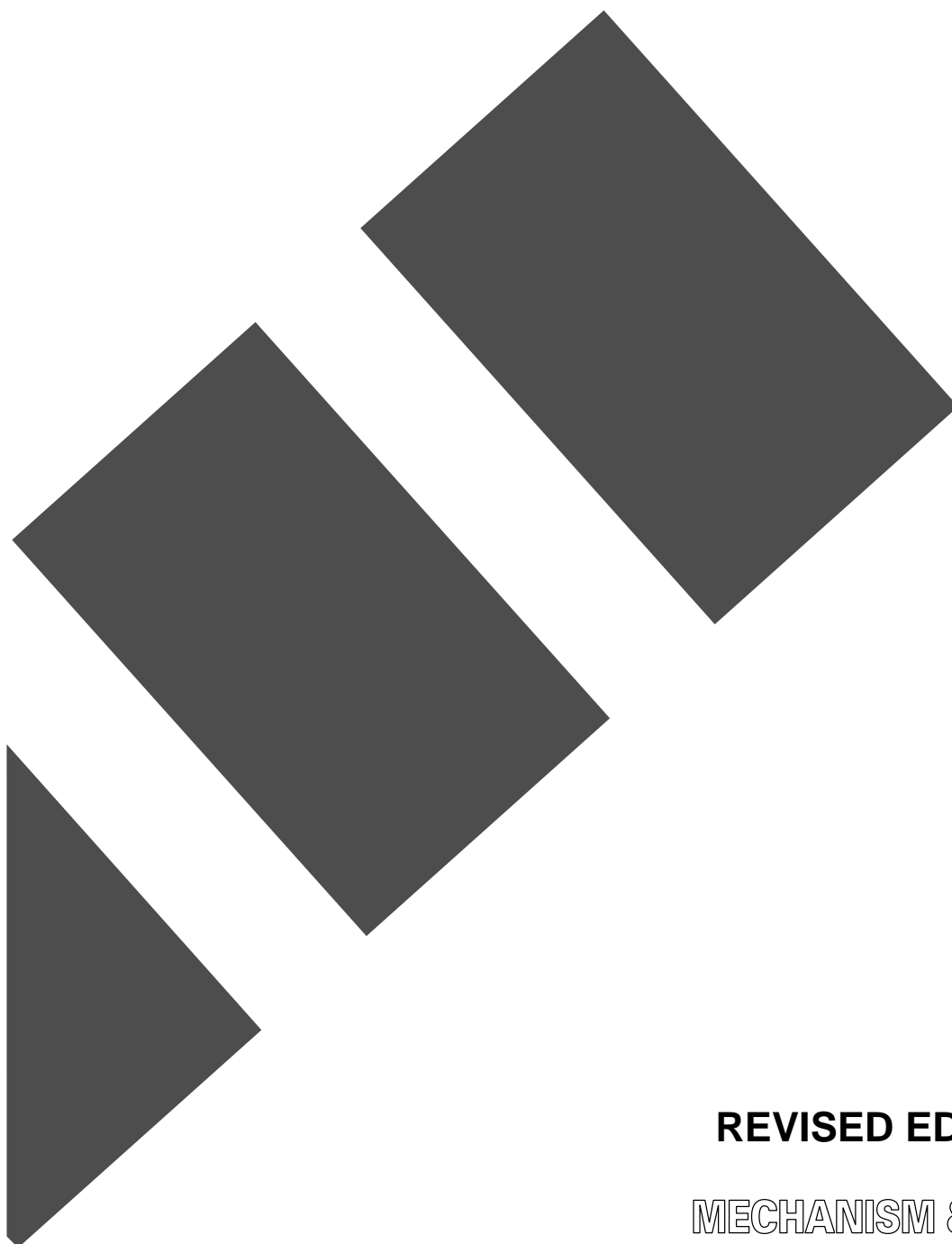




**WORD PROCESSOR  
SERVICE MANUAL**

**MODEL: DP-525CJ/DP-530CJ/DP-540CJ/DP-550CJ  
LW-800ic/LW-810ic/LW-810icBL/LW-840ic**



**REVISED EDITION**

**MECHANISM & ELECTRONICS**

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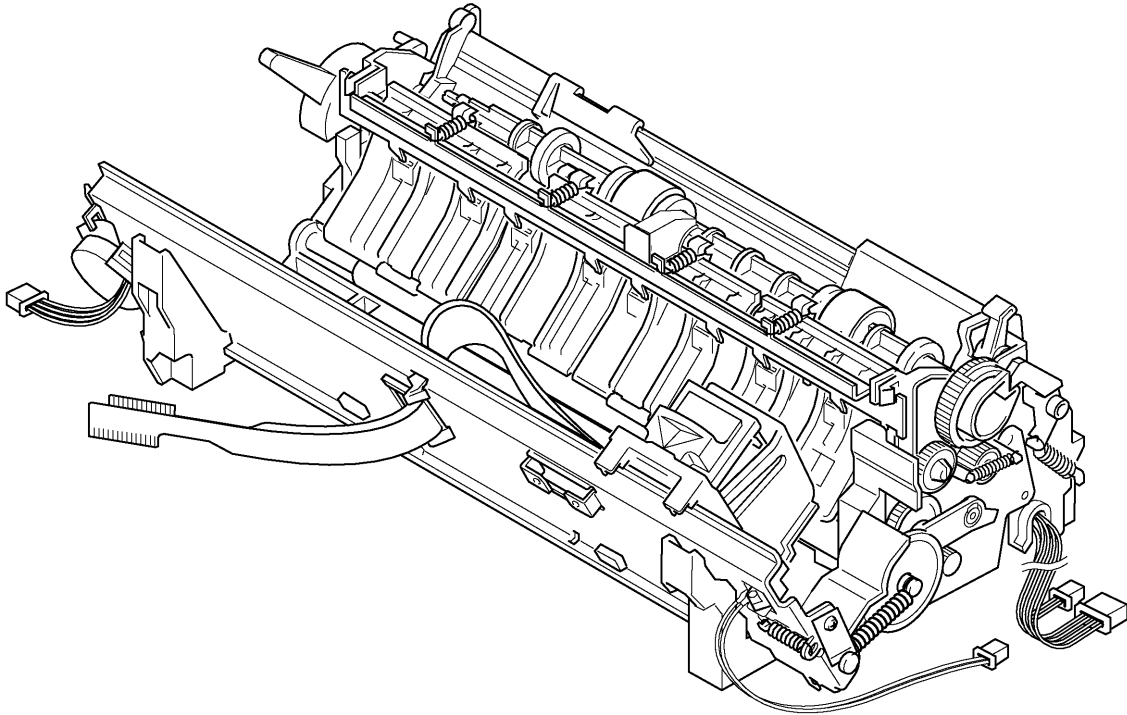
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**PART I      THEORY OF OPERATION****CHAPTER 1    MECHANICAL THEORY****1.      Ink Jet Printer**

**Fig. 1.1 Ink Jet Printer Assembly**

### **1.1. Ink Jet Printer System Configuration**

The ink jet printer contains the following components:

- Carriage assembly
- Carriage motion control system
- Paper feed mechanism
- Maintenance station
- Sensors

The outline of these components are described below.

#### **1. Carriage Assembly**

The carriage assembly consists of the carriage and ink cartridge (the cartridge contains the ink jet nozzles). The carriage consists of the head locker and locker spring, the rubber pad, and the flat cable.

#### **2. Carriage Motion Control System**

The carriage motion control system consists of the carriage motor, motor pulley, timing belt, idle pulley, and the idle pulley holder and holder spring.

#### **3. Paper Feed Mechanism**

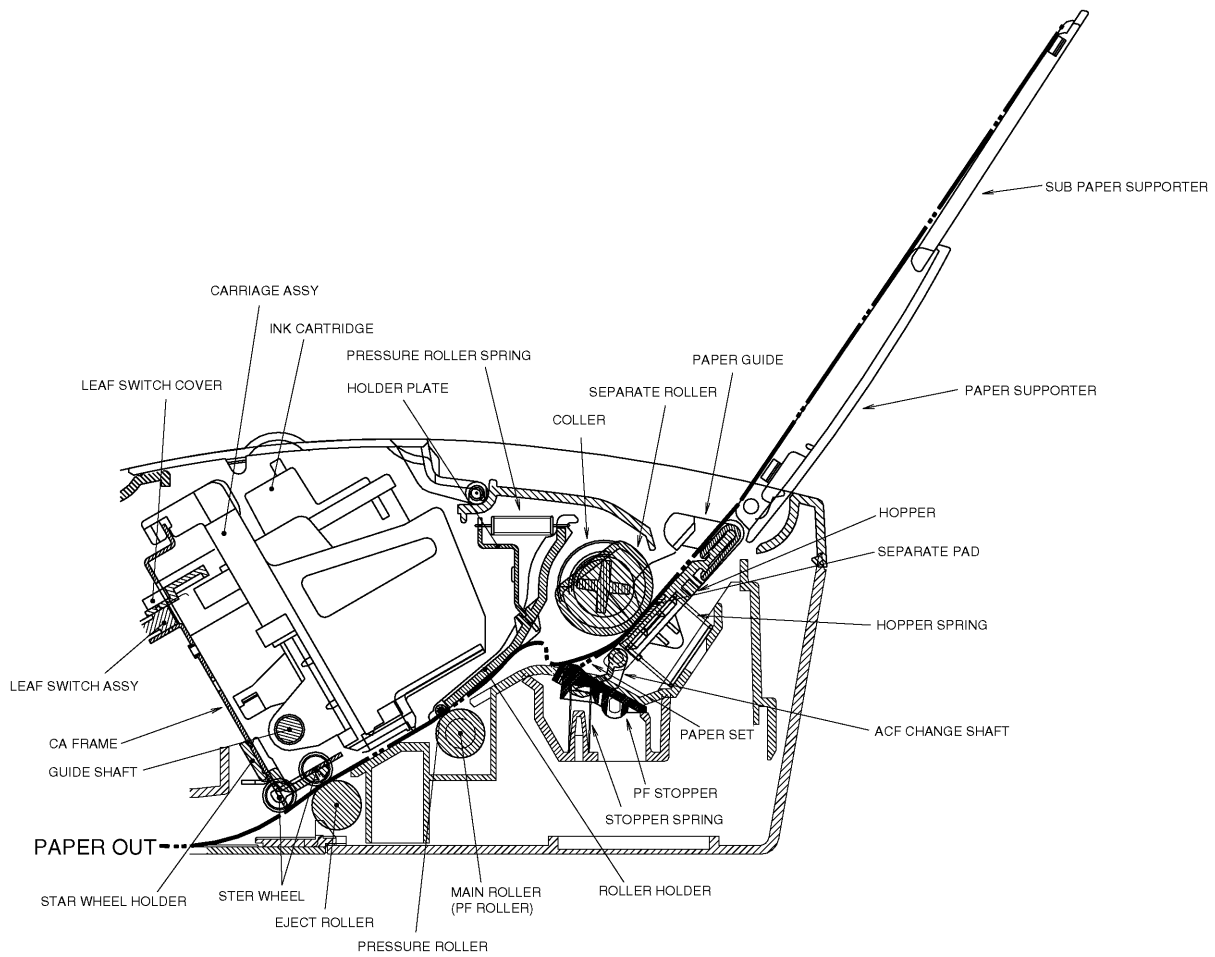
The paper feed mechanism consists of the paper feed system, paper eject system, and the paper setting system.

#### **4. Maintenance Station**

The maintenance station consists of the MS holder, the MS carriage assembly (carriage, rubber cap, plunger, compression spring, and extension spring), the wiper, and the felt form ink absorbers (in spitting trough and under carriage assembly ).

#### **5. Sensors**

There are two sensors in the printer assembly: the carriage home position sensor (attached to the top right end of the CA frame) and the paper end sensor (attached to the bottom of the PF base at the right rear).



**Fig. 1.2 General View of Printing Mechanism**

## 1.2. Ink Jet Operation

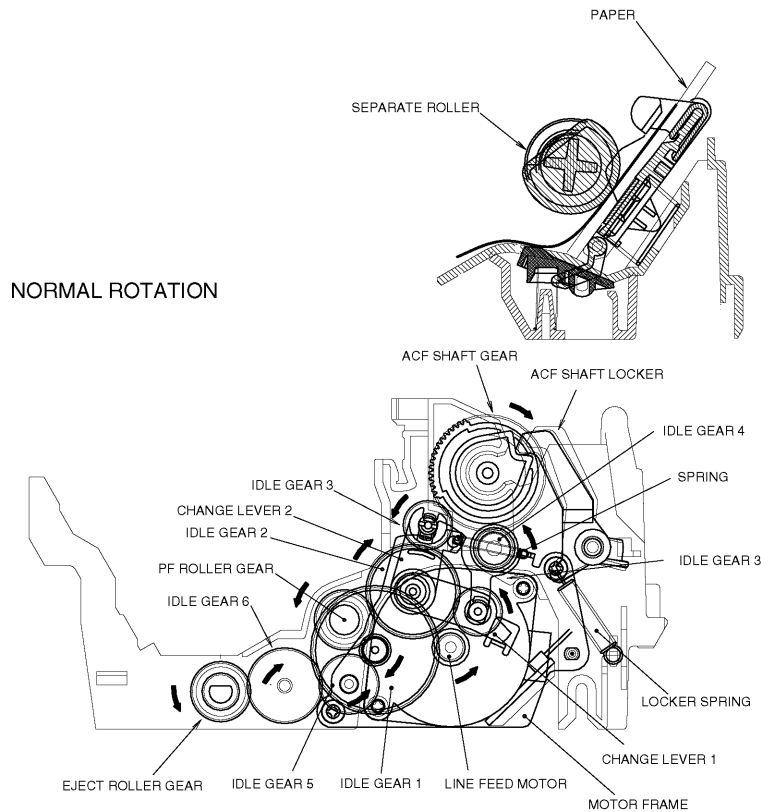
### 1.2.1. Paper Feed Mechanism

The paper feed mechanism consist of the paper feed system, paper eject system, and the paper setting system.

- (1)The paper feed system consists of the ACF shaft gear, separate roller, ACF shaft locker, locker spring, idle gears 1, 2, 3, and 4, PF roller gear, changer lever 1 and 2, spring, and the line feed motor.

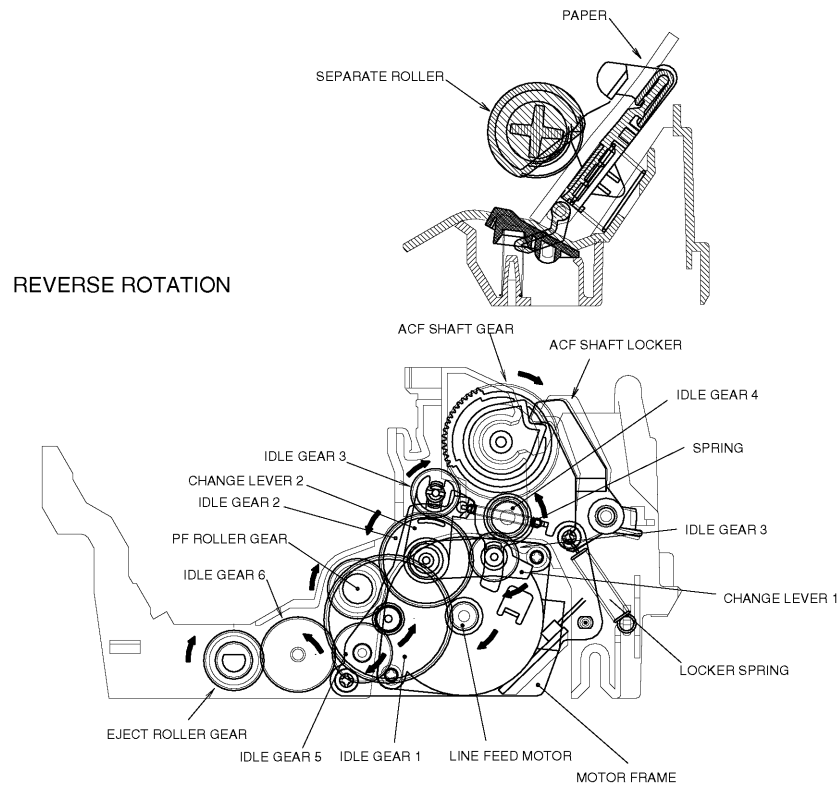
Paper feed system ACF(Auto cut-sheet feeder)

When the paper feed motor is driven in the opposite direction (reverse rotation) of the paper feeding, the change lever 1 moves to engage the ACF shaft gear via the idle gear. The separate roller rotates in the paper separation direction (normal rotation) and separates a sheet of paper. The separate roller rotates with paper feeding operation and returns to the initial position. Separated paper is fed to contact PF roller and the pressure roller by the separate roller where the top of the paper is registered.



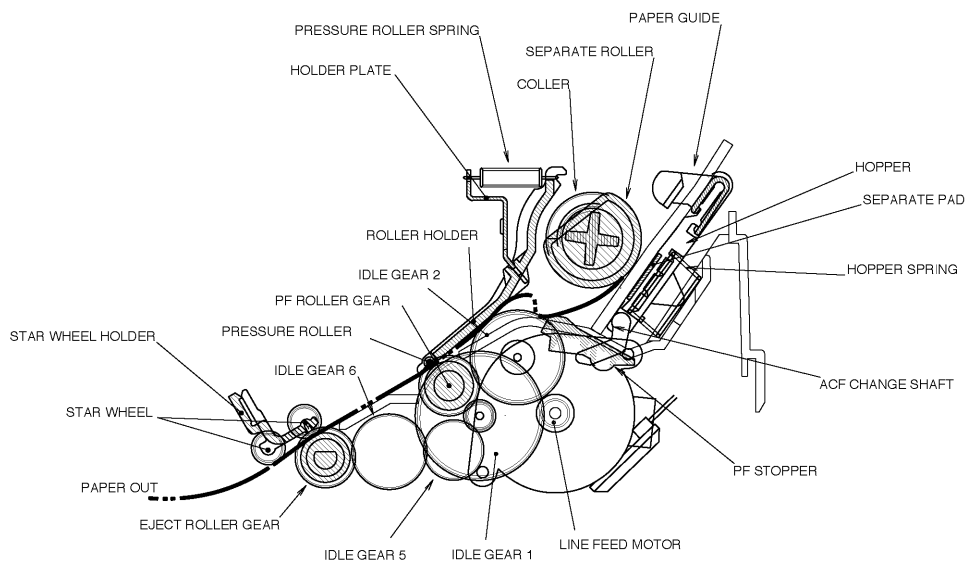
**Fig. 1.3A Paper Feed Mechanism**





**Fig. 1.3B Paper Feed Mechanism**

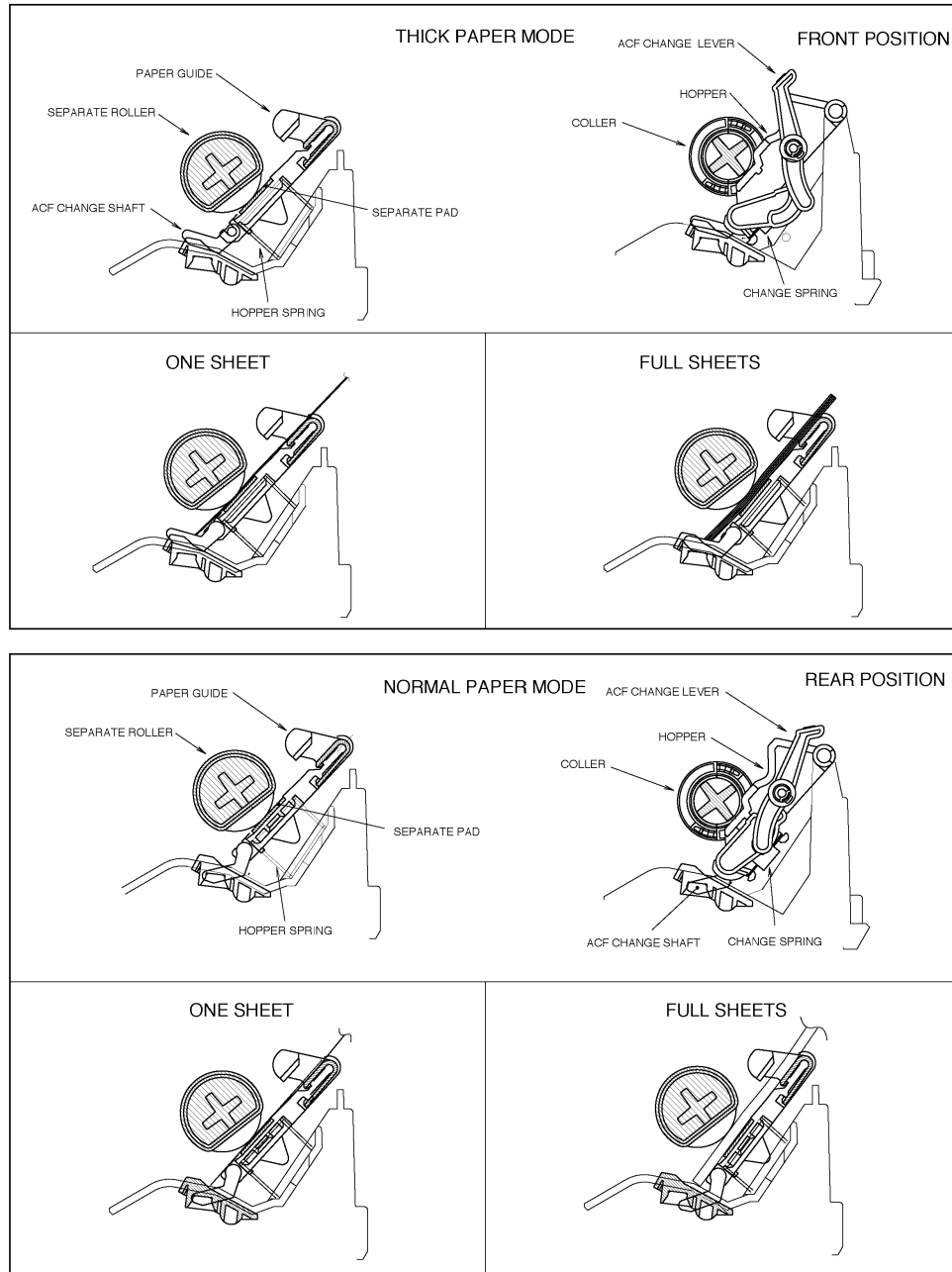
- (2) The paper eject system consists of the line feed motor, collar, idle gears 1, 5, and 6, PF roller gear, eject roller gear, pressure roller, roller holder, holder plate, pressure roller spring, star wheel holder, and the star wheel. After paper is registered, the paper feed motor is driven in the paper feeding direction (normal rotation) and paper is fed by the PF roller and the pressure roller. After printing paper is ejected by the eject roller and star wheel.



**Fig. 1.4 Paper Eject System**

- (3) The paper setting system consists of the hopper, hopper spring, separate pad, collar, paper guide, ACF change lever, change spring, and the ACF change shaft. When inserting a thick paper, the ACF change lever should place at the front position.

24lb Thick Paper  
Envelope  
Label  
Transparency etc.

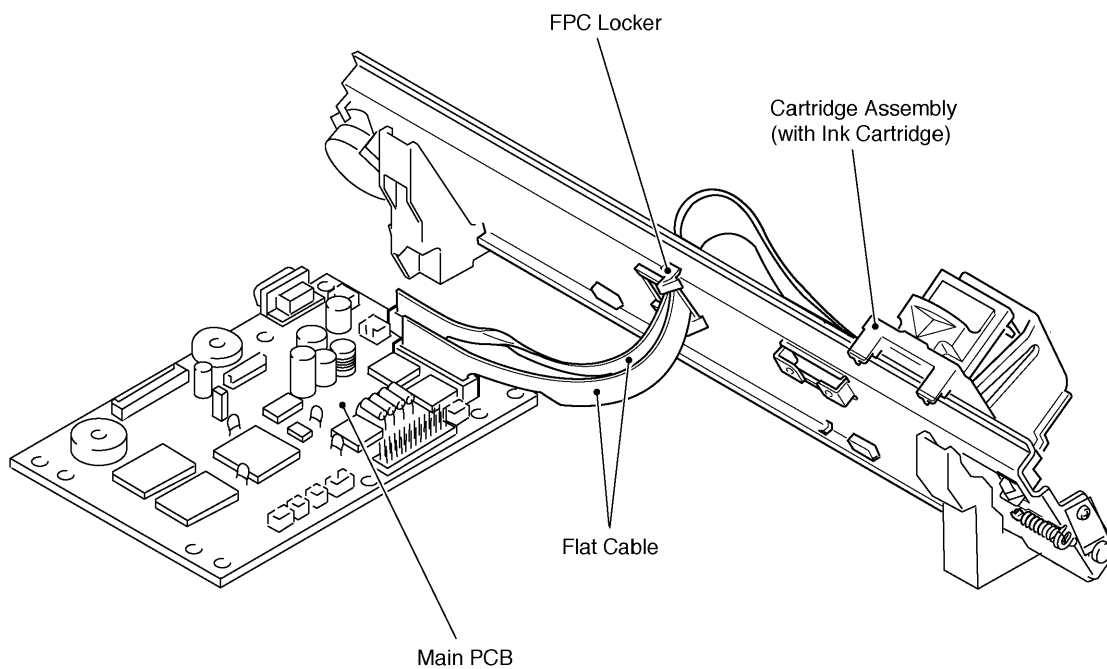


**Fig. 1.5 Paper Setting System**

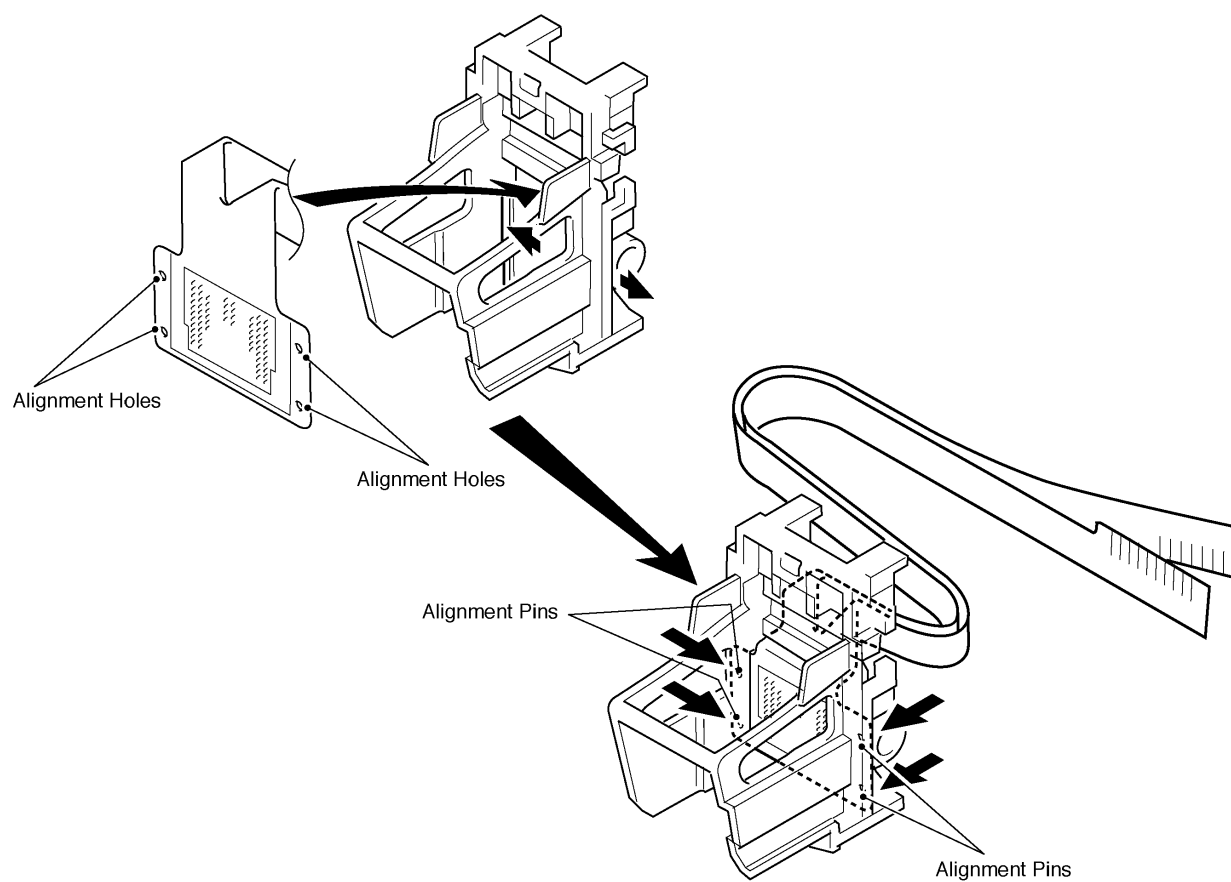
### 1.2.2. Carriage Assembly

The carriage assembly consists of the carriage and ink cartridge (the cartridge contains the ink jet nozzles). The carriage consists of the head locker and locker spring, the rubber pad, and the flat cable. The flat cable connects to the main PCB. See Fig. 1.6.

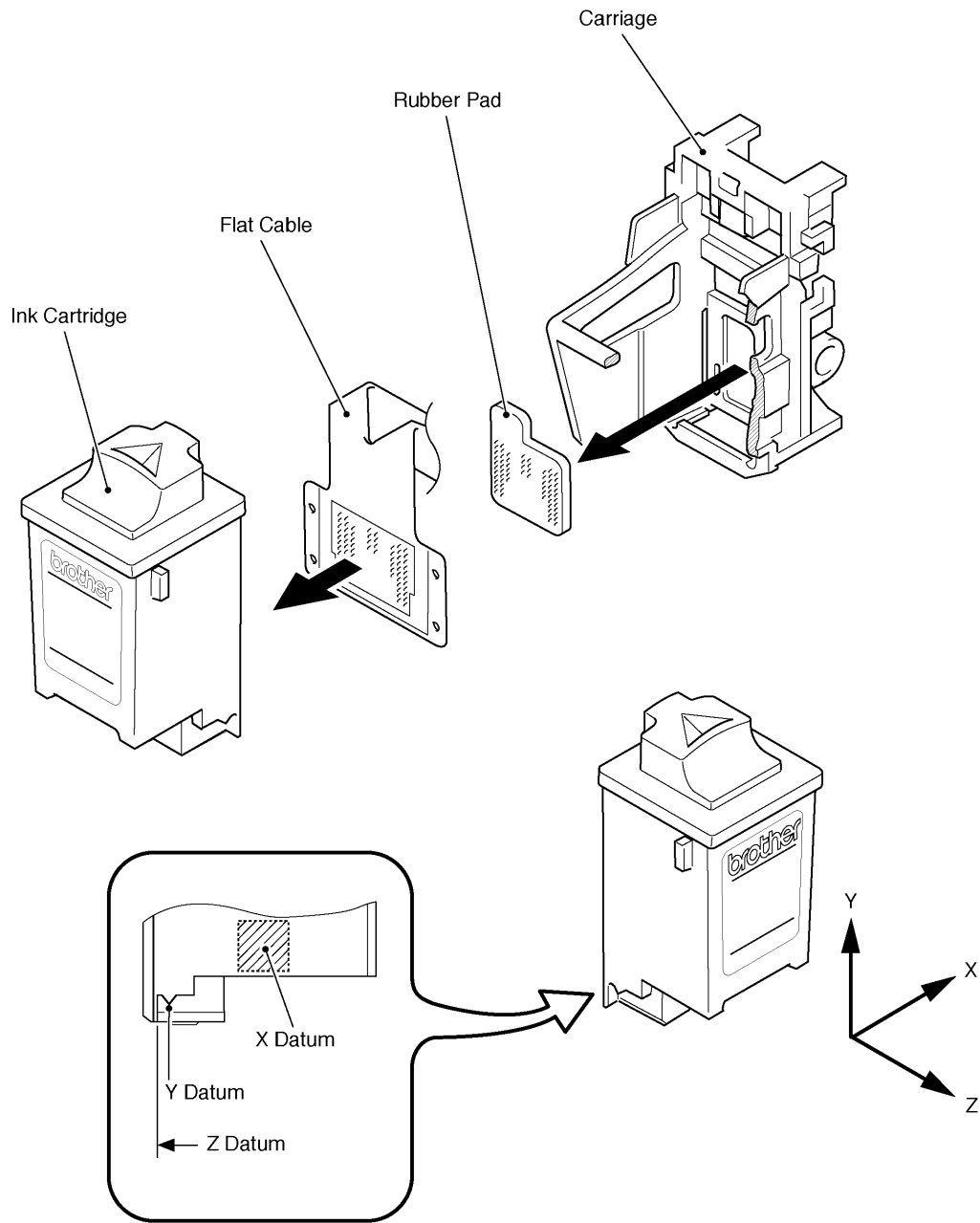
The printer flat cable must be firmly in contact with the ink jet cartridge for printing to be enabled. The flat cable is located in the carriage by four alignment pins; proper alignment of the cartridge to the cable is established in three datums (reference planes/points): X, Y, and Z. When the cartridge is installed in the carriage, the flat cable contacts are compressed against the cartridge contacts by the rubber pad. See Figs. 1.7 and 1.8.



**Fig. 1.6 Printer Flat Cable to Main PCB**



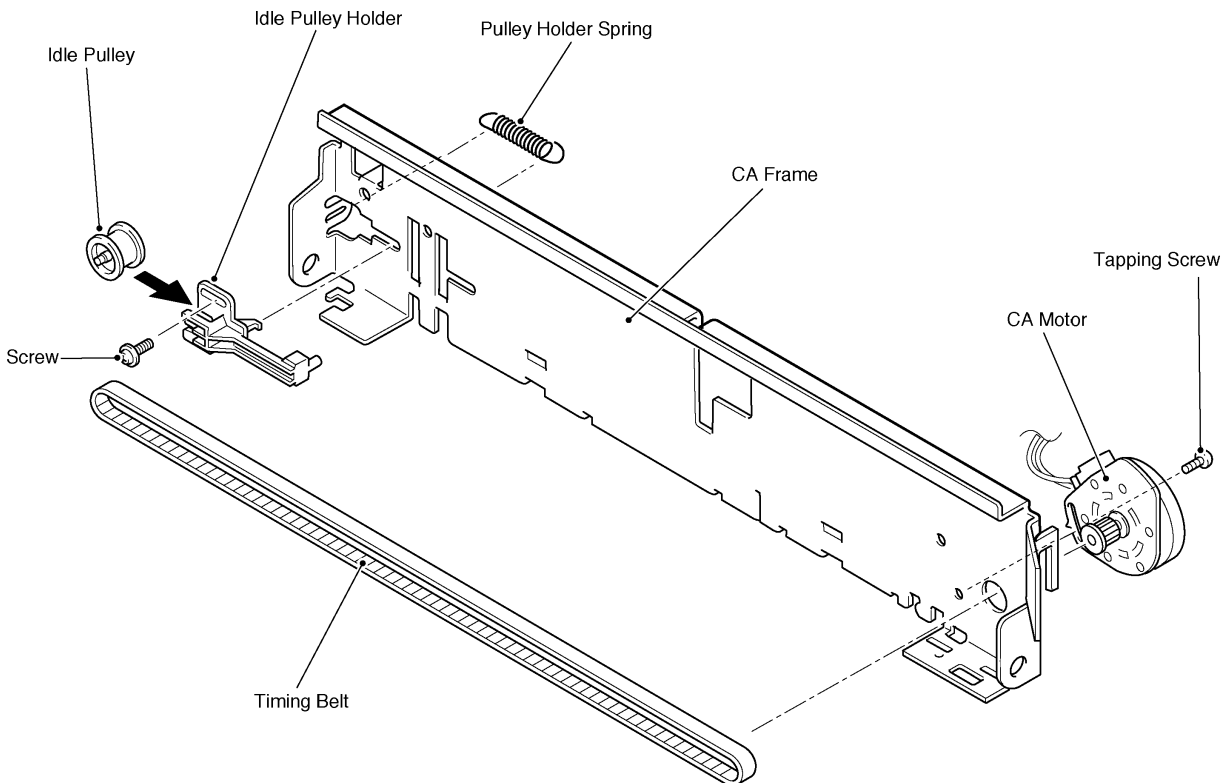
**Fig. 1.7 Printer Flat Cable to Cartridge Alignment**



**Fig. 1.8 Ink Jet Cartridge to Flat Cable Alignment**

### 1.2.3. Carriage Motion Control

All operations related to carriage movement are driven by the CA motor. The CA motor assembly consists of a motor, a timing belt, an idle pulley, and an idle pulley holder and pulley holder spring: the motor and the idle pulley holder are mounted to the CA frame; the belt runs between the motor and the pulley. The pulley holder spring between the idle pulley holder and the CA frame sets belt tension. See Fig. 1.9.



**Fig. 1.9 Carriage Motion Control**

#### 1.2.4. Maintenance Station Operation

The maintenance station operation consists of spitting, wiping, capping, and purging. Table 1.1 shows a summary of maintenance operation for various printer states.

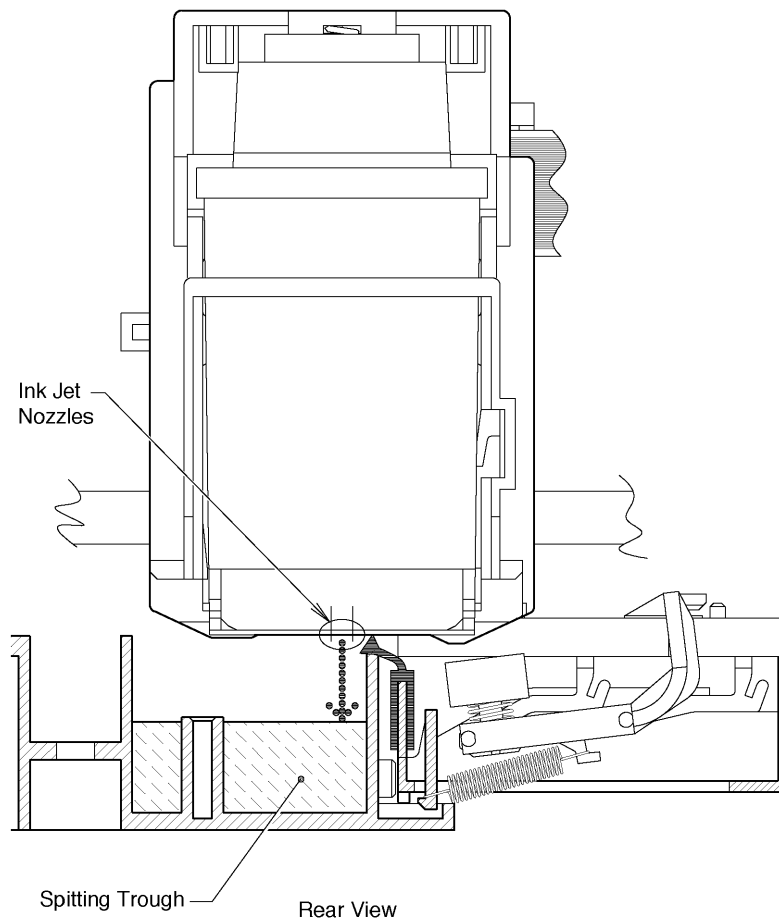
**Table 1.1 Summary of Maintenance Operations**

<b>Printer State</b>	<b>Spitting</b>	<b>Wiping</b>	<b>Capping</b>
Power-on	204	2	1
Beginning of print job	204 (after wiping)	1	0
Between pages of continuous printing	12	1	0
After 6 pages of continuous printing	204 (after wiping)	1	0
After 50 seconds of printing on the same page	12 (after wiping)	1	0
Purging	6,000 (after wiping)	1	1
Ink cartridge change	204 (after wiping)	1	1
If no cartridge motion for more than 30 seconds	0	1	1
Power-off	0	0	0

## 1.2.4.1. Spitting

Spitting is performed at machine power-on, after uncapping from the maintenance station to clear dormant nozzles, and during the printing process to ensure that infrequently used nozzles are available when required to print. There must also be spitting after a wipe cycle, except when the printhead is going to the cap position; otherwise wiping causes distorted printing if the wiper has experienced any wear.

The trough below the print line is intended to capture the ink during a spit cycle when no paper is present in the print area. The cup around the wiper is used when spitting is required and paper is present in the print area. Spitting with paper in print area occurs when a single page requires longer than 50 seconds to print. All spitting occurs in trough. At power on, any paper in the print area is ejected.

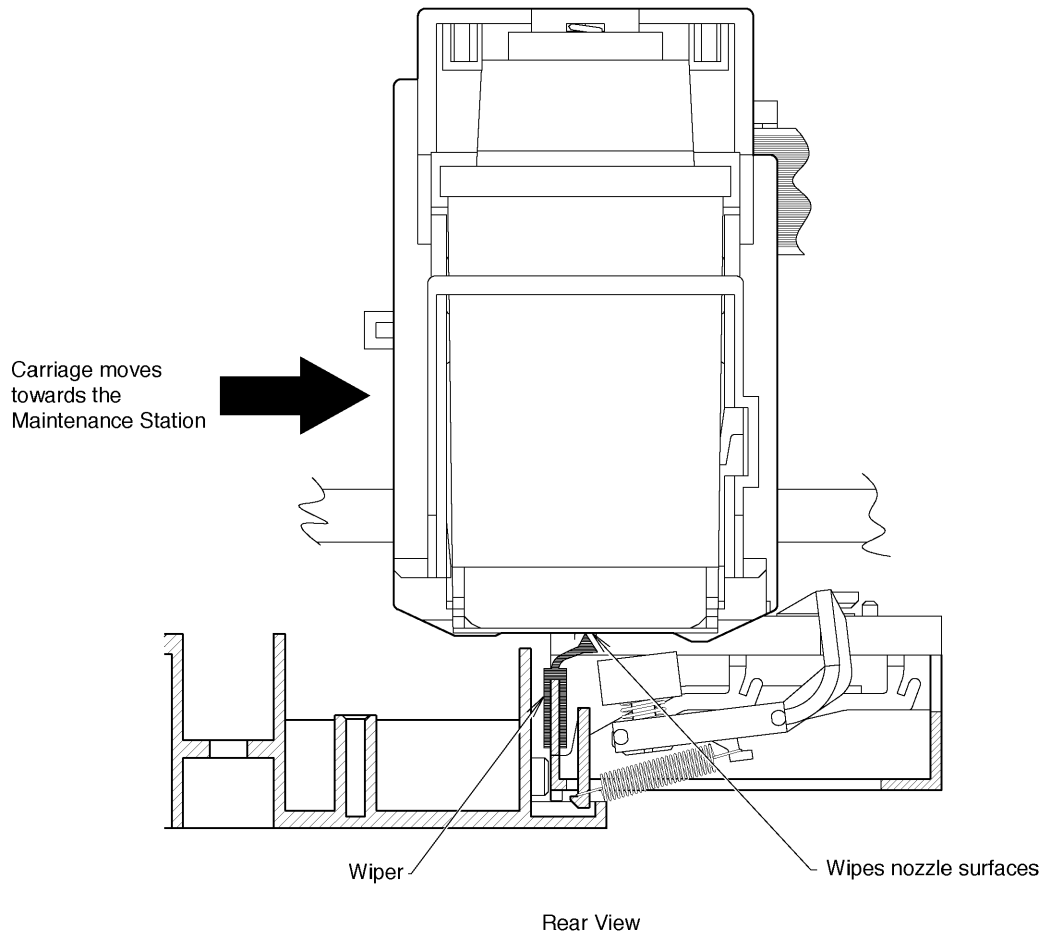


**Fig. 1.10 Print Maintenance Operation - Spitting**



## 1.2.4.2. Wiping

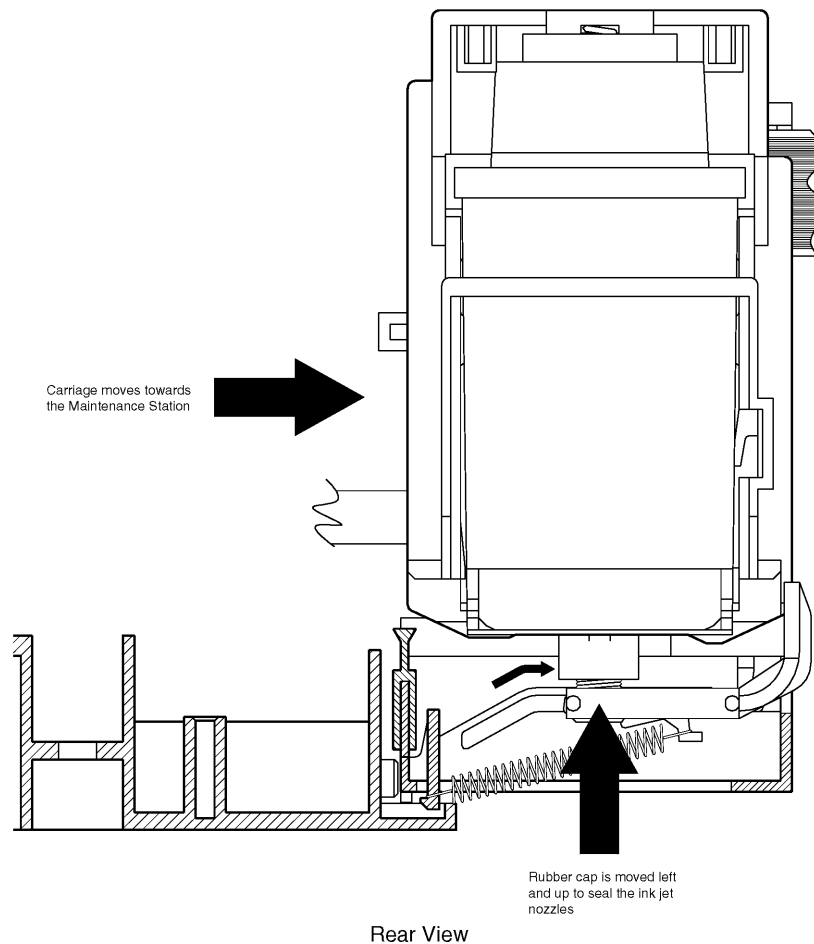
Wiping of the print head occurs when the cartridge moves across the wiper (in either direction). The printhead is wiped (twice) when power is turned on, when beginning a print job (after the print head has been capped for more than four minutes), after six pages of continuous printing, after 50 seconds of printing on the same page, and after purging or changing the ink cartridge.



**Fig. 1.11 Print Maintenance Operation - Wiping**

## 1.2.4.3. Capping

Capping occurs by the movement of the carriage assembly to the maintenance station, which moves the MS carriage up to the ramp to align the rubber cap with the ink jet nozzles. The rubber cap prevents the ink from drying and causing the printhead to clog. The printer will automatically cap the printhead when the system is powered on, when no data is received for 30 seconds, and after purging or ink cartridge change.



**Fig. 1.12 Print Maintenance Operation - Capping**

## 1.2.4.4. Purging

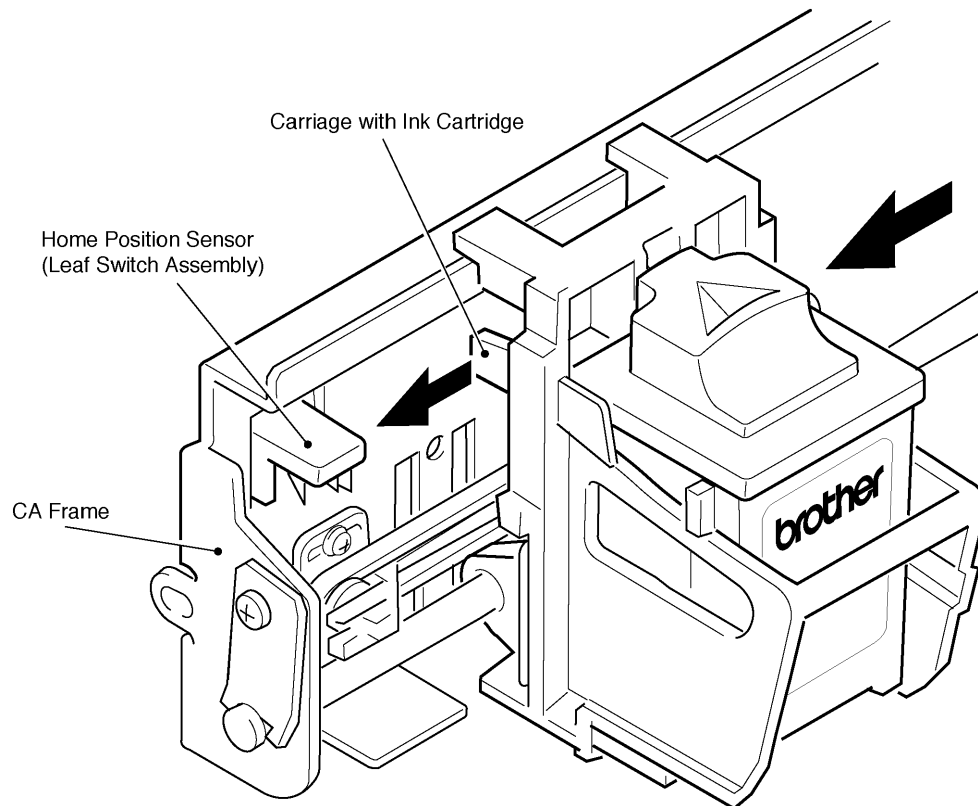
The purging function of the maintenance station is a combination of the wipe, cap, and spit operations. This initiates a sequence of 6,000 spits of each nozzle, in order to clear clogged ink from the nozzles. The ink is captured in the trough located below the print line. Purging is user-activated by pressing **CODE + SHIFT + INK CHG** from the keyboard. See 3. "Cleaning the Print head" in Chapter 5, MAINTENANCE, for instructions.

### 1.2.5. Sensors

There are two sensors in the printer assembly: the carriage home position sensor (leaf switch assembly, attached to the right end of the CA frame) and the paper end sensor (attached to the bottom of the PF base at the right rear).

#### 1.2.5.1. Carriage Home Position Sensor

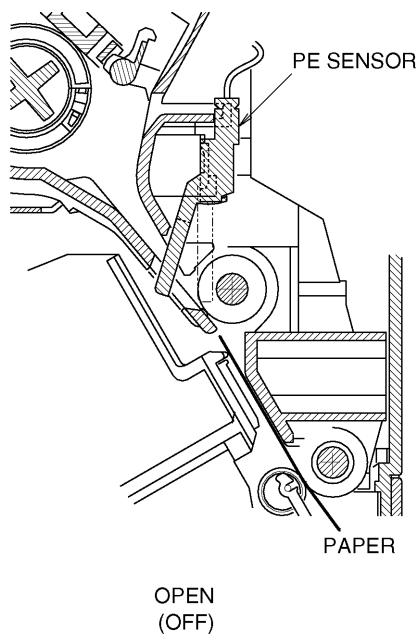
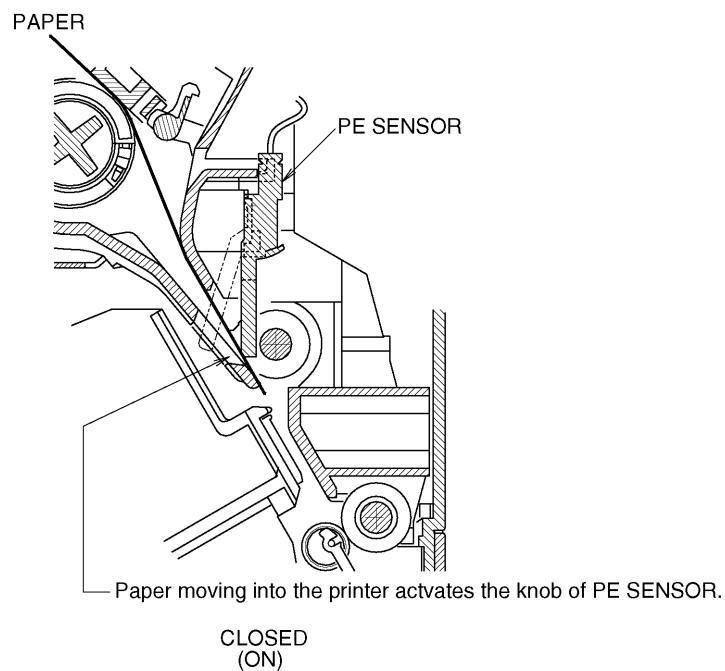
Upon power-up of the system or when the carriage is reset, the carriage moves to the right end of the printer assembly and activates the home position sensor (leaf switch assembly). See Fig. 1.13.



**Fig. 1.13 Carriage Home Position Sensor**

### 1.2.5.2. PE Sensor

PE sensor detects when the trailing edge of the paper passes the knob of PE sensor.  
PE sensor is 1C-1P Switch (normal open.) See Fig. 1.14.



**Fig. 1.14 PE Sensor Mechanism**

### **1.3. INK CHG (Ink Change) Functions**

There are two operator-initiated printer maintenance functions available from the keyboard: ink cartridge replacement and automatic printhead cleaning (purging).

#### **1.3.1. Ink Cartridge Installation/Replacement**

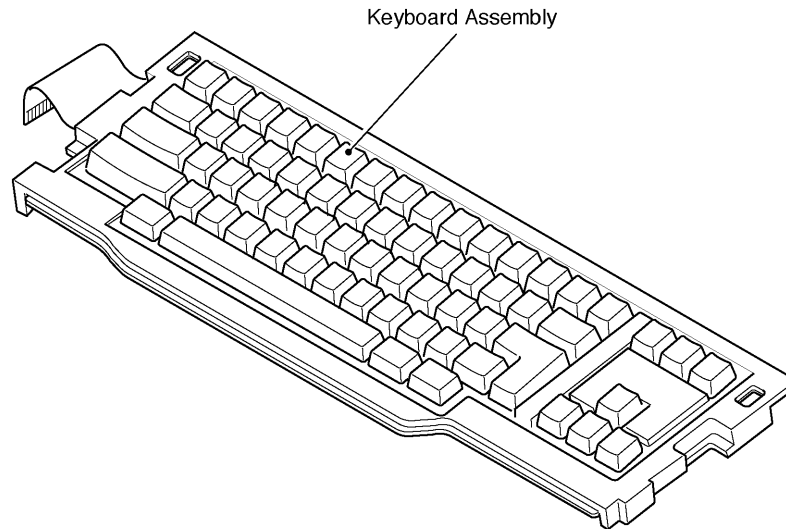
There is an ink cartridge installation/replacement function available from the keyboard. Pressing the key combination **CODE + INK CHG** moves the printhead from the maintenance station to the right end of the printer assembly. Pressing RETURN after installing or replacing the ink cartridge initializes the system: the cartridge activates the home position sensor switch and moves the printhead back to the maintenance station. See Chapter 5, MAINTENANCE, for ink cartridge replacement instructions.

