ML8810
Maintenance Manual

032707B

Document Revision History

Rev.No.	Date	Corrected items			Person in charge
		No.	Page	Description of change	
1	2006-05-24			ISSUE	ODS Noguchi
2	2006-06-24			Component change and Error in writing revision	ODS Endo

Preface

This service manual provides on-site maintenance procedures for the MICROLINE 8810 for field service engineers.

For handling and operation of the printer, see the operations manual.

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• The information given in this manual is subject to change without notice for the purpose of improvement to the product or to the contents of this manual.

Contents

1. Configuration

1.1 Standard Components

This printer consists of the components specified below.

    (1)   Upper-cover assembly

    (2)   Printer unit

    (3)   Power-supply unit

    (4)   Control unit

    (5)   Operating-panel assembly

    (6)   Lower-base assembly

Upper cover assembly

Sheet stacker

Stacker support

Printer unit

Operating panel assembly

Power supply unit

Control unit
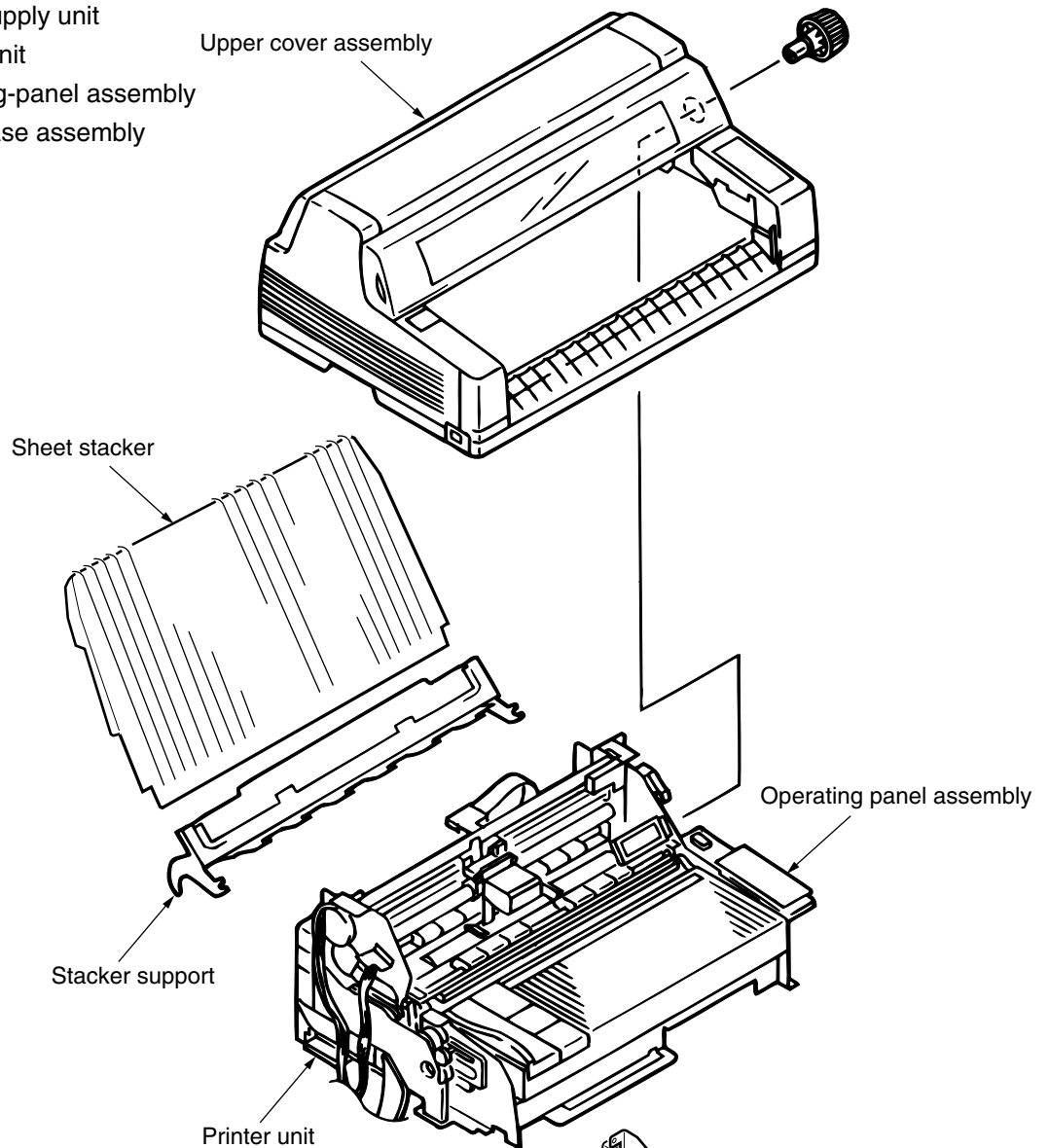
1.2 Optional Components

    (1)   Cut-sheet feeder

    (2)   Rear pin tractor

Lower base assembly
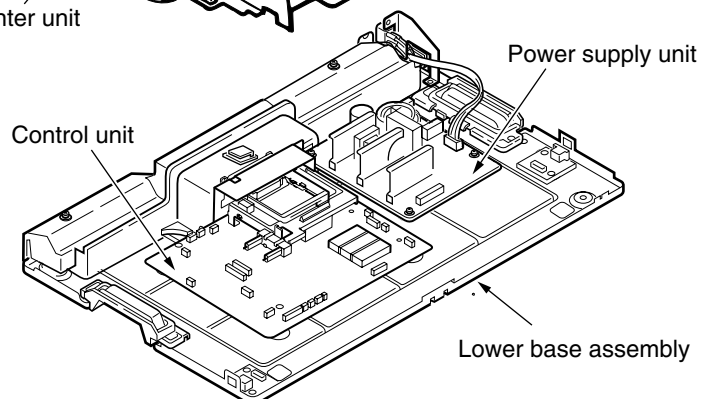
2. Periodic Inspection

Conducting the preventive maintenance described below in the specified cycle will help ensure the long and efficient operation of the printer and increase the MTBF (mean time between failure).
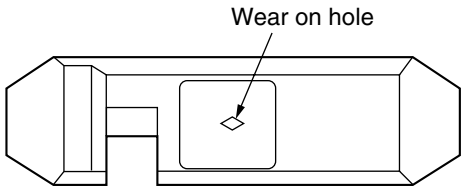
CAUTION: Turn off the power switch and disconnect the power cord before conducting maintenance work.

(1) Cycle: Every 6 months or 300 hours of operation, whichever comes first
(2) Tool: Maintenance tool list (see section 6)

* This printer is highly reliable and features a long lubrication cycle. Depending on the working conditions (e.g., duty and environment), the periodic inspection may be omitted. However, when repairing the printer, be sure to inspect, lubricate, and clean the parts.

2.1 Inspection Areas

Table 2-1

Inspection areas	Inspection method	Troubleshooting
(1) Loosening of screws	Check visually and using a screwdriver.	Tighten.
(2) Slack in space belt	(1) The belt shall not shake excessively. (Visual check) (2) Quality of print alignment	Loosen the mounting screw of the idle-pulley bracket, stretch the coil spring, and tighten the screw.
(3) Wear of ribbon protector	The hole in the center shall not be excessively worn. Wear on hole	Replace the ribbon protector (see section 7.2.13).
(4) Line-feed belt	(1) The belt shall not shake excessively. (Visual check) (2) Quality of line-feed pitch	Loosen the mounting screw of the tension pulley, and adjust the tension (see section 8.1).

3. Periodic Replacement Parts

The parts below require replacement in the specified cycles.

Table 3-1. Periodic Replacement Parts

No.	Description	Parts No.	Replacement cycle [The time (H) is the actual operating hours.]
1	Ribbon cartridge (single color)	41708210	10 million ANK characters in Utility mode
2	Ribbon protector	41589902	5 million new lines (estimated to equal 2,000 H)
3	Print head	43277301	300 million dots/pin
4	Platen	41872501	5 million new lines (100 million ANK characters)
5	Space motor	43267101	2,500 H (estimated)

4. Cleaning

CAUTION: • Turn off the power switch and disconnect the power cord before cleaning.
• Be careful to prevent paper dust from entering the mechanisms of the printer.
• After cleaning the lubrication areas, be sure to lubricate them.

Clean the inside of the printer as shown below in the specified cycle.

Cycle: Every 6 months or 300 hours of operation, whichever comes first
Duration: Approx. 15 minutes
Tool: Dry cloth (a soft cloth-like gauze), paint brush, and cotton swab (and a vacuum cleaner, if available)
Cleaning areas: See Table 4-1.

Table 4-1. Cleaning Areas

Cleaning areas	Detail of cleaning
Carriage shaft and surroundings	Remove paper dust and wipe off any smearing, dust, or ribbon lint.
Sub shaft	
Paper traveling surface	
SQC circuit-board sensor Rear PE sensor Sheet-guide upper-front-assembly sensor	Dust the sensors using a paintbrush or cotton swab, or vacuum the sensors.

Carriage shaft

Front/rear feed rollers (8 locations)

ViewB

Rear PE sensor

ViewA

Sheet-guide upper-front-assembly sensor (3 locations)

SQC circuit-board sensor (11 locations)

View A: Bottom View of Printer

SQC circuit board

Rear PE sensor

Sub shaft

View B: Rear View of Printer
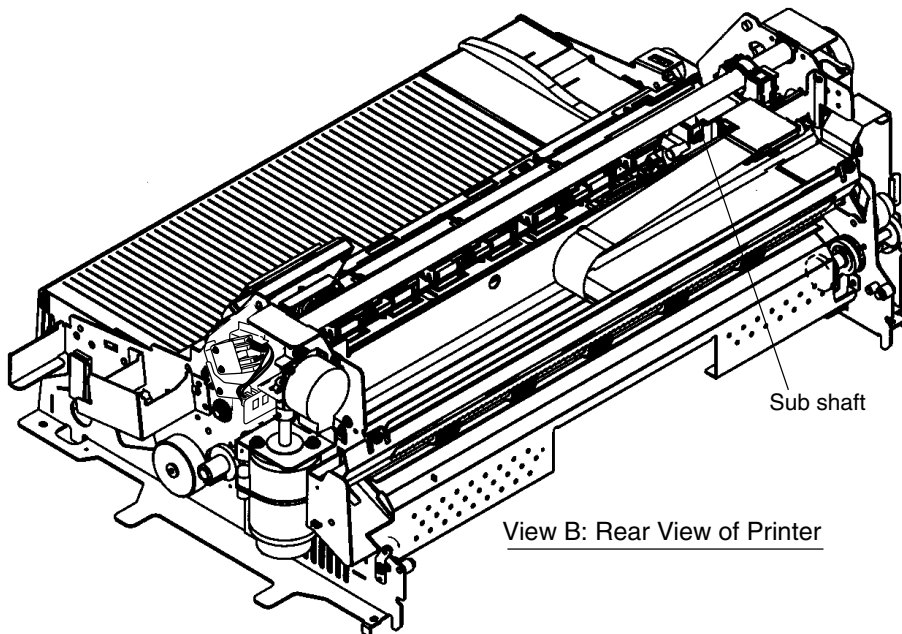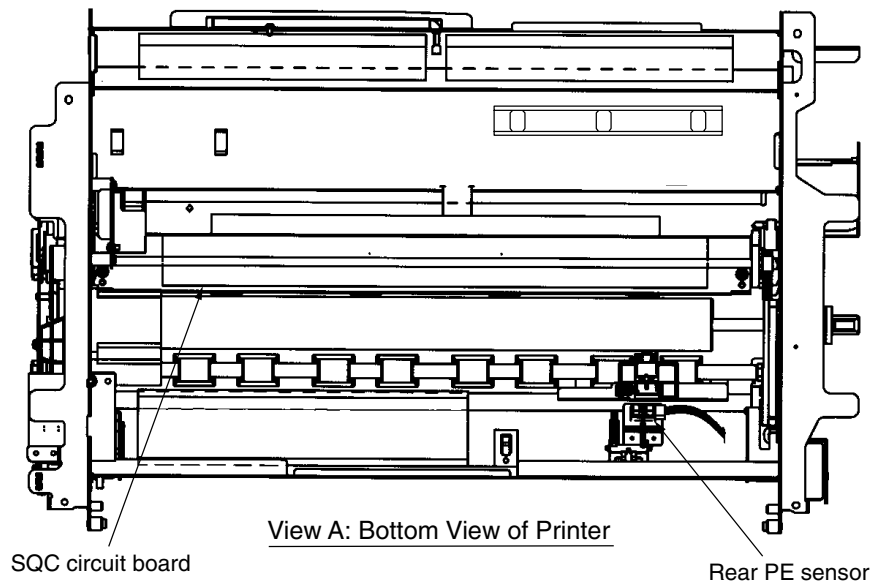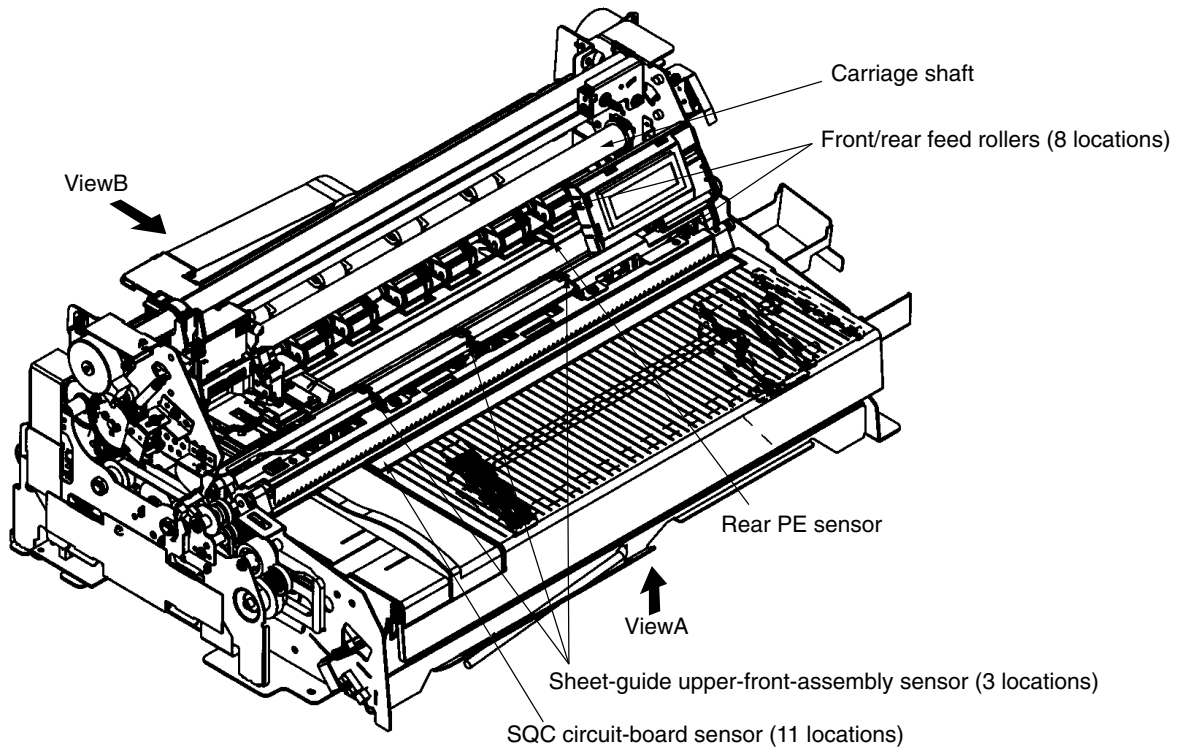
4.1 Cleaning of Sensors

(1) Cleaning of Rear PE Sensor

① Using a cotton swab, wipe the sensor on the platen side of the upper sheet guide.
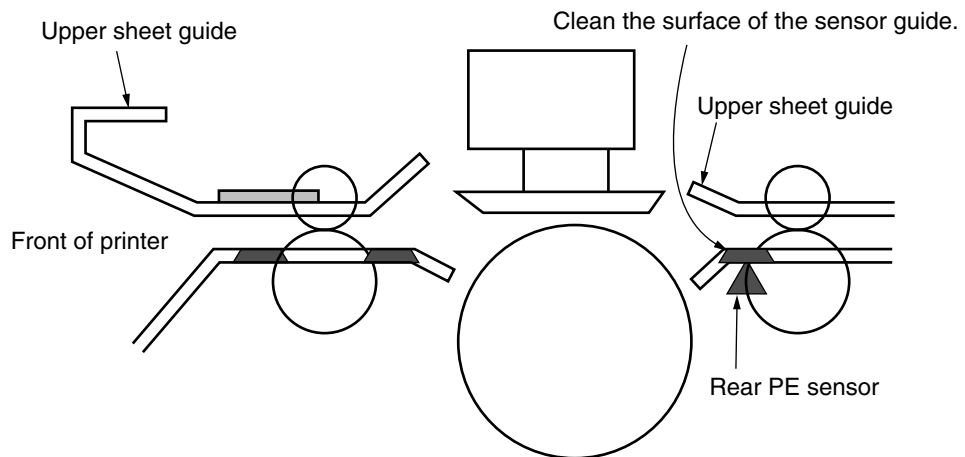
(2) Cleaning of the SQC Circuit-Board Sensor and Sheet-Guide Upper-Front-Assembly Sensor

① Referring to section 7.2.23, remove the sheet-guide upper front assembly. Wipe the sensor surface and the mounting area using a cotton swab.

② Place the sheet-guide upper front assembly back in the printer. Conduct the sensor slice-level learning function test and the postcard local test.
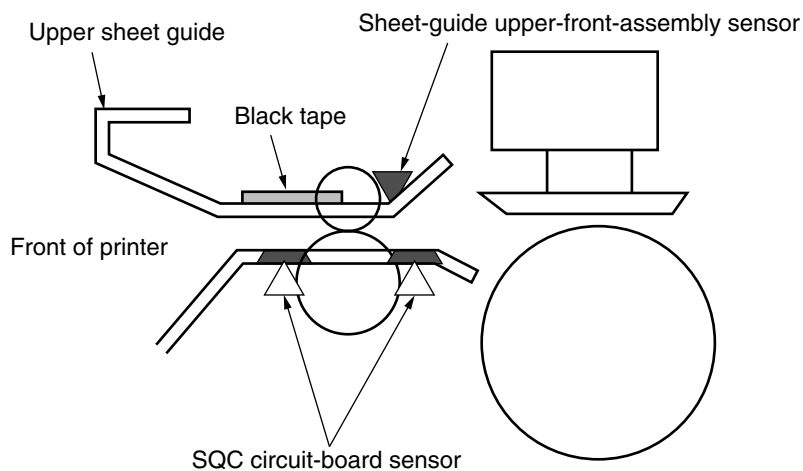
CAUTION: After cleaning the sensors, conduct the slice-level check (learning function) of the sensors, the sensor check, and correction of the paper-width sensor and the front PE sensor as described in section 8.8. In addition, conduct correction (checking) of the TOF position during auto loading as described in section 8.4.

5. Lubricating

Perform lubrication as specified below.

(1) Cycle

Lubricate every year or 600 hours of operation, whichever comes first (parts marked * only). Otherwise, this printer is maintenance-free and lubrication will not be necessary during operation. However, when you have conducted disassembly or reassembly, cleaned the lubrication areas, or replaced parts, perform lubrication.

(2) Type of Lubricant
- Pan motor oil 10W-30 (Nippon Oil equivalent) ....PM
- Albania grease #2EP (Showa Shell Sekiyu equivalent) ....GEP

(3) Lubrication dosage
- Large quantity ....(A)...... Lubricate well.
- Moderate quantity .....(B)...... Add 3 to 4 drops of oil or apply a film of grease approximately 0.2 mm in thickness.
- Small quantity ....(C)..... Add approximately one drop.

(4) Areas Not to Be Lubricated

Table 5-1. Areas Not to Be Lubricated

No.	Prohibited areas	Reason	Remarks
1	Ink ribbon	To prevent ink blurring	
2	Sensors	To prevent dust adhesion	
3	Platen (rubber surface)	To prevent smearing of paper	
4	Feed roller (rubber surface)	To prevent smearing of paper	
5	Pin tractor	To prevent smearing of paper	
6	Mini pitch belt	To prevent rubber deterioration and slackening	
7	Head cable assembly	To prevent cable cracking and contact failure	
8	Print head	To prevent print-head operation error	
9	Micro switch	To protect the contact	
10	Auto-gap disk	To prevent dust adhesion	
11	Carriage circuit board	To prevent contact failure	
12	Connectors and terminals	To prevent contact failure	
13	Carriage shaft	To prevent an increase in the space load	Be careful not to spill grease on the shaft when greasing the sliding surfaces of the collars on both sides.
14	Stacker roller (rubber surface)	To prevent smearing of paper	
15	Slip roller (rubber surface)	To prevent smearing of paper	

(5)   Lubrication Areas
See the illustrations below.

Adjust-cam surface
GEP Ⓑ (Right/left)

Slider felt (*)
PM Ⓑ

Sliding area between carriage shaft and collar
GEP Ⓑ (Right/left)

Gear tooth flank
GEP Ⓑ

Bearing sliding surface
PM Ⓑ

Gear tooth flank
GEP Ⓑ

Spring hook
GEP Ⓑ

Gear tooth flank
GEP Ⓑ

Arm-mode sliding surface
GEP Ⓑ
(2 locations each on right/left)

Arm-mode sliding surface
GEP Ⓑ
(2 locations each on right/left)

Gear tooth flank
GEP Ⓑ

Gear tooth flank
GEP Ⓑ

Engaged area between the pulley tractor
and the change clutch tractor.
GEP Ⓑ

Adjust-cam surface
GEP Ⓑ

Sliding area between carriage shaft and collar
GEP Ⓑ

Bearing sliding surface
PM Ⓑ

Spring hook
GEP Ⓑ

Sliding area between platen and platen collar
PM Ⓑ

Bearing sliding surface
PM Ⓑ
(2 locations each on right/left)

Bearing sliding surface
PM Ⓑ
(2 locations each on right/left)

Motor-idle gear tooth flank
GEP Ⓑ

Sliding area between stud and rack
GEP Ⓑ

Sliding area between arm mode and rack
GEP Ⓑ

Rack tooth flank
GEP Ⓑ

Sliding area between side frame and rack
GEP Ⓑ

Mode Rack R

Sliding area between stud and rack
GEP Ⓑ

Sliding area between arm mode and rack
GEP Ⓑ

Sliding area between change gear and rack
GEP Ⓑ

Rack tooth flank
GEP Ⓑ

Sliding area between change gear and rack
GEP Ⓑ

Mode Rack L

Sliding surface with mode arm

GEP Ⓑ

Drive-shaft sliding surface for rotation

PM Ⓒ

Drive-shaft sliding surface for rotation

PM Ⓒ

Sliding surface with mode arm

GEP Ⓑ

Sheet-Guide Upper F/R Assembly

Bearing portion of gear

GEP Ⓒ (4 locations)

Gear tooth flank

GEP Ⓒ (6 locations)

Bearing portion of gear

GEP Ⓒ (2 locations)

Ribbon Feed Assembly

6. Maintenance Tools

Table 6-1 shows the tools required for on-site maintenance services, such as replacement of printed circuit boards and other parts.

Table 6-1. Maintenance Tools

No.	Maintenance tools	Quantity	Parts for which the tools are used	Remarks
1	No.1-100 Phillips screwdriver	1	2- to 2.6-mm screw	
2	No.2-100 Phillips screwdriver	1	3- to 5-mm screw	In addition, have a mini-screwdriver ready.
3	No.2-200 Phillips screwdriver	1	3- to 5-mm screw	
4	5-200 screwdriver	1	3- to 5-mm screw	
5	200 screwdriver	1	2- to 2.6-mm screw	
6	Spring hook	1		
7	Thickness gauge	1	0.1 to 0.16 mm	
8	No. 3 half round-nose pliers	1		
9	No. 5 nippers	1		
10	Tester	1		
11	Stabilizer Phillips screwdriver	1		
12	500-gr pressure bar gauge	1		
13	Vernier caliper	1		
14	Precision screwdriver #3	1	Blade width of 2 mm	
15	Loctite 241	1		Screw lock adhesive – removable for disassembly (Loctite Japan equivalent)

7. Replacing Parts

7.1 Precautions in Parts Replacement

(1) Turn off the power switch, disconnect the AC plug from the AC outlet, and disconnect the AC cord and the interface cable from the printer before starting disassembly.

⚠**Warning**	Risk of electric shock	⚡
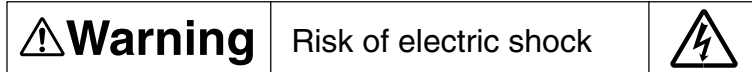
(2) The print head will be hot immediately after printing. Wait approximately 5 minutes after the power has been turned off before starting disassembly.

⚠**Caution**	Risk of burns	♨
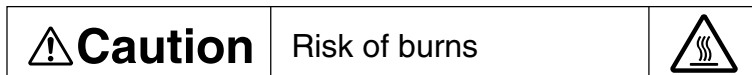
(3) Remove the paper, ribbon cartridge, and cut-sheet feeder from the printer before starting disassembly.

(4) Be sure to check the connection of the connectors before turning on the power after parts have been replaced or inspections have been conducted.

(5) Do not disassemble the printer if it is operating properly.

(6) Determine the extent to which you are going to disassemble the printer according to the purpose of its use. Do not disassemble the printer to a greater extent than necessary.

(7) Use the specified tools to conduct maintenance.

(8) Conduct disassembly in the specified order. Otherwise, the parts may be damaged.

(9) Small parts such as screws and collars are easily lost. Loosely fasten them back in place to prevent them from being lost.

(10) ICs such as the microprocessor, ROM, and RAM are vulnerable to static electricity. When handling a printed circuit board, do not wear gloves likely to cause static electricity.

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

(12) Areas Not to Be Disassembled

Do not disassemble the parts and areas specified below, as they cannot be restored.

Unit	Prohibited areas	Detail
Print head	Print head	Print-head body
Printer unit	Space motor Ribbon pulse motor Auto-gap motor Cut-sheet/continuous-form selector motor LF motor	Motor body
	Eccentric collar (L)/(R) (on the adjust-cam)	Eccentric-collar fixing screw (painted white)
Carriage unit	Gap sensor (EI sensor assembly)	Gap-sensor fixing screw

7.2 Removing and Installing Parts

7.2.1 Upper-Cover Assembly

(1) Remove the stacker ① and the stacker support ②.

(2) Disconnect the AC cord from the printer. Remove the earth screw, if any.

  CAUTION: If the AC cord is connected to the printer, the upper-cover assembly cannot be removed or installed.

(3) Remove the platen knob ③.

(4) Raise the table ④.

(5) Remove the three screws ⑤ and two screws ⑥.

(6) Lift and remove the upper-cover assembly ⑦.

(7) Perform installation in the reverse order of removal.
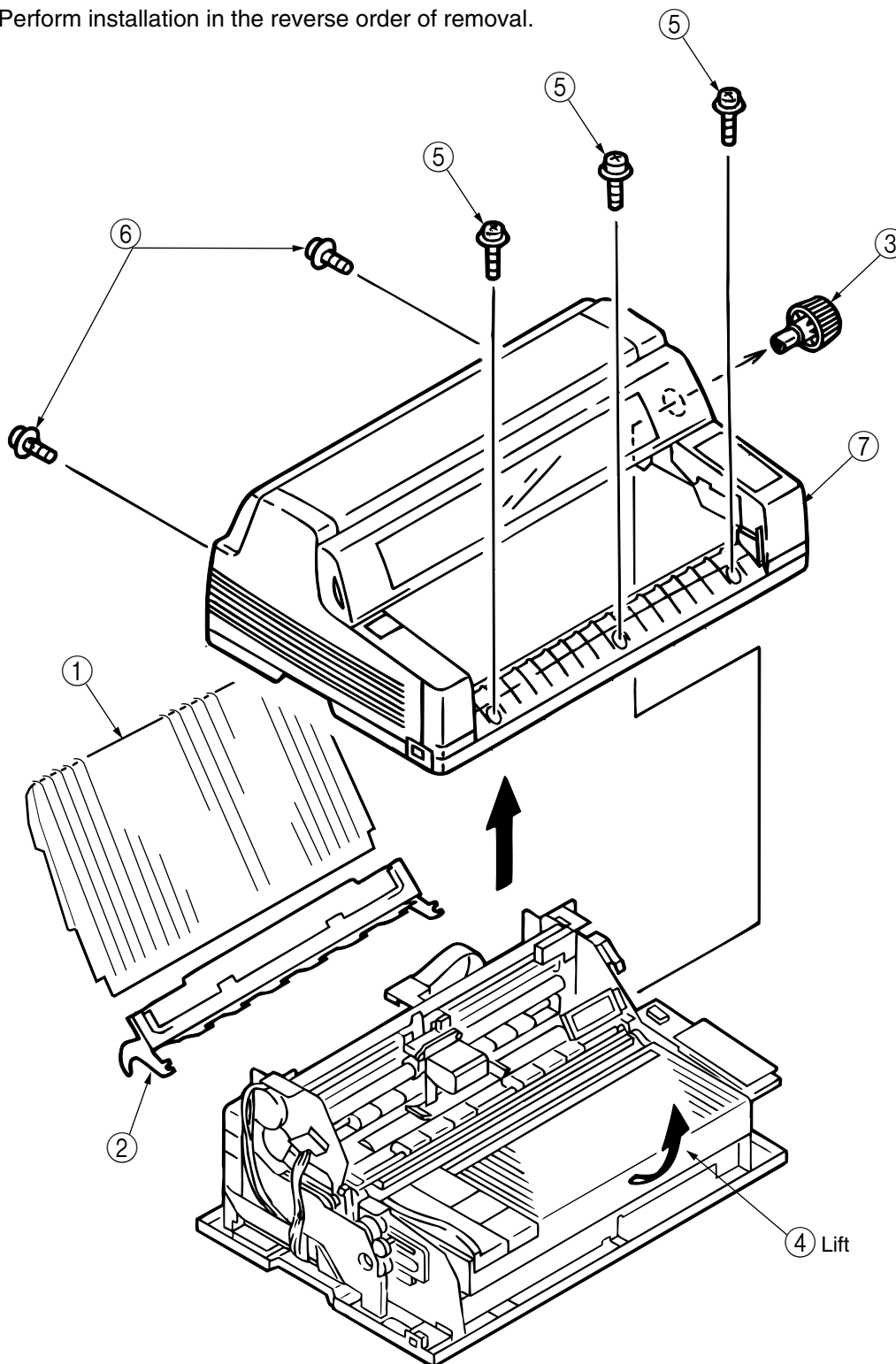
7.2.2   Raising and Lowering the Printer Unit

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Open the operating panel ① and remove the four screws ②.

(3)   Hold the pull and raise the printer unit ③, pivoting it on its back.

(4)   While holding the pull and raising the printer unit, insert the stand shaft into the groove in the lower cover ④, and support the printer unit using the shaft.

   CAUTION: When supporting the printer unit ③ using the stand shaft, make sure the stand shaft is securely inserted into the groove. If the shaft is not stable, the printer unit ③ may fall down while the parts are being replaced, resulting in injury.

(5)   Lower the printer unit in reverse order.

(Precautions on Installation)

1.   When lowering the printer unit ③, do so gently so as not to catch your finger or hand in the lower cover ④. In addition, be careful not to catch connection cords or cables.

① ② ③ ④

Pull

Gasket

Set the stand shaft securely.

Groove

Stand shaft
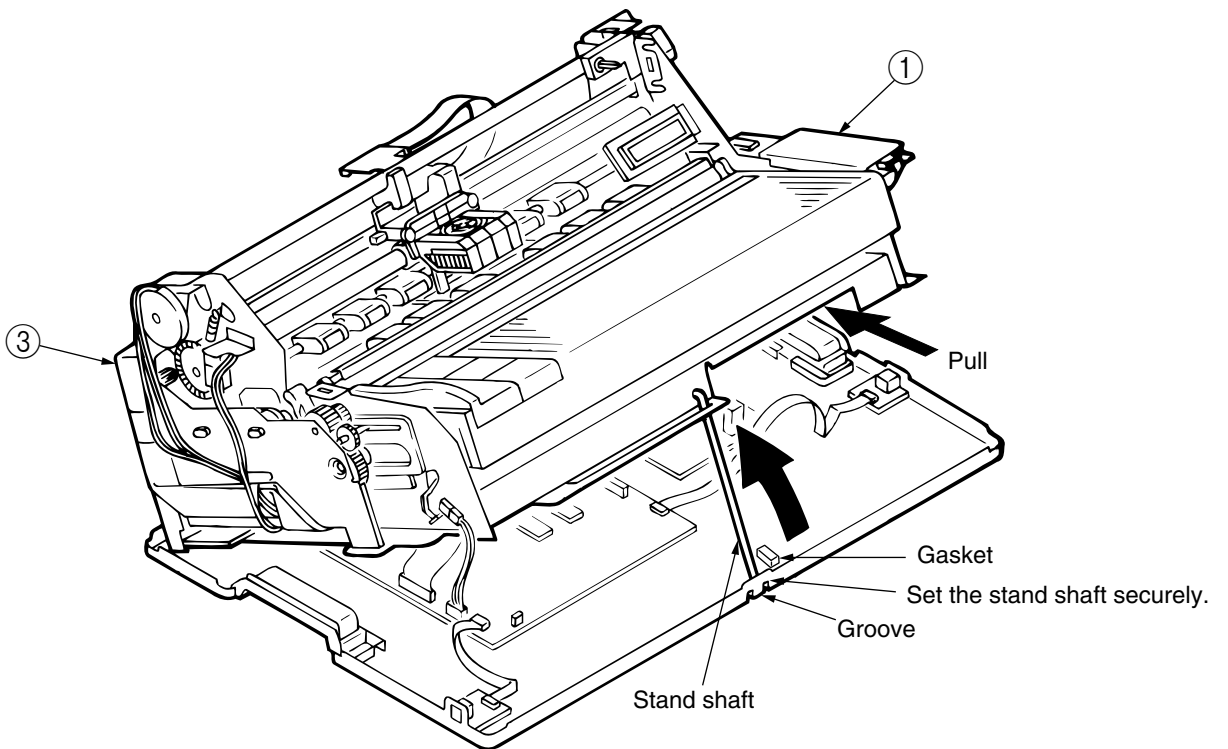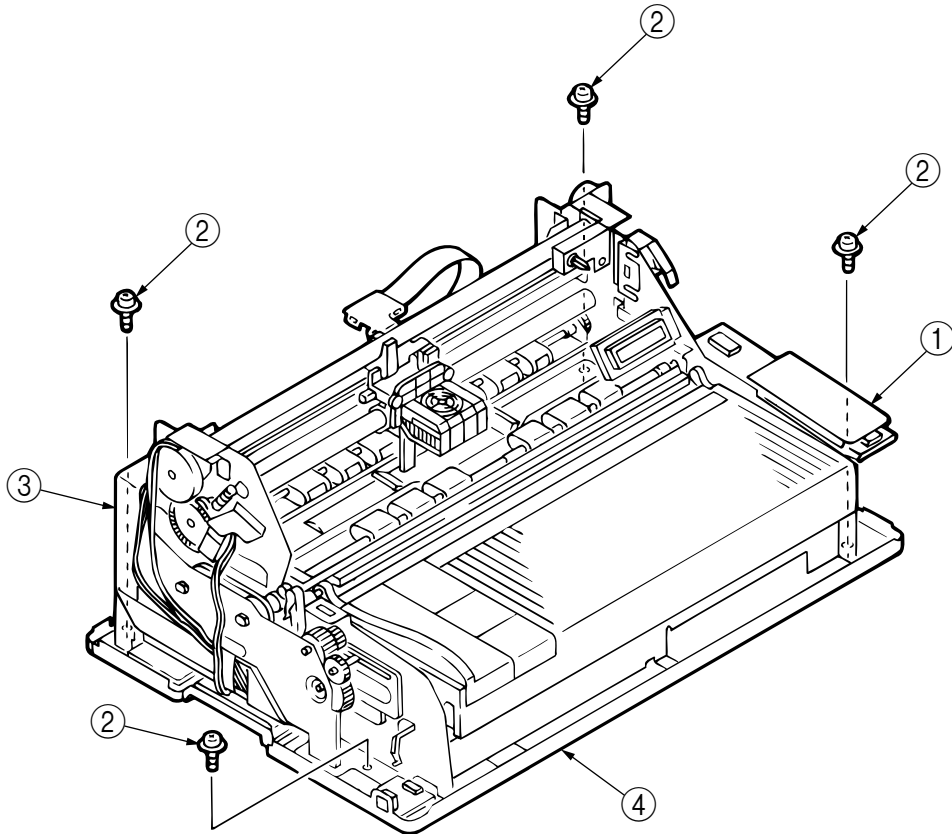
7.2.3 Control Unit (M2D Printed Circuit Board)

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Raise the printer unit (see section 7.2.2).

(3) Disconnect all connection cords connected to the control unit ①.

(4) Remove the five screws ② and the control unit ①.

(5) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. Be careful not to catch connection cords under the control unit ①.

2. When replacing the control unit ①, remove the EEPROM of the old circuit board and mount it on the new circuit board.
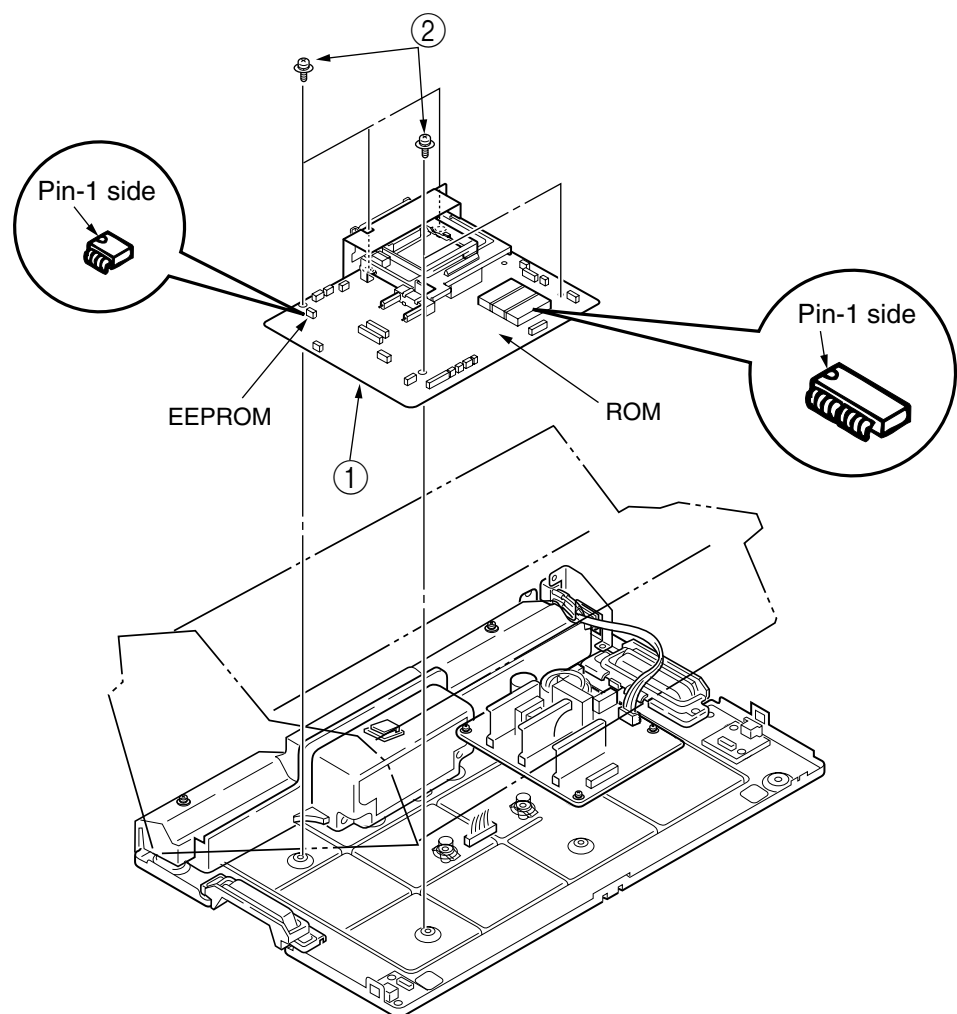
7.2.4　Power-Supply Unit

(1)　Remove the upper-cover assembly (see section 7.2.1).

(2)　Raise the printer unit (see section 7.2.2).

(3)　Disconnect all connectors connected to the power-supply unit ①.

(4)　Remove the five screws ②.

(5)　When removing the power-supply unit, disconnect the connectors, pull out the power switch upward from the lower cover ③, and disconnect the cords from the cord route of the lower cover ③.

(6)　Remove the film sheet ④.

(7)　Perform installation in the reverse order of removal.

Cord route
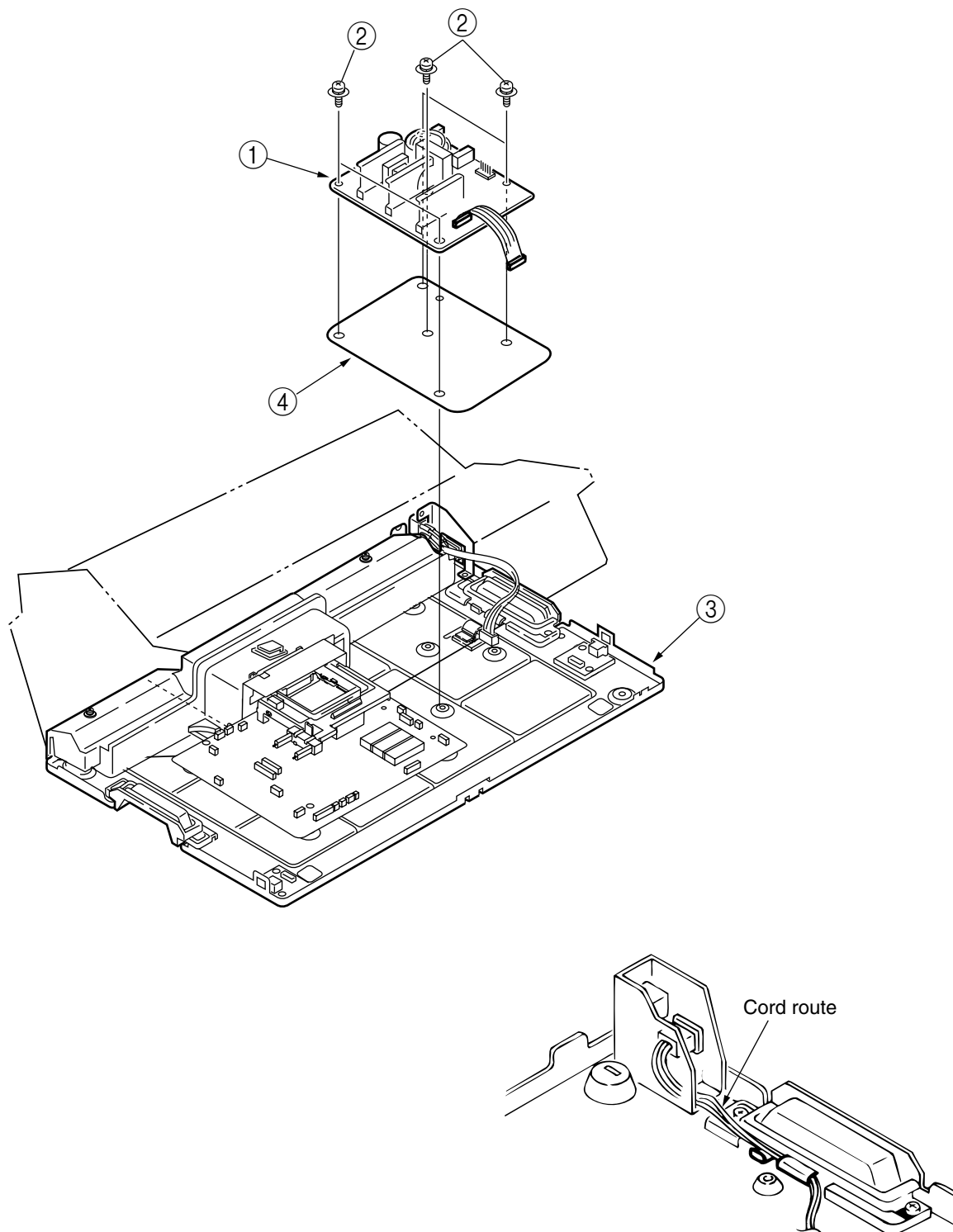
7.2.5   AG Sensor Circuit board

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Remove the screw ② and the AG-sensor circuit-board assembly ③. Disconnect the connector ① from the AG-sensor circuit board.

(3)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   Make sure the gap between the sensor and the slit disk does not exceed 0.5 mm.

2.   Loosen the screw ⑥, and move the sensor bracket ⑦ in the direction indicated by the arrow to make adjustment so that the slit disk ⑤ does not touch the sensor when the main shaft ④ is moved to the right by the distance of the backlash, and that the gap does not exceed 0.5 mm when the main shaft is moved to the left by the distance of the backlash. (Check the gap for the entire area of the slit disk ⑤.)

0.5 mm or less

Sensor
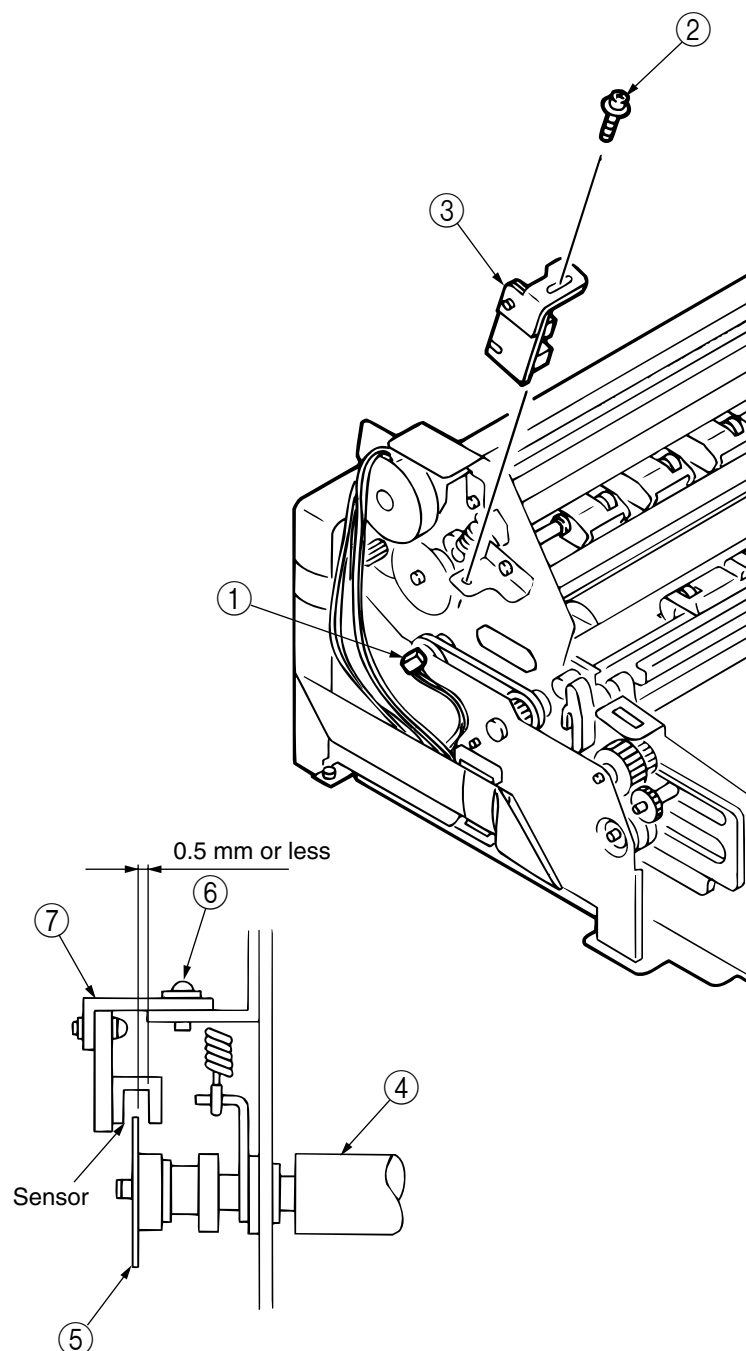
7.2.6   AG Motor Assembly

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Raise the printer unit (see section 7.2.2).

