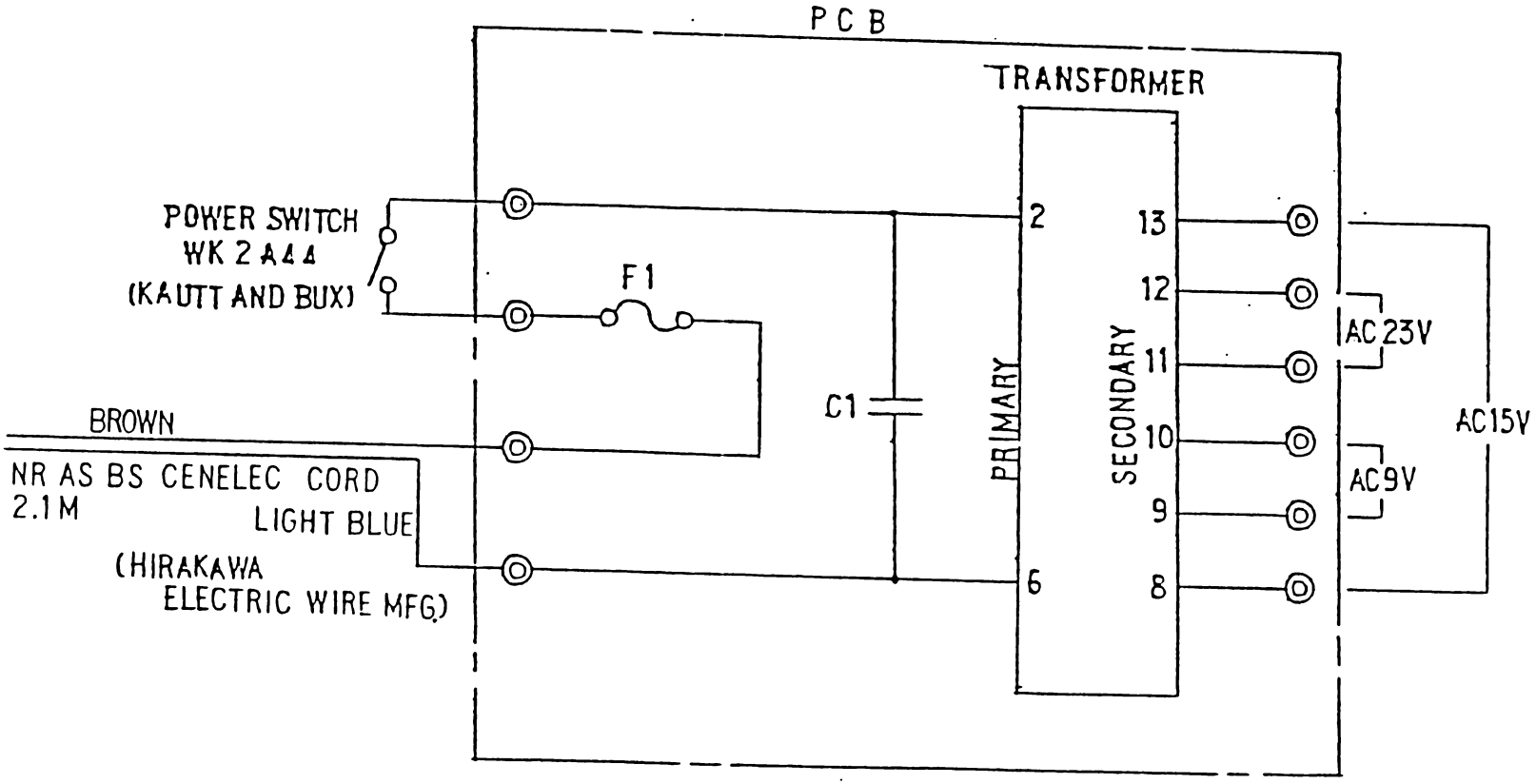
TRANSFORMER : GPT 06A (MINEBEA DENSHI)



TRANSFORMER
BOTTOM VIEW

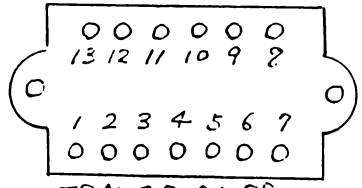
8.2 PRIMARY CIRCUIT

GP-500J16 FOR EUROPE



C1 : DE7150FZ103PVA-1 (MURATA)
OR CK45F2GA103Z (TDK)
F1 : SET. 250V, 160mA (SANO.)

