MICROLINE 280

MAINTENANCE MANUAL

PREFACE

This document describes field maintenance procedures for the Microline 280 printer. It is intended for field maintenance personnel.

TABLE OF CONTENTS

1. CONFIGURATION

1. CONFIGURATION

1.1 Standard Printer Configuration

The standard configuration of the ML280 is as follows:

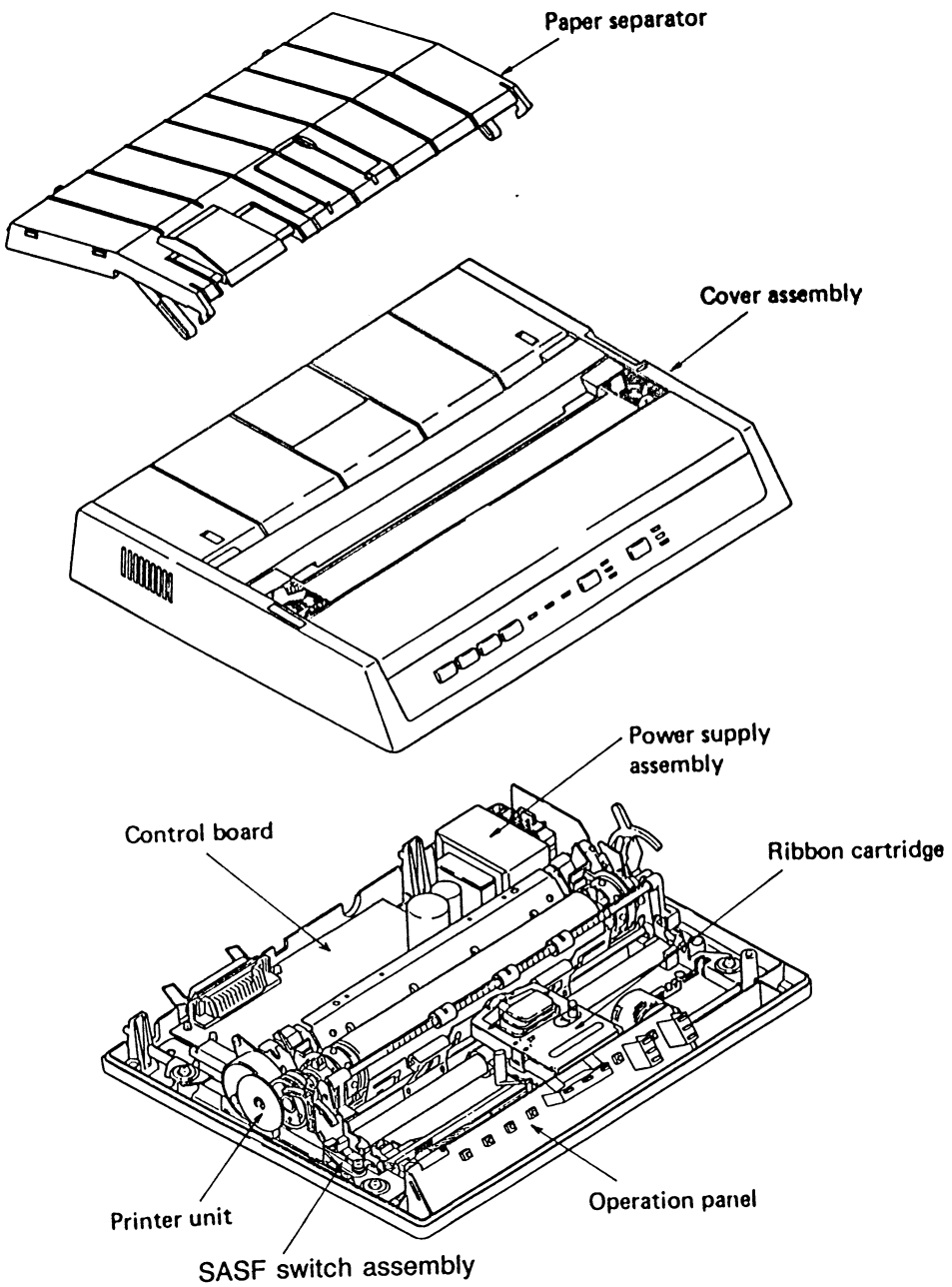
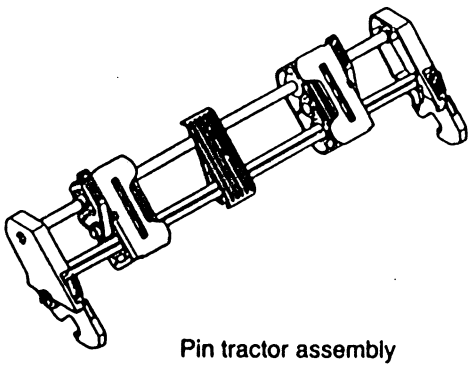


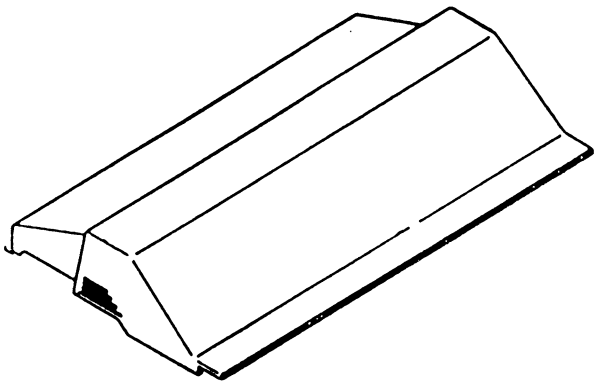
Figure 1-1. Printer Configuration

1.2 Options

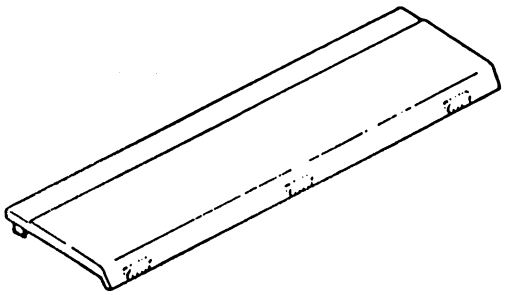
(1) Tractor unit (consists of Pin tractor assy, acoustic cover, and access cover)



Pin tractor assembly

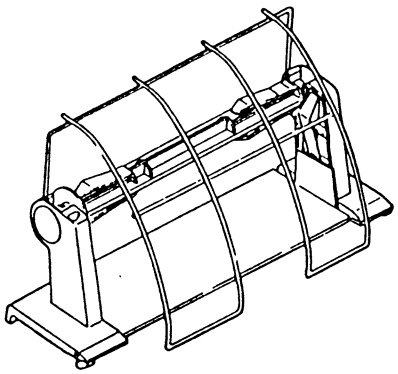


Acoustic cover

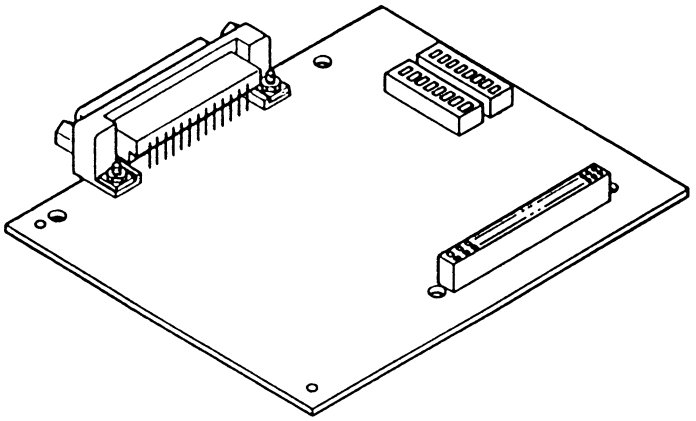


Access cover

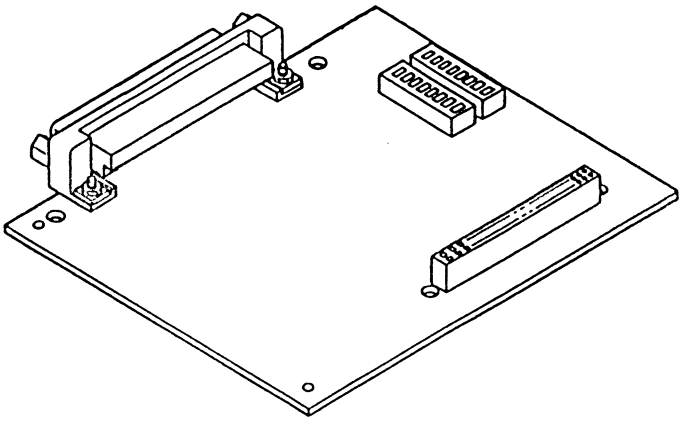
(2) Roll paper stand



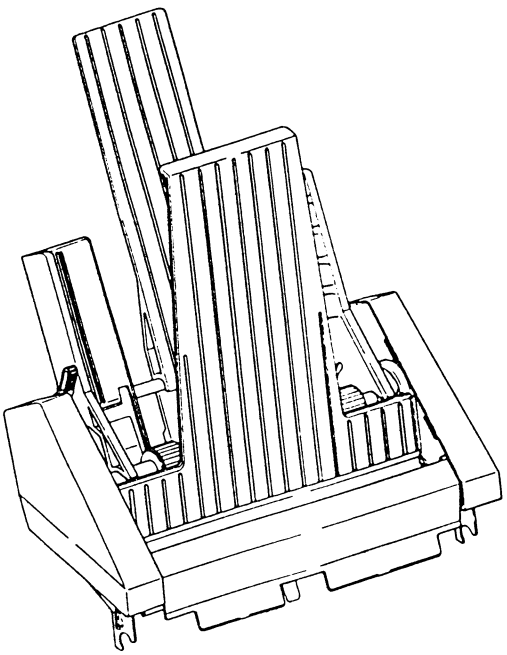
(3) Super-speed RS232-C serial interface board



(4) Super-speed RS422-A serial interface board



(5) Automatic Cut-Sheet Feeder (C.S.F.)



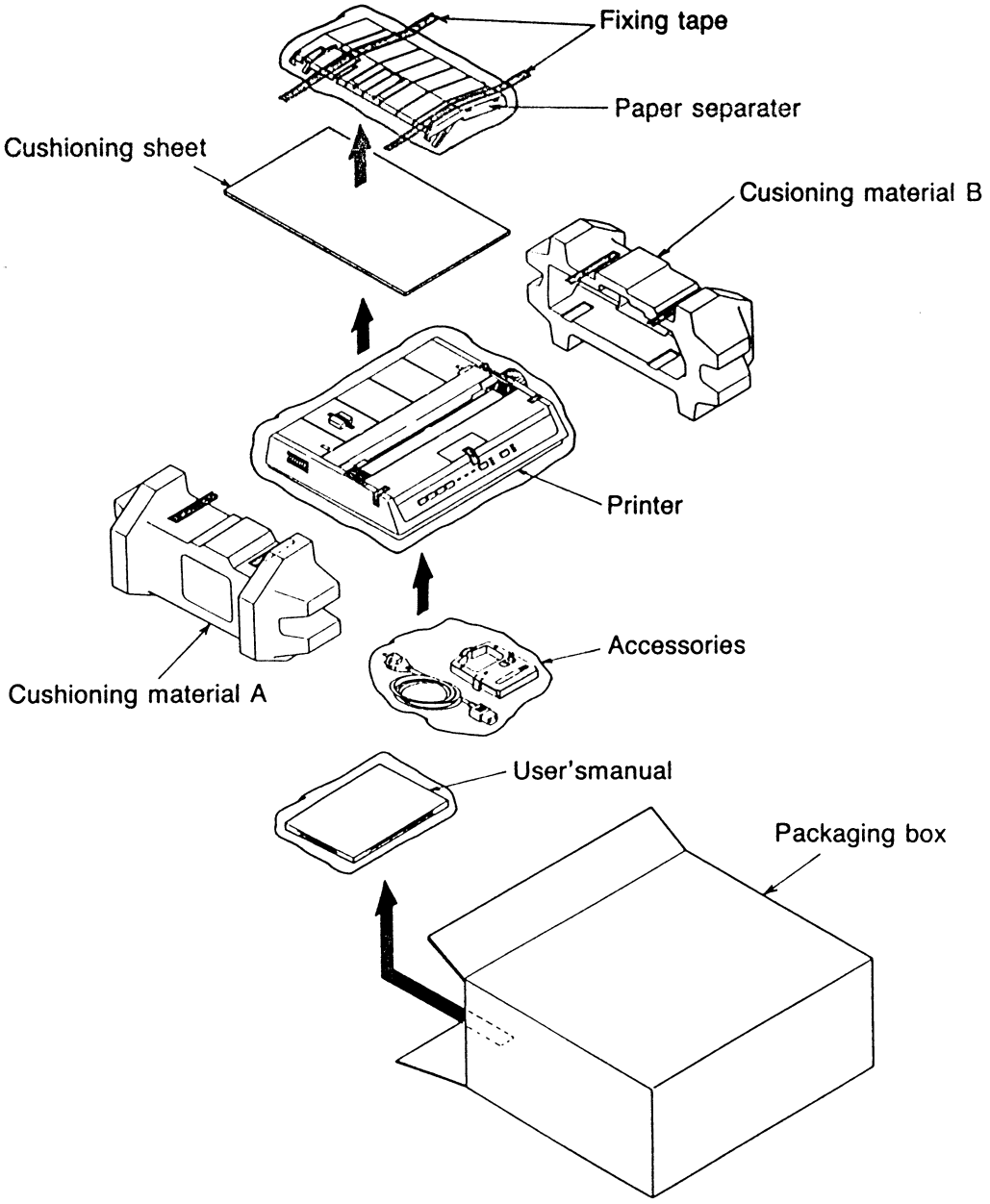
2. INSTALLATION PROCEDURE

2. INSTALLATION PROCEDURE

2.1 Unpacking

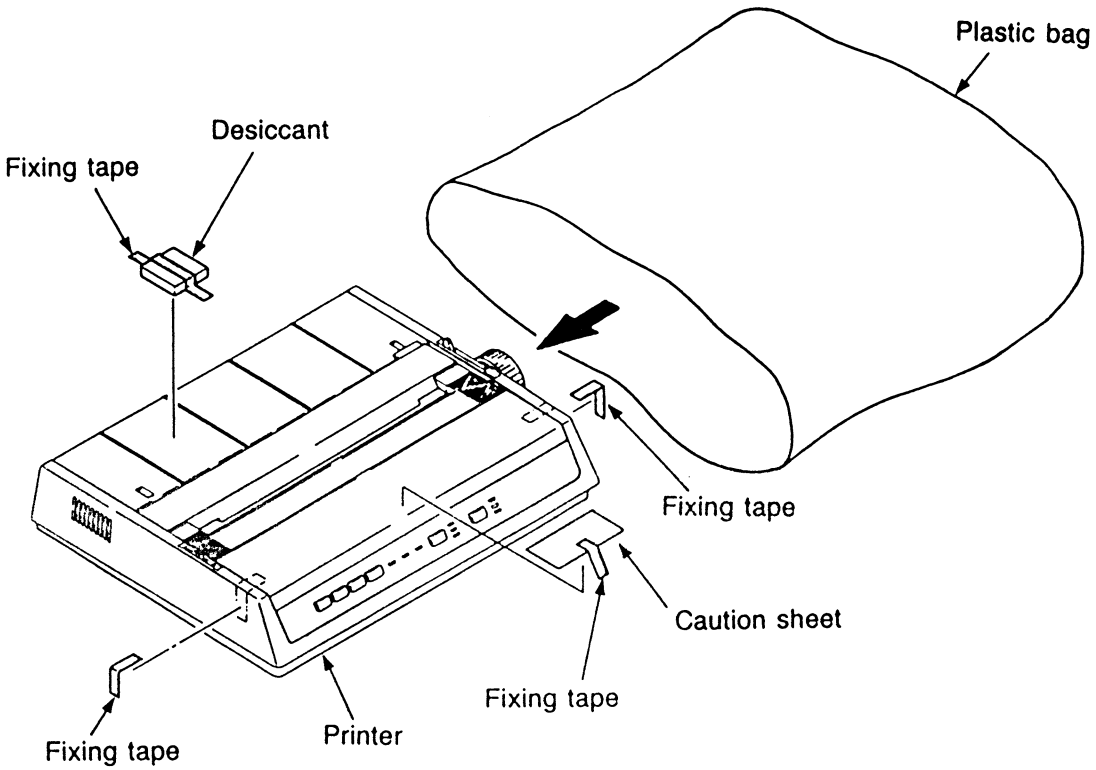
2.1.1 Unpacking the Packing Box

(1) Open the packing box.
(2) Remove the printer and the paper separater with the cushioning materials from the packing box.
(3) Peel the fixing tape off and remove the paper separater.
(4) Remove the cushioning material A, B and the cushioning sheet.
(5) Peel off the fixing tape off the packaging box and remove the accessories.
(6) Peel off the fixing tape off the packaging box and remove the user's manual.



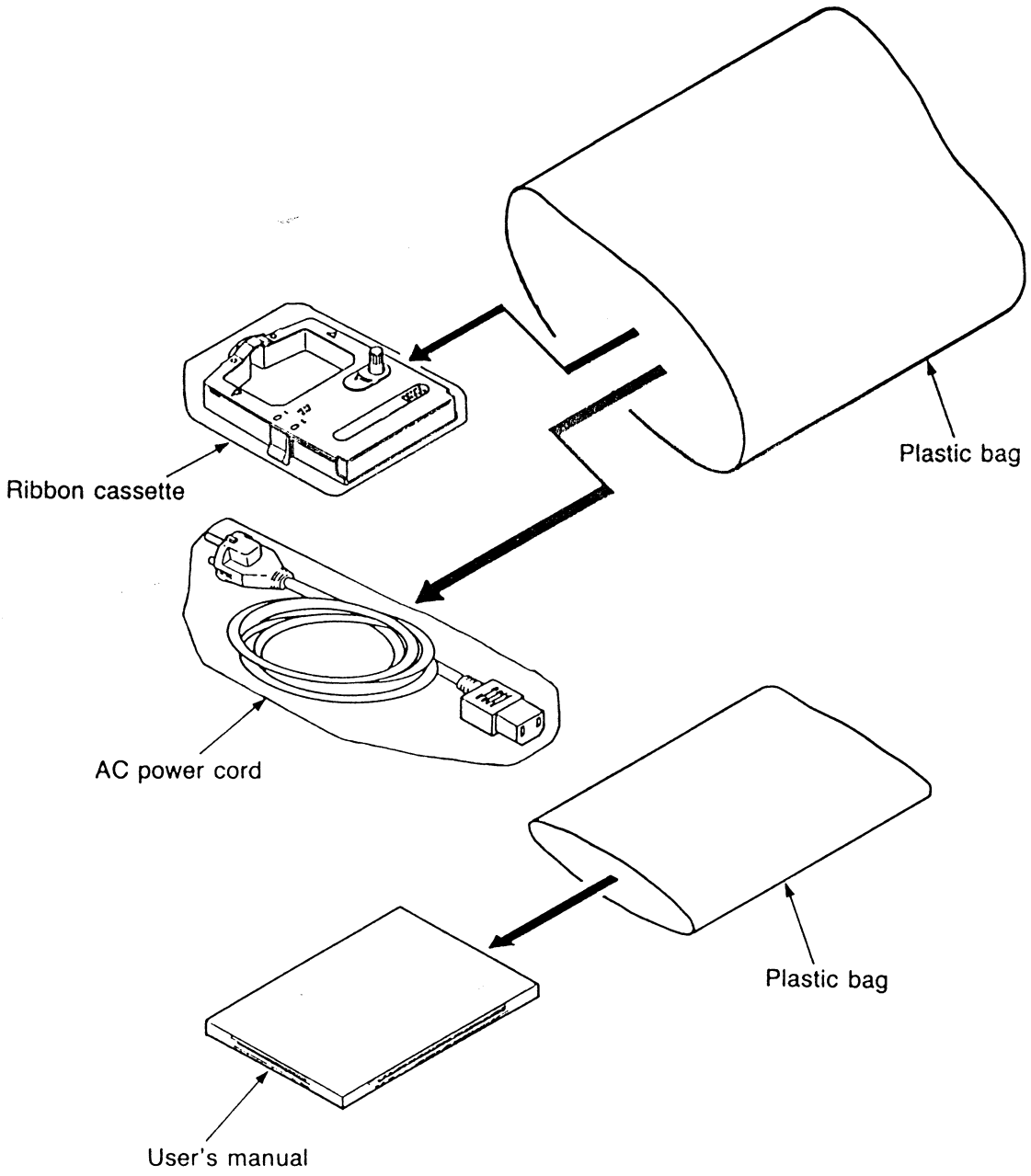
2.1.2 Unpacking the Printer Unit

(1) Take out the printer from the plastic bag.
(2) Remove the desiccant and the caution sheet along with the fixing tape.
(3) Remove the fixing tape from the access cover.



2.1.3 Unpacking the Accessories

(1) Take out the AC power cord, the ribbon cassette from the plastic bag.
(2) Take out the user's manual from the plastic bag.



2.2 Installation (For details, refer to the Setup Guide.)

2.2.1 Precautions for Installation

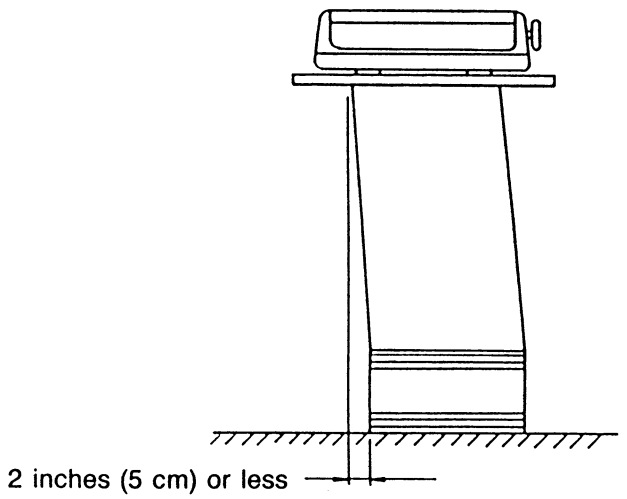
When installing the printer, observe the following precautions:

(1) Do not install the printer in the following places:
a) Place exposed to direct sunlight
b) Place with great fluctuations in temperature
c) Place exposed to outdoor wind
d) Dusty place
e) Near a door
f) Too near an air conditioner
g) Place subject to heavy vibrations

(2) Adjust the temperature and humidity of the installation site as follows:
Temperature: 41°F to 104°F (5°C to 40°C)
Humidity: 20%RH to 90%RH

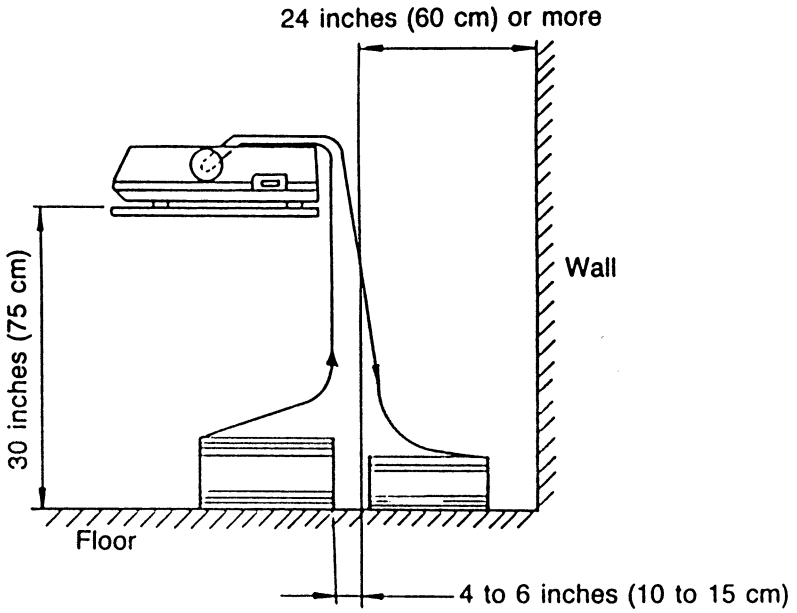
(3) To install the printer and printing paper, observe the following procedure:
a) Adjust the height of the desk on which to place the printer to 30 inches (75 cm) as a standard. (See to it that the desk surface is horizontal and smooth and that the rubber protectors on the bottom of the desk legs are level.)

b) Set the printing paper on the floor below the printer so that it may be fed into the printer without skewing from the feeding path by more than 2 inches (5 cm).



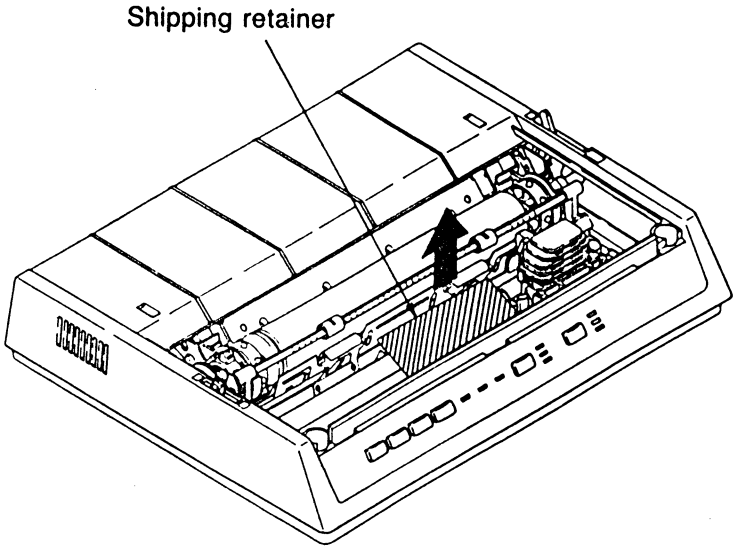
c) Align the rear section of the printer with the rear edge of the desk. Keep a distance of 24 inches (60 cm) or more between the rear section of the printer unit and the wall to provide a space for printed paper being fed out.

d) Keep a distance of 4 to 6 inches (10 to 15 cm) or more between the unprinted paper fed into the printer and the printed paper fed out of the printer. If the paper going in one direction interferes with the paper going the other way, they may jam inside the printer.



2.2.2 Removing the Shipping Retainer

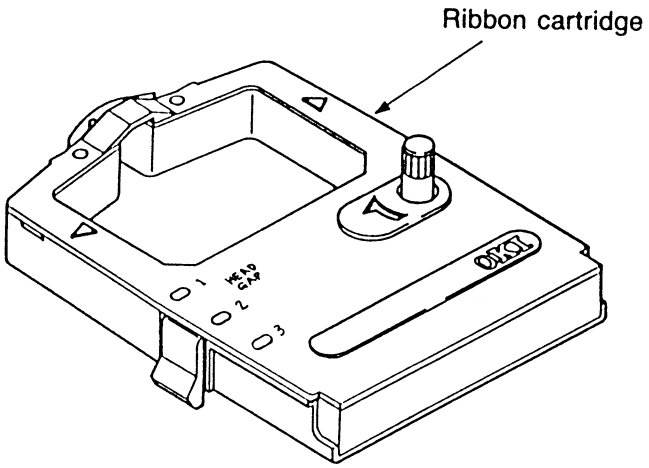
Remove the shipping retainer that secures the printhead.



2.2.3 Installation of the accessories

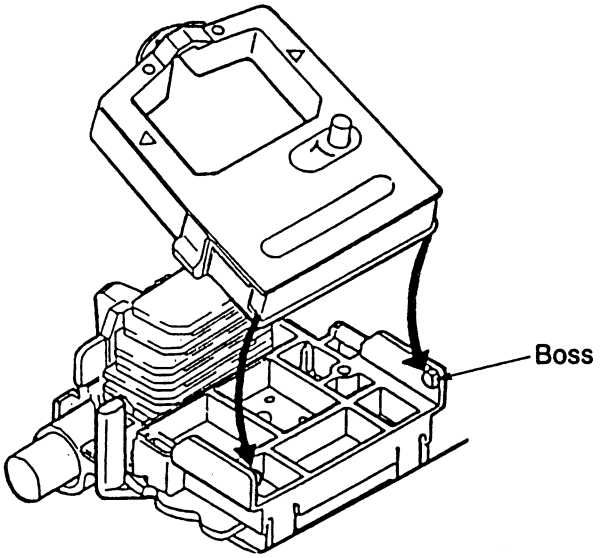
(1) Ribbon cartridge

① Remove the wrapper of the ribbon cartridge.



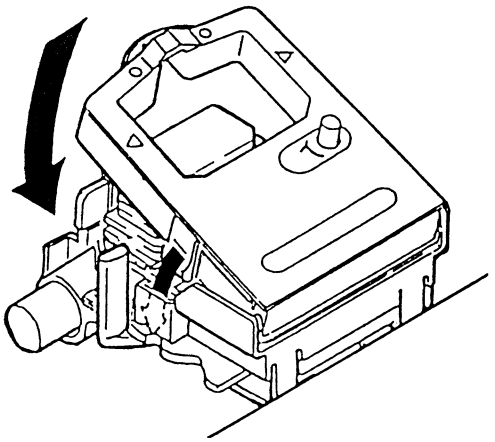
② Before setting, turn the take-up knob to tighten the ribbon.

③ Push the rear of the cartridge down first. Make sure it snaps into the boss.

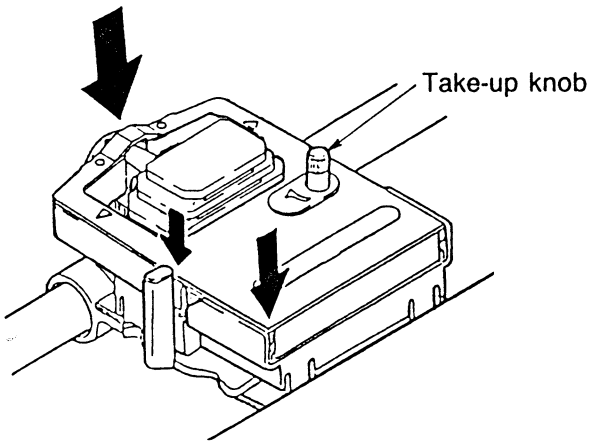


Important: *Do not peel off the plastic film on the top of the cartridge. It is a part of the cartridge.*

④ Lower the front of the cartridge over the printhead.



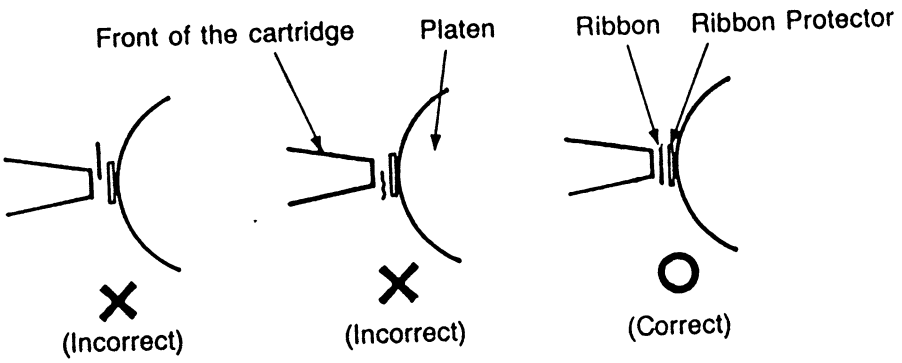
⑤ Make sure that the ribbon cartridge is fitted correctly.



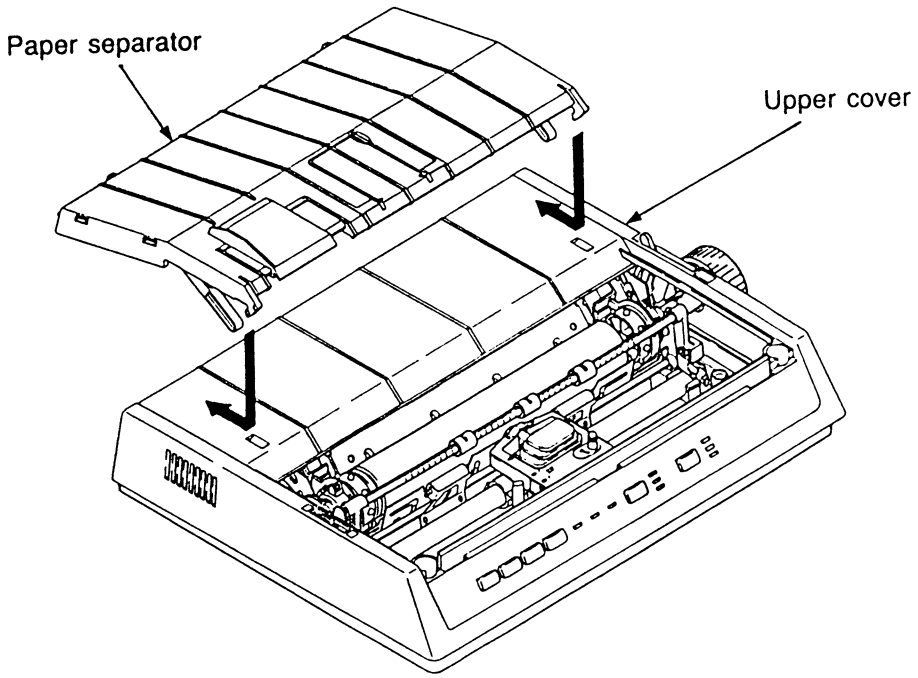
⑥ Grasp the cartridge on both sides, making sure the take-up knob revolves in the direction of the arrow icon.