(3)   Remove the cable guide ①.

(4)   Disconnect the connector ③ of the AG motor assembly ② from the CN16 on the control unit ④.

(5)   Remove the two screws ⑤ and the AG motor assembly ②.

(6)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   Install the AG motor assembly ① and confirm that the gear train rotates smoothly. Pass the motor cable inside the head cable ⑥ to prevent slack in the cable.

7.2.7   LF Motor Assembly

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Raise the printer unit (see section 7.2.2).

(3)   Remove the cable guide ① and the three screws ②. Remove the sub frame ③ and the bushes ④. When the sub frame ③ is removed, the coil spring ⑤ will come off with the frame. Be careful not to lose it.

(4)   Disconnect the connector ⑦ from the CN18 on the control unit ⑥.

(5)   Loosen the screw ⑧ of the idle-pulley bracket.

(6)   Remove the three screws ⑨ and the LF motor assembly ⑩.

(7)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   After assembling the LF motor assembly ⑩, adjust the slack in the mini pitch belt ⑪ before installing the assembly (see section 8.1).

7.2.8 Space Motor

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Loosen the mounting screw ② of the idle-pulley bracket ①, slide the screw in the direction indicated by the arrow, and tighten it.

(3) Raise the printer unit (see section 7.2.2).

(4) Disconnect the connector ④ from the CN3 on the control unit ③ and the connector ⑥ from the CN3 on the operating-panel circuit board ⑤.

(5) Remove the three guide-plate cables ⑦.

(6) Remove the two screws ⑧ and the space-motor assembly ⑨.

(7) Perform installation in the reverse order of removal.

(Precautions on Installation)

The cord of the connector ④ and ⑥ shall be passed through the clamp ⑩ and the square hole on the right-hand side of the printer.

Square hole
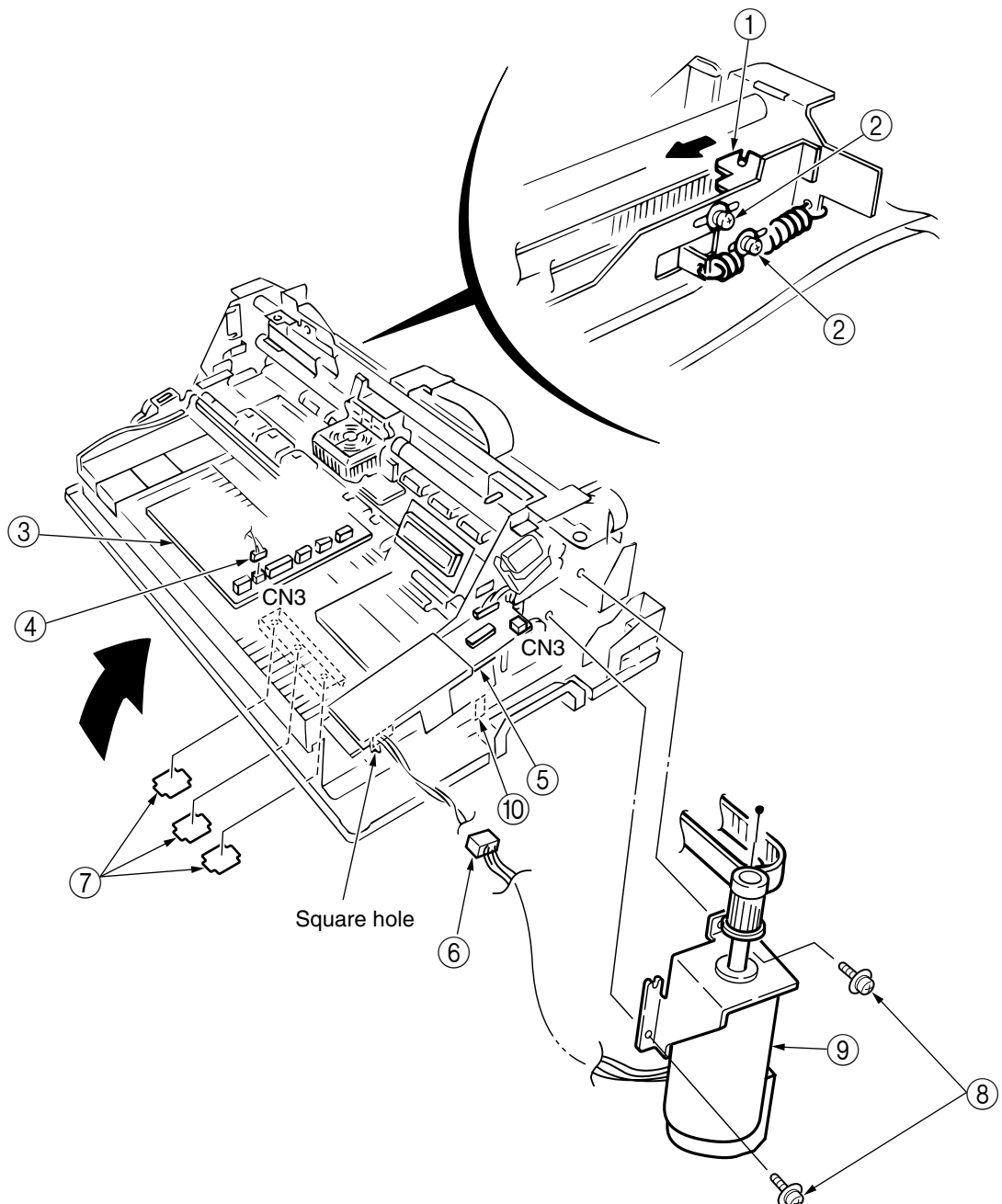
7.2.9   Operating-Panel Circuit Board

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Disconnect all connection cords connected to the operating-panel circuit board ①.

(3)   Release the operating-panel assembly ② from the catch.

(4)   Remove the screw ③ and the claws ④ (in 4 locations). Remove the operating-panel circuit board ① from the operating-panel assembly ②.

(5)   Perform installation in the reverse order of removal.
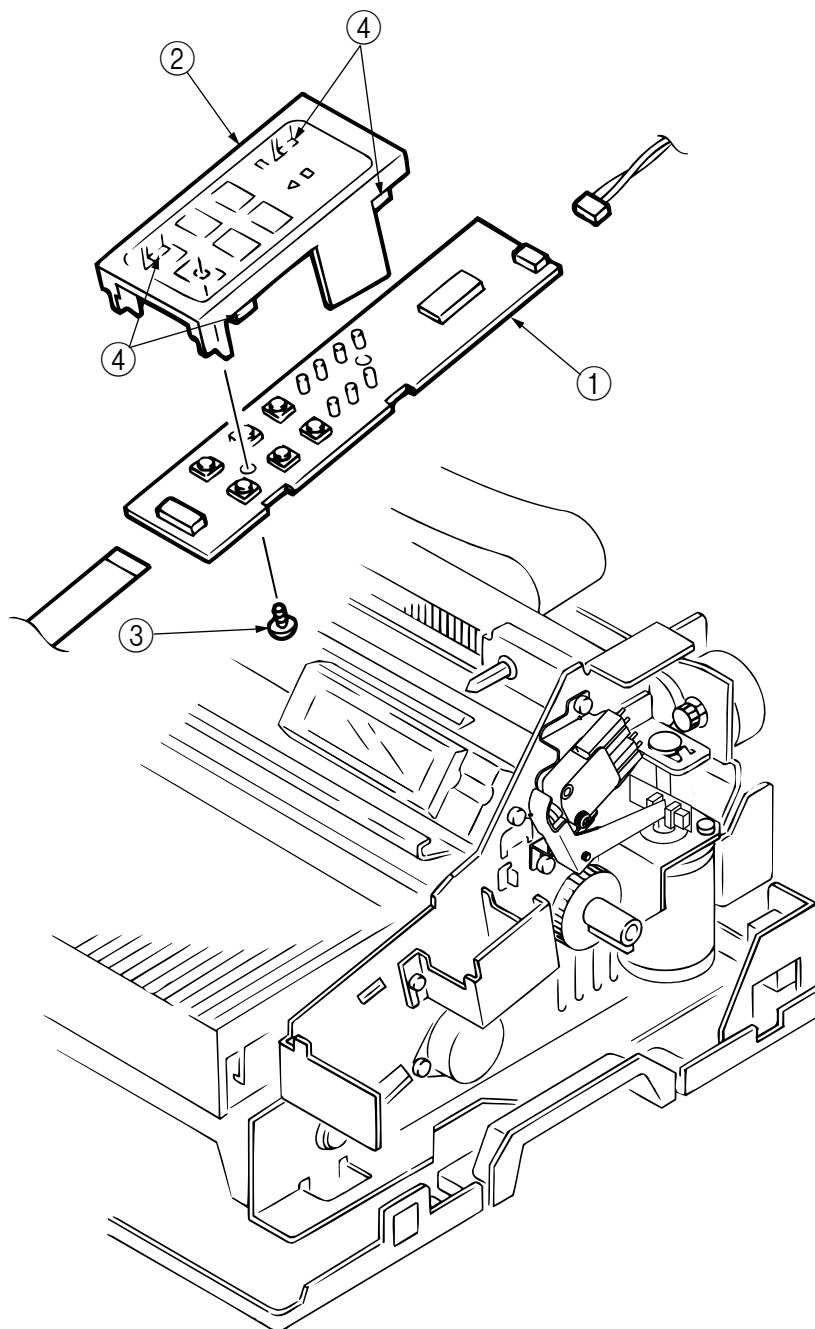
7.2.10 Starting Up in Gap Fully Open Mode
(Replacement of the head/ribbon guide/ribbon protector)

(1) While holding down switches 1, 5, and 6 on the operating panel, turn on the power switch to start up in maintenance mode.

(2) While holding down switch 6, press switch 3. Approximately 5 seconds later, turn off the power switch. (Gap fully open)

(3) Open the top cover ① and remove the two screws ②. Draw the middle cover ③ forward, and then lift it off. (Arrow C)

(4) While raising the upper roller ④ slightly in the direction indicated by arrow A, move the roller in the direction indicated by arrow B.

(5) During assembly, raise the upper roller ④ slightly in the direction indicated by arrow A, and then move it back in place.

(Precautions on Installation)

1. When moving the upper roller ④, be careful not to raise the roller excessively in the direction indicated by arrow A.

2. Be careful to prevent the upper roller ④ from touching the end of the frame.
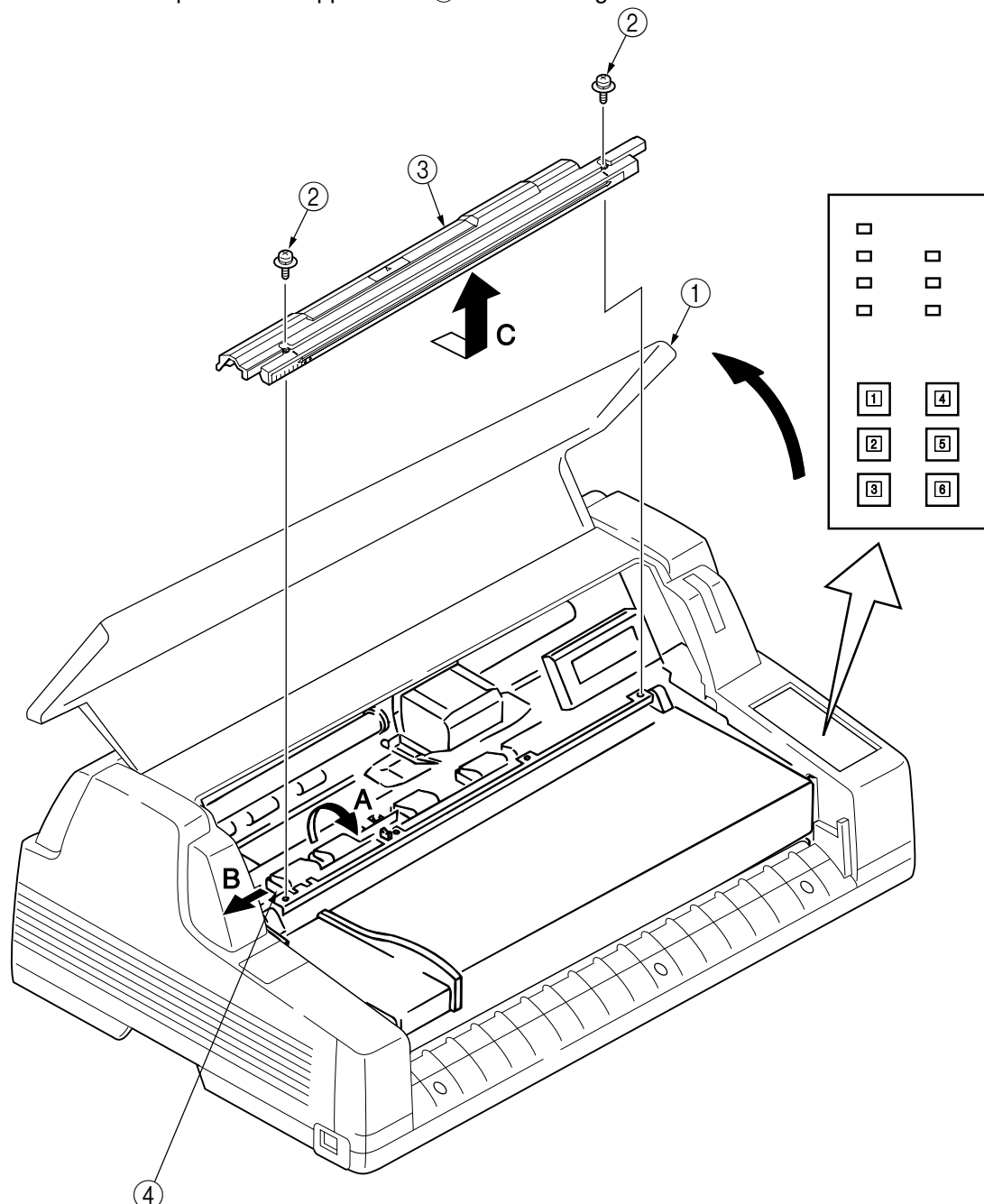
7.2.11 Ribbon Guide & Head Fan Assembly

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools.

(1) Start up in gap fully open mode (see section 7.2.10).

(2) Move the carriage ① to its leftmost position (at the cut in the front sheet guide).

(3) Remove the two screws ②, remove the head fan assembly ③, and disconnect the connection cord ④.

(4) Widen both sides of the ribbon guide ⑤ to release the protrusions of the ribbon guide from the holes in the carriage frame ⑥, and draw the guide forward to remove it.

(5) Perform installation in the reverse order of removal.

CAUTION: Be sure to turn off the power switch prior to disassembly.

Front sheet guide

Hole

7.2.12 Print Head

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools. Be sure to turn off the power switch prior to disassembly.

(1) Start up in gap fully open mode (see section 7.2.10).

(2) Remove the ribbon guide and the head fan assembly (see section 7.2.11).

(3) Open the head clamp ① in the direction indicated by the arrow, and disconnect the print head ② from the connector ③.

(4) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. Securely insert the print head ② into the connector ③. Close the head clamp ① tightly.

2. Be careful not to drop the print head ② toward the platen side (to prevent deformation of the ribbon protector).

3. Be careful not to drop the clamp-heat sink ④, ⑤.
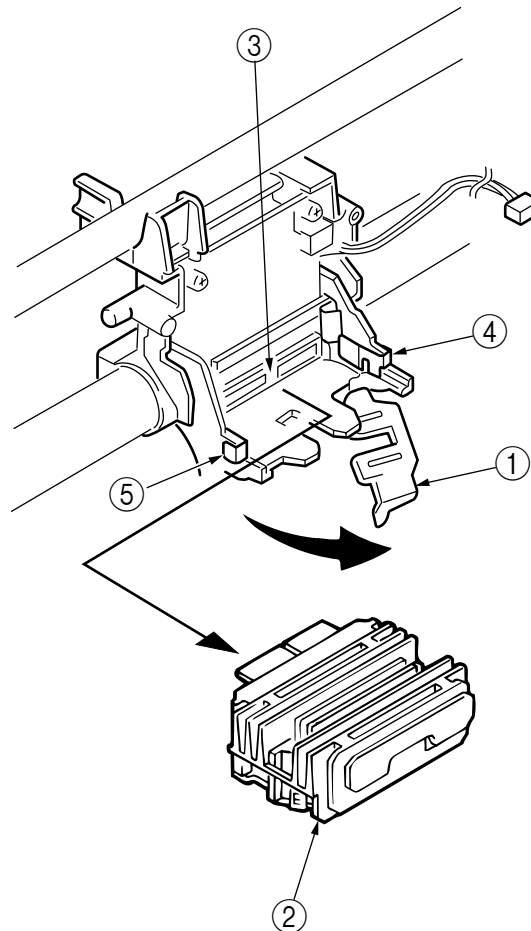
7.2.13 Ribbon Protector

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools.

(1) Remove the print head (see section 7.2.12).

(2) Remove the two screws ① and the two paper-width-sensor assemblies ②.

(3) While opening the arms of the ribbon protector ③ to both sides, remove the ribbon protector ③ from the carriage unit ④, rotating it forward in the direction indicated by arrow A. (The ribs of the carriage unit ④ are engaged with the ribs of the ribbon protector ③. Press the protector slightly in the direction indicated by arrow B when removing it.)

(4) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. After replacing the ribbon protector, conduct the sensor slice-level check (learning function), the sensor check, and correction of the paper-width sensor and the front PE sensor as described in section 8.8. In addition, conduct correction (check) of the TOF position during auto loading as described in section 8.4.
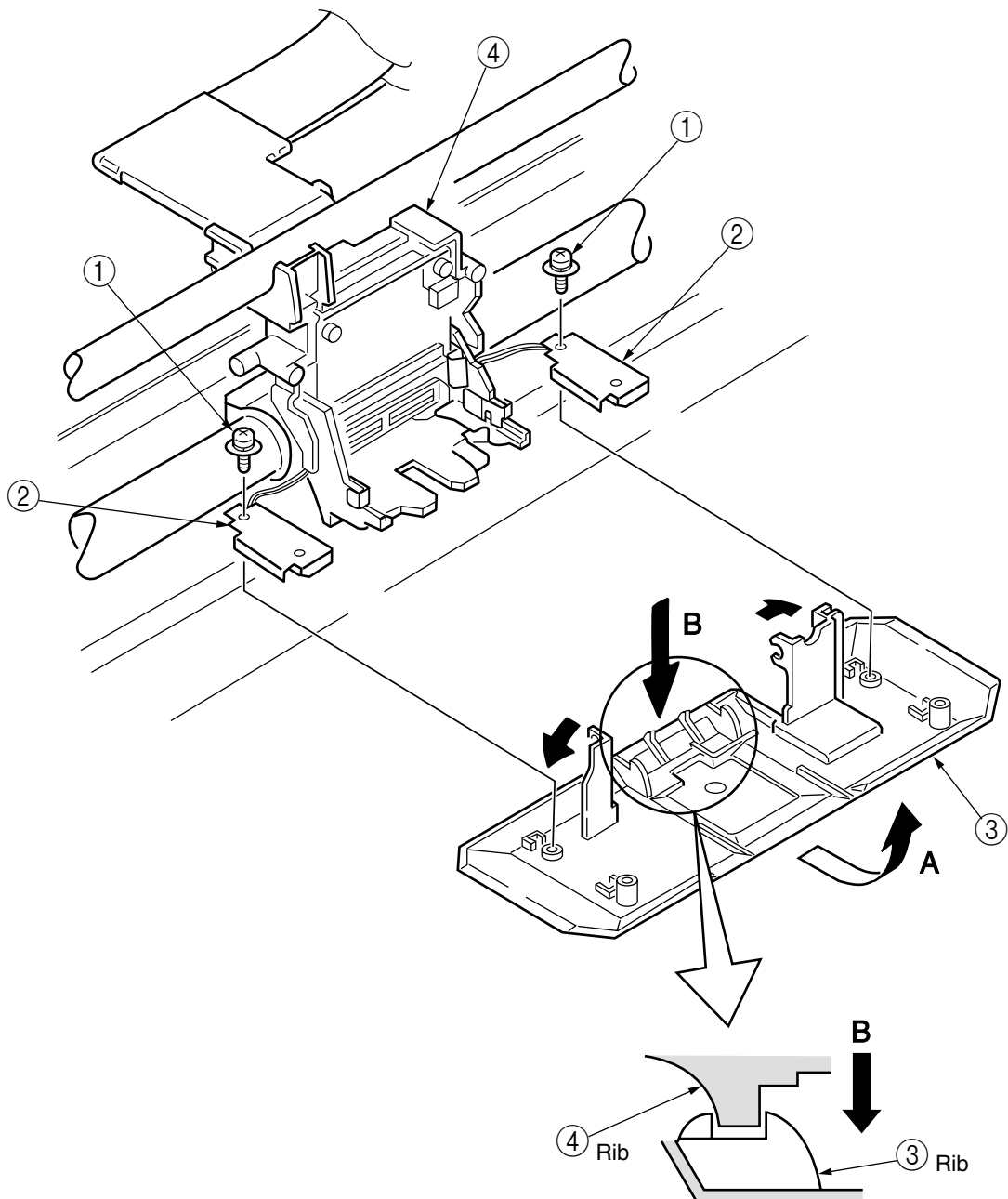
7.2.14 Ribbon Feed Assembly

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Remove the screws ① and ② and the ribbon feed assembly ③.

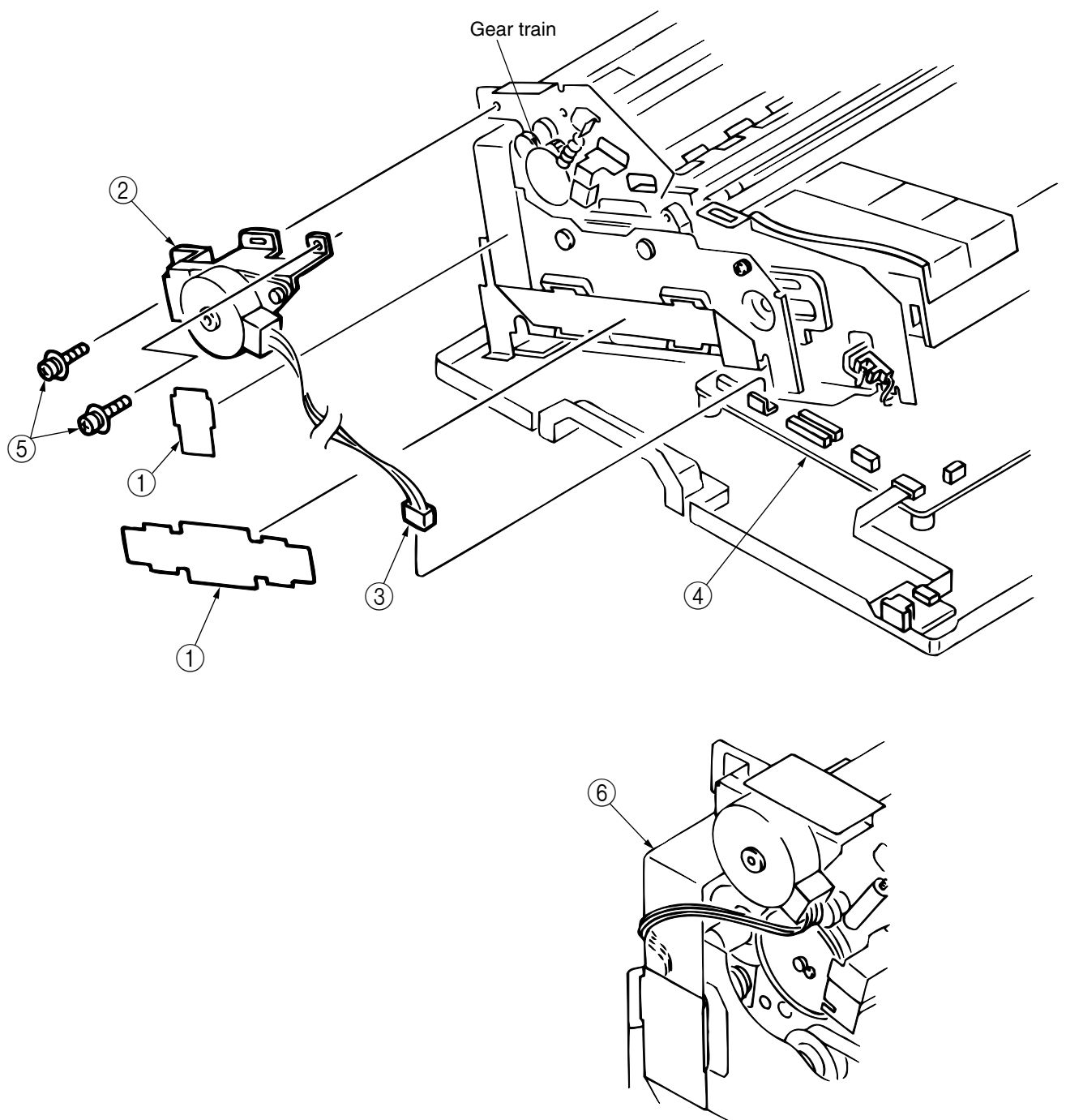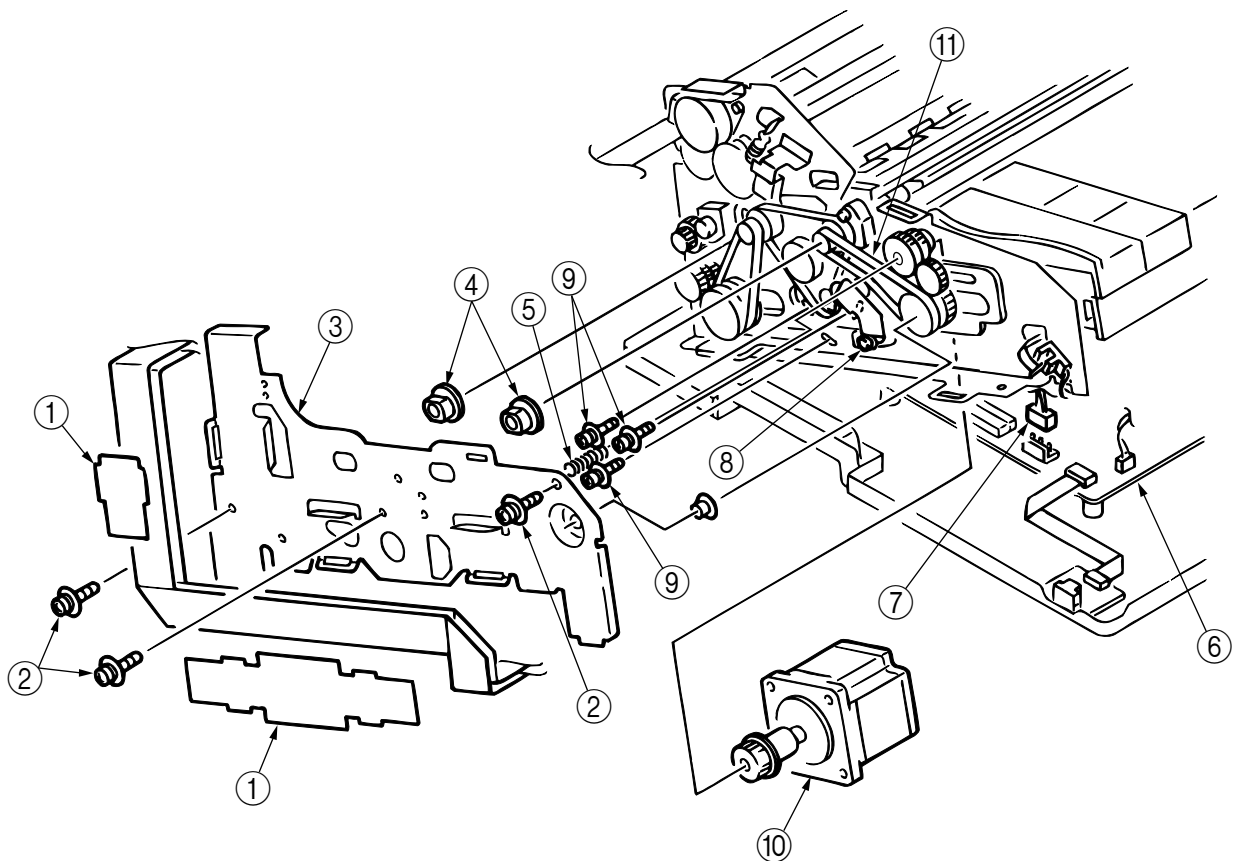(3) Perform installation in the reverse order of removal.
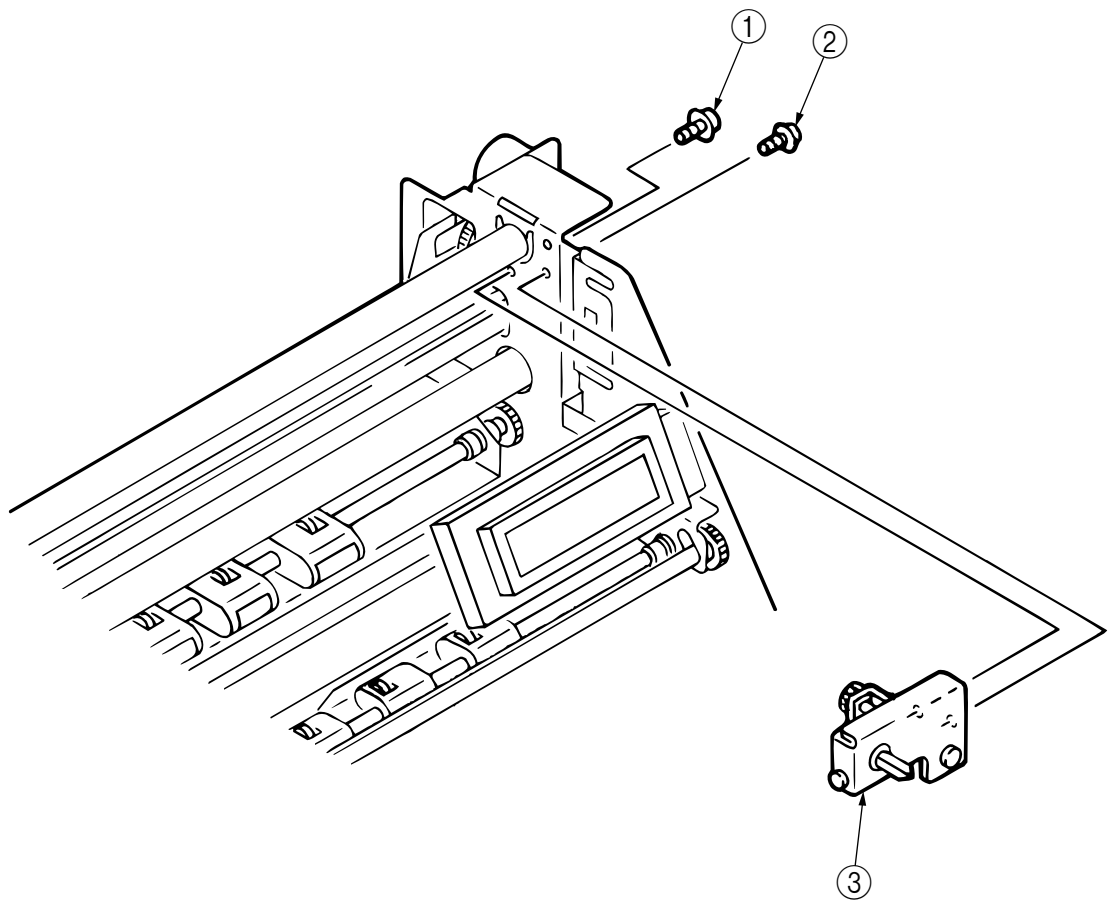
7.2.15 Ribbon Feed Motor

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Raise the printer unit (see section 7.2.2).

(3) Remove the purse lock ①.

(4) Disconnect the connector ③ from the CN19 on the control unit ②.

(5) Remove the three guide-plate cables ④.

(6) Remove the two screws ⑤ and the ribbon feed motor ⑥.

(7) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. The cord of the connector ③ shall be passed through the square hole on the right-hand side of the printer frame.
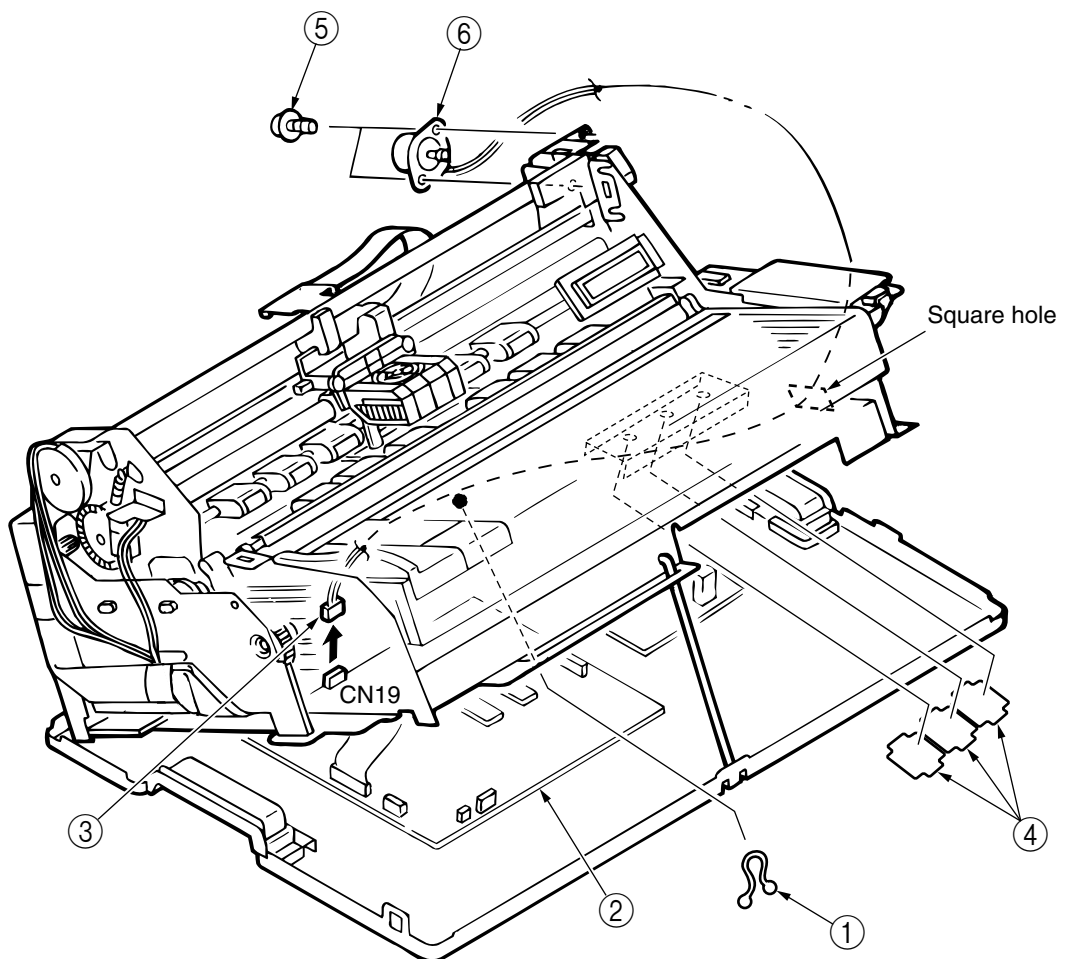
7.2.16 Space Belt

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Remove the space motor (see section 7.2.7).

(3)   Remove the print head (see section 7.2.10).

(4)   Remove the two screws ① and the carriage circuit board ②.

(5)   Remove the screw ③ and the belt clamp ④.

(6)   Remove the idle pulley ⑤ from the idle-pulley bracket ⑥, and then remove the space belt ⑦.

(7)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   Insert the claw of the belt clamp ④ into the hole in the carriage frame.

2.   Press the space belt ⑦ to the top of the belt clamp ④.

Claw of the belt clamp

Hole in the carriage frame
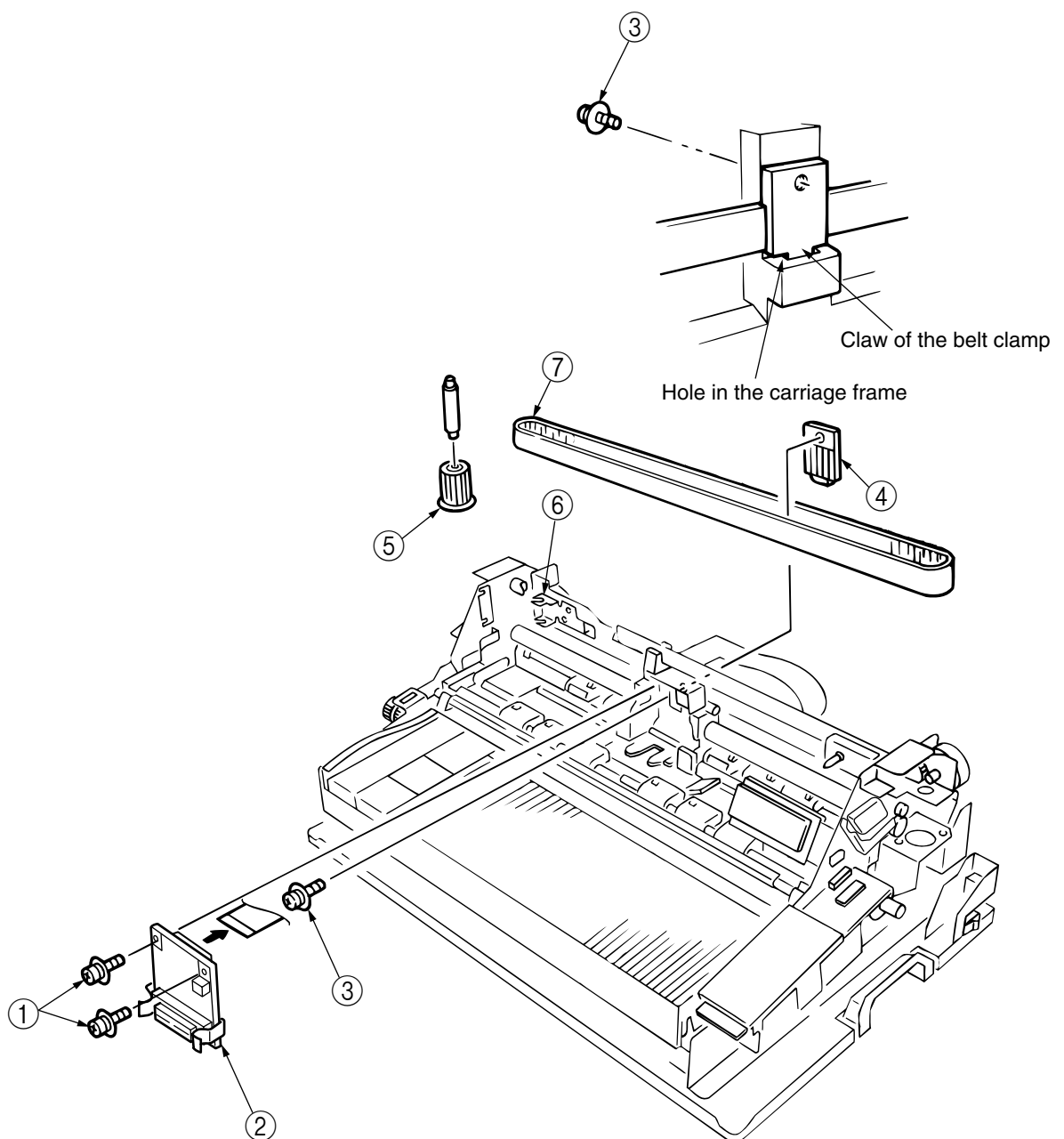
7.2.17 Cut-Sheet/Continuous-Form Sensor Circuit Board (RTS Printed Circuit Board)

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Raise the printer unit (see section 7.2.2).

(3) Remove the cable guide ①, the three screws ②, the sub frame ③, and then the bushes ④. Be careful not to lose the spring ⑤.

(4) Move the mode rack (L) ⑥ backward.

(5) Disconnect the cable from the connector CN10 on the control unit ⑦.

(6) Remove the screw ⑧, the cut-sheet/continuous-form sensor circuit board ⑨, and then the connector ⑩.

(7) Remove the screw ⑪ from the cut-sheet/continuous-form sensor circuit board ⑨, and then remove the bracket ⑫.

(8) Perform installation in the reverse order of removal.

CN10
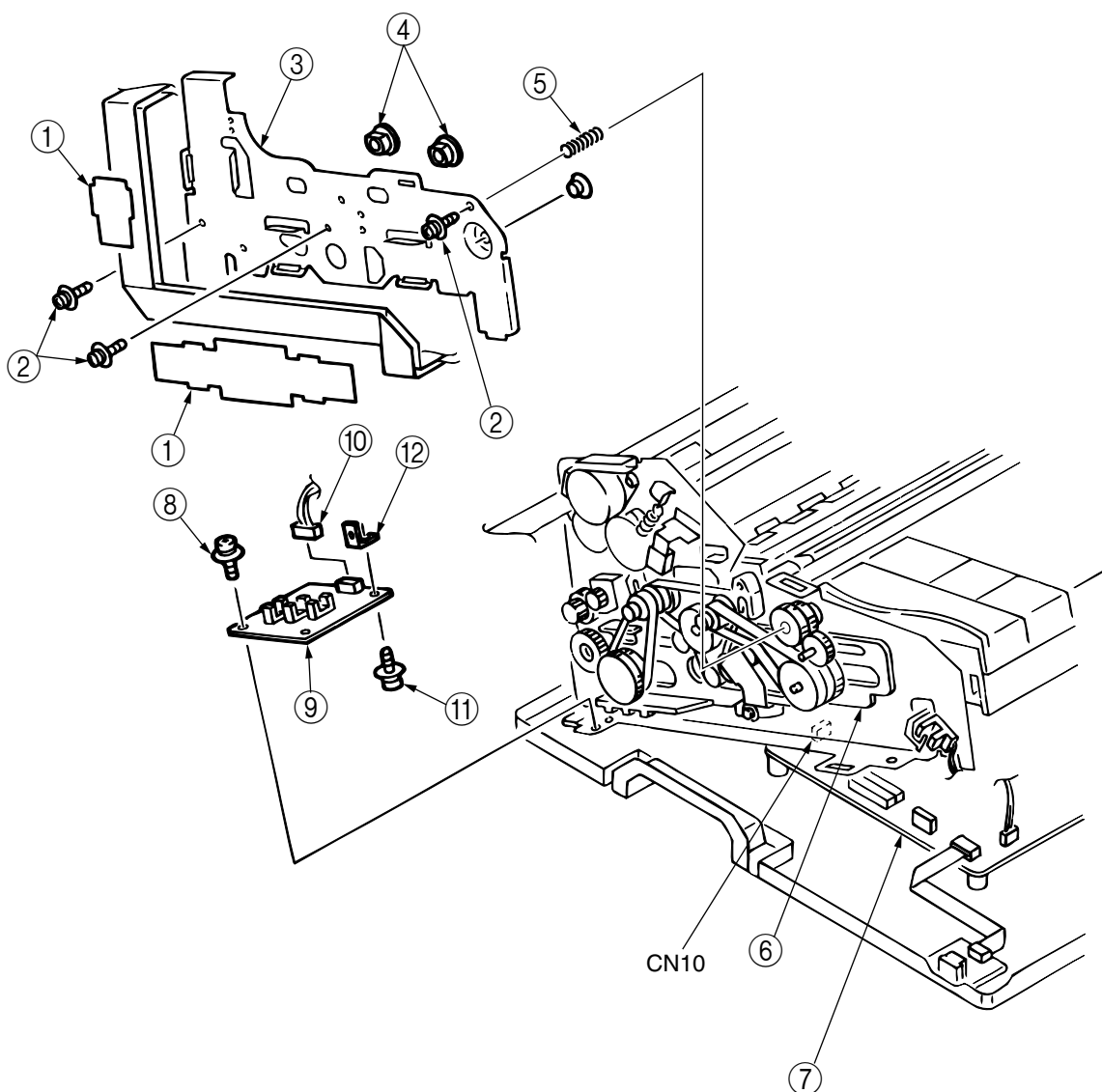
7.2.18 Platen

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Raise the printer unit (see section 7.2.2).

(3)   Remove the three screws ①, the sub frame ②, and then the bushes ③.
Be careful not to lose the coil spring ④.

(4)   Remove the LF motor assembly (see section 7.2.7).

(5)   Remove the gear ⑤.

(6)   Remove the screw ⑥ and the guide platen knob ⑦.

(7)   Remove the screw ⑧, the platen gear ⑨, and then the two bushes ⑩.

(8)   Ⓐ Move the platen ⑪ to the right Ⓐ, and then release the left side of the platen ⑪.

        Ⓑ Move the platen downward and to the left Ⓑ, and then release the right-hand side of the platen ⑪.
        (If it is difficult to move the platen, move it while raising the front of the printer unit.)

(9)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   When installing the platen ⑪, be careful not to catch the cords in the printer.

7.2.19 Cut-Sheet/Continuous-Form Selector Motor

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Raise the printer unit (see section 7.2.2).

(3) Disconnect the connector ② from the CN17 on the control unit ①.

(4) Remove the two screws ③ and the cut-sheet-continuous-form selector motor ④.

(5) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. The cord for the connector ② shall be passed through the square hole on the right-hand side of the printer.