#### **1.3.2. Automatic Print head Cleaning (Purging)**

With the ink cartridge installed, pressing the key combination **CODE + SHIFT + INK CHG** initiates print head purging. See Chapter 5, MAINTENANCE, for the instructions to manually clean the print head.

## **2. Keyboard**

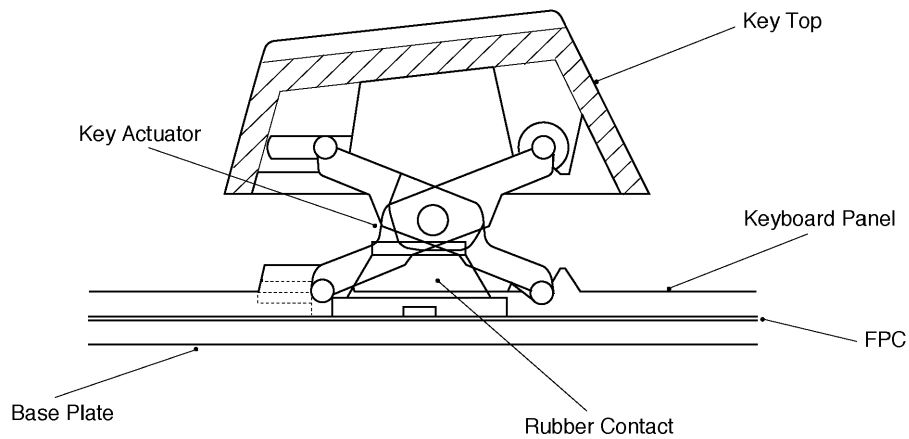
The keyboard assembly consists of the keyboard panel and keys, the FPC (flexible printed circuit) board, and the keyboard base plate.



**Fig. 1.15 Keyboard Assembly**

The key tops and key stems are assembled in the keyboard panel. The FPC (flexible printed circuit) board with rubber contacts is fitted to the base plate. See Fig. 1.16.

The FPC board is a single sheet of film (FPC) on which an electrode pattern is printed in layers. When the key top is pressed, the key actuator presses the rubber contact; the conductive part of the contact connects both of the electrodes to output the predetermined signal for the key.



**Fig. 1.16 Key Top/Key Stem Assembly**

### **3. LCD**

The LCD (Liquid Crystal Display) module is secured inside the upper cover by the LCD bearing at one end and the hinge assembly at the other end so that it can rotate up and down.

From the closed position, the LCD can be tilted up as much as approximately 132°. The hinge assembly is the friction type holder that holds the LCD at whatever angle the user sets within a range approximately 31° from the upright position.

Contrast adjustment varies depending on the model, as indicated below.

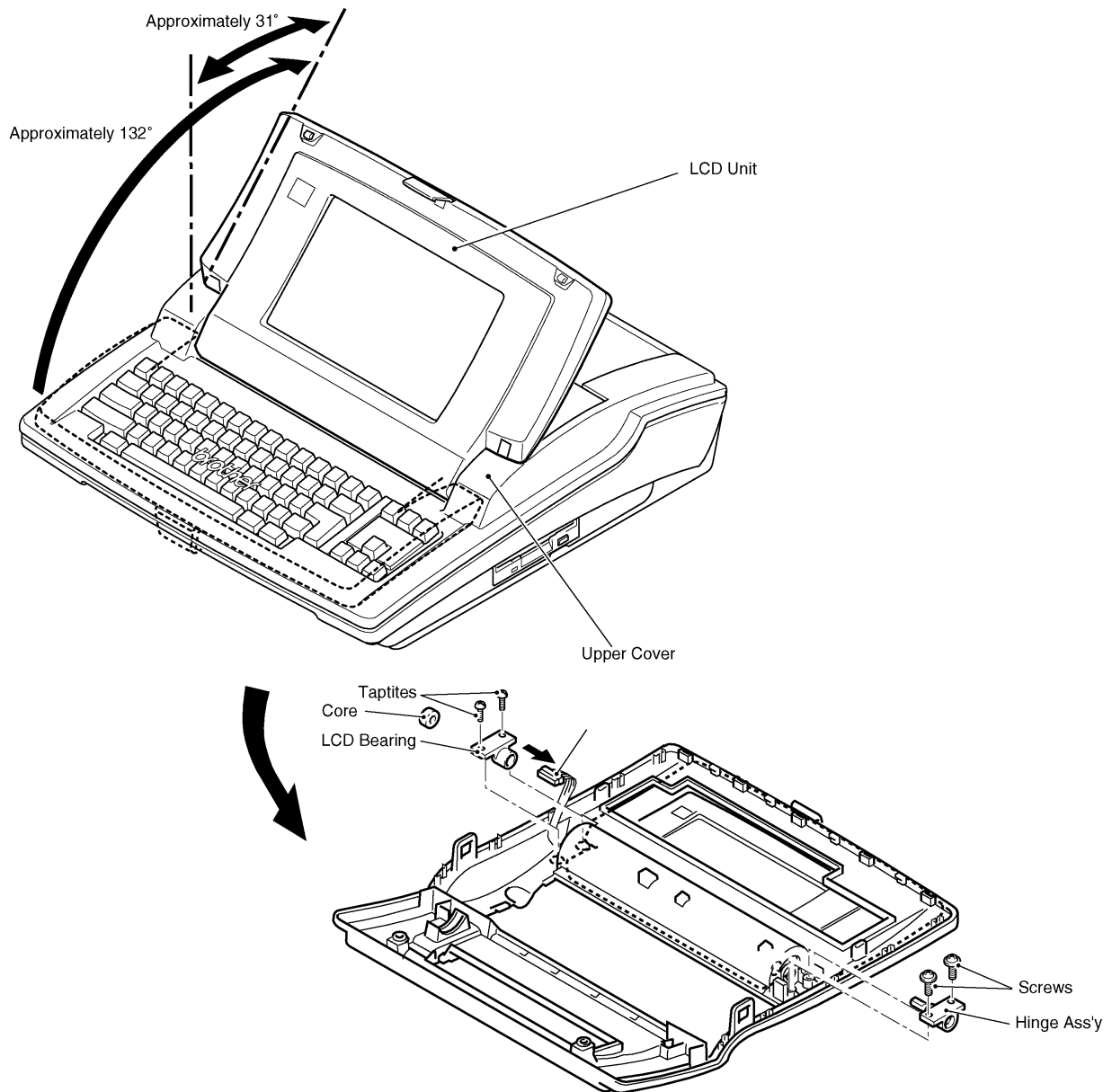
<DP-525CJ/LW-800ic, DP-530CJ/LW-810ic, LW-810icBL>

The slide type LCD volume knob located on the right side of the LCD upper cover is used to adjust the contrast.

<DP-540CJ, DP-550CJ/LW-840ic>

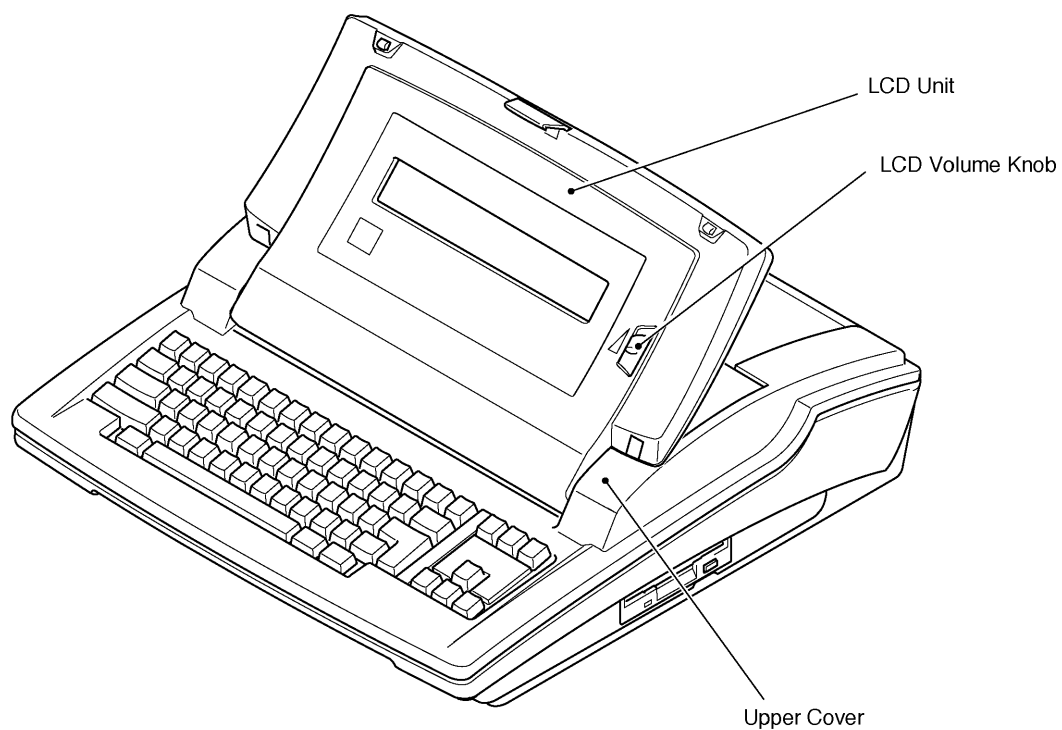
The LCD volume located on the left side of the bottom cover is used to adjust the contrast.





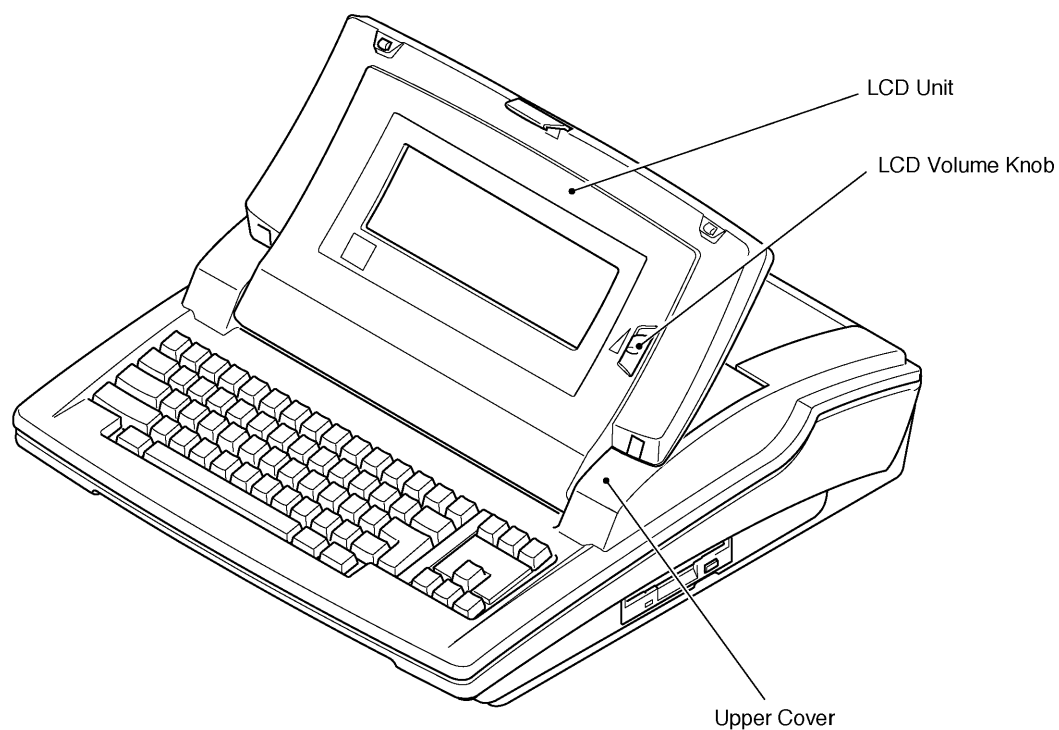
**Fig. 1.17 LCD Unit Installation in the Upper Cover**

<DP-525CJ/LW-800ic>



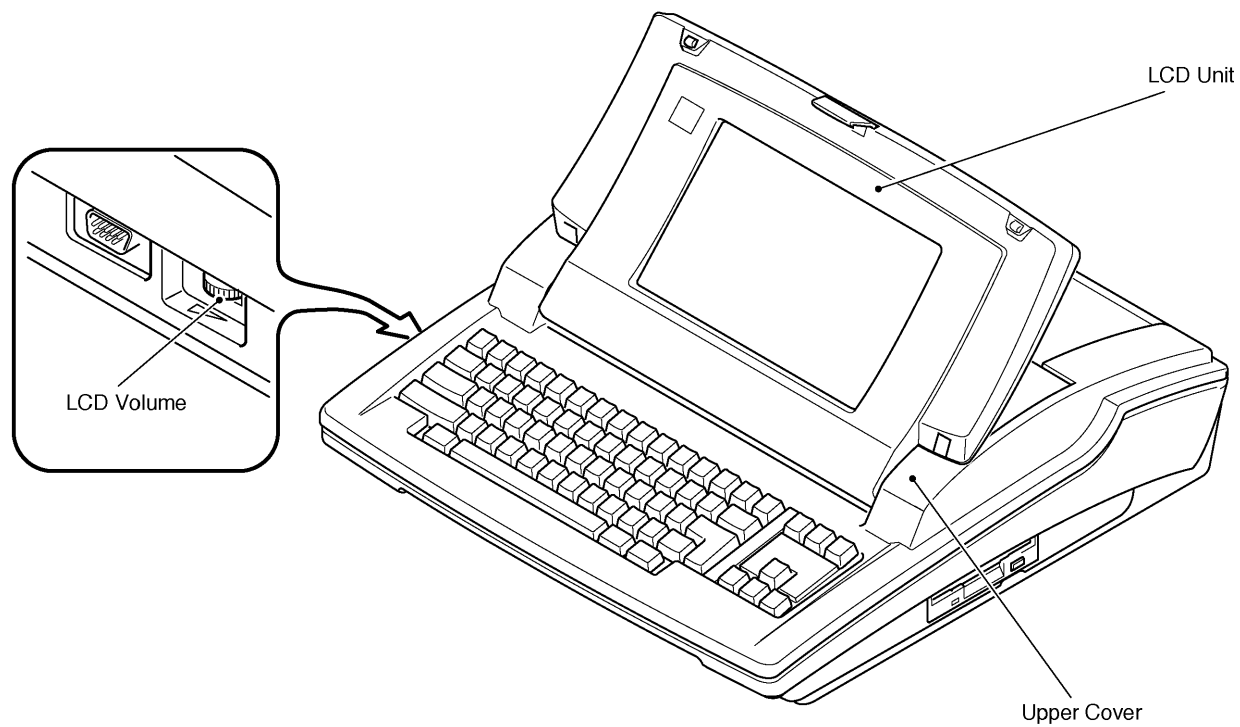
**Fig. 1.18 LCD of DP-525CJ/LW-800ic**

<DP-530CJ/LW-810ic, LW-810icBL>



**Fig. 1.19 LCD of DP-530CJ/LW-810ic and LW-810icBL**

<DP-540CJ, DP-550CJ/LW-840ic>



**Fig. 1.20 LCD of DP-540CJ, DP-550CJ/LW-840ic**

## **CHAPTER 2 ELECTRICAL THEORY**

### **1. System Configuration**

The major electronic component parts of the machine are shown in Fig. 2.1.

#### **1.1. Main PCB (Printed Circuit Board)**

The main PCB controls the entire system including the LCD, ink cartridge, and the motors in the printer.

The motors and the ink cartridge are driven by +24 VDC, and the CPU and other devices are driven by +5 VDC.

#### **1.2. Switch PCB (Printed Circuit Board)**

Receiving power from the AC adaptor, the switch PCB supplies voltage to the main PCB, through the power switch and the fuse.

#### **1.3. Keyboard FPC (Flexible Printed Circuit)**

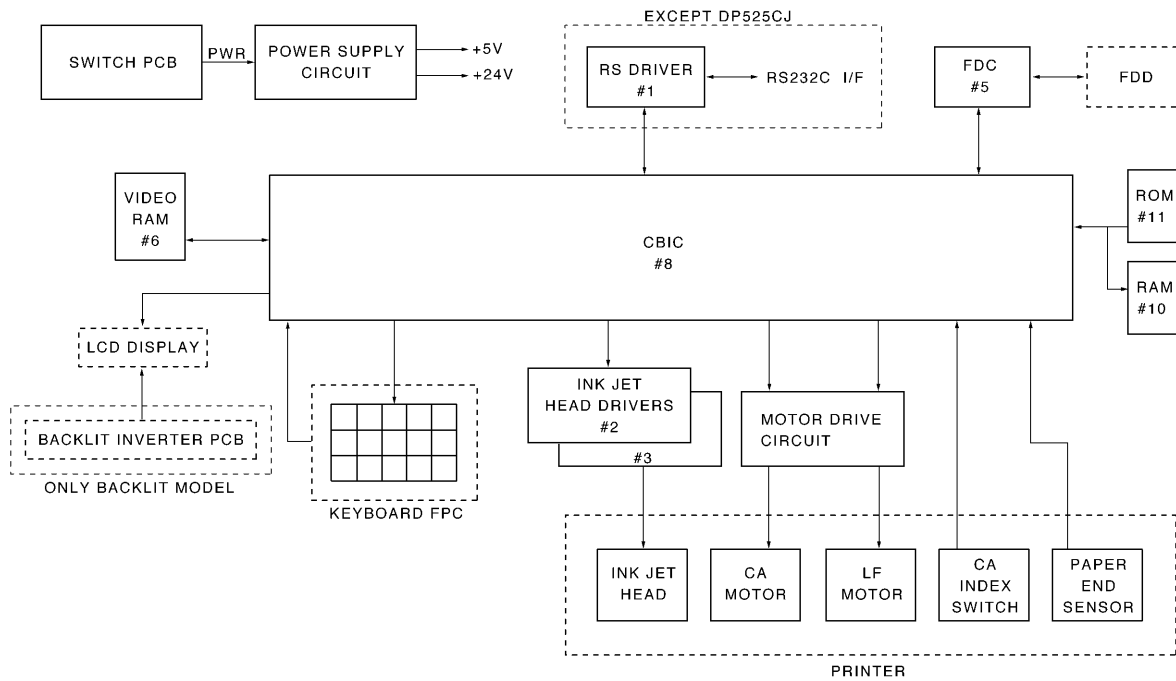
The keyboard FPC has electrodes arranged in a matrix circuit pattern. The keyboard status is sent from the FPC to the main PCB.

#### **1.4. FDD (Floppy Disk Drive) Module**

The FDD can read and write information supplied to the main PCB. The FDD is driven by +5 VDC.

#### **1.5. LCD (Liquid Crystal Display) Module**

The LCD PCB contains the driver for the dot matrix of the LCD on which various information is displayed. The CFL backlight (Models: DP-550, LW-810icBL, and LW-840ic) is driven by +5 VDC from the main PCB.



**Fig. 2.1 Major Electronic Component Parts**

## **2. Ink Jet Printer Configuration**

The following describes the operation of the ink cartridge, motors and other components.

### **2.1. Ink Cartridge**

An ink cartridge contains both ink and the print head which has 56 nozzles and prints at a resolution of 300 dpi.

### **2.2. Carriage Motor**

The carriage step motor drives the carriage right and left with precision motion control.

### **2.3. Line Feed Motor**

The line feed motor feeds the paper forward and in reverse.

### **2.4. Carriage Home Position Sensor**

The carriage home position sensor is mounted on the right of the CA frame. It detects the carriage home position to synchronize the carriage position and motor phase.

### **2.5. PE (Paper End) Sensor**

The PE sensor detects whether or not paper is in the printer. The PE sensor is located at the right rear of the bottom of the PF base.

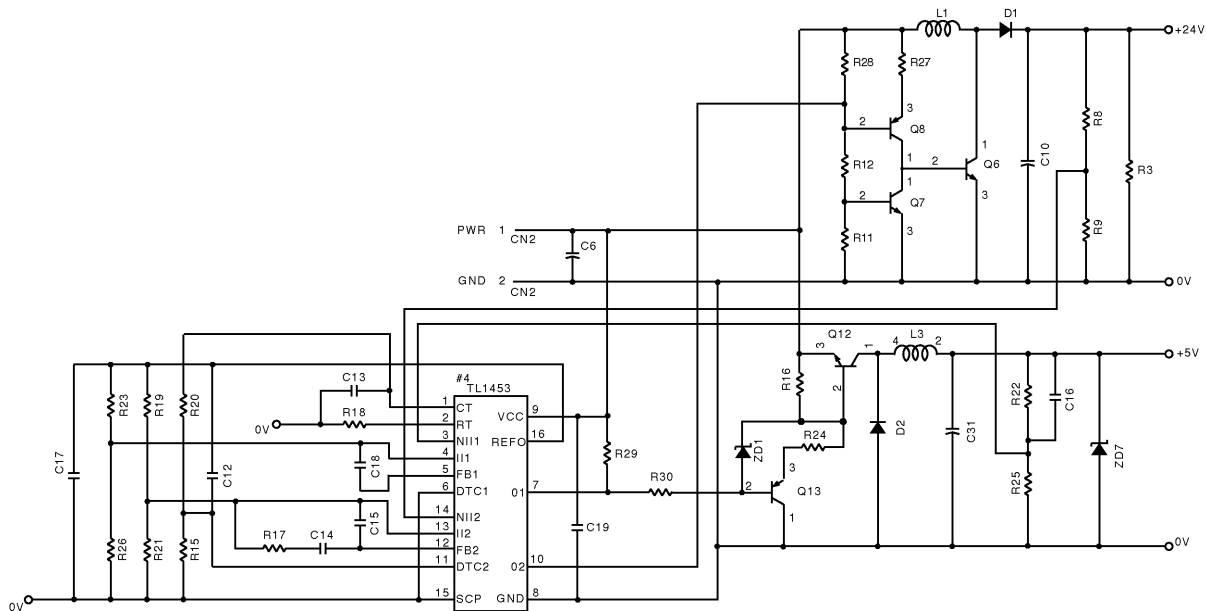
### 3. Power Supply Circuit

#### 3.1. Configuration

Fig. 2.2 shows the power supply circuit.

The power supply section converts the unstable input (PWR) supplied from the switch PCB into stable +24 VDC (for motors and print head) and +5 VDC (for logic).

A 2-channel switching regulator IC (#4) converts unstable input into stable output.



**Fig. 2.2 Power Supply Circuit**



### 3.2. +24V Generator

The timing chart of the +24V generation circuit during idling is shown in Fig. 2.3.

Switching Q6 by #4 at 100 kHz boosts the input to a stable +24V.

Energy is accumulated in L1 while Q6 is ON and the power is transmitted to the output side by the back electromotive force generated from the moment Q6 is turned OFF. Stabilization to +24V is achieved by changing the ON-OFF duty ratio of Q6.

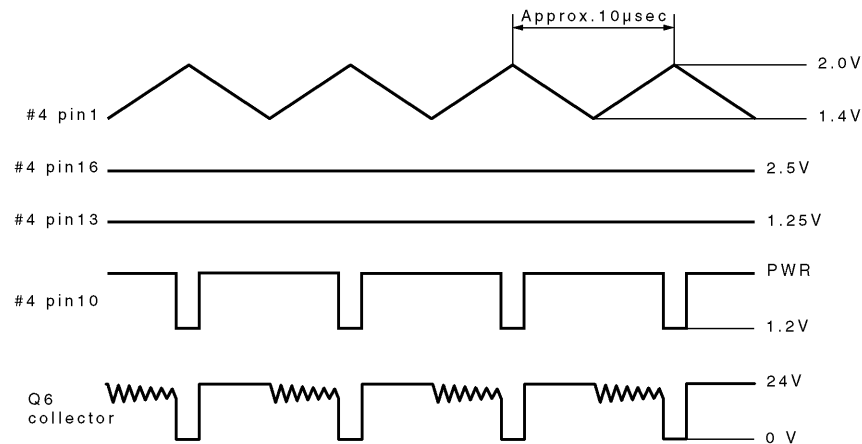


Fig. 2.3 Timing Chart of +24V Generation Circuit

### 3.3. +5V Generator

The timing chart of the +5V generation circuit during idling is shown in Fig. 2.4.

Switching Q12 by #4 at 100 kHz reduces the input voltage to a stable +5V.

While Q12 is ON, energy is supplied to L3, C31, and load. The energy accumulated in L3 is supplied to load through D2. Stabilization to +5V is achieved by changing the ON-OFF duty ratio of Q6.

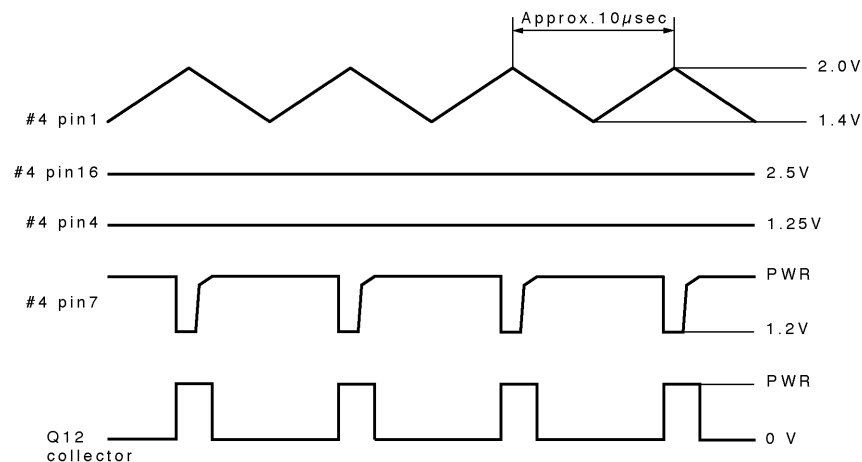


Fig. 2.4 Timing Chart of +5V Generation Circuit

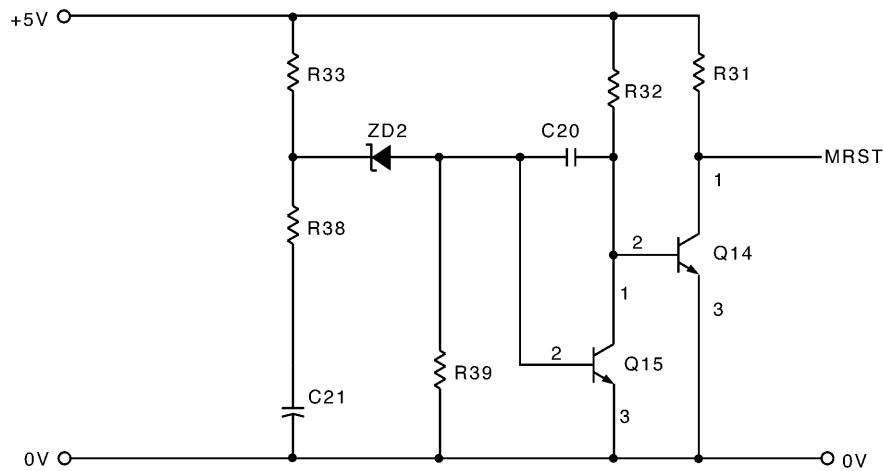
## 4. Reset Circuit

### 4.1. Configuration

The reset circuit is shown in Fig. 2.5. The reset signal (MRST) used to initialize the system is generated using the leading and trailing edges of the +5V voltage.

The reset signal is input to the following devices.

Device	Pin
CBIC (#8)	17
Printer drivers (#2, #3)	5



**Fig. 2.5 Reset Circuit**

## **5. CBIC and Peripherals**

### **5.1. CBIC #8**

CBIC (#8) is a Cell-based IC in which logic circuits for controlling peripherals are integrated with the CPU core. With the functions incorporated in it, CBIC (#8) controls all the functions of the system including printer control and control of the LCD display.

### **5.2. Main ROM (#11, #12)**

Installation of a maximum of 8 Mbytes (32 Mbits x 2 pcs.) of ROM is possible. The capacity of ROM installed in the machine is determined by whether or not the chip resistor R71 is installed.

R71 installed: 32 Mbit ROM

R71 not installed: 16 Mbit ROM

### **5.3. Main RAM (#9, #10)**

The following RAM can be installed at #9 and #10.

#9: 16 Mbit DRAM

#10: 4 Mbit DRAM

Note that simultaneous installation of RAM at #9 and #10 is not allowed.

### **5.4. Video RAM (#6)**

The capacity of the video RAM used to retain the data to be displayed on the LCD is 256 Kbit. It secures the display area for different sizes of LCDs, from 480 x 64 dots to 640 x 400 dots.

The RAM area not necessary for the LCD display can be used as the work area.

### **5.5. Printer Driver Circuits (#2, #3, Q1 to Q4, and Q23 to Q26)**

The printer driver circuits convert the motor phase driver signals output from CBIC (#8) to +24V drive signals, which are output to the motors and ink cartridge.

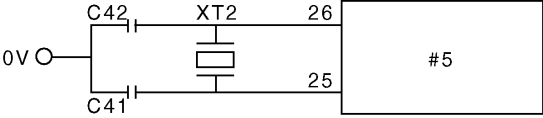
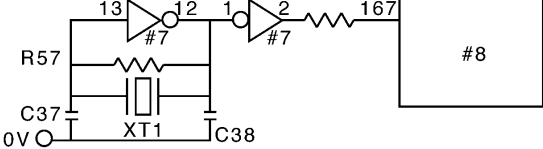
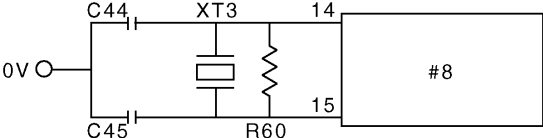
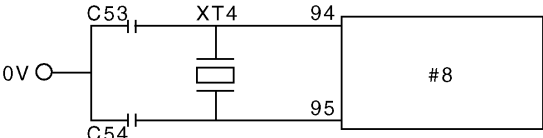
### **5.6. FDC (Floppy Disk Controller)**

The FDC controls floppy disk drive access through the FDD drive circuit.

### 5.7. Clock Circuit

Four different clock circuits shown in Table 2.1 are incorporated in the main PCB.

Table 2.1 Clock Circuit

Clock Circuit	Frequency	Function
	16MHz	XT2 is the standard clock for FDD control; it inputs for #5 (pins 25, 26).
	18MHz	XT1 is the standard clock for FDD control; it inputs for #8 (pin 167).
	20MHz	XT3 is the standard clock for printer control and other several timing; it inputs for #8 (pins 14, 15).
	14.74MHz	XT4 is the standard clock for CPU core; it inputs for #8 (pins 94, 95).

### 5.8. Buzzer Drive Circuit

The buzzer drive circuit is shown in Fig. 2.6. A 4 kHz pulse of 50% duty is output from port BUZ (pin 25) of CBIC (#8) when buzzer operation is needed.

The piezoelectric element in BZ1 generates sound on reception of this pulse. The output from port BUZ is Hi-Z when the buzzer is not in operation.

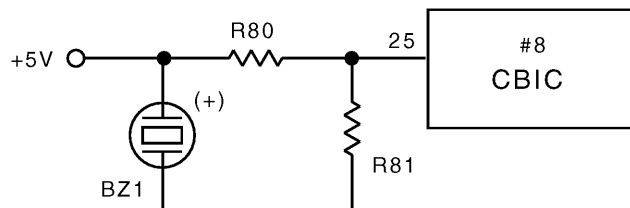


Fig. 2.6 Buzzer Drive Circuit

### 5.9. Country Specification Change-over

The country specification change-over circuit is shown in Fig. 2.7. The country specification is recognized by the CPU by sensing solder on the solder points.

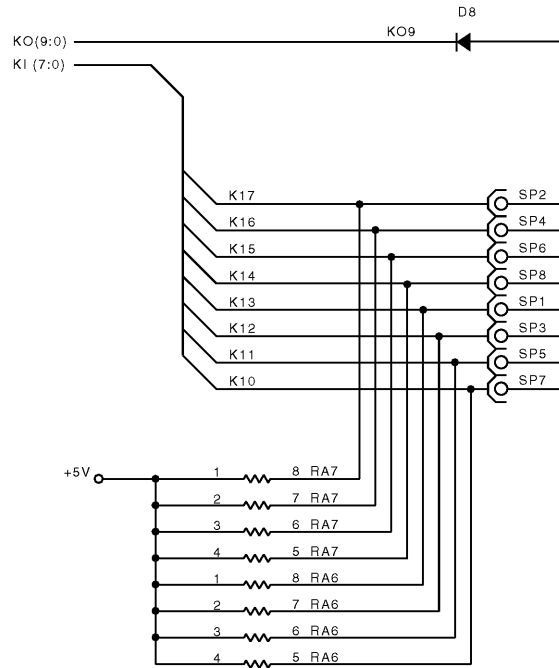
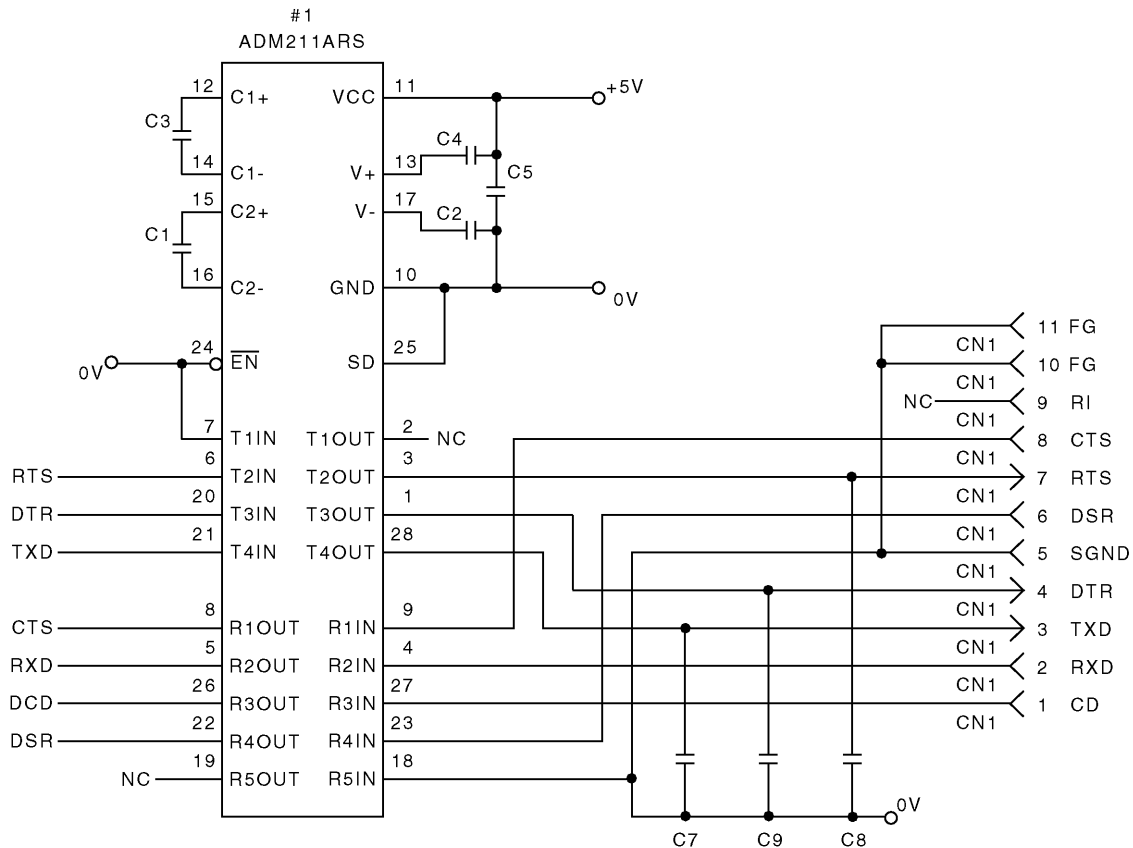


Fig. 2.7 Country & Model Specification Change-over Circuit

### 5.10. RS-232C I/F Circuit

The RS-232C I/F circuit is shown in Fig. 2.8. The driver IC (#1) converts the signal level (+5V – ±0V) on the main PCB to the RS-232C signal level in the external line and vice versa.



**Fig. 2.8 RS-232C I/F Circuit**

## 6. Printer Control

### 6.1. Ink Jet Head Control

The ink jet head drive circuit is shown in Fig. 2.9. The ink jet head has 50 active nozzles (monochrome). Two addressable multiplexing printer drive circuits (#2, #3) activate the nozzles for printing. Custom circuitry controls the timing and synchronization of ink deposited as the cartridge moves across the paper in printing. The same system controls ink jet head maintenance (spitting into the trough).

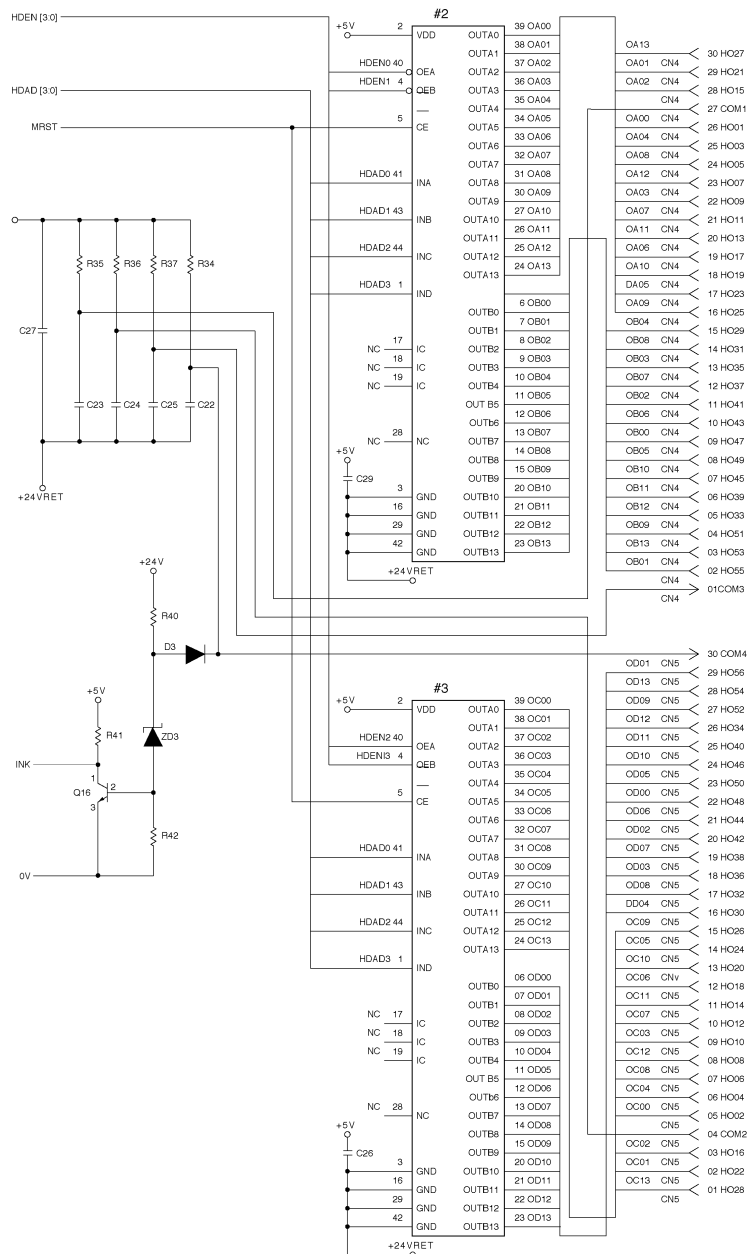
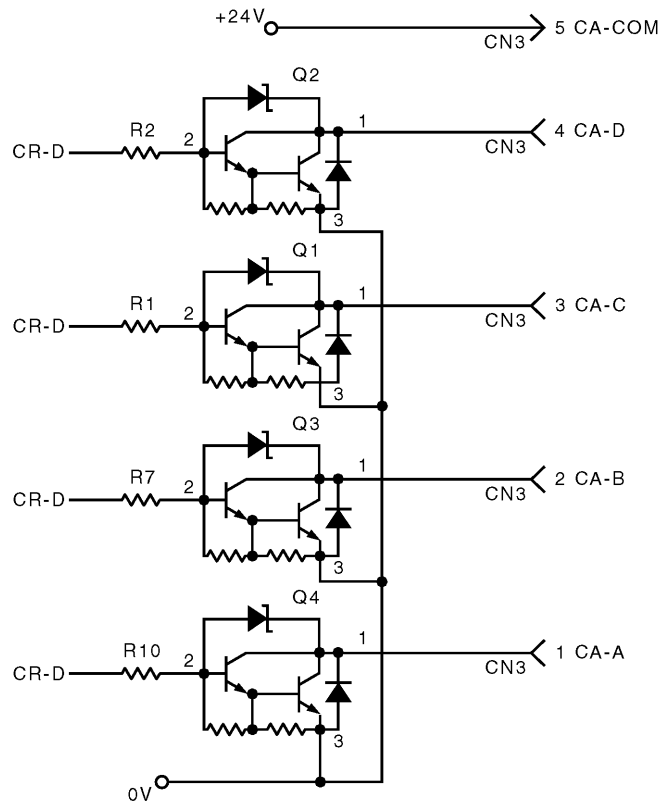


Fig. 2.9 Ink Jet Head Drive Circuit

## 6.2. Carriage Motor Control

The carriage motor control circuit is shown in Fig. 2.10. +24 VDC is supplied to the motor through connector CN3, pin 5. Motor phases A, B, C, and D are driven by the CBIC (#8) through pins 150 - 153, respectively. The outputs of the CBIC turn darlington transistors Q1 - Q4 on and off, which in turn affect the motor phases.



**Fig. 2.10 Carriage Motor Drive Circuit**



### 6.3. Line Feed Motor Control

The line feed motor drive circuit is shown in Fig. 2.11. The line feed motor is powered by +24 VDC. Each of the four phases of the motor is excited when CBIC (#8), via ports LF-A, B, C, and D, outputs to turn on the darlington transistors Q23 - Q26.

This provides a path to ground through the transistor, which allows current to flow. When the printer gate array outputs a LOW, the transistor remains off.

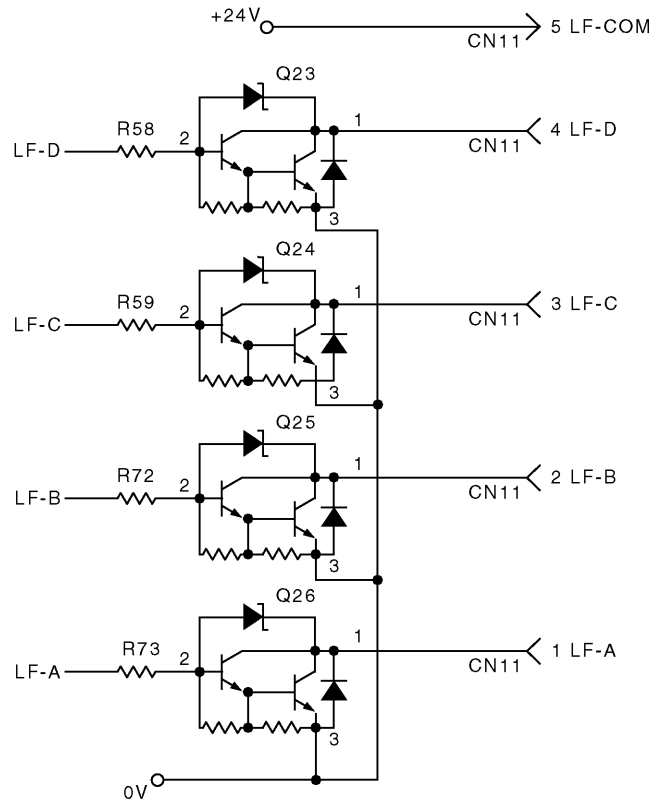
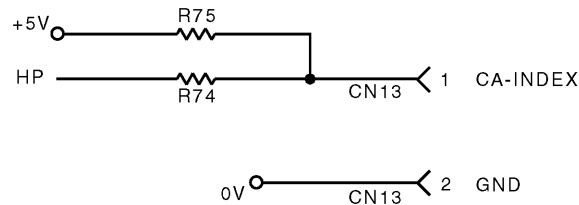


Fig. 2.11 Line Feed Motor Drive Circuit

#### 6.4. Carriage Home Position Sensor

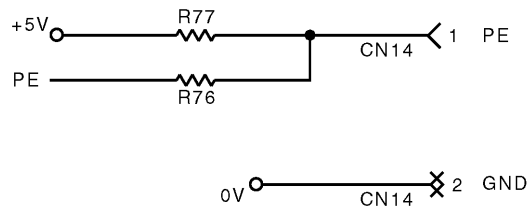
The carriage home position sensor circuit is shown in Fig. 2.12. The HIGH/LOW status of the sensor is read by pin 164 of the CBIC (#8). The signal goes LOW when the carriage reaches the home position.



**Fig. 2.12 Carriage Home Position Sensor Circuit**

#### 6.5. PE Sensor

The PE sensor detection circuit is shown in Fig. 2.13. The HIGH/LOW status of the PE sensor is read by pin 165 of the CBIC (#8). The signal is HIGH if there is no paper at the sensor position.



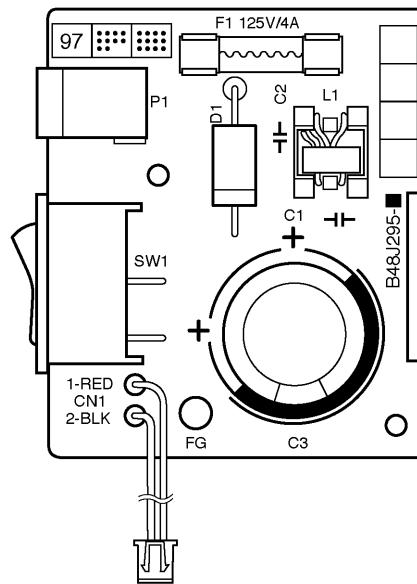
**Fig. 2.13 PE Sensor Detection Circuit**

## 7. Switch PCB

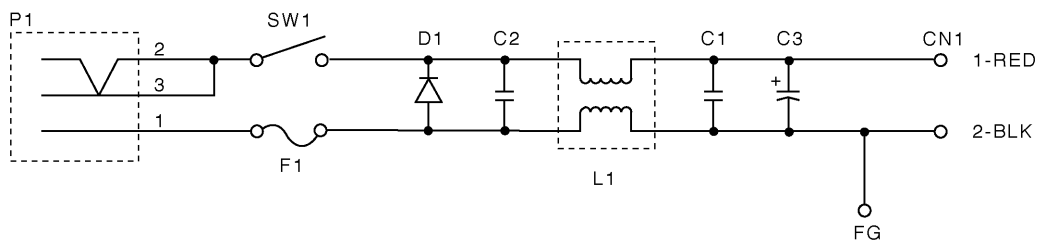
### 7.1. Configuration

The Switch PCB is installed between the AC adaptor and the main PCB to turn the power on and off and protect devices at the occurrence of an alarm, etc.

Fig. 2.14 shows the external view of the switch PCB and Fig. 2.15 the switch PCB circuit.



**Fig. 2.14 External View of the Switch PCB**

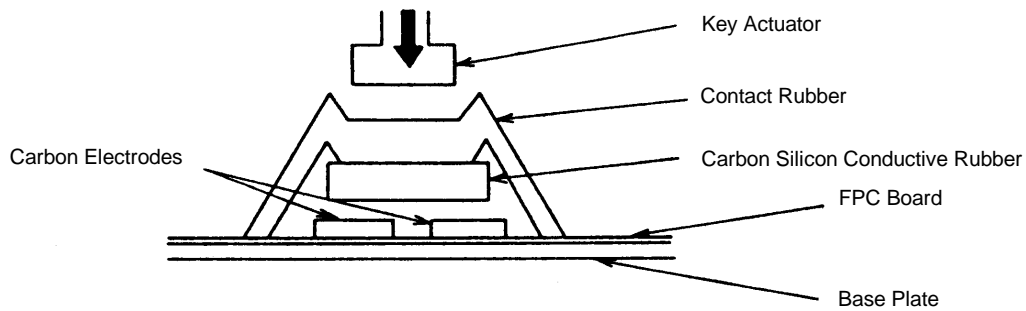


**Fig. 2.15 Switch PCB Circuit**

## 8. Keyboard System

### 8.1. FPC Operation

The keyboard is a flexible printed circuit (FPC) board on which the circuit pattern and electrodes are printed. When a key is pressed, the key stem is forced down until the carbon-type conductive silicone rubber makes a contact with the FPC electrode and electricity is conducted. See Fig. 2.16.



**Fig. 2.16 Key/FPC Operation**

## 8.2. Keyboard Scan

Fig. 2.17 shows the pattern from wiring electrodes on the board (this figure shows only simplified wiring for ease of explanation and is slightly different from the actual wiring). Refer to Fig. 2.17 to understand the keyboard scanning operation described. When a key is not pressed, continuity does not exist in any combination of the matrix (e.g. X1 and Y1 or X2 and Y2). For example, if key [A] is pressed, continuity will exist only in X2 and Y3, but not between any other pairs of points which are left in the OFF status. In other words, if continuity exists between X2 and Y3, it means that key [A] is being pressed.

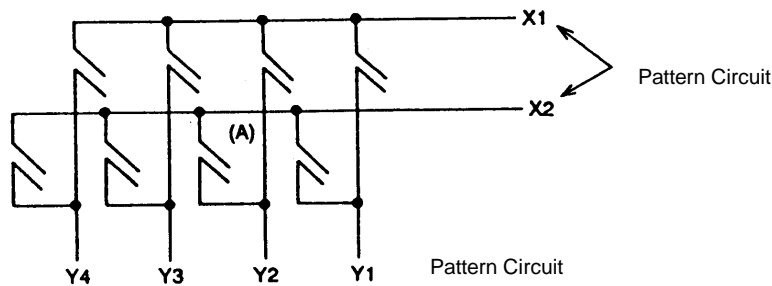
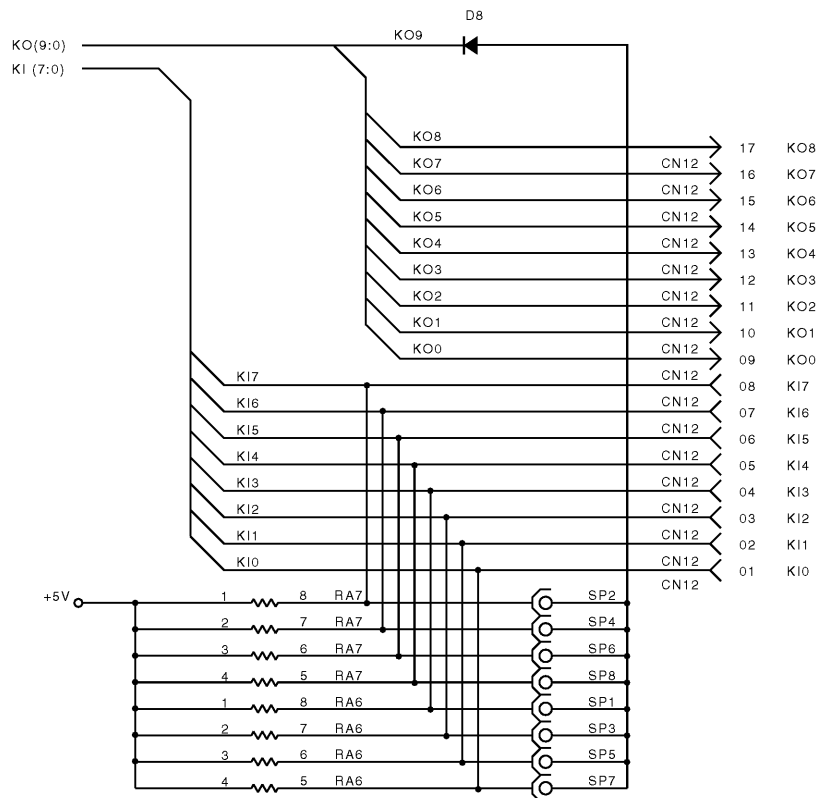


Fig. 2.17 Electrode Wiring

### 8.3. Keyboard Control Circuit

The keyboard control circuit is shown in Fig. 2.18.

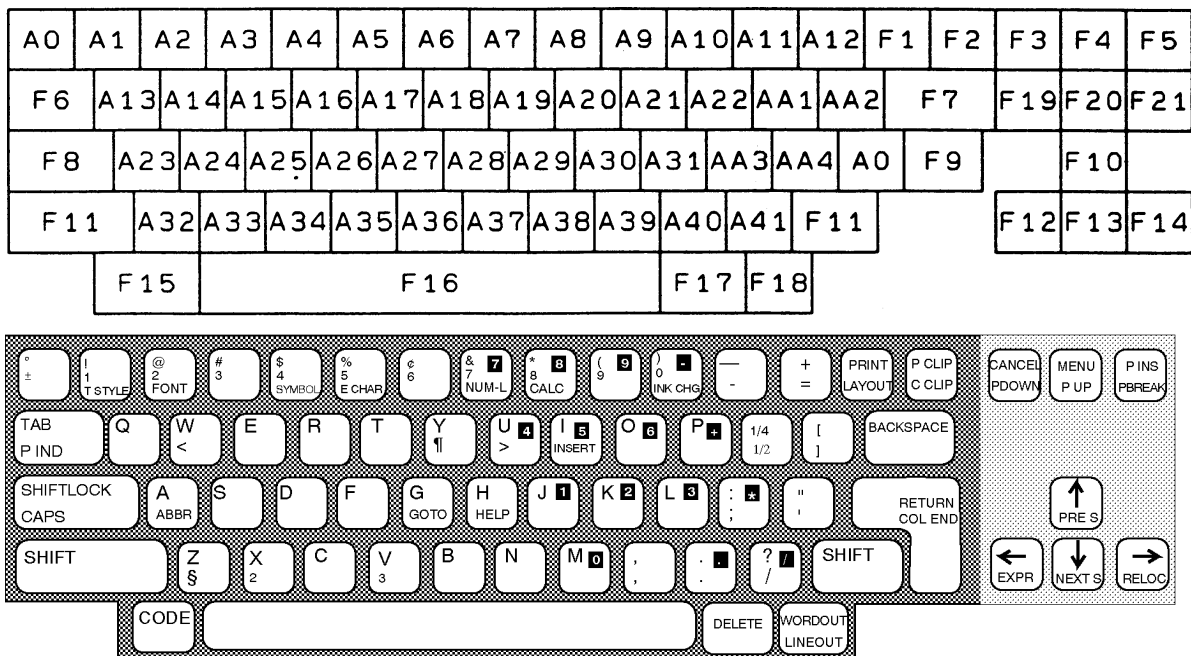
The matrix pattern on the keyboard FPC controls port 7 (0:7) of CBIC (#8) according to data signals KO0 through KO8. The LOW level signals are output to output lines KO0 through KO8. The electrode wiring is scanned line by line. The result of scanning is input to P70 through P77 of CBIC (#8). CBIC (#8) detects which key has been pressed. The key matrix given in Fig. 2.19 corresponds to the key arrangement shown in Fig. 2.20.



