# IMPORTANT SAFETY NOTICES

## PREVENTION OF PHYSICAL INJURY

1. Before disassembling or assembling parts of the printer and peripherals, make sure that the power cord is unplugged.
2. The wall outlet should be near the copier and easily accessible.
3. If any adjustment or operation check has to be made with exterior covers off or open while the main switch is turned on, keep hands away from electrified or mechanically driven components.

## HEALTH SAFETY CONDITIONS

1. If you get ink in your eyes by accident, try to remove with eye drops or flush with water as first aid. If unsuccessful, get medical attention.
2. If you ingest ink by accident, induce vomiting by sticking finger down throat or by giving soapy or strong salty water to drink.

## OBSERVANCE OF ELECTRICAL SAFETY STANDARDS

1. The printer and its peripherals must be installed and maintained by a customer service representative who has completed the training course on those models.

## SAFETY AND ECOLOGICAL NOTES FOR DISPOSAL

1. Dispose of replaced parts in accordance with local regulations.
2. Used ink and master should be disposed of in an environmentally safe manner and in accordance with local regulations.

# SECTION 1

# OVERALL MACHINE INFORMATION

# 1. SPECIFICATION



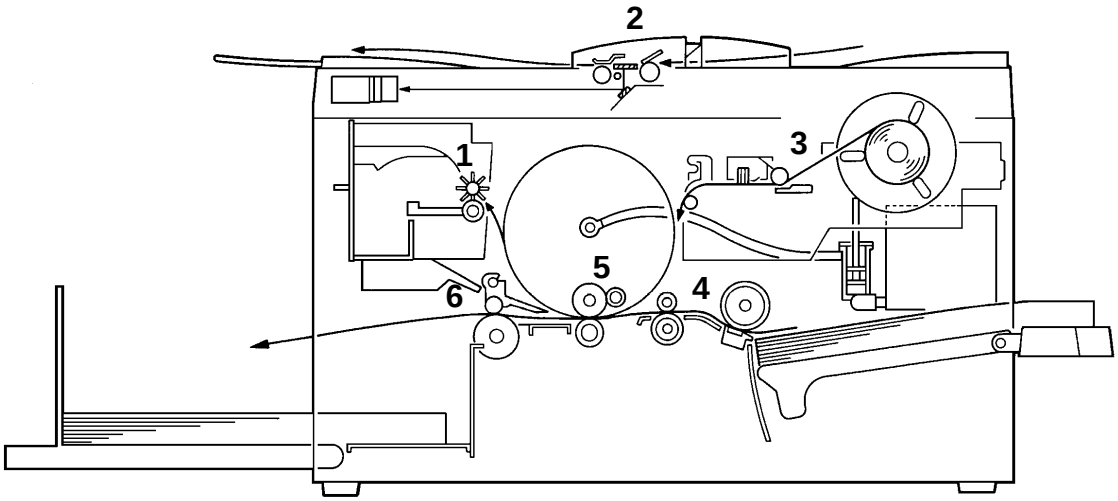
| | |
|---|---|
| Configuration: | Desk top |
| Master Making Process: | Digital |
| Printing Process: | Full automatic one drum stencil system |
| Image Mode: | Line/Photo |
| Original Type: | Sheet |
| Original Weight: | 64 g/m$^2$ ~ 104.7 g/m$^2$ (17.0 lb ~ 27.9 lb) |
| Original Size: | Max: 216 mm x 356 mm (8 1/2" x 14")<br>Min: 90 mm x 140 mm (3 1/2" x 5 1/2") |
| Paper Size: | Max: 216 mm x 356 mm (8 1/2" x 14")<br>Min: 90 mm x 140 mm (3 1/2" x 5 1/2") |
| Paper Weight: | 70 g/m$^2$ ~ 200 g/m$^2$ (18.6 lb ~ 53.2 lb) |
| Printing Area: | 210 mm x 349.6 mm (8.3" x 13.8") or less |
| Printing Speed: | 70/100/130 cpm (3 settings) |
| First Print Time: | 30 seconds ± 2 seconds |
| Leading Edge Margin: | 5 mm ± 2 mm (0.2" ± 0.08") |
| Trailing Edge Margin: | 1 mm ± 1 mm |
| Left Side Margin: | 5 mm ~ 10 mm (0.2" ~ 0.4") |
| Right Side Margin: | 5 mm ~ 10 mm (0.2" ~ 0.4") |
| Paper Feed Table Capacity: | 500 sheets (80 g/m$^2$, 20.0 lb) |
| Paper Delivery Table Capacity: | 500 sheets (80 g/m$^2$, 20.0 lb) |
| Master Eject Box Capacity: | More than15 masters |
| ADF Original Capacity: | 6 sheets or a 0.6 mm height |

| | |
|---|---|
| Weight: | 51 kg (112 lb) |
| Power Source: | 120 V 60 Hz more than 2.4 A (for North America)<br>220 V ~ 240 V 50/60 Hz more than 1.5 A (for Europe, Asia.) |
| Power Consumption: | Master Making: Less than 0.16 kW<br>Printing: Less than 0.16 kW |
| Dimensions:<br>(W x D x H) | [Stored] 692 mm x 612 mm x 440 mm<br>(26.2" x 24.1" x 17.3")<br>[Set up] 1050 mm x 612 mm x 440 mm<br>(41.3" x 24.1" x 17.3") |
| Pixel Density: | 300 dpi |
| Print Counter: | 7 digits |
| Master Counter: | 6 digits |
| Noise Emission:<br>(Sound Pressure level*)<br>*= The measurements are to be made according to ISO7779, respectively. | Less than 70 dB<br>Master Making: 54 dB<br>Printing: 70 cpm: 62 dB<br>100 cpm: 64 dB<br>130 cpm: 68 dB |
| Optional Equipment: | Key Counter, Tape Dispenser |

Consumables:

| Name | Size | Remarks |
|---|---|---|
| Thermal master | Length: 125 m (410 ft)/roll<br>Width: 240 mm (9.5) | 255 masters can be made per roll.<br>Storage Conditions:<br>--10 ~ 40°C, 10 ~ 90% RH |
| Ink | 500 cc/pack | Storage Conditions:<br>--5 ~ 40°C, 10 ~ 90% RH |
| Tape for tape maker | 35 m (114.8 ft)/roll | |
| Thermal head cleaner | Cleaner pen -- 1pc<br>Replacement felt -- 10 pcs<br>Cleaner bottle -- 1 pc | Clean the thermal head using the cleaner when 2 master rolls have been used. |

# 2. PRINTING PROCESS




1. Master Ejecting: Ejects the used master wrapped around the drum into the master eject box.

2. Scanning: Scans the original image with the CCD through the mirror and the lens while feeding the original.

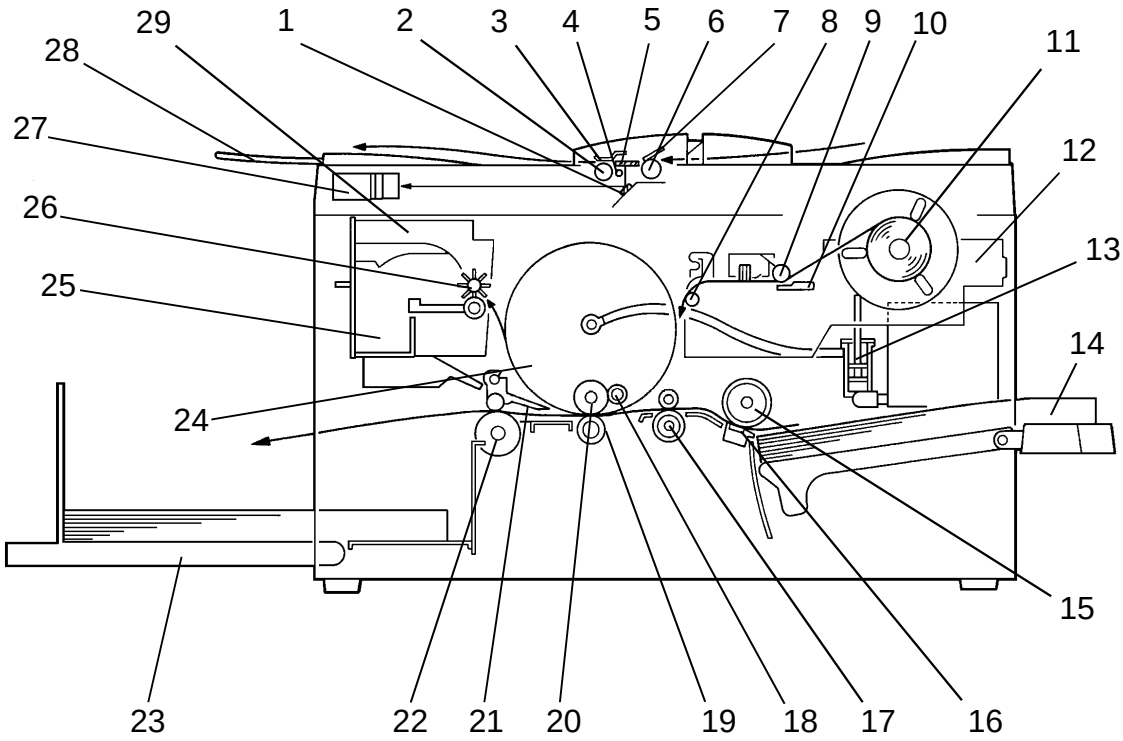
3. Master Feeding: Converts the image signal read by the CCD into digital signals and sends them to the thermal head to plot holes on the master. The master then wraps around the drum.

4. Paper Feeding: Sends paper separately to the drum section.

5. Printing: Presses the paper fed from the paper feed section to the drum. This transfers the ink to the paper through the drum screen and the master.

6. Paper Delivering: Peels the printed paper with the exit pawls and air knife, and ejects the paper onto the paper delivery table.

# 3. MECHANICAL COMPONENT LAYOUT




1. Mirror
2. Original Feed Roller
3. Original Pressure Plate
4. Exposure Lamp
5. Exposure Glass

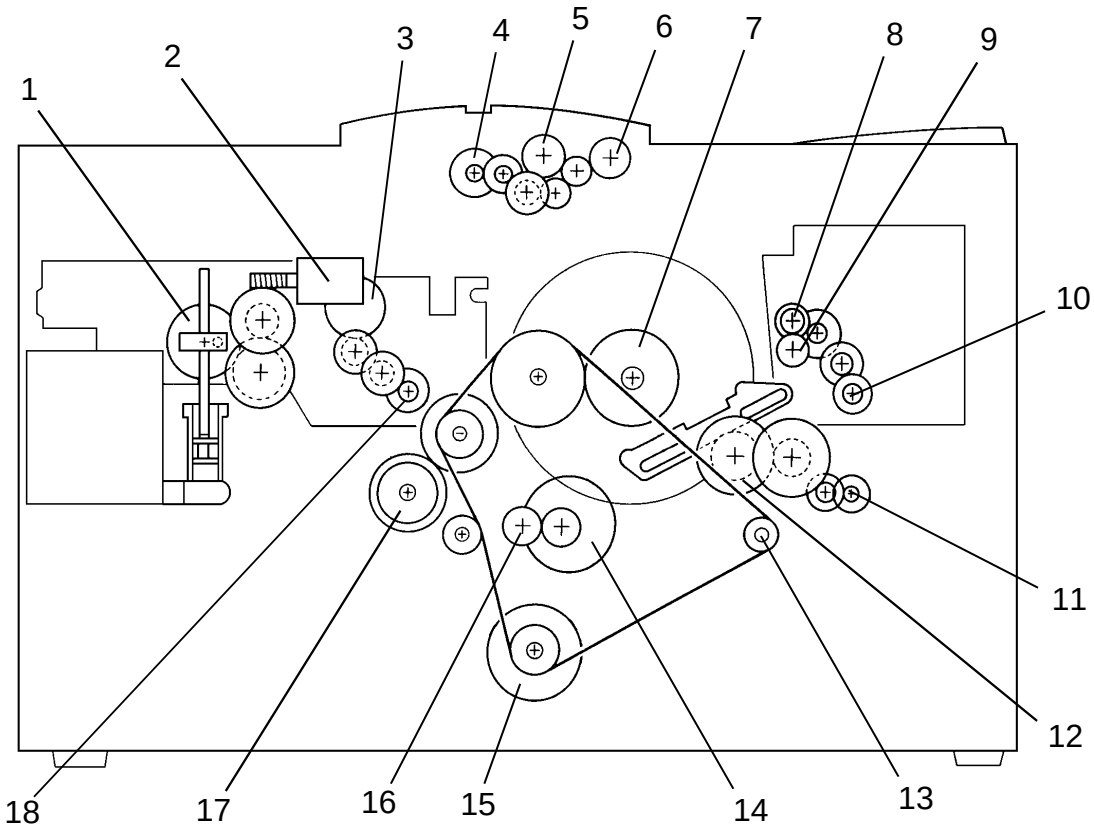
6. Original Friction Pad
7. Original Pick-up Roller
8. Master Tension Roller
9. Ploten Roller
10. Thermal Head

11. Master Roll
12. Platter Unit
13. Ink Pump
14. Paper Table
15. Paper Feed Roller
16. Friction Pad
17. 2nd Feed Roller
18. Doctor Roller
19. Press Roller
20. Ink Roller

21. Exit Pawl
22. Exit Roller
23. Paper Delivery Table
24. Drum
25. Master Eject Box

26. Master Eject Roller
27. CCD Unit
28. Original Exit Tray
29. Master Eject Unit

# 4. DRIVE LAYOUT




1. Pump Drive Gear
2. Ink Supply Motor
3. Platen Roller Gear
4. Original Feed Motor
5. Original Pick-up Roller
6. Original Feed Roller
7. Drum Drive Gear
8. Upper Master Eject Roller Gear
9. Lower Master Eject Roller Gear
10. Master Eject Motor
11. Master Clamper Motor
12. Master Clamper Drive Gear
13. Exit Roller Pulley
14. 2nd Feed Motor
15. Main Motor
16. 2nd Feed Roller Gear
17. Paper Feed Roller Gear
18. Master Feed Motor

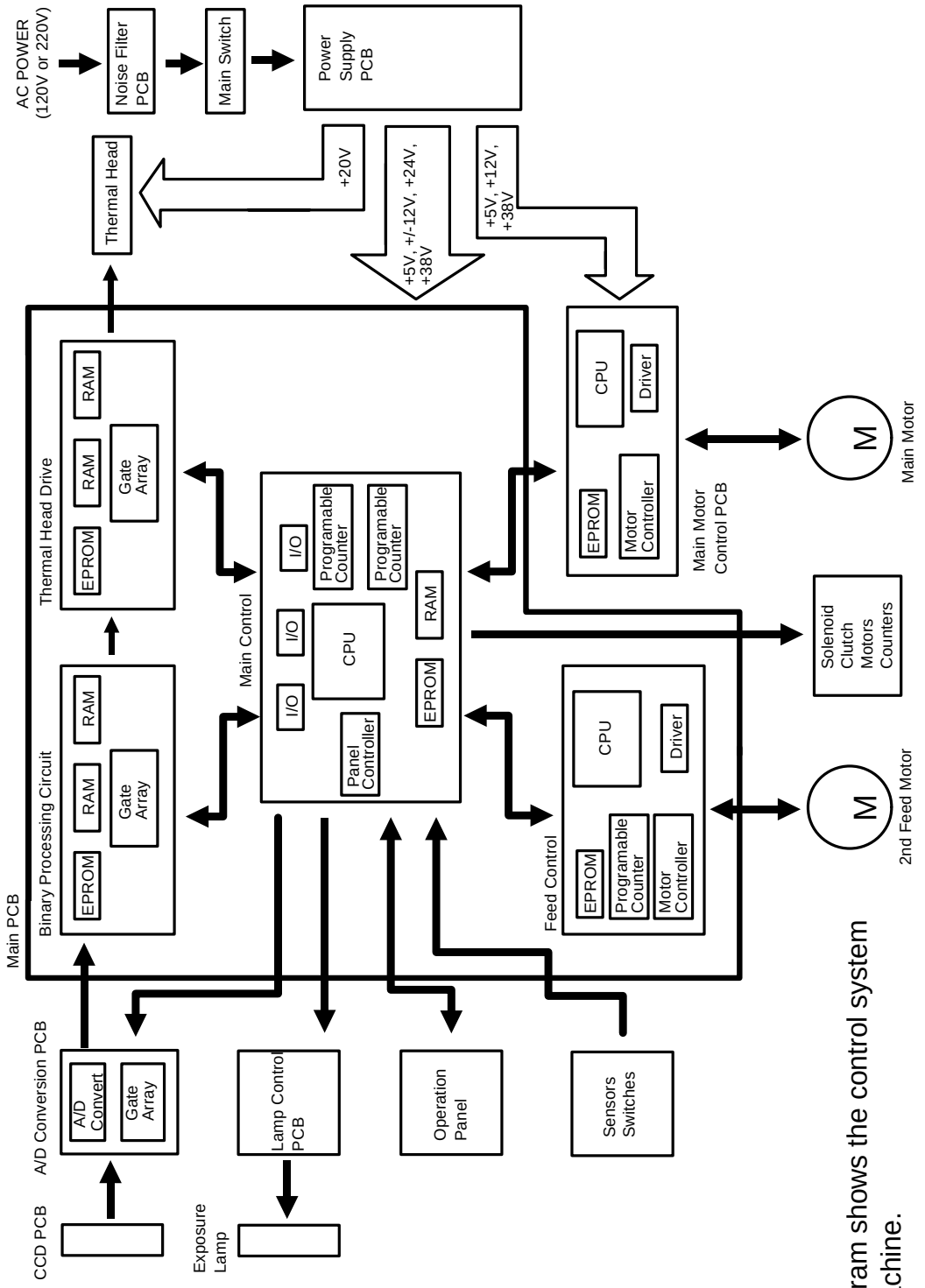
# 5. ELECTRICAL COMPONENT DESCRIPTION

| Index No. | Name | Function | P to P Location |
|---|---|---|---|
| **Motors** | | | |
| 11 | Master Feed | Feeds the master to the drum. | F-5 |
| 38 | Pressure Plate | Drives the pressure plate. | F-6 |
| 27 | Main | Drives paper feed, drum, printing and paper delivery unit components. | F-2 |
| 30 | 2nd Feed | Drives the 2nd feed roller. | B-7 |
| 33 | Master Clamper | Open and closes the master clamper. | B-7 |
| 36 | Air Knife | Rotates the fun to separate the paper from the drum. | B-7 |
| 24 | Master Eject | Sends used master into the master eject box. | F-6 |
| 43 | Original Feed | Transports the original for scanning. | A-3 |
| 44 | Master Cutter | Cuts the master. | F-4 |
| 47 | Ink Supply | Drives ink pump to supply ink. | B-6 |
| **Solenoid** | | | |
| 29 | Pressure Release Solenoid | Releases the press roller to apply printing pressure. | B-6 |
| **Sensors** | | | |
| 1 | Master End | Detects if the plotter unit runs out of master roll. | F-4 |
| 3 | Original Registration (Upper: light receiver, Lower: light emitter) | Informs the CPU of the original position. Also, detects original misfeed. | A-2 A-3 |
| 13 | Feed Jam Timing | Determines the paper misfeed check timing. | F-7 |
| 14 | Paper End | Detects if the paper is set on the paper table. | F-7 |
| 15 | Registration | Detects paper misfeeds. | F-7 |
| 16 | Feed Start Timing | Determines the paper feed start timing. | F-7 |
| 17 | Exit Jam Timing | Determines the master misfeed check timing. | F-8 |
| 18 | Master Eject Position | Detects master eject position of the drum. | F-7 |
| 25 | Drum Master | Detects if the master is on the drum. | F-8 |
| 28 | Exit | Detects paper misfeeds. | F-8 |
| 31 | Master Eject | Detects used master misfeeds. | F-6 |
| 35 | Full Master | Detects if the master eject box is full. | F-6 |
| 37 | Pressure Plate H.P. | Detects the pressure plate home position. | F-6 |
| 46 | Original Set | Detects if the original is set on the original table. | A-3 |
| **Switches** | | | |
| 5 | ADF Open | Check if the ADF is open. | A-3 |
| 6 | Left Cutter | Determines the left limit position of the cutter. | F-5 |
| 9 | Master Cut | Starts the cutter motor to cut the master. | F-5 |
| 20 | Scanner Unit Open | Checks if the scanner unit is open. | F-1 |
| 21 | Delivery Cover Open | Checks if the delivery cover is open. | F-1 |
| 22 | Main | Turns the power on or off. | B-1 |
| 26 | Master Eject Box | Checks if the master eject box is set correctly. | F-1 |

| Index No. | Name | Function | P to P Location |
|---|---|---|---|
| 34 | Master Clamper | Detects the master clamper open/close position. | F-8 |
| 45 | Right Cutter | Determines the right limit position of the cutter. | F-5 |
| **Printed Circuit Board** | | | |
| 4 | Lamp Control | Controls the power to the exposure lamp. | A-2 |
| 8 | Operation Panel | Interfaces the CPU and a operator. | B-5 |
| 12 | Main | Controls all machine functions. | C-5 |
| 19 | Power Supply | Provides power for all DC components. | D-1 |
| 23 | Main Motor Control | Controls the main motor speed. | F-2 |
| 32 | Noise Filter | Filters electrical noise on the AC power input lines. | A-1 |
| 39 | CCD | Converts light intensity into an electrical signal. | A-5 |
| 40 | A/D Conversion | Converts the analog signals into digital signals. | A-4 |
| **Counters** | | | |
| 7 | Print | Keeps track of the total number of prints made. | F-5 |
| 10 | Master | Keeps track of the total number of masters made. | F-5 |
| **Others** | | | |
| 2 | Thermal Head | Plots the master using heat. | E-2 |
| 41 | Paper Feed Clutch | Transmits the main motor drive to the paper feed roller at an appropriate timing. | B-6 |
| 42 | Exposure Lamp | Applies light to the original for exposure. | A-2 |

The index numbers of the electrical components correspond to the Electrical Component Layout on the reverse side of the Point To Point Diagram enclosed with this manual.

# 6. OVERALL MACHINE CONTROL



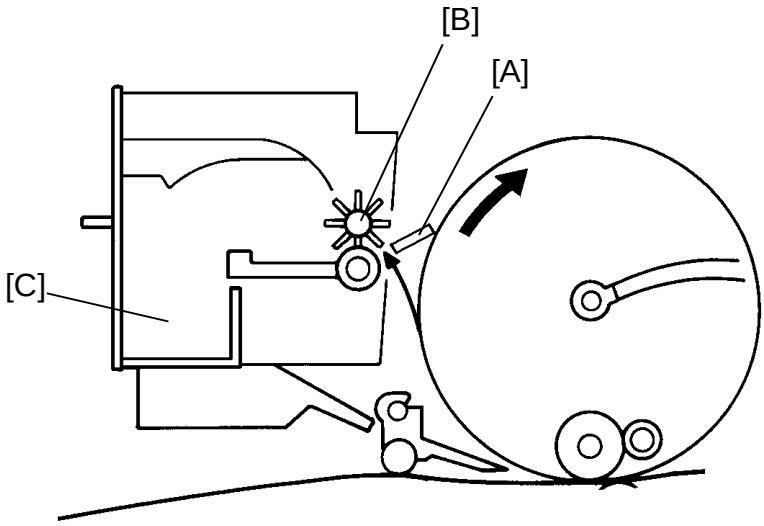

This diagram shows the control system of the machine.

# SECTION 2

# DETAILED SECTION DESCRIPTIONS

# 1. MASTER EJECT

## 1.1 OVERALL





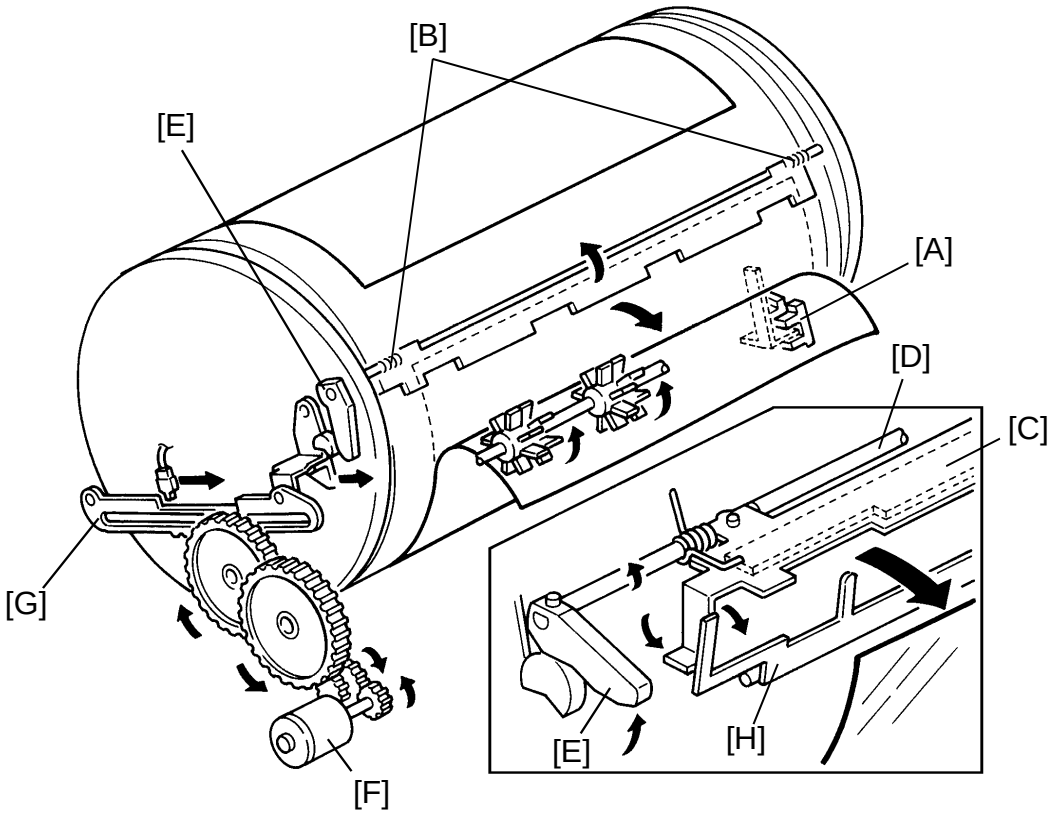

At the end of the printing cycle, the used master remains wrapped around the drum to prevent the ink on the drum surface from drying. When the Master Making key is pressed to make a new master, the used master is removed from the drum.

The machine checks if the drum is at the master eject position and if the master is on the drum by the drum master sensor. The master clamper [A] then opens to eject the master. If there is no master on the drum, the machine skips the master eject operation and starts the master making process.

The master eject rollers [B] turn for 0.5 seconds to pick the master's leading edge. After closing the master clamper, the drum starts rotating in the slowest speed (30 rpm). At the same time the master eject rollers turn and feed the used master into the master eject box [C].

When the drum stops at the master feed position after one and a half turns, the pressure plate drive motor starts turning to compress the used master in the master eject box.

## 1.2 MASTER CLAMPER OPEN MECHANISM



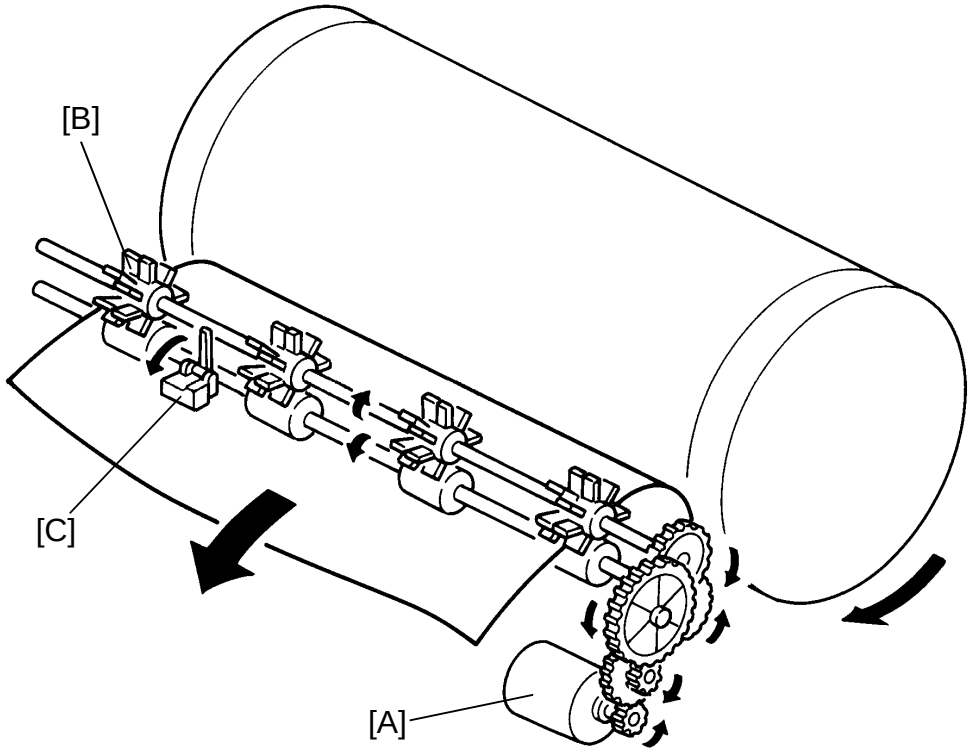

The master eject position sensor [A] is used to confirm that the drum is positioned at the master eject position when the Master Making key is pressed. Normally, the drum is stopped at this position after every print job. If the drum is not at this position, the machine first moves the drum to the master eject position before opening the master clamper.

The master clamper has two springs [B] and a magnet plate [C] to secure the master's leading edge in the clamper. The clamper is fixed on the clamper shaft [D] which has a lever [E] at the rear side.

The clamper motor [F] drives the moving link [G] and pushes up the clamper lever [E].

The master clamper then lifts the master eject arm [H] to release the master's leading edge from the clamper.

## 1.3 MASTER EJECT ROLLER MECHANISM






The master eject rollers are driven by the master eject motor [A] through idle gears. The upper eject roller [B] has paddles to assure the master pick-up.

When the master clamper is opened and the master's leading edge is released from the master clamper, the master eject motor turns on for 0.5 seconds to pick up the leading edge.

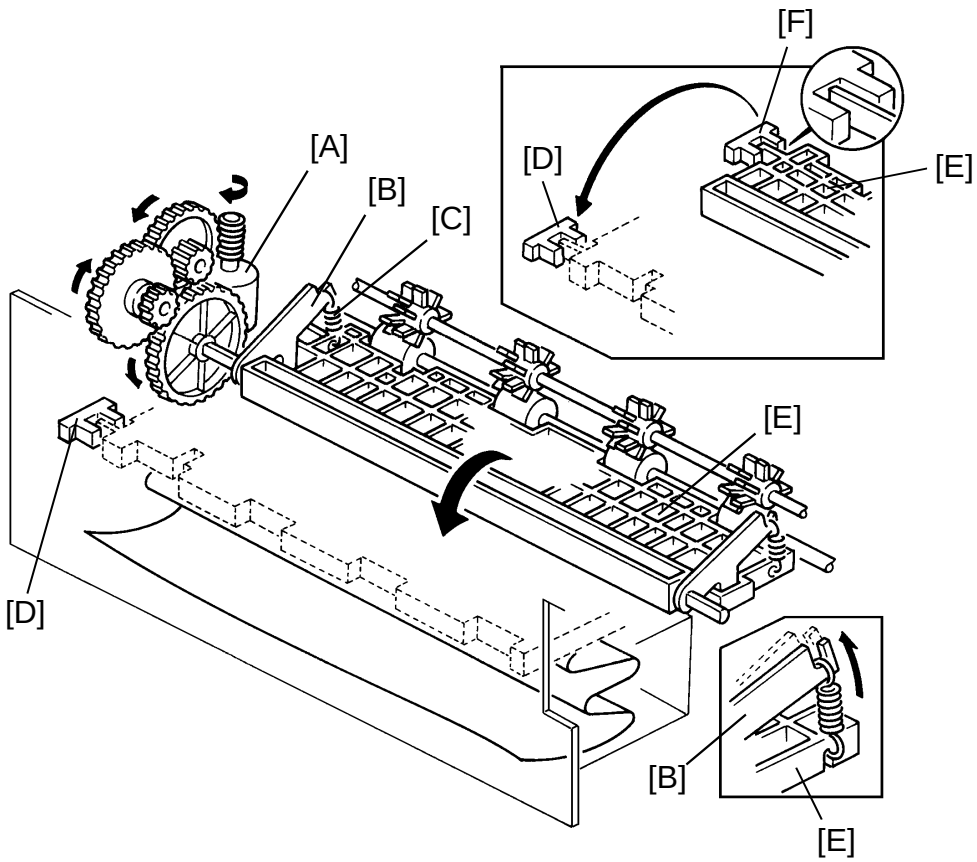
When the master eject motor is turned off, the master clamper motor turns in reverse direction to close the master clamper.

The drum then starts turning at the slowest speed (30 rpm). At the same time, the master eject rollers turn again to feed the master into the master eject box.

After one turn of the drum, the master eject motor stops.The drum continues turning for a half turn and stops at the master feed position.

The master eject sensor [C] is used to detect the master eject jams.

## 1.4 PRESSURE PLATE MECHANISM



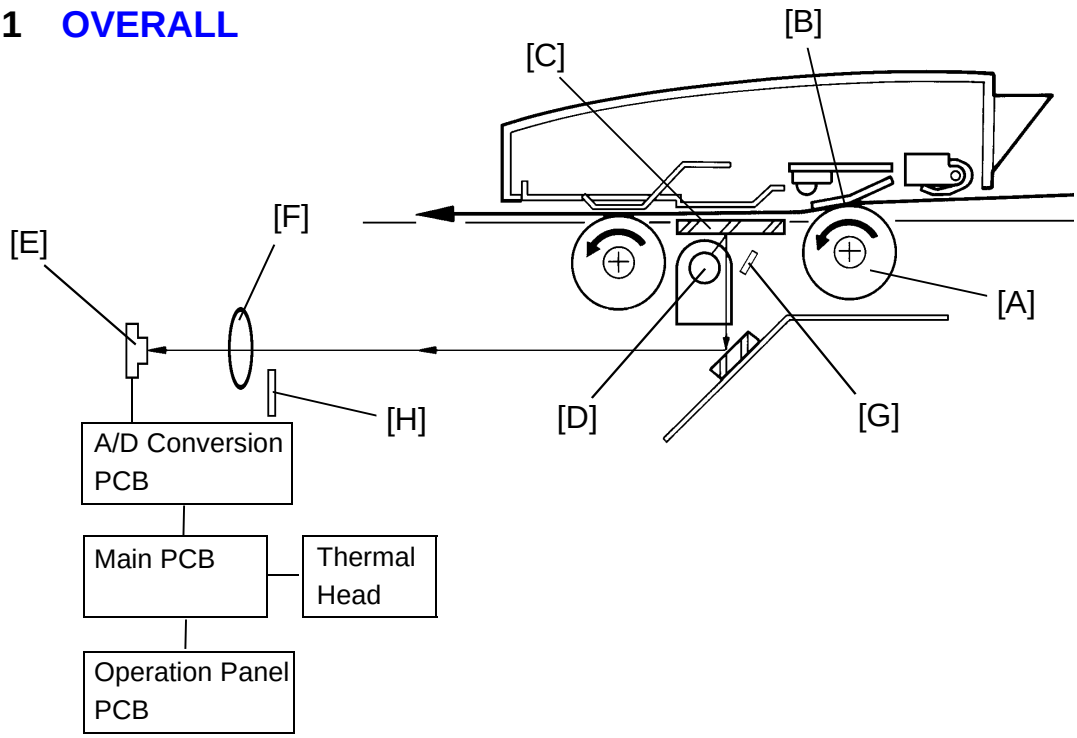

The pressure plate motor [A] drives the pressure plate through the drive arm [B] and the pressure springs [C].

When the master has been ejected into the master eject box, the pressure plate motor turns until the full master sensor [D] is actuated by the actuator on the pressure plate [E]. When the full master sensor is actuated, the motor stops. When master making and cutting are completed, the motor turns in reverse to return the pressure plate to the home position. When the pressure plate home position sensor [F] is actuated, the motor stops.

If the full master sensor is not actuated within 2.4 seconds after the pressure plate motor is activated, the machine stops the motor and the Empty Master Eject Box indicat or blinks, after the next master making has finished and the drum is positioned at the master exit position (drum home position).

# 2. SCANNER AND OPTICS SECTION

## 2.1 OVERALL

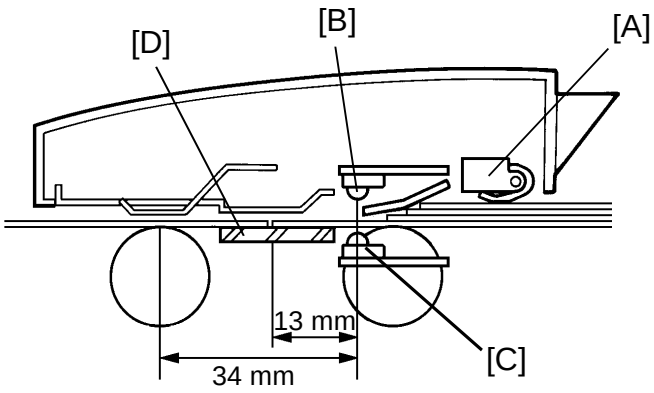



The first original at the bottom of the stack on the original table is separated from the other originals by the original pick-up roller [A] and the original friction pad [B], and is fed onto the exposure glass [C]. The scanning start when the original is transported 5mm from the scan line. The master plotting is synchronized with the original feeding.

The light of the exposure lamp [D] is reflected from the original and goes to the CCD [E] through the lens [F]. The reflector [G] counters shadows from the edges of cut-and-paste originals. A shading plate [H] installed between the mirror and the lens cuts some of the light to correct uneven light intensity between the center and both ends of the lamp.

The light is changed to an electrical signal in each element of the CCD. The analog signals from the CCD are converted into 4-bit digital signals in the A/D conversion PCB and sent to the main PCB in which each digital data is converted into 1-bit data. The main PCB holds the 1-bit data for each pixel. The PCB uses the data to drive the thermal head which burns each pixel onto the master.

## 2.2 ORIGINAL FEED MECHANISM



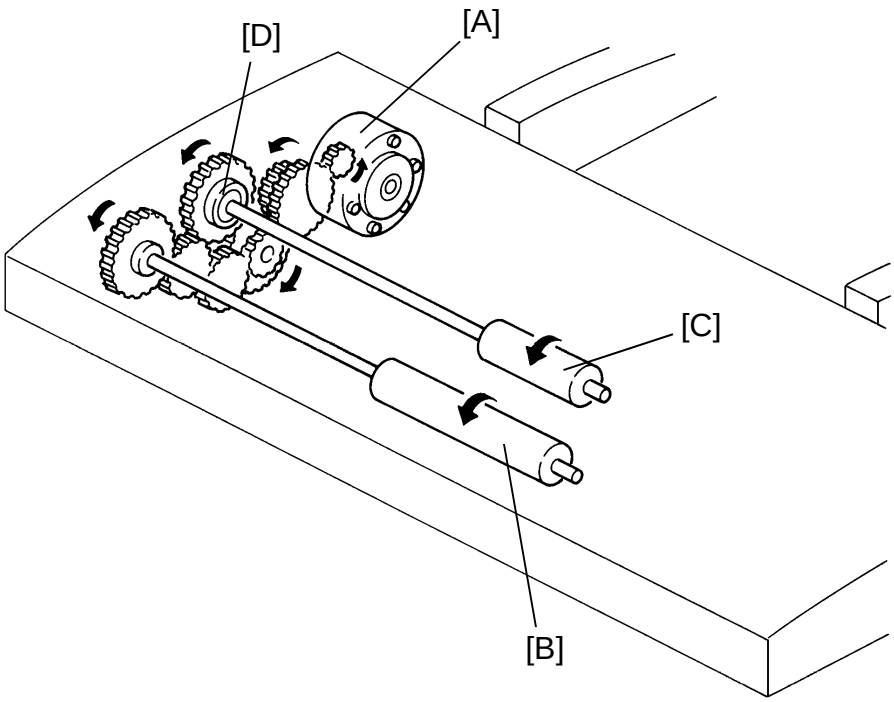

The originals set on the original table are detected by the original set sensor [A]. A photo-transister [B] in the upper position and a LED [C] in the lower position organize the original registration sensor.

After the master on the drum is ejected to the master eject box, the original feed motor (stepper motor) starts rotating to feed the original to the exposure glass [D]. When the original is transported 13 mm past the original registration sensor, the original feed motor stops. At this time the original leading edge is aligned with the CCD scan line on the exposure glass. The original feed motor starts again synchronizing with the master feed.

The original pick-up roller keeps rotation after the original trailing edge passes the roller, so if a 2nd original present, it follows directly after the trailing edge of the 1st original.

After the 1st originals trailing edge is detected and transported 12 mm past the original registration sensor, the original set sensor checks whether the next original is present. If no original is detected, after the original trailing edge passes the original registration sensor, the original is transported further 35 mm (34+1) and fed out. If the next original is detected, the originals are transported 1 mm further to align the 2nd original leading edge with the scan line (the 2nd original has been transported total 13 mm from the original registration sensor), then the original feed motor stops. After printing of the 1st original is completed, the original transport motor starts again for the next original.

## 2.3 ORIGINAL FEED DRIVE MECHANISM



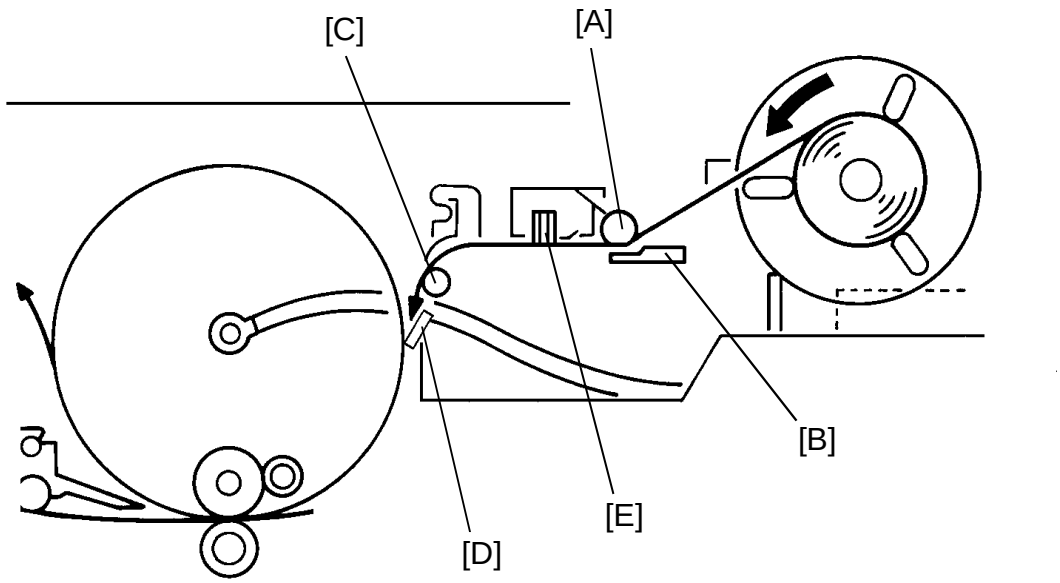



The pick-up roller and the original feed roller are driven by the original feed motor [A] (stepper motor) through gears.

The original feed roller [B] diameter is a little bit larger than the original pick-up roller [C], so that a small gap is made between the continuous originals while being transpoted. A one-way clutch is installed in the pick-up roller gear [D] to absorb the speed difference between the pick-up roller and the original transport roller.

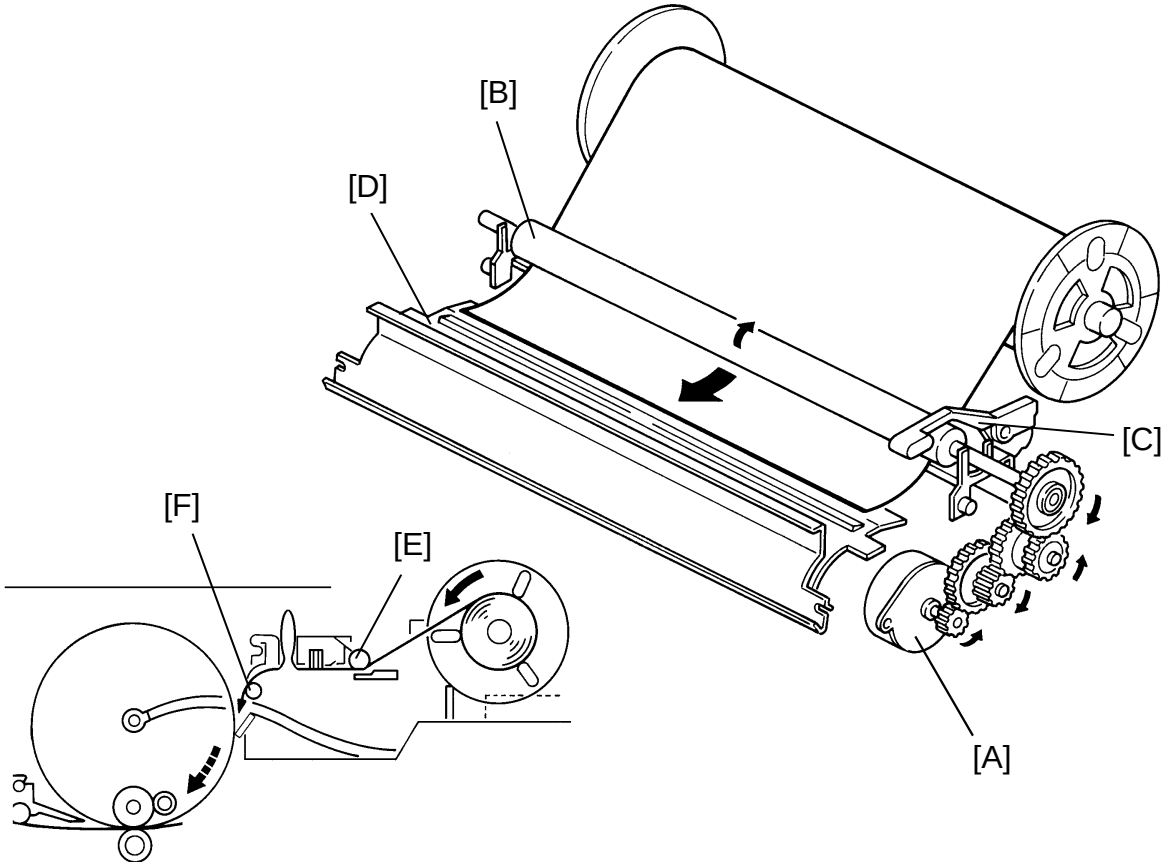
# 3. MASTER FEED

## 3.1 OVERALL




The master is fed by the platen roller [A] on the thermal head [B]. When the drum is at the master feed position and the master clamper is opened, the tension roller [C] is released by the master clamper so that the master's leading edge is fed to the master clamper [D]. The leading edge of the master is clamped by the master clamper, and the master is wrapped around the drum and cut by the cutter [E] to the desired length.