Note: *When passing the ribbon between the printhead and the platen, make sure that the ribbon is not twisted or bent and that the left/right arms of the cartridge fit correctly.*

Inserting the Ribbon Cartridge [a side view]

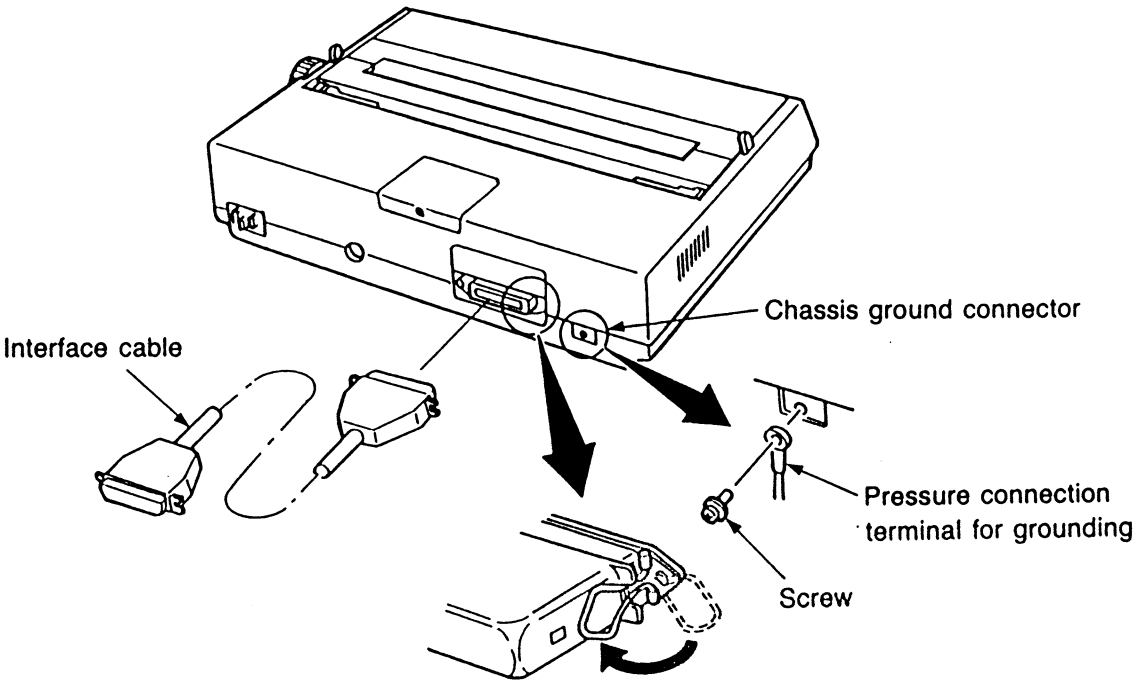


(2) Paper separator
Install the paper separator by placing its hooks in the slots provided in the upper cover.

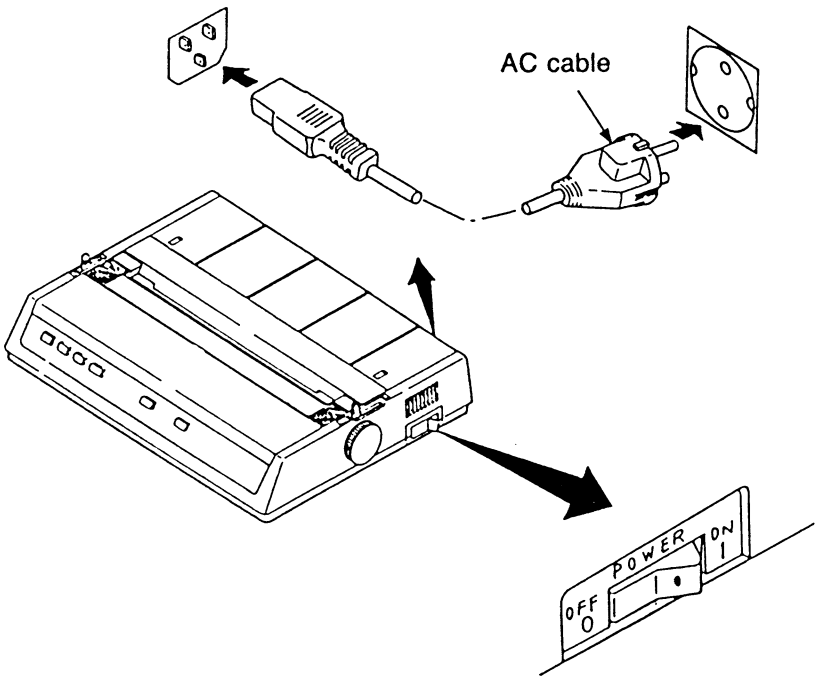


2.2.4 Connecting Cables

(1) Connect the interface cable to the printer.
If your interface has a pressure connection terminal for grounding, connect the terminal in the chassis ground connector by using a suitable screw.

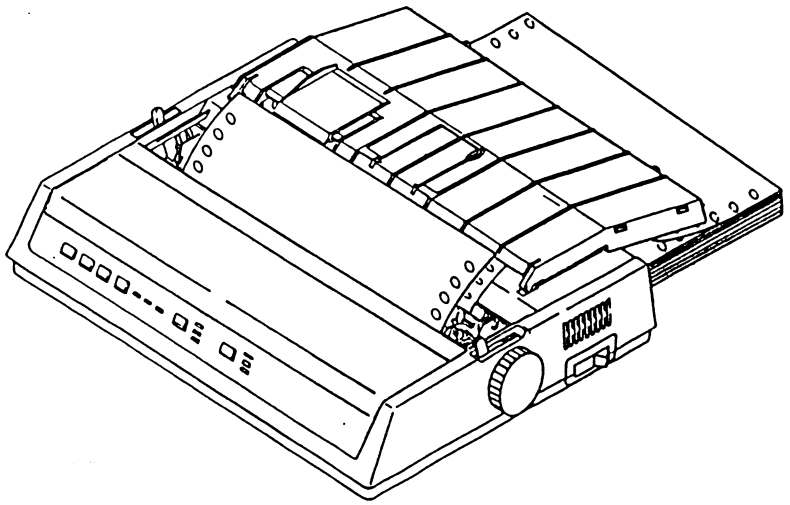


(2) Connect the AC cable to the printer.



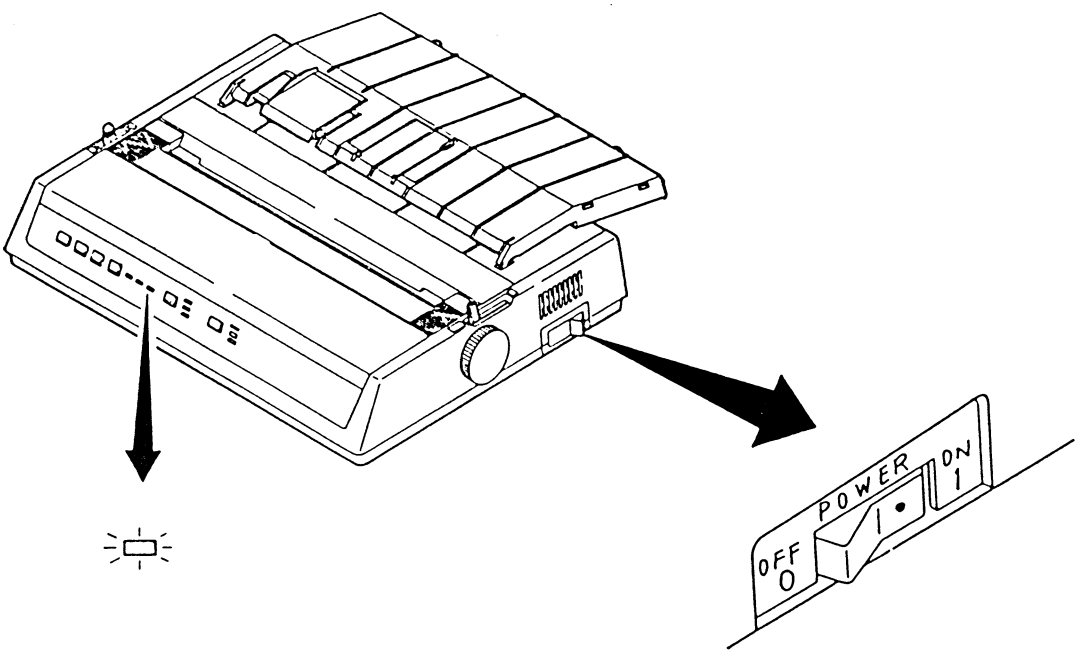
2.2.5 Installing Paper

Install printing paper on the printer for the test run.



2.2.6 Powering On

(1) Turn on the POWER switch on the right side of the printer unit.
(2) Confirm that the POWER LED is on and that the printhead returns to its home (left most) position.



(3) If the printer unit shows no abnormality after it is powered on, proceed to the next step (4) for test printing.

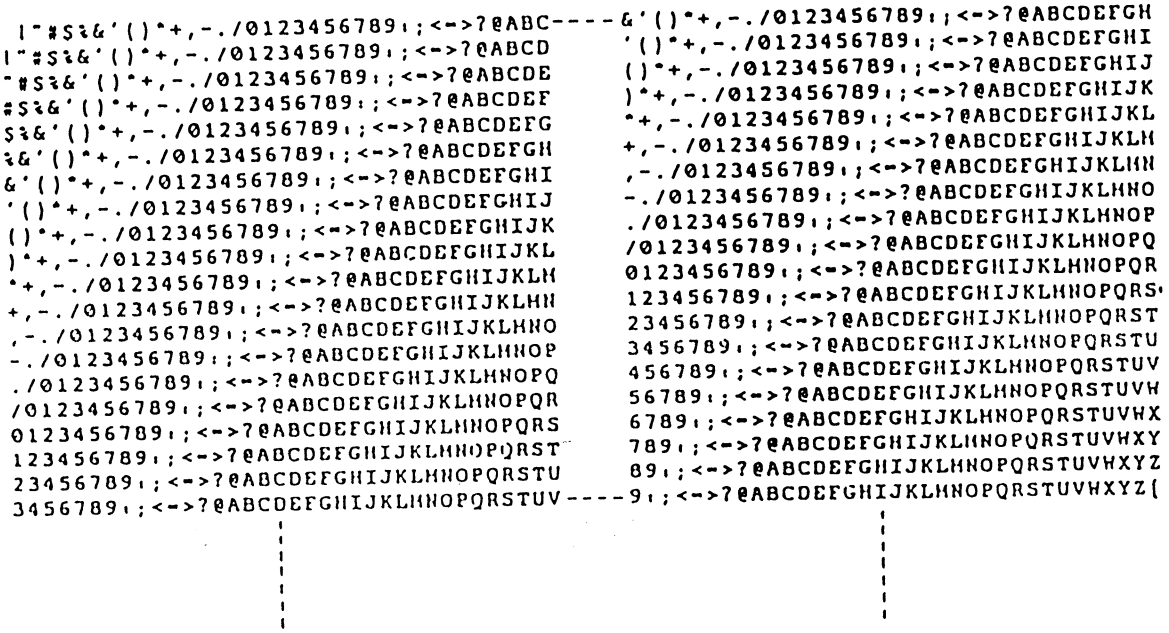
(4) Test printing

a) After confirming that the POWER switch is off, turn it on while pressing the LINE FEED and SELECT switch.

b) Confirm that the printer unit prints out the test pattern as shown in the figure below.

c) Press the SELECT switch to end the printing test.

d) Confirm that the SELECT lamp is on, indicating that the printer unit is ready to receive printing data from the host computer.



3. THEORY OF OPERATION

3. THEORY OF OPERATION

3.1 Electrical Operation

This section describes the operation of the printer circuits.

3.1.1 General

The electrical section of the printer consists of the components shown in figure 1.

In addition to the microprocessor, the control board also contains a DC power circuit, drive circuits, a paper-end sensor, and an interface connector.

The power supply connects with the control circuit board via a cable, and other electrical parts connect via the connection board.

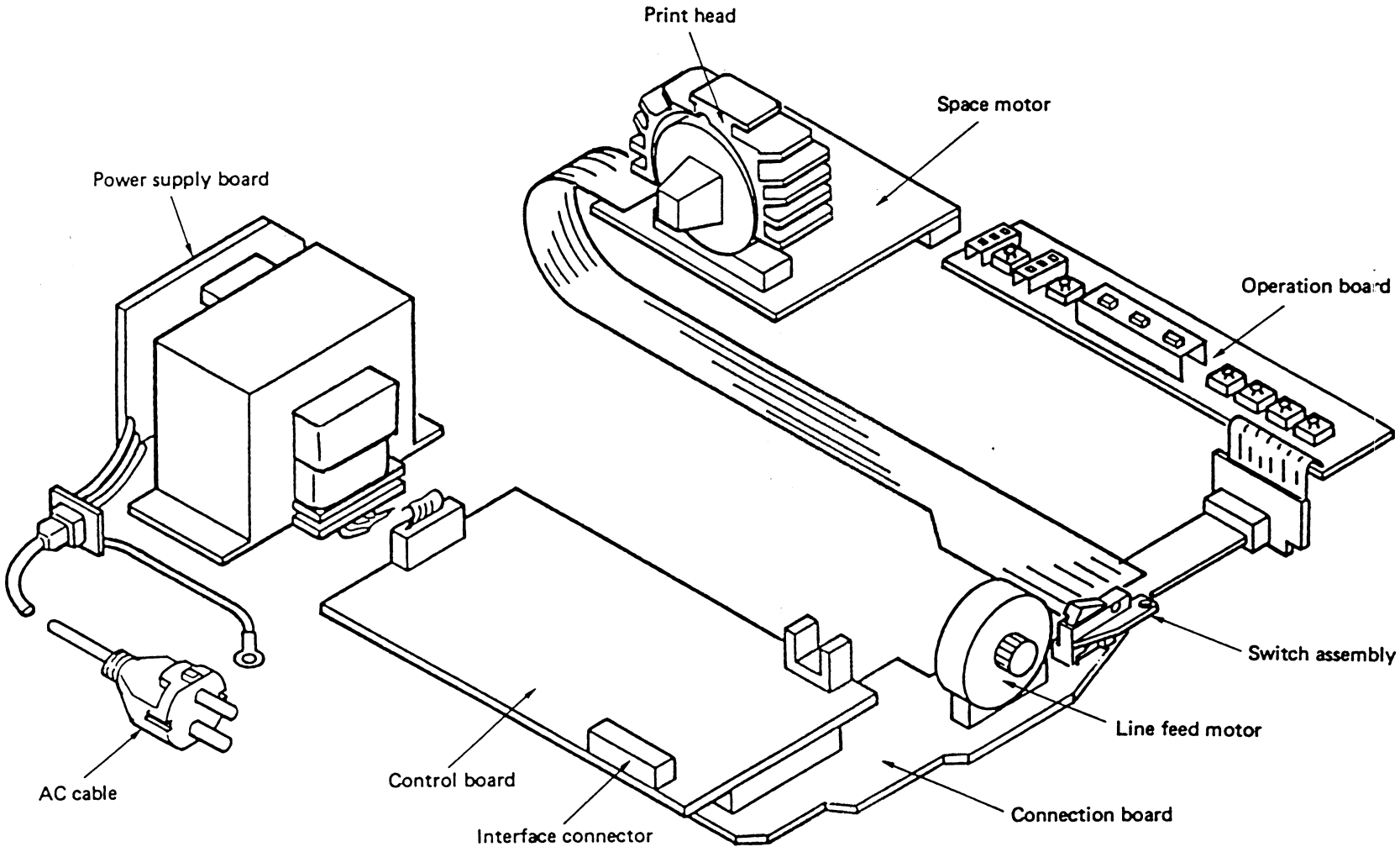


Figure 1. Configuration of Electrical Section

3.1.2 Microprocessor and Its Peripheral Circuits

(1) Microprocessor (Q12: 80C154)

The microprocessor is the nucleus of the control circuit, and its peripheral circuits operate under control of this microprocessor.

The I/O ports of the microprocessor are connected with the address bus, data bus, and control lines.

(2) Program ROM (Q8)

The program ROM stores the control program for the printer. The microprocessor operates under control of this program.

(3) RAM (Q13)

The RAM stores data such as received print data.

(4) LSI (MSM6990)

The MSM6990 is an external interface and motor control LSI. It has the following functions:

A: External interface controller

(a) Parallel interface function

The parallel interface function mode is selected when the level of the mode selection signal (ISEL) is high. In this mode, IFD1 to 8 are used as an input port; the parallel data received through the interface connectors is latched in synchronization with the strobe signal ($\overline{STB}$) and is sent to the CPU in synchronization with the RD signal. In this mode, the MSM6990 also sends $\overline{BUSY}$, $\overline{ACK}$, $\overline{PE}$ and $\overline{SELECT}$ signals to the interface connector in synchronization with the $\overline{WR}$ signal.

(b) Address decoder

The address decoder decodes the address signal (A12 to A15), and sends out the RAM (Q13) chip select signal ($\overline{S\ RAM\ SEL}$).

(c) Parallel port function

This function is used to load the DIP switch data.

B: Motor controller

(d) Space speed control function

This function accelerates and decelerates the space motor in accordance with commands from the microprocessor and controls the space motor speed in each printing mode.

(e) Dot timing generation function

This function generates the dot-on timing signal ($\overline{IPT}$), synchronized with the printing speed in accordance with output signals (PHASE A, B) of the encoder on the space motor, and sends this timing information to the microprocessor.

(f) I/O ports

The MSM6990 has a 12-bit output port and a 10-bit input port. It outputs control signals in accordance with the commands input from the microprocessor.

The input port is also used to read information from the operation panel switches, etc.

(g) Address latch

The address latch latches the low-order 8 bits of the address (A0 to A7). These bits are used as an address for read/write operations with peripheral devices.

3.1.3 Initialization

The printer is initialized when the power is turned on or when the parallel interface signal I-PRIME is received from the host computer.

Initialization is started by resetting Q12 (microprocessor) and Q4 (interface LSI) with the RST OUT signal output from the reset circuit (Q7 pin 13).

A program then starts and sets microprocessor (Q12) and LSI (Q4) modes, checks memory (ROM and RAM), initializes the RAM, and moves the carriage to home. Next, the program establishes the interface signals (output ACK and BUSY signals), turns on the SELECT indicator, and informs the host computer that the printer is ready to receive data, thus completing the initialization.

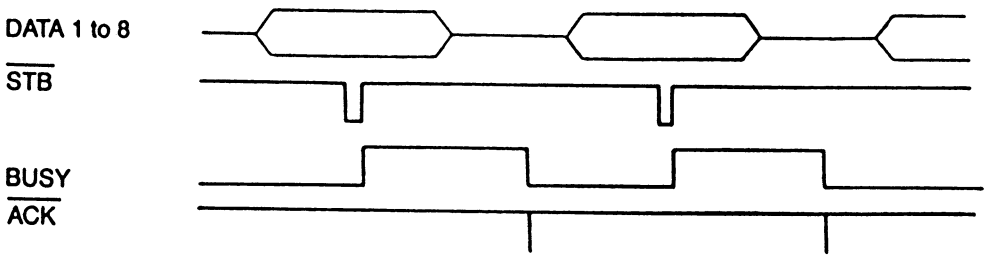
3.1.4 Interface Control

(1) Parallel interface

The data from the interface is input through the connector (CN1), and the interface LSI (Q4: MS6990) latches this input data in synchronization with the $\overline{STB}$ signal.

The BUSY signal is on while processing this data. After processing, the BUSY signal is turned off and an $\overline{ACK}$ signal is sent to request the next data.

The BUSY signal is also sent to stop data sending when the receive buffer is full.

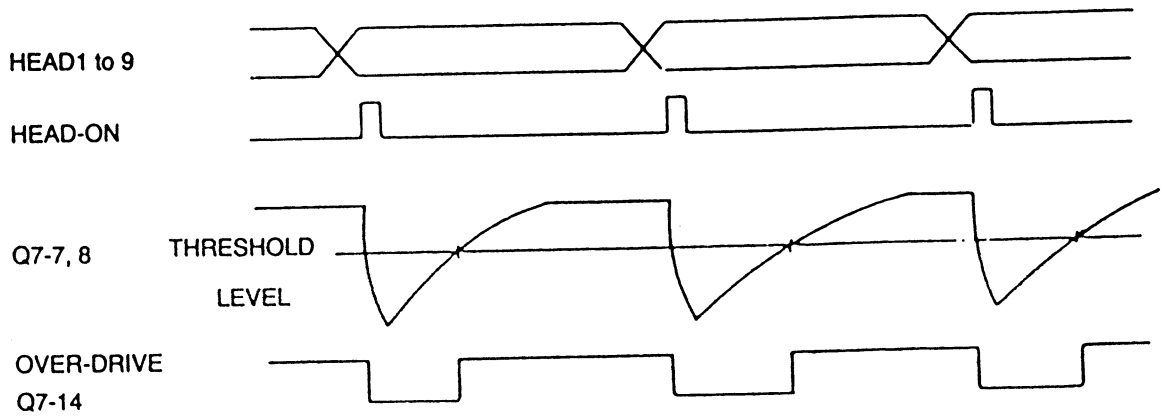


3.1.5 Print Head Drive Circuit

This circuit drives the head magnets corresponding to the HEAD DATA1 to 9 signals in synchronization with the HEAD-ON signal, thus making the print head print characters.

When the HEAD-ON signal goes high, the RC integrator (R548 and C5) determines the head drive time. This integrator adjusts the printing pressure automatically to compensate for variations in the drive voltage (+30 V).

That is, the integrator increases the drive time if the drive voltage drops and decreases the drive time if the drive voltage rises.



3.1.6 Spacing Drive Circuit

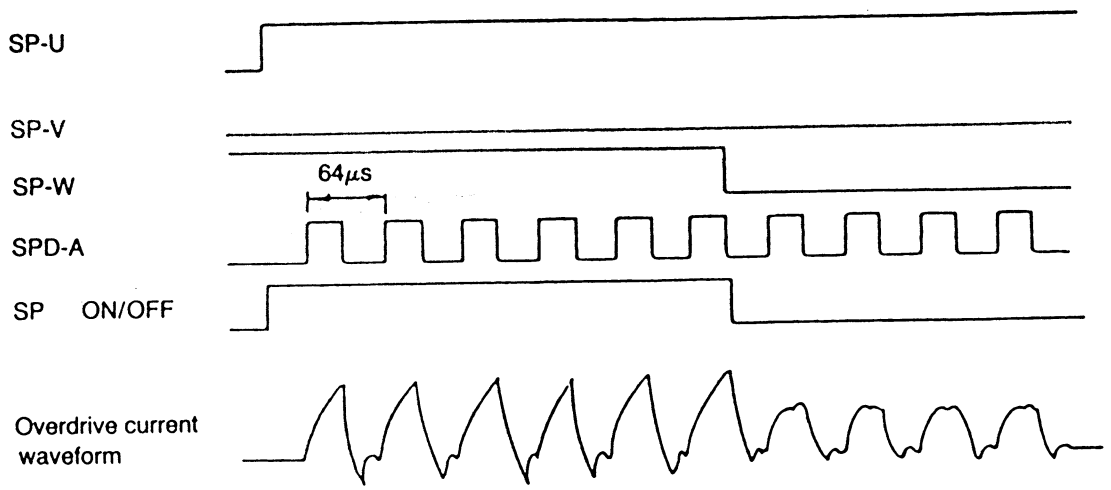
(1) Space motor control

The motor control LSI (Q4: MSM6990) outputs the space motor phase signals (SPU, SPV, and SPW) in accordance with the spacing command from the microprocessor. At the same time, it outputs the overdrive signal (SPD-A).

The SPD-A signal is a fixed-period pulse signal whose pulse width is controllable by program. It is used to control the motor drive time.

The SP ON/OFF signal is output during acceleration and deceleration, which requires a large amount of torques.

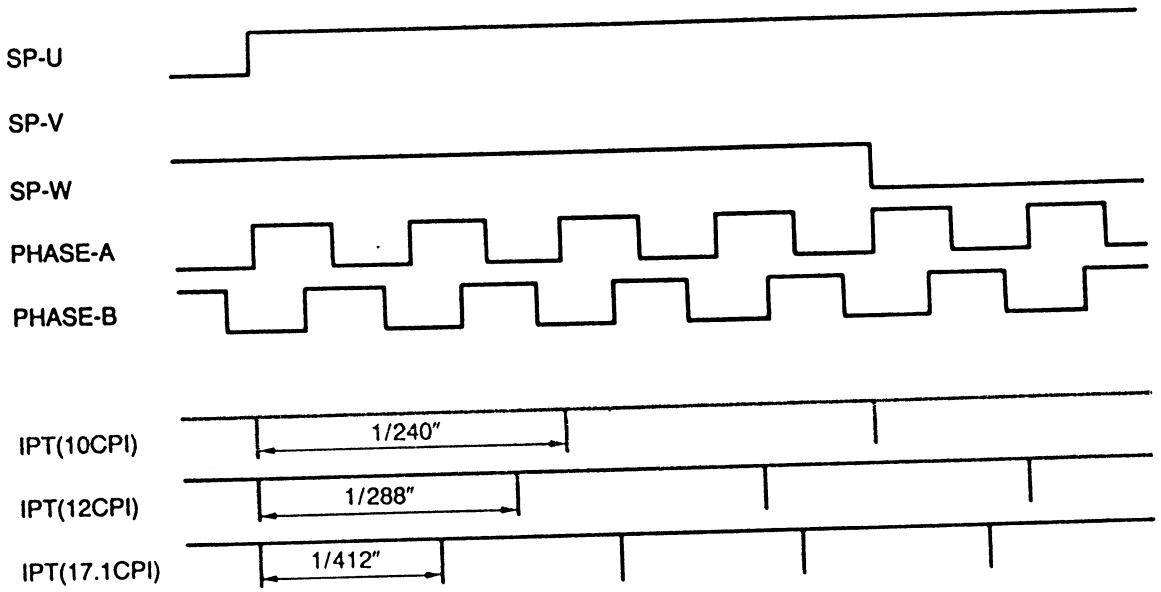
The motor driver (MTDV) drives the space motor in accordance with these signals. Pins 9 and 11 of the MTDV are for the overvoltage and overcurrent protective circuits respectively.



(2) Slit encoder

PHASE-A and PHASE-B signals are generated by the photosensor and circular slit when the space motor rotates.

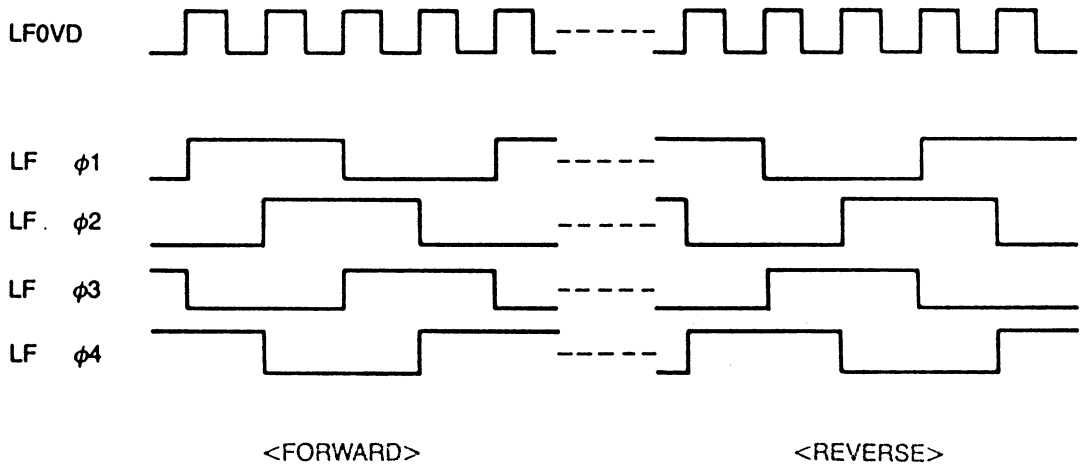
The motor control LSI (Q4: MSM6990) frequency divides these edge pulse signals in accordance with the print pitch and outputs the IPT signal to provide dot-on timing and carriage position detection timing.



3.1.7 Line Feed Circuit

The line feed motor is locked at +8 V when it is not turning.

During line feed, the line feed motor is driven by the +30 V level applied in accordance with the LF OVD signal.



3.1.8 Alarm Circuits

(1) Drive circuit error alarm

This circuit protects the print head drive circuit, space motor drive circuit, line feed motor drive circuit, and peripheral circuits by blowing a fuse when an error occurs.

The circuit monitors the drive time using the HDALM, SPALM, and LFALM signals interlocked with the overdrive signal of each drive circuit. If the drive time of any drive circuit exceeds the specified time, the drive circuit fault alarm circuit outputs an ALM signal (high) to turn on the SCR.

This short-circuits the secondary coil (30 V) of the transformer, resulting in an overcurrent in the primary coil, and blows the AC fuse.

(2) Head overheat alarm circuit

In order to protect the head coils, this circuit monitors the head temperature using the thermistor built into the print head.

If printing is performed continuously for an extended period, the print head gets hot. When the head temperature reaches a certain value (approximately 100 degrees C), a head overheat alarm is detected.

When this alarm is detected, printing stops temporarily to wait for the head to cool. When the head temperature drops below the alarm detection temperature, printing resumes.

Alarm detection is performed as follows:

When the temperature in the print head rises, the resistance of the thermistor decreases, and the potential of the comparator (Q7) negative input decreases to invert the comparator output, causing the HEAD TEMP signal to be output to the motor control LSI.

3.1.9 Paper End Detection Circuit

When the paper runs out, the photosensor (PE) on the control board turns off, and as a result, the PAPER END signal goes to 0. This signal is fed to pin 55 of the motor control LSI (Q4), stopping the printing operation and lighting the ALARM indicator.

3.1.10 Power Supply

The power supply consists of a power transformer, power supply board, and a DC power supply circuit.

The input AC voltage is transformed into 7.6 VAC, 24 VAC, and 10 VAC by the power transformer, and these AC voltages are further converted to +8 VDC, +5 VDC, and +30 VDC by the DC power supply circuit and supplied to each circuit.

(1) Power supply board

The power supply board contains the power switch, AC fuse, and the AC noise filter.

(2) Power transformer

If the power transformer temperature rises abnormally, the built- in temperature fuse of the transformer blows to prevent any adverse effect on other components.

3.2 Mechanical Operation

3.2.1 The Printhead Mechanism and Its Operation (see figure 3)

The print head is spring-loaded, utilizing a permanent magnet, and can be easily removed or installed. The print head is mounted on a carriage that runs parallel to the platen and is connected with the control circuit via the head board.

The print head consists of:

(a) Wire guide
(b) Print wires
(c) Armature assembly
(d) Yoke
(e) Springs
(f) Spacer
(g) Magnet assembly
(h) Thermistor
(i) Printed-circuit board

(1) Print head operation

When the print head is in the non-printing state, each armature is attracted by the permanent magnet, and the springs holding the armatures are compressed by the thickness of the spacer. The print wires, which are fastened to the individual armatures, are therefore held retracted within the wire guide.

When signals corresponding to a character to be printed are detected by the control circuit, currents flow through the corresponding coils to nullify the magnetic flux generated by the permanent magnet between the armatures corresponding to those coils and the permanent magnet pole. As a result, those armatures are driven toward the platen by the force of the armature springs, and the print wires fastened to those armatures eject from the tip of the wire guide and strike the paper through the ribbon to print dots on the paper.

After the character is printed, the magnetic flux of the permanent magnet attracts the armatures again so that the print wires retract into the wire guide.

The print head has a built-in thermistor to prevent the coils from overheating and burning due to continuous bi-directional printing over a long period. If the coil temperature exceeds the limit (approximately 100 degrees C), the control circuit detects the thermistor signal and stops the printing operation until the coil temperature drops below the limit.

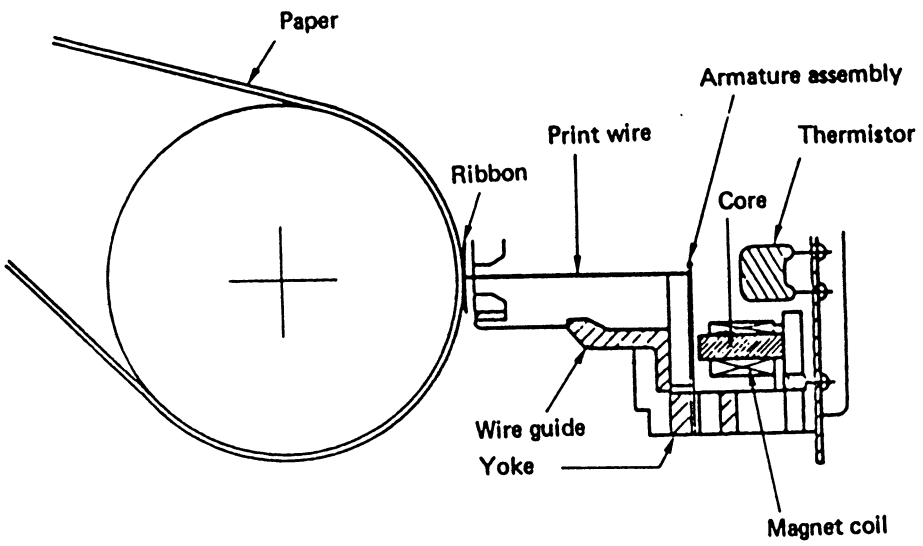

Paper
Armature assembly
Print wire
Thermistor
Ribbon
Core
Wire guide
Yoke
Magnet coil

Figure 3

3.2.2 Spacing Mechanism and Operation (see figure 4)

The spacing operation is performed by driving the carriage frame, which is guided by the carriage shaft mounted parallel to the platen, with the DC motor mounted on the bottom of the carriage frame.

The space mechanism consists of:

(a) DC motor with motor gear
(b) Carriage frame (including stator yoke and motor board)
(c) Carriage shaft
(d) Space rack
(e) Slit sensor
(f) Slit disk

(1) Spacing operation

The carriage, with the print head and space motor mounted on it, moves parallel to the platen along the carriage shaft. As the space motor rotates counterclockwise, the motor gear is driven rightward along the space rack, and as a result, the carriage is also driven rightward.

The spacing mechanism is so designed that the carriage frame moves 0.8 inch (20.56 mm) when the space motor rotates once.

The motor also rotates the slit disk, and the slit passes through the slit sensor. The position of the carriage frame can be obtained by counting the number of slits detected by the slit sensor.