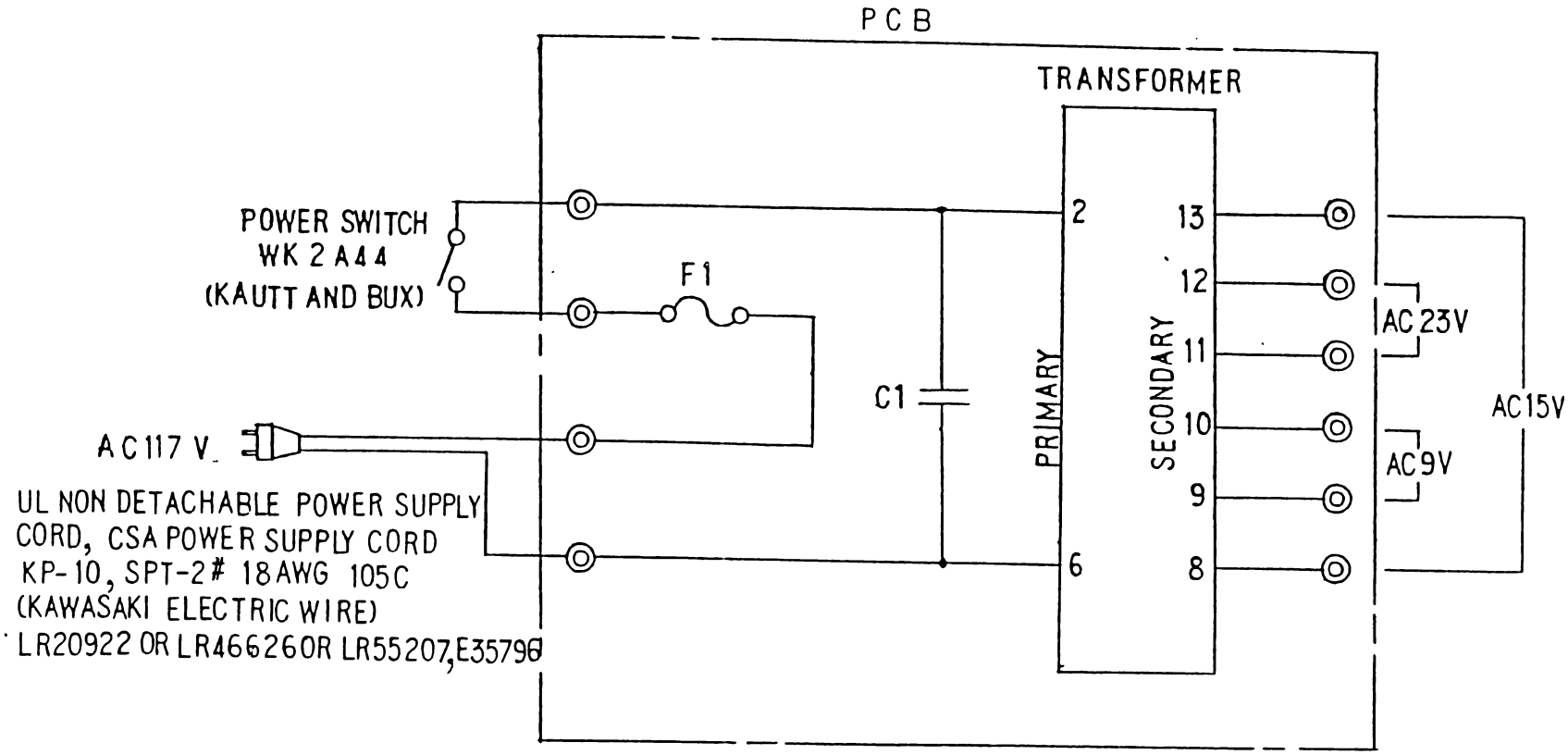
TRANSFORMER: GPT 06A(MINEBEA DENSHI)



TRANSFORMER
BOTTOM VIEW

8.3 PRIMARY CIRCUIT

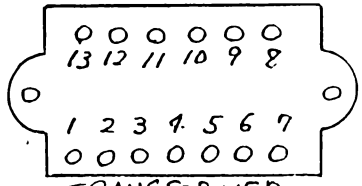
GP-500J18 FOR ENGLAND



C1: KC TYPE, 10000PF, 125VAC (MURATA) LR36214 E37921

F1: MT-4, 250V, 630mA (SANO) E39265 LR34647

TRANSFORMER: GPT 02A (MINEBEA DENSHI)