## 3.2 MASTER FEED MECHANISM



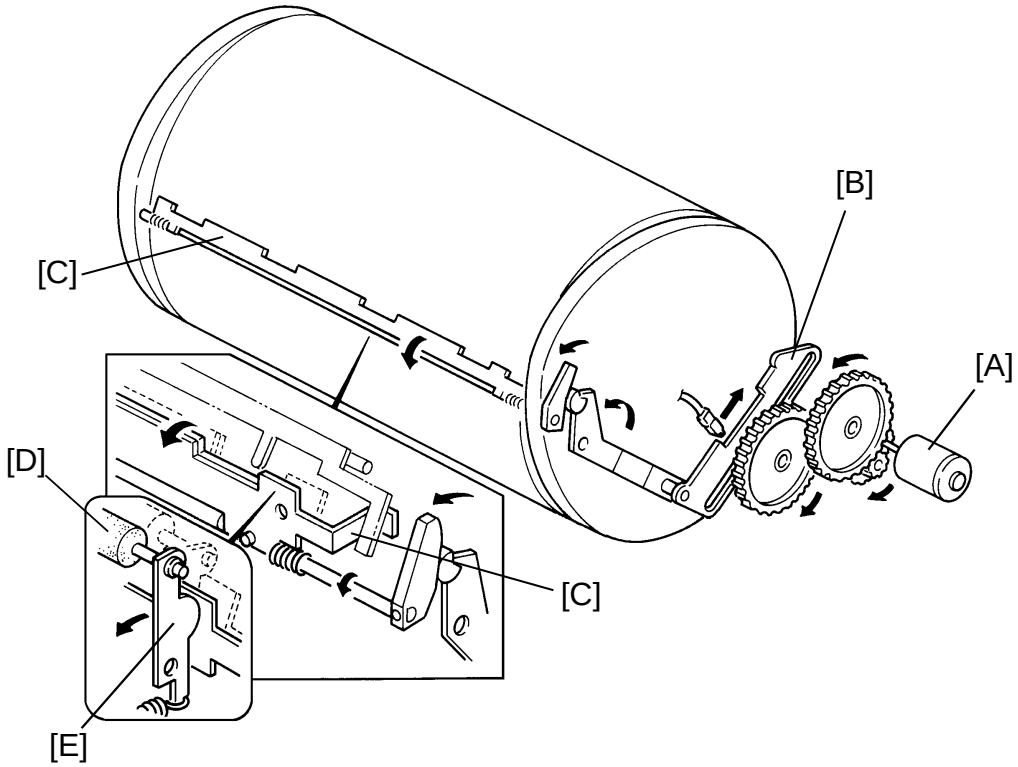

A stepper motor is used as the master feed motor [A] to drive the platen roller [B]. The thermal head is pressed against the platen roller by the pressure springs. The pressure can be released by the pressure release lever [C] for master roll replenishment.

After the master eject is finished, the drum is stopped at the master feed position and the master clamper is opened for the new master.

The master's leading edge is stopped on the guide plate [D] after the last master cut or after the manual master cut. The master is fed for 23 mm and stopped once to synchronize with the original feed. The master is fed for a further 67.5 mm before the master clamper is closed. Since the clamper closing timing is later than when the master's leading edge reaches the clamper, a master buckle [E] is made on the master feed guide. This master buckle absorbs the shockwave from the master clamping operation.

The drum then turns intermittently in the slowest mode (30 rpm) to wrap the master around the drum. The intermittent rotation keeps the master backle on the master feed guide to absorb the shockwave from the wrapping operation. The tension roller [F] is pressed to the guide plate which gives the tension to the master during the master wrapping operation.

## 3.3 MASTER CLAMPER OPERATION AND TENSION ROLLER RELEASE MECHANISM

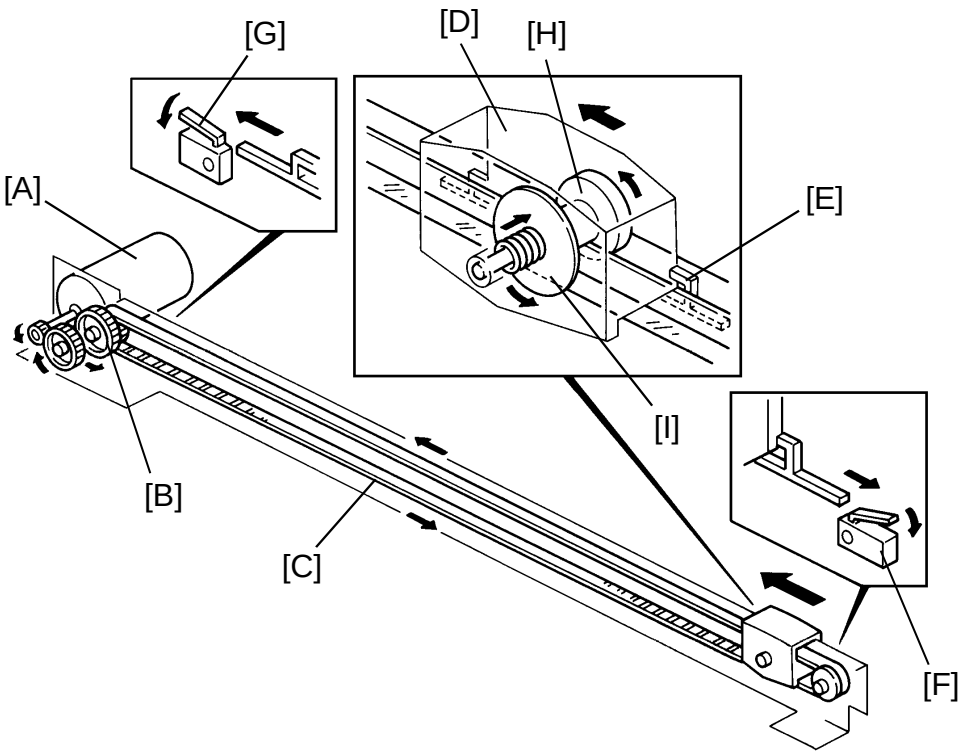



When the master eject is completed, the drum is stopped at the master feed position. At this time, the clamper motor [A] drives the moving link [B] to open the master clamper [C].

The friction roller [D] is normally pressed against the master feed guide plate to give tension to the master during the master wrapping operation. When the clamper is opened, the clamper pushes the friction roller arms [E] and releases the friction roller from the guide plate to allow the master to be fed into the master clamper.

To close the master clamper, the clamper motor turns in reverse direction.

## 3.4 CUTTER MECHANISM






After the master making process is finished, the master feed motor turns off and the cutter motor [A] starts turning.

The cutter motor drives the pulley [B] and the timing belt [C]. The cutter holder [D] is fixed on the timing belt and has switch actuators [E].

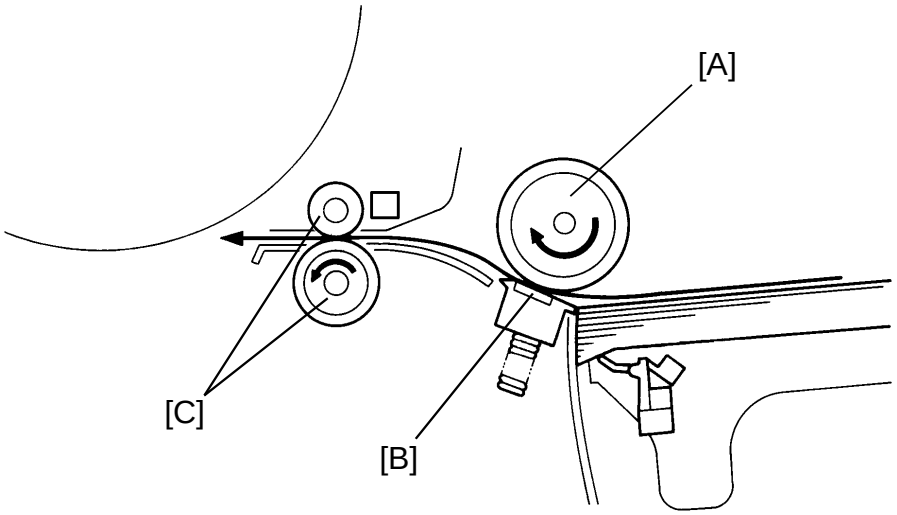
There are two cutter position switches at the front [F] and the rear [G] of the cutter rail. When the cutter holder actuates one of these switches at the end of cutter holder drive operation, the cutter motor is turned off.

The inner roller [H] on the shaft of the rotary cutter blade [I] is touching the cutter rail, so that the cutter blade is rotating while the cutter holder is moving.

After the master cut operation, the drum starts turning again to wrap the remaining part of the master around the drum. At the same time, the master is fed another 32.6 mm ready for the next master making.

# 4. PAPER FEED SECTION

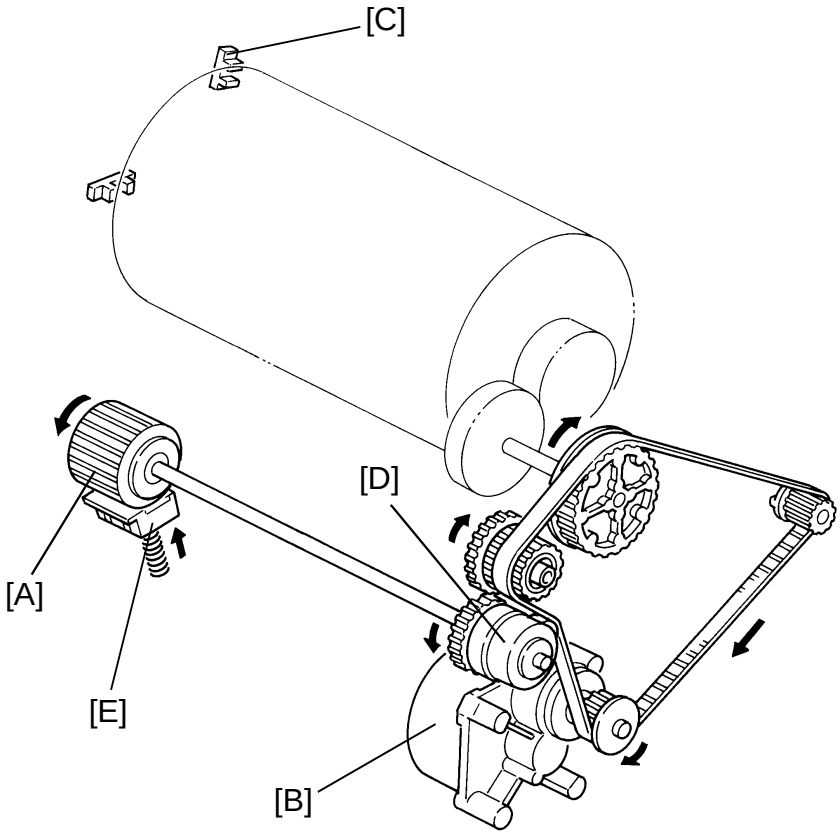
## 4.1 OVERALL




The top sheet of the paper on the paper table is separated by the paper feed roller [A] and the friction pad [B], and transported to the 2nd feed rollers [C]. The upper and lower 2nd feed rollers transport the sheet to the drum.

The paper feed roller is driven by the main motor, and an independent stepper motor is used to control the 2nd feed roller. The 2nd feed roller functions to synchronize the paper feed timing with the image on the drum. The 2nd feed roller starts rotating after the paper has come into contact with the rollers and alighned.

## 4.2 PAPER FEED ROLLER MECHANISM

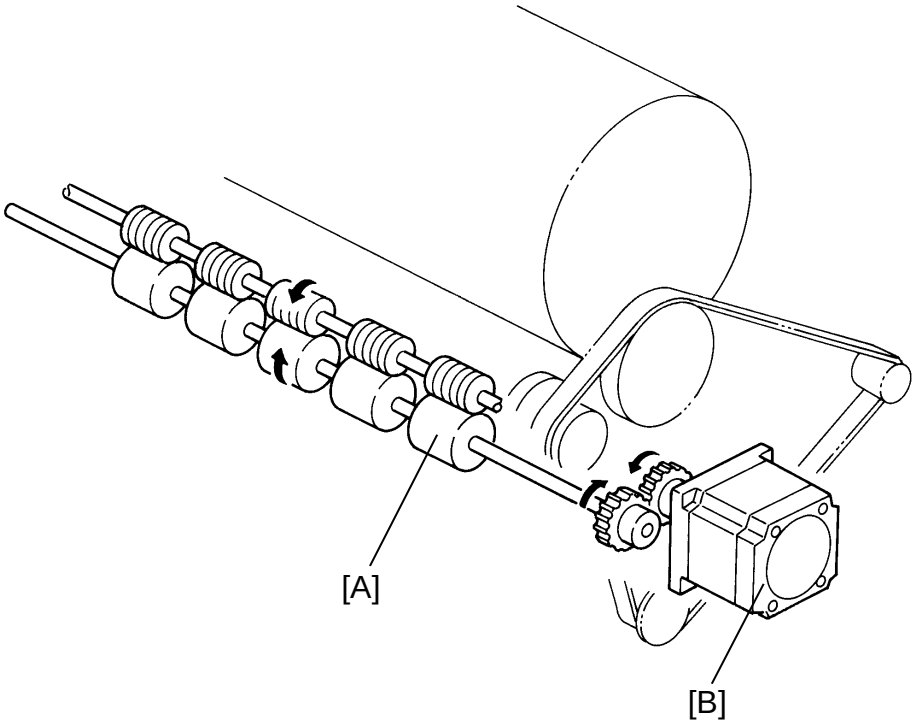



The paper feed roller [A] is driven by the main motor [B] through gears and a timing belt.

During the printing cycle, when the feed start timing sensor [C] is actuated by the actuator on the drum, the electromagnetic clutch [D] is energized to transmit the main motor rotation to the paper feed roller shaft. The top sheet of the paper is separated from the paper stack by the friction between the roller and the friction pad [E], and transported to the 2nd feed roller.

A one-way clutch is installed in the paper feed roller so that after the electromagnetic clutch is de-energized, it does not disturb paper transportation.

## 4.3 2ND FEED ROLLER MECHANISM



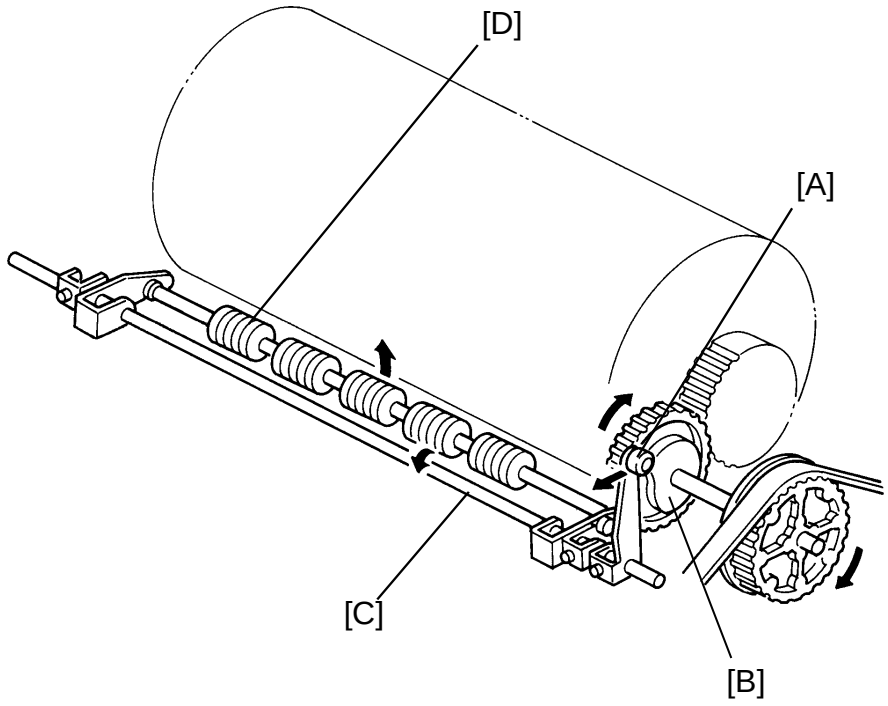

The lower 2nd feed roller [A] is driven by a stepper motor [B]. The main PCB controls the 2nd feed roller start timing to synchronize the image on the drum master and the printing paper.

The stepper motor rotation speed is changed according to the printing speed. Also, by pressing the image position keys on the operation panel, the 2nd feed timing is changed. If the paper feed timing is delayed, the image is shifted forward.

After printing paper is caught between the drum and the press roller, the stepper motor stops.

## 4.4 UPPER 2ND FEED ROLLER RELEASE MECHANISM



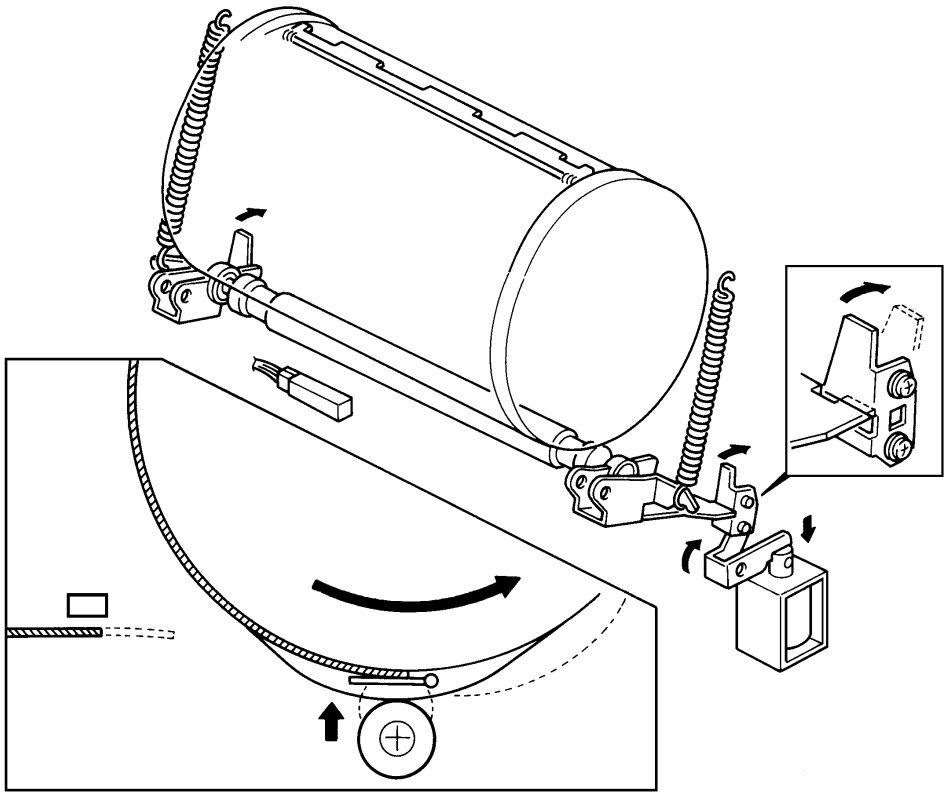



After the printing paper is caught between the drum and the press roller, the upper 2nd feed roller is released from the lower 2nd feed roller. This is to prevent interference of the 2nd feed rollers while the paper is transported by the drum and the press roller.

When the cam follower [A] reaches the top of the cam [B] which is installed on the drum drive gear, the shaft [C] rotates clockwise (as seen from the operation side) to release the upper 2nd feed roller [D] from the lower 2nd feed roller.

If no image shifting mode is used (the image position indicator is at the "0" position), the upper 2nd feed roller is released when the paper is transported 30mm after reaching the press roller. Even if the paper feed timing is fully delayed (Max. 15 mm), the paper leading edge reaches to the press roller before the upper 2nd feed roller is released.

## 4.5 PRINTING PRESSURE MECHANISM



While the machine is not in the printing cycle, the solenoid [A] stays off and the stoppers [B] locks the brackets [C] to keep the press roller [D] away from the drum.

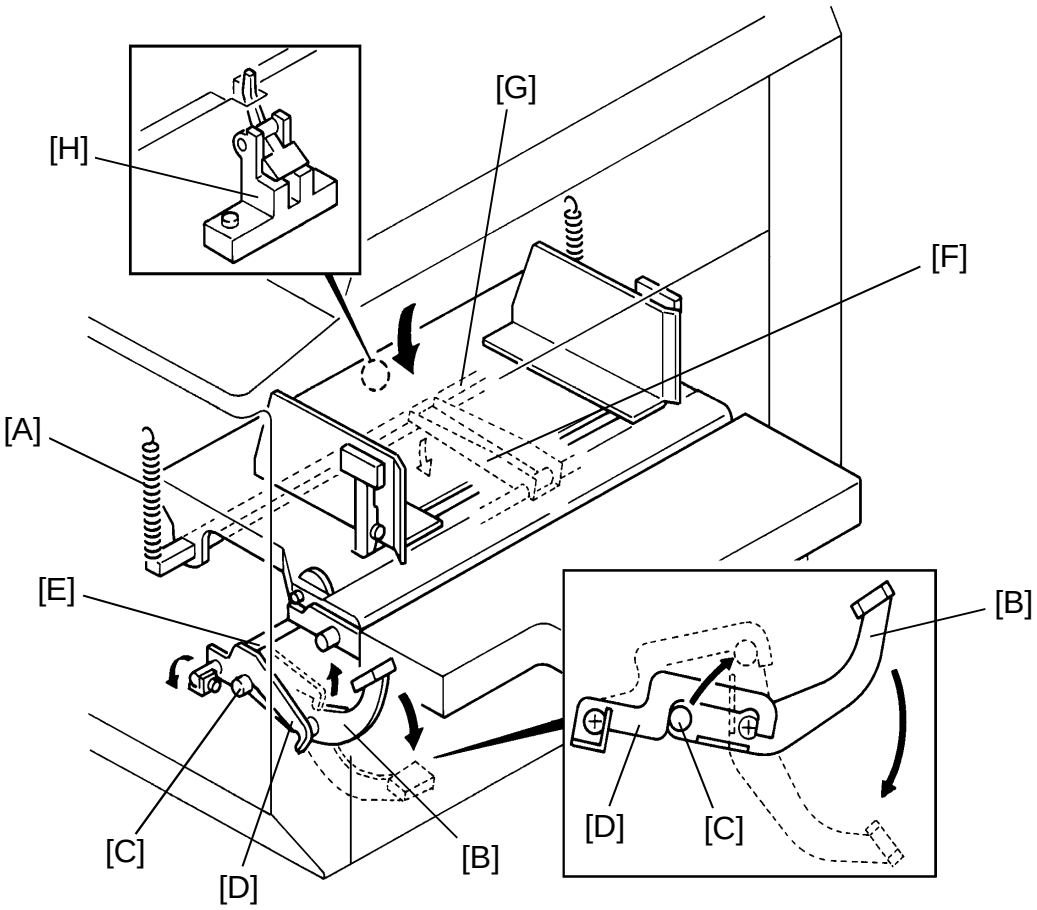
When the 1st sheet of paper is fed, the solenoid is energized but the brackets are still locked by the stoppers due to strong tension of the springs [E]. When the cam followers [F] installed on both sides of the press roller shaft reach the top of the cams [G] on the front and rear drum flanges, a small clearance is made between the stoppers and the brackets. The solenoid plunger is pulled down releasing the stoppers from the brackets. Printing pressure is applied by tension of the springs when the cam followers reach the bottom of the cams.

During printing cycle, the solenoid stays on. However, if paper does not reach the registration sensor [H] at the proper timing (at this time, the cam follower is on the top of the cam), the solenoid is de-energized to lock the brackets.

The printing pressure is released when the cams push down the cam followers so that the press roller does not contact the master clamper [I].

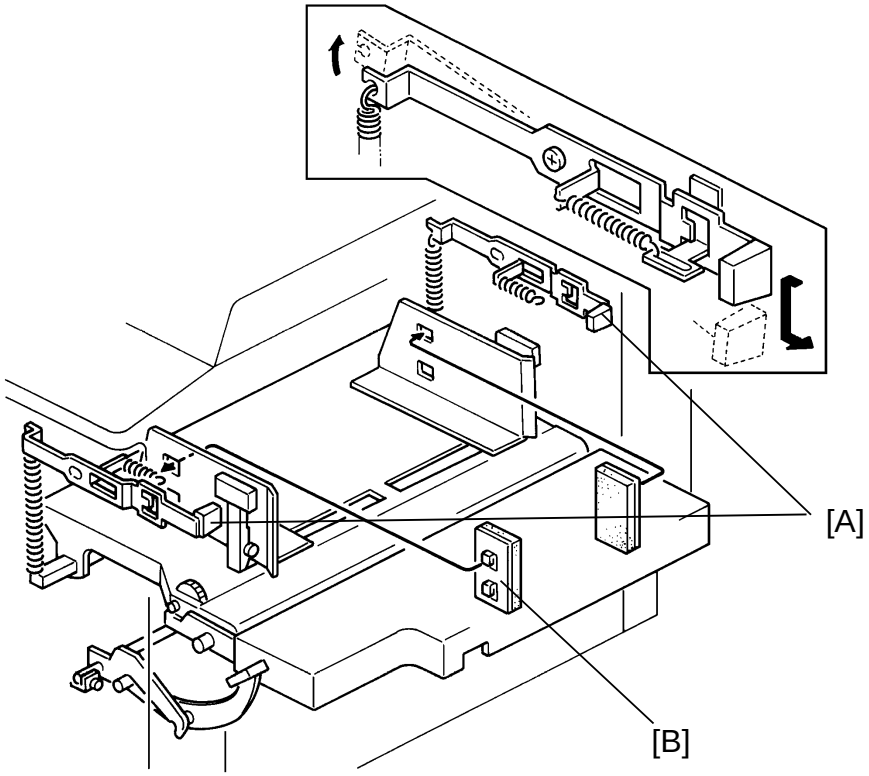
After printing is finished, the solenoid is de-energized and the stoppers return by tension of the springs. Before the drum returns to the home position, the bracket is locked by the stopper again when the cams push down the cam followers.

## 4.6 PAPER TABLE




Paper on the paper table is pushed up to contact the paper feed roller by tension of the springs [A]. When the lever [B] is lowered, the bearing [C] lifts up the arm [D] to rotate the shaft [E] counterclockwise. The bracket [F] pushes down the stay [G] and the paper table is lowered. The arm [D] hooks the bearing [C] to stop the table in the lower position to allow easy paper setting.

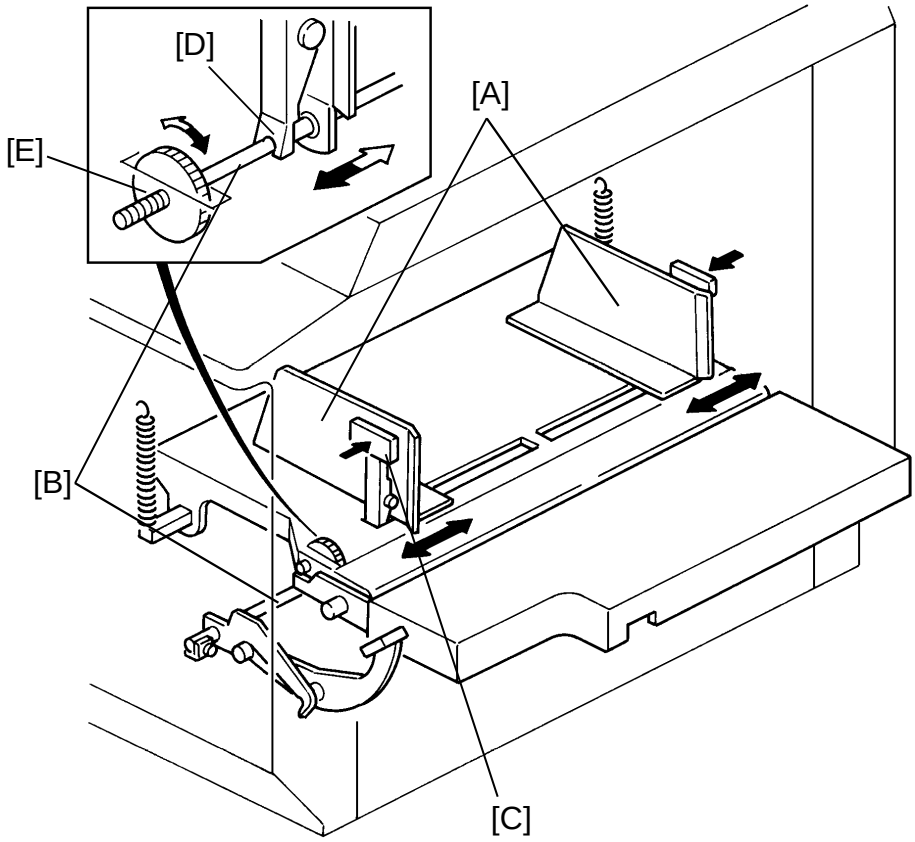
A photo-interrupter [H] is installed under the paper table to detect paper on the table.




The paper feed roller pressure can be changed by changing the position of the pressure adjustment levers [A] . Normaly the levers should be in the lower position. If paper multi-feeding jams frequently occurs, the levers should be raised to decrease the pressure.

If paper multifeed frequently occurs, the side pads [B] should be installed to apply stopping pressure to the paper.

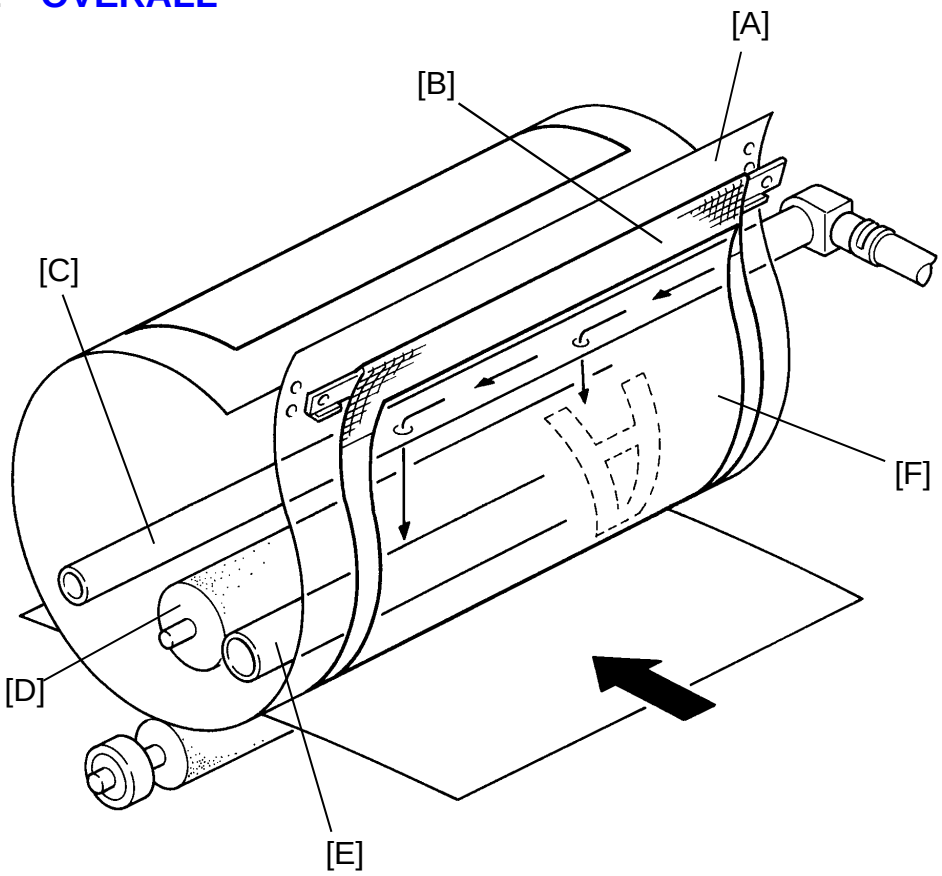
## 4.7 SIDE FENCE SLIDE MECHANISM




The paper table side fences [A] are installed on the shaft [B]. When the lever [C] is pinched, the stopper [D] is released from the shaft and the fence can be slid. By turning the dial [E], the shaft and the side fences move together side to side changing the paper position on the paper table. If the dial is turned clockwise, the fences move to the left.

# 5. DRUM

## 5.1 OVERALL



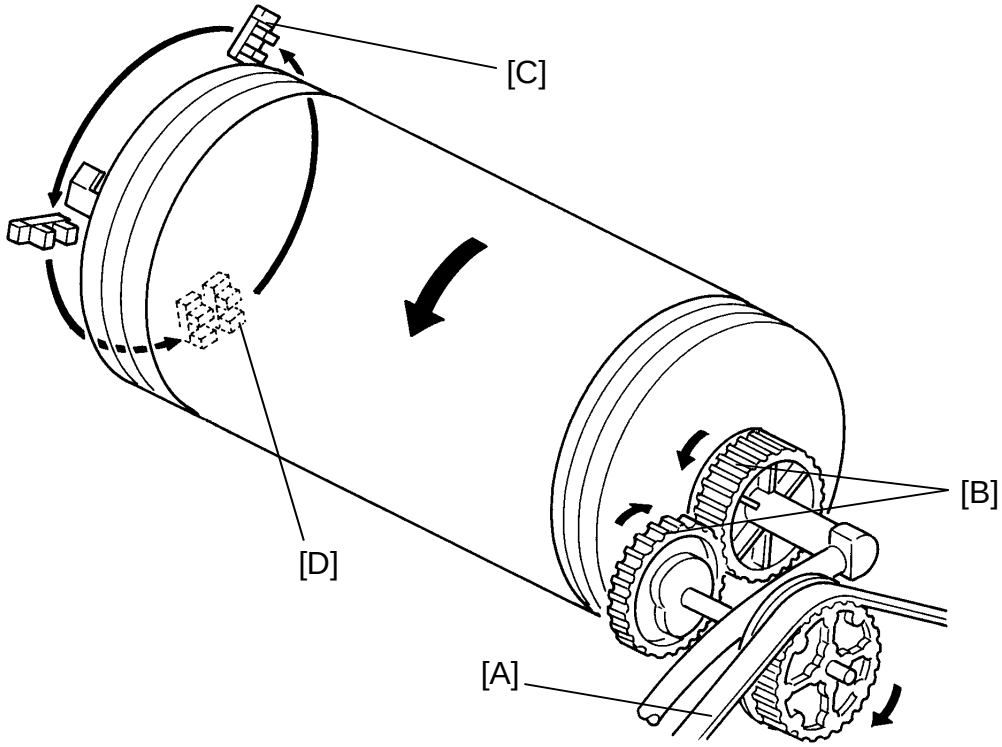



The drum consists of a metal screen [A] and a cloth screen [B].

The ink pump supplies ink from the ink cartridge into the drum through the drum shaft [C]. Ink is then evenly spread to the screens by the ink [D] and doctor [E] rollers. The master [F] which has image holes allows the supply of ink to the paper.

The drum is driven by the main motor and turns only clockwise (from the operator side). The motor speed and the drum stop positions are controlled by monitoring the motor encoder.

## 5.2 DRUM DRIVE MECHANISM




The drum is driven by the main motor (DC motor) through a timing belt [A] and gears [B]. The main motor has an encoder which sends pulses to the main PCB. The main PCB monitors the pulses and controls the drum speed and stop positions.

The drum has two stop positions as follows:

1) Master eject position

2) Master feed position

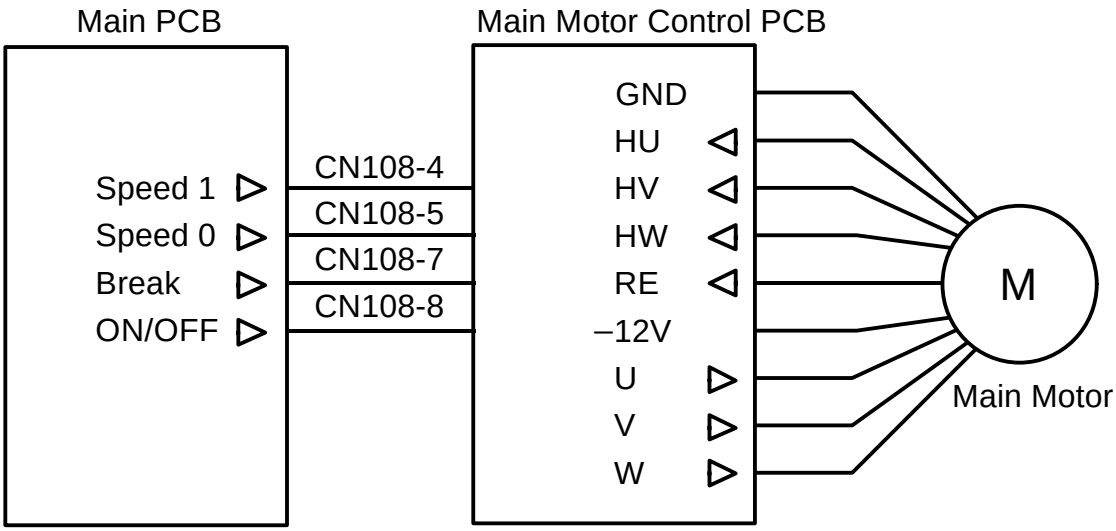
These stop positions are determined by checking the feed start timing sensor [C]. The main PCB starts counting the main motor encoder pulses when the feed start timing sensor is actuated. The following pulse count numbers are asigned for drum stop timing.

1) 440 pulses for the master eject position

2) 64 pulses for the master feed position

When the drum is stopped at the master eject position, the master eject position sensor [D] is actuated. When the master eject operation is started, the main PCB confirms if the drum is at the master eject position by this sensor.

## 5.3 MAIN MOTOR CONTROL





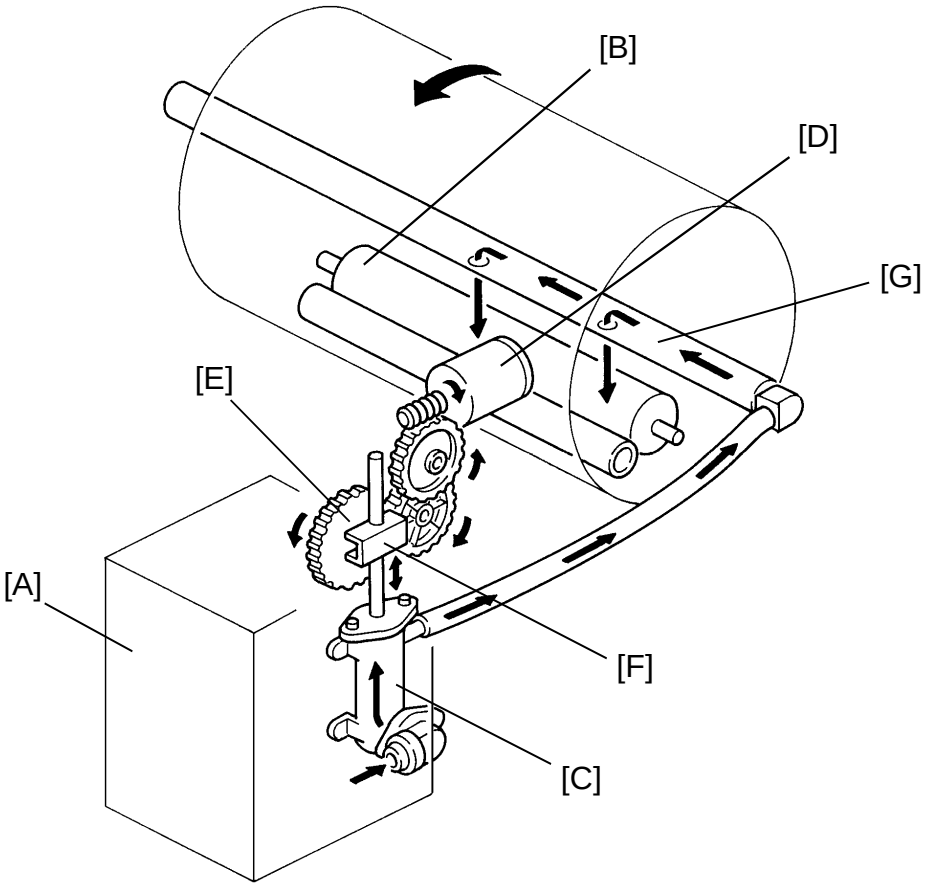

The main motor is driven by the main motor control PCB. The main PCB sends the speed signals (0 and 1), the motor ON trigger, and the motor brake trigger to the main motor control PCB. According to the combination of two speed signals, the control PCB maintains the main motor speed in the following four kinds of speed.

The main motor speed is converted in half for the drum rotation by the gears and timing belt. The drum rotates at 30rpm while the main motor rotates at 60rpm. This is used for the master eject and feed operations. For the master wrapping process, the main PCB sends the motor ON trigger as a pulse signal. As a result, the drum turns intermittently at 30 rpm.

The main motor speed is maintained by the main motor control PCB which is monitoring the encoder pulses from the main motor.

| | | | | |
|---|---|---|---|---|
| CN108-4 (Speed 1) | L | L | H | H |
| CN108-5 (Speed 0) | L | H | L | H |
| Motor Speed | 60 rpm | 140 rpm | 200 rpm | 260 rpm |
| Drum Speed | 30 rpm | 70 rpm | 100 rpm | 130 rpm |

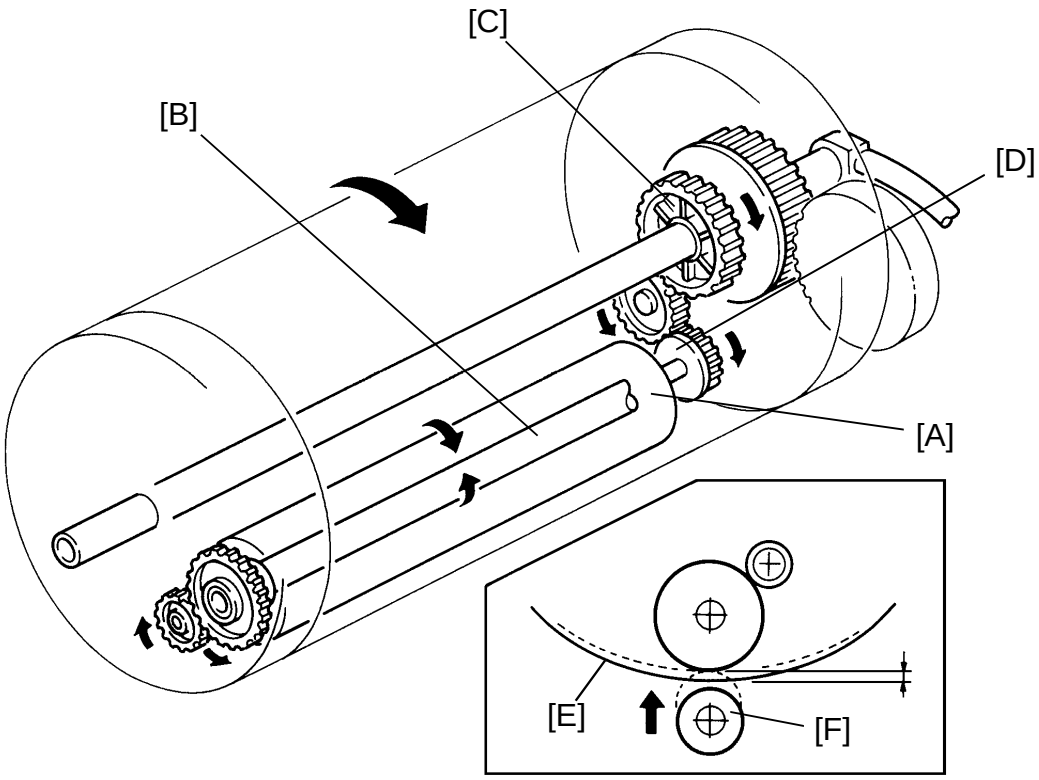
## 5.4 INK SUPPLY MECHANISM




Ink is supplied from the ink cartridge [A] to the ink roller [B] by a pump [C]. The ink pump is driven by the ink supply motor (DC motor) [D] through gears. There is a pin on the pump drive gear [E] which is coupled with the pin holder [F] on the pump piston shaft. This mechanism converts the gear rotating motion into the piston vertical alternating motion.

Two holes on the drum shaft [G] drops ink to the ink roller [H].

## 5.5 INK ROLLER MECHANISM

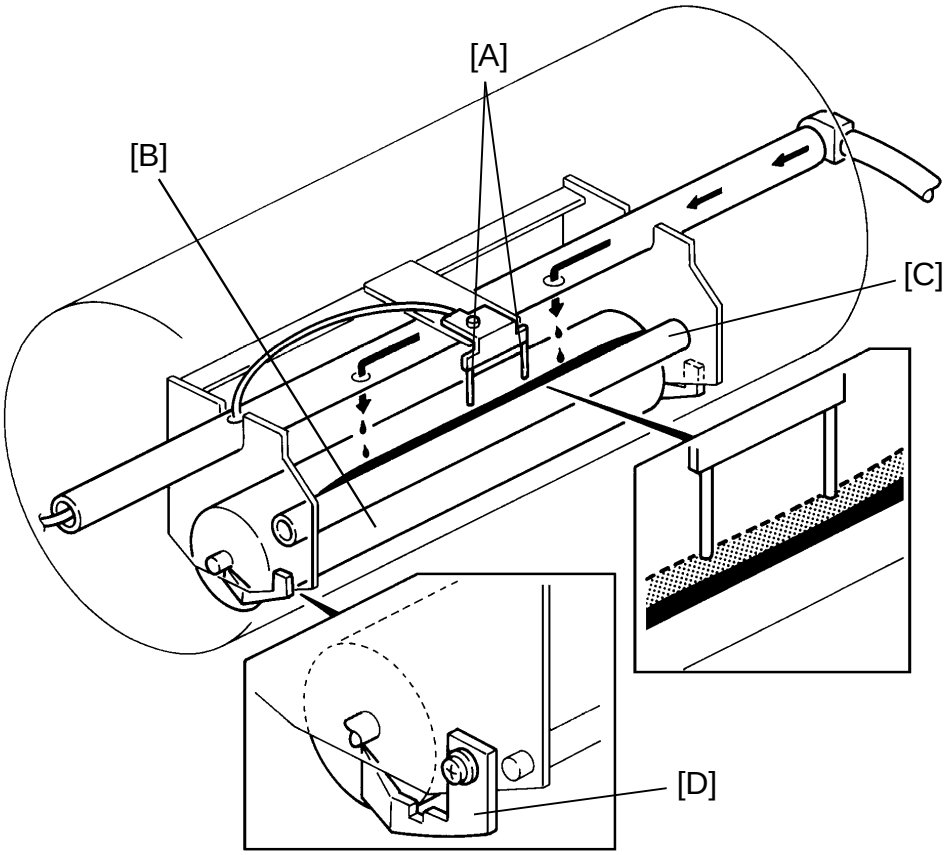





The ink roller [A] and the doctor roller [B] are driven by the gear [C] on the drum shaft. Ink supplied on the ink roller is squeezed by the doctor roller and an even thickness ink layer is applied to the ink roller. The ink drive gear [D] has a one-way clutch to prevent the ink roller from being turned in reverse when the drum is turned in the reverse direction manually.

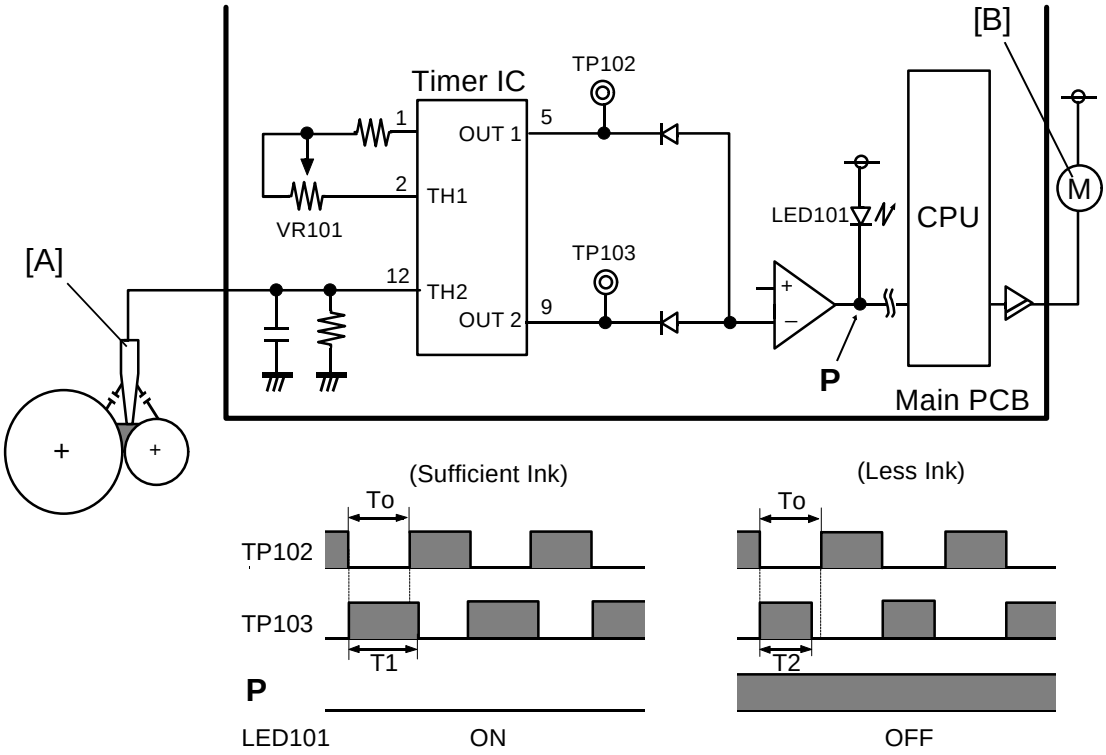
The ink roller does not touch the screen [E] when not printing. However, during the printing process, the ink on the ink roller is applied to the paper through holes in the screens and master. This happens while the drum screen and the master is held against the ink roller by the pressure roller [F] located underneath the drum.