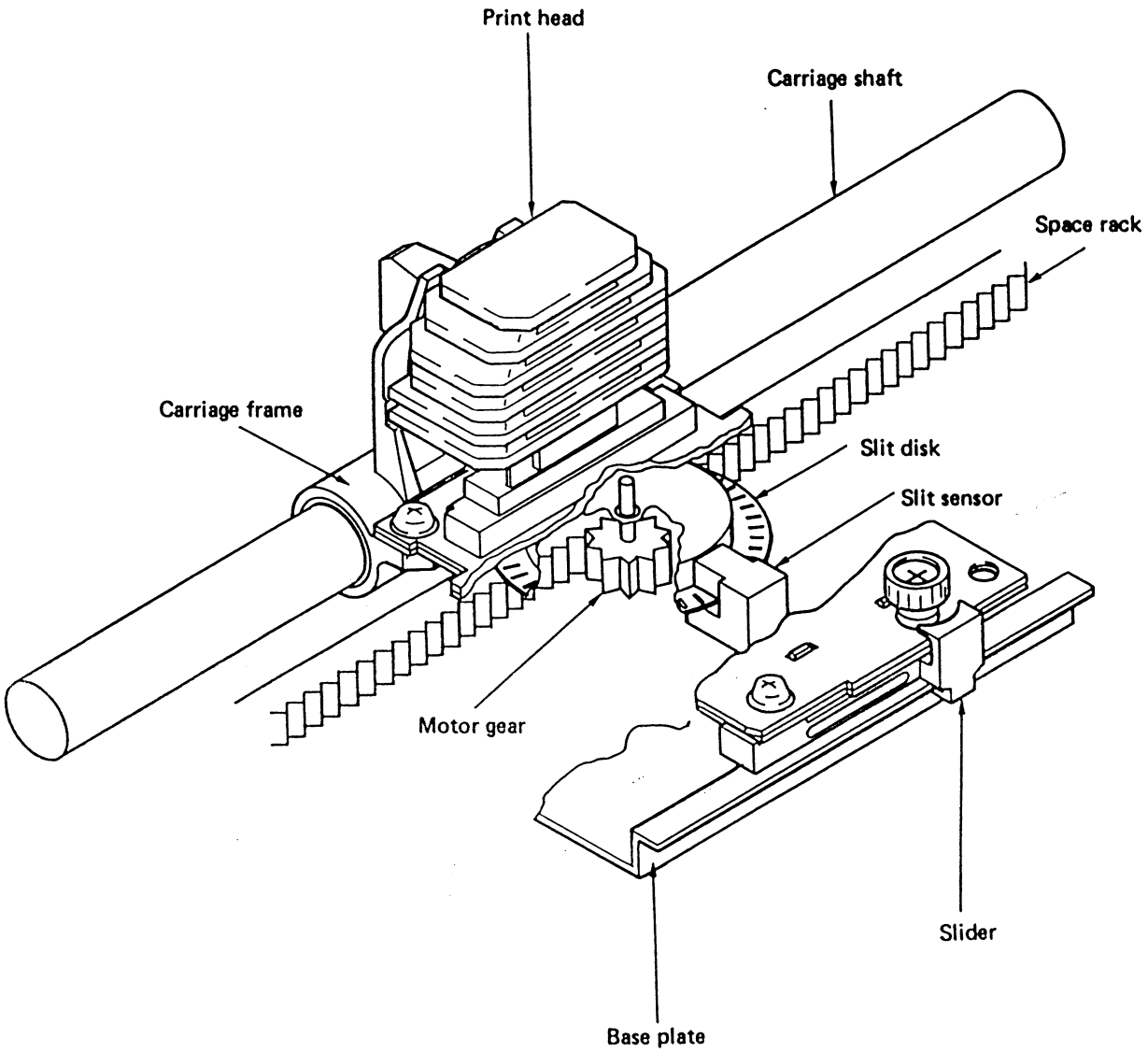

Print head
Carriage shaft
Space rack
Carriage frame
Slit disk
Slit sensor
Motor gear
Slider
Base plate

Figure 4

3.2.3 Head-Gap Adjusting Mechanism (see figure 5)

The head-gap adjusting mechanism adjusts the gap between the platen and print head by changing the tilt angle of the carriage frame with the adjusting lever.

When the adjusting lever is operated, the adjusting screw, which is interlocked with the lever via a gear, rotates to change the tilt angle of the carriage frame around the carriage shaft.

The print head, mounted vertically opposite the adjusting screw on the carriage frame, moves toward or away from the platen with change in the carriage frame tilt angle.

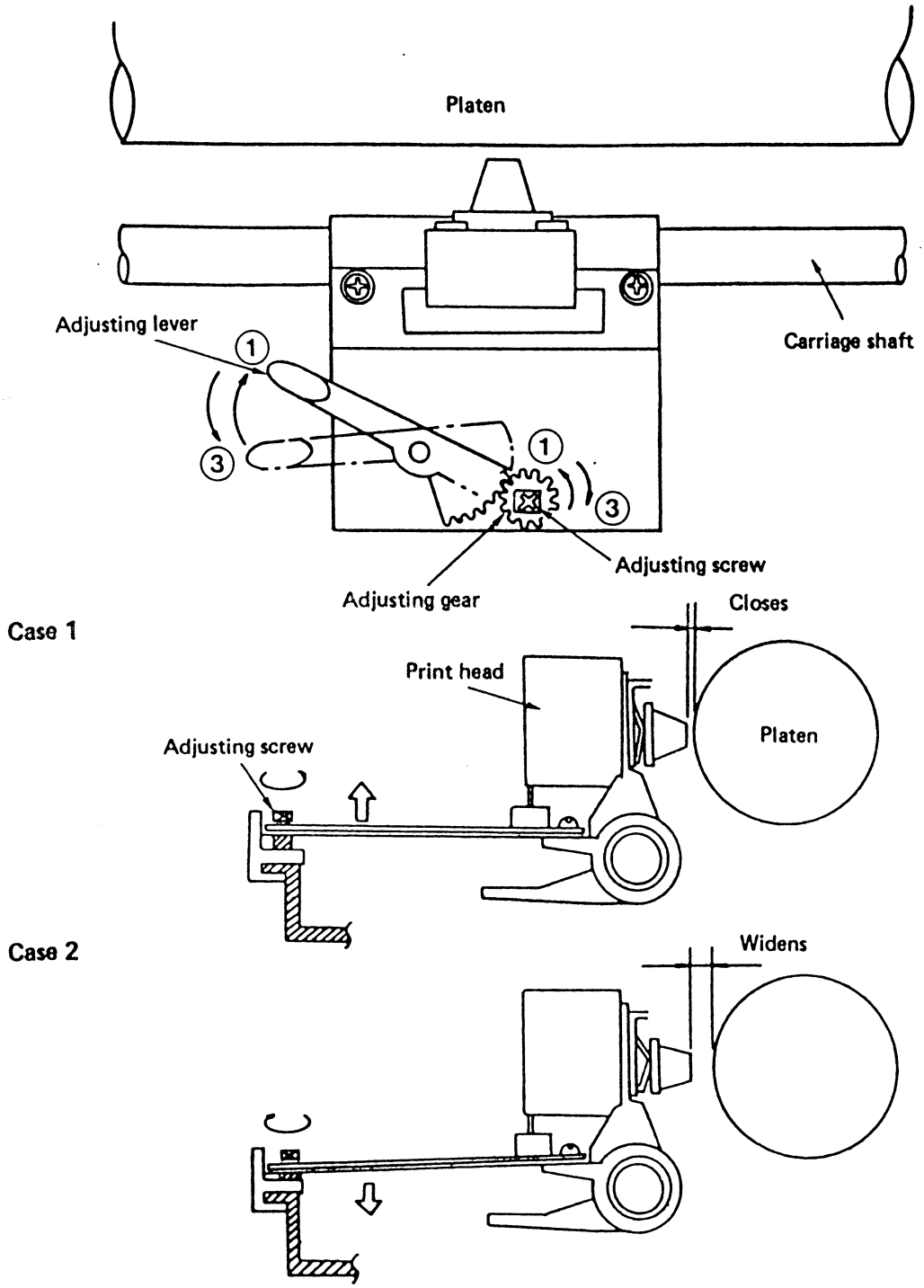

Platen
Adjusting lever
Carriage shaft
1
3
1
3
Adjusting screw
Adjusting gear
Case 1
Closes
Print head
Platen
Adjusting screw
Case 2
Widens

Figure 5

3.2.4 Ribbon Feed Mechanism and Operation (see figure 6)

The ribbon feed mechanism feeds the ribbon in synchronization with the spacing operation. The mechanism is driven by the space motor.

The ribbon feed mechanism consists of:

(a) Ribbon feed gear assembly
(b) Ribbon gear (space motor)
(c) Ribbon cartridge

(1) Ribbon cartridge

A one-way-feed endless ribbon is used. Ink is replenished by the built-in ink tank in the ribbon cartridge so that clear printing is always assured.

(2) Ribbon feed operation

As the space motor rotates, the ribbon gear on the space motor shaft rotates to drive the drive gear in the ribbon cartridge via the ribbon feed gear assembly, thus feeding the ribbon.

In bi-directional printing, the ribbon gear rotational direction reverses every time the carriage movement reverses. In this case, the gears in the ribbon feed gear assembly switch the rotational direction so as to feed the ribbon in a fixed direction.

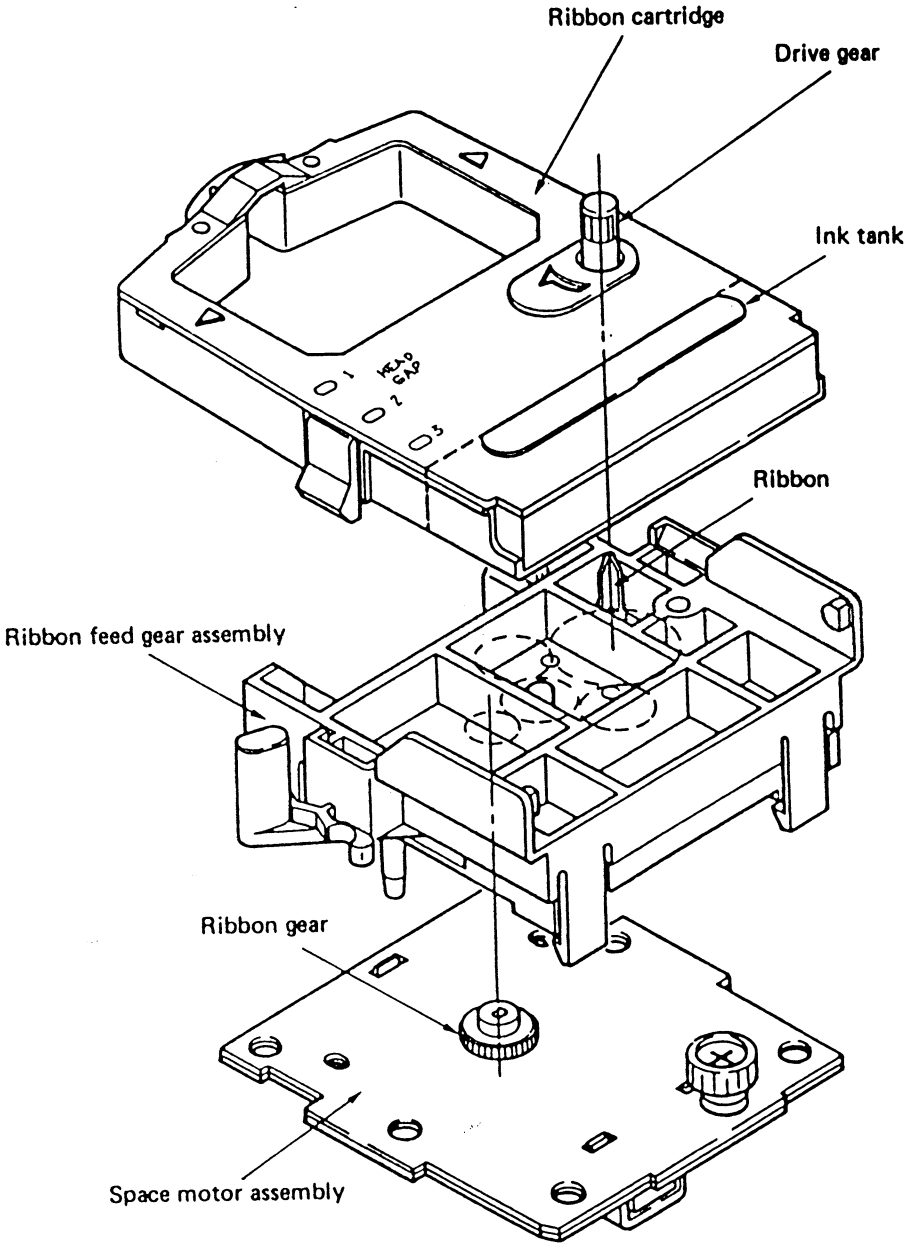

Ribbon cartridge
Drive gear
Ink tank
Ribbon
Ribbon feed gear assembly
Ribbon gear
Space motor assembly

Figure 6

3.2.5 Paper Feed Mechanism and Operation

Paper feed is performed by rotating the platen and pin tractors, which are driven by the LF pulse motor.

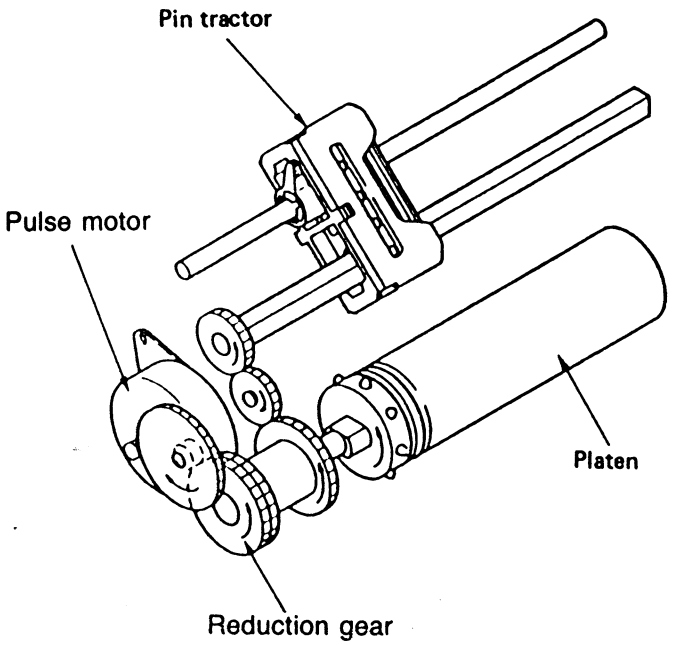
The paper feed mechanism consists of:

(a) Pulse motor with gear
(b) Reduction gear
(c) Platen
(d) Tractor feed unit
(e) Pressure roller

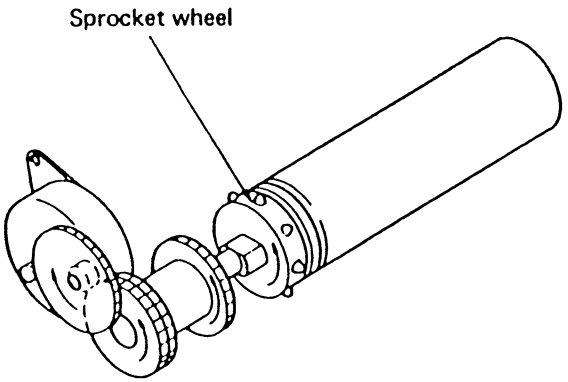
(1) Paper feed operation (see figure 7)

The paper feed pulse motor is mounted on the left side frame. Its rotation is transmitted to the platen through the reduction gear. Platen rotation is also transmitted through the idle gear to the tractor feed unit.

The paper feed mechanism is so designed that when the pulse motor rotates 48 steps (360 degrees), paper is fed 0.17 inch (4.32 mm).



Tractor feed (option)



Fixed pin feed

Figure 7

(2) Paper clamp mechanism (see figure 8)

When the release lever is set to open, the release link moves backward, and the front and rear release links rotate counterclockwise. At the same time, the interlocked release shaft also rotates counterclockwise so that a gap is made between the pressure rollers and platen, allowing insertion of paper.

When the release lever is set to close, the release link moves forward, and the front and rear release links rotate clockwise. At the same time, the interlocked release shaft also rotates clockwise so that the pressure rollers are pushed against the platen by the front and rear pressure levers, allowing paper to be fed.

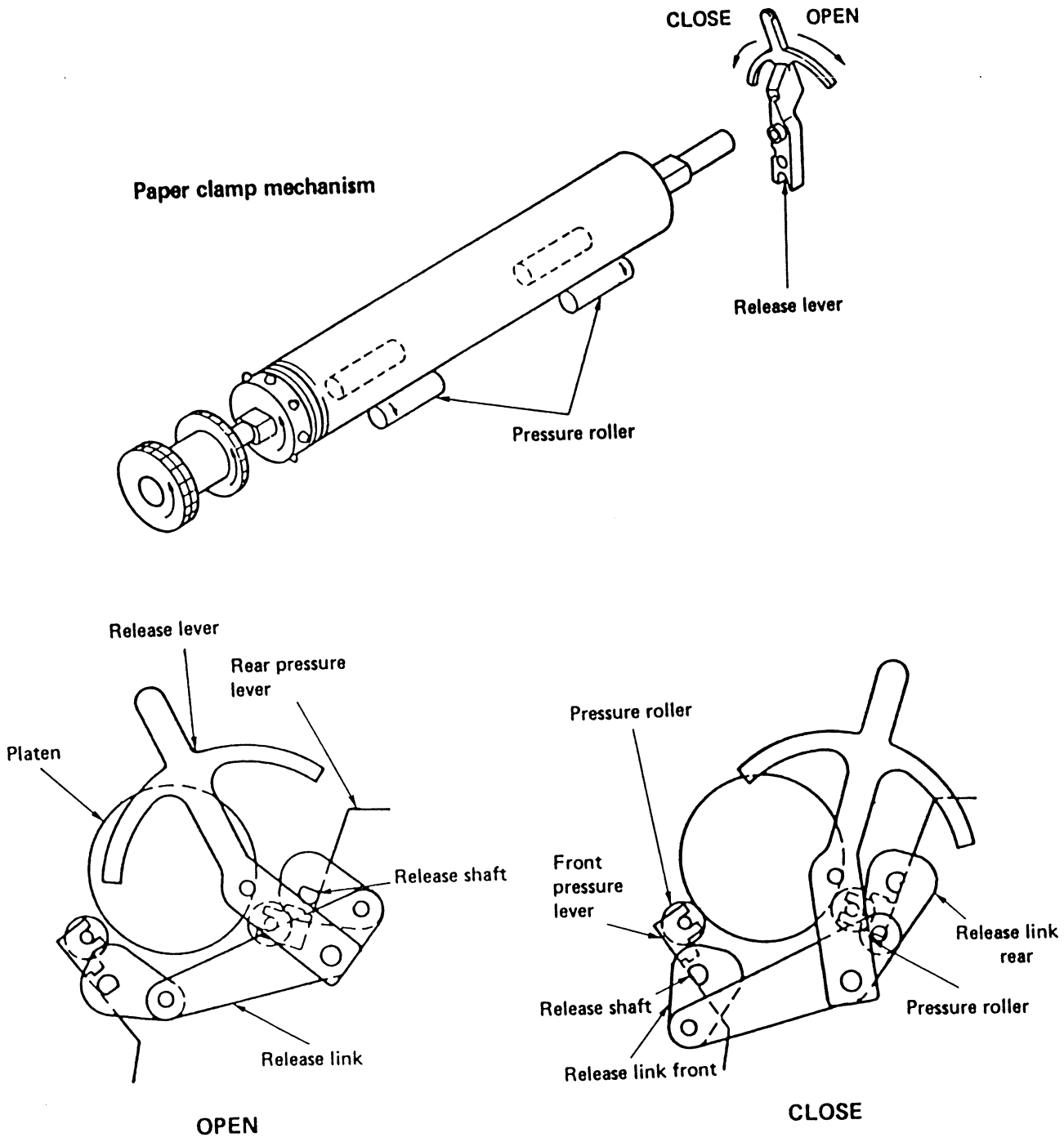

CLOSE
OPEN
Paper clamp mechanism
Release lever
Pressure roller
Release lever
Rear pressure lever
Platen
Release shaft
Release link
OPEN
Pressure roller
Front pressure lever
Release link rear
Release shaft
Pressure roller
Release link front
CLOSE

Figure 8

3.2.6 Paper-End Detection Mechanism (see figure 9)

(1) Rear paper feed

When paper is present in the printer, the paper prevents the near-end lever from falling into the groove of the paper-chute, and the paper-end sensor is on.

When the printer runs out of paper, the near-end lever falls into the groove of the paper-chute so that the rear part of the near- end lever turns off the paper-end sensor, and thus paper-end is detected. Paper-end is detected when the end of the remaining paper is approximately 1 inch (25.4 mm) from the printing position.

(2) Bottom paper feed

When paper is present in the printer, the paper prevents the bottom near-end lever from falling into the hole in the bottom paper guide. That is, the wedge on the bottom near-end lever pushes down the projection of the near-end lever, and the paper-end sensor is on.

When the printer runs out of paper, the tip of the bottom near- end lever falls into the hole in the bottom paper guide so that the rear part of the near-end lever turns off the paper-end sensor, and thus paper-end is detected. Paper-end is detected when the end of the remaining paper is approximately 1 inch (25.4 mm) from the printing position.

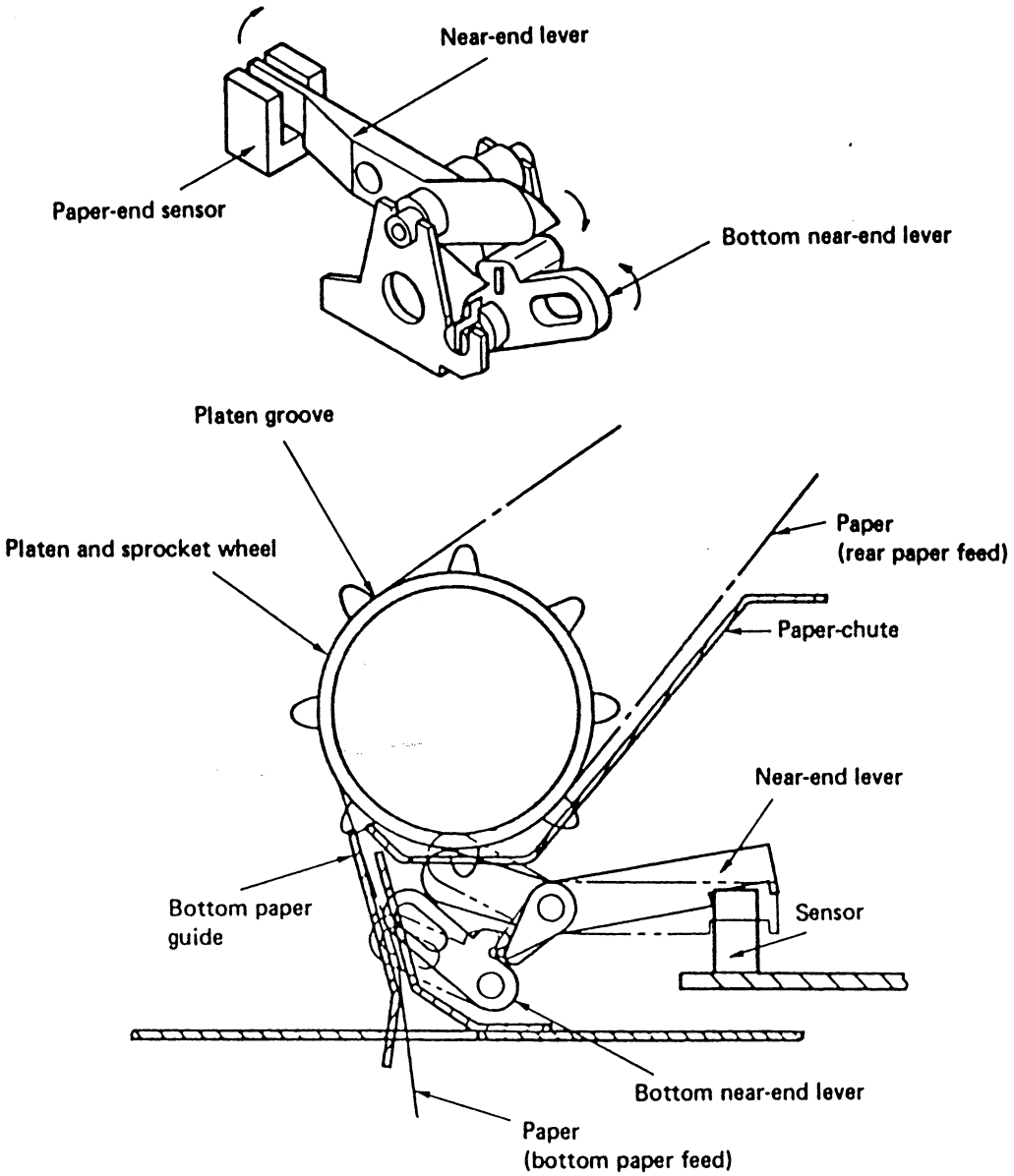

Near-end lever
Paper-end sensor
Bottom near-end lever
Platen groove
Platen and sprocket wheel
Paper
(rear paper feed)
Paper-chute
Near-end lever
Bottom paper
guide
Sensor
Bottom near-end lever
Paper
(bottom paper feed)

Figure 9

3.2.7 Semi-Automatic Sheet Feed (SASF) Mechanism and Function

1. Rear-feed type semi-automatic sheet feed (SASF) ML280

This mechanism has the function of automatically determining the position to start printing of the paper insertd after the paper-end indication has be made on the preceding paper, while printing is made in the single sheet mode.

Operation procedures are as described below:

(1) Insert a paper from behind the platen when the paper-end indication has been made.

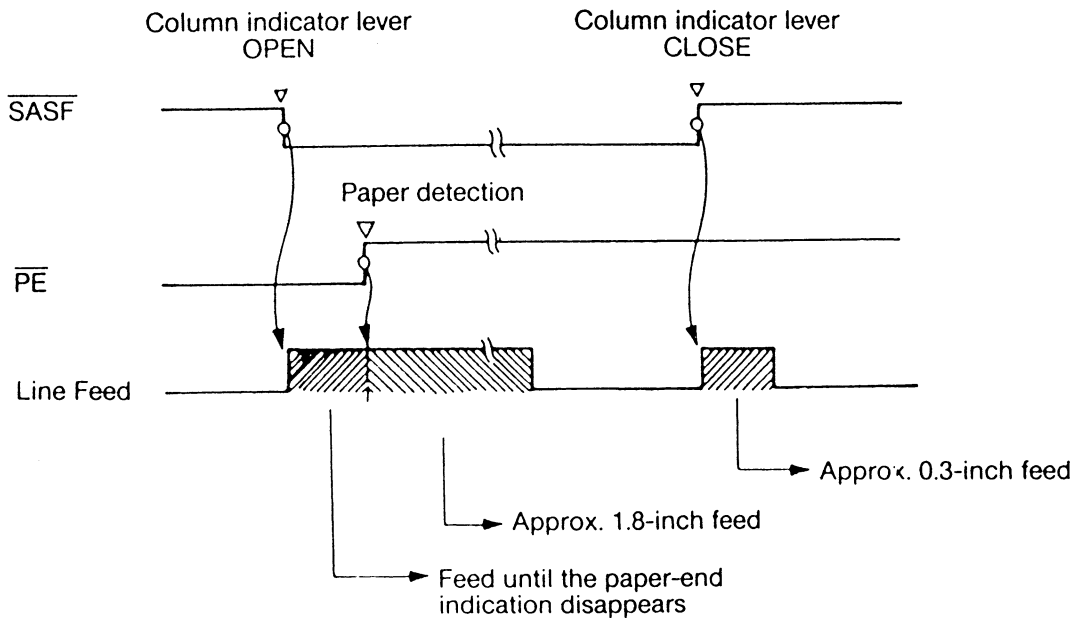
(2) Throw the column indicator lever toward you to set it to the OPEN position, then the SASF switch is turned on.

(3) Line-feed operation is started and the paper is fed until the paper-end indication disappears.

(4) Subsequently the paper is fed by approx. 1.8 inches.

(5) When restoring the column indicator lever to the original position, the paper is further fed by approx. 0.3 inch.

As the result, the first line of printing is set to the position approx. 1 inch below the paper top.



2. Semi-automatic sheet feed (SASF) used together with Sheet Insert Guide (SIG) ML280.

This mechanism has a function to automatically determine the position to start printing on the paper inserted while printing is made in the single-sheet mode.

Operation procedures are as described below.

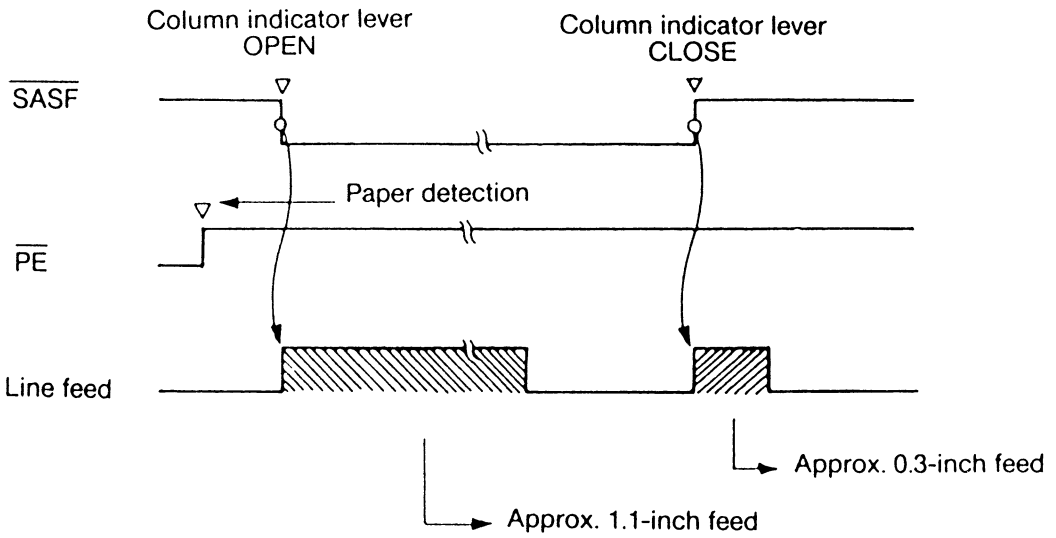
(1) Insert a paper from the front side along the SIG until reach the roller when the paper-end indication has been made. (The paper-end indication disappears when the paper is detected.)

(2) Throw the column indicator lever toward you to set it to the OPEN position, then the SASF switch is turned on.

(3) Line-feed operation is started and the paper is fed by approx. 1.1 inches.

(4) When restoring the column indicator lever to the original position, the paper is further fed by approx. 0.3 inch.

As the result the first line of printing is set to the position approx. 1 inch below the paper top.



4. ASSEMBLY/DISASSEMBLY

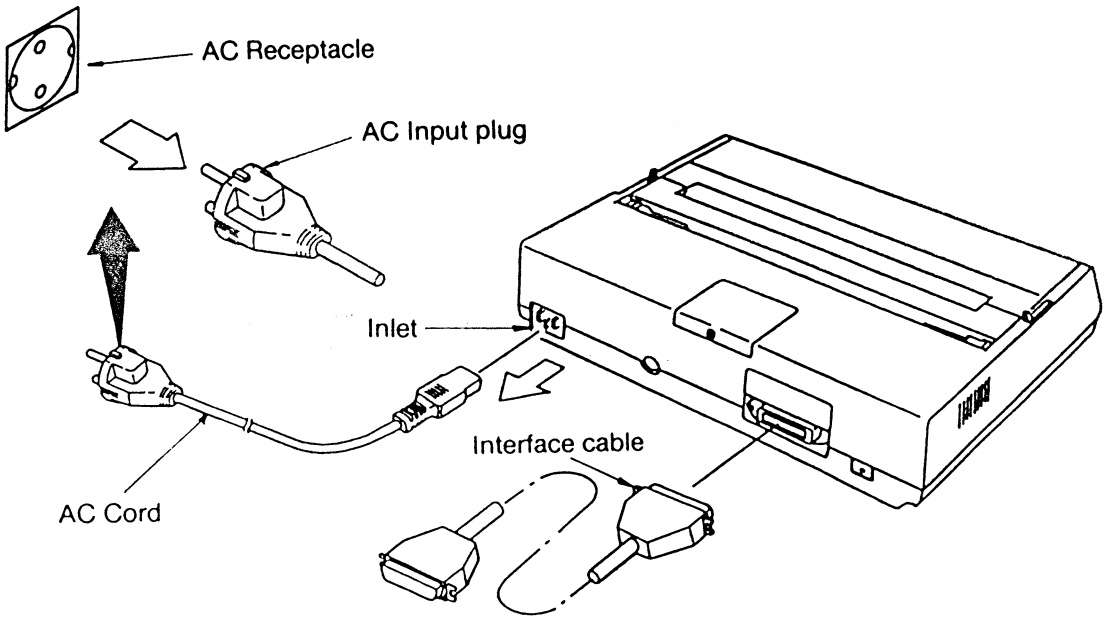
4. ASSEMBLY/DISASSEMBLY

4.1 Precautions for Parts Replacement

(1) Be sure to remove the AC cord and interface cable before disassembly or reassembly:

(a) Turn off the AC power switch, remove the AC input plug on the AC cord from the AC receptacle, then remove the AC cord from the inlet on the printer side.

(b) To reconnect the AC cord, first connect it to the inlet on the printer side, then connect the AC input plug to the AC receptacle.



(2) Do not disassemble the printer as long as it is in good operating condition.

(3) Be careful not to remove parts unless necessary. Disassembly should be kept to a minimum.

(4) Use only the specified maintenance tools.

(5) Disassemble the printer in the specified order. Otherwise, parts may be damaged.

(6) During disassembly temporarily attach small parts, such as screws and collars, in their original places so as not to lose them.

(7) ICs such as the microprocessor, ROM, and RAM units are easily damaged by static electricity. Do not wear gloves that are apt to produce static electricity when handling printed-circuit boards.

(8) Do not place the printed-circuit boards directly on the printer or the floor.

4.2 Maintenance Tools

The tools in table 4-1 are necessary for replacing printed-circuit boards and parts in the field. Different tools may be necessary for other maintenance procedure.

Table 4-1 Maintenance Tools

No.	Tool	Quantity	Purpose
1	Phillips screwdriver No. 1-100	1	2- to 2.6-mm screws
2	Phillips screwdriver No. 2-200	1	3- to 5-mm screws
3	Screwdriver No. 3-100	1	
4	Cutters No. 5H	1	
5	Round Pliers No. 1	1	
6	Tension gauge	1	250 g
7	Metal rod	1	for head gap adjustment
8	Volt-ohm-milliammeter	1	
9	Thickness gauge set	1 1	(1) for head gap adjustment (2) for adjusting gap between space rack and roller

4.3 Disassembly/Reassembly of Procedure

This section explains the assembly replacement procedures according to the following disassembly system.