TRANSFORMER BOTTOM VIEW

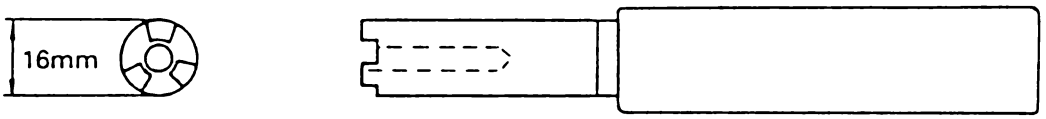
8.4 PRIMARY CIRCUIT

GP-500J12 FOR USA

[9] PREVENTIVE MAINTENANCE

1. Tools and measuring instruments

(1) Bearing driver (Special SEIKOSHA tool)
This is useful for replacing bearings.



9.1

(2) Screw for adjusting print head position, M3 × 6
(3) Screwdriver for 4mm nut
(4) Pliers and phillips screwdriver
(5) Oscilloscope
(6) Multimeter
All but (1) are commercially available.

2. Cleaning

Due to its material, each part has its own proper cleaning liquid and method. It should be noted that if an improper cleaning liquid is used or the cleaning method is incorrect, parts may be damaged or may not function properly. Follow the instructions in Table 1 to clean. It is helpful to use a hair drier to dry parts, but IF THE CLEANING LIQUID IS INFLAMMABLE, take care to keep it away from a blow drier.

PARTS	CLEANING METHOD	CLEANING OIL	DRYING METHOD	REMARKS
Metal parts	Brush washing	Benzine	Warm air	
Plastic parts of the Mechanisms	Brush washing	Benzine	Cool air	• Do not use any liquid other than the one designated. • Wash quickly, wipe with a cloth and dry rapidly. • Use good quality clean liquids.
Plastic parts of the enclosure	–	–	–	Wipe off dirt.
Rubber parts	–	–	–	Wipe off dirt.
Electrical parts	Do not wash			Wipe off dirt with a cloth dampened with benzine or alcohol.
Print head unit Carrier complete		–	–	

Table 1

3. Lubricants

Durability of the Printer is greatly affected by the type of lubricant employed. Following are the lubricants for exclusive use with the Printer and it is recommended that only those lubricants designated be used.

- Lubricant SF-100 Supplied in 30cc quantities
  Mainly for the gear shaft.
- Lubricant J-5 Supplied in 30cc quantities
  Only for the guide pillars B and C.
- Grease Commercially available
  Refer to the exploded view for the exact locations for applying lubricants.

[Note]

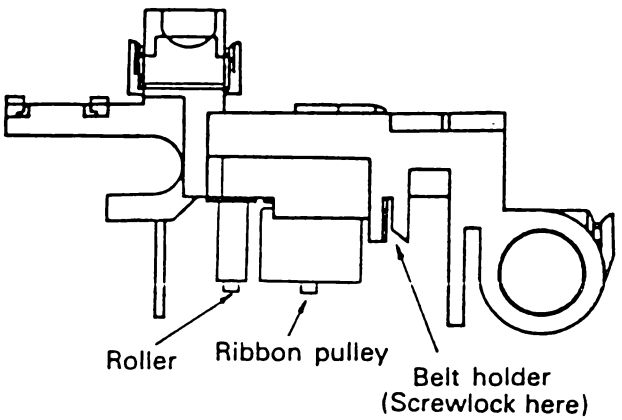
- Make sure that all points requiring lubrication are thoroughly cleaned before performing lubrication.

[10] ADJUSTMENTS

1. Timing belt installation

(1) Place the timing belt around the lower gear of the drive pulley (6-4) and around the idler pulley (4-2). The timing belt should be inserted into the belt holder of the carrier and also inserted between the ribbon pulley and the roller, as shown in the figure below. The timing belt is glued to the carrier at the belt holder with screwlocking agent.

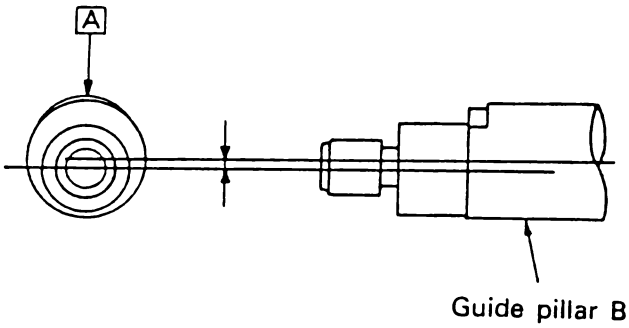
(2) While pressing the spring drum unit (4-3) outward to put tension on the timing belt, tighten the screw S-33 to hold the pulley plate block (4-4) in place on ground plate B (11-7).
There is a tendency for the carrier to return to the home position slower when the tension of the timing belt is increased.