## 5.6 INK SUPPLY CONTROL




The ink detection pins [A] work like the electrode of a capacitor and detect the capacitance between the detection pins and the ink [B] and doctor [C] rollers. This capacitance is different when the ink level is high and the pins touch ink, compaired to when the ink level is low and the pins do not touch ink. By detecting the capacitance, the ink supply motor is controlled to keep the ink level.

The ink roller blade [D] is installed on both ends of the ink roller to scrape off the bulit-up ink on the ink roller edges.




A timer IC is used to detect the ink level. The IC produces two pulse signals. TP102 outputs the standard pulse signal which pulse length T0 is determined by the VR101. TP103 outputs the detection pulse. This pulse length is determined by the capacitance between the detection pins and ink/doctor rollers.

**(Sufficient ink condition)**

When the ink level is high and the pins [A] are touching the ink, the capacitance becomes large and increases the detection pulse length (T1). When the detection pulse length is longer than the standard pulse length (T0<T1), **P** becomes low and turns on the LED101. While the CPU is receiving the low signal at **P**, the CPU recognizes that ink level is sufficient and does not turn on the ink supply motor [B].

**(Less ink condition)**

When the ink level is low, the capacitance is lowered and decreases the pulse length (T2). When the detection pulse length is shorter than the standard pulse length (T0>T2), **P** becomes high and turns off the LED101. While the CPU is receiving the high signal at **P**, the CPU recognizes that the ink level is low and turns on the ink supply motor to supply ink until the signal at **P** becomes low.

**(Ink End Condition)**

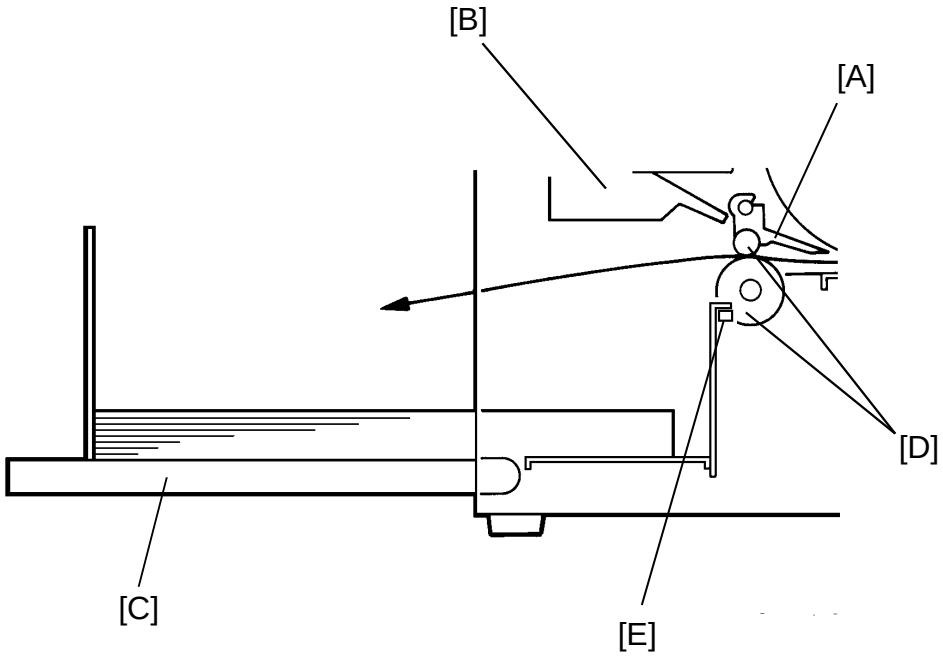
If the less ink condition is detected continuously for more then 25 seconds during the print cycle, the CPU stops the printing process and turns on the Ink End indicator.

When printing starts in the less ink condition, the main motor keeps turning, and turns on the ink supply motor turns on until the ink level returns to a sufficient level. If the ink returns to a sufficient level within 25 seconds, the machine starts the printing operation. If not, the machine lights the Ink End indicator.

A beeper sounds intermittently while the machine is idle during the ink supply. The machine has a forced ink supply mode. When the Reset key is pressed while holding down the "0" key, the machine starts the ink supply operation. This operation coutinues for 50 seconds and stops automatically when ink reaches a sufficient level.

# 6. PAPER DELIVERY SECTION

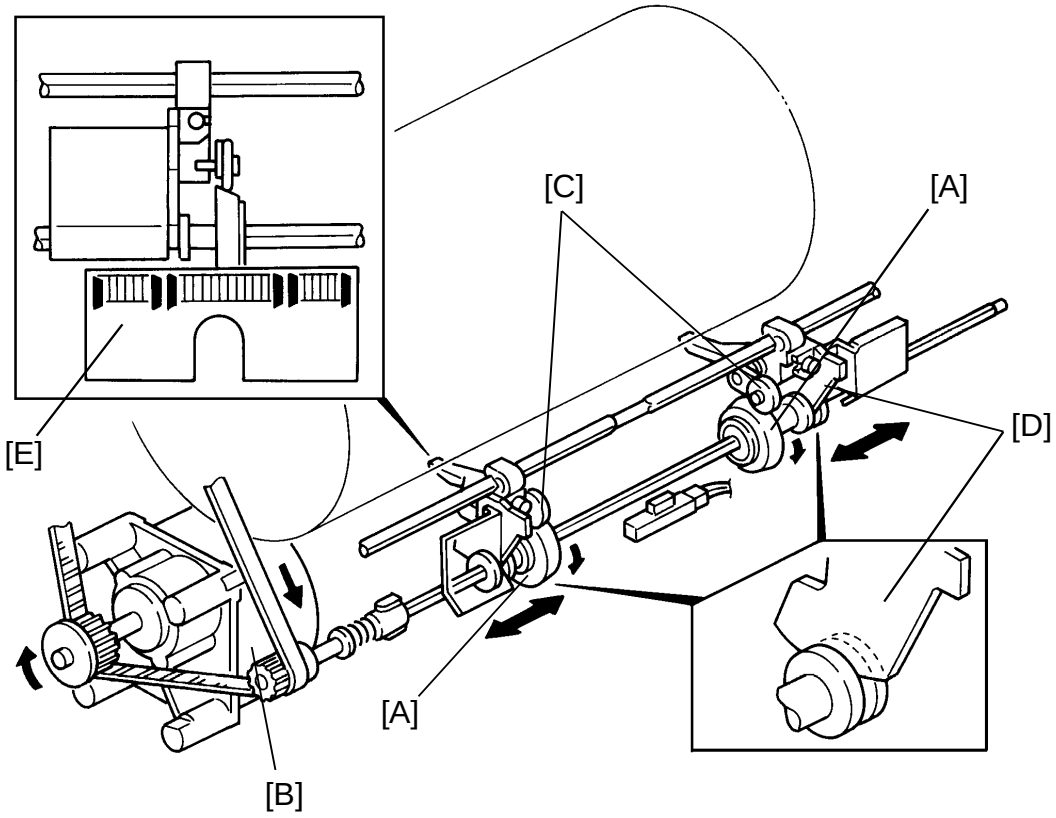
## 6.1 OVERALL




The exit pawls [A] and the air knife [B] separate the paper from the drum. The paper is delivered to the paper delivery table [C] by the upper and lower exit rollers [D].

There is a reflect-type photosensor [E] to detect paper jams.

## 6.2 PAPER DELIVERY ROLLER

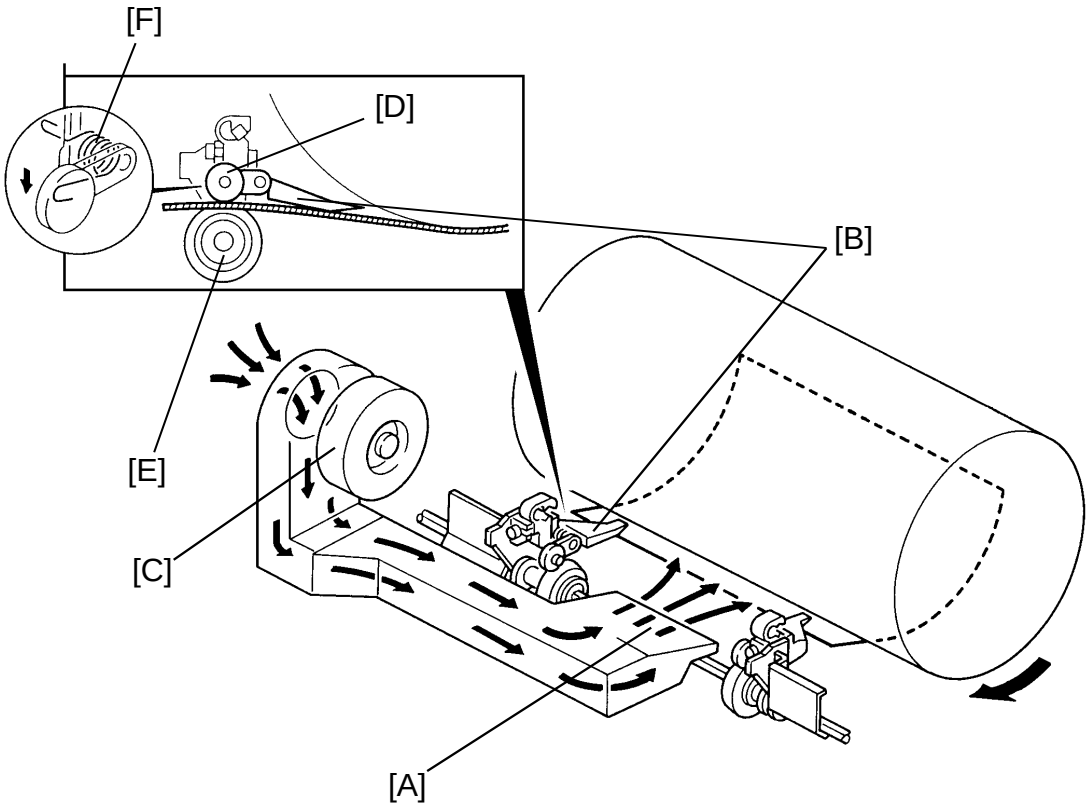



The lower exit rollers [A] are driven by the main motor [B] through the timing belt. The upper exit rollers [C] and the lower exit rollers catch the paper and transport it to the delivery table.

The lower exit roller guides the plate [D] fixed with the exit pawl, so that the upper and lower exit rollers move together.

Each roller position should be adjusted according to the paper position on the paper table, so that the upper and lower exit rollers catch 5 mm inside of the paper edge to transport it. The paper size indicator [E] shows the standard delivery roller position for each paper size.

## 6.3 EXIT PAWL/AIR KNIFE



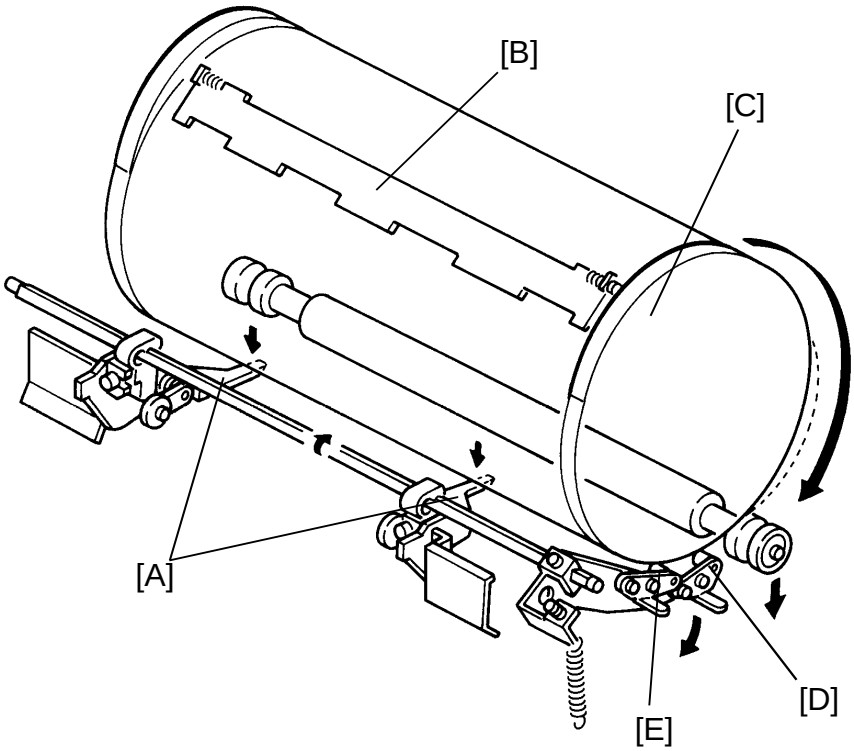



The air from the air knife nozzle [A] and the exit pawl [B] separate paper from the drum.

The air knife motor starts blowing air when the print start key is pressed or master cutting is finished. The paper passes under the exit pawls and it is caught by the exit rollers. The motor stops when the last paper is fed out.

The upper exit rollers [D] are installed on the exit pawls. They are pushed to the lower exit rollers [E] by tension of the springs [F].

## 6.4 EXIT PAWL RELEASE MECHANISM

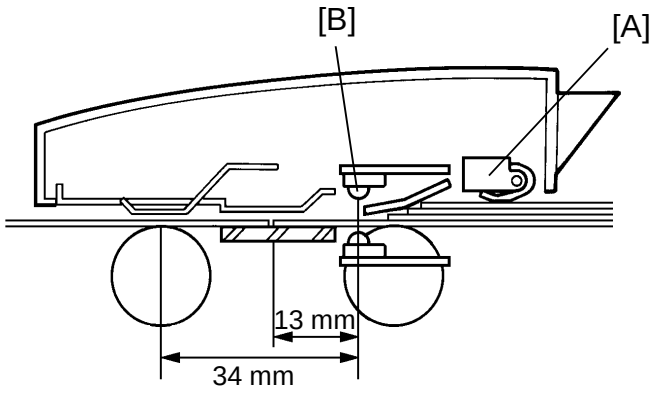



The exit pawls [A] move away from the drum when the master clamper [B] approaches the pawl. This is controled by the cam [C] installed on the front drum flange and the two cam followers [D and E] installed on the exit pawl shaft. The two cams give enough time releasing the pawls away from the drum.

While the cam followers are not on the top of the cam, the distance between the pawls and the drum is very small to prevent paper wrap jams. At this time, the distanceis determined by the stopper, and the cam followres are not in contact with the cam. However, when the master clamper approaches the exit pawls, the pawls have to be moved away from the drum to avoid contact and damage against the master clamper. As the master clamper approaches the exit pawls, the cam moves into contact with the cam follower pushing them down. This moves the arm towards the arrow direction, and the pawl shaft turns clockwise to move the pawls away from the drum. When both cam followers are out of contact with the cam, the pawls move back towards the drum to their normal position.

# 7. JAM DETECTION

## 7.1 ORIGINAL JAM DETECTION






Original jams are detected by the original set sensor [A] and the original registration sensor [B]. The misfeed indicator ( + A) lights in the following conditions:

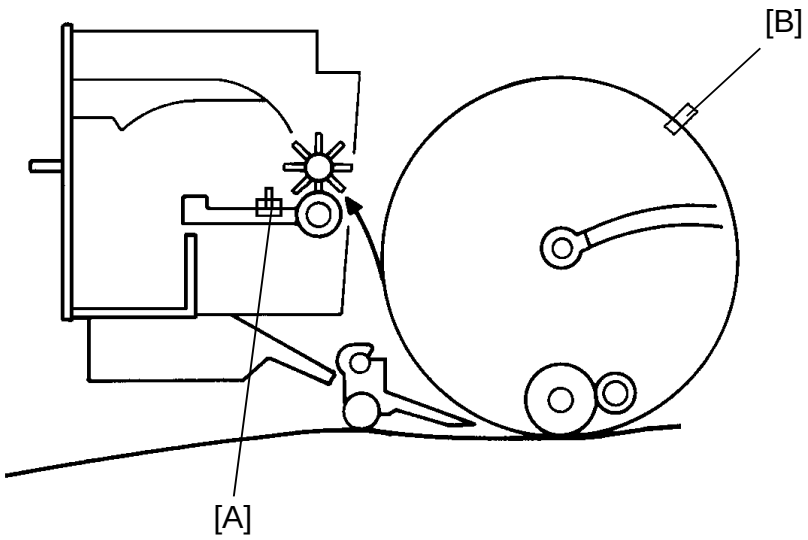
1) When the main switch is turned on, if the original registration sensor is interrupted.

2) When the original set sensor is actuated, if the original registration sensor does not detect the original leading edge within 3 seconds after the Master Making key is pressed.

3) If the original registration sensor does not detect the trailing edge of the original within 4 seconds after the original leading edge is transported 355.6 mm from the original registration sensor.

4) If the original stops interrupting the original registration sensor after the stop key is pressed while scanning.

## 7.2 MASTER EJECT JAM DETECTION




The master eject jams are detected by the master eject sensor [A]. The misfeed indicator ( + F) lights in the following conditions:

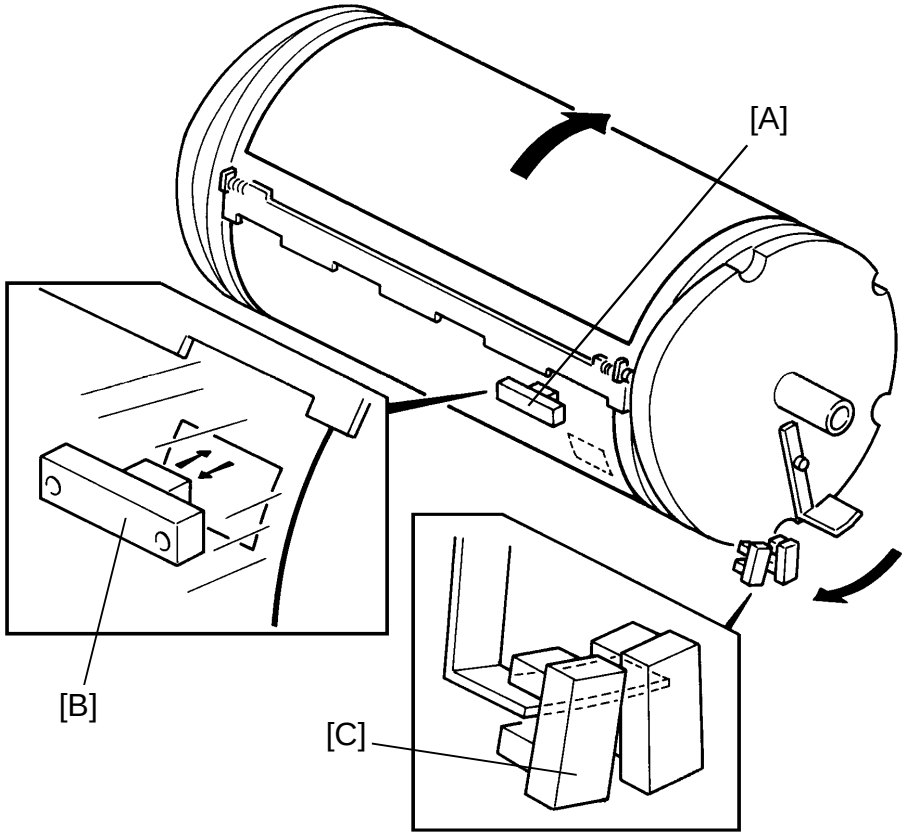
1) If the master eject sensor is actuated when the main switch is turned on.

2) If the master eject sensor is not actuated within 0.3 seconds after the drum started turning to feed the master into the master eject box.

3) If the master eject sensor is not actuated when the drum makes a half turn and passes the feed jam timing sensor [B]. This is the case when the picked up master leading edge is pulled back to the drum and the master remains on the drum. (The jam indicator lights after the drum returns the home position.)

4) If the master eject sensor is actuated when the pressure plate is returned to the home position. This is the case when the master trailing edge sticks on the pressure plate and is pulled back to the master eject rollers.

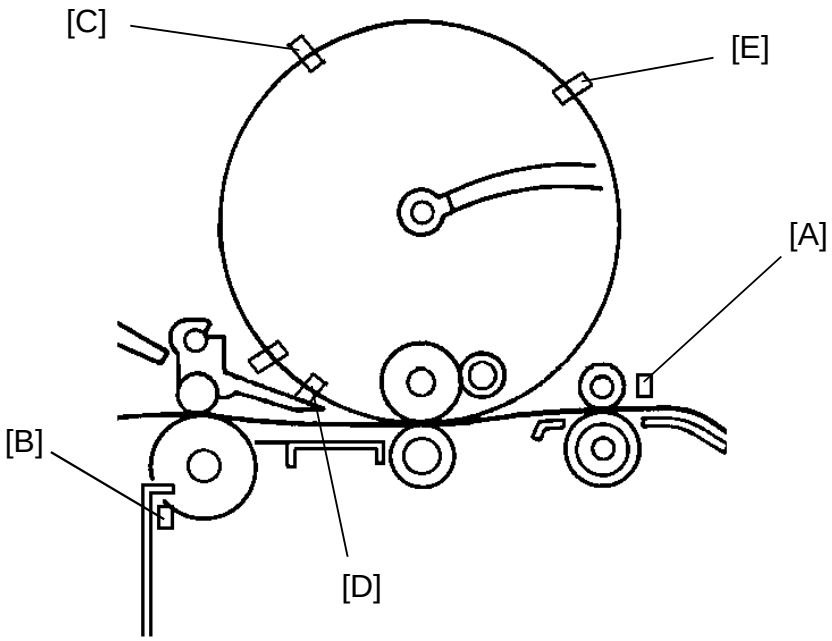
## 7.3 MASTER FEED JAM DETECTION



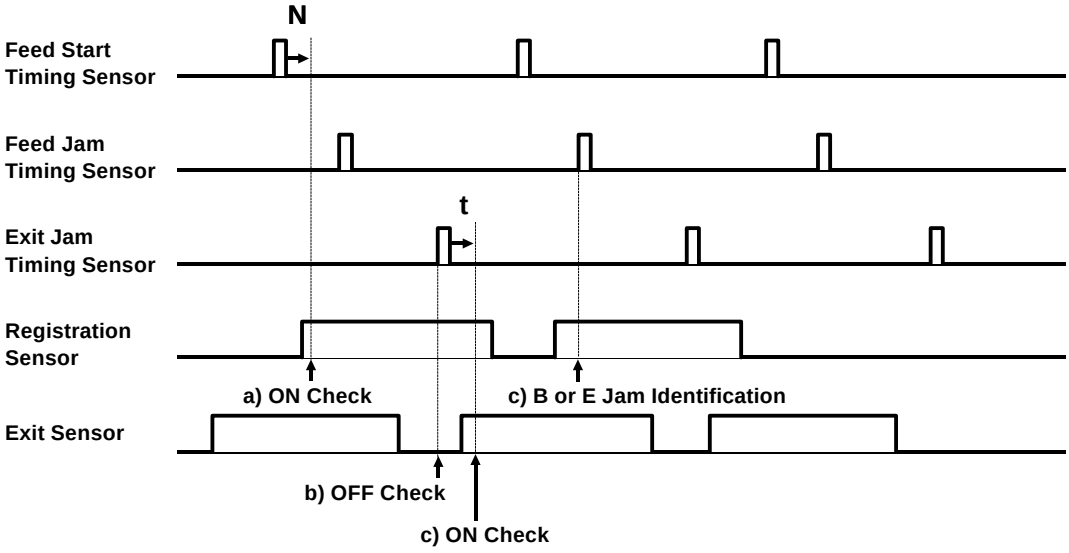

There is no master feed sensor on the master paper feed path to detect master feed jams. The master feed jam is detected by the drum master sensor [A] which detects the presence of the master existence on the drum.

When the drum is stopped at the master exit position to start printing (after the master making), if the master sensor [B] does not detect the master on the drum, the master misfeed indication ( + C) will be displayed on the operation panel. (The master eject position sensor [C] is used to confirm that the drum is positioned at the master eject position.)

## 7.4 PAPER FEED JAM DETECTION




Paper jams are detected by the registration sensor [A] and the exit sensor [B]. Jam detection timing is determined by the drum position sensors and the main motor encoder. The timing chart on the next page shows the jam detection timing.




a) When the CPU counts a determined number of pulses (N) from the main motor after the feed start timing sensor [C] is actuated, if the registration sensor does not detect the paper, B + light.

b) When the exit jam timing sensor [D] is actuated, if the exit sensor remains activated, G + light.

c) When the determined time (t) (this time depends on the drum speed) is counted after the exit jam timing sensor is actuated, if the exit sensor is not activated, the machine detects a paper jam. If this jam condition is detected, the main PCB stops the next paper from being fed. When the feed jam timing sensor [E] is actuated:

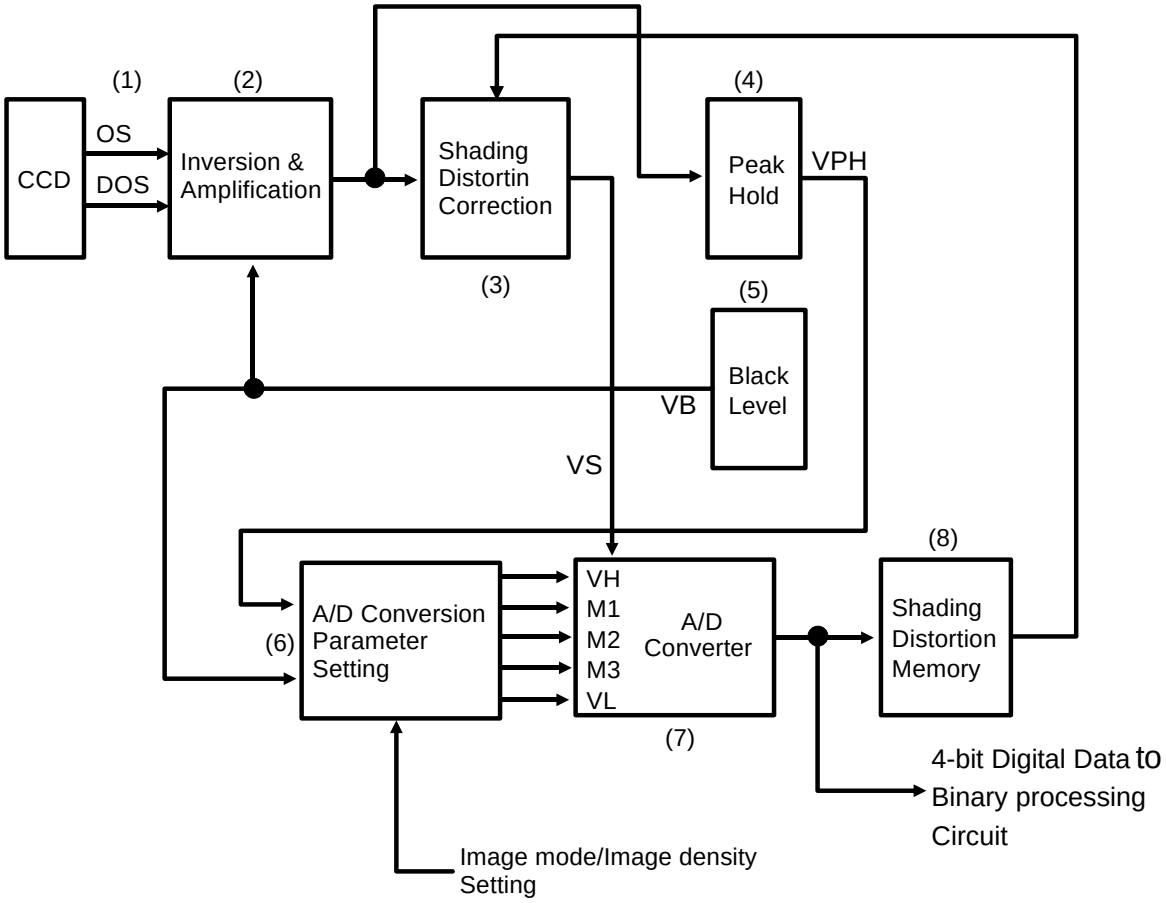
1. If the registration sensor is activated, a 2nd feed failure is detected. (B + )
2. If the registration sensor is not activated, a paper wrap jam is detected. (E + )

# 8. IMAGE PROCESSING

Image processing resolves how to transform an optical image of a continuous line, made up of an infinite number of color shades, into 2592 lined-up dots (pixels), each of which is black or white.

There are two basic sub-processes: first A/D conversion, i.e. converting an analog image to *4-bit digital data* representing 16 shades of grey; second binary processing, i.e. transforming that digital data into black or white pixels.

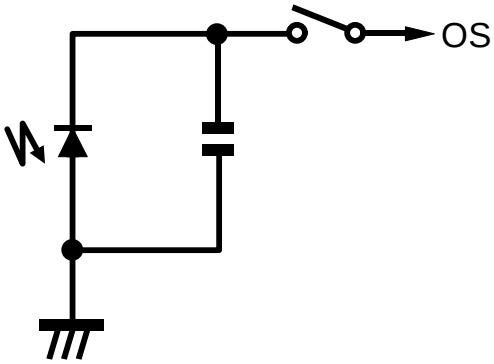
## 8.1 A/D CONVERSION




This block diagram shows the A/D conversion process (A/D= Analog to Digital). The analog signal generated from the CCD is inverted and amplified. Then the analog signal is converted into a 4-bit digital signal and is sent to the binary processing circuit.

**(1) CCD**

The light reflected from the original exposes the CCD (Charge Coupled Device) which can read one complete scan line at a time. The circuit of each element in the CCD is shown at the right. The CCD has 2592 effective elements. The light reflected from the original is sensed by a photodiode. A capacitor stores the electrical charge corresponding to the light's intensity.

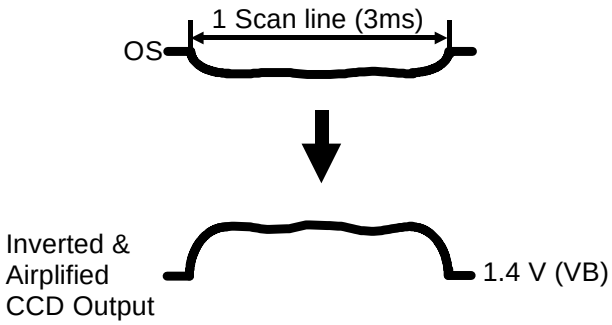



The electrical charges from the CCD elements are sent to the A/D conversion PCB one after the other (OS signal).

The CCD always outputs a compensation data signal (DOS signal) with the OS signal. This DOS signal is used for the inversion and amplification described below.

**(2) Inversion and Amplification**

The CCD output is inverted and amplified.




To remove electrical noise, the *difference* between the OS signal and the DOS signal is amplified. Even if electrical noise intrudes into the power source of the CCD, it does not effect the amplified signal, because the noise affects both signals identically. Therefore, substracting the DOS signal from the OS signal will cancel the noise out.

The amplification ratio can be changed by turning VR201.

### (3) Shading Distortion Correction

The image data of one main scan line sent from the CCD does not exactly represent the line of the original image, because of the following reasons:

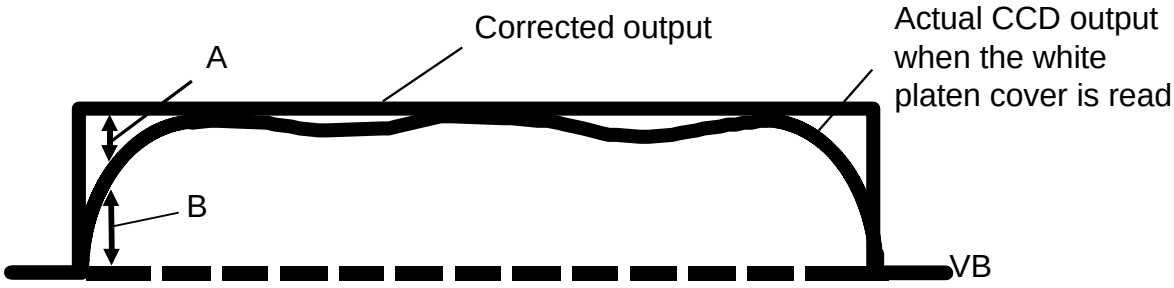
1) Loss of brightness towards the ends of the fluorescent lamp and the edge of the lens,

2) Variations in sensitivity among elements of the CCD,

3) Distortions of the light path.

These distortions are corrected by applying individual amplification ratios ($\alpha$) to the output of each CCD element. The amplification ratio of each element is determined so that all the CCD outputs are amplified to match the highest voltage from the platen cover data when the white platen cover is scanned.

When the main switch is turned on, the scanner scans the white platen cover 5 times. This white platen cover data which corresponds to each CCD element is stored as 4-bit digital data in the shading distortion memory circuit and used for the shading distortion correction.




Amplification ratio: $\alpha$

$$\alpha \approx \frac{A+B}{B}$$

### (4) Peak Hold (VPH)

Before the analog signal can be converted to digital data, the machine must know the high and low bounds that match white and black. These bounds are voltage values.

The low bound is called the black level (VB, see 5 below). The high bound is called the peak hold value, or VPH.

When the analog signal is digitized, VB and VPH will serve as references to determine how the CCD output will be distributed over the sixteen different 4-bit values.

a) Peak Hold for the Shading Distortion Memory

When the main switch is turned on, the exposure lamp turns on and the white platen cover is scanned 5 times. The white peak value from the platen cover scan is held in the peak hold circuit and used to determine the amplification ratio ($\alpha$) of the shading distortion memory.

b) Original Background Peak Hold

The peak hold from the platen cover scans is erased before original scanning starts. After original scanning starts, this circuit holds the whitest image voltage of the 43 mm (512 pixels) width in the middle of the scan line.

The highest value sensed during an original scan is called the original background peak hold. It does NOT always correspond to a pure white original, but it will serve to establish the whitest part of the print image. In other words it will turn a dark background white.

Once a peak hold is recorded, it does not change until a higher (whiter) value is scanned, or until the next original is scanned.



**(5) Black level (VB)**

This circuit always outputs 1.4V. This black level voltage is used as a reference for A/D conversion and as the lower limit of the amplified CCD output.

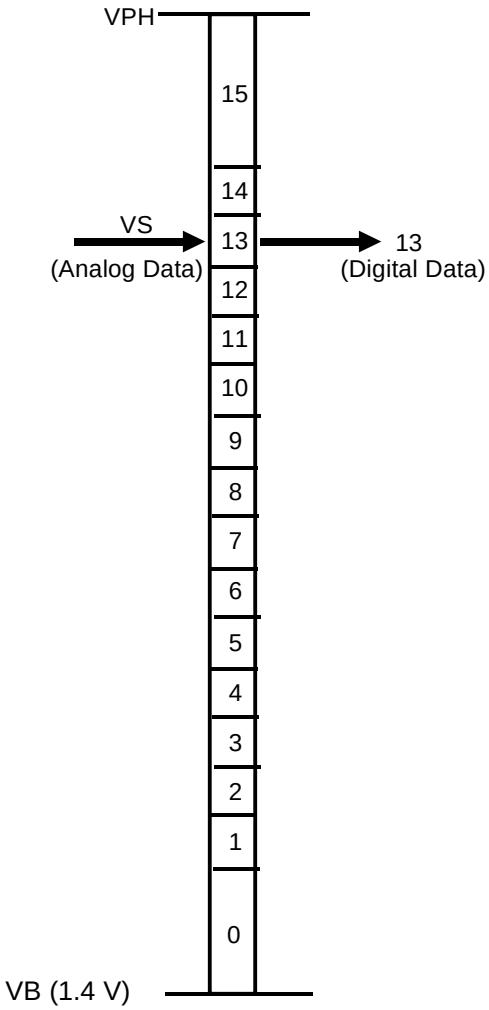
### (6) A/D Converter

The analog data VS (amplified CCD outputs) is changed into 4-bit digital data. The 4 bits of data represent a number between 0 and 15, for a total of 16 steps.

In the A/D conversion circuit, the difference between VH and VL (see 7 below) is divided into 16 steps. Each step corresponds to a VS voltage level.

The digital data from the analog image data (VS signal) is based on these 16 steps.

For example, the amplified CCD output (VS), whose level is as shown at right, is changed into "13" (digital data) to be sent to the binary processing circuit.



A/D Converter

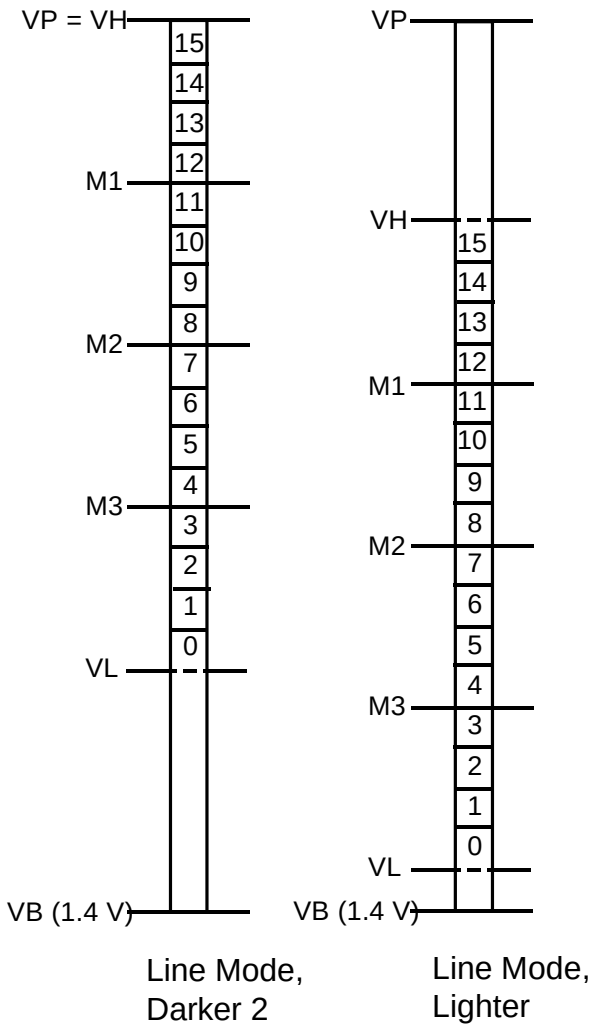
## (7) A/D Conversion Parameter Setting

| Process \ Parameter | | | VH (%) | M1 (%) | M2 (%) | M3 (%) | VL (%) |
|---|---|---|---|---|---|---|---|
| Shading Distortion Memory | | | 100 | 86.5 | 73.0 | 59.5 | 46.0 |
| Image Setting | Line Mode | Lighter | 74.0 | 57.0 | 40.0 | 23.0 | 6.0 |
| | | Normal | 100 | 76.5 | 53.0 | 29.5 | 6.0 |
| | | Darker 1 | 100 | 79.8 | 59.5 | 39.3 | 19.0 |
| | | Darker 2 | 100 | 84.5 | 69.0 | 53.5 | 38.0 |
| | Photo Mode | Lighter | 70.0 | 36.6 | 19.6 | 11.4 | 7.0 |
| | | Normal | 80.0 | 43.4 | 24.8 | 15.8 | 11.0 |
| | | Darker 1 | 85.0 | 47.9 | 29.0 | 19.9 | 15.0 |
| | | Darker 2 | 92.0 | 52.3 | 32.0 | 22.3 | 17.0 |

The A/D conversion parameters (VH, M1, M2, M3 and VL) decide how the the VS signal is distributed over 16 steps. The parameters are determined according to VPH, VB, the image mode setting, and the image density setting.

VH and VL are the upper and lower image density bounds. If a darker image setting is selected, VH and VL increase (as shown at right). M1, M2 and M3 are set to improve image quality in the photo mode.

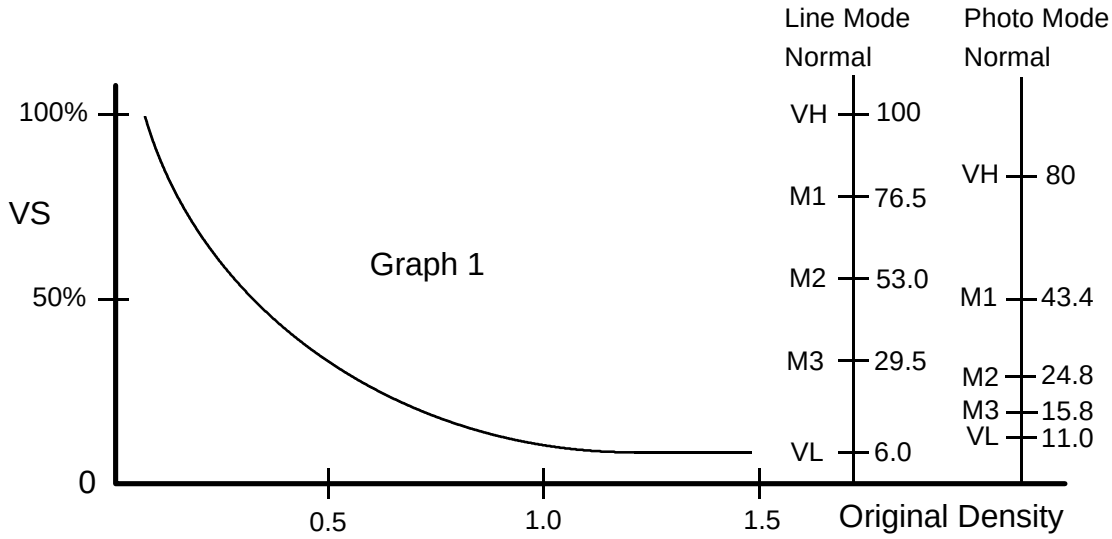
The above table shows the ratio of VPH (100%) and each parameter at various image mode settings (deciding the VB at 0%). The voltage between each parameter is divided into further 4 steps, thus the voltage between VH and VL is divided into 16.

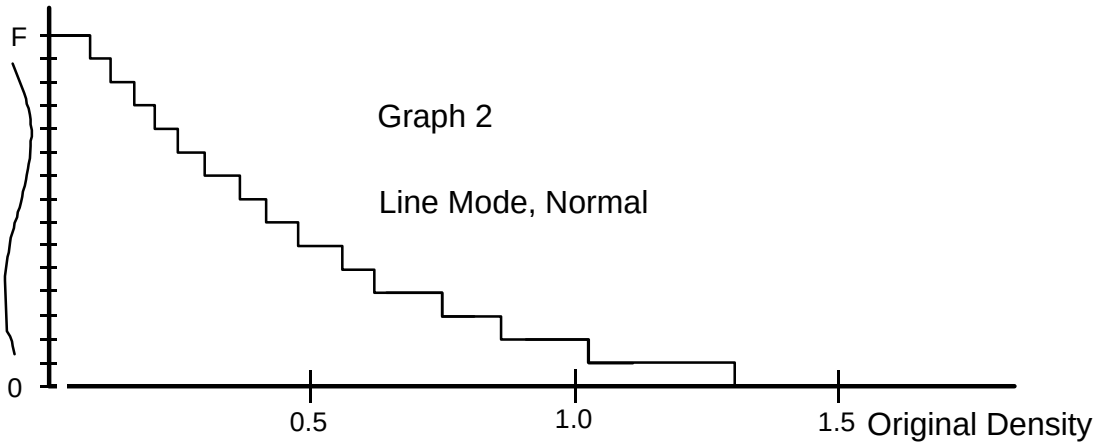


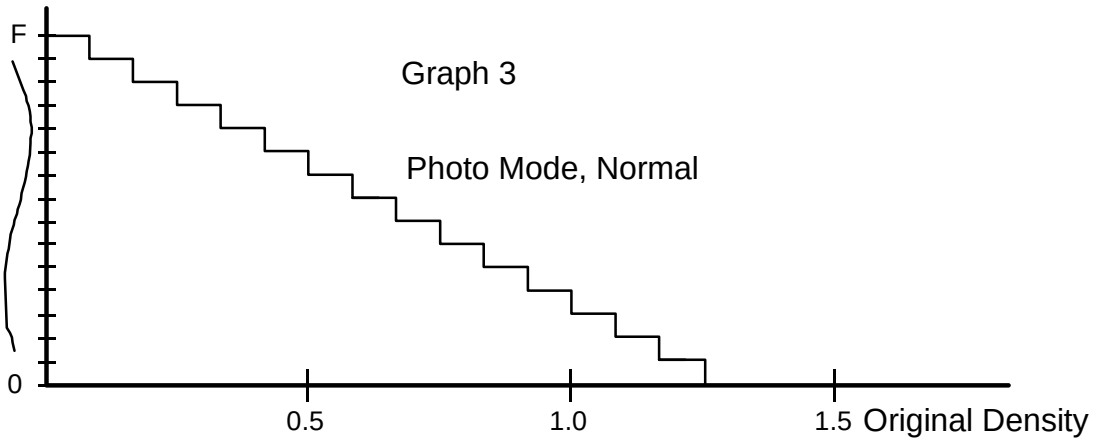

Line Mode, Darker 2

Line Mode, Lighter

Detailed Descriptions




As shown in Graph 1, the relationship between the original density and VS (amplified CCD output) is not linear due to CCD characteristic.

In the line mode, M1, M2, and M3 are set so that the distance between each of them is equal, and the relationship between the original density and the output digital data are as shown in graph 2.

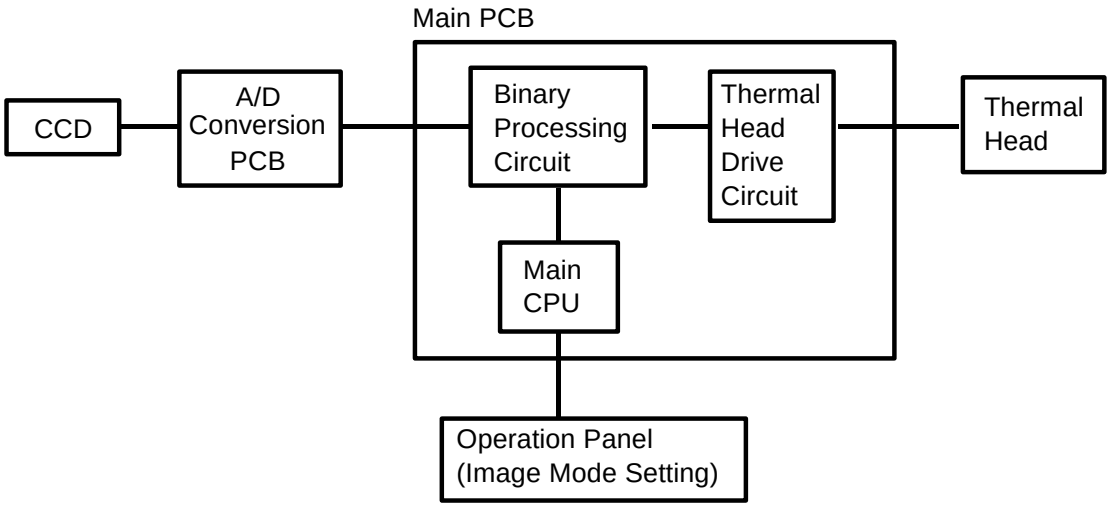
In the photo mode, M1, M2, and M3 are set so that there are more steps in the darker area (low sensitivity area). This improves the quality of the gradation. (Refer to (3) Shading Distortion Correction.)