[Parts Layout]

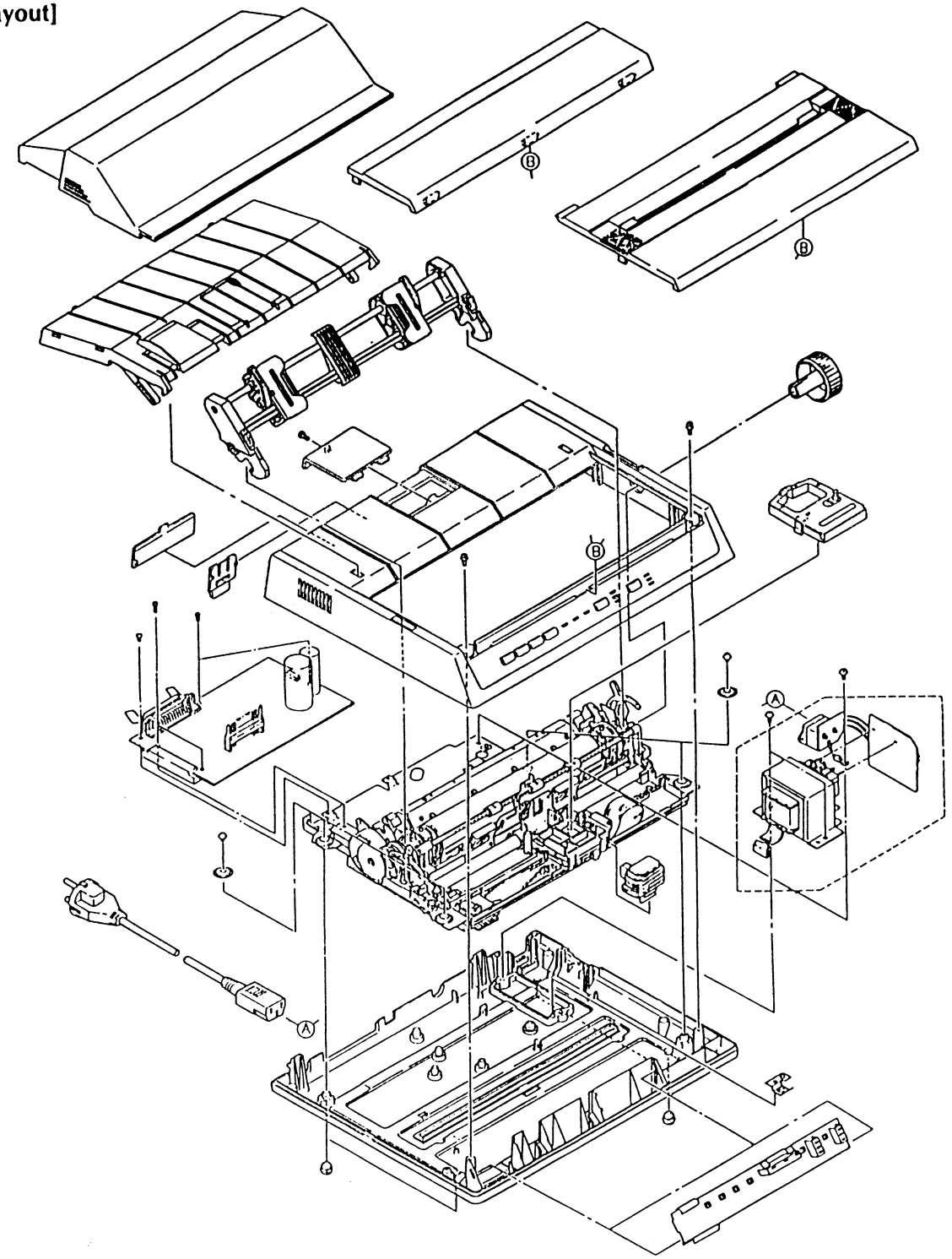
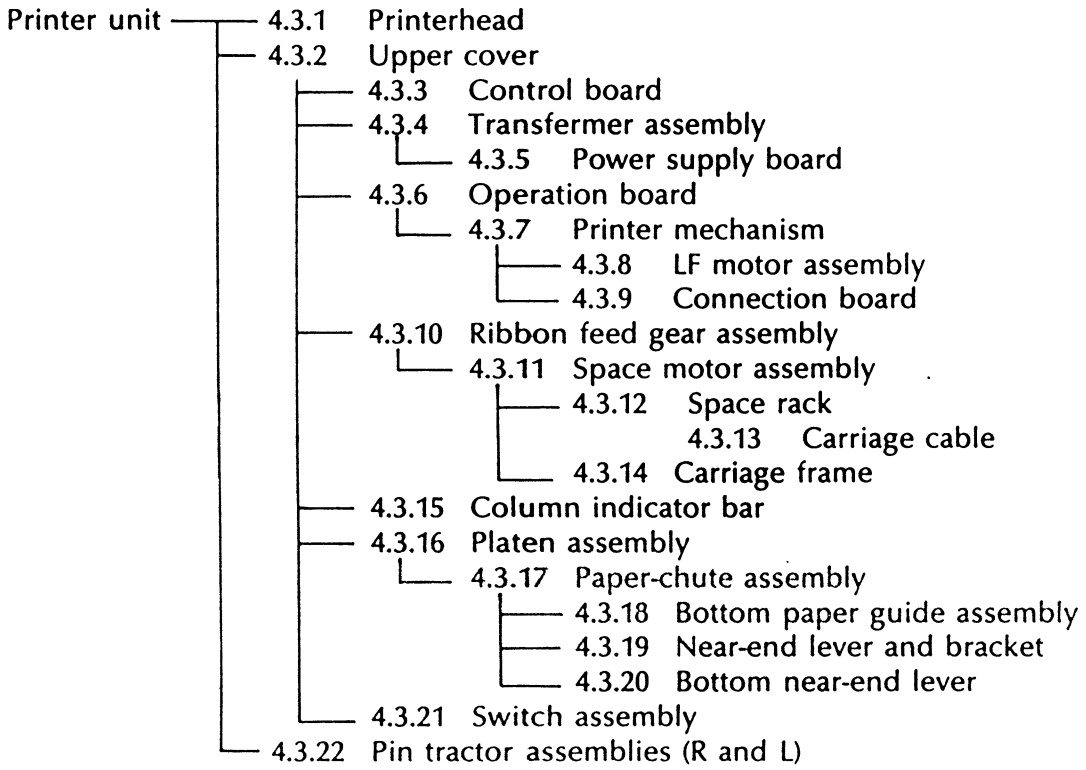


Figure 4-1

[How to Change Parts]

This section explains how to change parts and assemblies appearing in the disassembly diagram below.



4.3.1 Print Head

(1) Turn OFF the AC POWER switch, and remove AC cable ① from the outlet.

Caution: *Print head may be hot after printing.*

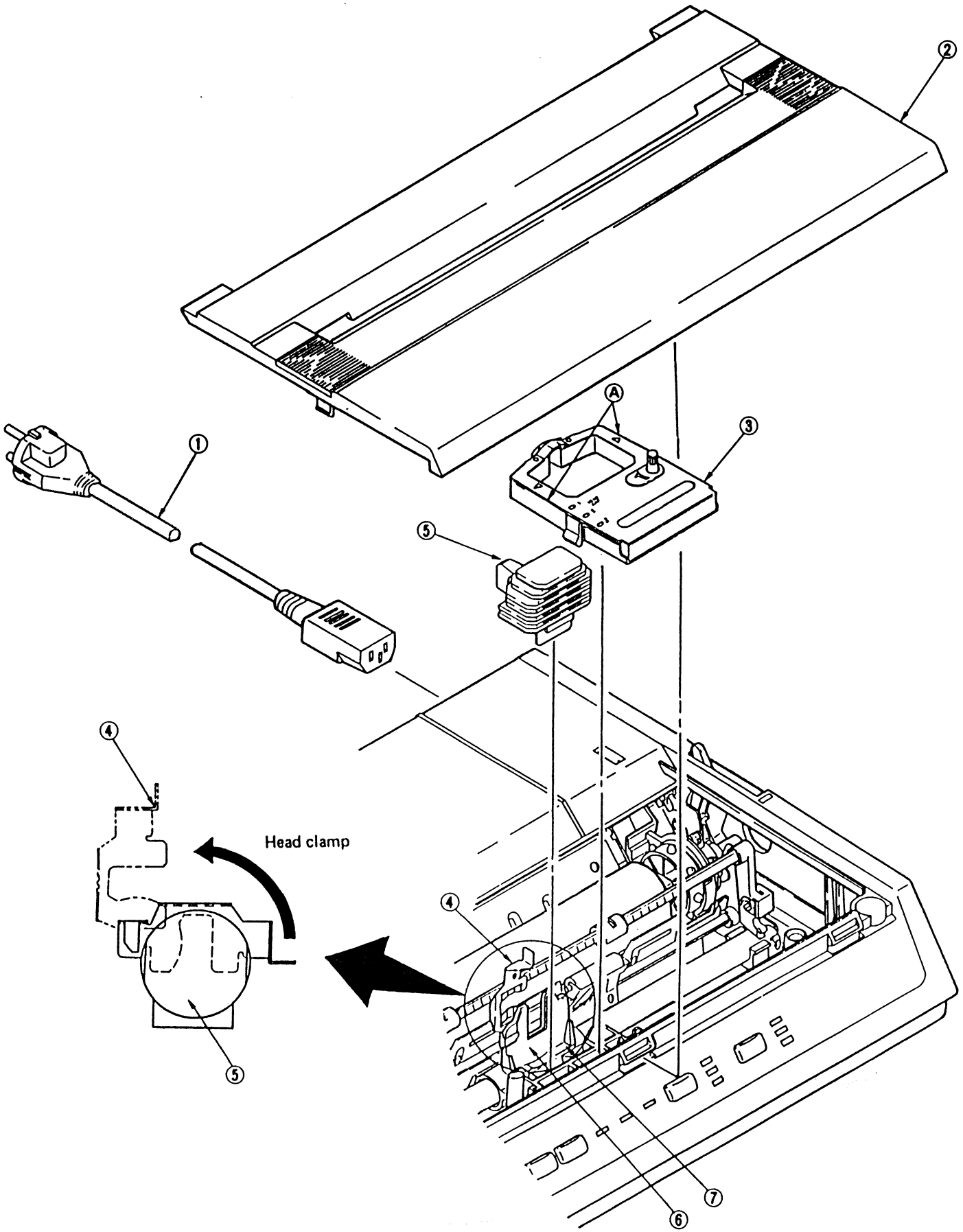
(2) Remove access cover ② by lifting the rear edge of the cover.

(3) Remove ribbon cartridge ③ by firmly holding both sides Ⓐ and lifting.

(4) Raise head clamp ④ and lift print head ⑤ straight up.

(5) For reassembly, reverse the disassembly procedure.

Note: *Insert the print head ⑤ in connector ⑦ while pressing it against the carriage frame ⑥.*


Head clamp

4.3.2 Upper Cover

A) Roll paper stand/Pull tractor assembly.

(1) Turn OFF the AC POWER switch, remove AC cable ① from the outlet, remove interface cable ②, and remove paper.

(2) Remove the acoustic cover and paper separator (if installed).

(3) Remove the pin tractor assembly ④ by depressing the lock lever ③ and tilting it backward (if installed).

(4) Remove screw ⑤, holding the ground strap to the roll paper stand ⑧, and open the sheet guide ⑥.

(5) Remove roll paper shaft ⑦ by pulling upward, then remove roll paper stand ⑧ by tilting it forward (if roll paper stand is installed).

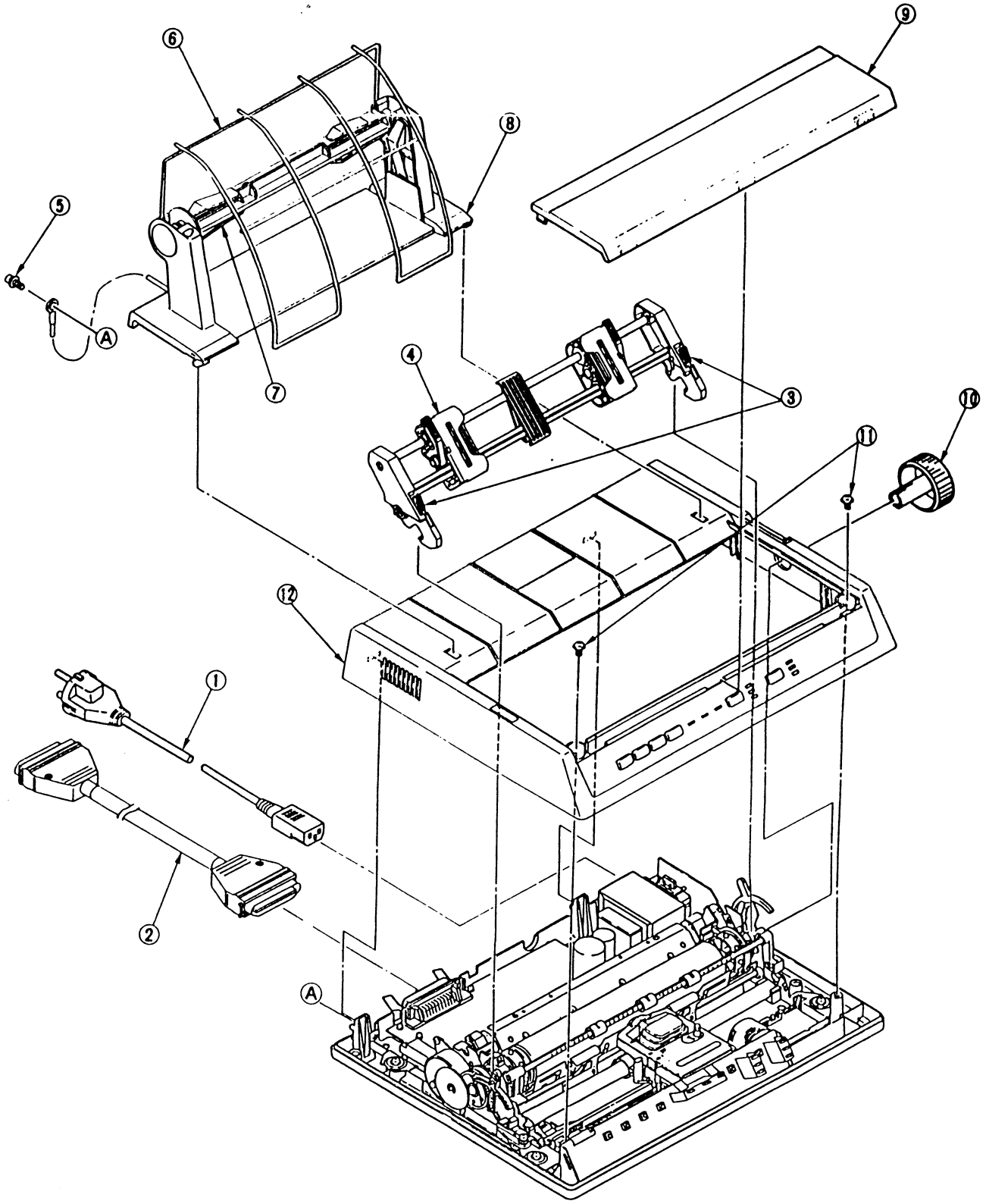
(6) Remove access cover ⑨ by lifting the rear edge.

(7) Pull out platen knob ⑩.

(8) Remove two screws ⑪.

(9) Remove upper cover ⑫ by lifting the front and pushing it backward.

(10) For reassembly, reverse the disassembly procedure.


⑥
⑨
⑧
⑤
Ⓐ
⑦
④
③
⑩
⑪
⑫
①
②
Ⓐ

B) Automatic Cut-Sheet Feeder (C.S.F.)

(1) Turn OFF the AC POWER switch, remove AC cable ①from the outlet, remove interface cable ②, and remove paper.

(2) Remove the acoustic cover and paper separator (if installed).

(3) Remove connector ④of the Cut-Sheet Feeder ③ .

(4) Remove the grooved hooks of the Cut-Sheet Feeder ③ off the platen shafts, and remove the Cut-Sheet Feeder ③ off.

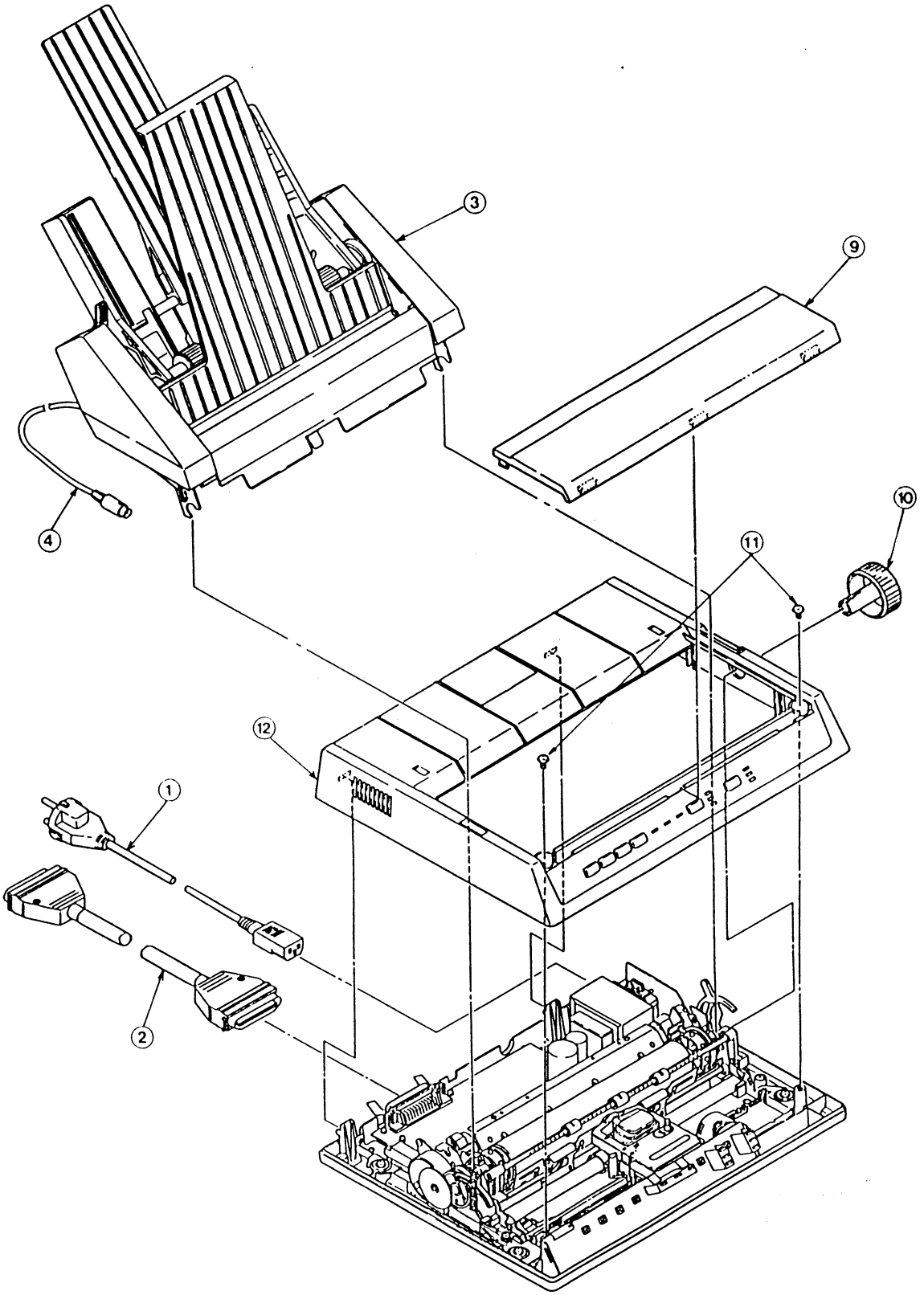
(5) Remove access cover⑨by lifting the rear edge.

(6) Pull out platen knob ⑩ .

(7) Remove two screws ⑪ .

(8) Remove upper cover ⑫ by lifting the front and pushing it backward.

(9) For reassembly, reverse the disassembly procedure.


3
9
4
10
11
12
1
2

4.3.3 Control Board

(1) Remove the upper cover (see 4.3.2).

(2) Remove the serial interface board if installed by removing two screws located on both sides of the interface connector. Remove the interface board by lifting (if installed).

(3) Remove transformer connector ① from the control board ④.

(4) Remove three screws ② and two screws ③.

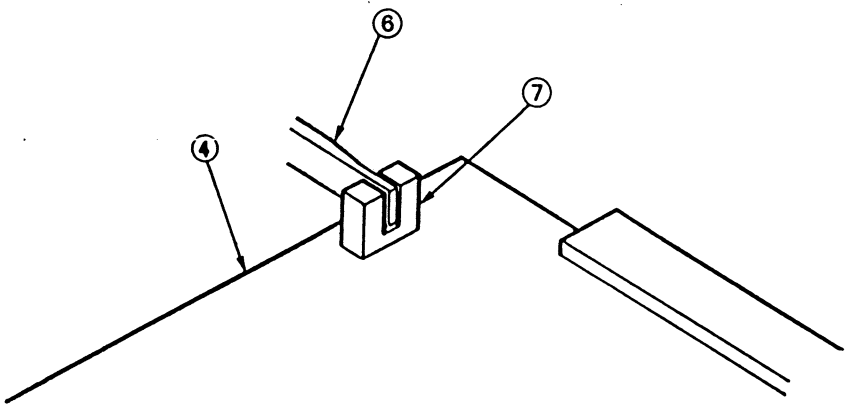
(5) Remove control board ④ by lifting (see note below). Check the paper near-end lever ⑥ when removing the printed-circuit board.

(6) For reassembly, reverse the disassembly procedure.

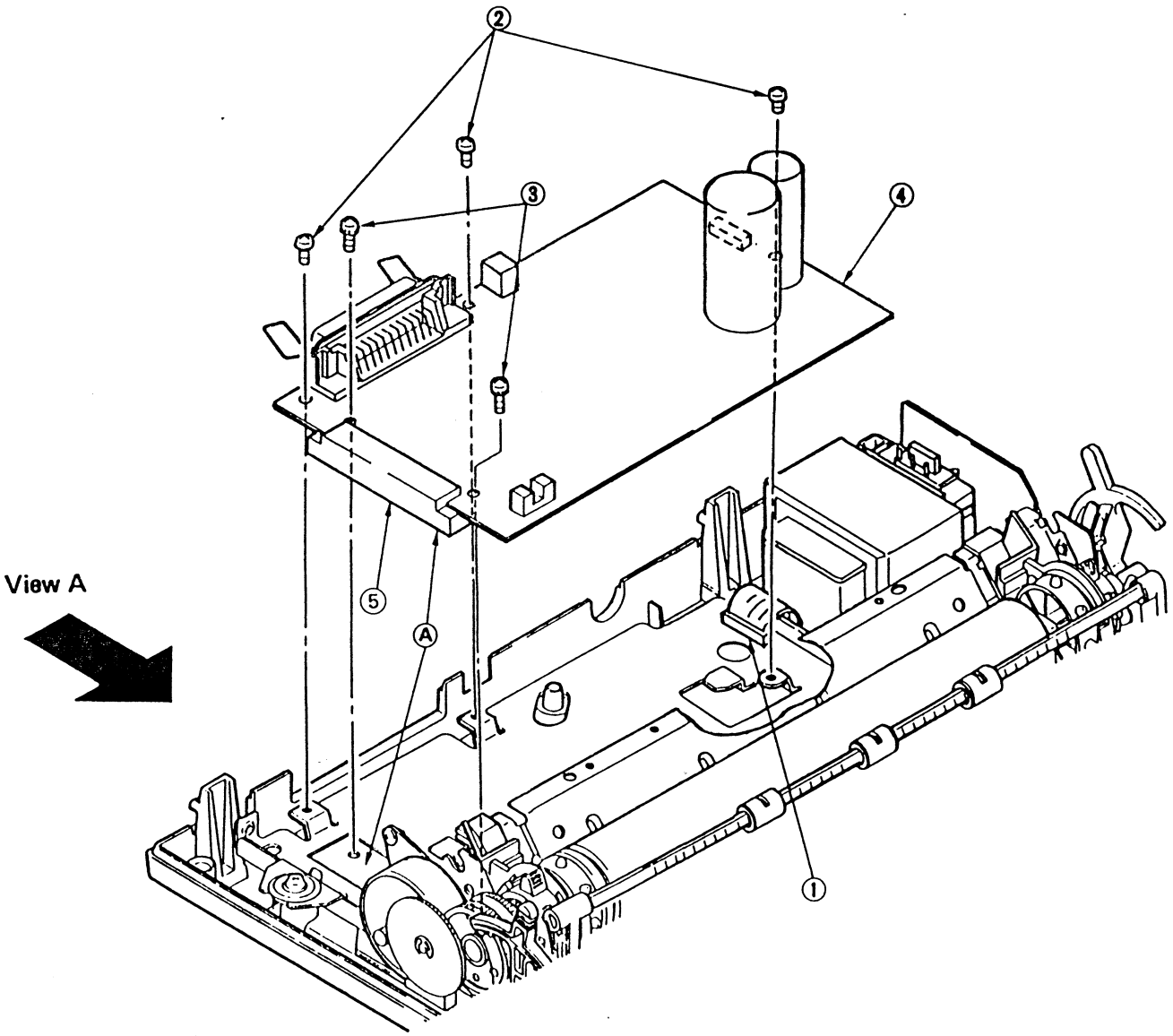
Notes:

1. *Do not touch the terminal (contact)* A *of connector ⑤ directly by hand. Also make sure it is clean.*

2. *When attaching, make sure that paper near-end lever ⑥ is in the photosensor grove ⑦ on the control board ④ .*



View A



View A

4.3.4 Transformer Assembly

(1) Remove the upper cover (see 4.3.2).

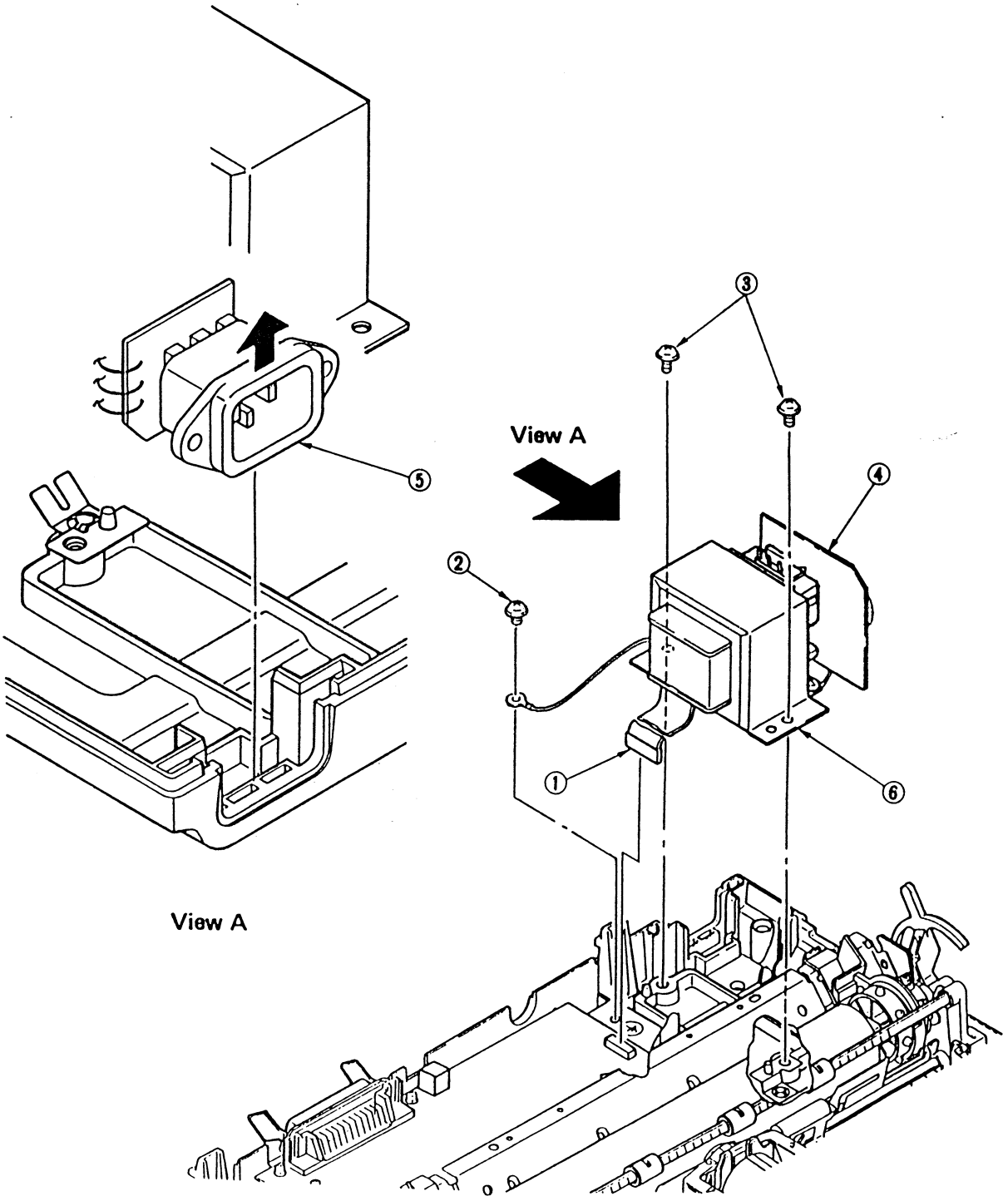
(2) Remove transformer connector ① from the control board.

(3) Remove ground strap screw ②.

(4) Remove two screws ③.

(5) Remove transformer assembly ⑥ together with printed-circuit board ④ and AC cord receptacle ⑤ by lifting.

(6) For reassembly, reverse the disassembly procedure.


View A
View A
1
2
3
4
5
6

4.3.5 Power Supply Board

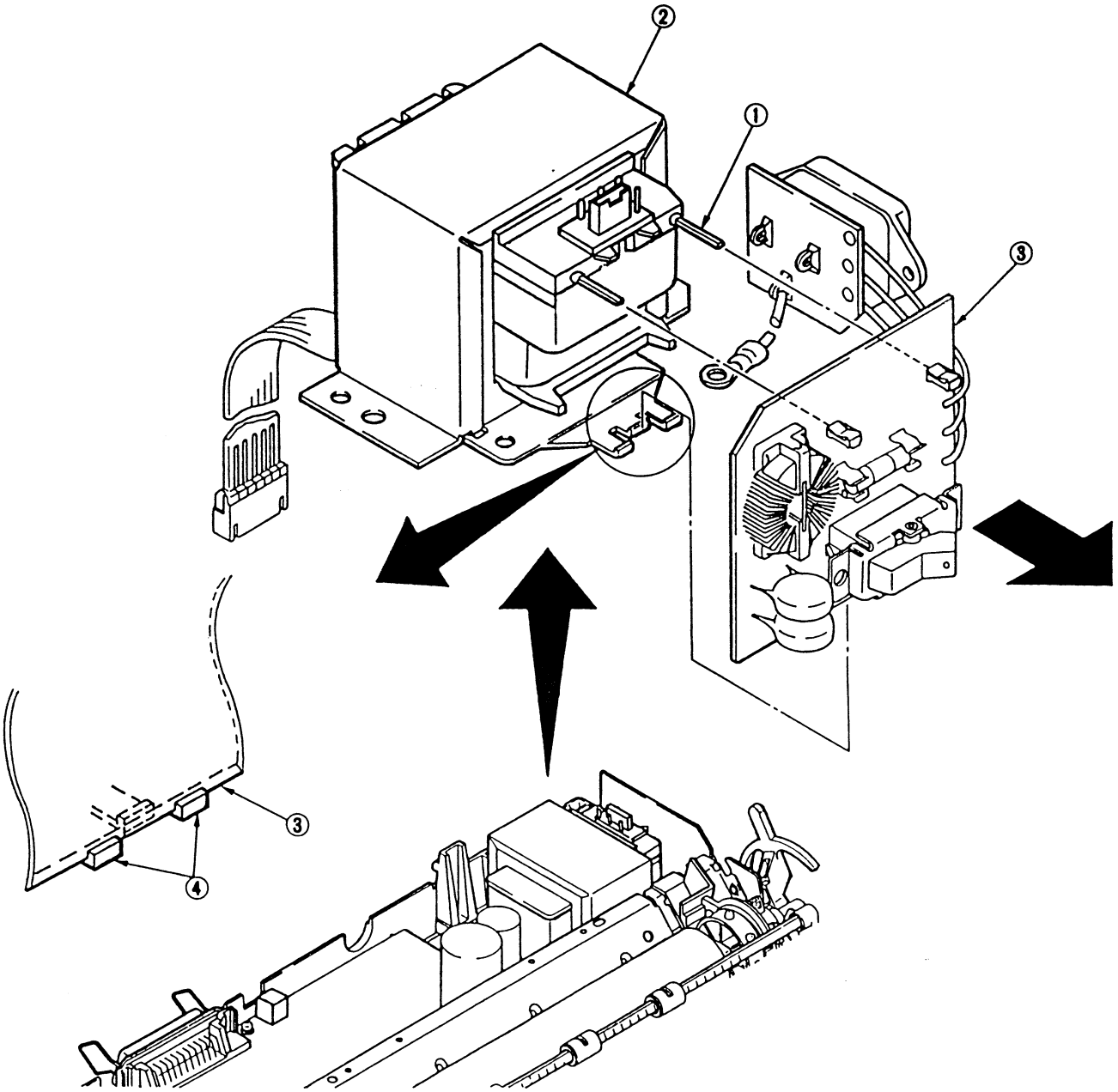
(1) Remove the upper cover (see 4.3.2).

(2) Remove the transformer assembly (see 4.3.4).

(3) Remove power supply board ③ from transformer ② by pulling out connection pins ①.

(4) For reassembly, reverse the disassembly procedure.

Note: *When assembling, set the power supply board ③ along guide ④ before inserting.*



4.3.6 Operation Board

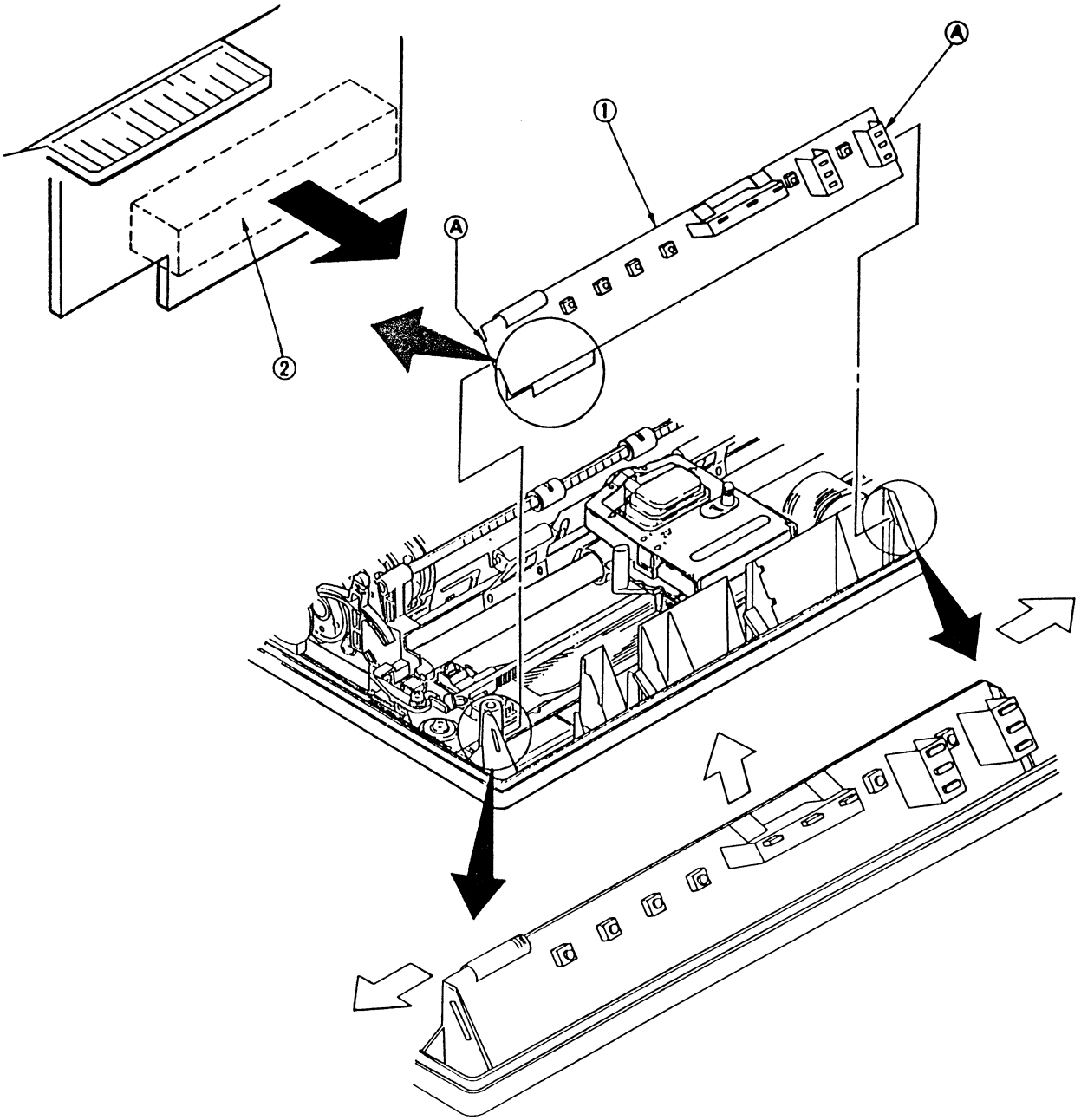
(1) Remove the upper cover (see 4.3.2).