Square hole
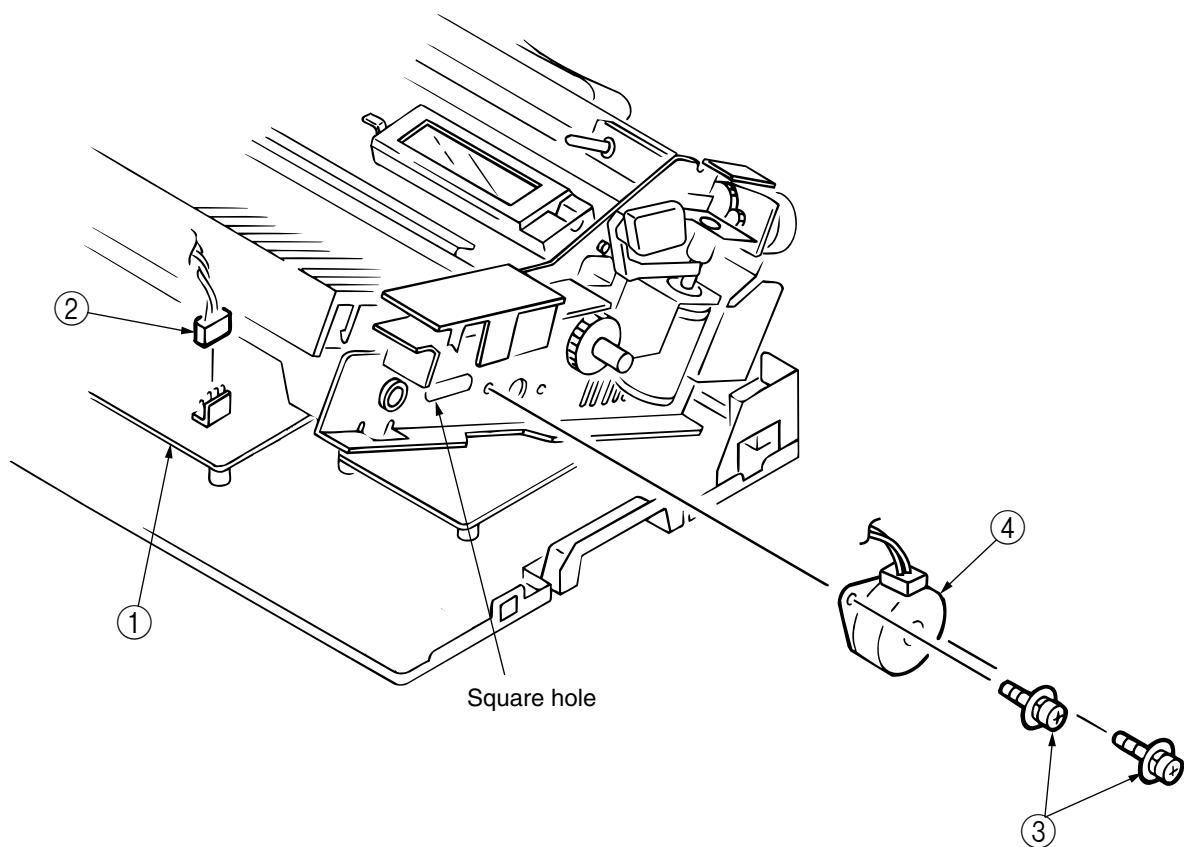
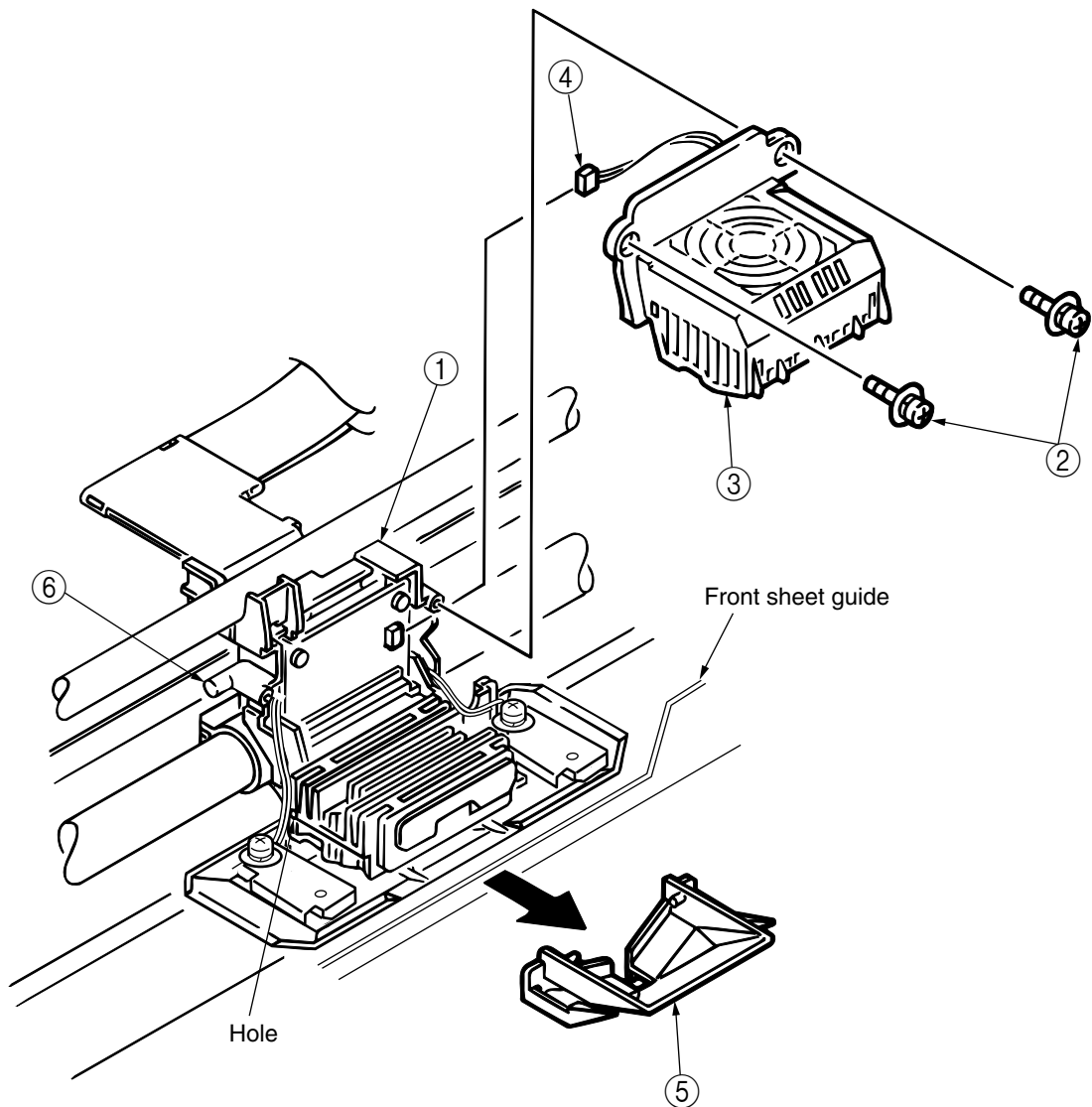### 7.2.20 EI Sensor Assembly

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools

(1) Remove the head fan assembly, the ribbon guide, and then the print head (see section 7.2.12).

(2) Remove the two screws ① and the carriage circuit board ②.

(3) Disconnect the connector ③, remove the screw ④, and then remove the EI sensor assembly ⑤.

(4) Perform installation in the reverse order of removal.

CAUTION: Be sure to turn off the power switch prior to disassembly.

(Precautions on Installation)

1. After installing the EI sensor assembly ⑤, adjust the gap between the platen and the core block. (see section 8.2.)
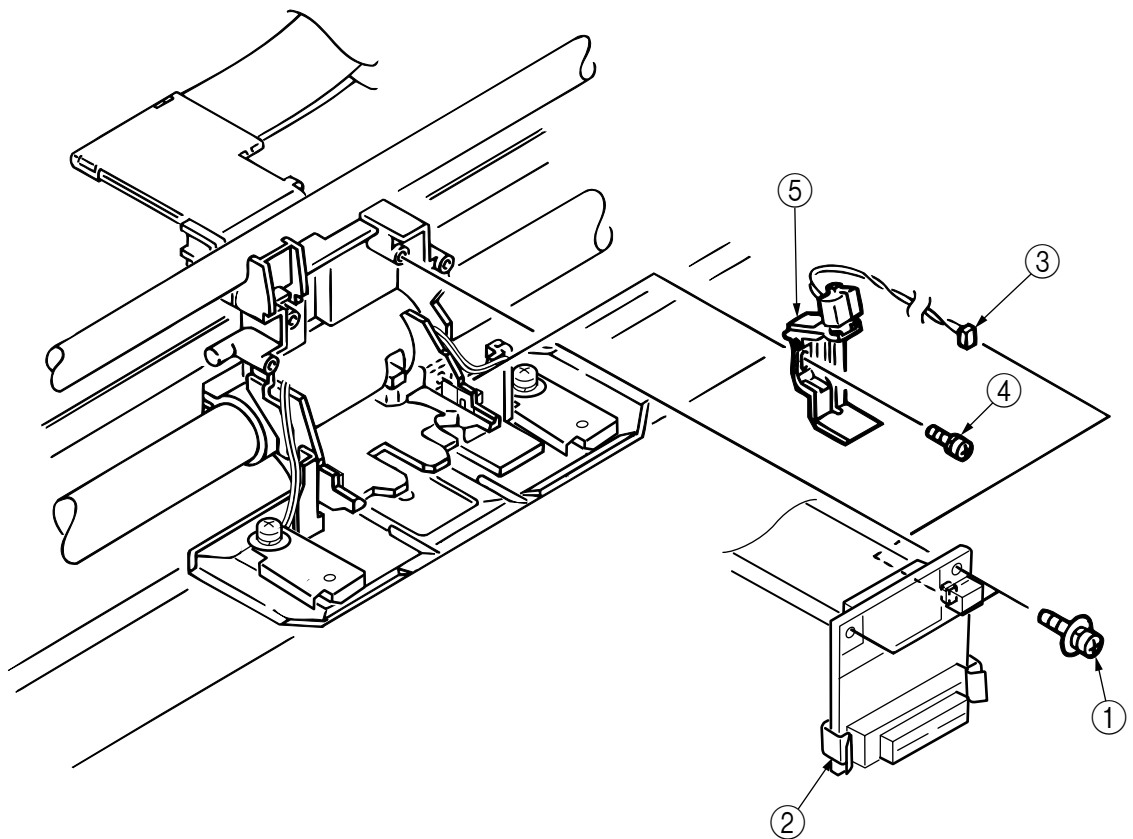
7.2.21 Paper-Width-Sensor Assembly

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools

(1) Remove the head fan assembly, the ribbon guide, and then the print head (see section 7.2.12).

(2) Remove the two screws ① and the carriage circuit board ②.

(3) Disconnect the connector ③ and remove the two screws ④. Remove the paper width sensor assembly ⑤ and the sensor cover ⑥.

(4) Perform installation in the reverse order of removal.

CAUTION: Be sure to turn off the power switch prior to disassembly.

(Precautions on Installation)

1. When replacing the assembly, note the right- and left-hand sensor-cord lengths.

2. After replacing the assembly, conduct the sensor slice-level check (learning function), the sensor check, and correction of the paper-width sensor and the front PE sensor as described in section 8.8. In addition, conduct correction (checking) of the TOF position during auto loading as described in section 8.4.

The cord is long.

⑤ The cord is short.
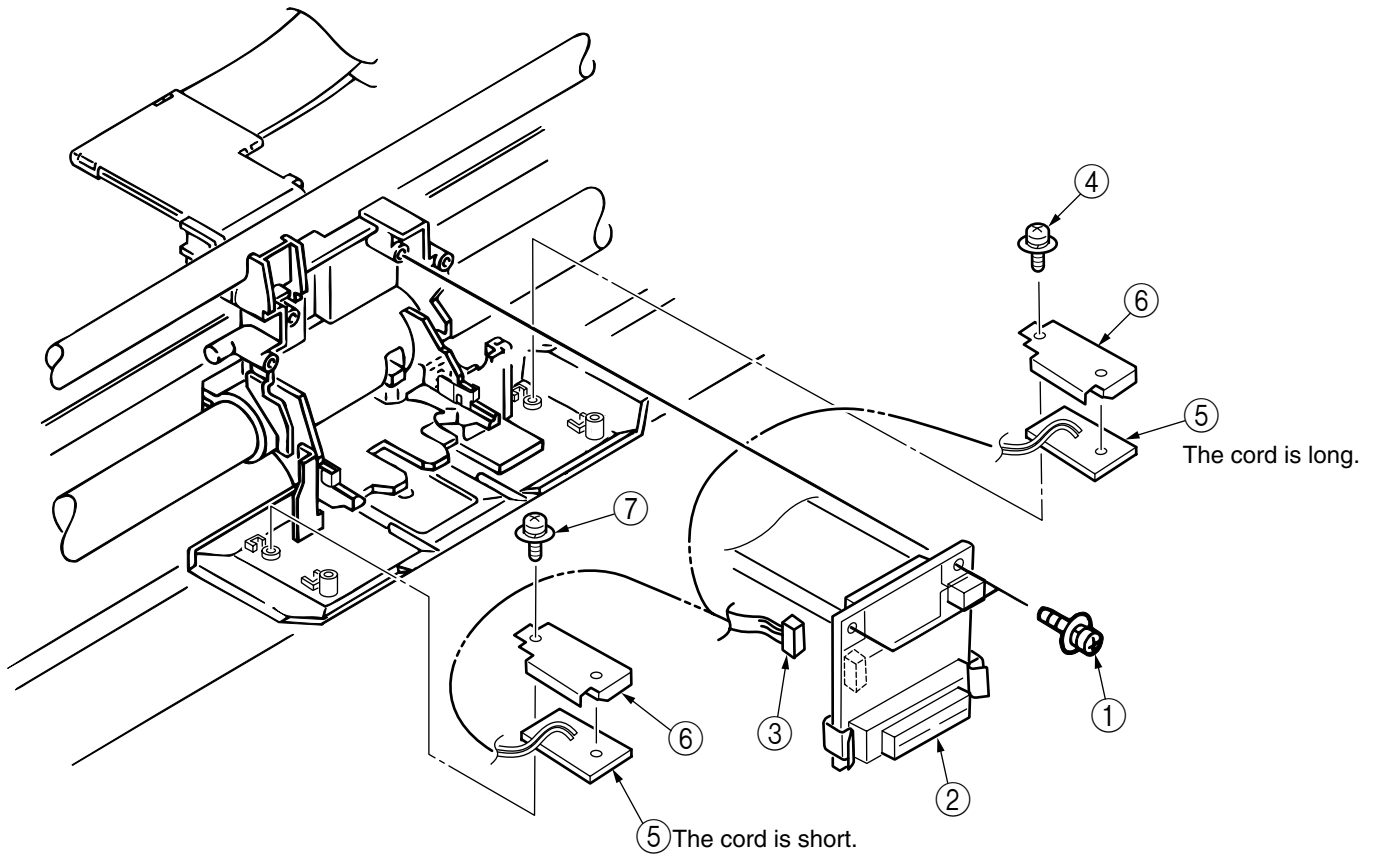
7.2.22 LCD Bracket Assembly

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Disconnect the connector ② from the CN2 on the operating-panel circuit board ①.

(3) Tilt the LCD bracket assembly ③ forward and downward. Remove the two screws ④ and the LCD bracket assembly ③.

(4) Perform installation in the reverse order of removal.
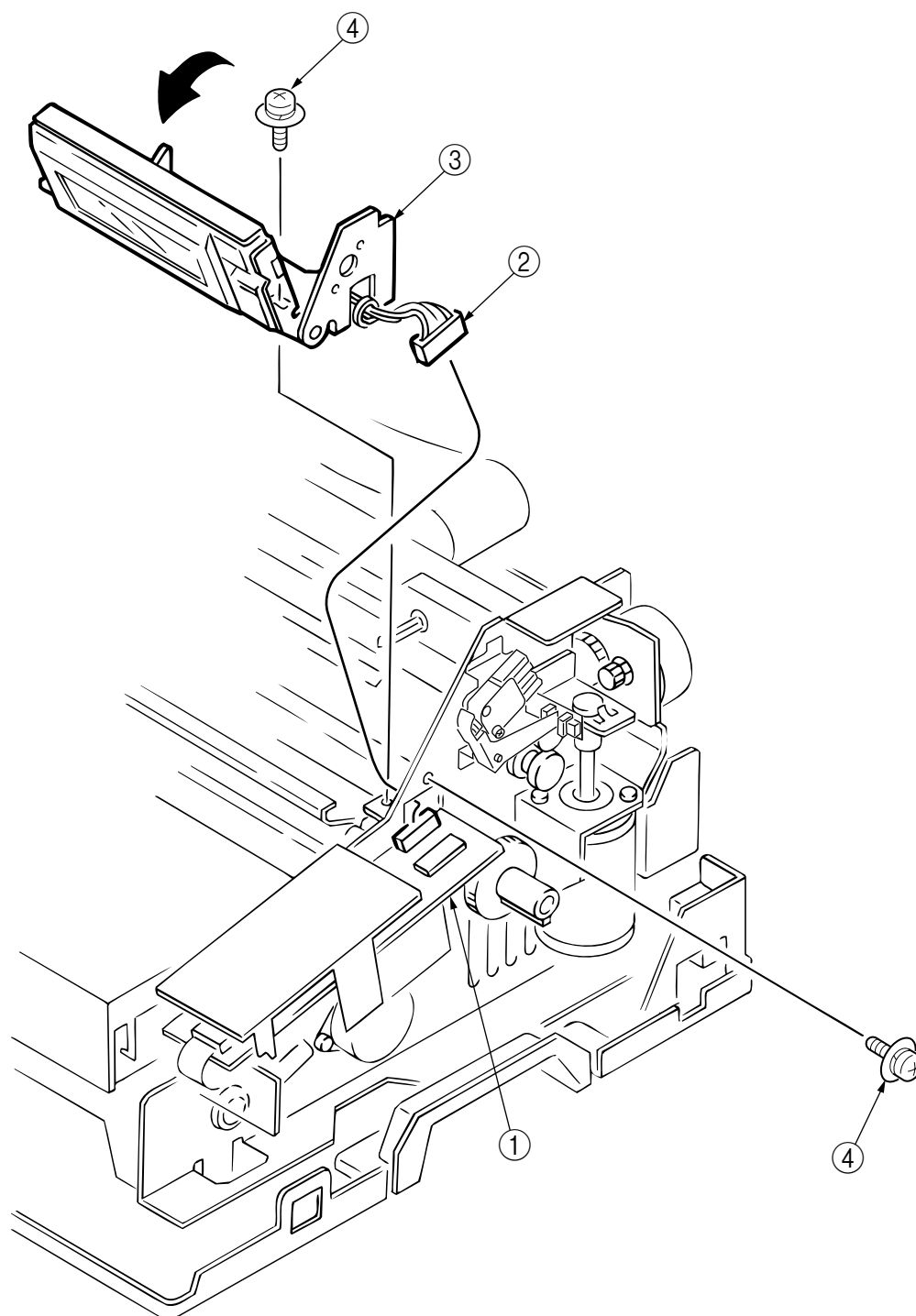
7.2.23 Sheet-Guide Upper Front Assembly

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Remove the LCD bracket assembly (see section 7.2.22).

(3) Raise the printer unit (see section 7.2.2).

(4) Remove the cable guide ①, and disconnect the connector from the SQC circuit board ②.

(5) Release the cable from the clamps ③.

(6) Remove the two screws ④, and draw the middle cover assembly ⑤ forward and then lift it off. (Arrow A)

(7) Remove the two screws ⑥ and the sheet-guide upper front assembly ⑦.

(8) Perform installation in the reverse order of removal.


(Precautions on Installation)

1. After replacing the assembly, conduct the sensor slice-level check (learning function), the sensor check, and correction of the paper-width sensor and the front PE sensor as described in section 8.8. In addition, conduct correction (checking) of the TOF position during auto loading as described in section 8.4.

2. After replacement, check to confirm that the cut sheet and continuous form are switched properly.
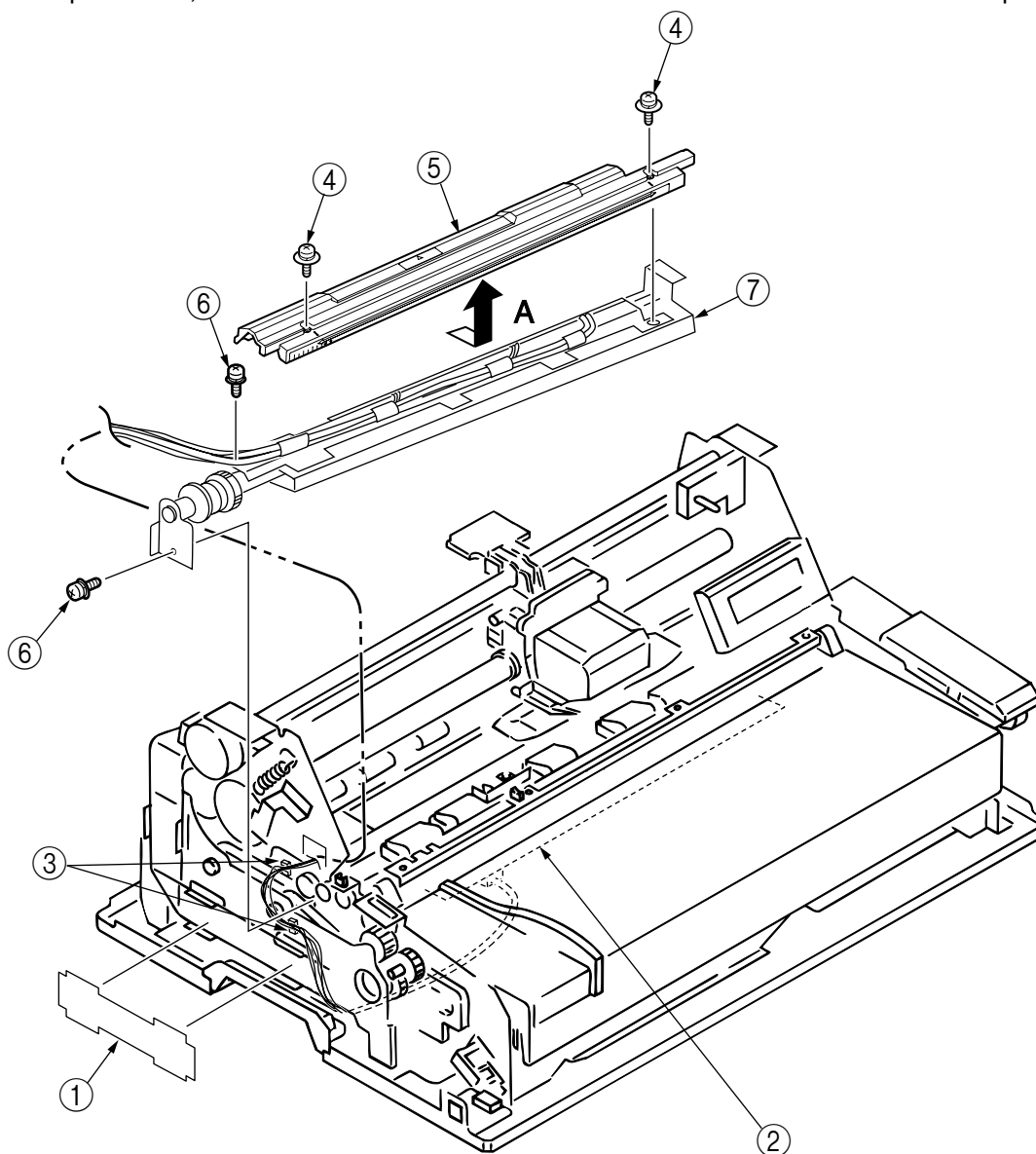
7.2.24 Mini Pitch Belt (LF)

(1)   Remove the upper-cover assembly (see section 7.2.1.)

(2)   Remove the sheet guide upper front assembly (see section 7.2.23).

(3)   Remove the cable guide ①, the three screws ②, the sub frame ③, the bushes ④, and then the flange ⑤. Be careful not to lose the coil spring.

(4)   Remove the rear tractor gear ⑥ and the rear belt ⑦.

(5)   Remove the front belt ⑧ and the front tractor gear ⑨.

(6)   Remove the two flanges ⑩ and the slip-roller belt ⑪.

(7)   Loosen the screw ⑫ of the idle-pulley bracket, and then loosen the main belt ⑬.

(8)   Remove the main belt ⑬.

(9)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   After installing the main belt ⑬, adjust the slack in the belt (see section 8.1).

Coil spring
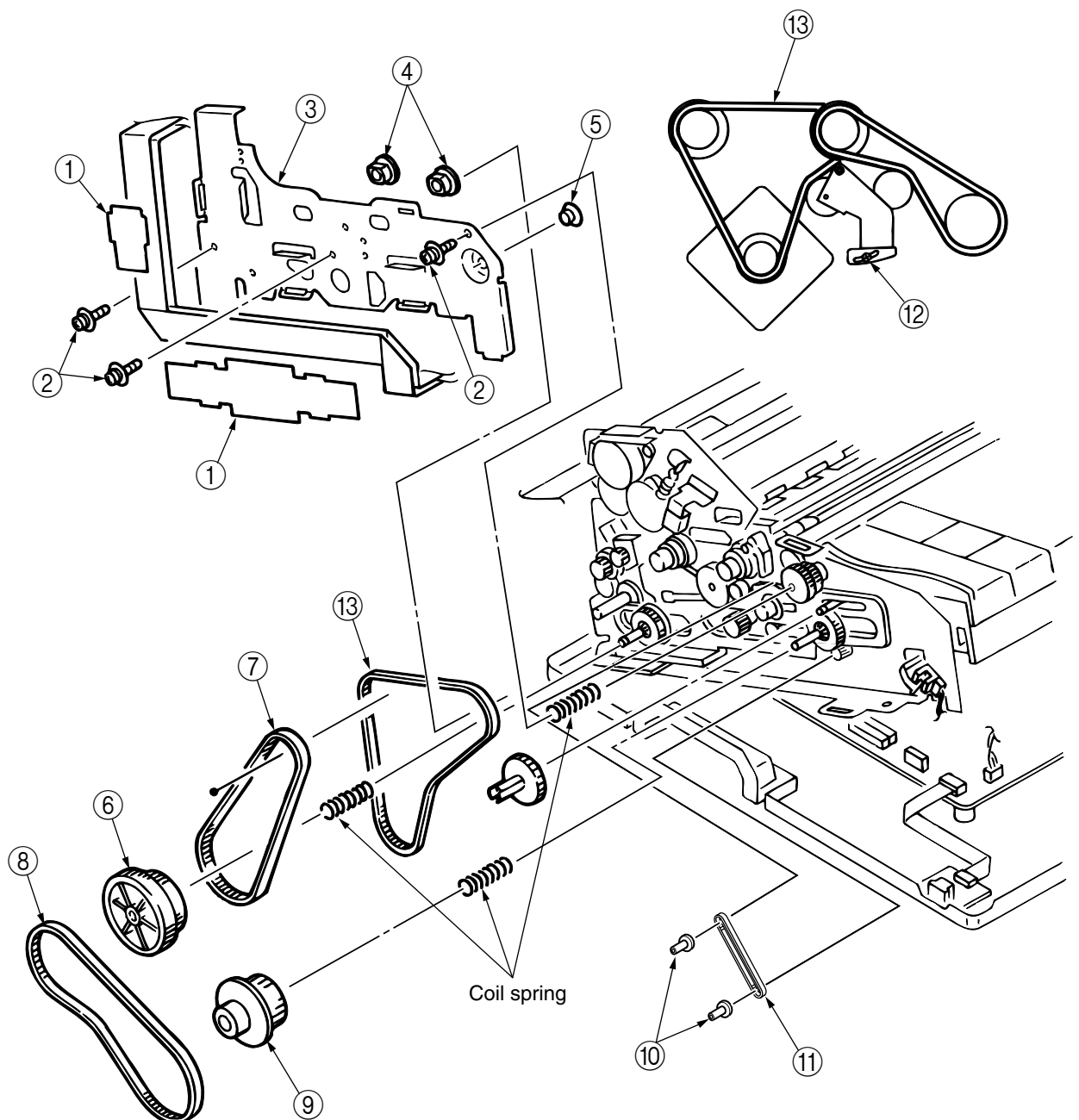
7.2.25 SC Motor Assembly

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Remove the sheet-guide upper front assembly (see section 7.2.23).

(3) Remove the mini pitch belt LF (see section 7.2.24).

(4) Disconnect the connector ① from the SQC circuit board ②.

(5) Remove the two screws ③ and the SC motor assembly ④.

(6) Perform installation in the reverse order of removal.
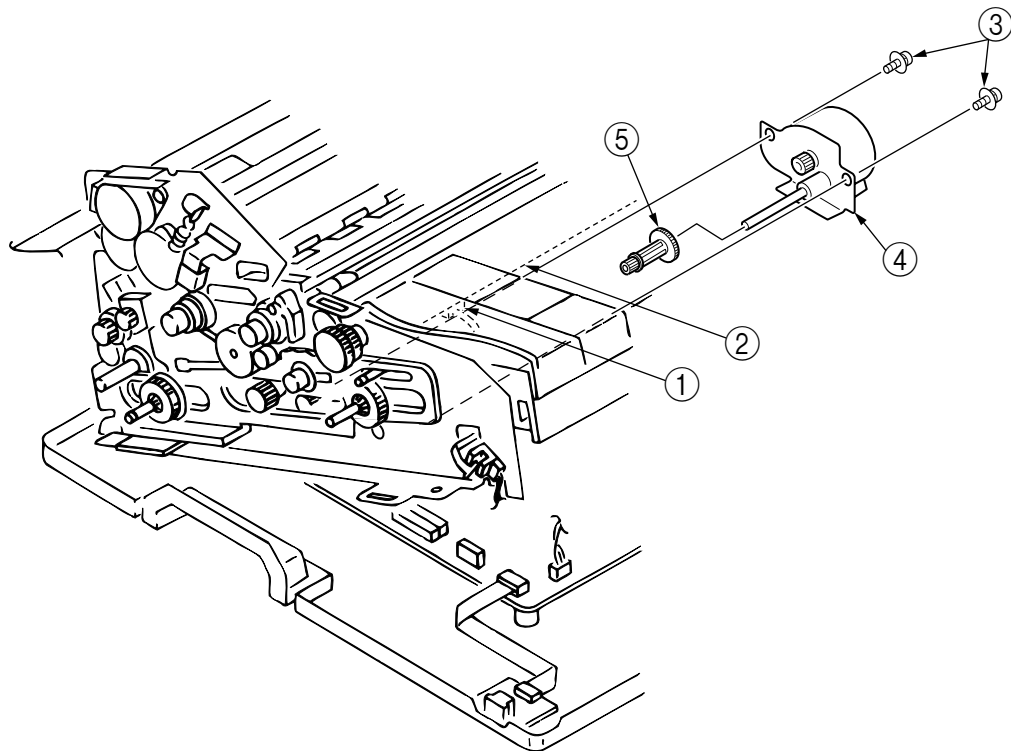
7.2.26 Carriage Circuit Board (KYA Printed Circuit Board)

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools.

(1) Remove the print head (see section 7.2.12).
(2) Remove the two screws ① and the carriage circuit board ②.
(3) Remove the head cable ③.
(4) Remove the connector clamp ④, the connector ⑤, the film ⑥, and then the plate ⑦.
(5) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. Fit the connector clamp ④ securely.
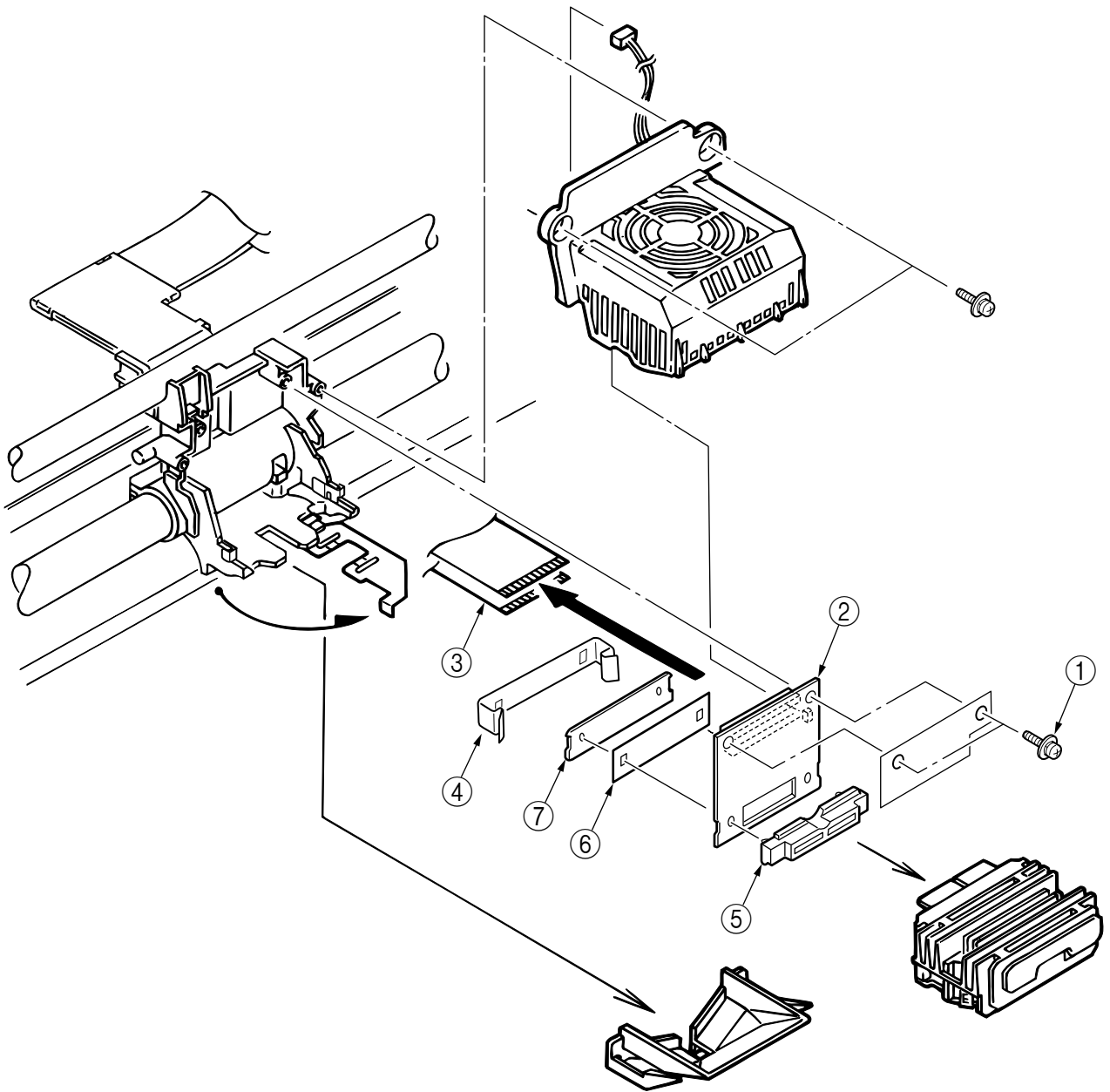
7.2.27 Connector

CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools.

(1) Remove the print head (see section 7.2.12).

(2) Remove the carriage circuit board (see section 7.2.26).

(3) Remove the connector clamp ②, the connector ③, the film ④, and then the plate ⑤ from the carriage circuit board ①.

(4) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. Place the connector with its concave surface facing up.

2. Insert the connector clamp ② securely.
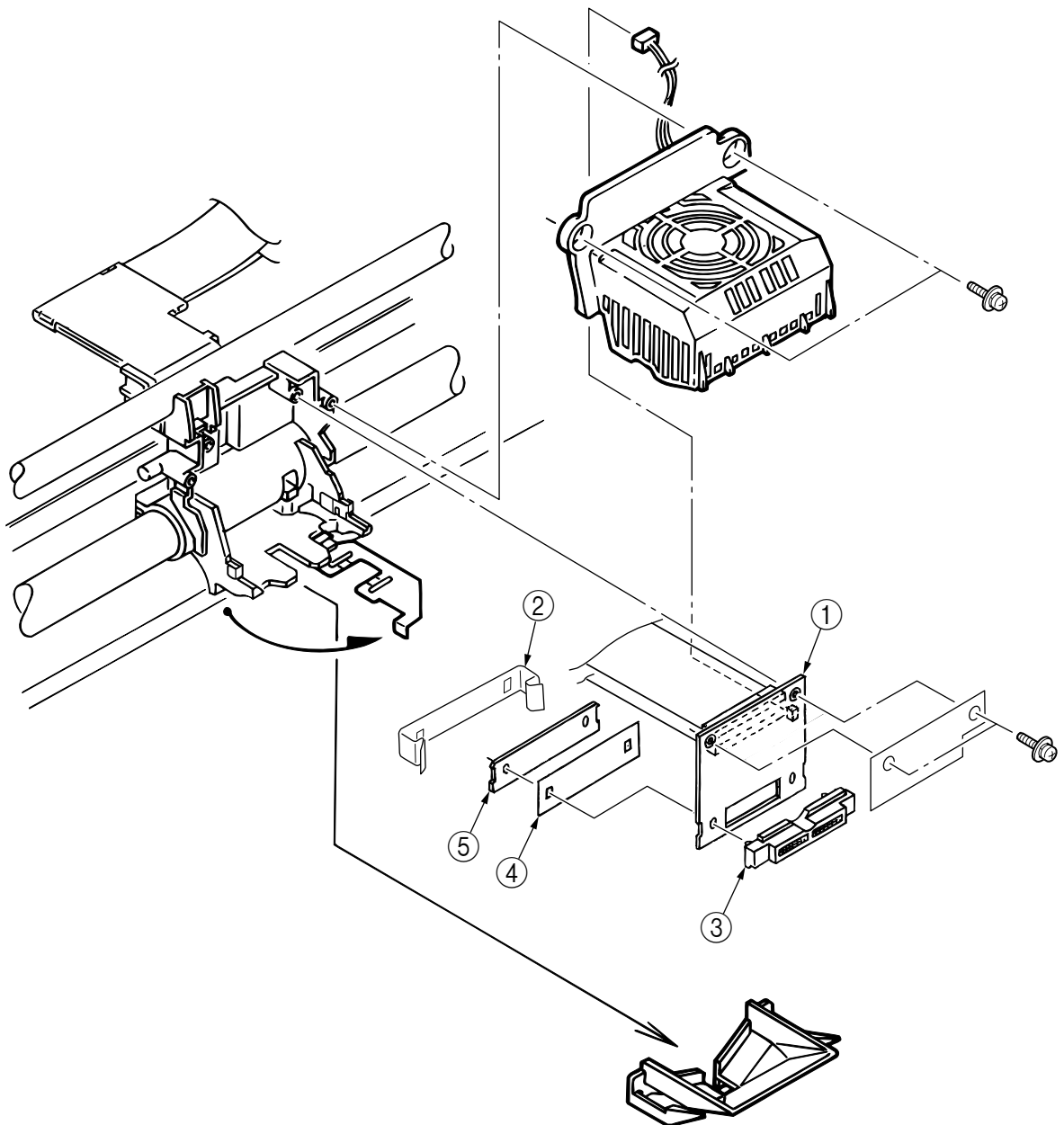
7.2.28 Cover Open Assembly

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Raise the printer unit (see section 7.2.2).

(3) Disconnect the connector ② from the CN3 on the operating-panel circuit board ①.

(4) Disconnect connectors ④ from the CN100 on the control circuit board ③.

(5) Remove the three guide-plate cables ⑤.

(6) Remove the operating-panel assembly ⑤ from the catch.

(7) Remove the two screws ⑥ and the interlock assembly ⑦.

(8) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. The cords of connectors ④ shall be passed through the clamp and the square hole on the right-hand side of the printer.
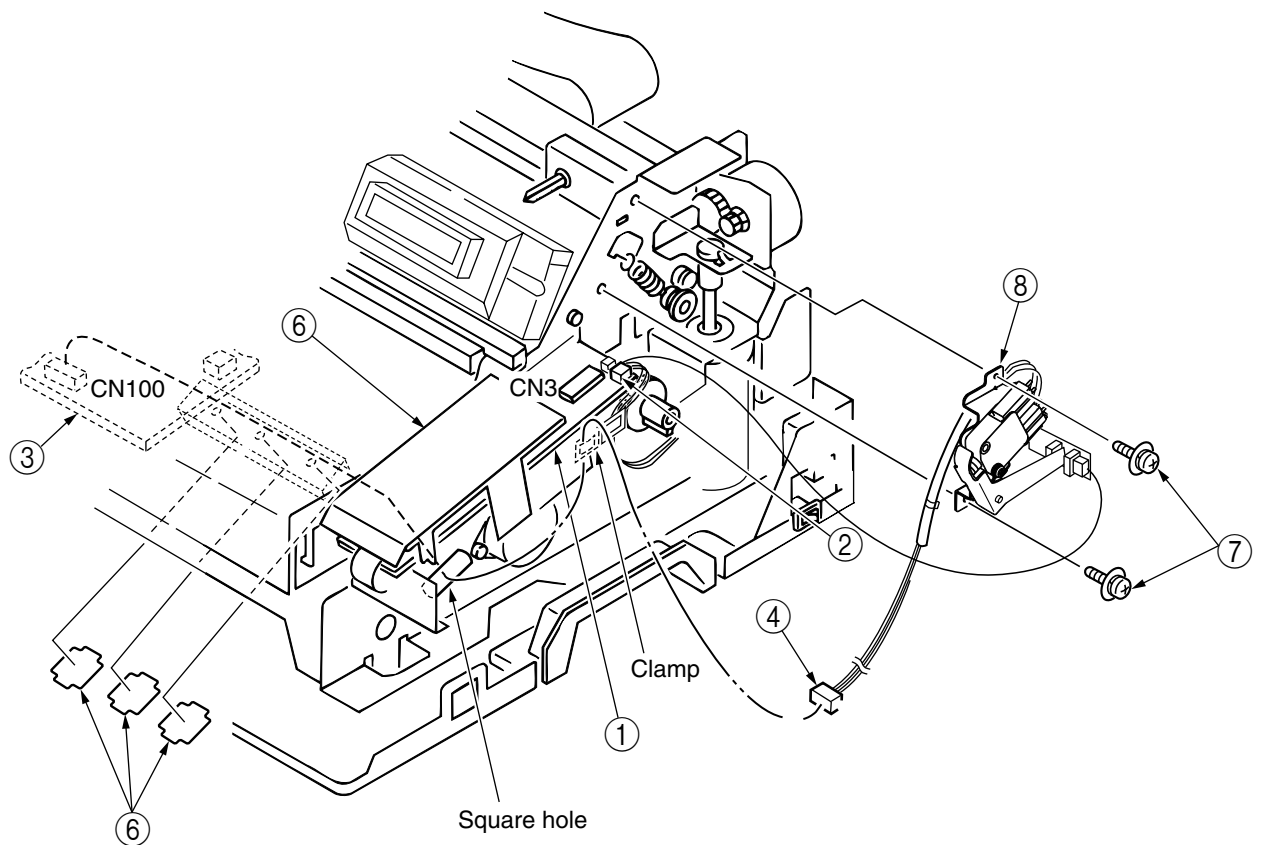
7.2.29 CSF Circuit Board
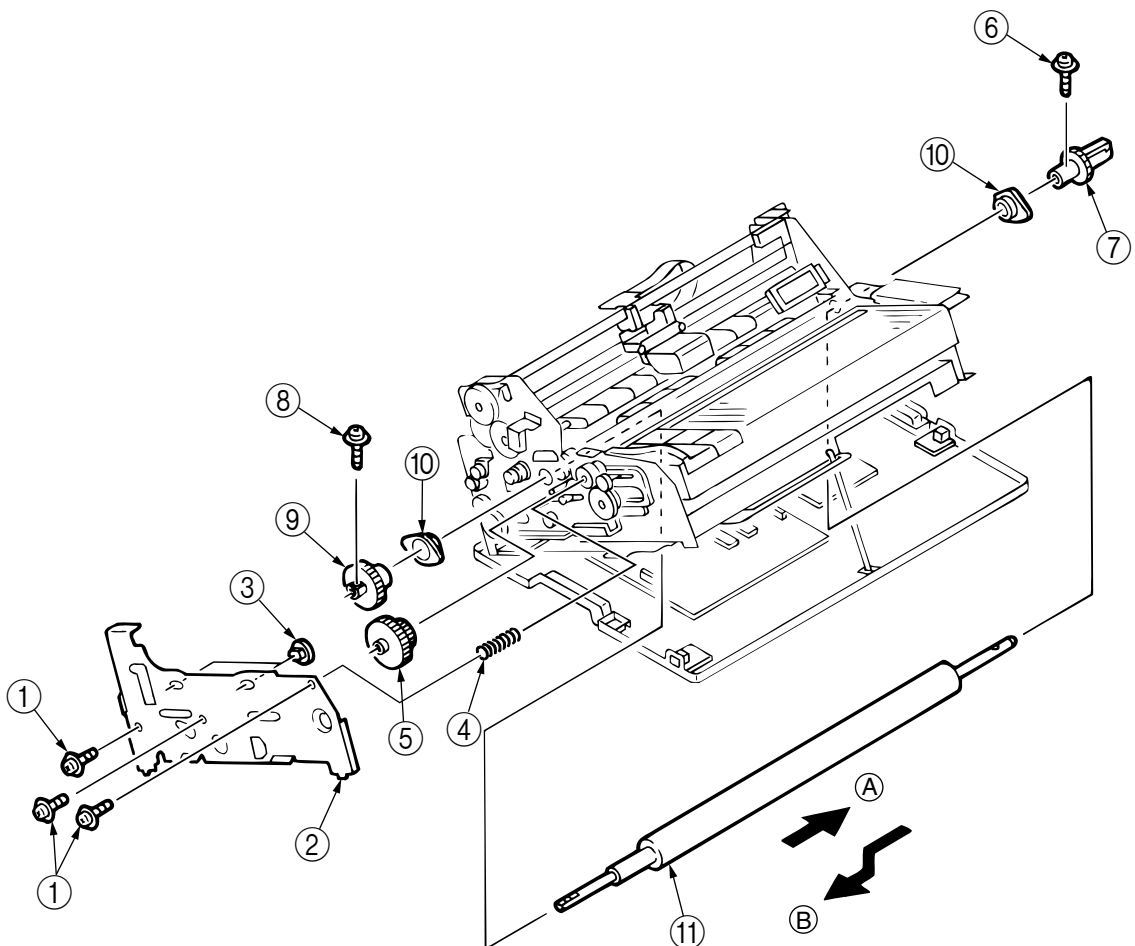
    (1)   Remove the upper-cover assembly (see section 7.2.1).

    (2)   Raise the printer unit (see section 7.2.2).

    (3)   Disconnect the flat cable connected to the CSF circuit board ①.

    (4)   Remove the four screws ②.

    (5)   Perform installation in the reverse order of removal.

    Reference: The same circuit board is used on the left (for the front CSF) and on the right (for the rear CSF).