### (8) Shading Distortion Memory

The amplification ratios ($\alpha$) which corresponds to each CCD elements are stored as 4-bit digital data in the shading distortion memory circuit and used for the shading distortion correction.

## 8.2 BINARY PROCESSING




Binary processing resolves how to transform a line of "gray" pixels (the 4-bit digital data from A/D conversion) into a line of black and white pixels in such a way as to preserve the quality of the image.

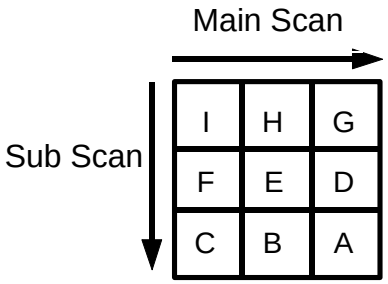
The binary processing circuit produces 1-bit data (white or black pixels) from the 4-bit output of the A/D converter, and sends it to the thermal head drive circuit. The binary process is different between the line mode and the photo mode.

1) Line Mode: MTF (Modulation Transfer Function) Correction
2) Photo Mode: Dither Processing and Edge Emphasis Processing
(Edge Enphasis Processing is selected only when the DIP-SW 101-6 is turned on.)

### 8.2.1 MTF Correction

When the original image is converted to electrical signals by the CCD, the contrast is reduced. This is because neighboring black and white parts of the image influence each other due to lens characteristics. This phenomenon is typical when the width and spacing of the black and white areas are narrower. MTF correction counters this phenomenon and emphasizes image detail. The value of a target pixel is modified according to the value of surrounding pixels. The modified data is compared to the threshold level. This determines if the pixel is to be black or white.






$E_2 = 2E - 1/2(D + F)$ ------ Main Scan Data Modified
$E_1 = 2E - 1/2(B + H)$ ------ Sub Scan Data Modified

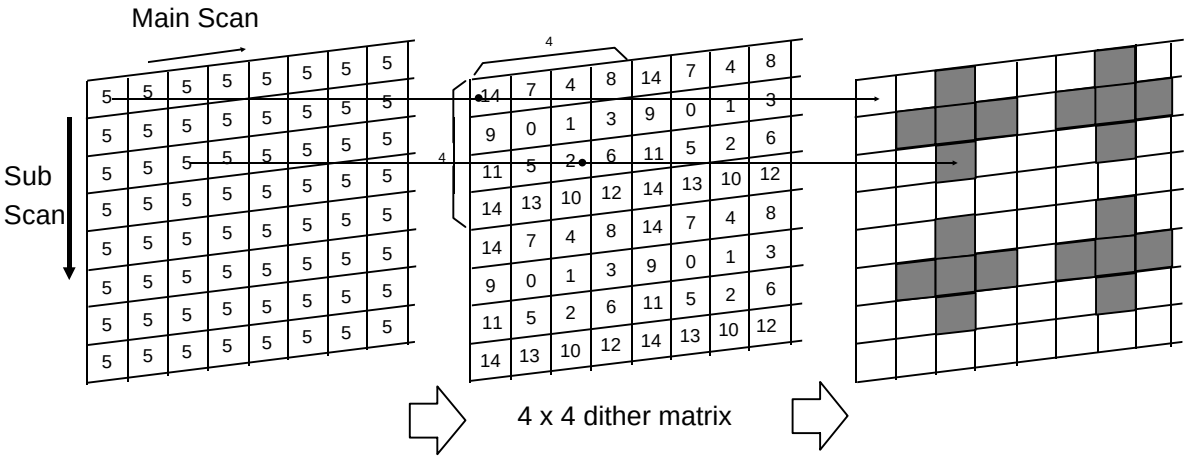
The modified data is compared to a threshold level to determine if the pixel is black or white.

Modified Data $E_2 \geq 8.0$ or Data $E_1 \geq 8.0$ ----- Black
Modified Data $E_2 < 8.0$ and Data $E_1 < 8.0$ ----- White

### 8.2.2 Dither Processing

A dither matrix is made of 4 x 4 pixels and contains 16 different threshold levels for the locations which correspond to 16 pixels of the original image. Each pixel data (En) from the A/D conversion circuit is compared with the corresponding threshold level (Vthn) in the dither matrix. Then each pixel data is converted to either black or white depending on whether the image data is greater or less than the threshold level.

En > Vthn Black
En ≤ Vthn White




4-bit pixel data to be read
Example: All pixels are at 5.

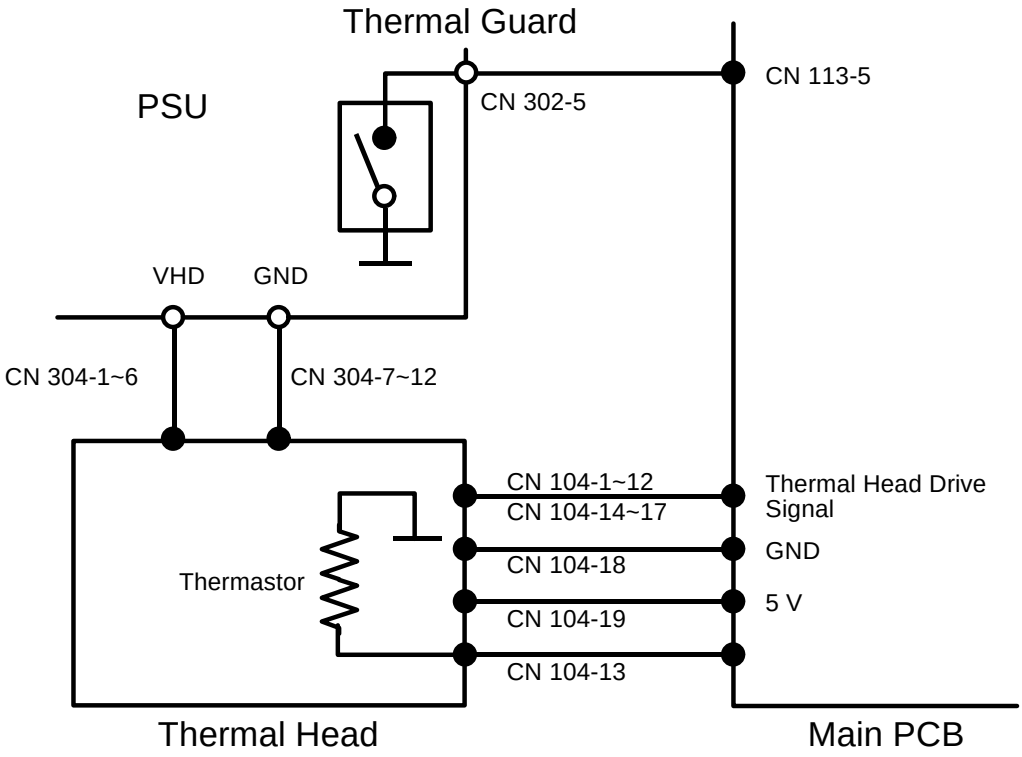
Threshold level of the dither matrix (number shows each Vthn).

Image reappearance (shaded pixels are black, showing the pixels with values below the threshold )

### 8.2.3 Edge Emphasis Processing in the Photo Mode

In the photo mode, if characters are processed using the dither method, they will be difficult to be read due to the distorting nature of the process. To counter this, when the density difference between a pixel and surrounding pixels is greater than a specified level, the surrounding pixel data is processed using MTF instead of the dither process.

## 8.3 THERMAL HEAD





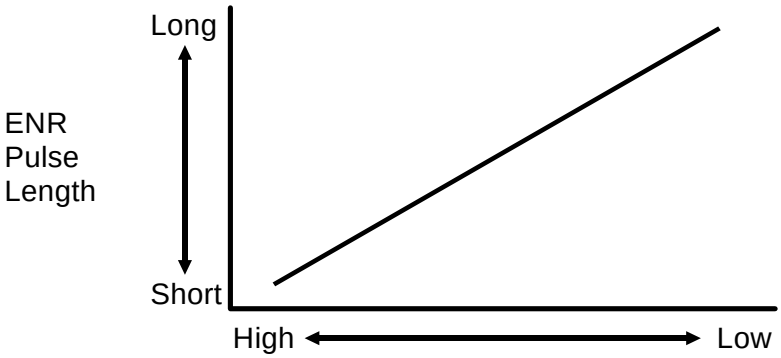

### 8.3.1 Thermal Head Control

The thermal head has heating elements at a density of 300 DPI. The thermal heating elements melt the over-coating and polyester film layers of the master according to the image signal for each pixel.

The Power Supply PCB applies power (VHD) to the thermal heating elements. The power sourse varies from one head to another since the average resistance of each element varies. Therefore, when the thermal head or Power Supply PCB is replaced, it is necessay to readjust the applied voltage with the particular value indicated for each thermal head.

The energy applied to the thermal heating elements is determined by the length of time (t) at which power is applied.

The time depends on the thermal head temperature which is detected by the thermistor on the thermal head. If the temperature is higher, the time (t) will be shorter.




The time(t) is determined when the Master Making key is pressed, and it is kept until the master making is finished.

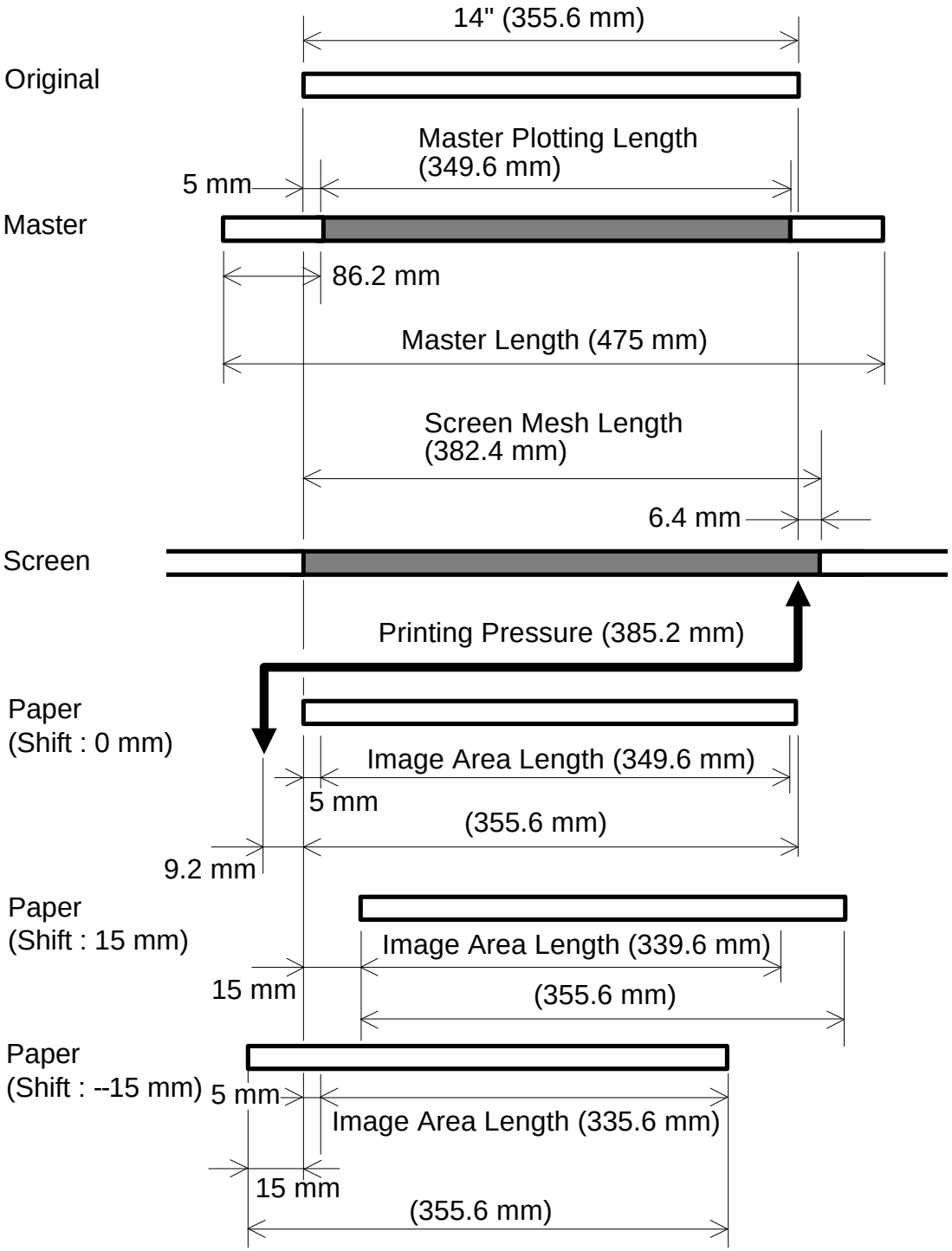
### 8.3.2 Thermal Head Protection

The thermistor on the thermal head and a thermal guard (a thermostat) on the PSU are used for thermal head protection. This prevents the thermal head and power supply unit from overheating when continuously processing a solid image. The CPU detects the abnormal condition when the Master Making key is pressed, and lights the SC code on the operation panel as follows:

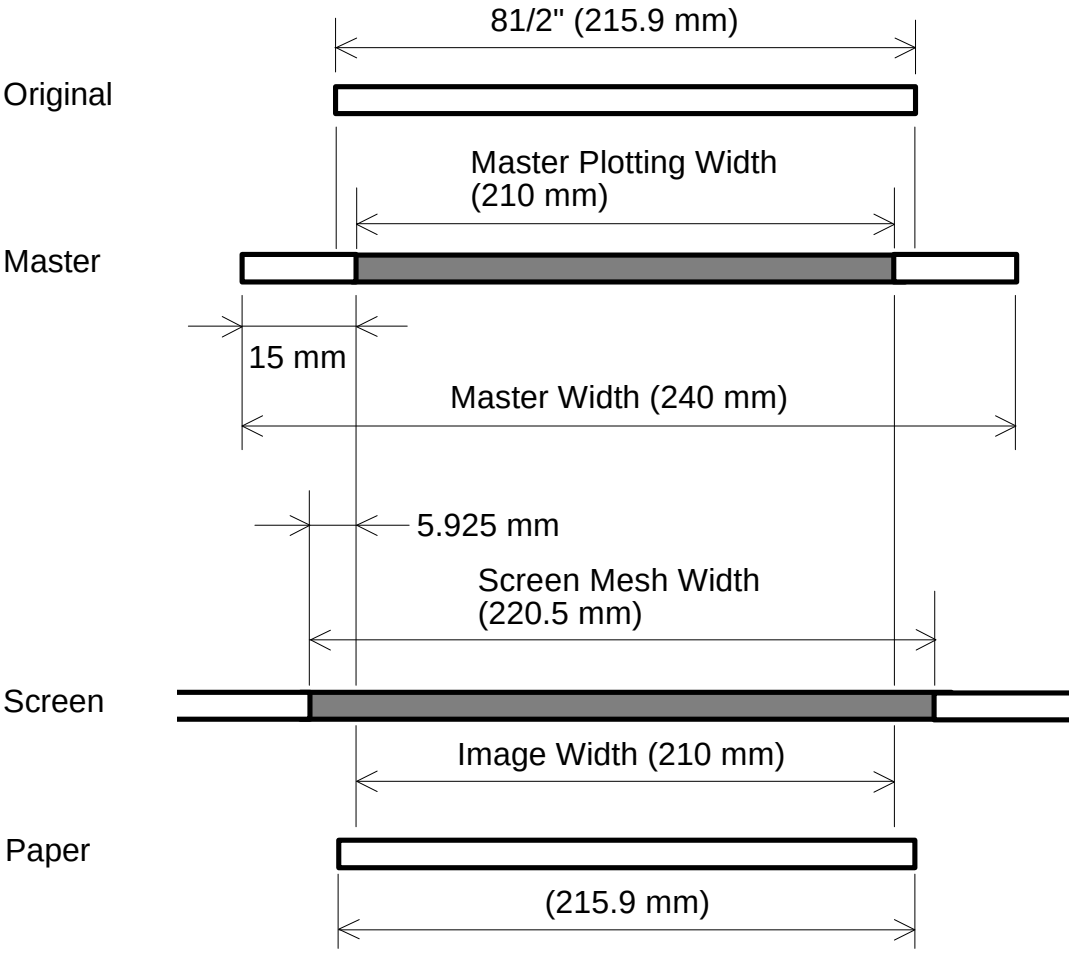
| Detecting Component | Conditions | SC Code |
|---|---|---|
| Thermistor | Over 54°C | E -- 04 |
| Thermistor | Under -- 20°C (Thermistor open) | E -- 09 |
| Thermal Guard | Over 85°C | E -- 08 |

# 9. MASTER PLOTTING AND PRINTING AREA

## 1. Length



**2. Width**


81/2" (215.9 mm)
Original
Master Plotting Width
(210 mm)
Master
15 mm
Master Width (240 mm)
5.925 mm
Screen Mesh Width
(220.5 mm)
Screen
Image Width (210 mm)
Paper
(215.9 mm)

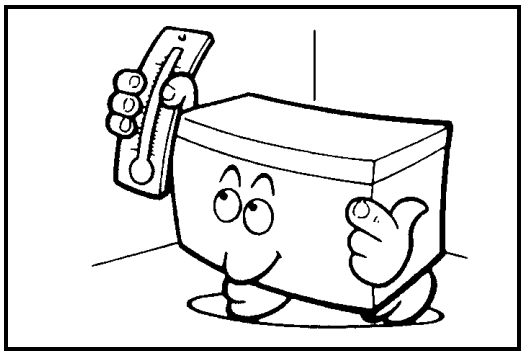
# SECTION 3

# INSTALLATION

# 1. INSTALLATION REQUIREMENTS

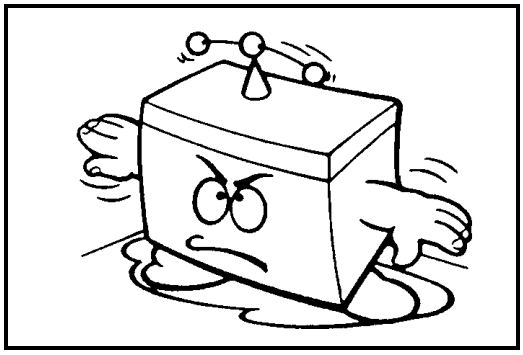
The installation location should be carefully chosen because the environmental conditions greatly affect the performance of the machine.

## 1.1 OPTIMUM ENVIRONMENTAL CONDITION:



Temperature — 10 to 30°C (50 to 86°F)

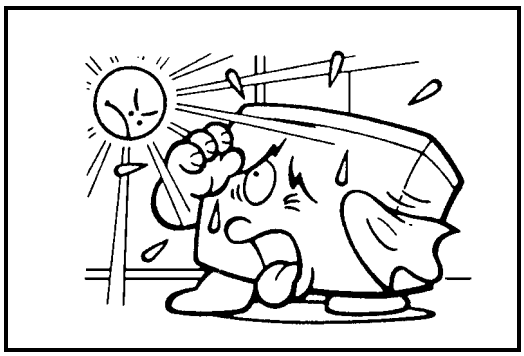
Humidity — 20 to 90 % RH



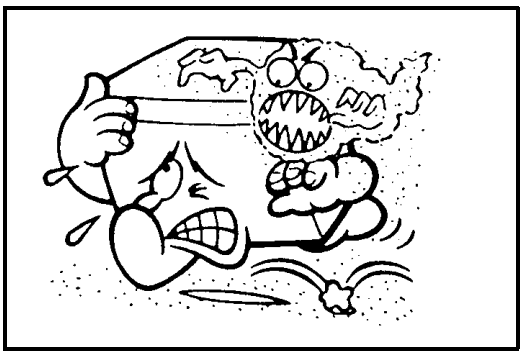
On a strong and level base.

The machine must be level within 5 mm (13/64") both front to rear and left to right.

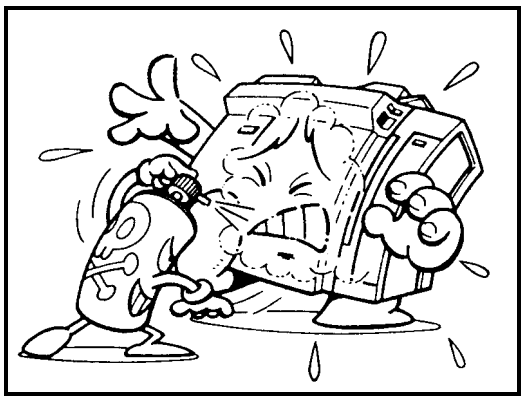
## 1.2 ENVIRONMENTS TO AVOID:



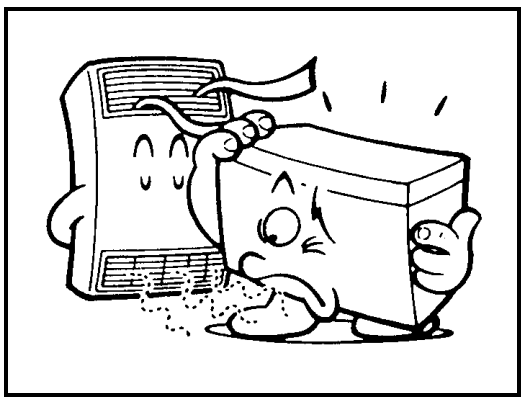
Locations exposed to direct sunlight or strong light (more than 1,500 lux).



Dusty areas.

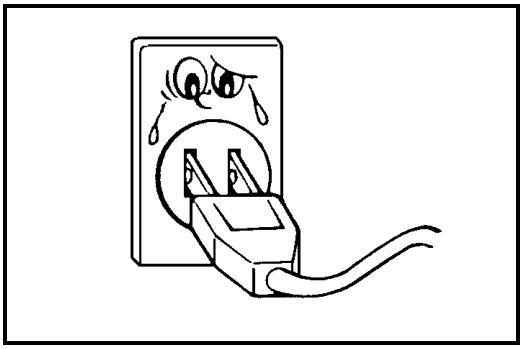


Areas with corrosive gases.



Locations directly exposed to cool air from an air conditioner or reflected heat from a space heater. (Sudden temperature changes from low to high or vice versa may cause condensation within the machine.)

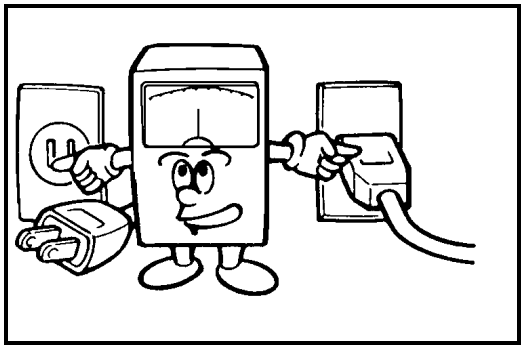
## 1.3 POWER CONNECTION:



Securely connect the power cord to a power source.

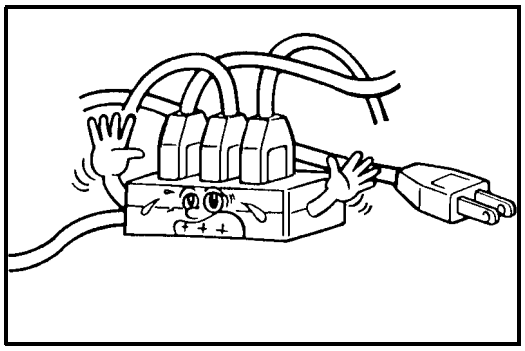
Make sure that the wall outlet is near the machine and easily accessible.

Make sure the plug is firmly inserted in the outlet.

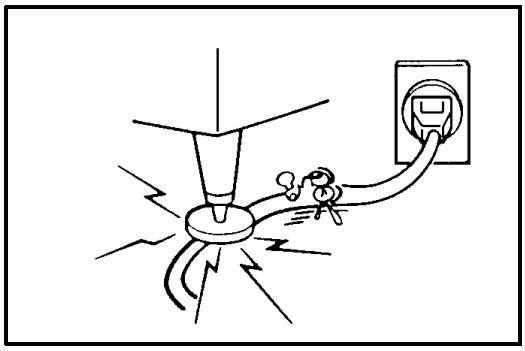


Voltage must not fluctuate more than 10%.





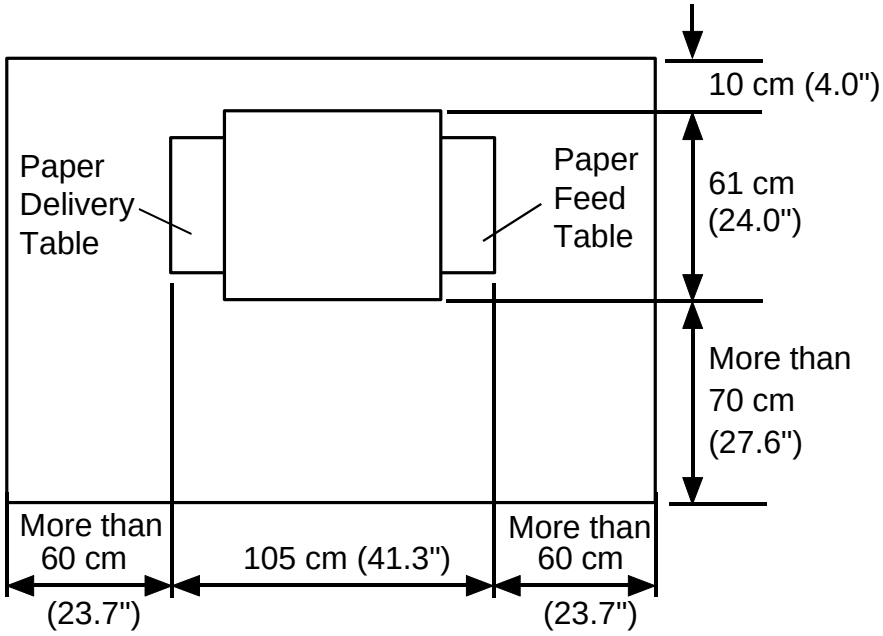
Avoid multiwiring.



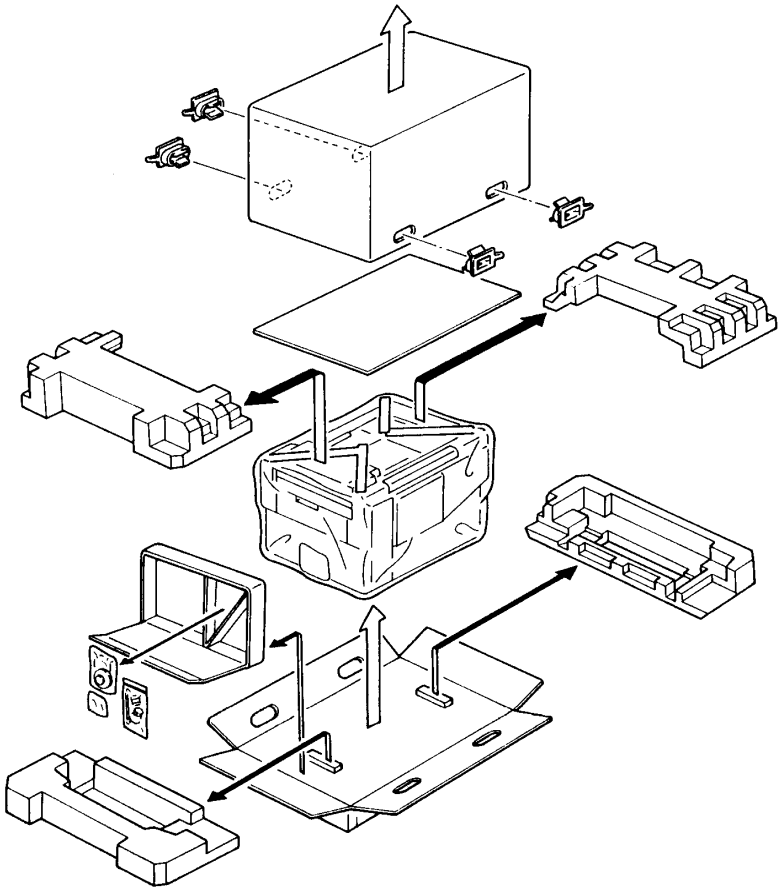
Do not pinch the power cord.

## 1.4 ACCESS TO MACHINE:

Place the machine near a power source, providing clearance as shown below.



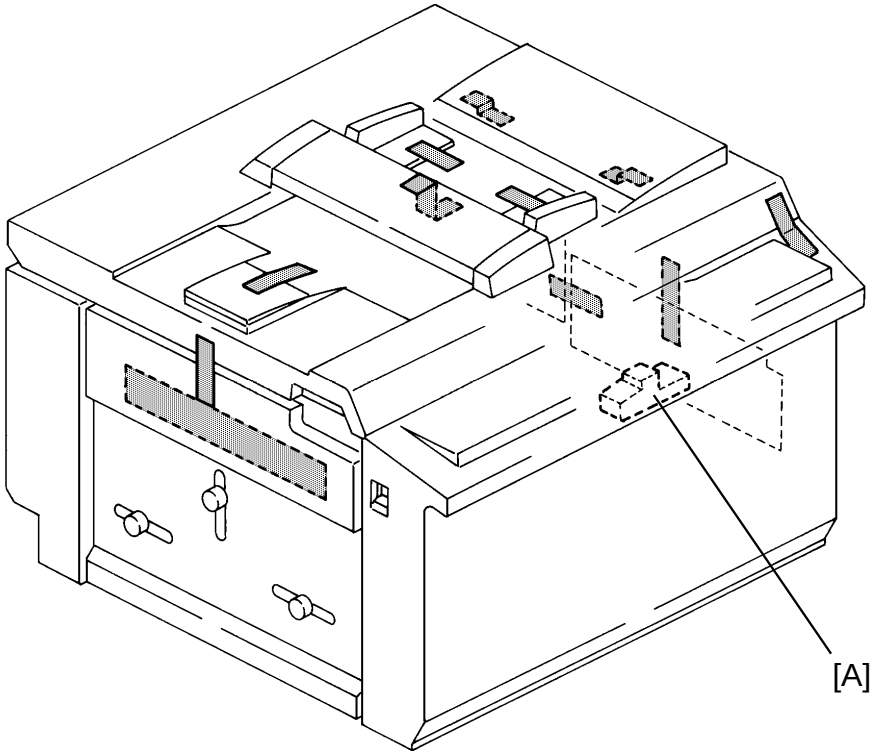
# 2. INSTALLATION PROCEDURE





1. Make sure that you have all the accessories listed below.

(1) Master Spool ..... 2
(2) Paper Feed Side Pad ..... 2
(3) Thermal Head Cleaner
(Excepting OEM's USA version) ..... 1
(4) Operating Instructions ..... 1
(5) NECR (Ricoh version only) ..... 1
(6) Installation Procedure
(Ricoh version only) ..... 1
(7) Brand Stickers
(OEM version only) ..... 1 set
(8) Model Name Plates
(OEM version only) ..... 1 set




2. Mount the machine on a strong and level base.

   **NOTE:** Use a sturdy desk, etc. The machine must be level within 5 mm (0.2") both front to rear and left to right.

3. Remove the tape and string securing the covers and units as shown above.

4. Open the paper feed tray. Then remove the cushion [A] holding the paper feed table.

5. Firmly insert the plug in the wall outlet.

   **NOTE:** Make sure that the wall outlet is near the machine and easily accessible.

6. Turn on the main switch.

7. Loading paper as follows:

a. Open the paper feed table carefully.

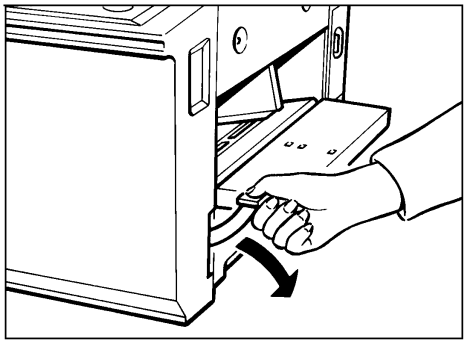
b. Press down the feed roller pressure lever.

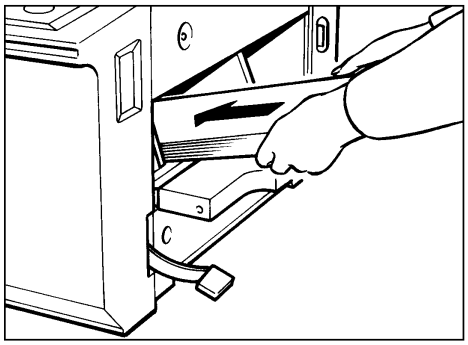
c. Place the paper on the paper feed table.

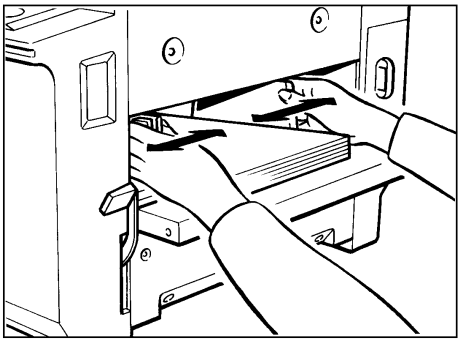
d. Adjust the paper feed side plates to match the paper size.

e. Lift the feed roller pressure lever.

f. Make sure that the paper feed side plates contact the paper lightly.





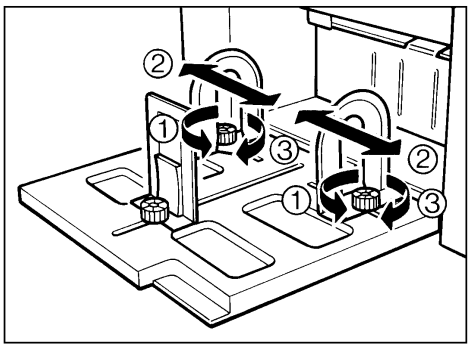


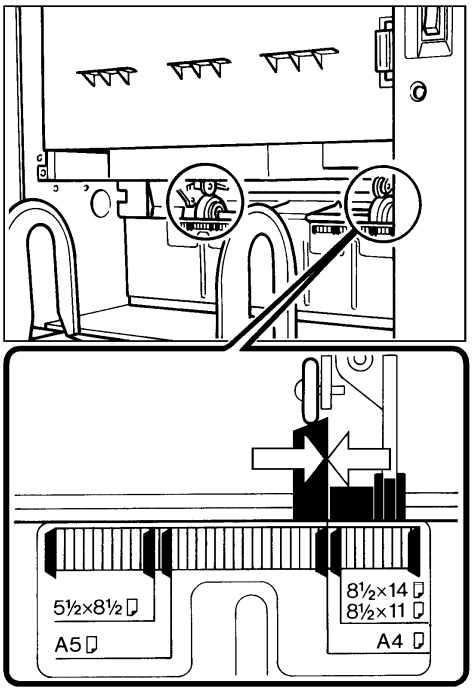
8. Set the paper delivery rollers and guides as follows:

   a. Open the paper delivery table.

   b. Move the paper delivery end and side plates to match the print paper size.

   c. Adjust the paper delivery rollers to match the paper size.

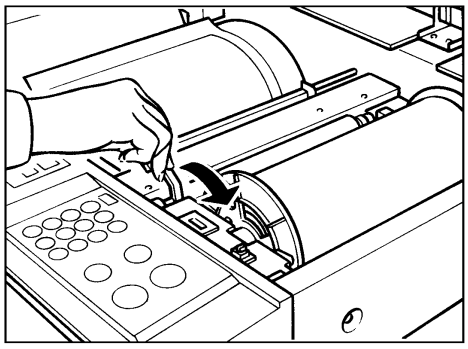


9. Install the master roll as follows:

a. Insert both spools into the new master roll.

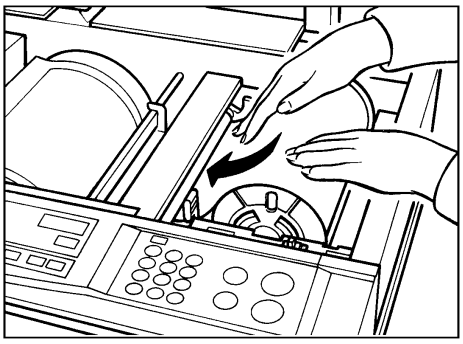
b. Open the top cover.



c. Set the master roll.

d. Lift the pressure release lever to release the feed roller pressure.

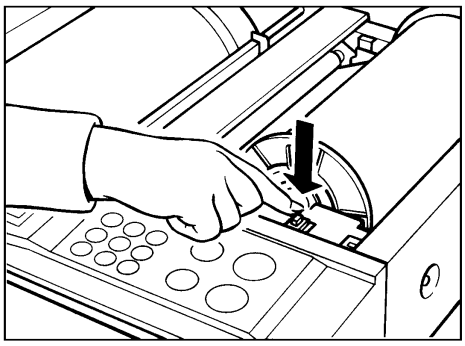
e. Insert the leading edge of the master roll under the pressure roller.



f. Return the pressure release lever to its original position.

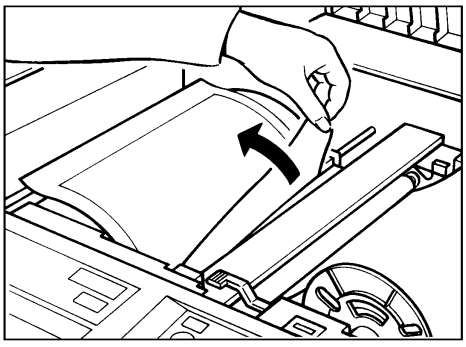
g. Turn on the main switch.

h. Press the master cut button to cut the leading edge of the master roll.



i. Remove the cut-off portion of the master roll.

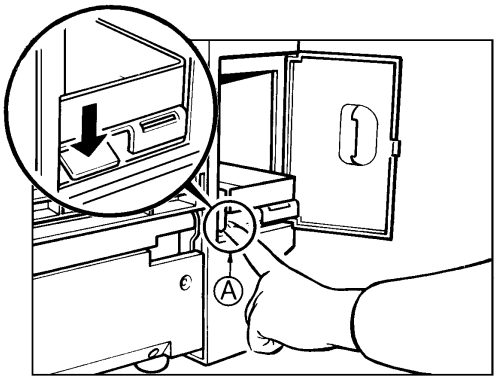
j. Close the top cover.



10. Install the ink cartridge as follows:

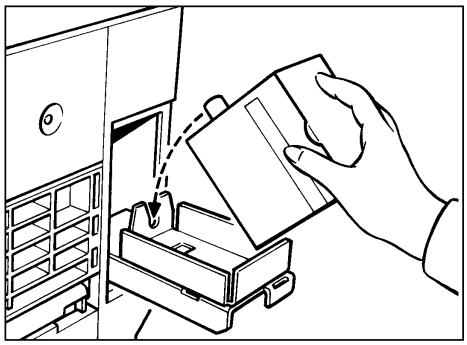
    a. Open the ink cover.

    b. Press down the release lever (green tab [A]). Then pull out the ink cartridge holder.




    c. Open the ink cap and set the ink cartridge as shown in the illustration.

    d. Slide in the ink cartridge holder. Then press the set lever (green tab) until it clicks in position.

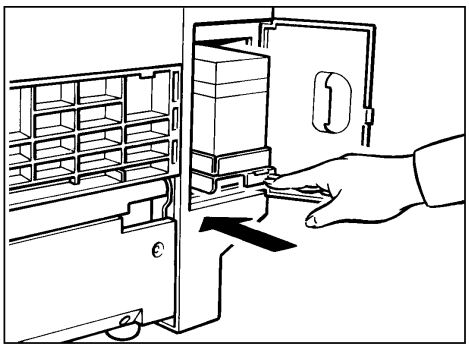


    e. Close the ink cover.

11. Make test prints as follows:

    a. Adjust the original guide to match the original size.

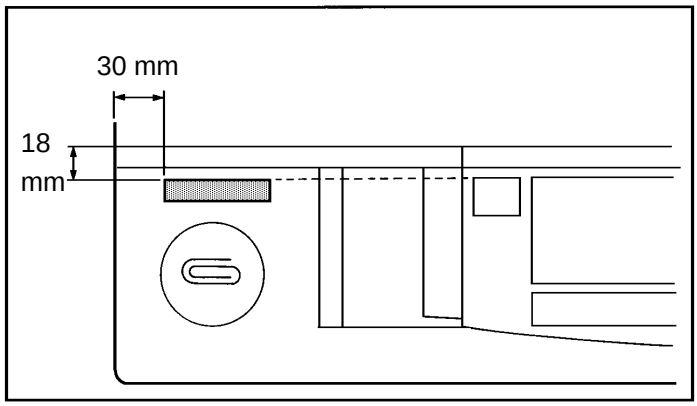
    b. Set the original face down.

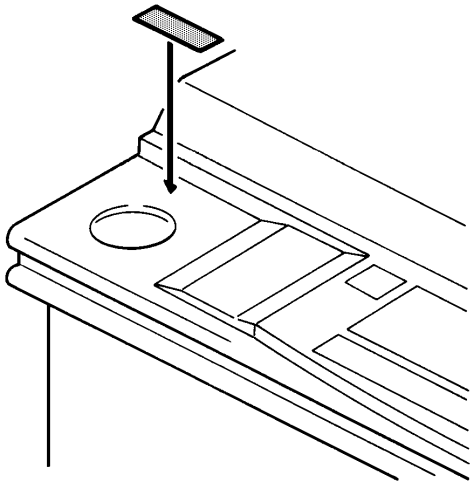


    c. Input the desired number of prints with the number keys and press the Master Making key.

    d. After one sheet of paper is delivered, press the Print Start key to make prints at the lowest print speed until the print image density stabilizes. Use a test chart to check for changes in the image density.

    e. Check the copy image after about one hundred prints.





## BRAND STICKER AND NAME PLATE INSTRUCTIONS

**This procedure is for the OEM version machine only.**

1. Peel off the backing film of the brand sticker (accessory).
2. Adhere the brand sticker to the operation panel as shown.
3. Peel off the backing film of the model name plate (accessory).
4. Adhere the model name plate in the recess on the front cover.

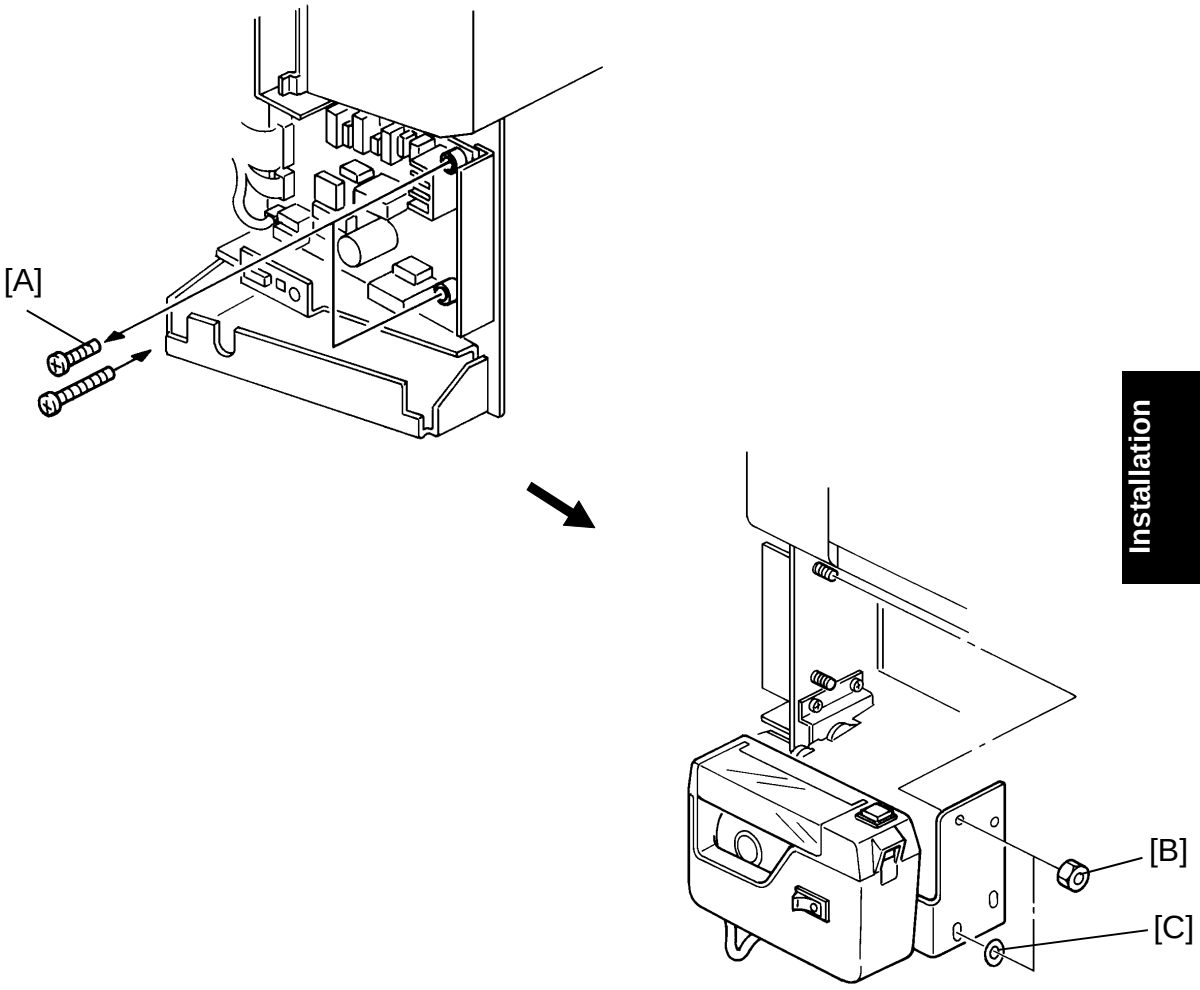
# 3. TAPE MARKER INSTALLATION

## 3.1 ACCESSORY CHECK

Check the quantity and condition of the accessories in the box according to the following list:

1. Knob Screw (For model #C210 only) ..... 2
2. Screw M4 x 10 (For model #C217 only) ..... 2
3. Screw M4 x 25
   (For models #C211, C212, C213, C214, and C216 only) ..... 2
4. Hexagon Nut M4
   (For models #C211, C212, C213, C214, C216, and C217 only) ..... 2
5. Lock washer ..... 1
6. Tape ..... 1

## 3.2 [For Models #C211, C212, C213, C214, and C216]






**Main Body:**

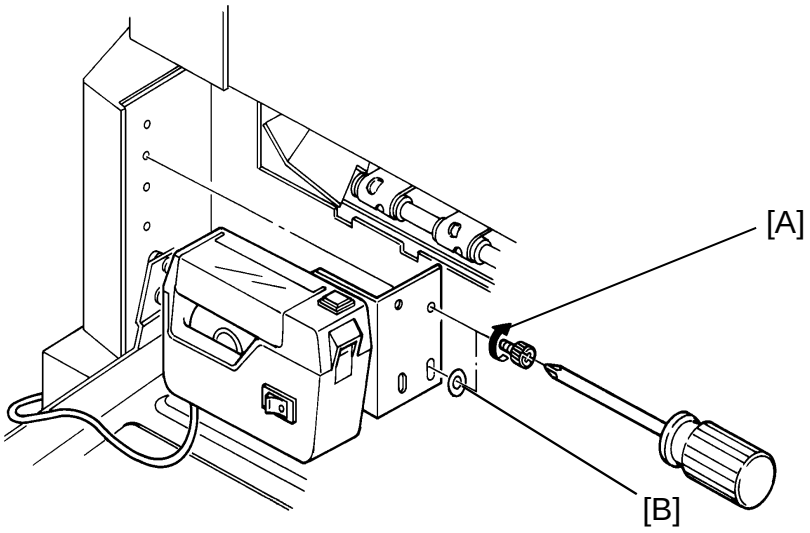
1. Turn off the main switch and unplug the power cord.
2. Remove the rear cover (6 screws).
3. Replace two screws [A] securing the AC drive PCB with M4 x 25 screws (accessory).
4. Reinstall the rear cover.

**Tape Marker:**

5. Install the tape marker on the main body in the two inside holes of the tape marker bracket. Then, tighten the two hexagon nuts [B] (accessory).

