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SECTION 1

OVERALL MACHINE INFORMATION

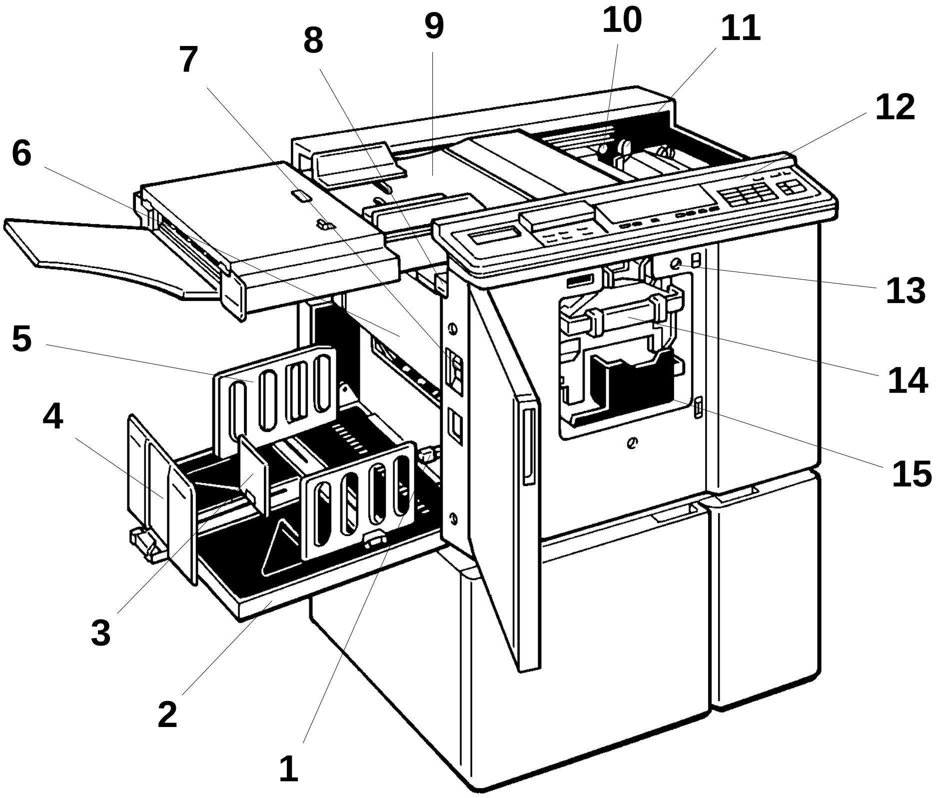
1. SPECIFICATIONS

Configuration:	Desk top
Master Processing:	Digital
Printing Process:	Fully automatic one drum stencil system
Original Type:	Sheet
Original Size:	Maximum 307 mm x 432 mm (12.0" x 17.0") Minimum 90 mm x 140 mm (3.6" x 5.5")
Reproduction Ratios:	LT version 93%, 77%, 74%, 65% A4 version 93%, 87%, 82%, 71%
Enlargement Ratio:	LT version 155%, 129%, 121% A4 version 141%, 122%, 115%
Image Mode:	Line/Photo
Color Printing:	Drum unit replacement system (red, blue, green and brown)
Master Feed/Eject:	Roll master automatic feed/eject
Leading Edge Margin:	10 mm (0.39")
Print Paper Size:	Maximum 325 mm x 447 mm (12.7" x 17.5") Minimum 90 mm x 148 mm (3.6" x 5.8")
Printing Area:	Maximum 290 mm x 405 mm (11.4" x 15.9") at 20°C/65% RH
Print Paper Weight:	50 g/m^2 to 215 g/m^2 (13.3 lb to 57.19 lb)
Printing Speed:	40, 60, 80, 100, 120 sheets/minute (5 steps)
First Print Time:	39 sec./A3/DLT (with "L" drum) 36 sec./A4/LT (with "L" drum) 29 sec./A4/LT (with "S" drum)
Paper Feed Table Capacity:	Table mode: 1,000 sheets (66 g/m^2, 17.6 lb) Cassette mode: 500 sheets (66 g/m^2, 17.6 lb)
Paper Delivery Table Capacity:	500 sheets (66 g/m^2, 17.6 lb)
Power Source:	110 V, 60 Hz, 5.5 A (for Taiwan) 120 V, 60 Hz, 4.8 A (for N.A.) 220/240 V, 50/60 Hz, 2.7 A (for Eu., Asia)

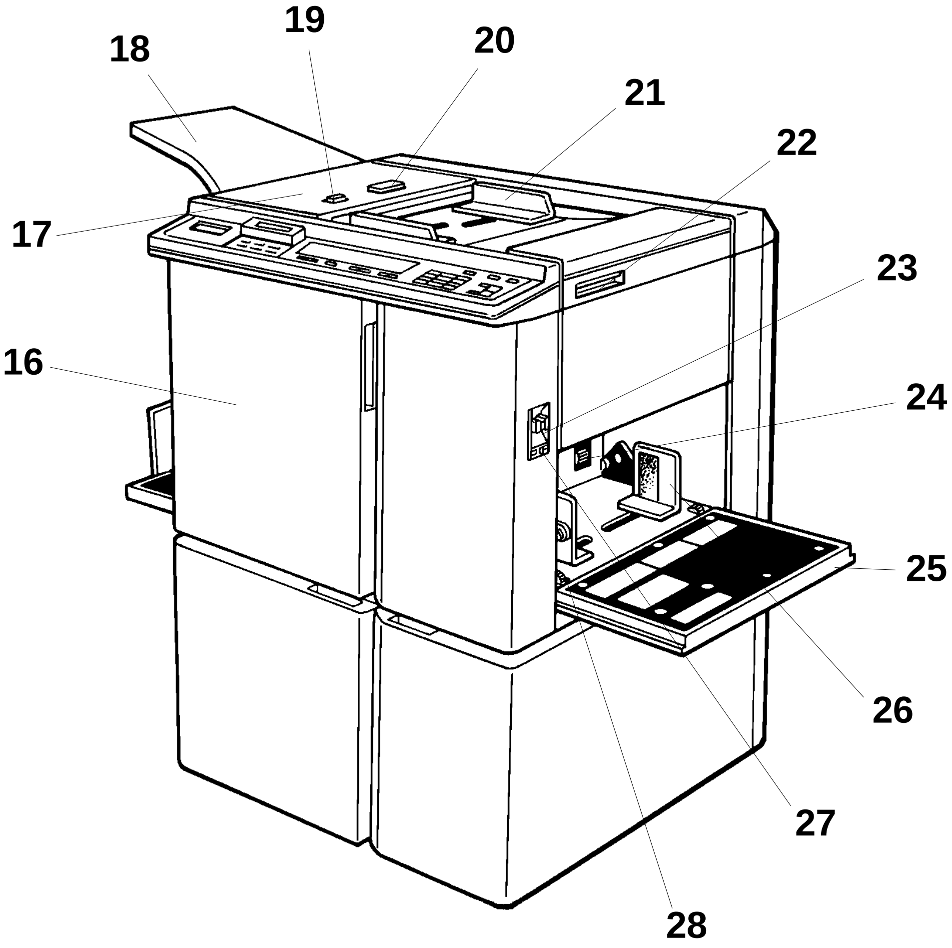
Power Consumption:	110 V, 60 Hz, 385 W (for Taiwan) 120 V, 60 Hz, 385 W (for N.A.) 220/240 V, 50/60 Hz, 443 W (for Eu., Asia)
Weight:	110 V version: 110 kg (242.5 lb) 120 V version: 110 kg (242.5 lb) 220/240 V version: 116 kg (255.7 lb) Cabinet: 23.5 kg (51.8 lb)
Dimensions (W x D x H):	Stored: 735 x 698 x 599 mm (29.0" x 27.5" x 23.5") Set up: 1331 x 698 x 616 mm (52.4" x 27.5" x 24.2") Cassette mode: 1386 x 698 x 616 mm (54.6" x 27.5" x 24.2") Cabinet: 719 x 630 x 426 mm (28.3" x 24.8" x 16.8")
ADF Original Capacity:	20 sheets (66 g/m^2, 17.6 lb) or 1.8 mm height
Original Scanning Time:	3 ms/1 line
Original Guide Movement distance:	90 mm to 310 mm (3.54" to 12.2")
Original Feed Speed:	21.4 mm/sec (while master processing) 87.8 mm/sec (not master processing)
Pixel Density:	400 dpi
Master Eject Box Capacity:	50 masters with "L" drum 70 masters with "S" drum
Paper Separation:	Friction roller/center separation system
Feed Table Side Plate Movement Distance:	88 mm to 336 mm (3.46" to 13.2")
Paper Feed Roller Pressure:	Normal position 300 g Thick paper position 600 g
Separation Roller Pressure:	Normal position 125 g Weak position 50 g
Separation Plate Pressure:	Weak 10 g Normal 20 g Strong 1 40 g Strong 2 60 g
Side Registration:	±10 mm
Vertical Registration:	±20 mm

Paper Table Raising/ Lowering speed:	22 mm/sec (50 Hz) 26 mm/sec (60 Hz)	
Ink Supply:	Automatic ink supply system	
Press Roller Pressure:	13 ± 1 kg	
Paper Delivery:	Air knife/vacuum delivery	
Delivery Side Plate Movement distance:	80 mm to 327 mm (31.5" to 12.9")	
Print Counter:	7 digits	
Supplies:	Master	Thermal master 320 mm width Master roll 225 masters/1 roll
		Roll diameter Master length 535 mm/1 master Max run length 2000 prints
	Ink	800 cc ink pack (black) 500 cc ink pack (red, blue, green, blown)

2. GUIDE TO COMPONENTS AND THEIR FUNCTION



No.	Name	Function
1.	**Wing Guide Release Lever**	Use to aid paper stack of large size paper.
2.	**Paper Delivery Table**	Completed prints are delivered here.
3.	**Small Size Paper Delivery End Plate (for smaller than A4)**	Use to align the leading edge of prints that are A4/LT or smaller.
4.	**Paper Delivery End Plate (for larger than A4)**	Use to align the leading edge of prints larger than A4/LT.
5.	**Paper Delivery Side Plate**	Use to align the prints on the paper delivery table.
6.	**Master Eject Box Cover**	Open when removing the master eject box.
7.	**Main Switch**	Use to turn the power on or off.
8.	**Master Eject Unit Open Button**	Press to remove misfed paper or a misfed master.
9.	**Original Table**	Place the originals on this table.
10.	**Master Cut Button**	Press this button to cut the master paper leading edge after installing a new master roll.
11.	**Pressure Release Lever**	Use to install the master roll, or to clean the thermal head.
12.	**Operation Panel**	Operator controls and indicators are located here.
13.	**Drum Rotation Button**	Press to rotate the drum manually.
14.	**Drum Unit**	The master paper is wrapped around this unit.
15.	**Ink Holder**	Set the ink cartridge in this holder.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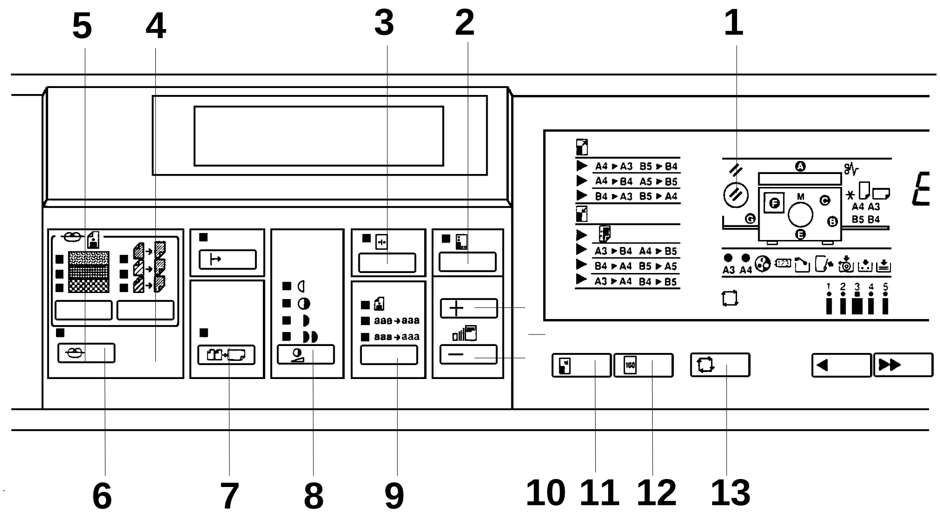
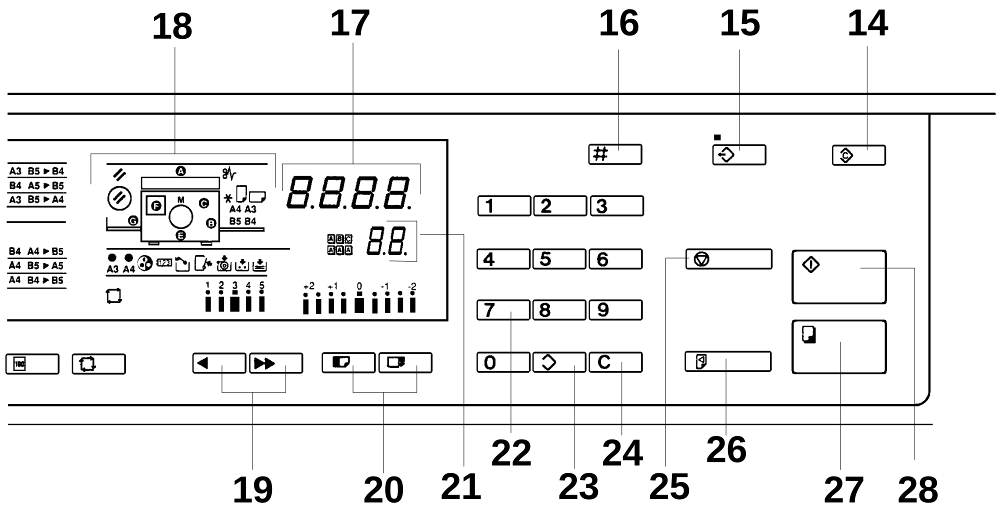
No. Name	Function
16. Front Door	Open for access to the inside of the machine.
17. ADF Unit	Feeds the original to the scanning position automatically.
18. Original Tray	Originals used to make master(s) are delivered to this tray.
19. ADF On/Off Select Switch	When setting originals one sheet at a time, set this switch to the off position.
20. ADF Unit Open Button	Use to open the ADF unit.
21. Original Guides	Adjust these guides to position the originals correctly.
22. Original Table Release Lever	Use to open the original table unit to the left for master installation.
23. Feed Roller Pressure Lever	Use to adjust the contact pressure of the paper feed roller according to paper thickness.
24. Separation Roller Pressure Lever	Use to adjust the separation roller pressure to prevent double feed.
25. Paper Table	Set paper on this table for printing.
26. Paper Feed Side Plate	Use to prevent paper skew.
27. Paper Table Down Button	Press to lower the paper table.
28. Side Registration Fine Adjusting Dial	Use to shift the paper table sideways.

3. OPERATION PANEL

– Keys and Indicators –

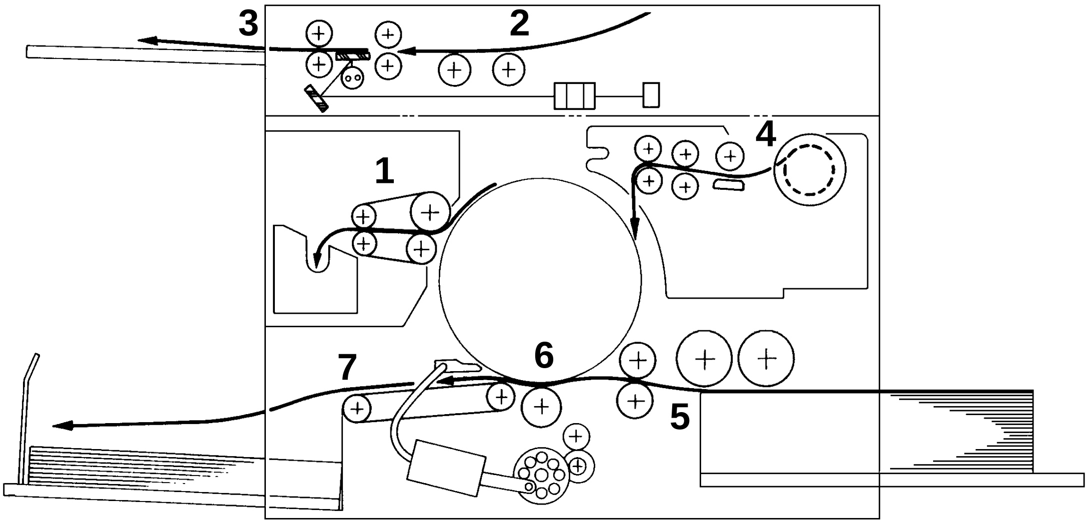


1. Reset key	Press to reset error indicators.
2. Directional Magnification key	Press to enter the horizontal or vertical magnification for copies, using the number keys.
3. Image Shift key	Press to shift the image.
4. Contrast key	Press to select the desired contrast according to the type and quality of the original.
5. Screen key	Press to select the desired grade of screening to be applied to the image according to the type and quality of the original.
6. Make Up key	Press to use the make-up function.
7. Combine 2 Originals key	Press to combine two originals onto one print image.
8. Image Density key	Press to make prints darker or lighter.
9. Image Mode key	Press to select line mode, photo mode or sharpen image mode according to the type and quality of the original.
10. Zoom keys	Press to alter the reproductions ratio in 1% increments from 50% to 200%.
11. Reduce/Enlarge key	Press to reduce or enlarge the image.
12. Full Size key	Press to make prints the same size as the original.
13. Auto Cycle key	Use to automatically process masters and make prints.



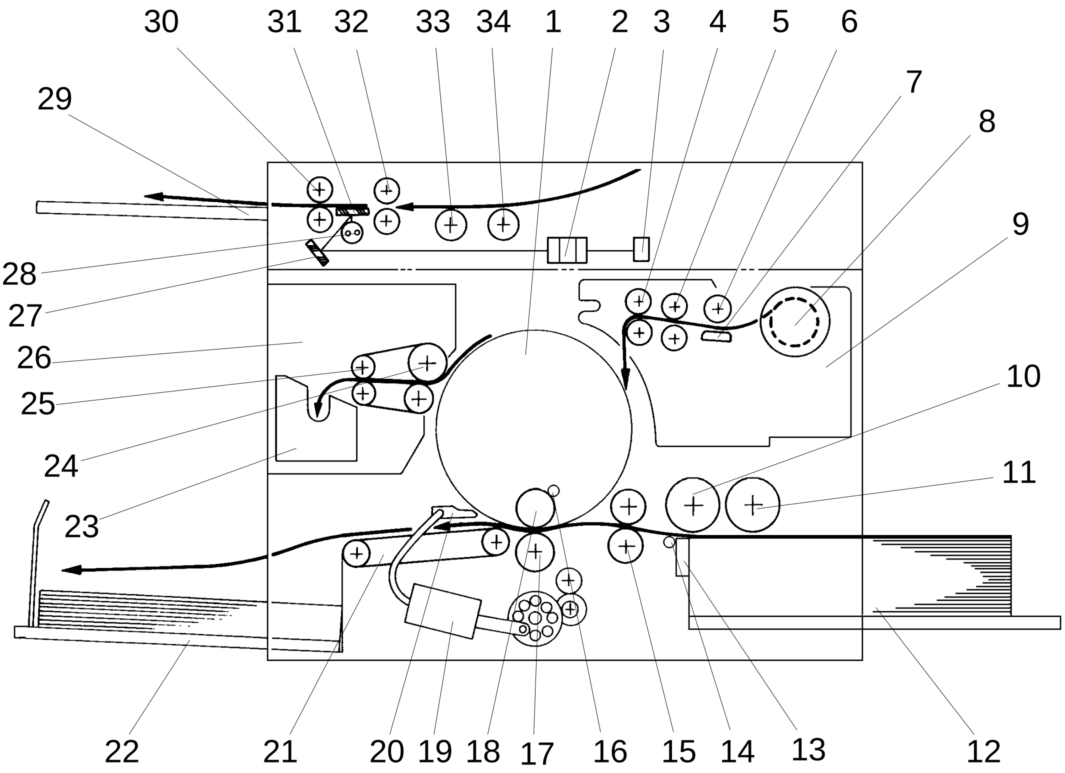
14. Clear Modes key	Press to cancel all previously entered settings and modes.
15. Program key	Press to input or recall user programs.
16. Enter key	Press to input information into memory.
17. Counter	Displays the number of prints entered. While printing, it shows the number of copies left to print.
18. Monitors	Light or blink when a non-standard condition occurs within the machine.
19. Speed keys	Press to adjust the rotation speed of the drum according to the type of image and printing paper.
20. Image Position key	Press to shift the image forwards or backwards on the print paper.
21. Memory/Class Indicators	Shows the number entered in memory mode or class mode.
22. Number keys	Press to enter the number of prints.
23. Memory/Class key	Press to select group printing in memory mode or class mode.
24. Clear key	Press to change the number set in the counter. Also use to change make-up mode. This key can be used only after the machine stops operation.
25. Stop key	Press to stop the machine operation. The machine will continue operation when the Print Start key or Master Making key is pressed.
26. Proof key	Press to make trial prints or extra prints.
27. Print Start key	Press to start printing.
28. Master Making key	Press to make a master.

4. PRINTING PROCESS



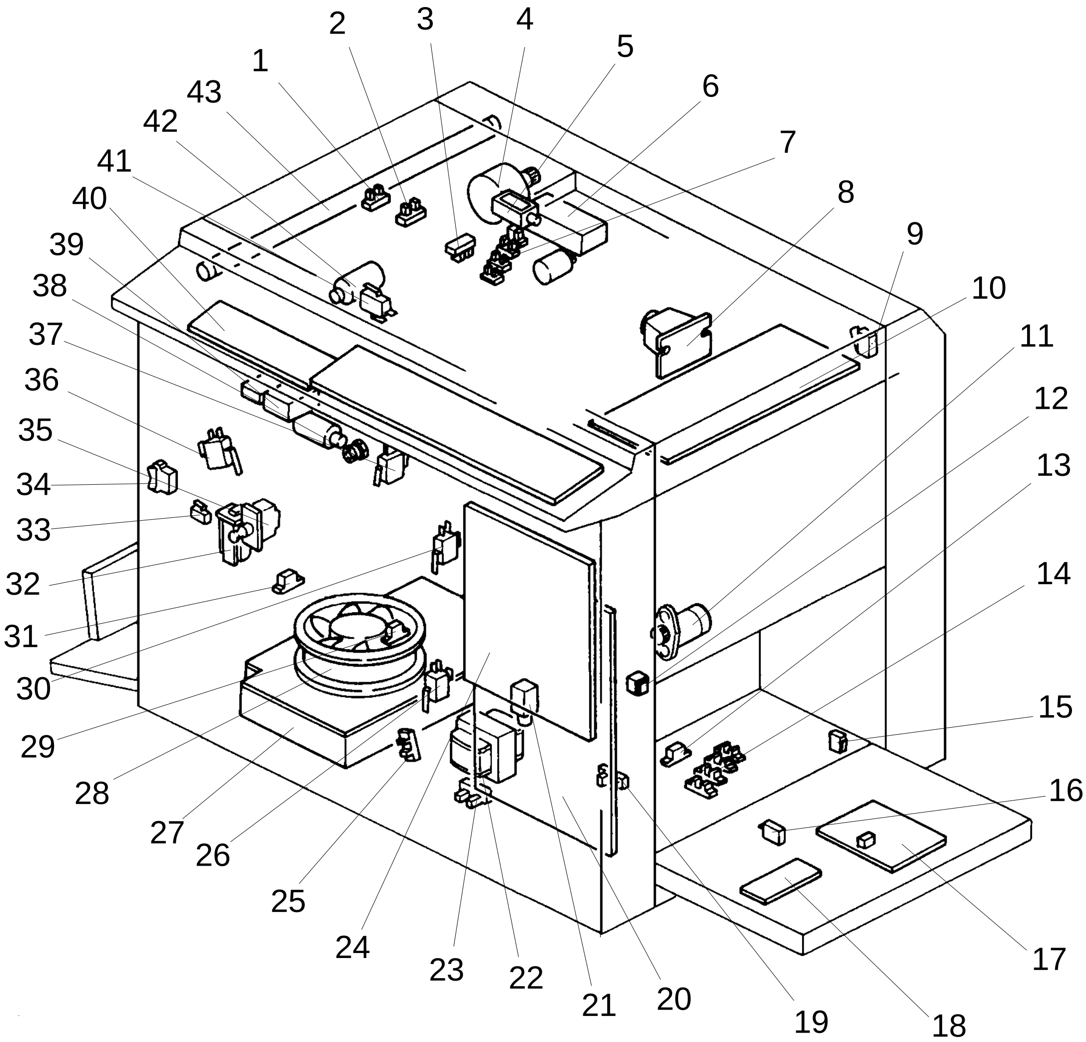
1. Master Ejecting:	Ejects the used master wrapped around the drum into the master eject box.
2. Original Feeding:	Transports the original to the scanner section.
3. Scanning:	Scans the original image with the CCD through the mirror and the lens while feeding the original.
4. Master Feeding:	Converts 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 dround the drum.
5. Paper Feeding:	Sends paper separately to the drum section.
6. Printing:	Presses the paper fed from the paper feed section to the drum. This transfers the ink to the print through the drum screen and the master.
7. Paper Delivering:	Peels the printed paper with the exit pawl and air knife and ejects the paper onto the paper delivery table.

5. MECHANICAL COMPONENT LAYOUT

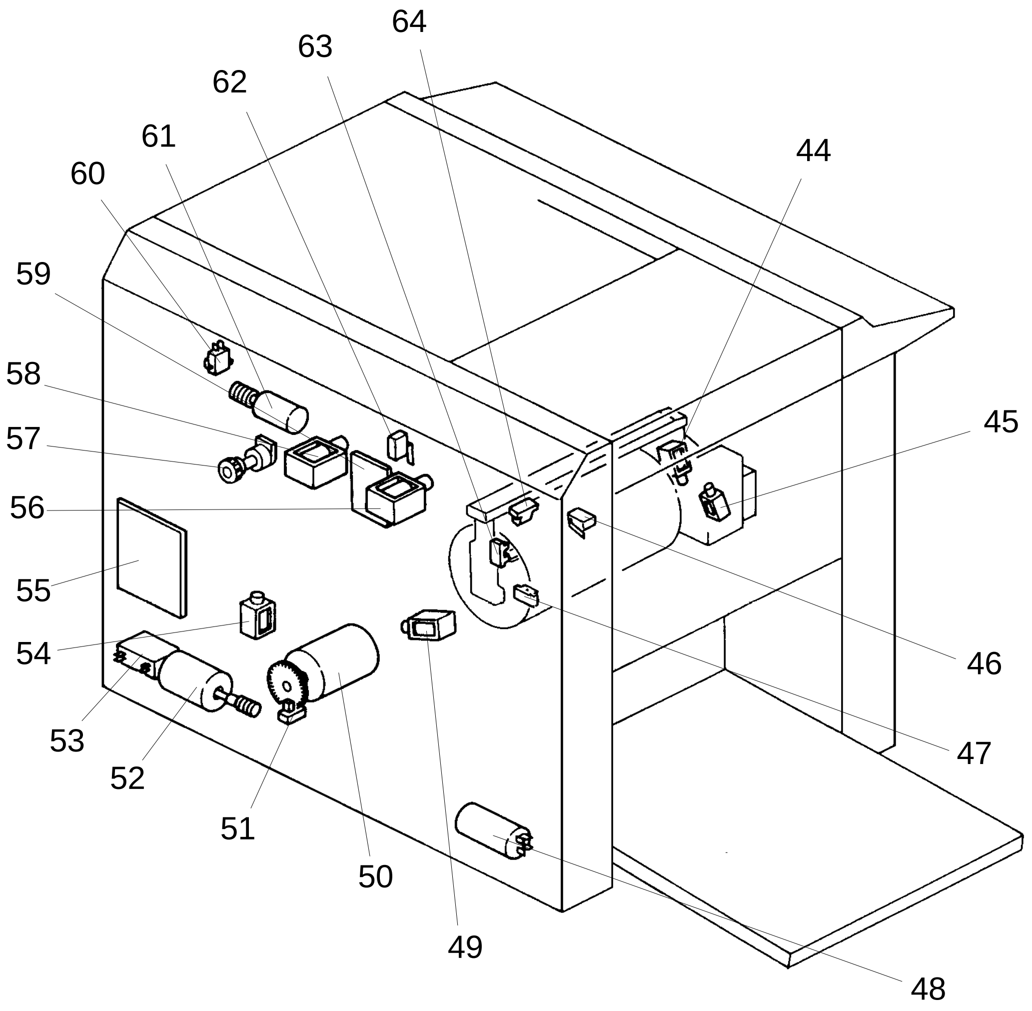


1. Drum Unit
2. Lens
3. CCD
4. Reverse Roller
5. Master Feed Roller
6. Platen Roller
7. Thermal Head
8. Master Roll
9. Plotter Unit
10. Upper Separation Roller
11. Paper Feed Roller
12. Paper Table
13. Separation Plate
14. Lower Separation Roller
15. 2nd Feed Roller
16. Doctor Roller
17. Press Roller
18. Ink Roller
19. Paper Exit Pawl Air Pump
20. Paper Exit Pawl
21. Transport Unit
22. Paper Delivery Table
23. Master Eject Box
24. 1st Eject Roller
25. 2nd Eject Roller
26. Master Eject Unit
27. Mirror
28. Fluorescent Lamp
29. Original Exit Tray
30. 2nd Original Transport Roller
31. Exposure Glass
32. 1st Original Transport Roller
33. Original Feed Roller
34. Pull-out Roller