**Fig. 2.18 Keyboard Control Circuit**

Pin No.	9	10	11	12	13	14	15	16	17
1	A4	A5	A8	A1	A9	A11	A2	F1	A12
2	A3	A6	A7	A2	A29	A10	AA3	F3	A31
3	A14	A16	A118	A13	A20	A22	AA2	F9	A0
4	A15	A17	A28	A32	A19	A21	AA1	F7	A30
5	A25	A34	A27	A23	A36	A38	F12	F17	A40
6	A33	A26	A35	A24	A37	A39	F13	F18	A41
7	X	F19	F21	X	F20	X	F15	F16	AA4
8	F6	F10	F5	F8	F14	F4	X	F11	

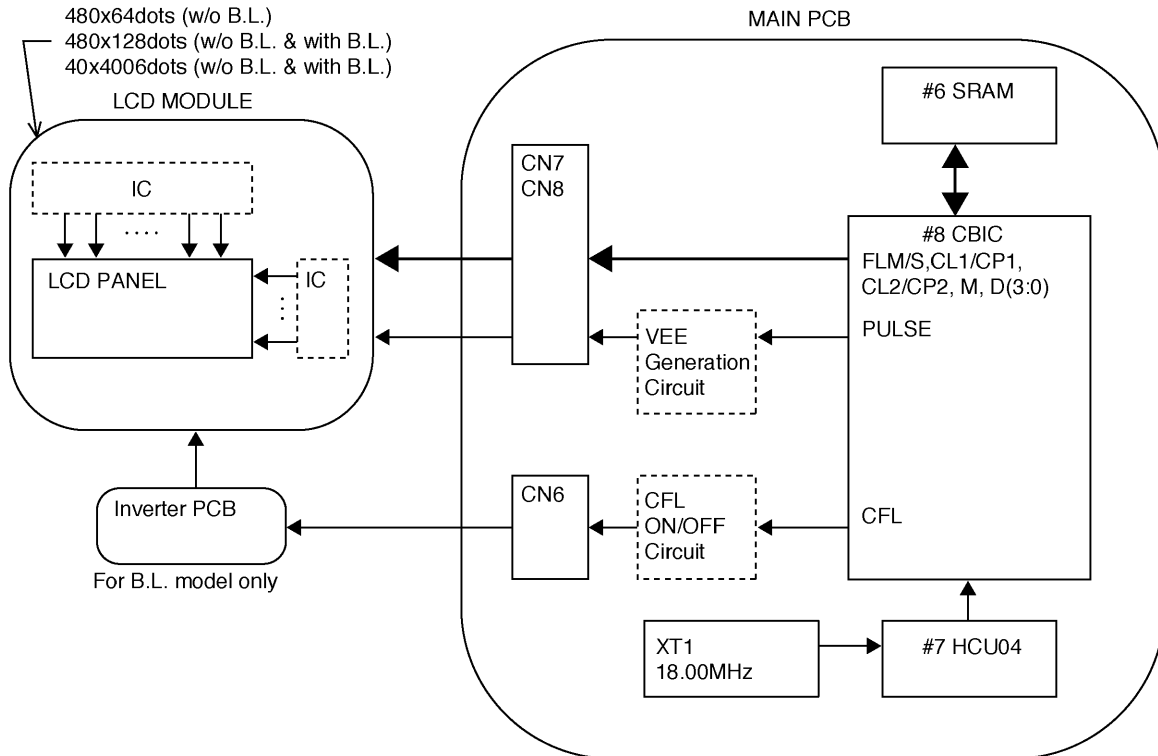
**Fig. 2.19 Keyboard Matrix**



**Fig. 2.20 Keyboard Symbols (Corresponding to Keyboard Matrix in Fig. 2.19)**

## 9. LCD Module

The block diagram of the LCD display operation is shown in Fig. 2.21. CBIC (#8) on the main PCB outputs the LCD module control signals to the LCD module. The LCD drive voltage (VEE) is generated by DC-DC convertor by the pulses output from CBIC (#8). Display data, the data written to the SRAM (#6) that functions as Video RAM is always sent to the LCD module as 4-bit parallel data.



**Fig. 2.21 LCD Display Operation Block Diagram**



## 9.1. LCD Control

The CBIC (#8) controls the LCD control signals and the SRAM access.

The display data written to the SRAM (#6) is read by the CBIC (#8) in regular intervals, converted into the 4-bit parallel data by the CBIC (#8) and then sent to the LCD module. Black and white of the display data are inverted by connecting the R55 (#8 REV terminal). Connect the R55 if the transmission type LCD is used.

The timing of display control signals differs according to the LCD type. The timing is set by the status of the DMODE (3:0) terminal in the CIBC (#8) in the reset state and by the setting in the program after the reset is canceled. An example of the control signal timing chart is shown in Fig. 2.22.

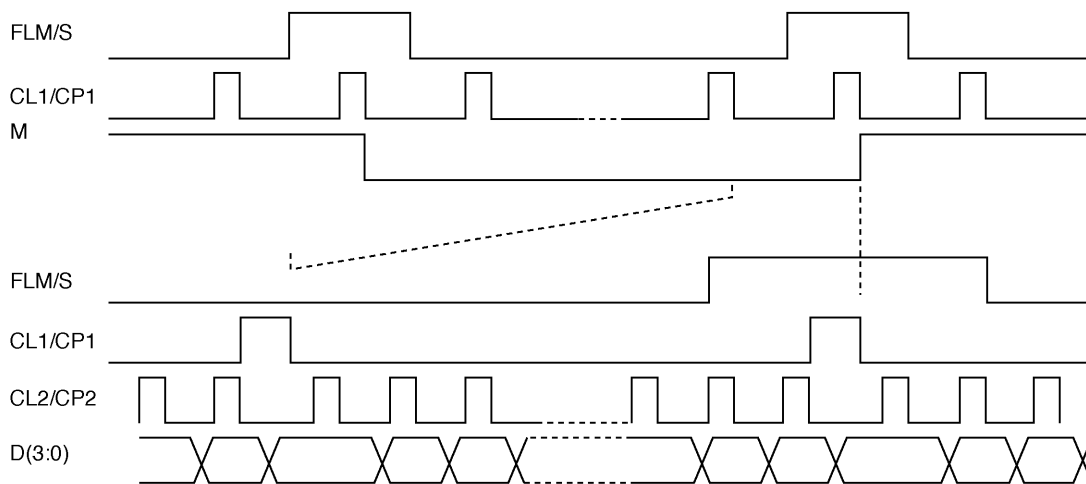


Fig. 2.22 Example of Control Signal Timing Chart

## 9.2. LCD Module

The LCD modules used in the respective models are shown in Table 2.2. The control signal timing and drive voltage (VEE) differ according to the LCD module.

Table 2.2 Table of LCD Modules

Specification		No. of Horizontal Dots	No. of Vertical Dots	Panel Type	Backlight	VEE (V)
Model Name						
DP-525CJ	LW-800ic	480	64	Reflective	no	-17.5 to -14.5
DP-530CJ	LW-810ic	480	128	Reflective	no	-17.5 to -14.5
	LW-810icBL	480	128	Transflective	yes	-17.5 to -14.5
DP-540CJ		640	400	Reflective	no	+22 to +30
DP-550CJ	LW-840ic	640	400	Transmissive	yes	+26 to +37

Note: VEE voltage is the values measured at connectors CN7 and CN8.

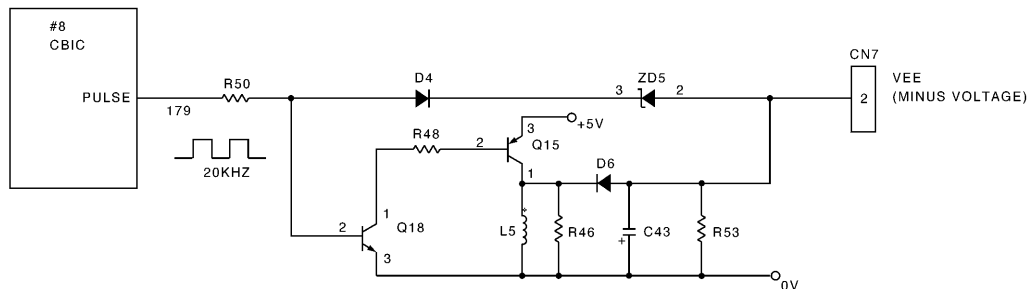
### 9.3. LCD Drive Voltage (VEE) Generation Circuit

The polarity of the LCD drive voltage (VEE) differs according to the LCD module.

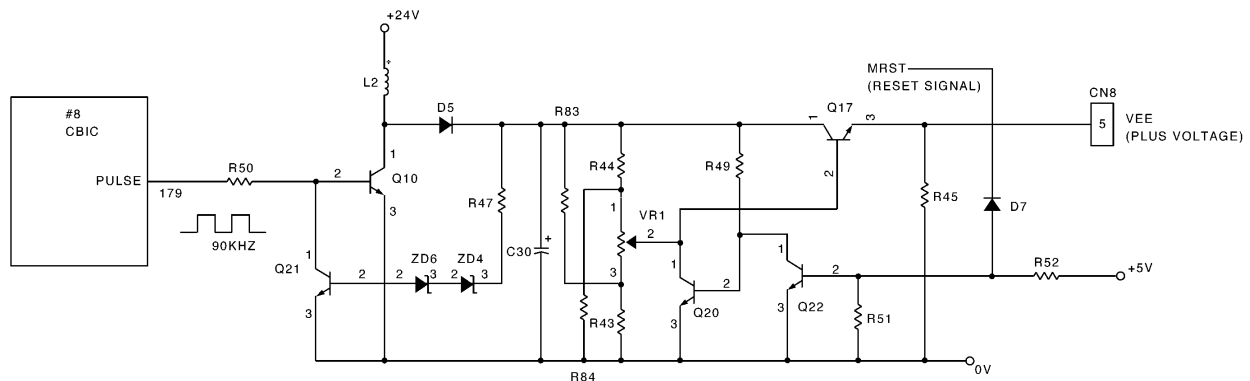
Fig. 2.23 shows the circuit for the LCD module driven by the minus VEE voltage. The +5 VDC source voltage is switched continuously by the 20 kHz pulses from CBIC (#8) to energize L5. The reverse voltage generated by L5 is rectified by D6 and regulated by ZD5. The ZD5 determines the VEE voltage (about -16 V).

The LCD module driven by the plus VEE voltage uses the circuit shown in Fig. 2.24. The +24 VDC source voltage is switched continuously by the 90 kHz pulses from CBIC (#8) to energize L2. The voltage generated by L2 is rectified by D5 and regulated by ZD4 and ZD6. The ZD4 and ZD6 determine the VEE voltage.

VEE voltage is adjusted by turning VR1.



**Fig. 2.23 LCD Drive Voltage Generation Circuit (Minus Voltage VEE)**



**Fig. 2.24 LCD Drive Voltage Generation Circuit (Plus Voltage VEE)**

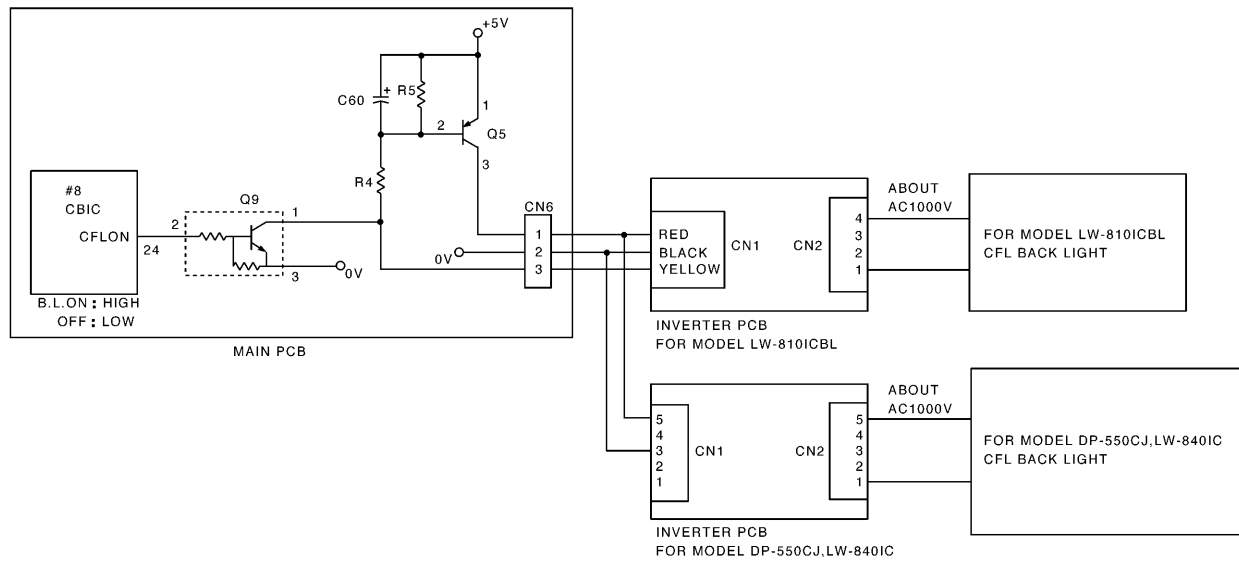
## 9.4. Power Supply for CFL Backlight

The CFL backlight circuit consists of the control circuit that turns ON/OFF the CFL and the inverter PCB.

The ON/OFF status of the CFL is controlled by the CFLON terminal of the CBIC (#8).

The inverter PCB converts +5V to AC voltage to drive the CFL tube. The type of inverter PCB differs according to the LCD.

Fig. 2.25 shows the CFL backlight circuit.



**Fig.2.25 CFL Backlight Circuit**

## 10. FDD (Floppy Disk Drive) Control

### 10.1. FDD Configuration

The FDD consists of two sections: the FDD controller and the FDD module. The FDD controller circuit controls the contents to be received and stores the data in the FDD module. The FDD module drives the motors, sensors, and magnetic head. The interface signals between the FDD and the FDC are shown in Table below:

**Table.2.3 FDC(#5) and FDD Module Links (Interface Signals)**

Signals			Pin No.	Function
Read/Write Circuits	DRIVE SELECT Ø		10 12	This signal is set to LOW when the FDD unit is opening (except for the DC Motor).
	WRITE GATE		24	When this signal is set to LOW, data can be written by the WRITE DATA signal. When this signal is set to HIGH, the READ and STEP operations are enabled.
	WRITE DATA		22	Data is written at the falling edge of this signal while the WRITE GATE signal is LOW.
	READ DATA		30	This signal indicates the polarity data read by the head.
	SIDE1 SELECT		32	This signal is used to select the head: LOW: Head 1 HIGH: Head 0
Motor Drive Circuit	DC MOTOR	MOTOR ON	16	This signal becomes LOW, starting the DC motor, when a disk is set in the drive. Setting this signal to HIGH or removing the disk stops the DC Motor.
	STEP MOTOR	STEP	20	This signal sets the head in the direction designated by the DIRECTION signal.
		DIRECTION SELECT	18	This signal designates the movement of the read/write head: LOW: Inward to the disk's center HIGH: Outward from the disk's center.
Status Check	WRITE PROTECT		28	When this signal is LOW, either there is no disk in the drive or the disk in the drive is write-protected.
	INDEX		8	This signal indicates the beginning of a track by outputting one pulse in each rotation of the disk.
	TRACKØØ		26	When this signal is LOW, the head is located at track 00 (the outside track). Otherwise, the signal is HIGH.
	DISK CHANGE		34	When this signal is LOW, there is no disk in the drive.

## 10.2. FDD Operation

### 10.2.1. Basic Operation

CBIC(#8) writes commands to FDC(#5), and the FDC(#5) controls the FDD in accordance with these commands and reads/writes data.

See Fig. 2.26.

### 10.2.2. Interface between CBIC (#8) and FDC (#5)

If CBIC(#8) accesses an internal register other than the data register in FDC (#5), the normal read/write operation will be performed.

If CBIC(#8)transmits data to or receives data from FDC (#5), DMA communications will be performed using the DMA function of CBIC(#8).

CBIC(#8) resets FDC(#5),detects the density signal which indicates whether the floppy disk is a 2DD or 2HD, and output to FDC(#5).

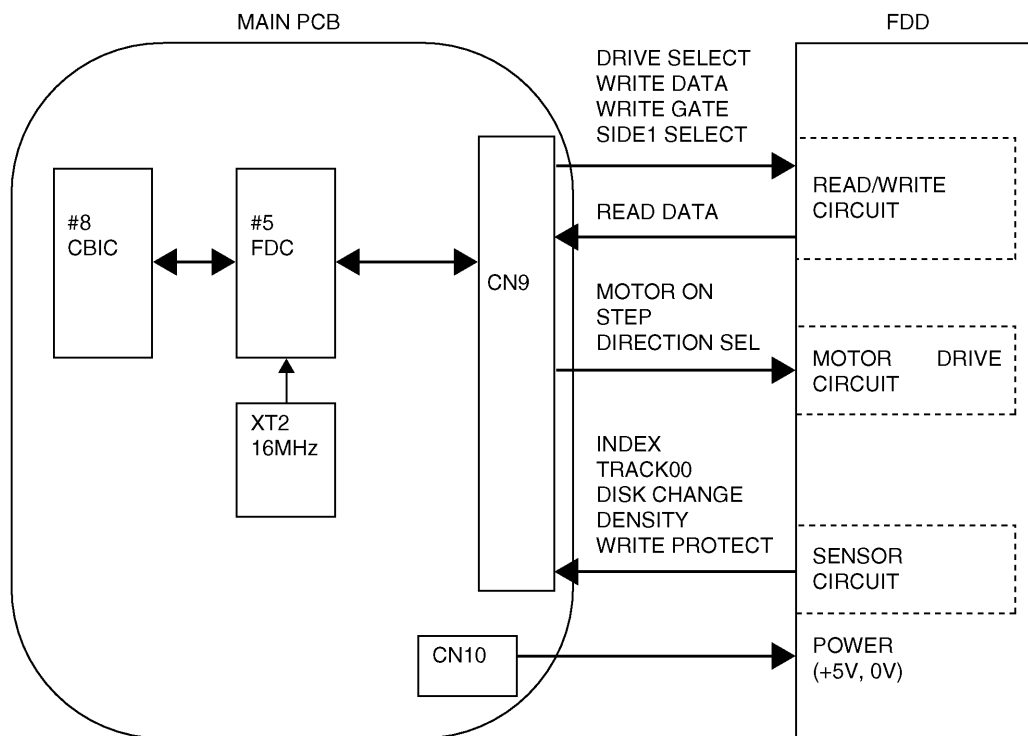


Fig.2.26 FDD Block Diagram

### **10.3. FDD Module**

The FDD Module is composed of the motor, sensor, magnetic head, and the IC that drives them. The FDD Module is controlled by the FDC (#5) of the MAIN PCB.

#### **10.3.1. Read/Write Circuit**

In read operation, the circuit amplifies the analog signals picked up by the magnetic head and converts the analog signal to serial digital pulses. The serial pulses are then transmitted to the FDC (#5) and decoded to parallel digital data.

In write operation, the circuit controls the current at the magnetic head according to the serial digital pulses from the FDC #5.

#### **10.3.2. Motor Drive Circuit**

The motor drive circuit consists of two parts: a DC motor drive circuit and a stepping motor drive circuit.

The DC motor drive circuit controls the DC motor, which rotates the spindle according to the MOTOR ON signal from the FDC. The stepping motor drive circuit controls the stepping motor, which operates the magnetic head unit according to the "STEP" and "DIRECTION SELECT" signals from the FDC #5.

#### **10.3.3. Sensor Circuits**

The following sensor circuits detect the status of the FDD:

##### **1. Write Protect Sensor**

When a write-protect notch on a disk is set to the write-protect position, the "WRITE PROTECT" signal becomes LOW. A micro-switch is used for detection.

##### **2. Index Sensor**

The "INDEX" signal shows the beginning of a track; when the beginning of a track is detected, the "INDEX" signal becomes LOW. A magnetic sensor is used for detection.

##### **3. Track00 Sensor**

When the magnetic head is positioned in track 0 on a disk, the "TRACK 00" signal becomes LOW. A photo sensor is used for detection.

#### 4. Disk-in Sensor

When a disk is inserted in the FDD, this sensor outputs a LOW level signal (HIGH when no disk).

The output of the sensor is connected to the controller and sent as a "DISK CHANGE" signal that shows whether a disk is changed; when a disk is changed, the "DISKCHANGE" signal becomes LOW.

Once the "DISK CHANGE" signal becomes LOW, it remains low until the "STEP" signal is received from the FDC #5.

## PART II REPAIR

### CHAPTER 3 TROUBLESHOOTING

#### 1. Introduction

This chapter explains troubleshooting procedures for the word processor. Since it is impossible to troubleshoot all instances of a problem, only a limited number of cases are presented. Thorough understanding of the procedures given in each section is essential for efficient troubleshooting, and can provide a good insight to the problem.

#### 2. Precautions

##### 2.1. Personal Safety

**WARNING:** If there is chance of electrical shock, this symbol will precede any instructions in this manual. Follow the safety advice carefully!



In addition to any specific warnings as described above, be sure to take the following precautions for your personal safety:

- Unplug the AC adapter from the AC outlet before removing the covers and PCBs, or before making any mechanical adjustments.
- Unplug the AC adapter from the AC outlet before checking continuity.
- When disconnecting a connector, grasp it firmly. Do not pull on the connector's lead wires. If the connector has a lock mechanism, unlock it before trying to disconnect it.

##### 2.2. Handling ESD-Sensitive Parts

Many electronic products use parts that are known to be sensitive to electrostatic discharge (ESD). To prevent damage to ESD-sensitive parts, observe the caution symbols throughout these instructions, as well as the additional precautions below.



**CAUTION:**

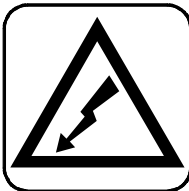
Electrostatic Discharge Hazard

Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

In addition to the usual precautions, such as turning off power before removing circuit boards:

- Keep the ESD-sensitive part in its original shipping container (a special "ESD bag") until you are ready to install it.
- Do not place the ESD-sensitive part on the machine cover or on a metal table; if you need to put down the ESD-sensitive part for any reason, first put it into its special bag.
- When holding ESD-sensitive parts, limit your body movement to prevent an increase of static electricity from clothing fibers, and furniture.
- Hold the ESD-sensitive part by its edge connector shroud (cover); do not touch its pins. If you are removing a plugable module, use the correct tool.
- Be extra careful in working with ESD-sensitive parts when cold-weather heating is used, because low humidity increases static electricity.
- Prevent ESD-sensitive parts from being accidentally touched by other personnel. Install machine covers when you are not working on the machine, and do not put unprotected ESD-sensitive parts on a table.
- If possible, keep all ESD-sensitive replacement parts stored in a grounded metal cabinet (case) until ready for use.

### 3. Checks Before Repair

**CAUTION:**

Electrostatic Discharge Hazard

Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

Check the following possible causes before attempting more extensive repairs to the machine:

- Run the appropriate Self Test operation (from the software) for the suspected problem before attempting any mechanical or electrical troubleshooting.
- Supply voltage: Check the AC input voltage and DC supply voltage for all sections. Make sure they meet specified voltage values.
- Connectors: Check all connectors and make sure they are tight.
- Fuses: Check for blown fuses (F1 and the thermo-fuse inside the AC adapter).

**NOTE:**

- In the logic control circuit, it is difficult to isolate faulty points in areas connected to the CPU by the address bus or the data bus. If a suspected problem involves the address bus or data bus, first check the solder bridge and the cut circuit pattern. If a faulty point cannot be isolated, replace the peripheral devices or the PCB.

#### **4. Checks After Repair**

After completing a repair, check to confirm that the trouble has been eliminated. Also, record the troubleshooting procedures used for reference.

## 5. Troubleshooting Flow Charts

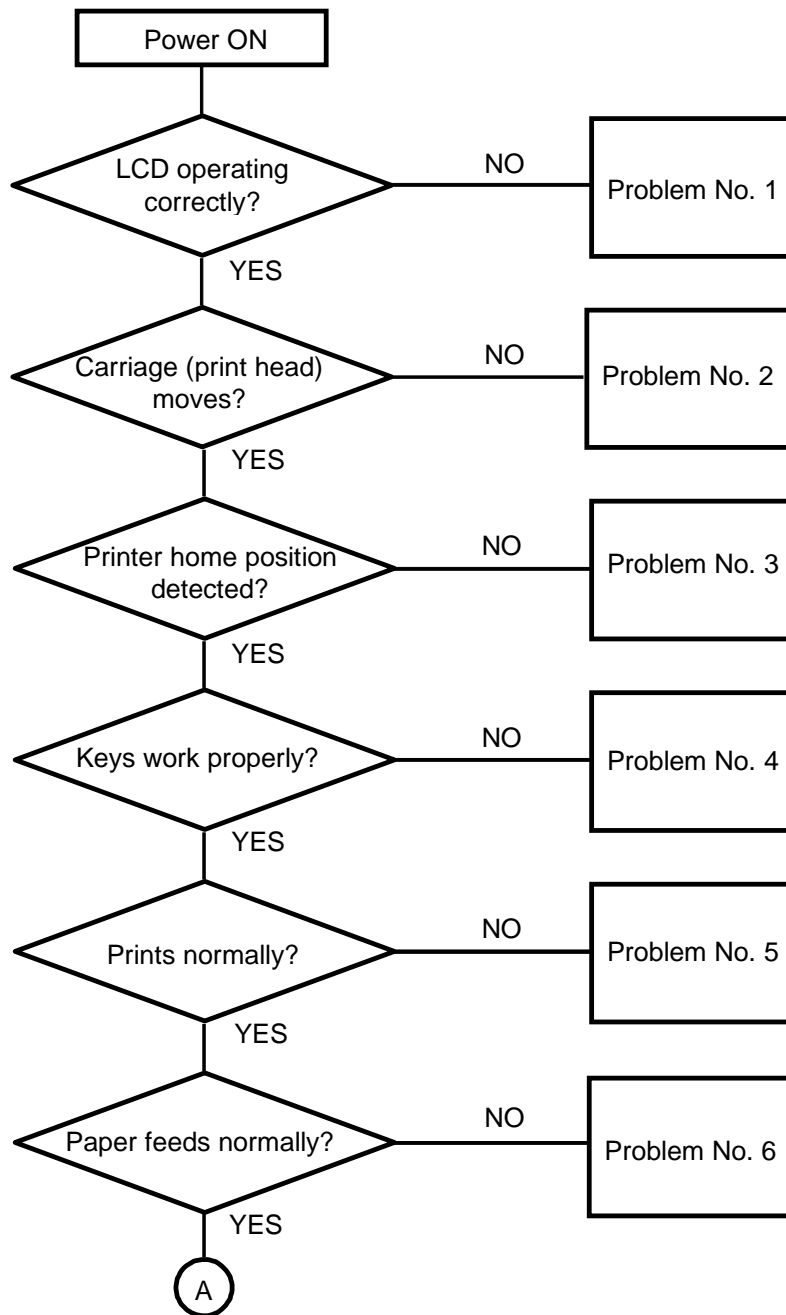


Fig. 3.1 Troubleshooting Flowchart

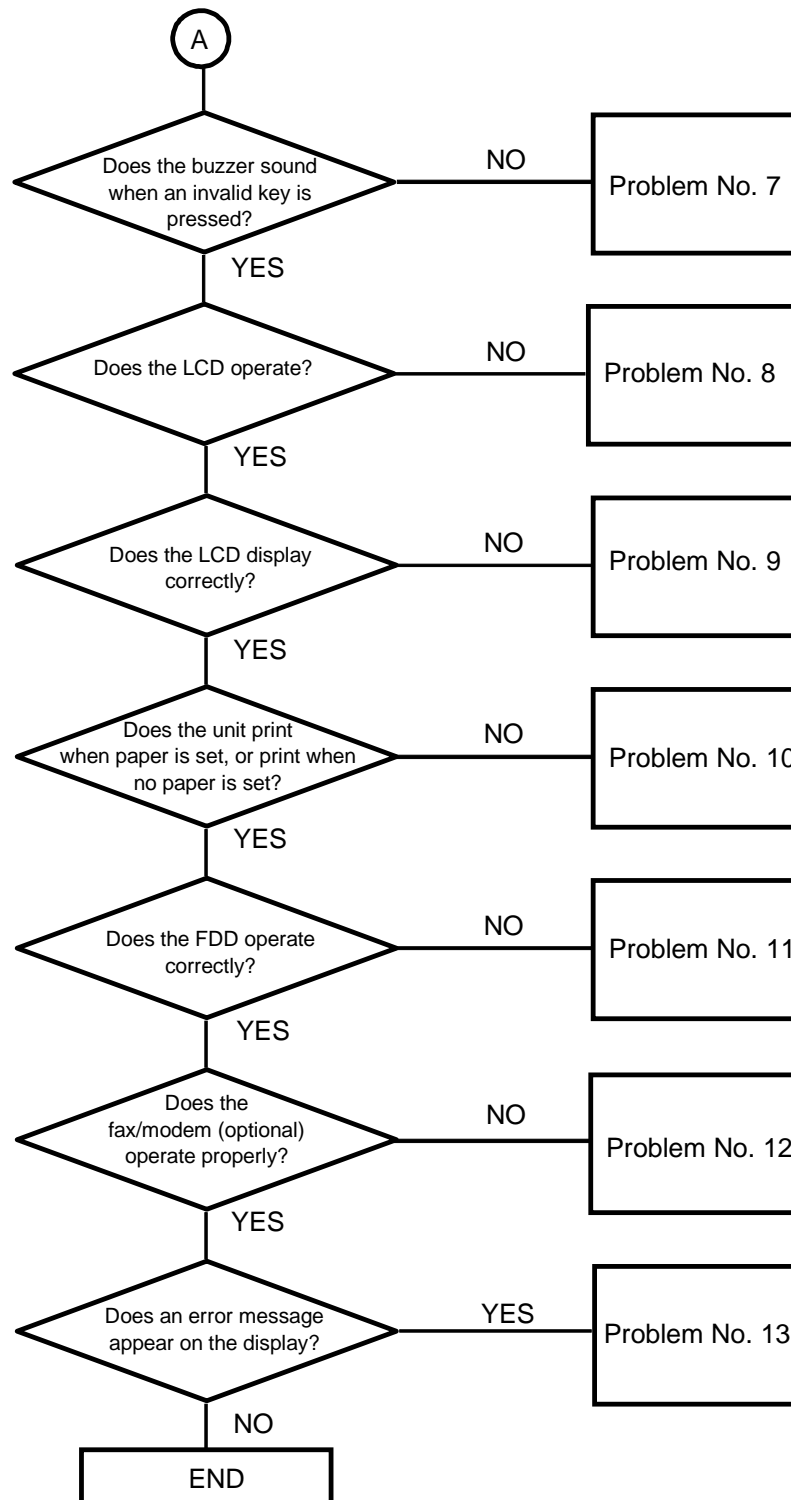


Fig. 3.2 Troubleshooting Flowchart (continued)

## 6. Failure Analysis

The following table lists the failure problems for troubleshooting all basic systems. See the Troubleshooting Tables on the following pages for a troubleshooting protocol.

**Table 3.1 Failure Analysis**

No	Problem
1	Nothing happens when the power is switched on (Nothing appears on the LCD).
2	When the power is switched on, the LCD display operates but the carrier does not return to its home position.
3	When the power is switched on, the carrier moves to the right but cannot detect its home position (i.e., the home position indexing mechanism is faulty).
4	Keys malfunction (do not insert characters or insert wrong characters)
5	Printing results abnormal (various unsatisfactory printing results)
6	The line feed (LF) motor does not rotate normally.
7	The buzzer does not sound.
8	Power in on, but nothing appears on the LCD.
9	LCD displays operates, but data displayed is incorrect (does not match input).
10	Word Processor prints when no paper is set, or will not print when paper is set (Paper End Sensor malfunction).
11	The FDD does not operate correctly.
12	Communication function (optional fax/modem) does not work or does not work properly.
13	An error message appears on the display.

## Troubleshooting Tables

**1**
**Problem:** Nothing happens when the power is switched on (nothing appears on the LCD).

Points to Check	Probable Cause	Corrective Action	Repair
Is (at least) about +16 V present on the output plug if the AC adapter?	Defective AC adapter	Replace the AC adapter.	
Is fuse F1 on the Switch PCB OK?	Blown fuse	Replace the Fuse.	
Are harnesses CN1 on the Switch PCB properly connected?	Harnesses improperly connected.	Replace the Switch PCB.	Rework the connectors.
Is about +16V present at CN1 on the Switch PCB?	Defective Switch PCB	Replace the Switch PCB.	
Is +5V present on the Main PCB?	Defective ZD7 or Q12 (Main PCB)	Replace the Main PCB.	Replace ZD7, Q12.

**2**
**Problem:** When the power is switched on, the LCD display operates but the carrier does not return to its home position.

Points to Check	Probable Cause	Corrective Action	Repair
With motor cable disconnected, is +24 V present at CN3, pin 5 on the Main PCB?	Defective Q6 (Main PCB)	Replace the Main PCB	Replace Q6.
Is resistance value across each of the phases and COM terminal (pin 5) of the carriage motor correct? (about 45Ω) Phases → ;(5-1); B(5-2); ,b(5-3); D(5-4)	Broken wire in the carriage motor assembly (broken wire in the carriage motor) (defective connector)	Replace carriage motor assembly.	
Are carriage motor drive pulse output from pin 150-153 of #8 just after power is switched on ? (Use an oscilloscope.)	Defective #8 (Main PCB)	Replace the Main PCB.	Replace #8.
Is output at the pin of transistors Q1-Q4 on and off according the drive pulses indicated above?	Defective transistor Q1-Q4 or circuit on the Main PCB	Replace the Main PCB.	Replace Q1-Q4.
Does the carriage motor occasionally stall?	Incorrect motor phase at home position (start up).	Adjust motor phase at home position (see Chapter 4 "INK JET PRINTER ASSEMBLY").	

**3**
**Problem:** When the power is switched on, the carrier moves to the right but cannot detect its home position.

Points to Check	Probable Cause	Corrective Action	Repair
Is the carriage index (home position) switch open?	CA index switch is not adjusted correctly.	Readjust.	

Points to Check	Probable Cause	Corrective Action	Repair
Does the signal level at pin 1 of CN13 remain HIGH when the carriage index switch is closed?	Broken wire in the carriage index switch assembly	Replace the carriage index switch assembly (after confirming discontinuity).	
Is the carriage index switch connected to CN13?	Incorrect connection	Reconnect.	

4

**Problem:** Keys malfunction (do not insert characters or insert wrong characters)

Points to Check	Probable Cause	Corrective Action	Repair
Is the key top and the key actuator correctly mounted?	Faulty keyboard assembly	Replace the keyboard.	
Is the keyboard FPC securely connected to Main PCB CN12?	Keyboard PCB not connected properly.	Reconnect.	
When a bad key is pressed, does the matrix row in which the pressed key is connected go LOW in synchronization with the output timing of output drive #8?	If YES, faulty Main PCB.	Replace the Main PCB.	
	If NO, faulty keyboard.	Replace the keyboard.	
Is solder present at the correct country specification change-over solder point?	Incorrect or faulty solder point for specified country (language)	Verify and correct solder point.	

5

**Problem:** [Abnormal Printing]

- Voids in characters
- Prints satellites
- Print head dries out prematurely
- Ink smearing
- Print lines crowded
- Will not print in color
- Light print
- Carrier moves, but does not print
- Vertical alignment off
- Vertical streaks on paper
- Gaps or overlapped areas in print
- Colors will not print correctly.

Points to Check	Probable Cause	Corrective Action	Repair
(1) Print Cartridge: Is the ink cartridge good, and is it properly installed?	Cartridge empty, dried out, or not locked in and aligned with contacts in carriage.	Replace with a new cartridge, and/or properly install the ink cartridge.	Replace the ink cartridge and/or the printer flat cable.
After executing the purge (auto printhead cleaning) function from the keyboard (CODE+SHIFT+INK CHG), are there still printing problems?	Dirty or clogged ink jet nozzles	Replace the ink cartridge and run the Self-Print test, and/or replace the printer flat cable.	
(2) Printhead Carriage Assembly: Is the flat cable firmly connected in the Main PCB?	Loose or worn printhead flat cable.	Reconnect loose flat cable or replace it.	Replace flat cable.

Points to Check	Probable Cause	Corrective Action	Repair
Is there wear or damage to the ink cartridge head locker, spring, or carriage assembly?	Head locker or spring worn or damaged: dirty, worn, or damaged gold-plated contacts the printer flat cable.	Remove the cartridge and clean the contacts on the flat cable in the carriage; Replace the carriage mechanism.	Replace spring, head locker, or printer flat cable.
(3) Maintenance Station: Is the wiper loose or worn?	Defective wiper	Replace wiper.	
Is the cap worn or loose?	Defective cap	Replace cap.	
Is the spring-loaded MS carriage moving freely?	Obstructions in carriage path; spring broken or loose; MS carriage out of tracks.	Remove obstructions, realign carriage on tracks, or replace MS assembly.	Replace spring or MS assembly.
(4) Paper/Line Feed: Are there any obstruction in the paper path?	Paper jam	Clear paper path.	
Is the correct type of paper in the machine?	Wrong paper (weight, size)	Try correct paper.	
Are star-wheels binding?	Star-wheels dirty, worn, or dislodged.	Replace star-wheel assembly.	
Is the main roller assembly rotating properly?	Worn or broken gears, bearing, defective line feed motor?	Replace main roller assembly.	Replace gears, bearing, and/or motor.
Does not the line/paper feed motor rotate normally?	See Problem 6, Line Feed Motor.		
Does the sheet lead edge contact the first print roller?	Paper jam, incorrect paper wt./type; worn main shaft rollers	Clear paper path, install proper wt./type paper.	Replace main shaft rollers.
Are the drive gears working properly?	Worn, misalign, or damaged gears.	Replace the gear holder assembly and/or the main shaft gear.	
(5) Color Print (Check Items 1-4 above) With a color cartridge properly installed, will the system display a color selection dialog box, and then print the file in the color selected?	If no, color detection circuit (Main PCB) is defective.	Replace the Main PCB.	Replace D3, ZD3, Q16, #8.
Run the Self-test color print test 1 (#2 from the SELF TEST MENU).	After eliminating items 1-4 (same as monochrome print), defective Main PCB.	Replace the Main PCB.	



**6** **Problem:** The line feed (LF) motor does not normally.

Points to Check	Probable Cause	Corrective Action	Repair
Is the LF motor turning activated ? is it noisy?	Defective LF motor	Replace LF motor.	
Are any motor harness wires damaged?	Defective motor wiring harness	Replace LF motor.	
Are there binds in the LF motor or gear train?	Worn, dirty, damaged, or obstructed gear train, improper gear backlash	Clean/remove obstructions. Space motor from gear. Replace damaged gear(s).	
Is the LF motor gear loose or worn?	Loose motor screws or worn LF motor gear	Tighten motor screws. Replace LF motor.	
Is the resistance between the pin 5 of the LF motor and each phase normal?(about 60Ω)Phases → A(5-1); B(5-2);C(5-3); D(5-4)	Defective LF motor (broken motor wire or defective connector)	Replace the LF motor assembly.	
Are LF motor drive pulses output from the pin131-134 of #8 when printing?	Defective #8 (Main PCB)	Replace the Main PCB.	Replace #8.
Is output at the output pin of transistors Q23-Q26 on and off according the drive pulses indicated above?	Defective transistor Q23-Q26 or circuit on the Main PCB	Replace the Main PCB.	Replace Q23-Q26.

**7** **Problem:** The buzzer does not sound.

Points to Check	Probable Cause	Corrective Action	Repair
Are pulses of 4kHz present on one pin and about 5V present at the other pin of buzzer BZ1?	If YES, defective buzzer	Replace the buzzer.	
	If NO, defective Main PCB.	Replace the Main PCB.	Replace #8.

**8** **Problem:** Power in on, but nothing appears on the LCD.

Points to Check	Probable Cause	Corrective Action	Repair
Is the contrast setting correct?	Faulty contrast adjustment	Re-adjust.	
Is the LCD harness free of breakage?	Broken LCD harness	Replace the harness.	
Is the correct voltage (about -16V) applied to the LCD on pin 2 of connector CN7 of the Main PCB? (without 640 × 400 LCD)	Incorrect power supply voltage to LCD module	Replace the Main PCB.	

Points to Check	Probable Cause	Corrective Action	Repair
Is the correct voltage (about 25V-36V) applied to the LCD on pin 11 of connector CN8 of the Main PCB? (640 × 400 LCD)	Incorrect power supply voltage to LCD module	Replace the Main PCB.	
Is oscillator XT1 operating correctly? (Use an oscilloscope to check)	Defective XT1 or #7		Replace XT1, #7.
Do the output pulses from MRD of #8 change?	Defective #8		Replace #8.

**9**
**Problem:** LCD displays operates, but data displayed is incorrect (does not match input).

Points to Check	Probable Cause	Corrective Action	Repair
Is solder present at the correct Country Specification Change-Over Solder Point?	Incorrect or faulty solder point for specified country (language)	Verify and correct solder point.	
Is there an output wave form at each pin in the connector CN7 or CN8	Defective #8 or solder bridge	Replace the Main PCB.	Replace #8.
Is there faulty soldering the LCD module?		Replace the LCD module.	
Do the CBIC (#8) MA0-MA14 pulses change sequentially	Defective #8		Replace #8.
Do video RAM (#6) MD0-M7 change in response to the MA0-MA14 pulses?	Defective #6		Replace #6.

**10**
**Problem:** Word processor prints when no paper is set, or will not print when paper is set (Paper End Sensor malfunction)

Points to Check	Probable Cause	Corrective Action	Repair
Is the PE(paper end) switch properly installed?	Incorrect installation	Reinstall.	
Is the PE switch lever stuck?	Incorrect installation	Reinstall.	
Is the PE switch damaged?		Replace the PE switch.	
Does pin 1 of CN14 go LOW when paper is not set and HIGH when Paper is set?	Harness wire break or defective PE switch	Replace the harness or the PE switch.	
Does the switch function abnormally even though the above signals are normal?	Defective #8	Replace the Main PCB.	Replace #8.

**11 Problem:** The FDD does not operate correctly

Points to Check	Probable Cause	Corrective Action	Repair
Is FDD power harness correctly connected?	FDD power harness is not correctly connected.	Reconnect.	Replace the FDD power harness.
Is FDD ribbon cable correctly connected?	FDD power cable is not correctly connected.	Reconnect.	Replace the FDD power cable.
ERROR on performing the FDD self-test (Since performing this destroys all data on the disk, always use a disk containing data whose loss is not important.)	Defective FDD or FDD ribbon cable.	Replace the FDD or the FDD ribbon cable, as req.	Replace the FDD or cable.
	Defective FDC (#5)	Replace the Main PCB.	Replace #5.
Is oscillator XT2 operation correctly? (Use an oscilloscope to check)	Defective XT2		Replace XT2.

**12 Problem:** Communication function (optional fax/modem)do not work or do not work properly.

Points to Check	Probable Cause	Corrective Action	Repair
Is the fax/modem cable connected properly?	Faulty/improper connection.	Reconnect cable.	Replace cable.
Is each level of CN1 signal approx. $\pm 10V$ ?	Defective #1	Replace the Main PCB.	Replace #1
Do the TXD of the CBIC (#8) signal change?	Defective #8	Replace the main PCB.	Replace #8.
Do the RXD of the CBIC (#8) signal change?	Defective #1 or circuit on the Main PCB	Replace the Main PCB.	Replace #1.

**13 Problem:** An error message appears on the display.

Points to Check	Probable Cause	Corrective Action	Repair
(1) "Check printer Press any key to continue." (After executing print command) Is the paper path clear	Possible paper jam.	Check/clear paper path	
Is the CA index (home position) switch working properly?	Home position cannot be detected (defective index switch)	See Problem 3, "Home position Switch Checks".	
Is ROM/RAM (#11,#12/#10) working properly?	Defective ROM/RAM (#11,#12/#10)	Execute the Self-Print test (in SELF TEST) and verify that the ROM/RAM (sum-check) test is normal (if error on Self-Test, replace the Main PCB).	Replace the Main PCB

<b>Points to Check</b>	<b>Probable Cause</b>	<b>Corrective Action</b>	<b>Repair</b>
(2) "Incorrect spec!"(when power on) Do the soldering points for the Country Code Change-Over circuit match the ROM?	Solder point setting is wrong, or the ROM (#11,#12) is incorrectly mounted.	Replace the Main PCB.	Set the correct solder point, or replace the ROM.
(3) "RAM down" (RAM cannot be accessed at power on) Is the RAM installed correctly?	RAM improperly installed (e.g. solder bridge) or defective RAM(#10).	Replace the Main PCB.	Reinstall/replace the RAM(#10).

## 7. SELF-TESTS

From the Main Menu, two self-test modes are available:

### 1. Self-Print

Press the CODE + SHIFT + RETURN keys.

### 2. Self-Test

Press the CODE + SHIFT + BACKSPACE keys.

### 7.1. SERIAL NUMBER Input Display

The machine prompts you for the unit serial number after the Self-Test mode is accessed, but before the test is started:

- From the SELF PRINT screen
- From the SELF TEST menu, after selecting a test, or after pressing the "S" key.

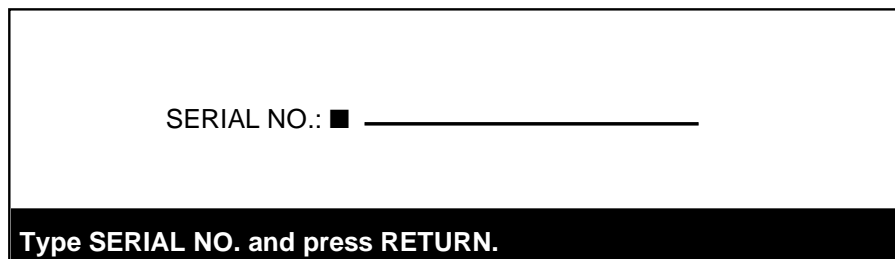


Fig. 3.3 Serial Number Entry Display

#### NOTES:

- The maximum number of characters that can be input is 9; alphanumeric keys are the only acceptable input.
- The RETURN key can also be pressed without entering a serial number.
- Pressing CANCEL while the SERIAL NUMBER prompt is displayed cancels any number entered (before pressing RETURN), and returns to the SELF TEST menu.

## 7.2. Self Print Mode

- (1) From the Main Menu, press CODE + SHIFT + RETURN. The SELF PRINT display appears, with the SERIAL NO. input pop-up screen.
- (2) Enter the unit serial number and press RETURN (or press RETURN without entering a number).
- (3) A sum check of the MAIN RAM, MAIN ROM and DICTIONARY ROM is then performed.

***** SELF PRINT *****			
VIDEO RAM	Checking...	OK.	NG.
MAIN ROM	Checking...	OK.	NG.
CG ROM	Checking...	OK.	NG.
DICTIONARY ROM	Checking...	OK.	NG.
MAIN RAM	Checking...	OK.	NG.
		(NORMAL)	(ABNORMAL)

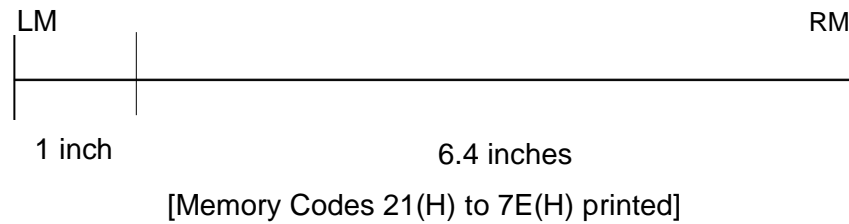
Fig. 3.4 Self-Print Pattern

### NOTES

- "OK" is displayed if the checked item is normal ("NG" if there is an error). If the result of all checks is "OK" the carriage is returned and, the self-print ("all character") test is starts.
- If there are any errors in the sum check, self-printing will not start. The buzzer will not sound, but the SELF PRINT screen will remain. It will not be possible to proceed with any operation (cycle the power switch to reset the system).
- The following print format settings are in effect for the test:

Font type:	Brougham
Font size:	12 point
Type style	Normal
Line space:	Auto
Left/right margins:	1 - 7.4 inch (with CSF)
Tab setting:	None

- The following printing pattern is printed:



- The serial number is printed on the first line (if it was entered), and then 59 lines of characters are printed at 64 characters per line; with each line beginning with one character from the right of the previous line.
- If the CANCEL is pressed while the serial number input screen is displayed, the input character string will not be registered as a serial number and display will return to the Main Menu screen.
- If the SPACE BAR or CANCEL key is pressed during printing, self printing is suspended and the pop-up screen shown below is displayed:

OK to cancel printing?

**Use cursor to select and press RETURN.**

**[YES]**
**[NO]**

- If RETURN is entered while the cursor is located at "YES", self-printing is canceled and the display returns to the Main Menu.
- If RETURN is pressed while the cursor is located at "NO", self-printing is resumed.

```
SERIAL NO.:
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`a
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`ab
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abc
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcd
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcde
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdef
()*,,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefg
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefgh
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghi
+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghij
,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijk
-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijkl
./0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklm
/0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmn
0123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmno
123456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnop
23456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
3456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
456789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
56789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
6789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
789:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
89:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
9:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
:;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
;<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
<=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{
=>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|
>?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
?@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
@ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
ABCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
BCDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
CDEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
DEFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
EFGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
FGHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
GHIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
HJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
HIJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
IJKLMN OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
JKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
JKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
JKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
JKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
NOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
QRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
RSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
STUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
TUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
UVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
VWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
WXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
XYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
YZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
Z[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+,-./0123456789:;<
```

Fig. 3.5 Results of Self-Print Test



### 7.3. Self-Test Mode

There are six tests types available in Self Test mode: (1) LCD Display tests, (2) Printer Checks, (3) Keyboard Test, (4) FDD Tests, (5) PE (Paper Exist), (6) CR (Carriage Reset to Home Position), and (7) RS-232C Test.

(1) From the Main Menu, press the CODE + SHIFT + BACKSPACE keys, and the menu shown below displays.

(2) Press the character key for the desired test:

<14-line model and 10 inch VGA model>

***** SELF TEST MENU *****	
DISPLAY	1
PRINTER	2, 3
KEYBOARD	4, 5, 6
FDD	7, 8, 9, D, E
PE	A
CR	B
RS-232C	C
SERIAL NO.	S [XXXXXXXX]
DISK TYPE.	T 2DD

← →2HD

**Please select the number. Press CANCEL to finish.**

<7-line model>

***** SELF TEST MENU *****			
DISPLAY	1	PE	A
PRINTER	2, 3	CR	B
KEYBOARD	4, 5, 6	SERIAL NO.	S [XXXXXXXX]
FDD	7, 8, 9, D, E	DISK TYPE.	T 2DD

← →2HD

**Please select the number. Press CANCEL to finish.**

Fig. 3.6 Self-Test Menu

**NOTES:**

- Pressing the CANCEL key while the above menu is displayed will return the display to the Main Menu.
- The keys that can be used while the SELF Test menu is displayed are:

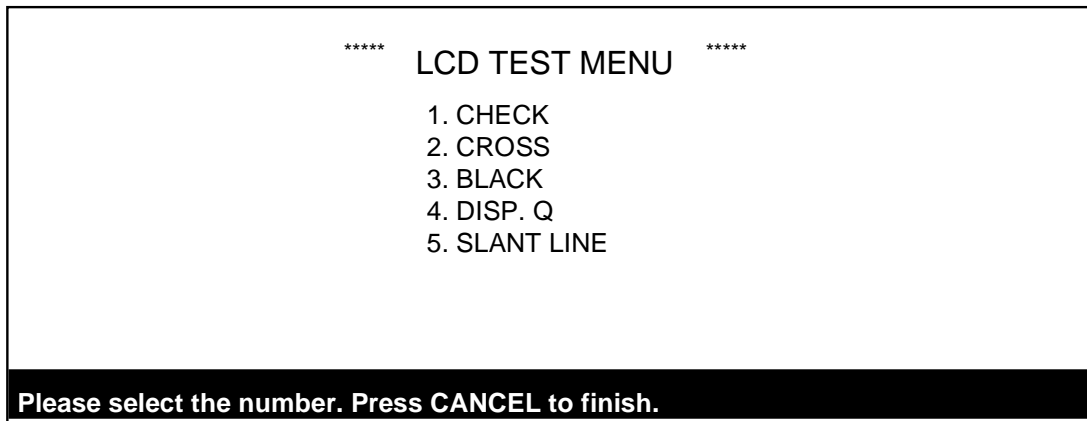
Alphanumeric keys	start the test
CODE+SHIFT+INSERT	paper insert
CODE+SHIFT+CANCEL	line feed
CODE+SHIFT+HELP	paper eject
CANCEL	returns to the Main Menu
- If a serial number has been input, it will be displayed in the brackets to the right of the serial number menu item; if no serial number has been entered, only the brackets will be displayed.
- If there is a problem with the printer, an error message is displayed, and testing will continue without performing the printer test.

### 7.3.1. Display (LCD) Test

There are four display checks available: 1) CHECK, 2) CROSS, 3) BLACK, and 4) DISP. Q. 5) SLANT LINE

- (1) From the Self Test menu, select "1" to open the LCD Test Menu.
- (2) Press the number key for the desired display test. The screen displays the selected test pattern.