(2) Disengage both ends Ⓐ and remove the operating panel ① by sliding upward.

(3) Remove connector ② from the connection board.

(4) For reassembly, reverse the disassembly procedure.

Note: *Be careful not to damage the cable connecting the switch and the connector.*



4.3.7 Printer Mechanism

(1) Remove the upper cover (see 4.3.2).

(2) Remove connector ① that connects the control board ⑧ and transformer assembly ⑨.

(3) Remove ground strap screw ②.

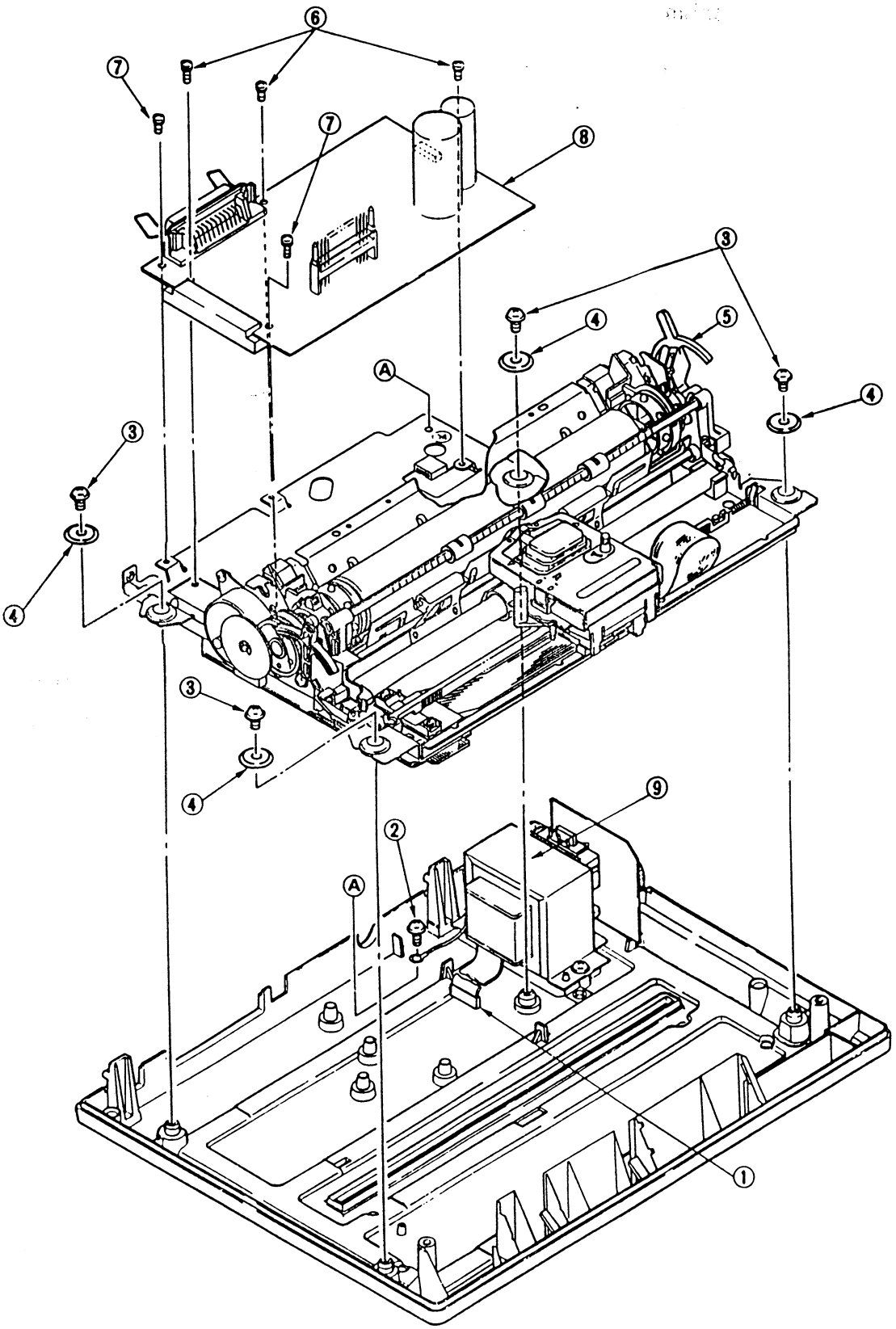
(4) Remove the operation board (see 4.3.6).

(5) Remove four screws ③ and washers ④.

(6) Remove printer mechanism ⑤.

(7) Remove three screws ⑥, two screws ⑦, and control board ⑧.

(8) For reassembly, reverse the disassembly procedure.


6
7
7
8
3
4
5
A
4
3
4
3
4
9
2
A
1

4.3.8 LF Motor Assembly

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

(3) Remove two screws ①.

(4) Remove LF motor assembly ②.

(5) For reassembly, reverse the disassembly procedure.

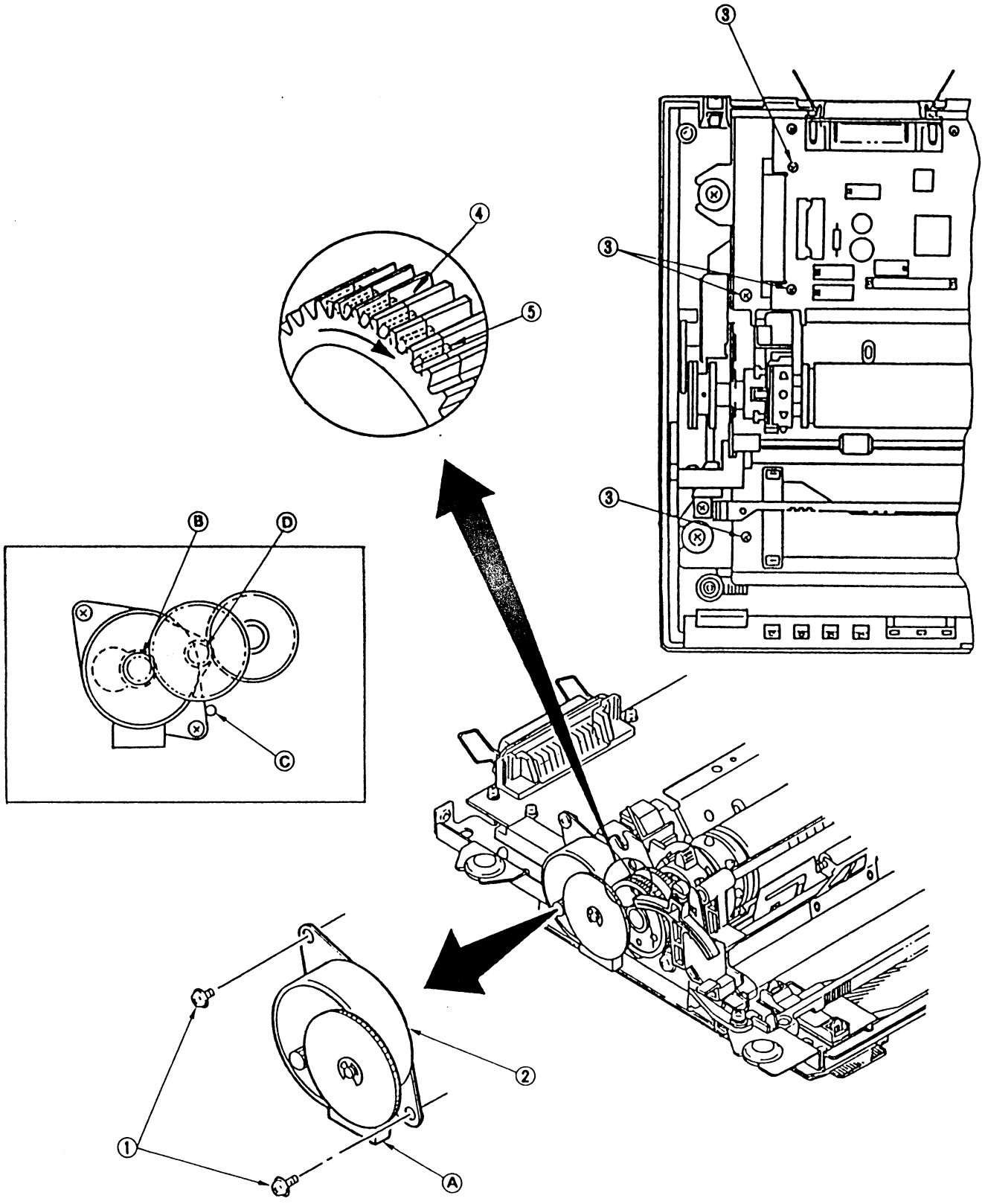
Notes:

1. *Do not touch the LF motor assembly ② terminal (contact) Ⓐ directly by hand or bend it. Also make sure it is clean.*

2. *When assembling, match the teeth of platen gear ④ and bias gear ⑤, then engage the gear at Ⓓ. (Bias gear ⑤ is offset from platen gear ④ by half the width of a tooth. Turn the bias gear half a tooth width in the direction of the arrow to align two teeth.)*

3. *When assembling the LF motor assembly ②, loosen the four screws ③ fastening the connection board and make a space between the base and connection board. Install the LF motor while pressing it against Ⓑ and Ⓒ. Tighten the four screws ③ fastening the connection board.*

4. *After assembling, make sure that the platen gear Ⓓ is correctly engaged and the platen turns smoothly.*


3
4
5
3
3
B
D
C
2
1
A

4.3.9 Connection Board

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

(3) Remove two screws ① and two screws ②.

(4) Move the carriage to left end.

(5) Pull out the carriage cable ④ together with the connection board ③.

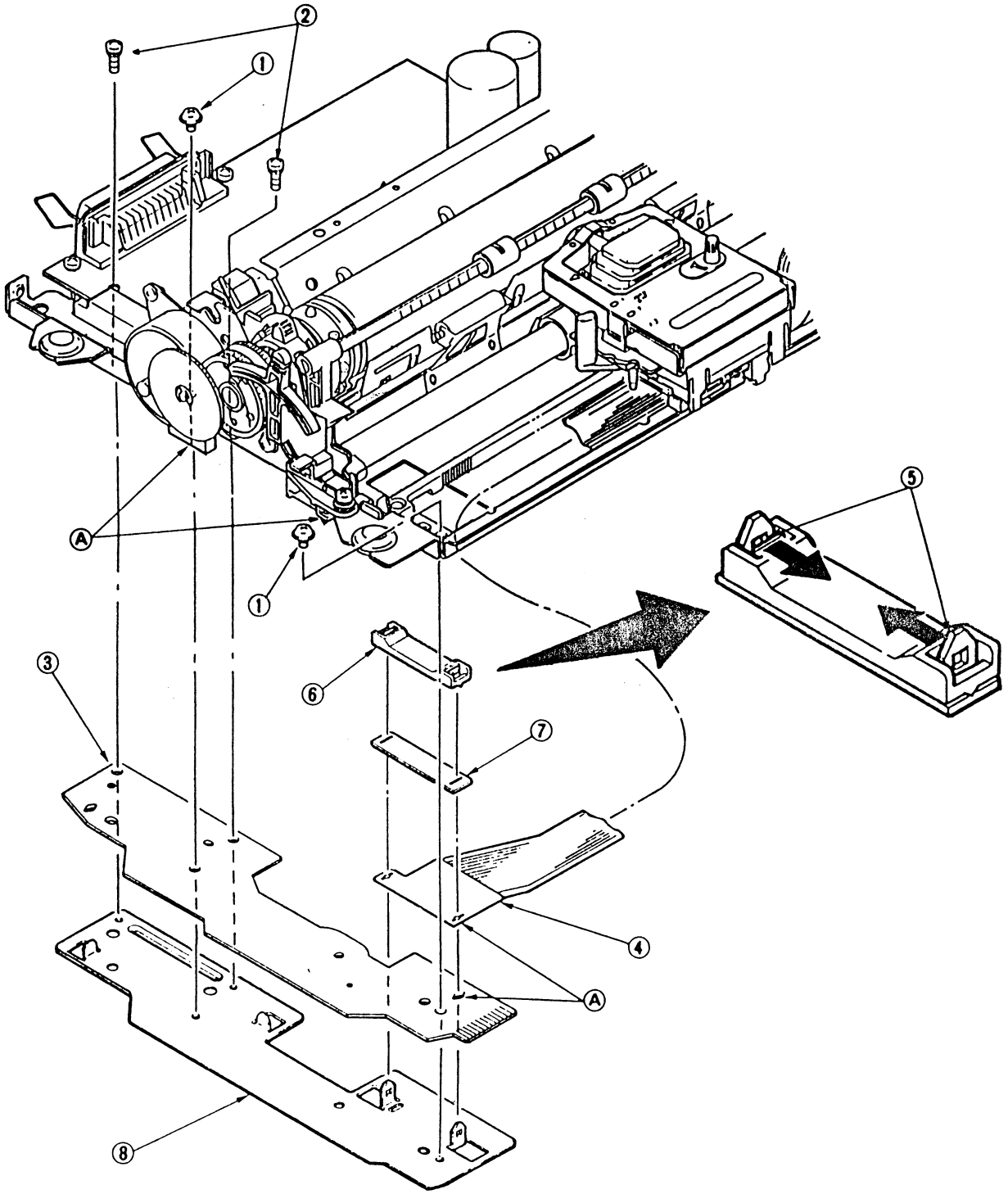
(6) Disengage two tabs ⑤, and remove cord clamp ⑥, contact rubber ⑦, and carriage cable ④.

(7) Remove connection board ③ from circuit support ⑧.

(8) For reassembly, reverse the disassembly procedure.

Notes:

1. *Do not bend carriage cable ④.*
2. *Do not touch any of the terminals (contacts) Ⓐ directly by hand or bend them. Also make sure they are kept clean.*


2
1
A
1
5
6
7
3
4
A
8

4.3.10 Ribbon-feed Gear Assembly

(1) Remove the upper cover (see 4.3.2).

(2) Remove ribbon cartridge ① by firmly holding sides Ⓐ and lifting.

Caution: *Print head may be hot after printing.*

(3) Disengage the two front tabs ③ and two rear tabs ②. Then lift by inserting small flat screwdriver in the slot.

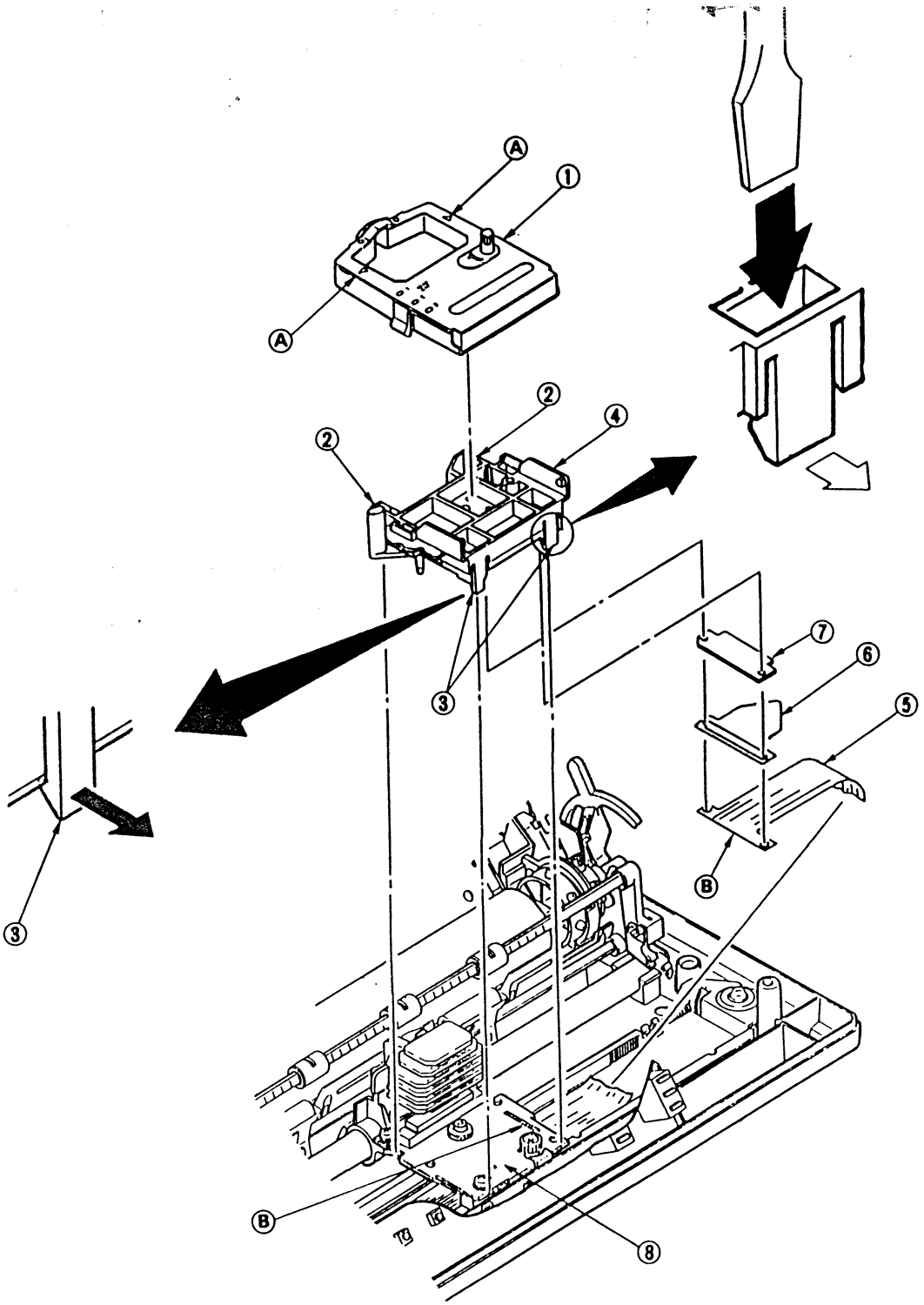
(4) Remove ribbon feed gear assembly ④.

(5) Remove carriage cable ⑤, cable holder ⑥, and contact pressure rubber ⑦ from ribbon feed gear assembly ④.

(6) For reassembly, reverse the disassembly procedure.

Notes:

1. *Do not touch the carriage cable ⑤ and space motor assembly ⑧ terminal (contact) Ⓑ directly by hand. Also make sure that the terminal is clean.*
2. *Make sure carriage cable ⑤ is not bent.*
3. *After installing ribbon feed gear assembly ④, check and adjust the gap between the platen and print head (see 5.1). Also, check and adjust the gap between the space rack and roller.*


A
1
A
2
4
2
3
7
6
5
3
B
B
8

4.3.11 Space Motor Assembly

(1) Remove the upper cover (see 4.3.2).

(2) Remove the print head (see 4.3.1).

(3) Remove the ribbon feed gear assembly (see 4.3.10).

(4) Remove connector ① while checking the concave surface.

(5) Remove three screws ②.

(6) Remove space motor assembly ③.

(7) For reassembly, reverse the disassembly procedure.

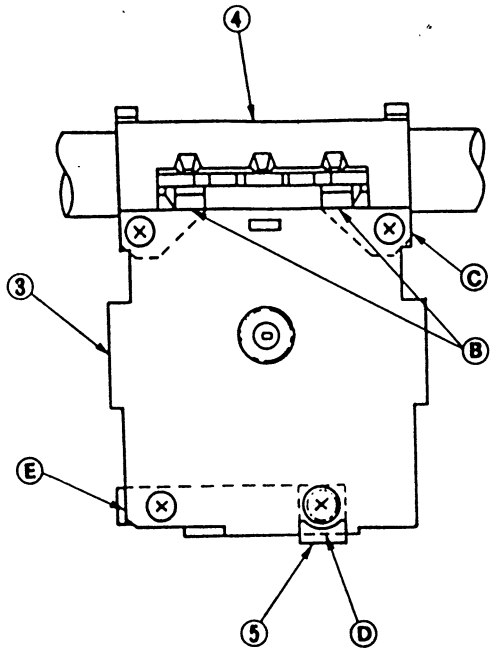
Notes:

1. *Do not touch the space motor assembly ③ terminal (contact) Ⓐ directly by hand. Also make sure that it is clean.*

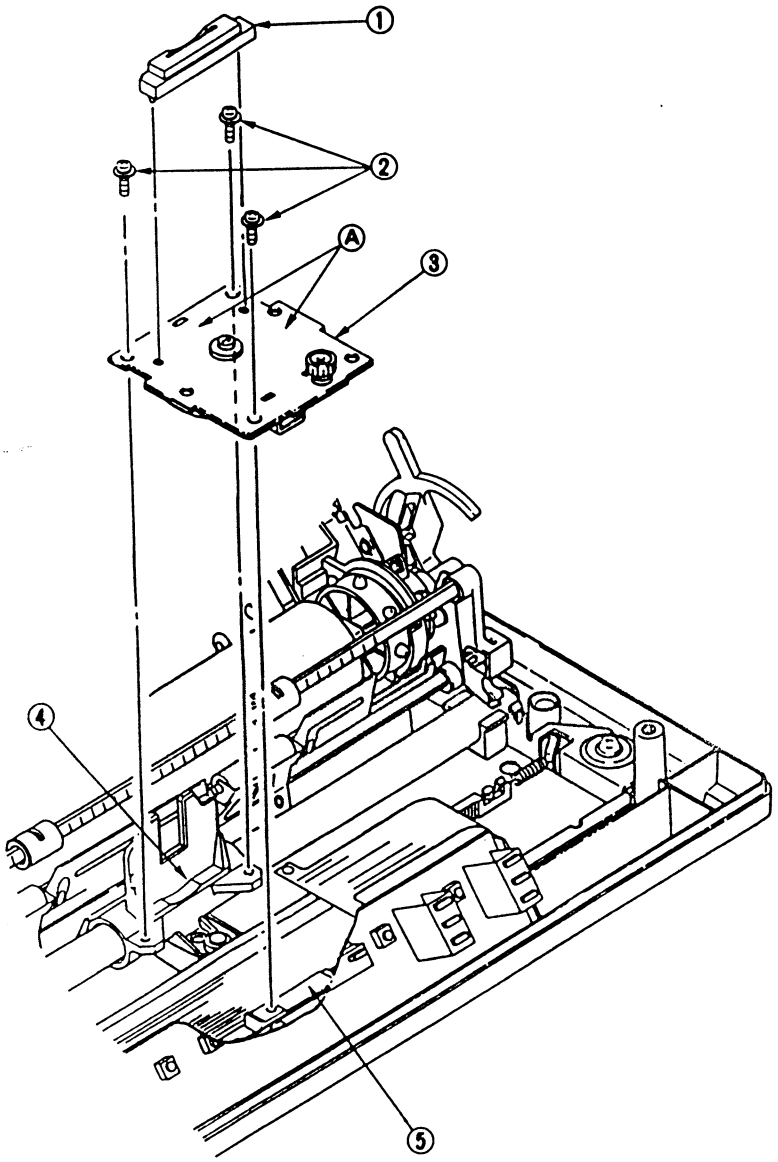
2. *When installing space motor assembly ③, place the Ⓑ side of the assembly close to carriage frame ④, and align the Ⓒ side of the assembly with the corresponding side of the carriage frame. Then adjust the gap between the space rack and roller (see 5.2).*

3. *When installing slider ⑤, place the Ⓓ and Ⓔ parts of the slider close to space motor assembly ③.*

4. *After installing space motor assembly, check and adjust the gap between the platen and print head (see 5.1).*



Top View



4.3.12 Space Rack

(1) Remove the upper cover (see 4.3.2).

(2) Remove the print head (see 4.3.1).

(3) Remove the ribbon feed gear assembly (see 4.3.10).

(4) Remove the space motor assembly (see 4.3.11).

(5) Remove spring ①.

(6) Disengage tab ②.

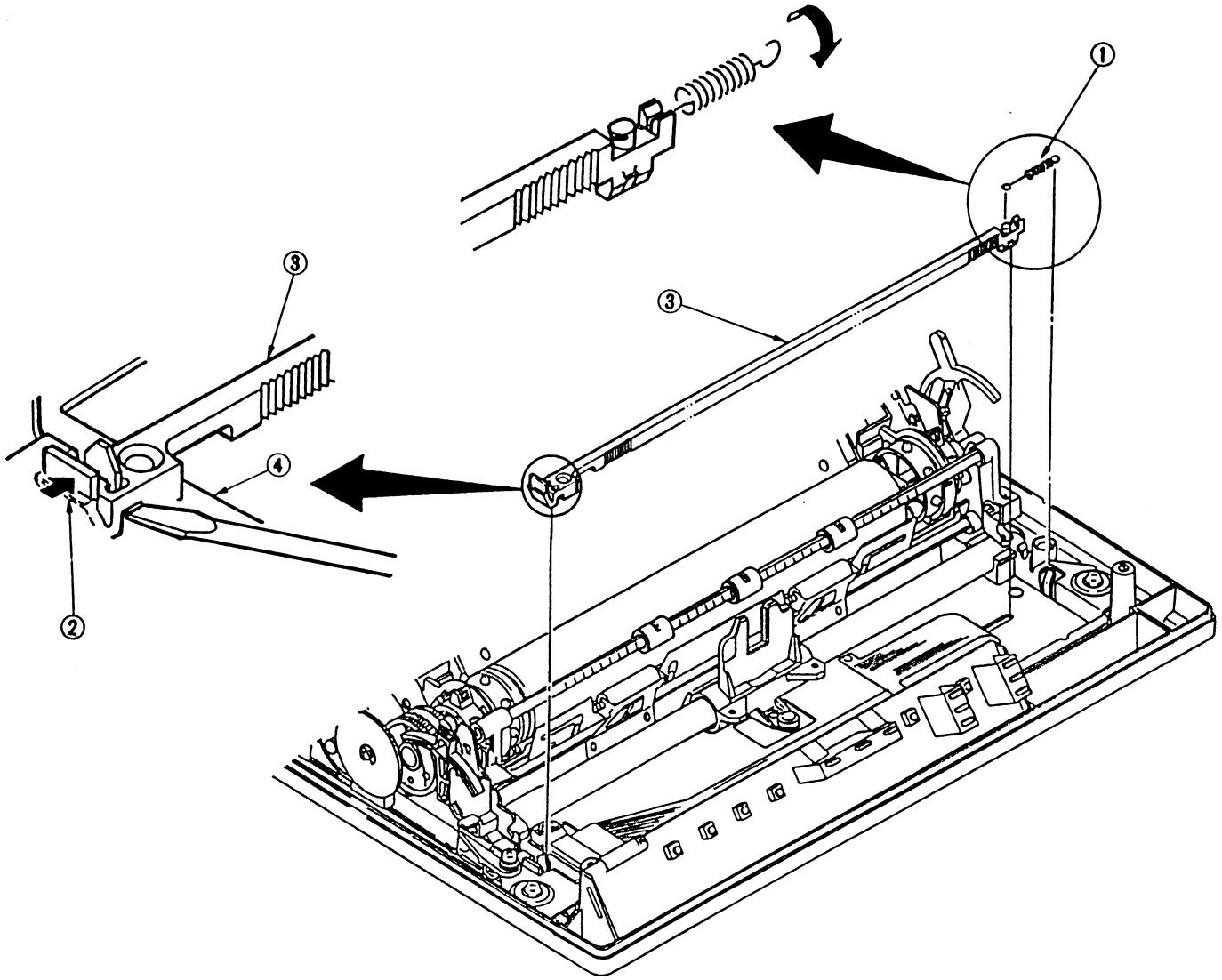
(7) Remove the space rack by inserting a flat screwdriver between space rack ③ and base frame ④ and gently lifting the space rack.

(8) For reassembly, reverse the disassembly procedure.

Notes:

1. *After installing the ribbon feed gear assembly, check and adjust the gap between the platen and print head (see 5.1). Also check and adjust the gap between the space rack and roller (see 5.2).*

2. *When installing spring ①, twist the right end of the spring 90 degrees counterclockwise.*


①
③
③
④
②

4.3.13 Carriage Cable

(1) Remove the upper cover (see 4.3.2).

(2) Remove the print head (See 4.3.1).

(3) Remove the ribbon feed gear assembly (see 4.3.10).

(4) Remove the space motor assembly (see 4.3.11).

(5) Remove the space rack (see 4.3.12).

(6) Unlock the two tabs ① and remove cord clamp ②.

(7) Remove contact rubber ③.

(8) Remove carriage cable ④.

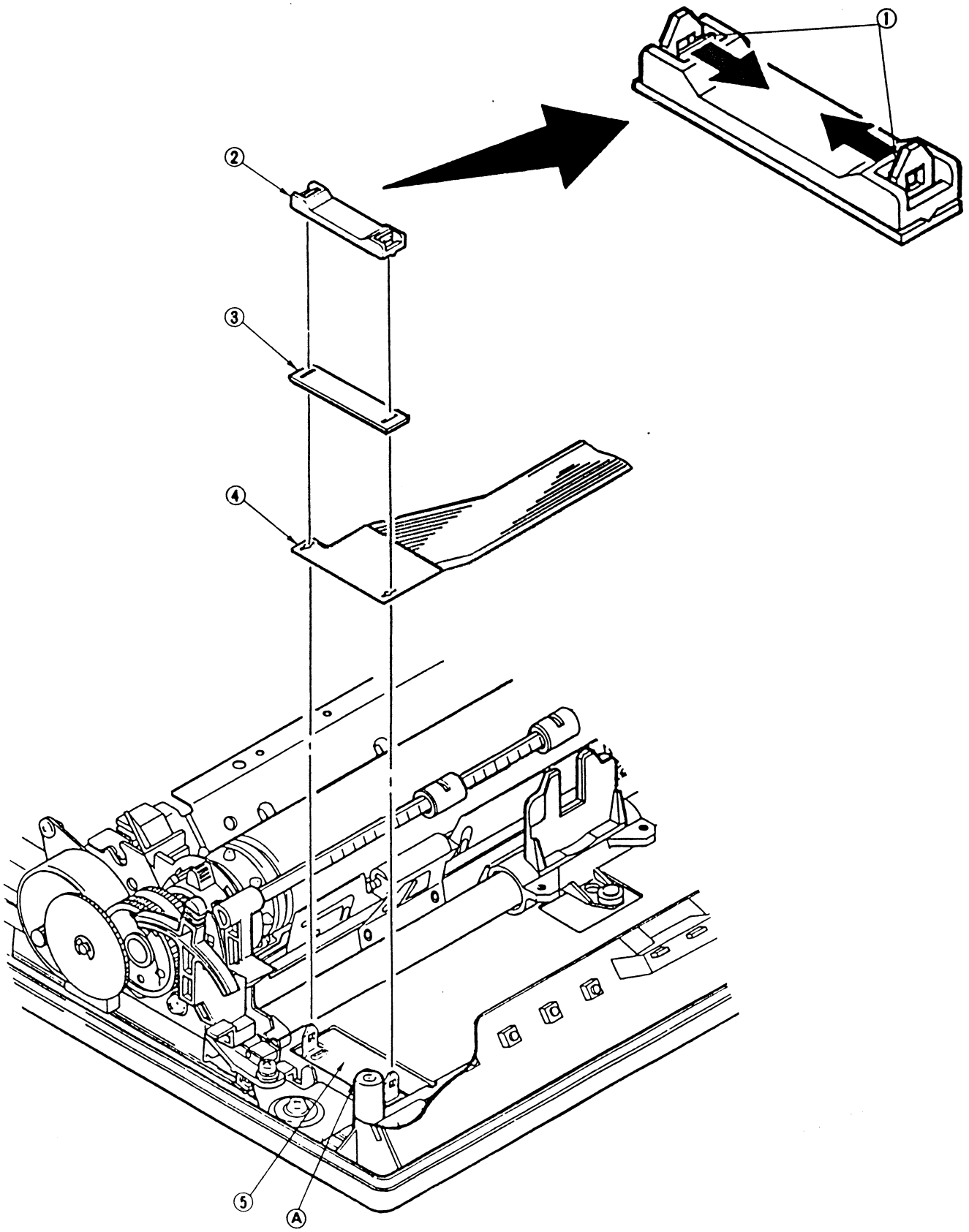
(9) For reassembly, reverse the disassembly procedure.

Notes:

1. *Do not touch the carriage cable ④ and connection board ⑤ terminal (contact) Ⓐ directly by hand. Also make sure it is clean.*

2. *Make sure the carriage cable ④ is not bent.*

3. *After installing the space motor assembly, check and adjust the gap between the platen and print head (see 5.1). Also check and adjust the gap between the space rack and roller (see 5.2).*


①
②
③
④
⑤
Ⓐ

4.3.14 Carriage Frame

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

(3) Remove the column indicator bar (see 4.3.15).

(4) Remove the print head (see 4.3.1).

(5) Remove the ribbon feed gear assembly (see 4.3.10).

(6) Remove the space motor assembly (see 4.3.11).

(7) Remove the switch assembly (see 4.3.21).