10.1 Side view of the carrier

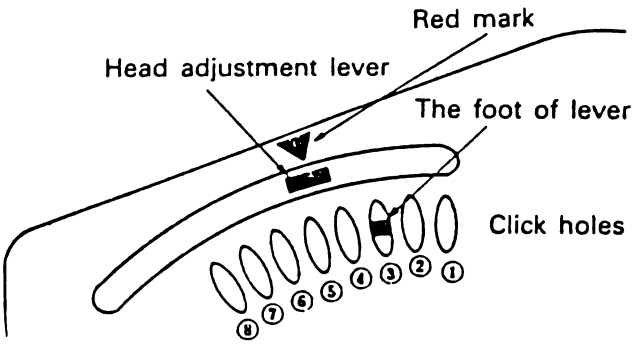
2. Guide pillar B installation

(1) Insert the damper (10-3), the carrier spacer (10-4), and the carrier unit (10-5) into guide pillar B (10-6). Insert guide pillar B into the ground plate R and L assemblies along with the bearing (9-4) on both ends. Guide pillar should be placed so that part [A] , which protrudes the most as shown in the figure below, is at the top position.



10.2

(2) Insert the head adjustment lever (10-2) into the left end of guide pillar B and tighten the flange nut (N-42) such the that the foot of the lever is set in click hole ③ , as shown in the figure below, when part [A] of guide pillar B is facing up. When tightening the flange nut, it is Q.K. to grasp the leftmost end of guide pillar B (10-6) with pliers, since it is coverd with the damper (10-3).



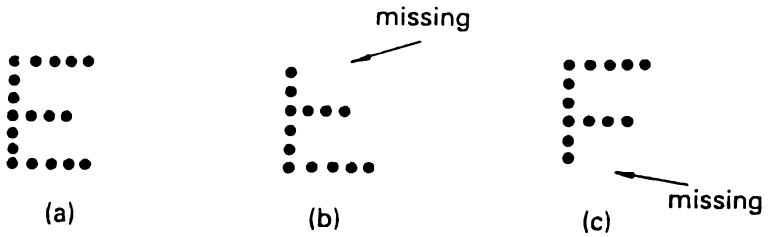
10.3 Ground plate L as viewed from the inside

[Note]

- Be sure that after tightening the flange nut, part [A] of guide pillar B (the part which protrudes the most), is at the top position when the foot of the lever is set in click hole ③

3. Dot sensor unit adjustment

Install the ribbon cassette and paper before printing.
Conduct printing and check to see if the upper part or the lower part of the printed characters is missing. If one or the other is missing, adjust position of the dot sensor unit to eliminate the missing part after loosening the screw S-36.