   **NOTE:** Install the lock washer [C] (accessory) with the lower of the two nuts.

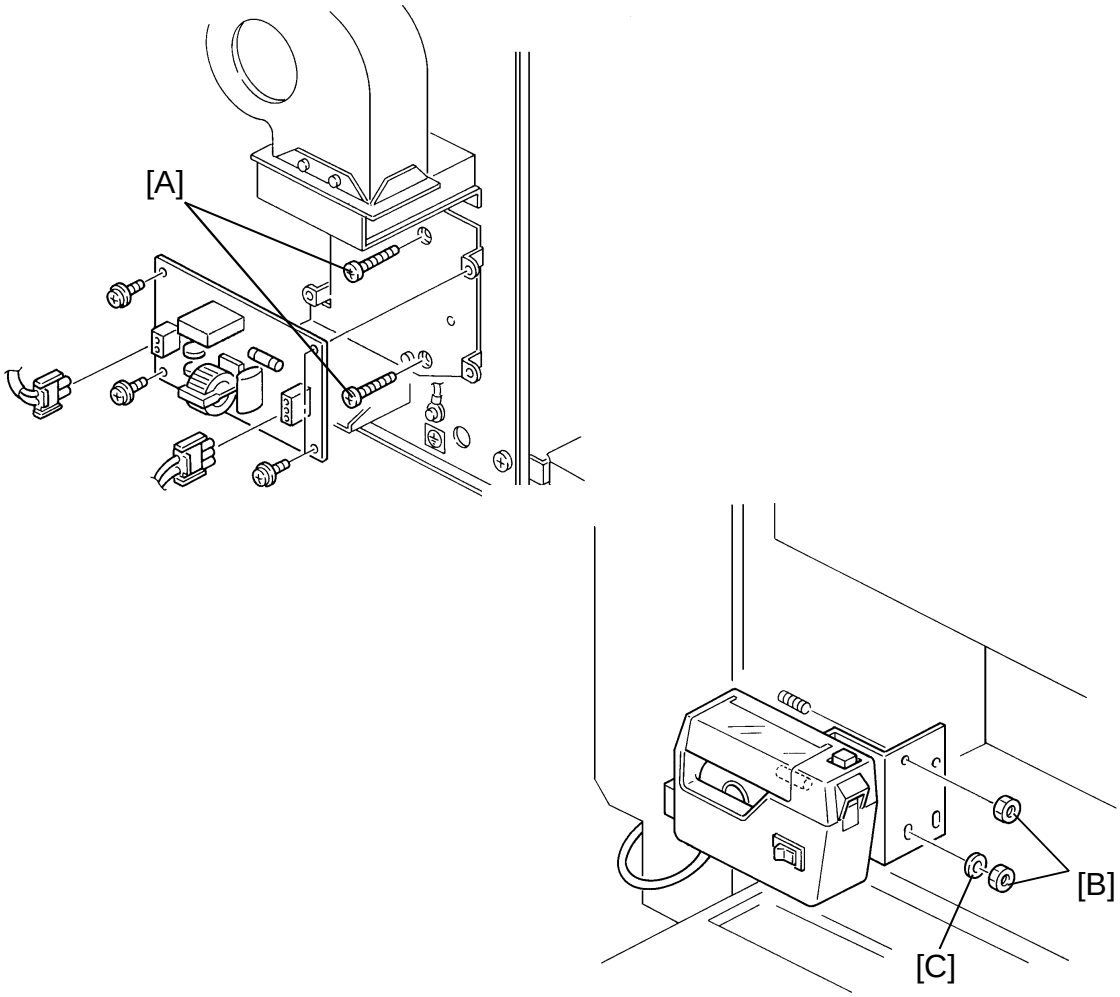
## 3.3 [For Model #C210]




1. Turn off the main switch and unplug the power cord.
2. Install the tape marker on the main body with two knob screws [A] (accessory) in the two outside holes of the tape marker bracket.

**NOTE:** 1) Tighten the knob screws with a screwdriver to prevent them from coming loose.
2) Install the lock washer [B] (accessory) with the lower of the two knob screws.

## 3.4 [For Model #C217]






**Main Body:**

1. Turn off the main switch and unplug the power cord.
2. Remove the rear cover (6 screws).
3. Remove the noise filter PCB (4 screws).
4. Install the two M4 x 10 screws [A] (accessory) as shown.
5. Reinstall the rear cover.

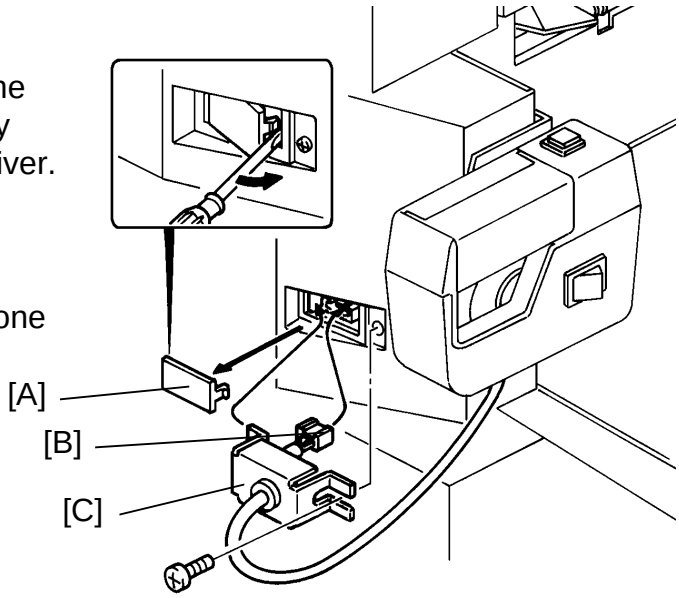
**Tape Marker:**

6. Install the tape marker on the main body in the two outside holes of the tape marker bracket. Then, tighten the two hexagon nuts [B] (accessory).

   **NOTE:** Install the lock washer [C] (accessory) with the lower of the two nuts.

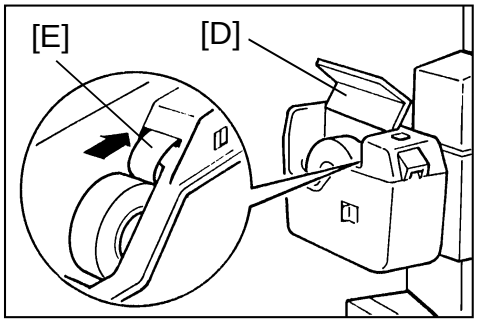
## 3.5 [Common Steps]

1. Remove the small cap in the rear cover of the main body [A] using a minus screw driver. Then, connect the tape marker harness [B] to the main body, and install the connector cover [C] using one of the rear cover fixing screws.

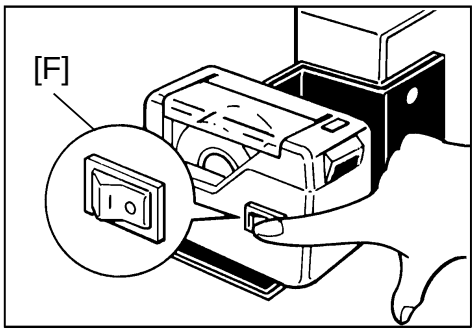



2. Open the tape marker cover [D]. Then, insert the leading edge of the tape into the tape entrance until it stops as shown in the illustration [E].

   **NOTE:** Be sure that the tape is installed in the proper direction. If it is not in the correct direction, the tape marker will not work correctly.

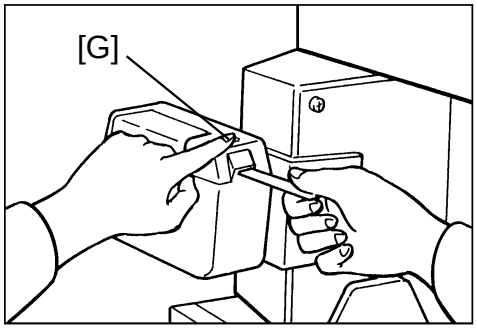



3. Turn on the main switch of the main body and the tape marker switch [F].




4. Press the tape cut button [G] to cut off the leading edge of the tape.

5. Check the tape marker operation using the Memory/Class modes of the main body.



# SECTION 4

# SERVICE TABLES

# 1. SERVICE REMARKS

## 1.1 SCANNER SECTION

### 1. Original Registration Sensor

When replacing the upper or lower original registration sensor with a new one, be sure to adjust the light intensity of the sensor LED.

### 2. Original Friction Pad

When replacing the original friction pad with a new one, be careful of the position on the spring plate. (See **"1.2 ORIGINAL FRICTION PAD REMOVAL."**)

### 3. Exposure Glass

When removing and reinstalling the exposure glass, be careful of the setting direction. (See **"1.6 EXPOSURE GLASS REMOVAL."** )

### 4. Exposure Lamp

Do not touch the exposure lamp while it is on. If you do so, you might receive weak electricalshock.



## 1.2 MASTER FEED SECTION

### 1. Thermal Head

When replacing the thermal head with a new one, be sure to adjust the voltage supplied to the thermal head.

### 2. Plotter Unit

When removing or installing the plotter unit, be careful not to damage the harness. (See **"3.3 PLOTTER UNIT REMOVAL."** )

## 1.3 PAPER FEED SECTION

### 1. Friction Pad

When removing and reinstalling the friction pad base, be sure to install it in the correct direction and position. (See **"5.1 PAPER FEED ROLLER AND FRICTION PAD REMOVAL."** )

### 2. Paper Feed Roller

Do not touch the surface of the roller with oily hands.

## 1.4 DRUM AND DRUM DRIVE SECTION

### 1. Main Motor

When the motor pulley has been removed from the motor and then reinstalled, be careful of the position of the pulley on the motor shaft. (See **"7.4 MAIN MOTOR REPLACEMENT."** )

### 2. Drum Unit

When removing and reinstalling the drum unit, be sure to engage the drum drive gears correctly. (See **"7.6 DRUM UNIT REMOVAL."** )

### 3. Doctor Roller

Normally the doctor roller gap is not adjusted or changed. It tends to be difficult to adjust in the field. If the gap becomes narrower, an uneven image may appear on the prints. If it becomes wider, too much ink will be applied to the drum screens, resulting in ink leakage from the drum.

### 4. Drum Master Clamper

1) When removing and reinstalling the drum master clamper, be sure to position the three springs in the drum master clamper correctly.
2) Do not allow the inside of the clamping plate to become dirty with ink.
3) Do not use alcohol or other solvents to clean the inside of the clamping plate. Use a cloth damped with water.

For all the above, see **"7.8 INK ROLLER UNIT REMOVAL."**

### 5. Ink Roller Unit

Do not disassemble the ink roller unit. Each part between the front and rear side plates of this unit has been exactly adjusted to keep the doctor and ink rollers parallel against the drum shaft in the production.

## 1.5 INK SUPPLY SECTION

### 1. Ink Pump

When the ink pump has been removed and reinstalled, be sure to adjust the plunger position.

### 2. Ink Cartridge Installation

When you set the ink cartridge, firmly slide it in and push the set lever (to which a green tab is adhered for identification) until it clicks in position. If it is not set correctly, the ink in the cartridge will not be supplied to the drum.

## 1.6 PAPER DELIVERY SECTION

### 1. Exit Pawl

1) The exit pawl clearance adjustment must be done prior to the drive timing adjustment. Once this has been done then the drive timing adjustment must be carried out.
2) Do not disassemble the exit pawl assembly. The clearance between the exit pawl and drum may change.
3) Never touch the exit pawls during the drum rotating. The exit pawls will touch the drum surface and damage it.

## 1.7 ELECTRICAL COMPONENTS

### 1. Main PCB

When replacing the main PCB with a new one, be sure to perform the followings:

1) Original registration adjustment
2) Leading edge registration adjustment
3) Vertical magnification adjustment
4) Trailing edge erase margin adjustment
5) Ink detection adjustment



### 2. Power Supply PCB

1) When replacing the power supply PCB with a new one, be sure to adjust the voltage supplied to the thermal head.
2) When swinging the power supply PCB out to carry out the exit pawl drive timing adjustment, drum unit removal, etc., be sure to disconnect all of the 4 connectors on the PCB. Especially, be sure to disconnect the connector for ac power supply to the PCB (on the left end of the PCB). If this is not disconnected, the connector itself and the harness may be damaged.

### 3. A/D Conversion PCB

When replacing the A/D conversion PCB with a new one, be sure to adjust the output of the white level.

### 4. CCD PCB

When replacing the CCD PCB with a new one, be sure to adjust the output of white level, scanning line position, scanning start position, focus, and horizontal magnification.

# 2. MAINTENANCE TABLE

The following items should be maintained periodically. There are two sets of intervals - one based on time and the other based on print count. For maintenance items with entries in both of them, use whichever comes first.

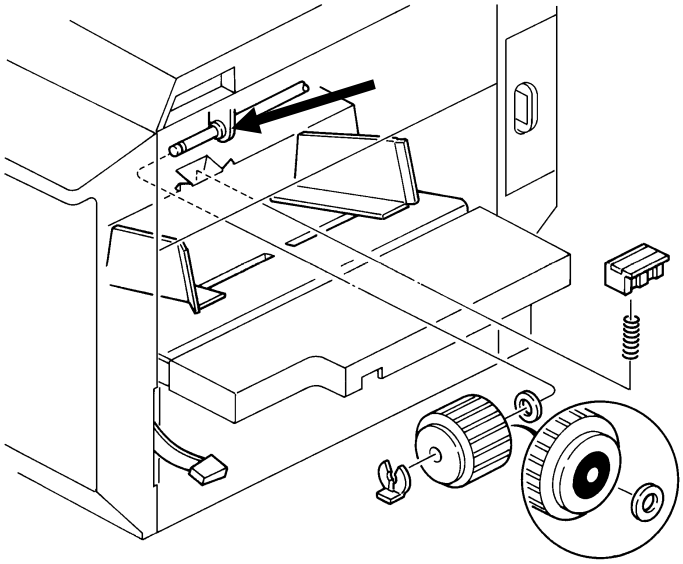
C: Clean R: Replace L: Lubricate A: Adjust

| Item \ Interval | Time | | | | Print Counter | | | | | EM | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6M | 1Y | 2Y | 3Y | 300K | 600K | 1M | 1.2M | 2M | | |
| **Scanner/Optics** | | | | | | | | | | | |
| Exposure Lamp | | C | C | C | | | | | | | Dry Cloth |
| Original Pick-up Roller | | | | R | | | | | | | |
| Mirror/Reflector | | C | C | C | | | | | | | Soft Cloth |
| Exposure Glass | | C | C | C | | | | | | | Dry Cloth |
| Original Registration Sensor | | C | C | C | | | | | | | Dry Cloth |
| **Master Feed** | | | | | | | | | | | |
| Platen Roller | | R | R | R | | | | | | | Expected life is 6K masters. |
| Master Eject Rollers | | C | C | C | | | | | | | Alcohol |
| Drum Master Sensor | | | | | | | | | | C | Dry Cloth |
| **Paper Feed** | | | | | | | | | | | |
| Paper Feed Roller | R | R | R | R | R | R | R | R | R | | |
| Friction Pad | C | C | C | C | | R | | R | | | Damp Cloth |
| Exit Roller | | | R | | | | | R | | | |
| Press Roller | | | R | | | | | R | | | |
| Paper Feed Roller One-way Clutch | | | | | | | R | | R | | |
| Paper Feed Clutch | | | | | | | | | R | | |
| Feed Roller and Exit Roller Bushings | | L | L | L | | | | | | | Motor Oil (SAE #20) |
| Feed Roller Drive Gears | | L | L | L | | | | | | | Grease (Alvania #2) |
| Registration/Exit Sensors | C | C | C | C | | | | | | | Dry Cloth |
| 2nd Feed Roller | C | C | C | C | | | | | | | Dry Cloth |
| **Drum and Ink Supply** | | | | | | | | | | | |
| Cloth Screen | | | R | | | | | R | | | |
| Drum Drive Gears and Cam | | L | L | L | | | | | | | Grease (Alvania #2) |
| Drum Flange Bushing | | L | L | L | | | | | | | Motor Oil (SAE #20) |
| In/Outside of Drum | | C | C | C | | | | | | | Alcohol |
| Ink Pump Nozzle | | C | C | C | | | | | | | Alcohol |
| **Others** | | | | | | | | | | | |
| Timing Belt Tension | | | A | | | | | | | | |
| Press Roller Lock Lever Position | | | A | | | | | | | | |

# 3. LUBRICATION POINTS

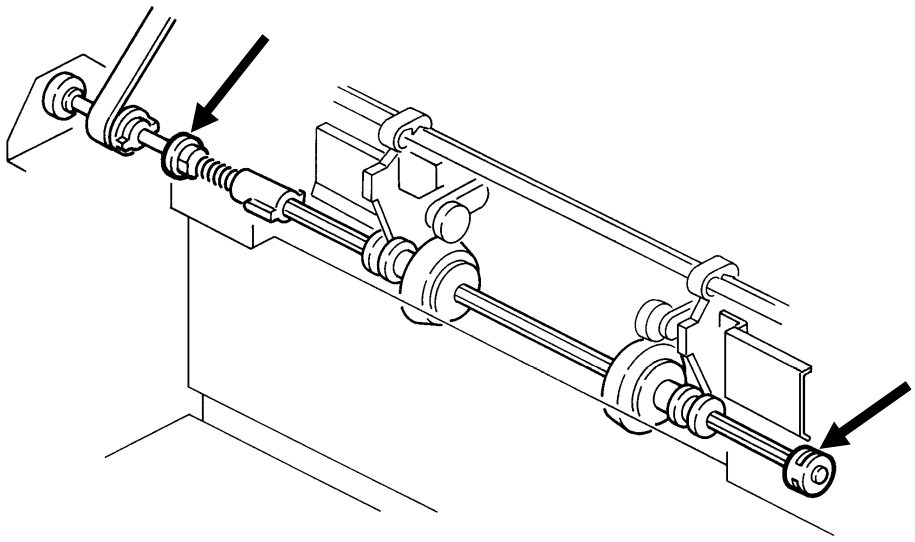
## 3.1 FEED ROLLER BUSHING

**Lubricant: Motor Oil**



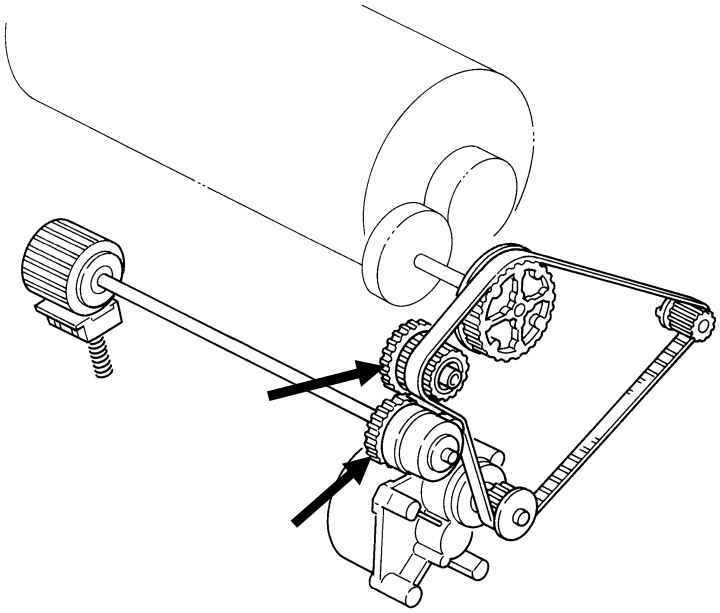
## 3.2 EXIT ROLLER BUSHINGS

**Lubricant: Motor Oil**



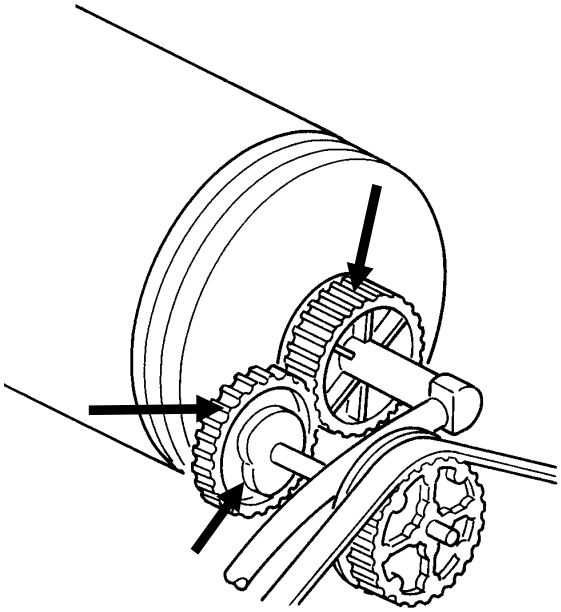
## 3.3 FEED ROLLER DRIVE GEARS

**Lubricant: Grease (Alvania #2)**



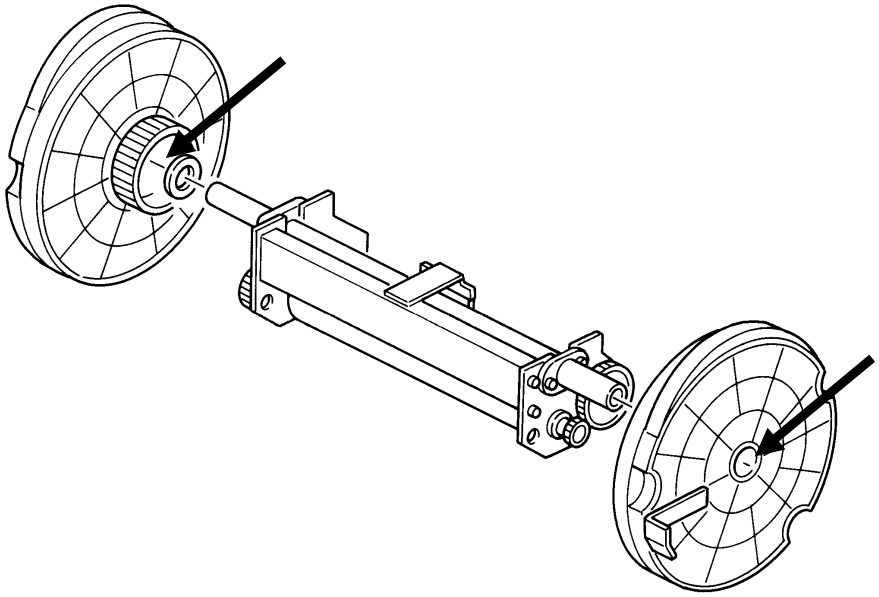
## 3.4 DRUM DRIVE GEARS AND CAM

**Lubricant: Grease (Alvania #2)**



## 3.5 DRUM FLANGE BUSHING

**Lubricant: Motor Oil**



# 4. INPUT/OUTPUT CHECK MODE

The electrical components can be checked by this program. The input check mode can check if the sensors or switches function correctly. The output check mode can manually activate the electrical devices, such as motors and solenoids.

## 4.1 ACCESS PROCEDURE

1. Turn on the main switch while holding down the Print Start, Stop, and Clear keys at the same time.
2. The memory indicator displays "01" which indicates that the Input Check mode is selected.
3. To select the Output Check mode, press the Memory/Class key. The memory indicator displays "00".

## 4.2 DRUM FREE RUN MODE

1. Select either the Input or Output Check mode.
2. Select the Photo mode by pressing the Image Mode key.
3. Free run starts by pressing the Image Density key. Operation depends on the image Density selection as follows:

| Image Density Selection | Drum Speed |
|---|---|
| Lighter | 30rpm |
| Normal | Stop |
| Darker | 30rpm |
| Darkest | 70/100/130rpm (see Note) |

**NOTE:** The drum speed can be changed by the Speed key.

## 4.3 INPUT CHECK MODE

By entering a number listed below after accessing the Input check mode, the input level of each electrical device can be checked. Depending on the electrical device's condition, the beeper sounds and the machine status indicators light.

| No. | Device | Conditions when the beeper sounds |
|---|---|---|
| 1 | Feed Start Timing Sensor | Sensor is actuated |
| 2 | Feed Jam Timing Sensor | Sensor is actuated |
| 3 | Exit Jam Timing Sensor | Sensor is actuated |
| 4 | Master Eject Position Sensor | Sensor is actuated |
| 5 | Drum Master Sensor | Sensor detects master on the drum |
| 6 | Scanner Unit Open Switch | Scanner unit is open |
| 7 | Master End Sensor | Sensor detects no master |
| 8 | Master Cut Switch | Switch is pressed |
| 9 | Left Cutter Switch | Switch is actuated |
| 10 | Right Cutter Switch | Switch is actuated |
| 11 | Paper End Sensor | Sensor detects no paper |
| 12 | Registration Sensor | Sensor detects paper |
| 13 | Exit Sensor | Sensor detects paper |
| 14 | Master Clamper Switch (Open) | Clamper is open |
| 15 | Master Clamper Switch (Close) | Clamper is closed |
| 16 | Original Set Sensor | Sensor detects original |
| 17 | Original Registration Sensor | Sensor detects original |
| 18 | ADF Open Switch | ADF is closed |
| 19 | Master Eject Sensor | Sensor is actuated |
| 20 | Pressure Plate H.P. Sensor | Sensor is actuated |
| 21 | Full Master Sensor | Sensor is actuated |
| 22 | DIP SW 103-1 | Switch is on |
| 23 | DIP SW 103-2 | Switch is on |
| 24 | DIP SW 103-3 | Switch is on |
| 25 | DIP SW 103-4 | Switch is on |
| 26 | DIP SW 103-5 | Switch is on |
| 27 | DIP SW 103-6 | Switch is on |
| 28 | DIP SW 103-7 | Switch is on |
| 29 | DIP SW 103-8 | Switch is on |

## 4.4 OUTPUT CHECK MODE

You can turn on each electrical device listed below individually. The procedure is as follows:

1. Select the output check mode.
2. Enter the number of the device which you would like to turn on.
3. Press the Print key to turn on the device.
4. To turn off the device, press the Clear key.

**NOTE:** Some of the devices are turned on only while the Print key is pressed (Marked with "*").

**CAUTION: 1. Do not turn the drum manually nor by using the output mode when the clamper is opened by the output mode.**
**2. Do not open the clamper when the drum is not at the master feed or eject positions. Use the drum stop functions (No. 15 or 16) before opening the clamper.**

| No. | Device/Function | Note |
|---|---|---|
| 1 | Thermal Head | Power is applied to the thermal head for 30 seconds after the Print key is pressed. While the power is applied to the thermal head, the beeper sounds. |
| 2 | Paper Feed Clutch * | |
| 3 | Pressure Release Solenoid * | |
| 4 | Master Eject Motor * | |
| 5 | Ink Supply Motor * | |
| 6 | Master Cutter Motor | The motor stops when one of the cutter position sensors is activated. |
| 7 | Print Counter | The counter is increased by one for each press of the Print key. |
| 8 | Master Counter | The counter is increased by one for each press of the Print key. |
| 9 | Exposure Lamp | |
| 10 | Master Clamper Motor (Open) * | The motor stops when the master clamper switch detects the clamper open condition. |
| 11 | Master Clamper Motor (Close) * | The motor stops when the master clamper switch detects the clamper closed condition. |
| 12 | Master Feed Motor | |
| 13 | Original Feed Motor | |
| 14 | Shading Distortion Correction | The shading distortion memory is rewritten. |
| 15 | Drum Stop (Master Exit) | The drum turns and stops at the master eject position automatically. |
| 16 | Drum Stop (Master Feed) | The drum turns and stops at the master feed position automatically. |

| No. | Device/Function | Note |
|---|---|---|
| 17 | Pressure Plate Motor *<br>(To Home Position) | The motor turns to move the pressure plate towards to the home position. The motor stops when the pressure plate H.P. sensor is actuated. |
| 18 | Pressure Plate Motor *<br>(To Pressed Position) | The motor turns to move the pressure plate towards to the pressed position. The motor stops when the full master sensor is actuated. |
| 19 | Air Knife Motor * | |
| 20 | Operation Panel Indicators | Turns on all the indicators on the operation panel. |

# 5. THERMAL HEAD TEST

This function is used to determine which printer component is causing an image problem on the master.

In this mode, the background pattern that is printed covers the entire sheet of paper.

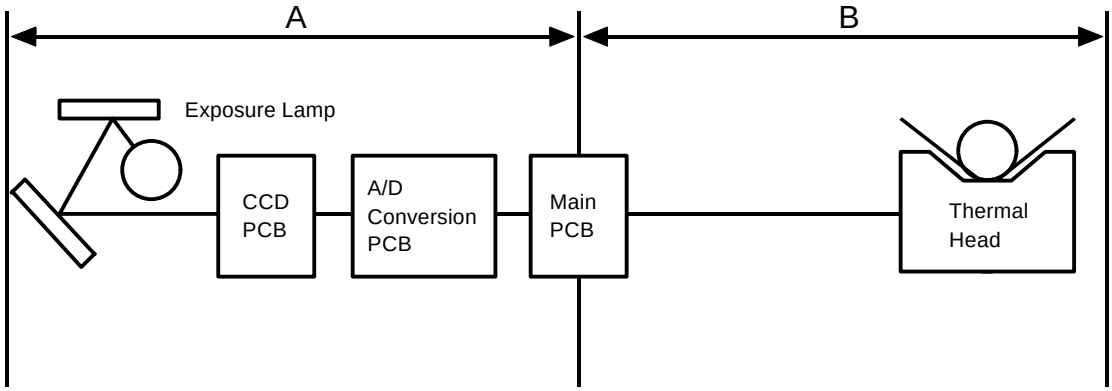
### Procedure

1. Turn off the main switch and unplug the power cord.
2. Remove the front cover and turn off the DIP switch 101-1.
3. Place paper on the paper table.
4. Plug the power cord and turn on the main switch.
5. Set an original in the ADF. (Any original is acceptable.)
6. Press the Master Making key.
7. Make prints and check the image.

### Assessment

Pattern image is normal ..... Part A component is defective.

Pattern image is abnormal ..... Part B component is defective.



# 6. SERVICE TABLES

## 6.1 TEST POINT TABLE

### Main PCB

| No | Usage |
|---|---|
| TP101 | –12 V |
| TP102 | Ink Level (Standard Pulse) |
| TP103 | Ink Level (Detection Pulse) |
| TP104 | GND--b |
| TP105 | +12 V |
| TP106 | +24 V |
| TP107 | 4MHz Clock |
| TP108 | +38 V |
| TP109 | +5 V |
| TP110 | GND--a |
| TP111 | Original Registration Sensor |

### A/D Conversion PCB

| No | Usage |
|---|---|
| TP201 | OS Signal (CCD Output) |
| TP202 | VS Signal (Inverted and Amplified CCD Output) |
| TP203 | GND |
| TP204 | Scan Line Trigger |



## 6.2 VARIABLE RESISTOR TABLE

### Main PCB

| No | Usage |
|---|---|
| VR101 | Ink Detection Adjustment |
| VR102 | Original Registration Sensor Adjustment |

### A/D Conversion PCB

| No | Usage |
|---|---|
| VR201 | White Level Adjustment |

### Power Supply PCB

| No | Usage |
|---|---|
| VR301 | Factory Use Only (+5V Adjustment) |
| VR401 | Thermal Head Voltage Adjustment |

## 6.3 DIP SW TABLE

### Main PCB

| DPS 101 | OFF | ON |
|---|---|---|
| 1 | Outputs Test Pattern | - |
| 2 | Dither Matrix (Screw Pattern) | - |
| 3 | Dither Matrix (Bayer Pattern) | - |
| 4 | Dither Matrix (8 x 8 Pattern) | - |
| 5 | Dither Matrix (6 x 6 Pattern) | Dither Matrix (4 x 4 Pattern) |
| 6 | Normal | Edge Emphasis in Photo Mode |
| 7 | Normal | Enable Data Noise Filter |
| 8 | Production Use Only | **Must be ON** |

### Factory Setting

| DPS 101 | |
|---|---|
| 1 | ON |
| 2 | ON |
| 3 | ON |
| 4 | ON |

| DPS 101 | |
|---|---|
| 5 | ON |
| 6 | OFF |
| 7 | OFF |
| 8 | ON |

If two or more the DIP-SW 101-2 ~ 6 are OFF, the image will not be produced.

| DPS 102 | OFF | ON |
|---|---|---|
| 1 | Thermal Head Power Off | Normal |

| DPS 102 | | | |
|---|---|---|---|
| 2 | 3 | 4 | Leading Edge Registration Adjustment |
| OFF | OFF | OFF | +2.4 mm |
| OFF | OFF | ON | +1.6 |
| OFF | ON | OFF | +0.8 |
| OFF | ON | ON | 0 (Standard) |
| ON | ON | ON | –0.8 |
| ON | ON | OFF | –1.6 |
| ON | OFF | ON | –2.4 |
| ON | OFF | OFF | –3.2 |

| DPS 103 | | | |
|---|---|---|---|
| 1 | 2 | 3 | Vertical Magnification |
| OFF | OFF | OFF | +1.75% |
| OFF | OFF | ON | +1.25 |
| OFF | ON | OFF | +0.75 |
| OFF | ON | ON | 0 (Standard) |
| ON | OFF | OFF | –0.75 |
| ON | OFF | ON | –1.25 |
| ON | ON | OFF | –1.75 |
| ON | ON | ON | –2.25 |

| DPS103 | | Description |
|---|---|---|
| 4 | 5 | Trailing Edge Erase Margin Adjustment |
| OFF | OFF | +1mm |
| OFF | ON | +2 mm |
| ON | OFF | +3 mm |
| ON | ON | –1mm |

| DPS 103 | OFF | ON |
|---|---|---|
| 6 | Normal | Enable Key Counter Operation |
| 7 | Not Used | |
| 8 | Not Used | |



## 6.4 LED TABLE

**Main PCB**

| LED # | OFF | ON |
|---|---|---|
| 101 | Less Ink Condition | Sufficient Ink Condition |
| 102 | -- | Paper Feed Condition |

## 6.5 FUSE TABLE

**Main PCB**

| FUSE # | Rated Current | Protect | |
|---|---|---|---|
| | | Voltage | Device |
| 101 | 630 mA | 24 V | Master Cutter, Master Clamper, and Plessure Plate Motors |
| 102 | 4 A | 38 V | Air Knife Motor |

# 7. SERVICE CALL INDICATIONS TABLE

| No. | *Description*/Definition | Points to Check |
|---|---|---|
| E-00 | *Clamper Motor Failure*<br>The main PCB cannot detect the master clamper switch signals (Open/Close) within 1.2 seconds after the clamper motor is turned on. | * Mechanical interference with the clamper drive<br>* Master clamper sensor<br>* Clamper motor<br>* Clamper drive mechanism |
| E-01 | *Cutter Unit Failure*<br>Neither the left nor right cutter switch turns on within 2 seconds after the cutter motor is turned on. | * Cutter switches<br>* Cutter motor<br>* Cutter drive mechanism |
| E-04 | *Thermal Head Overheat*<br>Temperature of the thermal head is greater than 48°C when the Master Making key is pressed. | * Thermal head<br>* Thermistor of the thermal head (short circuit) |
| E-06 | *Main Motor Failure*<br>The main PCB cannot detect the feed start timing sensor signal within 2 seconds after the main motor is turned on. | * Main motor<br>* Power to the main motor<br>* Feed start timing sensor<br>* Mechanical interference with the drum drive |
| E-07 | *ROM Data Error*<br>The CPU detects errors in the ROM data when the main switch is turned on. | * ROM on the main PCB<br>* CPU on the main PCB |
| E-08 | *Power Supply Unit Overheat*<br>The main PCB receives the overheat signal from the power supply unit when the Master Making key is pressed. | * Power supply unit |
| E-09 | *Thermal Head Thermistor Open*<br>The thermistor output voltage (CN104-13) is over 2.83 volt. | * Thermal head thermistor<br>* Thermal head connector |
| E-10 | *Thermal Head Drive Failure*<br>The CPU detects abnormal condition in the thermal head drive circuit. | * Thermal head<br>* Main PCB<br>* Thermal head connector and harness |
| E-12 | *Pressure Plate Motor Failure*<br>The pressure plate home position sensor signal is not detected within 3 seconds after the pressure plate motor is turned on. | * Mechanical interference with the pressure plate drive<br>* Pressure plate motor<br>* Pressure plate H.P. sensor |

# SECTION 5

# REPLACEMENT AND ADJUSTMENT

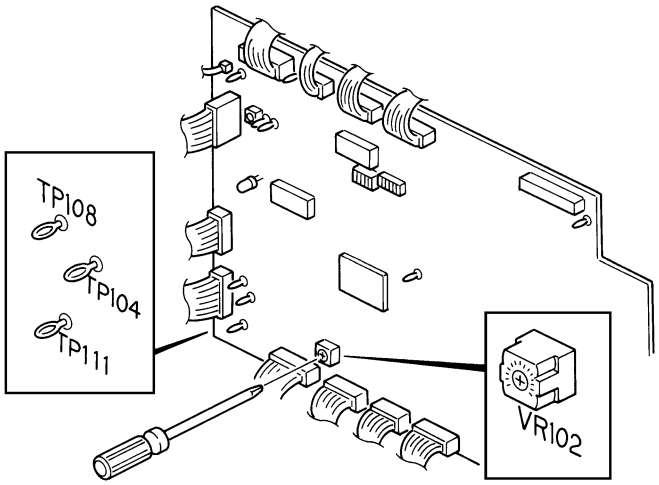
# 1. SCANNER SECTION

## 1.1 ORIGINAL REGISTRATION SENSOR ADJUSTMENT

**PURPOSE:** To ensure correct sensor detection for originals, obtain the correct light intensity of the sensor (light emitter side).

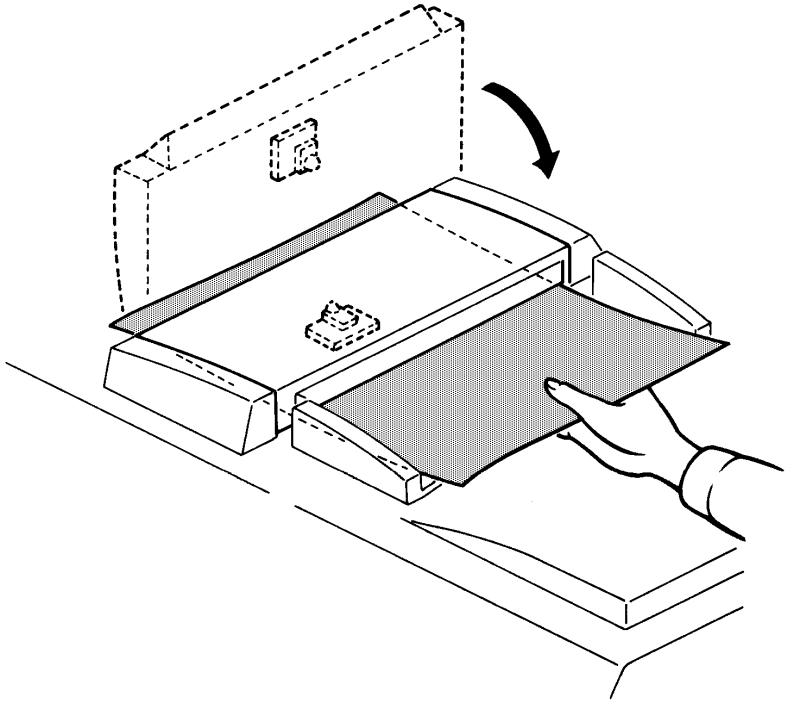
**ADJUSTMENT STANDARD:**

3.4 volts or more when 80 g/m$^2$ white paper is placed and the exposure lamp turns on. (It should be between 0.25 and 0.50 volts when there is no paper and light.)




**CAUTION: This adjustment is required when the upper original registration sensor (light receiver), lower original registration sensor (light emitter), or the main PCB has been replaced.**

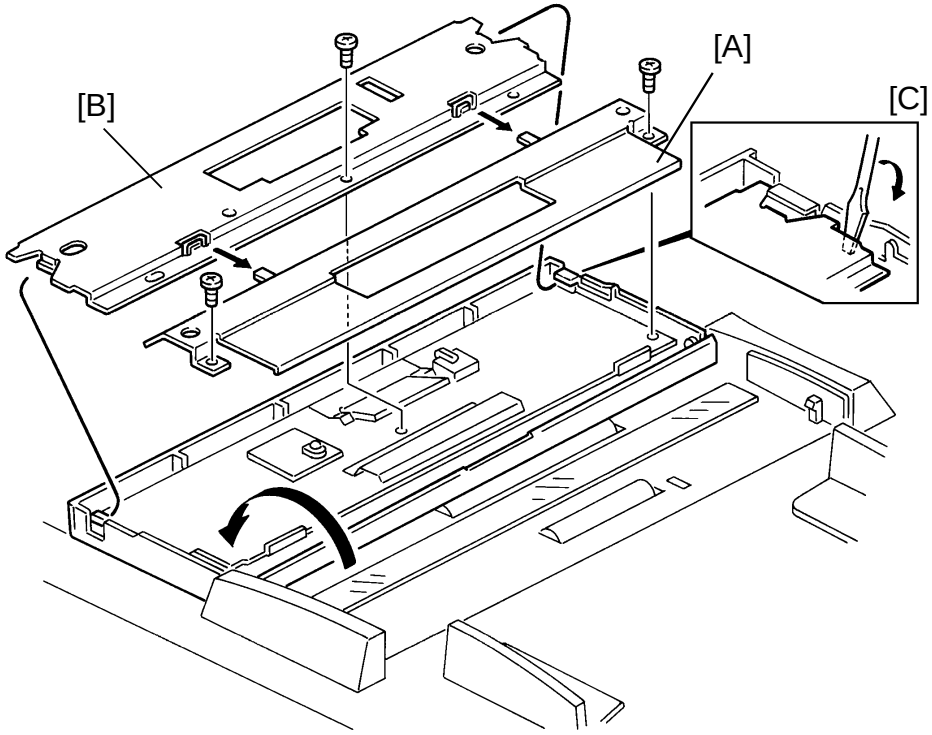
1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws).
3. Connect the power plug, and turn on the main switch to access the output mode. (Turn on the main switch while holding down the Print Start, Stop, and Clear keys together. Then, press the Memory/Class key once to indicate "00" in the memory display.)
4. Measure the sensor (light receiver) output voltage between TP104 (grounding) and TP111 on the main PCB. It should be between 0.25 and 0.50 volts. (0.375 volts is the target.)
5. If it is not correct, adjust the sensor (light emitter) output by turning VR102 on the main PCB.



6. Open the ADF unit and place a white sheet of 80 g/m$^2$ paper on the exposure glass. Then close the ADF unit.
7. Select the exposure lamp on mode. (Enter "9" with the number key.)
8. Press the Print Start key to turn on the exposure lamp. Then repeat step 4. The sensor output should be 3.4 volts or more.
9. If it is not correct, repeat steps 4 to 8.

**CAUTION: The sensor (light receiver) output level varies depending on the paper type placed on the exposure glass. If a white sheet of 64 g/m$^2$ paper is used, the sensor output should be 3.0 volts or more.**

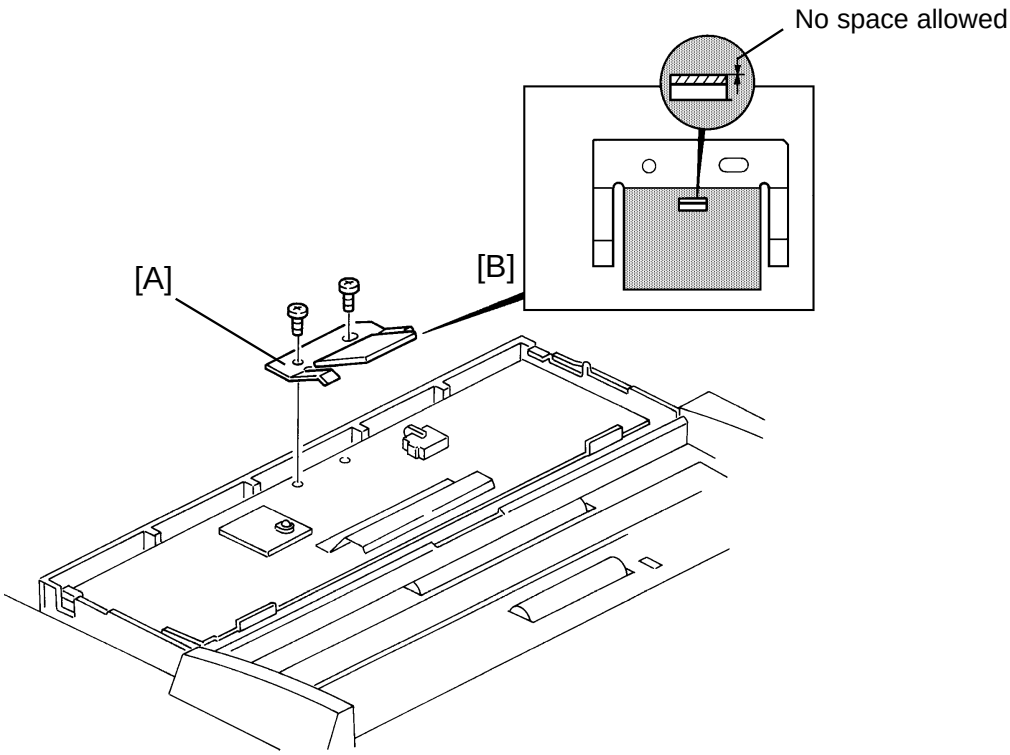
## 1.2 ORIGINAL FRICTION PAD REMOVAL




1. Turn off the main switch and disconnect the power plug.
2. Open the ADF and remove the white plate [A] (2 screws).
3. Remove the upper original guide plate [B] (1 screw).

NOTE: Using a minus screwdriver lift the rear (non-operation side) of the guide plate, which is hooked under the rear side fram, as shown [C], but not in the front side (operation side).

When installing the guide plate, set the hook on the operation side first.

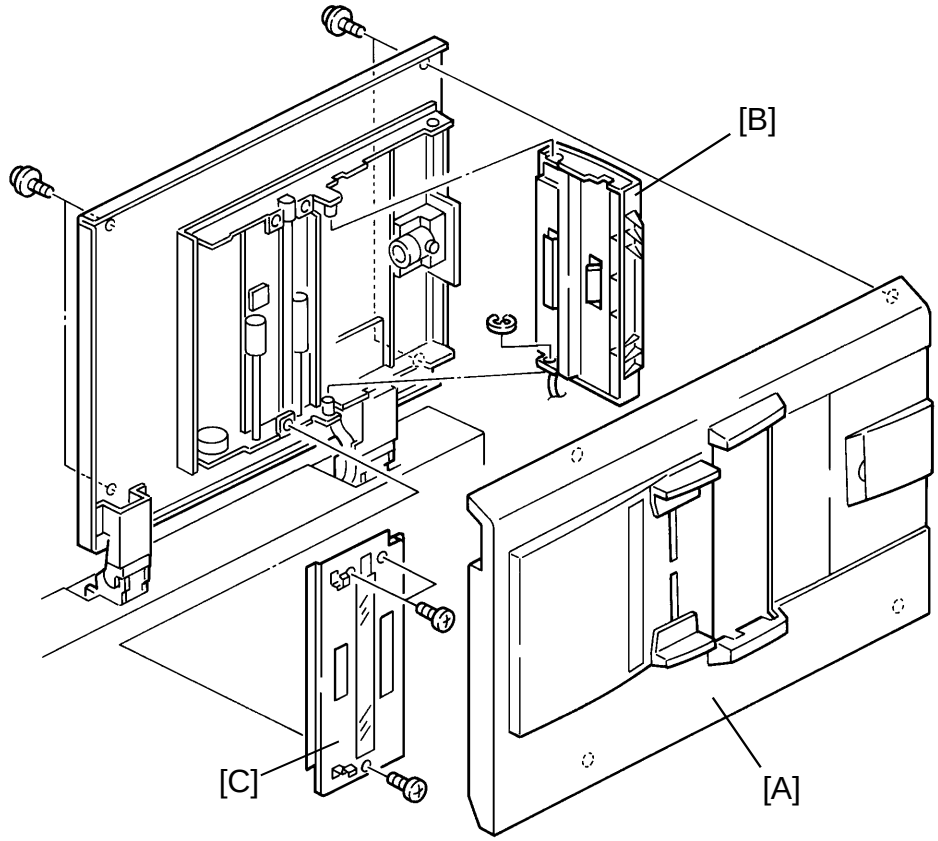



4. Remove the spring plate [A] (2 screws). Peel off the original friction pad from the spring plate and replace it if necessary.