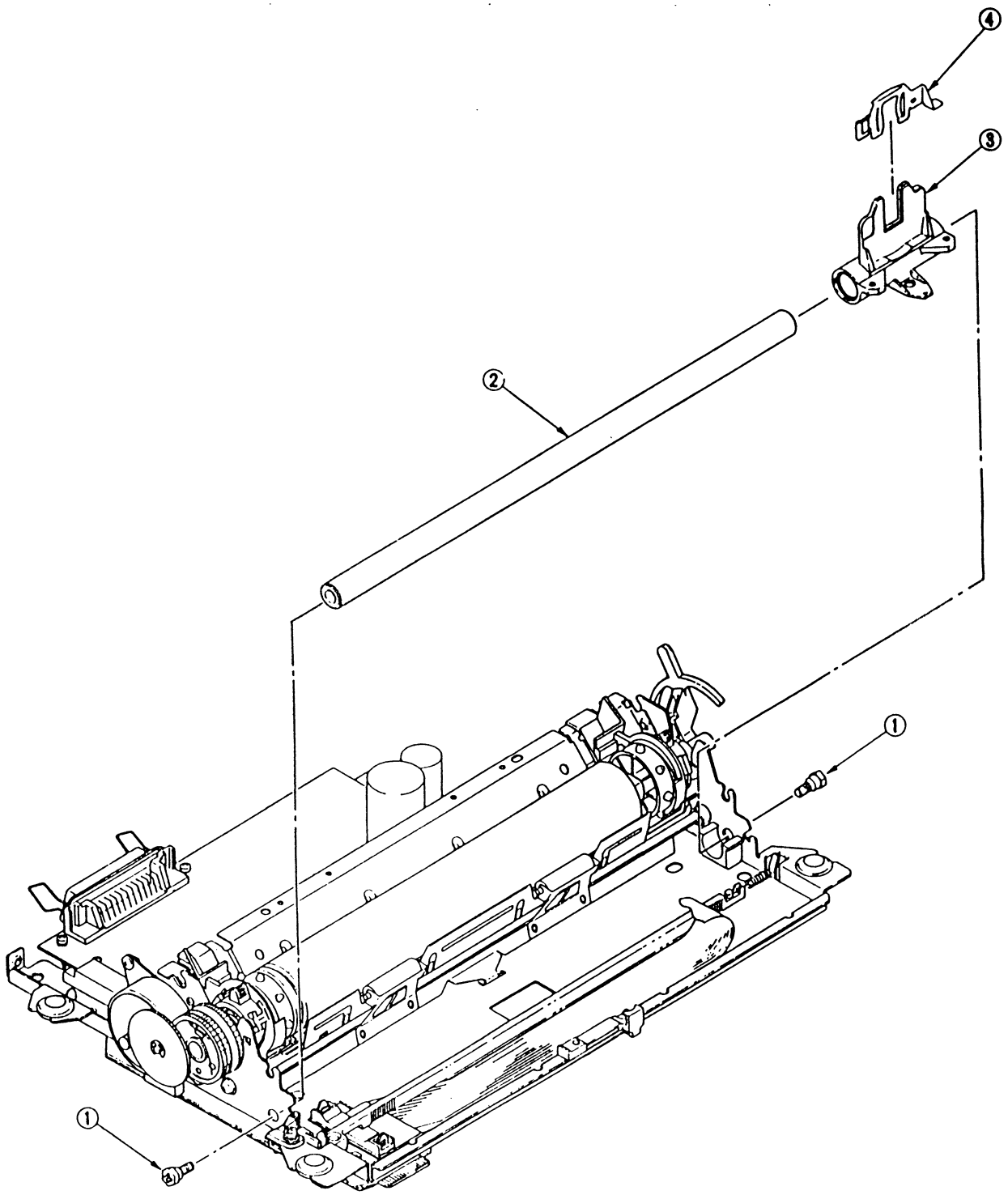
(8) Remove two screws on both sides ①.

(9) Remove the carriage shaft ② together with carriage frame ③.

(10) Remove the carriage frame ③ from carriage shaft ②.

(11) Remove the head clamp ④.

(12) For reassembly, reverse the disassembly procedure.


④
③
②
①
①

4.3.15 Column Indicator Bar

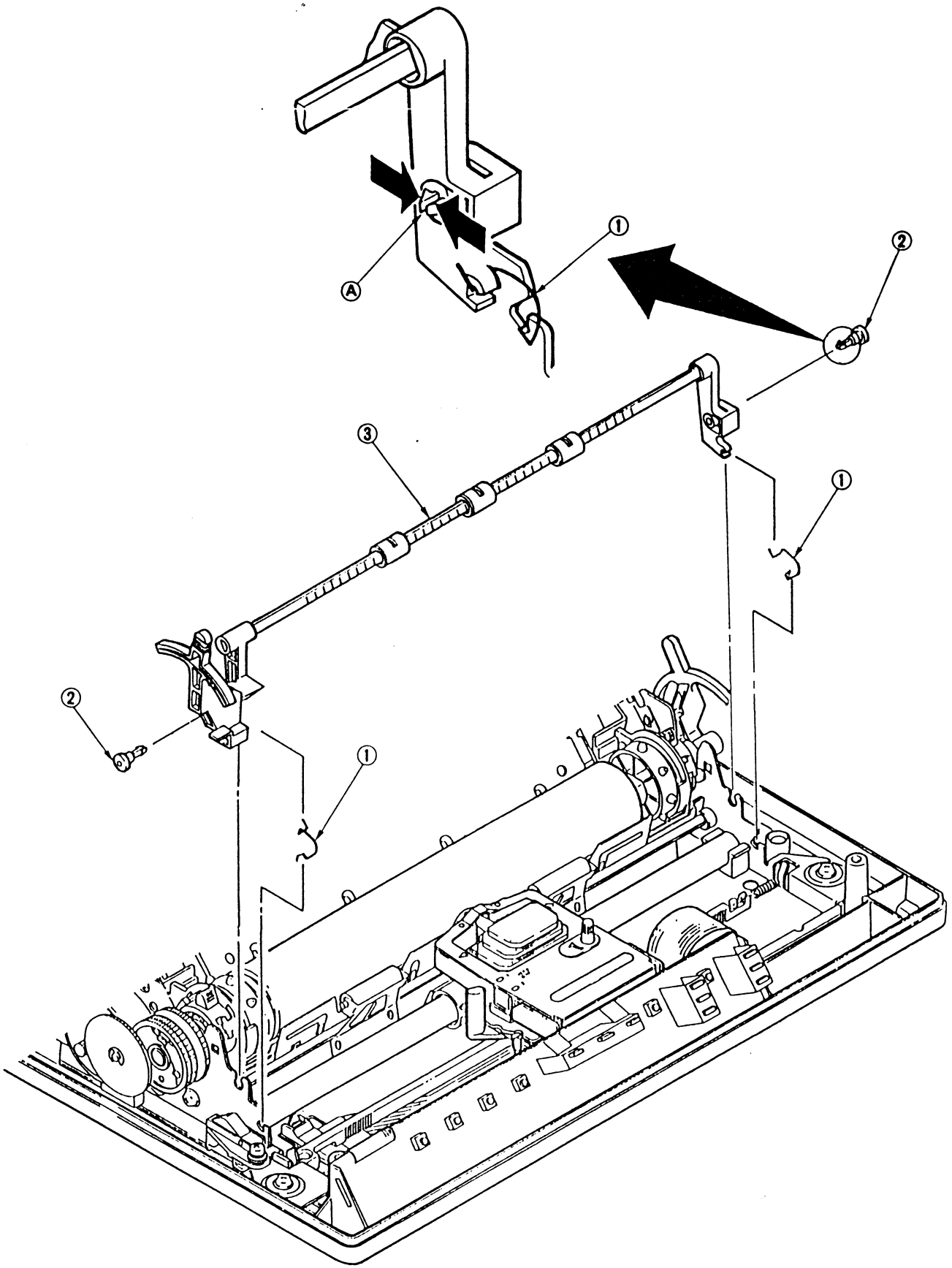
(1) Remove the upper cover (see 4.3.2).

(2) Remove two springs ①

(3) Remove two push shafts ② by squeezing the pins Ⓐ in the direction of the arrow.

(4) Remove column indicator bar ③.

(5) For reassembly, reverse the disassembly procedure.


A
1
2
3
1
2
1

4.3.16 Platen Assembly

(1) Remove the upper cover (see 4.3.2).

(2) Disengage four tabs ① by gently pushing tabs from side plate Ⓑ on each side.

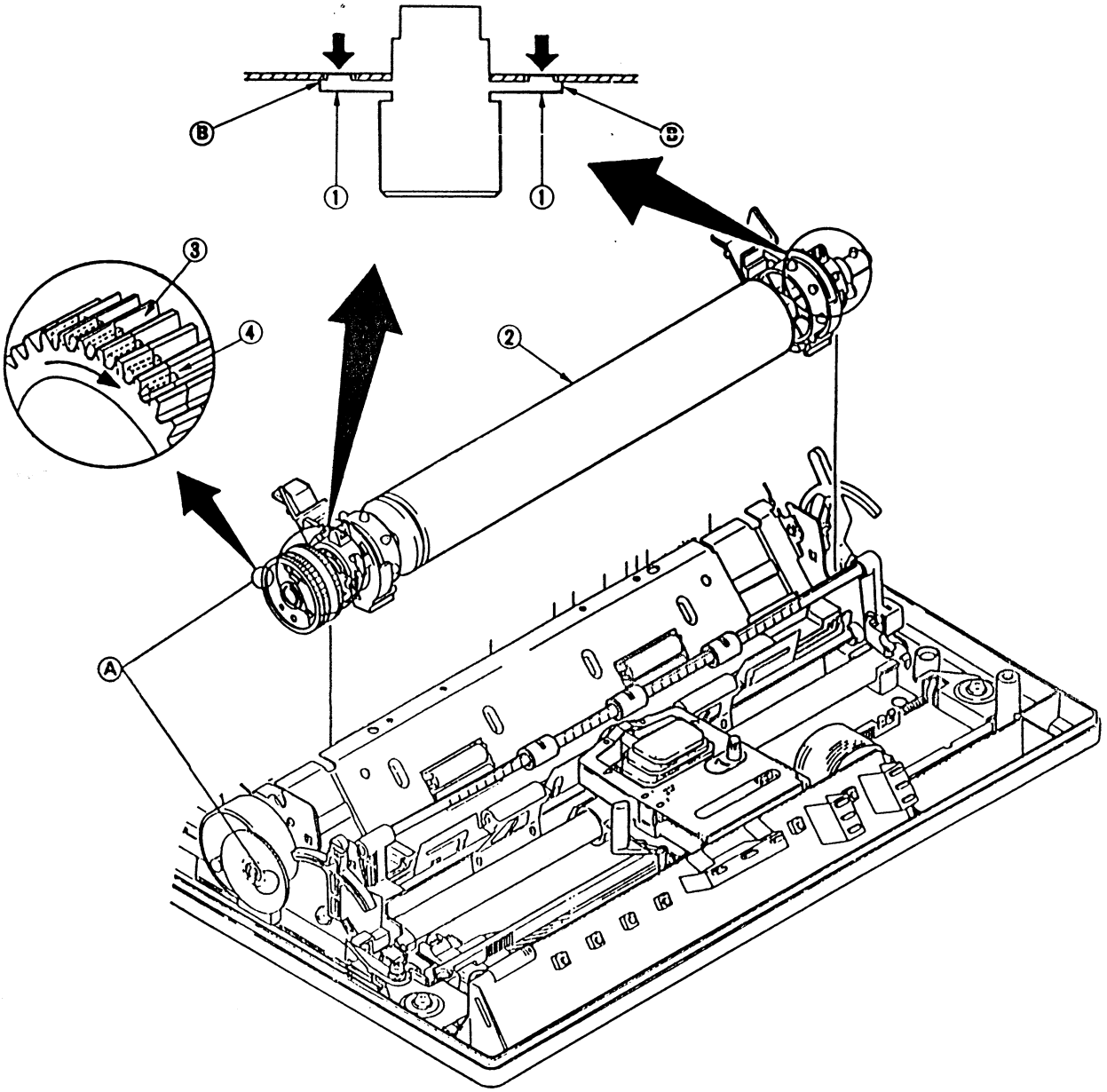
(3) Remove platen assembly ②.

(4) For reassembly, reverse the disassembly procedure.

Notes:

1. *When assembling, match the teeth of platen gear ③ and bias gear ④, then engage the gear at Ⓐ. (Bias gear ④ is offset from platen gear ③ by half the width of a tooth. Turn the bias gear half a tooth width in the direction of the arrow to align two teeth.)*

2. *After assembling, make sure that the platen gear is correctly engaged and the platen turns smoothly.*


B
B
1
1
3
4
2
A

4.3.17 Paper-chute Assembly

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

(3) Remove the LF motor assembly (see 4.3.8).

(4) Remove the platen assembly (see 4.3.16).

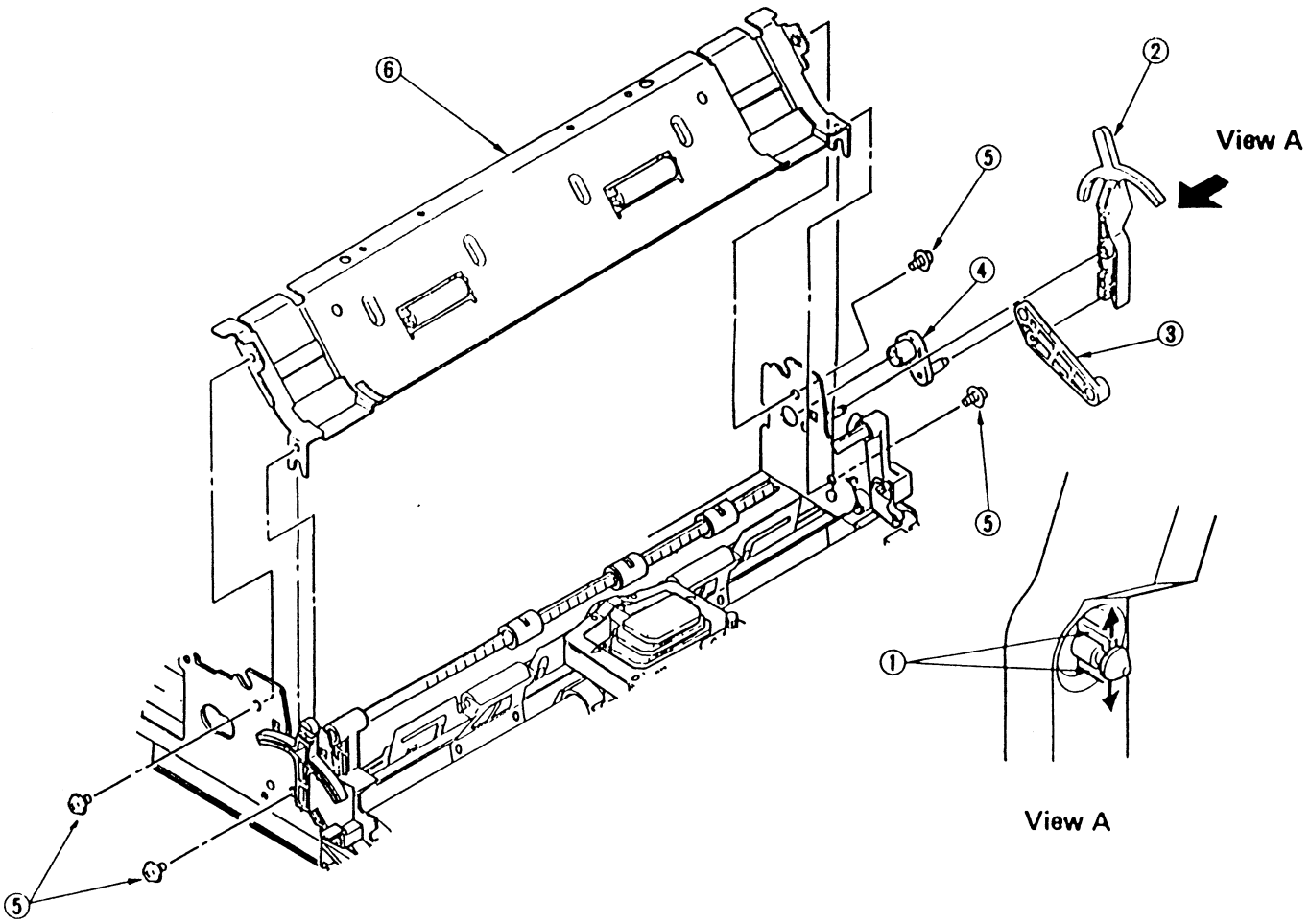
(5) Open two tabs ① with a flat screwdriver, then remove paper lock release lever ②. (Be careful with the tabs because they are very small.)

(6) Disengage middle release link ③ from rear release link ④, and remove rear release link ④.

(7) Remove four screws ⑤ (two on each side).

(8) Remove paper-chute assembly ⑥.

(9) For reassembly, reverse the disassembly procedure.



4.3.18 Bottom Paper Guide Assembly

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

(3) Remove the LF motor assembly (see 4.3.8).

(4) Remove the platen assembly (see 4.3.16).

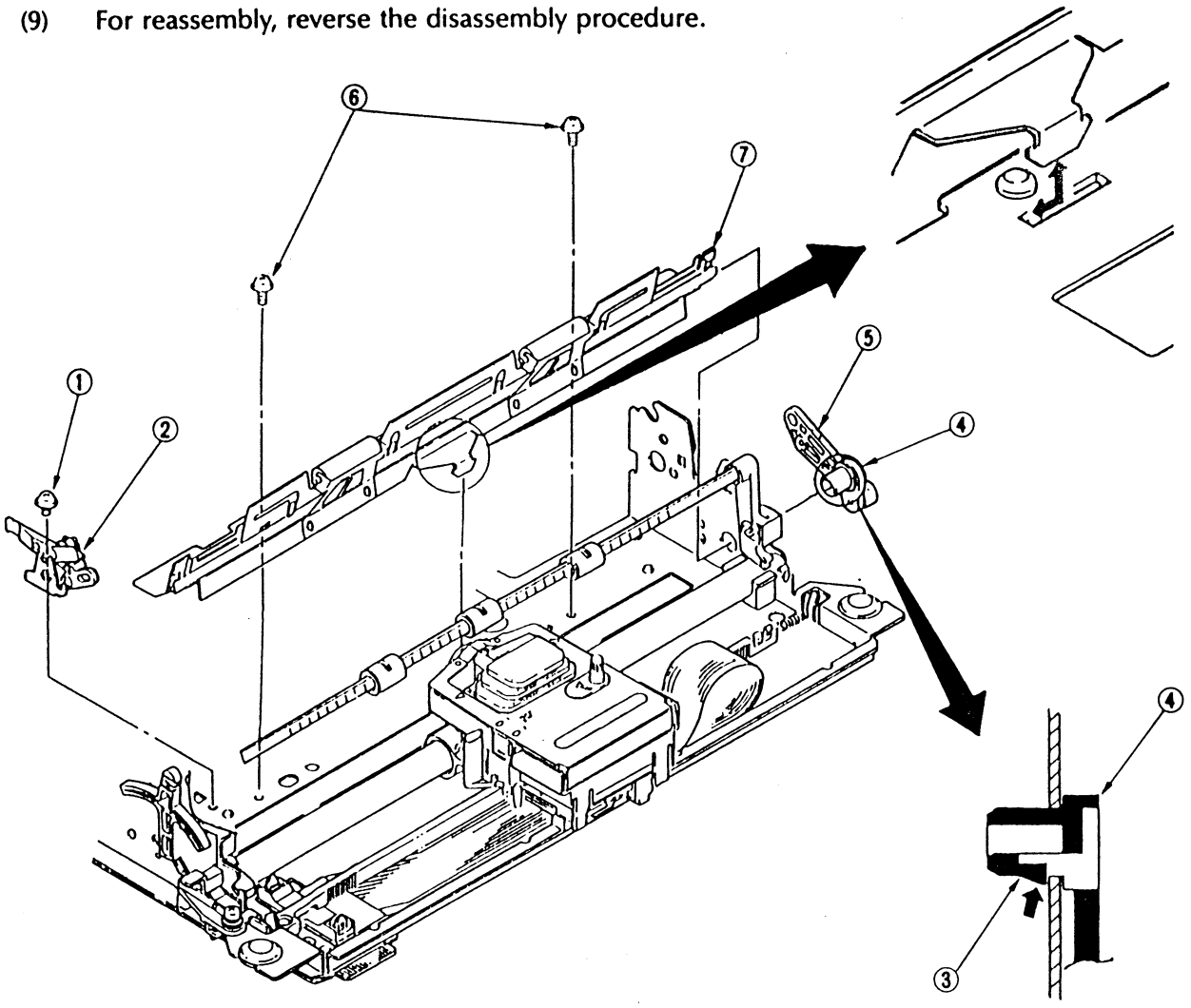
(5) Remove the paper-chute assembly (see 4.3.17).

(6) Remove screw ①, then remove near-end lever assembly ②.

(7) Close tab ③ and remove front release link ④ together with middle release link ⑤.

(8) Remove two screws ⑥ and remove bottom paper guide assembly ⑦.

(9) For reassembly, reverse the disassembly procedure.



4.3.19 Near-end Lever and Bracket

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

(3) Remove the LF motor assembly (see 4.3.8).

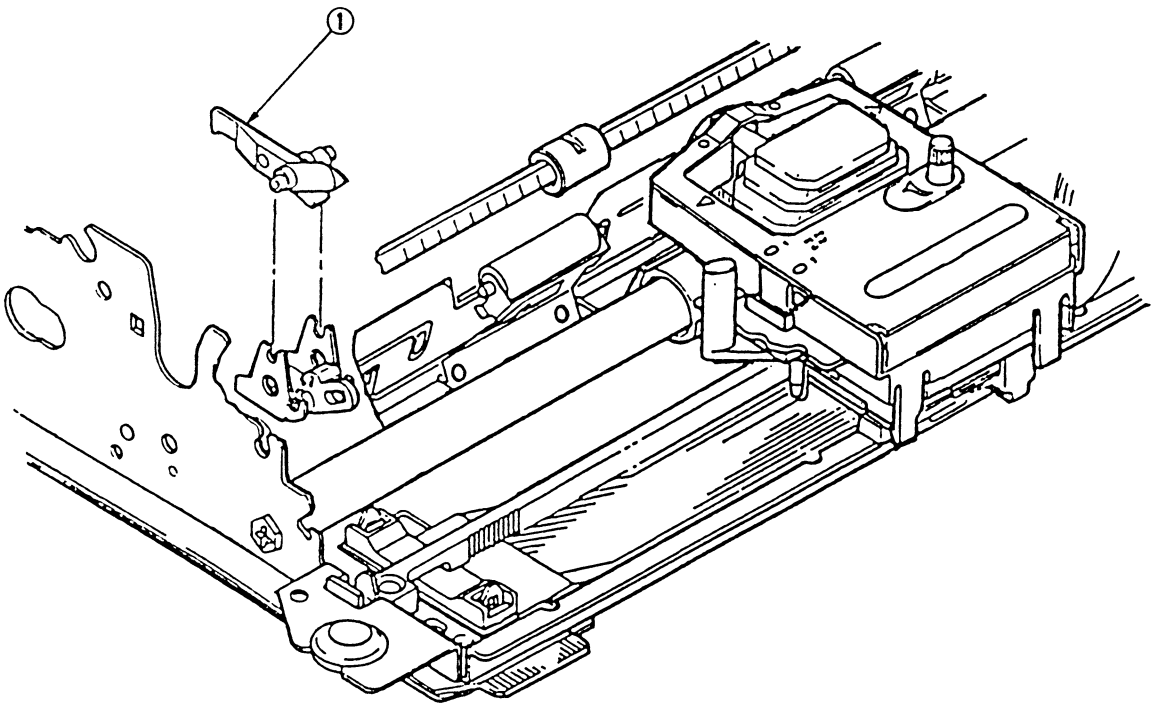
(4) Remove the platen assembly (see 4.3.16).

(5) Remove the paper-chute assembly (see 4.3.17).

(6) Remove near-end lever ①.

(7) For reassembly, reverse the disassembly procedure.

Note: *Remove the printed-circuit board (see 4.3.3)by lifting to remove just the near-end lever.*



4.3.20 Bottom Near-end Lever

(1) Remove the upper cover (see 4.3.2).

(2) Remove the printer mechanism. (See 4.3.7. The control board step 7 need not be removed.)

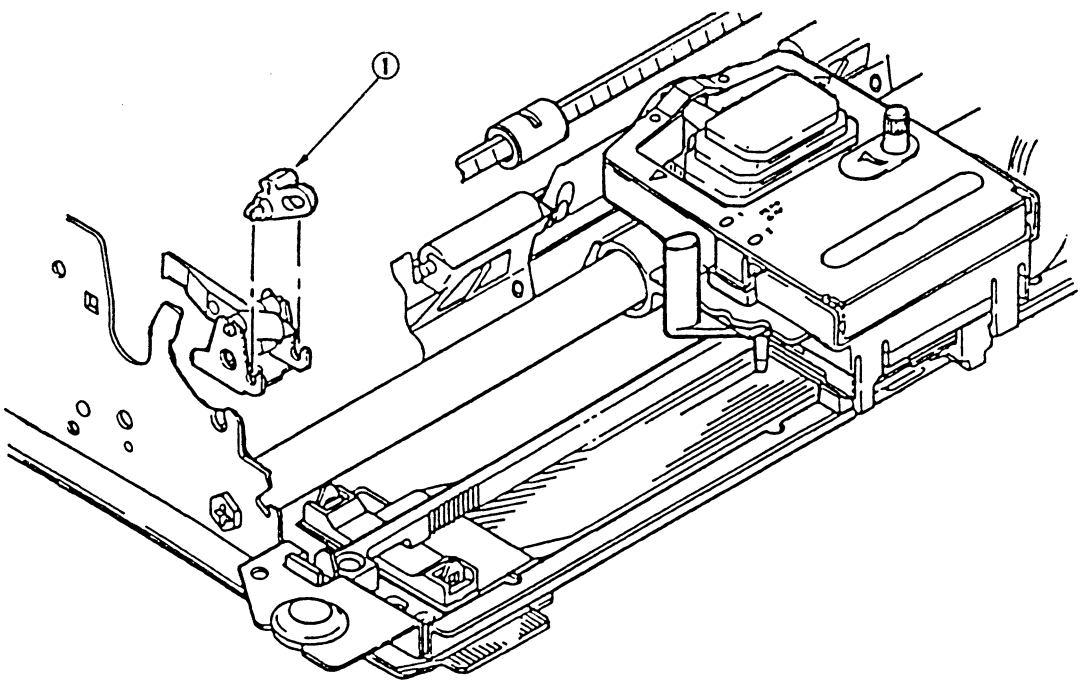
(3) Remove the LF motor assembly (see 4.3.8).

(4) Remove the platen assembly (see 4.3.16).

(5) Remove the paper-chute assembly (see 4.3.17).

(6) Remove bottom near-end lever ①.

(7) For reassembly, reverse the disassembly procedure.



4.3.21 Switch Assembly

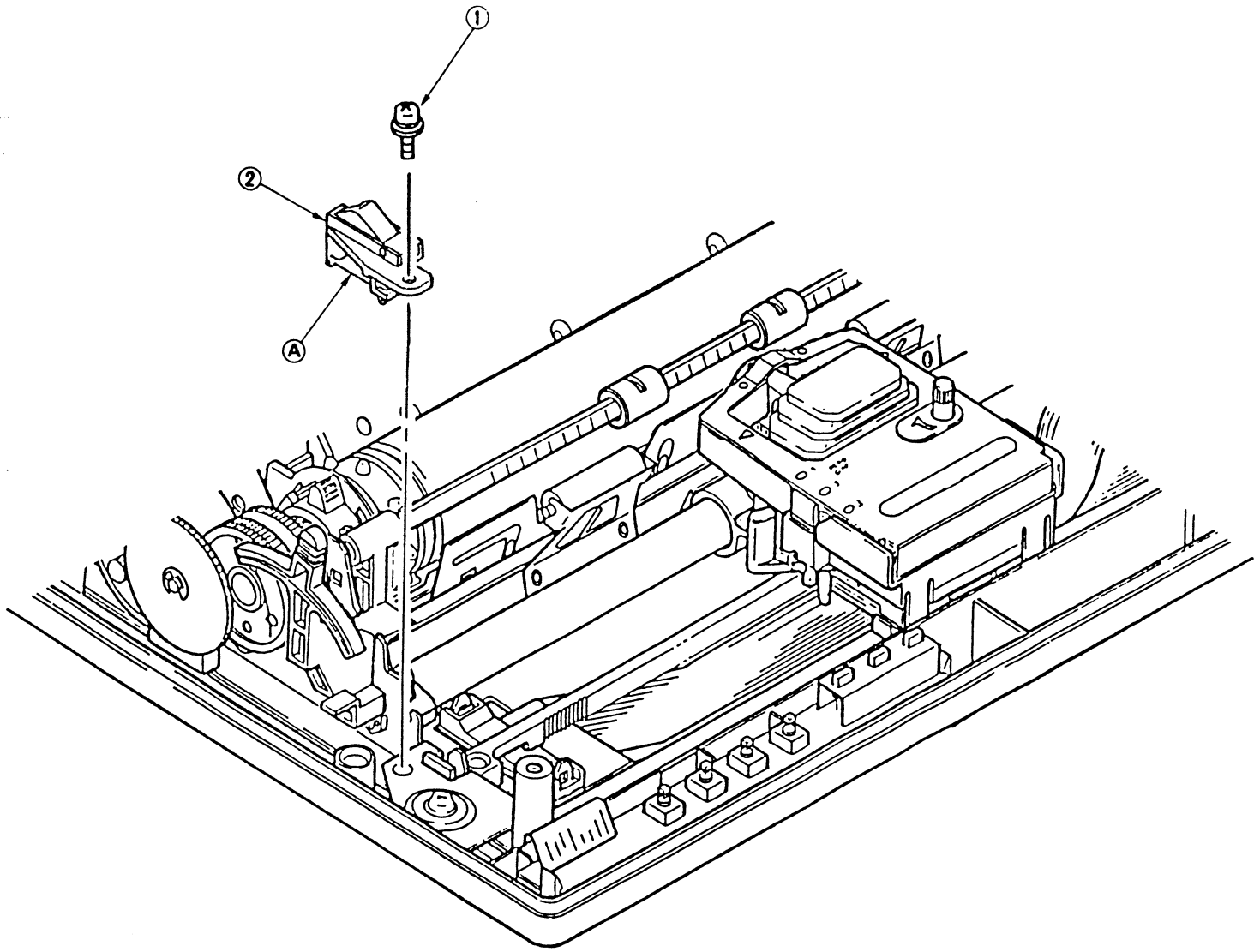
(1) Remove the upper cover (see 4.3.2).

(2) Remove screw ①.

(3) Remove the switch assembly ② by sliding it left.

(4) For reassembly, reverse the disassembly procedure.

Note: *Do not touch the switch assembly ② terminals (contacts) Ⓐ directly by hand or bend them. Also make sure they are kept clean.*



4.3.22 Pin Tractor Assemblies (R and L) (Optional Tractor Unit)

(1) Remove the sheet guide ①.

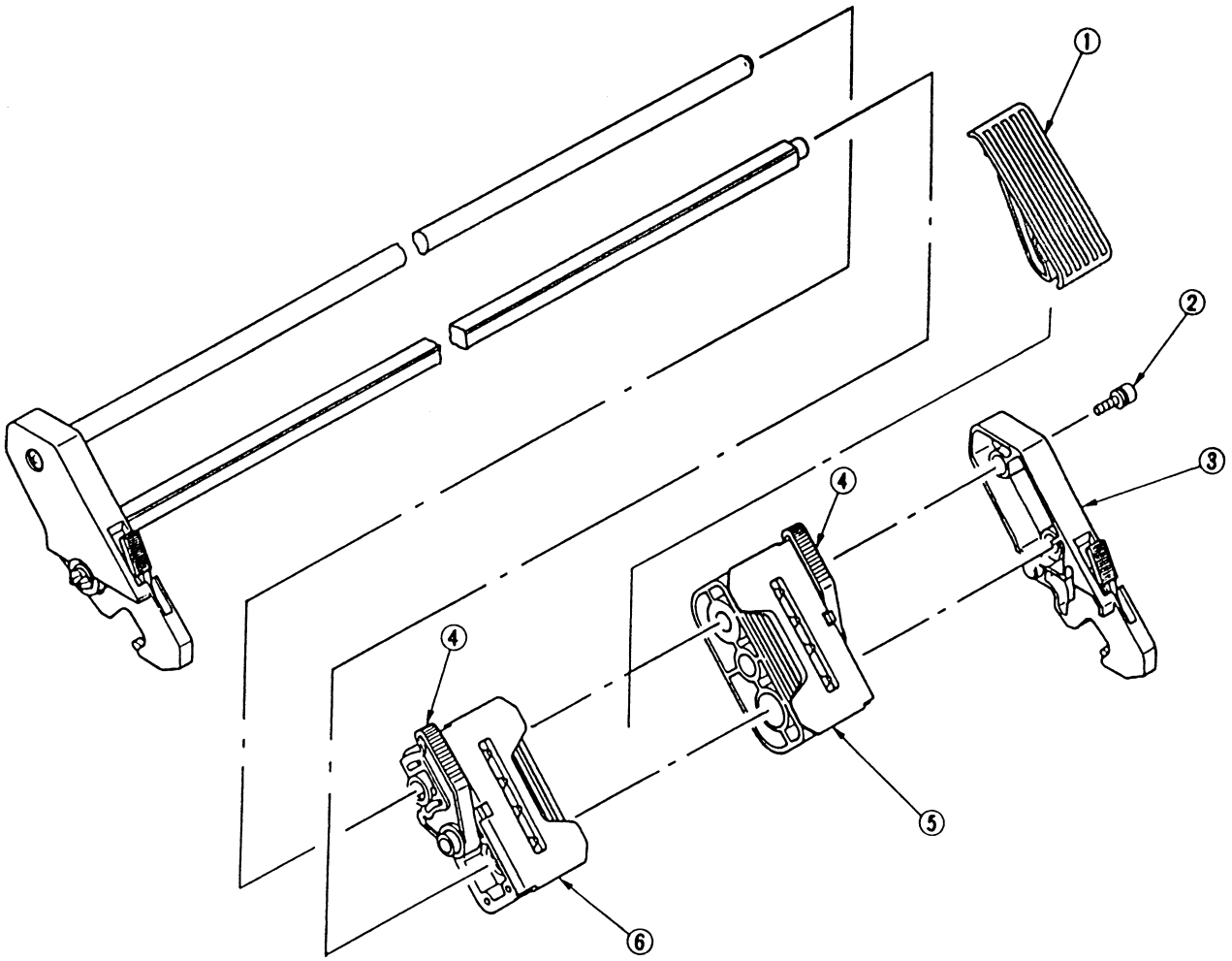
(2) Remove screw ②.

(3) Remove side frame ③.

(4) Unlock lock lever ④, and remove left ⑥ and right ⑤ pin tractor assemblies.

(5) For reassembly, reverse the disassembly procedure.

Note: *When assembling, verify that the left and right sprockets are aligned.*



5. ADJUSTMENT

5. ADJUSTMENT

5.1 Head-Gap Adjustment

Tools:

- Thickness gauge set
- Phillip's screwdriver No. 2-200
- Metal rod about 0.04 inch (1 mm) in diameter and 3 inches (76 mm) long (an extended paper clip can be used)

Adjustment procedure (see figure 5-1)

(1) Turn OFF the AC POWER switch and remove the AC plug from the AC receptacle.

(2) Remove the access cover.