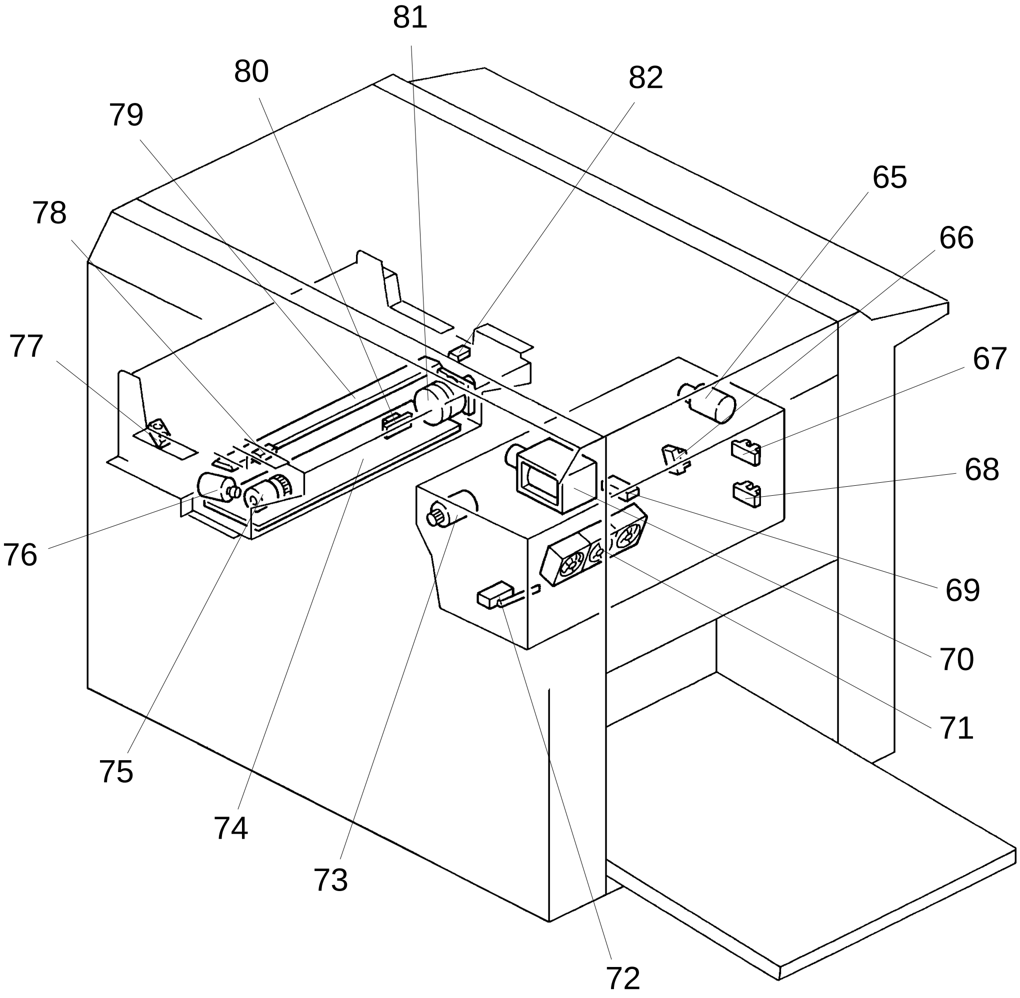
6. ELECTRICAL COMPONENT LAYOUT



1. Original Registration Sensor
2. 2nd Original Sensor
3. 1st Original Sensor
4. Original Transport Motor
5. Original Pressure Solenoid
6. Fluorescent Lamp Stabilizer
7. Original Width Sensor
8. CCD PCB
9. Scanner Unit Safety Switch
10. A/D Conversion PCB
11. Paper Return Motor
12. Paper Table Down Button
13. Paper End Sensor
14. Paper Width Sensor
15. Paper Table Open Switch
16. Paper Table Safety Switch
17. Paper Detection PCB (Paper Length Sensor)
18. Cassette Size Detection PCB
19. Paper Table Height Sensor
20. Image Processing PCB
21. Separation Plate Release Solenoid
22. Transformer
23. Paper Table Lower Limit Sensor
24. Main PCB
25. Printing Pressure Sensor
26. Front Door Safety Switch
27. Power Supply Unit
28. Vacuum Fan Motor
29. 1st Paper Exit Sensor
30. Drum Detection Switch
31. 2nd Paper Exit Sensor
32. Circuit Breaker
33. Delivery Table Open Switch
34. Main Switch
35. Interlock Switch
36. Air Knife Motor Safety Switch
37. Drum Rotation Switch
38. Drum Rotation LED
39. Total Counter
40. Operation Panel
41. ADF Safety Switch
42. ADF Drive Motor
43. Fluorescent Lamp



44. Ink Supply Solenoid
45. Drum Lock Solenoid
46. Master Eject Unit Safety Switch
47. 2nd Drum Position Sensor
48. Noise Filter
49. Printing Pressure Solenoid
50. Main Motor
51. Drum Rotation Sensor (Pulse Generator)
52. Paper Table Drive Motor
53. Paper Table Drive Motor Capacitor
54. Paper Feed Solenoid
55. AC Drive PCB
56. Master Eject Clamper Solenoid
57. Image Position Sensor
58. Master Feed Clamper Solenoid
59. Ink Detection PCB
60. Master Cut Button
61. Image Positioning Motor
62. Drum Unit Safety Switch
63. 1st Drum Position Sensor
64. Drum Master Detection Sensor



65. Pressure Plate Motor	75. Reverse Roller Magnetic Clutch
66. Lower Pressure Plate Sensor	76. Cutter Motor
67. Upper Pressure Plate Sensor	77. Master End Sensor
68. Full Master Detection Sensor	78. Right Cutter Switch
69. Master Eject Sensor	79. Thermal Head
70. Master Eject Solenoid	80. Master Buckle Sensor
71. Air Knife Motors	81. Master Feed Motor
72. Master Eject Box Switch	82. Left Cutter Switch
73. Master Eject Motor	
74. Thermal Head Drive PCB	

7. ELECTRICAL COMPONENT DESCRIPTIONS

Index No.	Name	Function
Motors		
4	Original Transport Motor	Transports the original to the scanner section.
11	Paper Return Motor	Returns paper to the paper table when the paper table is lowered.
28	Vacuum Fan Motor	Provides suction so paper is held firmly on the transport belt.
42	ADF Drive Motor	Feeds the original to the scanner section.
50	Main Motor	Drives paper feed, drum, printing and paper delivery unit components.
52	Paper Table Drive Motor	Raises and lowers the paper table.
61	Image Positioning Motor	Changes the timing between the paper feed roller and the drum to adjust the vertical image position.
65	Pressure Plate Motor	Raises and lowers the pressure plate.
71	Air Knife Motors	Rotates the fan to separate the paper leading edge from the drum.
73	Master Eject Motor	Sends used master into the master eject box.
76	Cutter Motor	Cuts the master.
81	Master Feed Motor	Feeds the master to the drum.
Solenoids		
5	Original Pressure Solenoid	Presses the original pressure plate down on the originals.
21	Separation Plate Release Solenoid	Releases the separation plate when the paper table is lowered.
44	Ink Supply Solenoid	Releases the spring clutch to turn on activate the ink supply pump.
45	Drum Lock Solenoid	Prevents the drum unit from being removed during the printing run.
49	Printing Pressure Solenoid	Engages the pressure ON/OFF lever when a paper misfeed occurs.
54	Paper Feed Solenoid	Releases the sector gears to feed the paper.

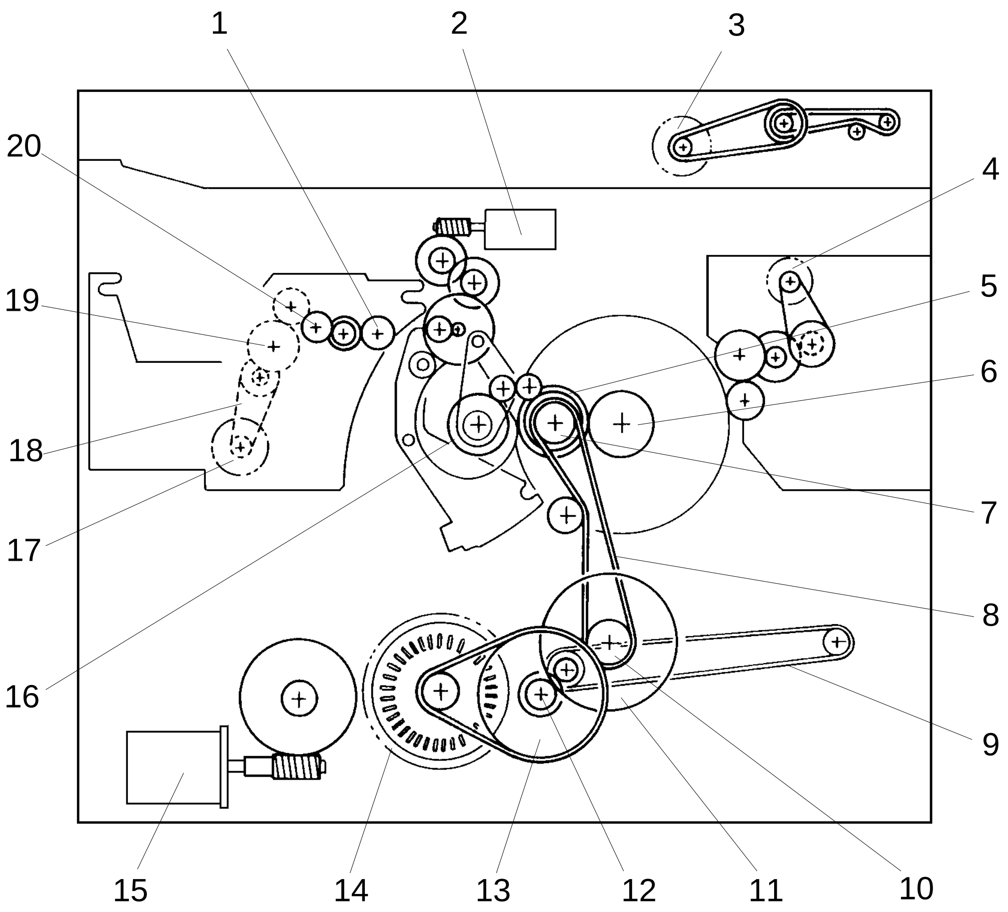
Index No.	Name	Function
56	Master Eject Clamper Solenoid	Opens the master clamper to eject the master.
58	Master Feed Clamper Solenoid	Opens the master clamper to clamp the master.
70	Master Eject Solenoid	Presses the lower master eject roller against the drum surface.
Sensors		
1	Original Registration Sensor	Informs the CPU when the original activates the sensor. Also, detects the original misfeed.
2	2nd Original Sensor	Informs the CPU when the original activates the sensor. Also, detects original misfeeds.
3	1st Original Sensor	Informs the CPU if the original is set in the ADF mode.
7	Original Width Sensor	Informs the CPU of the original width.
13	Paper End Sensor	Informs the CPU if the paper is set on the paper table.
14	Paper Width Sensor	Informs the CPU of the paper width.
19	Paper Table Height Sensor	Informs the CPU if the paper table is at the paper feed position.
23	Paper Table Lower Limit Sensor	Informs the CPU if the paper table is at the lowest position.
25	Printing Pressure Sensor	Informs the CPU if printing pressure is applied. Also, detects paper misfeeds.
29	1st Paper Exit Sensor	Detects paper misfeeds.
31	2nd Paper Exit Sensor	Detects paper misfeeds.
47	2nd Drum Position Sensor	Checks the position of the drum.
51	Drum Rotation Sensor	Supplies timing pulses to the CPU based on the main motor speed.
57	Image Position Sensor	Informs the CPU of the image position.
63	1st Drum Position Sensor	Checks the position of the drum.

Index No.	Name	Function
64	Drum Master Detection Sensor	Informs the CPU if the master is on the drum.
66	Lower Pressure Plate Sensor	Informs the CPU if the pressure plate is at the lower limit position.
67	Upper Pressure Plate Sensor	Informs the CPU if the pressure plate is at the upper limit position.
68	Full Master Detection Sensor	Informs the CPU when the master eject box is full of masters.
69	Master Eject Sensor	Detects used master misfeeds.
77	Master End Sensor	Informs the CPU if the plotter unit runs out of master roll.
80	Master Buckle Sensor	Informs the CPU if the master is buckling.
Switches		
9	Scanner Unit Safety Switch	Cuts off the power line of the main and paper table drive motors when the scanner unit is open.
12	Paper Table Down Button	Informs the CPU to turn on the paper table drive motor to lower the paper table.
15	Paper Table Open Switch	Checks whether the paper table is opened correctly or not.
16	Paper Table Safety Switch	Stops lowering the paper table to prevent catching fingers under it. Cuts the AC power line.
26	Front Door Safety Switch	Cuts off the power line of the paper table drive motor when the front door is open.
30	Drum Detection Switch	Checks whether the drum unit is set correctly or not.
33	Delivery Table Open Switch	Checks whether the delivery table is opened correctly or not.
34	Main Switch	Turns the power on or off.
35	Interlock Switch	Disables the front door, paper table, master eject unit, and scanner unit safety switches.
36	Air Knife Motor Safety Switch	Cuts off the power line of the paper table drive motor when the master eject unit is open.

Index No.	Name	Function
37	Drum Rotation Switch	Informs the CPU to rotate the drum at 10 rpm.
41	ADF Safety Switch	Cuts the power line of the paper table drive motor off when the ADF is open.
46	Master Eject Unit Safety Switch	Cuts off the power line of the paper table drive motor when the master eject unit is open. (Also, cuts off the power line of the main motor in the 220/240 V version machines.)
60	Master Cut Button	Informs the CPU to cut the master paper leading edge.
62	Drum Unit Safety Switch	Checks whether the drum unit is set correctly or not.
72	Master Eject Box Switch	Checks whether the master eject box is set correctly.
78	Right Cutter Switch	Detects when the cutter position is far right (non-operation side).
82	Left Cutter Switch	Detects when the cutter position is far left (operation side).
Printed Circuit Board		
8	CCD PCB	Converts light intensity into an electrical signal.
10	A/D Conversion PCB	Converts the analog signal into a digital signal.
17	Paper Detection PCB	Detects the size of the paper set on the table.
18	Cassette Size Detection PCB	Detects the size of the cassette set on the table.
20	Image Processing PCB	Controls the image processing performance.
24	Main PCB	Controls all machine functions both directly and through other boards.
55	AC Drive PCB	Controls the AC component by relays.
59	Ink Detection PCB	Controls the ink supply.
74	Thermal Head Drive PCB	Supplies the power to the thermal head according to the signal from the scanner section.

Index No.	Name	Function
Counters		
39	Total Counter	Keeps track of the total number of prints made.
Others		
6	Fluorescent Lamp Stabilizer	Stabilizes the power supplement to the fluorescent lamp.
22	Transformer	Steps down the wall voltage.
27	Power Supply Unit	Provides power for all DC components.
32	Circuit Breaker	Cuts the AC line off.
38	Drum Rotation LED	Turns to green from red when the drum stops to the home position.
43	Fluorescent Lamp	Applies light to the original for exposure.
48	Noise Filter	Filters electrical noise on the AC power input lines.
53	Paper Table Drive Motor Capacitor	Protects the AC drive PCB from induced current.
75	Reverse Roller Magnetic Clutch	Stops the reverse roller turning while the master buckle sensor is OFF.
79	Thermal Head	Plots the master using heat.

8. DRIVE LAYOUT



1. Reverse Roller Gear
2. Image Position Motor
3. Original Transport Motor
4. Master Eject Motor
5. Drum Drive Gear
6. Drum Unit Gear
7. Drum Drive Pulley
8. Main Drive Belt
9. Transport Belt
10. Printing Pressure Pulley
11. Printing Pressure Gear
12. Idle Gear
13. Idle Pulley
14. Main Motor
15. Paper Table Drive Motor
16. Paper Feed Cam Gear
17. Master Feed Motor
18. Timing Belt
19. Platen Roller Gear
20. Master Transport Roller Gear

SECTION 2

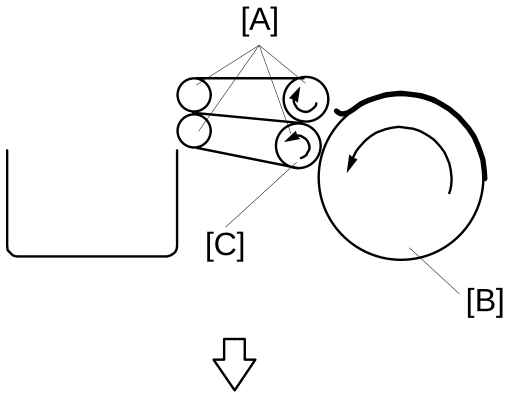
SECTIONAL DESCRIPTION

1. MASTER EJECT SECTION

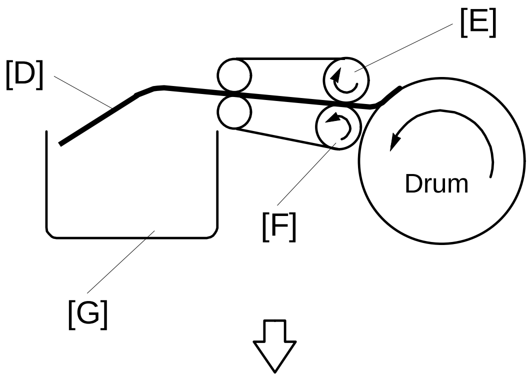
1.1 OVERALL

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 ejected from the drum.

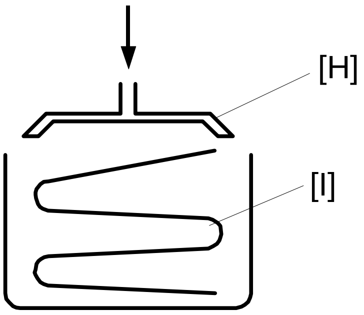
The master is pulled off the drum, then it goes through the eject rollers and into the master eject box. A pressure plate then compacts the used master.



- Drum [B] rotates in reverse (opposite to printing direction).
- Master eject rollers [A] rotate.
- Lower eject roller [C] is pressed against the drum.

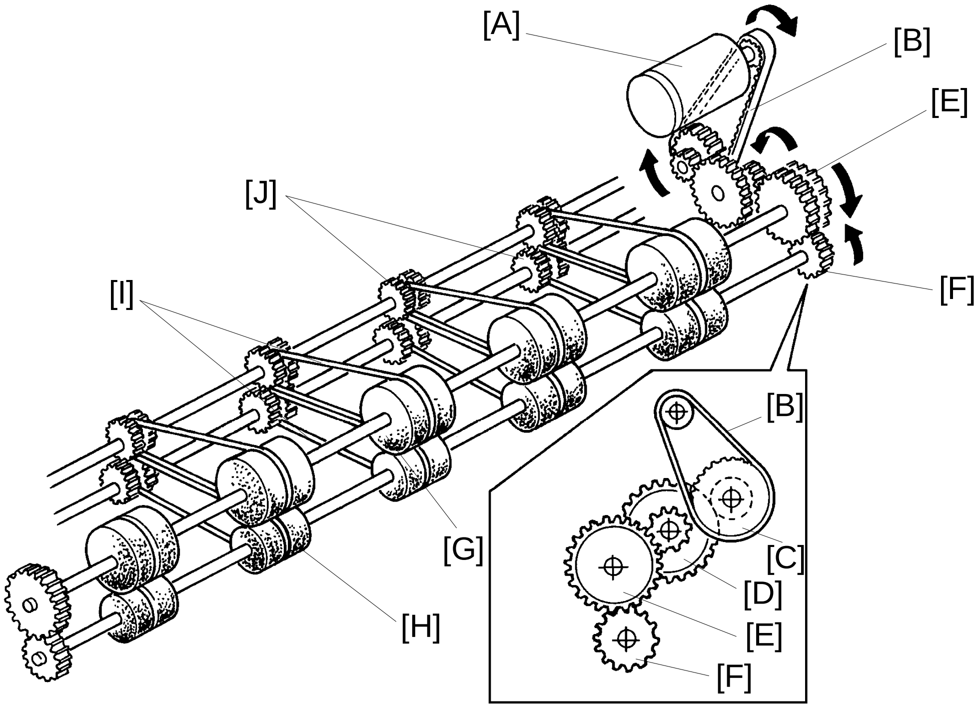


- The trailing edge of the master curls off the drum and passes between the upper [E] and lower [F] eject rollers, and the master [D] is dumped into the master eject box [G].



- The pressure plate [H] compacts the ejected master [I].

1.2 MASTER EJECT ROLLER ROTATING MECHANISM



When the original is set and the Master Making key is pressed, the main motor starts turning at 30 rpm in reverse. So now the drum also turns in reverse (compared with the printing rotations).

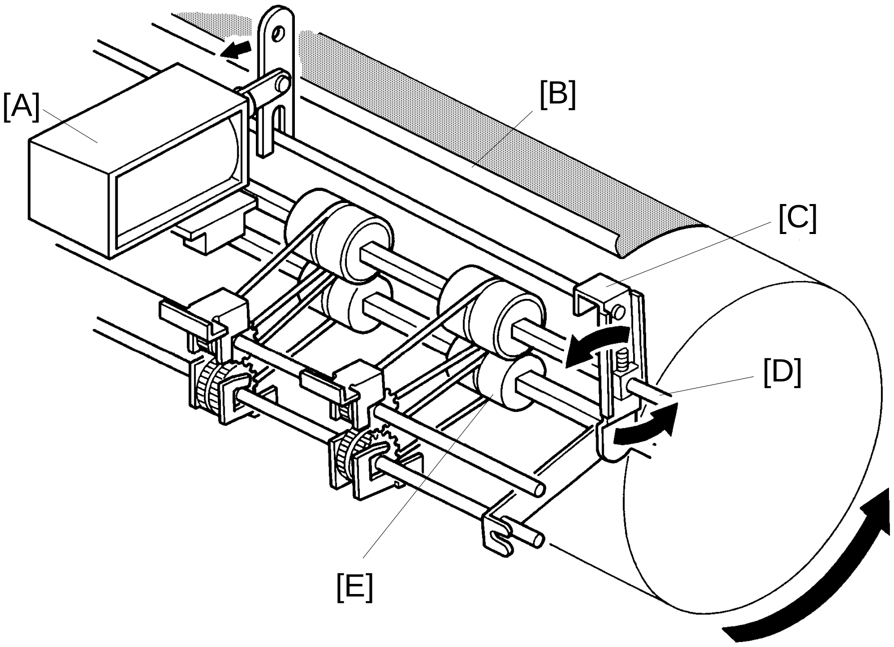
At this time, if the drum master detection sensor detects a master on the drum, the master eject motor [A] starts rotating. Drive is transmitted to gear [E] and to the upper first eject rollers [G] through the timing belt [B] and gears [C] and [D]. Gear [F] drives the lower first eject rollers [H]. The belts [I] transmit drive from the first eject rollers to the upper and lower second feed rollers [J].

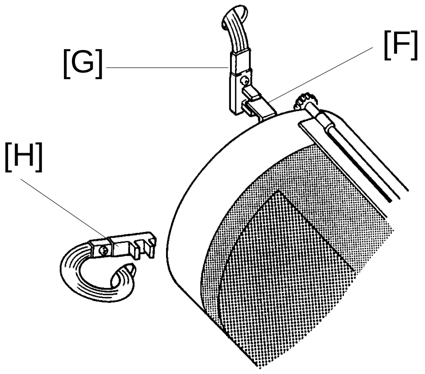
(If the drum master detection sensor detects no master on the drum when the Master Making key is pressed, the machine skips the master eject process and goes directly to the master making process.)

After the master eject process is completed, the drum returns to its home position. The master eject rollers then stop rotating.

This model has five rollers on each eject roller shaft. The roller shafts can feed up to A3/DLT sized masters.

1.3 MASTER EJECT ROLLER DRIVE MECHANISM

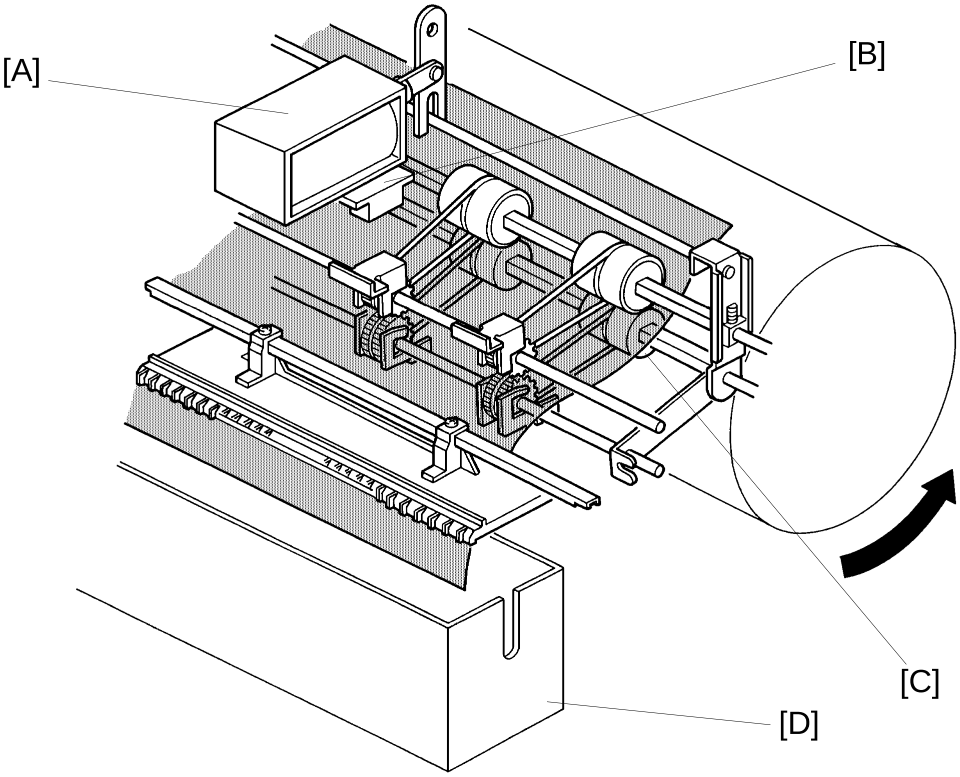




The drum position is detected by the first [G] and second [H] drum position sensors. When the drum reaches its home position, the first drum position sensor [G] is activated by the interrupter [F] at the rear side of the drum.

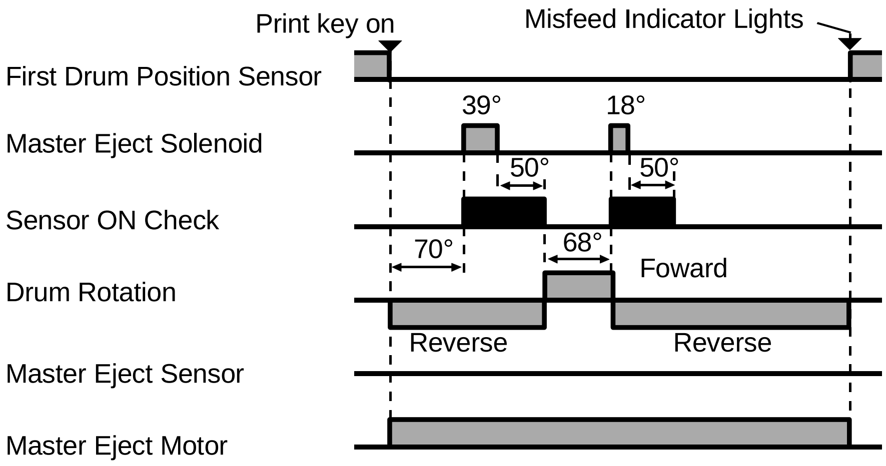
To eject the master, the drum turns in reverse (opposite to the printing direction). When the A3/DLT drum is 70° from the home position, the master eject solenoid [A] turns on and the supporter [C] rotates counterclockwise on the upper eject roller shaft [D]. This forces the lower first eject roller [E] against the drum.

As the drum turns, the curled trailing edge of the master [B] passes between the upper and lower first eject rollers. The first eject rollers then peel the master from the drum.



When the A3/DLT drum is 109 degrees from the home position, the master eject solenoid [A] turns off, separating the lower first eject rollers [C] from the drum.

When the ejected master passes between the upper and lower first eject rollers, the master eject sensor [B] is actuated. The master is then dumped into the master eject box [D].



[Master Eject Misfeed Detection]

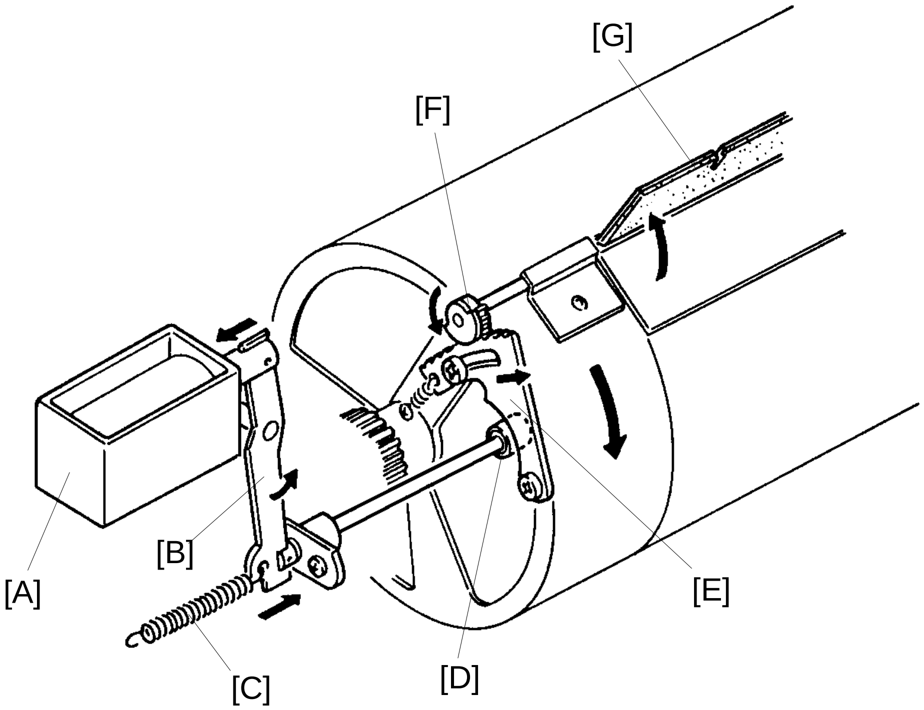
The misfeed indicator for the master eject section blinks in the following cases:

Case 1: The master eject sensor is not activated and the drum has turned 50 degrees more (still in reverse and after de-activation of the master eject solenoid). The machine knows that the eject rollers have failed to catch the master. So the drum returns 68 degrees (in the printing direction) to repeat the master eject process once again. The master eject solenoid is again energized while the drum turns another 18 degrees to try to catch the master.

If the master eject sensor once again fails to detect the master, then the drum returns to its home position and the misfeed indicator blinks.

Case 2: The drum finishes its rotation for the master ejecting process and retuns to the home position, but the master eject sensor does not turn off. This means that the master is still in between the master eject rollers, the misfeed indicator blinks.

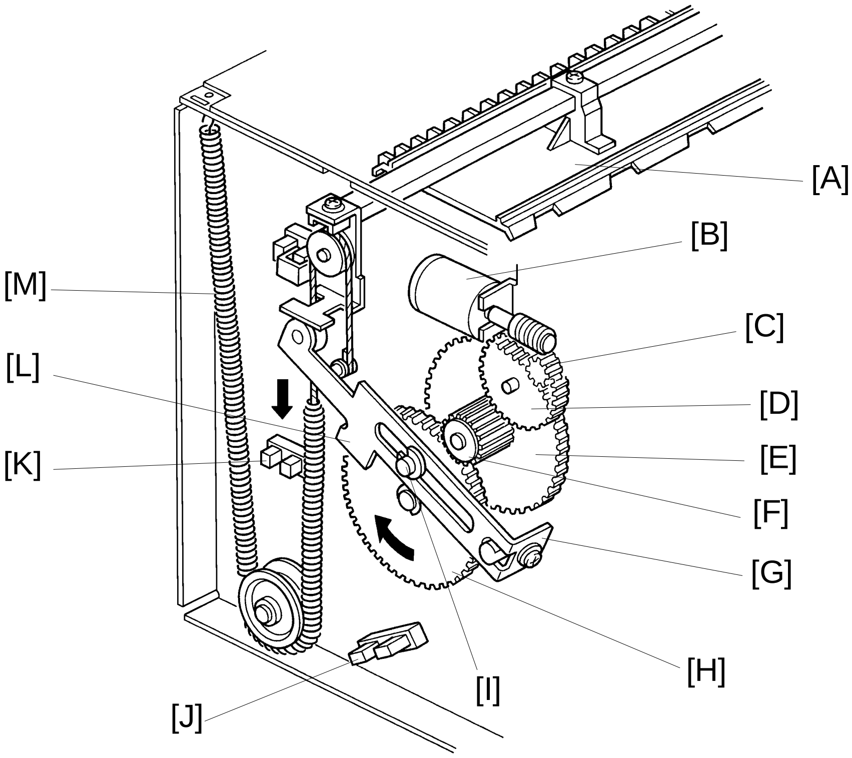
1.4 MASTER EJECT CLAMPER MECHANISM



When the drum rotates 306 degrees (in reverse) past the home position, the master eject clamper solenoid [A] turns on and lever [B] rotates counterclockwise as shown. This moves the cam [D] inside the drum. Drum rotation brings the clamper sector gear [E] against the cam [D]. Gear [F] turns counterclockwise as it engages the clamper sector gear, thus opening the master clamper [G]. This releases the master from the drum.

The drum keeps on turning until the interrupter at the rear side of the drum goes 13 degrees past the first drum position sensor. Then, the main motor turns off. Half a second later, the master eject clamper solenoid [A] turns off and spring [C] pulls cam [D] back to its initial position. The drum then rotates forward to its home position.