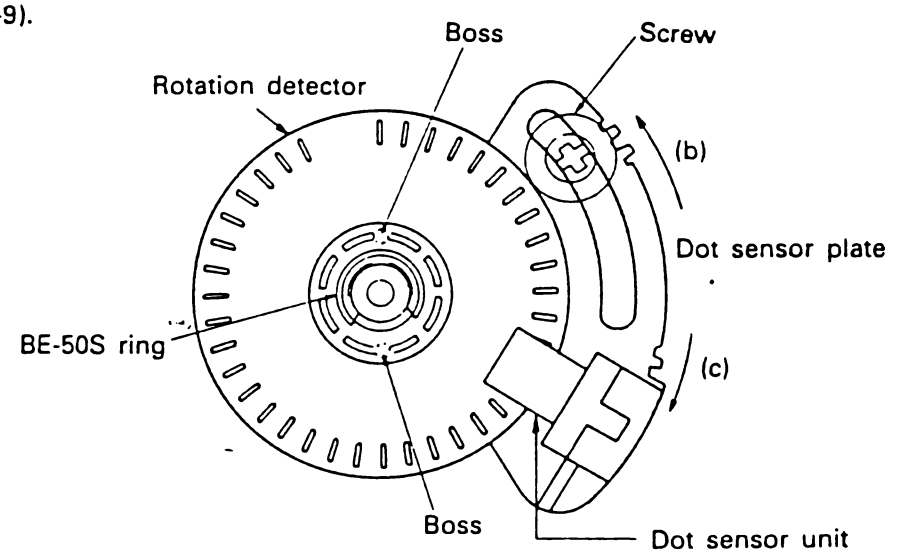
10.4

(a) Normal

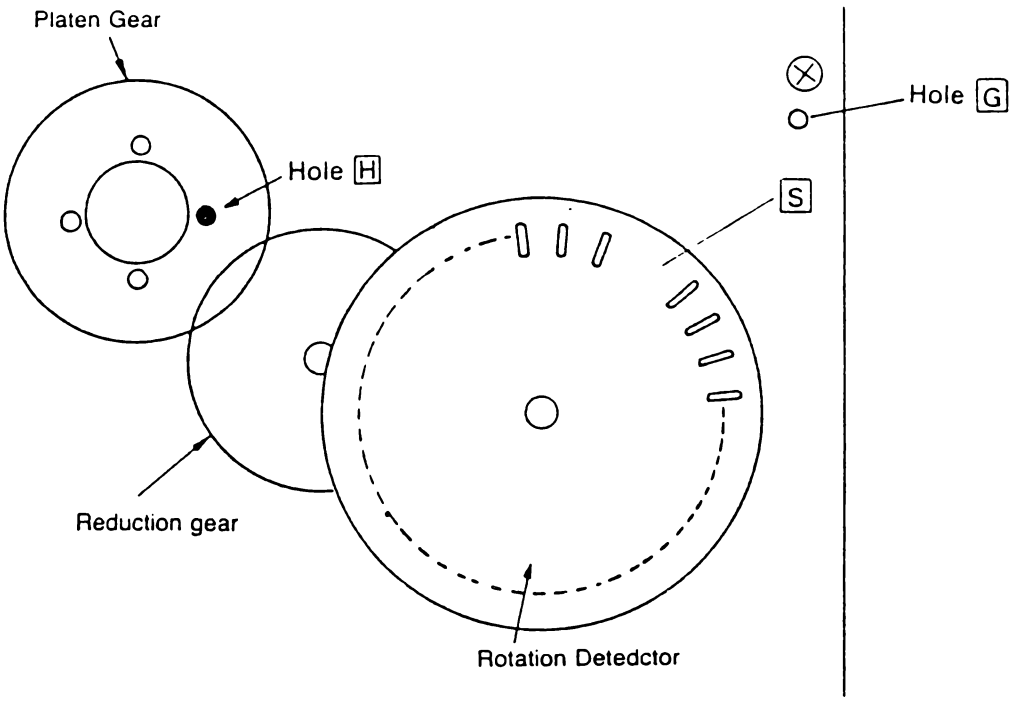
(b) The uppermost part is missing.
The hammer starts printing too early when a platen ridge has not yet reached the correct position.
In this case, move the dot sensor unit counterclockwise.

(c) The lower part is missing.
The hammer starts printing too late.
Move the dot sensor unit clockwise.

When it is impossible to make a satisfactory adjustment with the above method, after removing the rotation detector (8-7), rotate it clockwise 4 holes in the case of (b) or counterclockwise 4 holes in the case of (c) and then replace it.
The rotation detector can be replaced after removing the dot sensor unit and the BE-50S ring. Be sure to insert the rotation detector such that the two bosses on the rotation detector are engaged with the gears of the motor (8-9).



10.5

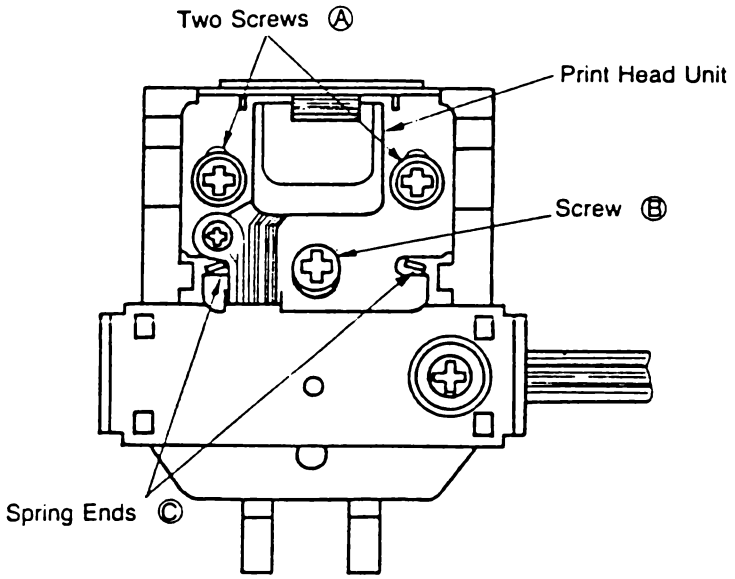


10.6

Rotate the platen gear (8-12) such that one of the holes of it matches hole H in ground plate R. Keep holding the platen gear while setting the rotation detector.
Set the rotation detector (8-7) so that part S , where there is no hole, is facing hole G of ground plate R.
Setting up by this method insures that it is possible to eliminate the missing upper or lower part of a character by only adjusting the position of the dot sensor unit.