<14-line model and 10 inch VGA model>



<7-line model>

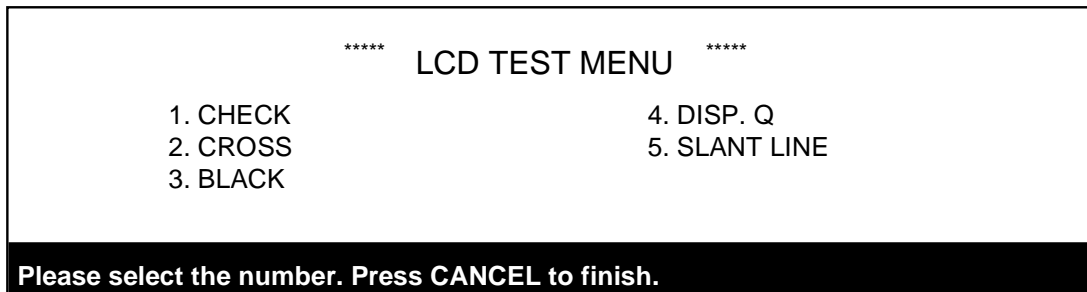


Fig. 3.7 LCD Test Menu

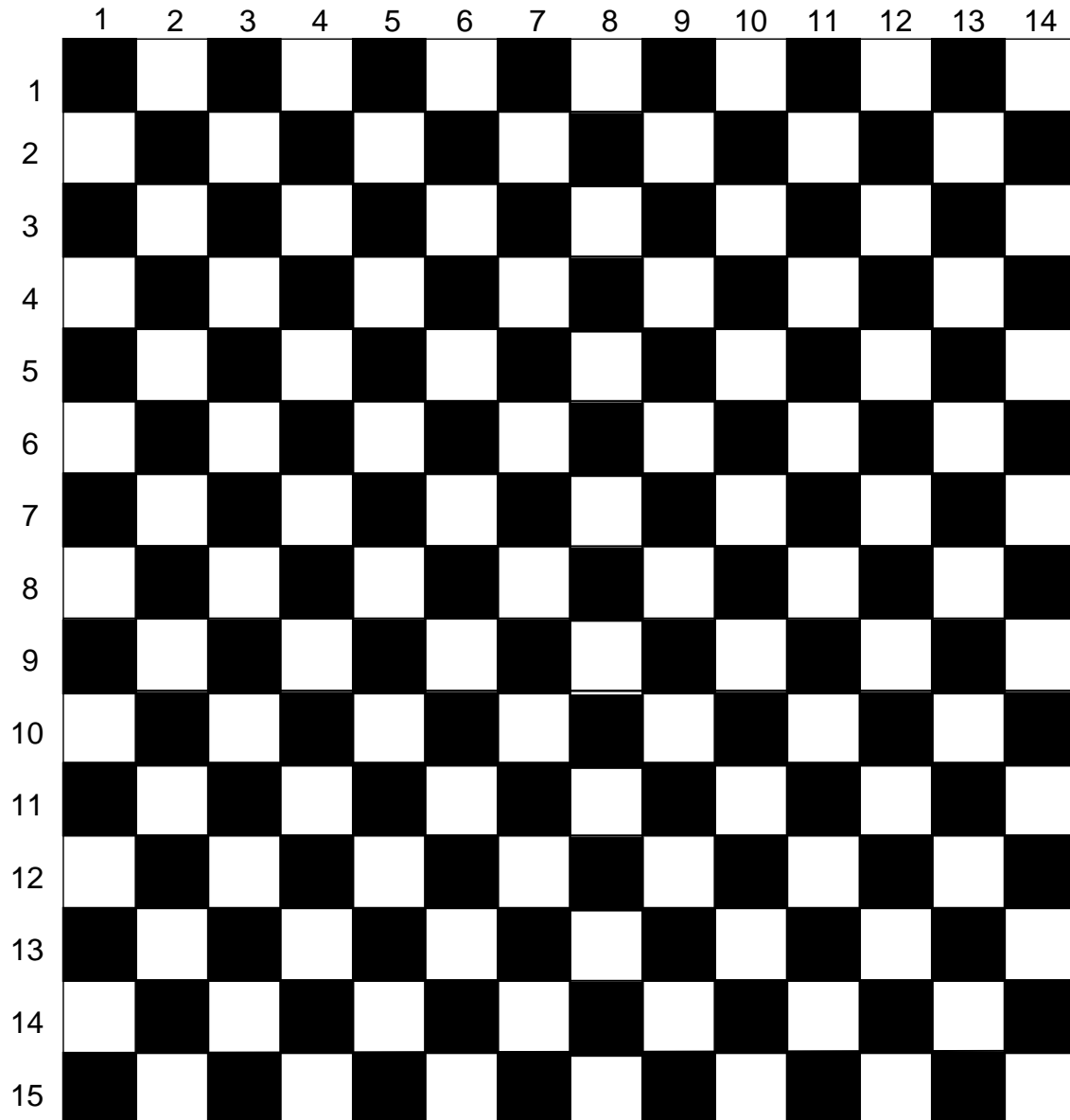
### 7.3.1.1. Check Test

The CHECK test displays every other bit as shown below (magnified).

Select "1" from the MENU screen.

**NOTE:**

- Press the space bar and the displayed bit pattern is reversed.



**Fig. 3.8 CHECK Test Display (magnified)**

### 7.3.1.2. Cross Test

The CROSS test displays the grid pattern shown below (magnified).

Select "2" from the MENU screen.

**NOTE:**

- Press the space bar and the displayed bit pattern is reversed.

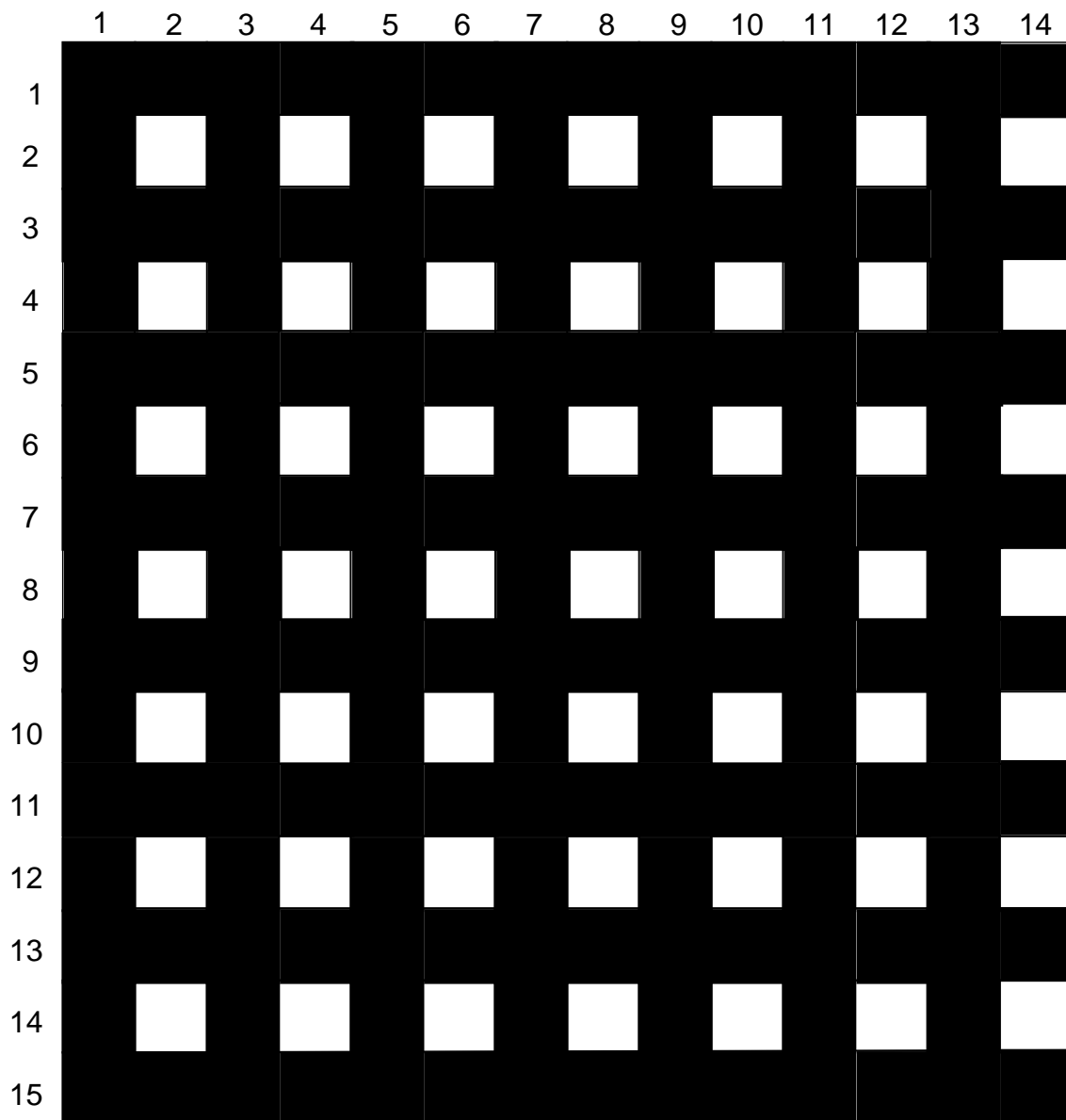


Fig. 3.9 CROSS Test Display (magnified)

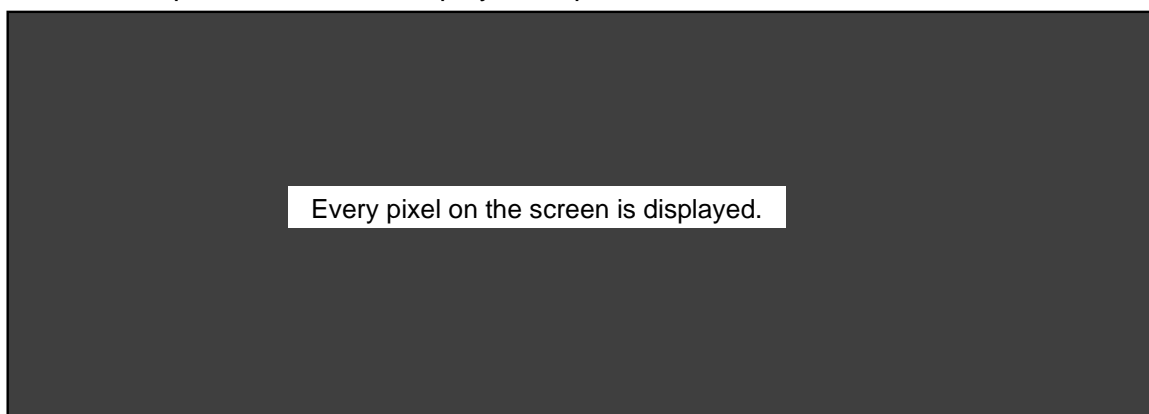
### 7.3.1.3. Black Test

The BLACK test checks for missing dots (pixels).

Select "3" from the MENU screen.

**NOTE:**

- Press the space bar and the displayed bit pattern is reversed.



**Fig. 3.10 BLACK Test Display**

#### 7.3.1.4. Display Q Test

The DISP Q test displays the character "Q" on the entire screen.

Select "4" from the MENU screen.

**NOTE:**

- Press the space bar and the displayed bit pattern is reversed.

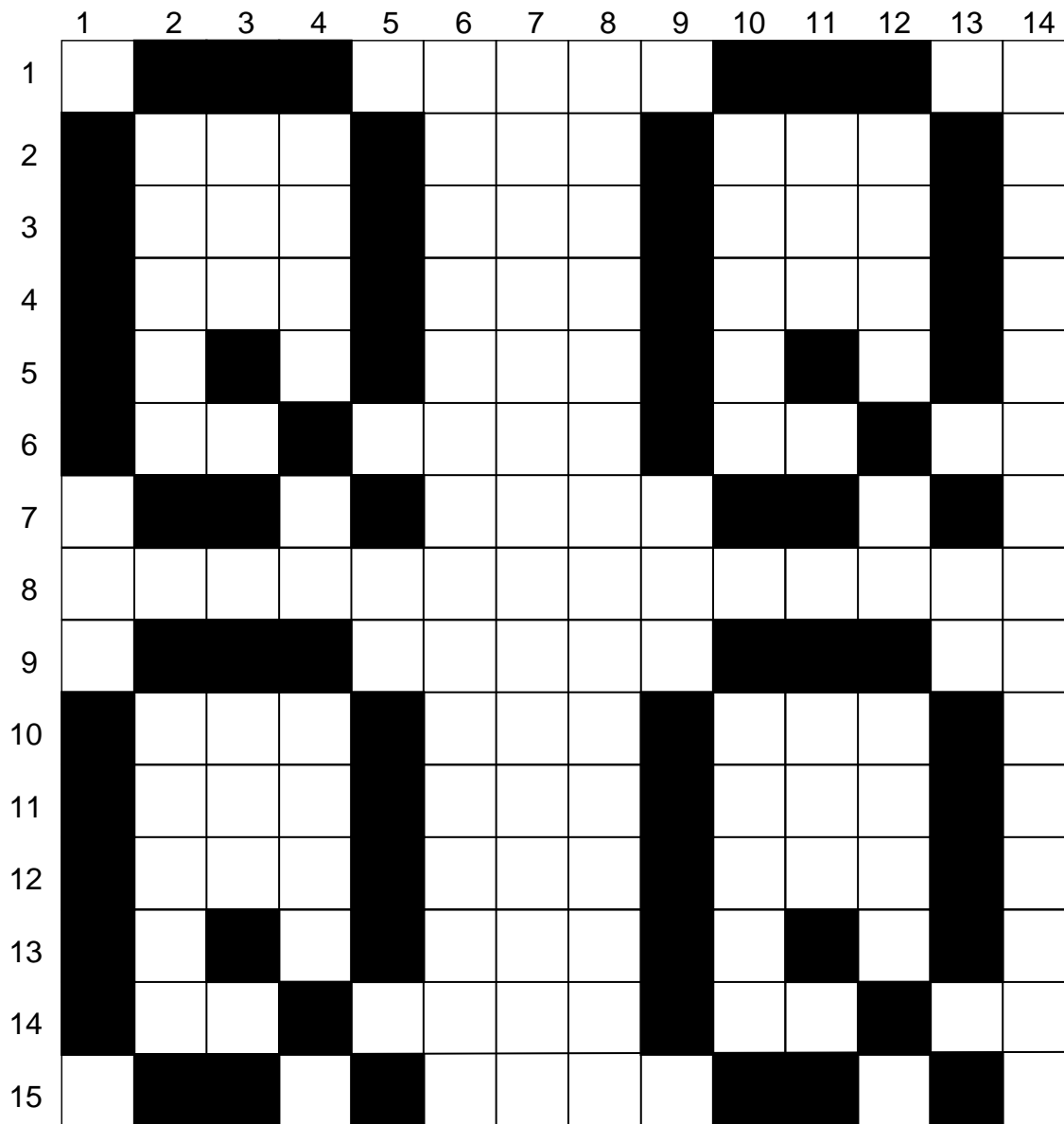


Fig. 3.11 DISP Q Test Display (magnified)

### 7.3.1.5. Slant Line Test

The SLANT LINE test displays the pattern as shown below.

Select "5" from the MENU screen. The following screen is displayed.

Upper left corner

**NOTE:**

- Press the space bar and the displayed bit pattern is reversed.
- If any key other than the key indicated above is pressed, the screen will return to the MENU screen.

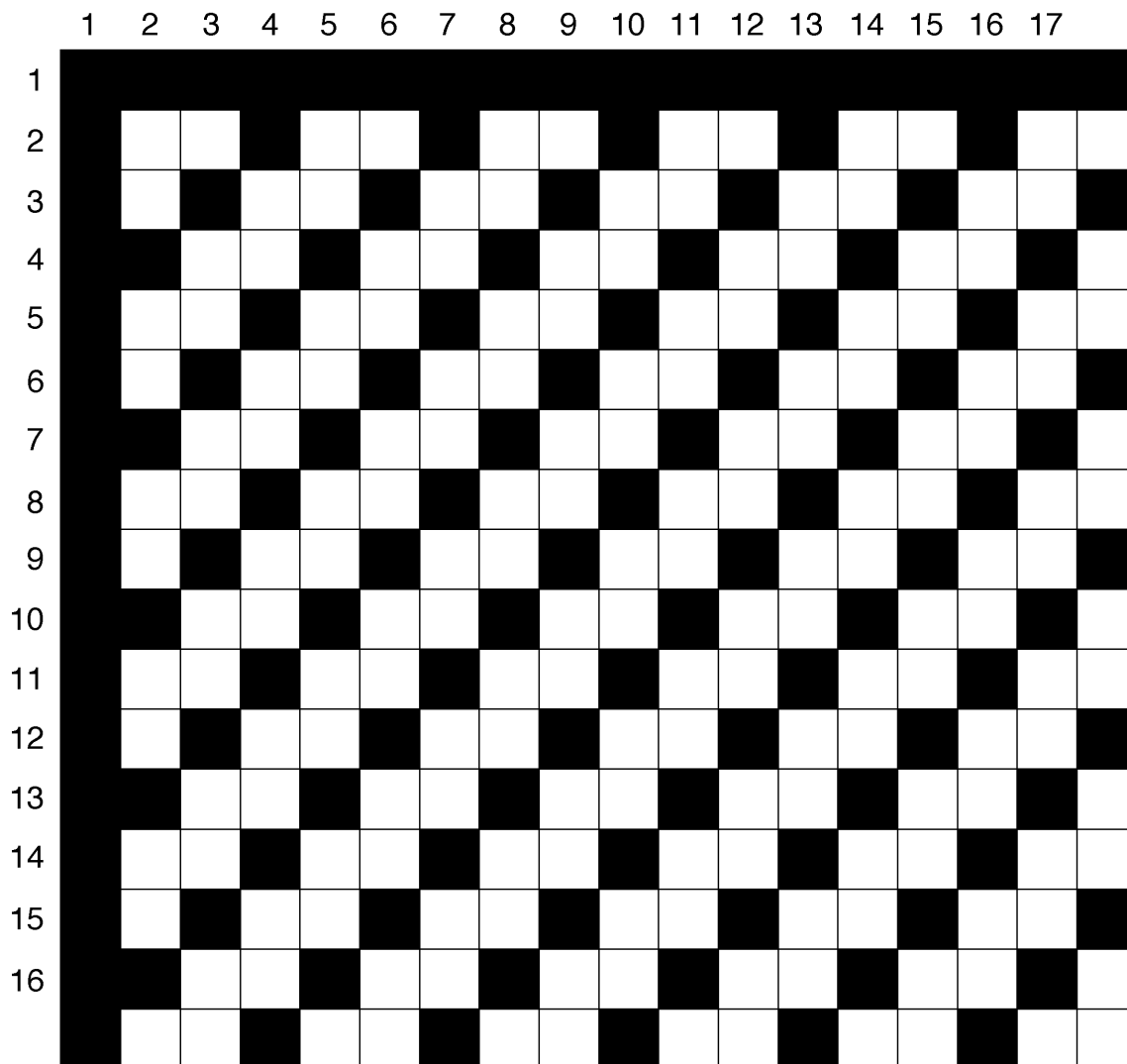


Fig. 3.12 Slant Line Test Display (magnified)



### 7.3.2. Print Checks

There are two self-test print checks.

#### 7.3.2.1. Print Test Pattern 1

Purpose: To check that all characters are printed correctly.

From the Self Test menu, select "2" at the MENU screen. When printing is complete, the display automatically return to the Self Test menu. The diagram (see in Fig. 3.14) shows which characters should be printed and their locations in reference to each other. A sample of the printed pattern is shown in Fig. 3.15.

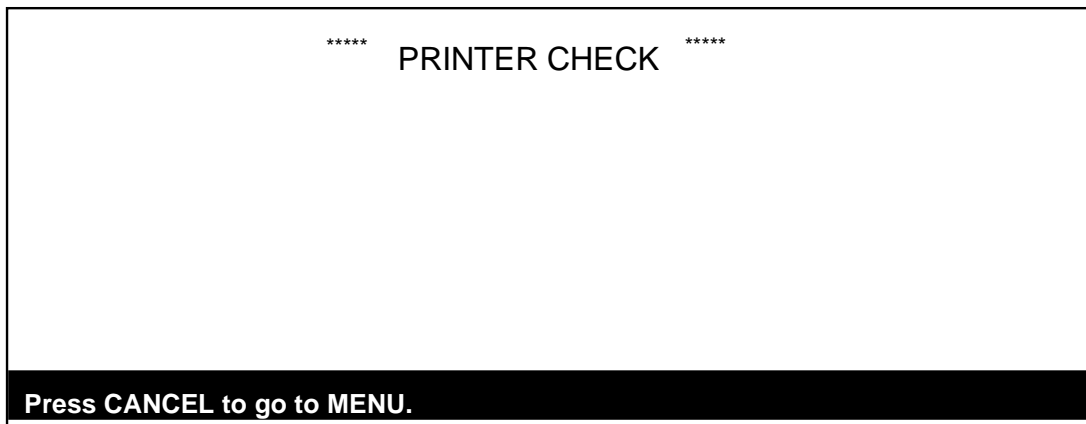


Fig. 3.13 Printer Check #1 (in progress) Display

#### NOTES

- A paper check is performed before printing. If paper is set, the print test is executed; if no paper is set, the ERROR pop-up window is displayed. If you select to continue printing, paper is automatically inserted by the ACF and to execute the print test.
- Pressing the CANCEL key during printing will stop the test (paper is advanced), and return the display to the Self Test menu.
- If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number, or press RETURN to start the test. If a serial number is entered, it will be printed on the first line of the test.

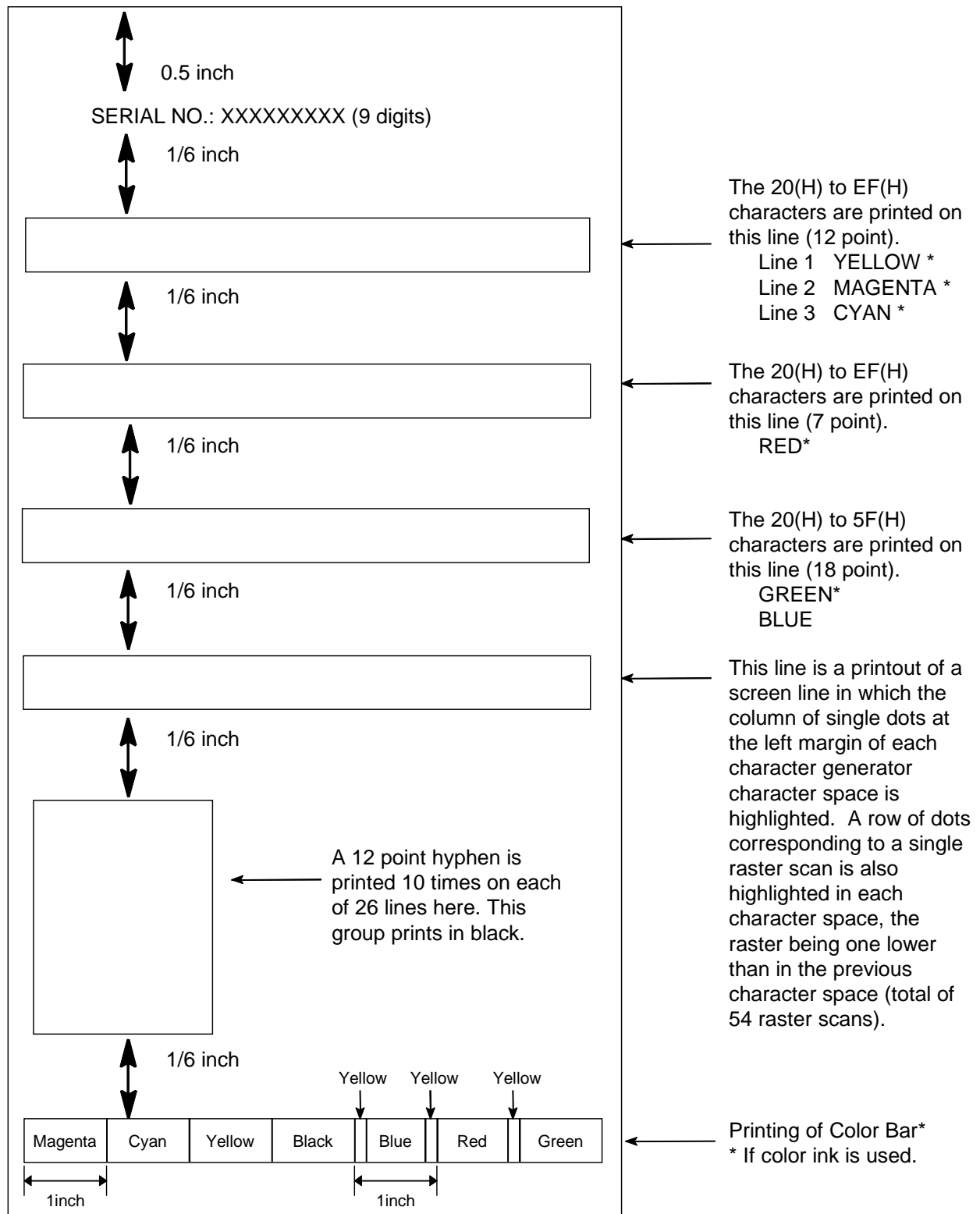


Fig. 3.14 Diagram of Print Test Pattern 1



## 7.3.2.2. Print Test Pattern 2

Purpose: To check that all characters are printed correctly.

From the Self Test menu, select "3" at the MENU screen. When printing is complete, the display automatically return to the Self Test menu. A sample of the printed pattern is shown in Fig. 3.17.

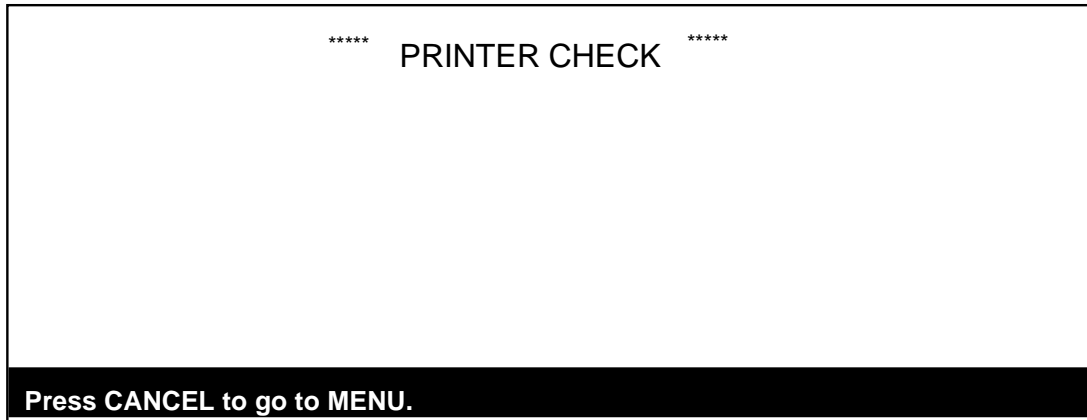


Fig. 3.16 Printer Check #2 (in progress) Display

**NOTES:**

- A paper check is performed before printing. If paper is set, the print test is executed; if no paper is set, the ERROR pop-up window is displayed. If you select to continue printing, paper is automatically inserted by the ACF and to execute the print test.
- Pressing the CANCEL key during printing will stop the test (paper is advanced), and return the display to the Self Test menu.
- If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number, or press RETURN to start the test. If a serial number is entered, it will be printed on the first line of the test.
- The print format settings are as follows:

Font:	Brougham
Type/Style:	Normal
Line space:	Auto
Left/right margins:	0.2 inches - 8.2 inches

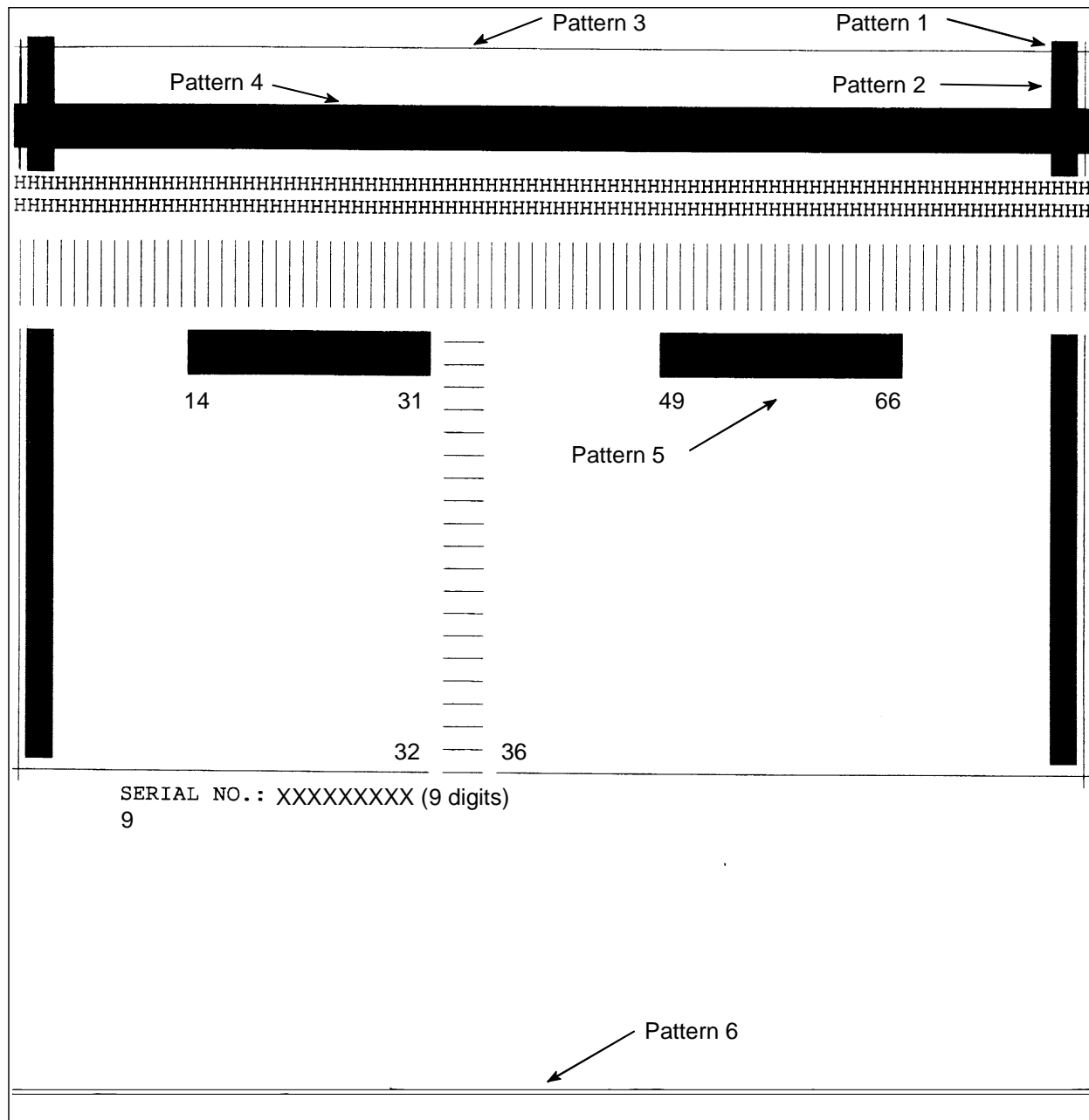
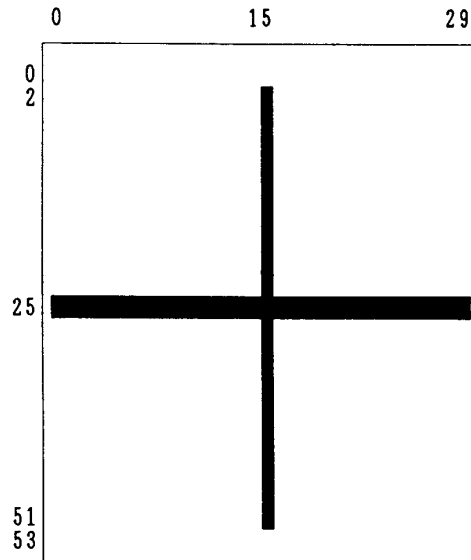


Fig. 3.17 Sample Test Pattern 2

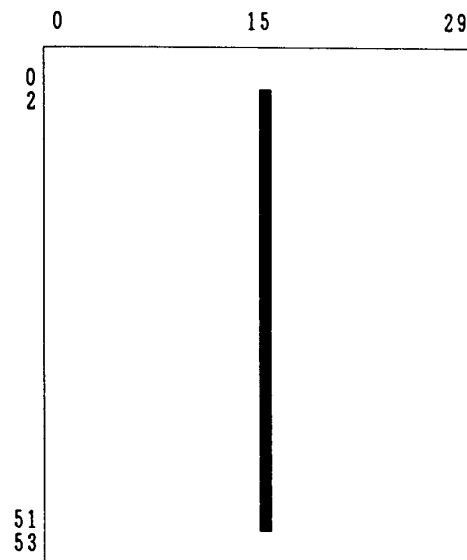
### 7.3.2.3. Dot Patterns

The following dot (print) patterns correspond to the print test #2 pattern result on the previous page. See also Fig. 3.17 for the location of each dot pattern type.

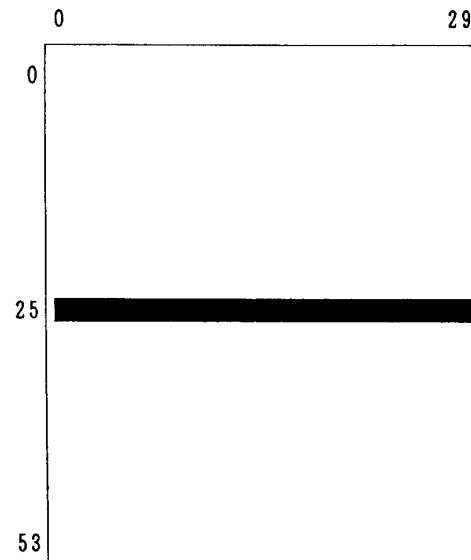
<Pattern 1>



<Pattern 2>



<Pattern 3>



<Pattern 4>

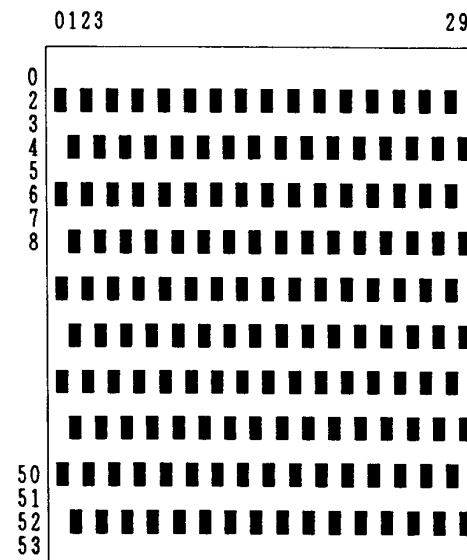
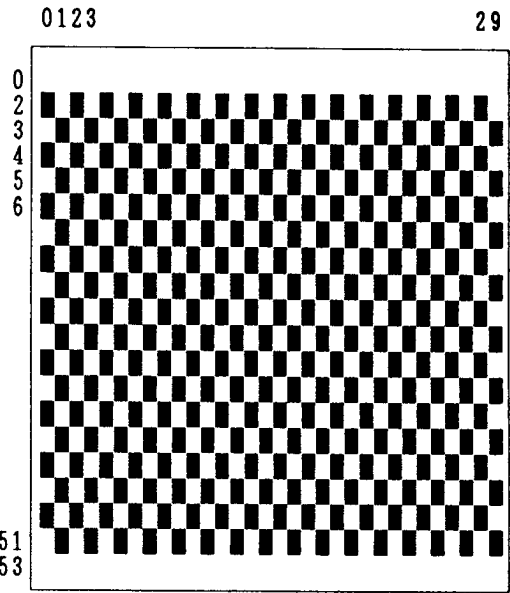


Fig. 3.18 Dot Patterns for Print Test #2 (Patterns 1 to 4)

<Pattern 5>



<Pattern 6>

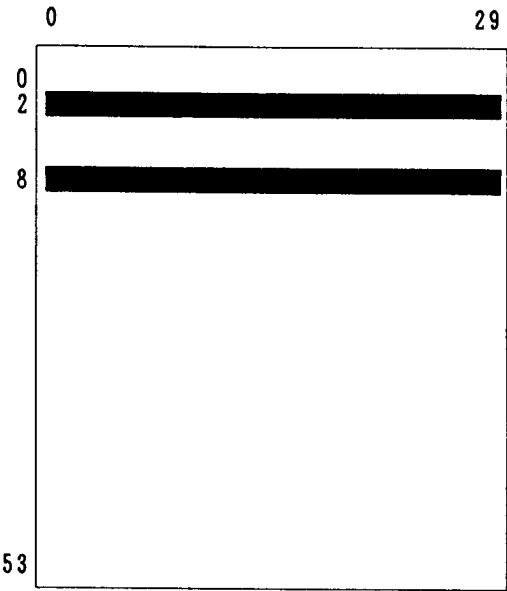
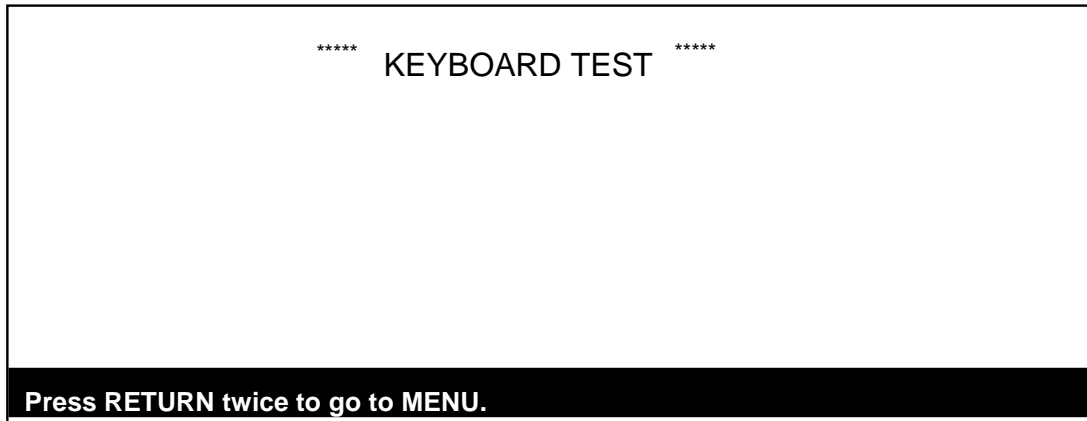


Fig. 3.19 Dot Patterns for Print Test #2 (Patterns 5 and 6)

### 7.3.3. Keyboard Tests

Keyboard inspection checks that the key are making proper contact. There are three keyboard self-tests.

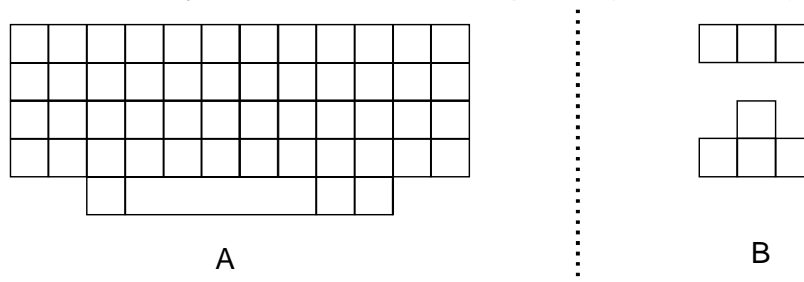
- (1) Select "4", "5", or "6" from the Self Test menu. If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number, or press RETURN to start the test. The display in Fig. 3.20 below indicates that the keyboard test mode has been established.



**Fig. 3.20 Keyboard Test #1 Display**

**NOTE:**

- The location of the keys tested in each test sequence (test 4, 5, or 6) are shown below.

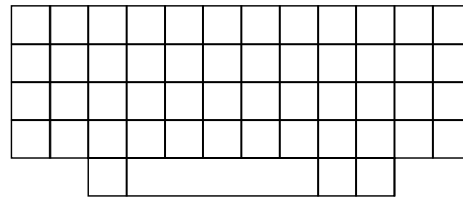


**Fig. 3.21 Keyboard Test Key Locations**

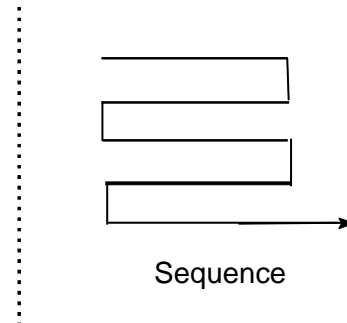


(2) To run Test "4" (all keys in Fig. 3.21, "A")

- a) Starting from the top left of the keyboard, press each key in turn (see sequence below).
- b) Then press SHIFT + Z, SHIFT + /, and CODE + SPACE. If there is no problem, the message "KB TEST OK" will be printed, and the display will return to the SELF Test menu.



Test Keys



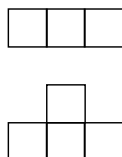
Sequence

**NOTES:**

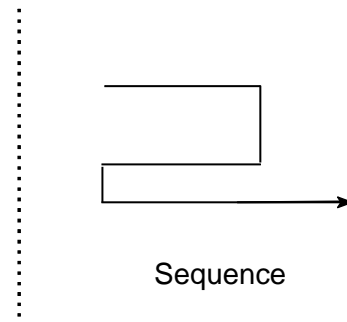
- After automatic carriage return, "KB TEST OK." prints, and the display returns to the SELF Test menu.
- A paper check is performed before printing. If paper is set, the print test is executed; if no paper is set, the ERROR pop-up window is displayed. If you select to continue printing, paper is automatically inserted by the ACF and to execute the print test.
- If the keys are pressed in the wrong sequence, a beep will sound. The test will continue when the correct key is pressed.
- At any time during the test, you may cancel by pressing the RETURN key twice to return to the SELF Test menu.

(3) To run Test "5" (all keys in Fig. 3.21, "B")

- a) Press the keys in the sequence indicated below.
- b) Then press "→". If there is no problem, the message "KB TEST OK" will be printed, and the display will return to the SELF Test menu.



Test Keys



Sequence

- 

- After automatic carriage return, "KB TEST OK" is printed, and the display returns to the SELF Test menu.
- A paper check is performed before printing. If paper is set, the print test is executed; if no paper is set, the ERROR pop-up window is displayed. If you select to continue printing, paper is automatically inserted by the ACF and to execute the print test.
- If the keys are pressed in the wrong sequence, a beep sounds. The test will continue when the correct key is pressed.
- At any time during the test, you may cancel by pressing RETURN twice to return to the SELF Test menu.

### 7.3.4. FDD Tests

There are five tests of the FDD:

1. FDD Test ("7") - checks disk switch, write protect switch, and read/write errors.
2. Special FDD Test ("8") - checks disk type, write protect switch, and read/write.
3. FDD Switch Test ("9") - checks disk switch and write protect switch.
4. FDD Error Rate Check ("D") - checks for disk writing errors.
5. FDD Error Rate Check ("E") - checks for disk reading errors.

#### 7.3.4.1. FDD Test

- (1) Insert a non-write protected diskette in the disk drive, and if necessary, change the "DISK TYPE" (2HD or 2DD) displayed on the Self Test menu to that of the test diskette.
- (2) With paper set, select "7" from the Self Test menu. If a serial number has not been input before starting the menu, the pop-up window will prompt for the serial number; either enter the serial number and press RETURN, or press RETURN to start the test. The display as shown below appears, the test results are printed, and the display returns to the SELF Test menu.

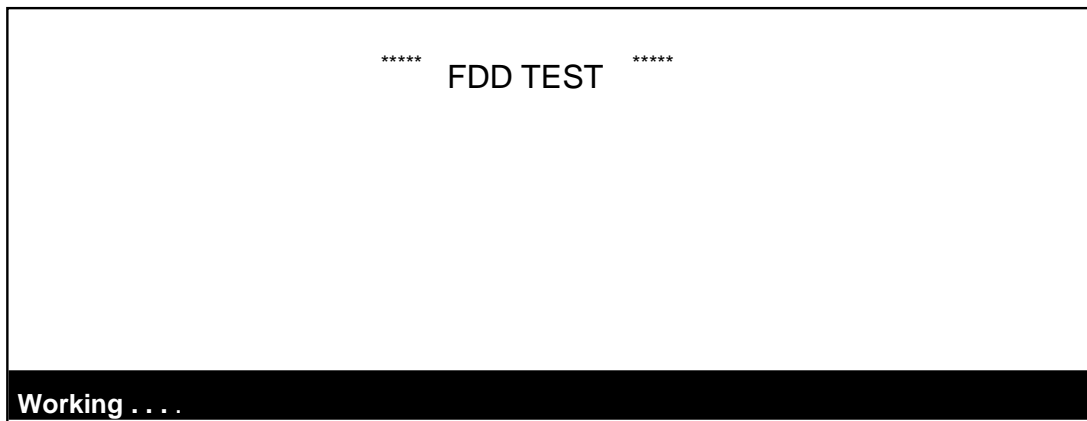


Fig. 3.22 FDD Test (in progress) Display

**NOTES:**

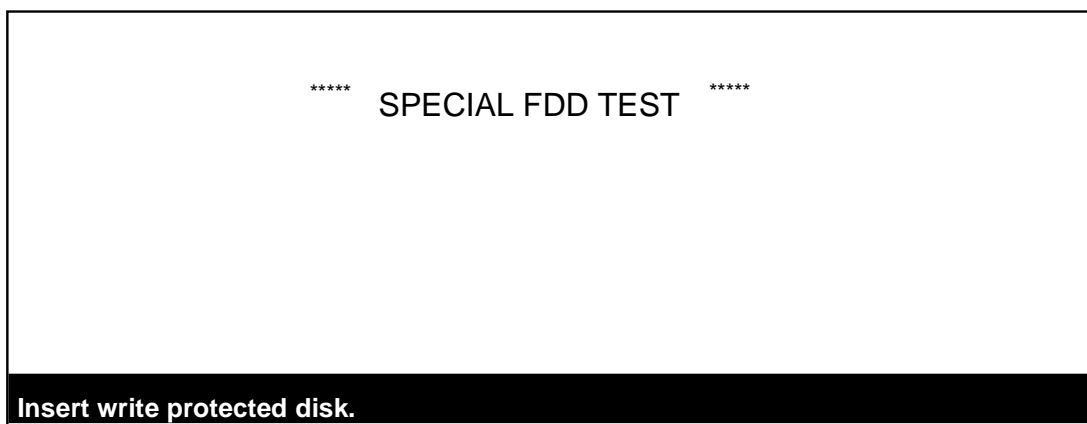
- If a key other than the RETURN key is pressed, an error will occur.
- A paper check is performed before printing. If paper is set, the print test is executed; if no paper is set, the ERROR pop-up window is displayed. If you select to continue printing, paper is automatically inserted by the ACF and to execute the print test.
- After completing the disk drive test, the carriage automatically returns and the test result is printed:

SERIAL NO.: (if it was entered)

If normal:	DISK TEST OK	DISK TYPE 0 (2DD)
		DISK TYPE 1 (2HD)
If disk switch is defective:		DISK ERROR 01
If write protect switch is defective:		DISK ERROR 03
If other read/write errors occur:		DISK ERROR 0F

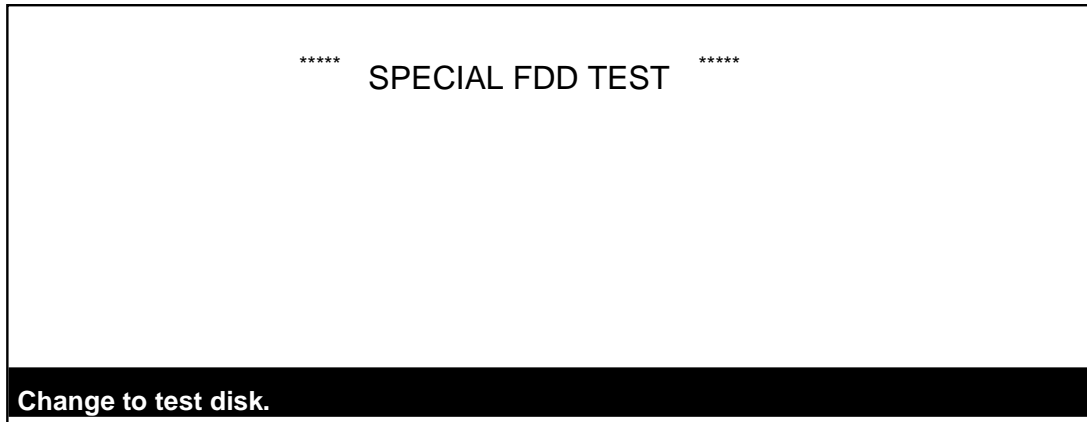
**7.3.4.2. Special FDD Test**

- (1) With paper set and no diskette in the disk drive, change the "DISK TYPE" (2HD or 2DD) displayed on the Self Test menu to that of test diskette.
- (2) Select "8" from the Self Test menu. (If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number and press RETURN, or press RETURN to start the test.) The display as shown below appears:



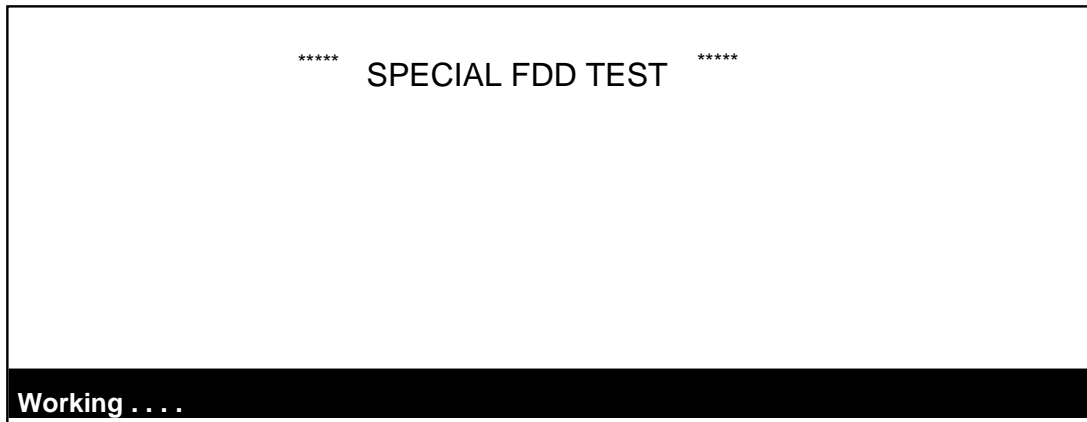
**Fig. 3.23 Special FDD Test Display 1**

- (3) When the direction "Insert write protected disk" is displayed, insert a write-protected diskette in the disk drive (if the disk is not write-protected, an error will occur). The display changes to the following:



**Fig. 3.24 Special FDD Test Display 2**

- (4) When the direction "Change to test disk" is displayed, insert a diskette that is not write-protected (if a write-protected diskette is inserted, an error will occur). The display changes to the one below. A reading and writing check is performed, the test results are printed, and the display returns to the Self Test menu.



**Fig. 3.25 Special FDD Test (in progress) Display**

**NOTES:**

- After completing the disk drive test, the carriage automatically returns and the test result is printed:
- SERIAL NO.: (if it was entered)
  - If normal: DISK TEST OK DISK TYPE 0 (2DD)  
DISK TYPE 1 (2HD)
  - If disk switch is defective: DISK ERROR 01
  - If write-protect switch is defective: DISK ERROR 03
  - If other read/write errors occur: DISK ERROR 0F
- If an error is detected, a two-digit error code is printed: the first digit is the stage number in the test at which the error was detected; the second digit is the type of error as described in the following tables.

**Table 3.2 FDD Special Test Error Stage Codes**

STAGE NO.	DESCRIPTION
0	Output of ABORT command Output of SPECIFY command Switching drive motor ON Checking write protect
1	Recalibration Reading SSB3 by means of CHECK DRIVE STATUS command and checking status of track 0 signal Seeking cylinder 1 Reading SSB3 by means of CHECK DEVICE STATUS command and checking status of track 0 signal
2	Seeking cylinder 0 Formatting cylinder 79
3	Formatting cylinder 0
4	Seeking cylinder 39 Formatting cylinder 39
5	Seeking cylinder 79 Formatting cylinder 79
6	Writing data for checking purposes (DB6DB6DB...)
7	Seeking cylinder 39 Writing data for checking purposes (B6DB6DB6...)
8	Seeking cylinder 0 (command = RECALIBRATE) Writing data for checking purposes (6DB6DB6D...)
9	Reading and checking cylinder 0 data
A	Seeking cylinder 39 Reading and checking cylinder 39 data
B	Seeking cylinder 79 Reading and checking cylinder 79 data
C	Recalibration Switching drive motor OFF

Table 3.3 FDD Special Test Error Codes

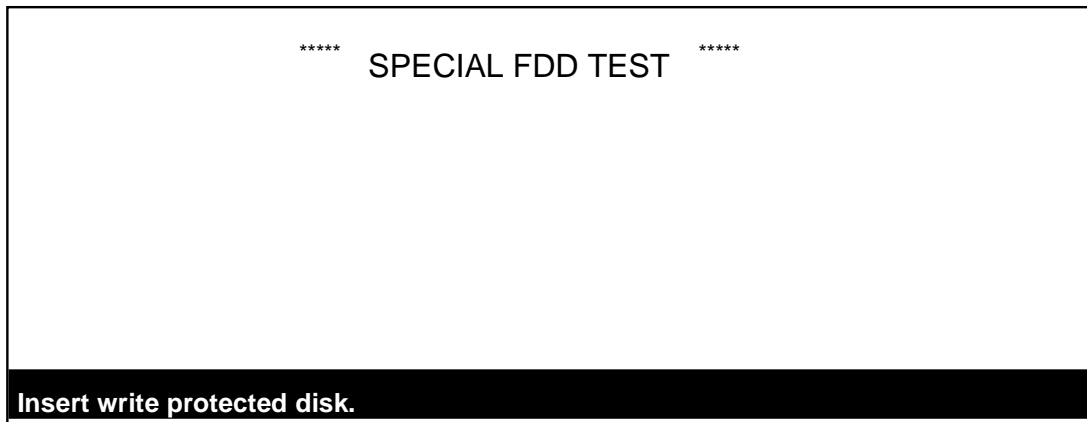
ERROR NO.	DESCRIPTION
1	READY signal has not been detected, although drive motor is ON Disk change signal could not be cleared
2	Disk change detected in the disk change check
3	Write protect error Write protect status detected in the write protect check
6	No ID found No address mark for ID area found No address mark for data area found
A	CRC error at the ID area CRC error at the data area
F	SEEK command or RECALIBRATE command not completed normally IRQ not detected in IRQ waiting status No command or parameter output Data overrun detected End of DMA transfer not detected Number of sectors for which reading/writing requested was 0 Attempt made to access sectors beyond the final sector on the disk Could not receive RESULT CODE

**NOTES:**

- If an error occurs at any of the steps corresponding to the stage numbers in Table 3.2, only stage C is executed and the check is terminated.
- Formatting, reading, and writing are performed on both sides of the disk.
- To check formatting, the reading verification check is performed.

### 7.3.4.3. FDD SW Test

- (1) Without a diskette in the disk drive, select "9" from the Self Test menu. If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number and press RETURN, or press RETURN to start the test. The display as shown below appears:



**Fig. 3.26 Special FDD Test Display 1**

- (2) Insert a diskette with the write-protect tab enabled. The disk switch is checked, the test results are printed, and the display returns to the Self Test menu (if a diskette that is not write-protected is inserted, an error will occur).