Right (for rear CSF)

Left (for front CSF)
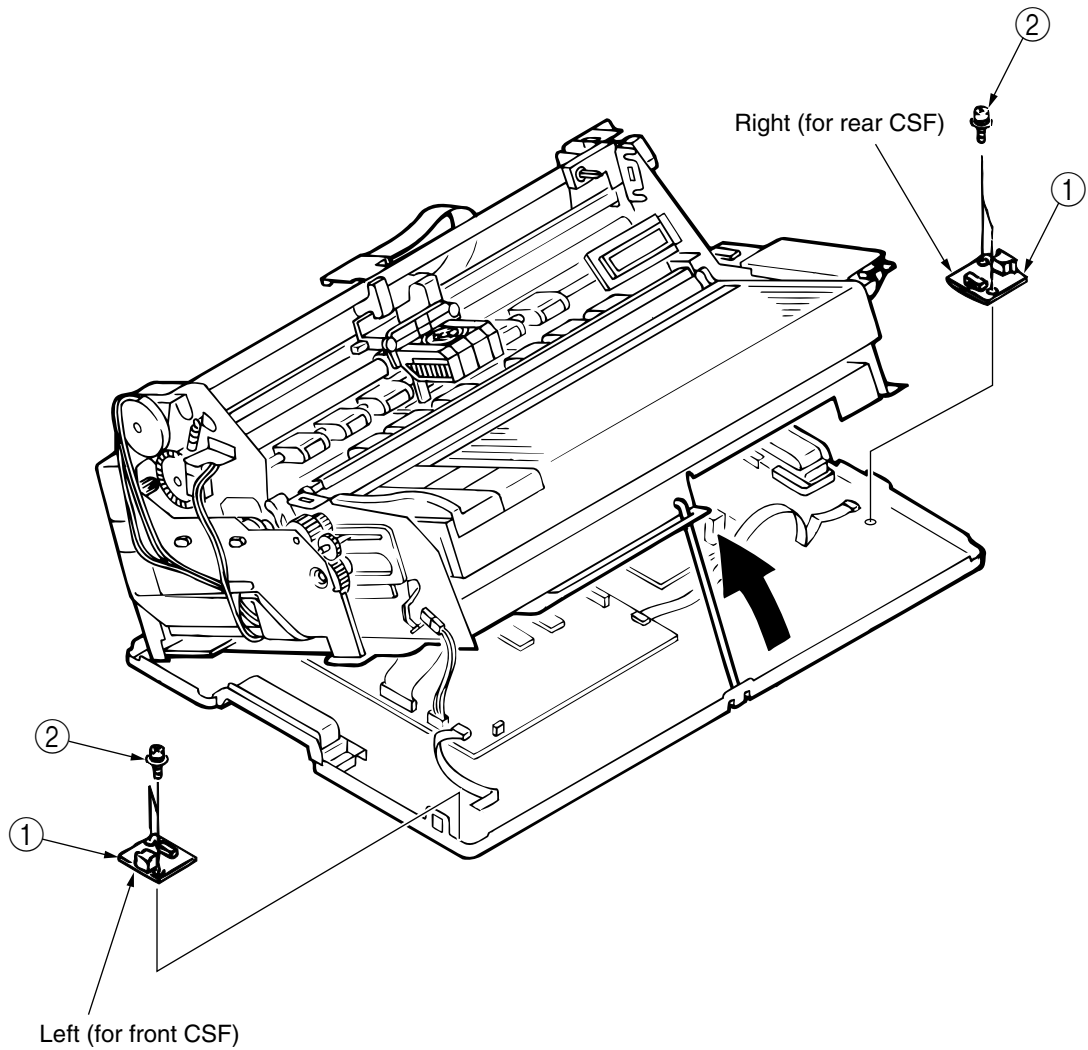
7.2.30 Removing the Printer Unit

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Remove the two screws ② fastening the front of the printer unit ①.

(3) Remove the two screws ③ fastening the rear of the printer unit ①.

(4) Raise the printer unit ① (see section 7.2.2).

(5) Disconnect all cords connected to the control unit ④.

(6) Hold the bends ⑤ on both sides and the posts on both sides at the front. Raise the unit and remove it from the lower cover ⑥. (You may hold the bottom right of the operating panel.)

   CAUTION: The printer unit ① must be removed by two people.

(7) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. The printer unit ① must be removed and installed by two people. When placing the removed printer unit ① on a table or other surface, be careful not to catch connection cords and cables under the unit.

2. When installing the printer unit ①, place the frame ⑦ of the printer unit ① in the groove of the lower cover ⑥. Be careful not to catch connection cords and cables under the unit.
After fastening the printer unit ① to the lower cover ⑥, raise the printer unit ① and support it using the stand shaft.

3. Make sure the earth plate at the rear of the lower cover is placed inside the printer unit ①.
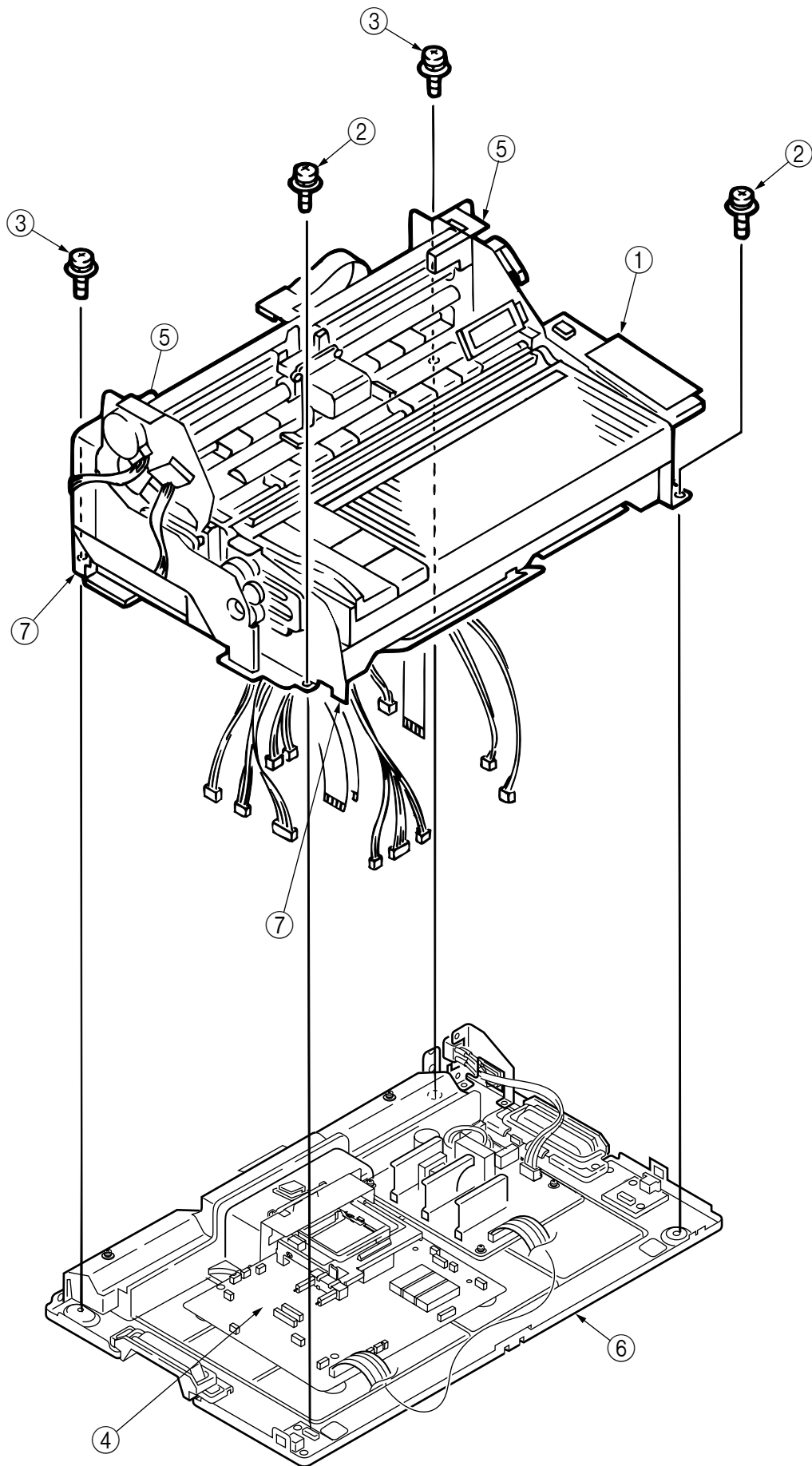
7.2.31 SQC Circuit Board

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Remove the printer unit (see section 7.2.30).

(3)   Place the printer unit ① upright.

(4)   Remove the four screws ② and the film guard (sc) ③.

(5)   Disconnect connectors ④, ⑤, and ⑥.

(6)   Remove the two screws ⑦ and the circuit-board bracket ⑧.

(7)   Remove the four screws ⑨ and the SQC circuit board ⑩.

(8)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   When installing the SQC circuit board ⑩, make sure the four protrusions of the SQC circuit board ⑩ are securely fitted into the slits in the circuit-board bracket ⑧.

2.   After replacement, conduct the sensor slice-level check (learning function), the sensor check, and correction of the paper-width sensor and the front PE sensor as described in section 8.8. In addition, conduct correction (checking) of the TOF position during auto loading as described in section 8.4.
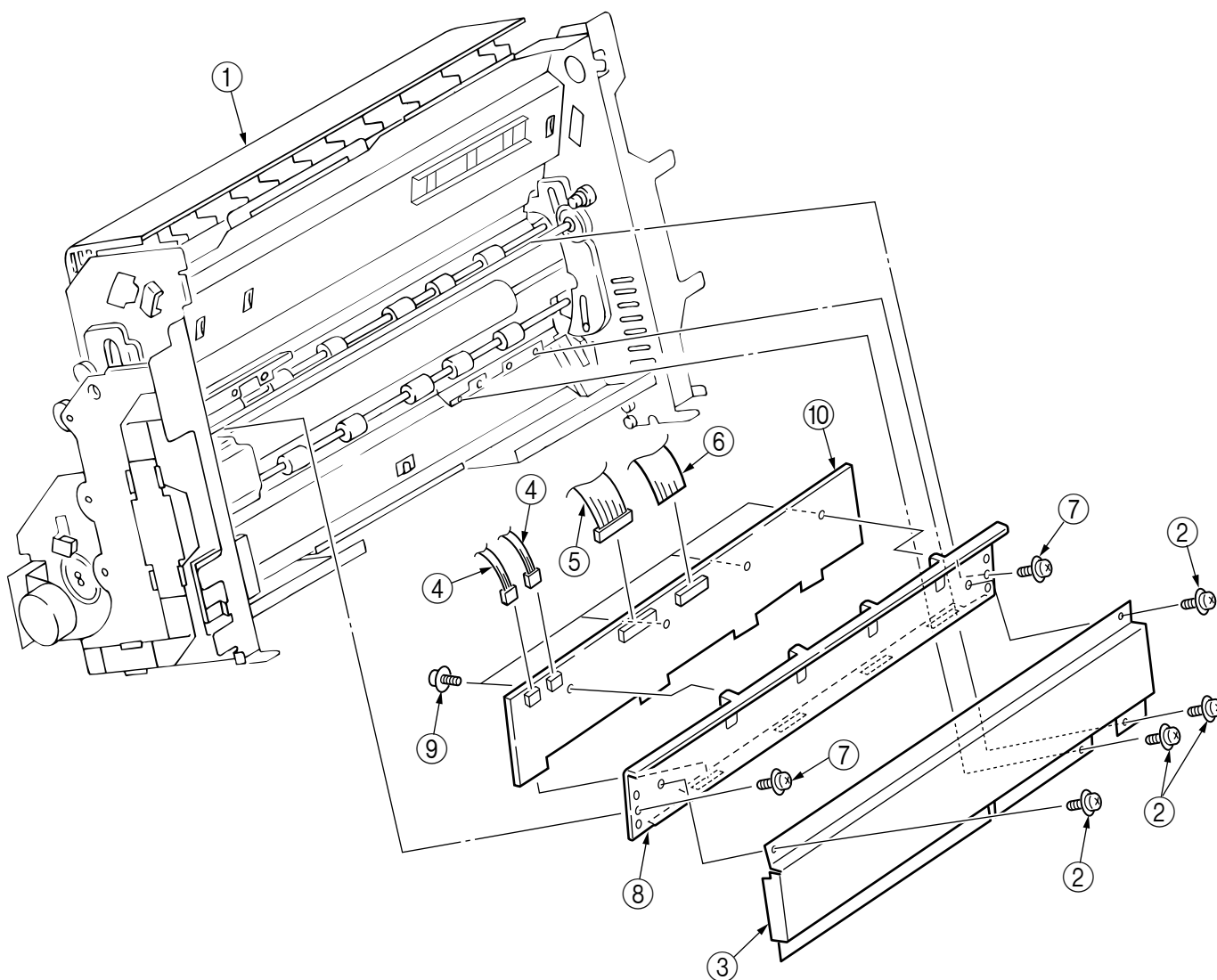
7.2.32 Rear PE-Sensor Assembly / Rear PE Sensor (Mechanical)

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Remove the printer unit (see section 7.2.21).

(3)   Place the printer unit ① in the upright position.

(4)   Disconnect connectors ③ and ④ from the CN5 and the CN20 on the control unit ②.

(5)   Disconnect cables ③ and ④ from clamps ⑤.

(6)   Cut the tie wrap ⑦ fastening cables ③ and ④.

(7)   Remove the screw ⑧ and the rear PE-sensor assembly ⑨.

(8)   Disconnect the connector ④ from the sensor ⑩.

(9)   Open the bracket ⑪ in the direction indicated by the arrow, and remove the rear PE-sensor lever ⑫.

(10)   Remove the sensor ⑩.

(11)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   When installing the rear PE-sensor assembly ⑨, make sure the protrusion of the sensor bracket is securely fitted into the hole of the lower sheet guide. Fasten the cables using a tie wrap.

2.   After replacement, conduct the sensor slice-level learning function (see section 8.6).

3.   After placing the printer unit ① on the lower cover ⑬, pass the cord of the connector ③ through clamps ⑤ and the cord of the connector ④ through the clamp ⑤.
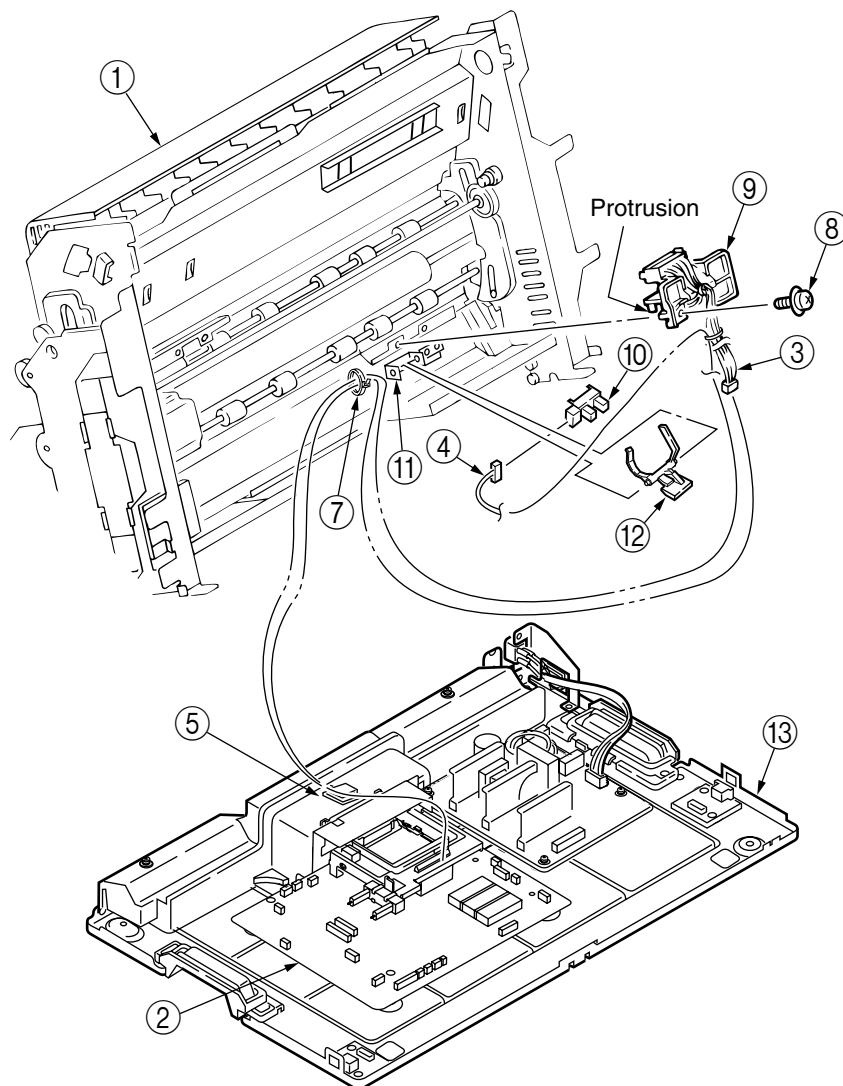
7.2.33 Head-Cable Assembly

(1) Remove the upper-cover assembly (see section 7.2.1).
   CAUTION: The print head will be hot immediately after printing. To prevent burns, do not touch it until it cools.
(2) Remove the print head (see section 7.2.12).
(3) Raise the printer unit (see section 7.2.2).
(4) Remove the carriage circuit board (see section 7.2.26).
(5) Disconnect the head cables from the connector on the carriage circuit board.
(6) Remove the screw ①, the cable guide ②, and then the two plates ③.
(7) Disconnect the cables ⑤ from the CN14 and the CN15 on the control unit ④.
(8) Perform installation in the reverse order of removal.

(Precautions on Installation)
1. Leave a gap of 0.5 to 1.5 mm between the head cables where they bend.
2. When the carriage is moved to the right, there shall be a gap of 1 to 5 mm between the head cables and the side frame.
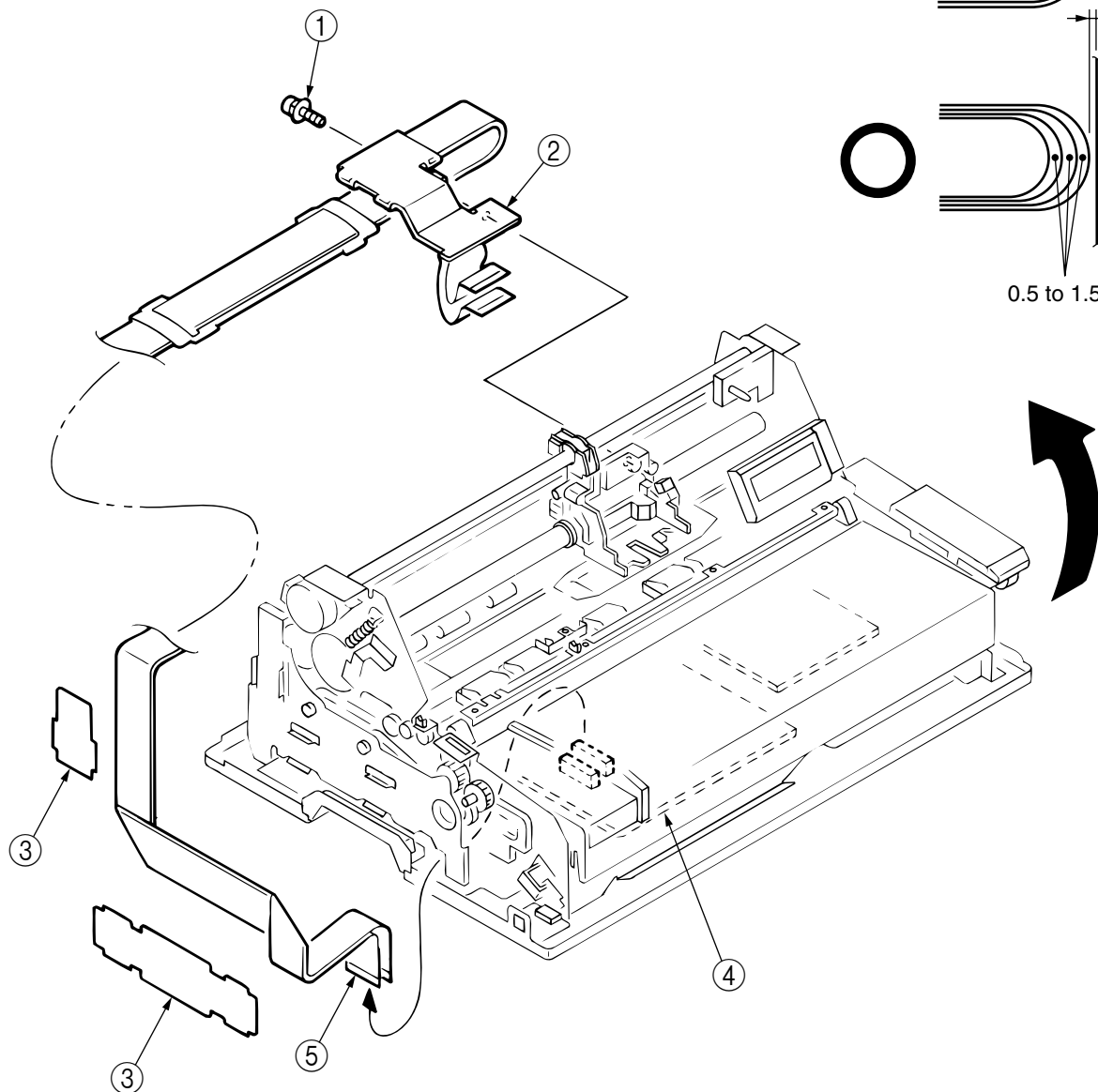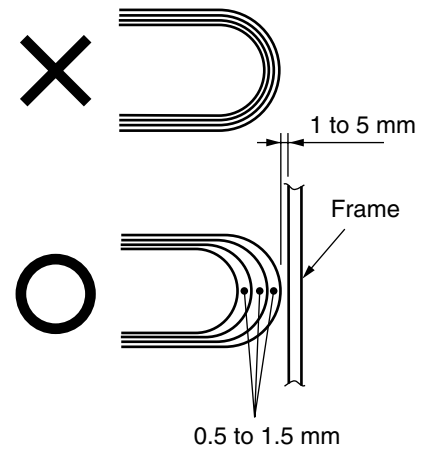
7.2.34 Continuous-Form Sensor

(1) Remove the upper-cover assembly (see section 7.2.1).

(2) Raise the printer unit (see section 7.2.2).

(3) Disconnect the connector ② from the continuous-form sensor ①.

(4) Press the lock of the continuous-form sensor ① inward from the rear of the frame ③ to remove the continuous-form sensor ①.

(5) Perform installation in the reverse order of removal.

(Precautions on Installation)

1. During installation, pass the cord through the hole through which other cables are passed.

2. Be careful to prevent the cord from obstructing the movement of the tractor sensor lever.
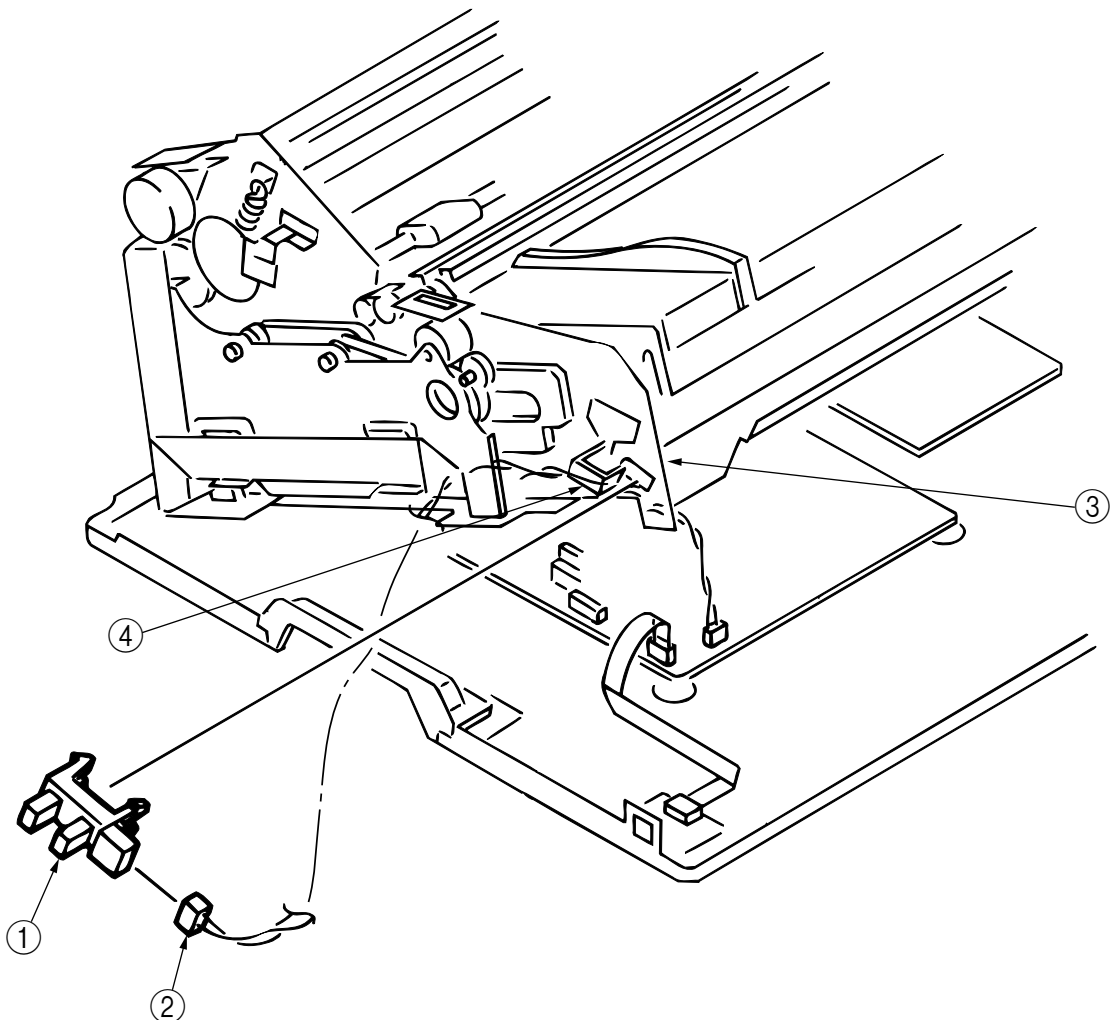
7.2.35 Slip-Roller Sensor

(1)   Remove the upper-cover assembly (see section 7.2.1).

(2)   Raise the printer unit (see section 7.2.2).

(3)   Remove the screw ① and the position-sensor bracket ②.

(4)   Disconnect the connector ④ from the slip-roller sensor ③.

(5)   Press the lock of the slip-roller sensor ③ inward from the rear of the position-sensor bracket ② to remove the slip-roller sensor ③.

(6)   Perform installation in the reverse order of removal.

(Precautions on Installation)

1.   During installation, pass the cord through the cord clamp ⑤.
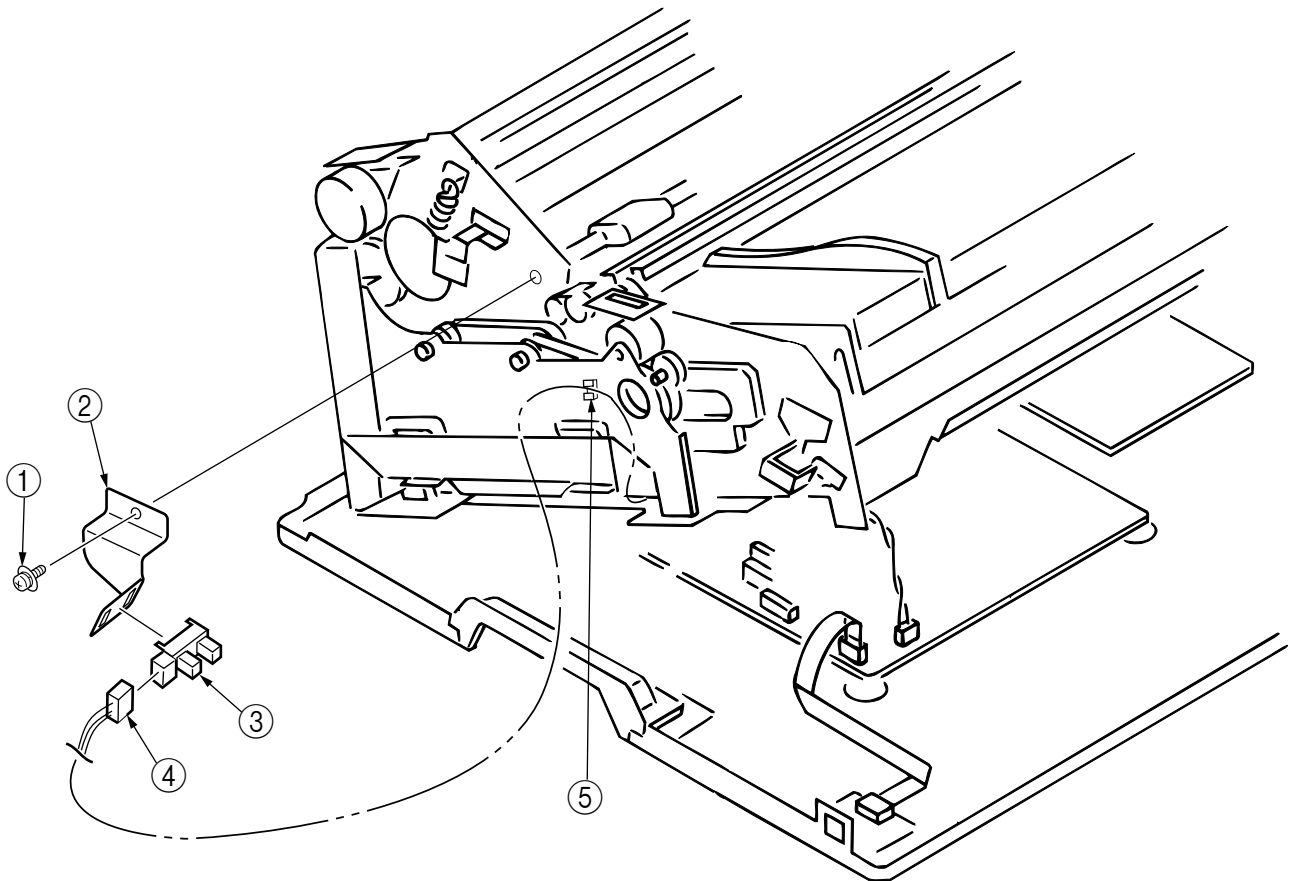
7.2.36 Slider

(1) Remove the upper cover (see section 7.2.1).
(2) Remove the screw ② from the carriage frame ①, and then remove the holder slider ③.
Be careful not to lose the coil spring ④ in the holder slider ③, as it may come off easily.
(3) Remove the coil spring ④, and then remove the slider ⑤ from the holder slider ③.
(4) Remove the felt ⑥ from the slider ⑤.
(5) Perform installation in the reverse order of removal.

(Precautions on Installation)
1. Be careful not to lose the felt ⑥ and the coil spring ④, as they may come off easily.
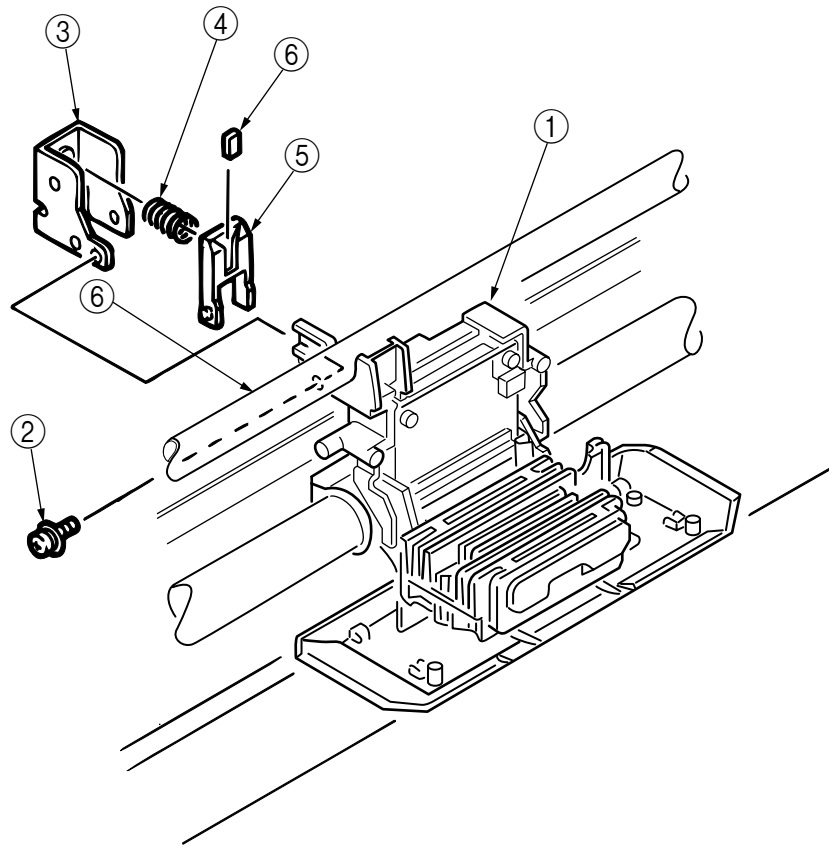
8. Adjusting

- Leave the printer unit fastened to the lower cover when making adjustments.
- To minimize deviation in adjustment, place the printer on a rigid assembly bench (flatness of 1 mm or less) and keep it level while conducting your work.
- When correction or adjustment is made for the functions specified below, the correction or adjustment value is stored in the EEPROM. When the EEPROM is replaced due to its malfunction, adjustments must be performed on all items.

Check and adjust the items specified below.

Section No	Check only	Adjustment	
		After parts replacement	New EEPROM
8.1 Adjusting line-feed belt		○	
8.2 Checking the gap between the platen and core block	○	○	
8.3 Correcting the automatic paper-thickness adjustment distance		○	○
8.4 Correcting the TOF position during auto loading		○	○
8.5 Adjusting the paper cut position 　　8.5.1 Adjustment in the rear tractor system		○	○
8.6 Correcting the horizontal printing position	○	○	○
8.7 Correcting the cut-sheet line-feed pitch		○	○
8.8 Adjusting the sensors 　　8.8.1 Slice-level setting function for sensors 　　8.8.2 Sensor check 　　8.8.3 Correction of the paper-width sensor 　　8.8.4 Correction of the front PE sensor 　　8.8.5 Manual setting of the sensor slice level	○ ○ *	○ ○ ○	○ ○ ○

* Need to be checked when paper detection fails during a sensor check

The diagram below shows the layout of the switches and lamps used in this chapter.

Layout of Switches and Lamps

□ Ⓐ

□ Ⓑ　　□ Ⓔ

□ Ⓒ　　□ Ⓕ

□ Ⓓ　　□ Ⓗ

| 1 | | 4 |

| 2 | | 5 |

| 3 | | 6 |
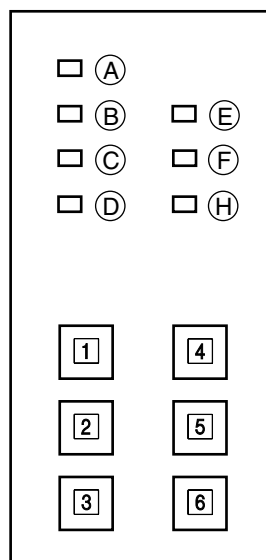
8.1   Adjusting the Line-Feed Belt

Tools
- 500-gr pressure bar gauge
- No. 2-200 Phillips screwdriver
- Vernier calipers

Adjustment Procedure

(1)   Turn off the power switch, and disconnect the AC plug from the AC outlet.

(2)   Remove the upper-cover assembly (see section 7.2.1).

(3)   Press mode rack L fully to the rear.

(4)   Measure the load required to bend the belt between pulley A and pulley B by 2 mm in the center. The load shall be between 120 and 180 g.

(5)   When it requires adjustment, loosen the mounting screw of the idle-pulley bracket and adjust its mounting position so that the load required to bend the belt by 2 mm falls within the range of 120 to 180 g.
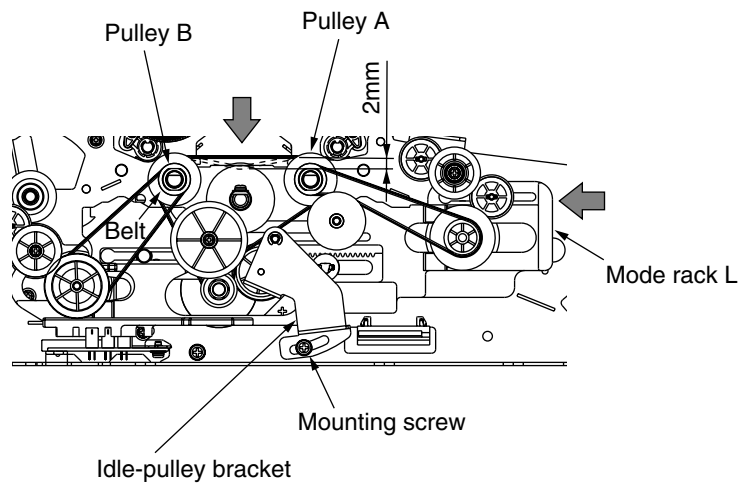
Figure 8-1

8.2   Checking the Gap between the Platen and Core Block

Turn on the power while holding down switches ⬚1, ⬚5, and ⬚6 to start up in maintenance mode. While holding down the switch ⬚6, press the switch ⬚1. The gap between the print head and the platen is set to range 1, and you can check the gap between the platen and the core block for automatic paper-thickness adjustment.

Tools
- Thickness gauge
- No. 2-200 Phillips screwdriver

Cases in which a check is required
- During replacement, there is a problem with paper feeding or carriage movement, ink-ribbon feeding, print-head movement, or automatic paper-thickness adjustment movement.
- The AG sensor assembly has been replaced.

Check Procedure
(1)   Turn off the power switch.
(2)   While holding down switches ⬚1, ⬚5, and ⬚6, turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. The printer performs the initial routine. The lamp Ⓗ starts blinking and "MAINTENANCE MODE" appears on the LCD.
(3)   While holding down the switch ⬚6, press the switch ⬚1. The print head moves to the range-1 position. The LCD displays "GAP CLOSE." Turn off the power switch again.
(4)   Move the carriage to the right and left, and then insert the thickness gauge into the core block on the right-hand side of the ribbon protector. Check to confirm that the gap between the platen and the core block is between 0.11 and 0.16 mm.
(5)   If the gap requires adjustment, loosen the mounting screw and move the core block up or down into the position at which the gap between the platen and the core block falls within the range of 0.11 to 0.16 mm.
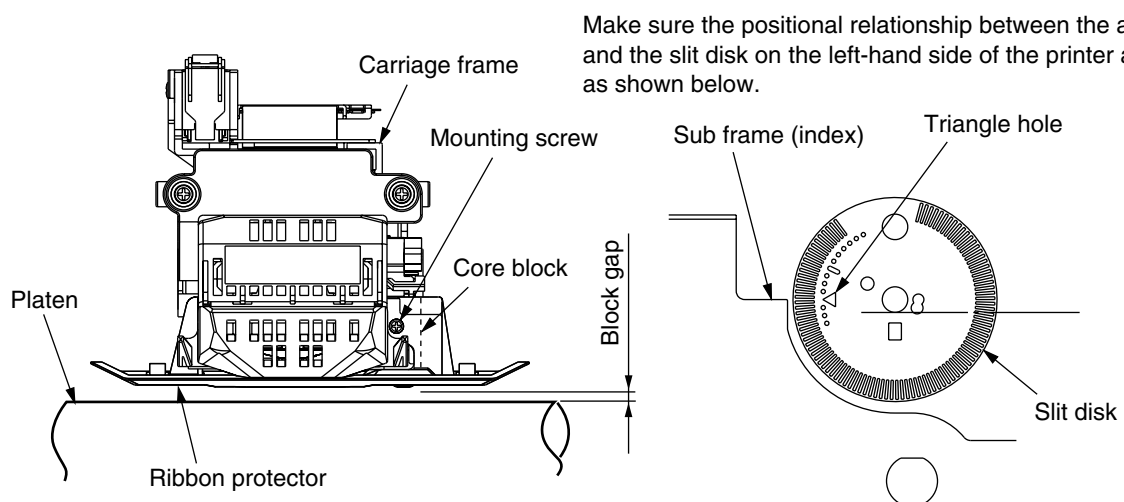
Figure 8-2

CAUTION: After this adjustment has been made, be sure to perform correction of the automatic paper-thickness adjustment described in section 8.3.

8.3   Correcting the Automatic Paper-Thickness Adjustment Distance

Turn on the power while holding down switches $\boxed{1}$, $\boxed{5}$, and $\boxed{6}$ to start up in maintenance mode. While holding down the switch $\boxed{6}$, press the switch $\boxed{5}$. The automatic paper-thickness adjustment distance is automatically corrected.

Cases in which correction is required
- During replacement, there is a problem with paper feeding or carriage movement, ink-ribbon feeding, print-head movement, or automatic paper-thickness adjustment movement.
- The AG sensor assembly has been replaced.
- There is a problem with EEPROM..
- The control circuit board has been replaced (or only the EEPROM has been replaced).
- The gap between the platen and the core block has been adjusted.

Correction Procedure
(1) Turn on the power switch.
(2) Make sure the pin tractor is selected and that a prompt to load paper is displayed on the LCD. If the prompt is not displayed and paper has already been loaded, press the switch $\boxed{1}$ to go offline (the lamp ⓓ goes out), and then press the switch $\boxed{4}$ to change the prompt on the screen. If the prompt is not displayed and paper has not been loaded, press the switch $\boxed{4}$ to change the prompt on the screen.
(3) Turn off the power switch.
(4) While holding down switches $\boxed{1}$, $\boxed{5}$, and $\boxed{6}$, turn on the power switch. Hold down the switches until [RELEASE SW] appears on the top row of the LCD screen. The printer performs the initial routine. The lamp ⓗ starts blinking and "MAINTENANCE MODE" appears on the LCD.
(5) While holding down the switch $\boxed{6}$, press the switch $\boxed{5}$. The LCD displays "AG DETECT DATA."
(6) Install single-layer continuous forms of 55 kg per ream on the pin tractor.
(7) Press the switch $\boxed{3}$ to load the paper.
(8) Press the switch $\boxed{1}$; the operations specified below will be repeated 15 times while the paper thickness is measured.

```
┌─────────────────────────────────────┐
│                   │                  │
│                   ▼                  │
│   ┌──────────────────────────────┐   │
│   │ Automatic paper-thickness    │   │
│   │ adjustment                   │   │
│   └──────────────────────────────┘   │
│                   │                  │
│                   ▼                  │
│        ┌─────────────────────┐       │
│        │  Printing of count  │       │
│        └─────────────────────┘       │
│                   │                  │
│                   ▼                  │
│   ┌──────────────────────────────┐   │
│   │ Line feeding by approx.      │   │
│   │ 73/216 inches                │   │
│   └──────────────────────────────┘   │
└─────────────────────────────────────┘
```
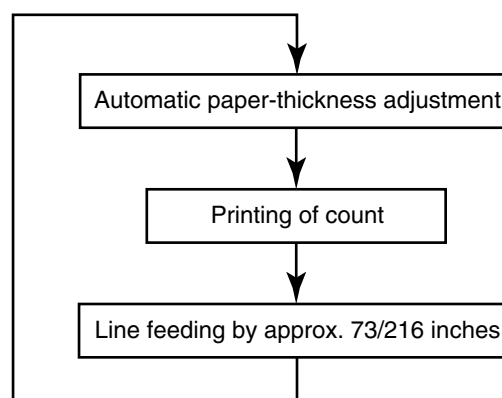
(9) When the operations have been completed, the printer prints [AV. = "correction value"] and automatically calculates the average of the 15 measurements. The calculation result is registered as the reference value for automatic paper-thickness adjustment. It is desirable that the value of [AV. = " "] be within the range of 009 to 032.

CAUTION:
- If paper has already been loaded, perform step (5) above. The measurement operations specified in (8) will then start.
- When using this function, be sure to use single-layer continuous forms of 55 kg per ream. If this condition is not satisfied, the accuracy of the head gap is not guaranteed.
- Be sure to make this adjustment under any of the following circumstances:
  - The platen has been replaced.
  - The AG sensor assembly has been replaced.
  - The control circuit board has been replaced (this adjustment is not necessary if the EEPROM of the old circuit board with the same program ROM version is installed).
- If the correction value of [AV. = " "] is between 8 and 61, and if differences between the AV value and the correction values of 15 measurements (max./min). are 5 or more, the lamp Ⓔ blinks. Press the switch ☐1 to stop the blinking.

8.4   Correcting the TOF Position during Auto Loading

The TOF (top of form) position of a continuous form or cut sheet during auto loading is corrected using the switches on the operating panel in accordance with the procedure specified below.

TOF distance
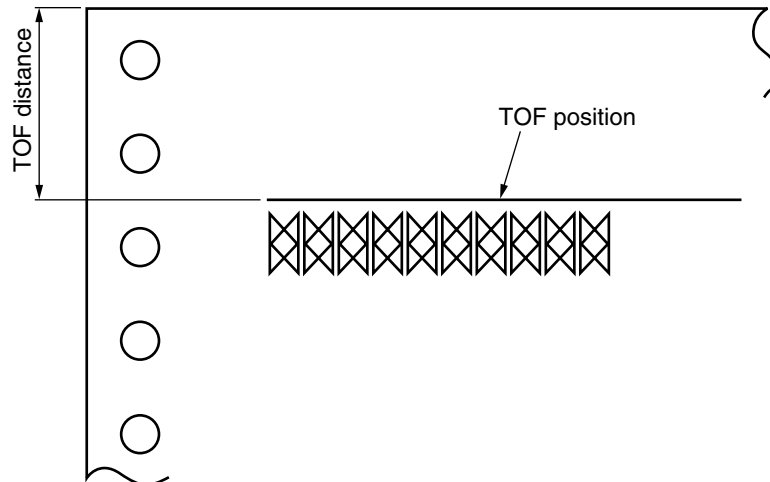
TOF position

Cases in which correction is required
- The PE sensor has been replaced, and the sensors have been cleaned (after the adjustment of the sensors specified in section 8.8 has been completed).
- The default TOF differs from the printing position in auto loading.
- There is a problem with EEPROM..
- The control circuit board has been replaced (or only the EEPROM has been replaced).

Correction Procedure
   Check the settings of [TOF Adj.xxx] and [xxx Load Adj.] in the adjustment mode in the function-setting menu. If they are not [0], change them to [0]. (Check the settings in all paper modes).
   (1)   Correction of the continuous-form TOF position (front tractor/rear tractor)
      ① Conduct test printing while referring to "9.1 Selecting Test Mode."
      ② Check to confirm that the TOF position conforms to the specification. If it does not, make correction by the method described in (4) below. The specification concerns the setting of [TOF] in the function-setting menu, as shown in section 9.2.1.

   (2)   Correction of the cut-sheet TOF position during manual feed (manual feed)
      ① Conduct test printing while referring to "9.1 Selecting Test Mode."
      ② Check to confirm that the TOF position conforms to the specification. If it does not, make correction by the method described in (4) below. The specification concerns the setting of [TOF] in the function-setting menu, as shown in section 9.2.1

   (3)   Correction of the cut-sheet TOF position during automatic feed (F-CSF/R-CSF)
      ① Install the auto sheet feeder and conduct test printing while referring to "9.1 Selecting Test Mode."
      ② Check to confirm that the TOF position conforms to the specification. If it does not, make correction by the method described in (4) below. The specification concerns the setting of [TOF] in the function-setting menu, as shown in section 9.2.1

(4) Press the switch ③ while offline, and install paper by auto loading. Continue to hold down the switch ③ after the auto loading has been completed. While holding down the switch ③, use switches ② and ⑤ to correct the TOF position.

- If you press the switch ② while holding down the switch ③, paper is fed in the forward direction at a 1/144-inch pitch for up to 40/144 inches.

- If you press the switch ⑤ while holding down the switch ③, paper is fed in the backward direction at a 1/144-inch pitch for up to 40/144 inches.