1.5 PRESSURE PLATE UP/DOWN MECHANISM



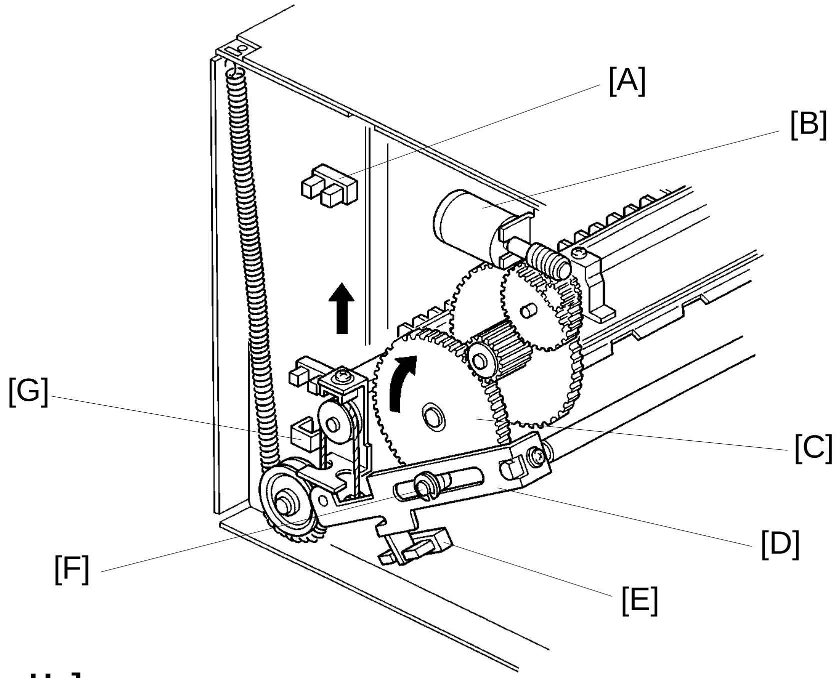
[Pressure Plate Down]

When the interrupter at the rear side of the drum interrupts the first drum position sensor (this means the end of the master eject process), the pressure plate motor [B] starts rotating. This drives gear [H] clockwise by means of gears [C], [D], [E], and [F].

Pin [I] on gear [H] moves link [G] down until the link interrupter [L] interrupts the lower pressure plate sensor [J]. Spring [M] pulls down on the pressure plate and the ejected master in the master eject box is compressed by the pressure plate [A].

If the full master detection sensor [K] does not turn on when the pressure plate goes down, it means the master eject box is filled with ejected masters. In this case, the Master Full indicator blinks, and the machine stops after a new master is wrapped around the drum.

Reset the Master Full indicator by turning the Master Eject Box switch OFF and ON. This is to prevent the master full indicator from being reset without removing the ejected masters from the box. When the Master Full indicator is blinking, the Master Making key does not work, but the Print Start key and Proof key work.



[Pressure Plate Up]

When the master has been wrapped around the drum in the master making process and the master cutter leaves the home position to cut the master, the pressure plate motor [B] starts rotating to raise the pressure plate.

When the pressure plate motor [B] turns, the gear [C] is driven through the relay gears. The pin [F] on the gear inserted into the link [D] rises and lifts the left end of the link, thus raising the pressure plate.

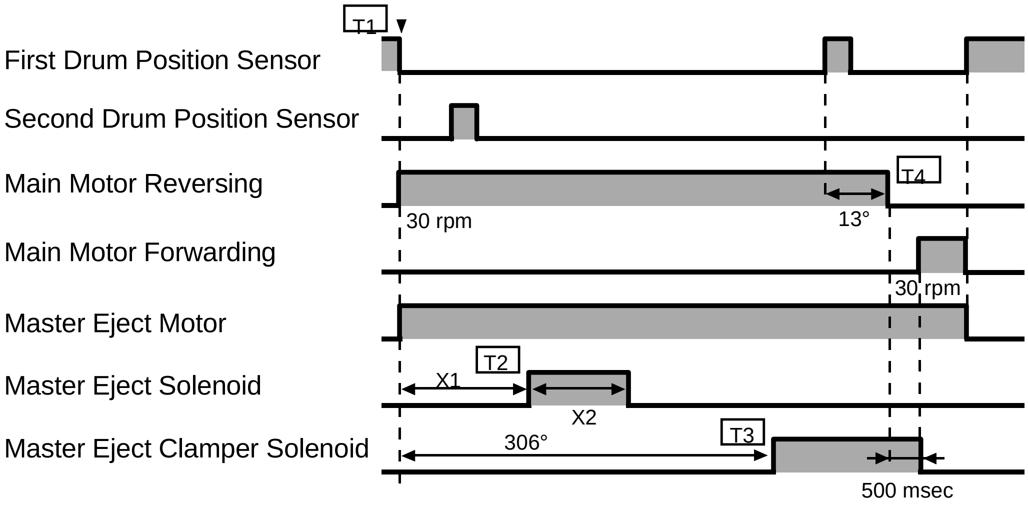
The gear [C] continues turning until the interrupter [G], installed in the front end of the pressure plate, blocks the upper pressure plate sensor [A]. At this time, the master eject motor [B] stops and the pressure plate is held in the upper position.

[Pressure Plate Motor Lock Detection]

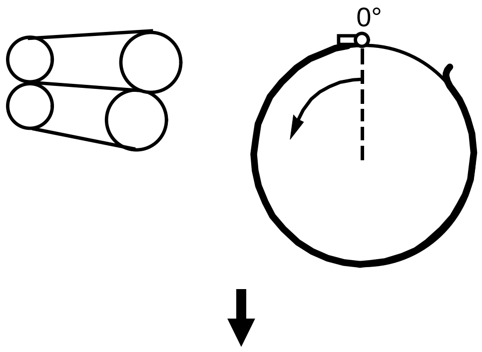
To prevent the pressure plate motor from locking, "E-12" lights up on the operation display panel under the following conditions:

1. The upper [A] or lower [E] pressure plate sensor remains activated for more than 4 seconds after the pressure plate motor starts turning.
2. The lower pressure plate sensor [E] is not activated within 8 seconds of the pressure plate motor starts turning even though the upper pressure plate sensor [A] is de-activated.
3. The upper pressure plate sensor [A] is not activated within 8 seconds of the pressure plate motor starts turning even though the lower pressure plate sensor [E] is de-activated.

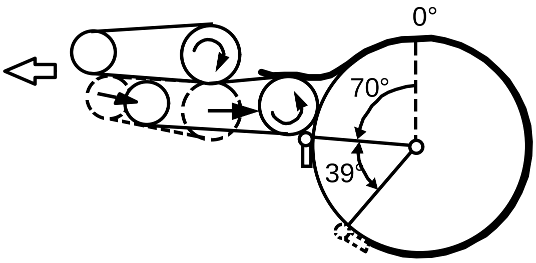
1.6 ELECTRICAL TIMING



T1: When the Master Making key is pressed, the main motor and master eject motor start turning. At the same time, the paper table drive motor starts turning to lift the paper table to the paper feed position.



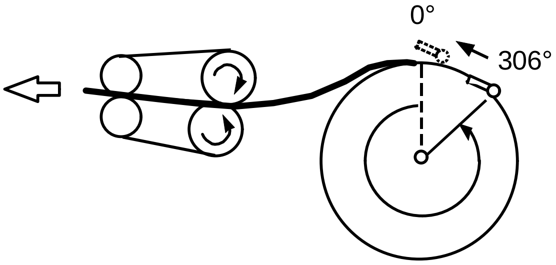
T2: When the drum rotates X1 degrees past the first drum position sensor actuation position (drum home position), the master eject solenoid is energized. This presses the lower eject rollers against the drum surface. The master eject solenoid is de-energized when the drum rotates X2 degrees more.



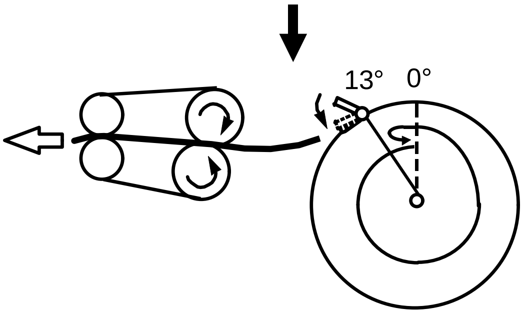
The drum rotation angles X1 and X2 depend on the drum type. This machine has two types of drums: one is the A3/DLT drum (standard), and the other is the A4/LT drum (optional). X1 and X2 for each drum are as follows:

Drum Type	A3/DLT	A4/LT
X1 (degree)	70	137
X2 (degree)	39	50

T3: When the drum rotates 306 degrees past the home position, the master eject clamper solenoid is energized.



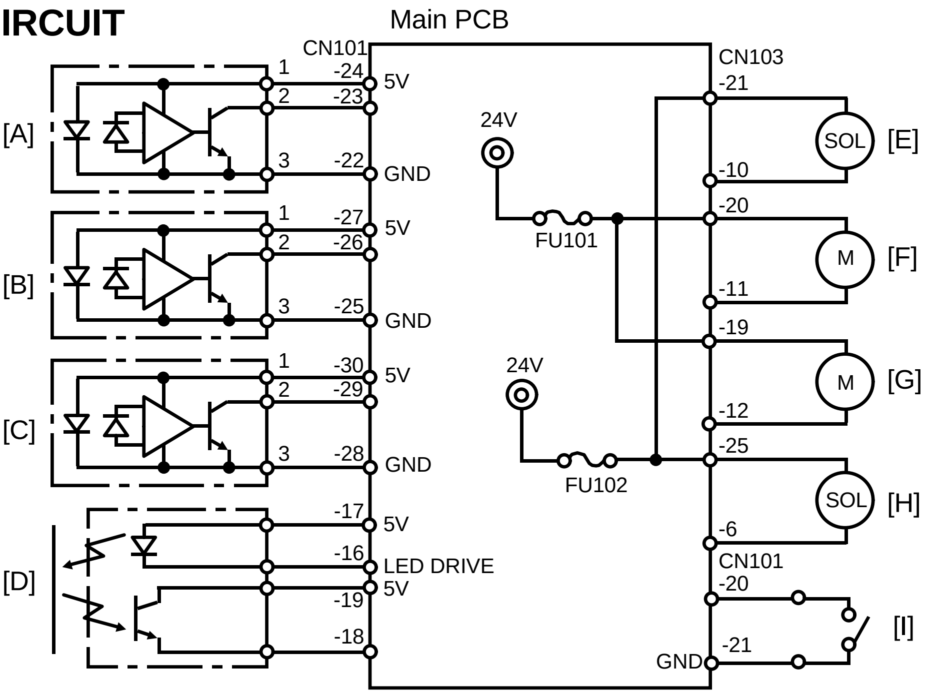
T4: When the drum rotates 13 degrees past the drum home position, the drum stops rotating.

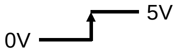
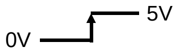
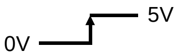
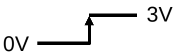
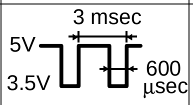
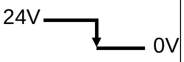
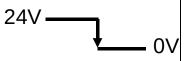
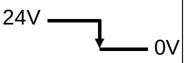
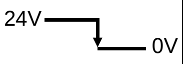
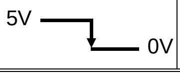


500 milliseconds later (the drum completely stops during this period), the master eject clamper solenoid is de-energized and the drum starts rotating forward. The drum then returns to its home position. The master eject process is now over.

Soon after this, the machine starts feeding a new master and the drum starts rotating in reverse to begin the master making process.

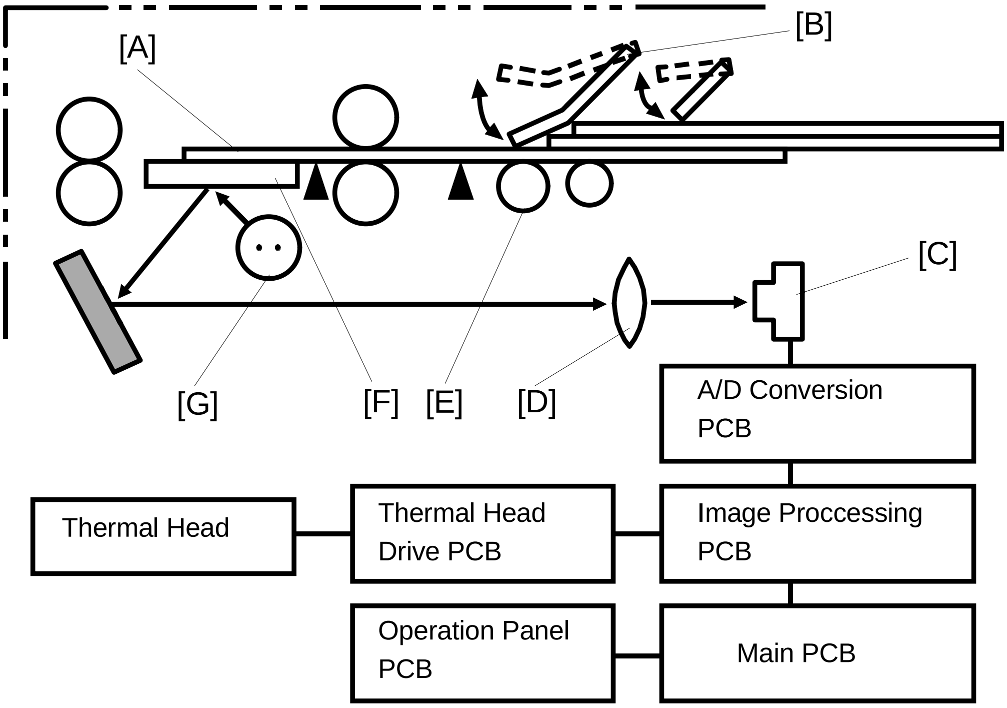
1.7 CIRCUIT



Component Name	In/Out	Main PCB		Description
		CN No.	Signal Level	
Upper Pressure Plate Sensor [A]	In	101-23		Signal goes High when the pressure plate is at the highest position.
Lower Pressure Plate Sensor [B]	In	101-26		Signal goes High when the pressure plate is at the lowest position.
Full Master Detection Sensor [C]	In	101-29		Signal goes High when the interrupter of the pressure plate passes through the sensor. (Master full detection in the master eject box.)
Master Eject Sensor [D]	In	TP104		Signal goes High when the sensor detects the master. This is a pulse signal.
Sensor LED [D]	Out	101-16		Pulse signal goes to Low and the LED lights when the main switch is turned on.
Master Eject Solenoid [E]	Out	103-10		Signal goes Low when the solenoid turns on.
Master Eject Motor [F]	Out	103-11		Signal goes Low when the motor turns on.
Pressure Plate Motor [G]	Out	103-12		Signal goes Low when the motor turns on.
Master Eject Clamper Solenoid [H]	Out	103-6		Signal goes Low when the solenoid turns on.
Master Eject Box Switch [I]	In	101-20		Signal goes Low when the master eject box is installed.

2. SCANNER/OPTICS SECTION

2.1 OVERALL



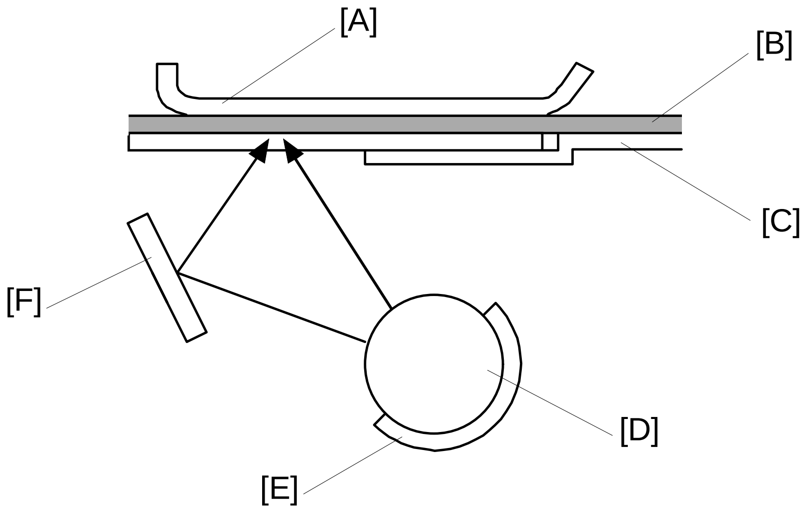
The first original [A] at the bottom of the stack on the original table is separated from the other originals by the original feed rollers [E] and the separation blade [B], and is fed onto the exposure glass [F].

The light of the fluorescent lamp [G] is reflected from the original and goes through the lens [D]. The light is changed to an electrical signal in the CCD (Charge Coupled Device) [C].

The electrical signal from the CCD is converted into an 8-bit digital signal in the A/D conversion PCB. Then the upper 6 bits of the 8 bits are used in the image processing PCB.

The binary circuit in the image processing PCB produces 1-bit data (white or black) from the 6-bit data and sends it to the thermal head drive PCB.

The thermal head plots image data on the master and is driven through the thermal head drive PCB.

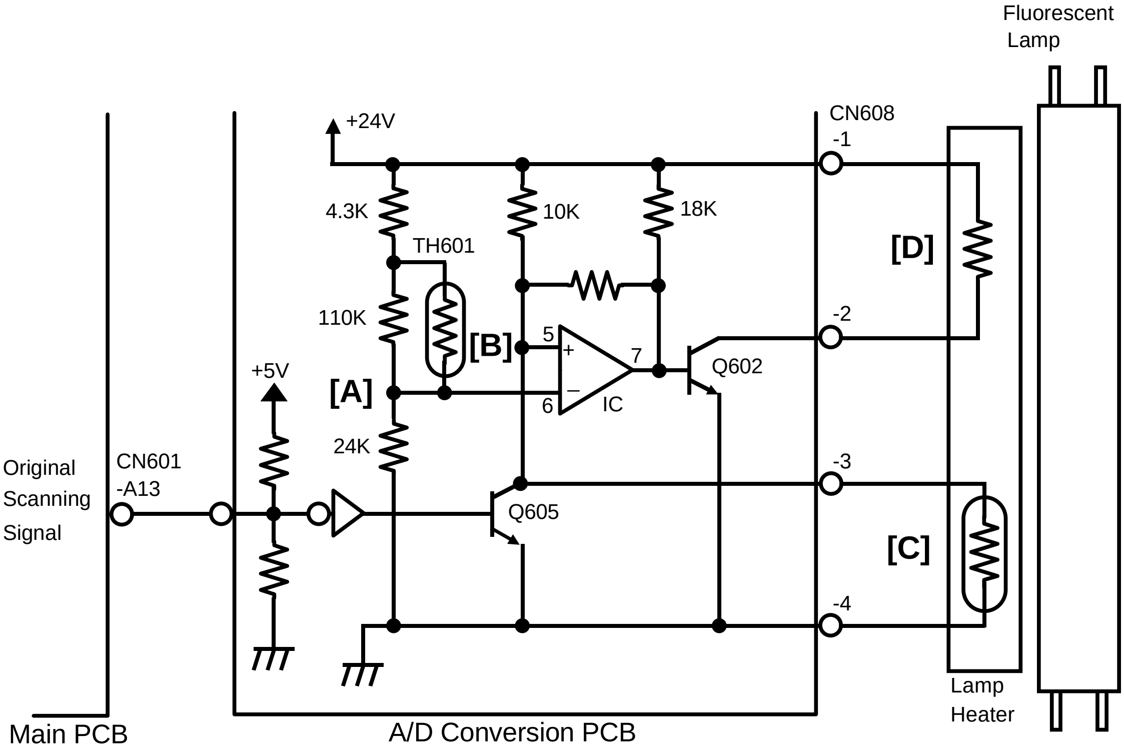


[Light Source]

A high frequency (15 kHz) fluorescent lamp [D] is used as a light source for high speed reading. The light is reflected at two angles using a mirror [F]. This prevents shadows from the edges of cut-and-paste originals from appearing on the original [B]. The original guide plate [C] blocks part of the direct light from the fluorescent lamp to make the light intensity of both the direct light and reflected light the same. A heater [E] is wrapped around the fluorescent lamp. The lamp stays on for one minute when the main switch is turned on to quickly raise the lamp temperature. This prevents a loss in light intensity that would occur if the temperature were too low.

[Platen Cover]

The CCD reads the platen cover [A] to obtain a standard white level before the original is read. The standard white data are used to correct for distortion such as bright or dull spots in the light path (lamp, reflectors, exposure glass, mirrors, lens, and CCD).



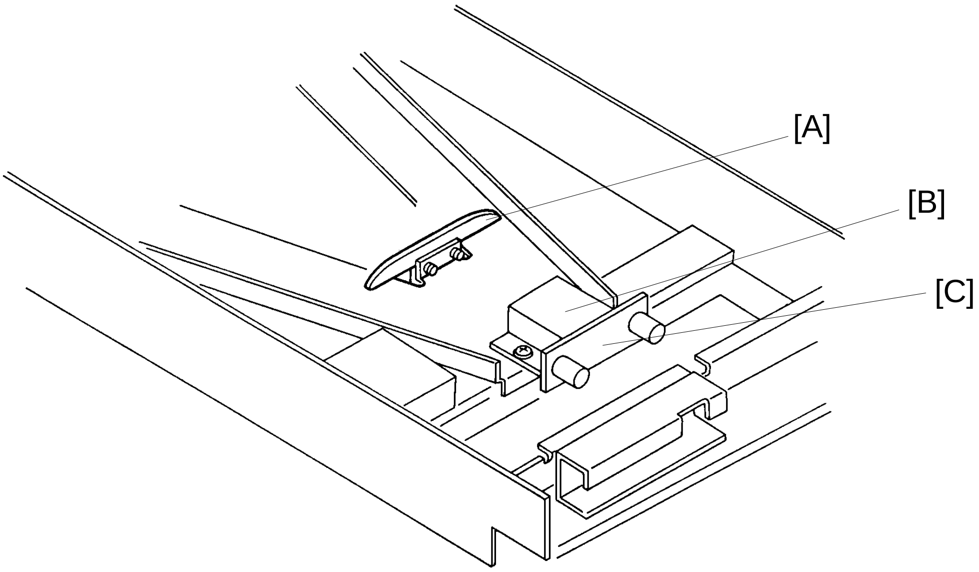
[Lamp Heater]

The thermistor [C] mounted in the lamp heater maintains the lamp temperature at about 40°C.

If the lamp temperature drops too low, the voltage at [B] goes High. This is because the resistance of thermistor [C] increases, causing the voltage at IC-pin 7 (operational amplifier) to go High. Q602 then turns on and the lamp heater [D] is energized. If the lamp temperature rises, the voltage at [B] becomes less than that at IC-pin 6. This causes IC-pin 7 to go Low, which turns off the lamp heater.

Thermistor TH601 in the A/D conversion PCB monitors the temperature inside the machine. If the temperature is low, the increased resistance of TH601 drops the voltage at [A] and the control temperature of the heater thermistor (heater ON/OFF temperature) is raised slightly. If the temperature is high, the control temperature is lowered slightly.

If Q605 turns on, the voltage at [B] becomes 0 volt and the lamp heater turns off. Q605 is turned on when the original scanning signal (active low) is sent from the main PCB. Consequently, the heater is always off during the original scanning process.



[Lens]

The lens assembly [B] consists of 6 lenses to transfer the image to the photoelectric elements of the CCD. It is possible to adjust the focus by moving the lens assembly.

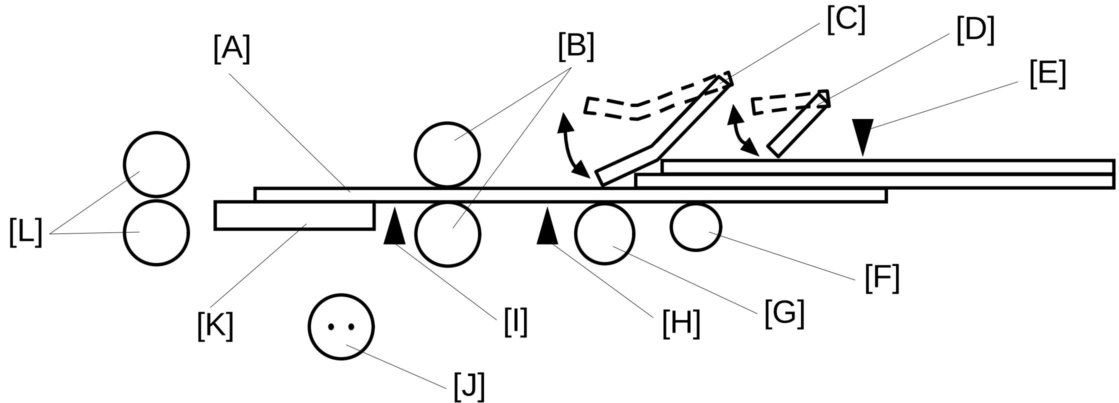
[Shading Plate]

Compared with the ends, the middle of the lamp is too bright. To correct this, a shading plate [A] is placed in front of the lens. This blocks some of the light and distributes it more uniformly.

[CCD (Charge Coupled Device)]

The CCD [C] is a solid-state device similar to a photodiode array, but unlike a photodiode array, a CCD can read one complete scan line at a time. The CCD produces an analog signal which is converted into a digital signal in the A/D conversion PCB.

2.2 ORIGINAL FEED MECHANISM



[J]: Fluorescent Lamp
[K]: Exposure Glass
[L]: 2nd Original Transport Rollers

Two original feed modes can be selected by the ADF ON/OFF select switch.

[ADF Mode]

The originals [A] set on the original table are detected by the 1st original sensor [E]. When the Master Making key is pressed, the original pressure plate [D] presses the originals down. The pull-out rollers [F] start moving the lowest original forward at the same time. The lowest original is separated from the other originals by the original feed rollers [G] and the separation blade [C].
350 milliseconds after the 2nd original sensor [H] detects the original, the 1st original transport rollers [B] start rotating. The rollers stop after the original activates the original registration sensor [I]. The 1st original transport rollers start rotating again after the drum section completes the preparation for the master making.

[SADF Mode]

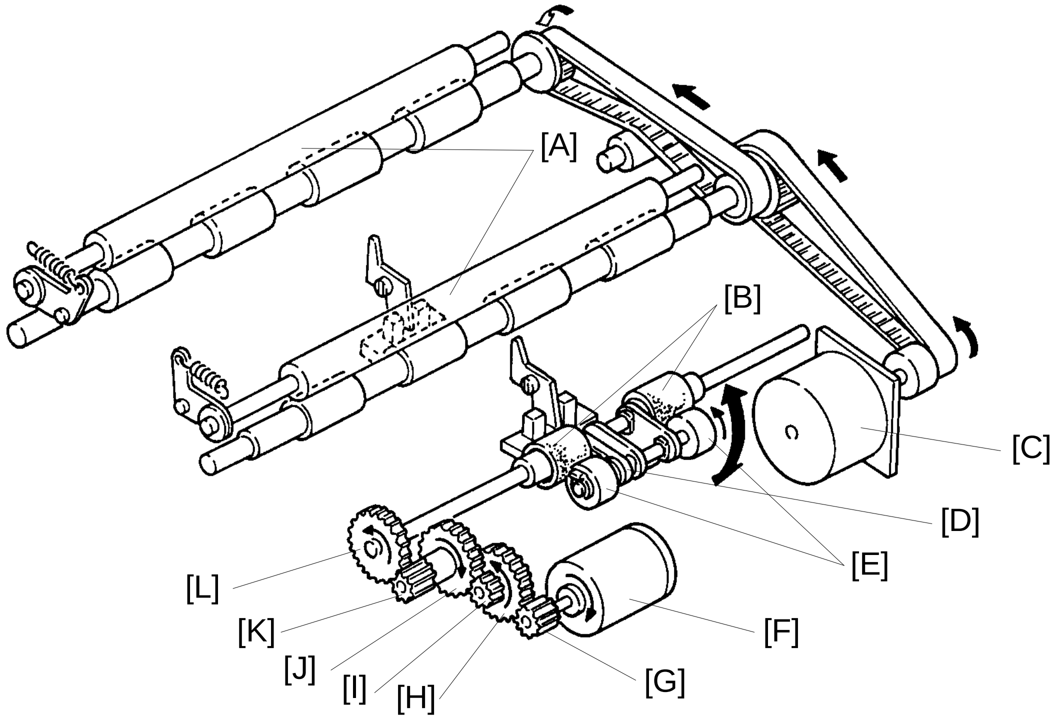
The separation blade [C] and the original pressure plate [D] are released in the SADF mode. The original on the original table is fed to the original reading position one second after the 2nd original sensor [H] detects the original.

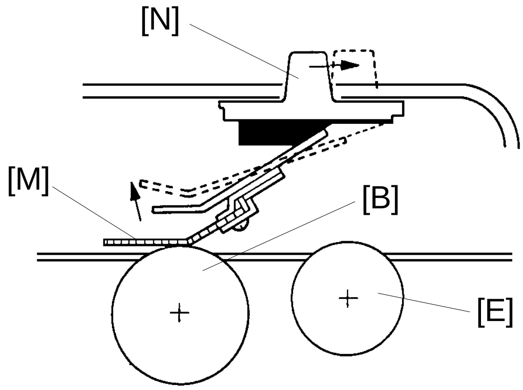
[Original Misfeed Detection]

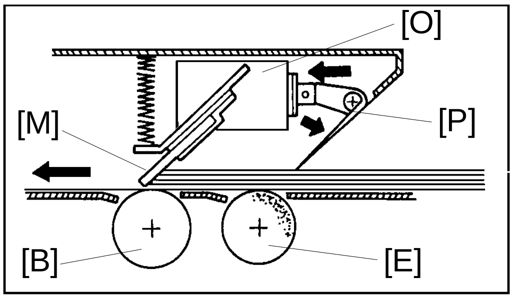
The original misfeed indicator blinks in the following conditions:

1. The 2nd original sensor is not activated within 3 seconds after the ADF drive motor turns on.
2. The original registration sensor is not activated within 3.5 seconds after the 2nd original sensor is activated.

2.3 ORIGINAL FEED DRIVE MECHANISM



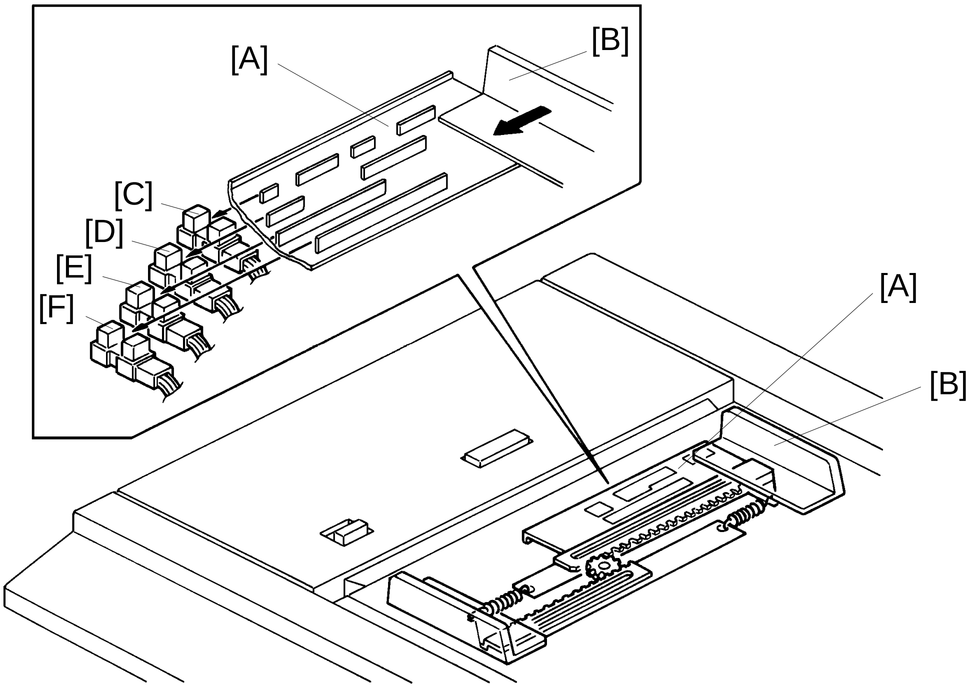




The original transport rollers [A] are driven by the original transport motor [C], which is a stepper motor. The original feed rollers [B] are driven by the ADF drive motor [F] (dc motor) through a series of gears [G] to [L]. The pull-out rollers [E] are driven by the ADF motor through a drive belt [D].