#### NOTES:

- The test results are printed as shown below:

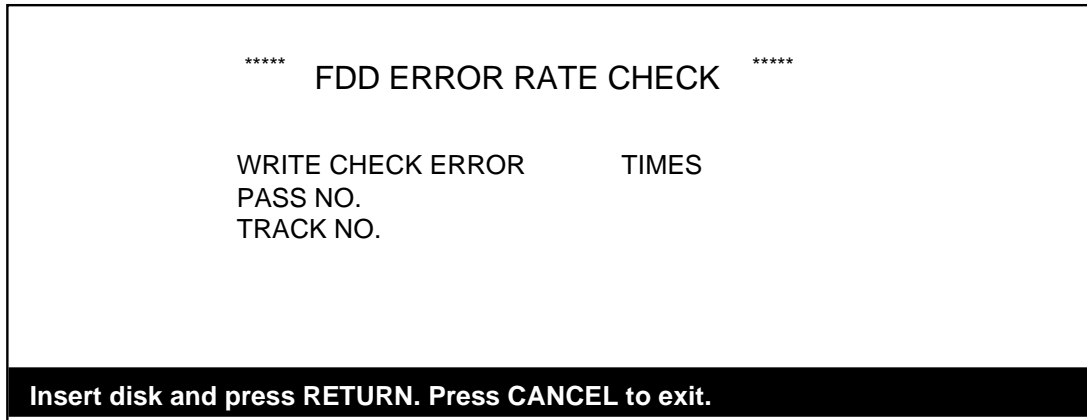
SERIAL NO.:	(if it was entered)		
If normal:		DISK TEST OK	DISK TYPE 0 (2DD) DISK TYPE 1 (2HD)
If disk switch is defective:		DISK ERROR 01	
If write-protect switch is defective:		DISK ERROR 03	
If other read/write errors occur:		DISK ERROR 0F	

- A paper check is performed before printing. If paper is set, the print test is executed; if no paper is set, the ERROR pop-up window is displayed. If you select to continue printing, paper is automatically inserted by the ACF and to execute the print test.



## 7.3.4.4. FDD Write Error Rate Check

- (1) Without a diskette in the disk drive, select "D" from the Self Test menu. (If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number and press RETURN, or press RETURN to start the test.) The display as shown below appears:



**Fig. 3.27 FDD Write Error Rate Check Display**

- (2) With paper set, insert a diskette that is not write-protected in the drive and press RETURN. The screen message changes to "working" during formatting, and 0 is displayed at PASS NO.; then the Write Error Rate check is started:
- The diskette is formatted.
  - Data "DB6" is repeatedly written on both sides of a randomly designated track.
  - The data written above is read (PASS NO. and TRACK NO. are printed if an error occurs).
  - Steps (b) and (c) are repeated for all tracks (should not be repeated twice for the same track).
  - 1 is added to the PASS NO. counter.
  - Steps (b) through (e) are repeated 500 times.

**NOTES:**

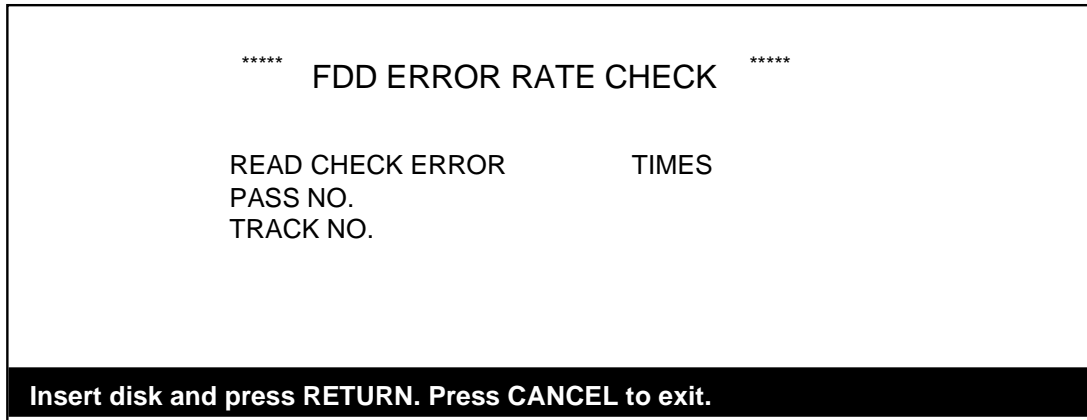
- If an error occurs during checking, PASS NO. and TRACK NO. are printed, and 1 is added to the counter "WRITE CHECK ERROR XXX TIMES.
- When an error occurs during formatting, formatting ends after the following is printed:

Printout if disk switch is defective:	DISK ERROR 01
Printout if write protect switch is defective:	DISK ERROR 03
Printout if other read/write errors:	DISK ERROR 0F
- After the check has run 500 times (or the CANCEL key has been pressed), the following items are printed:

PASS NO. XX (1-500)	
TRACK NO. XX (0-79)	
WRITE CHECK ERROR X (type error) TIMES XX	
SERIAL NO. : XXXXXXXXXX (if a serial no. was input, or blank)	
(if no errors detected):	DISK TEST OK      DISK TYPE 0 (2DD)
	or
	DISK TEST OK      DISK TYPE 1 (2HD)

## 7.3.4.5. FDD Read Error Rate Check

- (1) Without a diskette in the disk drive, select "E" from the Self Test menu. If a serial number has not been input before starting the test, the pop-up window will prompt for the serial number; either enter the serial number and press RETURN, or press RETURN to start the test. The display as shown below appears:



**Fig. 3.28 FDD Read Error Rate Check Display**

- (2) With paper set, insert a diskette that is not write-protected in the drive and press RETURN. The screen message changes to "working" during formatting, and 0 is displayed at PASS NO.; then the Read Error Rate check is started:
- a) The diskette is formatted.
  - b) Data "DB6" is written to all data areas in order, setting with track 0.
  - c) The data on both sides of a randomly designated track is read (Pass No. and TRACK NO. are printed if an error occurs.)
  - d) Written above is read (PASS NO. and TRACK NO. are printed if an error occurs).
  - d) Steps (c) is repeated for all tracks (should not be repeated twice for the same track).
  - e) 1 is added to the PASS NO. counter.
  - f) Steps (b) through (e) are repeated 500 times.

**NOTES:**

- If an error occurs during checking, PASS NO. and TRACK NO. are printed, and 1 is added to the counter "READ CHECK ERROR XXX TIMES.
- When an error occurs during formatting, formatting ends after the following is printed:

Printout if disk switch is defective:	DISK ERROR 01
Printout if write protect switch is defective:	DISK ERROR 03
Printout if other read/write errors:	DISK ERROR 0F
- After the check has run 500 times (or the CANCEL key has been pressed), the following items are printed:

PASS NO. XX (1-500)	
TRACK NO. XX (0-79)	
READ CHECK ERROR X (type error) TIMES XX	
SERIAL NO. : XXXXXXXXXX (if a serial no. was input, or blank)	
(if no errors detected):	DISK TEST OK      DISK TYPE 0 (2DD)
	or
	DISK TEST OK      DISK TYPE 1 (2HD)

### 7.3.5. PE (Paper-End) Sensor Test

The PE test checks that the PE sensor is working properly by verifying if paper is set or not.

(1) From the Self Test menu, press "A". The display changes to the following:

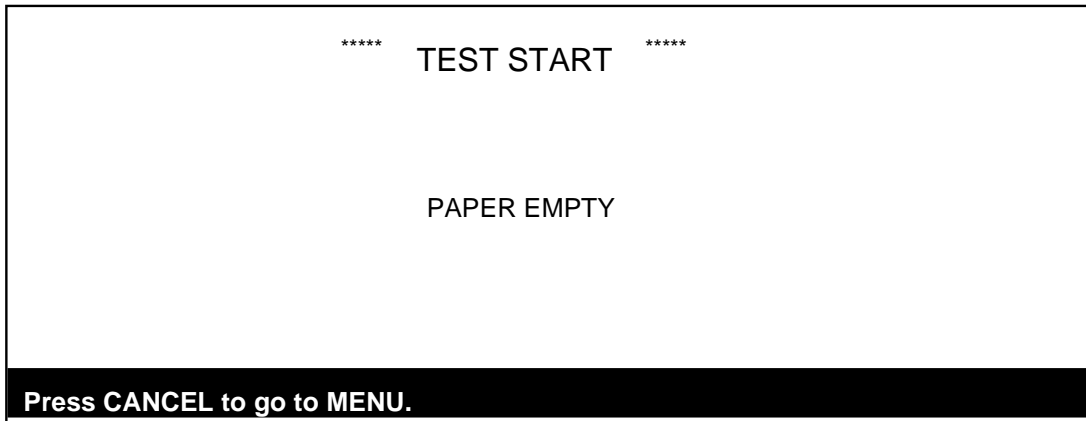


Fig. 3.29 PE Sensor Test Start Display 1

(2) Set paper in the carriage by pressing CODE + SHIFT + INSERT and verify that the screen message changes to the following:

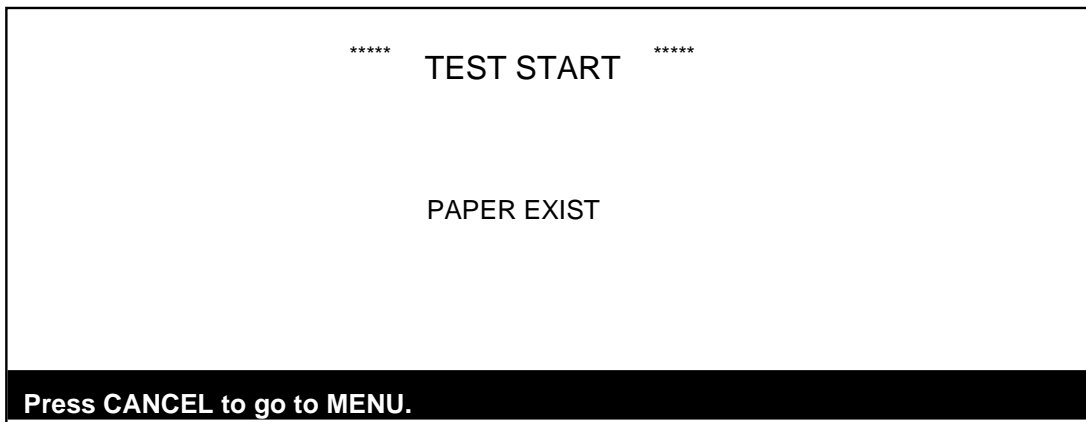


Fig. 3.30 PE Sensor Test Start Display 2

### 7.3.6. CR (Carriage Reset) Test

The CR test checks the carriage home position.

(1) From the Self Test menu, press "B". The following display appears:

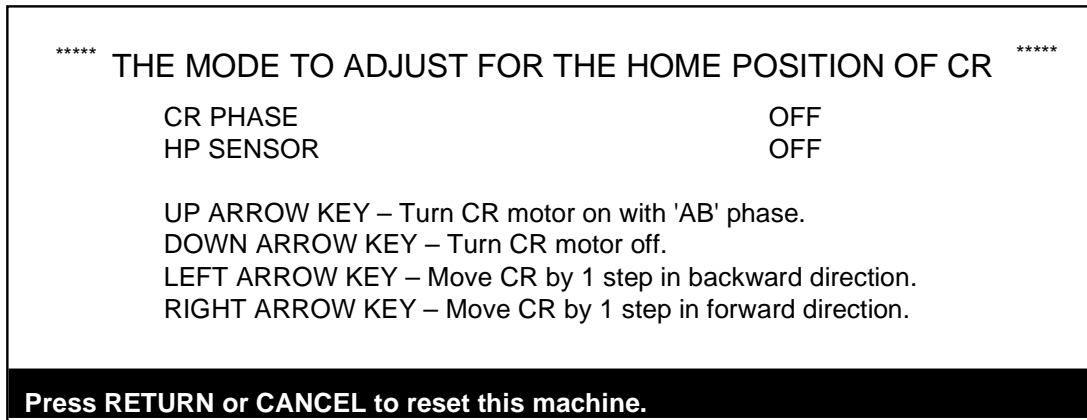


Fig. 3.31 CR Test Start Display 1

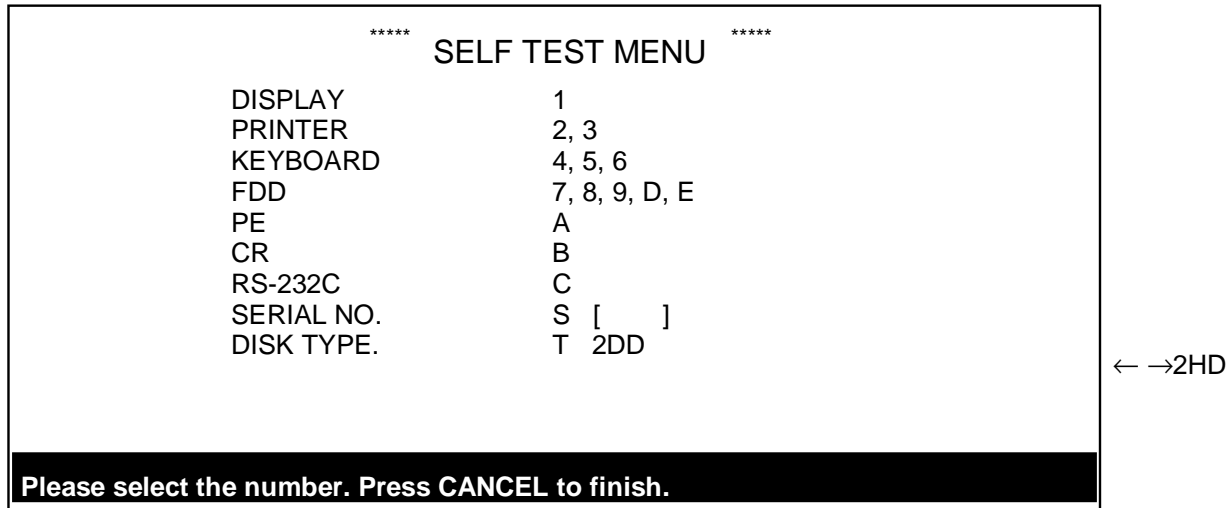
#### NOTES

- The following keys may be used to check the CR position as described:
  1. UP ARROW key – turns CR motor with "AB" phase.
  2. DOWN ARROW key – turn CR motor off.
  3. LEFT ARROW key – moves CR by 1 step backward (right to left) (CR phase change direction is AB → A → DA → D → CD → C → BC → B).
  4. RIGHT ARROW key – moves CR by 1 step forward (left to right) (CR phase change direction is AB → B → BC → C → CD → D → DA → A).
  5. RETURN or CANCEL key – ends the test (resets the carriage to the default home position and returns to the Main Menu).
- If no keys are pressed within 60 seconds after turning the motor on, the motor is turned off.

### 7.3.7. DISK TYPE

The DISK TYPE item on the Self Test menu toggles between 2DD and 2HD (used for specifying which type of disk is used in FDD tests).

Press "T" from the Self Test menu to change the DISK TYPE from 2DD to 2HD, as appropriate.



**Fig. 3.32 Self-Test Menu (DISK TYPE Setting)**

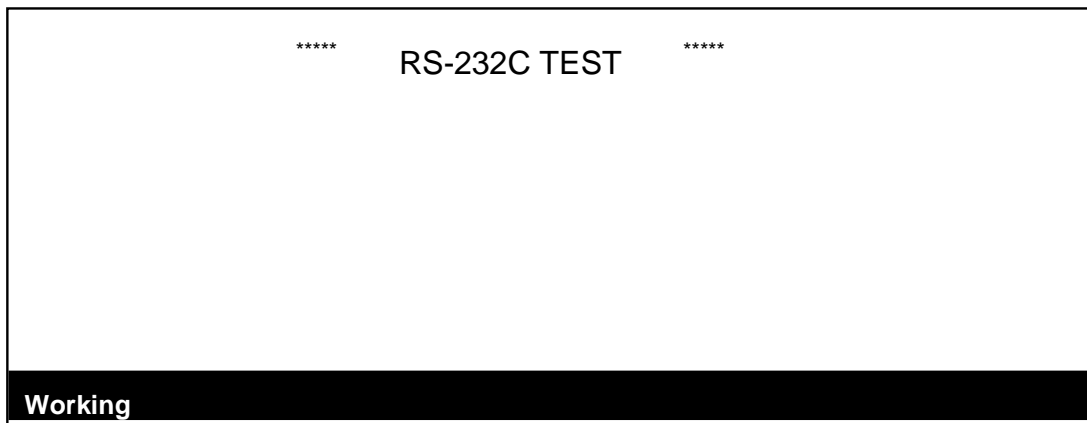
- RS232C item is not displayed for the LCD of 7-line type.

### 7.3.8. RS232C

The RS232C test executes the echo-back test for all models except DP-525CJ and LW-800ic.

#### (1) Test procedure

From the Self Test menu, press "C". The following display appears and the RS232C echo-back test starts. Once the test starts, the operation instructions given on the display show the procedure to follow.



**Fig. 3.33 RS232C Echo-Back Test Start Display**

#### (2) Check Procedures

- 1) Start the test with all RS232C serial port terminals open. The status of the signal is checked in the following order:
  - 1 Checks that CTS = HIGH and CD = HIGH regardless of the HIGH/LOW state of RTS
  - 2 Checks that DSR = HIGH regardless of the HIGH/LOW state of DTR
  - 3 Checks that data is not received at  $\overline{\text{RXD}}$  by sending the data\* from  $\overline{\text{TXD}}$   
As the test data, 00(H), FF(H), 55(H), and AA(H) are sent.
- 2) If the results of the test are normal, the following message is displayed.  
Connect echo back test connector and press RETURN.



3) Connect the connector for echo-back test and press RETURN. The echo-back test is executed in the following order:

- 1 Tests the following :  
 CTS = LOW and CD = LOW if RTS = LOW  
 CTS = HIGH and CD = HIGH if RTS = HIGH
- 2 Tests the following:  
 DSR = LOW if DTR = LOW  
 DSR = HIGH if DTR = HIGH
- 3 Tests that the data\* sent to TXD can be received at RXD correctly.  
 \* As the test data, 00(H), FF(H), 55(H), and AA(H) are sent.

4) If the result of test is normal, the following message is printed.

RS-232C TEST OK

### (3) Functions

1) If an error is detected during execution of the test, processing ends and the corresponding error code is printed.

RS-232C TEST ERROR XX

X X: Error code

- └── Lower digit ..... State of the error in each step.
- └── Upper digit ..... The step where the error occurred.

1 Upper digit = A

An error has occurred in the RTS → CTS, RTS → CD test executed while the terminal is open.

The lower digit expresses the status by bits.

- Bit 0 = 0: CTS = HIGH when RTS = LOW  
 1: CTS = LOW when RTS = LOW (error)
- Bit 1 = 0: CTS = HIGH when RTS = HIGH  
 1: CTS = LOW when RTS = HIGH (error)
- Bit 2 = 0: CD = HIGH when RTS = LOW  
 1: CD = LOW when RTS = LOW (error)
- Bit 3 = 0: CD = HIGH when RTS = HIGH  
 1: CD = LOW when RTS = HIGH (error)

**2 Upper digit = B**

An error has occurred in the DTR → DSR test executed while the terminal is open.

The lower digit expresses the status by bits.

- Bit 0 = 0: DSR = HIGH when DTR = LOW  
1: DSR = LOW when DTR = LOW (error)
- Bit 1 = 0: DSR = HIGH when DTR = HIGH  
1: DSR = LOW when DTR = HIGH (error)

**3 Upper digit = C**

An error has occurred in the TXD → RXD test executed while the terminal is open.

- Lower digit = 0: The data sent to TXD is received at RXD.
- Lower digit = 1: Data cannot be sent to TXD.
- Lower digit = 3: Discrepancy between the data sent to TXD and the data received at RXD

**4 Upper digit = 1**

An error has occurred in the RTS → CTS, RTS → CD test executed with the connector set.

The lower digit expresses the status by bits.

- Bit 0 = 0: CTS = LOW when RTS = LOW  
1: CTS = HIGH when RTS = LOW (error)
- Bit 1 = 0: CTS = HIGH when RTS = HIGH  
1: CTS = LOW when RTS = HIGH (error)
- Bit 2 = 0: CD = LOW when RTS = LOW  
1: CD = HIGH when RTS = LOW (error)
- Bit 3 = 0: CD = HIGH when RTS = HIGH  
1: CD = LOW when RTS = HIGH (error)

**5 Upper digit = 2**

An error has occurred in the DTR → DSR test executed with the connector set.

The lower digit expresses the status by bits.

- Bit 0 = 0: DSR = LOW when DTR = LOW  
1: DSR = HIGH when DTR = LOW (error)
- Bit 1 = 0: DSR = HIGH when DTR = HIGH  
1: DSR = LOW when DTR = HIGH (error)

**6 Upper digit = 3**

An error has occurred in the TXD → RXD test executed with the connector set.

- Lower digit = 1: Data cannot be sent to TXD.
- Lower digit = 2: The data sent to TXD is received at RXD.
- Lower digit = 3: Discrepancy between the data sent to TXD and the data received at RXD

2) The test connector to be used in the echo-back test is indicated below.

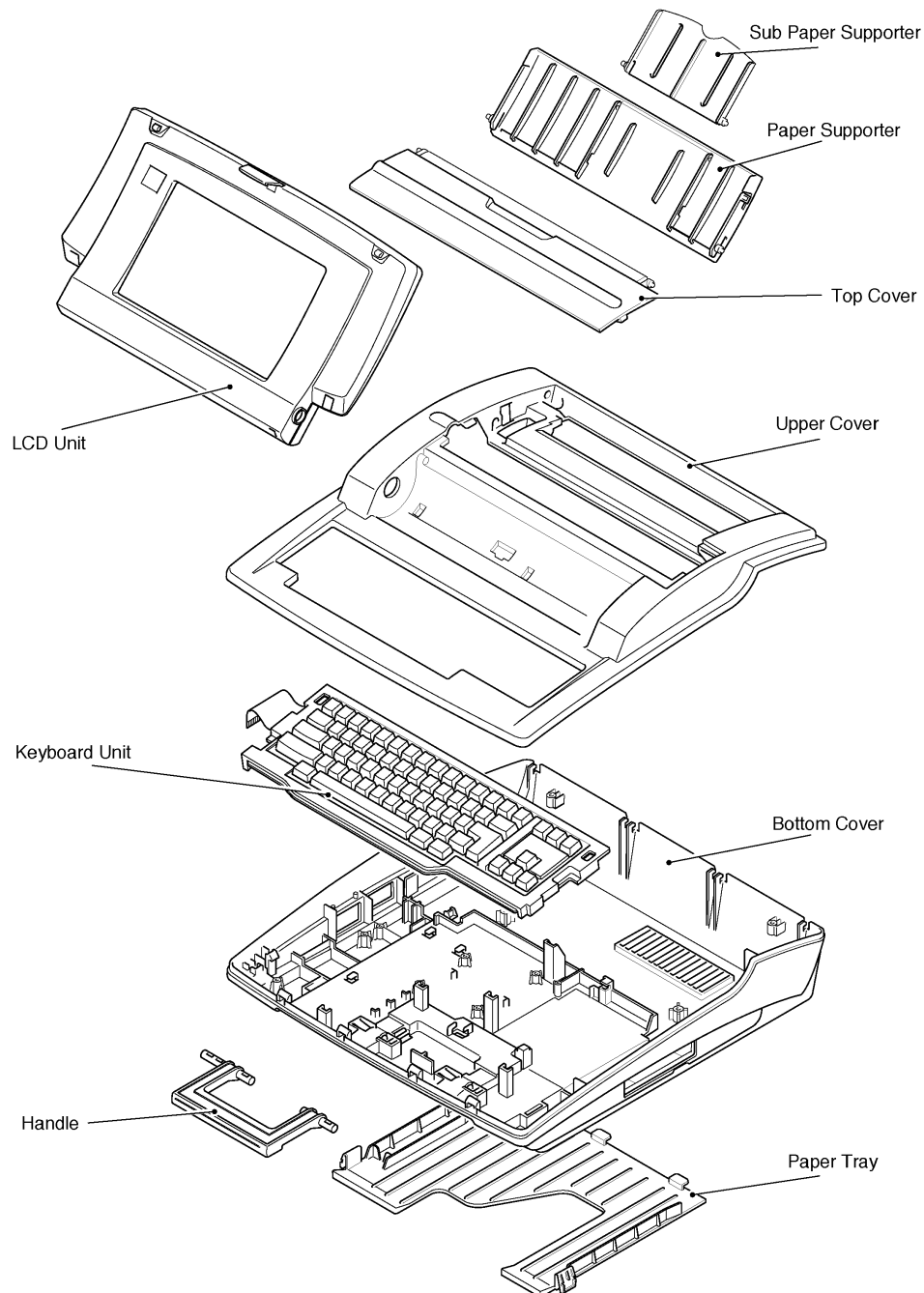
		Machine Terminal	Test Connector
(Output)	RTS	7	7
(Input)	CTS	8	8
(Input)	CD	1	1
(Output)	DTR	4	4
(Input)	DSR	6	6
(Output)	TXD	3	3
(Input)	RXD	2	2

## CHAPTER 4 COMPONENT DISASSEMBLY

### 1. Covers

**NOTE:**

- All model details may not be represented in all illustrations herein.



**Fig. 4.1 Cover Assemblies**

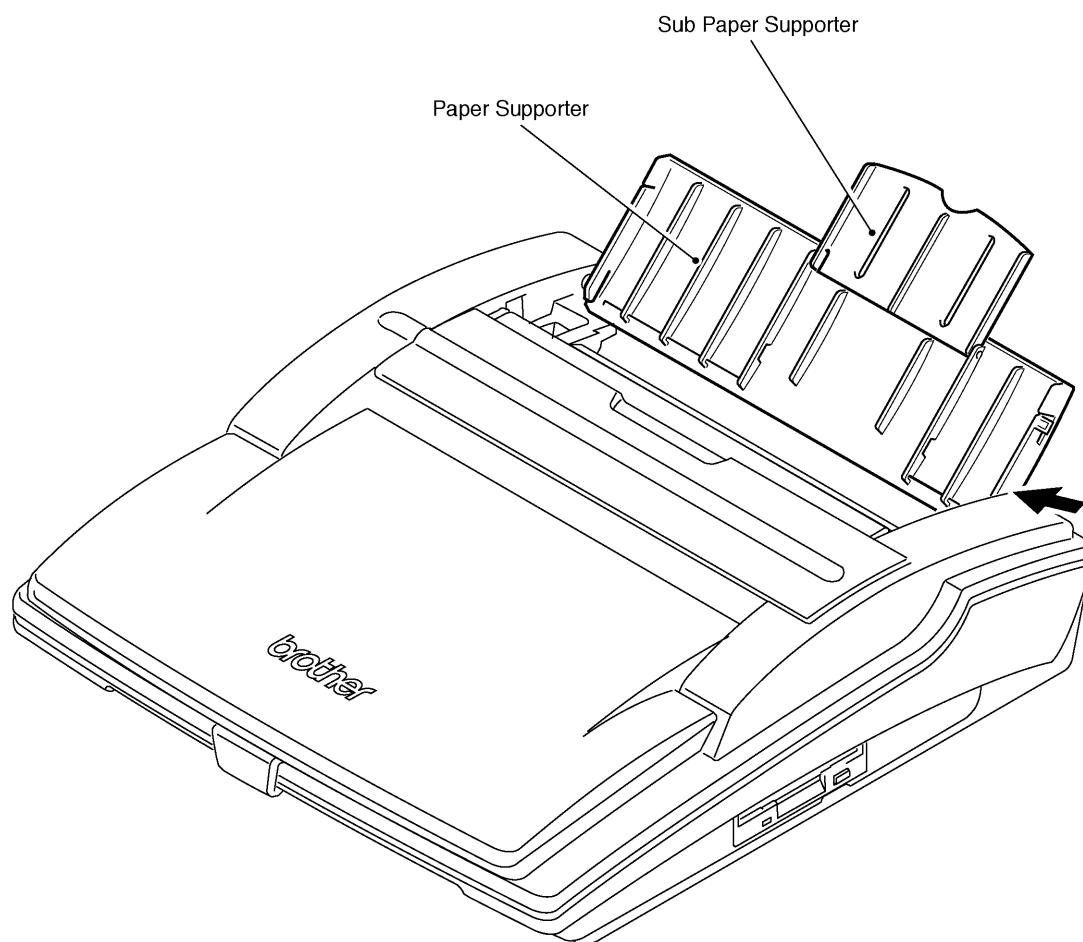
**CAUTION:** Many of the parts are held in place by plastic latches which may break if mishandled. To remove such parts, press the hook end of the latch away from the part to which it is latched.



## **1.1. Upper Cover**

### **1.1.1. Removing the Upper Cover**

- (1) Turn off the power switch.
- (2) Unplug the AC adaptor from the wall outlet, and unplug the adaptor from the machine.
- (3) Remove the paper support:
  - a) Push on the point indicated by the black arrow and disengage the hook from the rib on the paper support.
  - b) Hold the middle of the support and carefully push on the point indicated by the black arrow and disengage the hook from the upper cover.
  - c) Lift the paper support to remove it from the upper cover.

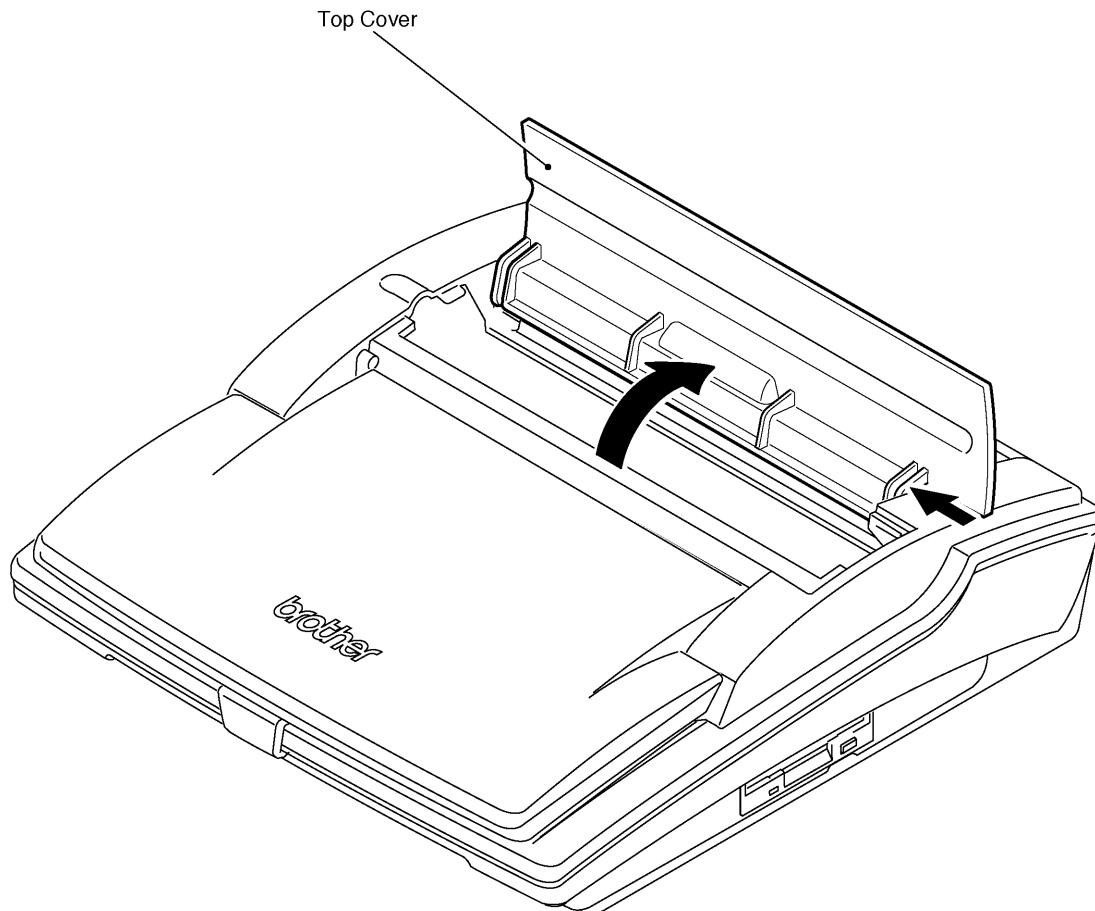


**Fig. 4.2 Removing the Sub Paper Supporter and Paper Support**

(4) Remove the top cover:

**NOTE:**

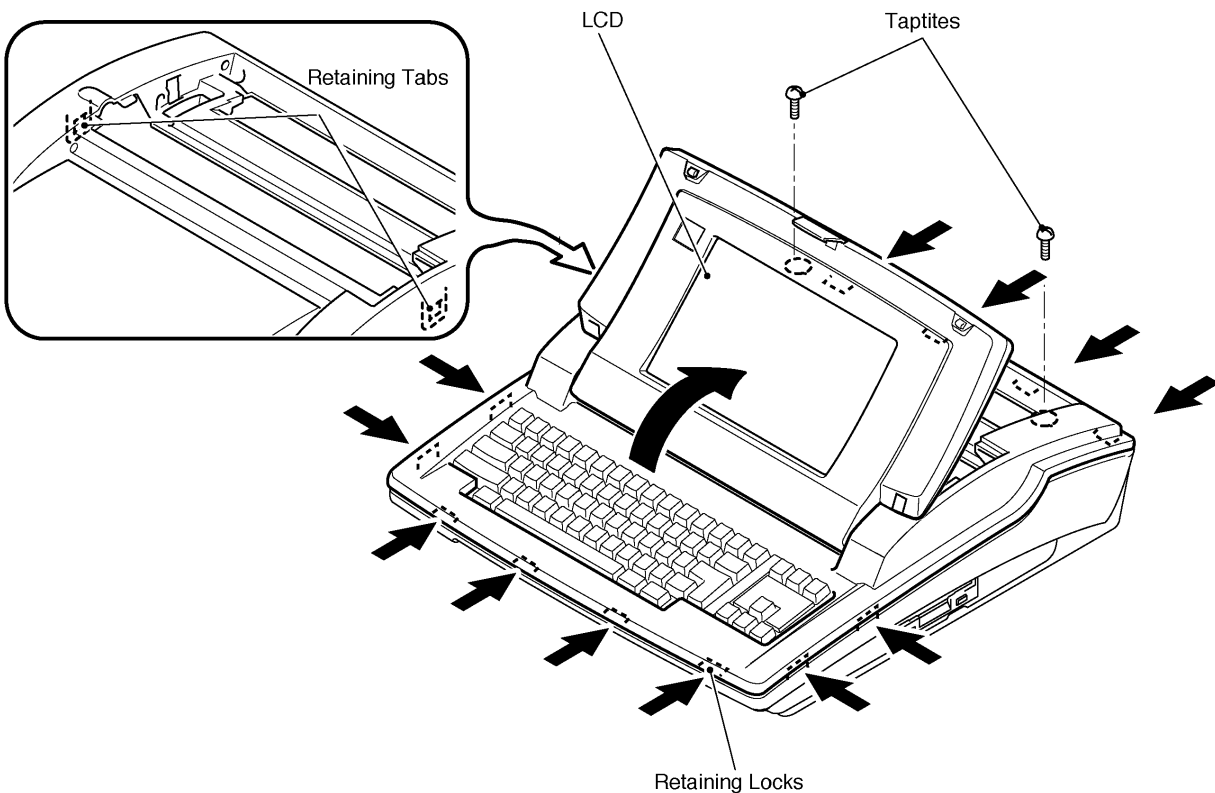
- The top cover fits on tabs on the upper cover.
  - a) Open the top cover to about 90°.
  - b) Push on the point indicated by the black arrow and disengage the top cover from the upper cover. Slide the top cover to the right and lift the upper cover clear of the top cover.



**Fig. 4.3 Removing the Top Cover**

(5) Remove the upper cover:

- a) Move the ink cartridge to the center position.
- b) Remove the two upper cover taptites at the rear of the machine.



**Fig. 4.4 Removing the Upper Cover**

- c) Unsnap the right and left retaining tabs inside the upper cover.
- d) Disengage the LCD latch from the upper cover and tilt the LCD to its upright position.



- e) Pry up the front of the upper cover and release the twelve retaining locks that secure the upper cover to the bottom cover.
- f) Raise the upper cover slightly to obtain access and disconnect the LCD harness from the main PCB.

**NOTE:**

- For European backlit models, also disconnect the backlight PCB harness from the main PCB.
- g) Release the four retaining locks at the rear and remove the upper cover from the bottom cover.  
Remove the upper cover from the bottom cover.

(6) Remove the LCD module (upper cover removed):

**CAUTION:**



Electro-Static Discharge Hazard

Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

**NOTE:**

- For the procedure for removing the LCD unit, refer to item (1) in 2.1 "Disassembling the LCD".

**1.1.2. Installing the Upper Cover****CAUTION:** Electro-Static Discharge Hazard

Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

- (1) Install the LCD unit into the upper cover:

**NOTE:**

- For the procedure for installing the LCD unit into the upper cover, refer to item (2) in 2.2 "Installing the LCD".

- (2) While holding the upper cover assembly over the machine, connect the LCD harness to the main PCB.
- (3) Place the upper cover on the bottom cover, and beginning in the middle of each side, apply pressure on the upper cover to engage the left and right hooks.
- (4) Apply pressure to the rear of the upper cover to engage the two rear locks, then to the front of the upper cover to lock the four front locks (keyboard side).

**NOTE:**

- Make sure that the LCD harness is still locked into the hook on the underside of the upper cover, that it is not pinched between the keyboard and any covers, and that all locks are properly engaged.

- (5) Replace the two upper cover clamp screws.
- (6) Reinstall the top cover, the paper support.

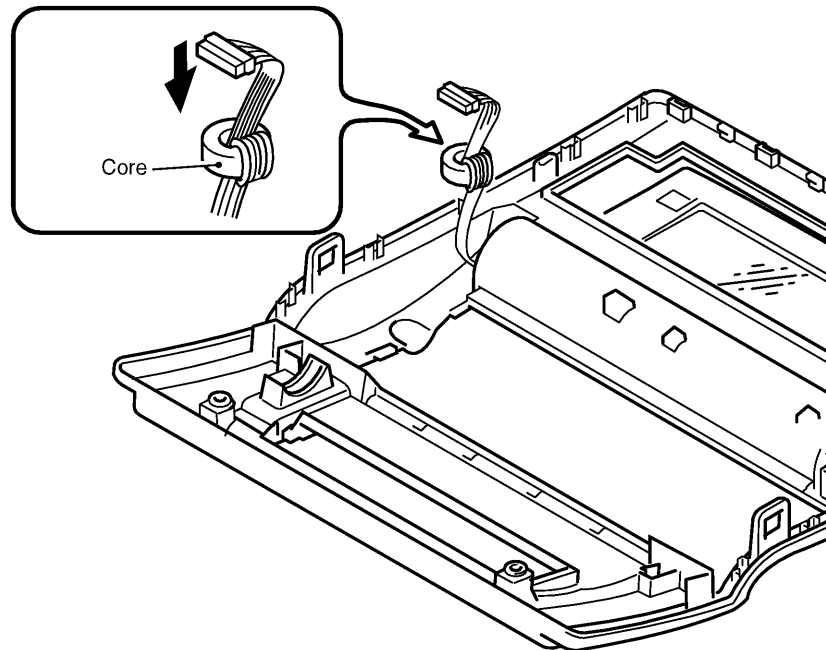
## 2. LCD Module

### 2.1. Disassembling the LCD Module

The LCD unit consists of the LCD upper cover, LCD PCB, LCD lower cover, LCD latch, and the LCD plate etc.

(1) Remove the LCD unit from the upper cover:

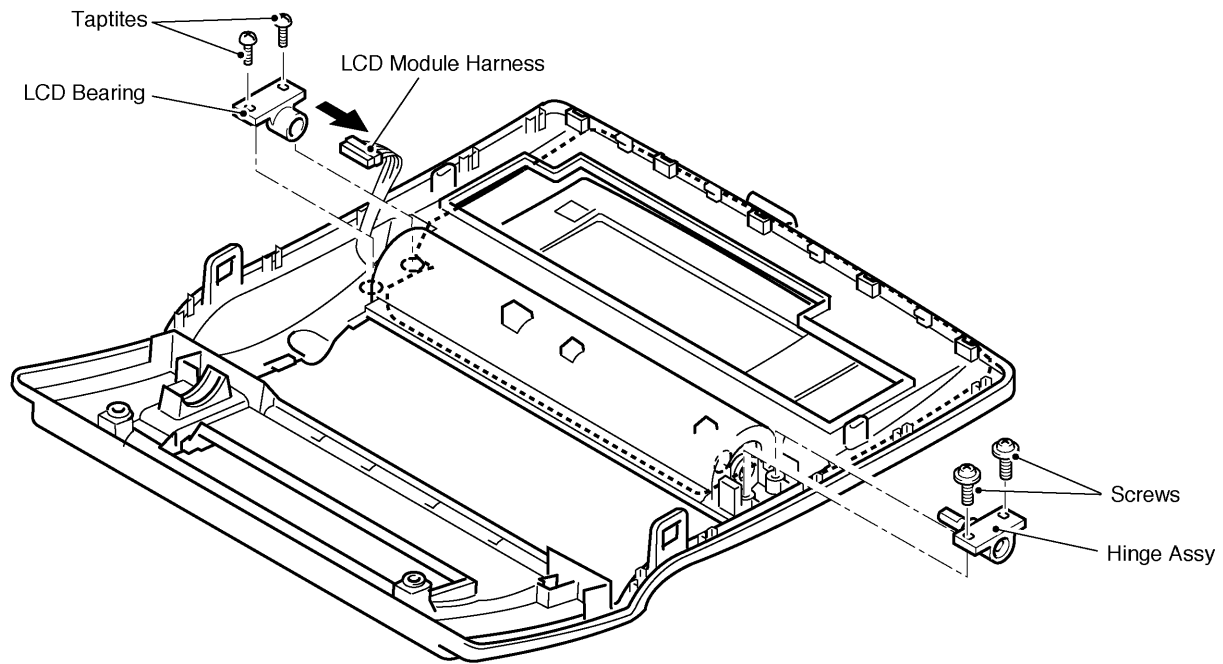
- a) Place the upper cover on the table with the LCD screen facing down.
- b) Remove the two screws that secure the hinge assy to the upper cover and remove the hinge assy from the upper cover.
- b) Remove the two taptites that secure the LCD bearing to the upper cover and remove the LCD bearing from the upper cover.
- c) Remove the LCD module harness from the LCD bearing by pulling the harness through the hole in the LCD bearing.  
The LCD module can now be removed from the upper cover.



**Fig. 4.5 Removing the Core**

**NOTE:**

- Before disassembling the LCD unit, remove the core that is wound on the cable.

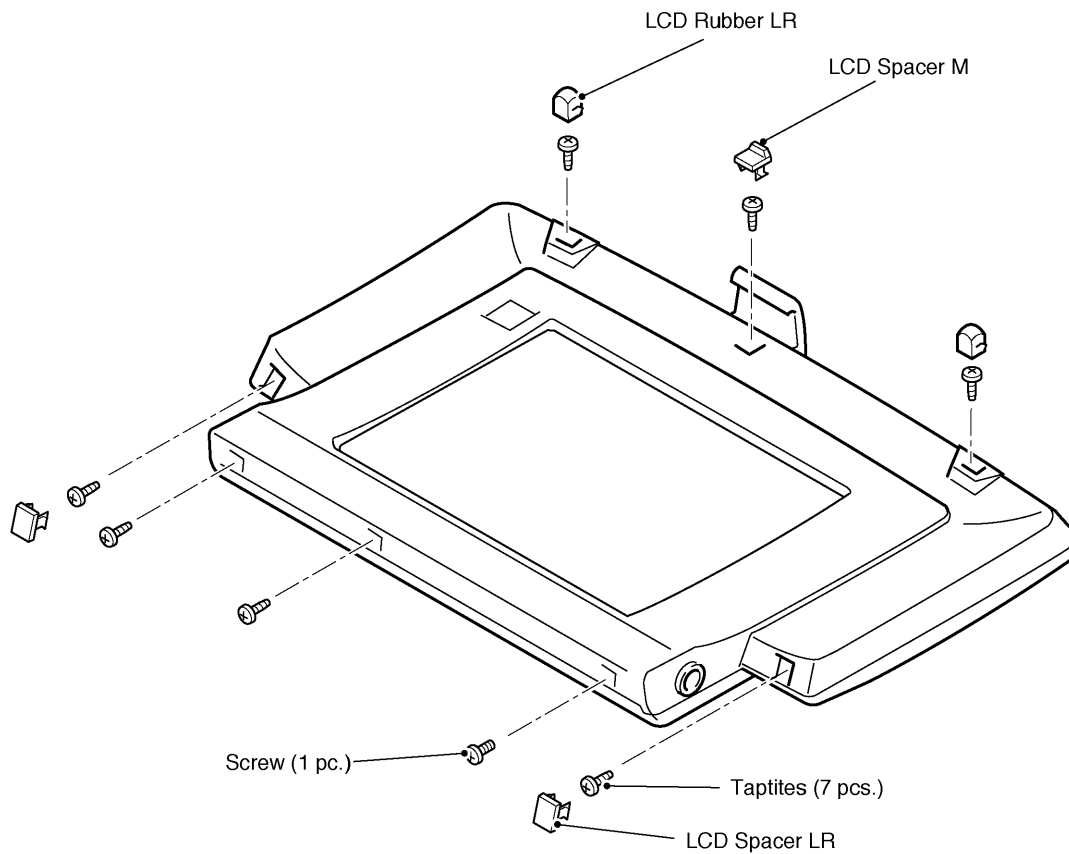


**Fig. 4.6 Removing the LCD Unit**

(2) Remove the LCD lower cover:

- a) Remove the LCD rubber LR (2 pcs.).
- b) Remove the LCD spacers: LCD spacer M (1 pc.) and LCD spacer LR (2 pcs.).
- c) Remove the seven taptites and one screw that secure the LCD lower cover to the LCD upper cover.

The LCD lower cover can now be removed.



**Fig. 4.7 Removing the LCD Lower Cover**

- (3) Remove the LCD PCB:

**CAUTION:**

Electro-Static Discharge Hazard

Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

- a) Place the LCD on the table with the LCD screen facing down.
- b) Remove the LCD PCB. The procedure to remove the LCD PCB varies according to the model.

<DP-525CJ/LW-800ic, DP-530CJ/LW-810ic, LW-810icBL>

Remove the taptites that secure the LCD PCB to the LCD upper cover and remove the LCD PCB by disengaging hook A on the LCD upper cover. See Figs. 4.8, 4.9, and 4.10.

<DP-540CJ, DP-550CJ/LW-840ic>

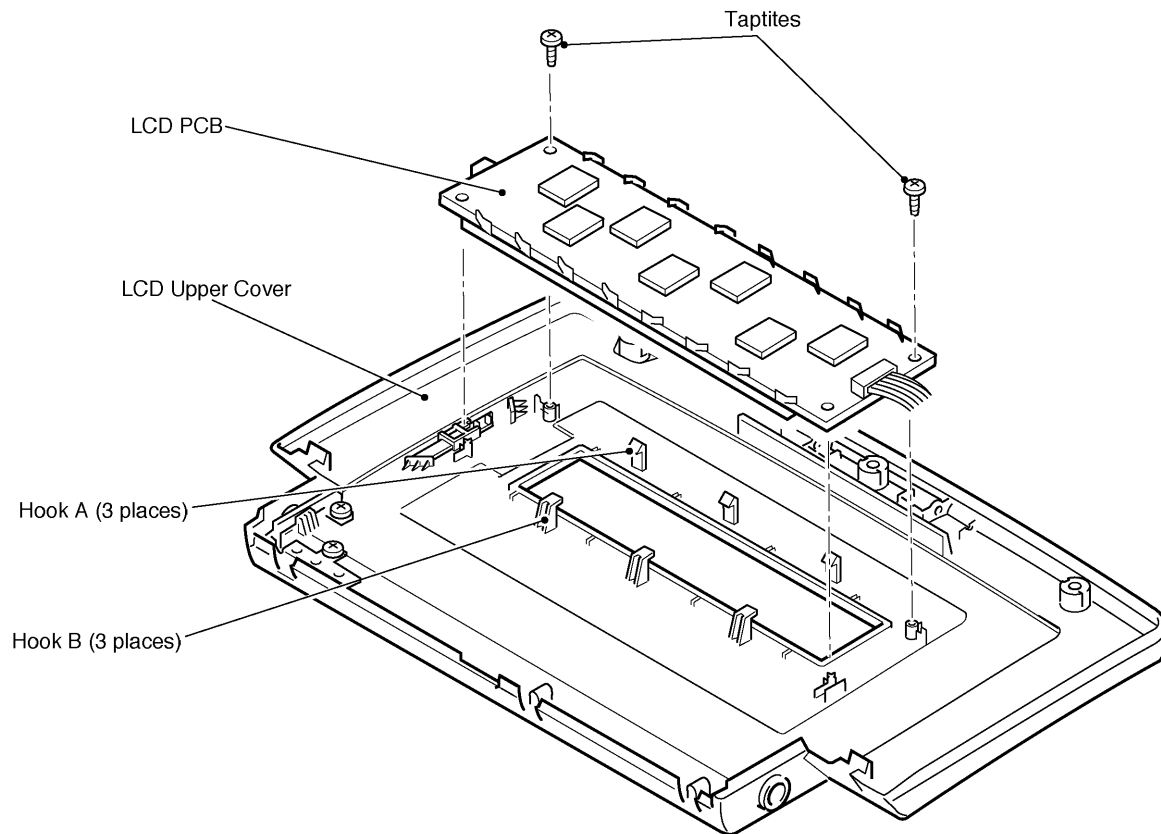
Remove the taptites that secure the LCD PCB to the LCD upper cover and remove the LCD PCB. See Figs. 4.11 and 4.12.

- c) Remove the inverter PCB by disengaging hook a on the LCD upper cover. See Figs. 4.10 and 4.12.

**NOTE:**

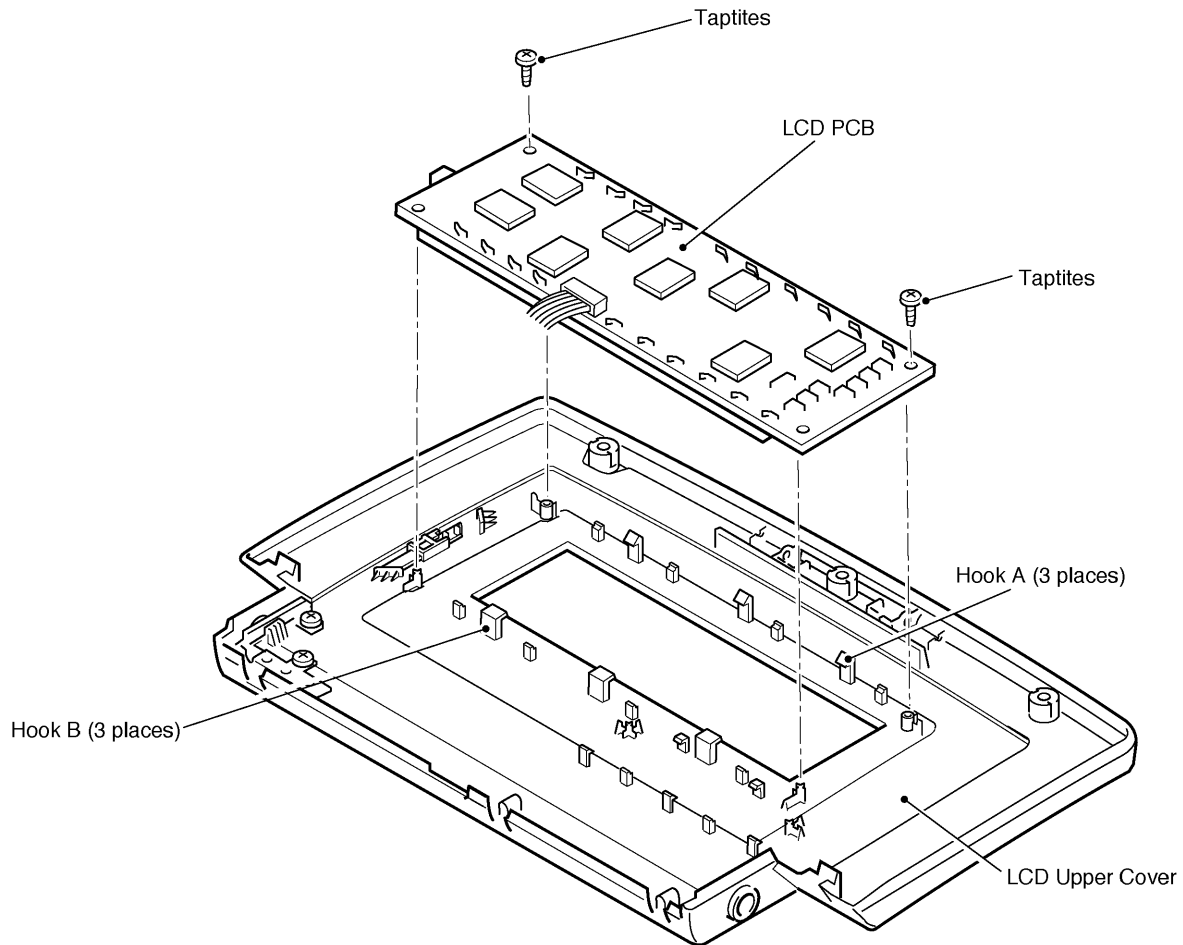
- The inverter PCB is installed in only LW-810icBL and DP-550CJ/LW-840ic.