4. Print head position adjustment

(1) Place the print head unit on top of the carrier so that both ends of spring Ⓒ appear.
(2) Loosely tighten the two screw Ⓐ Insert special adjusting screw to hole Ⓑ .
(3) Adjust the printed character quality with screw Ⓑ when the foot of the head adjustment lever is at position ③ , as shown in figure 11.3.
(4) Firmly tighten up the two screws Ⓐ and make sure that smudging does not apperar when the foot of the lever is at the position ① .
(5) Remove the screw Ⓑ which is a tool for adjusting print head position.



10.7 Top View of Print Head

5. Adjustment of Smudges on the Left or Right End

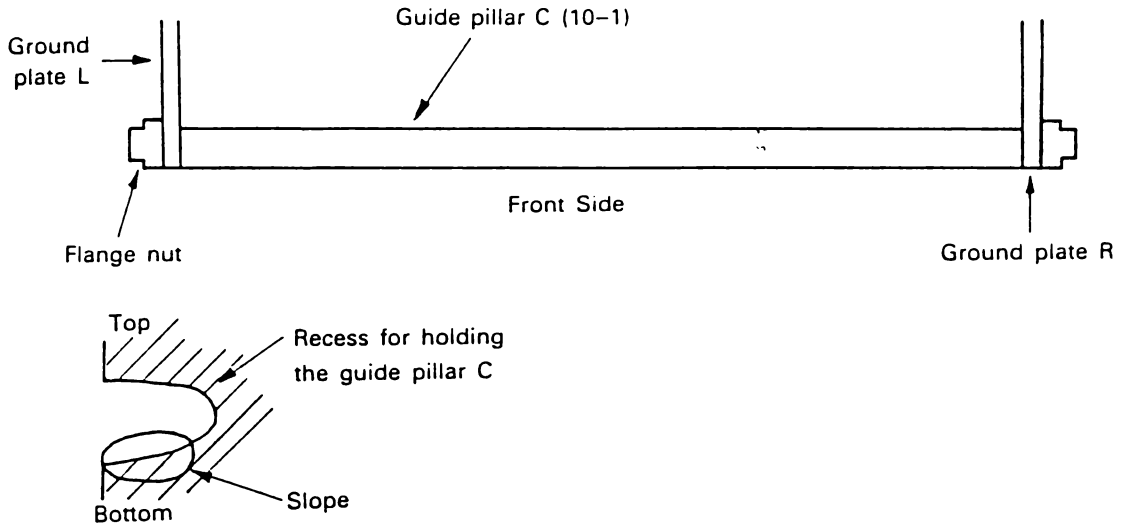
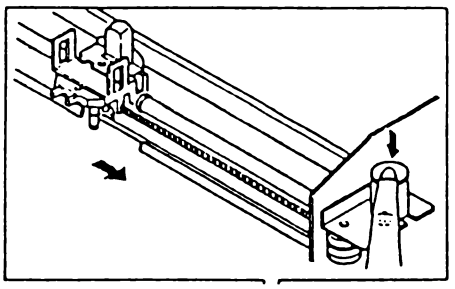


Figure 10-9

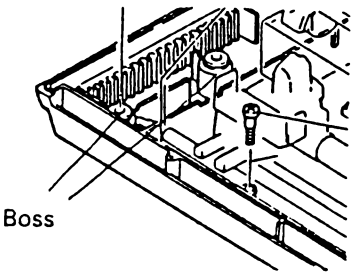
The recess on each ground plate for holding the guide pillar C has a slope at the bottom. When there is smudge on the left whereas no smudge on the right, slightly moving the left end of guide pillar C to the front can eliminate the smudge on the left.
If there is smudge on the right and no smudge on the left, moving the right end a little to the front eliminates the smudge appeared on the right.