(3) Remove the ribbon cartridge.

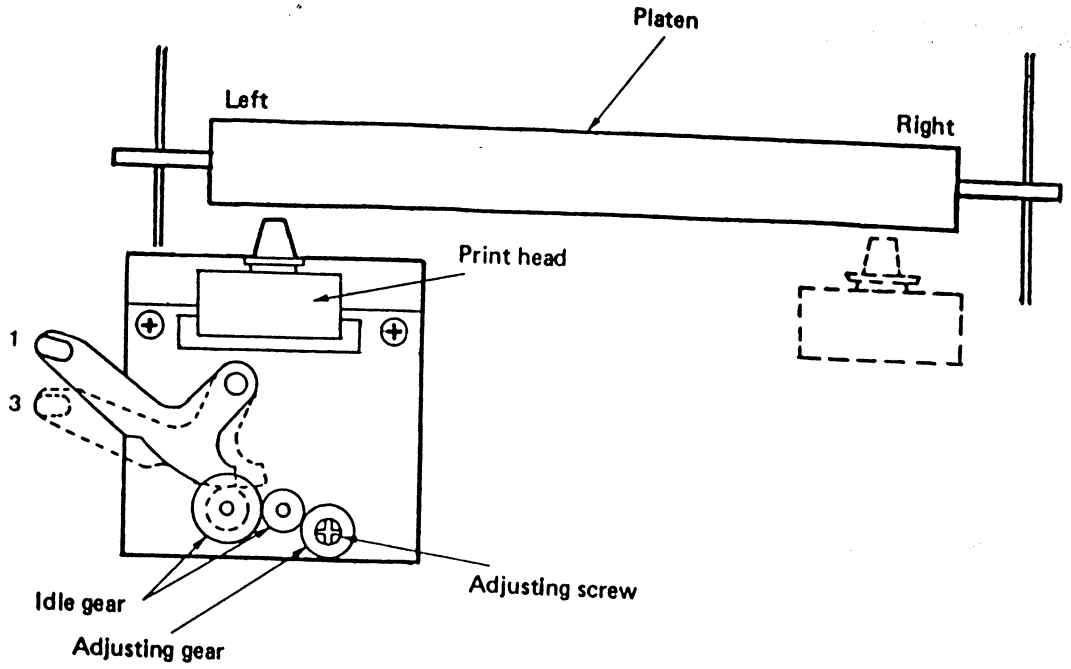
(4) Set the adjusting lever to range 1.

(5) Tilt the paper lock release lever back.

(6) Insert a 0.019-inch (0.45-mm) thickness gauge between the platen and print head. Make sure that the thickness gauge can be smoothly inserted, although there may be slight friction. Perform this operation at both ends of the platen.

(7) If gap adjustment is required, press down the adjusting gear with the metal rod to disengage the gear from the adjusting lever, and adjust the gap by turning the adjusting screw with a screwdriver.

(8) After adjustment, move the adjusting lever from position 1 to 3 to 1, then check the gap between the platen and print head once more. The gap must be between 0.0165 and 0.019 inch (0.42 to 0.48 mm).



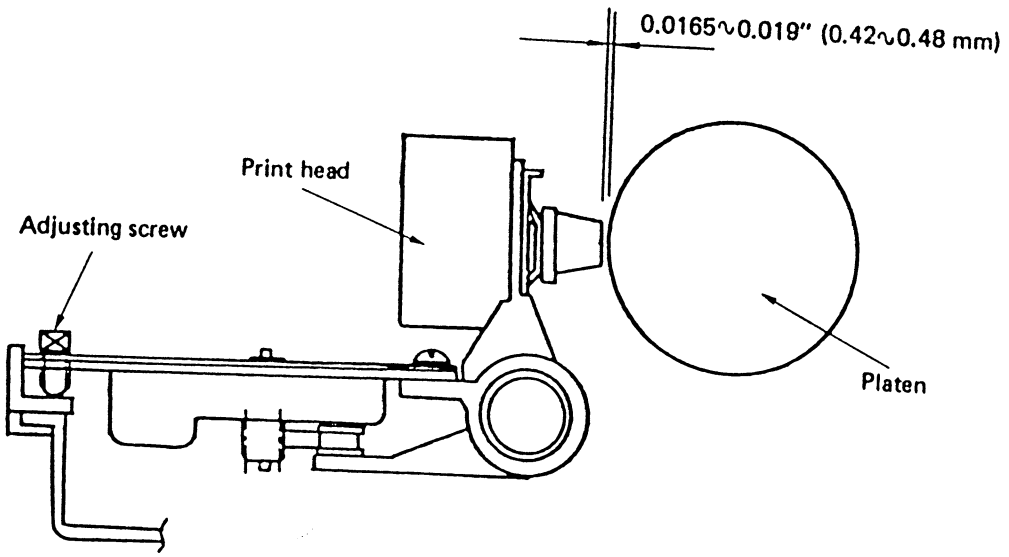


Figure 5-1. Head-Gap Adjustment

5.2 Space Rack and Roller-Gap Adjustment

Tools:
- Thickness guage
- Phillip's screwdriver No. 2-200
- Tension guage, 250 g

Adjustment procedure

(1) Turn OFF the AC POWER switch and remove the AC plug from the AC receptacle.

(2) Remove the upper cover.

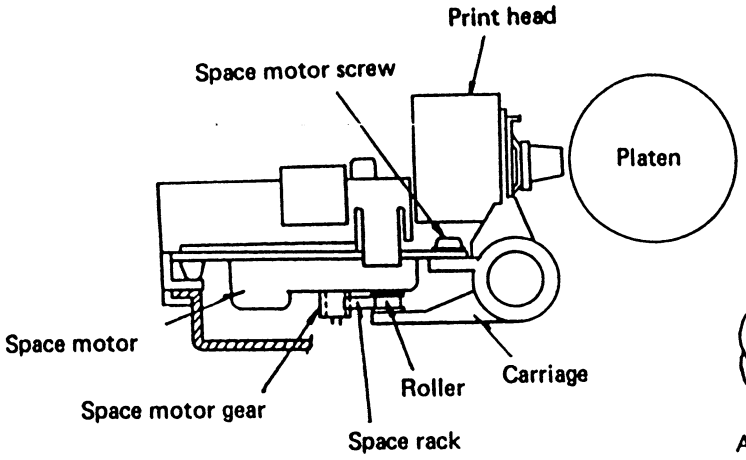
(3) Remove the ribbon cartridge.

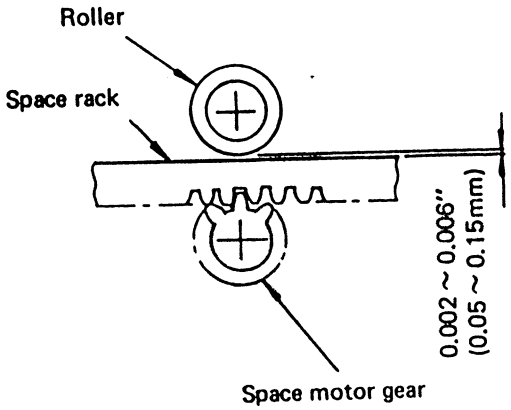
(4) Insert a 0.1-mm thickness gauge between the space rack and roller. Make sure that the thickness gauge can be smoothly inserted, although there may be slight friction.

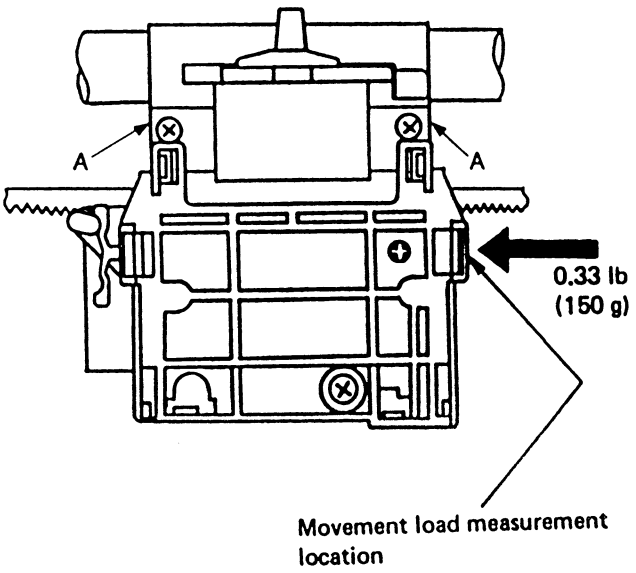
(5) If adjustment is required, loosen the space motor screws with a screwdriver and adjust.

Note: *Match side A with the corresponding carriage frame surface when attaching.*

(6) After adjustment, check the gap between the space rack and roller once more. The gap must be between 0.002 and 0.006 inch (0.05 to 0.15 mm). Also check that the carriage movement load without ribbon cartridge is 0.33 lb (150 g) or less.


Print head
Space motor screw
Platen
Space motor
Space motor gear
Roller
Carriage
Space rack


Roller
Space rack
0.002 ~ 0.006"
(0.05 ~ 0.15mm)
Space motor gear


A
A
0.33 lb
(150 g)
Movement load measurement
location

6. CLEANING AND LUBRICATION

6. CLEANING AND LUBRICATION

6.1 Cleaning

Cautions:
1. *Be sure to turn OFF the AC POWER switch before cleaning.*
2. *Be careful not to let paper lint get inside the mechanism.*

The printer should be cleaned periodically as follows:

Period: Either 6 months or 300 operating hours, whichever comes first.

Required time: Approximately 10 minutes.

Tools: Dry, soft cloth (such as gauze) (and vacuum cleaner if available)

Parts to be cleaned: See table 6-1.

Table 6-1. Parts To Be Cleaned

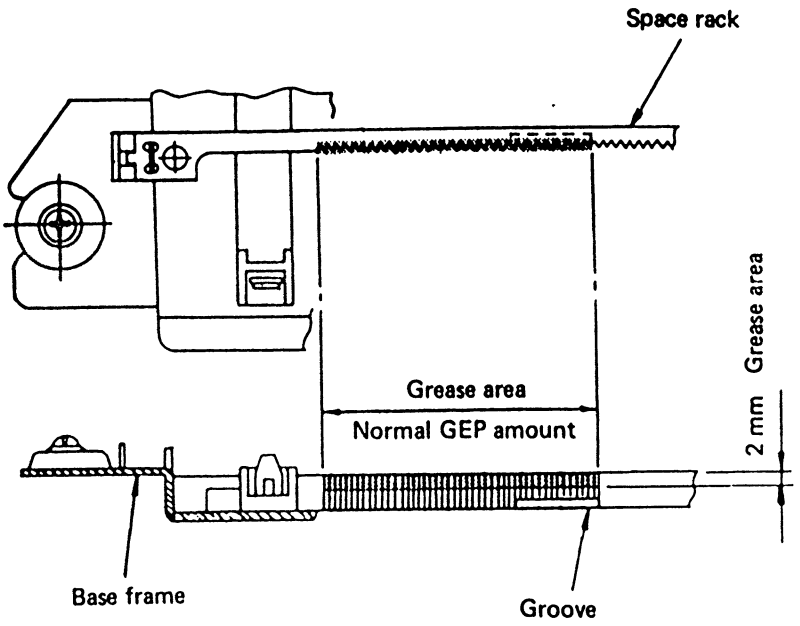
Parts	Description
Carriage and its surroundings	Remove paper lint, dust, dirt, and ribbon lint. Clean platen pinch rollers with cleaning fluid.
Paper path	
Paper-end sensor	Remove paper lint and dust attached to the sensor.

6.2 Lubrication

This printer requires no oiling during normal operation. Oiling must be performed, however, when disassembling, reassembling, after cleaning oiled parts, and after replacing parts.

Type of grease: Albania grease #2EP (Shell Oil equivalent product) GEP
Locations: See figure below.

***Note:** Do not apply any grease to carriage shaft or along paper path (platen, roller, etc.).*



Space Rack Greasing Locations

7. TROUBLESHOOTING AND REPAIR

7. TROUBLESHOOTING AND REPAIR

7.1 Items To Be Checked Before Repair

When there is a user request for repair, check whether the printer can be fixed by the troubleshooting procedure described in the User's Manual.

If possible, ask the user about the conditions that caused the error and make a record of the answer.

Before troubleshooting, operate the printer under the same conditions as at the time of error and see whether the error can be reproduced. If the error cannot be reproduced, run a print test and proceed with troubleshooting.

7.2 Finding the Cause of Error

First check the error condition against table 7-1. Then follow instructions in 7-3. Troubleshooting, to find the actual cause of error.

Read the precautions in 4-1 before repairing.

Figure 7-1 shows the connector locations and pin numbers. Table 7-2 shows the pin signal names. Figure 7-2 shows the INDU and SLSX board checkpoints.

Table 7-1. Error Conditions

Error Type	Description	Item
During POWER ON	The carriage does not move.	①
	The carriage does not move and the POWER lamp is lit.	②
	Carriage moves abnormally (runaway, vibration, or incomplete homing) and POWER lamp is lit.	③
	Homing operation is normal, but indicators are abnormal.	④
	Fuse (F1) on the power supply board (SLPB) is blown.	⑤
	Fuse (F1) on the power supply board (INDU) is blown.	⑥
During data receive or print	Neither spacing nor printing is performed and POWER and SELECT lamps are lit.	⑦
	Spacing is normal, but does not print.	⑧
	Printing stops.	⑨
	Wrong characters printed or some characters not printed.	⑩
	Some dots not printed.	⑪
	Print is too light.	⑫
	Line feed not performed.	⑬
	Fuse (F1) on power supply board is blown.	⑭
	Switch on the operation panel does not work. (Carriage moves to home at power on.)	⑮
	Paper does not feed to print position (SASF function).	⑯

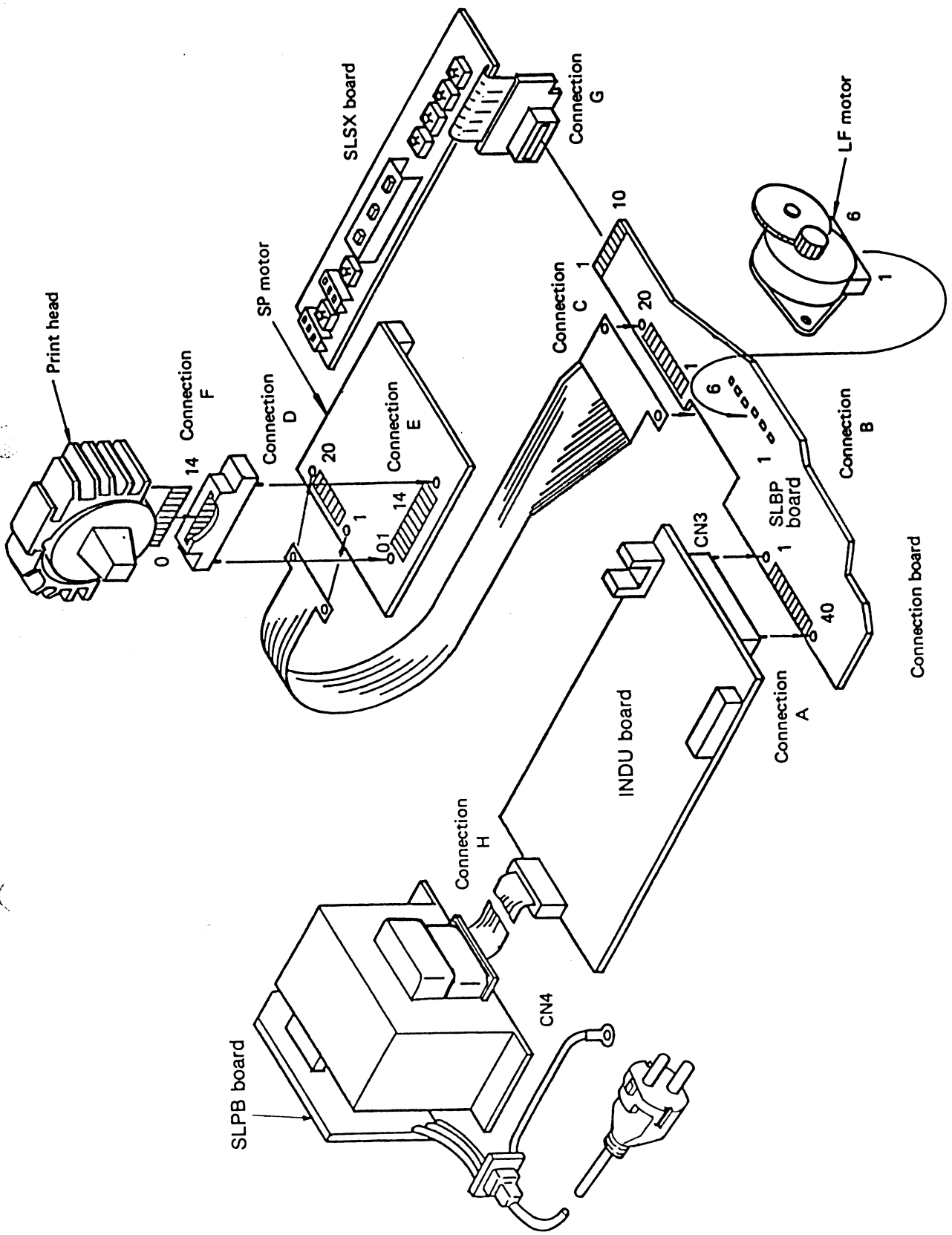
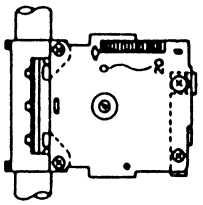
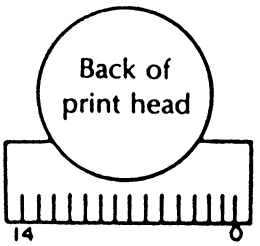
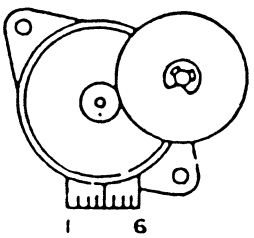
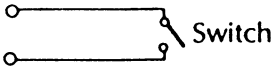
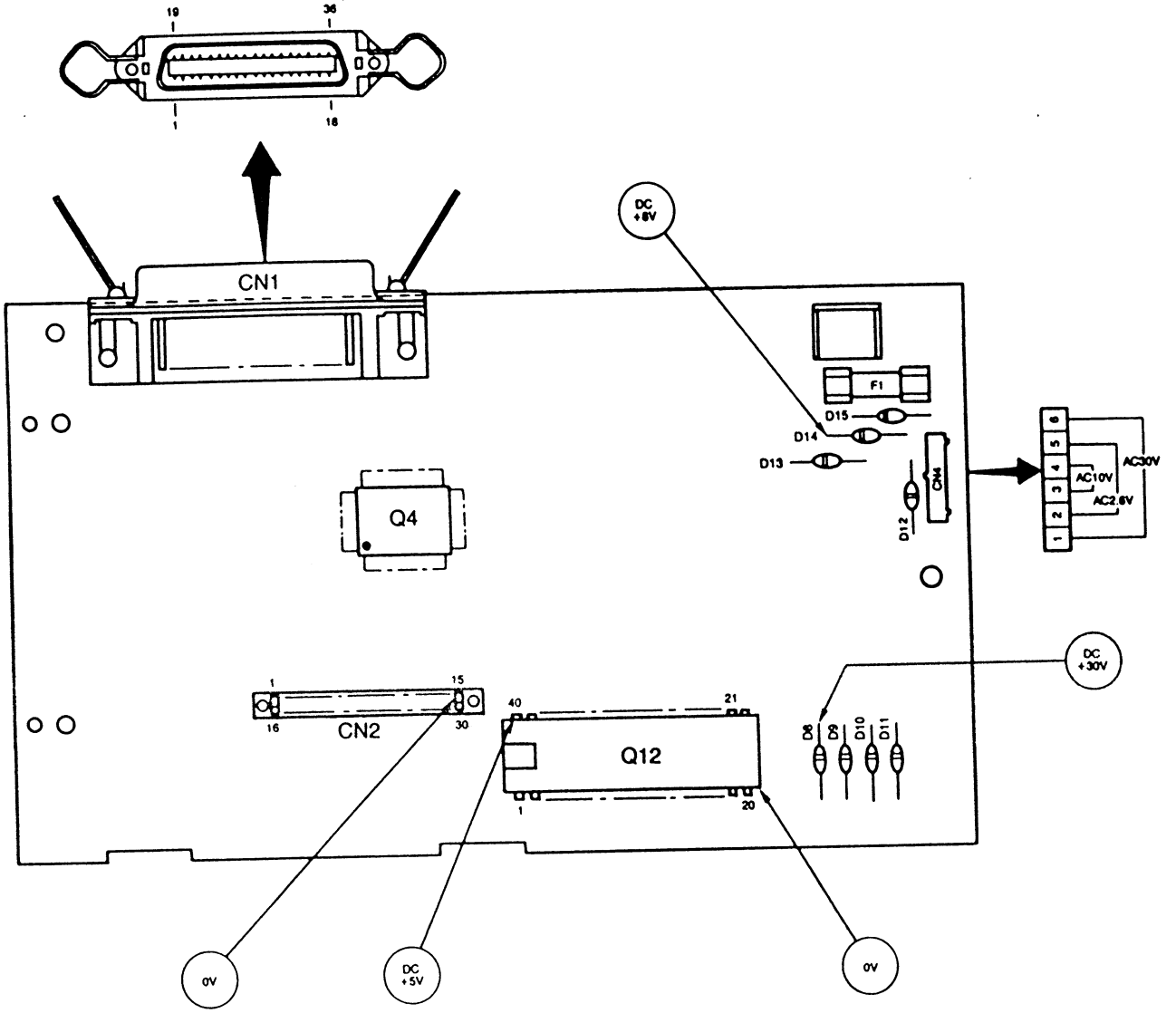


Figure 7-1. Connector Locations and Numbers of Pins

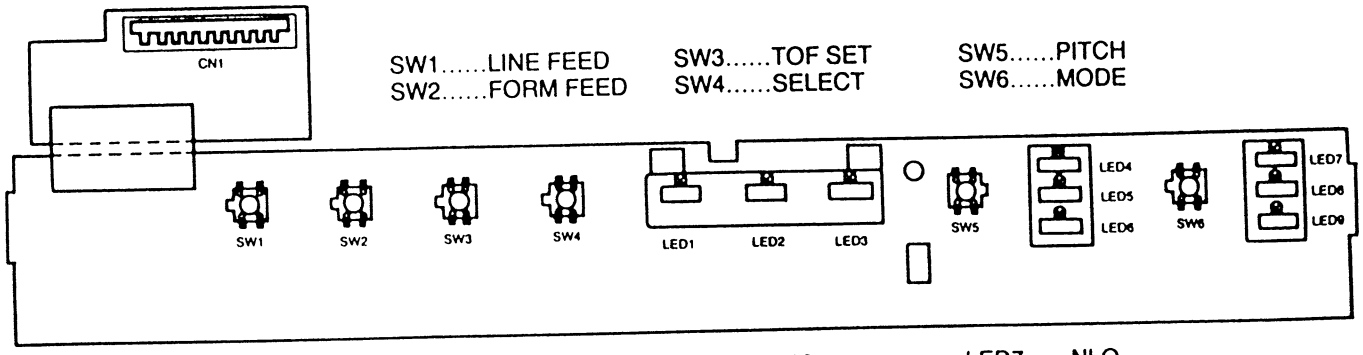
Table 7-2. Pin Numbers and Signal Names

Name	Signal Name	Connection								Coil Resistance	Figure
		A	B	C	D	E	F	G	H		
SP MOTOR	V	17		15	15					Approx. 21Ω	
	U	16		14	14						
	W	18		16	16						
	φA	22		20	20						
	φB	21		19	19						
PRINT HEAD	#1	14		13	13	14	14			Approx. 20Ω	
	#2	13		12	12	13	13				
	#3	1		1	1	1	1				
	#4	12		11	11	12	12				
	#5	2		2	2	2	2				
	#6	11		10	10	11	11				
	#7	3		3	3	3	3				
	#8	10		9	9	10	10				
	#9	4		4	4	4	4				
	Common	5,6,7		5,6	5,6	5,6,7	5,6,7				
	HEAD ALM	8		7	7	8	8				
	0V	9		8	8	9	9				
LF MOTOR	φ1	38	3							Approx. 70Ω	
	φ3	40	1								
	Common	39	2								
	φ2	37	4								
	φ4	35	6								
	Common	36	5								
OPERATION PANEL	SW SEL	31						7			
	SW 1	30						6			
	SW 2	28						4			
	SW 3	27						3			
	LAMP SEL	34						10			
	+5 V	32						8			
	0 V	29						5			
SWITCH	SASF	24									
	0V	20									
CN4	Approx. AC 7.6 V								2-5		
	Approx. AC 25.8 V								1-6		
	Approx. AC 10 V								3-4		

• INDU-Printed-Circuit Board



• SLSX-Printed-Circuit Board



SW1.....LINE FEED
SW2.....FORM FEED
SW3.....TOF SET
SW4.....SELECT
SW5.....PITCH
SW6.....MODE

LED1.....SELECT
LED2.....ALARM
LED3.....POWER
LED4.....10
LED5.....12
LED6.....17
LED7.....NLQ
LED8.....UTILITY
LED9.....HSD

Figure 7-2. Check points for Printed Circuit Boards

7.3 Troubleshooting

(1) Power is on, but carriage does not move.

- Is POWER LED (LED3) lit?

NO

- Is AC power supplied to transformer?

YES

- Is +8 VDC output?

YES

- Is +5 VDC output?

NO

- Replace the INDU board.

YES

- to step (2)

NO

- Is AC power supplied to SLPB board?

YES

- Is fuse F1 blown?

NO

- Replace the SLPB board.

NO

- Replace the AC cable assembly.

YES

- Replace fuse F1. If it blows again proceed to (5).

YES

- Is there a 7.6 VAC difference between CN4 pin 2 and pin 5?

YES

- Is fuse F1 on INDU board blown?

YES

- Replace fuse F1. If it blows again proceed to (6).

NO

- Replace the transformer.

NO

- Replace the INDU board.

YES

- to step (4-a)

(2) The Power LED lights when power is turned on, but the carriage does not move.

- Are the ALARM LED (LED3) and SELECT LED (LED1) lit?

NO — YES
- Replace the INDU board.

- Is the carriage easily moved by hand when the power is turned off?

YES — NO (2-a)
- Remove the ribbon cassette.
- Does the carriage move smoothly?

NO — YES
- Replace the ribbon cassette.

- Remove the ribbon feed gear assembly (see 4.3.10).
- Does the gear move smoothly?

NO — YES
- Replace ribbon gear feed assembly (see 4.3.10).

- Is space rack OK?

YES — NO
- Replace the space rack (see 4.3.12).

- Replace the space motor assembly (see 4.3.11).

- Is +30 V output?

YES — NO
- to step (2-1)

- Turn off the power, remove the INDU board, and check the resistance between pins 16 and 17, and pins 17 and 18 at CN3 (connection board side) of connection Ⓐ. (See figure 7-1.)

Note: *Be careful not to damage the copper foil on the connection board when measuring the resistance.*

- Is the resistance approximately 21 ohms?

YES — NO
- to step (2-2)

- Replace the INDU board.
- Is the printer normal?

YES — NO
- Replace the space motor assembly (see 4.3.11).

- END

(2-1)

- Is the voltage difference between pins 1 and 6 of CN4 28.5 VAC with CN4 disconnected?

YES NO

- Replace the transformer.

- Replace the INDU board.

(2-2)

- Is the cord clamp of connection © firmly attached?

YES NO

- Check that the contact pressure rubber is firmly inserted.

- Is the ribbon feed assembly attached correctly?

YES NO

- Check that the contact pressure rubber is firmly inserted.

- Are the screws on the connection board (SLBP) tight?

YES NO

- Match the assembly to the board and tighten the screws.

- Is carriage cable broken?

NO YES

- Replace the carriage cable (see 4.3.13).

- Remove the ribbon cassette and ribbon feed gear assembly. Check the resistance of space motor at connection Ⓓ (see Figure 7-1).
- Is the resistance approximately 21 ohms?

YES NO

- Replace the space motor assembly (see 4.3.11).

- Verify that the contacts of connection © are not damaged or worn.

③ Carriage movement is abnormal (runaway, vibration, incomplete homing) when the power is turned on.

- Runaway?

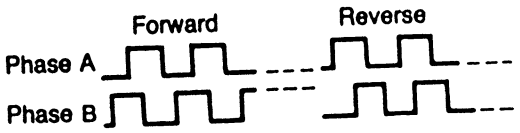
NO — YES
- Replace the INDU board.

- Vibration

YES — NO
- Is +30 V output?

YES — NO
- to step (2-1)

- to step C



- Are phase A, B signals output to Q4-79, 80?

YES — NO

A
- Is the cord clamp of connection © firmly attached?

YES — NO
- to step B

- Is the ribbon feed assembly attached correctly?

YES — NO

B
- Reassemble.

- Is connection board (SLBP) broken?

NO — YES
- Replace the connection board (see 4.3.9).

- Is carriage cable broken?

NO — YES
- Replace the carriage cable (see 4.3.13).

- Replace the space motor assembly (see 4.3.11).

C
- Replace the INDU board.
- Is printer normal?

YES — NO
- Is the carriage easily moved by hand when the power is off?

YES — NO
- to step (2-a)

- to step A

- END

(4) Homing operation is normal, but the indicators (LED1 to LED9) are abnormal when power is turned on.

- Is POWER LED (LED3) lit?

YES

- Is the ALARM LED (LED2) lit?

YES

- Is paper installed?

YES

- Is the near-end lever obstructing the PE sensor?

YES

- Reset or replace the near-end lever.

NO

- Replace the INDU board.

NO

- to step (4-1)

NO

- Install paper.

NO

(4-a)

- Is +5 V applied to the anode of POWER LED?

YES

- Replace the SLSX board.

NO

- Correct connection at Ⓐ and Ⓖ.

(4-1)

- Is SELECT LED (LED1) lit?

NO

YES
- to step (4-2)

- Is paper installed?

YES

NO
- Install paper.

- Is the printer in SELECT state?

YES

NO
- Press the SELECT switch (SW4).

- Is the SLSX board Q2-3 at H level and Q3-6 at L level?

YES

NO
- Replace the INDU board.

- Is +5 V applied to the anode of each LED?

YES

NO
- Correct connections at Ⓐ and Ⓖ.

- Replace the SLSX board.

(4-2)

- Is the 10 pitch LED (LED4) lit?

YES

- Is the UTILITY LED (LED8) lit?

YES

- END

NO

- Is the SLSX board Q2-5 at H level and Q3-2 at L level?

NO

- Replace the INDU board.

YES

- Is +5 V applied to the anode of SLSX board LED?

YES

- Replace the INDU board.

NO

- Correct connections at Ⓐ and Ⓖ.

NO

- Is the SLSX board Q2-12 at H level and Q3-10 at L level?

NO

- Replace the INDU board.

YES

- Is +5V applied to the anode of SLSX board LED?

YES

- Replace the INDU board.

NO

- Correct connections at Ⓐ and Ⓖ .

(5) Fuse F1 on power supply board (SLPB) blows when power is turned on.

- Is the fuse properly rated?

YES NO

- Replace the fuse with properly rated fuse.

- Remove connector CN4 and turn on the power.
- Does the fuse blow again?

YES NO

- Replace the INDU board.

- Replace the SLPB board and turn on the power.
- Does the fuse blow again?

YES NO

- Normal operation.

- Replace the transformer.

⑥ Fuse F1 on the control board (INDU) blows when power is turned on.

- Is the fuse properly rated (1.5 A)?

YES

- Replace the INDU board.

NO

- Replace the fuse with properly rated fuse.

(7) Neither spacing nor printing performed while receiving data.

- Verify that data is being sent to the printer.
- Is SELECT LED (LED1) lit?

YES

NO
- to step (4-1)

- Are the signal levels at CN1 as shown in the table below with the interface cable removed?

Signal	Level
Pin 10	H
Pin 11	L
Pin 12	L
Pin 13	H
Pin 32	H

NO

YES
- Are parallel data signals (pins 2 to 9) and STB (pin 1) received with the cable connected?

YES

NO
- Is the interface cable connected correctly?

YES

NO
- Correct the interface cable connection.

- Replace the interface cable.

- Is self-test possible? (Perform with the interface cable removed.)

YES

NO
- Replace the INDU board.

- Replace the INDU board.

- Replace the INDU board.

(8) Spacing is normal, but nothing is printed while receiving data.

- Does TR10 on INDU board alternate between ON and OFF?

YES
- NO
  - Replace the INDU board.
  - to step E

E
- Replace the print head.
- Is printer operation normal?

YES
- NO

(8-a)
- Turn off the power, remove the INDU board, and check the resistance between pins 5, 6, 7 and 1, 2, 3, 4, 10, 11, 12, 13, 14 at CN3 (connection board side) of connection Ⓐ. (See table 7-2.)(Note)
- Is the resistance approximately 20 ohms?

YES
- NO
  - Is the cord clamp of connection Ⓒ firmly attached?

YES
- NO
  - to step F

- Is the ribbon feed assembly correctly attached?

YES
- NO

F
- Attach correctly.

- Is the connection board broken?

NO
- YES
  - Replace the connection board (see 4.3.9).

- Is the carriage cable broken?

NO
- YES
  - Replace the carriage cable (see 4.3.13).

- Is the print head connector deformed?

NO
- YES
  - Replace the connector.

- Verify that contacts at connections Ⓒ, Ⓓ, Ⓔ, and Ⓕ, are not damaged or worn.

- Replace the INDU board.

- END

- ***Note:*** *Be careful not to damage the copper foil on the connection board when measuring the resistance.*

⑨ Printing stops due to an ALARM while receiving data and printing

- Is the ALARM lamp (LED2) lit?

YES — NO
- Wait until the print head cools.

- Is the SELECT LED flickering?

YES — NO
- Paper near end. Refill paper.

- Is paper installed correctly?

YES — NO
- Install paper correctly.

- Turn off the power and manually move the carriage.
- Does the carriage move smoothly?

YES — NO
- to step (2-a)

- Is homing performed properly?

NO — YES
- Replace the space motor or the INDU board.

- Check items ① to ③.

⑩ Wrong characters are printed or some characters are missing

- Is interface cable connected properly?

YES — NO
- Connect cable properly.

- Does self-test print normally?

YES — NO
- Replace the INDU board.

- Is the bit length set properly?

YES — NO
- Set the data bit length properly.

- Are data signals 1 to 8 input normally from host to CN1 pins 2 to 9?

YES — NO
- Replace the interface cable.

- Replace the INDU board.

(11) Some dots are missing

- Remove the print head.
- Is any pin broken?

NO — YES
- Replace the print head.

- Check the resistance of print head coil at connection Ⓕ. (See table 7-2.)
- Is the resistance approximately 20 ohms?

YES — NO
- Replace the print head.

- to step (8-a)

(12) Print is light

- Is the ribbon fed properly?