<DP-525CJ/LW-800ic>



**Fig. 4.8 Removing the LCD PCB (1)**

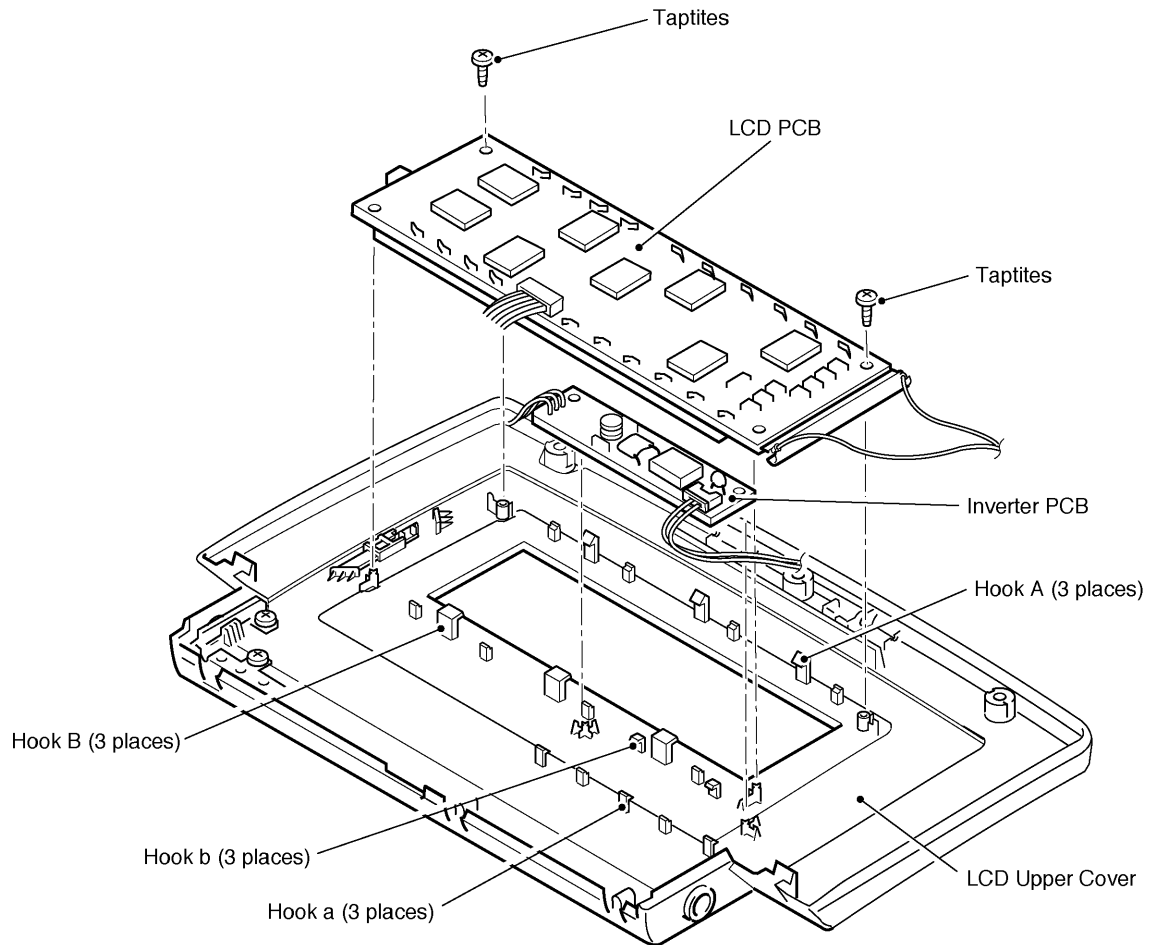
<DP-530CJ/LW-810ic>



**Fig. 4.9 Removing the LCD PCB (2)**

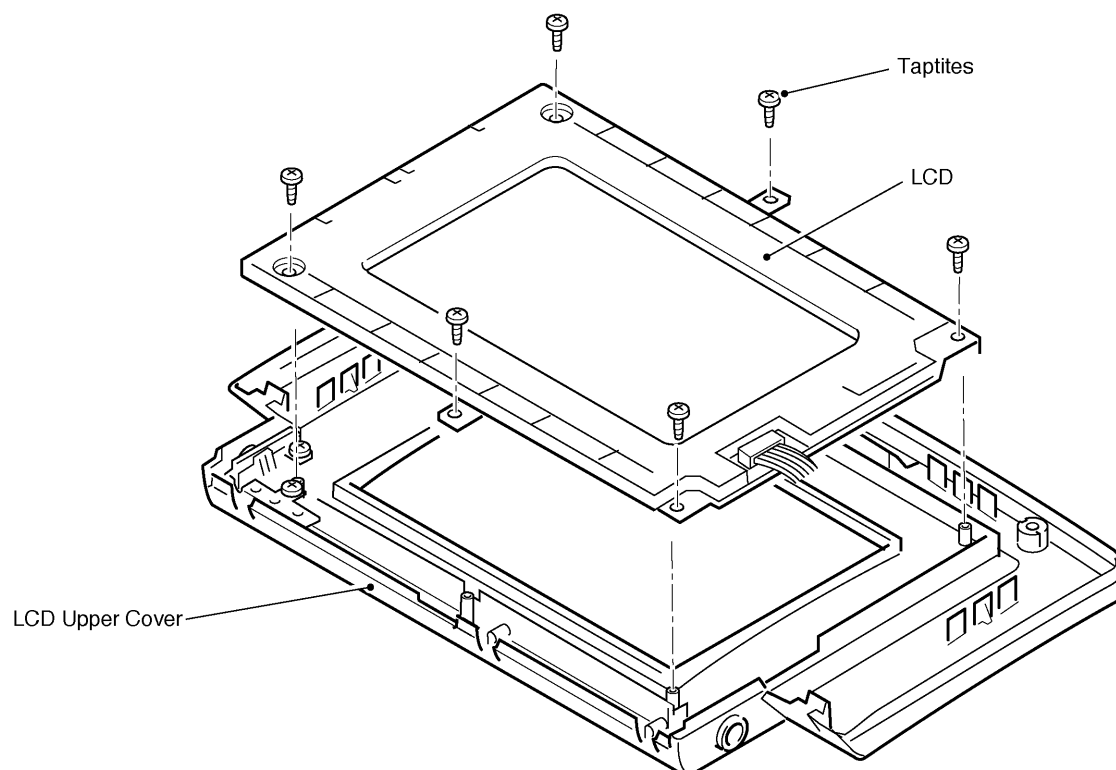


<LW-810icBL>



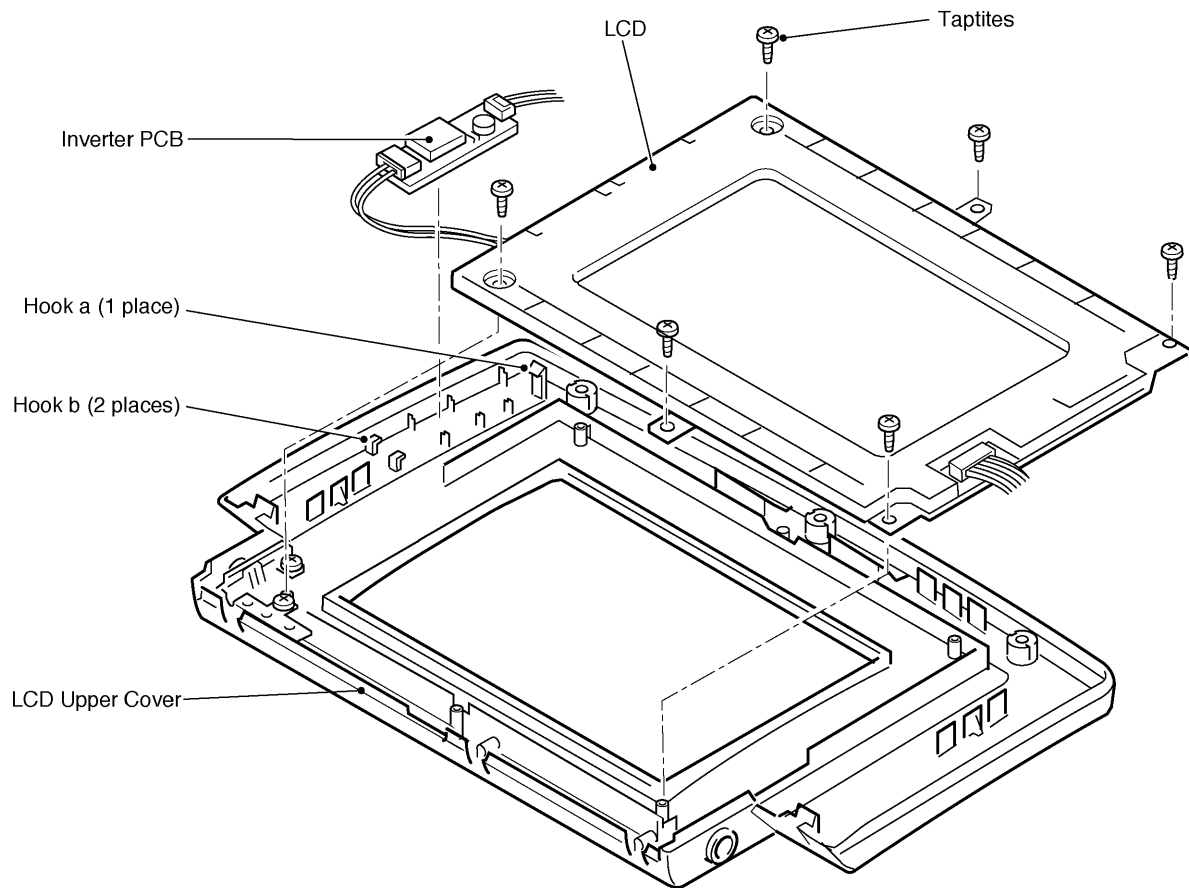
**Fig. 4.10 Removing the LCD PCB (3)**

<DP-540CJ>



**Fig. 4.11 Removing the LCD PCB (4)**

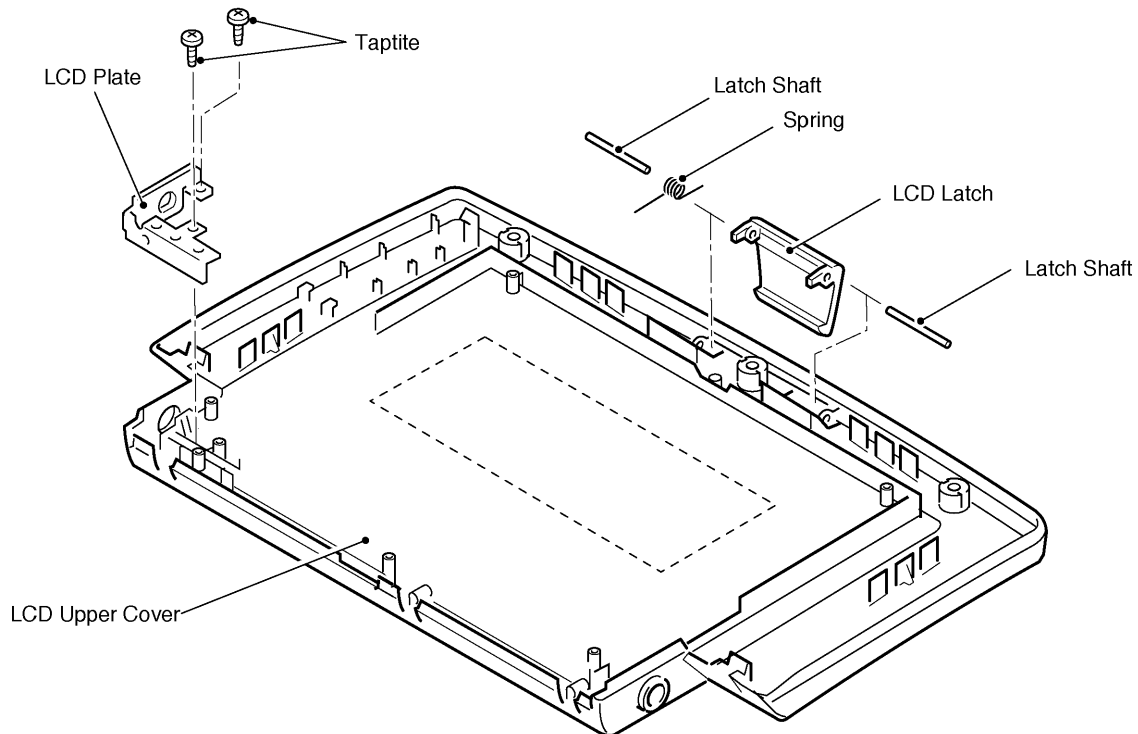
<DP-550CJ/LW-840ic>



**Fig. 4.12 Removing the LCD PCB (5)**

(3) Remove the LCD latch and LCD plate:

- a) Slide the latch shafts outwards and remove the LCD latch from the LCD upper cover.
- b) Remove the tapites (2 pcs.) and the LCD plate from the LCD upper cover.



**Fig. 4.13 Removing LCD Latch and LCD Plate**

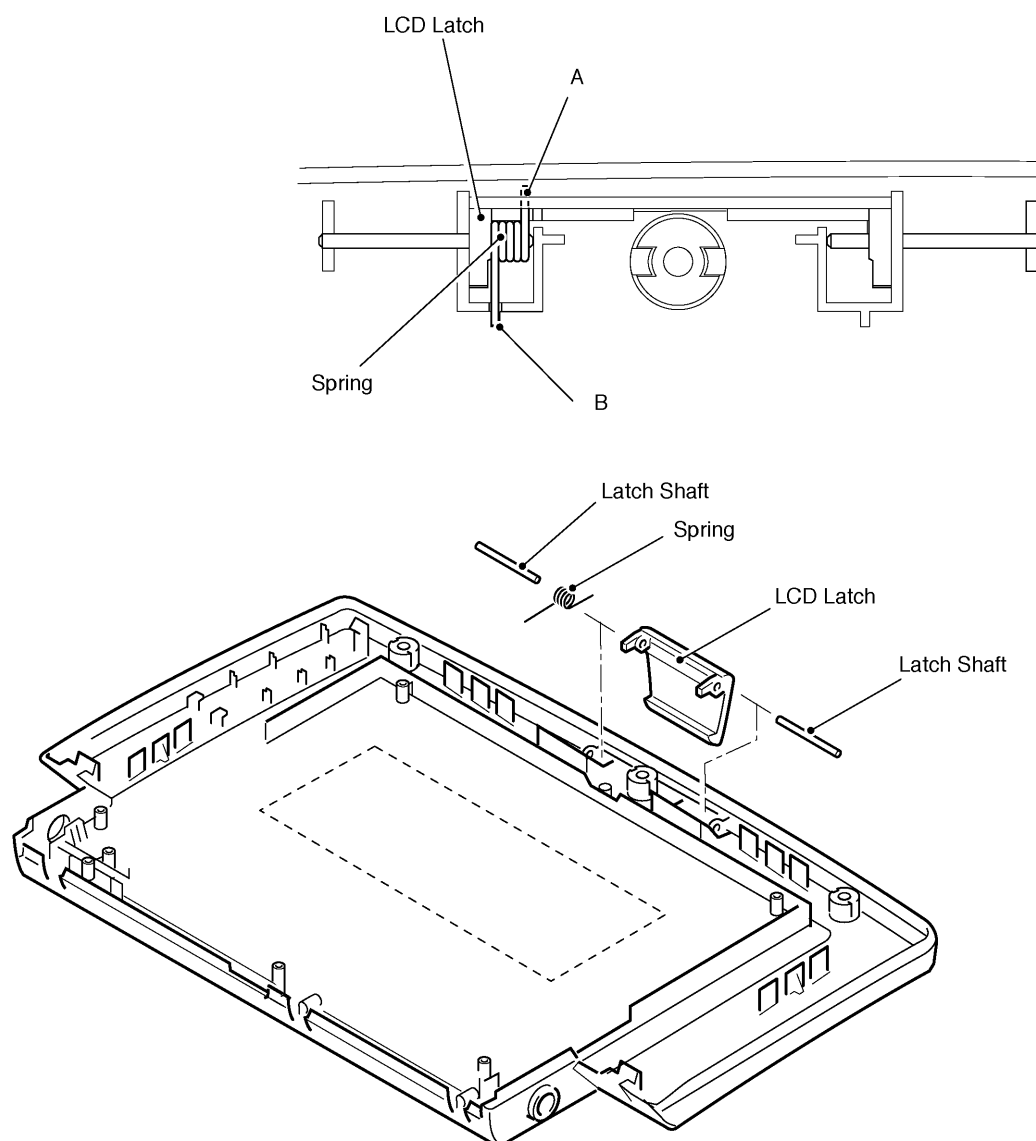
## 2.2. Reassembling the LCD Module

**CAUTION:** Electro-Static Discharge Hazard



Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

- (1) Install the LCD latch and the LCD plate:
  - a) Place the LCD plate on the LCD upper cover by aligning the holes in the LCD plate with the bosses on the LCD upper cover. Then, secure the LCD plate by tightening the taptites (2 pcs.).
  - b) Mount the LCD latch in the LCD upper cover. Insert the right latch shaft first. Then, after inserting the left latch shaft slightly, set the spring, by inserting A into latch and B into slot. Pass the shaft through the spring and the hole in the LCD latch.



**Fig. 4.14 Installing LCD Latch**

(2) Fit the LCD PCB into the LCD upper cover:

- a) While holding the inverter PCB at an angle of 45°, slide its edge into hooks b. Then, fit the inverter PCB into the LCD upper cover by prying hook a outwards. The Inverter PCB is held in place by hook a and hooks b.

**NOTE:**

- The inverter PCB is installed only in LW-810icBL and DP-550CJ/LW-840ic.
- b) The procedure to install the LCD PCB differs according to the model.

<DP-525CJ/LW-800ic, DP-530CJ/LW-810ic, LW-810icBL>

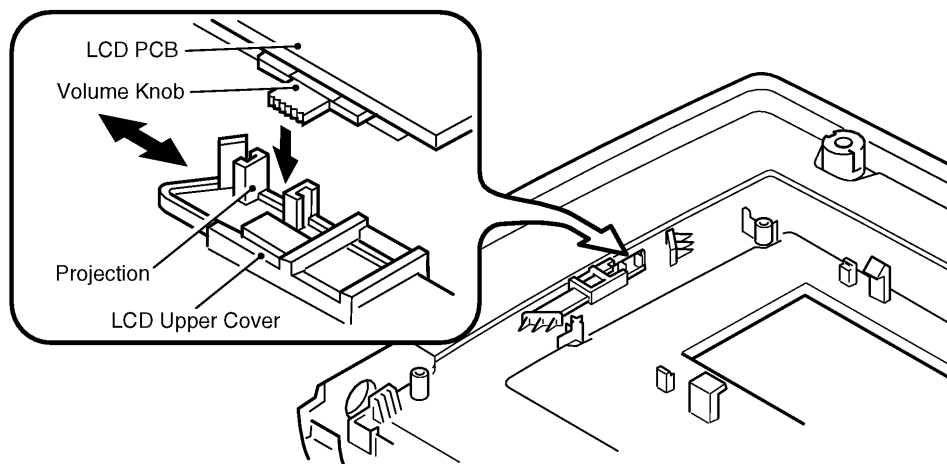
While holding the LCD PCB at an angle of 45°, slide its edge into hooks B. Then, fit the LCD PCB in the LCD upper cover by prying hooks A outwards. The LCD PCB is held in place by hooks A and hooks B.

When installing the LCD PCB, determine the position by aligning the holes in the LCD PCB with the bosses on the LCD upper cover.

**NOTE:**

- The volume guide on the LCD PCB must fit properly with the projection of the LCD volume knob attached to the LCD upper cover to allow the LCD volume knob to move smoothly. See Fig. 4.15.  
Finally, tighten the tapites.

<DP-525CJ/LW-800ic, DP-530CJ/LW-810ic, LW-810icBL>



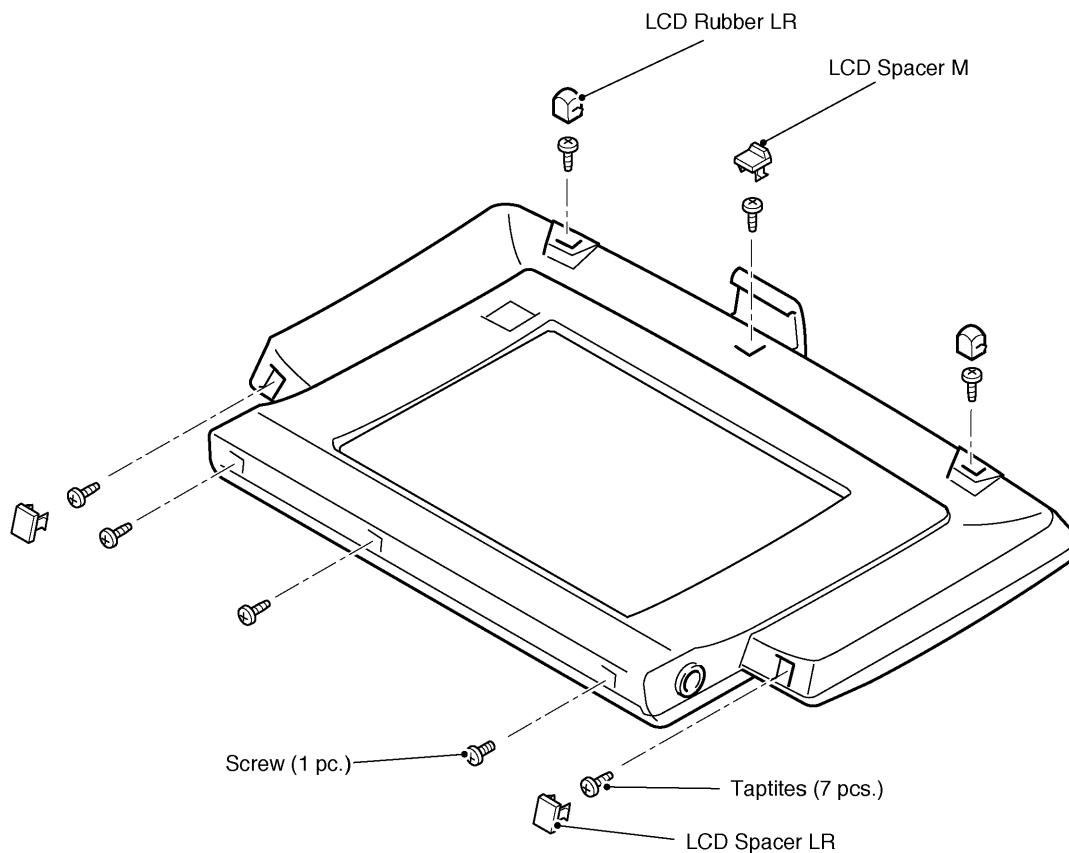
**Fig. 4.15 Fitting LCD Volume Guide to LCD Volume Knob**



<DP-540CJ, DP-550CJ/LW-840ic>

Adjust the position of the LCD PCB by aligning the holes in the LCD PCB with the bosses on the LCD upper cover. Tighten the screws to secure the LCD PCB in place.

- c) Return the LCD harness to its original position
- (3) Install the LCD lower cover:
  - a) Place the LCD lower cover on the LCD upper cover.
  - b) Place the assembly of the LCD lower cover and upper cover on the table with the LCD screen facing up.
  - c) Tighten the screw (1 pc.) and taptites (7 pcs.) to clamp the LCD lower cover to the LCD upper cover.
  - d) Fit the LCD spacer M (1 pc.) and LCD spacer LR (2 pcs.) to the LCD upper cover.
  - e) Fit the LCD rubber LR (2 pcs.) to the LCD upper cover.



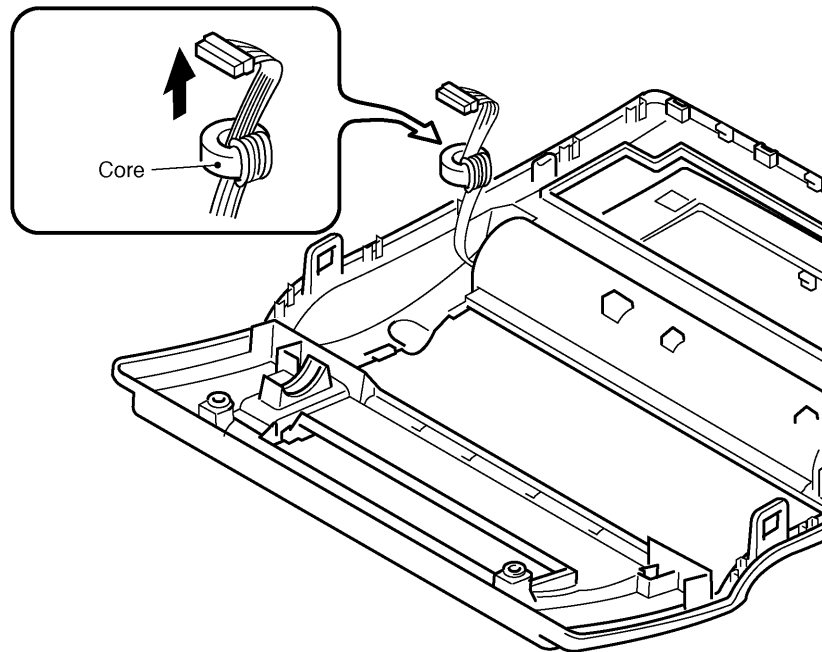
**Fig. 4.16 Installing the LCD Lower Cover**

(4) Install the LCD module in the upper cover:

- a) Pass the LCD module harness through the hole in the upper cover.
- b) Fit the LCD module into the LCD upper cover.
- c) Pass the LCD module harness through the hole in the LCD bearing. Insert the LCD bearing into the holes in the upper cover and the LCD module and secure it with the tapites (2 pcs.).
- d) Insert the hinge assy into the holes in the upper cover and the LCD module (LCD plate) tighten the screws (2 pcs.) while holding the hinge assy.

**NOTE:**

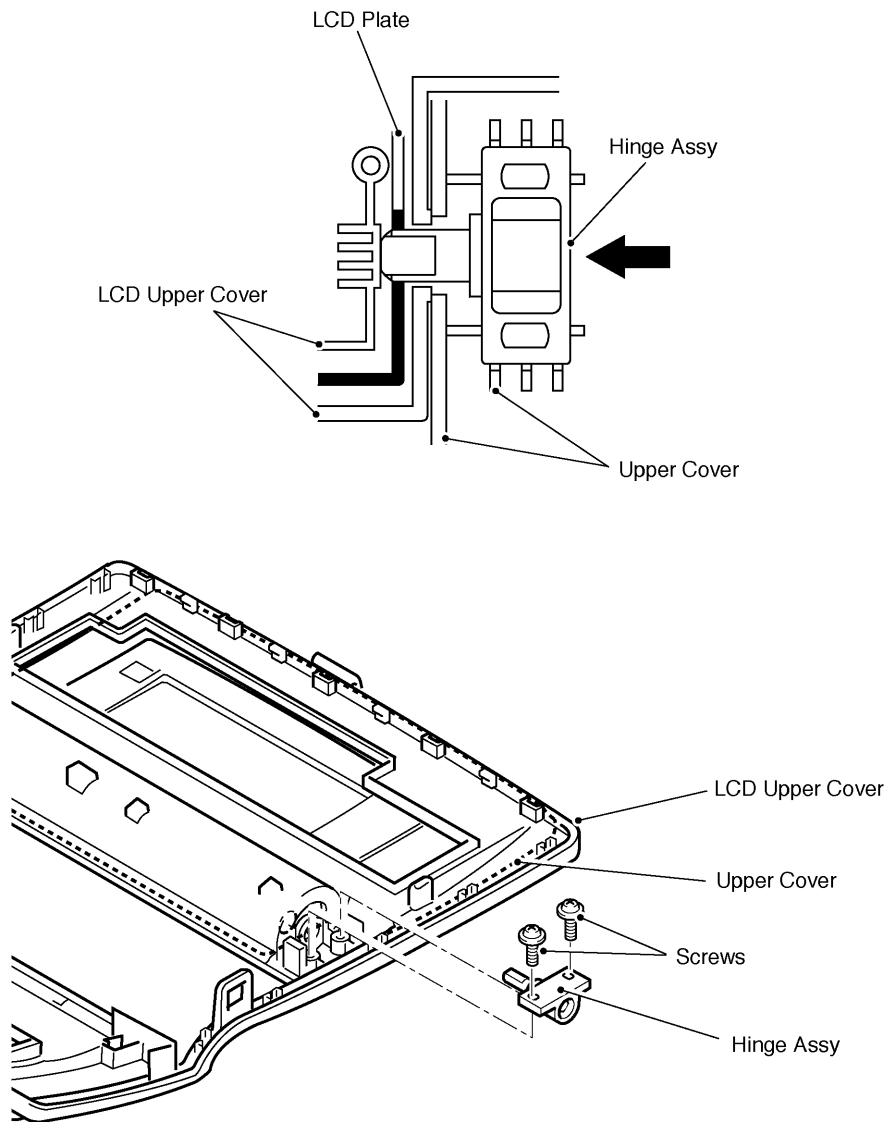
- When mounting the hinge assy, push it fully into the LCD unit until the end of the hinge assy shaft touches the rib in the LCD upper cover. See Fig. 4.18.



**Fig. 4.17 Fitting the Core**

**NOTE:**

- After installing the LCD module in the upper cover, attach the core to the cable.



**Fig. 4.18 Installing the Hinge Assy**

### 3. Keyboard Assembly

**CAUTION:** Electro-Static Discharge Hazard



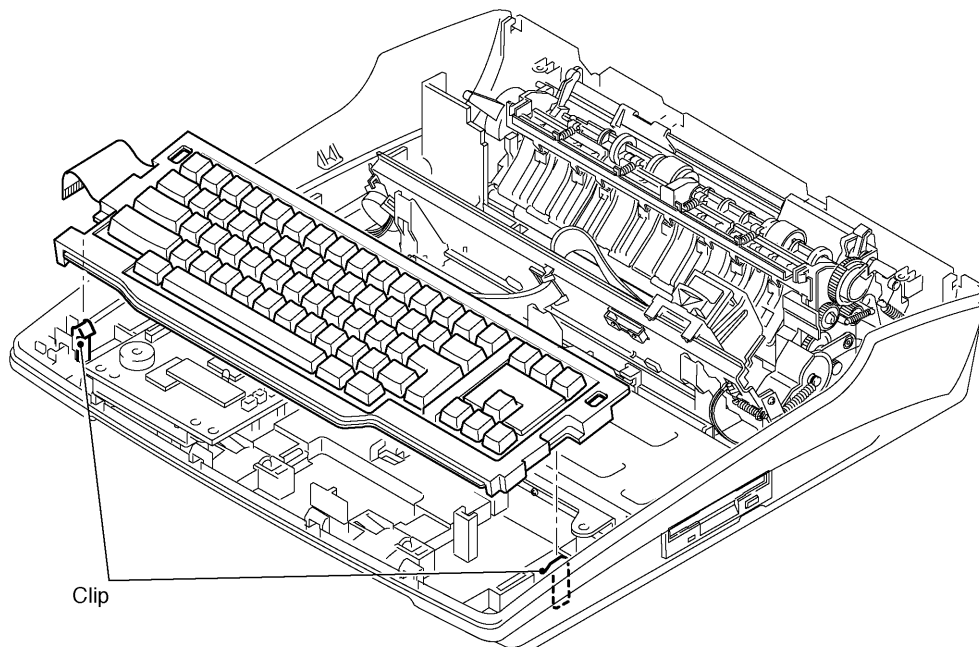
Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

#### 3.1. Removing the Keyboard

- (1) Turn off the power and unplug the power cord.
- (2) Remove the sub paper support, paper support, top cover, and the upper cover.
- (3) Press outward on the two clips (one on each side of the keyboard), lift up on the keyboard panel to just clear the bottom cover keyboard supports, and unplug the keyboard harness from the main PCB (left side).

**NOTE:**

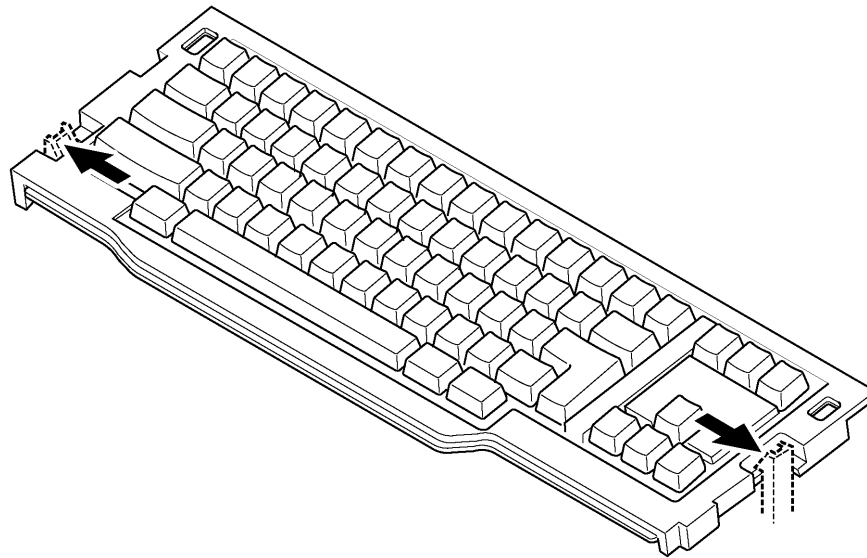
- The keyboard PCB and the base plate are attached to the bottom of the keyboard, and are not removable (entire assembly must be replaced).



**Fig. 4.19 Removing the Keyboard Assembly**

### 3.2. Installing the Keyboard

Place the keyboard in the bottom cover on the keyboard supports, plug the keyboard PCB harness into the main PCB, and push down on each side of the keyboard to snap it into place.



**Fig. 4.20** Installing the Keyboard

## 4. Carrying Handle

### 4.1. Removing the Carrying Handle

- (1) Stand the machine on its rear side with the underside facing you.
- (2) Turn the carrying handle perpendicular to the bottom cover.
- (3) While pushing the carrying handle to the left, press in on the right stopper with a small screwdriver to disengage the handle pivot shaft from the stoppers.
- (4) Slide the handle fully to the left to clear the locks in the bottom cover, and pull it toward you.

### 4.2. Installing the Carrying Handle

- (1) Turn the handle perpendicular to the bottom cover, and slide the left pivot shaft into the hole in the left side of the bottom cover.
- (2) Align the right pivot shaft with its hole at the right side, and slide the handle to the right until the stoppers engage the locks.

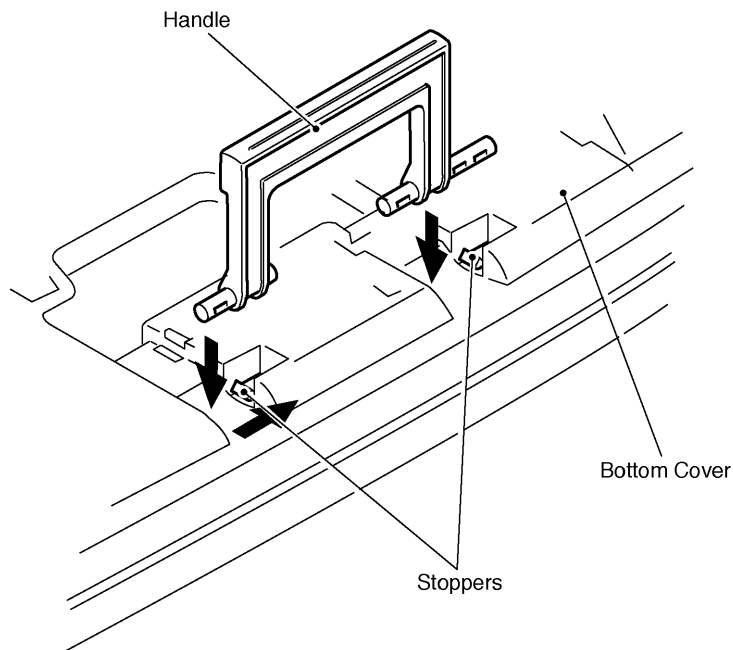
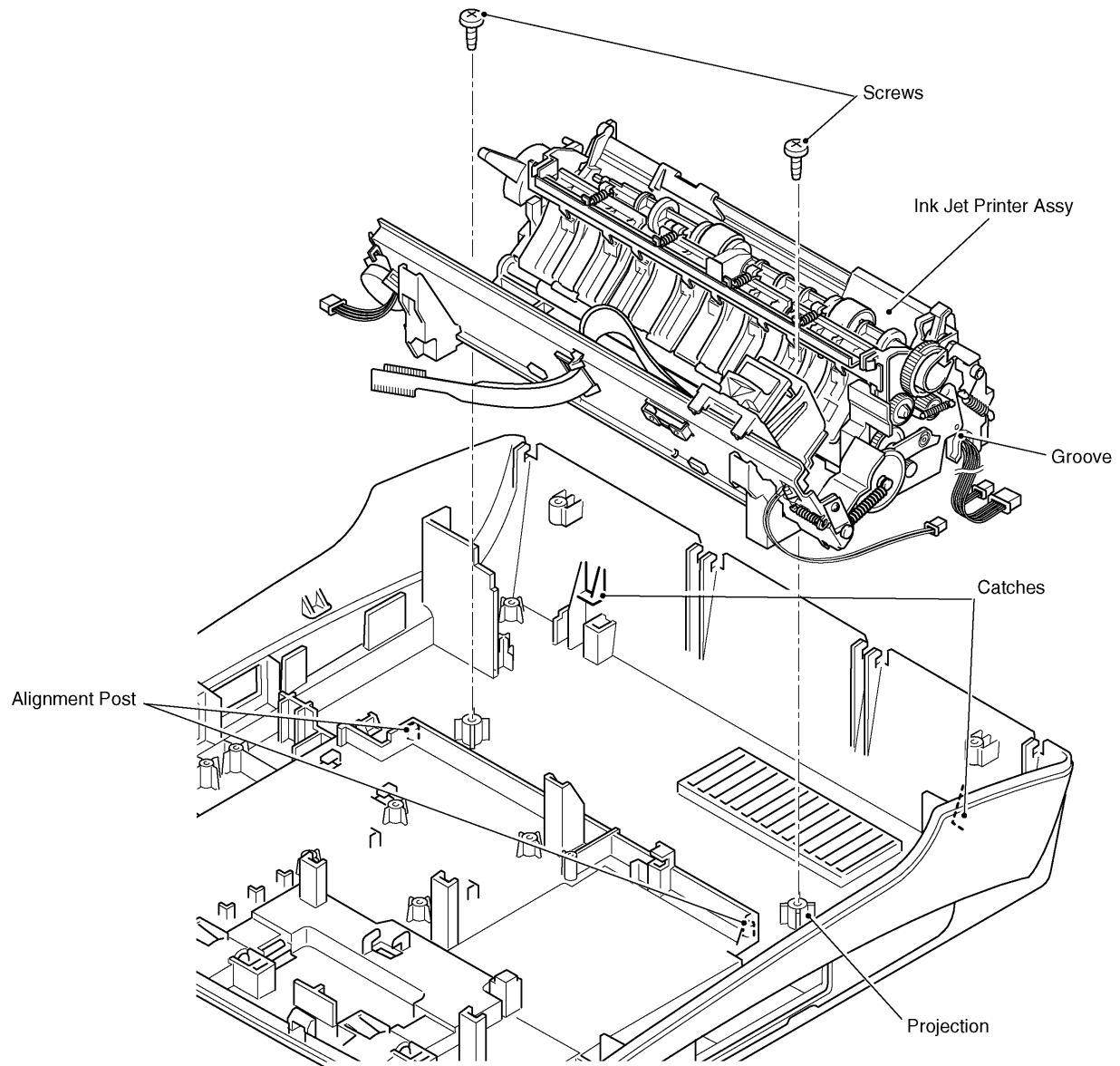


Fig. 4.21 Removing the Carrying Handle

## 5. Ink Jet Printer Assembly

The ink jet printer assembly consists of the PF unit, CA unit, and the earth spring.

The ink jet printer assembly is secured to the rear of the bottom cover by two screws.



**Fig. 4.22 Ink Jet Printer Assembly**

### **5.1. Removing the Printer Assembly**

- (1) Remove the upper cover assembly.

See steps (1) to (5) in 1.1.1 "Removing the Upper Cover".

- (2) Unplug the six connectors from the main PCB.

Unplug the connectors of the following cables and harnesses:

- 1) Two flat cables (to carriage)
- 2) Leaf switch harness
- 3) PE sensor harness
- 4) PF motor harness
- 5) CA motor harness

**NOTE:**

- Remove harnesses 2), 3), and 4) from the harness retainers in the bottom cover.

- (3) Remove the two screws from the middle of the printer assembly.
- (4) Push the bottom cover outward above each catch in turn (each catch holds a projection from both sides of the PF base assembly) and lift the printer assembly from the PF base assembly supports in the bottom cover.

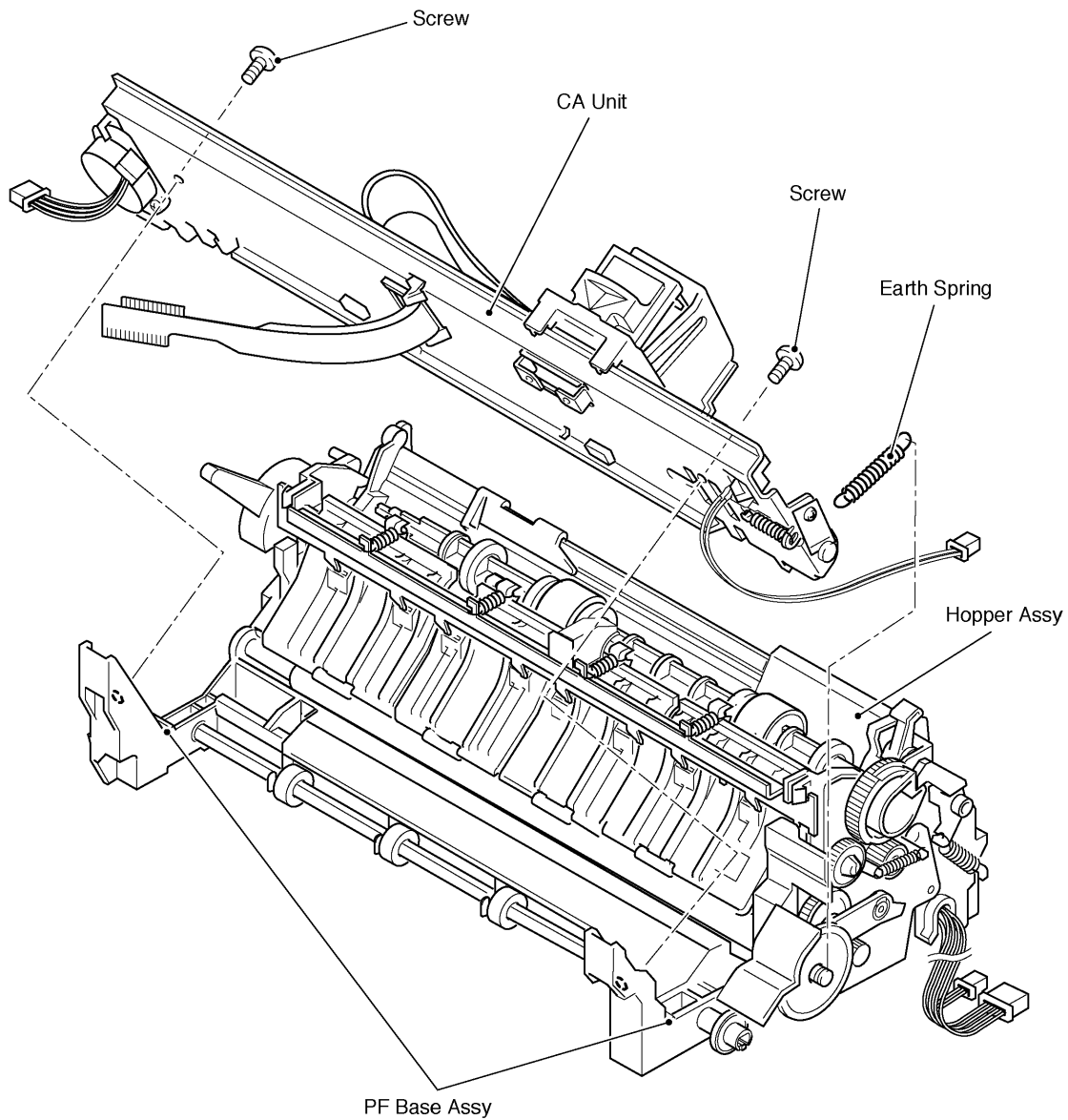
### **5.2. Installing the Printer Assembly**

- (1) Slide the rear of the printer assembly into the catches in the bottom cover while holding harnesses 3) and 4) in the groove in the PF unit. Then, place the front of the printer assembly on the alignment posts in the bottom cover, push down on the printer assembly and snap the projections in the PF base assembly in place.
- (2) Connect the six connectors to the main PCB and run the harnesses 2), 3), and 4) through the retainers in the bottom cover.
- (3) Secure the printer assembly in the bottom cover by tightening the two screws at the middle of the printer assembly.
- (4) Install the upper cover assembly.

See steps (2) to (6) in 1.1.2 "Installing the Upper Cover".



### 5.3. Disassembling the Printer Assembly



**Fig. 4.23 Disassembling the Printer Assembly**

**5.3.1. Removing the CA Unit**

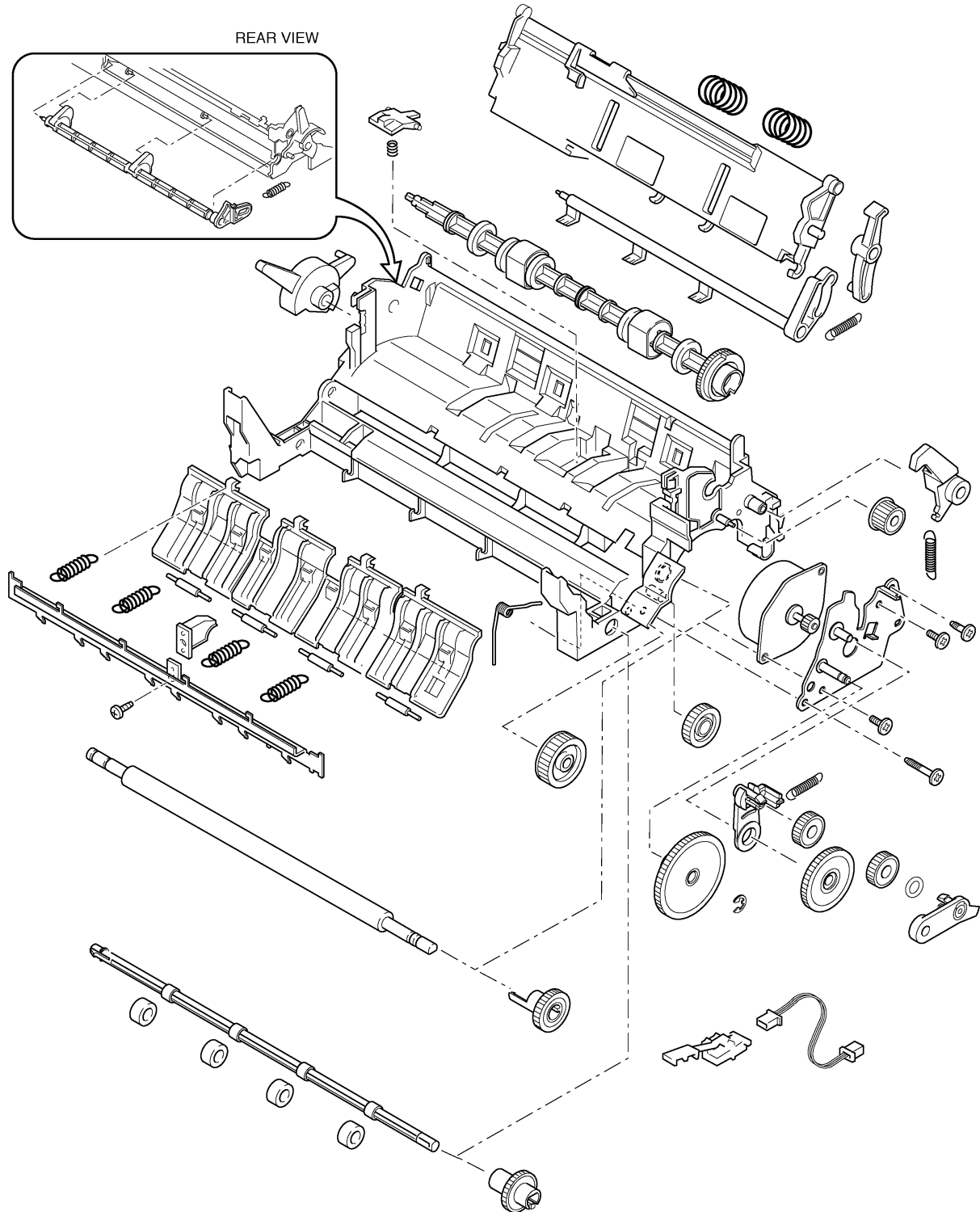
- (1) Remove the earth spring.
- (2) Remove the two screws from the CA unit.
- (3) Lift the CA unit to clear it from the catches in the PF unit.

**5.3.2. Installing the CA Unit**

- (1) Hold both ends of the CA unit and slide it in so that the alignment ribs on both sides of the CA unit engage in the catch of the PF unit.
- (2) Secure the CA unit to the PF unit by tightening the screws (2 pcs.).
- (3) Fit the earth spring.

### 5.3.3. Disassembling the PF Unit

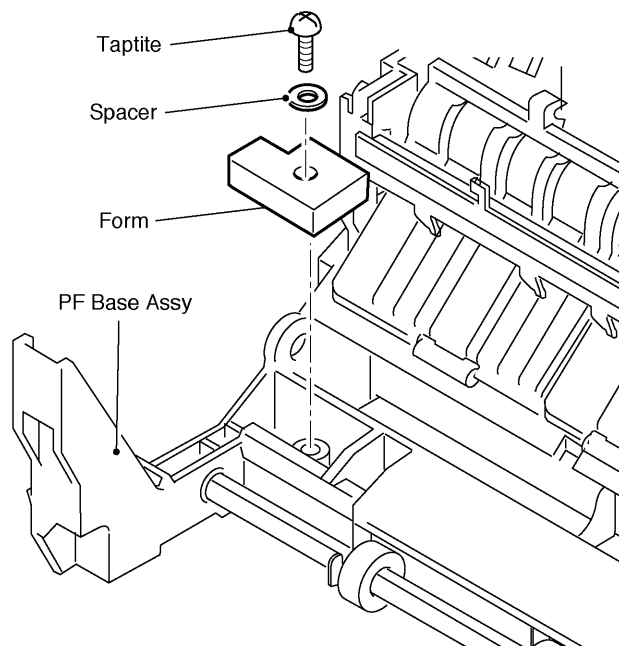
This section describes the procedure for disassembling the PF unit.



**Fig. 4.24 Construction of the PF Unit**

### 5.3.3.1. Removing the Form

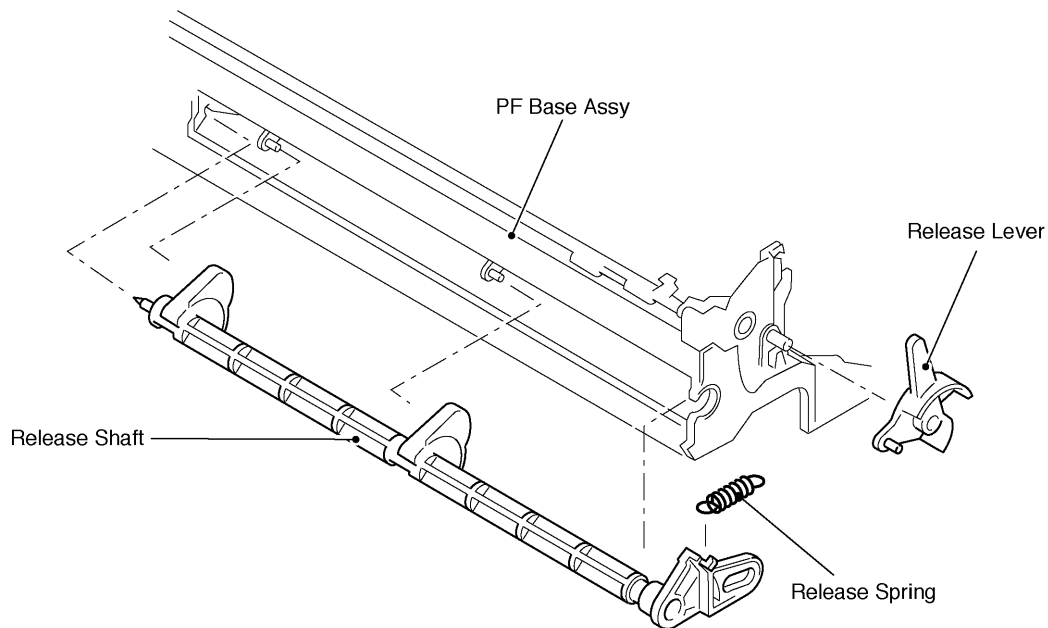
Remove the screw and the spacer, then take out the form.



**Fig. 4.25 Removing the Form**

### 5.3.3.2. Removing the Release Lever and Release Shaft

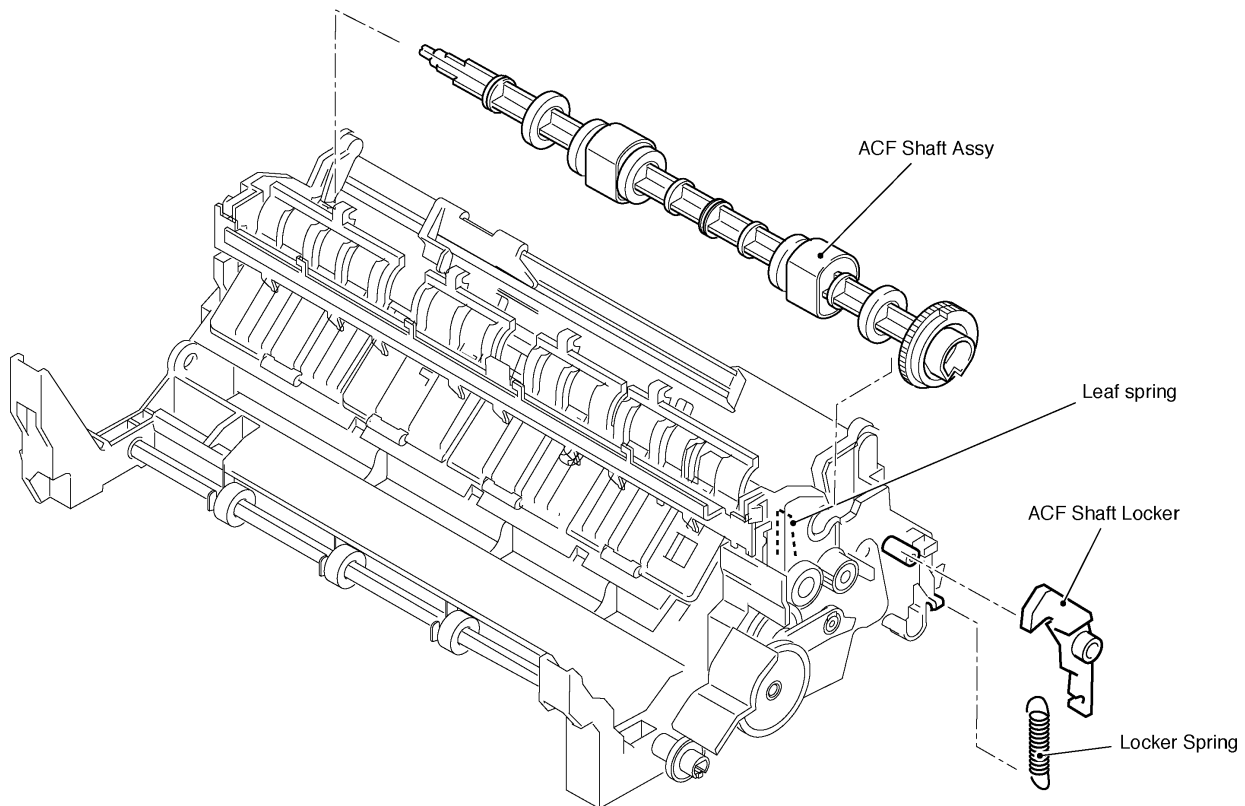
- (1) Remove the release spring.
- (2) After disengaging the release shaft from the PF base assembly by lightly pushing the leaf spring, slide the release shaft in the thrust direction and align the recess in the release shaft with the cutout in the PF base assembly. Remove the release shaft from the PF base assembly.
- (3) Turn the release lever clockwise and remove it from the PF base assembly.