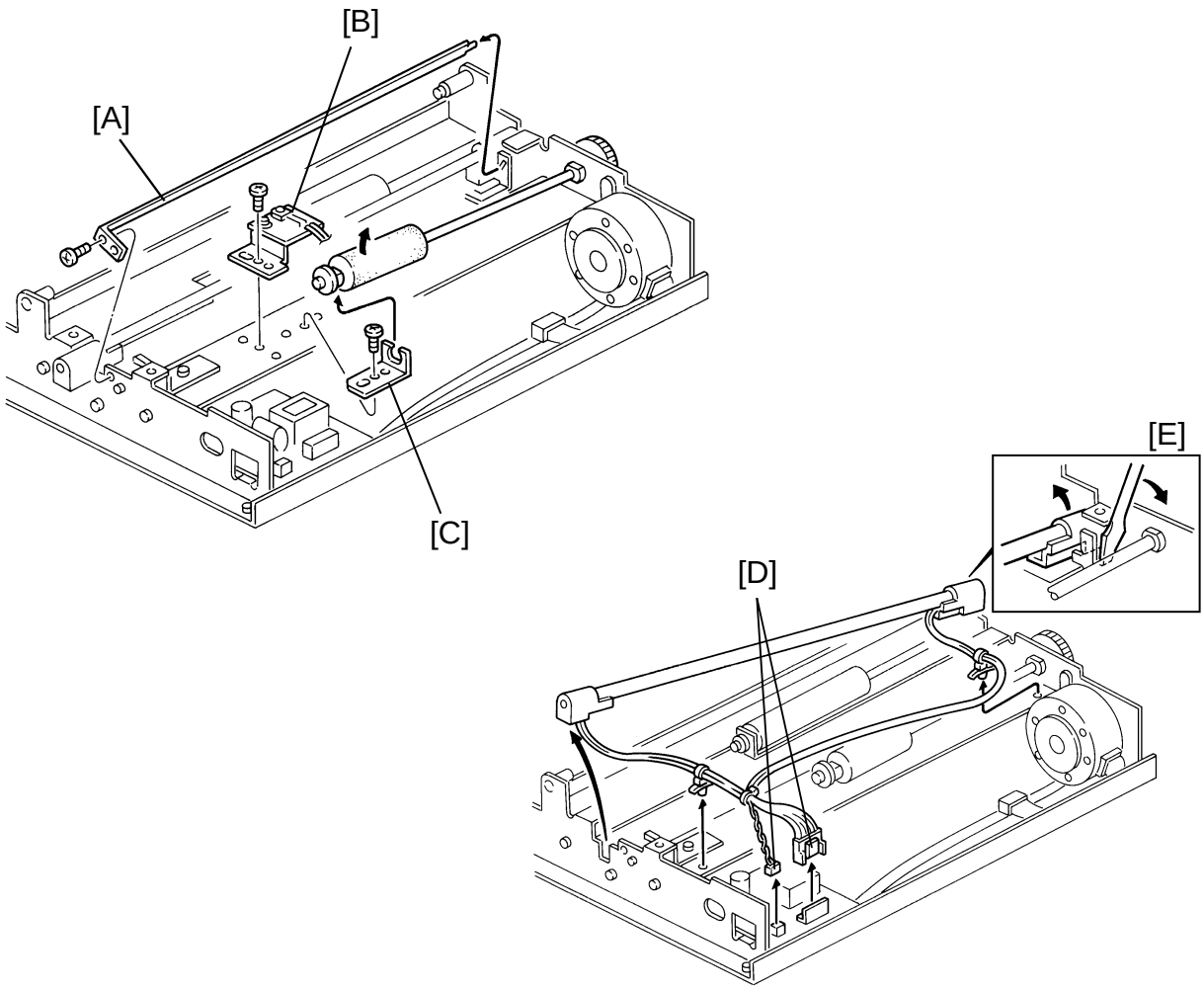
**CAUTION: 1) When you stick the original friction pad on the spring plate, make sure that the edge of the hole in the pad is flush with the bent portion of the spring plate as shown [B].**

**2) Do not damage or bend the spring plate. Original misfeeds may occur if it is deformed.**

## 1.3 EXPOSURE LAMP REMOVAL



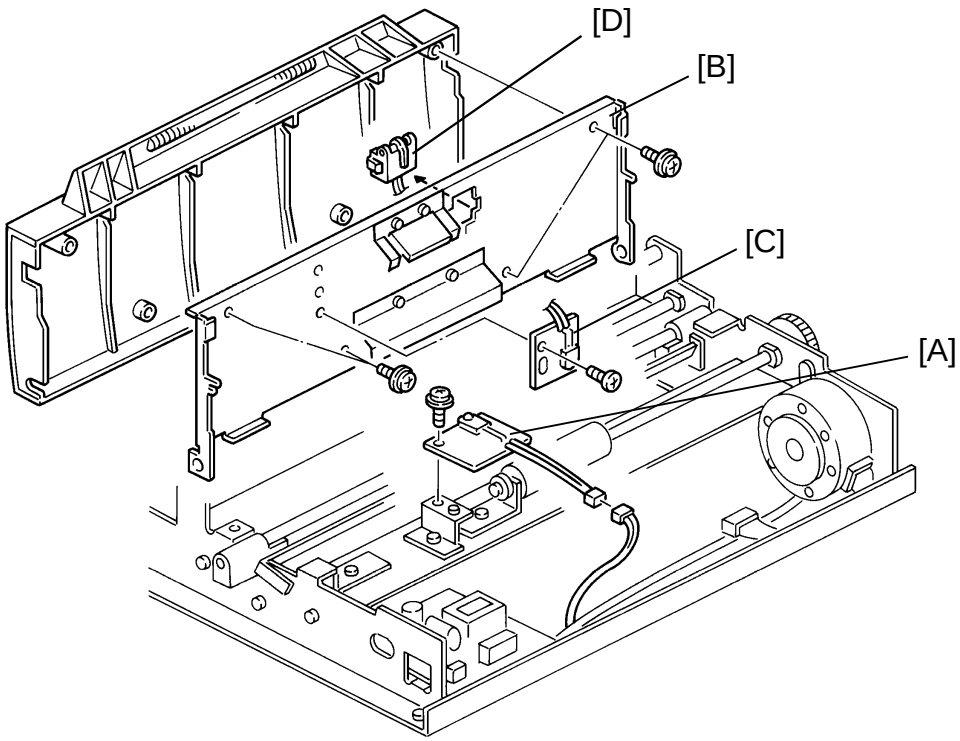

1. Turn off the main switch and disconnect the power plug.
2. Open the scanner unit.
3. Remove the scanner cover [A] (4 screws).
4. Remove the ADF unit [B] (1 E-ring). You do not have to remove it completely by disconnecting the connector from the ADF.
5. Remove the lower original guide plate [C] (3 screws).




6. Remove the reflector [A] (1 screw).
7. Remove the bracket [B] with the original registration sensor and the bracket [C] holding the original pick-up roller shaft (1 screw each).
8. Disconnect the connectors [D] to the lamp control PCB. Then, take off the two harness clamps from the base plate.
9. Lift up the front end of the lamp (operation side). Then, twist the other end slightly and remove it using a minus screw driver as shown [E].

NOTE: When installing the lamp, insert the non-operation side first.

## 1.4 ORIGINAL SET AND REGISTRATION SENSOR REMOVAL



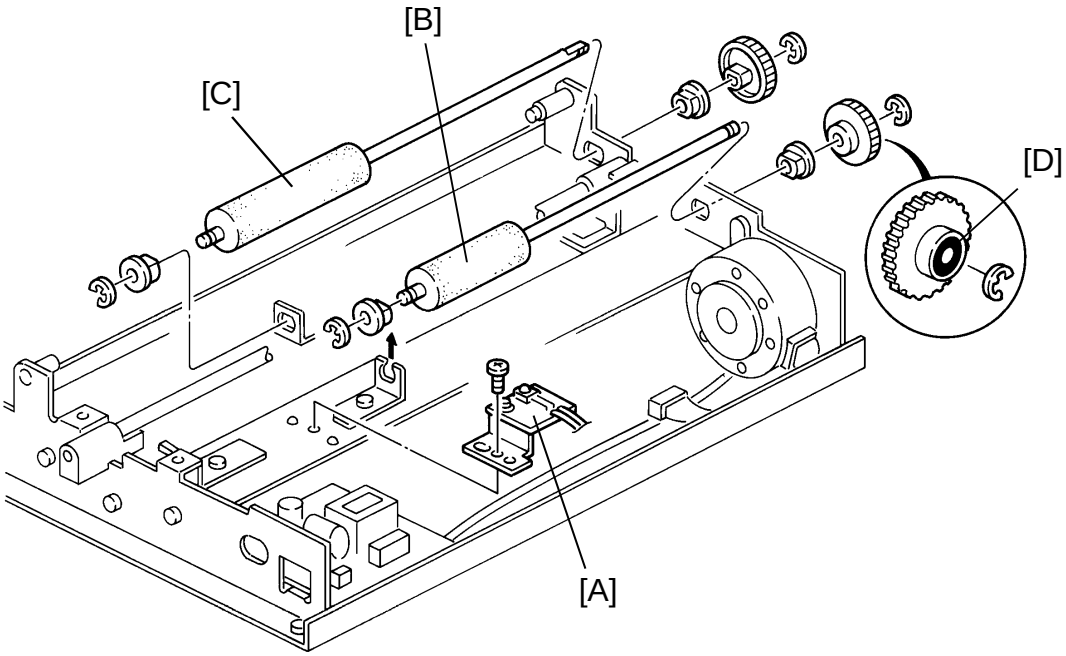

**UPPER ORIGINAL REGISTRATION SENSOR:**

1. Follow steps 1 to 5 in **"1.3 EXPOSURE LAMP REMOVAL"** to remove the lower original guide plate.
2. Remove the lower original registration sensor [A] (light emitter) (1 screw).

**LOWER ORIGINAL REGISTRATION AND ORIGINAL SET SENSORS:**

1. Follow steps 1 to 3 in **"1.2 ORIGINAL FRICTION PAD REMOVAL"** to remove the upper original guide plate.
2. Remove the ADF base [B] (4 screws).
3. Remove the upper original registration sensor [C] (light receiver) (1 screw) and original set sensor [D].

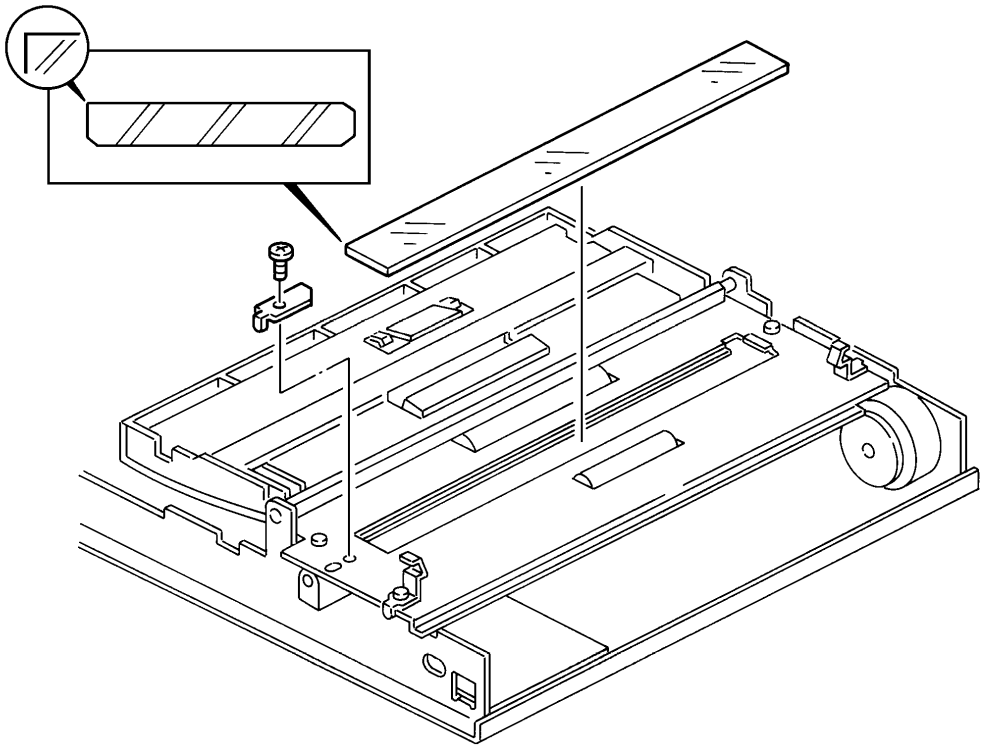
## 1.5 ORIGINAL PICK-UP AND FEED ROLLER REMOVAL




1. Follow steps 1 to 5 in **"1.3 EXPOSURE LAMP REMOVAL"** to remove the lower original guide plate.
2. Remove the bracket [A] with the original registration sensor (1 screw).
3. Remove the original pick-up roller [B] and original feed roller [C] (2 E-rings, 2 bushings, and 1 gear each).

**CAUTION: Note that the gear on the pick-up roller shaft has a built in one-way clutch. Make sure that the blue flange of the gear [D] faces the outside.**

## 1.6 EXPOSURE GLASS REMOVAL



When the exposure glass is installed, set it as shown.

# 2. COPY IMAGE ADJUSTMENT

## 2.1 LEADING EDGE REGISTRATION ADJUSTMENT

**PURPOSE:** To meet the image position in the vertical direction on the print paper with that on the original.

**ADJUSTMENT STANDARD:**

0±2.0 mm

**CAUTION: This adjustment is required when the main PCB has been replaced.**

1. Turn on the main switch, and make a print.

NOTE: The image position on a trial print, which is automatically made after making a master, tends to vary. Do not use the trial print to check the image registration.

2. Measure the difference between the leading edge registration of the original and print.

3. If the value does not meet the standard, then adjust it. The leading edge registration changes depending on the positions of DPS102-2, -3, and -4 (DIP switches) on the main PCB as follows:

| DPS102--2 | --3 | --4 | Difference [mm] |
|---|---|---|---|
| OFF | OFF | OFF | +2.4 |
| OFF | OFF | ON | +1.6 |
| OFF | ON | OFF | +0.8 |
| OFF | ON | ON | 0 (Standard) |
| ON | ON | ON | --0.8 |
| ON | ON | OFF | --1.6 |
| ON | OFF | ON | --2.4 |
| ON | OFF | OFF | --3.2 |

NOTE: The initial DPS settings differ from one machine to another as they are changed during production.

4. After adjustment, make more than 10 continuous copies to check the variation.

## 2.2 VERTICAL MAGNIFICATION ADJUSTMENT

**ADJUSTMENT STANDARD:**

Within 100 ± 0.8%

**CAUTION: This adjustment is required when the main PCB has been replaced.**

**NOTE:** The horizontal magnification depends on the position of the CCD PCB. (The standard is within 0.5%.)

1. Turn on the main switch, and make a print.
2. Compare the image on the print with that on the original.
3. Make sure that the difference of the vertical magnification is within the standard (0.8% or less).

NOTE: If an original has a line of 100 mm in the exact vertical direction, the line on the print should be between 99.5 to 100.5 mm.

4. If it is out of the standard, then adjust it. The vertical magnification changes depending on the positions of DPS103-1, -2, and -3 (DIP switches) on the main PCB as follows:

| DPS103--1 | --2 | --3 | Difference [%] |
|---|---|---|---|
| OFF | OFF | OFF | +1.75 |
| OFF | OFF | ON | +1.25 |
| OFF | ON | OFF | +0.75 |
| OFF | ON | ON | 0 (Standard) |
| ON | OFF | OFF | --0.75 |
| ON | OFF | ON | --1.25 |
| ON | ON | OFF | --1.75 |
| ON | ON | ON | --2.25 |

NOTE: The initial DPS settings differ from one machine to another as they are adjusted during production.

## 2.3 TRAILING EDGE ERASE MARGIN ADJUSTMENT

**PURPOSE:** To minimize the dirtiness of ink on the press roller.

**ADJUSTMENT STANDARD:**

1.0 to 2.0 mm

**CAUTION: This adjustment is required when the main PCB has been replaced.**

1. Turn on the main switch, and make a print using an original that has an image in the trailing part.
2. Measure the trailing edge erase margin.

NOTE: If the trailing edge of the original is not sited on the print, shift the image in the forward direction by pressing the Image Shifting key and make another print.

3. Make sure that the value is within the standard (1.0 to 2.0 mm).
4. If it is out of the standard, then adjust it. The trailing edge erase margin changes depending on the positions of DPS103-4, and -5 (DIP switches) on the main PCB as follows:

| DPS103--4 | --5 | Difference [mm] |
|---|---|---|
| OFF | OFF | +1 |
| OFF | ON | +2 |
| ON | OFF | +3 |
| ON | ON | –1 |

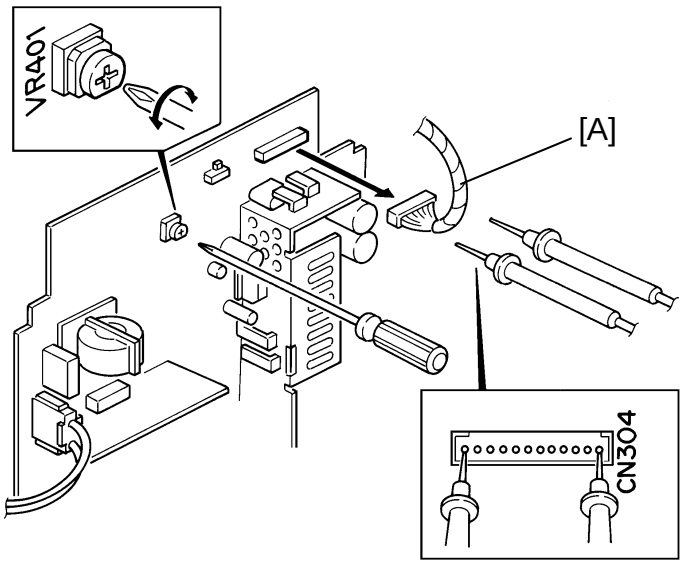
NOTE: The initial DPS settings differ from one machine to another as they are adjusted during production.

# 3. MASTER FEED SECTION

## 3.1 THERMAL HEAD VOLTAGE ADJUSTMENT

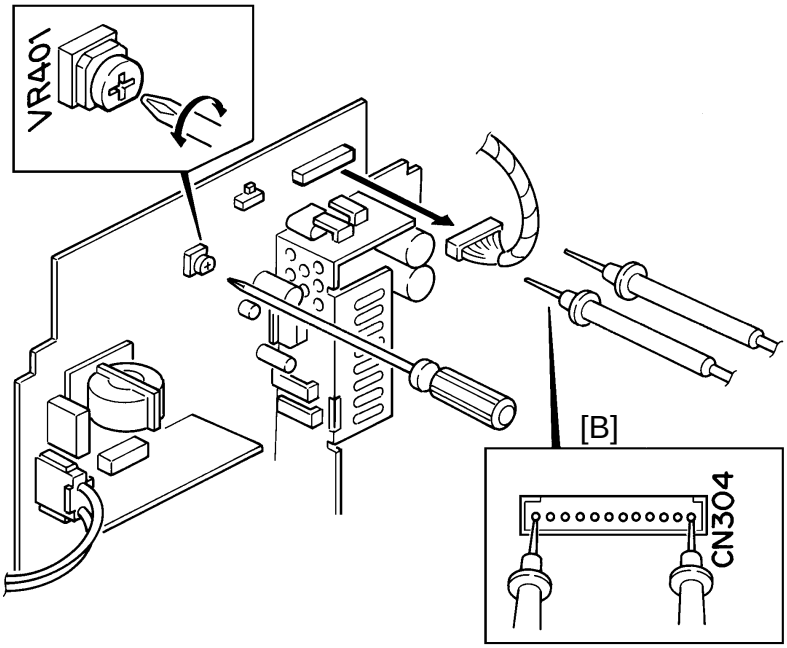
**PURPOSE:** To maintain quality when making masters and to prevent the thermal head from being damaged.

**ADJUSTMENT STANDARD:** Refer to the voltage value (X) described on the thermal head. The value varies from one thermal head to another. The adjustment voltage should be between "X - 0.05" and "X + 0.05."




**CAUTION: This adjustment is always required when the thermal head or power supply PCB has been replaced.**

1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws).
3. Disconnect CN304 [A] on the power supply PCB.
4. Read the voltage value described on the decal on the thermal head.
5. Connect the power plug, and turn on the main switch to access the output mode. (Turn on the main switch while holding down the Print Start, Stop, and Clear keys together. Then, press the Memory/Class key once to indicate "00" in the memory display.)
6. Select the thermal head power supply mode. (Enter "1" with the number key.)




7. Press the Print Start key. The power to the thermal head is applied for about 30 seconds. Press it again if you cannot finish the adjustment.

NOTE: A beeper sounds while supplying the power.

8. Measure the voltage between output terminal and grounding terminal of CN304.

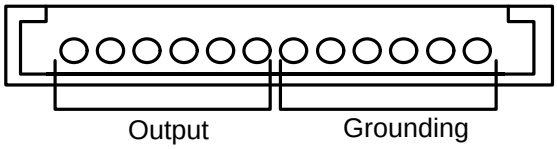
**CAUTION: Use the outside terminals in the connector as shown [B] to measure the voltage. If the output terminal and grounding touch each other, the PCB will become damaged.**

9. Turn VR401 so that the value becomes within 0.05 volts from the value that you obtained in step 4.

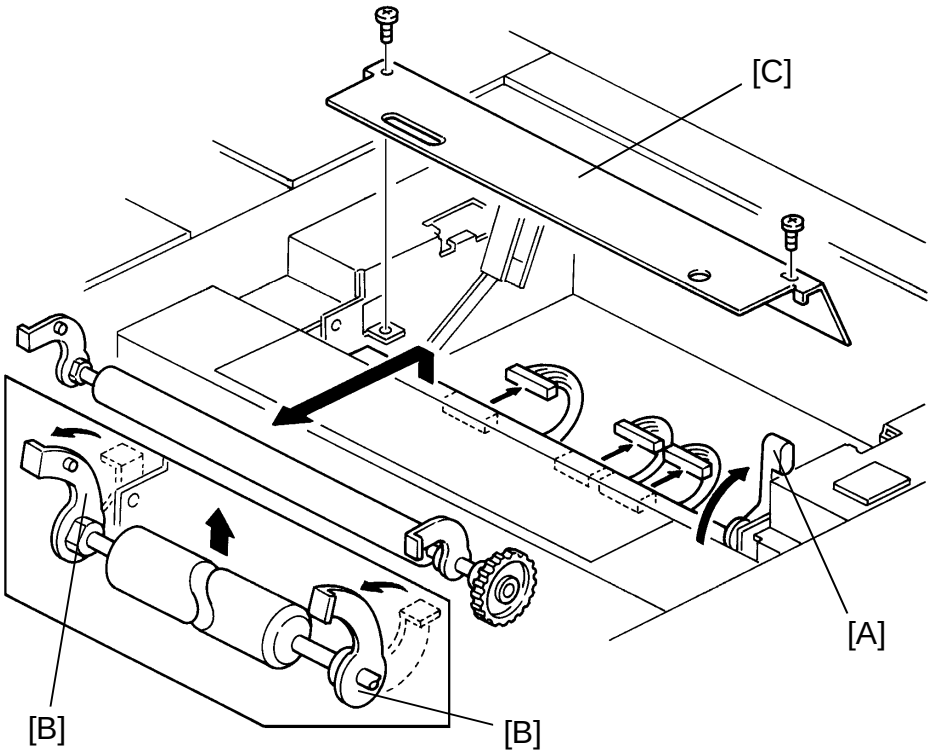
**CAUTION: Never turn VR401 clockwise rapidly while the connector is connected. The thermal head will be damaged if too much voltage is supplied suddenly.**

NOTE: The output and grounding terminals are positioned in the connector as follows:

**CN304**

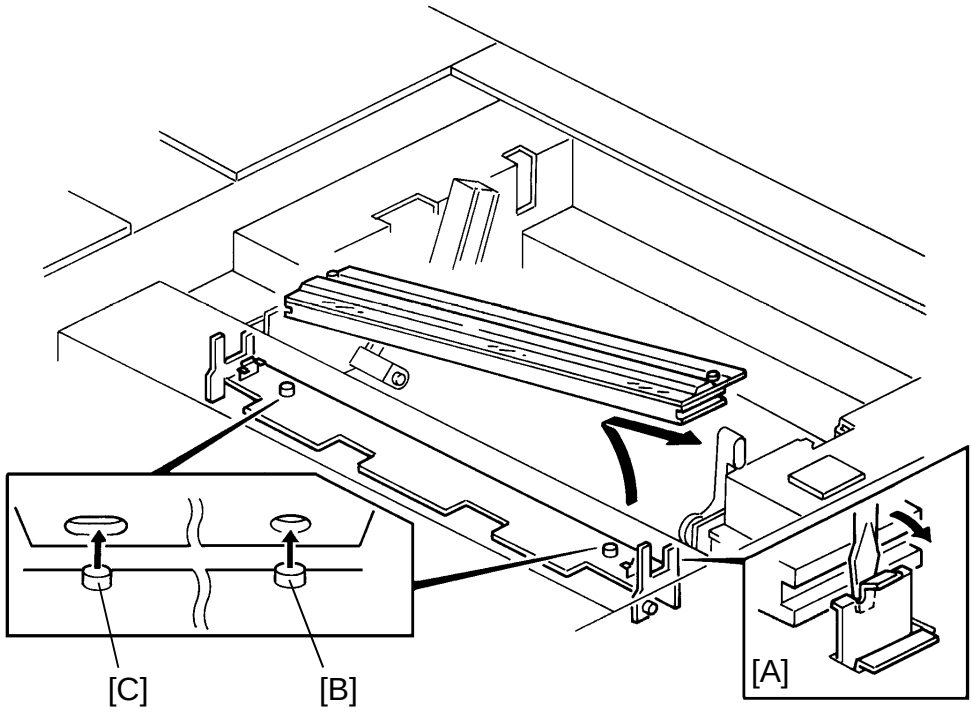


## 3.2 THERMAL HEAD REMOVAL




**CAUTION: If the thermal head has been replaced with a new one, the input voltage must be adjusted. Follow "3.1 THERMAL HEAD VOLTAGE ADJUSTMENT".**

1. Turn off the main switch and disconnect the power plug.
2. Open the scanner unit.
3. Lift the platen roller release lever [A] up until it locks. Then, unhook the lock levers [B] on both ends of the platen roller and remove the platen roller.
4. Remove the thermal head cover [C] (2 screws).
5. Disconnect the connectors from the thermal head.



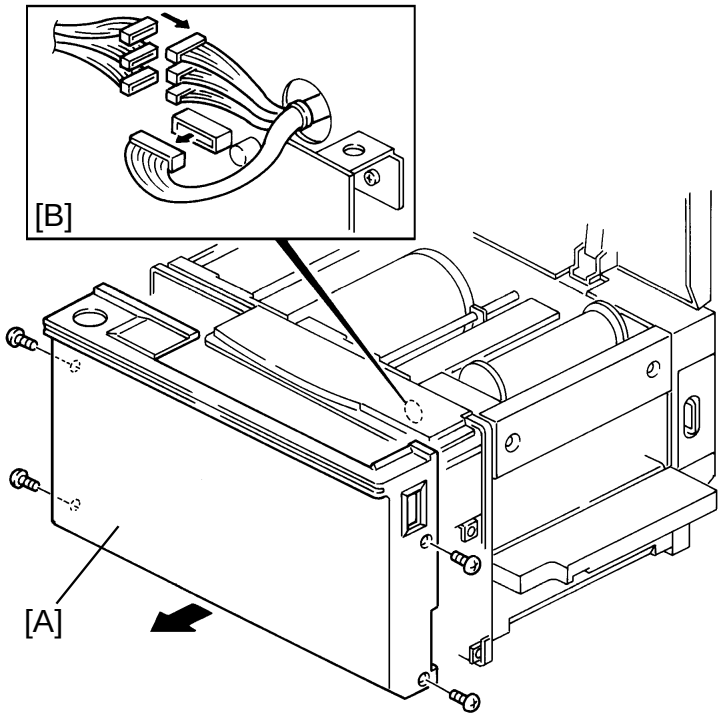

6. Unhook the lock pawl [A] on the front side of the thermal head (operation side) using a small minus screwdriver. While during this, remove the thermal head.

**CAUTION: Be careful not to hit the thermal head surface against the plate above it.**

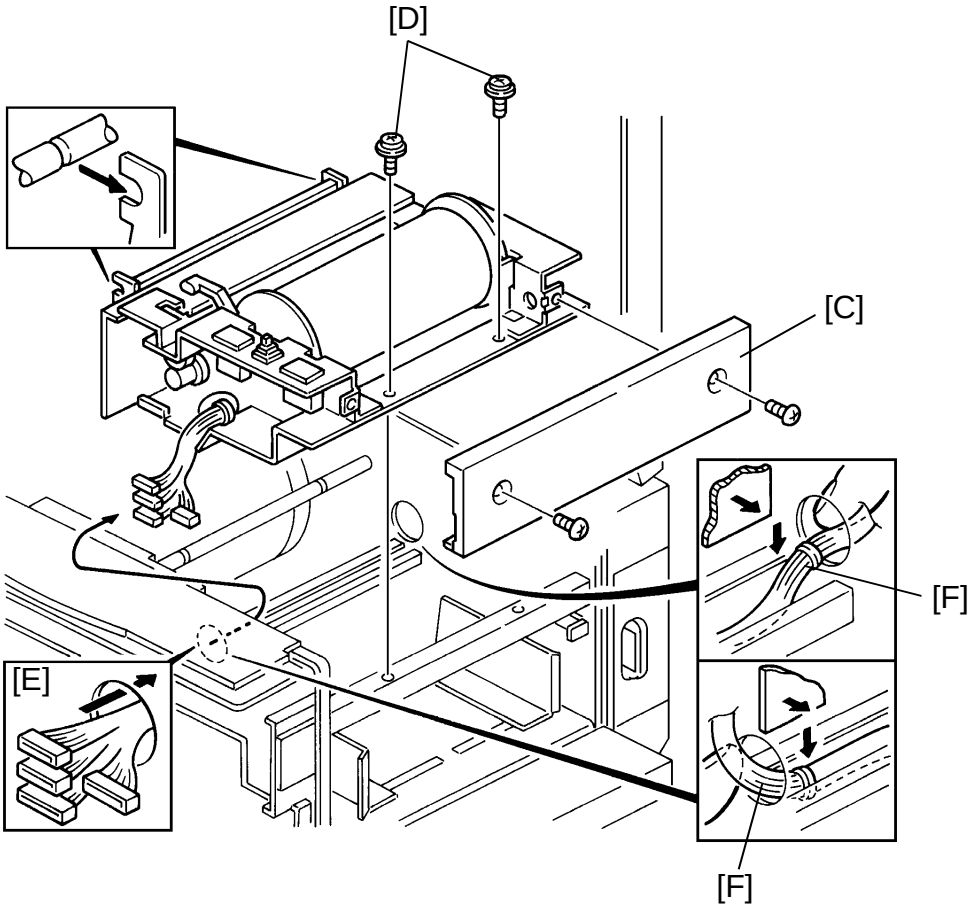
NOTE: There are two projections on the thermal head base, and they meet the holes behind the thermal head. The projection on the front [B] (operation side) securely meet the hole, but the other [C] is loose. Therefore, remove the front side first.

When installing, make sure to set the front side first.

## 3.3 PLOTTER UNIT REMOVAL




1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover [A] (4 screws), then disconnect the connectors [B] of the harnesses from the plotter unit.

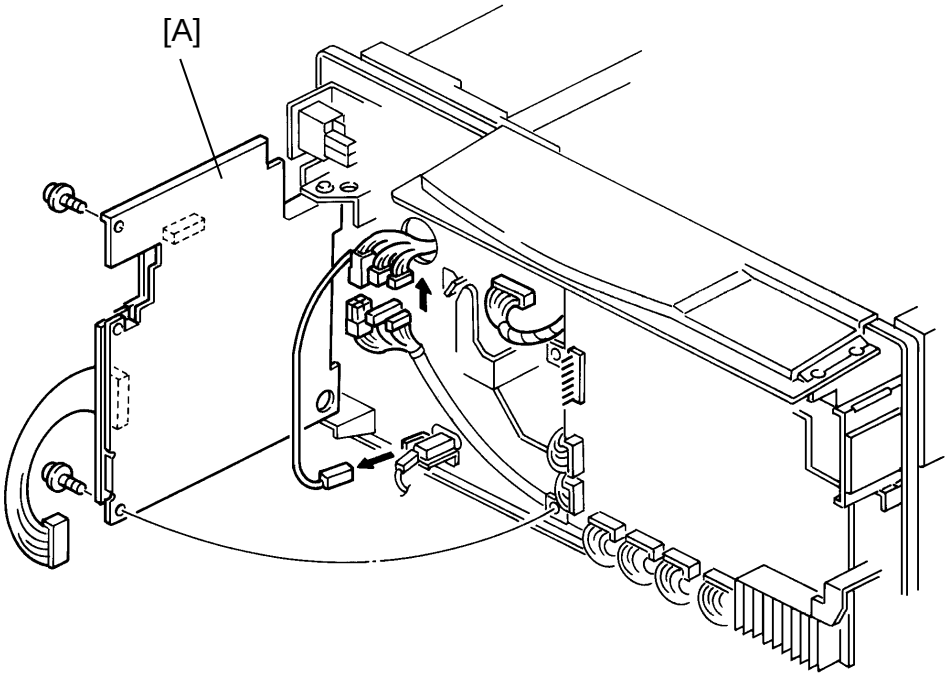



3. Open the scanner unit.
4. Remove the upper right cover [C] (2 screws), and remove the 2 screws [D] securing the plotter unit.
5. While pulling the harnesses [E] from the plotter unit, remove the unit.

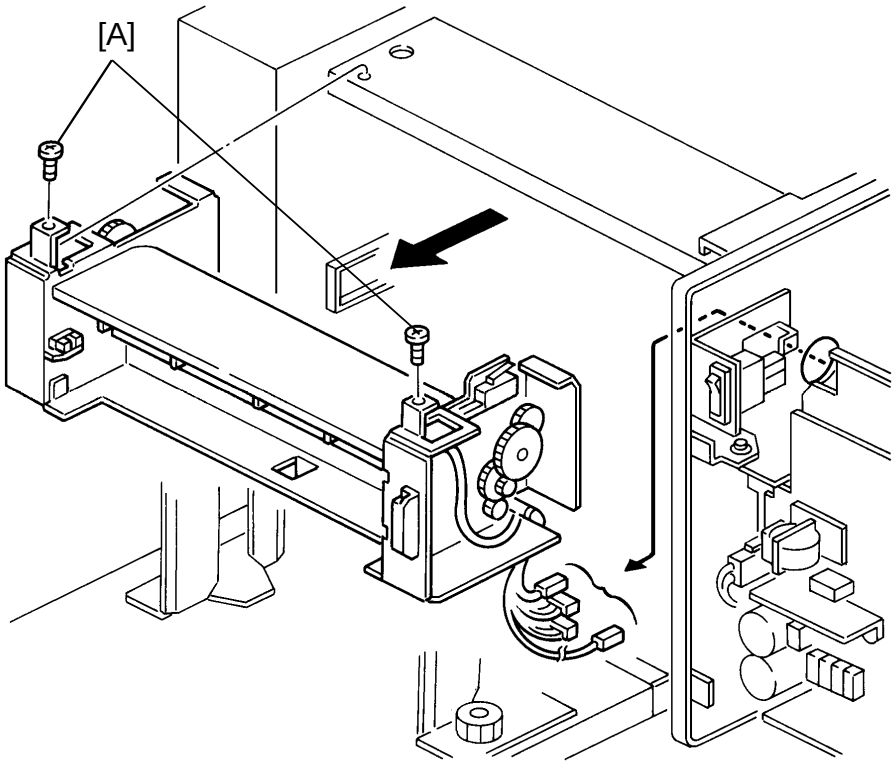
**CAUTION: Be careful not to damage the harness [F] by the corners of the plotter unit when removing the unit. Also, be careful not to pinch the harness when reinstalling the unit.**

# 4. MASTER EJECT SECTION

## 4.1 MASTER EJECT UNIT REMOVAL




1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws).
3. Swing out the power supply PCB [A] (2 screws and 4 connectors) and disconnect the 4 connectors to the master eject unit (3 from the main harness and 1 from the safety switch).

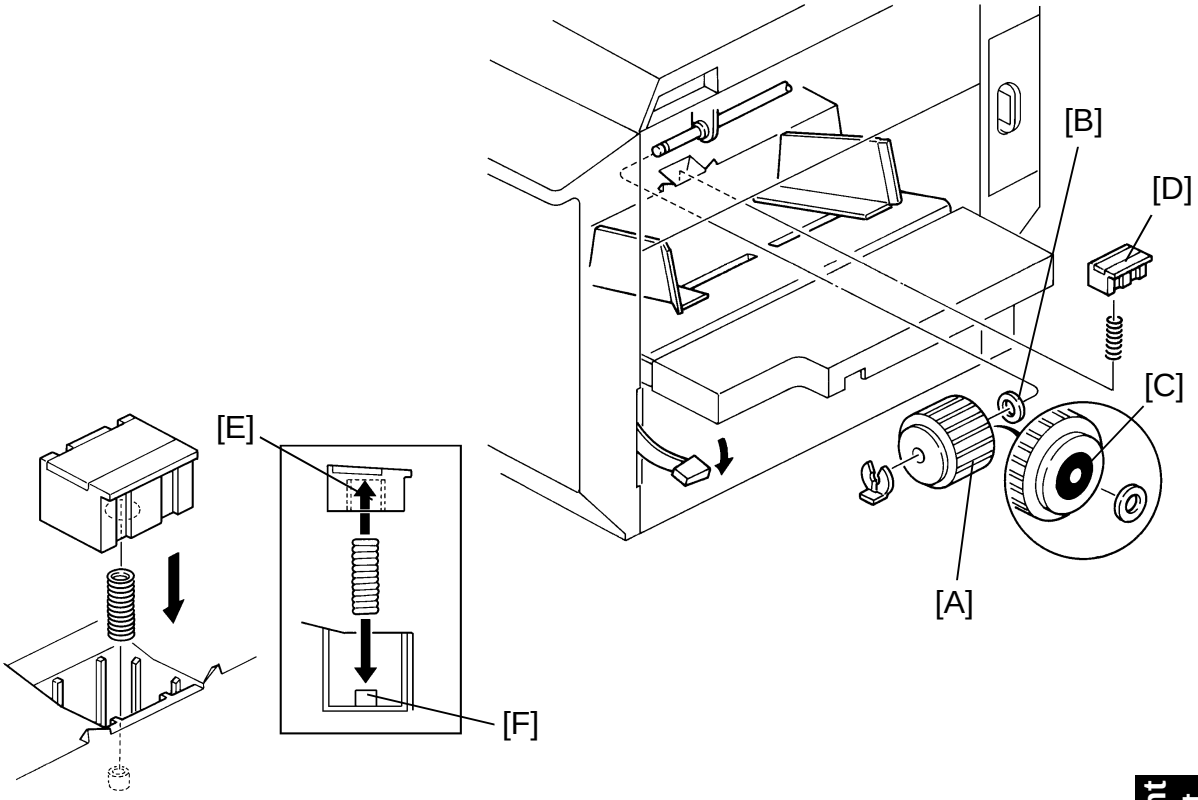



4. Remove the master eject box.
5. Open the scanner unit, and remove the two screws [A] fixing the unit.
6. Remove the master eject unit while pulling the harness out of the cutout of the front frame.

**CAUTION: Do not pinch the harnesses when reinstalling the master eject unit.**

# 5. PAPER FEED SECTION

## 5.1 PAPER FEED ROLLER AND FRICTION PAD REMOVAL






1. Turn off the main switch and disconnect the power plug.
2. Lower the paper table, and remove the paper feed roller [A] (1 snap ring).

**CAUTION: 1) Do not lose the small spacer [B] inside the paper feed roller.**
**2) Install the paper feed roller in the proper direction due to the one-way built-in clutch. The blue flange [C] faces inside.**

**3. Remove the friction pad base [D]. Peel off the friction pad and replace it if necessary.**

**CAUTION: 1) Install the friction pad base in the proper direction as shown. Otherwise, paper misfeeds will occur.**
**2) Be sure that the hole [E] in the friction pad base and projection [F] in the bottom hold the friction pressure spring properly. Otherwise, paper misfeeds will occur.**

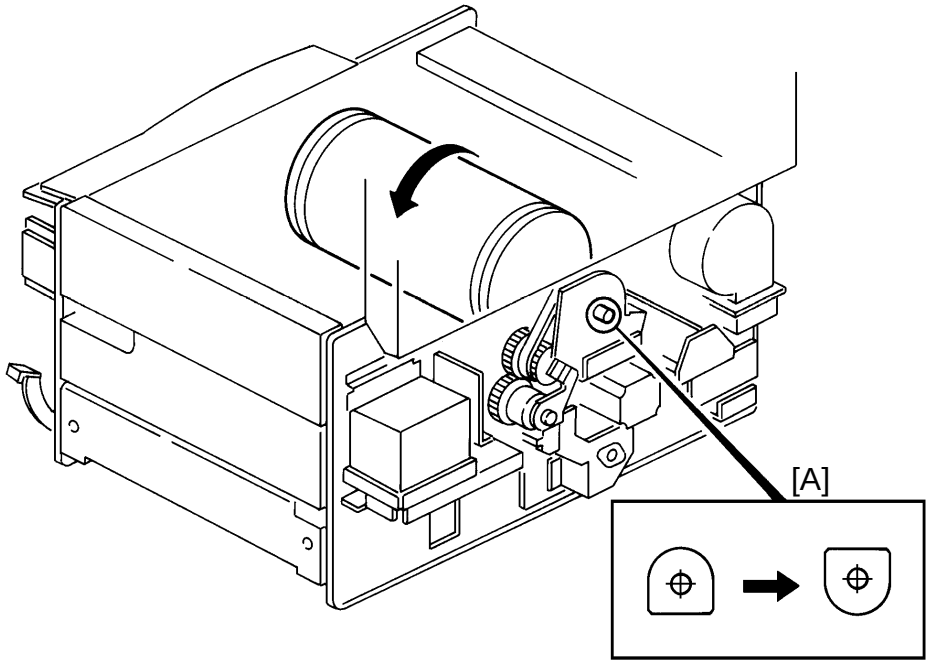
# 6. PRINTING SECTION

## 6.1 PRESS ROLLER LOCK LEVER ADJUSTMENT

**PURPOSE:** To maintain the correct clearance between the press roller arms and press roller lock levers. This ensures that the press roller is correctly released and pressed against the drum when the press roller release solenoid is energized.

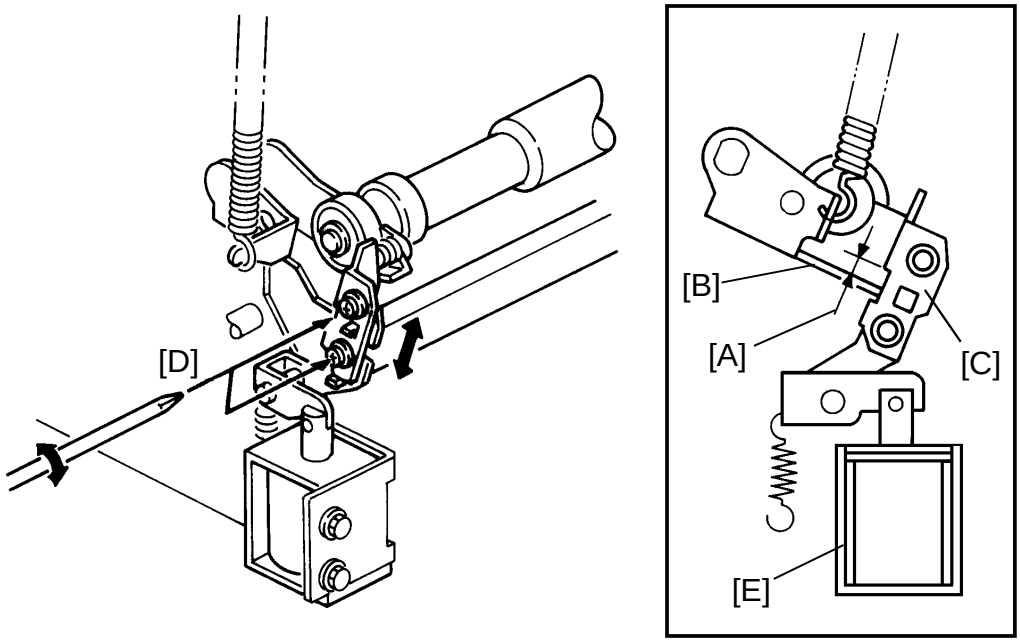
**ADJUSTMENT STANDARD:**

Between 1.0 and 1.2 mm



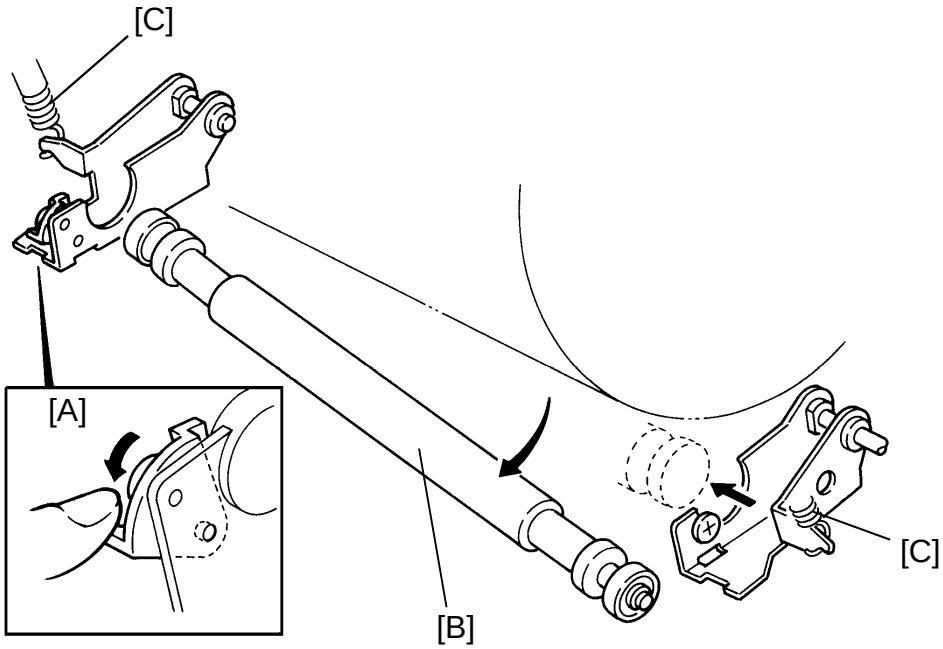

1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws) and rear cover (6 screws).
3. Open the scanner unit, and turn the drum manually until the drum master clamper on the drum moves into the bottom most position. (The top of the cams on the drum flanges meet with the cam followers on both ends of the press roller.)

NOTE: To find out the correct position of the drum for the adjustment, refer to the rear end of the drum shaft. The round part of the shaft must face to the bottom as shown [A].




4. Using a thickness gauge, measure the clearance [A] between the press roller arm [B] and press roller lock lever [C] (rear side). It should be between 1.0 and 1.2 mm.
5. If it is not correct, adjust the position of the press roller lock lever after loosening the two screws [D].
6. Swing out the power supply PCB (2 screws and 4 connectors).
7. Repeat steps 5 and 6 for the front side.
8. After finishing the adjustment, make sure that the press roller lock levers are released from the press roller arms by pressing the plunger of the press roller release solenoid [E] manually.