[11] CAUTIONS

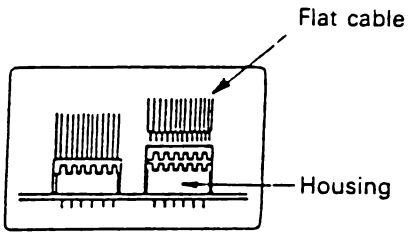
- Be sure to unplug the power cord from the outlet before removing the upper case.
- Do not try to move or apply undue force to the print head and carrier unit.
  They can be moved manually if the top of H solenoid (6-9) is pressed down to free clutch B (6-5) after removing the ribbon cassette.



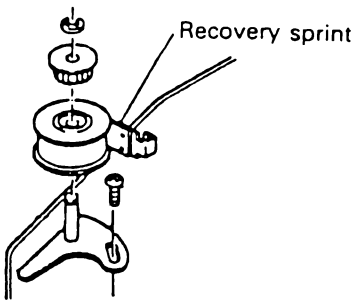
- Since the enclosure material is plastic, it is recommended that the 4 screws which hold the upper and lower cases together not be overtightened. Also replacing the transformer PCB unit too many times should be avoided because the 2 bosses of the bottom case may become too loose to hold the transformer PCB unit with two screws.



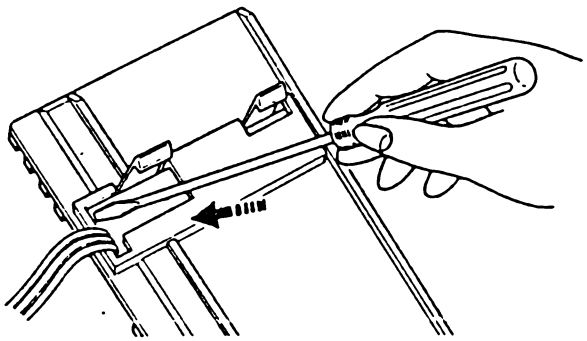
- Do not use lubricants other than the designated ones. Wipe off dirt with a clean cloth before lubrication.
- To detach the flat cable from the PCB, lift the connector housing and pull up on the cable. The cable is secured by lifting the connector housing, inserting the cable, and then pressing the housing down until it clicks into position. Make sure the connection is good by pulling up on the cable slightly.



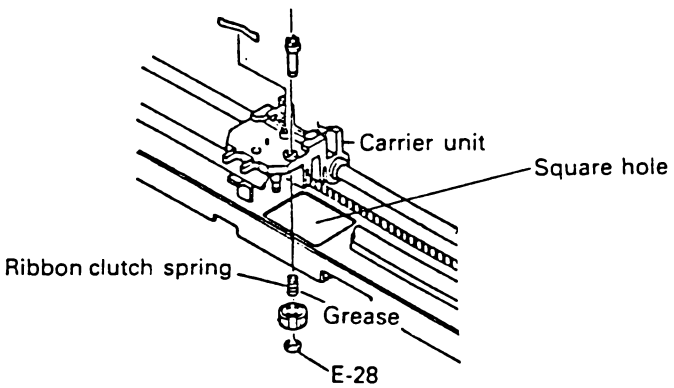
- Be careful not to cut your finger when detaching the spring of the idler pulley (4-2) from the carrier unit (10-5) since it is a very strong one.



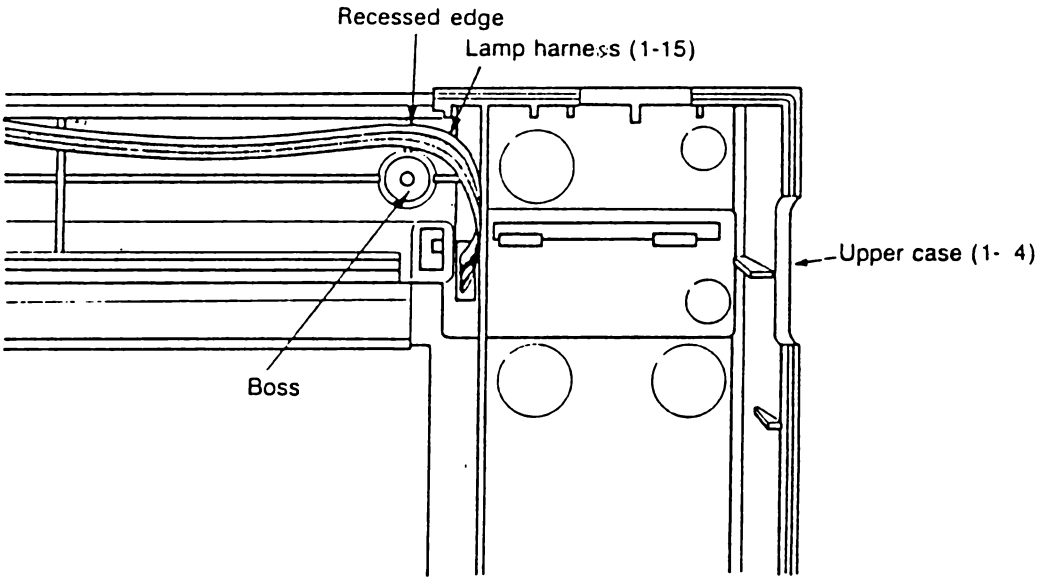
- The smooth side of E-ring should face a rotating gear.
- Once Pin B (7-3) is removed, replace it with a new one because it is quite easy to deform it while removing.
- To replace the lamp (1-14), push the lamp PCB unit (1-13) with a driver from the bottom of the decorative plate B (1-5). Refer to the figure below.