**Fig. 4.26 Removing the Release Lever and Release Shaft from the PF Base Assembly**

## 5.3.3.3. Removing the ACF Shaft Assembly

- (1) Remove the locker spring.
- (2) Turn the ACF shaft locker clockwise and remove it from the PF base assembly.
- (3) After disengaging the ACF shaft assembly from the PF base assembly by lightly pushing the leaf spring, slide the ACF shaft assembly in the thrust direction and align the recess in the ACF shaft assembly with the cutout in the PF base assembly. Remove the ACF shaft assembly from the PF base assembly.

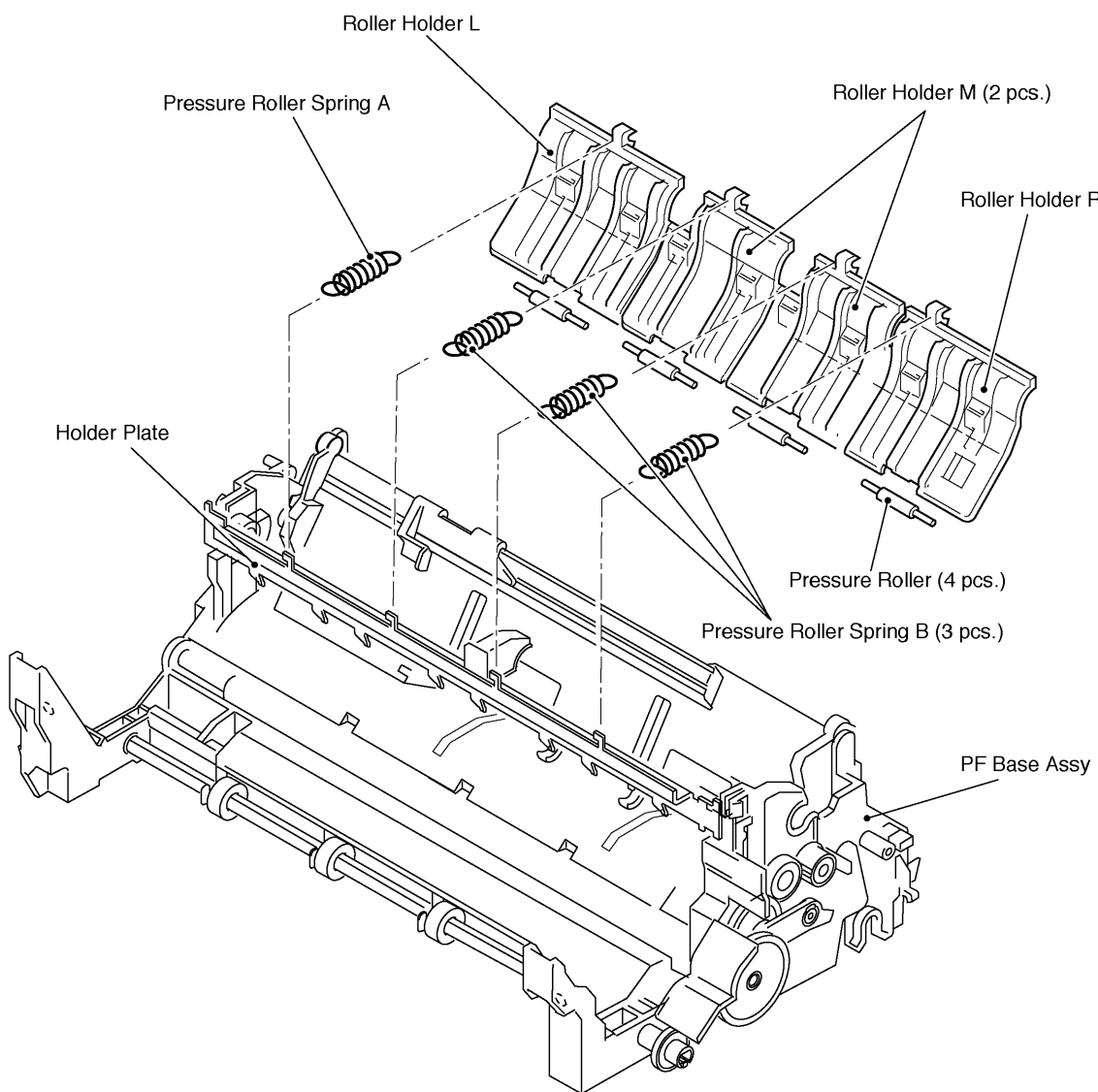


**Fig. 4.27 Removing the ACF Shaft Assembly**

#### 5.3.3.4. Removing the Pressure Rollers and Roller Holders

There are four pressure rollers used in the machine and the same removal procedure can be used for all of them.

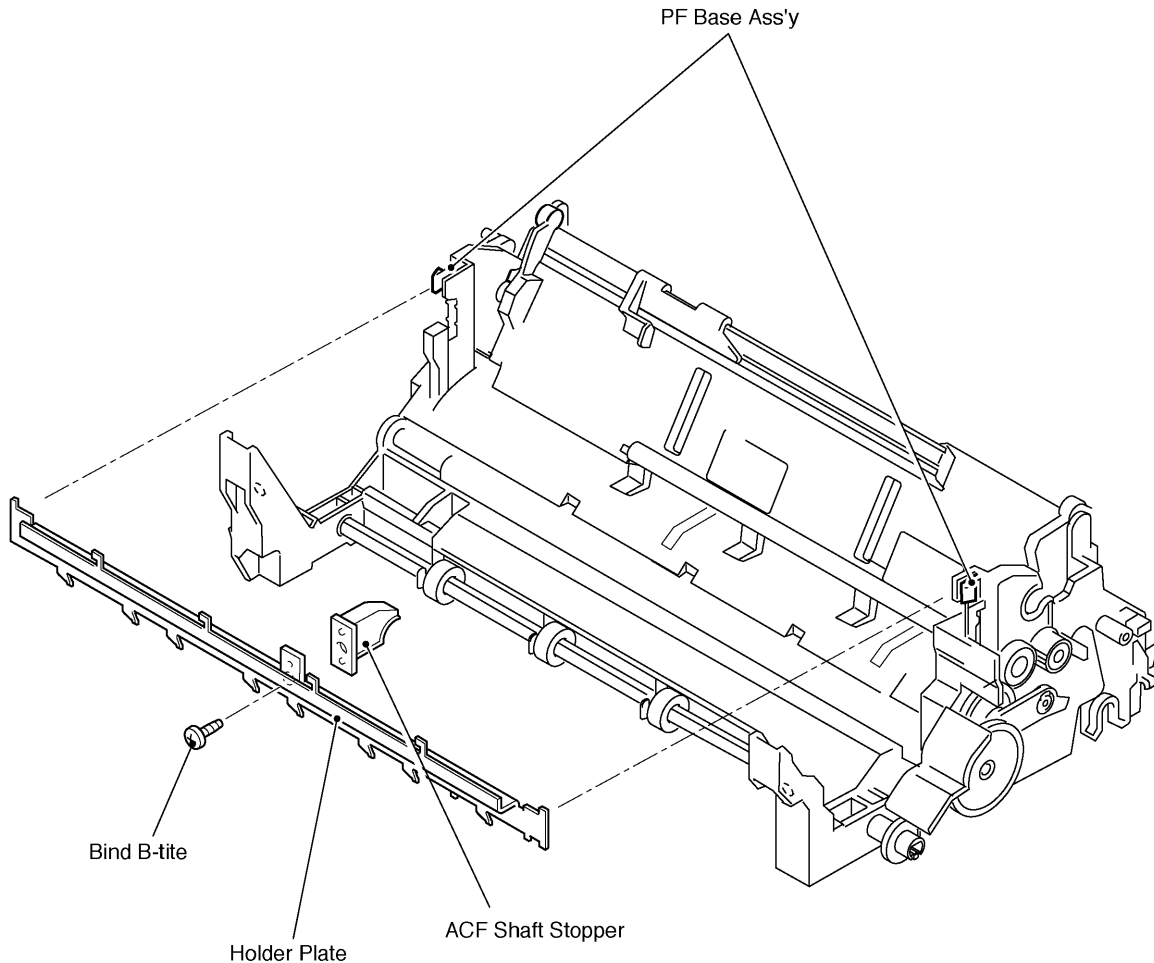
- (1) Remove the pressure roller springs (spring A and springs B).
- (2) Disengage a roller holder from a holder plate and take away the holder plate upward with a roller in it.
- (3) Push the pressure roller to the cut-out side in the roller holder to remove it from the roller holder.



**Fig. 4.28 Removing the Pressure Rollers and Roller Holders**

## 5.3.3.5. Removing the Holder Plate

- (1) Unsnap the two hooks in the PF base assembly to disengage the holder plate from the PF base assembly. Then, lift the holder plate away from the PF base assembly upward by tilting it towards you.
- (2) Remove the screw and then the ACF shaft stopper.

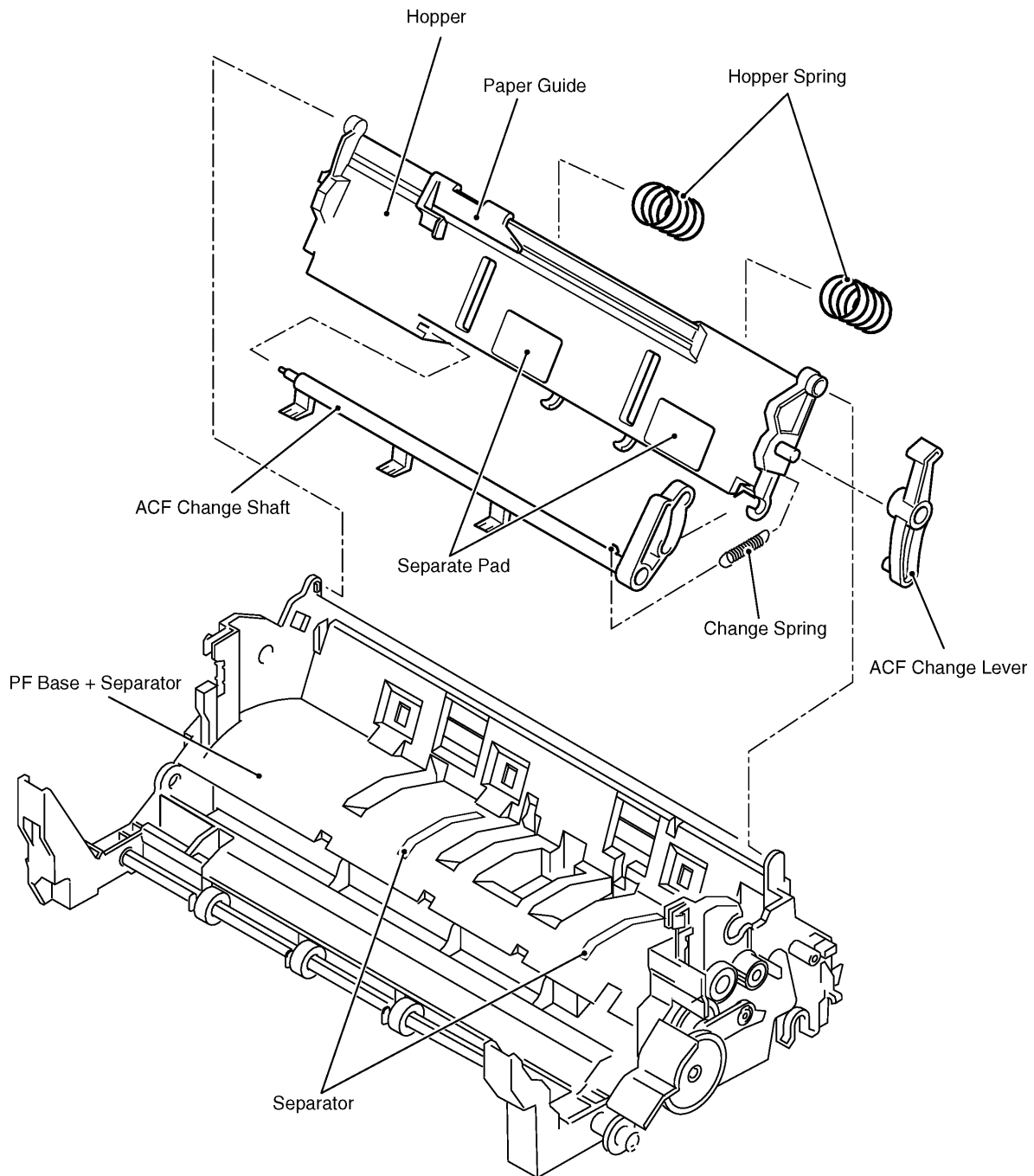


**Fig. 4.29 Removing the Holder Plate**



#### 5.3.3.6. Removing the Hopper Assembly

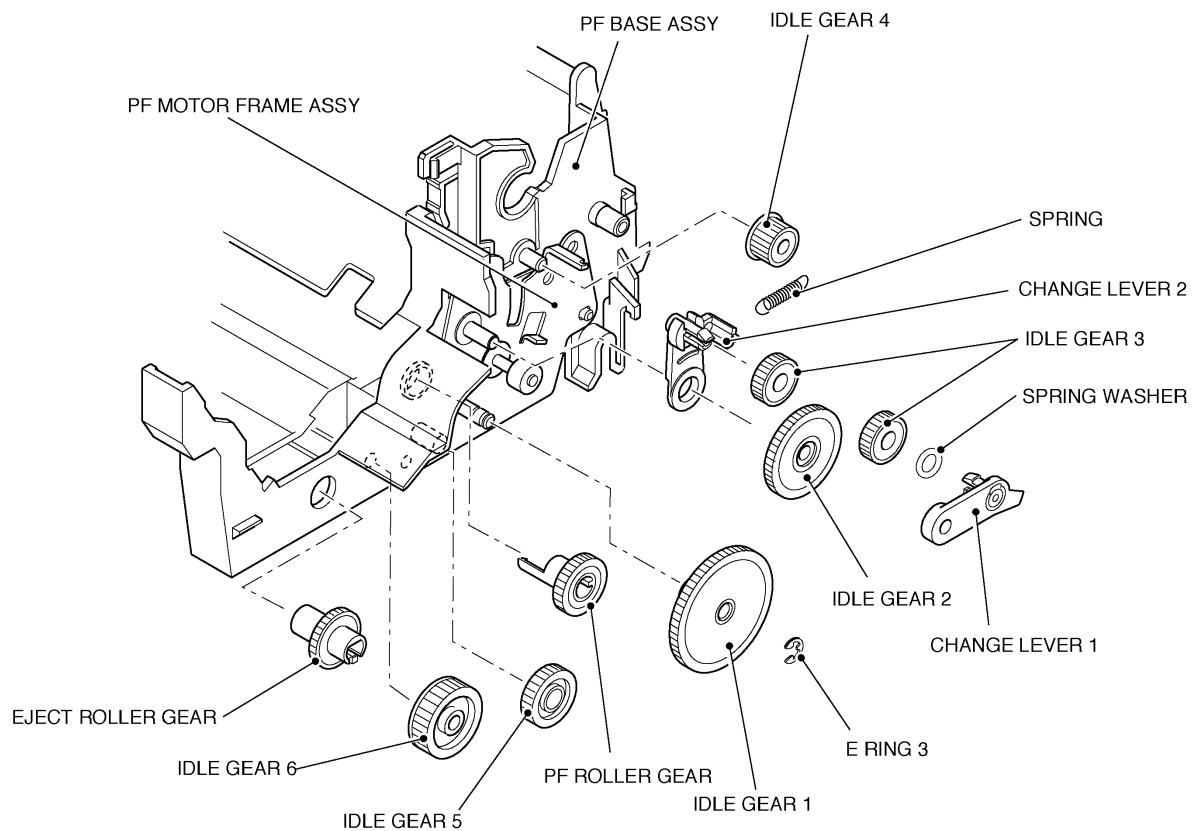
- (1) Unsnap the hook at the left side of the hopper assembly to disengage it from the PF base assembly. Turn the hopper assembly until the oval pin of the PF base assembly is aligned with the cut-out in the hopper assembly fitting hole. Lift the hopper assembly away from the PF base assembly.
- (2) Remove the hopper springs.
- (3) Remove the change spring.
- (4) Unsnap the hook in the hopper assembly to disengage the ACF change lever from the hopper assembly. Then, turn the ACF change lever up in the counterclockwise direction to remove it from the hopper assembly.
- (5) Make sure that the pin on the ACF change shaft has cleared the hook in the hopper ass'y. Then, turn the ACF change shaft to align the recess of the ACF change shaft with the cut-out in the shaft support of the hopper assembly, and remove the ACF change shaft from the hopper assembly.



**Fig. 4.30 Removing the Hopper Assembly**

### 5.3.3.7. Disassembling the Paper Feed Assembly

- (1) Remove the spring.
- (2) Remove idle gear 4.
- (3) Remove the eject roller gear.
- (4) Remove E ring 3.
- (5) Remove idle gears 1, 5, and 6.
- (6) Remove the change lever 1 assembly (changer lever 1, idle gear 3, and spring washer).
- (7) Remove idle gear 2.
- (8) Remove the change lever 2 assembly (change lever 2, idle gear 3, and spring washer).
- (9) Remove the PF roller gear.



**Fig. 4.31 Disassembling the Paper Feed Assembly**

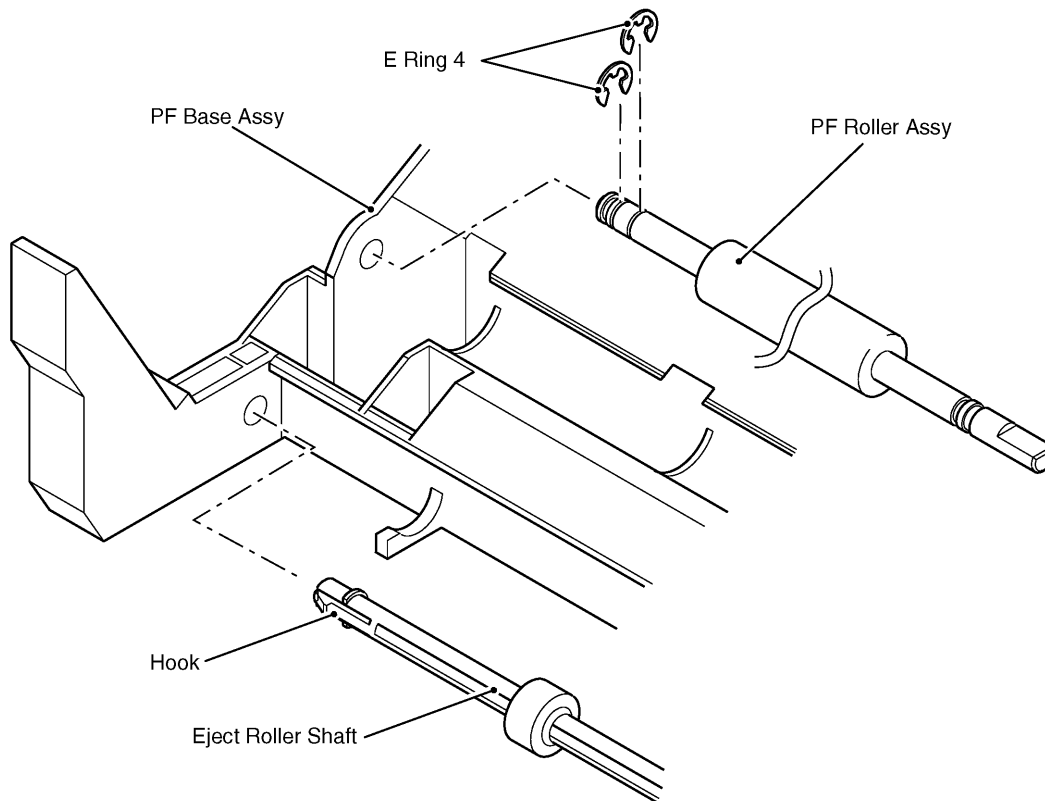
## 5.3.3.8. Removing the Eject Roller Assembly and the PF Roller Assembly

### <Removing the Eject Roller Assembly>

After releasing the hook in the ejector roller assembly, slide it to the right to remove it from the PF base assembly.

### <Removing the PF Roller Assembly>

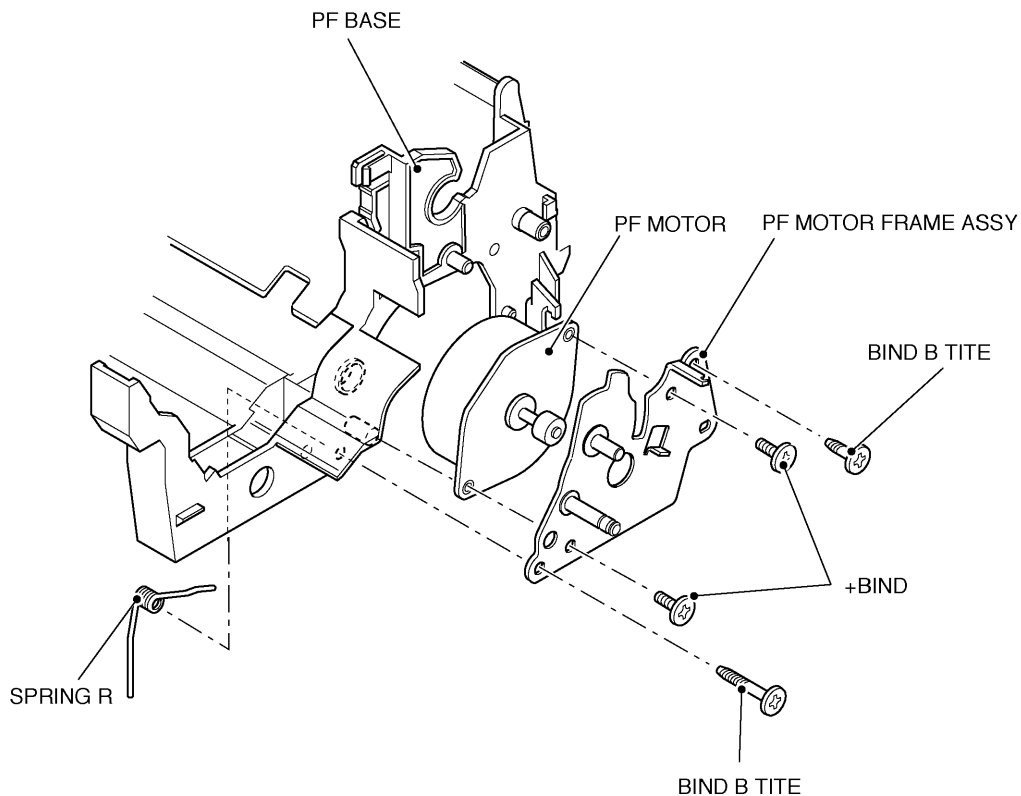
After releasing the E rings from the PF roller assembly, slide it to the right to remove it from the PF base assembly.



**Fig. 4.32 Removing the Eject Roller Assembly and the PF Roller Assembly**

#### 5.3.3.9. Removing the Motor Frame Assembly

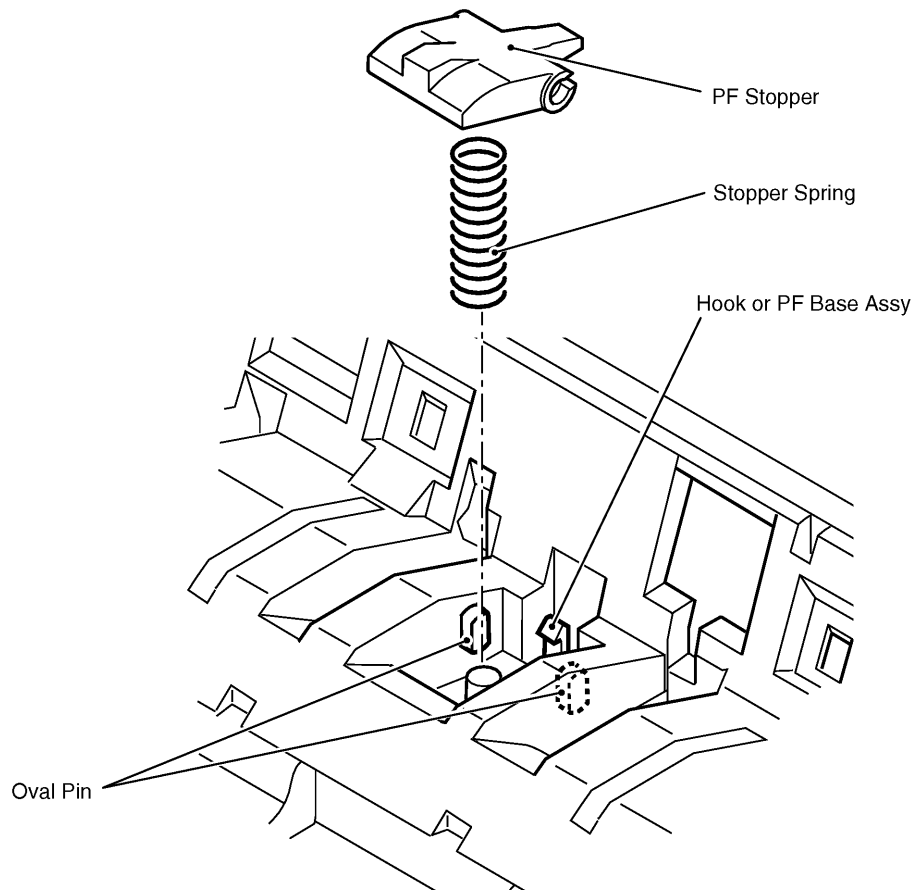
- (1) Remove the spring R.
- (2) Remove the two taptites (3x10, 3x20) to remove the motor frame assembly from the PF base assembly.
- (3) Remove the screw (3x5) to remove the PF motor from the PF motor frame assembly.



**Fig. 4.33 Removing the Motor Frame Assembly**

## 5.3.3.10. Removing the PF Stopper

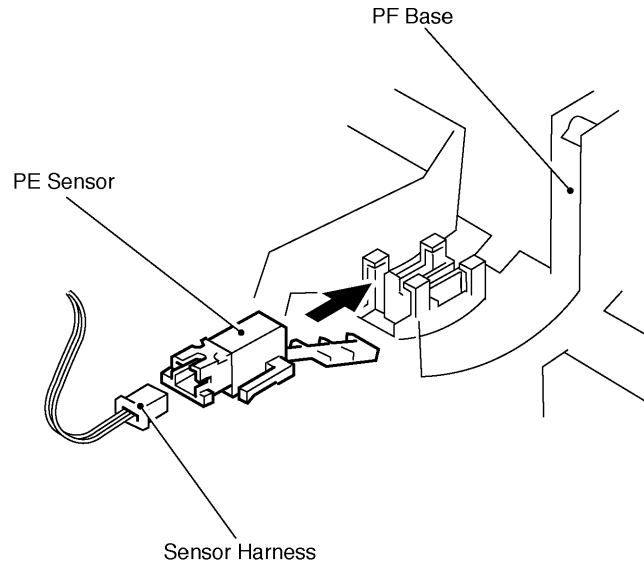
- (1) Unsnap the hook on the PF base assembly by pushing it with a screwdriver from the rear of the PF base assembly and the PF stopper is forced upward by spring force. Turn the PF stopper to align the cut-out in the PF stopper bearing with the oval pin of the PF base assembly. Remove the PF stopper from the PF base assembly.
- (2) Remove the stopper spring.



**Fig. 4.34 Removing the PF Stopper**

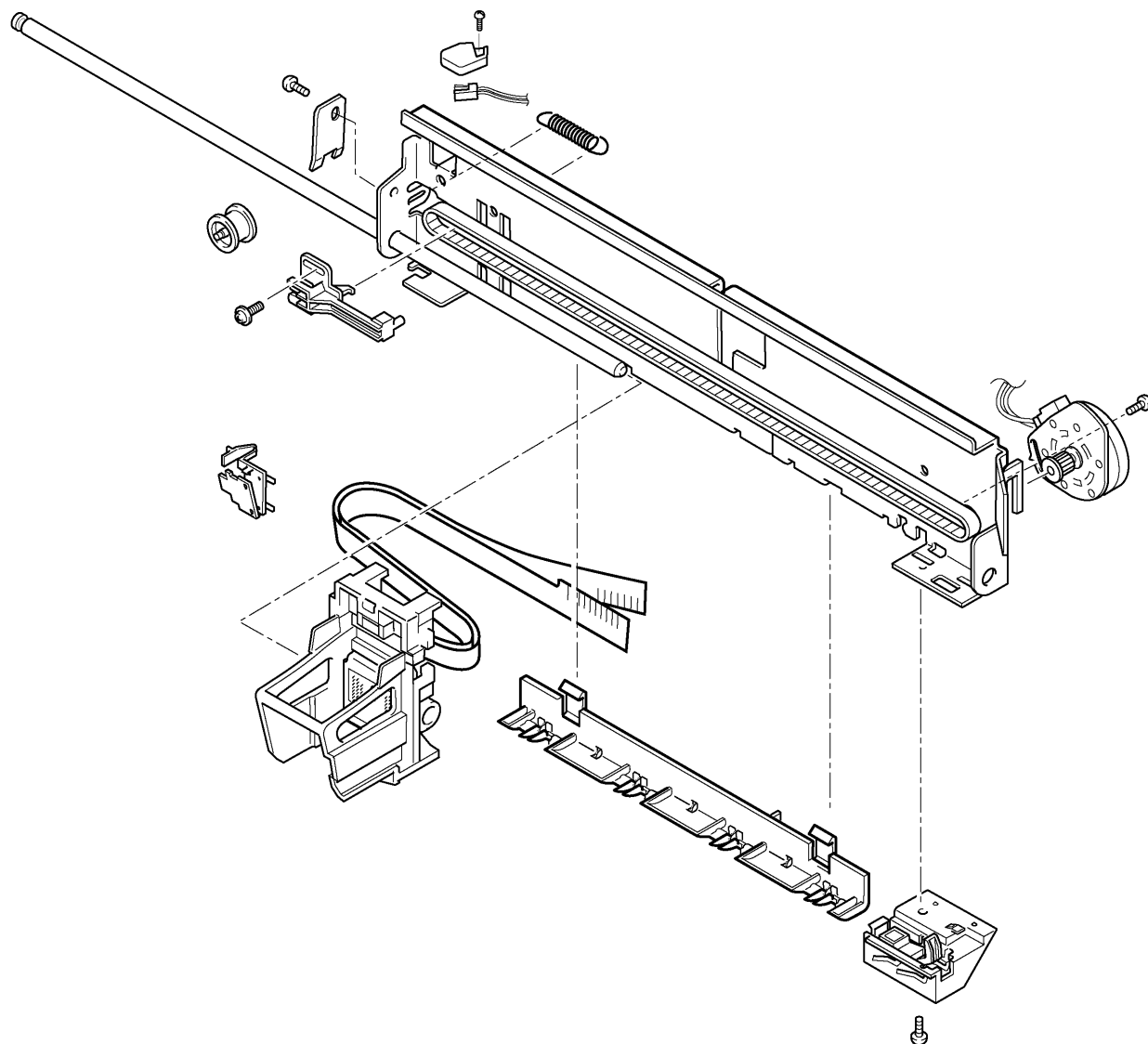
#### 5.3.3.11. Removing the PE Sensor

- (1) Unsnap the hook on the PE sensor by pushing it from the top side of the PF base assembly to disengage it from the PF base assembly. Remove the PE sensor by sliding it towards you.
- (2) Disconnect the sensor harness connector from the PE sensor.



**Fig. 4.35 Removing the PE Sensor**

This section describes the procedure for disassembling the CA unit.



**Fig. 4.36 Construction of the CA Unit**

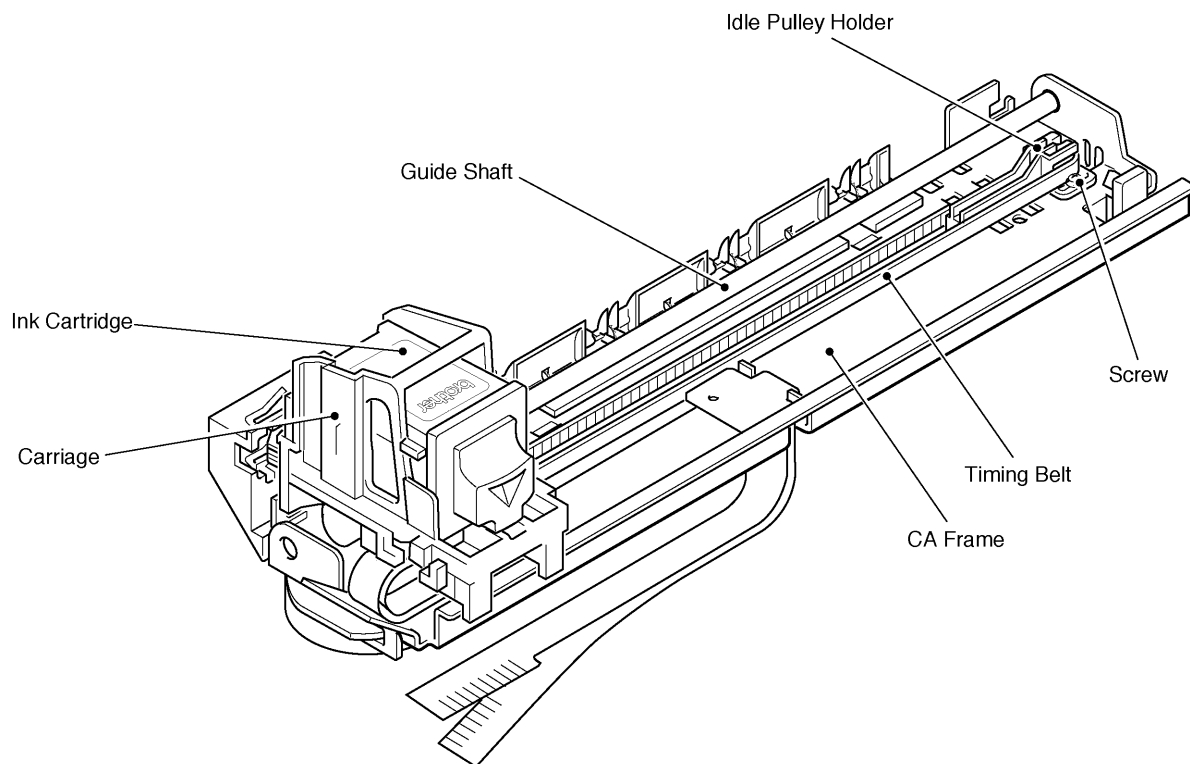


#### 5.3.4.1. Removing the Carriage

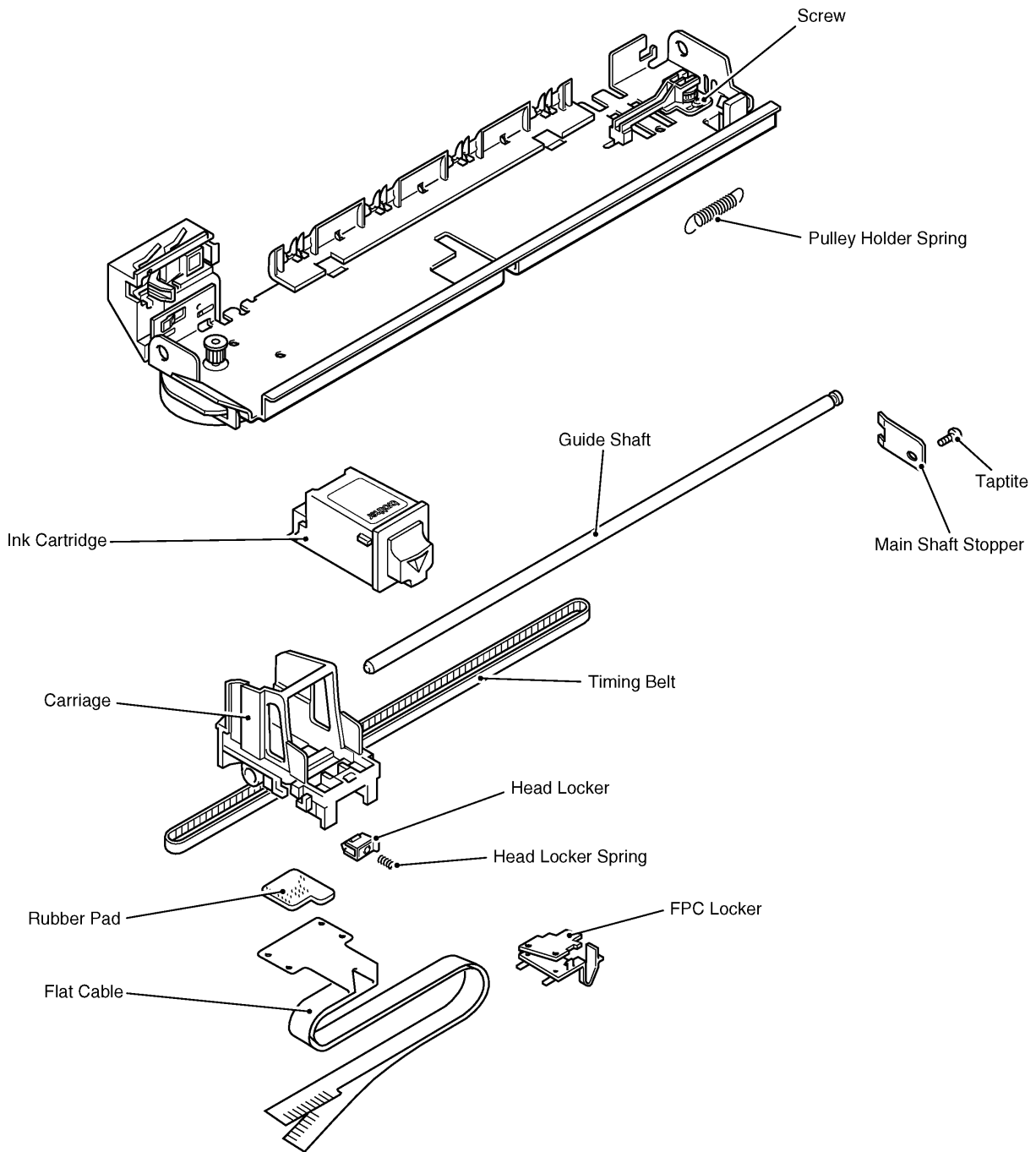
The outline of the printer mechanism is shown in Fig. 4.37.

The procedure for removing the carriage is explained below.

- (1) If necessary, remove the ink cartridge and store it in a safe place.
- (2) Loosen the idle pulley holder screw and remove the idle pulley holder spring to remove the timing belt from the idle pulley.
- (3) Remove the screw from the main shaft stopper and remove the main shaft stopper.
- (4) Remove the main shaft by sliding it to the right.
- (5) Remove the FPC locker from the CA frame by unsnapping the hooks (2 pcs.) of the FPC locker.
- (6) Disengage the carriage and the timing belt from the CA frame.
- (7) The timing belt is held under the carriage. Clear the belt holding hook to remove the timing belt from the carriage.



**Fig. 4.37 Printer Mechanism**



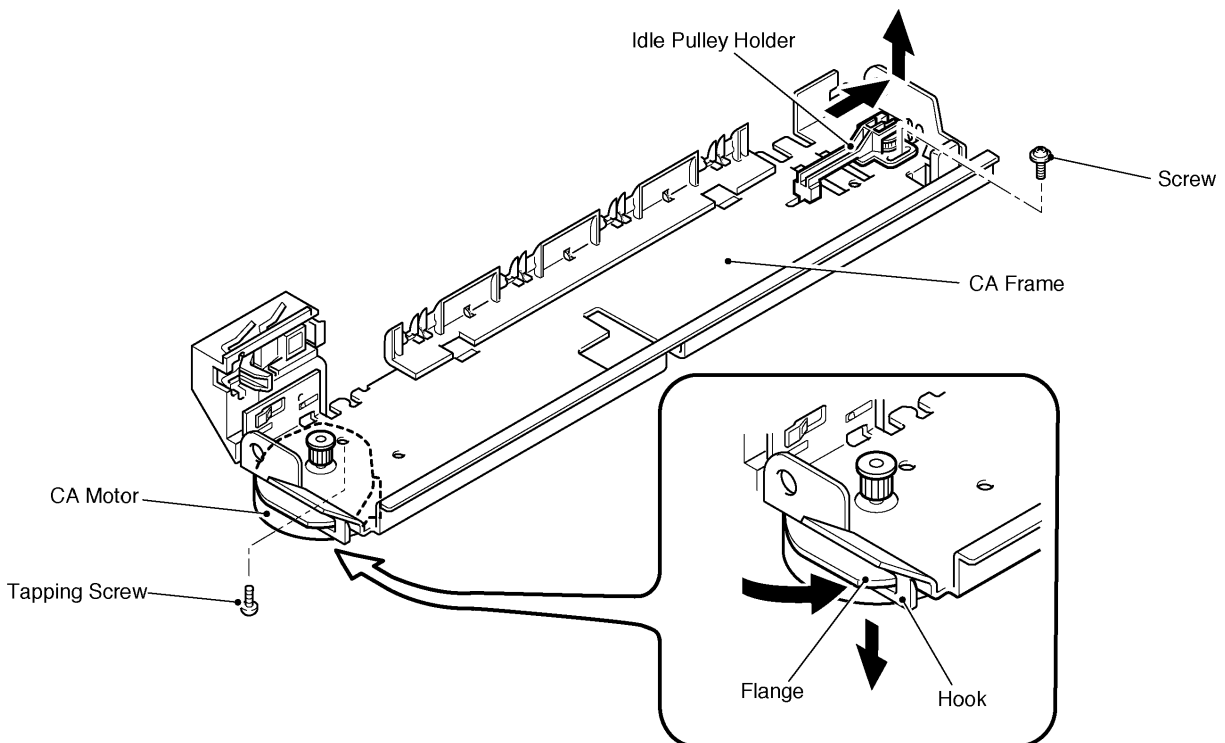
**Fig. 4.38 Removing the Carriage**

#### 5.3.4.2. Removing the Carriage Drive

- (1) Remove the idle pulley holder screw, the idle pulley and the idle pulley holder; to remove the idle pulley holder, slide it to the right then pull it up.
- (2) Remove the CA motor screw, then remove the CA motor by turning the CA motor in order to disengage the CA motor flange from the hook on the CA frame.

**NOTE:**

- After reassembling the timing belt and the motor, it is necessary to adjust the carriage home position and check the carriage belt tension. See 5.4.1. "Adjusting the Carriage Home Position" and 5.4.2. "Adjusting Belt Tension".



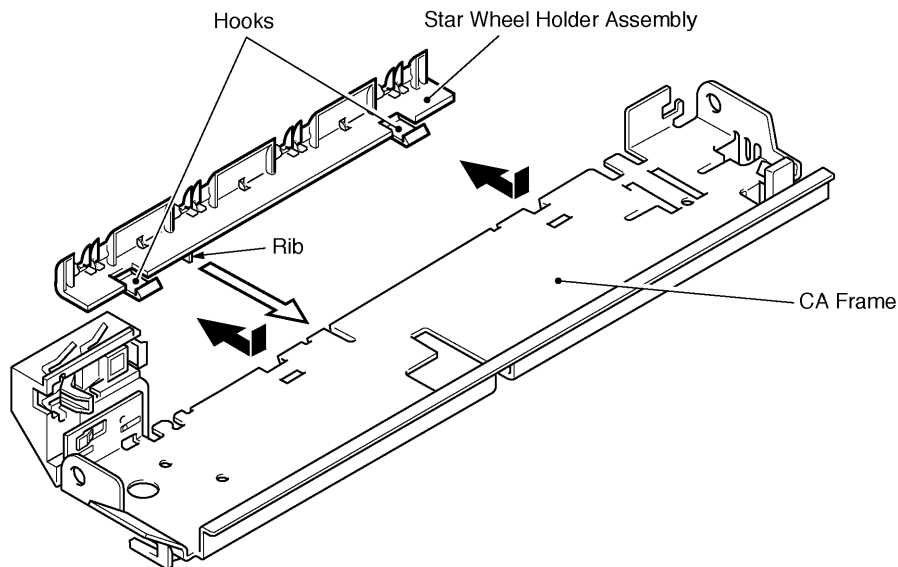
**Fig. 4.39 Removing the Carriage Drive**

## 5.3.4.3. Removing the Star Wheel Holder Assembly

- (1) Push downward on either of the two hooks on the star wheel holder assembly, and push the star wheel holder forward to disengage the hook from the CA frame.
- (2) Disengage the other hook in the same manner as described in step (1) above.
- (3) Push the star wheel holder assembly forward to remove it from the CA frame.

### NOTE:

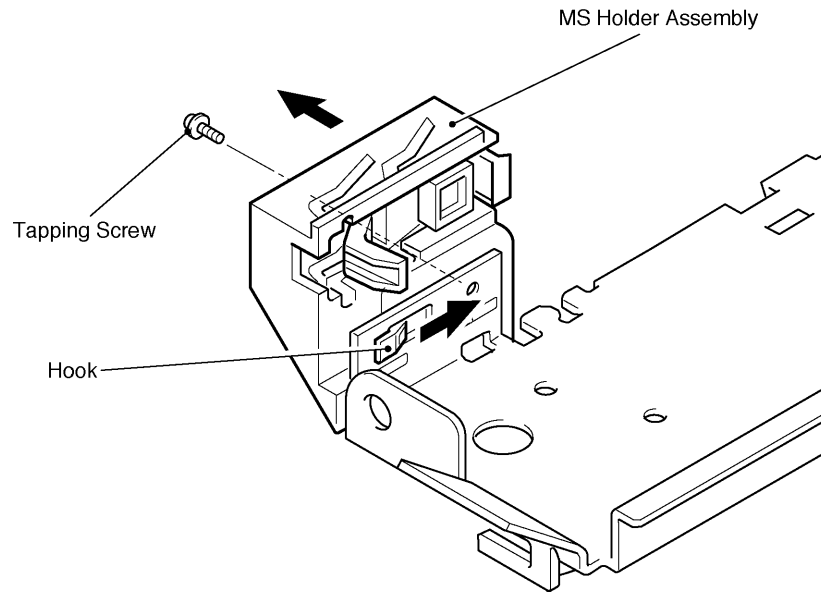
- When installing the star wheel holder assembly to the CA frame, fit the rib under the star wheel holder into the slit in the CA frame.



**Fig. 4.40 Removing the Star Wheel Holder Assembly**

#### 5.3.4.4. Removing the MS Holder Assembly

- (1) Remove the MS holder assembly screw.
- (2) Slide the MS holder to clear the hook and remove it from the CA frame.



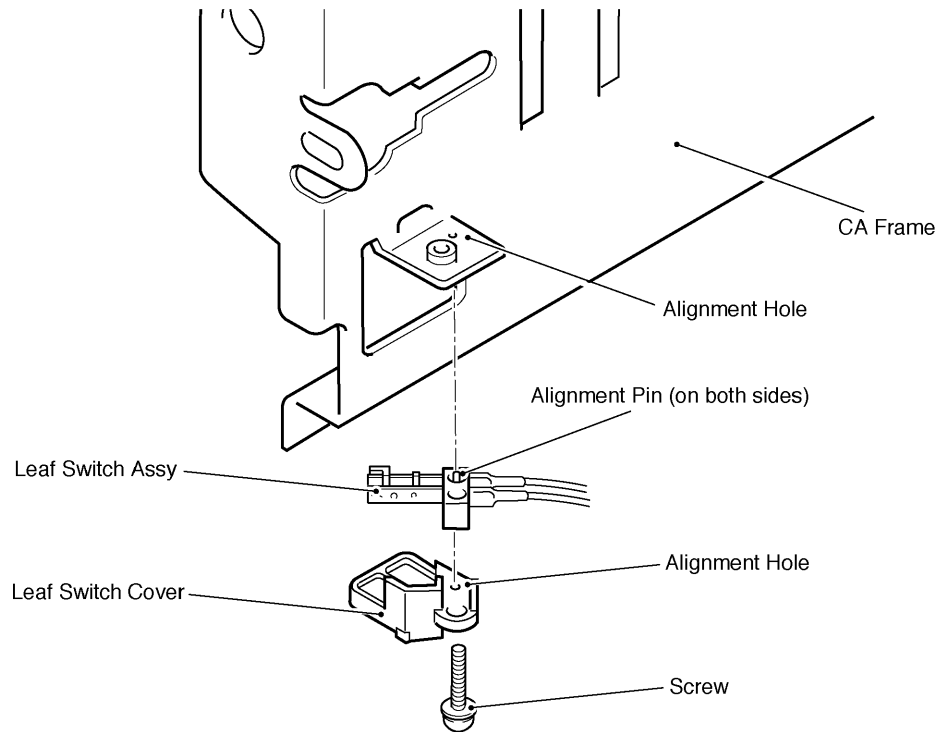
**Fig. 4.41 Removing the MS Holder Assembly**

## 5.3.4.5. Removing the Leaf Switch (Home Position Sensor)

- (1) Remove the leaf switch screw and remove the leaf switch assembly with the cover from the CA frame.
- (2) Remove the leaf switch assembly from the leaf switch cover.

### NOTE:

- When reassembling the leaf switch, first fit the leaf switch cover on the leaf switch so that the alignment pin on the leaf switch assembly fits correctly into the alignment hole in the leaf switch cover. Then determine the position by inserting the alignment pin into the alignment hole in the CA frame.



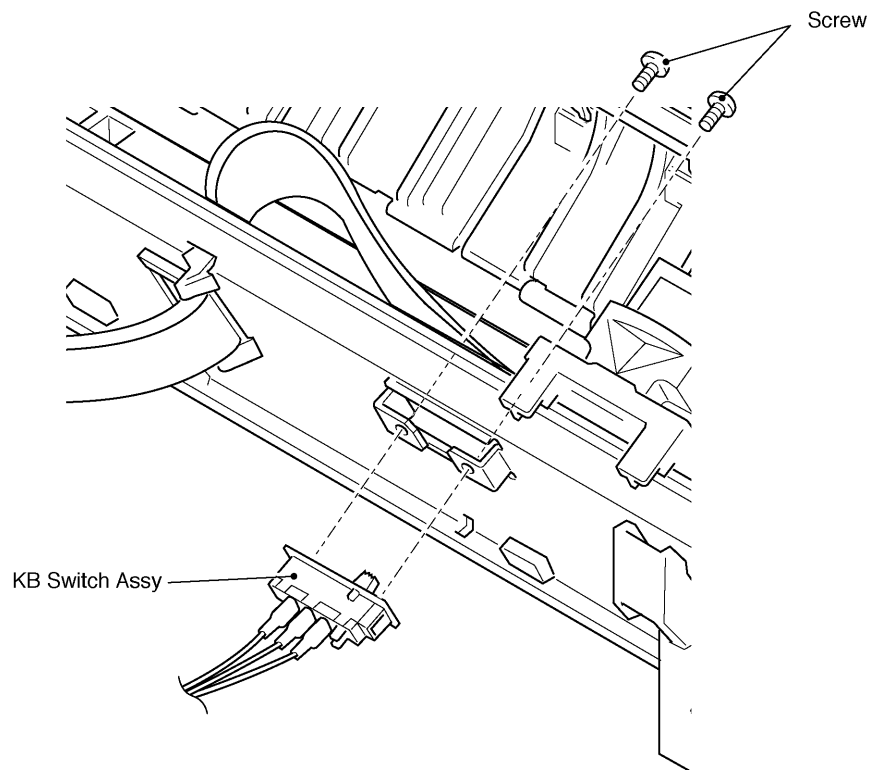
**Fig. 4.42 Removing the Leaf Switch (Home Position Sensor)**

#### 5.3.4.6. Removing and Mounting the KB Switch Assy

The switch in the KB switch assy is used for the following specifications.

- Belgium
- Switzerland
- Canada

Remove the screw from the CA frame and remove the KB Switch Assy.



**Fig. 4.43 Removing and Mounting the KB Switch Assy**

## 5.4. Adjusting the CA Unit

**NOTE:**

- Any time the CA motor or the timing belt is removed or replaced, the carriage friction and home position should be checked and adjusted as required. Perform the following adjustments with an ink cartridge installed.

**CAUTION:** Electro-Static Discharge Hazard

Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

### 5.4.1. Adjusting the Carriage Home Position

- Remove all covers and remove the printer mechanism.
- Install a wiring harness to connect the carriage motor and the home position sensor to the main PCB.

**CAUTION:**

If an extra harness is not available, you may simply remove the two screws securing the printer assembly to the bottom cover and raise the mechanism to access the carriage motor screw; however, you **MUST** place a non-conductive material (such as paper) between the printer and other electrical components - especially the power supply PCB - to avoid grounding damage to the equipment.

- Loosen the CA motor screw.
- Turn on all power and from the Main Menu, press CODE + SHIFT + BACKSPACE, then select "B" from the Self Test menu to start the CR (Carriage Reset) test.
- Manually move the carriage to the right end.
- While holding the carriage at the right end, press the UP arrow key to turn the motor on, and verify that the motor is in phase AB (from the display).
- Slowly rotate the motor to the point of least vibration (motor noise), hold the motor at this position, and retighten the screw.



- (8) Check the carriage motor "jumping" phase:
  - a) With the CR test still active, press the UP arrow key to turn the motor on.
  - b) Step the motor right with the RIGHT arrow key until the carriage moves to the rightmost position and then "jumps" (moves) back to the left one step.
  - c) Verify that the motor phase at the "jumping" point is "CD", "D", or "DA" only.
  - d) If the motor phase is not correct, repeat steps (3) through (7) above, and repeat this step (8) to verify that the motor "jumping" phase is still correct.
  - e) Press RETURN or CANCEL to end the Self Test, turn OFF the machine, and reinstall the printer and all covers.