- The paper position at the time the switch is released becomes the new TOF position.

Switch ③ + Switch ②

Forward direction

Switch ③ + Switch ⑤

Backward direction
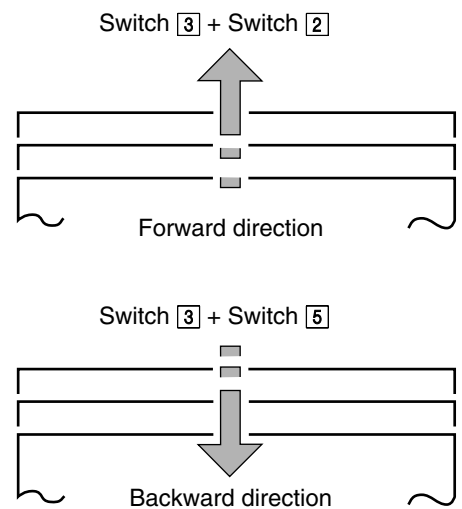
CAUTION:
- The adjustment range is from +40/144 to –40/144 inches.
- During adjustment, the lamp Ⓑ blinks.
  If the adjustment value reaches its maximum or minimum and no more adjustment is possible, the lamp Ⓑ remains lit.
  The messages specified below appear on the LCD in the correction mode.
  ① The printer is in the correction mode, and correction can be performed.
       [xxx Load Adj.] or [TOF Adj. Xxx]
  ② The printer is in the correction mode, and the adjustment has exceeded the correction range.
       [RANGE OVER]
  ③ The correction value is being written to the EEPROM.
  Ex)

T	O	F		A	d	j	.	X	X	X	X	X		
W	R	I	T	I	N	G		S	E	T	T	I	N	G	S

- The adjustment value is kept in storage after the power is turned off.
- The correction may be also made by opening the adjustment-mode menu (section 9.2.2).

8.5 Adjusting the Paper Cut Position

By operating the switches on the operating panel in accordance with the procedure specified below, the paper cut position is adjusted so as to match separate continuous forms at their perforation.

8.5.1 Adjustment in the Rear Tractor System
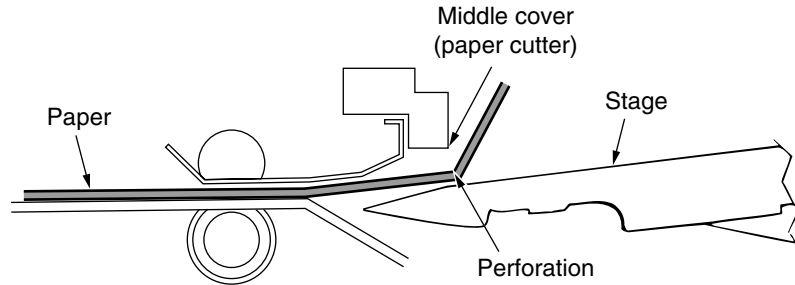
Figure 8-3

Cases in which adjustment is required:
- The paper cut position does not coincide with the perforation.
- There is a problem with EEPROM..
- The control circuit board has been replaced (or only the EEPROM has been replaced).

Adjustment Procedure
① Install continuous forms (1 layer, 55 kg, 15 inches) on the rear tractor (optional).
② Turn on the power. If the printer is in the rear tractor mode, the paper is fed automatically. If it is in another mode, press the switch ①1 to go offline, and then press the switch ④4 to change the mode. The paper is fed automatically.
Press the switch ①1 to go offline, and press the switch ②2 to force a page break.
③ Press the switch ①1 to go offline. The lamp Ⓓ lights up.
④ Press the switch ⑥6 to feed the paper to the paper cut position. Check to confirm that the perforation position conforms to the specification.

If it does not, make correction as specified below.

⑤ Press the switch ⑥6 to retract the paper.
⑥ Repeat step ④ above. After the paper has reached the paper cut position, continue to hold down the switch ⑥6. While holding down the switch ⑥6, use switches ②2 and ⑤5 to correct the cut position.

- If you press the switch ②2 while holding down the switch ⑥6, paper is fed in the forward direction at a 1/144-inch pitch.

- If you press the switch ⑤5 while holding down the switch ⑥6, paper is fed in the backward direction at a 1/144-inch pitch.

Switch ⑥6 + Switch ②2

Forward direction

Switch ⑥6 + Switch ⑤5

Backward direction
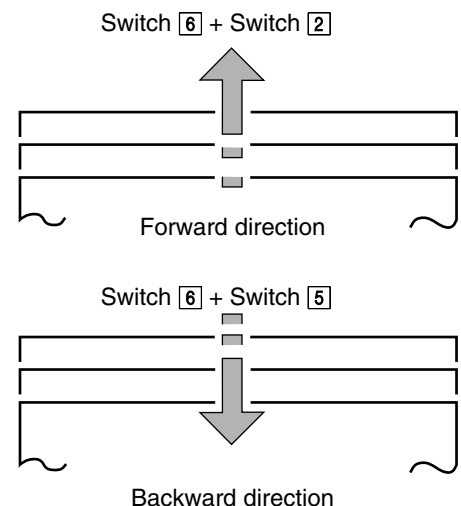
⑦　When the leading edge of the paper is aligned with the paper cut position, release the switch. The paper position at the time the switch is released is registered as the new paper cut position.

CAUTION:
- The adjustment range is from +200/144 to –40/144 inches.
- During adjustment, the lamp Ⓑ blinks.
  If the adjustment value reaches its maximum or minimum and no more adjustment is possible, the lamp Ⓑ changes to solidly lit.
  The messages shown below appear on the LCD during paper-cut-position correction.
  (1) The printer is in the correction mode, and correction can be performed.

T	E	A	R		O	F	F		P	O	S		A	D	J

  (2) The printer is in the correction mode, and the adjustment has exceeded the correction range.

T	E	A	R		O	F	F		P	O	S		A	D	J
R	A	N	G	E		O	V	E	R						

  (3) The correction value is being written to the EEPROM.

T	E	A	R		O	F	F		P	O	S		A	D	J
W	R	I	T	I	N	G		S	E	T	T	I	N	G	S

- The adjustment value is kept in storage after the power is turned off.

8.6 Correcting the Horizontal Printing Position

When the settings in the adjustment-mode menu (section 9.2.2).are changed by the procedure specified below, horizontal offsets between lines in bidirectional printing are corrected. The correction value is separately adjustable for each print mode: low speed, normal speed, high speed 1, and high speed 2.

Cases in which adjustment is required
- The printed letters are not aligned between lines in bidirectional printing.
- There is a problem with EEPROM.
- The control circuit board has been replaced (or only the EEPROM has been replaced).

Adjust Menu

Regist. LOW   PRREG=0

||||||||||||||||||||||||| SEL ← ||||| → MODE ||||||||||||||||||||||||||||||

Regist. Normal   PRREG=0

||||||||||||||||||||||||| SEL ← ||||| → MODE ||||||||||||||||||||||||||||||

Regist. High1   PRREG=0

||||||||||||||||||||||||| SEL ← ||||| → MODE ||||||||||||||||||||||||||||||

Regist. High2   PRREG=0

||||||||||||||||||||||||| SEL ← ||||| → MODE ||||||||||||||||||||||||||||||

Adjust Menu End

Adjustment Procedure
① While holding down switches ☐1, ☐2, and ☐5, turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. If paper is not installed, install paper and then press the switch ☐3 to load it.
② The printer prints out the currently set horizontal printing-position correction value in each print mode. Check to confirm that there are no offsets. If there are offsets, make corrections as shown below.
③ Press switch ☐2 or ☐5 to scroll the menu and choose the print mode for which the offset is to be corrected. In each print mode, vertical lines are printed as the carriage travels from right to left and from left to right. By checking the vertical lines, you can determine whether there are offsets between forward printing and reverse printing.
④ Every time the switch ☐1 is pressed, the reverse printing position moves to the left by 1/360 inches. Every time the switch ☐4 is pressed, it moves to the right by 1/360 inches (the names of the switches to be pressed are printed out). While monitoring the results, use these switches to correct the offsets in the vertical lines.
    Make the adjustment for all print modes: low speed, normal speed, high speed 1, and high speed 2.
⑤ Press the switch ☐3. The printer prints [Adjust Menu End], and the last printed settings are registered. The printer exits the menu.
    CAUTION: • The adjustment range is from +5/360 to –5/360 inches.
                       • This function is effective for both continuous forms and cut sheets.

8.7 Correcting the Cut-Sheet Line-Feed Pitch

When the setting in the adjustment-mode menu (section 9.2.2).is changed in accordance with the following procedure, the cut-sheet line-feed pitches for manual feed and CSF are corrected.

Cases in which correction is required
- The printed text does not fit a preprinted format, or the length of the cut sheet*s* does not satisfy the specification or the like.
- There is a problem with EEPROM.
- The control circuit board has been replaced (or only the EEPROM has been replaced).

Correction Procedure

Check the setting of [LF Revise (xx)] in the adjustment mode in the function-setting menu (section 9.2.1).. If it is not [0], change it to [0]. (Check the settings in all paper modes for cut sheets).

(1) While holding down switches ①, ②, and ⑤, turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. If paper is not installed, install paper and press the switch ③ to load it.

(2) The printer prints out the currently set horizontal printing-position correction value, followed by [LF Revise (CSFR)]. Use switches ② and ⑤ to choose the cut-sheet LF pitch correction in the paper mode for which corrections are to be made.

(3) Use switches ① and ④ to edit the setting. Use the correction values in the table below as a guide.

(4) Press the switch ③. The printer prints [Adjust Menu End], and the setting is registered.

The table below shows the cut-sheet LF pitch correction value of each preset.

Cut-Sheet LF Pitch Correction Values

Preset	Correction value	Correction per 40 lines (6LPI)
0	Makes no correction (default)	
±1	Corrects ±1/432 for every 976/432 inches	±0.11mm
±2	Corrects ±1/432 for every 491/432 inches	±0.29mm
±3	Corrects ±1/432 for every 328/432 inches	±0.47mm
±4	Corrects ±1/432 for every 246/432 inches	±0.65mm
±5	Corrects ±1/432 for every 197/432 inches	±0.82mm
±6	Corrects ±1/432 for every 163/432 inches	±1.00mm
±7	Corrects ±1/432 for every 140/432 inches	±1.18mm
±8	Corrects ±1/432 for every 122/432 inches	±1.35mm
±9	Corrects ±1/432 for every 109/432 inches	±1.53mm
±10	Corrects ±1/432 for every 99/432 inches	±1.71mm

If the line feed does not fit a cut-sheet preprinted form, set the correction to an appropriate value.

8.8   Adjusting Sensors

8.8.1   Checking the Slice Level of Sensors

Turn on the power while holding down switches [1], [5], and [6] to start up in maintenance mode. While holding down the switch [3], press the switch [5]. The detection level of each sensor is automatically adjusted to determine whether the level is normal.

Objective of adjustment
   • To automatically store in the memory the slice level that matches the paper end detection output (low level) of each sensor after sensors have been replaced

Cases in which adjustment is required
   • The sensor (paper-width sensor assembly, sheet-guide upper front assembly, SQC circuit board, or rear PE sensor assembly) has been replaced.
   • The sensors have been cleaned.
   • The ribbon protector has been replaced.
   • There is a problem with EEPROM.
   • The control circuit board has been replaced (or only the EEPROM has been replaced).

Adjustment Procedure
   (1)   Remove all sheets of paper. While holding down switches [1], [5], and [6], turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. The LCD displays [MAINTENANCE MODE].
   (2)   While holding down the switch [3], press the switch [5]. The LCD displays [OPTICAL SENSOR].
   (3)   Check to confirm whether each sensor is normal or abnormal based on the sound of the buzzer.

   Normal : Buzzer ‾‾|Beep|_____|Beep|_____ End

   Abnormal : Buzzer ‾‾|Beep|_____| Beep   It continues to beep until any switch is pressed or the power is turned off.

   (4)   When a sensor is detected to be abnormal, the lamp Ⓑ blinks and the LCD shows which sensor is abnormal. An abnormal sensor is one with its output at a high level. This may be caused by paper dust on the sensor. Clean and adjust the sensor.

   LCD message

   | L | E | V | E | L | | E | R | R | O | R | | | | |
   | T | A | B | L | E | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |

   ↓

   | L | E | V | E | L | | E | R | R | O | R | | | | |
   | F | R | O | N | T | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |

   ↓

   | L | E | V | E | L | | E | R | R | O | R | | | | |
   | R | | P | L | | P | R | | | | | | | | |

Faulty sensor	LCD message
Front PE sensor	FRONT(1 to 7)
Rear PE sensor	R
Table sensor	TABLE(1 to 7)
Left-hand paper-width sensor	PL
Right-hand paper-width sensor	PR

   *   The sensor detected to have an error is shown in the bottom row of the LCD screen. (All sensors are abnormal in the example above.)

   CAUTION: • Be sure to perform this function without paper.
                • After the slice-level setting has been completed, the message shown below appears on the LCD.

   | S | E | T | | U | P | | C | O | M | P | L | E | T | E |
   | | | | | | | | | | | | | | | |

8.8.2 Sensor Check

Turn on the power while holding down switches ⑴, ⑸, and ⑹ to start up in maintenance mode. While holding down the switch ⑶, press the switch ⑴. The printer checks to determine whether each sensor is operating properly.

Objective of the check and cases in which it is required:
- To determine which sensor's output is faulty when a problem occurs involving paper detection due to a sensor-related error
- The sensor slice-level check (setting function) has been conducted.

Check Procedure
(1) Turn on the power switch, choose the cut-sheet manual feed mode, and then turn off the power switch (the CSF shall not be installed).
(2) Remove all sheets of paper. While holding down switches ⑴, ⑸, and ⑹, turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. The LCD displays [MAINTENANCE MODE].
(3) While holding down the switch ⑶, press the switch ⑴. The LCD displays [SENSOR TEST].
(4) Make sure the bottom row of the LCD does not display any message.
(If a message is displayed, the sensor is not normal, as it detects paper even though there is no paper).
(5) Place cut sheets on the table, and press the switch ⑶ to load the sheets. To load paper sheets from the table, place A3-size sheets in landscape orientation.

Feeder inlet	Cut sheet used
Table	A3 landscape

(6) Sensors that have detected paper are displayed in the bottom row of the LCD, as shown below. Check to confirm that the sensors are operating properly. (All sensors are normal in the example below.)

```
S E N S E R   T E S T
T A B L E   1 2 3 4 5 6 7
```

```
S E N S E R   T E S T
F R O N T   1 2 3 4 5 6 7
```

```
S E N S E R   T E S T
R   P L   P R
```
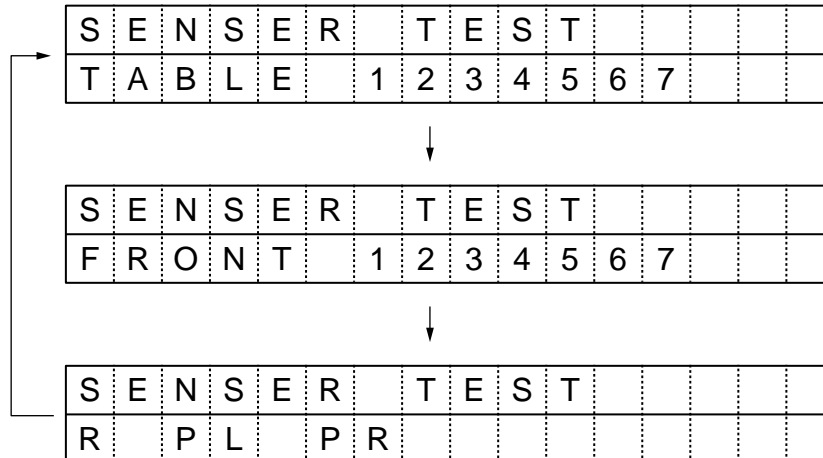
Sensor detecting paper	LCD message
Front PE sensor	FRONT(1 to 7)
Rear PE sensor	R
Table detection sensor	TABLE(1 to 7)
Left-hand paper-width sensor	PL
Right-hand paper-width sensor	PR

(7) The cut sheets are output by pressing the switch ⑶.

CAUTION: This mode will not activate in continuous-form mode.

8.8.3 Correcting the Paper-Width Sensor

Turn on the power while holding down switches [1], [5], and [6] to start up in maintenance mode. While holding down the switch [1], press the switch [4]. The horizontal positions of the right- and left-hand paper-width sensors are automatically adjusted.

Cases in which correction is required
- The sensor slice-level check (setting function) has been conducted, or a sensor slice level has been manually set.

Correction Procedure
(1) Turn on the power switch, choose the cut-sheet manual feed mode, and turn off the power switch (the CSF shall not be installed).
(2) While holding down switches [1], [5], and [6], turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. The LCD displays [MAINTENANCE MODE].
(3) While holding down the switch [1], press the switch [4]. The LCD displays [P WIDTH SNSR ADJ].
(4) Move the paper guide to the right-hand jog position. Place postcards (portrait) along the paper guide, and feed from the table.

Feeder inlet	Medium used
Table	Postcard (portrait) (paper width: 100 mm)

(5) After a postcard is fed, the printer measures the paper width and prints horizontal lines. Another postcard is fed, and the printer measures the paper width.
(6) If the measurement results are correct, the printer stores the correction value in the EEPROM, outputs the paper, and exits the correction mode. If a result is abnormal (a paper width other than that of the postcard is detected) or if the two measurements at the right end and the left end are different, an alarm message [PAPERWIDTH ERR] appears on the LCD. If paper is misplaced, [SET POSITION ERR] appears. If an alarm occurs, press the switch [3]. The paper is output and the printer will stand by for paper re-feed (measurement).
(7) When the correction mode ends without the issuance of an alarm, turn off the power switch. While holding down switches [2] and [3], turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen, and then start the local test. Feed paper of 55 kg per ream by quick loading to print for the local test. Make sure the distance between the left-hand edge of paper and the left-hand edge of the first dot conforms to the specification.

Measure the distance to the left-hand edge of the 1st dot.
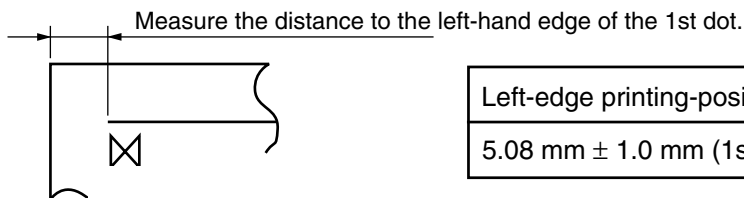
Left-edge printing-position specification
5.08 mm ± 1.0 mm (1st dot center)

LCD Message

(1) The paper width is not correct or the measurements at the right and left ends are different.

P	A	P	E	R		W	I	D	T	H		E	R	R	
P	R	E	S	S		L	O	A	D		S	W			

(2) Paper is misplaced.

S	E	T		P	O	S	I	T	I	O	N		E	R	R
P	R	E	S	S		L	O	A	D		S	W			

CAUTION: • This mode cannot be activated in the continuous-form mode.
• If the left-edge printing position differs from the specification, perform the paper-width sensor correction again and check the left-edge printing position.

8.8.4 Correcting the Front PE Sensor

Turn on the power while holding down switches ⑴, ⑸, and ⑹ to start up in maintenance mode. While holding down the switch ⑴, press the switch ⑹. The vertical positions of the seven front PE sensors are automatically adjusted.

Cases in which correction is required
- The sensor slice-level check (setting function) has been conducted or a sensor slice level has been manually set.

Correction Procedure
(1) Turn on the power switch, choose the cut-sheet manual feed mode, and then turn off the power switch (the CSF shall not be installed).
(2) While holding down switches ⑴, ⑸, and ⑹, turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. The LCD displays [MAINTENANCE MODE].
(3) While holding down the switch ⑴, press the switch ⑹. The LCD displays [FRONT SENSOR ADJ].
(4) Move the paper guide to the right-hand jog position. Place B4-size paper (landscape) along the paper guide, and feed from the table.

Feeder inlet	Medium used
Table	B4 (landscape) (367 mm)

(5) After a sheet is fed, the printer measures the top edge of the sheet using the sensors and prints horizontal lines. The printer feeds another sheet and measures the sheet width.
(6) If the measurement results are correct, the printer stores the correction value in the EEPROM, outputs the paper, and exits the correction mode. If a result is abnormal (paper width other than that of B4-size landscape is detected or any of the seven sensors fails to detect the top edge of the paper), the fed sheet is out of position, or the sensor correction range is exceeded, an alarm message appears on the LCD. If an alarm occurs, press the switch ⑶. The paper is output and the printer will stand by for paper re-feeding (measurement).

LCD Message

(1) The paper width is not correct or a fed sheet is out of position.

P	A	P	E	R		W	I	D	T	H		E	R	R	
P	R	E	S	S		L	O	A	D		S	W			

(2) The correction range is exceeded.

S	N	S		A	D	J		R	N	G	E		E	R	R
P	R	E	S	S		L	O	A	D		S	W			

CAUTION: This mode will not activate in the continuous-form mode.

8.8.5 Manual Setting of the Sensor Slice Level

Turn on the power while holding down switches ⬛1, ⬛5, and ⬛6 to start up in maintenance mode. While holding down the switch ⬛3, press the switch ⬛2. The slice level of each sensor is viewed on the LCD and set manually (seven levels [1 to 7] are available).

Objective of adjustment and cases in which it is required
- After the sensor slice-level check (setting function) has been conducted, an error occurs in paper detection during the sensor check. In such a case, adjust the slice level manually so that the relevant sensor operates properly.

Adjustment Procedure
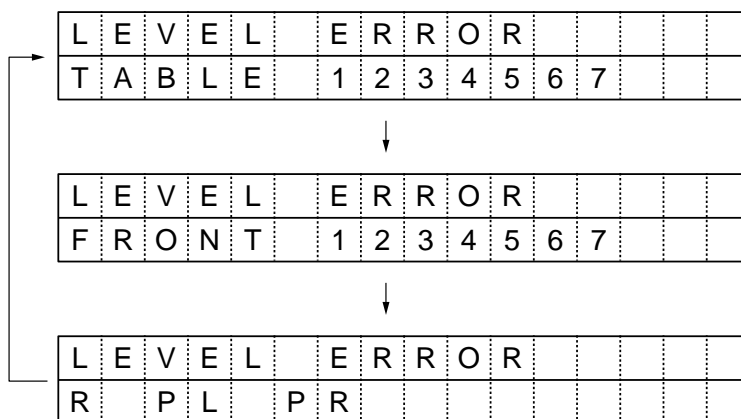- (1) Remove all paper. While holding down switches ⬛1, ⬛5, and ⬛6, turn on the power switch. Hold down the switches until [RELEASE SW] appears in the bottom row of the LCD screen. The LCD displays [MAINTENANCE MODE].
- (2) While holding down the switch ⬛3, press the switch ⬛2. The LCD displays [LEV. MANUAL].
- (3) In the operating procedure specified below, choose the slice level of a sensor and edit the setting on the LCD. Edit the setting of only the sensor detected to be faulty in paper detection during the sensor check. If the sensor fails in paper detection, lower the slice level by one notch. If the sensor fails in paper end detection, raise the slice level by one notch.
    <Operating Procedure>

Switch No.	Function
2	• Displays the first item [Table Sensor 1] when pressed at startup • Scrolls the setting sensors forward each time it is pressed
5	• Displays the first item [Table Sensor 1] when pressed at startup • Scrolls the setting sensors backward each time it is pressed
1	• Scrolls the slice levels forward each time it is pressed (Moves to Level 1 when pressed at Level 7)
4	• Scrolls the slice levels backward each time it is pressed (Moves to Level 7 when pressed at Level 1)
3	• Stores the set slice level in the EEPROM and exits this function

<Setting Item>

Item	Function	Preset
Table Sensor 1 to 7	Sets the slice level of table sensors 1 to 7	Level 1 Level 2 Level 3 Level 4 Level 5 Level 6 Level 7
Front PE Sensor 1 to 7	Sets the slice level of front TOF/PE sensors 1 to 7	↑
Rear PE Sensor	Sets the slice level of the rear TOF/PE sensor	↑
Left Paper W	Sets the slice level of the left-hand paper-width detection sensor	↑
Right Paper W	Sets the slice level of the right-hand paper-width detection sensor	↑

(4)   Press the switch ③. The set slice level is stored in the EEPROM, and the printer exits this function.

CAUTION: • After a slice level has been changed using this function, perform the sensor check to determine whether all sensors are operating properly.
•   After a slice level has been changed using this function, perform the paper-width-sensor correction and the front-PE-sensor correction.

9. Maintenance Test

9.1 Selecting Test Mode

9.1.1 Local Mode Start Switch

The switches on the operating panel have the functions as shown in Table 9-1 for various tests for maintenance. When the power is turned on while a switch marked with ● is held down, the printer enters the mode shown in Table 9-1. Each switch must be kept depressed until [RELEASE SW] appears in the bottom row of the LCD. When the switches specified in Table 9-2 are pressed after maintenance mode has been entered, the printer enters the adjustment mode corresponding to each switch.

Layout of Switches and Lamps
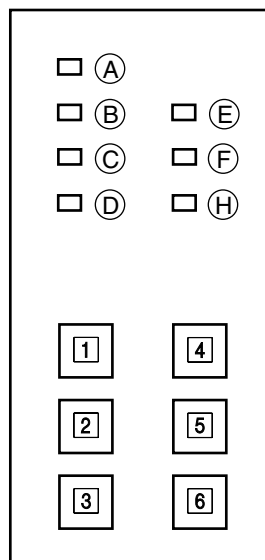
Table 9-1. Startup of the Menu and Maintenance Modes (1/3)

Test Item	Switch						Paper mode	Remarks
	1	2	3	4	5	6		
Function-setting menu				○		●		Press in offline mode. Press the switch 4 while holding down the switch 6.
Adjustment-mode menu	●	●			●			
Maintenance mode	●				●	●		
Function-setting-menu default	●					●		
All-menu default	●	●	●			●		Turn on the power while holding down switches 1, 2, and 3, and immediately press the switch 6.
Menu-setting-list print	●			●				List of setting data in the function-setting menu
Correction-list print	●			●	●			

Table 9-1. Local test (2/3)

Test Item	Switch 1	2	3	4	5	6	Paper mode	Remarks
6-inch| rolling ASCII single		●			●			
6-inch skip ANK continuous		●	●		●			
13.6-inch skip ANK continuous		●	●				Continuous-form	136 characters (fixed)
							Cut-sheet	60 characters (fixed)
Postcard						●	Cut-sheet	

Table 9-1. Hexadecimal Dump (3/3)

Test Item	Switch 1	2	3	4	5	6	Paper mode	Remarks
Hexadecimal dump				●	●	●		

Table 9-2. Maintenance Mode (note)

Test Item	Switch 1	2	3	4	5	6	Paper mode	Remarks
Sensor slice-level setting function			●	○				
Sensor slice-level manual setting		○	●					
Sensor check	○		●				Cut-sheet manual feed	
Auto-gap automatic correction				○	●		Continuous-form	Use 55 kg paper.
Auto-gap test			○		●			Continuous operations for 100 times
Gap adjustment	○				●			Range 1 head close
Gap fully open			○		●			
Auto-gap data display		○			●			
Pin test-pattern print	○			●				
Adjustment-mode menu				●				
Paper-width sensor correction	●	○		○		○	Cut-sheet manual feed	
Front-PE-sensor correction	●						Cut-sheet manual feed	

CAUTION: After maintenance mode has started up, press ○ while holding down ●.

9.2 Menu

This printer has the internal memory necessary to store the control-mode data. When returned to the default settings by power-on operation or reset-signal input, the printer refers to the memory and automatically sets up the modes. If commands have been input from the host computer, the printer operates according to these commands.

The memory for menu setting maintains the data after the power is turned off. To edit the settings, change the setting data in the memory using the switches on the operating panel shown below. Two setting menus are available: the function-setting menu and the adjustment-mode menu. They are started up by the operations specified below.

Type of menu	Startup procedure
Function-setting menu	Press the switch ④ while holding down the switch ⑥ in offline mode..
Adjustment-mode menu	Turn on the power while holding down switches ①, ②, and ⑤.

9.2.1 Function Setting Menu

With a printer placed in the DESELECT state after it is turned on, pressing ④ switch while holding ⑥ down provides a function setting menu, on the printer.

The function setting menu consists of the following 12 modes, and the mode 1) is established directly after the function setting menu is provided. Every time when ②, or ⑤ switch, is pressed while holding ⑥ down, the mode of the menu changes in the following order or in reverse order of the following.

(1) Printer Control
(2) Font
(3) Symbol Sets
(4) Set up
(5) Manual Feed
(6) CSF front
(7) CSF Rear
(8) Front Feed   (10) Parallel I/F
(9) Rear Feed   (11) Serial I/F
(12) Adjustment

```
OFF-LINE   EPS-FX
FRONT
```

```
⬍ Printer Control
```

```
⬍ Font
```

```
⬍ Symbol Sets
```

⋮⋮

```
⬍ Adjustment
```
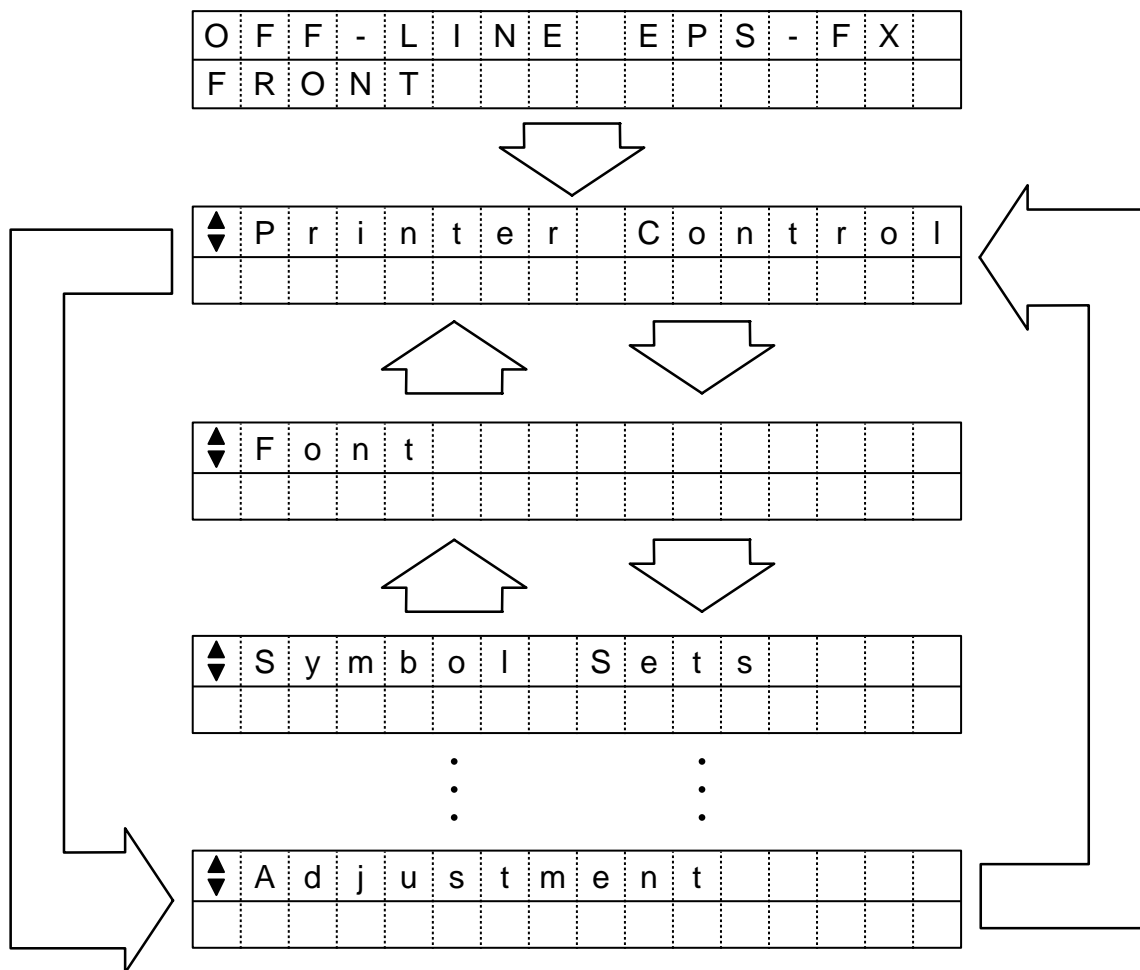
(1) Printer Control

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Emulation Mode	Selects IBM PPR mode, EPSON FX mode or ML mode.	IBM PPR EPSON FX ML

(2) Font

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Print Mode	Sets ANK character quality.	Utility NLQ Courier NLQ Gothic DRAFT
2	DRAFT Mode	Sets the DRAFT mode.	HSD SSD
3	Pitch	Selects a character pitch.	10 CPI 12 CPI 15 CPI 17.1 CPI 20 CPI
4	Prop.Spacing	Selects proportional mode.	NO YES
5	Style	Selects italics mode.	Normal Italics
6	Size	Selects a character width and height en-largement ratio.	Single Double

(3) Symbol Sets

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Character Set	Selects an ANK character code table.	<u>Set I</u> Set II Standard, Line Graphics, Block Graphics (ML Mode only)
2	Language Set	Selects a foreign character set.	<u>American</u> French German British Danish I Swedish Italian Spanish I Japanese Norwegian Danish II Spanish II Latin American French Canadian Dutch Publisher
3	Zero Character	Selects a 30H (zero character) code reception print font pattern.	<u>Slashed</u> Unslashed
4	Code Page	Select a code page type.	<u>USA</u> Canada French Multilingual Portugal Norway BRASCII Abicomp Multilingual858 ISO 8859-15

(4) Set Up

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Multi Pass	Selects a printing direction for a print line containing double-height print data.	<u>Bi-Directional</u> Uni-Directional
2	Graphics	Selects a printing direction for a print line containing image data.	<u>Bi-Directional</u> Uni-Directional
3	Graphics Data(ML Only)	Sets graphics data to either 7 Bits or 8 Bits.	8 Bits <u>7 Bits</u>
4	Rcv.Buffer	Selects whether to use a receive buffer.	<u>128K</u> 0K
5	Data Word (ML Only)	Sets a character code and graphics data to either 7 Bits or 8 Bits.	<u>8 Bits</u> 7 Bits
6	Panel Function	Sets a valid condition for the operator panel SW.	<u>Full</u> Limited
7	Path Change	Selects whether to perform continuous-form paper cut operation at media switching.	<u>Not Tear Off</u> Tear Off
8	Cut Sheet Smooth	Selects making fed cut sheets, and cut sheets after line feeding, smooth.	Invalid <u>Valid</u>

9	Skp Ovr Binding	Selects whether to enable the function that provides protection against ribbon protector's hole damage (control that, before form or line feeding, moves to a specified position a print head that is only in a given range).
		<Valid1>
		    Functions only in continuous-form modes, and applies only before form feeding and perforation skipping, and 18 mm or more line feeding.
		<Valid2>
		    Functions in any of paper modes, and applies before line feeding irrespective of how it is conditioned.
			Invalid
			<u>Valid1</u>
			Valid2

10	High Skip	Selects whether to enable the low-vibration mode that reduce vibration during printing.	<u>Yes</u> No
11	Eject Condition	Selects a paper ejection condition at (paper) bottom detection in the manual and auto cut-sheet feed modes.	<u>Bottom Detect</u> FF Code
12	Sheet Feed Mode	Selects a manual or auto cut-sheet feed mode to be established at initialization with the media mode set to a CSF-equipped cut-sheet mode.	<u>Manual</u> CSF
13	CSF Select Note 1)	Assigns priority to any of installed front and rear CSFs.	CSF Front <u>CSF Rear</u>
14	Print Suppress	Selects whether to enable DC1/DC3 code.	<u>NO</u> YES
15	Auto LF	Selects behavior at CR (carriage return) code reception.	<u>NO</u> YES
16	Auto CR	Selects behavior of carriage return (CR) system commands (whether to include CR) (this item is displayed only during IBM emulation).	<u>NO</u> YES
17	Print DEL Code	Sets whether or not to print the 7FH code with the DEL mark (this item is displayed only during IBM emulation).	<u>NO</u> YES

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
18	SI PITCH (10)	Sets handling of the SI command received in 10CPI mode (this item is displayed only during IBM emulation).	15 CPI <u>17.1 CPI</u>
19	SI PITCH (12)	Sets handling of the SI command received in 12CPI mode (this item is displayed only during IBM emulation).	12 CPI <u>20 CPI</u>
20	Reset Inhibit	Sets whether to enable INITIAL command.	<u>NO</u> YES
21	ESC SI Pitch (IBM Only)	Sets contents of the ESC SI command.	<u>17.1 CPI</u> 20 CPI
22	Time Out Print	Sets/Cancels the print mode with a 150ms time-out.	<u>Valid</u> Invalid
23	Auto Select	Selects whether to set or not the select mode automatically after paper is fed.	<u>No</u> Yes
24	Impact made	Selects the print mode at power on. <When Quiet is selected> Trims print data (as is the case with the high-speed print mode) and performs printing at a normal print speed.	<u>Normal</u> Quiet
25	Print Dir. CMD	Selects Valid or Invalid for a one-direction print setting command.	Invalid <u>Valid</u>
26	Host Interface	Selects an interface mode (auto or fixed).	<u>Auto Interface</u> Parallel USB Option I/F
27	I/F Time Out	Sets the time between the interruption of data reception and the interface idle state (where data can be received by any of parallel and USB interfaces) when the interface mode is auto.	<u>15 sec</u> 30 sec 45 sec 1 min 2 min 3 min 4 min 5 min
28	Buzzer	Selects whether to enable buzzer beeping.	<u>Enable</u> Disable
29	Buzzer Volume	Selects a buzzer beeping volume.	<u>Low</u> Middle High
30	Power Saving	Selects whether to enable a power saving function.	<u>Enable</u> Disable
31	Power Save Time	Selects the time to a power saving state.	5 min <u>10 min</u> 15 min 30 min 60 min
32	Tear Mode (Rear Feed Mode only)	Selects a tear-up function.	<u>FF+Tear up</u> Tear up

Note 1) The item is provided, and a value for the item can be set, on the LCDs of only printers equipped a CSF at each of their front and rear.

5) Manual Feed

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Line Spacing	Selects line spacing.	6LPI 8LPI
2	Auto Eject Pos. (Note 2)	Selects the position to be detected for the ejection of cut-sheet paper. (a distance between the bottom edge and character center of the paper).	3.18mm (1/8") 6.35mm (1/4")
3	Page Width	Selects the maximum number of bytes printed on a line.	8" 10.6" 13.2" 13.6"
4	Page Length	Selects the page length. This setting becomes effective when "Select Mode" is selected in "Page Leng. Mode." (See Note 2.) (If a page length setting command is received, the received command is given priority over the setting.)	76.2mm (3") 82.6mm (3.25") 88.9mm (3.5") 101.6mm (4") 127.0mm (5") 139.7mm (5.5") 152.4mm (6") 177.8mm (7") 203.2mm (8") 215.9mm (8.5") 279.4mm (11") 296.3mm (11.67") 304.8mm (12") 355.6mm (14") 431.8mm (17")
5	TOF (Note 1) (Note 3)	Selects a basic top-of-form position in manual cut-sheet feed modes <the vertical center of the first print (character) line of each form, except that 8.47mm means the upper edge of the first character line of each form>.	2.12mm (1/12") 3.18mm (1/8") 6.35mm (1/4") 7.62mm (3/10") 8.47mm (1/3") 10.58mm (5/12") 21.59mm (0.85") 23.28mm (11/12") 25.4mm (1") 27.52mm (13/12") 1 Chr. Set Pos.
6	WAIT TIME	Selects the time for waiting for the start of paper insertion from a table. The setting for the item is valid only when an auto alignment function is disabled.	2.0 sec 1.5 sec 1.0 sec 0.5 sec
7	Load LF Speed	Selects a paper feed speed after manual cut-sheet insertion.	Fast Speed Slow Speed
8	Eject Dir.	Selects a paper ejection destination in manual cut-sheet feed modes.	Front Rear
9	Paper End	Selects whether to output paper-end (a state where there is no fed paper) information at detection of paper-end in manual cut-sheet feed modes.	On-line Off-line

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
10	Gap Control	Selects a paper weight measurement method and gap range in manual cut-sheet feed modes.	<u>Auto</u> Manual Gap 1 Manual Gap 2 Manual Gap 3 Manual Gap 4 Manual Gap 5 Manual Gap 6 Manual Gap 7 Manual Gap 8 Manual Gap A Manual Gap B Manual Gap C Manual Gap D Manual Gap E
11	Gap Pos	Selects the position at which auto-gap operation of manual cut-sheet feed modes is performed. Each setting for the position shows the distance between the left end edge of, and the auto gap sensor for, paper. When auto alighment is disabled, it shows the distance between the first dot position of, and the auto gap sensor for, paper.	<u>50.8mm (2")</u> 101.6mm (4")
12	Auto Align(POW)	Selects whether to enable, at printer's power-on, a skew adjustment mechanism and a left margin. Valid1: Selects enabling skew adjustment and Align1 Pos.Adj. Valid2: Selects enabling skew adjustmen and Align2 Pos.Adj. Valid3: Selects enabling skew adjustment and Align3 Pos.Adj Valid4: Selects enabling skew adjustment and Align4 Pos.Adj. SelectAutoAlign: Uses a Auto Align menu setup. (This item does not apply at initialization by I-PRIME reception).	Align1 Align2 Align3 Align4 <u>SelectAutoAlign</u>
13	Auto Align	Selects whether to enable, at printer's power-on, a skew adjustment mechanism and a left margin when Auto Align(POW) is set to SelectAutoAlign. Valid1: Selects enabling skew adjustment and Align1 Pos.Adj. Valid2: Selects enabling skew adjustment and Align2 Pos.Adj. Valid3: Selects enabling skew adjustment and Align3 Pos.Adj. Valid4: Selects enabling skew adjsutment and Align4 Pos.Adj. Invalid: Disables skew adjustment. (This item does not apply at initialization by I-PRIME reception).	<u>Align1</u> Align2 Align3 Align4 Invalid
14	Memory AutoAlign	Selects whether to store, as the setting for Auto Align, that new setting for Auto Align which is made using Skew Correction Set Mode switch.	<u>Valid</u> Invalid

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
15	Align1 Pos.Adj.	Adjusts within a range of 0 to 45.4 mm a left margin when a Auto Align function is used (in 1/90 inch increments). When Valid1 is menu-selected, or selected using Auto Align Set Mode switch, the function is enabled.	0mm : 5.1mm : 45.4mm
16	Align2 Pos.Adj.	Adjusts within a range of 0 to 45.4 mm a left margin when a Auto Align function is used (in 1/90 inch increments). When Valid2 is menu-selected, or selected using Auto Align Set Mode switch, the function is enabled.	0mm : 5.1mm : 45.4mm
17	Align3 Pos.Adj.	Adjusts within a range of 0 to 45.4 mm a left margin when a Auto Align function is used (in 1/90 inch increments). When Valid3 is menu-selected, or selected using Auto Align Set Mode switch, the function is enabled.	0mm : 5.1mm : 45.4mm
18	Align4 Pos.Adj.	Adjusts within a range of 0 to 45.4 mm a left margin when a Auto Align function is used (in 1/90 inch increments). When Valid4 is menu-selected, or selected using Auto Align Set Mode switch, the function is enabled.	0mm : 5.1mm : 45.4mm
19	AutoAlignDetect	Sets whether to enable skew detection and sets skew detection accuracy, when a skew adjustment function is used and paper is fed. Invalid does not detect skew.	Valid Level1 Valid Level2 Invalid
20	SkewDetect(Cut)	Sets whether to enable skew detection and sets skew detection accuracy, when a skew adjustment function is disabled and paper is fed. Invalid does not detet skew.	Valid Level1 Valid Level2 Invalid
21	Check PrintArea	Sets processing at reception of data that overflows the print area of paper loaded from a table with an auto alignment function enabled. The setting Valid cuts data overflowing the area (within 5.08 mm of the right edge of the paper). Invalid directly prints the overflowing data.	Valid Invalid
22	FF Function	Selects a FF code function in manual cut-sheet feed modes.	Eject Form Feed

Note 1) "1Chr. Set Pos." is displayed only when the position to print the first line is set with the paper position setting function.

Note 2) Although it is possible to set 2.12mm (1/12") or 3.18mm (1/8"), print quality is not guaranteed. In the case of starting printing at from 2.12mm (1/12") and also printing to the full page width, curls of page corners, folds, and paper jams may be generated.

Note 3) To use paper that has a step at its bottom, select Rear for the direction to output.

(6) CSF front

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Line Spacing	Selects line spacing.	<u>6LPI</u> 8LPI
2	Auto Eject Pos. (Note 2)	Selects the position to be detected for the ejection of cut-sheet paper. (a distance between the bottom edge and character center of the paper).	3.18mm (1/8") <u>6.35mm (1/4")</u>
3	Page Width	Selects the maximum number of bytes printed on a line.	8" 10.6" 13.2" <u>13.6"</u>
4	Page Length	Selects the page length. This setting becomes effective when "Select Mode" is selected in "Page Leng. Mode." (If a page length setting command is received, the received command is given priority over the setting.)	88.9mm (3.5") 101.6mm (4") 127.0mm (5") 139.7mm (5.5") 152.4mm (6") 177.8mm (7") 203.2mm (8") 215.9mm (8.5") <u>279.4mm (11")</u> 296.3mm (11.67") 304.8mm (12") 355.6mm (14") 431.8mm (17")
5	TOF (Note 1) (Note 2) (Note 4)	Selects a basic top-of-form position in the auto feed mode for cut sheets <the vertical center of the first print (character) line of each form, except that 8.47mm means the upper edge of the first character line of each form>.	2.12mm (1/12") 3.18mm (1/8") <u>6.35mm (1/4")</u> 7.62mm (3/10") 8.47mm (1/3") 10.58mm (5/12") 21.59mm (0.85") 23.28mm (11/12") 25.4mm (1") 27.52mm (13/12") 1 Chr. Set Pos.
6	Eject Dir. (Note 2) (Note 5)	Selects a paper ejection destination in the auto feed mode for cut sheets.	<u>Rear</u> Front
7	Auto Gap Timing	Selects auto gap operation performed every time when paper is fed in the auto feed mode for cut sheets, or performed only when paper is first fed in the auto feed mode for cut sheets after paper mode change.	Every Paper <u>1st. Paper</u>
8	Gap Control (Note 2)	Selects a paper weight measurement method and gap range in the auto feed mode for cut sheets.	<u>Auto</u> Manual Gap 1 Manual Gap 2 Manual Gap 3 Manual Gap 4 Manual Gap 5 Manual Gap 6 Manual Gap 7 Manual Gap 8 Manual Gap A Manual Gap B Manual Gap C Manual Gap D Manual Gap E

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
9	Gap Pos (Note 2)	Selects the position at which auto-gap operation of auto feed mode for cut sheets is performed. Each setting for the position shows the distance between the first dot position of, and the auto gap sensor for, paper.	<u>50.8mm (2")</u> 101.6mm (4")
10	Skew Detect	Sets skew detection and skew detection accuracy when cut-sheet paper is fed in the auto feed mode for cut sheets (a front CSF mode). Invalid does not detect skew.	Valid Level1 <u>Valid Level2</u> Invalid
11	ManualFeedCSF	Selects whether to load semi-automatically, irrespective of auto cut-sheet feed timings, paper loaded in a table while there is no fed paper in an auto cut-sheet feed mode.	<u>Valid</u> Invalid
12	ManualSheetCSF (Note 3)	Selects an auto or manual cut-sheet feed mode setup to be followed, including the top-of-form position and output destination of paper, after the paper is load while there is no fed paper in an auto cut-sheet feed mode. The setting Manual handles table-fed paper using a manual cut-sheet feed mode setup and, after the output of the paper, restores a corresponding auto cut-sheet feed mode.	<u>CSF</u> Manual

Note 1) "1Chr. Set Pos." is displayed only when the position to print the first line is set with the paper position setting function.