The original pressure plate [P] is pressed down on the originals by the original pressure solenoid [O]. The separation blade [M] is moved up and down by the ADF ON/OFF select switch [N].

2.4 ORIGINAL SIZE DETECTION



The original width detection plate [A] installed behind the rear original guide [B] has 4 photointerrupters.

The front and rear original guides are adjusted according to the original width. Depending on which original size sensors are interrupted, the machine determines the original width as shown in the below table. The original size sensors are 4 photointerrupters.

Original Size*	A3	DLT	B4	LT/LG	A4	B5	A5	HLT	
Original Size Sensor - 3 [C]	o	x	o	x	x	o	x	x	o
Original Size Sensor - 2 [D]	x	o	o	x	x	o	o	o	o
Original Size Sensor - 1 [E]	x	x	o	o	o	o	x	x	x
Original Size Sensor - 0 [F]	x	x	x	x	o	o	o	o	o

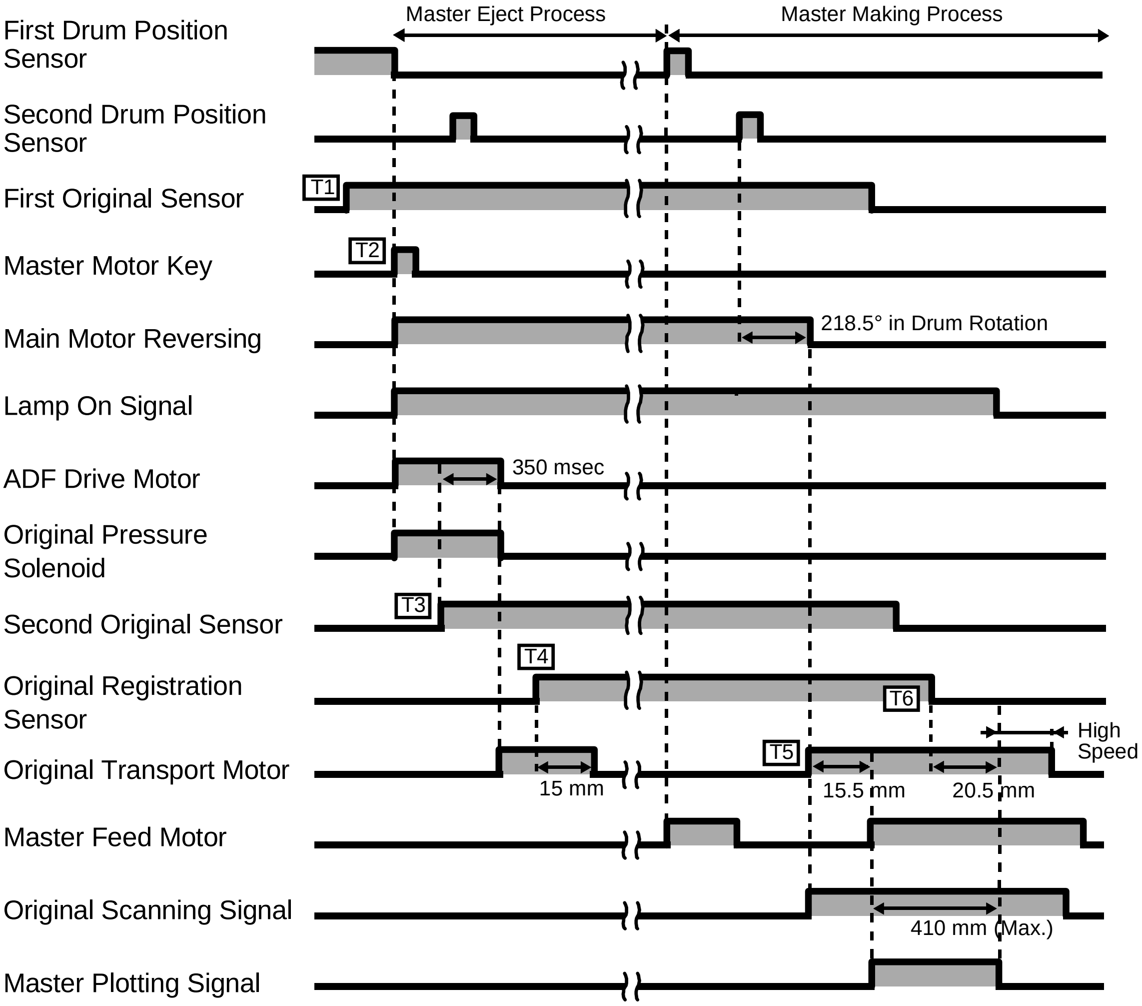
x: Non-blocked, o: Blocked
* All of the above original sizes are for lengthwise feed.

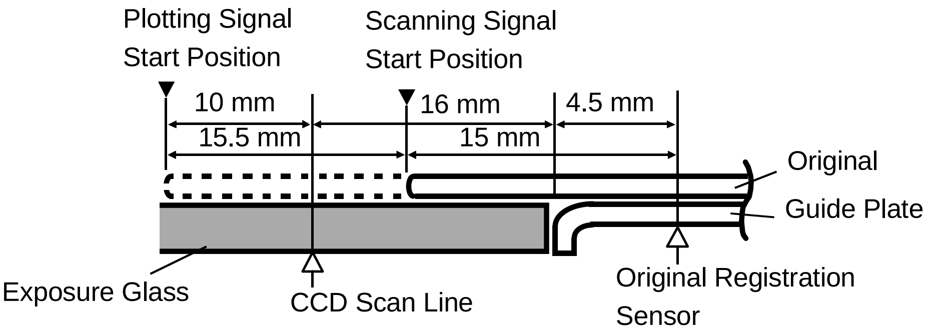
The machine also checks the paper size on the paper feed table (both the length and width).

When the paper width is smaller than the original width (multiplied by the reproduction ratio), the machine indicates "Check paper size" on the operation display for 3 seconds when the Master Making key is pressed. If the operator ignores the indication and presses the Master Making key again, the machine goes ahead with normal processing.

If the original size is different from the paper size, the machine compares the length of the original and paper. The master’s length will be the shorter of the two. The machine runs the same procedure for the width. (The original length is detected by scanning the original.)

2.5 ELECTRICAL TIMING





T1: When originals are inserted in the ADF unit, the first original sensor is activated.

T2: When the Master Making key is pressed, the ADF drive motor starts rotating and the lowest original in the ADF unit is fed. At the same time, the original pressure solenoid is energized and the pressure plate presses the originals against the pull-out rollers. The fluorescent lamp lights about 3 milliseconds after the lamp on signal turns on.

T3: The original transport motor starts rotating and turns the transport rollers. This happens 350 milliseconds after the second original sensor is activated.

T4: The original transport motor stops rotating when the original is fed 15 millimeters past the original registration sensor actuation position. The leading edge of the original is stopped 5.5 millimeters before the scanning position. (See illustration on the previous page.)

T5: After the master eject process is finished, the drum rotates 218.5 degrees more (in reverse) past the second drum position sensor actuation position and stops at the master clamping position.

When the drum stops, the original starts being fed and the original scanning starts. Since there is a 5.5 millimeter distance until the leading edge of the original reaches the scanning position, the CCD reads the platen cover as a standard white level during this period.

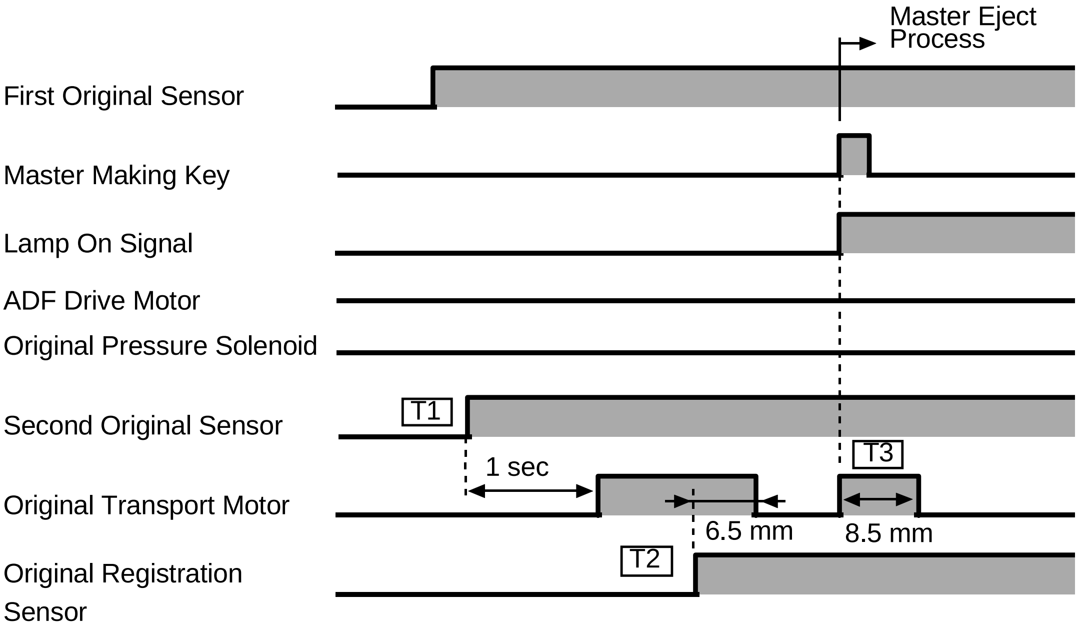
After the original is fed 15.5 millimeters, the master starts being fed and is plotted by the thermal head. At this time, the master has a 10 millimeters blank margin at its leading edge.

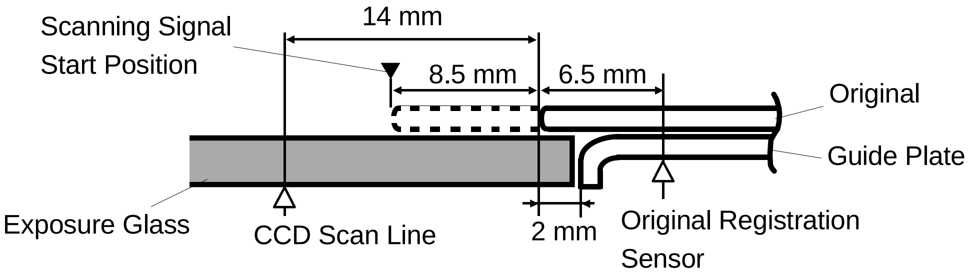
T6: When the original scanning for the plotting area is finished, the master plotting signal is de-energized and the thermal head turns off. At the same time, the original transport motor speeds up (about 4 times) and spits out the original.

The plotting area of the master depends on whether the paper size or original size is smaller. If the original length is shorter than the paper length, then scanning finishes 20.5 millimeters after the trailing edge of the original has passed the original registration sensor.

If the paper length is the same or shorter than the original, scanning finishes when the master has been fed the length of the paper. For the A3/DLT drum, the master is fed 410 millimeters, at most, and for the A4/LT drum, the master is fed a maximum of 206 millimeters.

[Electrical Timing for SADF Mode]



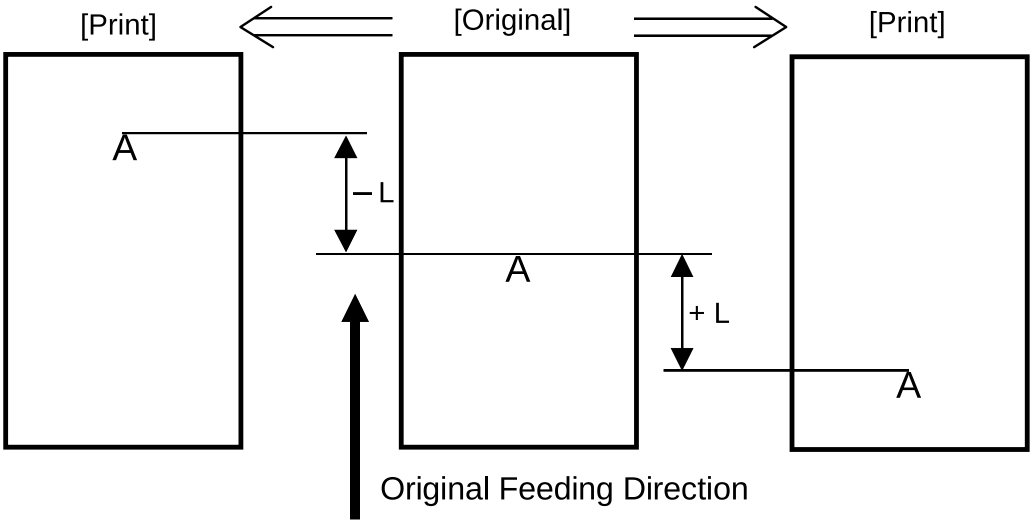


T1: The original transport motor starts rotating 1 second after the leading edge of the original activates the second original sensor.
The ADF drive motor and original pressure solenoid do not work in the SADF mode.

T2: The original transport motor stops rotating when the original registration sensor is activated and the original is fed 6.5 millimeters.

T3: When the Master making key is pressed, the original is fed 8.5 millimeters before it stops. From this point on, the timing continues in the same manner as in the ADF mode.

[Electrical Timing for Image Shifting Mode]



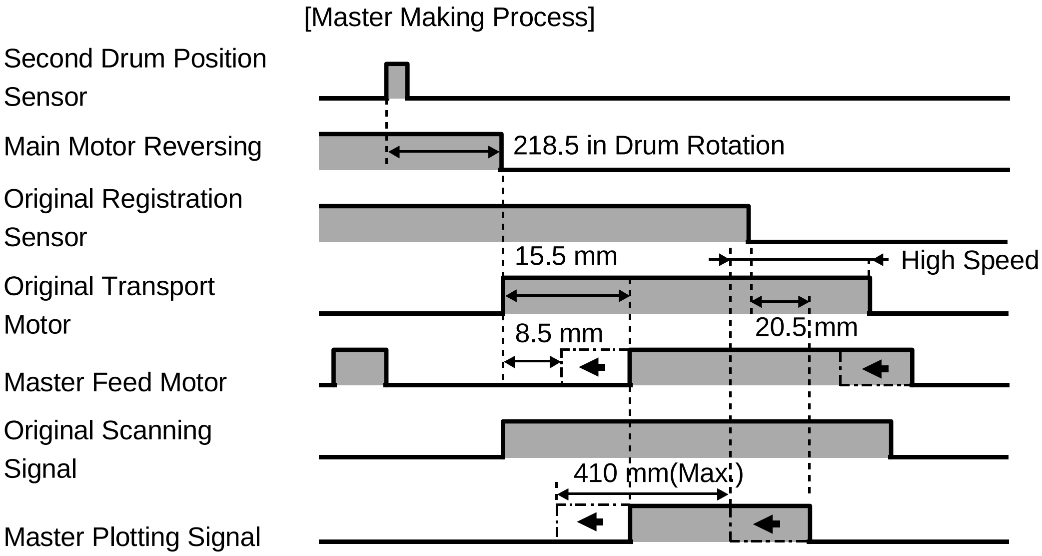
The image is shifted in the sub-scanning direction by changing the start timing for the original feed or master feed. (In the main scanning direction, the image is shifted by changing the output timing of the image data in the image processing PCB. See "9.3 IMAGE PROCESSING PCB".)

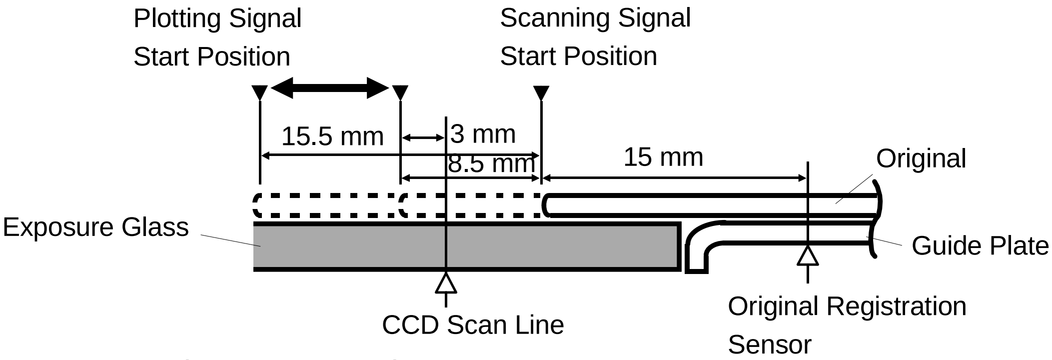
When the original image moves forward in the sub-scanning direction on the print, the shift is represented by a minus (–). The opposite shift is represented by a plus (+). The shift length is represented as "L". For example, if the original image moves 100 millimeters backwards in the sub-scanning direction, this is represented as "L=(+)100 mm".

There are three image shift cases to consider:

1) No shift or a backward shift of 7 millimeters or less
2) A backward shift of 8 millimeters or more
3) A forward shift

Because of the 10 millimeters blank margin at the top of the print and because the first three millimeters of the original are not scanned, the backward shift works differently when it is between 1 and 7 millimeters and when it is 8 millimeters or more.





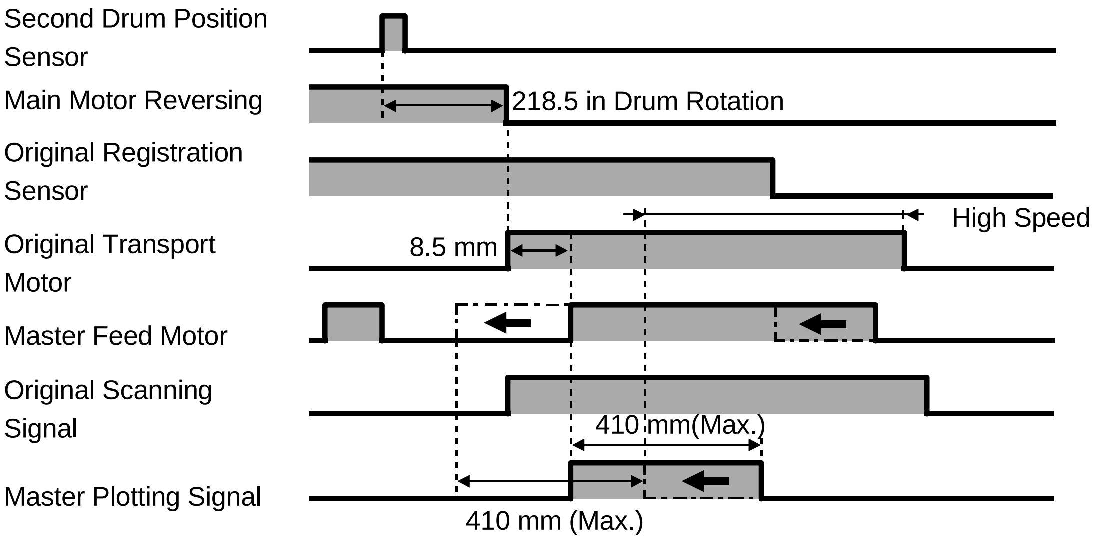
1. 0 ≤ L ≤ 7 mm (L=0, 1, 2, ..., 7)

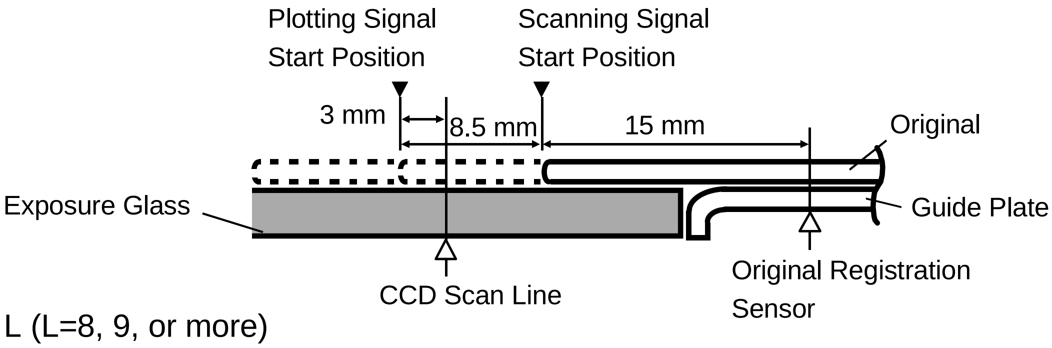
The image of the original is moved backwards by advancing the master feed timing during the master making process. First, the print must have a 10 millimeters blank margin at its leading edge. This is to let the machine easily peal the print off the drum. To allow for the margin, a 10 millimeters margin must also be made on the master; so plotting on the master starts from the line (on the master) that corresponds to the first line on the print immediately following the 10 millimeters margin. Prints and master will always have this margin when the value of L is between 0 and 7 millimeter

If the shifting length L is +7 millimeters, the master starts being fed and the master plotting signal is energized when the original is fed 8.5 millimeters (after the drum stops rotating). The image is scanned from 3 millimeters after the leading edge of the original. Then the scanned image is plotted on the master from the line (on the master) that corresponds to 10 millimeters from the leading edge of the print.

The master plotting signal is de-energized when the original scanning for the plotting area is finished. Then, the master feed motor turns off.

[Master Making Process]



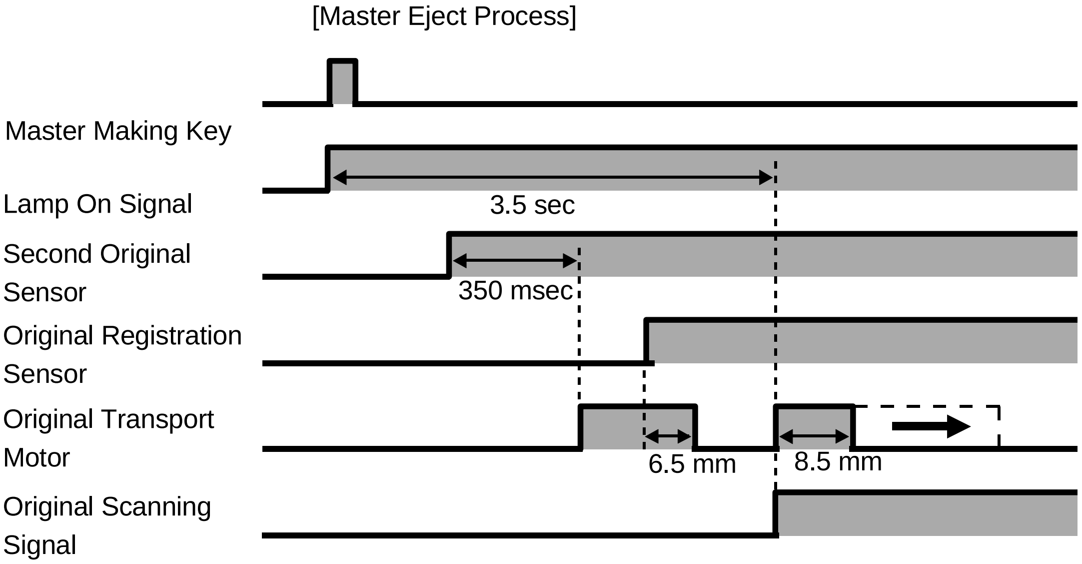


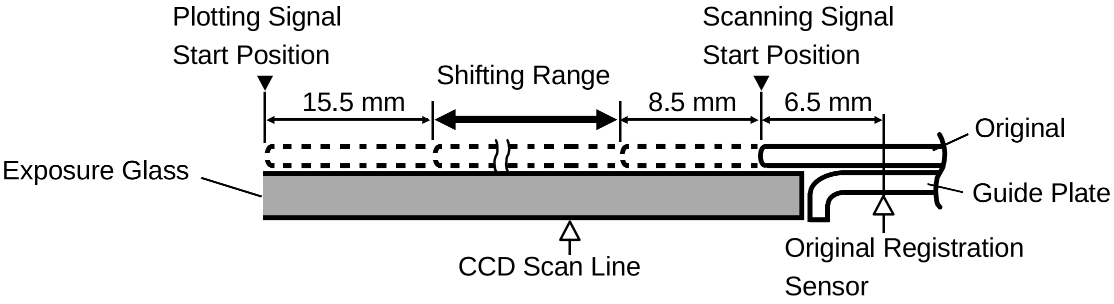
2. 7 < L (L=8, 9, or more)

When the shifting length L is longer than 7 millimeters, the image of the original is moved backwards by advancing the master feed timing in the master making process.

If the shifting length L is +8 millimeters, the master starts being fed when the original is fed 7.5 millimeters (after the drum stops rotating). Thus the master feed timing is advanced 1 millimeter in the original transport length compared with the timing of "L=+7 millimeters". Therefore, the image is moved backwards 8 millimeters on the print. When L is more than 8 millimeters, the master feed timing is accordingly advanced.

If L is more than 7, the master plotting signal is energized when the original is fed 8.5 millimeters (after the drum stops rotating). Therefore, the original scanned from 3 millimeters after the leading edge of the original. When L is 8 millimeters, the scanned image is plotted on the master from the line that corresponds to the line (on the print) 11 millimeters from the leading edge. This means that the print has a blank of 11 millimeters or more on the leading edge when L is more than 8 millimeters.



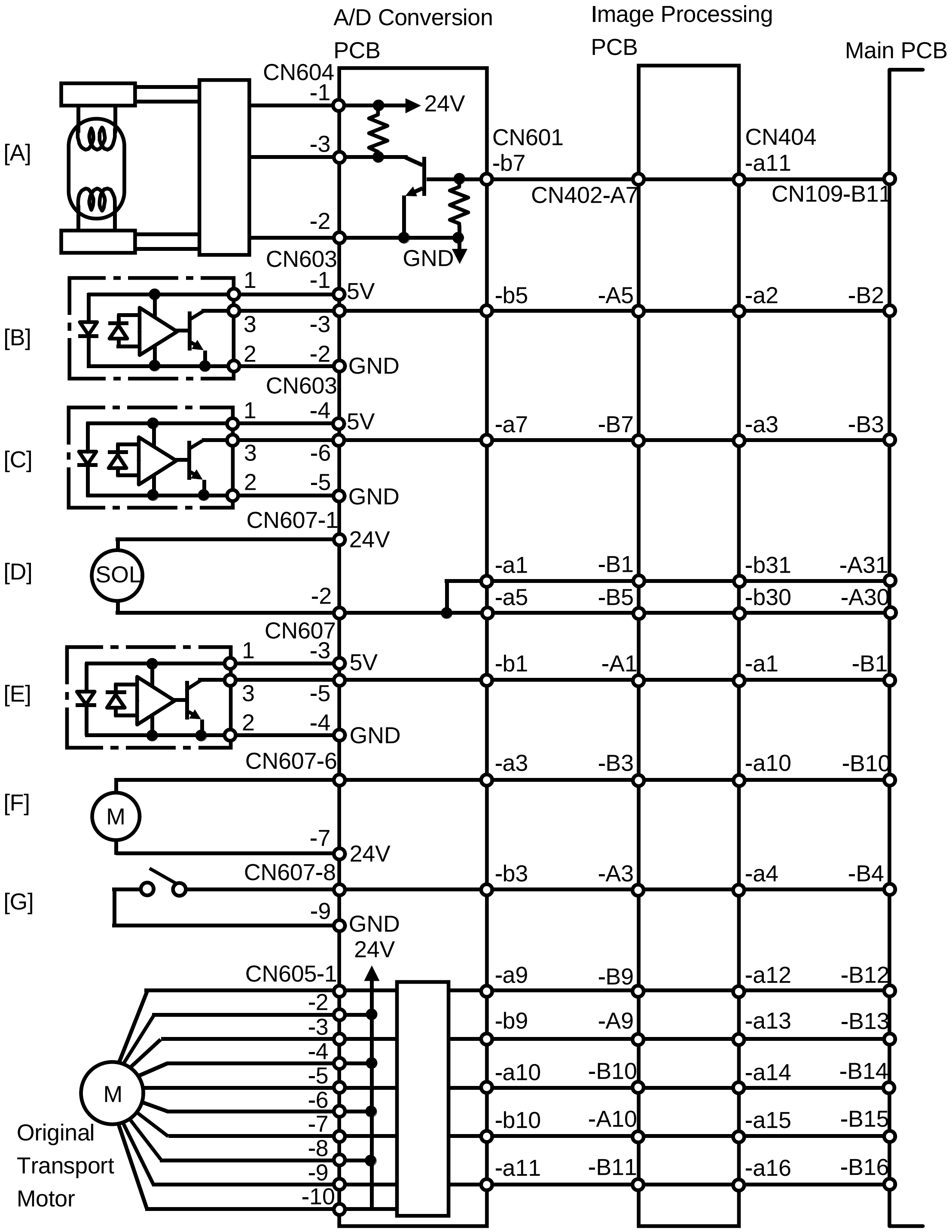


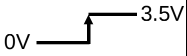
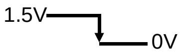
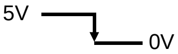
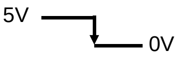
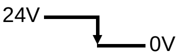
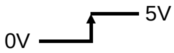
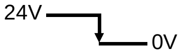
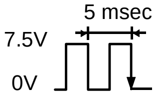
3. L < 0 (L=-1, -2, or less)

The image of the original is moved forward by transporting the original during the master eject process, before the master feed and plotting start.

The original is fed 350 milliseconds after the second original sensor is activated. Once the original stops when it is fed 6.5 millimeters after the original registration sensor is activated. The original again starts being fed 3.5 seconds after the lamp on signal turns on. This is to allow the fluorescent lamp to stabilize. At the same time, the original scanning signal is energized. The CCD reads the platen cover as a standard white level until the leading edge of the original reaches the CCD scanning position. The original is fed a little while after that. The waiting time depends on the image shifting length.

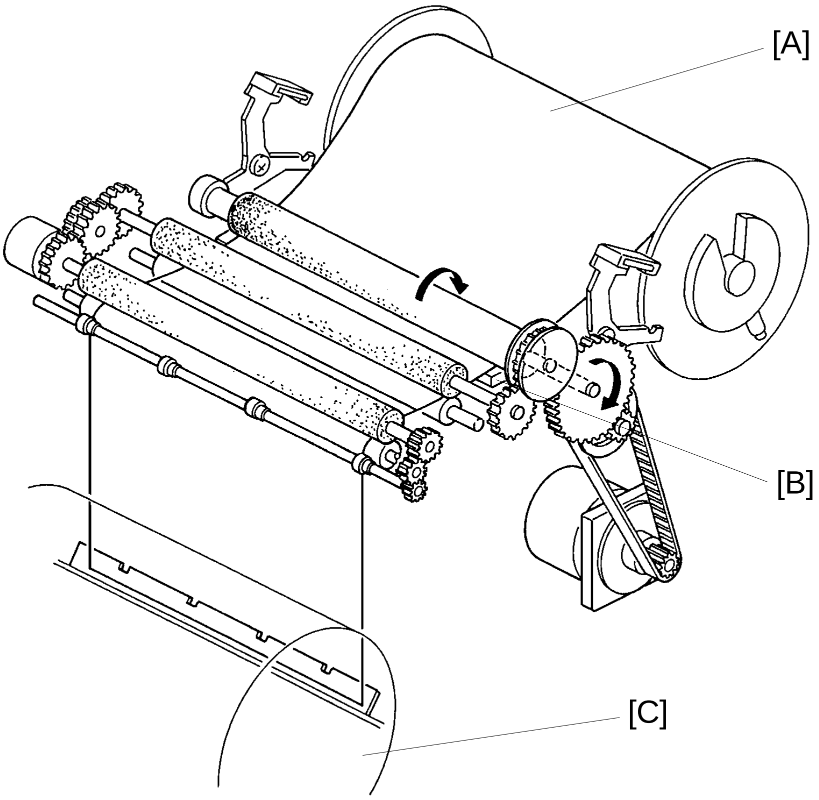
2.6 CIRCUIT


A/D Conversion PCB
Image Processing PCB
Main PCB
CN604
-1
-3
-2
24V
CN601
-b7
CN402-A7
CN404
-a11
CN109-B11
GND
[A]
CN603
1
-1
5V
3
-3
2
-2
GND
[B]
-b5
-A5
-a2
-B2
CN603
1
-4
5V
3
-6
2
-5
GND
[C]
-a7
-B7
-a3
-B3
CN607-1
24V
[D]
SOL
-2
-a1
-B1
-b31
-A31
-a5
-B5
-b30
-A30
CN607
1
-3
5V
3
-5
2
-4
GND
[E]
-b1
-A1
-a1
-B1
CN607-6
[F]
M
-7
24V
-a3
-B3
-a10
-B10
CN607-8
[G]
-9
GND
-b3
-A3
-a4
-B4
24V
CN605-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
M
Original Transport Motor
-a9
-B9
-a12
-B12
-b9
-A9
-a13
-B13
-a10
-B10
-a14
-B14
-b10
-A10
-a15
-B15
-a11
-B11
-a16
-B16

Component Name	In/Out	A/D Conversion PCB		Description
		CN No.	Signal Level	
Fluorescent Lamp [A]	In	601-b7		Signal goes High when the lamp on signal turns on.
Fluorescent Lamp [A]	Out	604-3		Signal goes Low when the lamp on signal turns on.
Second Original Sensor [B]	In	603-3		Signal goes Low when the sensor detects original.
Original Registration Sensor [C]	In	603-6		Signal goes Low when the sensor detects original.
Original Pressure Solenoid [D]	Out	607-2		Signal goes Low when the solenoid turns on. (2 lines from A/D conversion PCB to main PCB increase current carrying capacity for safety purposes.)
First Original Sensor [E]	In	607-5		Signal goes High when the sensor detects original.
ADF Drive Motor [F]	Out	607-6		Signal goes Low when the motor turns on.
ADF Cover Switch [G]	In	607-8		Pulse signal goes to Low when the ADF cover is closed.