- The ribbon clutch spring (3-5) can be replaced through a square hole of the ground plate B (11-7) without removing any guide pillars.



- Whe replacing the upper case (1-4) on top of the lower case (1-6), push the lamp harness (1-5) into the recessed edge which is located between the boss and the rear panel of the upper case as shown in the figure below. .



[12] TROUBLESHOOTING

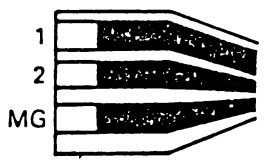
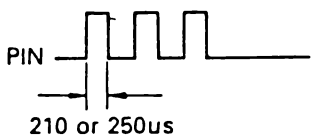
SYMPTOM 1. The POWER lamp does not light.

	POSSIBLE CAUSE	SOLUTIONS
1.	Fuse is blown	Replace only with a fuse of the same rating
2.	Power switch is broken	Replace it
3.	Transformer is bad	Disconnect the control PCB from the transformer PCB and check the secondary output of the transfomer.

SYMPTOM 2. The carrier unit does not move or movement is too slow or too fast.

	POSSIBLE CAUSE	SOLUTIONS
1.	Recovery spring (4-3) is broken.	Replace it.
2.	H solenoid (6-9) is defective.	Replace it.
3.	Timing belt (4-1) is broken.	Replace it.
4.	Motor (8-9) does not revolve.	Replace it or repair the control PCB.
5.	Guide pillar B (10-6) is not oiled.	Lubricate with the designated oil after wiping off dirt.
6.	The position of the idler pulley (4-2) is not correct.	Loosen the screw S-38 and adjust the position.
7.	The print head position is too near to the platen.	Readjust the position.

SYMPTOM 3. The carrier unit moves, but there is no printing.

	POSSIBLE CAUSE	SOLUTIONS
1.	The print head is defective. 	About 3.5 ohms of resistance should be measured between 1 and 2 if the print head is normal. Replace it if defective.
2.	Control PCB is defective. 	Check the output of PIN. Repair it.

SYMPTOM 4. Some part of a printed character is missing.

	POSSIBLE CAUSE	SOLUTIONS
1.	Part of the platen ridge is broken.	Replace the platen(11-6)
2.	Control PCB is defective.	Repair it.
3.	The position of the dot sensor(8-2)is not correct.	Adjust it.

SYMPTOM 5. Printing is too light.

	POSSIBLE CAUSE	SOLUTIONS
1.	Ribbon clutch spring is broken. (Ribbon shaft does not revolve to re-ink the ribbon.)	Replace it.
2.	Inker in the ribbon cassette is not correctly installed.	Reinstall or replace the inker.
3.	Print head is defective.	Replace it.
4.	Driver Q2 for PIN is broken.	Replace it.

SYMPTOM 6. Improper paper feeding.

	POSSIBLE CAUSE	SOLUTIONS
1.	LF motor(7-1)is defective.	Replace it.
2.	Control PCB is defective.	Check signals LF1～LF4 and repair.
3.	Pin B(7-3)is broken.	Replace it.

SYMPTOM 7. Self-test does not work.

	POSSIBLE CAUSE	SOLUTIONS
1.	Dot sensor(8-2)is bad.	Replace it or repair control PCB.
2.	Home sensor(4-9)is bad.	Repalce it or repair control PCB.
3.	Connections to PCB are defective or loose.	Replace or repair connections.
4.	Control PCB is defective	Repair it.
5.	Transformer PCB is broken	Repair it.

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