#### **5.4.2. Adjusting Belt Tension**

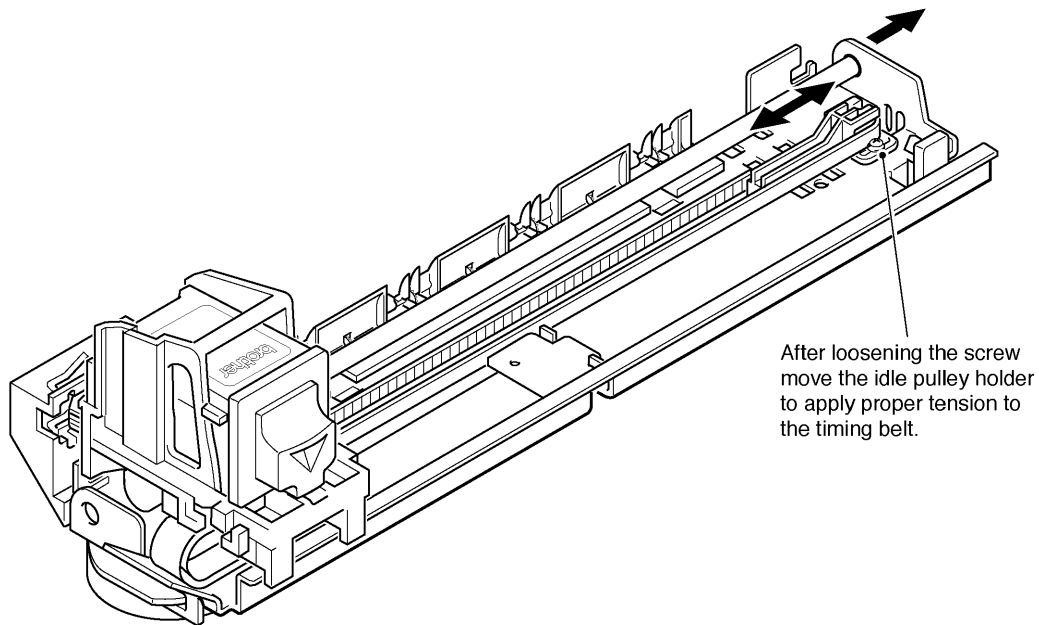
Belt tension is maintained by the pulley holder spring. The spring is preset to hold the idle pulley in position to maintain the proper tension on the timing belt. If the carriage does not move freely, or if the belt is removed or replaced, the tension should be checked and adjusted as follows:

- (1) With power disconnected from the machine, move the carriage to the left end (maintenance station side) and verify that the belt is properly installed.
- (2) Push the idle pulley holder to verify that it moves freely. If the pulley holder cannot be moved smoothly, there is too much friction between the pulley holder and the CA frame.
- (3) Line up the carriage with the first star wheel from the left side of the CA unit (maintenance station side), and engage a friction meter (push-pull gauge) on the carriage at the belt holding portion.
- (4) With the friction meter (push-pull gauge), pull the carriage to the right to the last star wheel and verify that the carriage moves freely with a friction reading of less than 0.7 kg force.
- (5) If the carriage friction is not correct, loosen the idle pulley holder screw, move the holder as necessary to change the tension on the pulley holder spring, and retighten the screw.

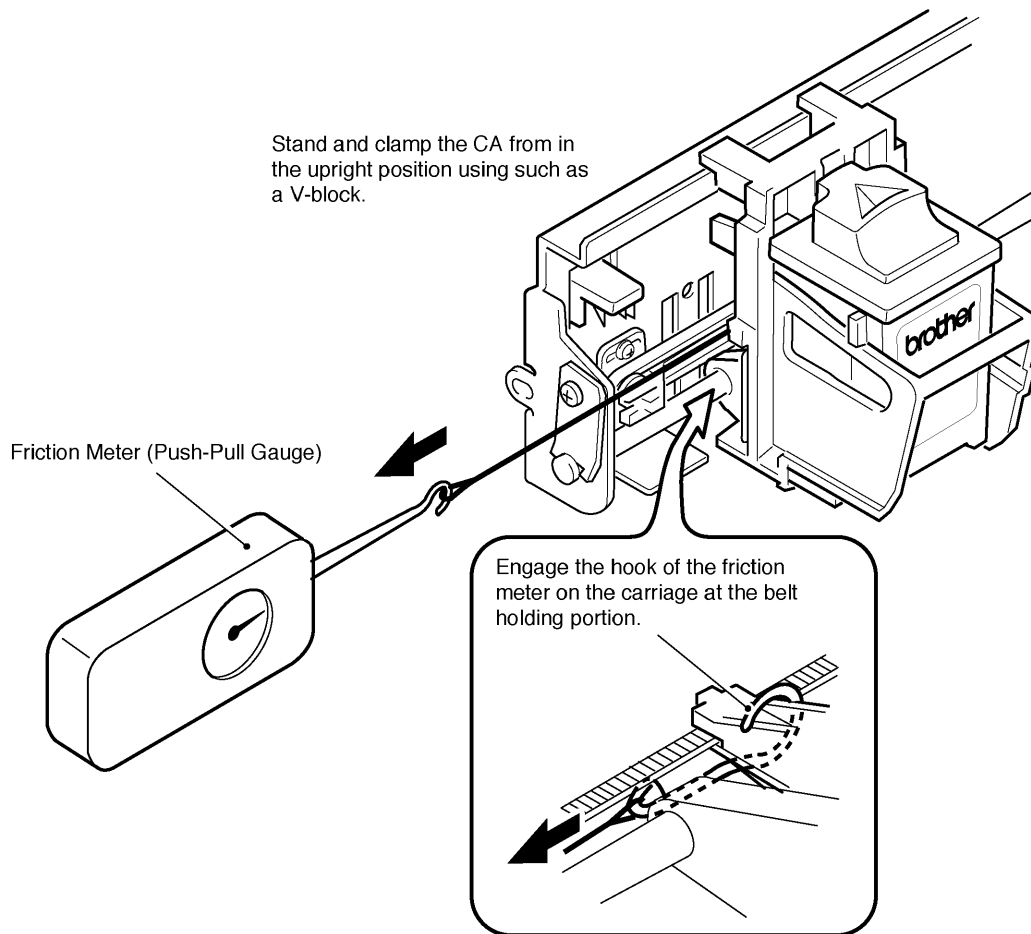
- (6) Repeat the test with the friction meter (push-pull gauge) to verify that the cartridge friction (belt tension) is within the acceptable range.

**NOTE:**

- If adjustment is not satisfactory and the carriage friction is still larger than the acceptable limit, lubricate the idle pulley shaft and idle pulley rotation point. See Lubrication in Chapter 5 "MAINTENANCE" for details.



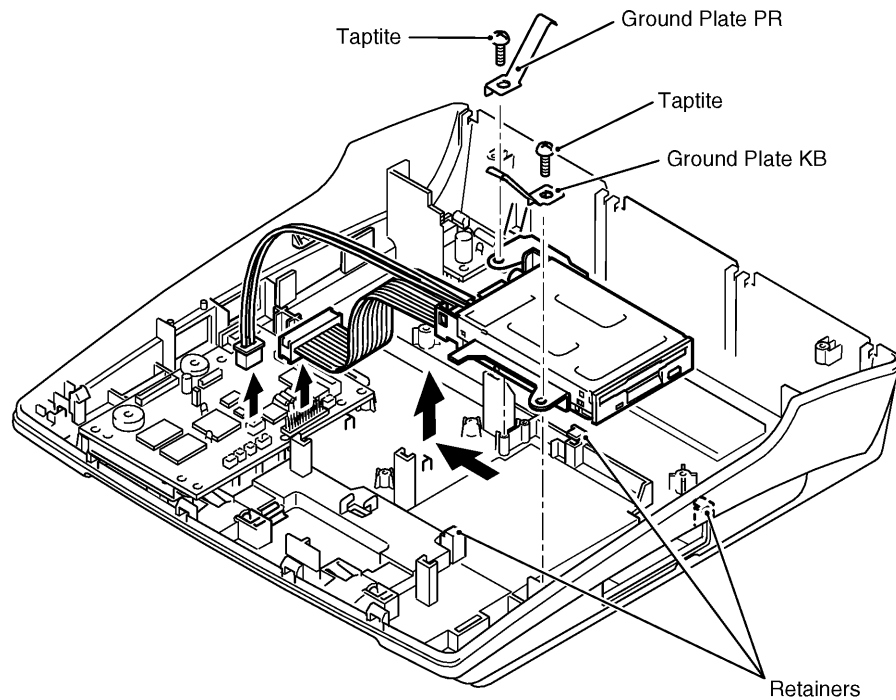
**Fig. 4.44 Adjusting the Belt Tension**



**Fig. 4.45 Measuring Friction during Carriage Movement**

## 6. Removing the FDD Assembly

- (1) Remove the FDD flat cable from the Main PCB.
- (2) Unplug the power cable from the FDD.
- (3) Remove the two screws securing the FDD to the bottom cover. The two ground plates secured on the FDD are also removed.
- (4) Move the FDD to the left to clear the retainers in the bottom cover, and lift it out.



**Fig. 4.46 Removing the FDD Assembly**

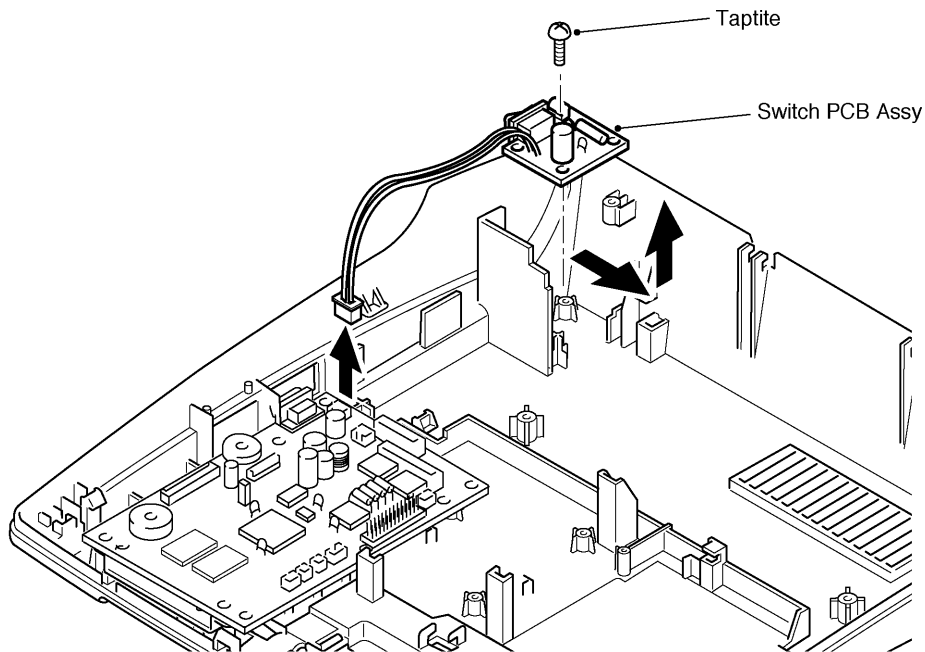
## 7. Switch PCB

**CAUTION:** Electro-Static Discharge hazard



Wear an anti-static wrist strap with ground wire to prevent damage to sensitive electronic components.

As shown in Fig. 4.47, the switch PCB is mounted on the bottom cover.



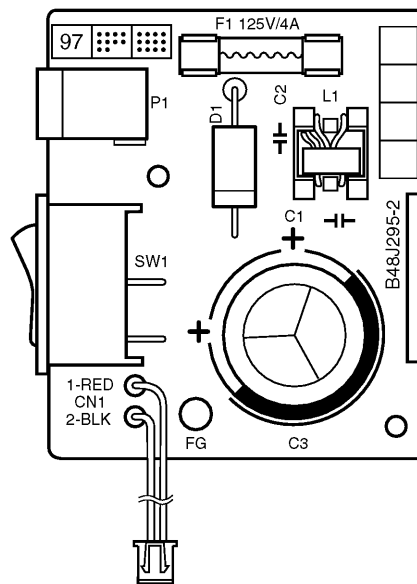
**Fig. 4.47 Switch PCB**

## 7.1. Removing the Switch PCB

- (1) Unplug the power harness from the main PCB.
- (2) Remove the screw securing the switch PCB switch section, slide it to the right and up to clear the switch housing, and lift it out.

## 7.2. Installing the Switch PCB

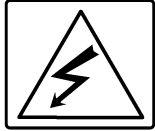
- (1) Place the switch PCB switch section into its location in the bottom cover, slide it to the left and down to insert the switch in its housing, and secure it in place with the screw.
- (2) Reconnect the power harness to the main PCB.



**Fig. 4.48 Switch PCB**

## 8. Removing the Main PCB

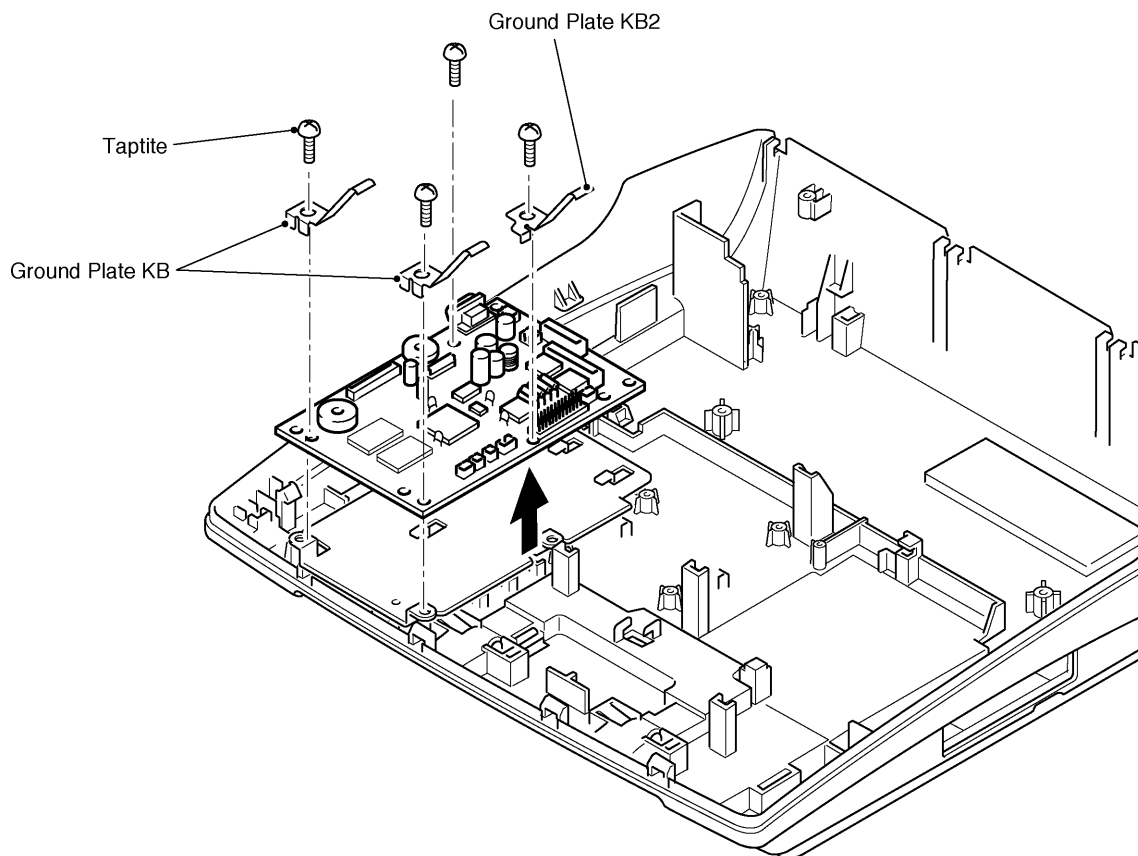
**CAUTION:** Electro-Static Discharge Hazard



Wear an anti-static wire strap with ground wire to prevent damage to sensitive electronic components. Be sure to hold the connector - not the cable - when connecting or disconnecting a harness.

The main PCB is fitted to the bottom cover and secured by screws. Remove the screws, and all harnesses and cables from the main PCB, and lift it out of the bottom cover.

The ground plates secured on the main PCB are also removed when the screws are removed.



**Fig. 4.49 Removing the Main PCB**

## 9. Removing the Shield Plate (ESD)

Lift up on the rear side of the shield plate to clear the alignment pin, slide the shield plate forward to clear the three retaining clips in the bottom cover, and lift it out.

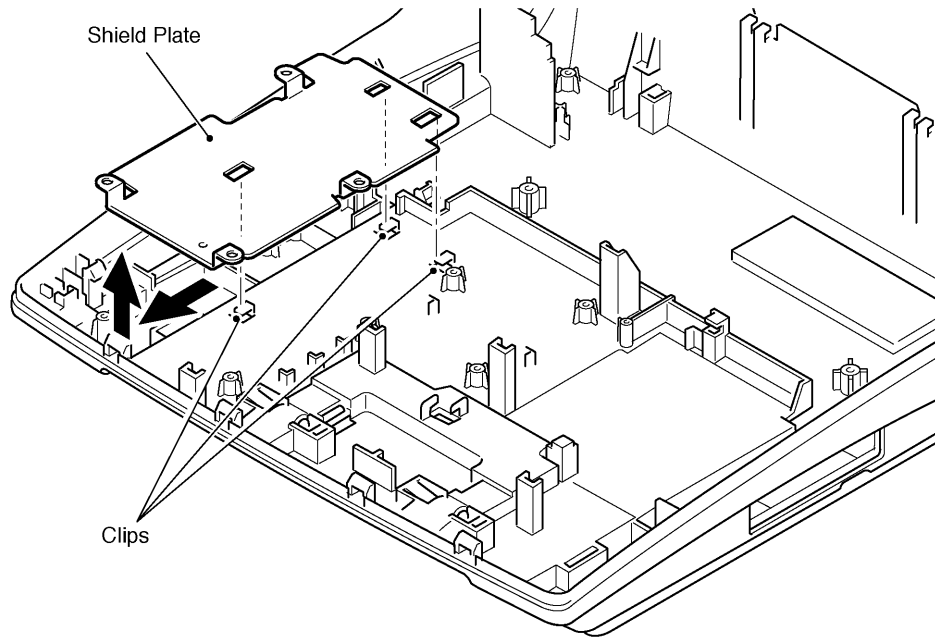


Fig. 4.50 Removing the Shield Plate (ESD)



## CHAPTER 5 MAINTENANCE

### 1. Lubrication

#### 1.1. Lubricants

**Table 5.1 Recommended Lubricants**

Symbol	Lubricant
E	Epinoc grease #1
S1	Silicone grease G-501
S2	Silicone grease KS64F
SO	Silicone oil KF96
T	FBK Turbin#32

#### 1.2. Precautions

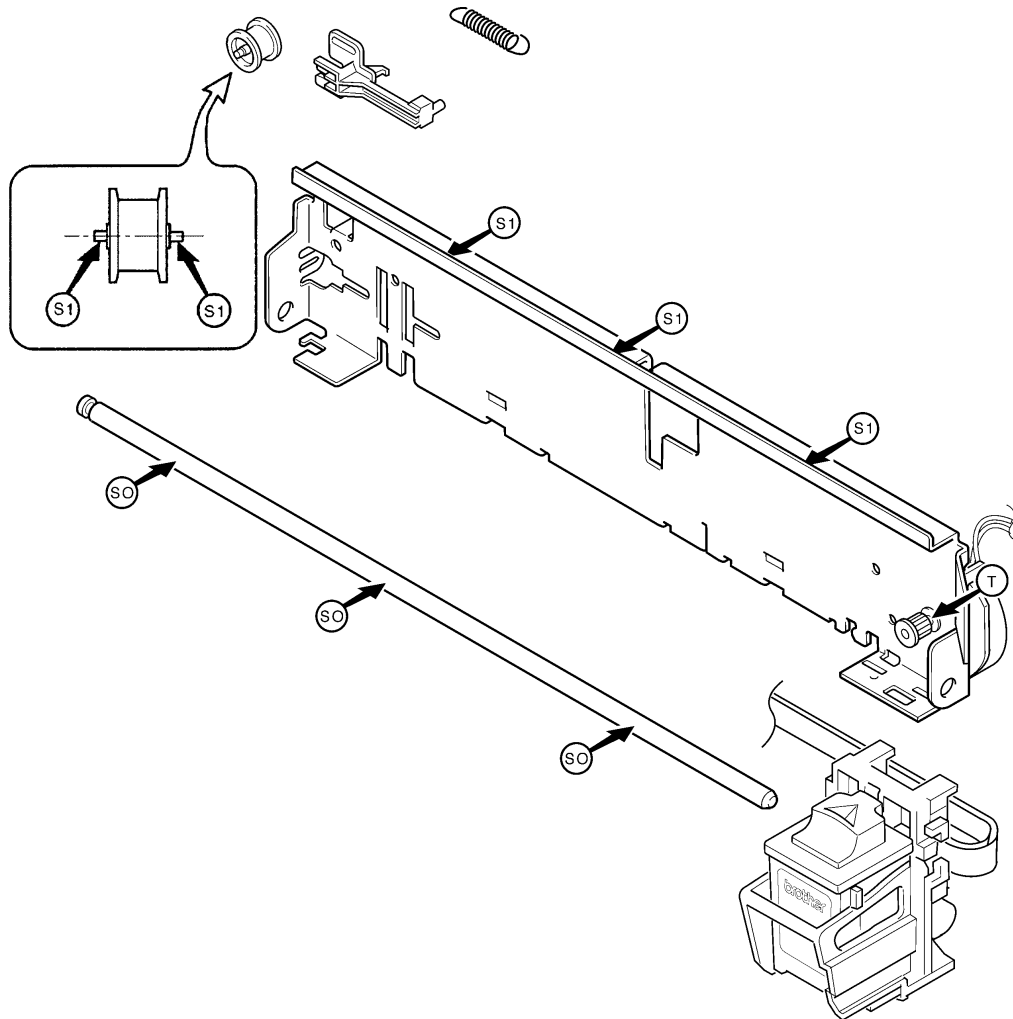
1. Lubricate carefully so that the oil or grease will not stick to places other than the specified points; otherwise, the plastic parts and electronic boards will be adversely affected.
2. Do not apply an excessive amount of lubricant; otherwise, the lubricant may drip onto places other than the specified lubrication points during use or storage.
3. Make sure to apply a sufficient amount of lubricant to contact parts and sliding surfaces consisting of more than one material.

#### 1.3. Lubrication Points

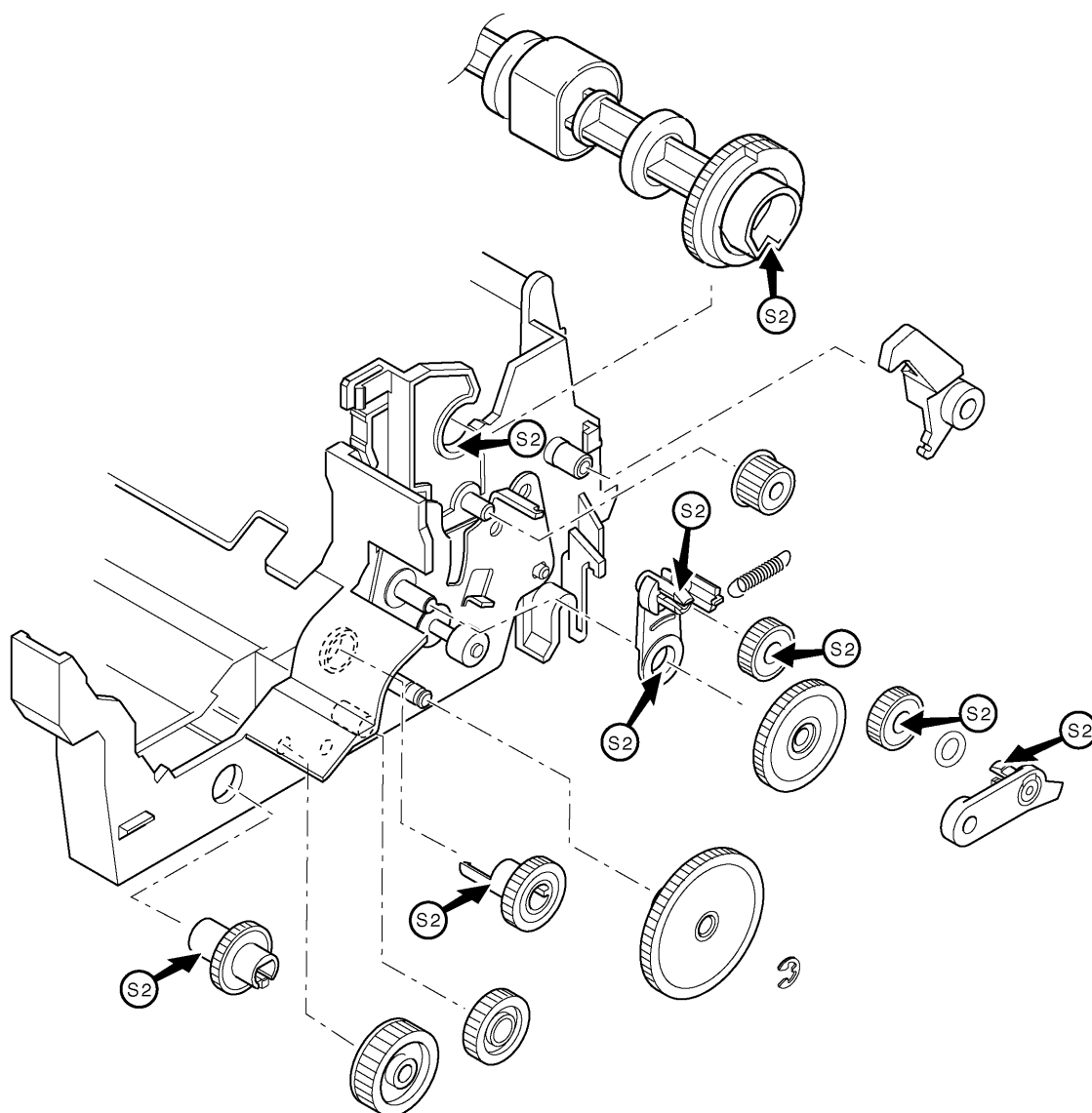
See the illustrations on the following pages for location and types of lubricant for the following components:

**NOTE:**

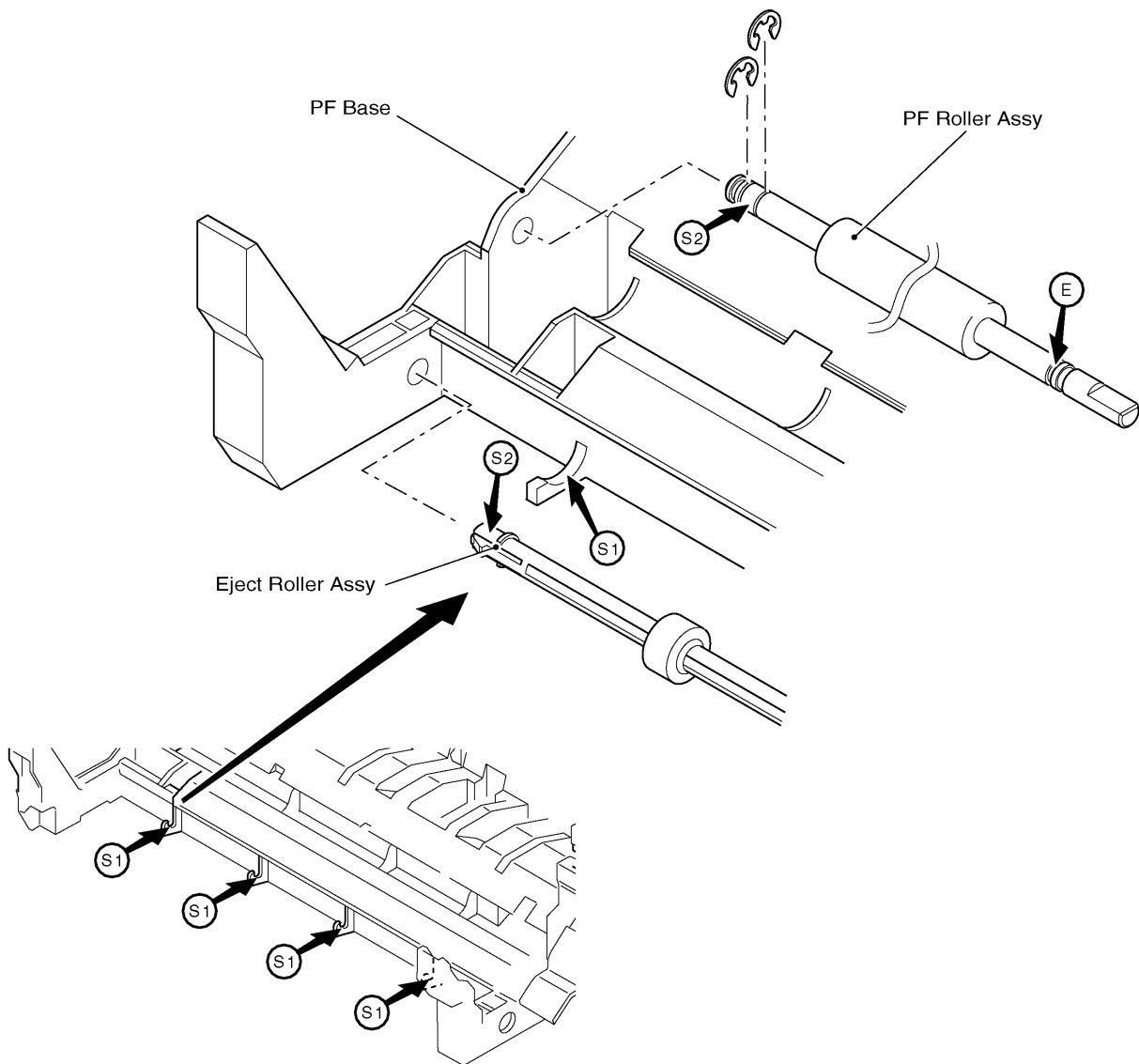
- Some assemblies must be disassembled for lubrication.
  1. Carriage Assembly (see Fig. 5.1.)
  2. Paper Feed Assembly (see Fig. 5.2.)
  3. Eject Roller Assembly and PF Roller Assembly (see Fig. 5.3.)



**Fig. 5.1 Carriage Assembly Lubrication Points**



**Fig. 5.2 Paper Feed Assembly Lubrication Points**



**Fig. 5.3 Eject Roller Assembly and PF Roller Assembly Lubrication Points**

## 2. Replacing the Ink Cartridge

**WARNING:**

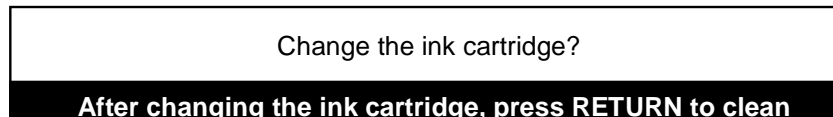
The bottom of the ink jet cartridge is covered with wet ink.

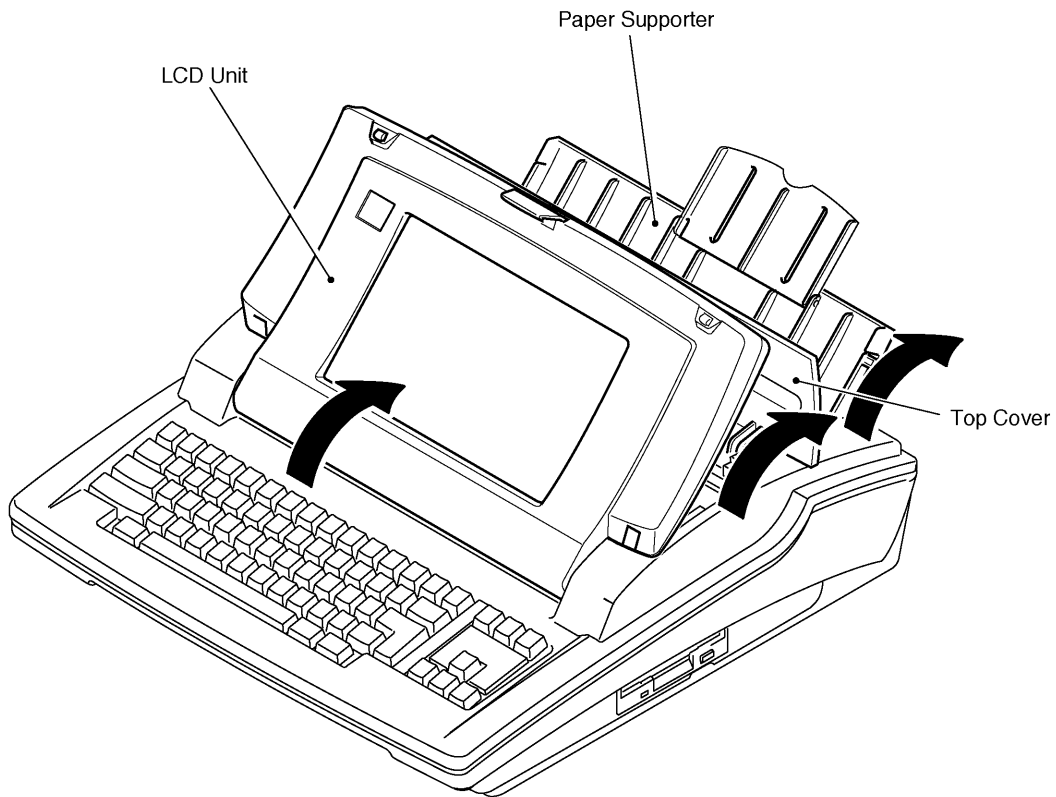
Avoid contact of ink with skin and clothing. Ink may cause irritation - especially to the eyes.

The machine uses a replaceable ink jet cartridge that contains both the print head and ink. It should be replaced after about 1,000,000 characters (estimated using normal text, 12 point, Brougham font).

- (1) Open the paper support and the top cover.
- (2) Tilt the LCD module into the upright position.
- (3) At the keyboard, press CODE + INK CHG. The carriage will move to the ink change (home) position. Do not move the carriage manually from side to side.

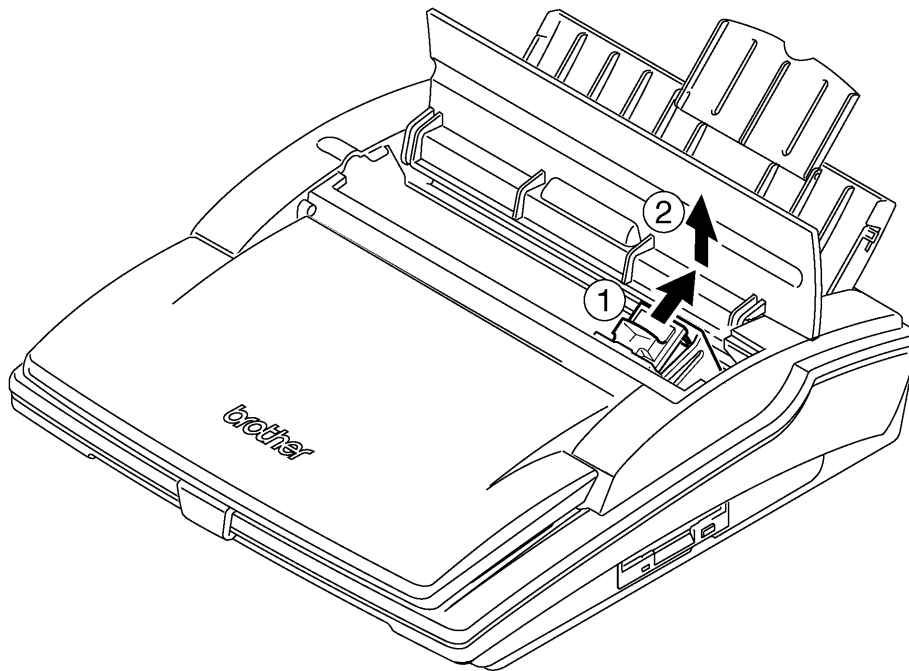
The following screen message will appear:





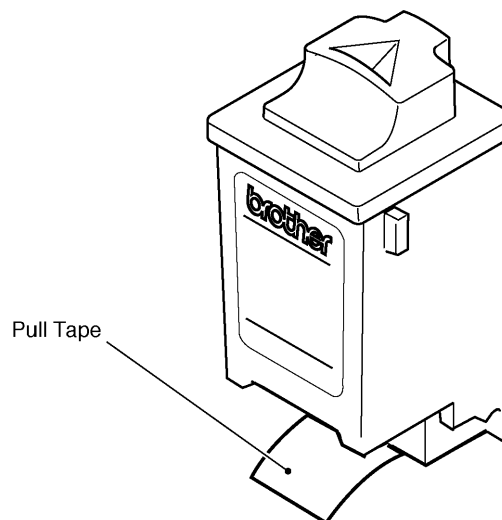
**Fig. 5.4 Open the Paper Support and Top Cover and Tilting the LCD to the Upright Position**

- (4) After making sure that the carriage has returned to the home position, return the LCD module in the close position.
- (5) Grasp the ink jet cartridge as shown below and push it backward until a click of release is heard; then pull the cartridge straight up and out of the carriage.



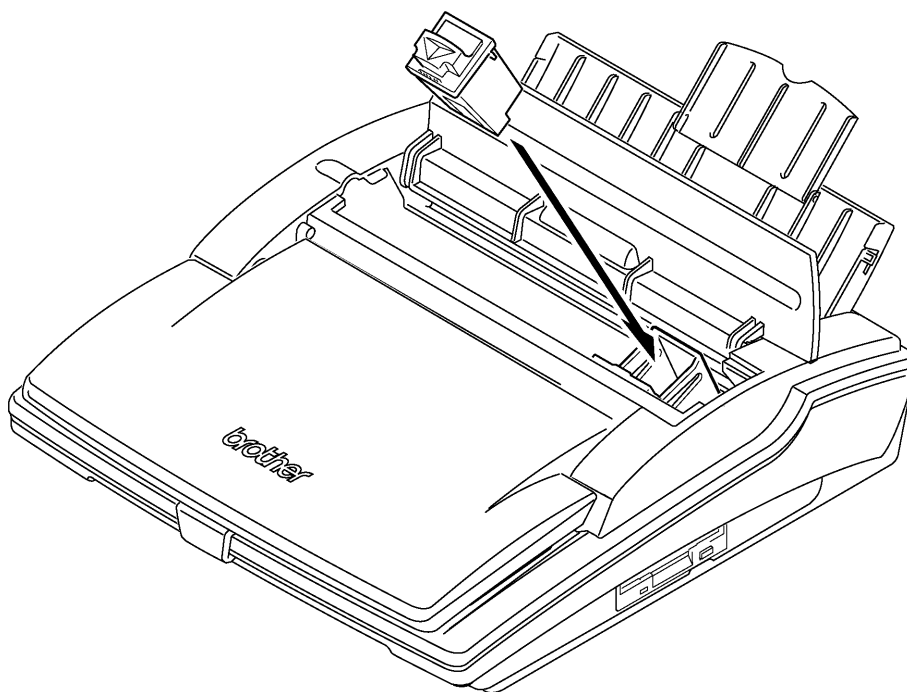
**Fig. 5.5 Removing the Ink Jet Cartridge**

- (6) Remove the protection tape from the new ink jet cartridge. Do not shake the cartridge after the tape has been removed.



**Fig. 5.6 Removing the Protection Tape**

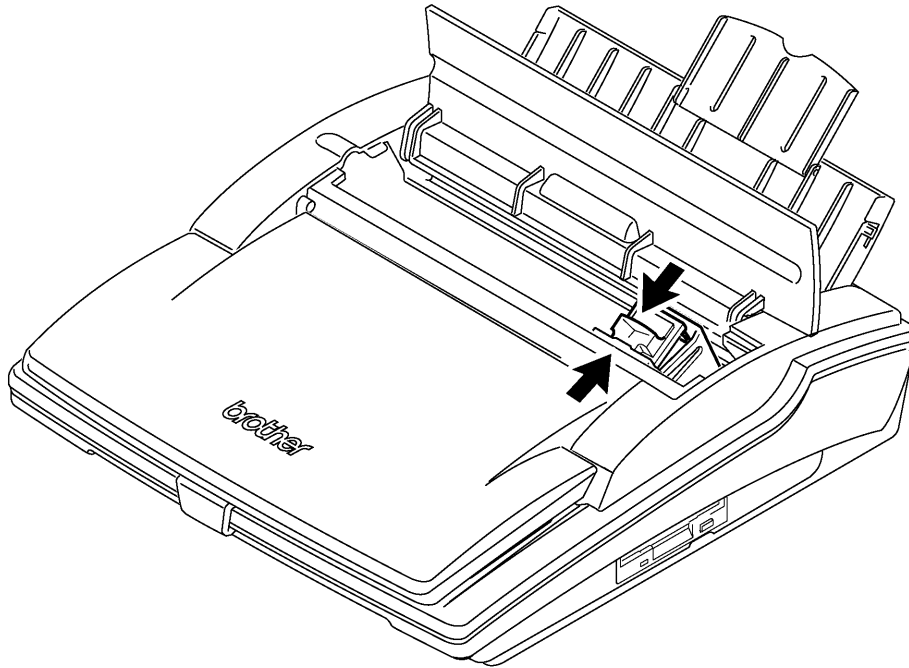
- (7) Slide the cartridge into the carriage bracket as shown below.



**Fig. 5.7 Placing the Cartridge in the Carriage**



- (8) Squeeze the cartridge bracket and cartridge together until the cartridge snaps under the latch on the bracket.



**Fig. 5.8 Fitting the Cartridge in the Carriage**

- (9) Tilt the LCD module into the upright position and at the keyboard press RETURN. The ink jet cartridge is ready to use.
- (10) Close the LCD module, top cover, and the paper support.

### 3. Cleaning the Print Head

**WARNING:**



The bottom of the ink jet cartridge is covered with wet ink.

Avoid contact of ink with skin and clothing. Ink may cause irritation - especially to the eyes.

#### 3.1. Cleaning the Print Head Automatically

If the ink on the page looks splotchy or smeared, or if blank spaces appear in characters, the print head should be cleaned. To automatically clean the print head, press CODE + SHIFT + INK CHG.

#### 3.2. Cleaning the Ink Jet Nozzles and Contacts

If print quality does not improve after automatically cleaning the print head, the problem may be dried ink on the nozzles, contacts, or on the print cartridge bracket contacts.

- (1) Remove the ink-jet cartridge.
- (2) With a clean, water-dampened cloth, gently wipe the entire copper colored area, including the nozzles and contacts.

**NOTE:**

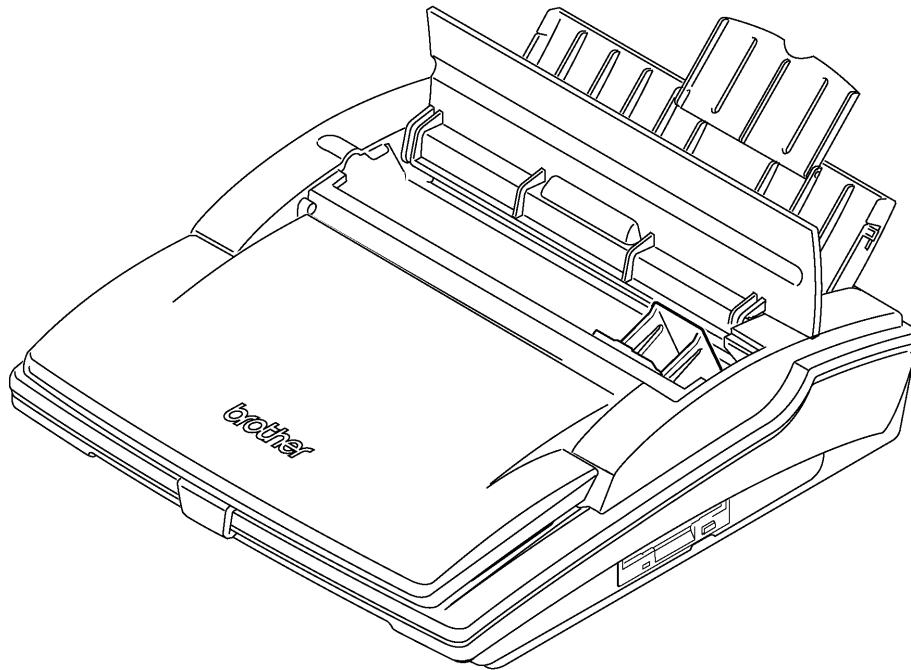
- To dissolve any dried ink, hold the damp cloth against the nozzles for a few seconds; then gently blot and wipe dry.
- (3) Allow the copper-colored area to dry, and re-install the cartridge.
- (4) Press RETURN, and then CODE + SHIFT + INK CHG, and close the cover.

**NOTE:**

- If the machine still fails to print properly, clean the bracket contacts in the carriage.

### 3.3. Cleaning the Bracket Contacts (Carriage)

- (1) Press CODE + INK CHG to move the carriage assembly to the home position (right side).
- (2) Without turning off the machine, unplug the DC jack from the DC plug connector on the rear of the machine. This will keep the carriage assembly from returning to the maintenance station.
- (3) Turn the machine off and remove the ink cartridge.
- (4) With a clean, dry cloth, clean the gold-colored contacts on the ink cartridge bracket as shown below.



**Fig. 5.9 Cleaning the Bracket Contacts**

## APPENDIX A

### Specifications

#### 1. Electrical System

(1)	Main PCB Size:	116 × 190 mm
(2)	CPU:	H8
(3)	ROM:	3 Mbyte(5 fonts) 2 ~ 3Mbyte
(4)	RAM:	512 Kbyte
(5)	FDC:	LG GM82C765B
(6)	KB Matrix:	8 × 9
(7)	Switch PCB Size:	58 × 49 mm
(8)	Display (LCD):	480 × 64(DP-525CJ) 480 × 128(DP-530CJ) 640 × 400 (DP-540CJ/550CJ)
(9)	Printer:	Mono/Color
(10)	CA Step Motor:	Chopper Control
(11)	LF Step Motor:	Constant Voltage Control
(12)	HP Sensor:	Leaf Type Switch
(13)	PE Sensor:	Leaf Type Switch
(14)	Auxiliary Memory:	FDD (1.44 MB/720KB) MFM form (MS-DOS format) 3. 5" 2HD, 3.5" 2DD

## 2. Printing

- |      |  |   |
|------|--|---|
| (1)  | Printing Method:   | Lexmark Thermal Ink Jet   |
| (2)  | Heads:   | Color/Mono  |
| (3)  | Head Type:   | Thermal Ink Jet   |
| (4)  | Nozzle (mono)  | 50 active + 6 nozzles (1/300" spots/inch)   |
| (5)  | Head Weight:   | 74 g maximum (full)<br>36 g minimum (empty)   |
| (6)  | Ink Color:   | Black/Color   |
| (7)  | Head Cartridge   |   |
|      | Set Force:   | 4,000 g maximum   |
|      | Release Force:   | 4,000 g maximum   |
| (8)  | Printing Capacity:   |   |
|      | Max. Paper Width:  | 241.3 mm (9.5")   |
|      | Max. Printing Width:   | 205.74 mm (8.1")  |
|      | Possible Printing Area:  | except 12.7 mm (1/2") from top and bottom,<br>and 25.4 mm (1") area from bottom           |
| (9)  | Paper Sizes:   | length (a): 100 to 355.6 mm (3.94 to 14.0")<br>width (b): 139.7 to 241.3 mm (5.5 to 9.5") |
| (10) | Base Paper Handling Position:  | right side  |
| (11) | Paper Type:  |   |
|      | letter:  | 215.9 × 279.4 mm (8.5 × 11.0")  |
|      | legal:   | 215.9 × 355.6 mm (8.5 × 14.0")  |
|      | B5:  | 182 × 257 mm (7.17 × 10.2")   |
|      | A4:  | 210 × 297 mm (8.27 × 11.69")  |
|      | executive:   | 184 × 267 mm (7.24 × 10.51")  |
|      | A5:  | 148 × 210 mm (5.83 × 8.27")   |
|      | Ground or recycled paper can contain up to 40% de-inked or 50% post-mill fiber |   |
|      | Chemical wood pulp fiber   |   |
|      | Transparencies: HPC3834A, HP51636G   |   |

(12) Auto Cut-sheet Feeder

Paper Weight: 60 to 90 g/sqm (16 to 24 lb)  
 Paper Thickness: 0.071 to 0.18 mm (0.0028 to 0.007")  
 Print Speed: LQ: 160 cps; "Ink Saver Mode": 160 cps

Paper Set Capacity:

Feeder Tray: 30 sheets of 20 lb paper  
 Paper Tray (stacker): 15 sheets of 20 lb paper

Performance/Error Ratio:

multi-feeds: 1/100 sheets (avg.)  
 jam/misfeed: 1/200 (avg.)  
 Misc. (nick, wrinkle, dogear, etc.): 1/100 (avg.)

The above results were achieved under the following conditions:

Temperature: 15 – 25°C  
 Relative Humidity: 45 – 70%  
 Paper: 20 lb, A4 & US letter

(13) Printing Direction: text: bidirectional  
 graphics: unidirectional

(14) Cartridge Yield: up to 1,000 pages of text at 5%  
 (1,170 characters, 238k ink drops)

(15) Carriage

Driving Resolution: 1.968spmm (50 spi) full step;

(16) Acoustics:

Printing noise: 55 dB maximum (1m, A Scale fast)

(17) Reliability

Durable life time: 5-year printing quality or 30,000,000  
 characters or 12,000 sheets printed

Mean Time Between Failure: 2,000 hour minimum

Ink cartridge change duration: 500 times

Head travel duration: 700,000 times

Head initiation duration: 3,000 times

Paper release lever duration: 3,000 times

Allowable temperature range: +10 – +40°C  
 (+15 – +35°C for best print quality)

Allowable relative humidity: 20 – 80% (20 – 70% for best print quality)

### 3. Keyboard

(1) Keying System:	Conductive-rubber contact (plus Koala 1 actuator system)
(2) Construction:	PCB: multi-layer printed FPC (single-sheet) Rubber: silicon rubber with conductive Actuator: Koala style with 2 cranks
(3) Keystroke:	3.8 mm $\pm$ 0.3mm (touch force 300g)
(4) Key Touch Load:	60 g $\pm$ 20 g (except SPACEBAR: 70 g $\pm$ 30 g)
(5) Gap between Key Tops & KB Panel:	1.0 mm – 2.0 mm
(6) Gap between Key Tops:	0.8 mm – 1.0 mm
(7) Keyboard Features:	
Style:	fixed-type
Shape:	step key
Key Roll-over:	limited key
Total keys:	65
Key touch load:	$\leq$ 150 g
Pressure resistance:	smooth return of keytop after 3 kg
Key top take-off force:	$\geq$ 0.7 kg(except SPACEBAR $\geq$ 1 kg)

## 4. Environmental Tolerance

### (1) Durability

Keyboard cycles:	1,000,000 times/key
Top cover operation cycles:	3,000 times
Paper support operation cycles:	3,000 times
LCD cover operation cycles:	6,000 times
Paper tray:	1,500 times

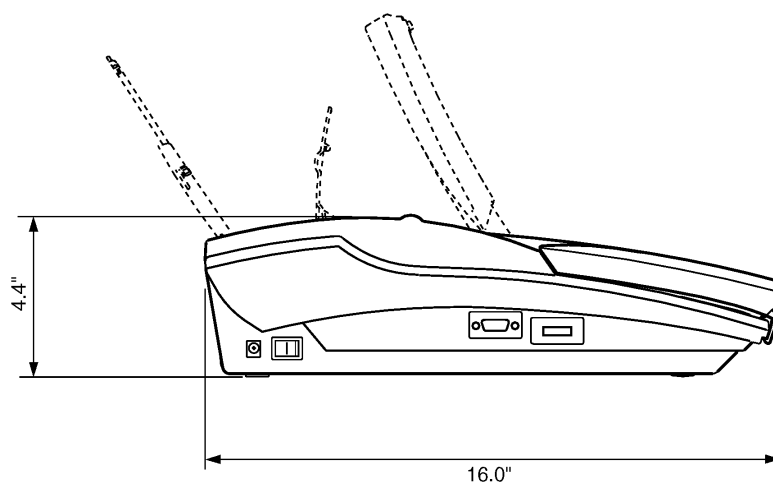
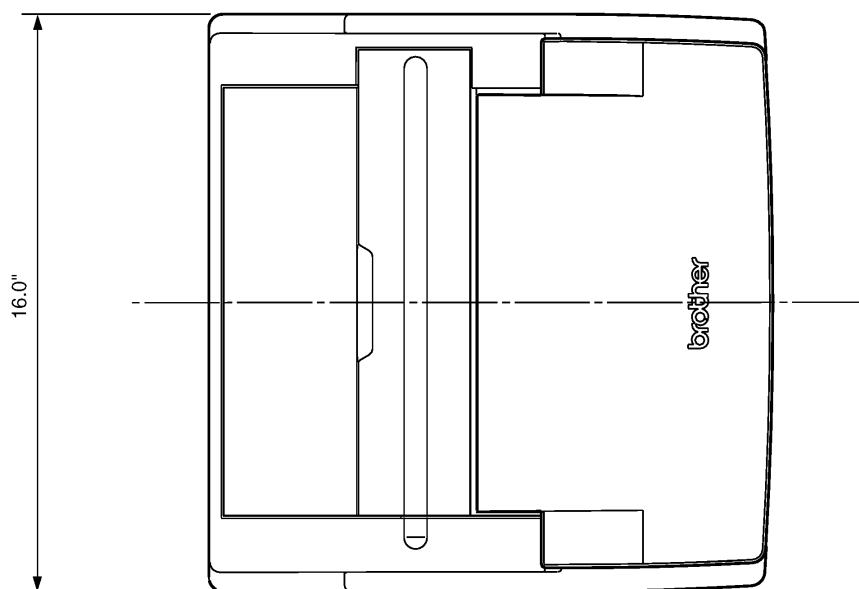
### (2) Physical Environment

Vibration cycles:	IMV vibration test machine 5–55 Hz, each direction 0.1 G – no operation error after 30-minute test
Edge drop test:	50 mm edge drop – no damage
Temperature:	
Range:	+10 – +40°C
Thermal shrinkage:	2 hours & 5 cycles between -40°C and +70°C – no damage
Cold-start:	power on after 2 hours at 0°C – no operation error (print quality excluded)
Storage:	48 hours at -20°C, +60°C, and +45°C at 95% relative humidity – no damage to product



## 5. Dimensions & Weight

- (1) Dimensions: 16.0(d) × 16.0 (w) × 4.4(h) in.
- (2) Weight: 11.1 lbs. (5.0kg) (packaged)



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