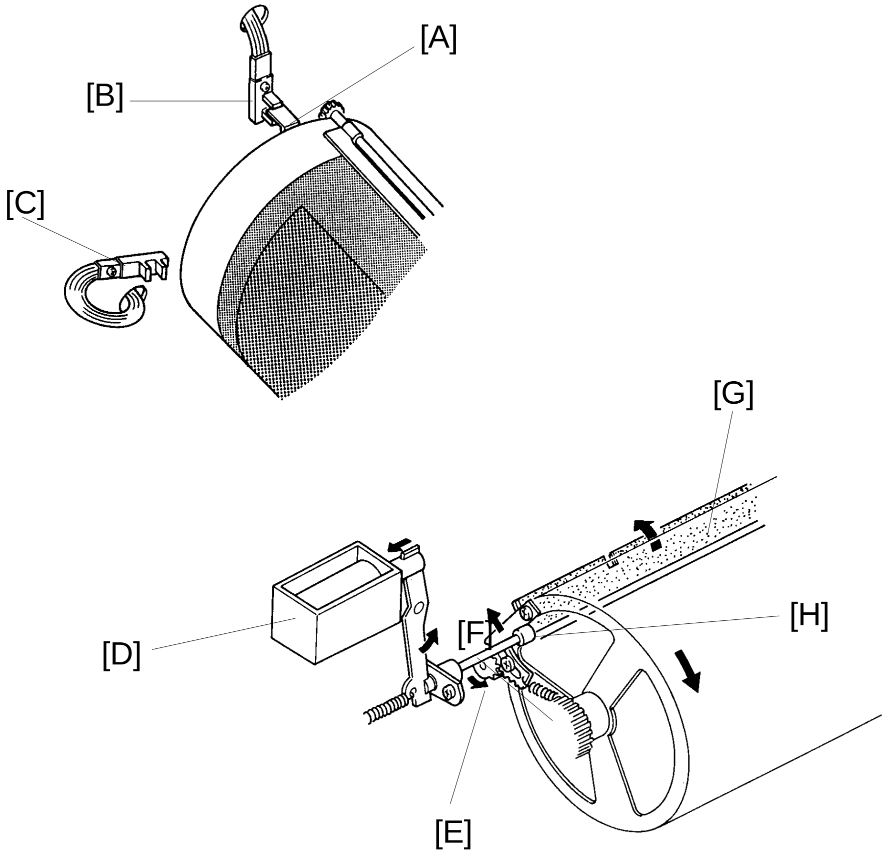
3. MASTER FEED SECTION

3.1 OVERALL



The thermal head [B] burns the image (scanned by the CCD) on the master [A] as it is being fed to the drum [C]. The master is then clamped to and wrapped around the drum.

3.2 MASTER CLAMPER OPENING MECHANISM

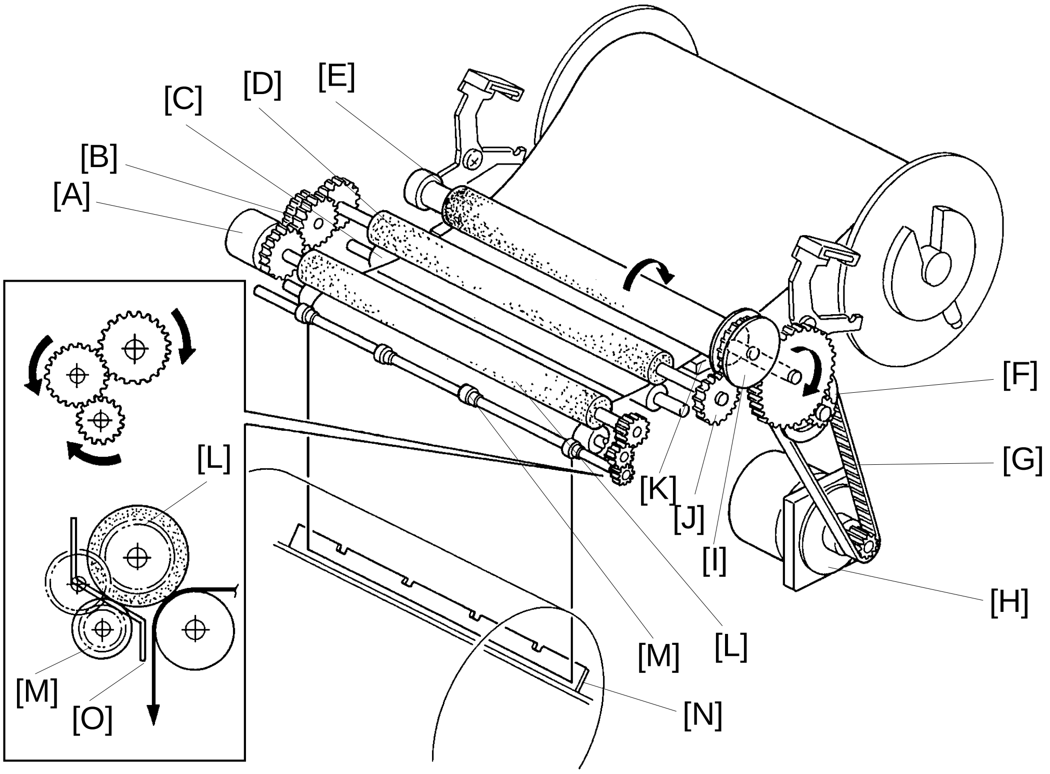


After the master eject process is finished and the interrupter [A] is positioned in the first drum position sensor [B], the main motor turns on and the drum starts rotating (30 rpm) in reverse (opposite to the printing direction).

When the drum turns 160 degrees past the actuation position of the second drum position sensor [C], the cam [H] moves inside the drum and the master feed clamper solenoid [D] turns on.

When the drum turns another 58.5 degrees, the sector gear [F] rotates upwards as it contacts the cam [H]. This engages the sector gear and gear [E], which turns counterclockwise to open the clamper [G]. At the same time, the drum stops and the clamper remains open to clamp the master's leading edge.

3.3 MASTER FEEDING MECHANISM

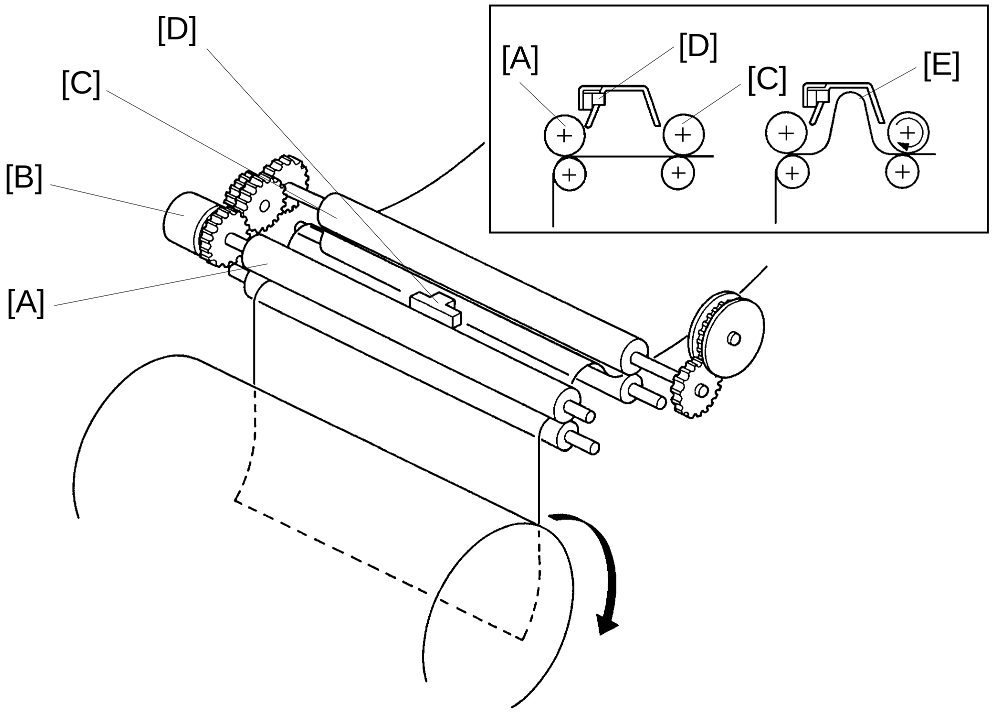


The drum rotates 218.5 degrees past the second drum position sensor and stops. At this time, the magnetic clutch [A] behind the reverse roller [L] and the master feed motor [H] turns on. The rotation of the master feed motor [H] is transmitted to the platen roller [E] through the belt [G] and the gear/pulley [F]. The platen roller then feeds the master and presses it against the thermal head [K]. Also, the rotation of the gear/pulley [F] is transmitted to a gear [J] through the relay gear [I] to drive the upper feed roller [D] and the lower feed roller [C] for master feeding.

When the magnetic clutch [A] turns on, the rotation of the upper feed roller [D] is transmitted to the reverse roller [L] through the relay gears [B], thus feeding the master. Also, the master is directed down to the clamper [N] of the drum by the reverse guide [O]. The counter rollers [M] are to prevent the leading edge of the master from wrapping around the reverse roller [L].

After the master is fed 59.5 millimeters, the magnetic clutch [A] turns off and the reverse roller [L] stops. Then, after the master is fed another 5 millimeters, the master feed clamper solenoid turns off because the master’s leading edge has already reached the clamper [N].

3.4 MASTER WRAPPING MECHANISM

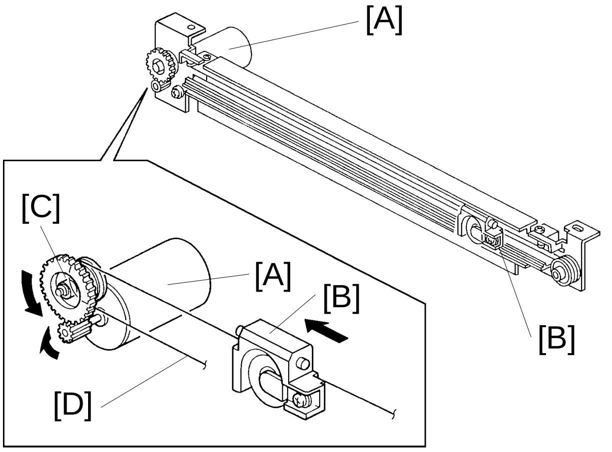


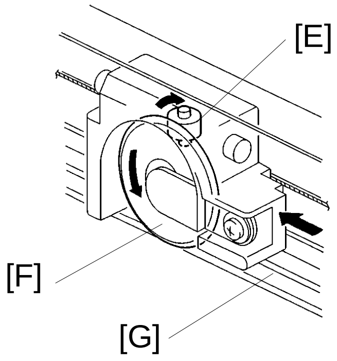
When the magnetic clutch [B] is turned off, the reverse roller [A] stops.

However, since the feed rollers [C] turn continuously, the master continues to be fed, causing the master to buckle. This buckle [E] is detected by the master buckle sensor [D]. When the sensor turns on, the main motor turns on at 10 rpm to rotate the drum. The main motor turns off when the sensor turns off.

So, the master is fed by repeating the ON/OFF action of the master buckle sensor. This mechanism prevents the shockwave from having an effect on plotting when the drum pulls the master (for instance by jiggling the master above the thermal head).

3.5 CUTTER MECHANISM





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

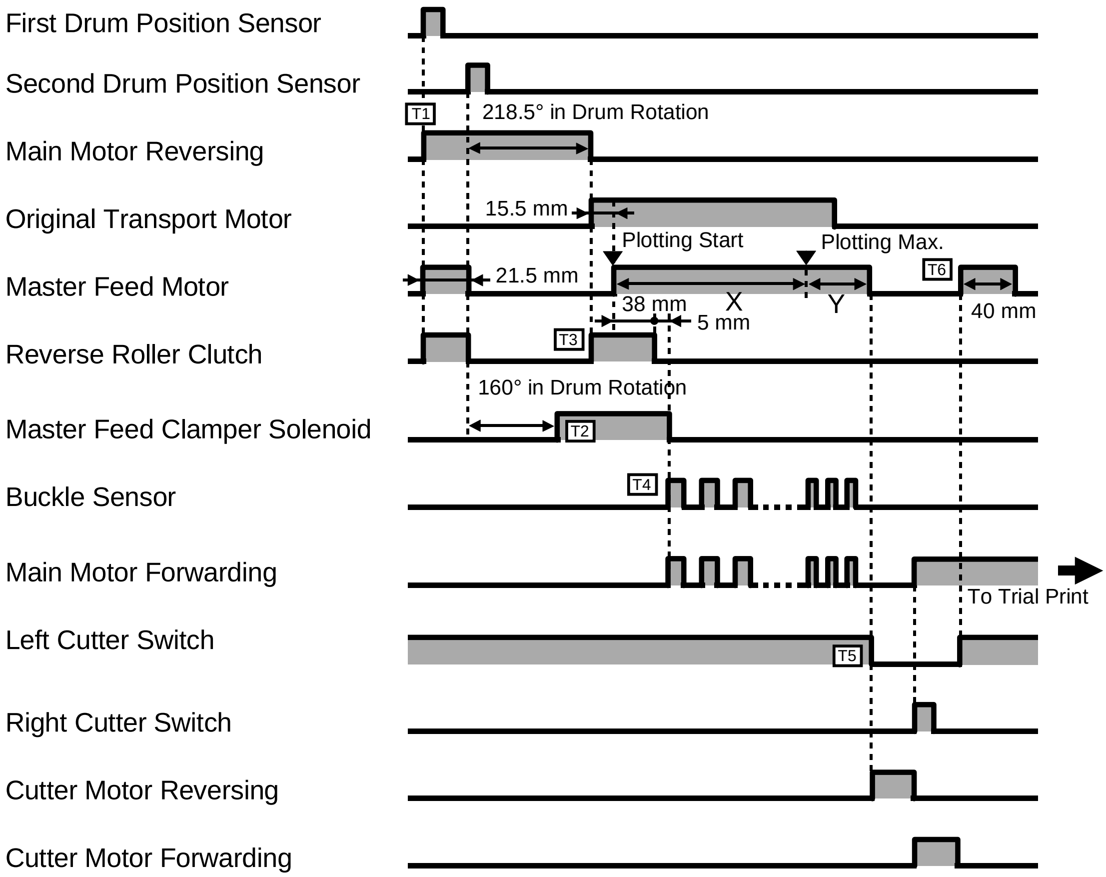
The cutter motor [A] starts turning in reverse (arrows) when the cutter holder [B] pushes the left cutter switch at the front (operation side) end of the cutter rail (cutter holder home position). This drives the cutter holder [B] toward the rear (non-operation side) by means of the gear/pulley [C] and the wire [D] on which the cutter holder [B] is fixed.

When the cutter holder reaches the rear end of the cutter rail and pushes the right cutter switch, the cutter motor [A] changes the rotating direction, so the cutter holder [B] starts moving toward the front. Then, the cutter motor [A] stops turning when the cutter holder [B] goes back to its home position and pushes the left cutter switch. The master cutting process is now finished.

While the cutter holder [B] is traveling to the rear, the roller [E] installed in the cutter holder is turning clockwise because it touches the cutter rail. The roller [E] rotates the rotary cutter blade [F] as indicated by the arrow. The master is between the rotary blade and blade plate [G] and as the cutter moves back, it cuts the master. The blade plate also serves as a lower guide plate for the master.

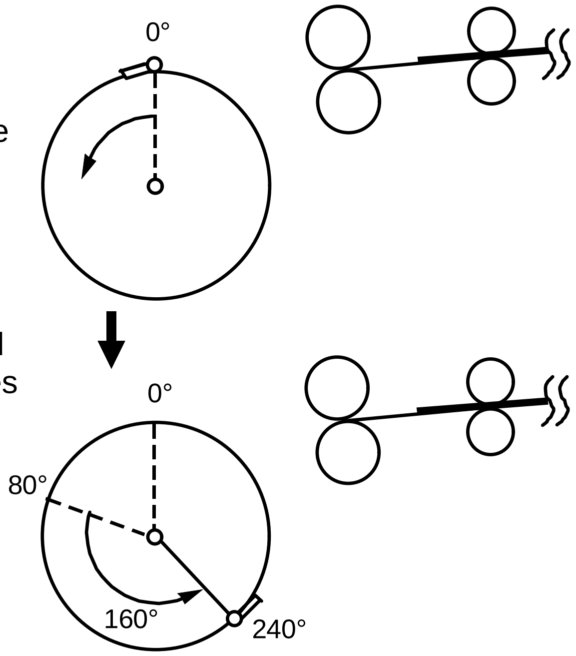
After the master cutting process is finished, the master is fed another 40 millimeters and the master feed process is finished.

3.6 ELECTRICAL TIMING



T1: After the master eject process is completed, the main motor starts rotating in reverse (opposite to printing direction) at 30 rpm. At the same time, the master feed motor and the reverse roller magnetic clutch turn on to feed the master 21.5 millimeters.

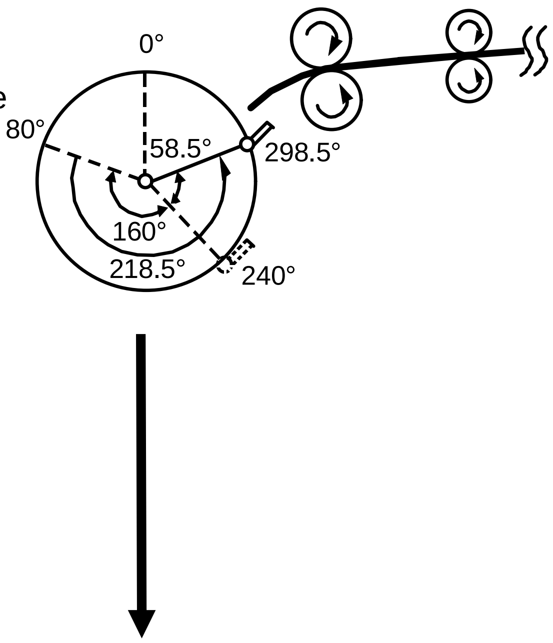
T2: The master feed clamper solenoid is energized when the drum rotates 160 degrees (in reverse) past the second drum position sensor actuation position.



T3: When the drum rotates 58.5 degrees more, the drum master clamper is completely open, and the drum stops.

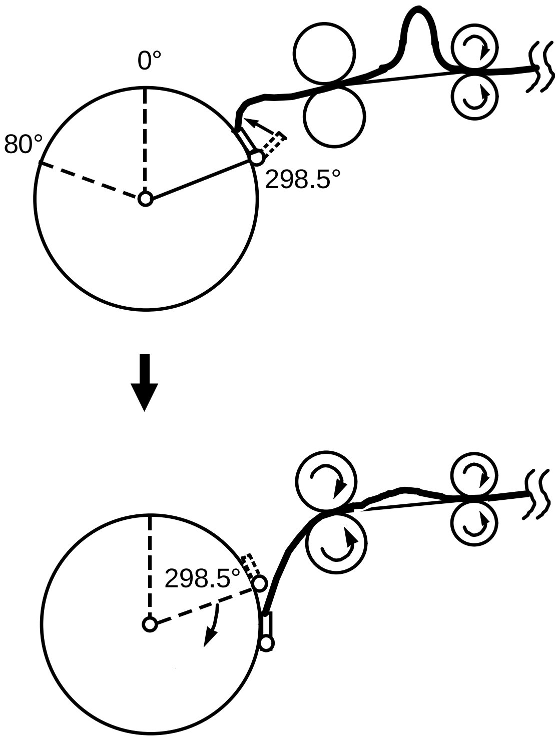
When the drum stops, the original starts being fed. After the original has been fed 15.5 millimeters, the master starts being fed, and the thermal head starts plotting on the master.

At the same time, the reverse roller magnetic clutch also turns to feed the master 38 millimeters. The master starts buckling when the reverse roller magnetic clutch turns off.



T4: After the reverse roller magnetic clutch turns off, the master is fed 5 millimeters more. Then, the master feed clamper solenoid is de-energized and the master clamper is closed. (At this moment, the master plotting has already begun.)

Because the shockwave from clamping might affect plotting (for instance by jiggling the master above the thermal head), the extra 5 millimeters of the master feed will buckle the master and the buckle will absorb the shockwave.



When the master feed clamper solenoid is de-energized, the drum starts rotating forward (the printing direction) at 10 rpm to wrap the master around the drum. The drum pulls the master and straightens out the buckle. The drum stops when the buckle sensor is de-activated. Then the master again buckles since the master feed motor keeps on feeding the master. The master is wrapped around the drum by repeating these steps, controlled by the ON/OFF action of the buckle sensor.

The original transport and master feed motors speed up once the master plotting is done, so the master is now being wrapped more quickly. The master feeding length for the plotting area is fixed at 410 millimeters (maximum plotting length) in the standard A3/DLT drum (206 millimeters in the A4/LT drum).

The master feed motor stops after the master is fed X1 and X2 millimeter. X1 and X2 depend on the drum type as follows:

Drum Type	A3/DLT	A4/LT
X1 (mm)	410	206
X2 (mm)	60	61

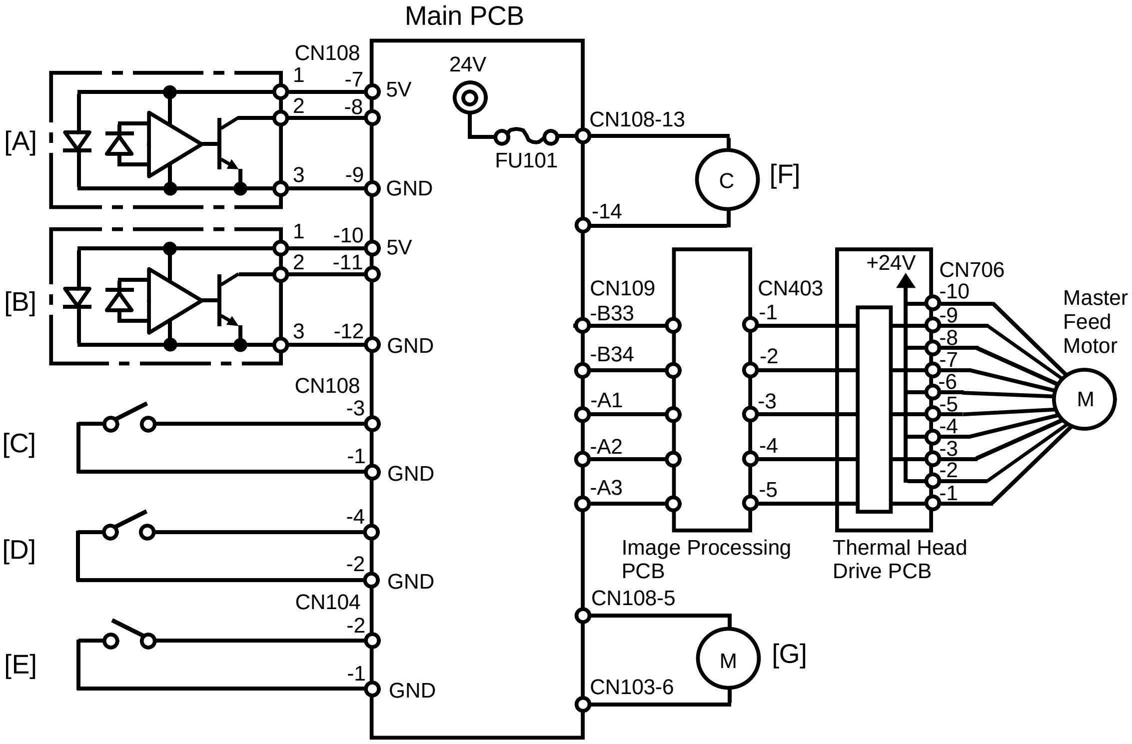
T5: The drum (main motor) stops after the master has been fed 537 millimeters.

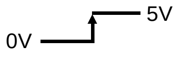
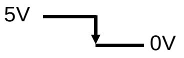
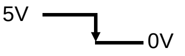
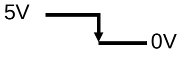
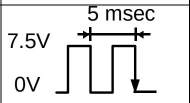
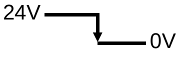
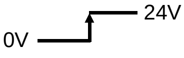
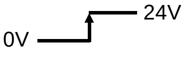
At the same time, the cutter motor starts rotating and the master is cut. Then, the cutter motor changes the rotating direction when the cutter holder pushes the right cutter switch. The cutter motor stops when the cutter holder goes back to the home position and the left cutter switch is again activated. (The pressure plate motor also starts turning to raise the pressure plate at the same time.)

When the right cutter switch is activated, the drum starts rotating forward at 30 rpm to go back to its home position. The drum keeps rotating forward to make a trial print.

T6: When the left cutter switch is activated (the cutter home position) and the cutter motor stops, the master feed motor again turns on to feed the master 40 millimeters more, then turns off.

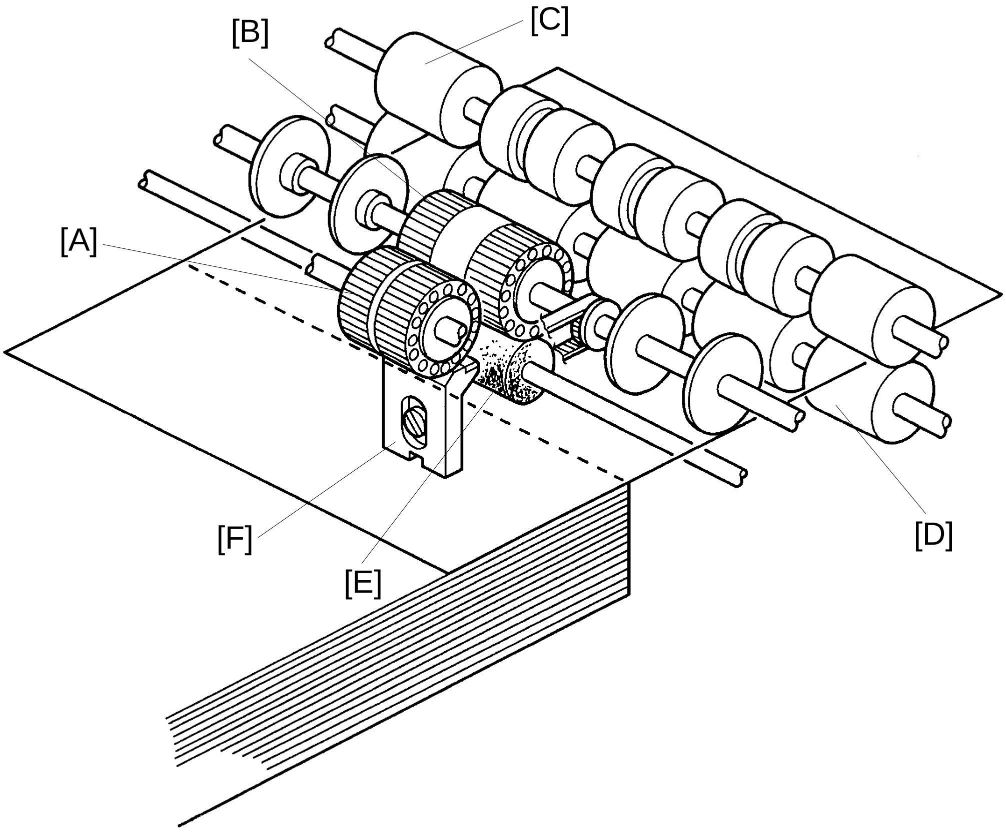
3.7 CIRCUIT



Component Name	In/Out	Main PCB		Description
		CN No.	Signal Level	
Master Buckle Sensor [A]	In	108-8	 	Signal goes High when the sensor detects the master buckle.
Master Roll Detection Sensor [B]	In	108-11	 	Signal goes Low when the sensor detects the master on the master roll.
Left Cutter Switch [C]	In	108-3	 	Signal goes Low when the cutter holder pushes the switch actuator (home position).
Right Cutter Switch [D]	In	108-4	 	Signal goes Low when the cutter holder pushes the switch actuator.
Master Cut Button [E]	In	104-2	 	Pulse signal goes to Low when the button is pressed.
Reverse Roller Magnetic Clutch [F]	Out	108-14	 	Signal goes Low when the clutch is energized.
Cutter Motor (Forward) [G]	Out	108-5	 	Signal goes High when the cutter holder is returning.
Cutter Motor (Reverse) [G]	Out	108-6	 	Signal goes High when the cutter holder is moving toward the rear.

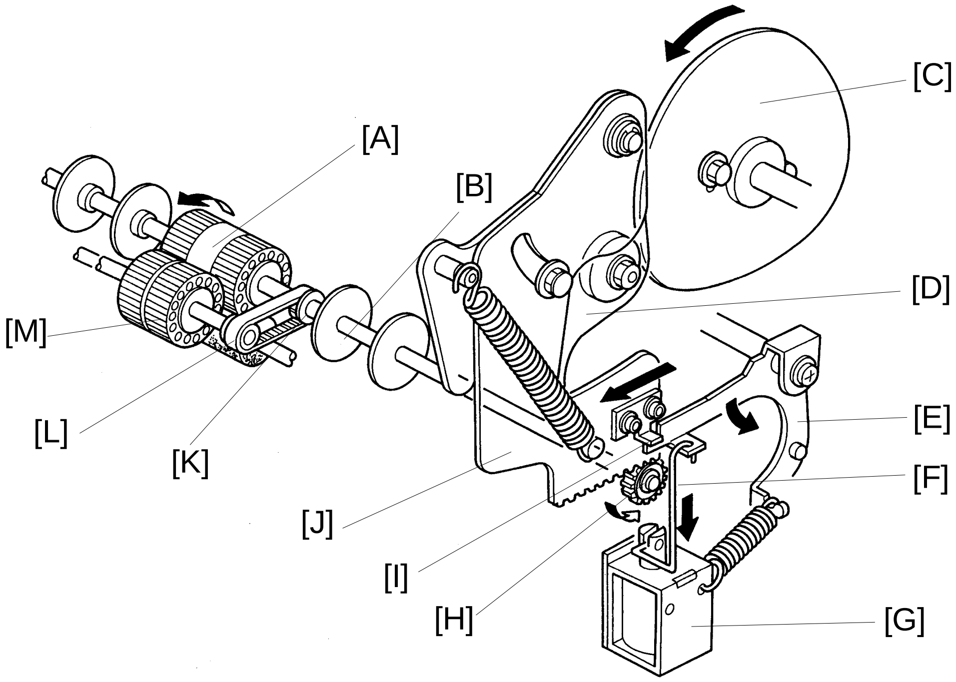
4. PAPER FEED SECTION

4.1 OVERALL



This mechanism uses a center separation system, which consists of the separation plate [F], upper separation roller [B], and lower separation roller [E]. Because of the separation system, if a few sheets of paper are picked up from the paper stack (paper table) by the paper feed roller [A], only one sheet of paper is transported to the second upper feed roller [C] and second lower feed roller [D].