YES

NO

- Does the ribbon feed mechanism work properly when removing the ribbon cassette?

YES

NO

- Replace the ribbon feed gear assembly (see 4.3.10).

- Replace the ribbon cartridge.

- Is the ribbon wear excessive?

NO

YES

- Replace the ribbon cartridge.

- Is the print head gap set correctly?

YES

NO

- Adjust the print head gap (see 5.1).

- Is +30 V (cathode of D10) output?

YES

NO

- to step (2-1)

- Replace the print head.
- Is printer operation normal?

YES

NO

- Replace the INDU board.

- END

⑬ Line feed is not performed

- Is paper installed correctly?

YES — NO

- Install paper correctly.
  (When single sheet is used the friction lever must be set to closed position.)

- Is the platen unusually hard to turn manually with the power off?

NO — YES

- Adjust the paper feed mechanism. (Check for paper jam and damaged parts.)

- Turn off the power, remove the INDU board, and check the resistance between pins 35 and 36, 36 and 37, 38 and 39, and 39 and 40 at CN3 (connection board side) of connection Ⓐ. (See table 7-2.) (Note)

- Is the resistance approximately 70 ohms?

YES — NO

- Is connection Ⓑ correct?

YES — NO

- Verify that the LF motor position is correct and the contacts are not bent.

- Is the pattern of connection board broken?

NO — YES

- Replace the connection board (see 4.3.9).

- Replace the LF motor (see 4.3.8).

- Replace the INDU board.
- Is printer operation normal?

YES — NO

- Replace the LF motor (see 4.3.8).

- END

- ***Note:*** *Be careful not to damage the copper foil on the connection board when measuring the resistance.*

(14) Fuse F1 on power supply board blows while receiving data and printing

- Is the fuse properly rated?

YES NO

- Replace with properly rated fuse.

- Turn off the power and check the print head coil, SP motor, and LF motor resistance. (See table 7-2.)
- Is the print head resistance approximately 20 ohms?

YES NO

- Replace the print head. Connect connections Ⓐ, Ⓒ, Ⓓ, Ⓔ, and Ⓕ properly.

- Is the SP motor resistance approximately 21 ohms?

YES NO

- Replace the SP motor. Connect connections Ⓐ, Ⓒ, and Ⓓ properly.

- Is the LF motor resistance approximately 70 ohms?

YES NO

- Replace the LF motor. Connect connections Ⓐ and Ⓑ properly.

- Replace the INDU board.

⑮ Switch on the operation panel does not work (Carriage returns to home position when power is turned on)

- Is signal input to Q4 pins 49 to 52 when the switch is pressed?

NO

YES

- Replace the INDU board.

- Are connections Ⓐ and Ⓖ proper?

YES

NO

- Correct the connections.

- Replace the SLSX board.

(16) Paper not fed properly (SASF function)

- Turn off the power, remove the INDU board, open the bail arm, and check the resistance between pins 20 and 24 at connection Ⓐ.
- Is the resistance 0 ohms?

NO ↓

YES
- Replace the INDU board.

- Is the connection board broken?

NO ↓

YES
- Replace the connection board (see 4.3.9).

- Is the switch broken?

NO ↓

YES
- Replace the switch assembly (see 4.3.21).

- Replace the INDU board.

APPENDIX A

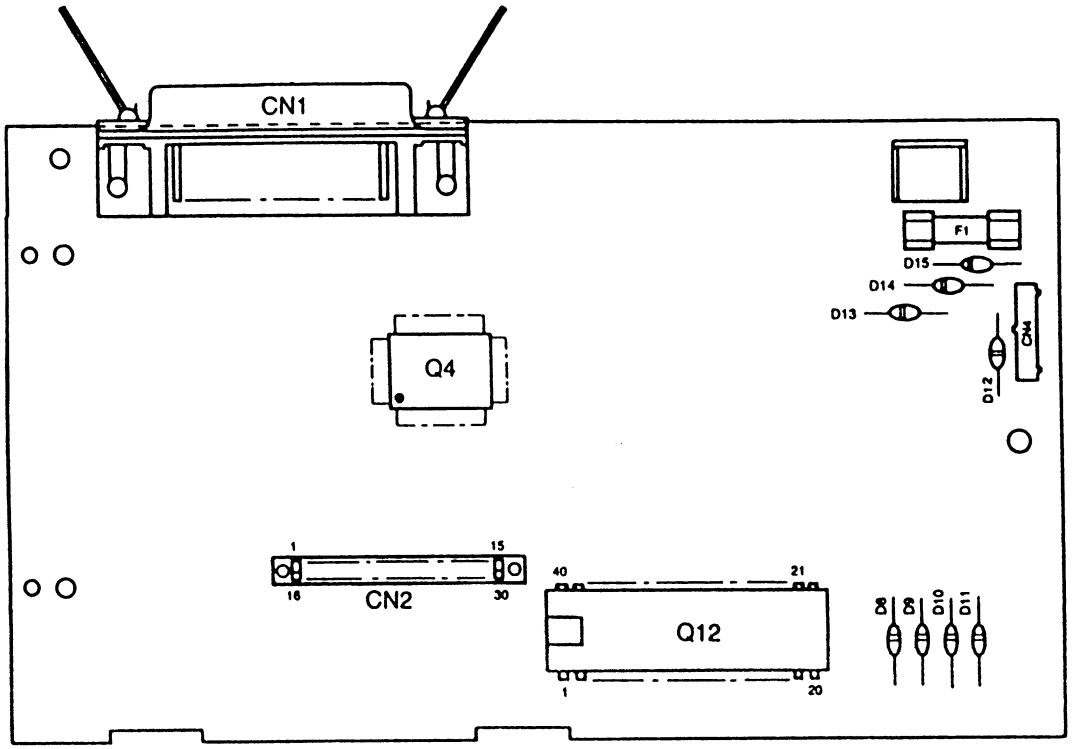
PCB LAYOUT

APPENDIX A PCB LAYOUT

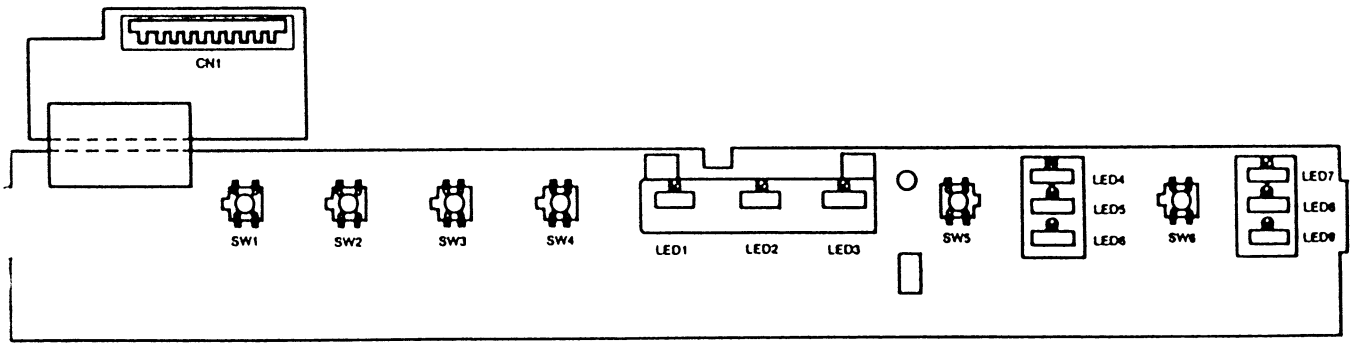
— PCB List —

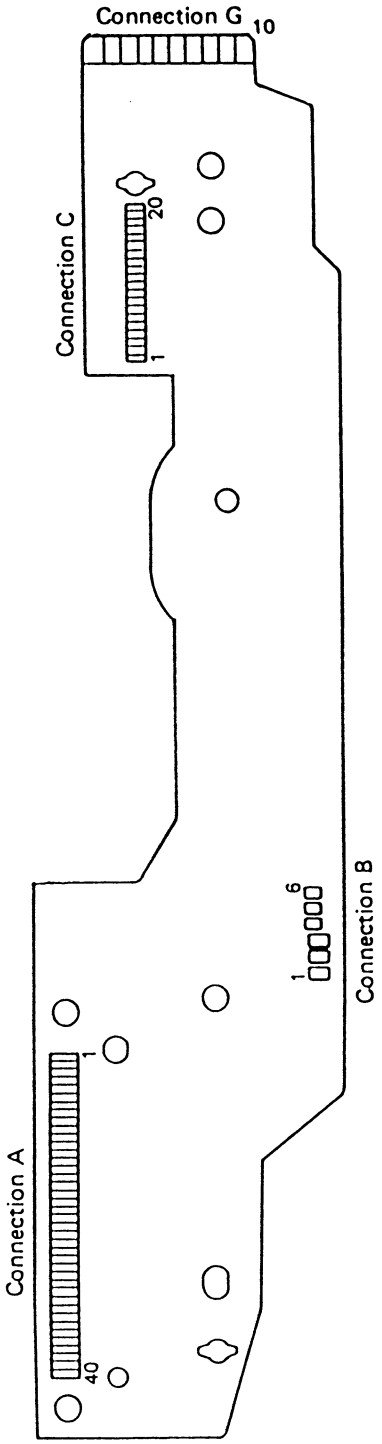
(1) Circuit board, INDU (Main Controller)
(2) Circuit board, SLSX (Operator Panel)
(3) Circuit board, SLBP
(4) Circuit board, SLHI (Option)

INDU-Printed-Circuit Board

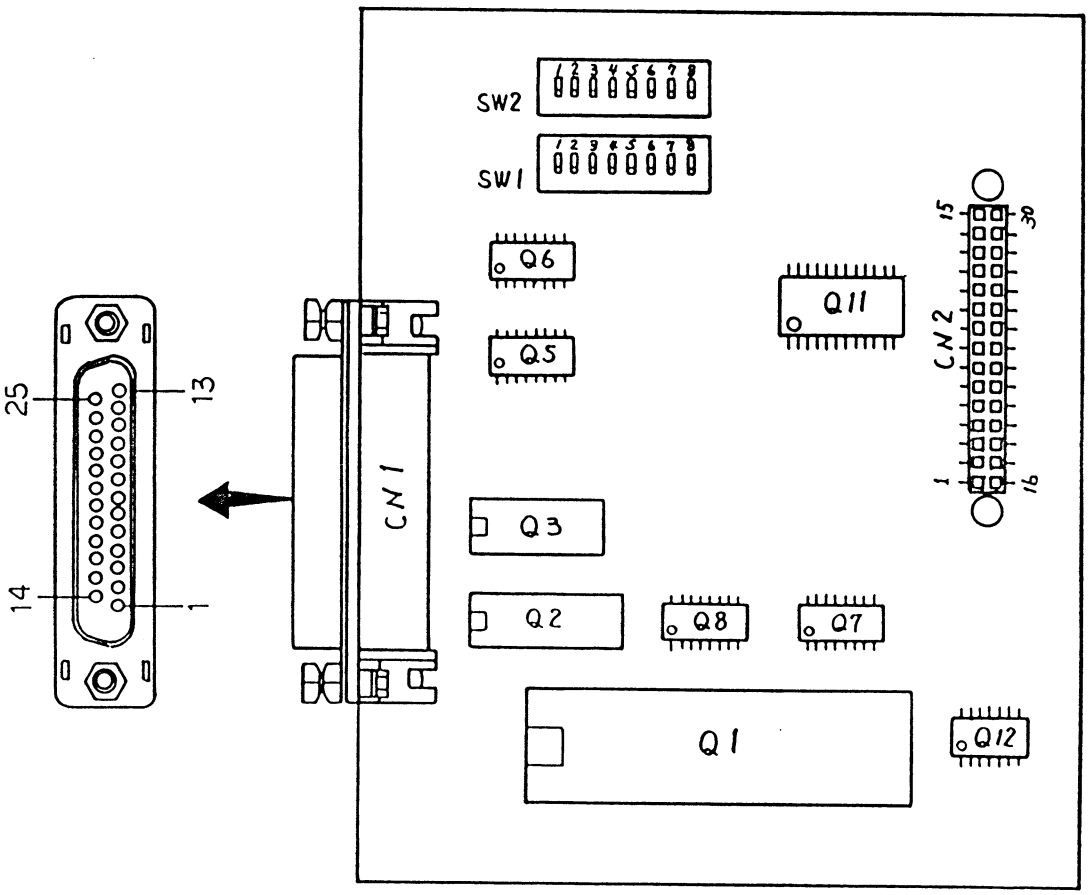


• SLSX-Printed-Circuit Board





SLBP-Circuit Board



SLHI-Circuit Board

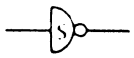
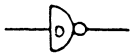
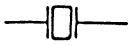
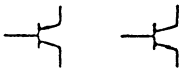
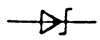
APPENDIX B

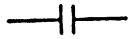
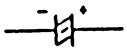
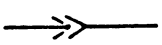
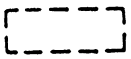
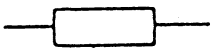
CIRCUIT SYMBOLS AND CIRCUIT DIAGRAMS

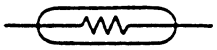
APPENDIX B CIRCUIT SYMBOLS AND CIRCUIT DIAGRAMS

Table 7-1 shows the symbols used in the circuit diagrams. Figure 9-1 is the circuit diagram.

Table 9-1 Table of Symbols

Symbol	Mark	Description
	Q	SN74LS05 inverter (open collector)
	Q	SN7406 inverter (open collector)
	OSC	Ceramic oscillator
	TR	Transistor
	SCR	Thyristor
	D	Diode
	D	Zener diode
	D	Light-emitting diode
	REG	Regulator

Symbol	Mark	Description
	C	Capacitor
	C	Electrolytic capacitor
	R	Resistor
	SW	Switch
	S	Jumper wire or plug
	CN	Connector (terminal)
 (Reference)		Means a single part.
	FG	Frame ground
		Dot head (element)
	L	Coil

Symbol	Mark	Description
	Q	339 Comparator
	THERMISTOR	Thermistor
	SG	Signal ground
	TF	Transformer
		Photo sensor
	F	Fuse

APPENDIX C

SPARE PARTS LIST

APPENDIX C SPARE PARTS LIST

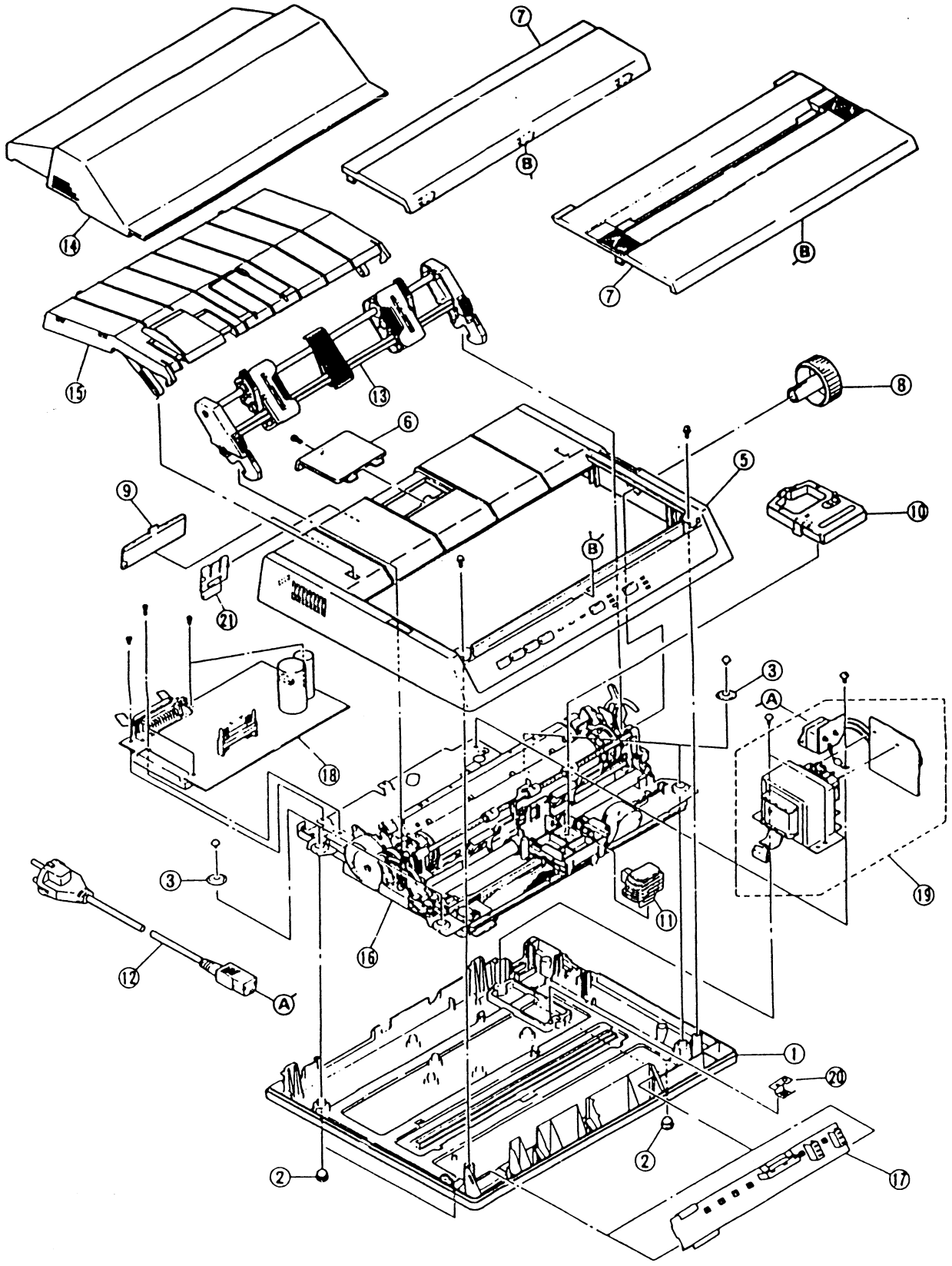


Figure 10-1. Printer Unit

Table 10-1. Printer Unit

No.	Part No.	Description	ODA Part No.	Q'ty	Remarks
1	2PB4017-3037P4	Lower cover	53506204	1	
2	4PB4025-1137P1	Rubber foot	53452701	4	
3	4PP4025-1152P1	Washer	50512101	4	
5	3PP4050-2174G3	Upper cover	53506303	1	
6	4PB4025-1123P10	DIP switch access cover	53447310	1	
7	3PA4017-3044P10	Access cover	53467410	1	
7	2PB4017-3048P7	Access cover (tractor)		1	Option
8	3PB4043-2156P7	Platen knob	53459807	1	
9	4PB4017-3046P9	Connector cover	53469209	1	
11	4YA4025-1401G2	Print head		1	
12	3YS4011-1265P1	AC cord		1	220/240V
13	3PA4025-2633G1	Pin tractor assembly		1	Option
14	2PB4025-1130P1	Acoustic cover	53450001	1	Option
15	2PA4017-3378G4	Paper separator	53459303	1	
16	3YX4025-1010G4	Printer mechanism		1	
17	4YA4050-2155G1	SLSX printed-circuit board	55035601	1	
18	4YA4050-2881G3	INDU printed-circuit board (with EP ROM)	N/A	1	(IBM)
18	4YA4050-2881G11	INDU printed-circuit board (for maintenance, (without ROM)	N/A	1	
19	3YX4021-1032G1	AC transformer assembly	55029501	1	220/240 V
20	4PP4017-3038P1	Earth spring	50922701	1	
21	4PP4016-5904P4	Connector cover	53469209	1	

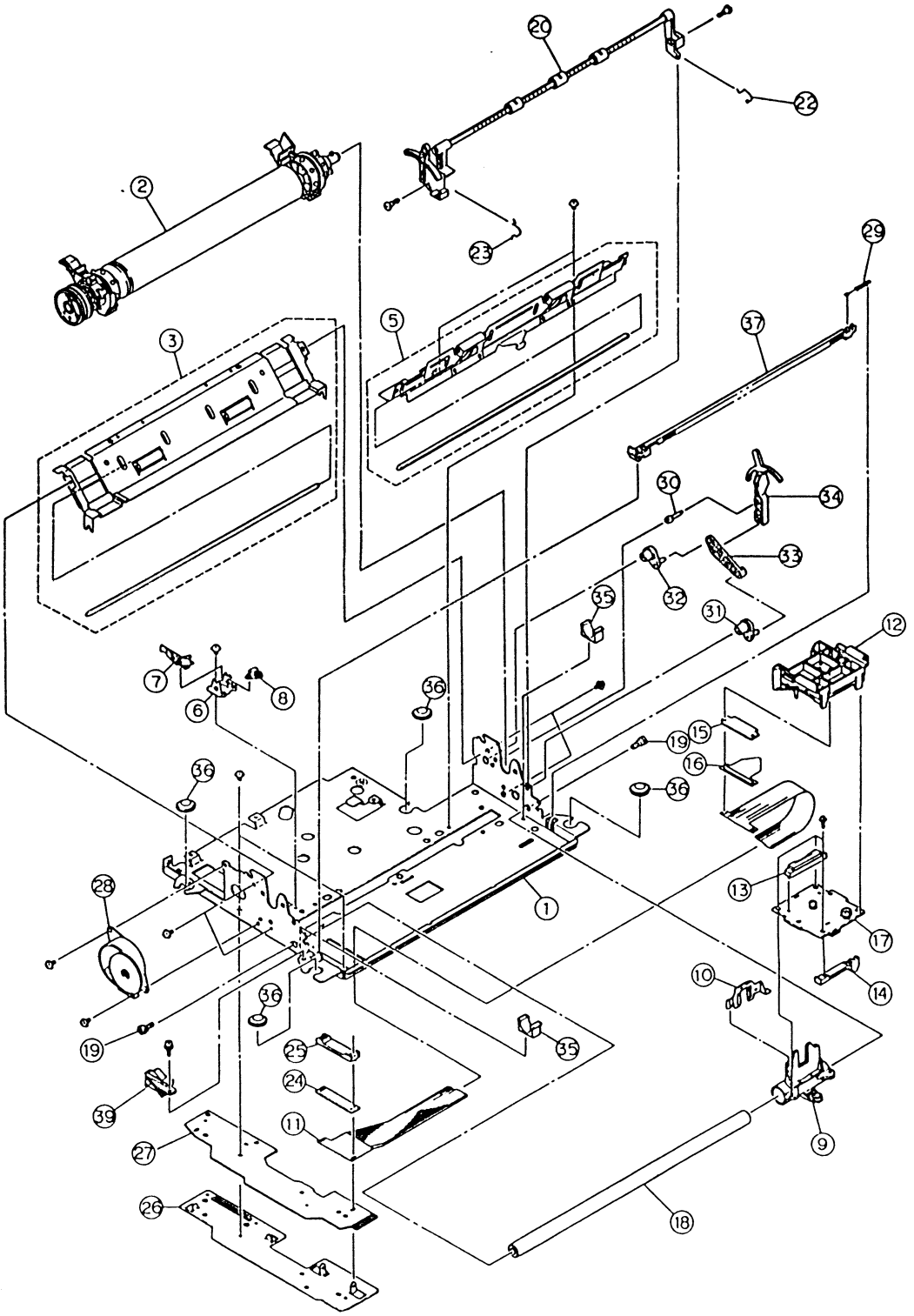


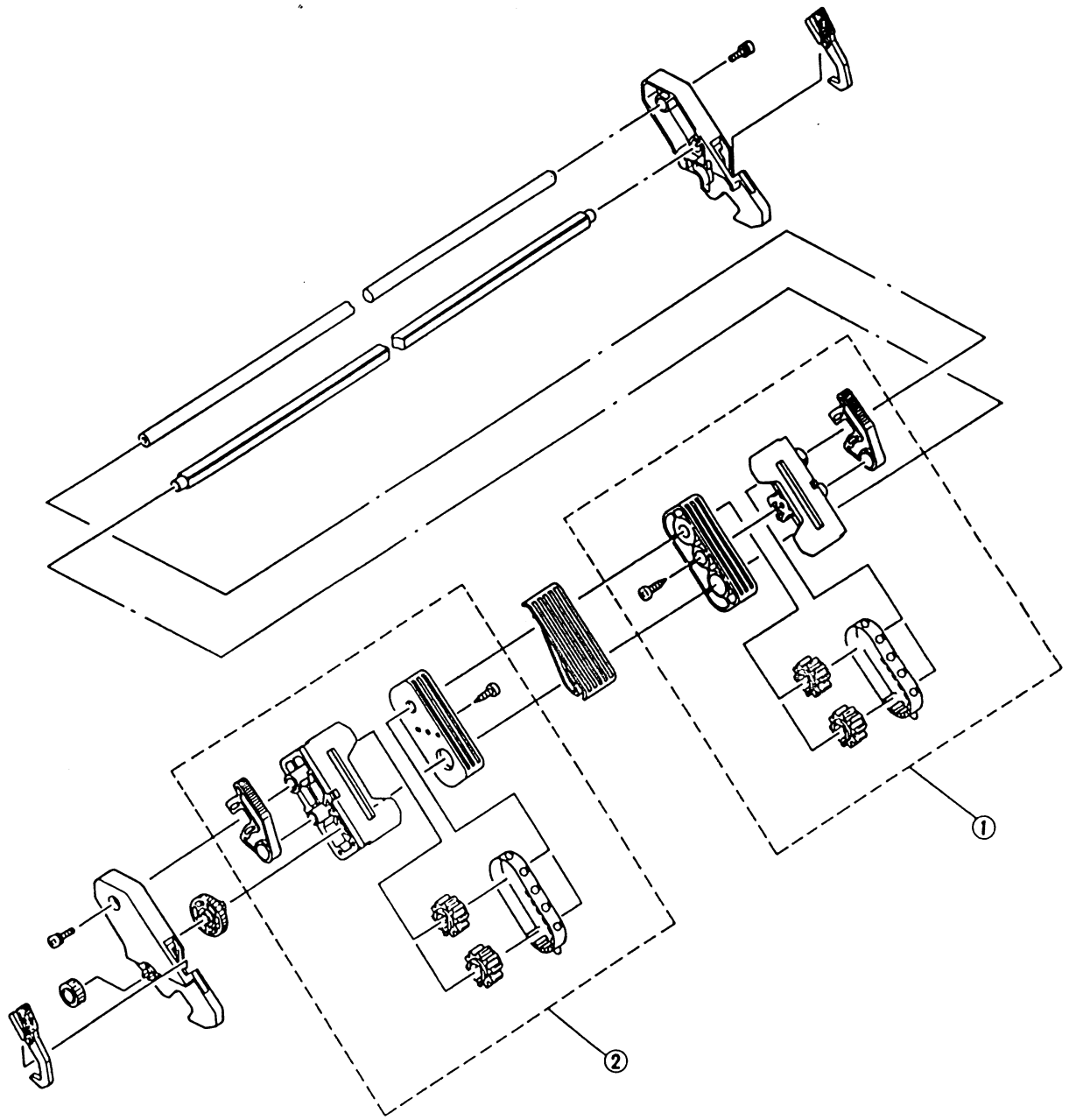
Figure 10-2. Printer Mechanism

Table 10-2. Printer Mechanism

No.	Part No.	Description	ODA Part No.	Q'ty	Remarks
1	1PP4025-1011P1	Base frame	53322301	1	
2	4PA4025-1012G1	Platen assembly	50210801	1	
3	3PA4025-1027G1	Paper chute assembly	50039101	1	
5	3PA4025-1032G1	Bottom paper guide assembly	50211401	1	
6	4PP4025-1038P1	Near-end bracket	53050601	1	
7	4PB4025-1039P1	Near-end lever	53050701	1	
8	4PB4025-1040P1	Bottom near-end lever	53051701	1	
9	4PP4025-1118G1	Carriage roller	53322501	1	
10	4PP4025-1048P1	Head clamp	50702901	1	
11	2PU4007-1065P1	Carriage cable	56613701	1	
12	4PA4025-1075G1	Ribbon feed gear assembly	50036501	1	
13	3PB4025-1116P1	Connector	56718601	1	
14	4PB4025-1088P1	Slider	51001401	1	
15	4PP4025-1114P1	Contact pressure rubber	53453001	1	
16	4PP4025-1182P1	Cable clamp	50703101	1	
17	4YX4025-1800G1	Space motor assembly	56404101	1	
18	4PB4025-1089P1	Carriage shaft	51109101	1	
19	4PB4025-1090P1	Main shaft screw	50310001	2	
20	3PA4025-2102G1	Indicator bar assembly	55035301	1	
22	4PB4025-1097P1	Pressure roller spring (R)	50907302	1	
23	4PB4025-1139P1	Pressure roller spring (L)	50907301	1	
24	4PP4025-1099P1	Contact rubber	53452901	1	
25	4PB4025-1100P1	Cord clamp	50702801	1	
26	3PP4025-1103P1	Circuit support		1	
27	2PU4003-5723P1	SLBP pinted-circuit board	55017801	1	
28	4PB4025-1105P1	LF motor	56504201	1	
29	4PB4025-1106P1	Tension spring	50907201	1	
30	4PB4025-1107P1	Release post	50605101	1	

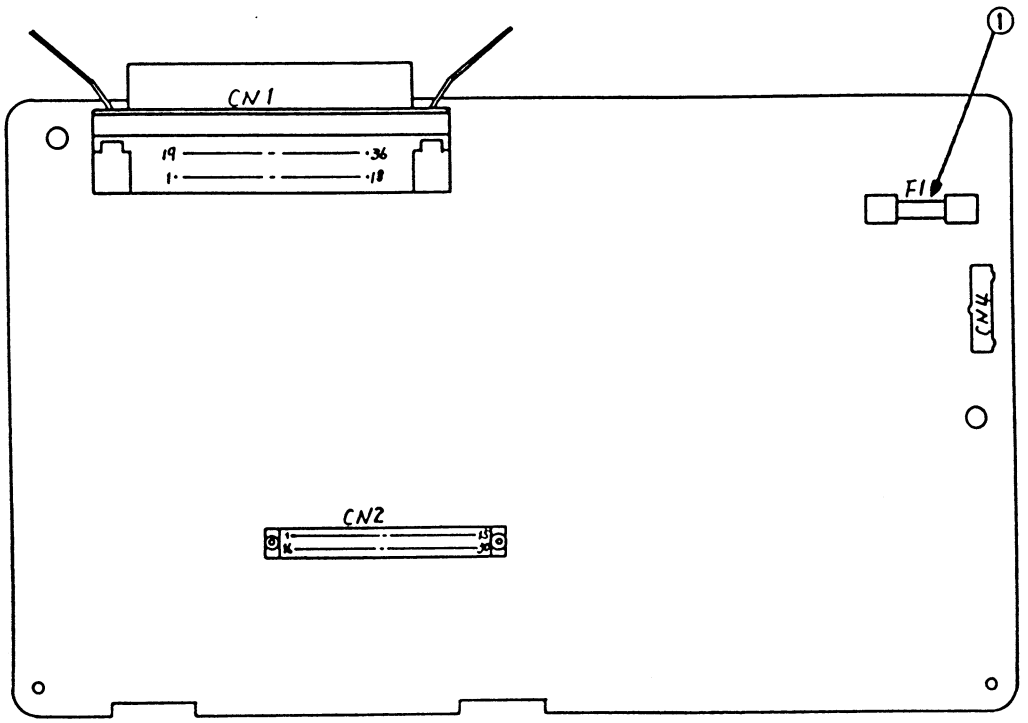
Table 10-2. Printer Mechanism (Con'd)

No.	Part No.	Description	ODA Part No.	Q'ty	Remarks
31	4PB4025-1108P1	Release link (front)	51302401	1	
32	4PB4025-1109P1	Release link (rear)	51302501	1	
33	4PB4025-1110P1	Release link	51302601	1	
34	4PB4025-1113P1	Paper lock release lever	53448401	1	
35	4PB4025-1115P1	Stopper rubber	53453101	2	
36	4PB4025-1159P1	Grommet	50512201	4	
37	3PB4025-1049P1	Space rack	53447401	1	
39	4PA4025-2617G1	Switch assembly	56208401	1	



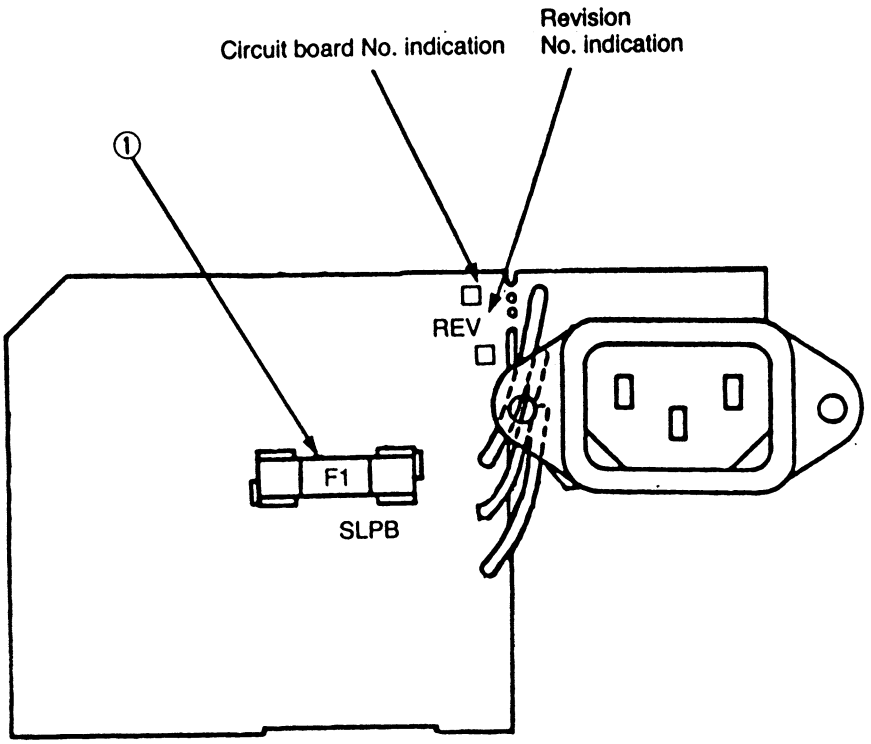
No.	Part No.	Description	ODA Parts No.	Q'ty	Remarks
1	3PB4025-2667P1	Pin tractor (R) assembly	50052701	1	Option
2	3PB4025-2668P1	Pin tractor (L) assembly	50052801	1	Option

Figure 10-3. Pin Tractor Unit



No.	Part No.	Description	ODA Parts No.	Q'ty	Remarks
1	540A0220M1152	Fuse 1.5 A	56301710	1	
1	540A2057M2162	Fuse 1.6 A		1	for UK Products

Figure 10-4. INDU-**Printed-Circuit Board**



No.	Part No.	Description	ODA Parts No.	Q'ty	Remarks
1	540A2036M2102	Fuse 1.0 A	56301501	1	120 V
1	540A2044S2631	Fuse 0.63 A	56301601	1	220 V/240 V

Figure 10-5. SLPB-Printed-Circuit Board