Note 2) When cut-paper is fed manually in the auto feed mode (Front) and the menu "Manual Sheet CSF" is set to "CSF", the printer follows the setting of the auto feed (Front) mode for cut-paper.

It if is "Manual", the printer follows the setting of the manual mode.

Note 3) ① In the case of "CSF"

Each setting of "TOF", "Eject Dir.", "Gap Control", and "Gap Pos." follows the setting of the auto feed mode.

The distance to be corrected with "TOF Adj.", "PE Adj.", "1stDot Adj.", and "LF Revise" follows the setting of the manual mode.

The setting of "Skew Detect" follows the setting of "AutoAlignDetect" when "AutoAlign" is valid, and the setting of "AutoAlignDetect" follows the setting of "Skew Detect" when "AutoAlign" is invalid.

② In the case of "Manual"

Each setting of "TOF", "Eject Dir.", "Gap Control", "Gap Pos.", "TOF Adj.", "PE Adj.", "1stDot Adj.", and "LF Revise" follows the setting of the auto feed mode.

The setting of "Skew Detect" follows the setting of "AutoAlignDetect" when "AutoAlign" is valid, and the setting of "AutoAlignDetect" follows the setting of "Skew Detect" when "AutoAlign" is invalid.

Note 4) Although it is possible to set 2.12mm (1/12") or 3.18mm (1/8"), print quality is not guaranteed. In the case of starting printing at from 2.12mm (1/12") and also printing to the full page width, curls of page corners, folds, and paper jams may be generated.

Note 5) To use paper that has a step at its bottom, select Rear for the direction to output.

(7) CSF Rear

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Line Spacing	Selects line spacing.	6LPI 8LPI
2	Auto Eject Pos. (Note 2)	Selects the position to be detected for the ejection of cut-sheet paper. (a distance between the bottom edge and character center of the paper).	3.18mm (1/8") 6.35mm (1/4")
3	Page Width	Selects the maximum number of bytes printed on a line.	8" 10.6" 13.2" 13.6"
4	Page Length	Selects the page length. This setting becomes effective when "Select Mode" is selected in "Page Leng. Mode." (If a page length setting command is received, the received command is given priority over the setting.)	101.6mm (4") 127.0mm (5") 139.7mm (5.5") 152.4mm (6") 177.8mm (7") 203.2mm (8") 215.9mm (8.5") 279.4mm (11") 296.3mm (11.67") 304.8mm (12") 355.6mm (14") 431.8mm (17")
5	TOF (Note 1) (Note 2) (Note 4)	Selects a basic top-of-form position in the auto feed mode for cut sheets <the vertical center of the first print (character) line of each form, except that 8.47mm means the upper edge of the first character line of each form>.	2.12mm (1/12") 3.18mm (1/8") 6.35mm (1/4") 7.62mm (3/10") 8.47mm (1/3") 10.58mm (5/12") 21.59mm (0.85") 23.28mm (11/12") 25.4mm (1") 27.52mm (13/12") 1 Chr. Set Pos.
6	Eject Dir. (Note 2) (Note 5)	Selects a paper ejection destination in the auto feed mode for cut sheets.	Rear Front
7	Auto Gap Timing	Selects auto gap operation performed every time when paper is fed in the auto feed mode for cut sheets, or performed only when paper is first fed in the auto feed mode for cut sheets after paper mode change.	Every Paper 1st. Paper
8	Gap Control (Note 2)	Selects a paper weight measurement method and gap range in the auto feed mode for cut sheets.	Auto Manual Gap 1 Manual Gap 2 Manual Gap 3 Manual Gap 4 Manual Gap 5 Manual Gap 6 Manual Gap 7 Manual Gap 8 Manual Gap A Manual Gap B Manual Gap C Manual Gap D Manual Gap E

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
9	Gap Pos (Note 2)	Selects the position at which auto-gap operation is performed in the auto feed mode for cut sheets. Each setting for the position shows the distance between the first dot position of, and the auto gap sensor for, paper.	50.8mm (2") 101.6mm (4")
10	RemoveSheetWait	Selects whether to issue an alarm when paper is output on a table and the state of waiting for removal of the output paper occur, in the auto feed mode for cut sheets (a rear CSF mode). Alarm give an alarm waiting for cut-sheet paper removal when one or more of seven table sensors detect existence of paper. Wait Paper Feed does not give an alarm waiting for cut-sheet paper removal, waiting for paper feeding from an auto paper feeder (a rear CSF).	Alarm Wait Paper Feed
11	ManualFeedCSF	Selects whether to load semi-automatically, irrespective of auto cut-sheet feed timings, paper loaded in a table while there is no fed paper in an auto cut-sheet feed mode.	Valid Invalid
12	ManualSheetCSF (Note 3)	Selects an auto or manual cut-sheet feed mode setup to be followed, including the top-of-form position and output destination of paper, after the paper is load while there is no fed paper in an auto cut-sheet feed mode. The setting Manual handles table-fed paper using a manual cut-sheet feed mode setup and, after the output of the paper, restores a corresponding auto cut-sheet feed mode.	CSF Manual

Note 1) "1Chr. Set Pos." is displayed only when the position to print the first line is set with the paper position setting function.

Note 2) When cut-paper is fed manually in the auto feed mode (Rear) and the menu "Manual Sheet CSF" is set to "CSF", the printer follows the setting of the auto feed (Front) mode for cut-paper.

It if is "Manual", the printer follows the setting of the manual mode.

Note 3) ① In the case of "CSF"

Each setting of "TOF", "Eject Dir.", "Gap Control", and "Gap Pos." follows the setting of the auto feed mode.

The distance to be corrected with "TOF Adj.", "PE Adj.", "1stDot Adj.", and "LF Revise" follows the setting of the manual mode.

The setting of "Skew Detect" follows the setting of "AutoAlignDetect" when "AutoAlign" is valid, and the setting of "AutoAlignDetect" follows the setting of "Skew Detect" when "AutoAlign" is invalid.

② In the case of "Manual"

Each setting of "TOF", "Eject Dir.", "Gap Control", "Gap Pos.", "TOF Adj.", "PE Adj.", "1stDot Adj.", and "LF Revise" follows the setting of the auto feed mode.

The setting of "Skew Detect" follows the setting of "AutoAlignDetect" when "AutoAlign" is valid, and the setting of "AutoAlignDetect" follows the setting of "Skew Detect" when "AutoAlign" is invalid.

Note 4) Although it is possible to set 2.12mm (1/12") or 3.18mm (1/8"), print quality is not guaranteed. In the case of starting printing at from 2.12mm (1/12") and also printing to the full page width, curls of page corners, folds, and paper jams may be generated.

Note 5) To use paper that has a step at its bottom, select Rear for the direction to output.

(8) Front Feed

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Line Spacing	Selects line spacing.	6LPI 8LPI
2	Form Tear-off	Selects moving to the position for perforation tear-off of a continuous-form front tractor mode.	Off 500mS 1 sec 2 sec
3	Skip Over Perf.	Selects a perforation skip length.	No Yes
4	Page Width	Selects the maximum number of bytes printed on a line.	8" 10.6" 13.2" 13.6"
5	Page Length	Selects the page length. This setting becomes effective when "Select Mode" is selected in "Page Leng. Mode." (See Note 2.) (If a page length setting command is received, the received command is given priority over the setting.)	76.2mm (3") 82.6mm (3.25") 88.9mm (3.5") 101.6mm (4") 127.0mm (5") 139.7mm (5.5") 152.4mm (6") 177.8mm (7") 203.2mm (8") 215.9mm (8.5") 279.4mm (11") 296.3mm (11.67") 304.8mm (12") 355.6mm (14") 431.8mm (17")
6	TOF (Note 1) (Note 3)	Selects a basic top-of-form position for auto loading in a continuous-form front tractor mode <the vertical center of the first print (character) line of each form, except that 8.47mm means the upper edge of the first character line of each form>.	2.12mm (1/12") 3.18mm (1/8") 6.35mm (1/4") 7.62mm (3/10") 8.47mm (1/3") 10.58mm (5/12") 19.05mm (9/12") 21.59mm (0.85") 23.28mm (11/12") 25.4mm (1") 27.52mm (13/12") 1 Chr. Set Pos.
7	Initial Pos.	Selects the position of paper present at printer's power-on in a continuous-form front tractor mode.	Print Tear Off
8	PE Pos.	Selects the paper-end position of a continuous-form front tractor mode (a distance between the bottom edge and character center of paper).	3.18mm (1/8") 6.35mm (1/4")
9	Paper End	Selects SEL or DESEL to put the printer into either status on occasions when there is no paper on the front PUSH tractor in the continuous form mode.	On-line Off-line

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
10	Gap Control	Selects a paper weight measurement method and gap range of a continuous-form front tractor mode.	<u>Auto</u> Manual Gap 1 Manual Gap 2 Manual Gap 3 Manual Gap 4 Manual Gap 5 Manual Gap 6 Manual Gap 7 Manual Gap 8 Manual Gap A Manual Gap B Manual Gap C Manual Gap D Manual Gap E
11	Gap Pos.	Selects the position at which auto gap operation of a continuous-form front tractor mode is performed. Each selectable setting shows a distance bewteen the physically-first dot of, and the auto gap sensor for, paper.	<u>50.8mm (2")</u> 101.6mm (4")

Note 1) "1Chr. Set Pos." is displayed only when the position to print the first line is set with the paper position setting function.

Note 2) Although it is possible to set 2.12mm (1/12") or 3.18mm (1/8"), print quality is not guaranteed. In the case of starting printing at from 2.12mm (1/12") and also printing to the full page width, curls of page corners, folds and paper jams may be generated.

(9) Rear Feed

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Line Spacing	Selects line spacing.	<u>6LPI</u> 8LPI
2	Form Tear-off	Selects moving to the position for perforation tear-off of a continuous-form front tractor mode.	<u>Off</u> 500mS 1 sec 2 sec
3	Skip Over Perf.	Selects a perforation skip length.	<u>No</u> Yes
4	Page Width	Selects the maximum number of bytes printed on a line.	8" 10.6" 13.2" <u>13.6"</u>
5	Page Length	Selects the page length. This setting becomes effective when "Select Mode" is selected in "Page Leng. Mode." (See Note 2.) (If a page length setting command is received, the received command is given priority over the setting.)	76.2mm (3") 82.6mm (3.25") 88.9mm (3.5") 101.6mm (4") 127.0mm (5") 139.7mm (5.5") 152.4mm (6") 177.8mm (7") 203.2mm (8") 215.9mm (8.5") <u>279.4mm (11")</u> 296.3mm (11.67") 304.8mm (12") 355.6mm (14") 431.8mm (17")
6	TOF (Note 1) (Note 3)	Selects a basic top-of-form position for auto loading in a continuous-form rear tractor mode <the vertical center of the first print (character) line of each form, except that 8.47mm means the upper edge of the first character line of each form>.	2.12mm (1/12") 3.18mm (1/8") <u>6.35mm (1/4")</u> 8.47mm (1/3") 10.58mm (5/12") 19.05mm (9/12") 21.59mm (0.85") 23.28mm (11/12") 25.4mm (1") 27.52mm (13/12") 1 Chr. Set Pos.
7	Initial Pos.	Selects the paper-end position of a continuous-form rear ractor mode (a distance between the bottom edge and character center of paper).	<u>Print</u> Tear Off
8	PE Pos.	Selects the position of paper present at printer's power-on in a continuous-form rear tractor mode.	3.18mm (1/8") <u>6.35mm (1/4")</u>
9	Paper End	Selects SEL or DESEL to put the printer into either status on occasions when there is no paper on the rear PUSH tractor in the continuous form mode.	<u>On-line</u> Off-line

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
10	Gap Control	Selects a paper weight measurement method and gap range of a continuous-form rear tractor mode.	<u>Auto</u> Manual Gap 1 Manual Gap 2 Manual Gap 3 Manual Gap 4 Manual Gap 5 Manual Gap 6 Manual Gap 7 Manual Gap 8 Manual Gap A Manual Gap B Manual Gap C Manual Gap D Manual Gap E
11	Gap Pos.	Selects the position at which auto gap operation of a continuous-form rear tractor mode is performed. Each selectable setting shows a distance bewteen the physically-first dot of, and the auto gap sensor for, paper.	<u>50.8mm (2")</u> 101.6mm (4")

Note 1) "1Chr. Set Pos." is displayed only when the position to print the first line is set with the paper position setting function.

Note 2) Although it is possible to set 2.12mm (1/12") or 3.18mm (1/8"), print quality is not guaranteed. In the case of starting printing at from 2.12mm (1/12") and also printing to the full page width, curls of page corners, folds and paper jams may be generated.

(10) Parallel I/F

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	I-Prime	Selects whether to enable I-PRIME.	Invalid Buffer Print Buffer Clear
2	Cont. I-Prime	Selects a control method for continuous I-PRIME signals. When "Valid" is selected, always performs initialization accompanied with the motion of the mechanism when an I-PRIME signal is received. When "Invalid" is selected, performs initialization without the motion of the mechanism when an I-PRIME signal is received. Neither is performed in the power save mode.	Valid Invalid
3	AUTO FEED XT	Selects whether to enable AUTO FEED XT signal.	Invalid Valid
4	Bi-direction (Note 1)	Selects whether enable or disable the bi-directional interface.	Disable Enable

Note 1) A bi-directional I/F supports only the nibble mode.

(11) Serial I/F

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	Parity	Sets parity.	None Odd Even
2	Serial Data	Sets serial data length.	8Bits 7Bits
3	Protocol	Sets a protocol.	Ready/Busy X-ON/X-OFF
4	Diagnostic Test	Sets/cancels a loop test for the serial I/F.	No Yes
5	Busy Line	Sets Busy Line of the serial I/F.	SSD- SSD+ DTR RTS
6	Baud Rate	Sets baud rate for the serial I/F.	300 BPS 600 BPS 1200 BPS 2400 BPS 4800 BPS 9600 BPS 19200 BPS 38400 BPS
7	DSR Signal	Selects valid or invalid for DSR signals of the serial I/F.	Valid Invalid
8	DTR Signal	Sets whether to switch DTR signals with select/deselect of the serial I/F or fix after power on.	Power UP Select
9	Busy Time	Sets the minimum time between Busy and Ready.	200mS 1 Sec

(12) Adjustment

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
1	TOF Adj.(Cut) (Note 1)	Sets a correction value for a basic top-of-form position for manual cut-sheet feeding (the position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±40)
2	TOF Adj.(CSFF) (Note 1)	Sets a correction value for a basic top-of-form position for auto cut-sheet (front CSF) feeding (the position is corrected in 1/144inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±40)
3	TOF Adj.(CSFR) (Note 1)	Sets a correction value for a basic top-of-form position for auto cut-sheet (rear CSF) feeding (the position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±40)
4	Front Load Adj. (Note 1)	Sets a correction value fora basic top-of-form position of a continuous-form front tractor (the position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±40)
5	Rear Load Adj. (Note 1)	Sets a correction value for a basic top-of-form position of a continuous-form rear tractor (the position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±40)
6	PE Adj.(Cut)	Selects a correction value for Auto Eject POS. in the manual feed mode for cut sheets (a corresponding position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±15)
7	PE Adj.(CSFF)	Selects a correction value for Auto Eject POS. in the auto feed mode for cut sheets (a front CSF mode) (a corresponding position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±15)
8	PE Adj.(CSFR)	Selects a correction value for Auto Eject POS. in the auto feed mode for cut sheets (a rear CSF mode) (a corresponding position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±15)
9	PE Adj.(Front)	Selects a correction value for PE POS. in a continuous-form front tractor mode (a corresponding position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±15)
10	PE Adj.(Rear)	Selects a correction value for PE POS. in a continuous-form rear tractor mode (a corresponding position is corrected in 1/144 inch increments downward using positive values, and upward using negative values).	<u>0</u> (or any of numbers of up to ±15)

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
11	1stDotAdjCut	Selects a correction value for the frist-character print start position of manual cut-sheet feeding when an auto alignment function is disabled <in 1/180 inch (0.14 mm) increments>.	Left 10 Left9 Left8 Left7 Left6 Left5 Left4 Left3 Left2 Left1 <u>0</u> Right1 Right2 Right3 Right4 Right5 Right6 Right7 Right8 Right9 Right10
12	1stDotAdjAlign	Selects a correction value for the first-character print start position of manual cut-sheet feeding when an auto alignment function is enabled <in 1/180 inch (0.14 mm) increments>.	Same as above
13	1stDotAdjCSFF	Selects a correction value for the first-character print start position of auto cut-sheet feeding (a front CSF) <in 1/180 inch (0.14 mm) increments>.	Same as above
14	1stDotAdjCSFR	Selects a correction value for the first-character print start position of auto cut-sheet feeding (a rear CSF) <in 1/180 inch (0.14 mm) increments>.	Same as above
15	1stDotAdjFront	Selects a correction value for the first-character print start position of a front tractor <in 1/180 inch (0.14 mm) increments>.	Same as above
16	1stDotAdjRear	Selects a correction value for the first-character print start position of a rear tractor <in 1/180 inch (0.14 mm) increments>.	Same as above
17	Regist. Low (Note 2)	Corrects low-print-speed registration. The print dot positions of backward printing in unidirectional printing is corrercted in 1/360 inch increments.	An appropriate value to which the registration is adjusted at factory shipping (any of numbers of up to ±5)
18	Regist. Normal (Note 2)	Corrects normal-print-speed registration. The print dot positions of backward printing in unidirectional printing is corrercted in 1/360 inch increments.	An appropriate value that is configured at factory shipping (any of numbers of up to ±5)
19	Regist. High1 (Note 2)	Corrects high-print-speed registration. The print dot positions of backward printing in unidirectional printing is corrercted in 1/360 inch increments.	An appropriate value that is configured at factory shipping (any of numbers of up to ±5)
20	Regist. High2 (Note 2)	Corrects high-print-speed registration. The print dot positions of backward printing in unidirectional printing is corrercted in 1/360 inch increments.	An appropriate value that is configured at factory shipping (any of numbers of up to ±5)

Underlined values are defaults.

No.	Item (LCD Display)	Function	Settings (LCD Display)
21	LF Revise(Cut) (Note 3)	Corrects the line feed amount after feeding in the manual feed mode for cut sheets.	TLFP = 0 (or any of numbers of up to ±10) (the number 0 is taken by default)
22	LF Revise(CSFF) (Note 3)	Corrects the line feed amount after feeding in the auto feed mode for cut sheets (a front CSF mode).	TLFP = 0 (or any of numbers of up to ±10) (the number 0 is taken by default)
23	LF Revise(CSFR) (Note 3)	Corrects the line feed amount after feeding in the auto feed mode for cut sheets (a front CSF mode).	TLFP = 0 (or any of numbers of up to ±10) (the number 0 is taken by default)

Note 1) In administration, top-of-form correction values in the menu are independent of those set in an adjustment mode menu (for factory use). The sums, each are of those values corresponding to each other which are in both menus, respectively, are used as correction values for operation.

Note 2) The menu mode does not perform registration pattern printing.

For setting for the mode, the setting (value) for the mode is provided on printer's LCD display.

Registration correction values are shared between the menu and an adjustment mode menu (for factory use), and the former menu displays the same value as that displayed on the latter menu.

Note 3) A set LF pitch correction value in the menu and that in an adjustment mode menu (for factory use) are independently administered. The sum of the values is used as a LF correction value for operation, and the range of the value is within ±20.

Example 1) When the setting for LF Revise(Cut) in the menu is +3 and that in the adjustment menu is -1, the sum of the settings, +2 is used for operation.

Example 2) When the setting for LF Revise(Cut) in the menu is -7 and that in the adjustment menu is -5, the sum of the settings, -12 is used for operation.

9.2.1.1 Functions of Switches

During menu setting, the switches on the operating panel have the functions specified below.

Switch	Function
2	• Pressing switch 2 while holding down the switch 6 moves forward by one mode, or returns to the first mode if pressed in the last mode. • Moves forward by one item, or returns to the first item if pressed at the last item
5	• Pressing switch 5 while holding down the switch 6 moves backward by one mode, or moves to the last mode if pressed at the first mode. • Moves backward by one item, or moves to the last item if pressed at the first item
1	Moves forward by one preset, or returns to the first preset if pressed at the last preset
4	Moves backward by one preset, or moves to the last preset if pressed at the first preset
3	Exits the menu

The settings of the menu are edited in accordance with the procedure specified below.

[Function-Setting Menu]

   ①   Press the switch 4 while holding down the switch 6 in offline mode.

   ②   The message shown below appears on the LCD.

▲▼	P	r	i	n	t	e	r		C	o	n	t	r	o	l
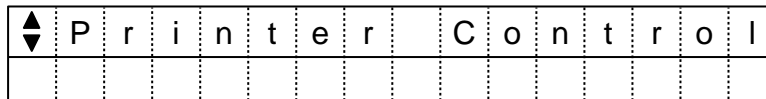
   ③   Each time the switch 2 is pressed while holding down the switch 6, the menu mode is scrolled forward.
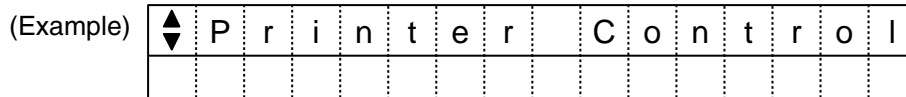
(Example)

▲▼	P	r	i	n	t	e	r		C	o	n	t	r	o	l

Press the switch 2 while holding down the switch 6.

▲▼	F	o	n	t											
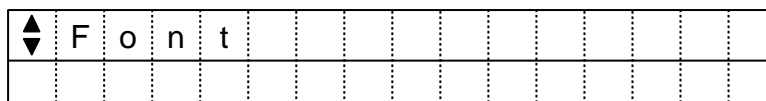
If you press the switch 5 instead of the switch 2, the menu mode is scrolled backward.

   ④   If switch 2 or 5 is pressed while the menu mode is displayed on the screen, the first item of the mode appears.

The LCD displays the item in the top row and the setting in the bottom row.

(Example)

▲▼	F	o	n	t											
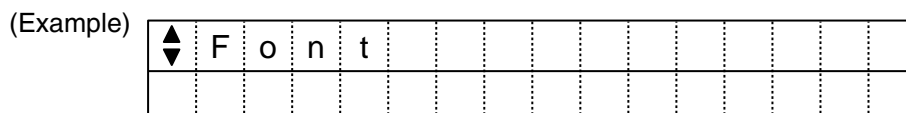
Press switch 2 or 5.
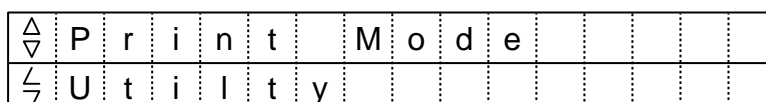
△▽	P	r	i	n	t		M	o	d	e					
↳	U	t	i	l	t	y									

⑤ Every time the switch ☐2 is pressed, the setting items are scrolled forward.

(Example)

△▽	P	r	i	n	t		M	o	d	e				
∠7	L	Q		C	o	u	r	i	e	r				

⬇ Press the switch ☐2.

△▽	D	R	A	F	T		M	o	d	e				
∠7	H	S	D											

⬇ Press the switch ☐2.

△▽	P	i	t	c	h							g		
∠7	1	0		C	P	I								

Press the switch ☐2 repeatedly until the desired item appears.

If you press the switch ☐5 instead of the switch ☐2, the setting items are scrolled backward.

⑥ When the desired item appears, press the switch ☐1. Every time the switch is pressed, the preset changes.

(Example)

△▽	P	i	t	c	h									
∠7	1	0		C	P	I								

⬇ Press the switch ☐1.

△▽	P	i	t	c	h									
∠7	1	2		C	P	I								

Press the switch ☐1 repeatedly until the desired preset appears.

If you press the switch ☐4 instead of the switch ☐1, the presets are scrolled backward.

In the format-setting mode, when the desired preset appears, press the switch ☐3 while holding down the switch ☐6 to store the setting in the memory.

⑦ Press switch ☐2 or ☐5, and repeat the procedure specified above to edit other settings.

⑧ To finish editing the menu setting, press the switch ☐3. The LCD displays the message shown below for approximately 2 seconds and the printer goes online.

M	E	N	U		M	O	D	E		E	N	D			

The most recently displayed settings are stored in the memory of the printer.

9.2.2　Adjustment mode menu items

Adjustment items and values of the adjustment mode menu are listed in the table below.

At the time of entering the adjustment mode menu, the following message is displayed on the LCD.

No.	Items (LCD Display)	Functions	Adjusted values (LCD Display)
1	TOF Adj.(CUT) Note 1) Note 3)	Sets a correction value to the reference start position at manual feeding of cut paper. (In increments of 1/144 inch; downward for + and upward for –) (This items itself is not printed.) (For factories)	To be corrected to a proper value at factory shipment. (Correctable up to±40)
2	TOF Adj.(CSFF) Note 1) Note 3)	Sets a correction value to the reference start position in the cut-sheet with automatic feed mode (the front CSF). (In increment of 1/144 inch; downward for + and upward for –) (This items itself is not printed.) (For factories)	To be corrected to a proper value at factory shipment. (Correctable up to±40)
3	TOF Adj.(CSFR) Note 1) Note 3)	Sets a correction value to the reference start position in the cut-sheet with automatic feed mode (the rear CSF). (In increment of 1/144 inch; downward for + and upward for –) (This items itself is not printed.) (For factories)	To be corrected to a proper value at factory shipment. (Correctable up to±40)
4	Front Load Adj. Note 1) Note 3)	Sets a correction value to the reference start position at feeding of continuous forms by a front tractor. (In increment of 1/144 inch; downward for + and upward for –) (This items itself is not printed.) (For factories)	To be corrected to a proper value at factory shipment. (Correctable up to±40)
5	Rear Load Adj. Note 1) Note 3)	Sets a correction value to the reference start position at feeding continuous forms by a rear tractor. (In increment of 1/144 inch; downward for + and upward for –) (This items itself is not printed.) (For factories)	To be corrected to a proper value at factory shipment. (Correctable up to±40)
6	Regist. Low Note 2)	Corrects registration for low speed printing. Corrects a print dot position in the reverse direction in increments of 1/360 inch at bidirectional printing.	To be corrected to a proper value at factory shipment. (Correctable up to±5)
7	Regist. Normal Note 2)	Corrects registration for normal speed printing. Corrects a print dot position in the reverse direction in increments of 1/360 inch at bidirectional printing.	To be corrected to a proper value at factory shipment. (Correctable up to±5)
8	Regist. High1 Note 2)	Corrects registration for high speed printing. Corrects a print dot position in the reverse direction in increments of 1/360 inch at bidirectional printing.	To be corrected to a proper value at factory shipment. (Correctable up to±5)
9	Regist. High2 Note 2)	Corrects registration for ultrahigh speed printing. Corrects a print dot position in the reverse direction in inch increments of 1/360 at bidirectional printing.	To be corrected to a proper value at factory shipment. (Correctable up to±5)
10	LF Revise(Cut) Note 1)	Corrects the line feed amount after feeding in the manual feed mode. (This items itself is not printed.) (For factories)	To be corrected to a proper value at factory shipment. (Correctable up to±10)

9.2.2.1 Operating Procedure

After the adjustment-mode menu has been opened (if paper is not installed, install paper and press the switch ③ to load it), the printer prints out the horizontal printing-position correction items (Nos. 6 to 9), displays the last item (No. 12) on the LCD, and stands by for switch operation. Then, use the switches to edit the settings of items that require editing. (The switch functions are the same as those for the function-setting menu.)

9.3 Printing the Menu-Setting List

After printing of the menu-setting list has started (if paper is not installed, install paper and press the switch ③ to load it), the printer prints out the settings of all items in the function-setting menu, and then automatically switches off.
During this operation, the LCD displays [MENU PRINT].

9.4 Printing the Correction List

After printing of the correction list has started (if paper is not installed, install paper and press the switch ③ to load it), the printer prints out the settings specified below and automatically switches off.
During this operation, the LCD displays [ADJUST VAL PRINT].

(1)   TOF position correction (section 8.4)
(2)   Horizontal printing-position correction (section 8.6)
(3)   LF pitch correction (section 8.7)
(4)   Paper cut-position correction (section 8.5)
(5)   Automatic paper-thickness adjustment distance (section 8.3)
(6)   Sensor slice level (sections 8.8.1/8.8.5)
(7)   Paper-width-sensor correction (section 8.8.3)
(8)   Front-PE-sensor correction (section 8.8.4)

> **CAUTION:** The procedure for making each setting should be conducted in the sequential order specified above.

9.5 Resetting the Function-Setting Menu to the Default Settings

This function returns the settings of function-setting-menu items to their defaults.
However, this does not affect any setting of the adjustment-mode items [Align1 Pos. Adj.] and [Align4 Pos. Adj.] in manual-feed-mode setting.

9.6 Resetting All Menu Items to the Default Settings

This function returns the settings of all function-setting-menu items (including adjustment-mode items) to their default settings and clears the format data.

> **CAUTION:** • This reset returns the horizontal printing-position correction value to its default setting of 0.
> • This reset does not affect any of the items in the adjustment-mode menu (section 9.2.2) except for horizontal printing-position correction.

10. Procedures for Repairing

(1) Before Conducting Repair

When you have received a request for repair from a customer, first check whether the problem can be solved through troubleshooting using the operations manual.

If possible, ask the customer in what situation the problem occurred and make a note of it.

Before investigating the cause, operate the printer in the situation in which the problem occurred, and check whether the problem recurs.

If it does not, first conduct a printing test before conducting an investigation.

(2) Investigating Causes

There are following two methods for investigating causes.

① If the phenomenon is a known problem, take the appropriate action in accordance with Table 10-1.

② If the problem is unknown, identify the phenomenon using the problem analysis procedure described in section 10.1, and take the appropriate action. If the phenomenon cannot be identified, check for similar problems.

When the cause is investigated, the printer may have to be operated with the upper cover open. In such a case, fasten the cover-open switch using adhesive tape. In addition, be aware of any sudden carriage motion or rise in the temperature of the print head.

After the power switch has been turned off, it takes several seconds for the voltage to fall from DC 40 V. Wait 10 seconds before disconnecting a cable or touching a circuit board.

10.1 Problem Analysis Procedure

Layout of switches and lamps

> Start

↓

Turn off the power switch.

Disconnect the interface cable.

Remove the paper.

↓

Move the carriage to the right and left by hand.

↓

Does the carriage move smoothly?

    N: Does the carriage move smoothly if the ribbon cartridge is removed?

        N: Check for a carriage motion error as specified in section 10.2.6.

        Y: Check for an ink-ribbon feed error as specified in section 10.2.7.

    Y: Is the ink ribbon fed properly?

        N: Check for an ink-ribbon feed error as specified in section 10.2.7.

        Y: Does the power lamp Ⓐ light up when the power is turned on?

            N: Do other lamps light up?

                N: Check for a power-supply error as specified in section 10.2.1.

                Y: Check for an operating-panel error as specified in section 10.2.4.

            Y: Do other lamps also not light up and does operation not occur?

                Y: Check for a reset-circuit error as specified in section 10.2.2.

                N: Does an alarm message appear?

                    Y: Check the alarm messages in section 10.2.3.

                    N: Go to (1).

(1)

↓

Install the paper and press the switch ③ (when the front tractor is used). Place the paper on the table when "MANUAL" is selected.

↓

Is paper loaded into the printer?

    N: Check for an operating-panel error as specified in section 10.2.4, or for a paper-feed error as specified in section 10.2.5.

    Y: Press the switch ① repeatedly.

        ↓

        Does the lamp Ⓓ light up and go out alternately every time the switch is pressed?

            N: Check for an operating-panel error as specified in section 10.2.4.

            Y: Press the switch ① to turn off the lamp Ⓓ.

                ↓

                Press the switch ⑤.

                ↓

                Go to the next page.

CAUTION: • Press the switch 4 to switch among the front tractor, rear tractor, and manual feed.
• Choose the rear tractor when the optional rear tractor is installed.

Continued from the previous page

↓

Does the printer perform line-feed motion?

    ├─ N: Check for an operating-panel error as specified in section 10.2.4, or for a paper-feed error as specified in section 10.2.5.

    └─ Y: Press the switch ☐2.

      ↓

    Is paper output?

        ├─ N: Check for an operating-panel error as specified in section 10.2.4, or for a paper-feed error as specified in section 10.2.5.

        └─ Y: Select the front tractor, turn off the power, and install continuous forms.

          ↓

        While holding down switches ☐2 and ☐3, turn on the power switch and conduct a printing test.

          ↓

        Does the printing test start?

          ├─ N: Is the carriage moving?

              ├─ N: Check for a carriage motion error as specified in section 10.2.6.

              └─ Y: Check for a print-head motion error as specified in section 10.2.8.

          └─ Y: Does an error occur?

              ├─ Y: Check the alarm messages in section 10.2.3.

              └─ N: Is the print quality normal?

                 ├─ N: Determine the location of the fault from the printing.

                 └─ Y: Check for similar problems in Table 10-1.

10.2 Repair Procedure

The table below shows typical problems. If your problem is not in the table, check for similar problems.

Table 10-1

Layout of switches and lamps

Section No.	Item	D-etails of problem	Remarks
10.2.1	Power-supply error	• The power switch is turned on but nothing happens (no lamps light up). • When the power switch is turned on, the power lamp lights up momentarily and then goes out (the power shuts down). • The power shuts down during printing.	
10.2.2	Reset-circuit error	• The power switch is turned on but nothing happens (there is no change in the lamp on/off state at power-on).	
10.2.3	Alarm display	• The lamps (Ⓕ (green), Ⓑ (red)) on the operating panel indicate an alarm.	
10.2.4	Operating-panel error	• One or more lamps do not light up (the carriage moves). • One or more lamps remain on (excluding the power lamp). • One or more switches do not function or cannot be turned off. • After returning to the home position, the printer enters an incorrect mode.	
10.2.5	Paper-feed error	• Paper end is detected even if there is paper installed (the lamp Ⓑ lights up). • Paper end is not detected even if there is no paper installed (the lamp Ⓑ does not light up). • Paper is not fed at all or the line-feed pitch is abnormal. • The LF motor makes an inappropriate noise.	
	Feed jam (front/rear)	• Paper jams occur frequently. • Paper is torn. • Skew occurs.	
10.2.6	Carriage motion error	• The character pitch is abnormal, characters overlap, or the printing position offsets horizontally. • ERROR 101 (homing error) occurs. • ERROR 102 (spacing error) occurs.	
10.2.7	Ink-ribbon feed error	• The ink ribbon is not fed properly or is not fed at all. • Ink-ribbon jams occur. • The print is too light or smeared, or the print density is uneven.	
10.2.8	Print-head motion error	• Dots are missing or excess dots are printed. • Dots are offset. • The printer does not print at all (the carriage moves).	
10.2.9	Parallel-interface error	• The lamp Ⓓ is on but the printer does not print at all (no reaction). • The lamp Ⓓ goes out and the printer does not print at all. • The printer misprints or prints meaningless characters.	
10.2.10	USB interface error	• The lamp Ⓓ is on but the printer does not print at all (no reaction). • The lamp Ⓓ goes out and the printer does does not print at all. • The printer misprints or prints meaningless characters.	
10.2.11	Automatic paper-thickness adjustment motion error	• ERROR 0103 (gap error) occurs.	
10.2.12	Printing-position error	• The printing start position is offset. The printer prints past the paper edge.	

10.2.1 Power-Supply Error

• The power switch is turned on but nothing happens.
(no lamps light up)

Does the AC cord conduct electricity properly?

N: Replace the AC cord.

Y: Is the AC fuse in the power supply blown?

Y: Replace the power-supply assembly (do not replace the fuse).

N: Are the voltages below output to the power-supply output cable?

Pin No.	Tolerance
1, 2	+38 to +42.4 V
3, 4	0V (drive system)
5, 6	+4.75 to +5.25 V
7, 8	0V (logic system)
9	+7 to +12 V

N: Replace the power-supply assembly.

Y: Is the connection cord for the power supply connected properly?

N: Connect it properly.

Y: While leaving the cables connected to the CN7 (operating panel) and the CN13 (power supply) of the MIB printed circuit board, disconnect the other cables individually and check whether the lamp lights up.

Y: Replace the assembly to which the disconnected cable was connected.

N: Replace the OPN printed circuit board or MIB printed circuit board.

CAUTION: Before disconnecting cables, wait 10 seconds after the power has been turned off.
When disconnecting cables, be careful to prevent disconnected cables from touching the circuit boards.

• When the power switch is turned on, the power lamp lights up momentarily and then goes out.
(the power shuts down)

Disconnect the connection cord for power supply from the MIB printed circuit board, and operate the printer. Check whether the power shuts down (determine by measuring the output voltage of the power supply).

Y: Replace the power-supply assembly.

N: While leaving the cables connected to the CN7 (operating panel) and the CN13 (power supply) of the MIB printed circuit board, disconnect the other cables individually and check whether the lamp lights up.

Y: Replace the assembly to which the disconnected cable was connected.

N: Replace the OPN printed circuit board or MIB printed circuit board.

CAUTION: Before disconnecting cables, wait 10 seconds after the power has been turned off.
When disconnecting cables, be careful to prevent disconnected cables from touching the circuit boards.

10.2.2 Reset-Circuit Error

- The power switch is turned on but nothing happens.
  (there is no change in the lamp on/off state at power-on)

N: Replace the MIB printed circuit board.

Y: Remove the ROM
   and install it again.
   Does it operate properly?

Y: End

10.2.3 Alarm Display

If an error occurs, this printer displays the content of the error using the lamps on the operating panel and the LCD. Lamps Ⓑ and Ⓕ blink to display the status.

Layout of switches and lamps

Time chart

Primary blinking | 0.75 sec. | Secondary blinking | 0.75 sec.

Primary blinking: Lamps Ⓑ and Ⓕ both blink.
Secondary blinking: Only the lamp Ⓑ blinks.
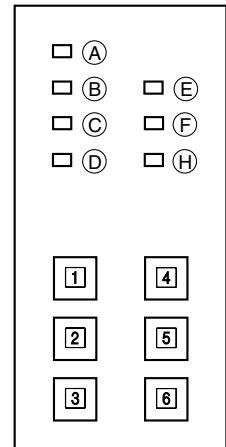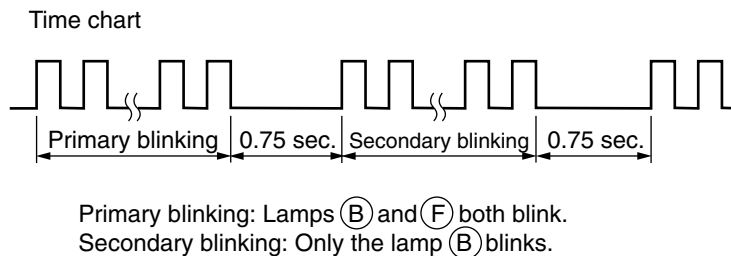
Table 10-2

Primary blinking	Secondary blinking	LCD top-row indication	Alarm	Repair procedure
1	1	0101	Homing error	See section 10.2.6.
	2	0102	Spacing error	
	3	0103	Gap error	See section 10.2.10.
	7	0107	Fan error	See section 10.2.12.
	8	0108	Cut-sheet/continuous-form selection error	
	9	0109	Quick-loading motor error	Replace the SC motor assembly, the D roller position sensor, or SQC PCB.
2	1	0201	Program ROM error	See ① below.
3	1	0301	Dram error	Replace the MIB printed circuit board.
	2	0302	EEPROM error	See ② below.
4	1	0401	LCD timeout error	See section 10.2.4.
	3	0403	Illegal interrupt error	Replace the MIB printed circuit board.
	4	0404	Watchdog timer error	
	8	0408	Quick-loading LSI response error	See ③ below.
	9	0409	Program ROM and Control PCB combination error	See ① below.
8	2	0802	Head-thermistor error	See section 10.2.12.

The bottom row of the LCD displays [POWER OFF].

①
├─N: Replace the MIB printed circuit board.
└─Y: End

②
├─N: Replace the MIB printed circuit board.
└─

③ Is the connection cord for the SQC circuit board connected properly?
├─N: Connect it properly.
└─Y: Does the connection cord for the SQC circuit board continuity read good.
    ├─N: Replace the connection cord.
    └─Y: Replace the MIB printed circuit board or the SQC printed circuit board.

10.2.4 Operating-panel error

• One or more lamps do not light up (the carriage moves).

└ Do all of the lamps remain off?

  ┌ Y: Are the voltages between pins 6/8 and pins 4/5/7 of connector CN1 of the OPN printed
  │   circuit board within the range of 4.75 to 5.25 V?

    ┌ N: Is the connection cord for the operating panel connected properly?

      ┌ N: Connect it properly.

      └ Y: Does the connection cord for the operating panel continuity read good.

        ┌ N: Replace the connection cord.

        └ Y: Replace the OPN printed circuit board.

    └ Y: Replace the OPN printed circuit board.

  └ N: Is the connection cord for the operating panel connected properly?

    ┌ N: Connect it properly.

    └ Y: Does the connection cord for the operating panel continuity read good.

      ┌ N: Replace the connection cord.

      └ Y: Replace the OPN printed circuit board.

• One of more lamps remain on (excluding the power lamp).

└ Replace the OPN printed circuit board.

• One or more switches do not function or cannot be turned off.
• After returning to the home position, the printer enters an incorrect mode.

└ Replace the OPN printed circuit board.

10.2.5 Paper-feed error

> • Paper end is detected even if there is paper installed (the lamp Ⓑ lights up).

① Continuous forms are used (front tractor).
Is [FRONT] selected on the LCD?

— N: Go offline and press the switch ４ to choose [FRONT].

— Y: Is the SQC circuit-board sensor or the sheet-guide upper-front-assembly sensor dusty or stained?

  — Y: Clean them and go to N.

  — N: In offline mode, press the switch ４ to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install the paper, and turn the platen knob or press the switch ３ to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

    Does the sensor change properly?

      — Y: End

      — N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

        — Y: End

        — N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

          Conduct the sensor check again. Does the sensor change properly?

            — Y: End

            — N: Return the slice-level setting to the previous level.

              Is the sensor not changing properly FRONT 2, 4, or 6

                — Y: Is the connection cord connected properly to the connector CN2 on the SQC PCB?

                  — N: Connect them properly.

                  — Y: Measure the voltage levels of pins 4, 8, and 12 of the CN2 on the SQC PCB. Is the difference between sensor on and off 1 V or more?

                    — N: Replace the sensor assembly.

                    — Y: Go to (1).

                — N: Go to (1).

(1) Is the connection cord connected properly to the connector CN1 on the SQC PCB?

— N: Connect them properly.

— Y: Is the connection cord connected properly to the CN21 on the MIB PCB?

  — N: Connect them properly.

  — Y: Replace the SQC PCB or the MIB PCB.

② Continuous forms are used (rear tractor: optional).

Is [REAR] selected on the LCD?

— N: Go offline and press the switch ④ to choose [REAR].

— Y: Are cut sheets also installed?

— Y: Remove the cut sheets.

— N: Is the rear PE sensor dusty or stained?

— Y: Clean it and go to N.

— N: In offline mode, press the switch ④ to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install the paper and turn the platen knob or press the switch ③ to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

Does the sensor change properly?

— Y: End

— N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: Return the slice-level setting to the previous level.

Is the connection cord connected properly to the connector CN5 on the MIB PCB?

— N: Connect them properly.

— Y: Measure the voltage level of pin 1 of the CN5 on the MIB PCB. Is the difference between sensor on and off 1 V or more?

— N: Replace the sensor assembly.

— Y: Replace the MIB PCB.

③ Cut sheets are used (rear CSF: optional).

Is [CSF Rear] selected on the LCD?

├─ N: Go offline and press the switch ④ to choose [CSF Rear].

└─ Y: Is the rear PE sensor dusty or stained?

    ├─ Y: Clean it and go to N.

    └─ N: In offline mode, press the switch ④ to choose [MANUAL]. Conduct the sensor check in maintenance mode. Place the paper, and turn the platen knob or press the switch ③ to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

        Does the sensor change properly?

        ├─ Y: End

        └─ N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

            ├─ Y: End

            └─ N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

                Conduct the sensor check again. Does the sensor change properly?

                ├─ Y: End

                └─ N: Return the slice-level setting to the previous level.

                    Is the connection cord properly connected to the connector CN5 on the MIB PCB?

                    ├─ N: Connect them properly.

                    └─ Y: Measure the voltage level of pin 1 of the CN5 on the MIB PCB. Is the difference between sensor on and off 1 V or more?

                        ├─ N: Replace the sensor assembly.

                        └─ Y: Replace the MIB PCB.

• Checking the rear PE sensor

Is [CSF Rear] selected on the LCD?

├─ N: Go offline and press the switch ④ to choose [CSF Rear].

└─ Y: Place paper on the rear CSF, and press the switch ③ repeatedly.

    └─ Is the signal of pin 3 of the CN20 on the MIB PCB turned on and off with the paper-feed/output motions repeated by every operation of the switch ③?

        ├─ N: Replace the PE sensor assembly (rear), the sensor cord, and the photo interrupter.

        └─ Y: Replace the MIB PCB.

④ Cut sheets are used (manual feed).

Is [MANUAL] selected on the LCD?

— N: Go offline and press the switch ④ to choose [MANUAL].

— Y: Is the SQC circuit-board sensor or the sheet-guide upper-front-assembly sensor dusty or stained?

— Y: Clean them and go to N.

— N: Conduct the sensor check in maintenance mode. Install paper, and turn the platen knob or press the switch ③ to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly. Does the sensor change properly?

— Y: End

— N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

— Y: End.

— N: Return the slice-level setting to the previous level.

Is the sensor not changing properly FRONT 2, 4, or 6?

— Y: Is the connection cord connected properly to the connector CN2 on the SQC PCB?

— N: Connect them properly.

— Y: Measure the voltage levels of pins 4, 8, and 12 of the CN2 on the SQC PCB. Is the difference between sensor on and off 1 V or more?

— N: Replace the sensor assembly.

— Y: Go to (1).

— N: Go to (1).

(1) Is the connection cord connected properly to the connector CN1 on the SQC PCB?

— N: Connect them properly.

— Y: Is the connection cord connected properly to the CN21 on the MIB PCB?

— N: Connect them properly.

— Y: Replace the SQC PCB or the MIB PCB.

- Paper end is not detected even if there is no paper installed (the lamp Ⓑ does not light up).

① Continuous forms are used (front tractor).

Is [FRONT] selected on the LCD?

— N: Go offline and press the switch 4 to choose [FRONT].

— Y: Is the SQC circuit-board sensor or the sheet-guide upper-front-assembly sensor dusty or stained?