4.2 PAPER FEED ROLLER/UPPER SEPARATION ROLLER MECHANISM



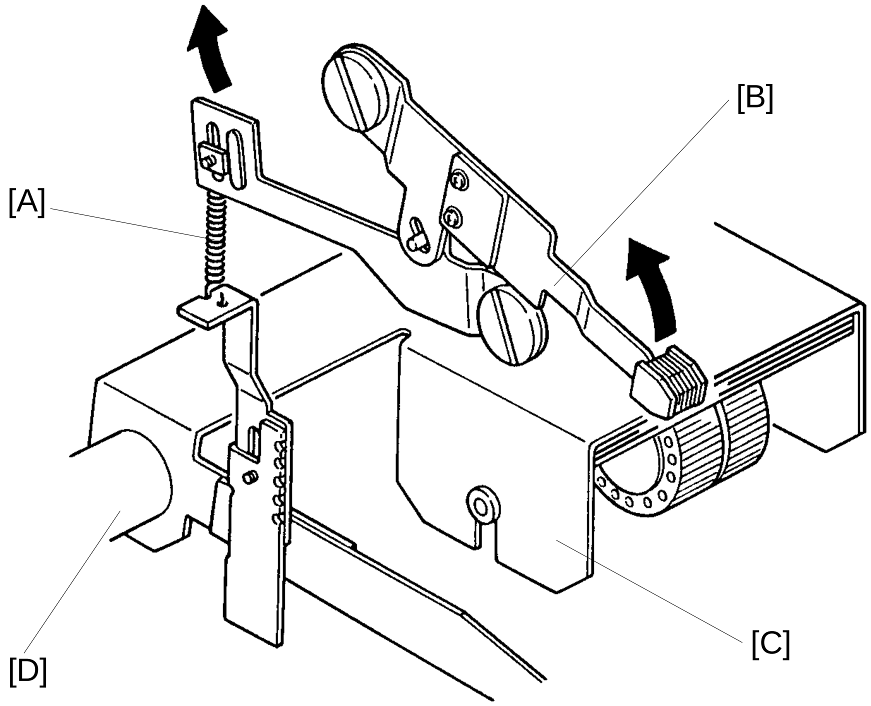
The sector gear [J], located on the non-operation side, rotates the paper feed roller [M] and the upper separation roller [A]. When the paper feed solenoid [G] turns on, the link [F] is pulled. When the cam roller [D] is positioned on top of the paper feed roller cam [C], the sector stopper [E] turns counterclockwise as a clearance is formed between the pin [I] and the stopper [E]. Then, the cam roller [D] of the sector gear moves along the cam face of the paper feed roller cam [C].

When moving the cam roller [D] from the bottom to the top of the paper feed roller cam [C], the sector gear [J] turns clockwise and the gear [H] is turned counterclockwise. The rotation of the gear [H] is transmitted to the upper separation roller shaft [B] by a one-way clutch inside the gear [H], and the upper separation roller [A] turns counterclockwise.

At the same time, the pulley [K] mounted on the upper separation roller shaft [B] turns, and the belt [L] rotates the paper feed roller [M] counterclockwise to feed the printing paper.

When the cam roller [D] moves from the top to the bottom of the paper feed roller cam [C], the sector gear [J] turns counterclockwise and the gear [H] is turned clockwise. However, due to the one-way clutch inside the gear [H], the upper separation roller [A] and the paper feed roller [M] do not turn.

4.3 FEED ROLLER PRESSURE MECHANISM

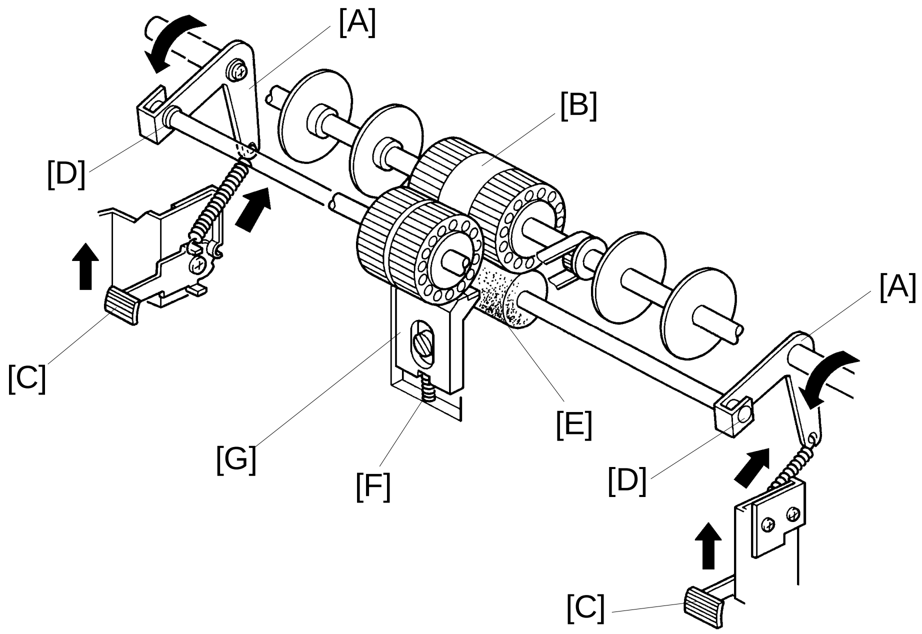


Due to the weight of the feed roller assembly [C] the paper feed roller presses the paper stacked on the paper table. This is because the feed roller assembly rotates freely around its shaft [D].

The spring [A] applies tension to the feed roller assembly in the direction in which the paper feed roller is pulled up. When the feed-pressure lever [B] is moved up, the spring [A] is also moved up. Thus, the tension of the spring is increased, weakening the feed roller pressure.

Originally, the feed-pressure lever is in the up position. When thick paper (132.5 to 215 g/m^2, or 35.2 to 57 lb.) is used and frequently paper is not fed, push down the feed-pressure lever. The feed roller pressure will increase.

4.4 PAPER SEPARATION MECHANISM



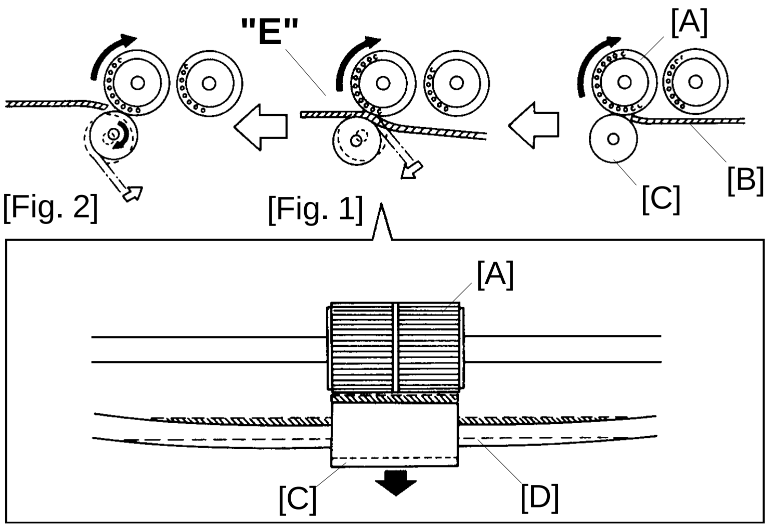
Spring tension [F] holds the separation plate [G] against the upper separation roller. A rubber pad is on top of the separation plate to separate a few sheets of paper before they reach the lower separation roller. If too many sheets of paper are fed to the lower separation roller at the same time, the lower separation roller will maybe not separate the sheets, it can separate only two or three sheets of paper.

Springs pull lever [A] and this pushes up the lower separation roller [E]. Then this roller presses the sheets to be fed against the upper separation roller [B]. Also, the lower separation roller does not turn in the paper feeding direction. (It turns in the opposite direction due to the one-way clutch bearings [D] provided on both right and left separation levers [A].) When 2 sheets of paper are fed, brake force is applied to the lower sheets of paper due to the friction between the paper and the lower separation roller. Then, the sheets are separated and a sheet of paper is fed to the second feed rollers.

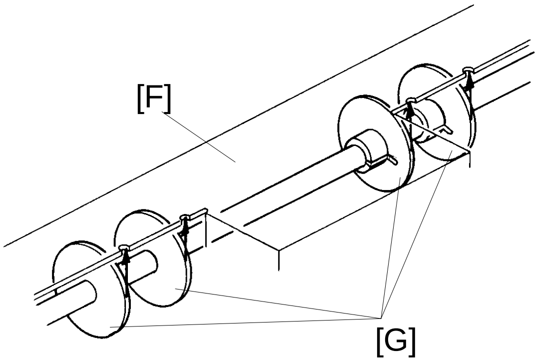
The pressure between upper and lower separation rollers can be adjusted in two steps by changing the right and left separation pressure adjusting levers [C] as follows:

Levers Up:	Separation pressure decreases.
Levers Down:	Standard position.

When dog-eared or wrinkled prints are delivered, the separation pressure should be decreased.

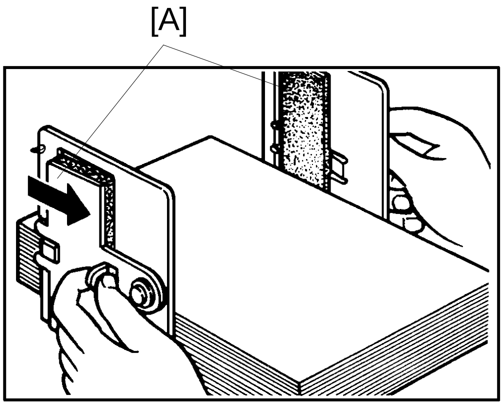


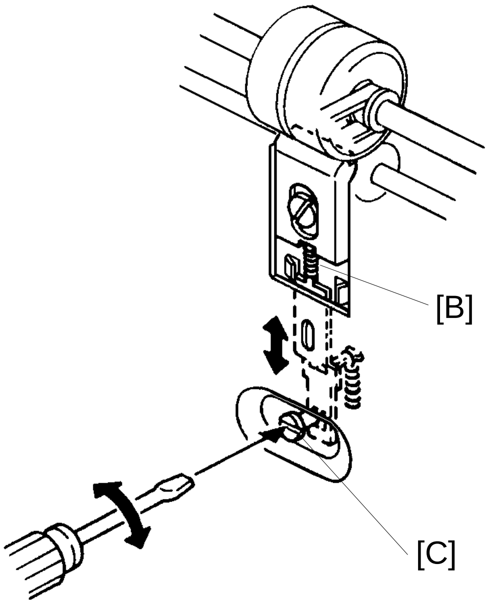
View from **"E"**



The lower separation roller [C] turns slightly (arrow Fig. 2) due to the one-way clutch bearings when paper passes through the roller. The lower separation roller [C] and its shaft [D] are slightly pushed down by the paper [B] when the upper separation roller [A] is feeding the paper. (Fig.1) Just when the paper is fed out from the rollers, the lower separation roller [C] and its shaft [D] spring back against roller [A]. (Fig. 2) This rotates the lower separation roller and insures that it will wear out evenly.

Four paper guide rollers [G] are there to reduce curl in the paper's leading edge, and to feed the paper smoothly into the guide plates. There are four marks on the bracket [F] corresponding to the roller positions as shown in the lower figure.



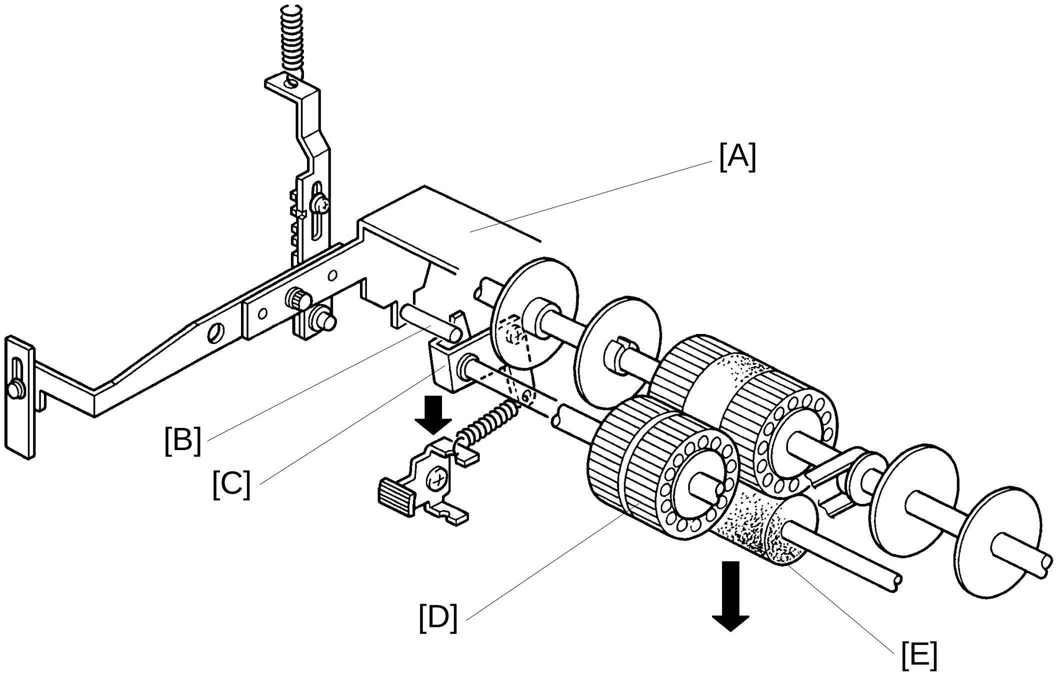


The side pads [A] installed in the front and rear paper side guides prevent multiple feed. These are especially useful when thin paper is used. After adjusting the paper side plates to the proper paper width (so that they touch the paper lightly), move the front and rear side pad levers to the right. Normally, the side pads pressure should be released by moving the levers to the left.

The separation plate pressure can be adjusted to match the type of paper being used. The plate which supports the pressure plate spring [B] can be moved up or down by turning the eccentric cam shaft [C].

If multiple paper feed frequently occurs, the plate should be moved up.
If paper misfeeds frequently, the plate should be moved down.

4.5 SEPARATION ROLLER PRESSURE RELEASE MECHANISM

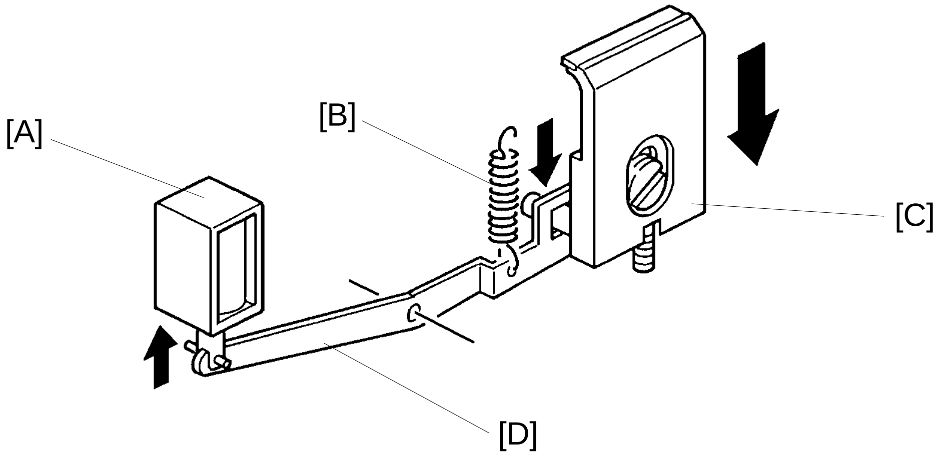


When printing is finished or a misfeed occurs, the paper table drive motor rotates for 500 milliseconds to lower the paper table. The paper on the paper table moves down from the paper feed roller [D] and the paper feed bracket [A] is pulled down by its own weight.

At this time, the shaft [B] pushes down the left separation lever [C] and this moves the lower separation roller [E] slightly downward.

This mechanism makes it easier to remove paper caught between the upper and lower separation rollers.

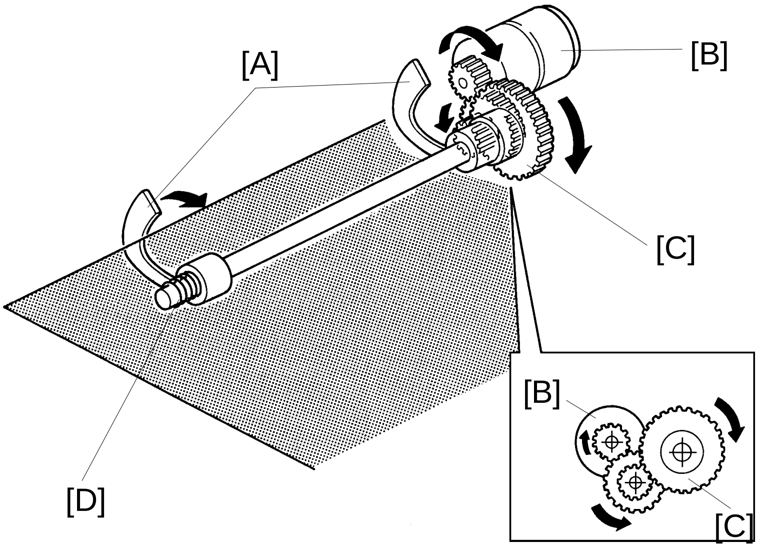
4.6 SEPARATION PLATE PRESSURE RELEASE MECHANISM

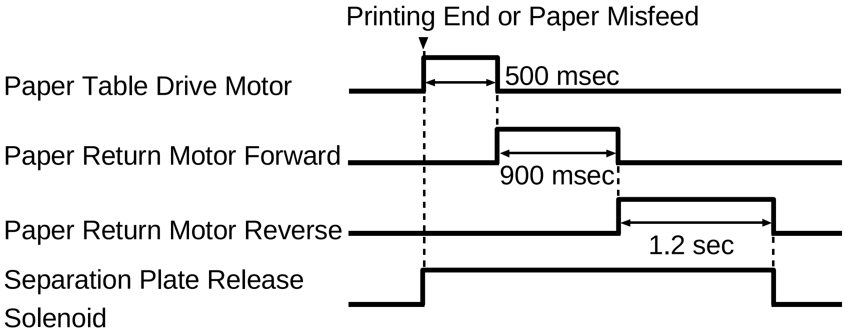


When the paper table starts going down, the separation plate release solenoid [A] is energized. The pressure release arm [D] turns clockwise, and the separation plate [C] moves down from the upper separation roller. This mechanism allows for easy removal of any paper caught between the upper separation roller and the separation plate.

After the paper table is lowered, the separation plate release solenoid is de-energized. Spring [B] tension moves the separation plate back to the original position.

4.7 PAPER RETURN MECHANISM



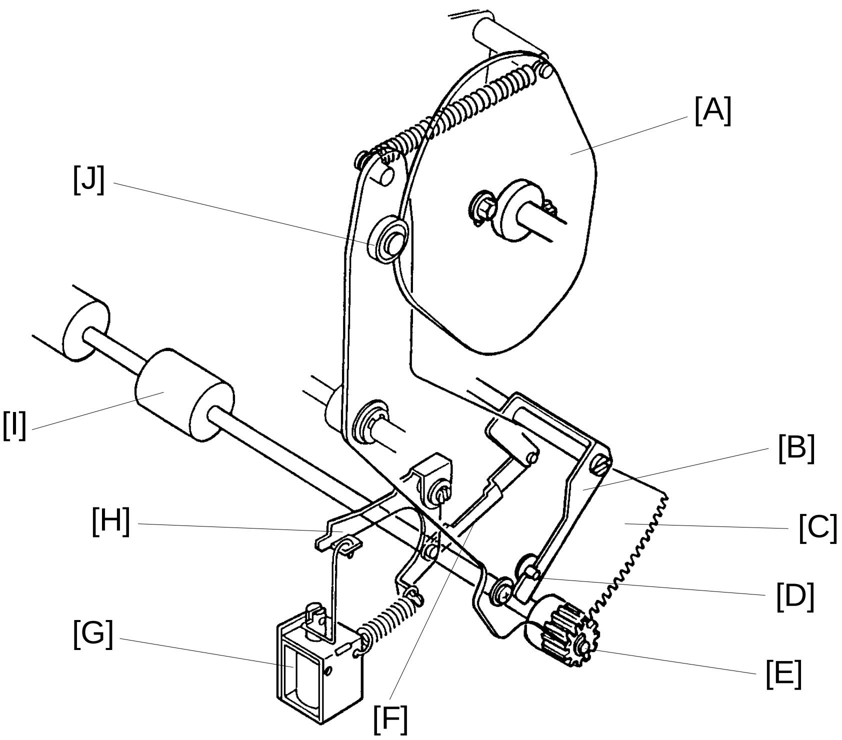


When the paper feed stops, there may still be some paper between the upper and lower separation rollers. This mechanism returns any paper between the rollers back to the paper stack on the paper table.

When the paper table has been lowered, the paper return motor [B] (stepping motor) starts rotating. The paper return levers [A] then turn toward the paper table, and push the paper between the upper and lower separation rollers back onto the paper stack on the paper table.

The paper return levers turn toward the paper table for 900 milliseconds. Then, The paper return motor starts rotating in reverse. This helps the spring [D] pull back the levers. (In reverse, the motor does not turn the levers directly through the gears because one gear [C] has a one-way clutch.) The paper return motor keeps on rotating for 1.2 seconds. During this period the paper return levers hit the edge of a bracket and stop. When the paper return levers are stopped, the paper return motor is still turning. However, this rotation is not transmitted to the levers due to the one-way clutch in the gear [C].

4.8 SECOND FEED ROLLER MECHANISM



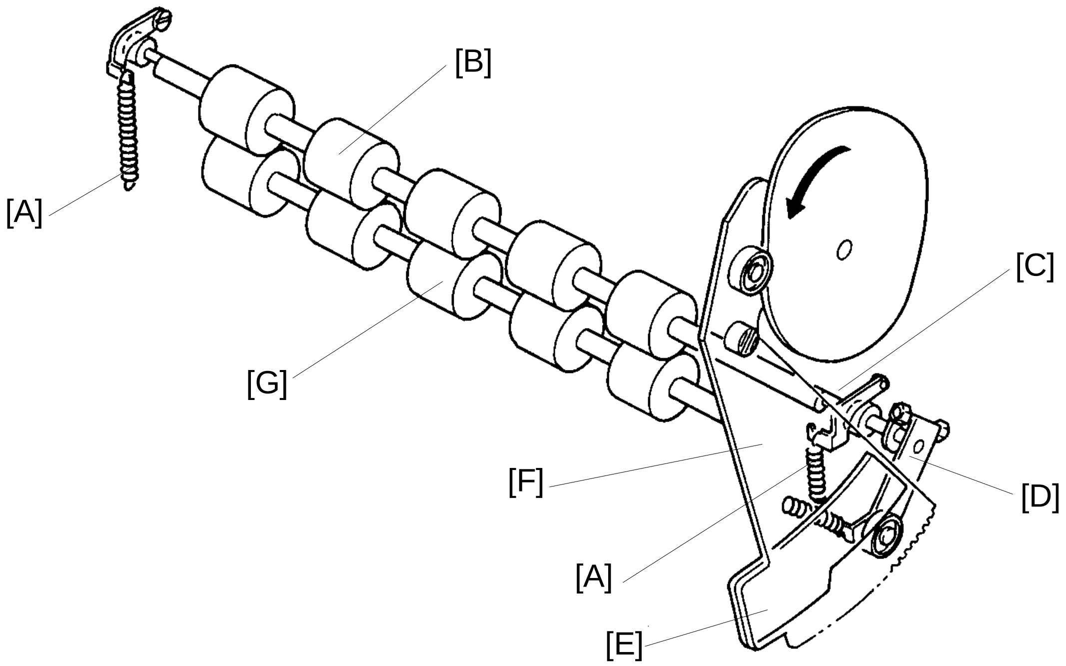
[Drive Mechanism]

The lower second feed roller [I] is driven by the sector gear [C] and the feed roller gear [E]. When the paper feed solenoid [G] turns on, the link [F] combined with the paper feed roller sector stopper [H] are pulled.

The bearing [J] of the sector gear moves along the second feed roller cam face. When the bearing of the sector gear comes to the top of the lower second feed roller cam [A], the stopper [B] is released from the sector gear as a clearance is formed between the pin of the sector gear [D] and the stopper.

When the feed roller gear turns counterclockwise, its rotation is not transmitted to the lower second feed roller due to the one-way clutch bearing press-fit into the gear.

When the bearing of the sector gear moves up from the bottom of the second feed roller cam, the sector gear turns counterclockwise and the feed roller gear turns clockwise. As the rotation of the feed roller gear is transmitted to the lower second feed roller, the lower second feed roller turns clockwise to feed the paper to the drum section.



[Release Mechanism]

The release mechanism does two things: it raises and lowers the upper second feed roller, and it activates the lower one. It also synchronizes these two steps.

The mechanism is made up of several parts. First, a cam which transmits motion to a sector gear [F]; then another cam [E] that is part of the sector gear. A lever [D] is rotated by this cam through the lever's bearing. There are two rollers called the second feed rollers: the upper one [B] and the lower one [G]. The lever turns a shaft [C] and this shaft moves the upper roller.

At the beginning of each cycle the two rollers are apart, they will come together halfway through the cycle and at the end of the cycle they will again be apart.

At first, the rollers are apart, and the sector gear is ready to start moving clockwise. The lever's bearing is in contact with the sector gear's cam. As the gear turns clockwise, it causes the cam to turn the lever in the same direction (clockwise).

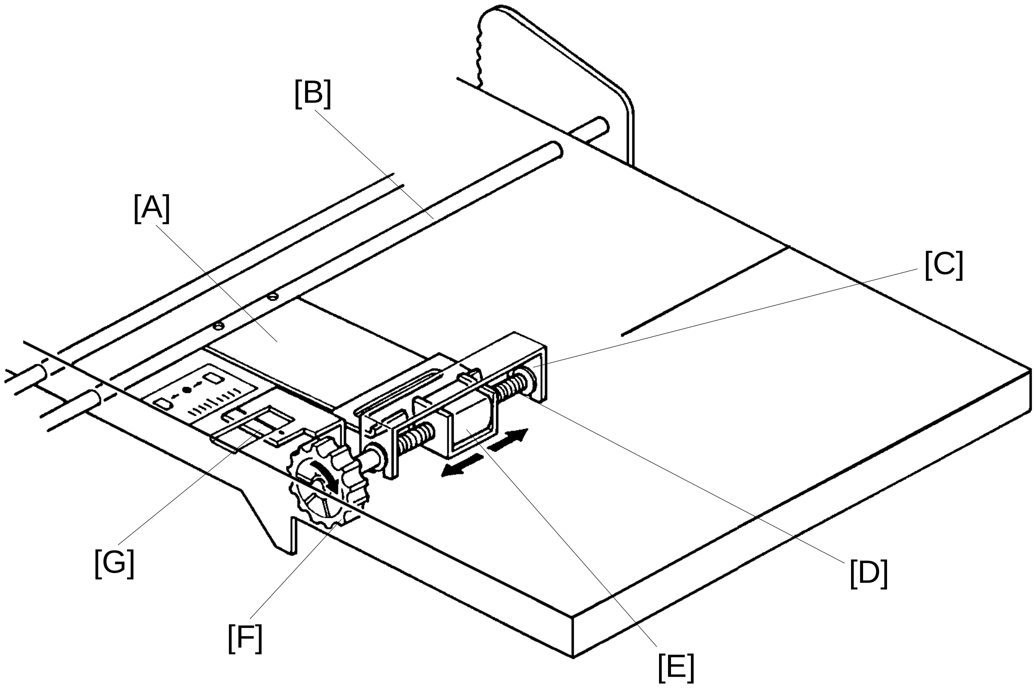
The lever then lowers the upper roller [B]. It does this by turning the roller's eccentric shaft [C]. Eccentric means that the shaft does not go through the center of the roller, but actually is a little off center. So when the shaft turns the roller, the roller moves up or down.

When the cycle is halfway through, the sector gear has reached its maximum clockwise position. Now the upper roller touches the lower one and a pair of springs [A] apply tension at each end of the upper roller. Until now the lower roller has not turned.

At this point, the paper arrives from the first paper feed rollers. The leading edge hits the two rollers and the paper buckles slightly. This insures that the paper will go into the rollers straight.

The lower roller now begins turning and feeds the paper to the drum section. The sector gear is now turning counterclockwise, raising the upper roller. The gear returns to its original position and the cycle is now over.

4.9 PAPER TABLE SIDE ADJUSTMENT MECHANISM



The shaft [D] of the fine adjusting dial [F] is threaded. The inside of the sleeve [E] is also threaded. The sleeve is fixed to the paper table stay [B] through a bracket [A].

The paper table bracket [C] mounted under the table is fixed on both ends of the adjusting dial shaft. When the adjusting dial is turned clockwise, the feed table bracket [C] and the paper table move to the right.

The indicator [G] fixed to the bracket [A] shows the movement value of the paper table.

4.10 PAPER TABLE UP/DOWN MECHANISM

The paper table is raised and lowered by the paper table drive motor.

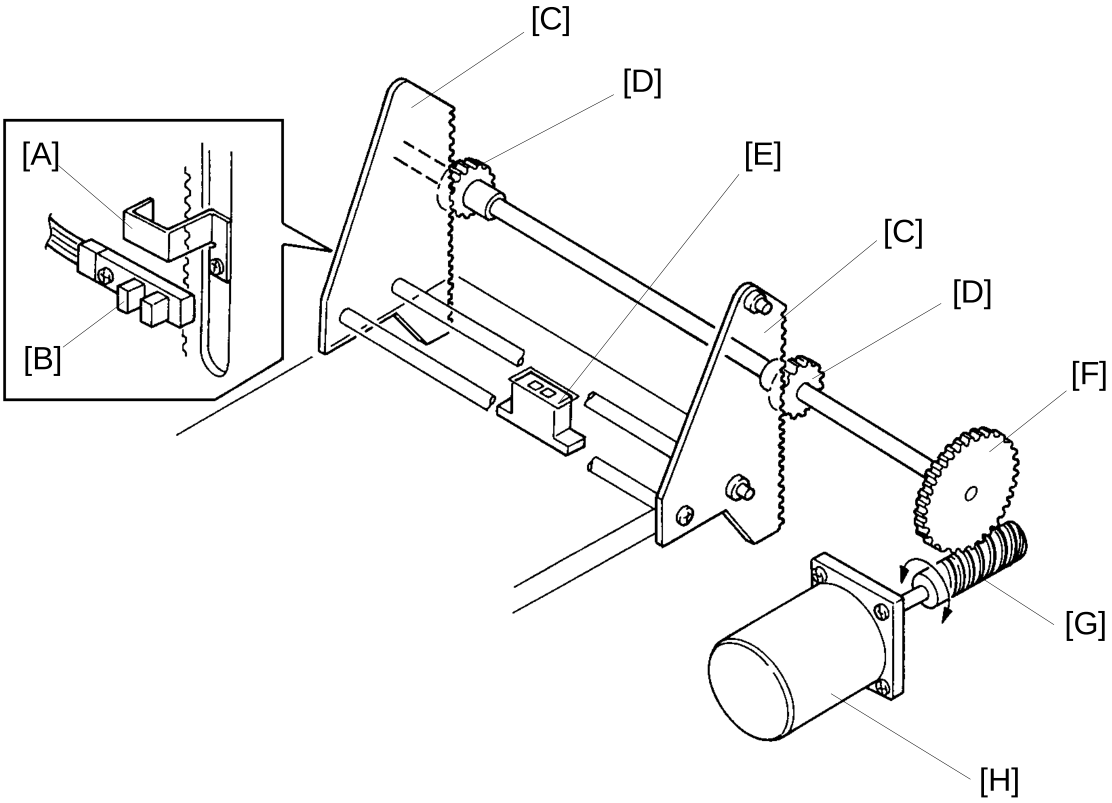
The paper end sensor [E] (a reflective photosensor) is actuated when the paper is set on the paper table. When the Print Start key is pressed, the paper table drive motor [H] starts turning clockwise and the worm gear [G] also turns. The worm wheel [F] turns clockwise and both gears [D] turn to raise the racks [C].