## 6.2 PRESS ROLLER REMOVAL




1. Turn off the main switch and disconnect the power plug.
2. Remove the drum unit. (Refer to **"7.6 DRUM UNIT REMOVAL."** )
3. Release the press roller lock lever [A].
4. Slightly slide the press roller [B] toward the rear and remove it.

**CAUTION: Take caution to avoid possible injury. If the printing pressure springs [C], which pull the press roller up, are not removed, the press roller may suddenly move by accident when the lock levers are unhooked.**

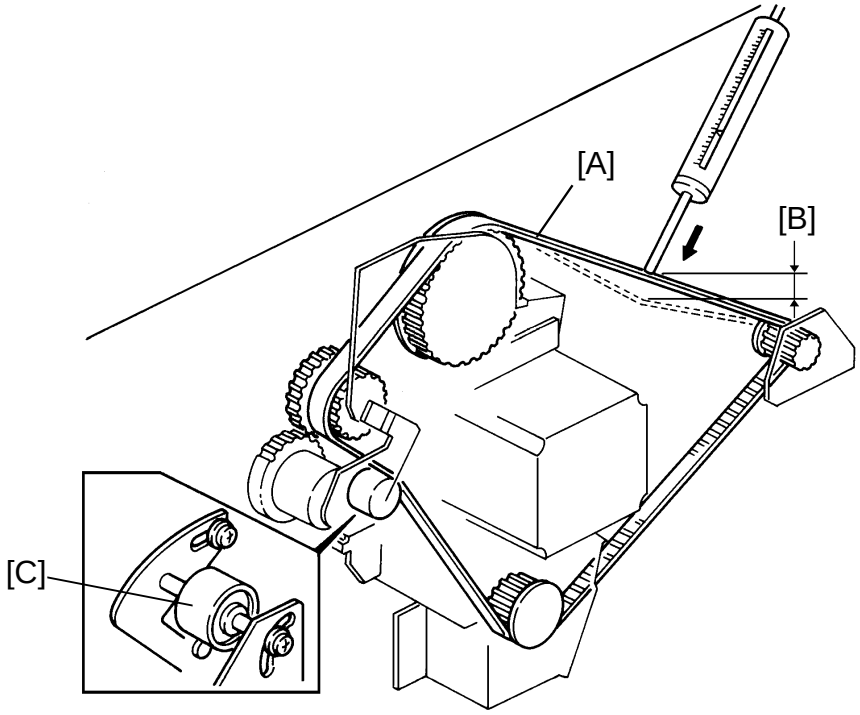
# 7. DRUM, DRUM DRIVE, AND INK SUPPLY SECTION

## 7.1 DRIVE BELT TENSION ADJUSTMENT

**PURPOSE:** To ensure that the main motor rotation is correctly transmitted to the drum and each paper feed roller.

**ADJUSTMENT STANDARD:**

Between 2.8 and 3.0 mm deflection at 570-gram load.




1. Turn off the main switch and disconnect the power plug.
2. Remove the rear cover (5 screws).
3. Using a tension gauge, apply a 570-gram load to the center of the drive belt [A]. Make sure that the belt deflects between 2.8 and 3.0 mm [B].
4. If it dose not deflect within this amount, adjust the position of the belt tightened [C] after loosening the screws.

NOTE: The 2nd feed motor bracket helps to maintain the drive belt tension. Do not remove the motor bracket when the drive belt tension is adjusted.

## 7.2 DOCTOR ROLLER GAP ADJUSTMENT

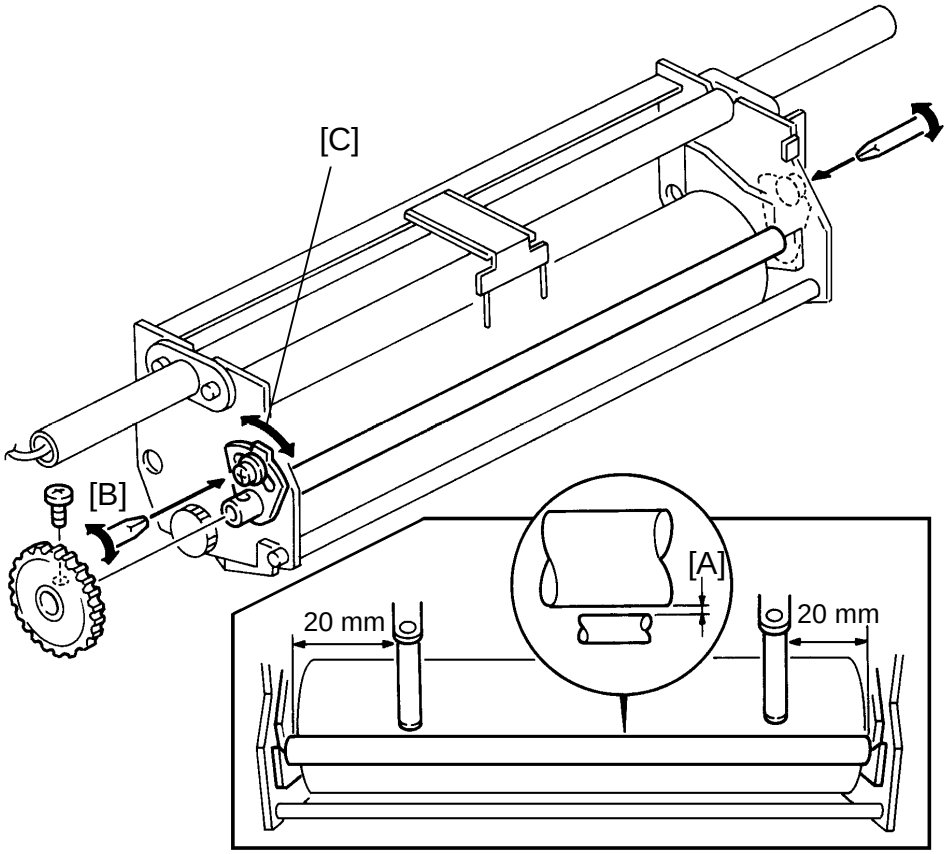
**PURPOSE:** To control the ink thickness around the ink roller.

**ADJUSTMENT STANDARD:**

0.08 (±0.01) mm

**CAUTION: Normally the doctor roller gap is not adjusted or changed. It tends to be difficult to change in the field. If the gap becomes narrower, an uneven image may appear on the prints. If it becomes wider, too much ink will be applied to the drum screens, resulting in ink leakage from the drum.**

1. Remove the ink cartridge and make prints until the ink end indicator lights in order to remove ink from inside the drum.
2. Turn off the main switch and disconnect the power plug.
3. Remove the drum unit, then remove the ink roller unit. (Refer to **"7.8 INK ROLLER UNIT REMOVAL."** )
4. Wipe off the ink around the ink roller and doctor roller.






5. Make sure that a 0.08 mm gap gauge goes through the gap [A] between the ink and doctor rollers, and that a 0.09 mm gap gauge dose not.

NOTE: 1) The gap should be checked at both ends of the doctor roller. Insert a gap gauge approximately 20 mm from the front or rear end of the roller, then repeat for the other side.
2) While the gap gauge is inserted, hold the doctor and ink rollers with your fingers in order to stop the rollers from rotating.

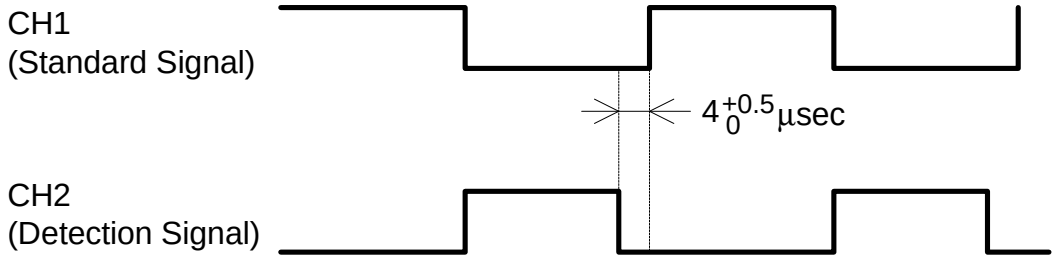
6. If the gap is out of the standard, loosen the screw [B] and adjust the gap by turning the eccentric cam bushing [C] for the front and rear each.

NOTE: For the gap adjustment, insert a 0.08 mm gap gauge in between the rollers. Then, turn the eccentric cam bushing until the doctor roller lightly touches the gap gauge. Repeat this procedure twice each for the front and rear of the rollers. Finally repeat step 5 to check the gap.

## 7.3 INK DETECTION ADJUSTMENT

**PURPOSE:** To ensure that the ink detection PCB detects a no ink condition.

**ADJUSTMENT STANDARD:** See the below illustration.




**CAUTION: This adjustment is required when the main PCB has been replaced.**

1. Remove the ink cartridge and make prints until the ink end indicator lights in order to remove ink inside from the drum.
2. Turn off the main switch and disconnect the power plug.
3. Remove the front cover (4 screws).
4. Connect CH1 probe of an oscilloscope to TP102, CH2 probe to TP103, and grounding leads of both probes to TP101 (--12 volts). Select the 5 microsecond range on the oscilloscope.

NOTE: The test pins (TP's) are located on the upper left corner of the main PCB.

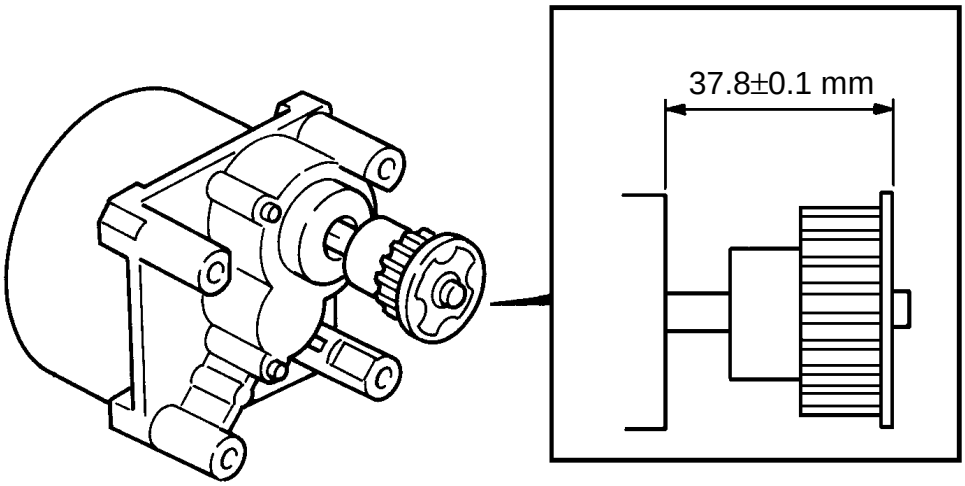
5. Connect the power plug and turn on the main switch.
6. Make sure that the waveform is as shown in the illustration while the ink end indicator lights.

NOTE: This adjustment should be done under normal room temperature (approximately 20°C). The period of the waveform for the detection signal varies inversely with temperature. (If the temperature becomes higher, the period is reduced, and vice versa.)

7. If it is not correct, adjust the ON timing of the detection signal by turning VR101 beside the test pins.

NOTE: If the standard signal is delayed from the detection signal, the machine cannot detect the no ink condition. In such case, LED101 on the main PCB lights to warn of this.

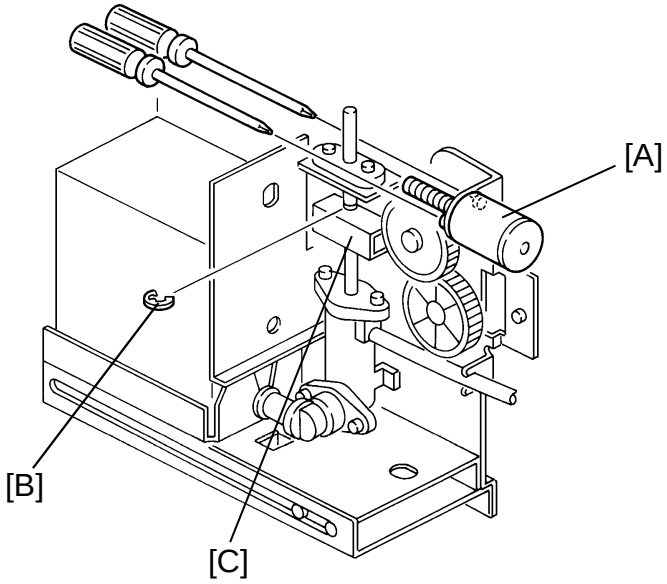
## 7.4 MAIN MOTOR REPLACEMENT

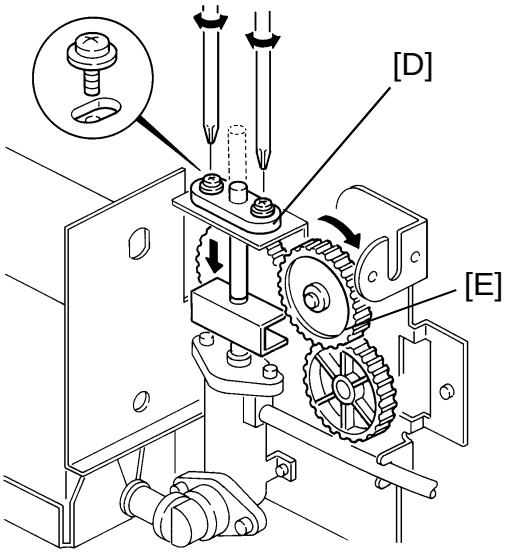



When the pulley is installed onto the main motor shaft, refer to the above illustration for the position of the pulley.

## 7.5 INK PUMP PLUNGER POSITION ADJUSTMENT

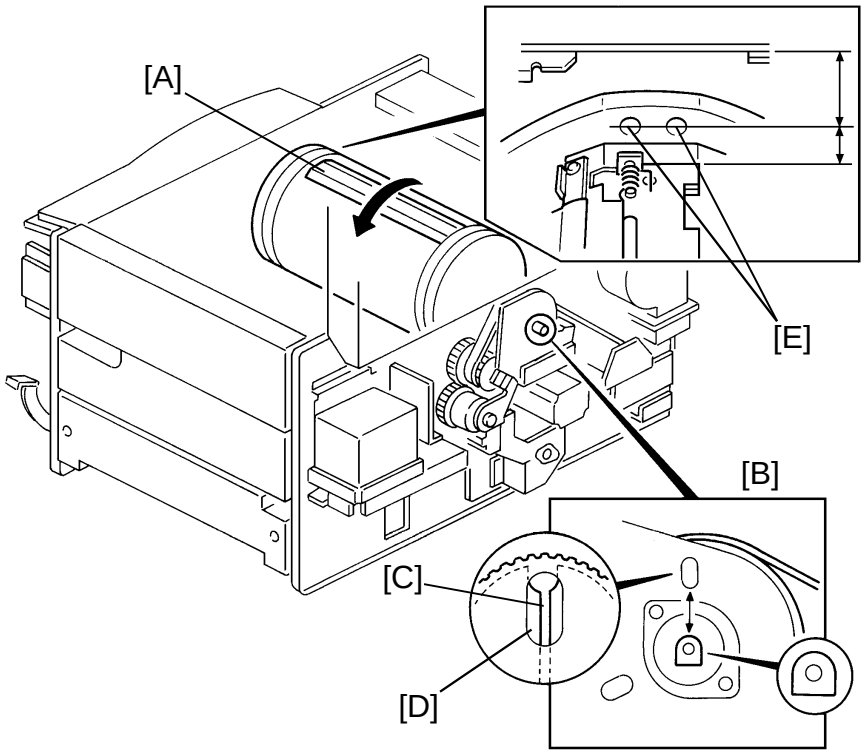
**PURPOSE:** To ensure the smooth operation of the ink pump plunger by properly positioning its bearing.




1. Turn off the main switch and disconnect the power plug.
2. Remove the rear cover (6 screws), and then remove the ink supply motor [A] (2 screws).
3. Remove the E-ring [B] to free the plunger from the pump drive slider [C].
4. Loosen the two screws securing the bearing [D]. (Do not remove the bearing.)
5. By turning the gear [E] manually, move the plunger until it reaches the bottom.
6. While holding the bearing [D] with your fingers, re-tighten the two screws.
7. Reinstall the E-ring [B].

## 7.6 DRUM UNIT REMOVAL

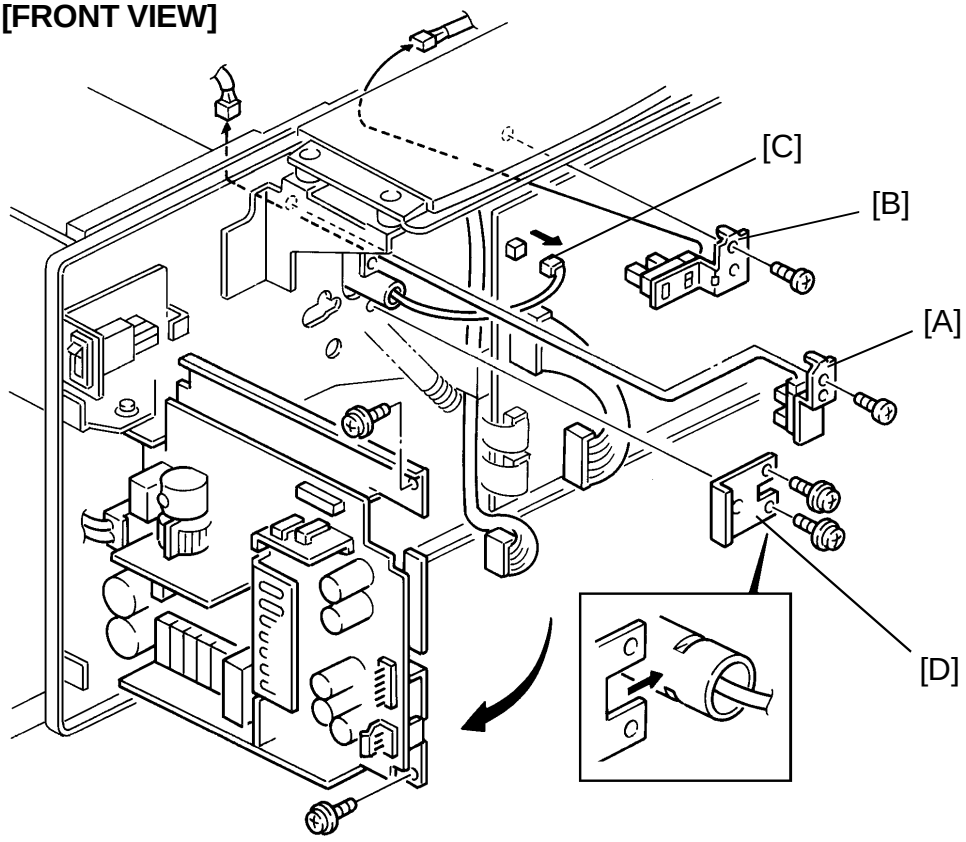



1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws) and rear cover (6 screws).
3. Open the scanner unit, and turn the drum manually until the drum master clamper [A] on the drum moves into the top most position.

NOTE: To find out the correct position of the drum for the above, refer to the rear end of the drum shaft. When the drum master clamper is positioned exactly at the top, the round part of the shaft faces the long hole as shown [B]. (The rib [C] of the drum drive pulley will meet the long hole [D].)

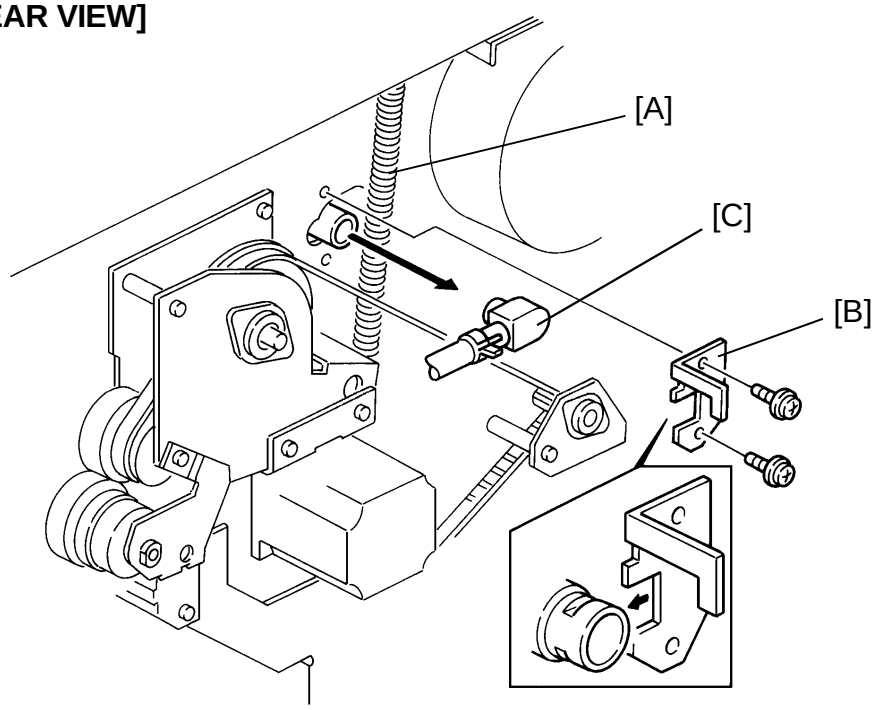
**CAUTION: When reinstalling the drum unit, install it so that the two holes [E] are parallel with the top edge of the front frame. They should be facing exactly up. The drum drive gear at the drum unit side must be engaged at the correct position with the other at the main body side. (If the gears do not meet each other correctly, the upper 2nd feed roller will not be driven properly and paper misfeed will occur. This is because the upper 2nd feed roller moves up and down by the cam mounted on the drum drive gear.)**

**[FRONT VIEW]**




4. Swing out the power supply PCB (2 screws and 4 connectors). Remove the feed start timing sensor [A] and feed jam timing sensor [B] (1 screw and connector each).
5. Remove the front printing pressure spring.
6. Disconnect the connector [C] from the main PCB.
7. Remove the front drum shaft fixing plate [D] (2 screws).

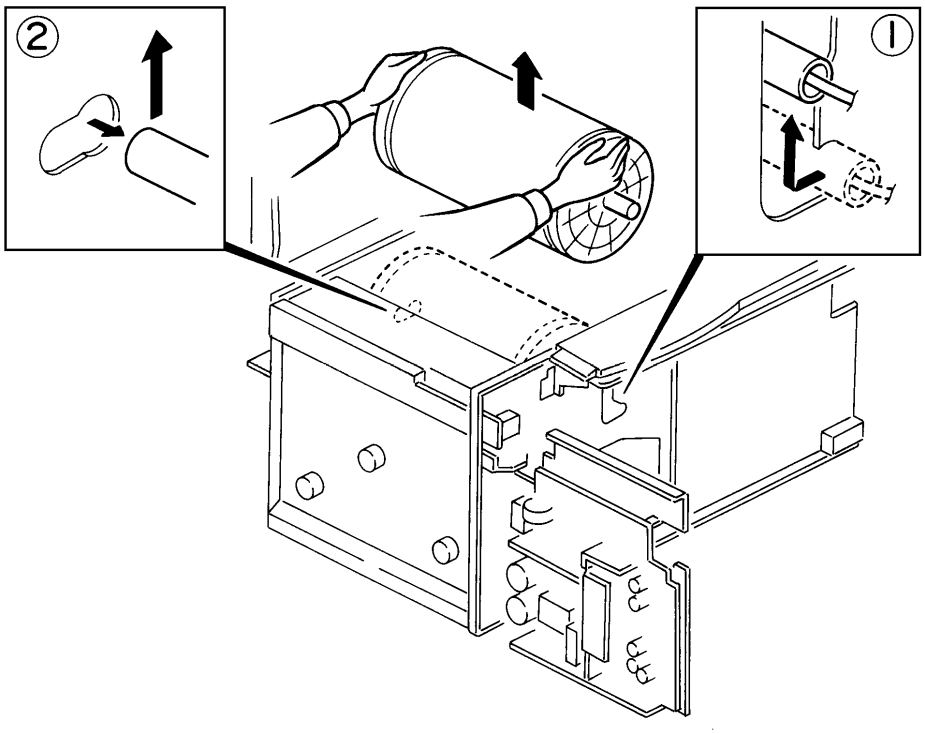
**[REAR VIEW]**




8. From the rear of the machine, remove the reare printing pressure spring [A].
9. Remove the rear drum shaft fixing plate [B].

**CAUTION: 1) Securely hold the drum unit with your hand when you remove the front and rear drum shaft fixing plates. Otherwise, the drum drive gears may be disengaged and the drum will accidentally turn.**
**2) When installing the front and rear drum shaft fixing plates, install the front first to obtain the correct position of the drum shaft. Place the projection on the front drum shaft fixing plate in the hole within the frame before tightening the screws.**

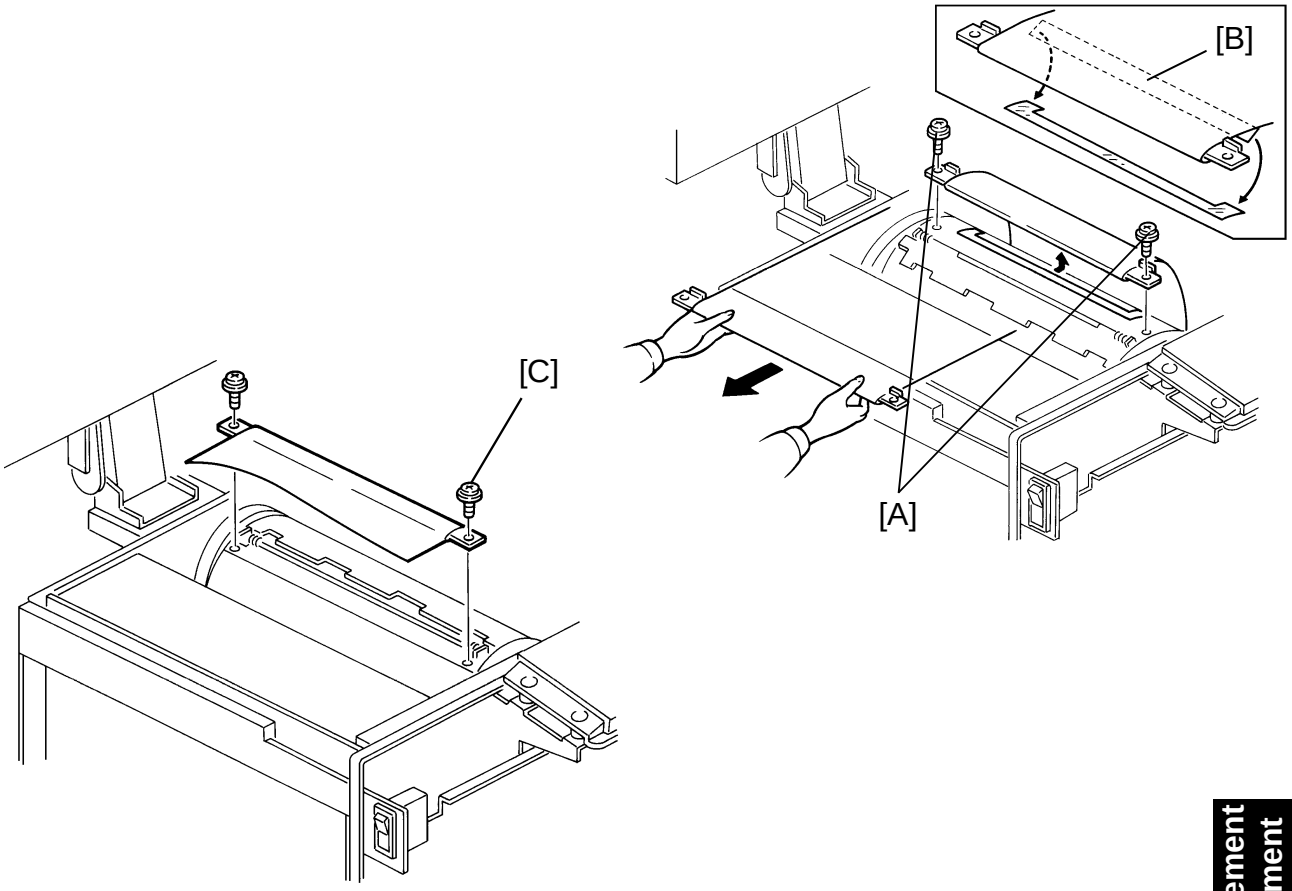
10. Pull out the ink supply nozzle [C].




11. While lifting the front side of the drum up, remove the drum unit as shown.

**CAUTION: 1) Do not loosen the spacer installed on the rear of the drum shaft.**
**2) Do not touch the front drum flange against the sensors to avoid any damage.**
**3) Do not deform the sensor actuator that is mounted on the edge of the front drum flange.**
**4) Do not scratch the drum surface.**

## 7.7 DRUM SCREEN REMOVAL



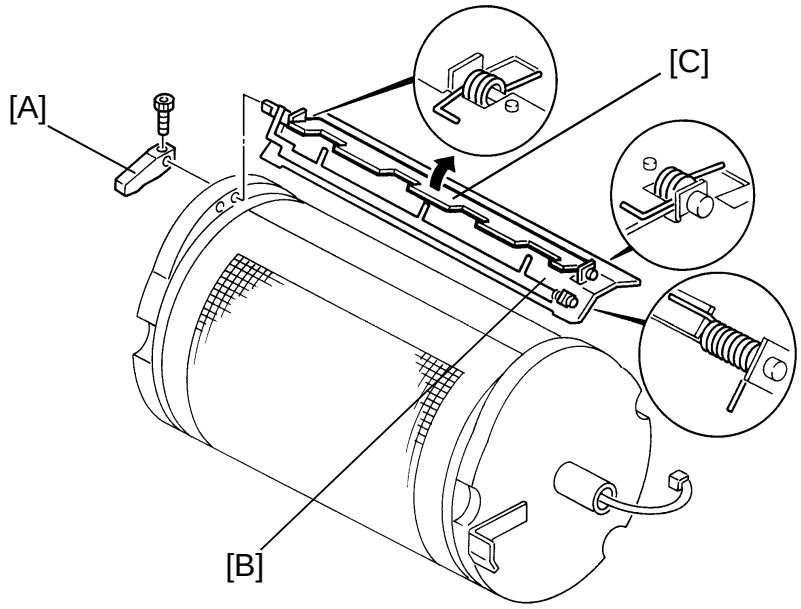



1. Turn off the main switch and disconnect the power plug.
2. Open the scanner unit.
3. Remove the two screws [A] securing the rear screen holder.
4. While turning the drum manually, pull out the drum screen as shown.

**CAUTION: 1) The mylar strip [B] is inserted under the mylar strip on the drum side. Unhook the mylar strip in order not to damage it before pulling out the drum screen.**
**2) When reinstalling the drum screen, do not forget to set the mylar strip as it was. (The two strips of mylar are to prevent ink from leaking from the trailing edge of the master that wraps around the drum.)**

5. Remove the front screen holder [C] (2 screws), then remove the drum screen.

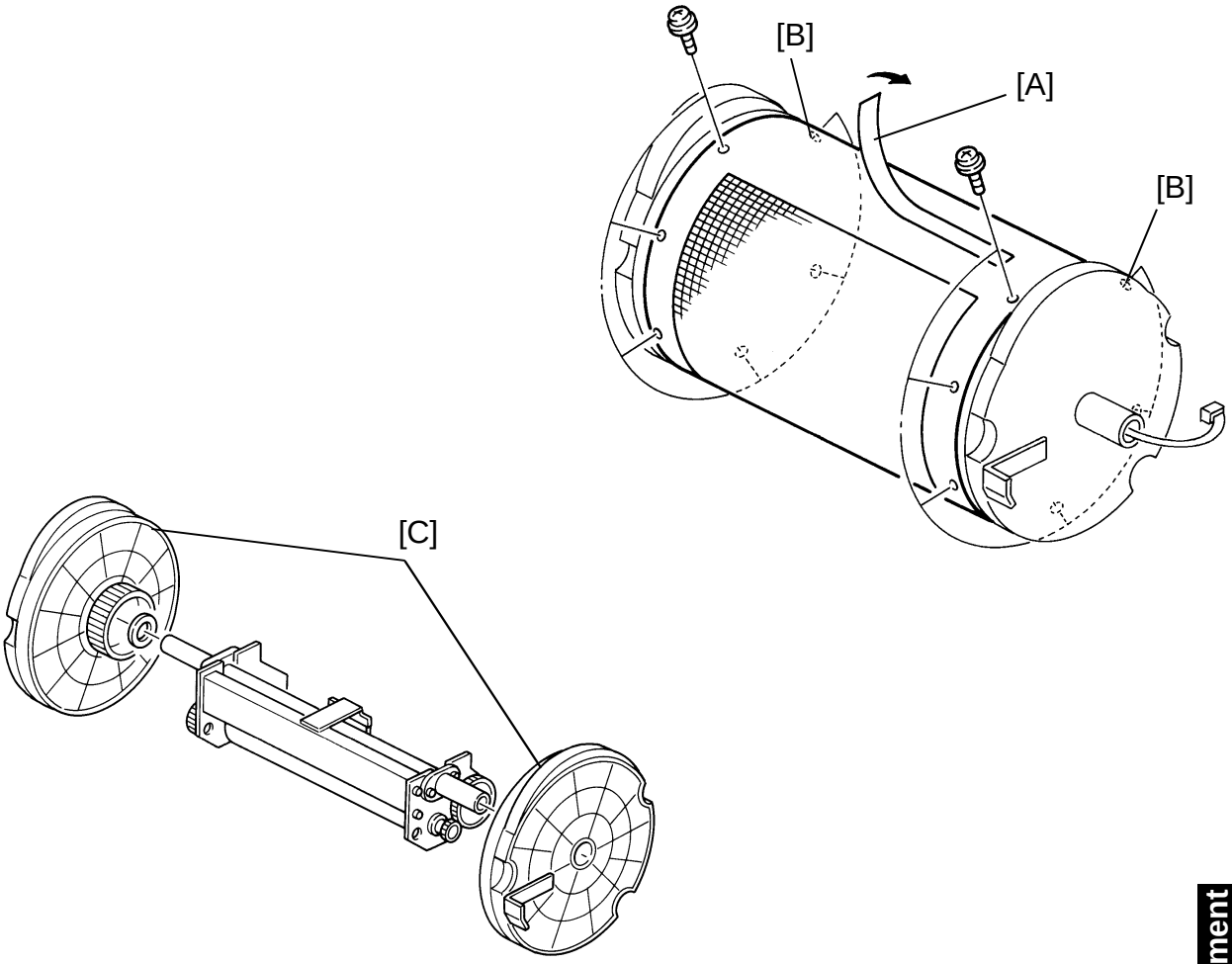
## 7.8 INK ROLLER UNIT REMOVAL




**CAUTION: Never disassemble the ink roller unit. Each part between the front and rear side plates of this unit has been exactly adjusted to keep the doctor and ink rollers parallel against the drum shaft in the production.**

1. Turn off the main switch and disconnect the power plug.
2. Remove the drum screen. (Refer to **"7.7 DRUM SCREEN REMOVAL."** )
3. Remove the drum unit. (Refer to **"7.6 DRUM UNIT REMOVAL."** )
4. Remove the clamper open lever [A], then remove the drum master clamper [B] while opening the clamping plate [C].

**CAUTION: 1) Position the springs (two on the front and one on the rear) as shown when reinstalling the drum master clamper.**
**2) Do not allow the inside of the clamping plate [C] to become dirty with ink. If it is dirty with ink, the master may slip off and the image position on the prints will move toward the trailing edge of the print during a printing run.**
**3) Use a cloth damped with water to clean the inside of the clamping plate [C]. Never use alcohol or other solvents. The clamping force by magnet may be weakened.**






5. Peel off the tape [A], and remove the metal screen (12 screws).

**CAUTION: 1) The length of the 4 screws fixing the drum master clamper is longer than that of the 12 screws fixing the metal screen, although they are similar in appearance. Be careful not to mix then up or use the wrong screws.**

**2) When installing the metal drum screen, fix the trailing edge first with the 2 screws. Then, tighten the other screws while removing the slack from the screen. (The two holes [B] on the trailing side are round holes and the other holes are long holes to allow for the removal of the slack.)**

6. Remove the front and rear drum flanges [C].

# 8. PAPER DELIVERY SECTION

## 8.1 EXIT PAWL CLEARANCE ADJUSTMENT

**PURPOSE:** If the clearance is too narrow, the exit pawls may hit the drum screen and damage it. If it is too wide, paper may easily be wrapped around the drum.

**ADJUSTMENT STANDARD:**

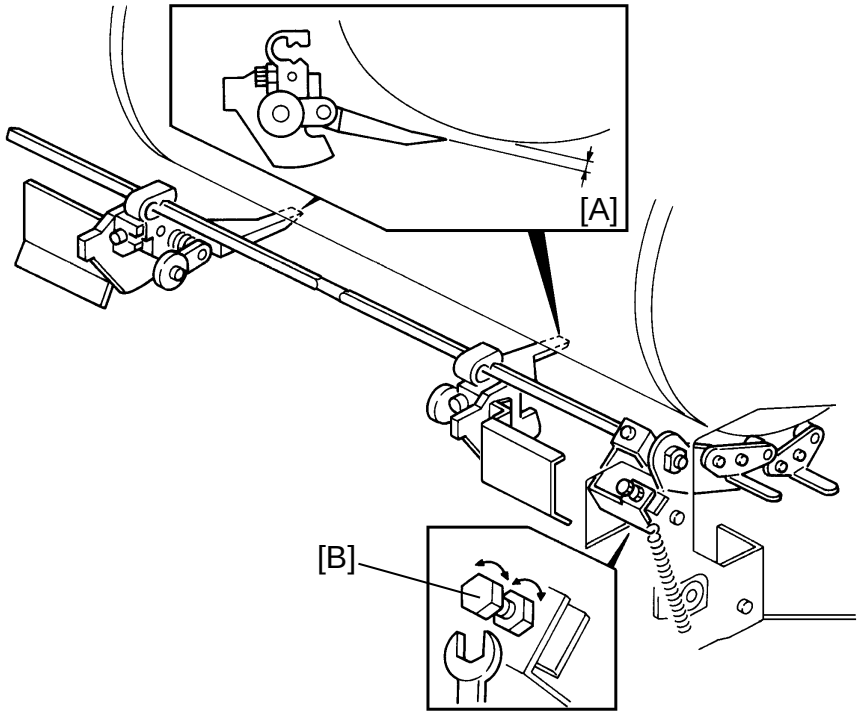
0.8 (±0.2) mm

**CAUTION: When this adjustment has been performed, check the exit pawl drive timing. (Refer to "8.2 EXIT PAWL DRIVE TIMING ADJUSTMENT." )**

1. Turn off the main switch and disconnect the power plug.
2. Open the scanner unit, and make sure that the drum master clamper on the drum faces to the top. (This means that the exit pawls are in the closest position to the drum surface.)

NOTE: The exit pawls move apart from the drum surface only when the drum master clamper passes the exit pawls.

3. Remove the front cover (4 screws) and swing out the power supply PCB (2 screws and 4 connectors).
4. Remove the air knife chamber (2 screws).

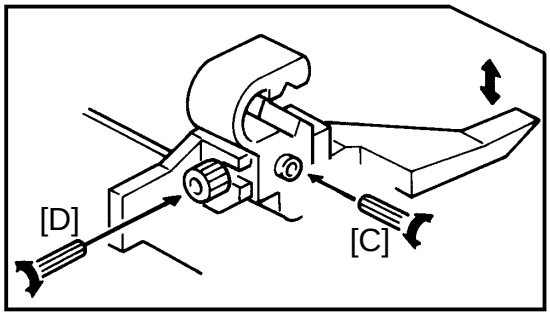



5. Using a gap gauge, measure the clearances [A] between the drum surface and the exit pawls. It should be 0.8 mm. There is allowance for a 0.2 mm difference.

**6. If the clearance is not correct, loosen the lock nut. Then adjust the clearance by turning the bolt [B].**



NOTE: The clearance for the front and rear exit pawls can be changed separately as follows:
1) Loosen the lock screw [C].
2) Adjust the exit pawl position by turning the bolt [D].

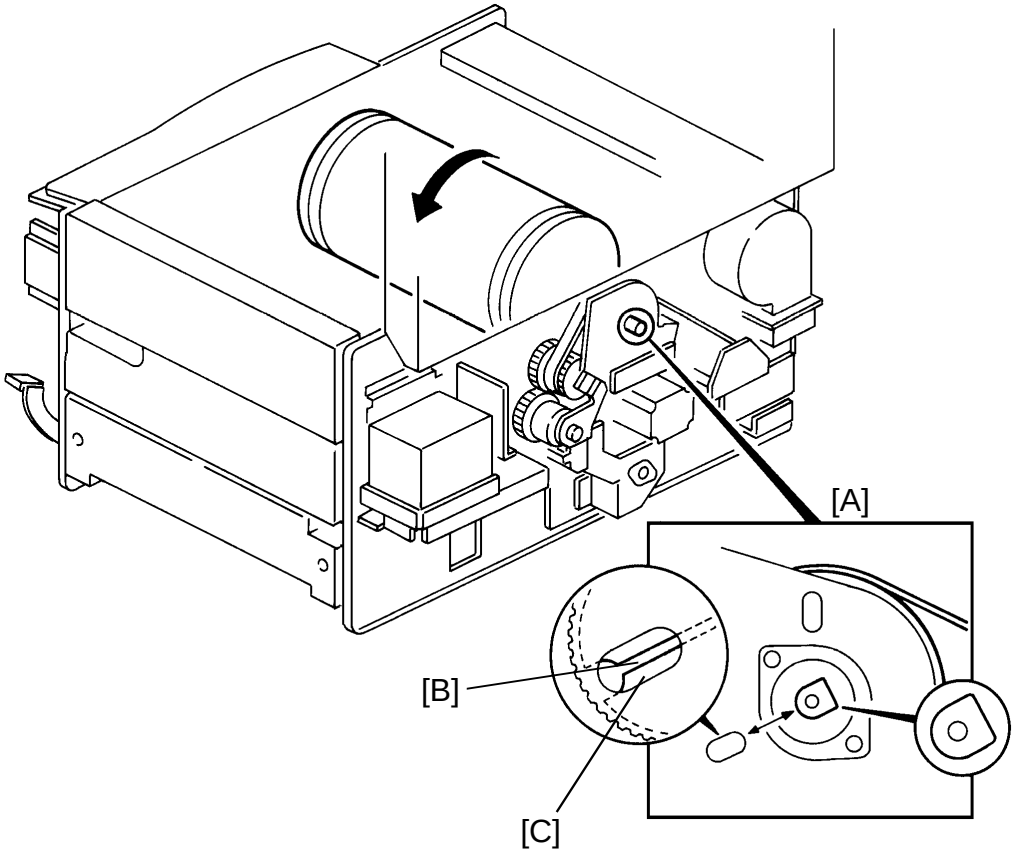



This adjustment should be done only when the clearances for the two exit pawls are different from each other. Normally this is adjusted during production. Adjust the clearance by following steps 1 to 6 above.

## 8.2 EXIT PAWL DRIVE TIMING ADJUSTMENT

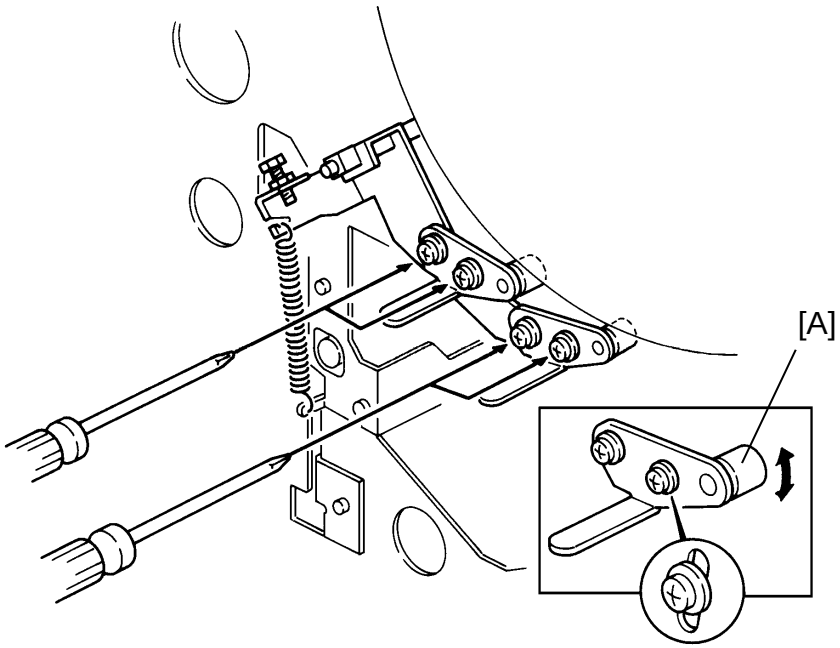
**PURPOSE:** To ensure that the exit pawls move and escape the drum master clamper while the drum is rotating.

**ADJUSTMENT STANDARD:**
0 to 0.5 mm




**CAUTION: Before this adjustment, the exit pawl clearance from the drum must be checked. (See "8.1 EXIT PAWL CLEARANCE ADJUSTMENT".)**

1. Turn off the main switch and disconnect the power plug.
2. Remove the front cover (4 screws) and rear cover (6 screws).
3. Open the scanner unit. By referring to the rear end of the drum shaft, turn the drum manually until the round part of the shaft faces the long hole as shown [A]. (The rib [B] of the drum drive pulley will meet the long hole [C].)

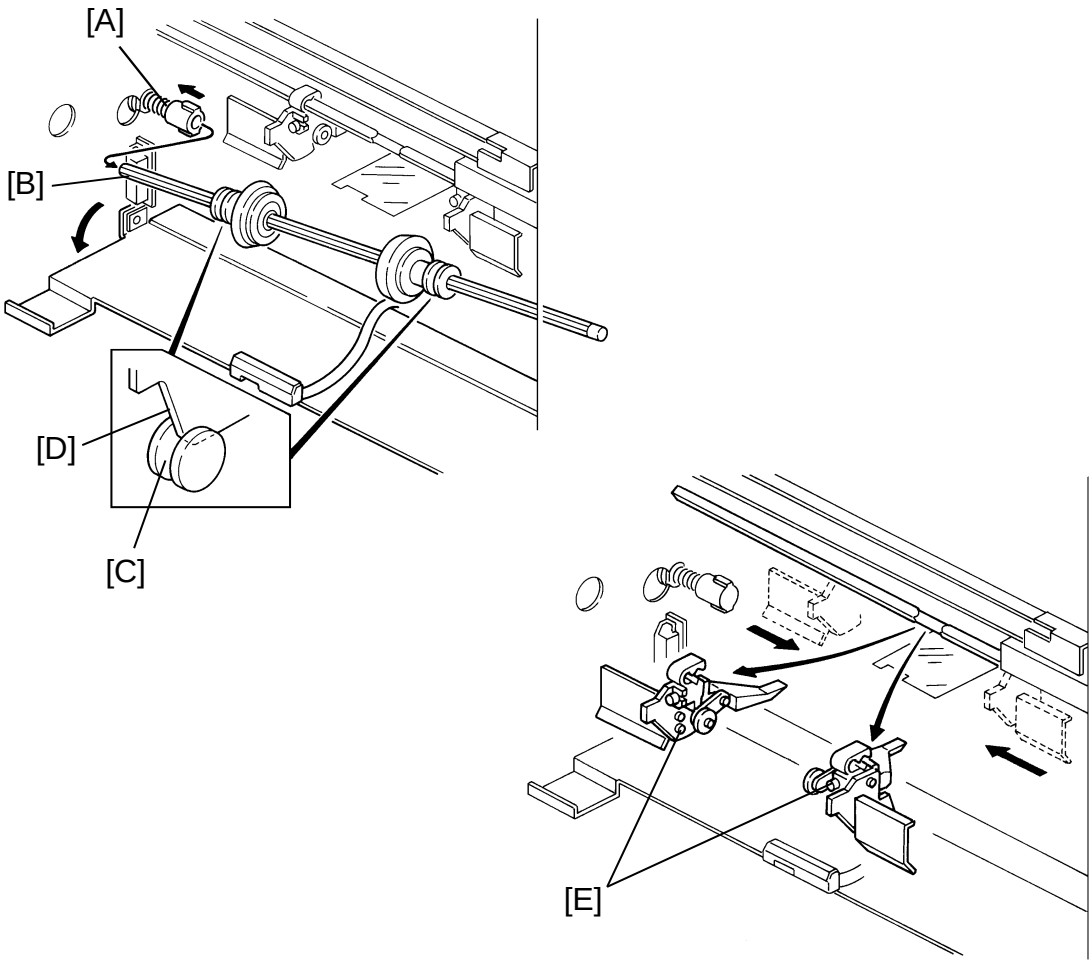



4. Swing out the power supply PCB (2 screws and 4 connector).
5. For each cam follower, measure the gap between the cam follower and cam face. It should be 0 to 0.5 mm.
6. If the gap is not correct, loosen the two screws and adjust the cam follower position [A].