— Y: Clean them and go to N.

— N: In offline mode, press the switch 4 to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install paper, and turn the platen knob or press the switch 3 to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

Does the sensor change properly?

— Y: End

— N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: Return the slice-level setting to the previous level.

Is the sensor not changing properly FRONT 2, 4, or 6?

— Y: Is the connection cord connected properly to the connector CN2 on the MIB PCB?

— N: Connect them properly.

— Y: Measure the voltage levels of pins 4, 8, and 12 of the CN2 on the SQC PCB. Is the difference between sensor on and off 1 V or more?

— N: Replace the sensor assembly.

— Y: Go to (1).

— N: Go to (1).

(1) Is the connection cord connected properly to the connector CN1 on the SQC PCB?

— N: Connect them properly.

— Y: Is the connection cord connected properly to the CN21 on the MIB PCB?

— N: Connect them properly.

— Y: Replace the SQC PCB or the MIB PCB.

② Continuous forms are used (rear tractor: optional).

Is [REAR] selected on the LCD?

— N: Go offline and press the switch 4 to choose [REAR].

— Y: Is the rear PE sensor dusty or stained?

    — Y: Clean it and go to N.

    — N: In offline mode, press the switch 4 to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install paper and turn the platen knob or press the switch 3 to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

Does the sensor change properly?

    — Y: End

    — N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

        — Y: End

        — N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

        — Y: End

        — N: Return the slice-level setting to the previous level.

Is the connection cord connected properly to the connector CN5 on the MIB PCB?

        — N: Connect them properly.

        — Y: Measure the voltage level of pin 1 of the CN5 on the MIB PCB. Is the difference between sensor on and off 1 V or more?

            — N: Replace the sensor assembly.

            — Y: Replace the MIB PCB.

③ Cut sheets are used (rear CSF: optional).

Is [CSF Rear] selected on the LCD?

— N: Go offline and press the switch 4 to choose [CSF Rear].

— Y: Is the rear PE sensor dusty or stained?

— Y: Clean it and go to N.

— N: In offline mode, press the switch 4 to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install paper, and turn the platen knob or press the switch 3 to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

Does the sensor change properly?

— Y: End

— N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: Return the slice-level setting to the previous level.

Is the connection cord connected properly to the connector CN5 on the MIB PCB?

— N: Connect them properly.

— Y: Measure the voltage level of pin 1 of the CN5 on the MIB PCB. Is the difference between sensor on and off 1 V or more?

— N: Replace the sensor assembly.

— Y: Replace the MIB PCB.

• Checking the rear PE sensor

Is [CSF Rear] selected on the LCD?

— N: Go offline and press the switch 4 to choose [CSF Rear].

— Y: Place paper on the rear CSF, and press the switch 3 repeatedly.

— Is the signal of pin 3 of the CN20 on the MIB PCB turned on and off in accordance with the repeated paper-feed/output motions when the switch 3 is pressed repeatedly?

— N: Replace the PE sensor assembly (rear), the sensor cord, and the photo interrupter.

— Y: Replace the MIB PCB.

④ Cut sheets are used (manual feed).

Is [MANUAL] selected on the LCD?

— N: Go offline and press the switch ④ to choose [MANUAL].

— Y: Edit the menu settings and print them out.

— Is the printer set to output a paper-end signal if paper end is detected in cut-sheet manual mode (set to [Offline])?

— N: Select [Offline], and check whether the printer has recovered from the error. If it has not recovered, go to Y.

— Y: Is the SQC circuit-board sensor or the sheet-guide upper-front-assembly sensor dusty or stained?

— Y: Clean them and go to N.

— N: In offline mode, press the switch ④ to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install paper, and turn the platen knob or press the switch ③ to feed paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

Does the sensor change properly?

— Y: End

— N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: In the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

— Y: End

— N: Return the slice-level setting to the previous level.

Is the sensor not changing properly FRONT 2, 4, or 6?

— Y: Is the connection cord connected properly to the connector CN2 on the SQC PCB?

— N: Connect them properly.

— Y: Measure the voltage levels of pins 4, 8, and 12 of the CN2 on the SQC PCB. Is the difference between sensor on and off 1 V or more?

— N: Replace the sensor assembly.

— Y: Go to (1).

— N: Go to (1).

(1) Is the connection cord connected properly to the connector CN1 on the SQC PCB?

— N: Connect them properly.

— Y: Is the connection cord connected properly to the CN21 on the MIB PCB?

— N: Connect them properly.

— Y: Replace the SQC PCB or the MIB PCB.

- Paper is not fed at all or the line-feed pitch is abnormal.
- The LF motor makes an inappropriate noise.

Turn off the power switch. Does the platen knob rotate smoothly?

　　N: Remove the mini pitch belt from the LF motor gear. Rotate the LF motor by hand, or turn on the power to perform LF/FF motions.

　　　　Does the LF motor operate smoothly?

　　　　　　N: Replace the LF motor.

　　　　　　Y: Is the tension of the mini pitch belt appropriate?

　　　　　　　　N: Adjust the tension of the mini pitch belt.

　　　　　　　　Y: Are the teeth of the mini pitch belt damaged?

　　　　　　　　　　Y: Replace the mini pitch belt.

　　　　　　　　　　N: End

　　Y: Measure the resistance between the terminals of the LF motor in the location specified below, and check for broken wires, short circuits with another cord, and other faults [Normal: Approx. 3.3 Ω/phase (normal temperature)].

　　　　Is the resistor normal at the connector CN18 (LF motor side) on the MIB PCB (disconnect the connector)?

　　　　　　N: Replace the LF motor.

　　　　　　Y: Replace the MIB PCB.

- Paper jams occur frequently.
- Paper is torn.
- Skew occurs.

Is the paper path clogged with paper dust?

    Y: Remove the paper dust.

    N: Are the paper's sprocket holes aligned with the pins of the pin tractor?

        N: Adjust the sheet-feeder assembly so that the pins of the pin tractor are positioned in the center of each sprocket hole.

        Y: Is auto-gap mode selected?

            Y: Correct the automatic paper-thickness adjustment distance (see section 8.3).

            N: If the printer is in auto-gap mode, does the setting of [GAP X] (X=1 to 8, A to E) displayed on the screen during printing match the paper thickness?

                N: Edit the manual gap setting to match the paper thickness.

                Y: Does paper pass between the platen and the ribbon protector smoothly?

                    N: Re-install or replace the ribbon protector.

                    Y: Is the diamond-shaped hole in the ribbon protector deformed?

                        Y: Replace the ribbon protector.

                        N: Are the right- and left-hand pin tractor belts in phase?

                            N: Align the phases of the pin tractor belts.

                            Y: Is paper transferred smoothly from the pin tractor belts to the sprocket wheels?

                                N: Align the phases of the pin tractor belts and the sprocket wheels.

                                Y: End

10.2.6 Carriage Motion Error

- The character pitch is abnormal, characters overlap, or the printing position offsets horizontally.
- ERROR 101 (homing error) occurs.
- ERROR 102 (spacing error) occurs.

Turn off the power switch, remove the ribbon cartridge, and rotate the ribbon feed knob by hand.

Is the ink ribbon wound slightly?

N: Replace the ribbon cartridge.

Y: Press the carriage by hand. Does it move smoothly?

Y: Is the cord properly connected to the connector CN3 on the OPN PCB?

N: Connect them properly.

Y: Turn on the power and move the carriage by hand. Check whether the φA and φB signals are output as shown below.

φA(Pin 2 of CN3)   High level
                          Low level
φB(Pin 1 of CN3)
Phase difference of approx. 90°

* φA and φB signals are reversed depending on the carriage travel direction.
* There shall be no extreme pulse rounding or cracking in the waveform.
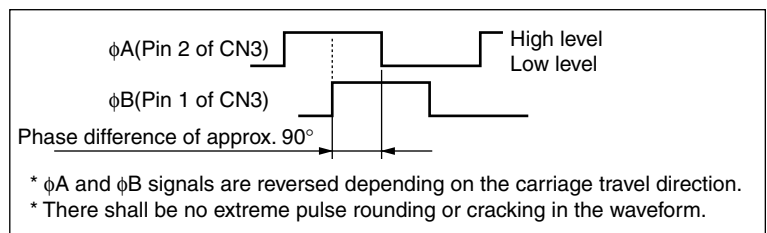
Is the waveform normal?

N: Replace the SP motor.

Y: Is the OPN PCB connected properly to the MIB PCB?

N: Connect them properly.

Y: Is the SP motor connected properly to the connector CN3 on the MIB PCB?

N: Connect them properly.

Y: Measure the resistance between terminals of the space motor [Normal: Approx. 6.1 Ω (normal temperature)].

Is there a broken wire, short circuit, connection failure, or other failure?

N: Replace the space motor.

Y: Replace the MIB PCB.

Go to the next page.

Continued from the previous page

└─N: Is the auto-gap mode selected?

    ├─Y: Correct the automatic paper-thickness adjustment distance (see section 8.3).

    └─N: If the printer is in auto-gap mode, does the setting of [GAP X] (X=1 to 8, A to E) displayed on the screen during printing match the paper thickness?

        ├─N: Edit the manual gap setting to match the paper thickness.

        └─Y: Does paper pass between the platen and the ribbon protector smoothly?

            ├─N: Re-install or replace the ribbon protector.

            └─Y: Does paper dust collect on the main shaft, thereby increasing the load?

                ├─N: Clean and lubricate the main shaft.

                └─Y: Is the tension of the mini pitch belt normal?

                    ├─N: Adjust the tension of the mini pitch belt.

                    └─Y: Are the teeth of the mini pitch belt damaged?

                        ├─N: Replace the mini pitch belt.

                        └─Y: Is the rotation of the idle pulley not smooth?

                            ├─Y: Replace the idle pulley.

                            └─N: Is the rotation of the space motor not smooth?

                                ├─Y: Replace the space motor.

                                └─N: End

10.2.7 Ink-Ribbon Feed Error

- The ink ribbon is not fed properly or is not fed at all.
- Ink-ribbon jams occur.
- The print is too light or smeared, or the print density is uneven.

Is the problem solved if the ribbon cartridge is replaced?

    Y: Replace the ribbon cartridge.

    N: Is auto-gap mode selected?

        Y: Correct the automatic paper-thickness adjustment distance (see section 8.3).

        N: If the printer is in auto-gap mode, does the setting of [GAP X] (X=1 to 8, A to E) displayed on the screen during printing match the paper thickness?

            N: Edit the manual gap setting to match the paper thickness.

            Y: Does paper pass between the platen and the ribbon protector smoothly?

                N: Is the diamond-shaped hole in the ribbon protector deformed?

                    Y: Replace the ribbon protector.

                    N: Is the coupling gear coupled with the ribbon cartridge smoothly?

                        N: Replace the coupling gear.

                        Y: Does the planet gear switch over smoothly?

                            Y: Replace the ribbon feed assembly.

              Y: Remove the ribbon cartridge. Does the coupling piece rotate properly (when the power is turned on or during printing)?

                Y: Is the coupling gear coupled with the ribbon cartridge smoothly?

                    N: Replace the coupling gear.

                    Y: Does the planet gear switch over smoothly?

                      Y: Replace the ribbon feed assembly.

              N: Is the ribbon feed motor connected properly to the connector CN19 on the MIB PCB?

                N: Connect them properly.

                Y: Measure the resistance between terminals of the ribbon feed motor [Normal: Approx. 159 Ω (normal temperature)].

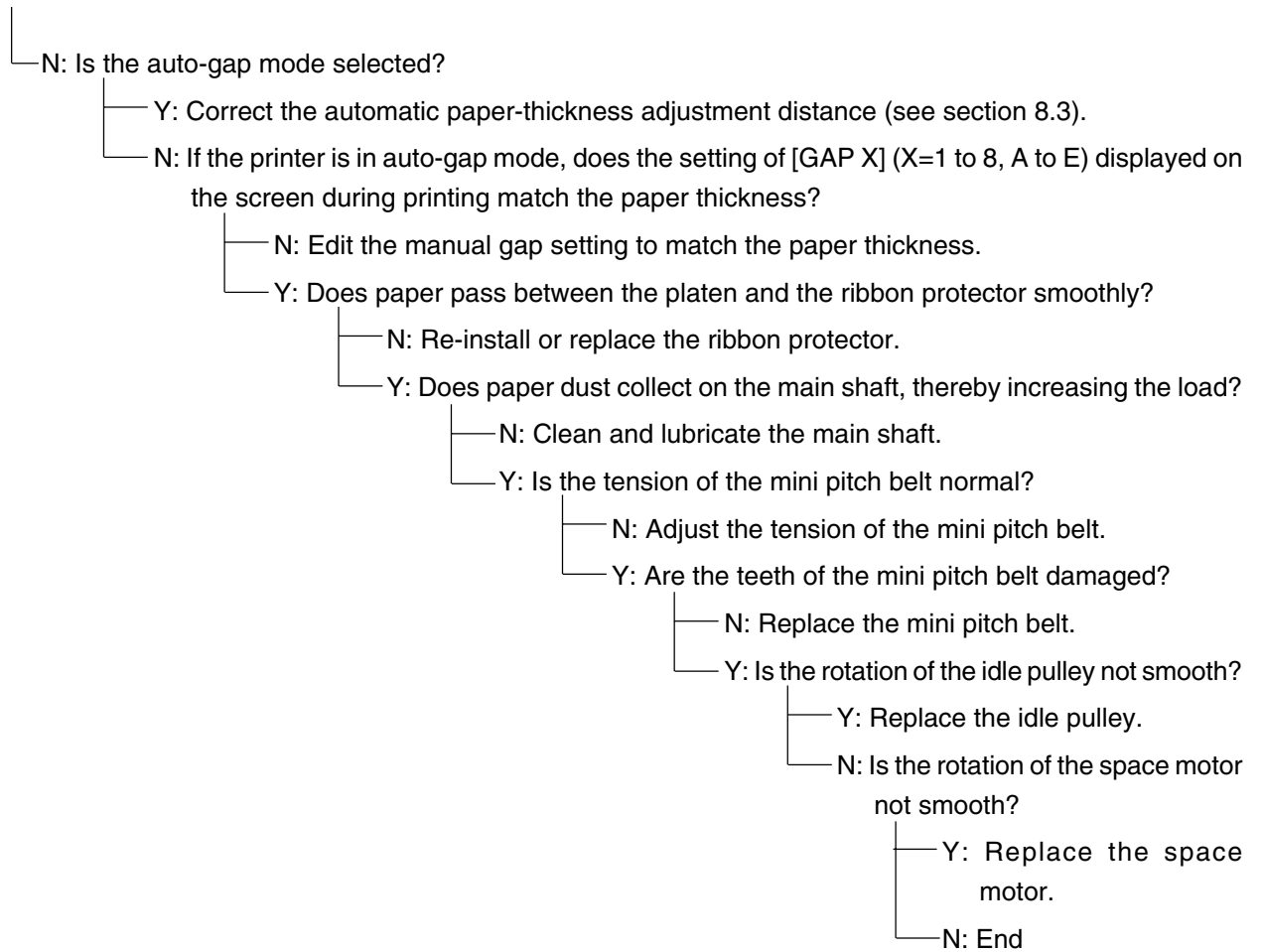   Is there a broken wire, short circuit, connection failure, or other failure?

                  N: Replace the ribbon feed motor.
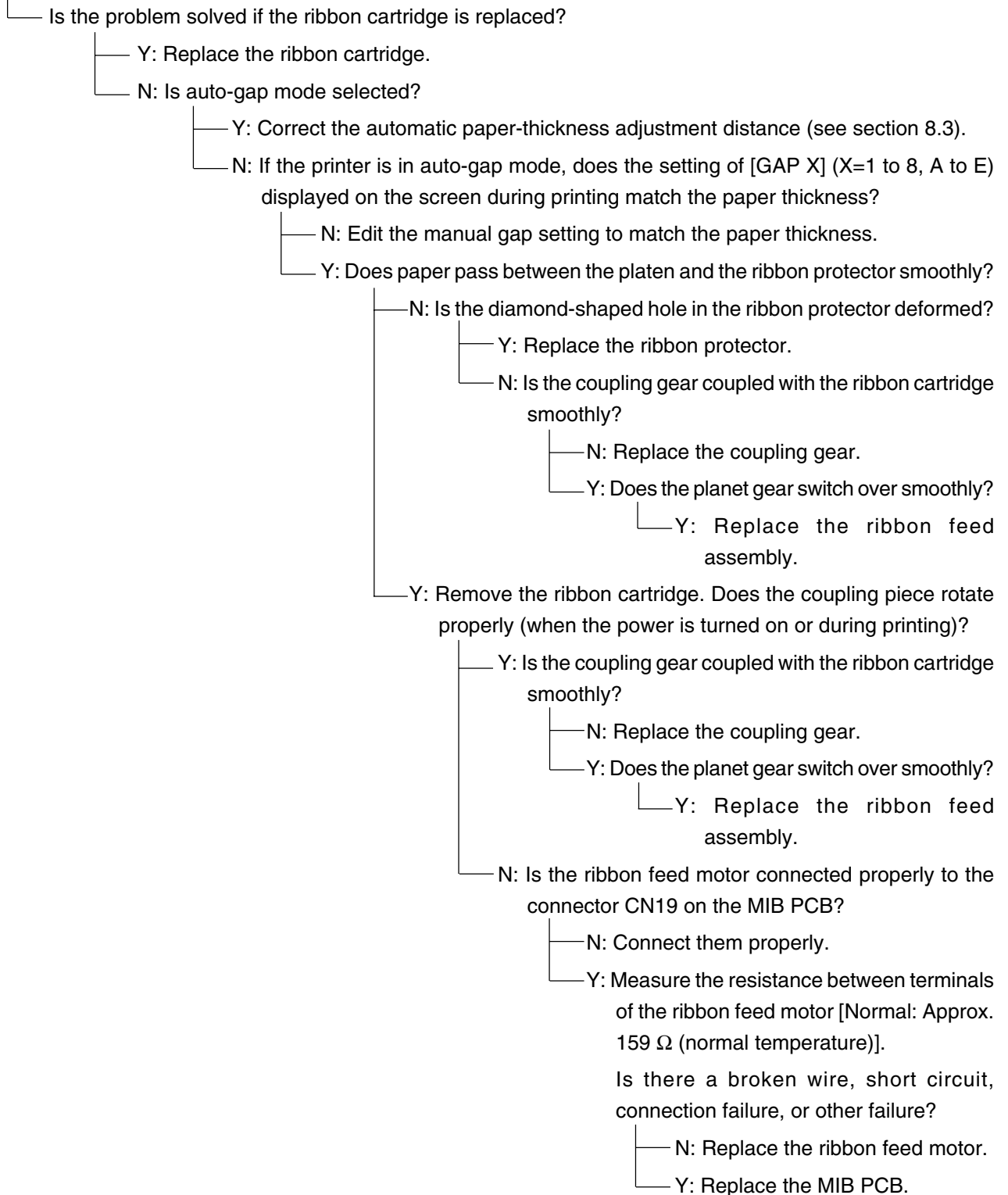
                  Y: Replace the MIB PCB.

10.2.8 Print-Head Motion Error

- Dots are missing or excess dots are printed.
- Dots are offset.
- The printer does not print at all (the carriage moves).

Is auto-gap mode selected?

Y: Correct the automatic paper-thickness adjustment distance (see section 8.3).

N: If the printer is in auto-gap mode, does the setting of [GAP X] (X=1 to 8, A to E) displayed on the screen during printing match the paper thickness?

N: Edit the manual gap setting to match the paper thickness.

Y: Are connectors CN14 and CN15 (head connection cords) connected properly ?

N: Connect them properly.

Y: Are the head connection cords connected properly to connectors CN14 and CN15 on the KYA PCB?

N: Connect them properly.

Y: Is there continuity between the KYA PCB and the head connectors (pressure welding)?

N: Replace the head connector.

Y: Check whether the print head is covered with paper dust or ink ribbon lint, or whether the pins are broken. Are there any of these problems?

N: Clean or replace the print head.

Y: Measure the coil resistance between the dot terminals of the print head, and check whether it is normal (approx. 18 Ω at normal temperature; the resistance becomes larger if the print-head temperature is higher). In addition, check whether there is short circuit or half short circuit with other terminals or FG (head housing).

Are there any of these problems?

N: Replace the print head.

Y: Check the continuity of the print-head connection cords, and whether there is a short circuit or half short circuit with other cords or FG. Are there any of these problems?

N: Replace the print-head connection cords.

Y: Replace the MIB PCB.

10.2.9 Parallel-Interface Error

- The lamp Ⓓ is on but the printer does not print at all (no reaction).
- The lamp Ⓓ goes out and the printer does not print.
- The printer misprints or prints meaningless characters.

Leave the power on and press the switch ① repeatedly.

Does the lamp Ⓓ go out and light up repeatedly?

Y: (This indicates that the printer can receive data.)

: Check the following:

① Check whether [Host Interface] of the menu item is set to [Auto Interface] or [Parallel]. If it is not, edit the setting.

② Check for continuity between the same signals within the route from the parallel interface cord to the MIB PCB, and for short circuiting with other cords (e.g., signal, +5 V, 0 V). If there is a problem, perform the necessary replacement.

③ Set the printer in hexadecimal dump mode. (While holding down switches ④, ⑤, and ⑥, turn on the power.) Print the exact data received from the host.

- If the printed codes are garbled, check ② above. If there is no problem, replace the MIB PCB.

N: (This indicates that the printer cannot receive data.)

: Check the following:

④ Turn on the power. When the lamp Ⓓ lights up after homing, check the parallel-interface signals specified below.

Signal name	Check point	Normal level
ACK-N	Pin 10 of CN6	H level
BUSY-P	Pin 11 of CN6	L level
PE-P	Pin 12 of CN6	L level

If there is a problem, check ② above. If there is no problem with the result, replace the MIB PCB.

⑤ Check whether a normal strobe signal is input to pin 1 of the connector CN6 on the MIB PCB.

- If there is a problem, check ② above. If there is no problem with the result, adjust the host machine.
- If a normal strobe signal is input, replace the MIB PCB.

10.2.10 USB Interface Error

- The lamp Ⓓ is on but the printer does not print at all (no reaction).
- The lamp Ⓓ goes out and the printer does not print.
- The printer misprints or prints meaningless characters.

Leave the power on and press the switch 1 repeatedly.

Does the lamp Ⓓ go out and light up repeatedly?

Y: (This indicates that the printer can receive data.)

: Check the following:

① Check whether [Host Interface] of the menu item is set to [Auto Interface] or [USB]. If it is not, edit the setting.

② Check for continuity between the same signals within the route from the USB interface cord to the MIB PCB, and for short circuiting with other cords (e.g., signal, VCC, 0 V). If there is a problem, conduct the necessary replacement.

③ Set the printer in hexadecimal dump mode. (While holding down switches 4, 5, and 6, turn on the power.) Print the exact data received from the host.

- If the printed codes are garbled, check ② above. If there is no problem, replace the MIB PCB.

N: (This indicates that the printer cannot receive data.)
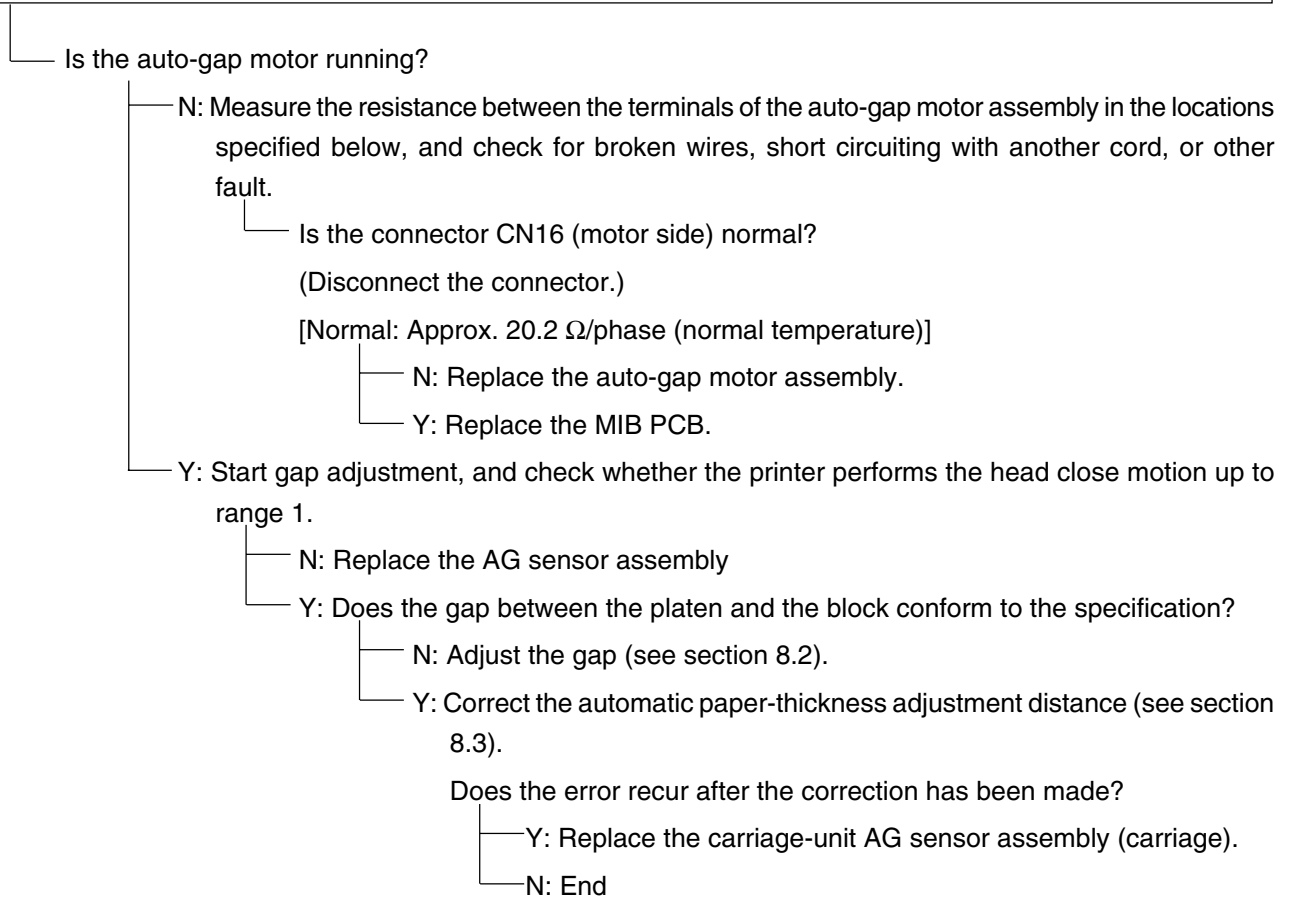
: Check the following:

④ Turn on the power. When the lamp Ⓓ lights up after homing, check the interface signals specified below.

Signal name	Check point	Normal level
D+	Pin 3 of CN4	H level

If there is a problem, check ② above. If there is no problem with the result, replace the MIU PCB.

10.2.11 Automatic Paper-Thickness Adjustment Motion Error

- ERROR 0103 (auto gap error) occurs.

Is the auto-gap motor running?

- N: Measure the resistance between the terminals of the auto-gap motor assembly in the locations specified below, and check for broken wires, short circuiting with another cord, or other fault.

    Is the connector CN16 (motor side) normal?

    (Disconnect the connector.)

    [Normal: Approx. 20.2 Ω/phase (normal temperature)]

    - N: Replace the auto-gap motor assembly.
    - Y: Replace the MIB PCB.

- Y: Start gap adjustment, and check whether the printer performs the head close motion up to range 1.

    - N: Replace the AG sensor assembly
    - Y: Does the gap between the platen and the block conform to the specification?

        - N: Adjust the gap (see section 8.2).
        - Y: Correct the automatic paper-thickness adjustment distance (see section 8.3).

            Does the error recur after the correction has been made?

            - Y: Replace the carriage-unit AG sensor assembly (carriage).
            - N: End

10.2.12 Printing-Position Error

- The printing start position is offset. The printer prints past the paper edge.

Is the paper-width sensor dusty or stained?

Y: Clean it and go to N.

N: In offline mode, press the switch 4 to choose [MANUAL]. Conduct the sensor check in maintenance mode. Install paper, and turn the platen knob or press the switch 3 to feed the paper to the front and rear of the paper end sensor. Check whether the sensor changes properly.

Does the sensor change properly?

Y: Perform correction of the paper-width sensor so that the left-edge printing position conforms to the specification.

N: Perform the sensor slice-level setting function, and conduct the sensor check again. Does the sensor change properly?

Y: Perform correction of the paper-width sensor so that the left-edge printing position conforms to the specification.

N: During the sensor slice-level manual setting, if the sensor fails in paper detection, lower the slice level by one notch. If it fails in paper end detection, raise the slice level by one notch.

Conduct the sensor check again. Does the sensor change properly?

Y: Perform correction of the paper-width sensor so that the left-edge printing position conforms to the specification.

N: Return the slice-level setting to the previous level.

Is the connection cord connected properly to the connector CN14 on the MIB PCB?
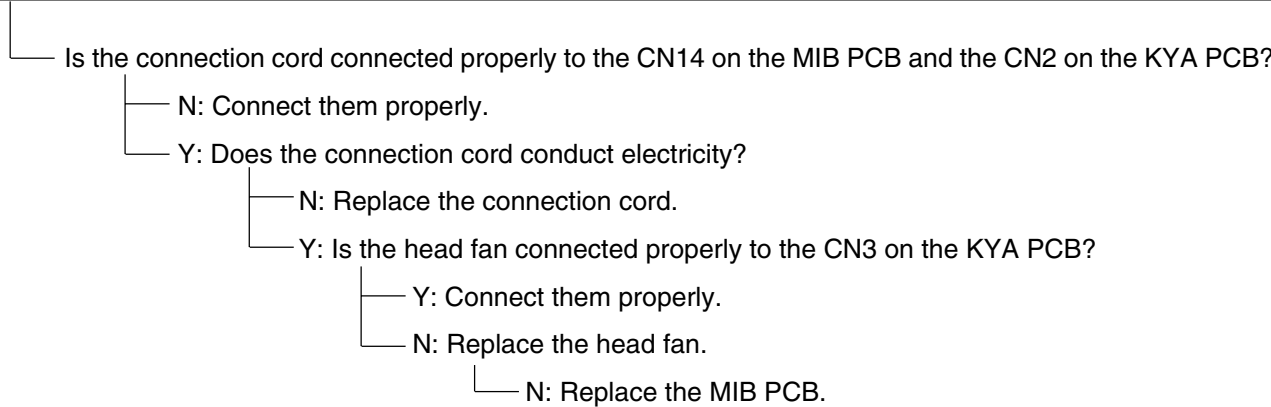
N: Connect them properly.

Y: Measure the voltage levels of pins 21 and 22 of the CN14 on the MIB PCB. Is the difference between sensor on and off 1 V or more?
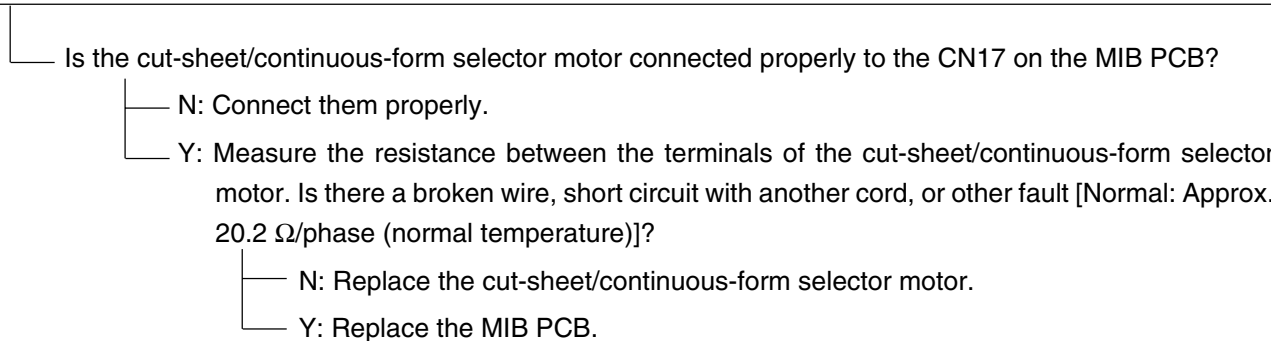
N: Replace the sensor assembly.

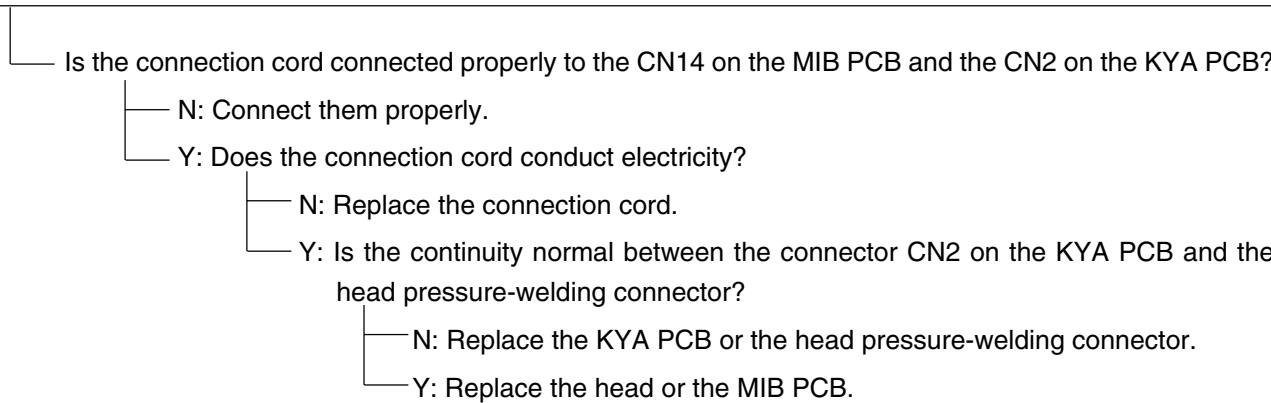Y: Replace the MIB PCB.

10.2.13 Unrecoverable Errors

① ERROR 0107 (fan error) occurs.

Is the connection cord connected properly to the CN14 on the MIB PCB and the CN2 on the KYA PCB?

N: Connect them properly.

Y: Does the connection cord conduct electricity?

N: Replace the connection cord.

Y: Is the head fan connected properly to the CN3 on the KYA PCB?

Y: Connect them properly.

N: Replace the head fan.

N: Replace the MIB PCB.

② ERROR 0108 (cut-sheet/continuous-form selection error)

Is the cut-sheet/continuous-form selector motor connected properly to the CN17 on the MIB PCB?

N: Connect them properly.

Y: Measure the resistance between the terminals of the cut-sheet/continuous-form selector motor. Is there a broken wire, short circuit with another cord, or other fault [Normal: Approx. 20.2 Ω/phase (normal temperature)]?

N: Replace the cut-sheet/continuous-form selector motor.

Y: Replace the MIB PCB.

③ ERROR 0802 (head thermistor error) occurs.

Is the connection cord connected properly to the CN14 on the MIB PCB and the CN2 on the KYA PCB?

N: Connect them properly.

Y: Does the connection cord conduct electricity?

N: Replace the connection cord.

Y: Is the continuity normal between the connector CN2 on the KYA PCB and the head pressure-welding connector?

N: Replace the KYA PCB or the head pressure-welding connector.

Y: Replace the head or the MIB PCB.

11. Periodically Replaced Parts

The table below shows the maintenance parts for the mechanical and control units that are required when 100 units of this printer are used under the working conditions specified below for a year.

(1) Working Conditions
Mechanical unit: The estimated service hours shall be 2 hours/day or 50 hours/month.
Control unit: The estimated time for which the power is on shall be 8 hours/day or 200 hours/month.
* Variations in quantity due to the maintenance conditions are not considered.

(2) Requirement Level
A: The quantity must be increased as the number of printers used is increased.
B: The quantity may not need to be increased even if the number of printers used is increased.
C: It may be desirable to have the part ready.

Table 11-1 (1/2) Maintenance Parts List

No.	Description	Diagram No.	Quantity used for a printer	Quantity as maintenance parts	Requirement level	Remarks
1	Print head	43277301	1	4	A	
2	Head cover assembly	43507801	1	1	B	
3	Ribbon guide A	41570401	1	1	B	
4	Operating-panel assembly	43504501	1	1	C	
5	Cover-Top assembly	43117102	1	1	C	
6	Cover-Upper assembly	43117201	1	1	C	
7	Cover-Lower assembly	41590907	1	1	C	
8	Cover-Gear (Rear)	41787401	1	1	C	
9	Cover-Rear	43501101	1	1	C	
10	CSF printed circuit board	41652002	2	2	B	
11	CSF PCB connection cable	2381013P0012	1	1	B	
12	CSF PCB connection cable	2381013P0013	1	1	B	
13	Operating-panel PCB connection cable	2381013P0016	1	1	B	
14	M2D printed circuit board	43508002	1	1	B	
15	Power-supply assembly	43111301	1	2	B	
16	Stacker support	41569701	1	1	C	
17	Platen	41872501	1	2	A	
18	PE sensor assembly (rear)	41708602	1	1	B	
19	Photo interrupter	40135301	3	3	B	
20	Tractor-sensor connection cord	43356801	1	1	B	
21	LF motor assembly	41587202	1	1	B	
22	Sheet-guide upper front assembly	41836202	1	1	B	
23	RTS printed circuit board	41651804	1	1	B	
24	Timing belt (main)	43263101	1	3	B	

Table 11-1 (2/2) Maintenance Parts List

No.	Description	Diagram No.	Quantity used for a printer	Quantity as maintenance parts	Requirement level	Remarks
25	Timing-belt rear tractor	41568601	1	3	B	
26	Motor mode	43375401	2	2	B	
27	LCD assembly	43513801	1	1	B	
28	Slider	41633501	2	2	B	
29	AG-sensor PCB assembly	41542302	1	1	B	
30	Space motor	43267101	1	2	A	
31	Ribbon motor assembly	41636702	1	1	B	
32	Ribbon feed assembly	41588901	1	1	B	
33	Cover-open SW assembly	41999102	1	1	B	
34	Belt tractor (front)	41760401	1	3	B	
35	Front tractor assembly L	41587901	1	1	B	
36	Front tractor assembly R	41588001	1	1	B	
37	FAN-SP Motor	43333801	1	1	B	
38	Rear PE position sensor cord	43357101	1	1	B	
39	SC sensor assembly	41835904	1	1	B	
40	SC-sensor-assembly connection cable	2381019P0003	1	1	B	
41	SC motor assembly	43507701	1	1	B	
42	D-roller position sensor cord	43357401	1	1	B	
43	Belt slip roller	41858901	1	3	B	
44	Ribbon-protector assembly	41589902	1	4	A	
45	AG sensor assembly (carriage)	41588602	1	1	B	
46	Head cable assembly	43460101	1	3	B	
47	Space belt	43390301	1	3	B	
48	KYA printed circuit board	41652104	1	1	B	
49	Connector	PB4025-1241P001	1	1	B	
50	Paper-width-sensor assembly	43356401	1	1	B	
51	OPN printed circuit board	41651916	1	1	B	

12. Operation

12.1 Outline

This printer consists of the print mechanical unit and the print control unit.

The mechanical unit consists of the print head, the space system, the line-feed system, the ribbon-feed system, the auto-gap system, and the skew correction system. These components perform the actions specified below.

(1)	Print head	Prints using a 9x2-wire dot magnet. The dot pattern is configured by the control unit.
(2)	Space system	The DC motor moves the carriage to leave a space, move to a tab stop, or return home.
(3)	Line-feed system	Feeds lines by using a stepping motor to feed a continuous form or cut sheet
(4)	Ribbon-feed system	Feeds the ink ribbon using the drive of a stepping motor
(5)	Auto-gap system	Moves the carriage up and down by using a stepping motor to adjust the gap between the print head and the platen. The carriage is moved to a position at which the optimum printing pressure for the paper thickness is applied.
(6)	Skew correction system	Detects skewed paper in the printer using several table sensors. Drives the D roller by using a stepping motor to correct the skew. In addition, detects how much paper is skewed using several paper end sensors.
(7)	Control unit	A single microprocessor (hereinafter referred to as a μ CPU") MSM67X640GS-BK and LSI (μ PD65949S1-087-F6) are used for both interface control and mechanical control.

12.2 About the operation of a control board (See Figure 12-1)

A control board is equipped with two CPUs, and the main CPU (M-CPU) controls the entire operation of the device, and the slave CPU (S_CPU) controls only the printing operation.

12.2.1 Explanation of the basic operation

(1) μCPU (M_CPU)

The μCPU (M_CPU) is connected to the main LSI (M_LSI) and controls the SP operation, the operation panel and interfaces. Also, it monitors each sensor.

(2) Memory

a) In the main control memory (M_EP), the program that runs the main μCPU (S_CPU) has been stored.

b) In the slave control memory (S-FP), the program that extracts impact data and gets the printing operation to take place has been stored.

c) In the CG memory (M-CG), the data essential for character printing has been stored.

((3) Main LSI

a) Centronics interface control

b) LF/SP motor control

c) USB interface control

d) Operation panel/LCD screen control

e) Skew correction control

(4) μCPU (S_CPU)

The μCPU (S_CPU) is connected to the main CPU (M_CPU) and transmits the data received from the main CPU to the sub LSI for the print head (PRE1, PRE2, POS1, and POS2).

(5) Sub LSI

The sub LSI (PRE1, PRE2, POS1, and POS2) extracts print data and transmits the print data to the print head driver.
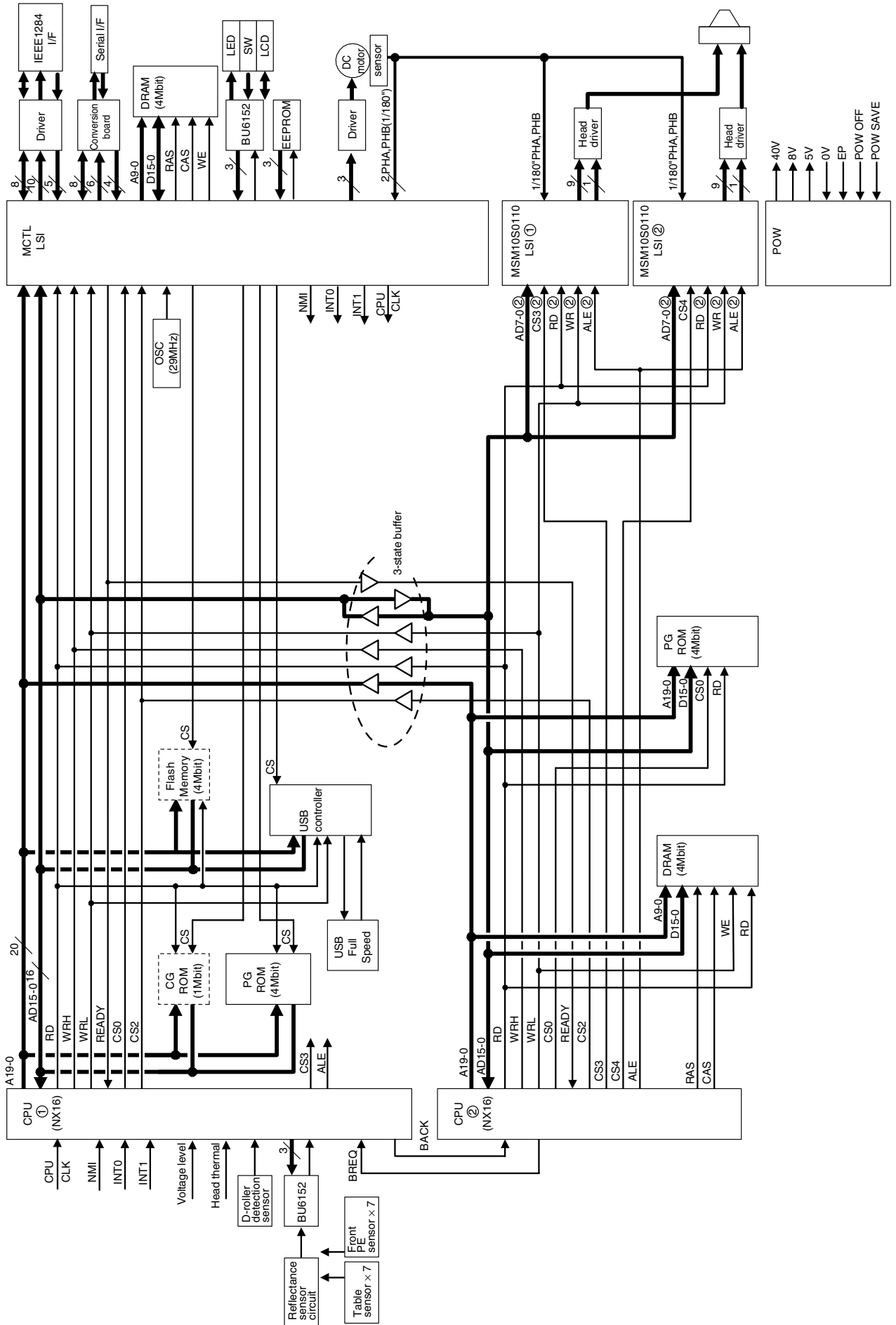
12.3 Actions of the Mechanical Unit

12.3.1 Mechanism and Actions of the Print Head (See Figures 12-2 & 12-3.)

The print head is a spring-charged head using a permanent magnet. The head is mounted on the carriage, which travels parallel to the platen.
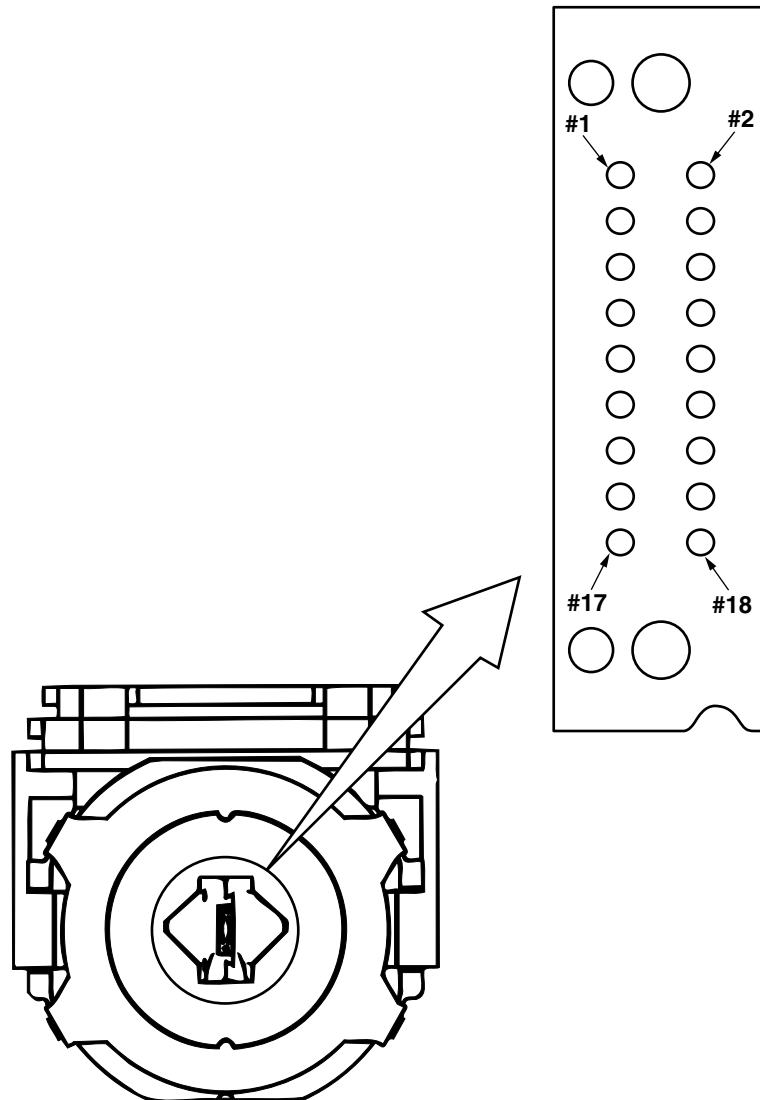
Figure 12-2. Head Pin Arrangement
(Front view of the tip of the head)

(1)   Actions of the Print Head (See Figure 12-3.)