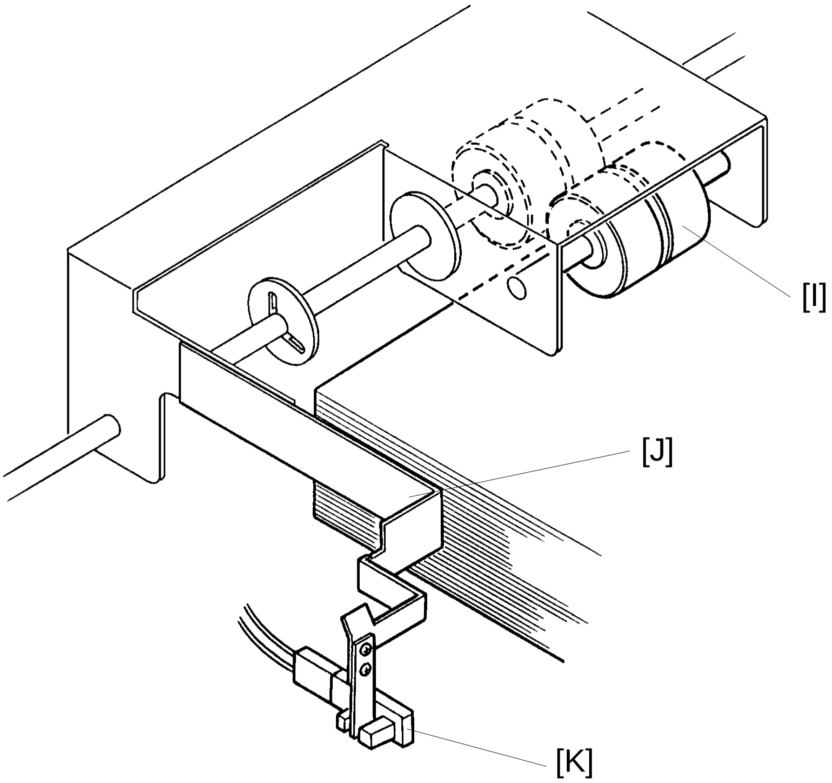
As the paper table rises, the paper pushes against the paper feed roller [I]. This, raises the lever [J] which is mounted on the paper feed bracket. This activates the paper table height sensor [K] (the phototransistor senses the light from the photocoupler, which up to now was cut off by the lever), and that causes the paper table motor [H] to turn OFF and stop raising the paper table.

As printing proceeds and the paper level runs down, the lever [J] cuts off the light of the photocoupler and the motor [H] turns clockwise until the phototransistor is reactivated. As a result, the top of the paper stack is constantly kept at the correct height.

When no paper is present, the paper end sensor [E] is not activated and the motor [H] turns counterclockwise to lower the paper table. The paper table is lowered until the actuator [A] (fixed to the front rack) interrupts the lower limit sensor [B].

When a misfeed occurs or printing is finished, the paper table motor [H] turns counterclockwise for 500 milliseconds, slightly lowering the paper table.


[C]
[D]
[A]
[E]
[C]
[D]
[B]
[F]
[G]
[H]


[I]
[J]
[K]

4.11 PAPER SIZE DETECTION

This machine uses two methods for detecting paper size. One method is used for the paper on the paper table, and the other is for the optional cassette.

The machine determines the master plotting area based on the detected paper size and the original size (which is detected during the original scanning process). If the original size is different from the paper size, the machine compares the length of the original and paper. The master's length will be the shorter of the two. The machine runs the same procedure for the width. (The determined plotting area is not changed if paper on the paper table is replaced with another size paper during the master making process.) The master plotting area for each detected paper size is as follows:

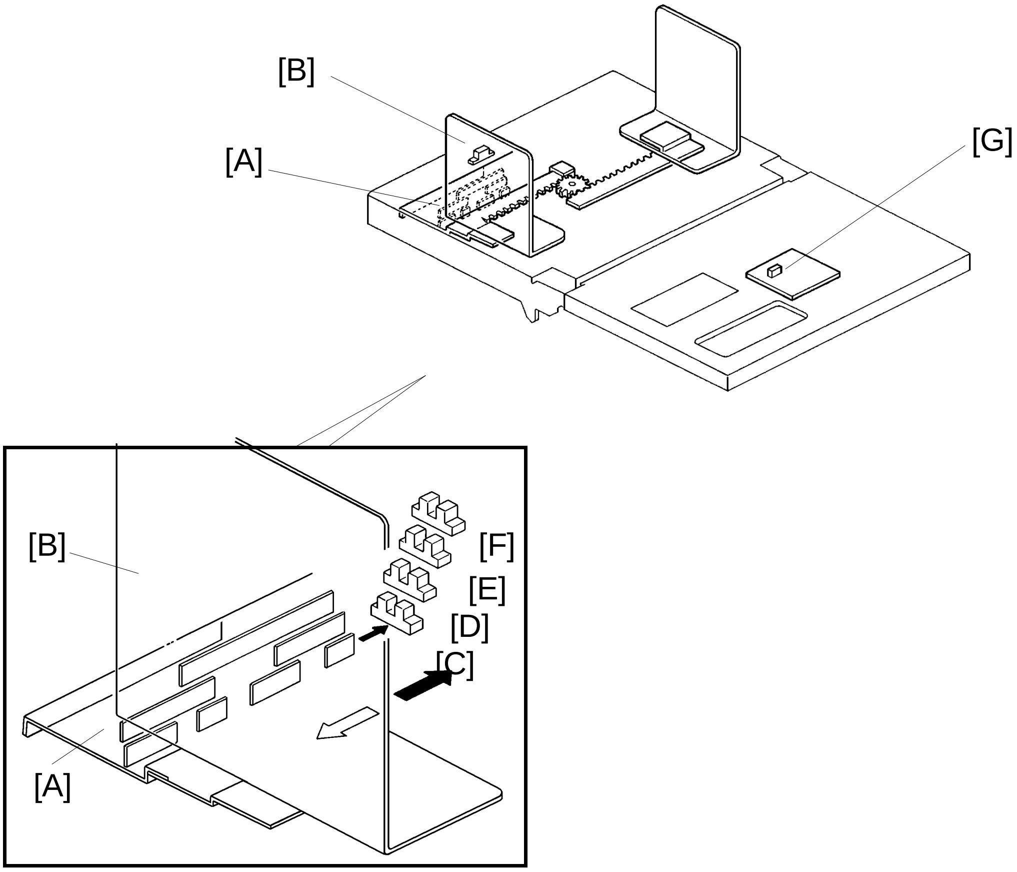
Paper Size	Master Plotting Area	
	Width (mm)	Length (mm)
A3	292	407
B4	256	351
A4	208	284
A4-S	292	197
B5	180	244
B5-S	256	169
A5	146	197
DLT	278	407
LG	214	343
LT	214	266
LT-S	278	203
HLT	138	203

S: Sideways feed

The machine can only distinguish standard sizes. If a non-standard sized paper or original is used, the machine will judge the non-standard sized paper or original as a standard size. If the actual sized paper, the non-standard sized paper, or the original is larger than the judged paper size, the remaining area will not be plotted on the master.

In that case, the original width, paper size, and cassette size detections can separately be canceled using SP mode in order to obtain the entire image of the original. However, the press roller may become contaminated with ink when paper is smaller than the plotted image on the master. The ink will be transferred to the back side of the prints when the next printing is done with larger paper.

[Paper Size Detection for Paper Table]



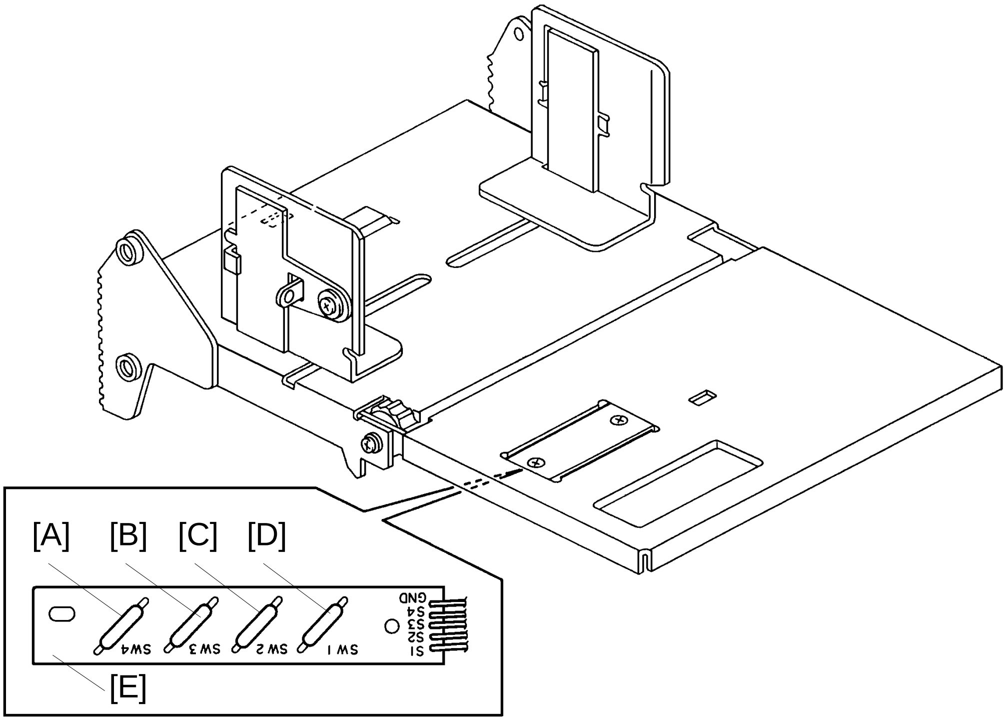
The paper width detection plate [A] installed behind the front paper side guide [B] has several interrupters.

The front and rear paper side guides are adjusted to the paper width. Depending on which paper width sensors [C] [D] [E] [F] (4 photointerrupters) are interrupted and whether the paper length sensor [G] (a reflective sensor) on the paper detection PCB is activated, the machine determines the paper size as shown in the below table.

Paper Size	A4-S	LT-S	B5-S	LT	A4		B5	A5	HLT		A3	DLT	B4	LG
Paper Width Sensor-0 [C]	o	x	o	x	x	x	o	x	x	o	o	x	o	x
Paper Width Sensor-1 [D]	x	o	o	x	x	x	o	o	o	o	x	o	o	x
Paper Width Sensor-2 [E]	x	x	o	o	o	o	o	x	x	x	x	x	o	o
Paper Width Sensor-3 [F]	x	x	x	x	x	o	o	o	o	o	x	x	x	x
Paper Length Sensor [G]	x	x	x	x	x	x	x	x	x	x	o	o	o	o

x: Non-blocked or Non-activated, o: Blocked or Activated
S: Sideways feed

[Cassette Paper Size Detection]

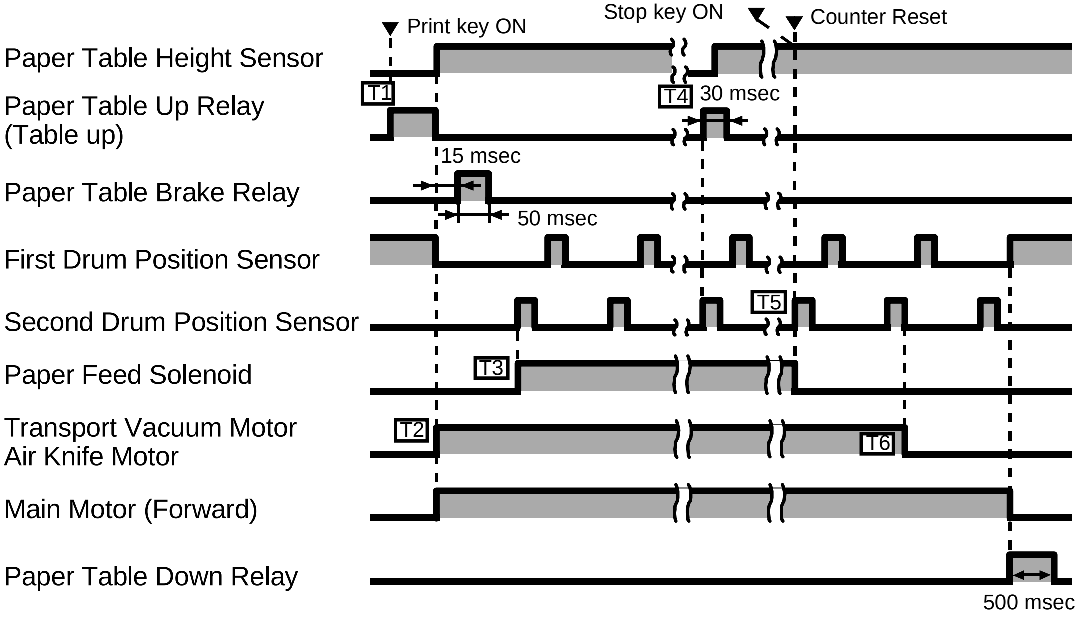


The machine determines the cassette size through the cassette size detection PCB [E]. The reed switches on this PCB are activated by magnets positioned on the back of the cassette. The magnets are positioned according to the paper size (the magnet position for each of size paper is described on the back of the cassette). Depending on which reed switches [A] [B] [C] [D] are activated, the machine determines the cassette size as shown in the table below:

Paper Size	A3	B4	A4	A4-S	B5	B5-S	DLT	LG	LT	LT-S
Switch - 1 [D]	x	x	x	x	x	x	x	o	o	o
Switch - 2 [C]	x	x	x	o	o	o	o	x	x	x
Switch - 3 [B]	x	o	o	x	x	o	o	o	x	x
Switch - 4 [A]	o	x	o	x	o	x	o	x	x	o

x: Not activated, o: Activated by magnet, S: Sideways feed

4.12 ELECTRICAL TIMING



T1: When paper is set on the paper table and the Print key is pressed, the paper table moves up until the paper table height sensor is activated. 15 milliseconds after the height sensor is activated, the paper table brake signal turns on for 50 milliseconds and SSR303 in the AC drive PCB is energized. Brake force is then applied to the paper table drive motor to prevent the paper table from overrunning.

T2: When the height sensor is activated, the transport vacuum motor and air knife motors turn on. At the same time, the drum (main motor) starts turning forward (printing direction).

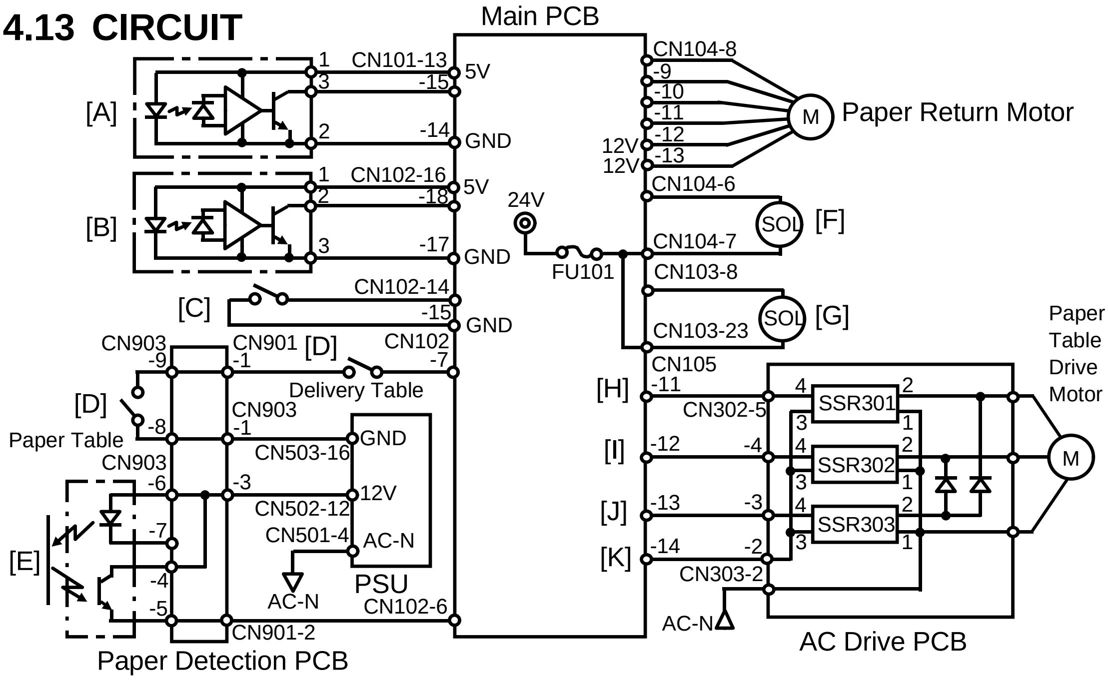
T3: The paper feed solenoid is energized when the interrupter at the rear side of the drum activates the second drum position sensor.

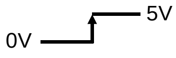
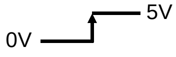
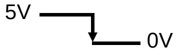
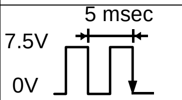
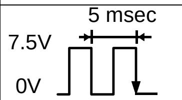
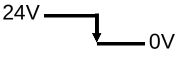
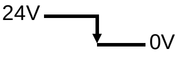
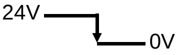
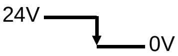
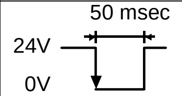
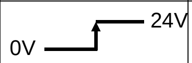
T4: After the paper is fed, the top of the paper stack is a little lower and the height sensor is de-activated. When the second drum position sensor is activated, the paper table drive motor starts rotating. This lifts the paper table until the height sensor is re-activated (approximately 30 millisecond after the motor starts). When the height sensor is re-activated, the motor stops rotating.

T5: After the Stop key is pressed, the paper feed solenoid is de-energized and the second drum position sensor is activated. This will reset the counter on the operation panel.

T6: When the second drum position sensor is again activated after one more drum rotation, the transport vacuum motor and air knife motors turn off. Then, the drum rotates once more and stops at the first drum position actuation position (the drum home position).

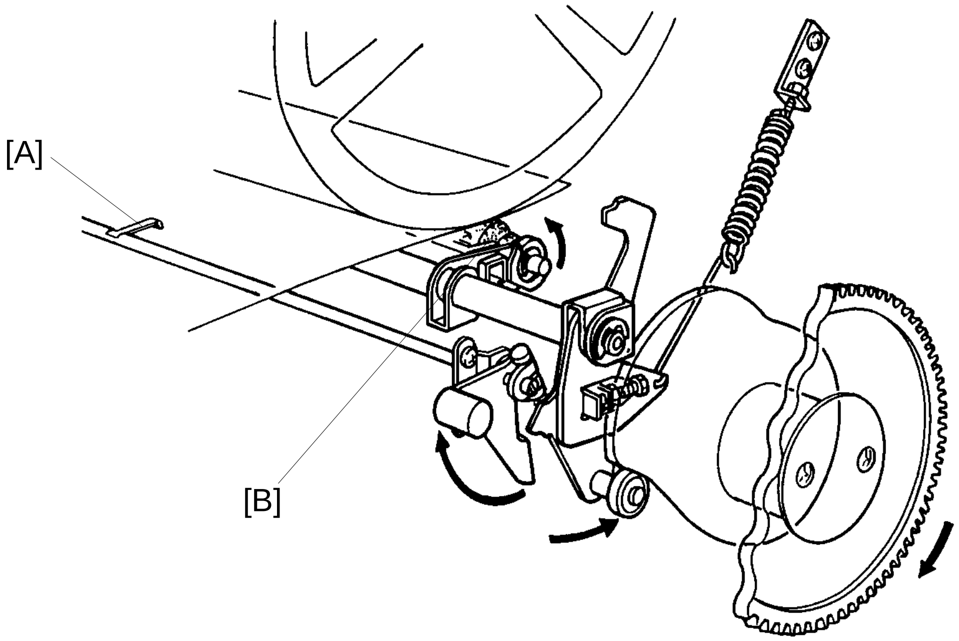
4.13 CIRCUIT



<table>
<tr><th rowspan="2">Component Name</th><th rowspan="2">In/Out</th><th colspan="2">Main PCB</th><th rowspan="2">Description</th></tr>
<tr><th>CN No.</th><th>Signal Level</th></tr>
<tr><td>Paper Table Lower Limit Sensor [A]</td><td>In</td><td>101-15</td><td> </td><td>Signal goes High when the sensor is interrupted.</td></tr>
<tr><td>Paper Table Height Sensor [B]</td><td>In</td><td>102-18</td><td> </td><td>Signal goes High when the sensor is interrupted.</td></tr>
<tr><td>Paper Table Down Button [C]</td><td>In</td><td>102-14</td><td> </td><td>Signal goes Low when the button is pressed.</td></tr>
<tr><td>Paper Table & Delivery Table Open Switches [D]</td><td>In</td><td>102-7</td><td> </td><td>Pulse signal goes Low when the paper table and delivery table are open and the switches are turned on.</td></tr>
<tr><td>Paper End Sensor [E]</td><td>In</td><td>102-6</td><td> </td><td>Pulse signal goes Low when the sensor detects paper.</td></tr>
<tr><td>Separation Plate Release Solenoid [F]</td><td>Out</td><td>104-6</td><td> </td><td>The solenoid is energized when the signal goes Low.</td></tr>
<tr><td>Paper Feed Solenoid [G]</td><td>Out</td><td>103-8</td><td> </td><td>The solenoid is energized when the signal goes Low.</td></tr>
<tr><td>Paper Table Up Relay [H]</td><td>Out</td><td>105-11</td><td> </td><td>The paper table up relay is energized when the signal goes Low. (The table moves up.)</td></tr>
<tr><td>Paper Table Down Relay [I]</td><td>Out</td><td>105-12</td><td> </td><td>The paper table down relay is energized when the signal goes Low. (The table moves down.)</td></tr>
<tr><td>Paper Table Brake Relay [J]</td><td>Out</td><td>105-13</td><td> </td><td>Activated for 50 milliseconds when the paper table reaches the upper or lower limit. Brake force is applied to the paper table drive motor.</td></tr>
<tr><td>Common Relay Line [K]</td><td>Out</td><td>105-14</td><td> </td><td>Activated when the main switch is turned on.</td></tr>
</table>

5. PRINTING SECTION

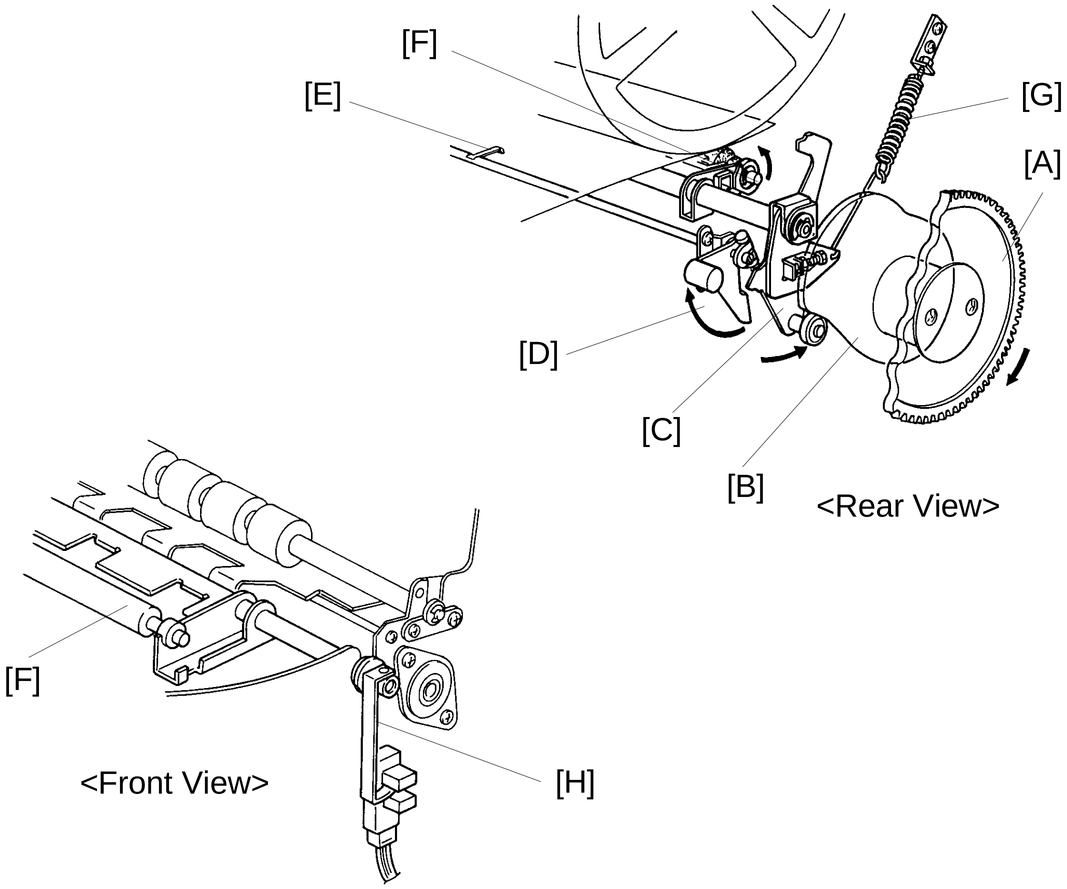
5.1 OVERALL



In this section, the paper detecting feeler [A] detects whether paper is fed correctly to the second paper feed roller section or not.

Only when the paper is correctly fed, printing pressure is applied (the press roller [B] touches the drum) to transfer the ink from the master to the printing paper.

5.2 PAPER DETECTING AND PRINTING PRESSURE ON/OFF MECHANISM



<Rear View>

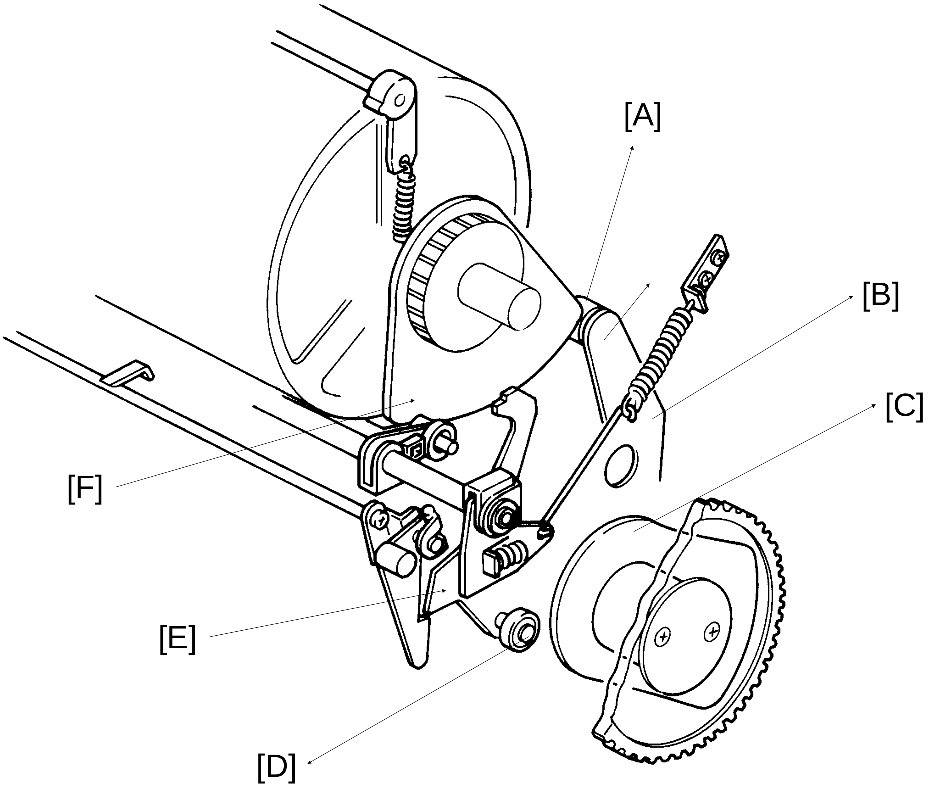
<Front View>

During the printing process, the main motor turns the gear [A] and pressure cam [B] clockwise.

When the bearing of the pressure ON/OFF lever [C] reaches the top of the pressure cam [B], the paper detecting arm [D] separates from the pressure ON/OFF lever [C]. At this moment, if paper is being fed, the paper fed presses down the paper detecting feeler [E]. Then, the paper detecting arm [D] turns clockwise to release the pressure ON/OFF lever. As a result, the pressure ON/OFF bearing continues moving along the pressure cam and the press roller [F] moves against the drum to apply printing pressure.

The printing pressure can be adjusted by the pressure spring [G]. The printing pressure sensor feeler [H] is away from the sensor while printing pressure is applied.

5.3 PRINTING PRESSURE ON/OFF MECHANISM FOR A4/LT DRUM



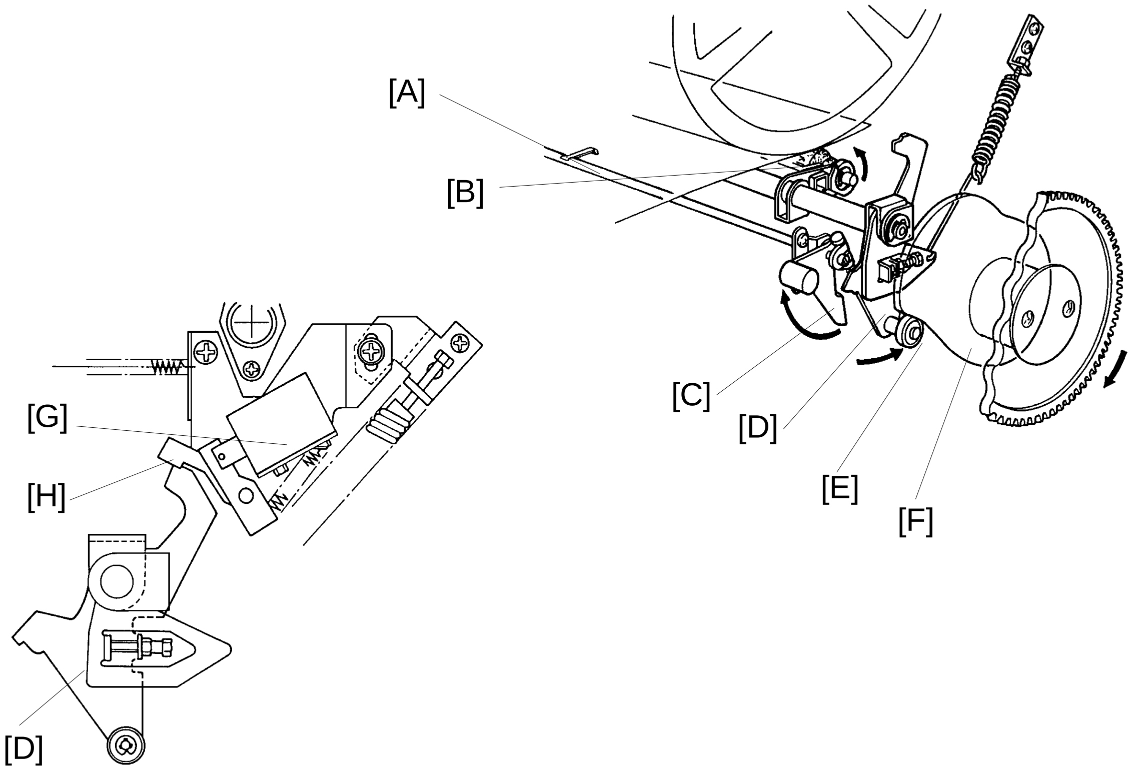
When the A3/DLT drum is used, printing pressure is applied while the bearing [D] of the pressure ON/OFF lever [E] is on the bottom of the pressure cam [C]. Pressure is released while the bearing is on top of the cam.