**CAUTION: Do not push the cam followers to strongly against the cam.**

7. After adjustment, turn the drum manually and be sure that the exit pawls move properly to escape the drum master clamper.

## 8.3 EXIT ROLLER AND EXIT PAWL REMOVAL




1. Turn off the main switch and disconnect the power plug.
2. Remove the air knife camber (2 screws).
3. Open the paper delivery fence.
4. While pushing the joint [A] to the rear, remove the shaft [B] with the lower exit rollers.

NOTE: When installing, be sure to meet the grooves [C] of the lower rollers with the plates [D] beside the upper rollers.

5. Slide the exit pawl assemblies [E] to the middle of the shaft, which is the the thinnest area, for removal.

**CAUTION: Do not disassemble the exit pawl assembly. If it is disassembled, the clearance between the exit pawl and the drum must be checked after reinstallation.**

# 9. OPTICS SECTION

## 9.1 OVERVIEW

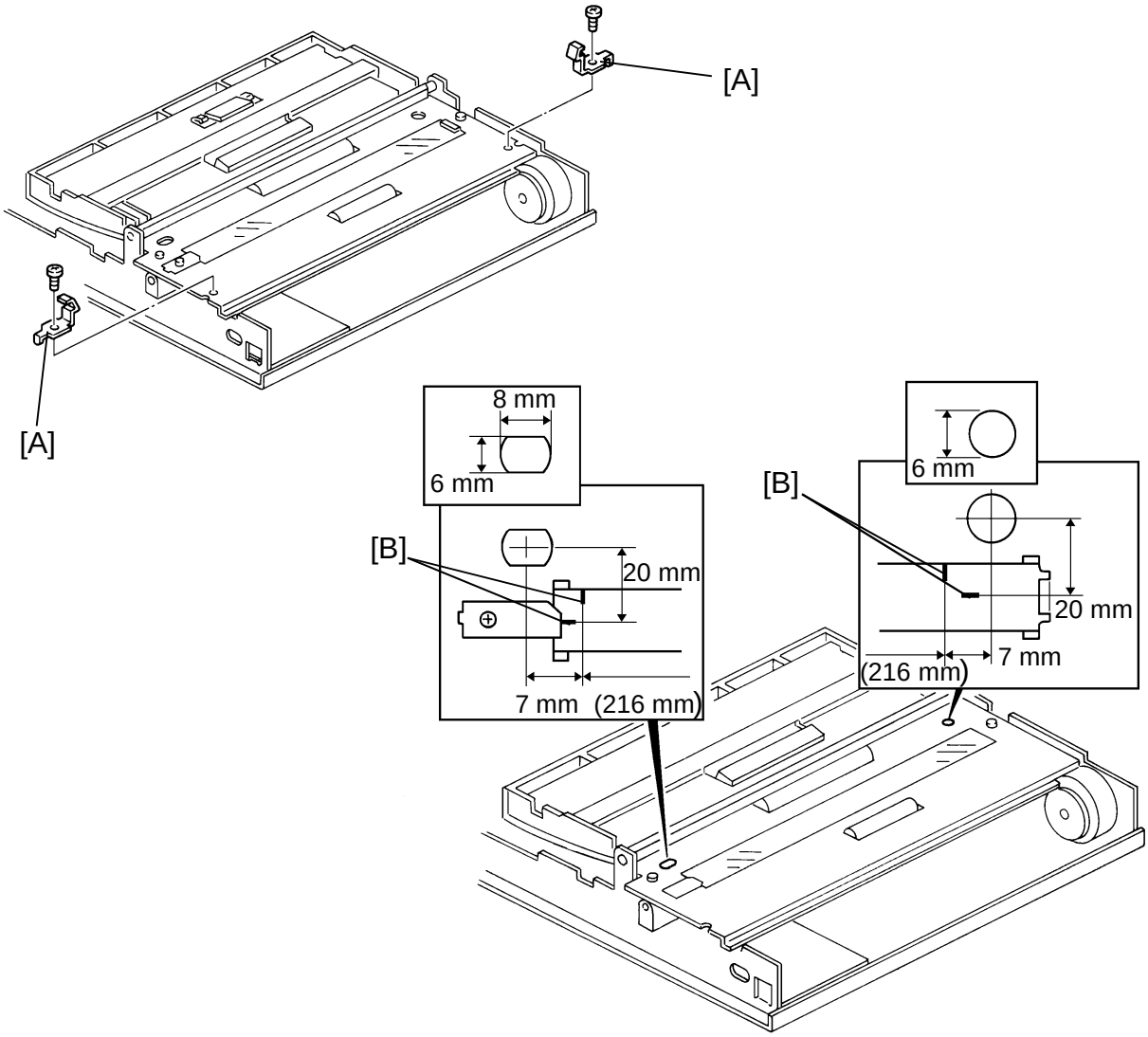
Double check all optics adjustments, because these adjustments influence each other.

The following table shows the reciprocal relationship between the adjustment procedures. The **"O"** indicates those items that must be checked (check items) after items in the left column (adjustment item) is adjusted.

| Check Item / Adjustment Item | White Level | Scanning Line Position | Scanning Start Position | Focus (MTF) | Magnification Ratio |
|---|---|---|---|---|---|
| White Level | | | | | |
| Scanning Line Position | O | | O | | |
| Scanning Start Position | O | O | | | |
| Focus (MTF) | | | | | O |
| Magnification Ratio | O | O | O | O | |

* Necessary Tools
1) Facsimile Test Chart R-21 (P/N 99992131)
2) Oscilloscope

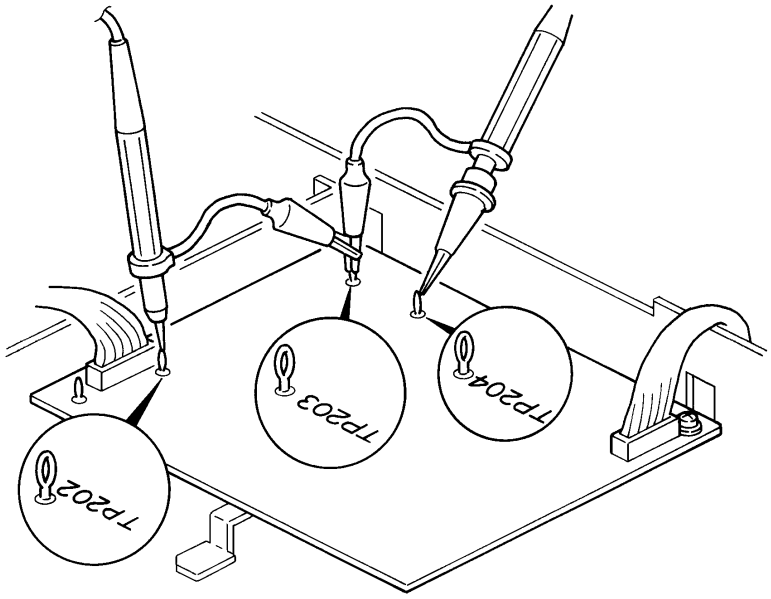
### 9.1.1 Preparation For Adjustment




1. Turn off the main switch and disconnect the power plug.
2. Remove the scanner cover (4 screws).
3. Remove the ADF lock plates [A] (1 screw each).
4. Put two marks [B] on each side of the exposure glass.

   **NOTE:** The marks on the operation side are used for the scanning start and line position adjustments, and those on the other side are used for the magnification adjustment.

The marks are to correctly place the test chart so that the CCD scans 216 mm of the line on the test chart.




| Oscilloscope | Test pin |
|---|---|
| Channel 1 (Scanning line trigger) | TP204 |
| Channel 2 (CCD video data) | TP202 |
| GND | TP203 |

| | Channel 1 | Channel 2 |
|---|---|---|
| Vols/DIV. | DC 5 V/DIV. | AC 0.2 V/DIV. (DC 0.5 V/DIV. for white level adjustment) |
| Time | 0.5 msec/DIV. | |



5. Connect channel 1 and 2 probes and the grounding terminals of the oscilloscope to the test pins (TP's) on the A/D conversion PCB, as shown in Table 1.

   **NOTE:** Be sure that the light path between the exposure lamp and lens is not obstructed by the probes or their lead wires.

6. Select the time range and volts/division for each channel of the oscilloscope as shown in Table 2. Then turn on the main switch of the oscilloscope.

   NOTE: Select DC 0.5 V/DIV. for channel 2 when the white level adjustment is carried out.

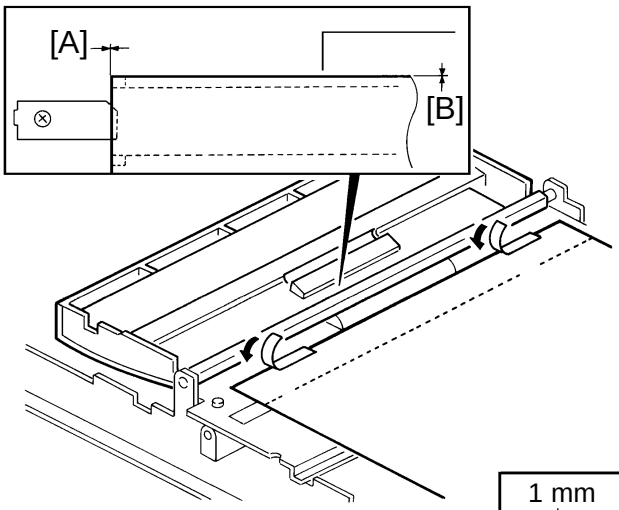
7. Connect the power plug, and turn on the main switch to access the output mode. (Turn on the main switch while holding down the Print Start, Stop, and Clear keys together. Then, press the Memory/Class key once to get "00" in the memory display.)
8. Select the exposure lamp on mode. (Enter "9" with the number key.)

**NOTE1:** If the positions of the CCD PCB, lens, and/or lens housing are different from the original positions (if some are replaced) fix each part temporarily as follows, to make the adjustment easier:

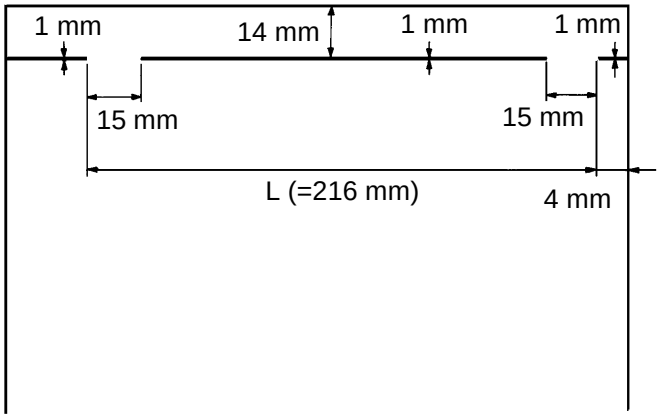
1) Position the CCD PCB fully on the operation side.

2) Fully insert the lens into the lens housing. Also, be sure that the white mark on the lens faces to the top.

3) Move the lens housing fully to the exposure lamp side.




[Test Chart]



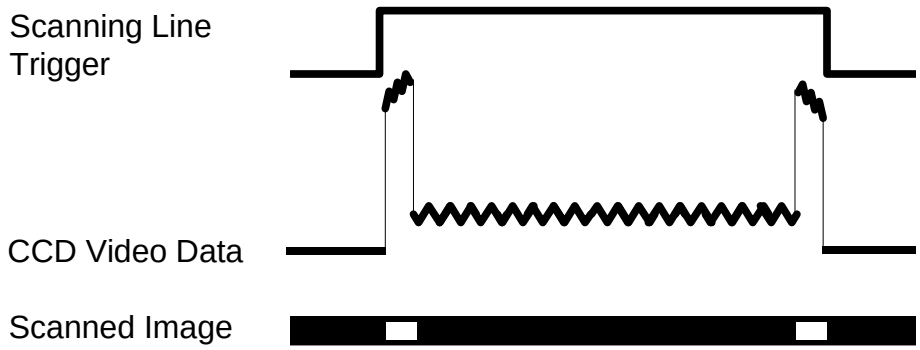



**"L" in the illustration must be 216 mm exactly. Otherwise, the magnification ratio cannot be adjusted correctly.**

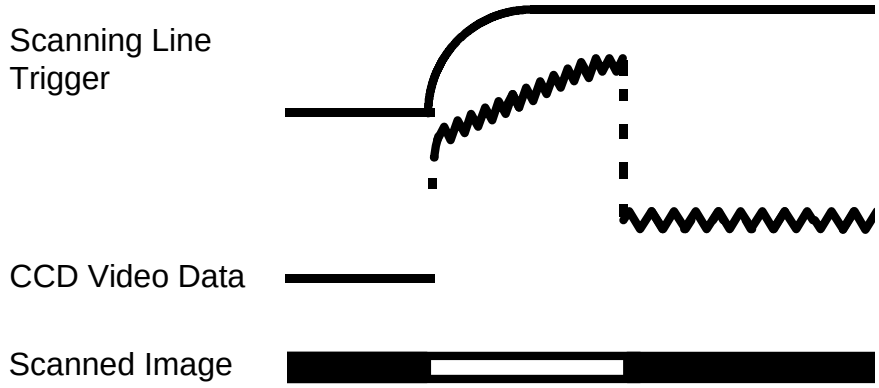
**NOTE2:** If facsimile test chart R-21 is not available, you can make a test chart, as shown, to do the scanning line position, scanning start position, and magnification ratio adjustments. (See the following pages for each adjustment.) Place the test shart with the image side down and fix it with tape as shown. Place the leading edge of the test chart even with the edge of the cutout for the original feed roller [B]. Also, the rigiht side edge should be even with the edge of the cutout for the exposure glass [A].

If you use the test chart, the waveform for each adjustment that can be seen in the screen of an oscilloscope will be represented as follows:

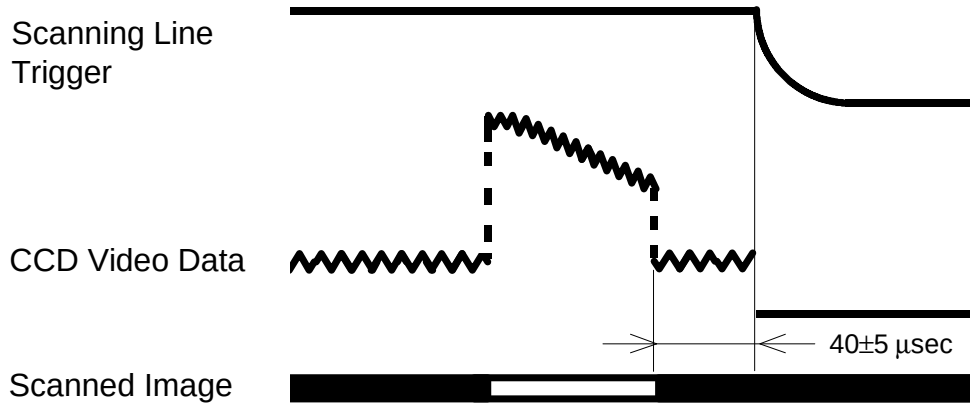
(1) Scanning Line Position Adjustment




(2) Scanning Line Start Position Adjustment

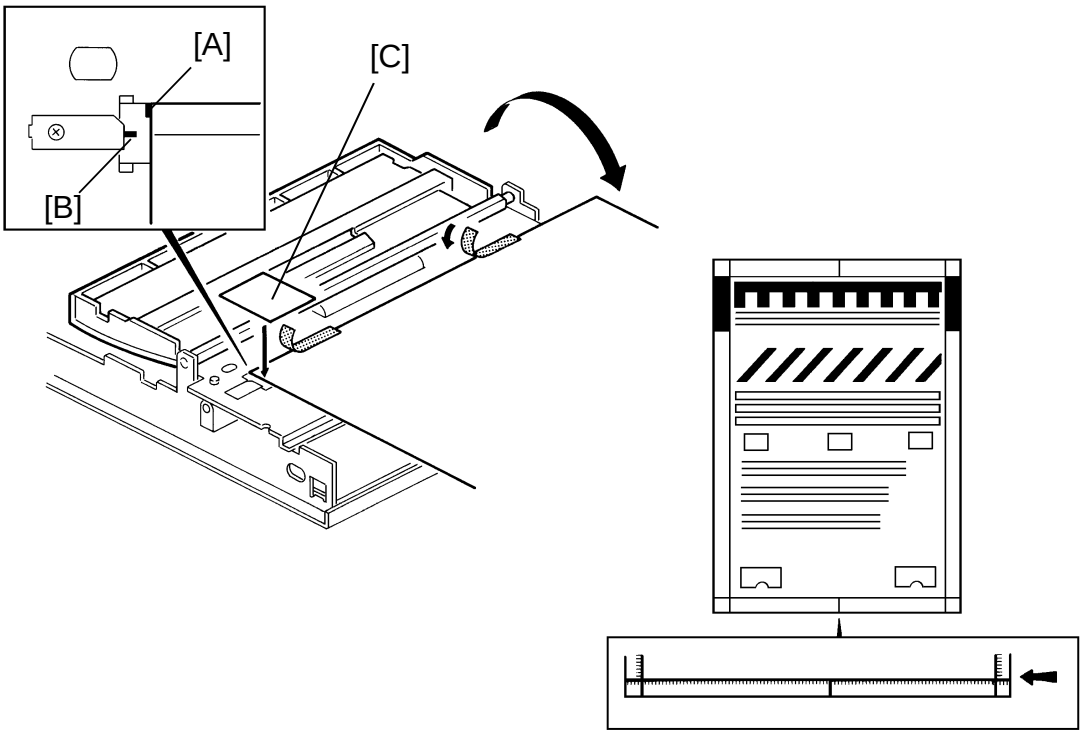



(3) Magnification Ratio Adjustment



### 9.1.2 Scanning Start And Line Position Adjustment

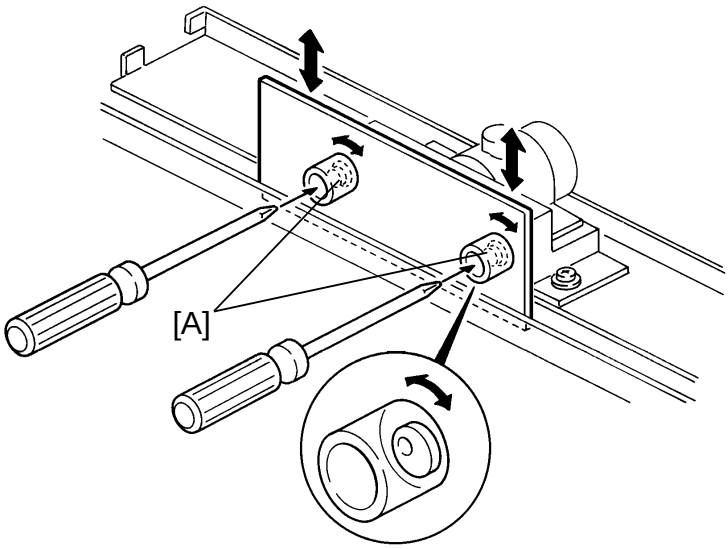
**PURPOSE:** To ensure that the CCD alignment is perpendicular to the original feed direction (scanning line position). Also, to ensure that the CCD scanning starts from the correct position on the exposure glass (scanning start position). The first element of the 2592 effective CCD elements should read the end of 216 mm length of a line, which is the maximum length for the CCD main scanning line.

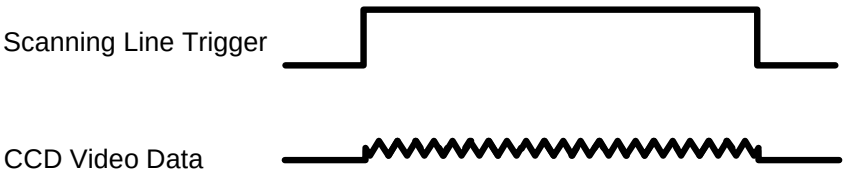



[Facsimile Test Chart R-21]

1. According to the two marks on the operation side of the exposure glass, and place facsimile test chart R-21 so that the line on the test chart (see illustration) is correctly positioned on the exposure glass.

   NOTE: The right edge of the test chart meets mark [A], and the line on the test chart meets mark [B].
2. Fix the test chart with tape as shown. Then close the ADF.
3. Place a white sheet [C] beside the test chart.
4. Close the ADF.
5. Access the exposure lamp on mode and press the Print Start key to turn on the exposure lamp.



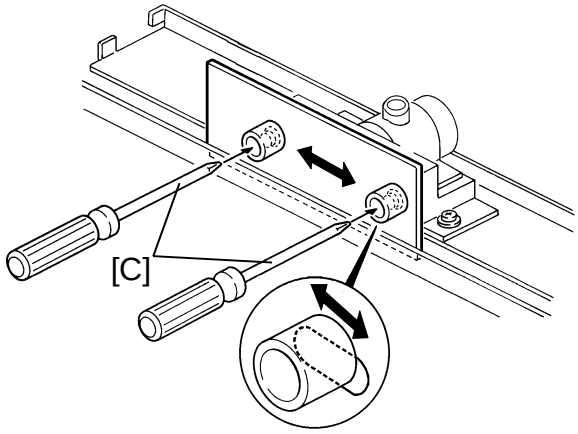

6. Look at the waveform on the oscilloscope. If the CCD scans the black line on the test chart correctly, the waveform will look like the one shown in the illustration above.

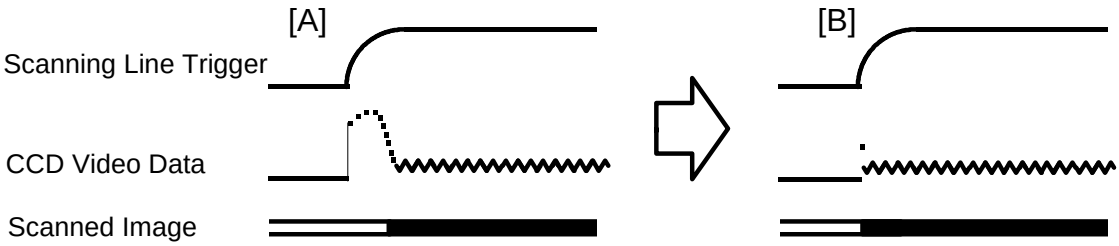
7. If the waveform is different, slightly loosen the screws inside the adjusting knobs [A] and turn the adjusting knobs to make the waveform as shown. (Scanning line position adjustment)

   **NOTE:**

   1) The bottom of the adjusting knobs is an eccentric cam. By turning the adjusting knobs, the CCD PCB moves up or down.

   2) If the CCD scanning line is completely out of the correct position, a similar waveform will be seen. If the waveform does not change when white paper is placed on the exposure glass instead of the test chart, repeat step 7.



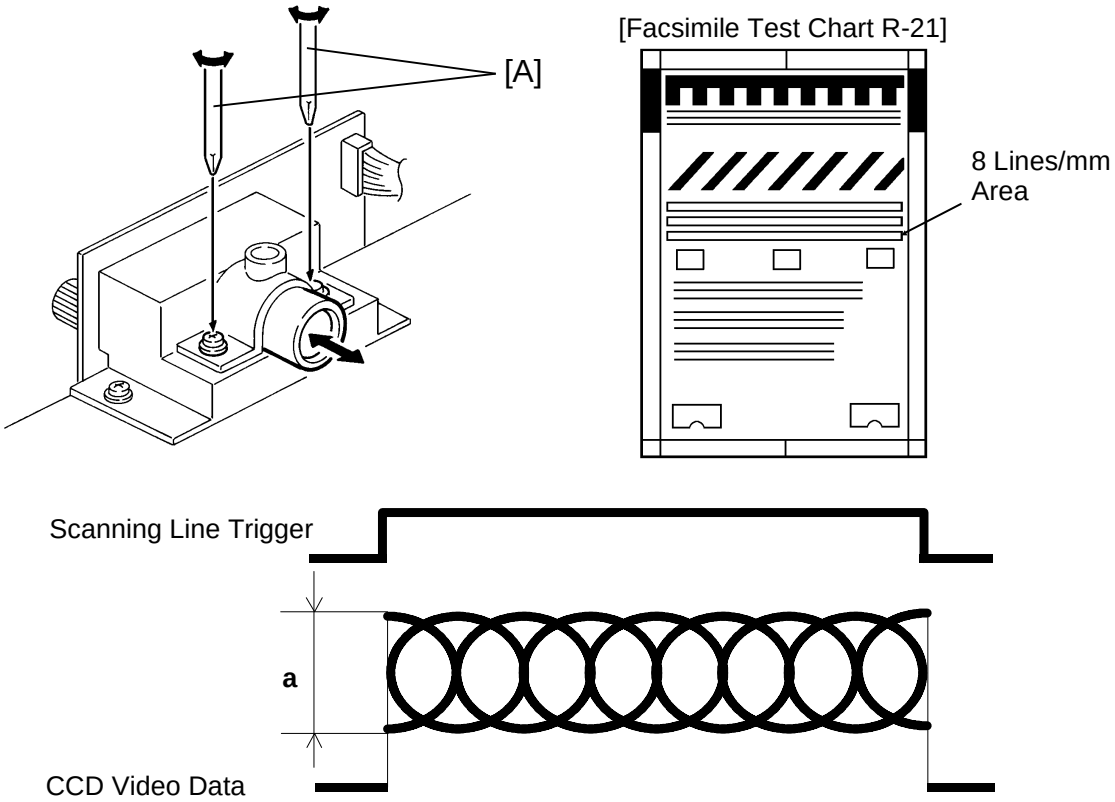

8. Select 10 times enlargement mode of the oscilloscope to see the waveform in better detail.
9. Look at the waveform on the oscilloscope. If the first CCD effective elements scan a white area, but not the black line on the test chart, the waveform for the first part of the CCD main scanning line will be as shown [A].
10. If the waveform is not as shown [A], move slightly the CCD PCB to the non-operation side until the CCD scans the white area. (The screws inside the adjusting knobs must be loosened to move the CCD PCB.)
11. While monitoring the oscilloscope, gradually move the CCD PCB to the operation side until the first CCD effective element reads the end of the black line on the test chart. (A few elements leeway is allowed)

    NOTE: If step 11 is completed, the waveform will be as shown [B]. The illustration [B] means that the end of the black line is read by one element before the first CCD effective element.
12. Securely tighten the screws [C] inside the adjusting knobs.

    NOTE: The CCD position may be changed when the screws are tightened. Repeat steps 6 and 7 to check the CCD position.

### 9.1.3 Focus (Modulation Transfer Function) Adjustment

**PURPOSE:** To adjust the focus distance between the CCD and the lens.




1. Place facsimile test chart R-21 on the exposure glass so that the 8 lines/mm area is scanned by the CCD.
2. Access the exposure lamp on mode and press the Print Start key to turn on the exposure lamp.
3. Check if the waveform looks like the one shown in the illustration above.

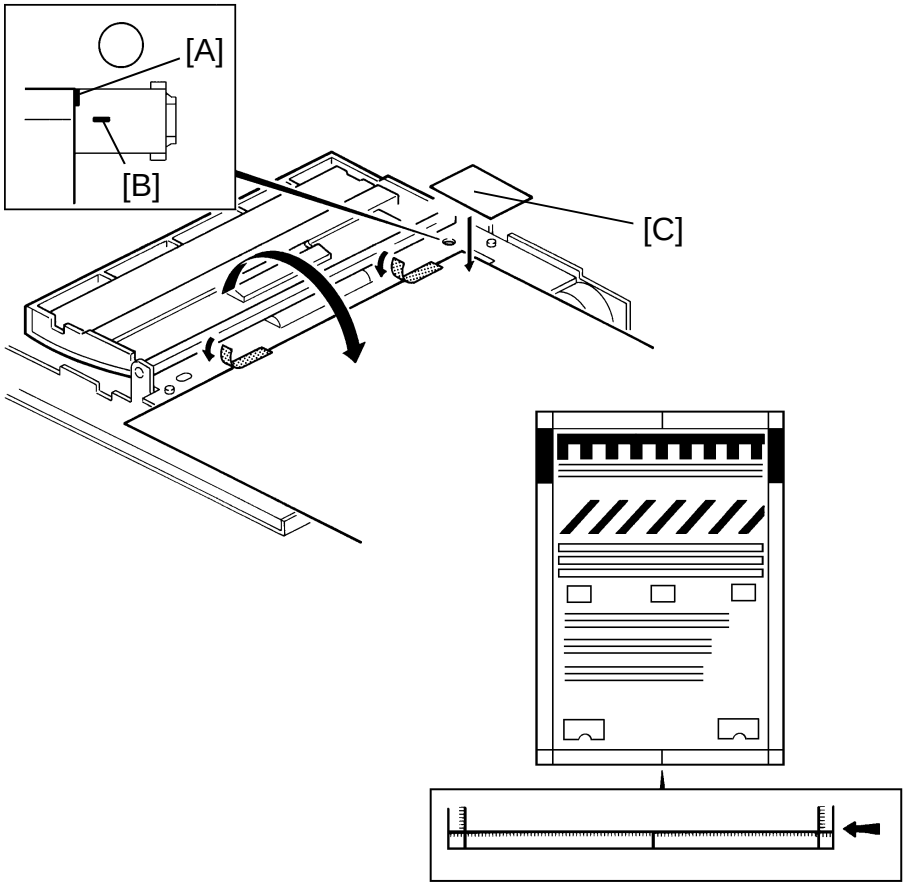
NOTE: Be sure that the light path between the exposure lamp and lens is not obstructed by the ADF cover.

4. Loosen the two screws [A] and then move the lens as shown.
5. Secure the lens when "a" of the waveform reaches its maximum.

**CAUTION: Be sure that the white mark on the lens always faces towards the top.**

### 9.1.4 Magnification Ratio Adjustment

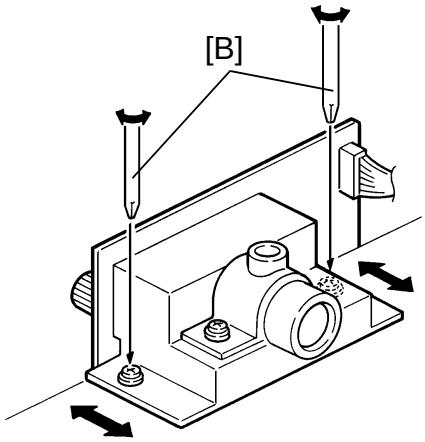
**PURPOSE:** To adjust the distance between the lens and original on the exposure glass to reproduce the images at full size (100%) magnification ratio.

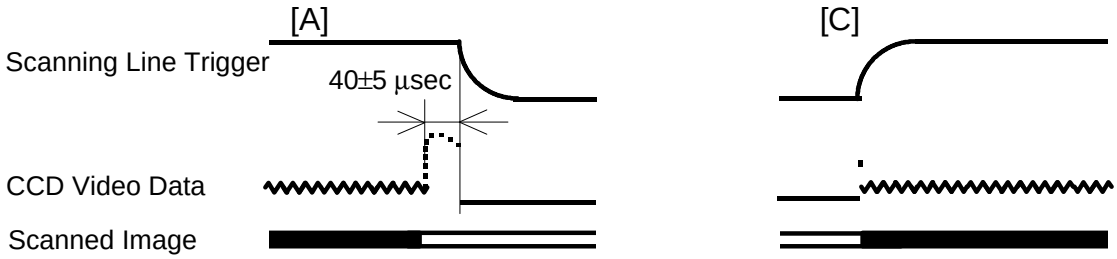



[Facsimile Test Chart R-21]

1. According to the two marks on the non-operation side of the exposure glass, place facsimile test chart R-21 so that the line on the test chart (see illustration) is correctly positioned on the exposure glass.

   NOTE: The left edge of the test chart meets mark [A], and the line on the test chart meets mark [B].
2. Fix the test chart with tape as shown. Then close the ADF.
3. Place a white sheet [C] beside the test chart.
4. Access the exposure lamp on mode and press the Print Start key to turn on the exposure lamp.



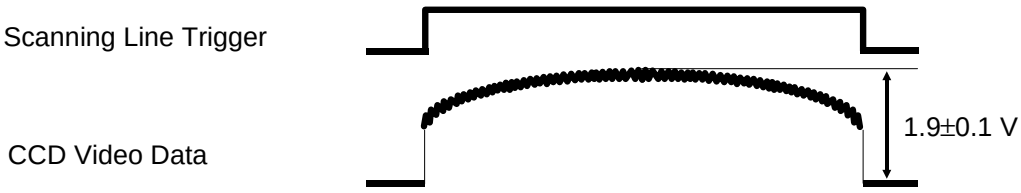

5. Check if the CCD reads the black line on the test chart correctly. If not, follow **"9.1.2 Scanning Start And Line Position Adjustment."**

NOTE: If **"9.1.2 Scanning Start And Line Position Adjustment"** is completed and the CCD does not scan the black line properly, reposition the test chart.

6. Select 10 times enlargement mode of the oscilloscope to see the waveform in better detail.
7. Look at the waveform on the oscilloscope. If the last CCD effective elements scan a white sheet, but not the black line on the test chart, the waveform for the last part of the CCD main scanning line will be as shown [A].
8. Loosen the two screws [B] and then move the lens housing as shown.
9. Secure the lens housing when "a" of the waveform becomes 40±5 µsec.
10. Be sure that the waveform for the first part of the CCD main scanning line is as shown [C].
11. If not, follow steps 10 to 12 of **"9.1.2 Scanning Start And Line Position Adjustment."** Then repeat steps 8 to 10 above.

### 9.1.5 White Level Adjustment

**PURPOSE:** To be sure that the CCD video data is properly amplified through the A/D conversion PCB.




1. Select DC 0.5 volts/Division for channel 2 and DC 5 volts/ Division for channel 1.
2. Close the ADF.
3. Access the exposure lamp on mode and press the Print Start key to turn on the exposure lamp.
4. Turn VR201 on the A/D conversion PCB so that the maximum level of the waveform is 1.9±0.1 volts as shown.

# SECTION 6

# TROUBLESHOOTING

# 1. ELECTRICAL COMPONENT TROUBLE

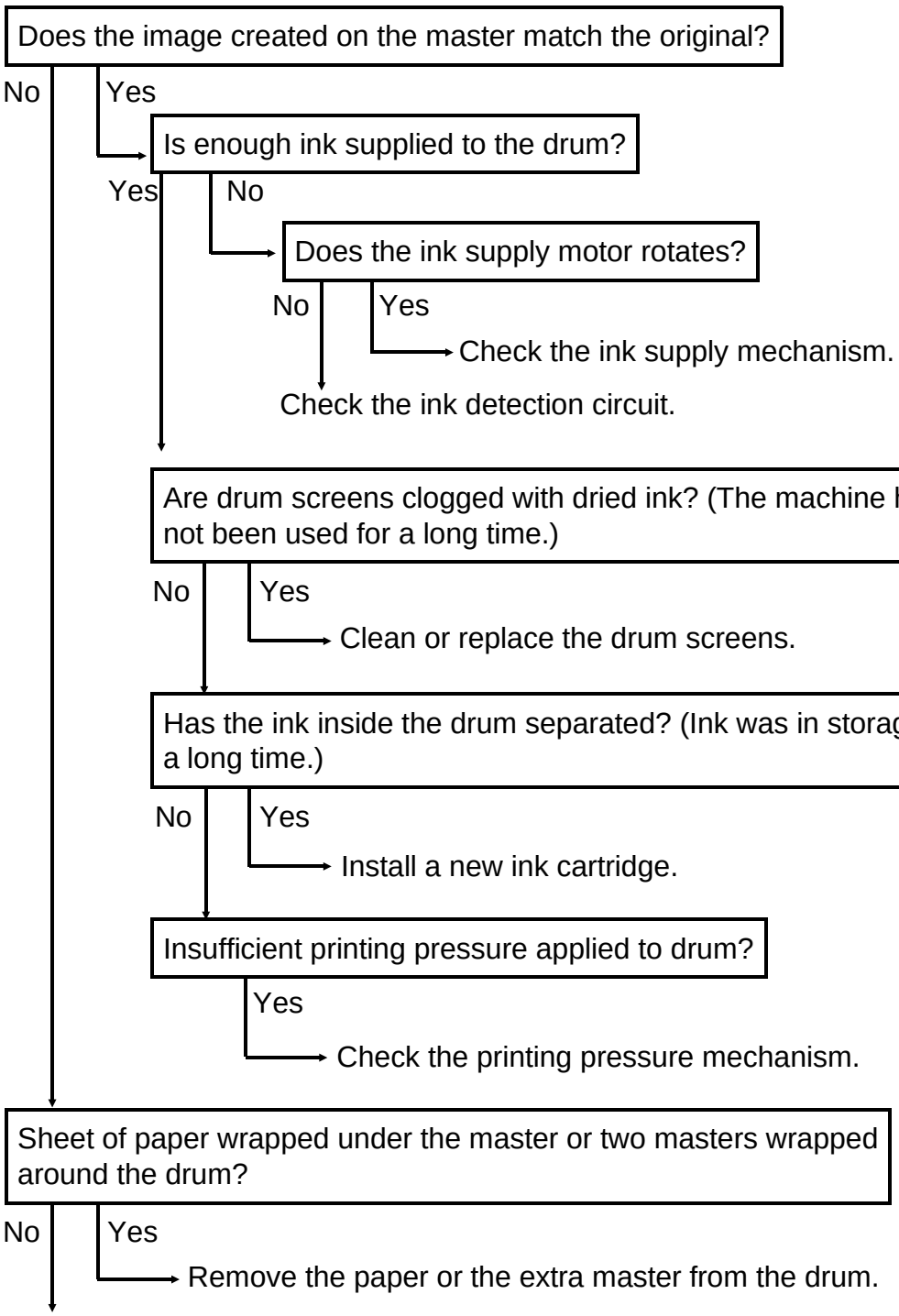
| Component | Condition | Phenomenon |
|---|---|---|
| FU101 (Main PCB) | Open | When the master making key is pressed, "E-00" is displayed. |
| FU102 (Main PCB) | Open | The air knife motor does not work. |
| FU401 (AC Drive PCB) | Open | Machine does not work. (No indicators on the operation panel turn on.) |
| Master End Sensor | ON condition (Activated) | Even though no master is present, the machine starts master feed operation, then "C" and light. |
| | OFF condition (Not activated) | Even if a master is present, lights. |
| Original Registration Sensor | ON condition (Photo-transistor is not activated) | When the main switch is turned an, "A" and light. |
| | OFF condition (Photo-transistor is not activated) | After the master making key is pressed, "A" and light. |
| Feed Jam Timing Sensor | ON condition (Interrupted) | The last paper is not fed and "E" and light. |
| | OFF condition (Not interrupted) | After the print start key is pressed, the drum keeps rotating without paper feed. |
| Paper End Sensor | ON condition (Activated) | Even if there is no paper on the paper table, the print start key cam activated but "B" and light. |
| | OFF condition (Not activated) | Even if there is paper on the paper table, lights. |
| Registration Sensor | ON condition (Activated) | When the main switch is turned or, "B" and light. |
| | OFF condition (Not activated) | After the print start key is pressed, "B" and light. |
| Feed Start Timing Sensor | ON condition (Interrupted) | After the main motor starts rotating, "E-06" is displayed. |
| | OFF condition (Not interrupted) | After the main motor starts rotating, "E-06" is displayed. |
| Exit Jam Timing Sensor | ON condition (Interrupted) | After the 1st print is delivered, "E" and light. |
| | OFF condition (Not interrupted) | There is no print count down. (The machine does not stop printing until the last paper is fed.) |
| Master Eject Position Sensor | ON condition (Interrupted) | The drum rotation speed is kept at 30 rpm while printing. |
| | OFF condition (Not interrupted) | The drum keeps rotating at 30 rpm after the print start key or the master making key is pressed. |
| Drum Master Sensor | ON condition (Activated) | Prints can be made without having a master around the drum. |
| | OFF condition (Not activated) | After the master feed operation is finished, "C" and light. |

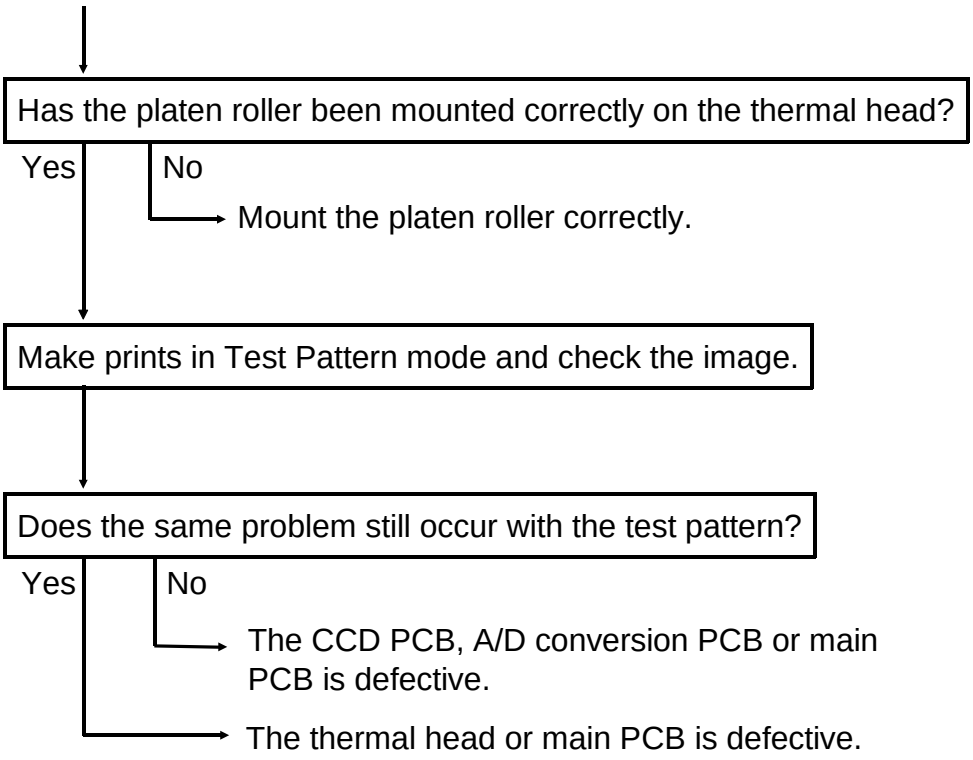
| Component | Condition | Phenomenon |
|---|---|---|
| Exit Sensor | ON condition (Activated) | When the print start key or the master making key is pressed, "G" and light. |
| | OFF condition (Not activated) | After the first paper is delivered, "E" and light. |
| Master Eject Sensor | ON condition (Activated) | When the main switch is turned on, "F" and light. |
| | OFF condition (Not activated) | After the master making key is pressed, "F" and light. |
| Full Master Sensor | ON condition (Interrupted) | After the drum master is ejected, it is not compressed. (A master eject jam occurs.) |
| | OFF condition (Not interrupted) | After the drum master is ejected, lights. |
| Pressure Plate H.P. Sensor | ON condition (Interrupted) | The pressure plate does not return to the home position. (A master eject jam occurs at the next master eject operation.) |
| | OFF condition (Not interrupted) | When the main switch is turned on, E-12 is displayed. The pressure plate drive gears are damaged. |
| Original Set Sensor | ON condition (Activated) | After the printing operation of the last original is finished, "A" and light. |
| | OFF condition (Not activated) | When the master making key is pressed, "A" blinks. |
| Left Cutter Switch Right Cutter Switch | ON condition (Activated) | The master is not cut. (A master feed jam occurs.) |
| | OFF condition (Not activated) | When the main switch is turned on, or after the master is cut, "E-05" is displayed. |
| Master Clamper Switch | ON condition (Activated) | Master clamper is not opened or closed. (A master feed/eject jam occurs.) |
| | OFF condition (Not activated) | When the main switch is turned on, or the master clamper is opened, "E-00" is displayed. |

# 2. TROUBLESHOOTING

## 2.1 IMAGE TROUBLE

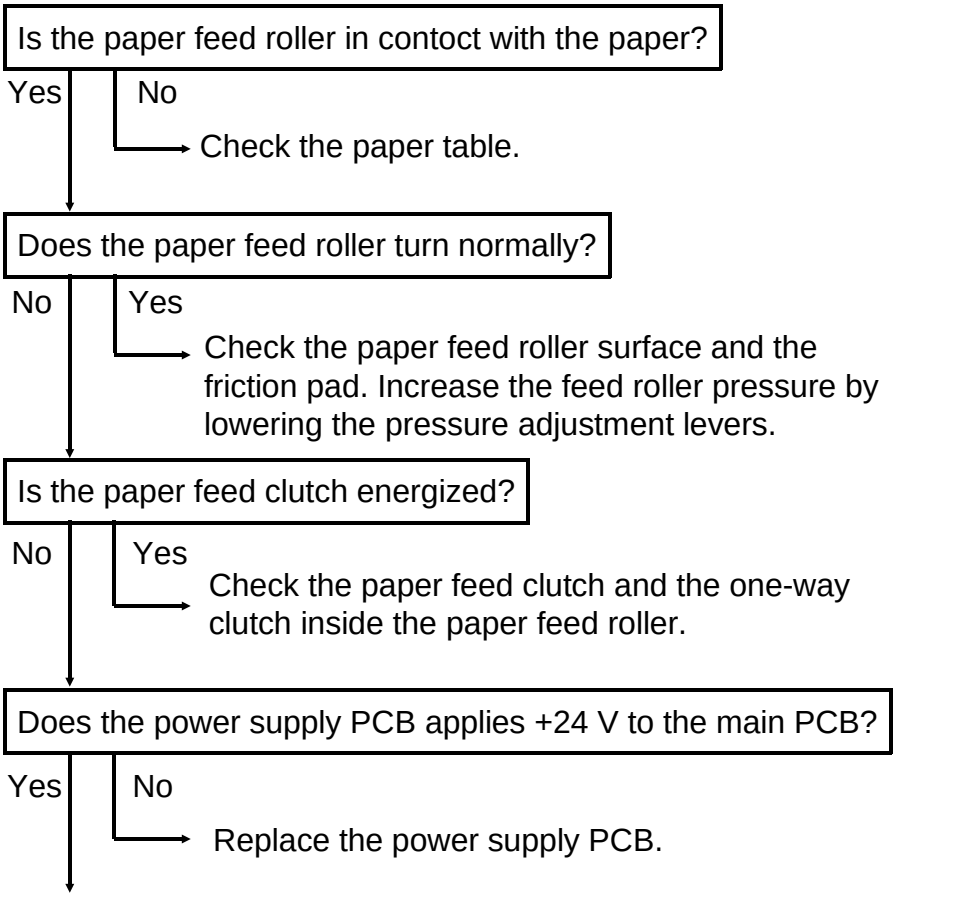
### 1. No image, white lines, uneven image on copy




Has the platen roller been mounted correctly on the thermal head?
Yes
No
Mount the platen roller correctly.
Make prints in Test Pattern mode and check the image.
Does the same problem still occur with the test pattern?
Yes
No
The CCD PCB, A/D conversion PCB or main PCB is defective.
The thermal head or main PCB is defective.

## 2.2 PAPER FEED TROUBLE

**1. No paper is fed from the paper table.**



**2. Paper jams under the second feed roller.**