The armature spring is loosened by the permanent magnet, and the armature is adhered to the core. The print wire attached to the armature is in the reset state. When a print command is sent from the print control unit, the magnet coil is excited and generates a magnetic field opposite that of the permanent magnet. By the restoring force of the spring, the armature moves in the direction opposite the core, and the print wire strikes the platen. Paper and the ink ribbon are placed between the platen and the print wire. As the wire strikes the platen, the ink on the ink ribbon is transferred to the paper.
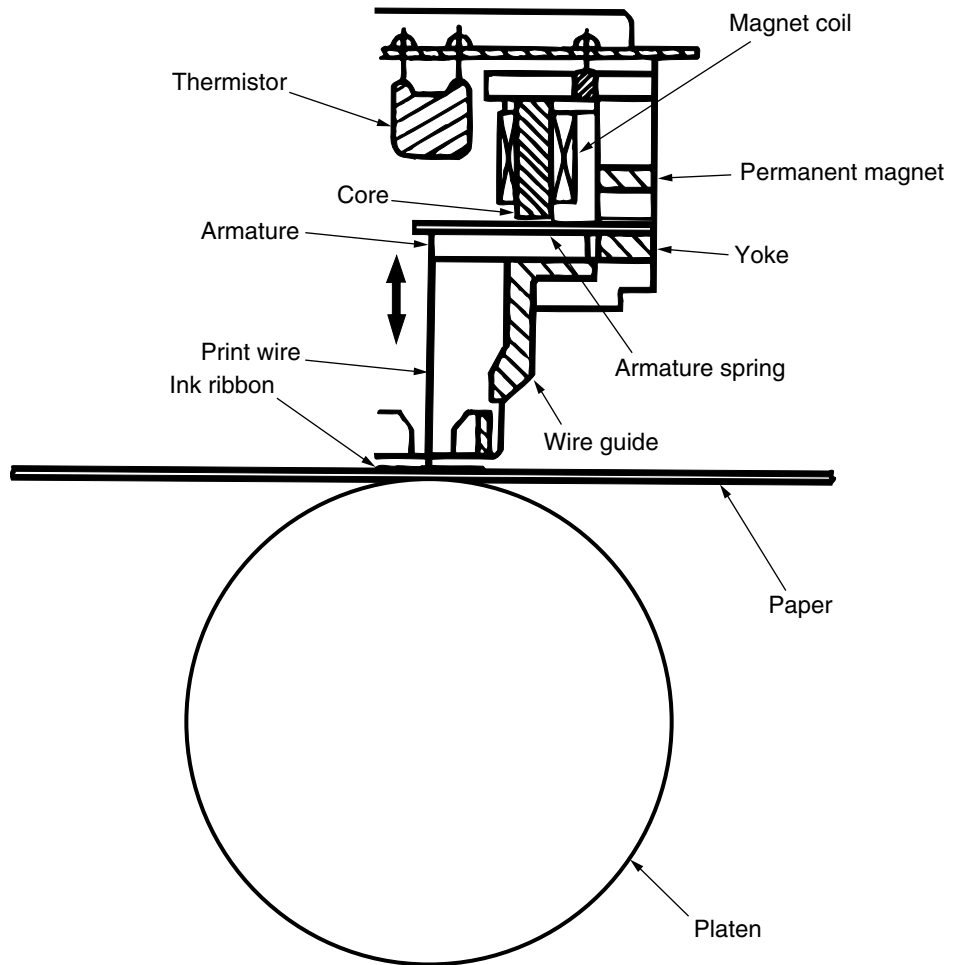
Figure 12-3

12.3.2 Space Mechanism and its Actions

Spacing is performed by driving the carriage on the main and sub shafts mounted in parallel to the platen by the DC servo motor.

(1) Spacing (See Figure 12-4.)
The carriage carrying the print head is moved in parallel to the platen by the main shaft and the sub shaft. The carriage is fastened to the mini pitch belt at the rear of the carriage frame. When the DC servo motor rotates counterclockwise as you face the top of the motor, the driving force is conveyed to the mini pitch belt, and the carriage travels from left to right. The rotational angle and speed of the DC servo motor are controlled by the count of the ϕ A and ϕB signals (with a phase difference of approx. 90°) and their interval output from the encoder in the motor. The rotational direction is determined by the positive and negative values of the phase difference of the ϕ A and ϕ B signals. The carriage is designed to travel 40.64 mm with every revolution of the DC servo motor.
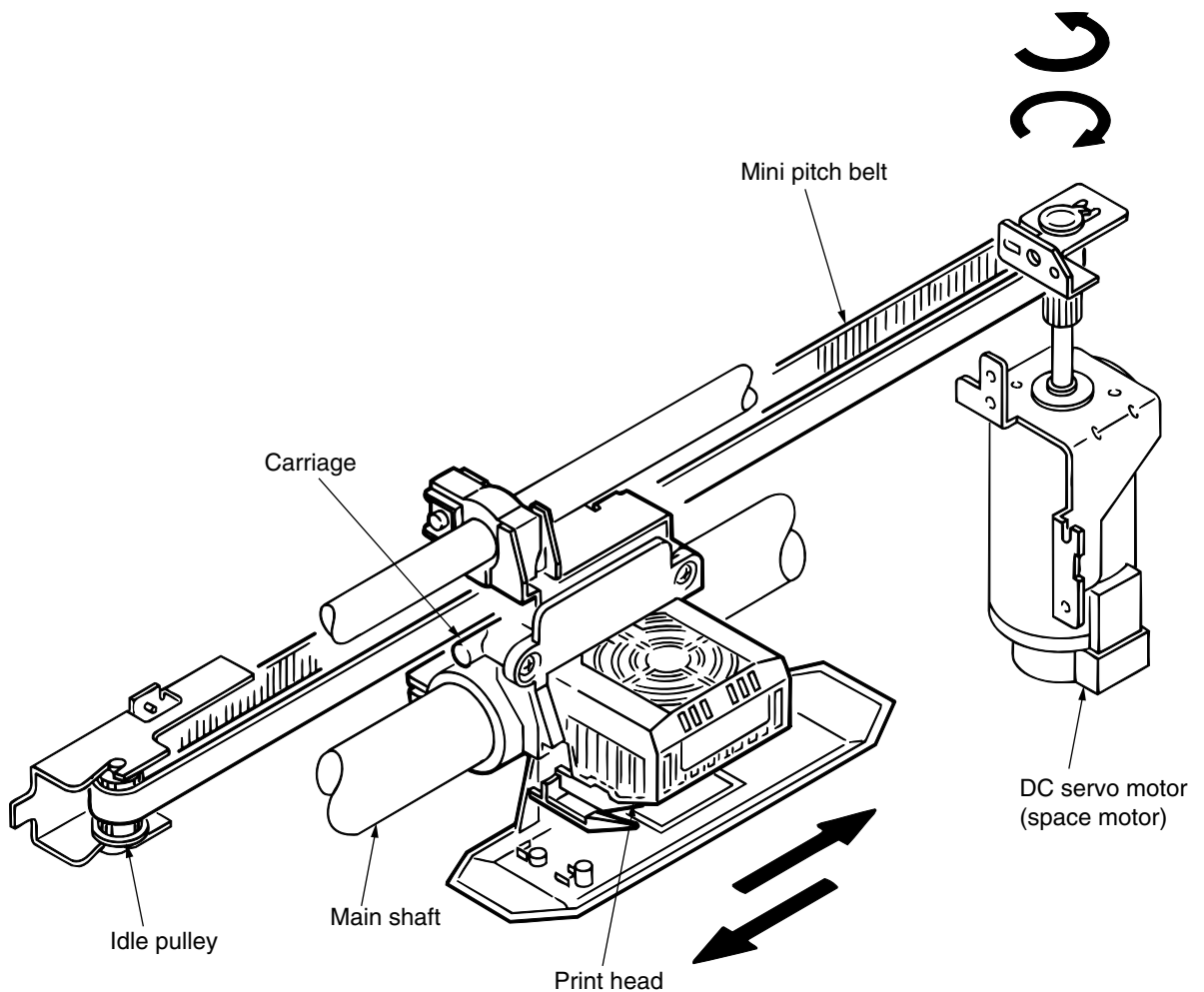
Figure 12-4. Space Mechanism

12.3.3 Ribbon-Feed Mechanism and Its Actions (See Figure 12-5.)

The ribbon-feed mechanism feeds the ink ribbon, and drives using the stepping motor.

(1) Ribbon Cartridge
A one-way-feed endless ribbon is used. The mechanism is designed to ensure consistently clear printing.

(2) Feeding
The ribbon-feed mechanism not only operates during printing, but also begins to drive as soon as the spacing motion begins to operate, and stops ribbon feeding when spacing stops.
When the stepping motor begins to operate, the rotation is conveyed via the ribbon feed gear to the drive roller in the ribbon cartridge, which feeds the ink ribbon.
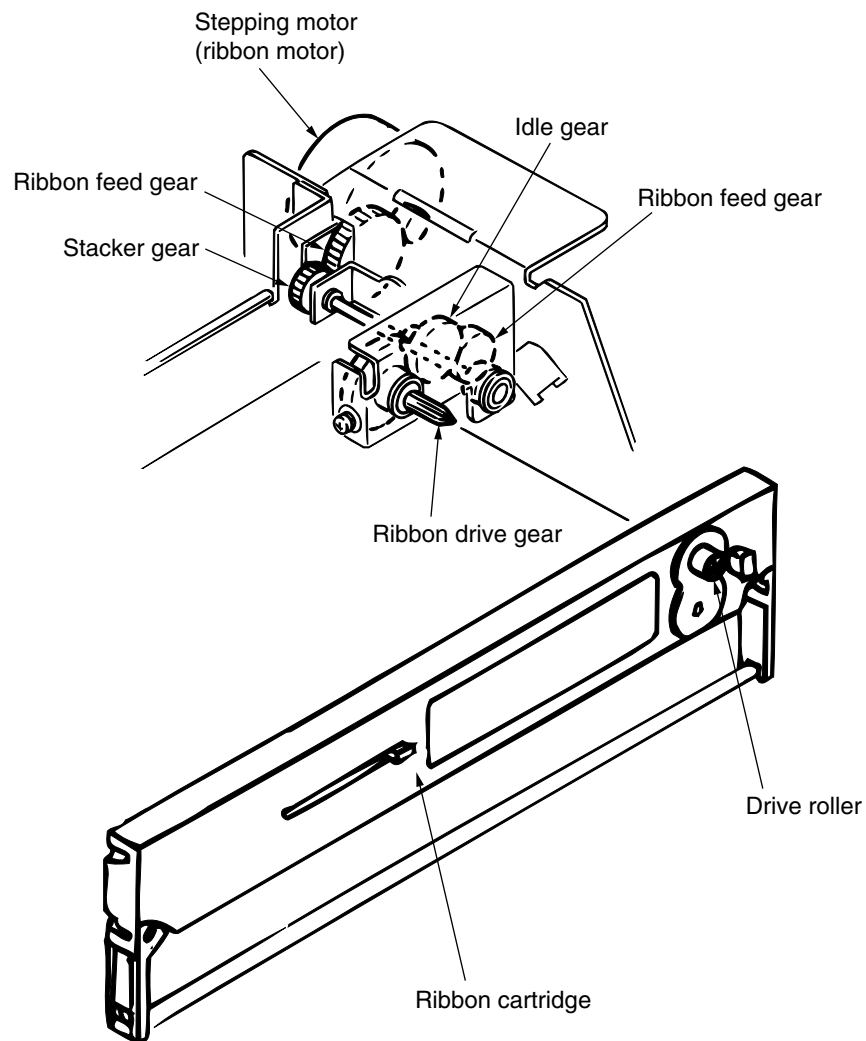
Figure 12-5. Ribbon-Feed Mechanism

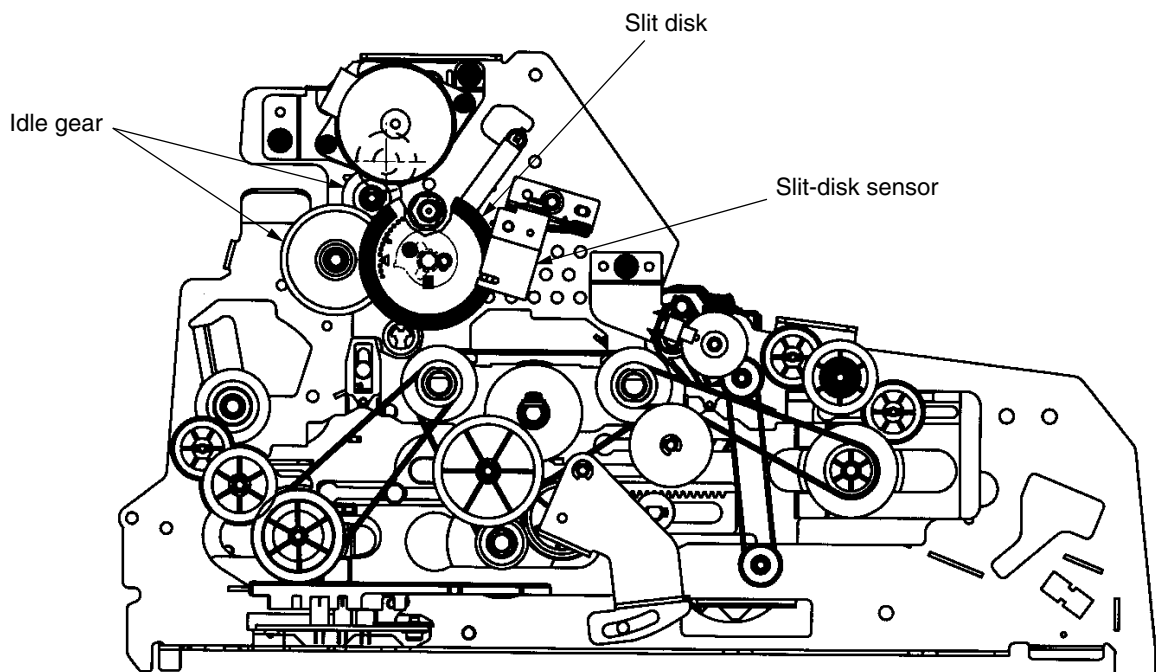## 12.3.4 Head Gap Adjustment Mechanism

There are two head gap adjustment mechanisms: the manual gap adjustment mechanism and the auto gap adjustment mechanism. The manual gap adjustment mechanism adjusts the gap between the print head and the platen according to the paper thickness through operation of a switch on the operating panel or a menu setting. The auto gap adjustment mechanism adjusts the gap automatically.

(1) Auto and Manual Gap Selection
Set the paper-thickness adjustment to [Auto] or [Manual] on the operating panel

(2) Manual Gap Adjustment Mechanism
Run the auto-gap motor to rotate the main shaft and move it up and down. Set the gap between the print head and the platen to the appropriate range for the paper thickness. The main shaft is directly linked to the gears and adjust cams. The main shaft is kept pulled up by the spring via the bracket.
When the gap is set to a range between 1 and E, the auto-gap motor runs to rotate the main shaft and the slide cam via the idle gear. The slide cam touches a roller. The distance between the slide cam and the roller is changed by the rotation, which moves the main shaft up or down. This increases or decreases the gap between the print head and the platen.
The rotation of the main shaft is controlled by the count of slit signals output from ϕ A and ϕ B of the slit sensor for the slit disk attached to the main shaft, which controls the up-and-down movement of the print head.
For better printing quality on NCR paper, the drive conditions of the print head for ranges 3 and above are different from those for the lower ranges, thereby increasing the printing force. The drive conditions are changed by detecting the number of slits in the main shaft.

Figure 12-6. Manual Gap Adjustment Mechanism

(3) Auto Gap Adjustment Mechanism

The auto gap adjustment mechanism adjusts the gap between the platen and the print head automatically according to the paper thickness.

When [Auto] is selected, the mechanism moves the print head up and down, and drives using a stepping motor. The print head first moves up, and then the auto gap adjustment motion begins.

The print head moves up when the power is turned on or when the printer goes offline, such as due to cover-open detection or paper end detection. The auto gap adjustment motion begins when the printer receives data online.

When the power is turned on or the printer goes offline, such as due to cover-open detection, the print head moves up to where the gap with the platen is larger than the paper thickness.

After the print head has moved up, the printer goes online. If the printer receives data, the stepping motor drives in the direction that decreases the gap between the print head and the platen. The rotation of the stepping motor is conveyed via idle gears and adjust cams, and it moves the main shaft to the platen (decreasing the gap).

When the sensor block touches the paper, it is bent, which changes the core gap of the auto gap sensor attached to the sensor block. When the change in the core gap is detected, the stepping motor stops rotation.

The stepping motor runs in the reverse direction for the specified number of steps, and then stops. This raises the print head, and an appropriate gap is left from the paper.

The main-shaft rotation is controlled by the count of slit signals output from ƒÓ A and ƒÓ B of the slit sensor for the slit disk attached to the main shaft, which controls the up-and-down movement of the print head.

The print head is moved up and down by the rotation of the adjust cams. The main shaft is kept pulled up by the spring.
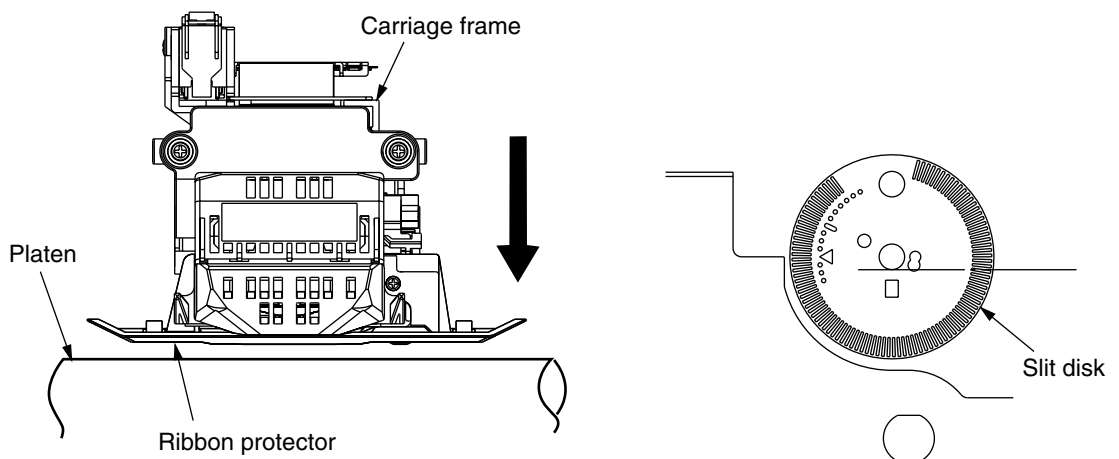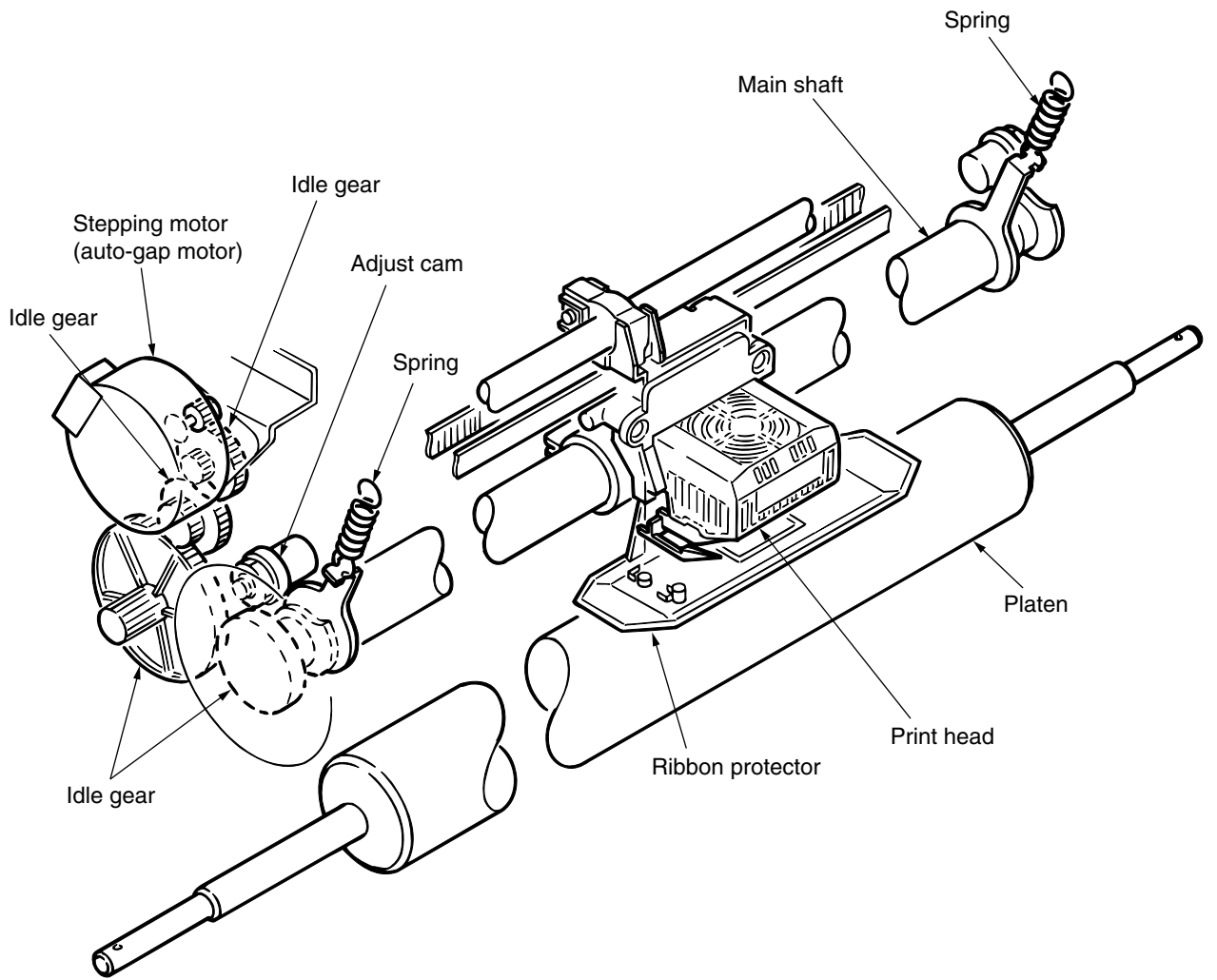
Spring

Main shaft

Idle gear

Stepping motor
(auto-gap motor)

Adjust cam

Idle gear

Spring

Platen

Print head

Idle gear

Ribbon protector

Carriage frame

Platen

Slit disk

Ribbon protector

Figure 12-7. Auto Gap Adjustment Mechanism

12.3.5 Paper Feeding (See Figures 12-8, 12-9, and 12-10.)

Line feeding is done by the rotation of the feed roller, platen, and sheet feeder, which are driven by a stepping motor.

(1) Paper Feeding

The stepping motor for line feeding is mounted on the left-hand frame.

The rotation of the stepping motor for line feeding is conveyed via the idle gear and the platen gear to the platen. (The platen is rotated at a reduced speed compared with the paper-feeding speed.)

The motor rotation is conveyed to the front tractor via the belt -> the pulley for cut sheets -> the front tractor belt.

The motor rotation is conveyed to the optional rear tractor via the belt -> the pulley for cut sheets -> the rear tractor belt -> the idle gear.

The printer is designed to feed paper by 4.23 mm every 30 steps of the stepping motor. The minimum feed rate is 0.07 mm, which equals 0.5 steps of the stepping motor.
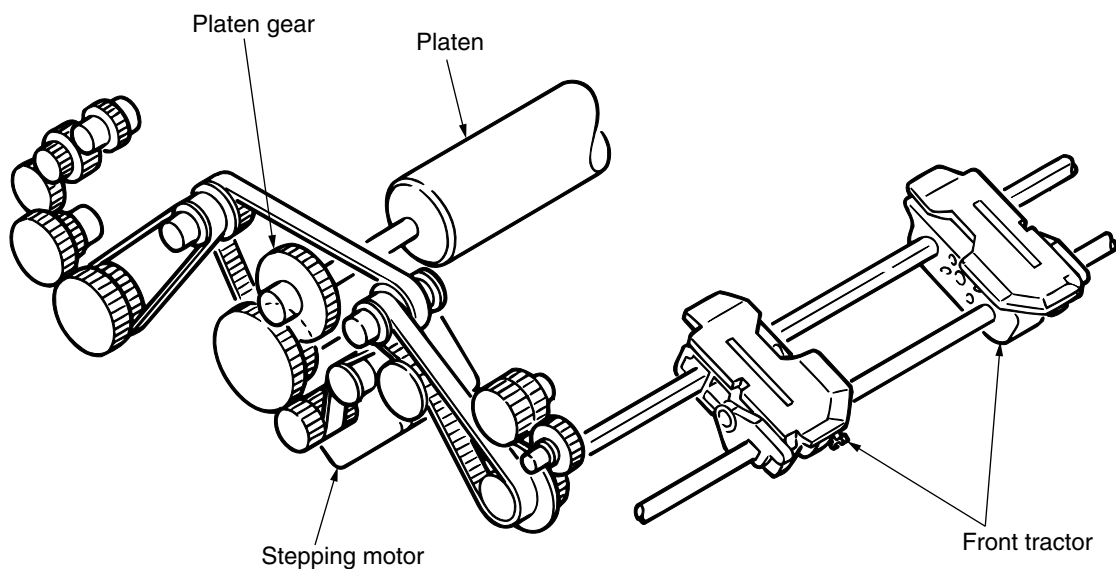
Figure 12-8. Continuous-Form Driving Mechanism (Front Tractor)

(2) Cut-Sheet/Continuous-Form Selector Mechanism

The selection of cut sheets and continuous forms is made by switch operation on the printer's operating panel. Press the paper-mode switch on the operating panel to select [MANUAL]. The cut-sheet/continuous-form selector motor begins to run and slides the mode rack, driving via the gears and shafts. This rotates the mode cam and raises the mode arm. The upper roller is pressed against the feed roller, and a cut sheet is fed.

When [XXXX tractor] is selected using the mode switch, the mode cam rotates to lower the mode arm and move up the upper roller, which releases the upper roller from the feed roller.

The change gear (rear) and the change gear (front) are pressed against the springs, and are slid by the concave and convex shape of the mode rack. In this way, the rotation of the LF motor is conveyed to the front tractor/rear tractor, and the printer can feed continuous forms.

When the switch for retracting continuous forms is pressed, the mode rack moves into the concave position. The mode arm lowers, moving up the upper roller. The upper roller is released from the feed roller and the continuous form is retracted.

There is a sensor at the rear of the mode rack. This sensor detects the position of the mode rack and sets the paper mode (medium mode).
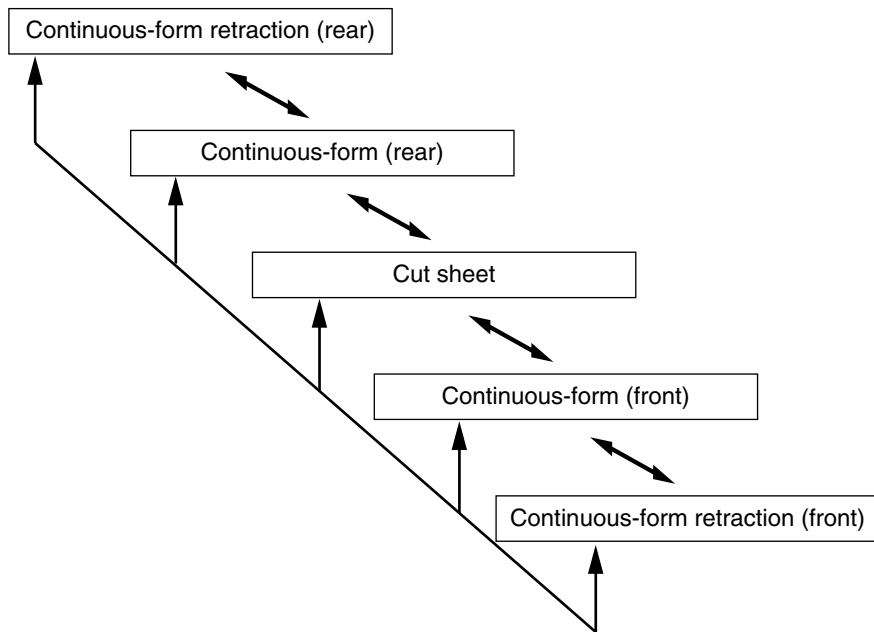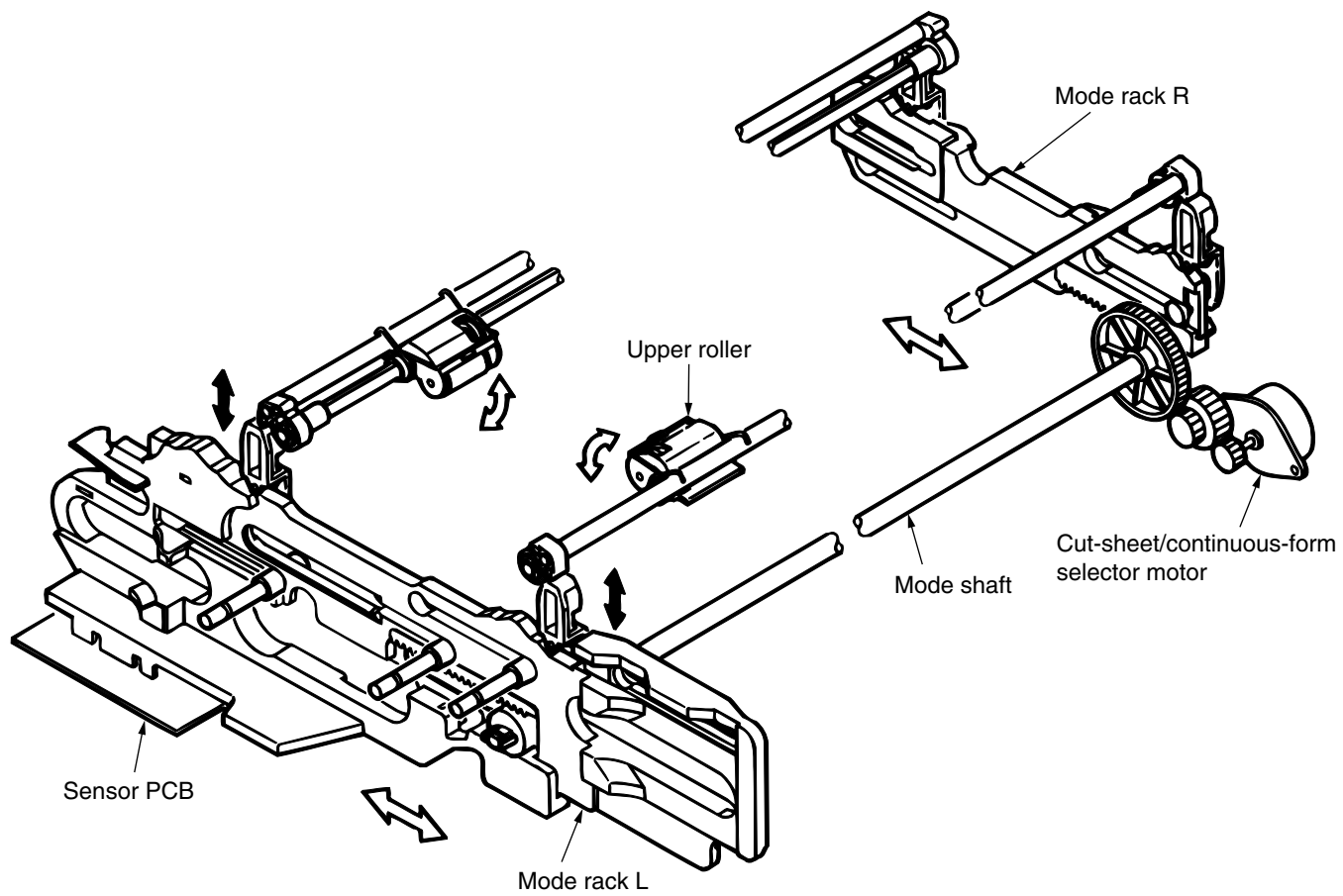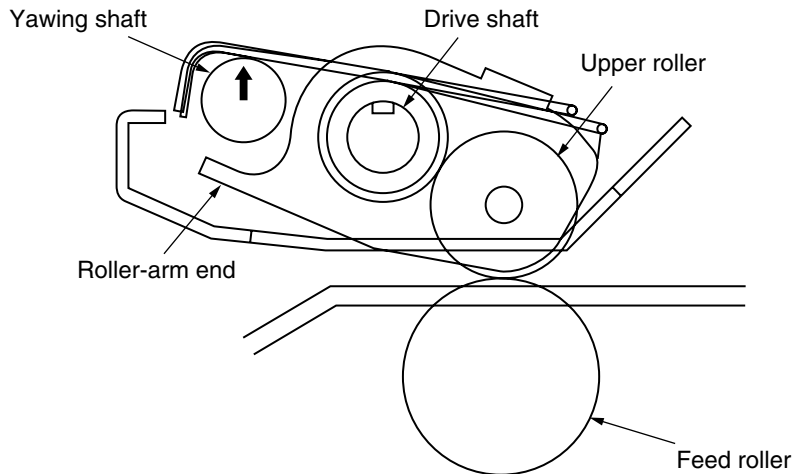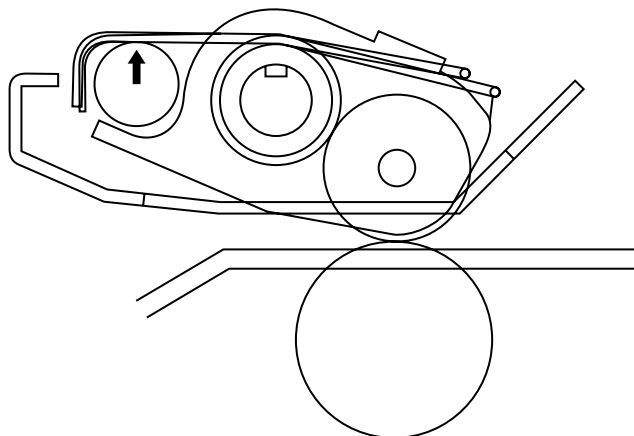
Mode rack R

Upper roller

Mode shaft

Cut-sheet/continuous-form
selector motor

Sensor PCB

Mode rack L

Continuous-form retraction (rear)

Continuous-form (rear)

Cut sheet

Continuous-form (front)

Continuous-form retraction (front)

Figure 12-9

Cut sheet

Yawing shaft   Drive shaft

Upper roller

Roller-arm end

Feed roller

Continuous form

Release

(Continuous-form retraction)
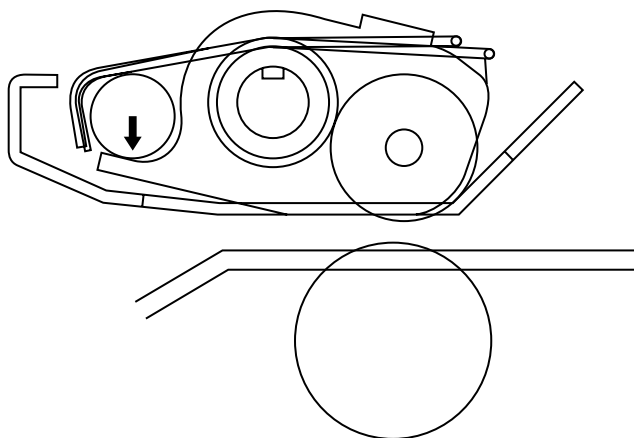
Figure 12-10. Positions of the Upper Roller

12.3.6 Paper End Detection Mechanism (See Figure 12-11.)

A reflective sensor is used to detect whether paper is loaded.

From the position detected by this sensor, the remaining amount of paper is calculated and paper end is detected in accordance with the menu setting.

When the front tractor, the front ASF, or the manual feed mode is selected, the front paper end (top) sensor is also used to increase the accuracy of paper end detection.

When the rear tractor or the rear ASF is used, the rear mechanical sensor is also used.
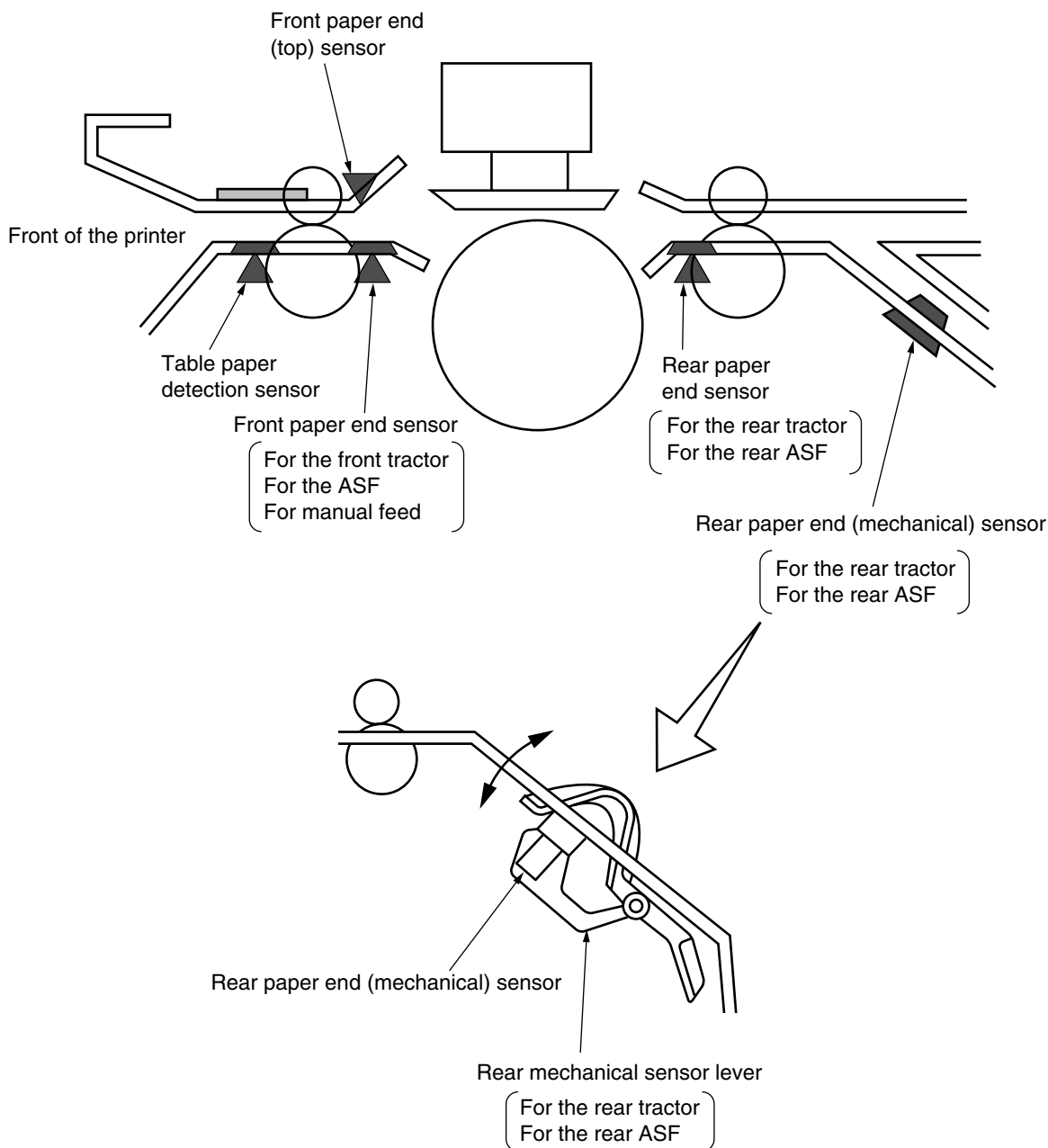
Figure 12-11. Paper End Detection Mechanism

12.3.7 Skew Correction Mechanism/Skew Detection Mechanism

The skew correction mechanism detects paper on the table, and presses the paper to the feed roller using the slip roller to automatically correct the skew of the paper (see figure 12-12).

Initially, the slip roller is in the retract position. The slip roller is rotated by the stepping motor. The roller is controlled by the transmissive sensor's monitoring of the slit position of the slit disk fastened at the end of the slip-roller shaft.

When paper is placed on the table, the slip roller rotates a certain amount depending on the number of table sensors that have detected the paper. The paper is fed towards the feed roller. When the paper touches the feed roller, the slip roller slips, thereby correcting the skew of the paper.
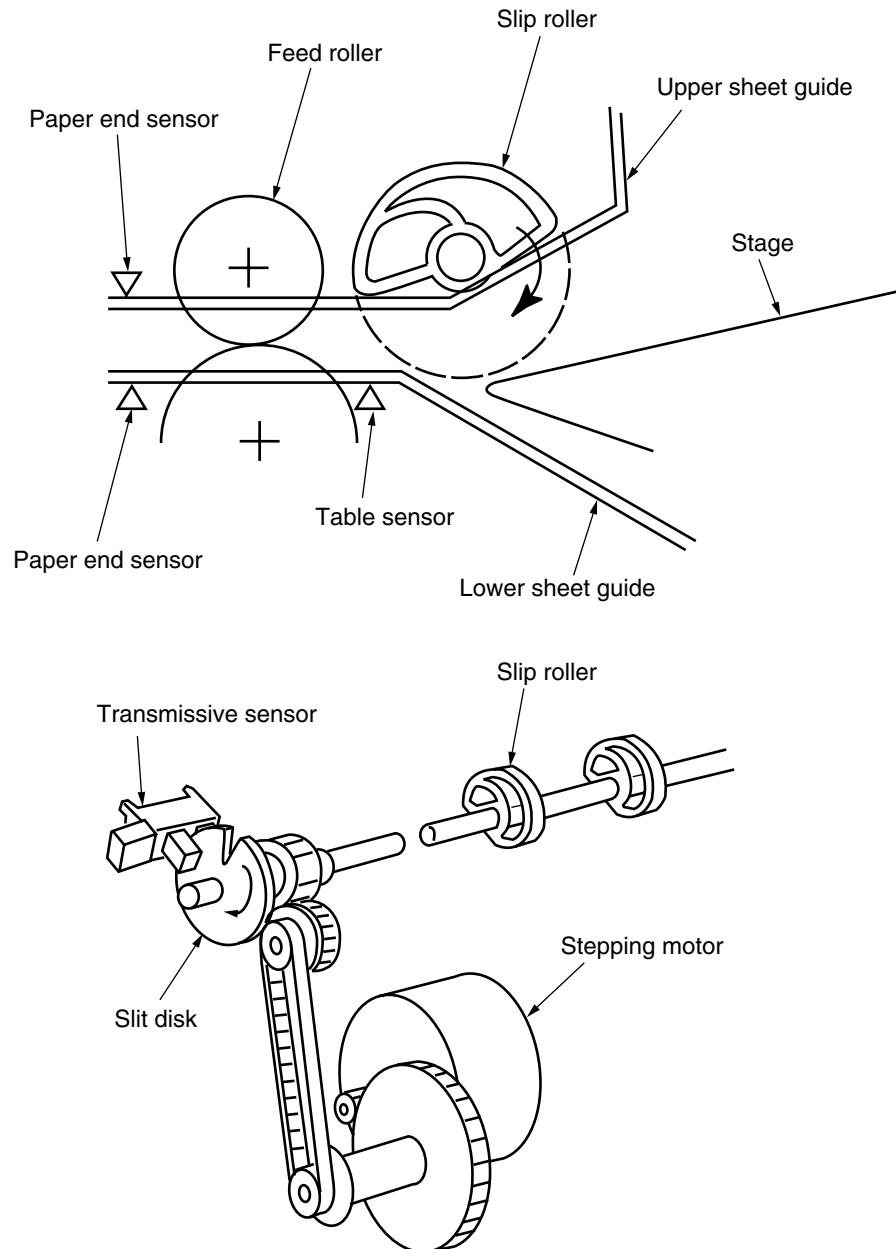
Figure 12-12. Skew Correction Mechanism

The skew detection mechanism detects skew of the paper by monitoring the leading edge of paper fed by the feed rollers using the seven paper end sensors (reflective sensors) mounted in parallel to the feed rollers (Figure 12-13).

If the skew is smaller than the level set on the menu (difference between reflective sensors), paper is loaded into the printer. If it is larger, paper is output onto the table.

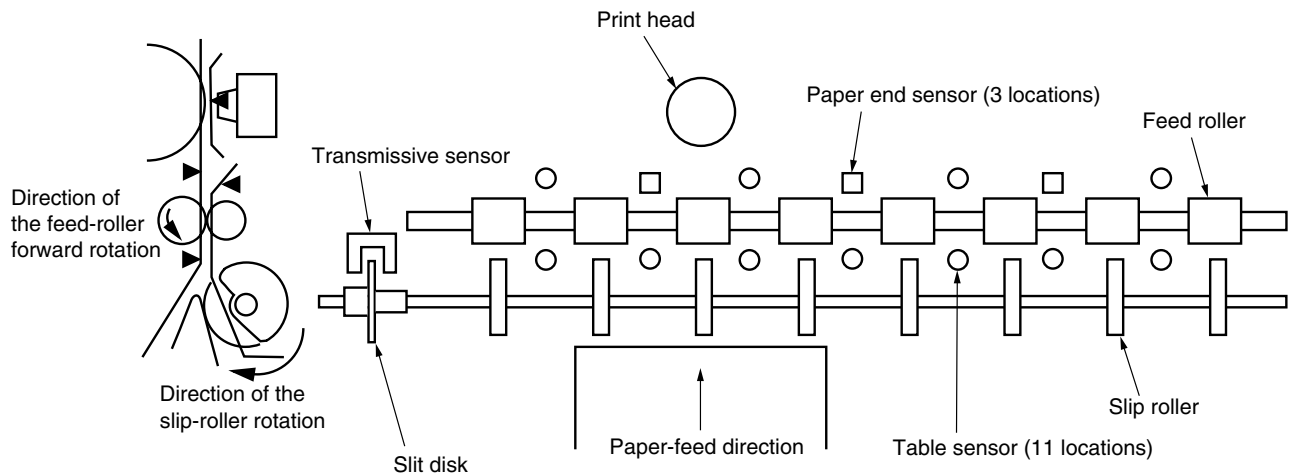If the printer is in the skew correction mode, it performs the skew correction motion again.

Figure 12-13. Skew Detection Mechanism