However, when the A4/LT drum is used, printing pressure should be released sooner because the master on the A4/LT drum is shorter than the master on the A3/DLT drum. This is to prevent the press roller from getting dirty.

Before the bearing [D] comes to the top of the pressure cam, the bearing [A] of the arm [B] (fixed with the pressure ON/OFF lever) rides up the A4/LT cam [F] and the arm moves (arrow).

As a result, the pressure ON/OFF lever turns clockwise and printing pressure is released.

5.4 PRINTING PRESSURE RELEASE MECHANISM



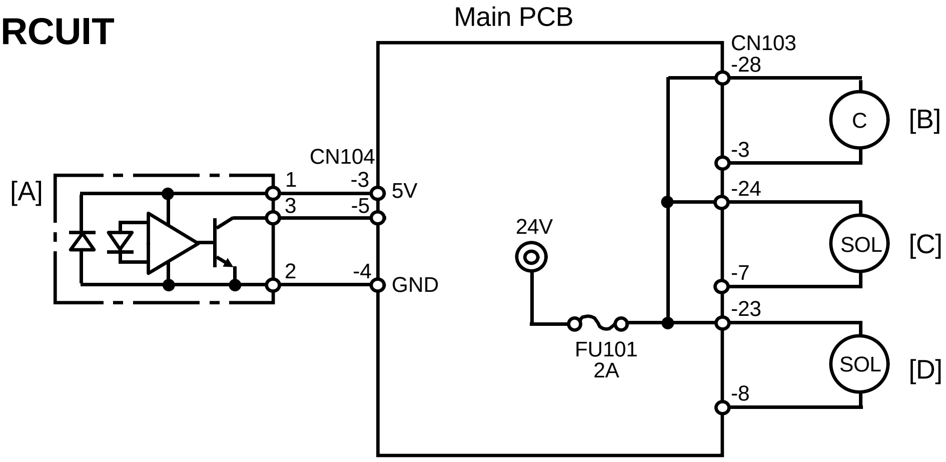
The pressure release solenoid [G] energizes to release the pressure ON/OFF lever [D] when the paper feed solenoid energizes during normal operation.

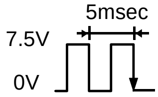
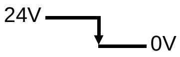
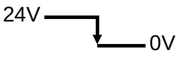
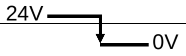
If a jammed sheet of paper in the printing section presses down on the paper detecting feeler [A], the pressure ON/OFF lever [D] remains disengaged from the paper detecting arm [C]. Printing pressure will keep on being applied to the drum.

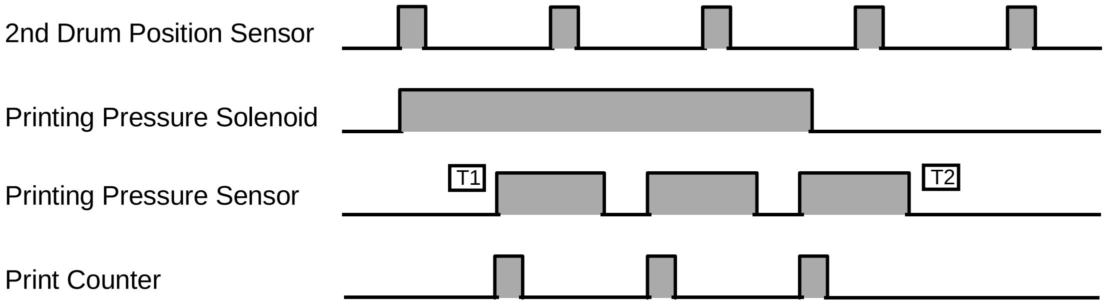
If printing pressure is still applied when an operator slides out the drum unit to remove the jammed sheet, the drum surface and the press roller may be damaged.

To prevent this, printing pressure is released from the drum if a paper misfeed is detected. When a misfeed is detected, the printing pressure solenoid [G] is de-energized. Then, the drum rotates to the home position. During the drum return to the home position, the bearing [E] will ride on top of the pressure cam [F]. This rotates the pressure ON/OFF lever [D] clockwise, then the stopper [H] engages the lever [D] (the stopper [H] is pressed down by spring tension). Thus, printing pressure is released since the lever [D] is connected to the press roller [B].

5.5 CIRCUIT



Component Name	In/Out	Main PCB		Description
		CN No.	Signal Level	
Printing Pressure Sensor [A]	In	104-5		Activated when the sensor is interrupted.
Print Counter [B]	Out	103-3		Activated when the counter is energized.
Printing Pressure SOL [C]	Out	103-7		Activated when the sensor is energized.
Paper Feed SOL [D]	Out	103-8		Activated when the sensor is energized.

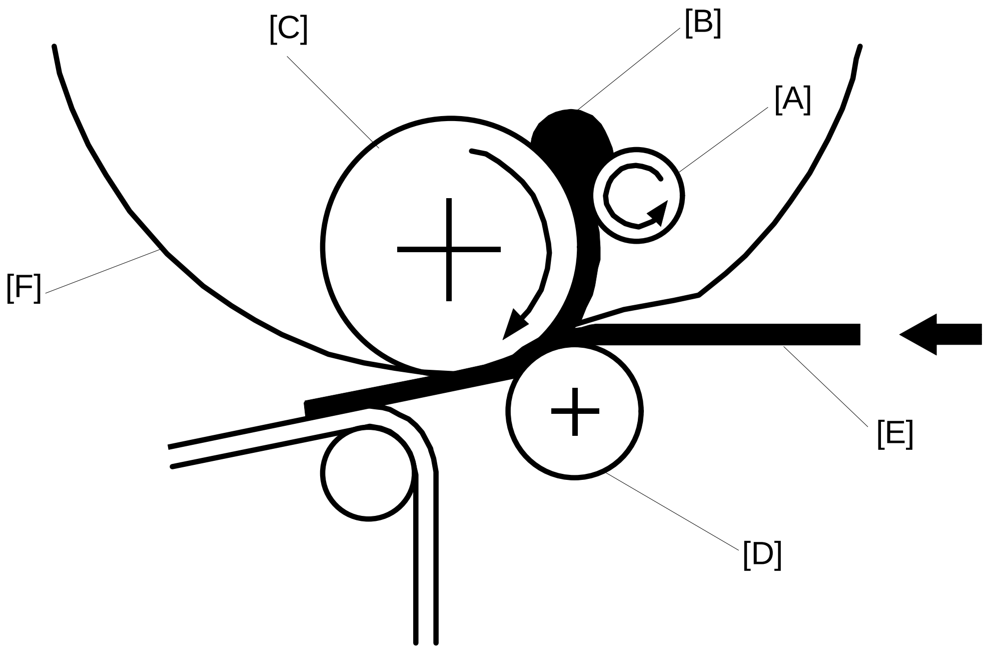


T1: When printing pressure is applied and the printing pressure sensor is not interrupted, the print counter signal is applied for 100 milliseconds to increase the total counter and decrease the counter on the operation panel.

T2: When the printing pressure sensor is not interrupted and the copy counter on the operation panel indicates "0", the paper feed solenoid and the printing pressure solenoid turn off to stop paper feeding and to release printing pressure.

6. DRUM SECTION

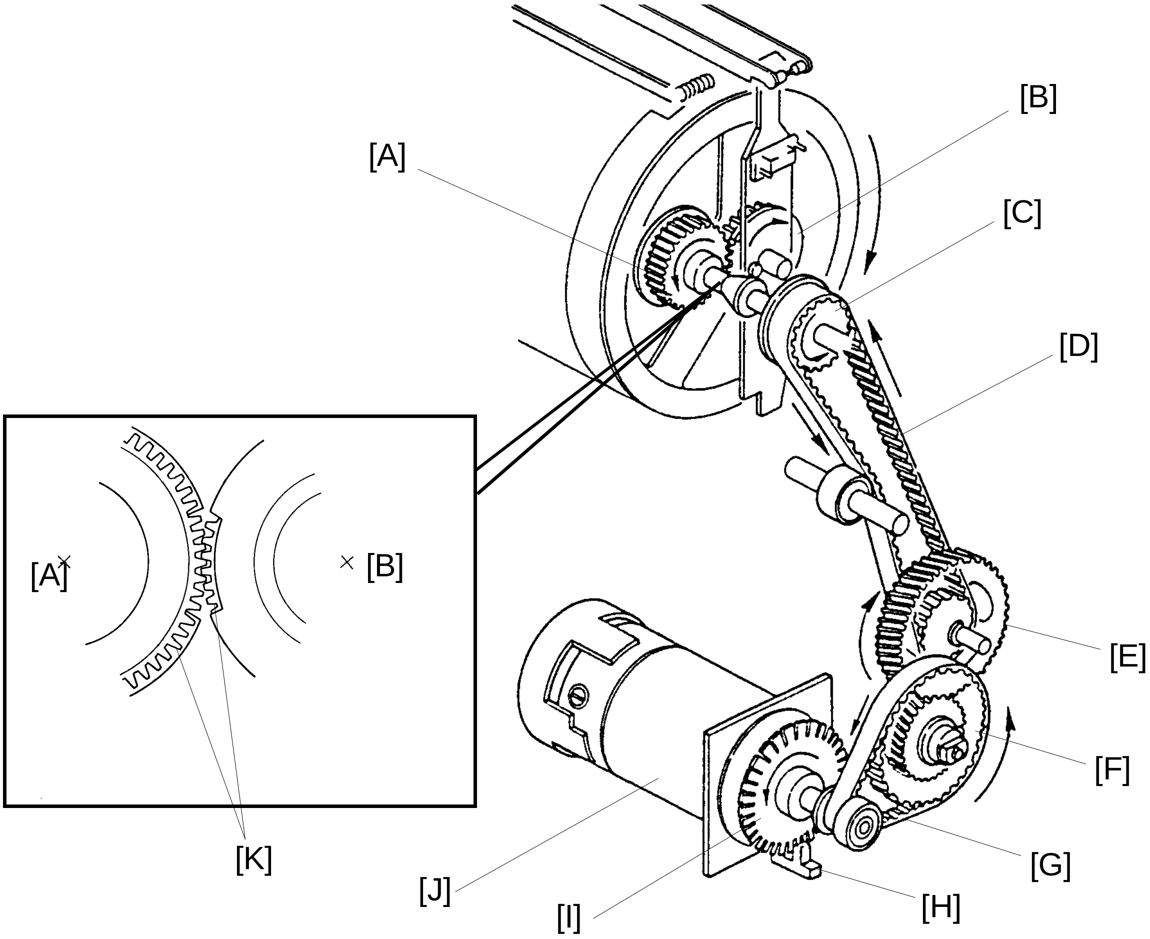
6.1 OVERALL



[A]: Doctor Roller
[B]: Ink
[C]: Ink Roller
[D]: Press Roller
[E]: Paper
[F]: Drum

In this section, ink is supplied from the ink cartridge and is applied to the ink roller uniformly. The ink is then transferred to the printing paper through the holes in the master.

6.2 DRUM ROTATION MECHANISM

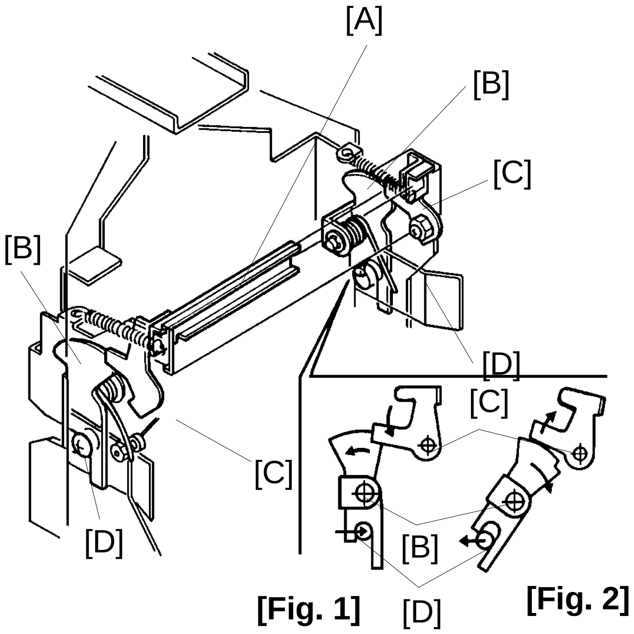


The main motor (DC motor) [J], located under the rear side plate, turns the drum either clockwise or counterclockwise through belt [G], then through gears [F] and [E], then belt [D], and pulley [C]. The drive mechanism uses helical gears because they turn more quietly.

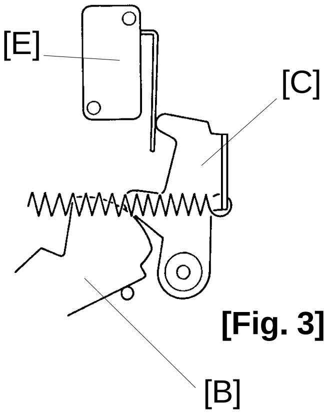
Notice gear [A], the last gear of the drive, and gear [B] at the rear end of the drum: they each have a part cut out of the flange [K]. When the drum is in the home position, the cutout parts meet, and the drum unit can be pulled out.

Pulse disk [I] and sensor [H] on the main motor shaft monitor the drum rotation speed.

6.3 DRUM LOCK MECHANISM 1



[Fig. 1] **[Fig. 2]**

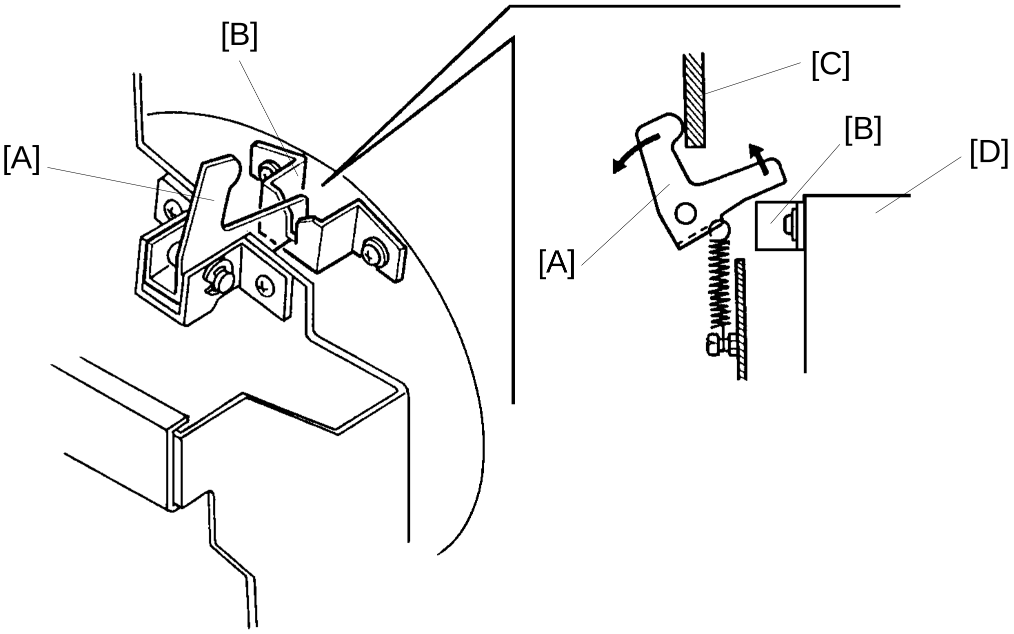


[Fig. 3]

When the drum unit is set in the machine, the arm [B] is pushed by the lock pin [D] until the top of the arm [B] is locked by the stopper [C]. The lock pin [D] is mounted on the front side plate of the main body. This completely locks the drum unit in the machine (Fig. 1). At the same time, the top of the right stopper [C] turns on the drum detection switch [E]. The switch [E] tells the machine that the drum unit is set (Fig. 3).

Pulling the lever [A] to the operation side turns the stopper [C] clockwise and disengages the arm [B]. Therefore, the lock pin [D] of the main body is also released from the arm [B] due to spring tension (Fig. 2).

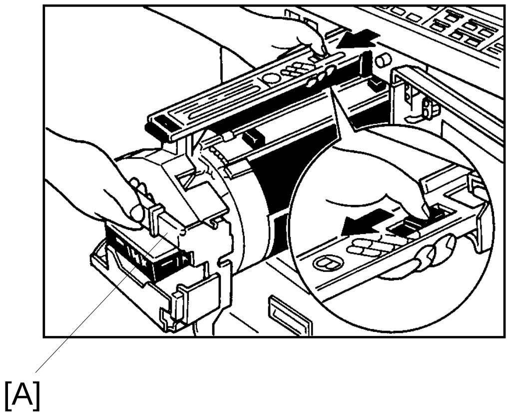
6.4 DRUM LOCK MECHANISM 2

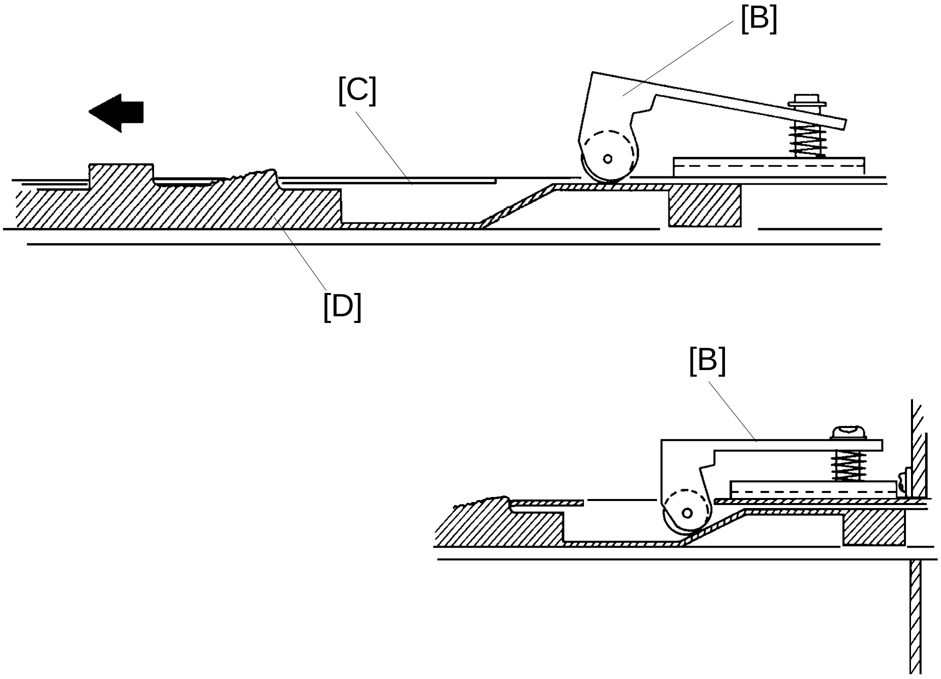


To prevent the drum from rotating when the drum unit is slid out, the drum stopper [A] drops into the drum lock [B]. This secures the drum [D].

When the drum unit is put back, the front side plate of the main body [C] holds the drum stopper [A] out of the drum lock.

6.5 DRUM LOCK MECHANISM 3

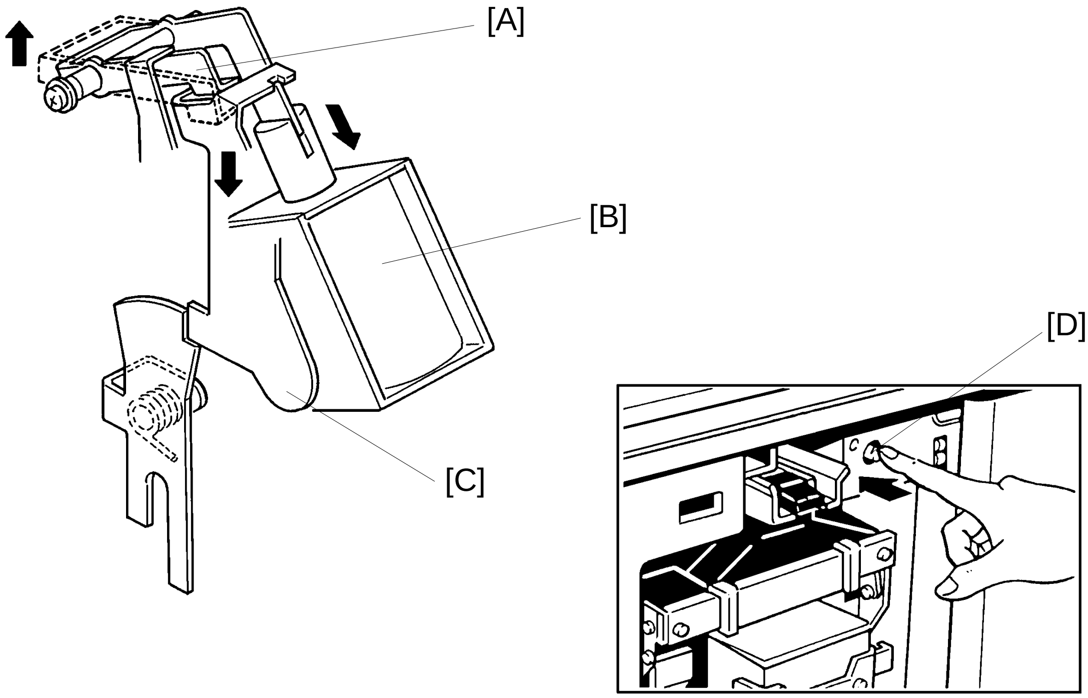




When the drum is pulled out, the drum stopper [B] drops in the hole (see above figure). This stops the drum unit from being pulled out any further. Now, if the operator pulls handle [A], the drum unit won’t fall out.

When the operator pulls stopper release [D] in this direction (arrow), he pushes up drum stopper [B] to the level of drum rail cover [C]. This allows the drum to be removed.

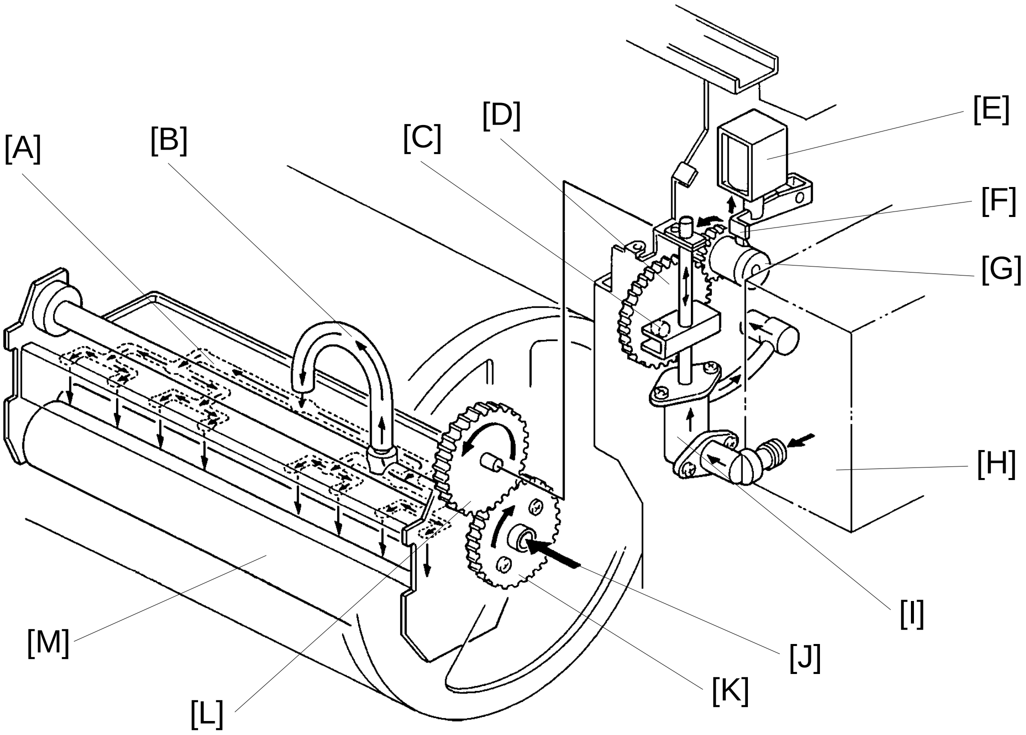
6.6 DRUM LOCK MECHANISM 4



The drum lock solenoid [B] activates when the drum is turning. If someone interrupts the printing cycle by opening a cover, then the drum will stop. If the drum does not stop in the home position, then the drum lock will stay on. The stopper lock arm [A] then locks the left stopper [C] in place. This prevents the drum unit from being removed when it isn’t in the home position.

The Drum Rotating button [D] is to rotate the drum manually. When the drum is not in the home position, the LED for the Drum Rotation button [D] turns red. By pressing the Drum Rotation button until the beeper sounds, the drum returns to the home position and the LED turns green.

6.7 INK SUPPLY MECHANISM



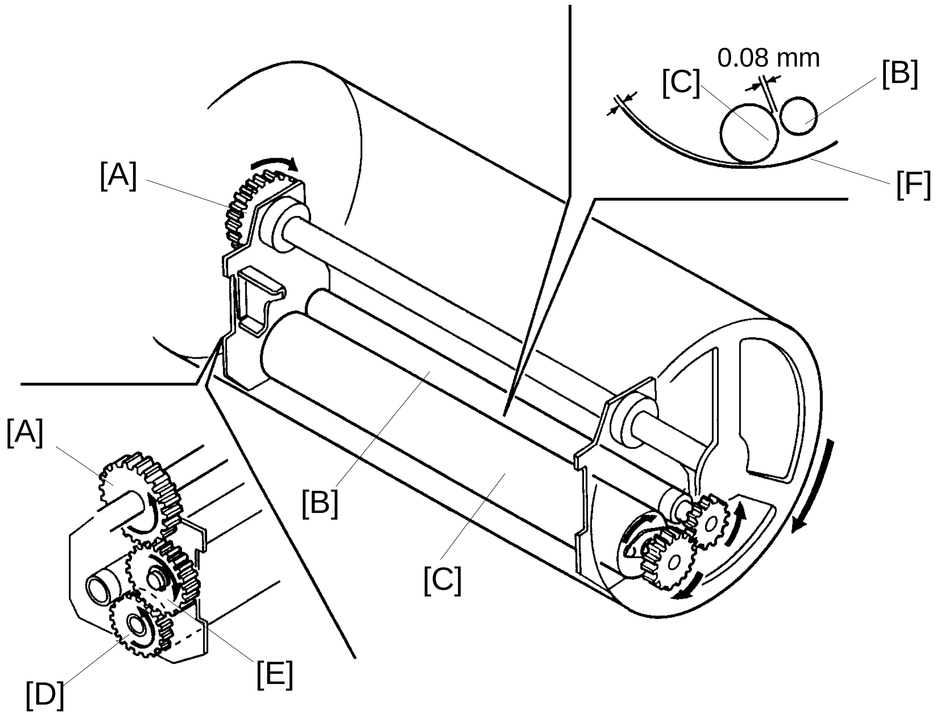
Ink is supplied from the ink cartridge [H] to the ink roller [M] by the ink pump [I] and then through 8 holes in the ink distributor [A].

Drum rotation is transmitted from gear [K] to gear [L], then to the gear of the spring clutch [G]. However, the rotation is not transmitted to gear [D] because of the spring clutch [G].

When the ink detector detects less ink on the ink roller [M], the ink supply solenoid [E] turns on, and the ink supply stopper [F] releases clutch [G] allowing the gear [D] to turn.

The pin [C] moves the pump shaft up and down as the gear [D] rotates. (One stroke of the ink pump occurs for every 2 rotations of the drum.) Therefore, the ink in the ink cartridge is sucked into the pump [I]. The pump then sends the ink out into the drum shaft [J]. Then, the ink goes from the ink distributor [A] onto the ink roller [M] through the tube [B].

6.8 INK KNEADING MECHANISM



The ink kneading mechanism consists of the ink roller [C] and the doctor roller [B]. The ink roller [C] rotates with the drum and the doctor roller [B] insures that the ink goes evenly to the ink roller.

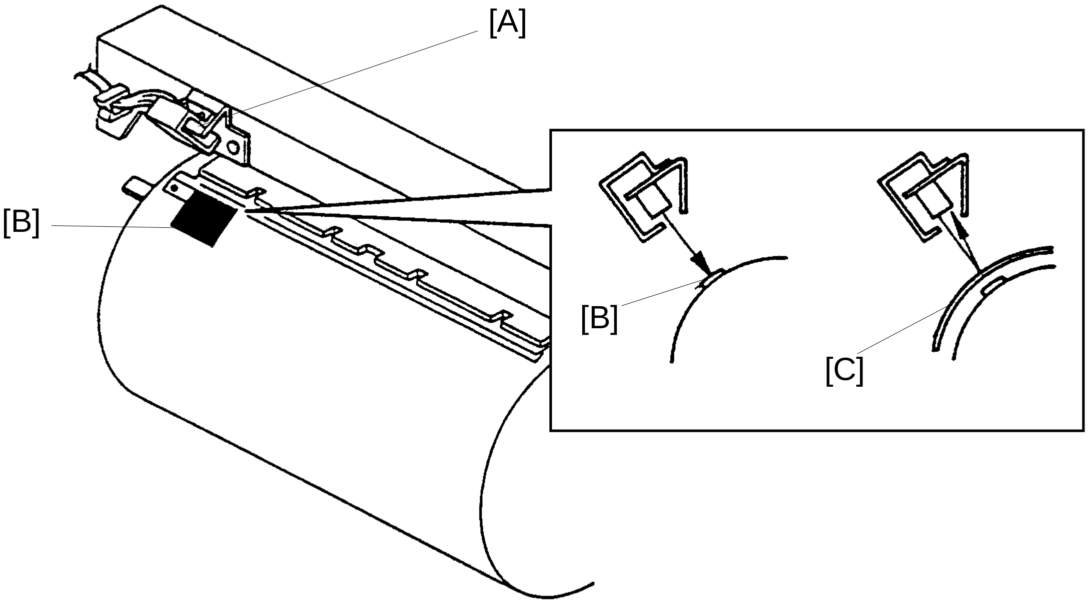
The ink roller [C] rotates with the drum this way: the drum turns a gear [A], the gear [A] turns an idle gear [E], and the idle gear [E] turns the roller gear [D]. The gear [D] is mounted on the ink roller.

The doctor roller is adjusted to give a distance of 0.08 millimeters between itself and the ink roller. It rotates to create an even thickness of ink.

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

During the master eject process, the drum rotates in the reverse direction but the ink roller does not rotate at all: the gear [D] has a one-way clutch to prevent that.

6.9 DRUM MASTER DETECTION

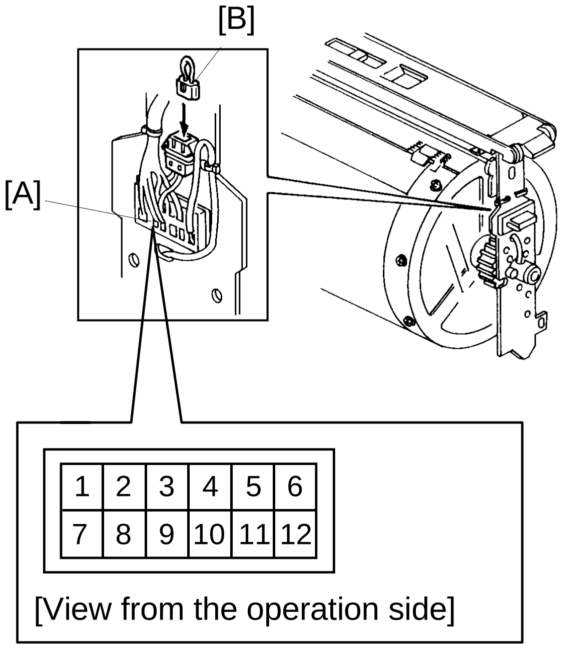


The drum master detection sensor [A] is mounted on the drum rail and it detects whether a master is on the drum.

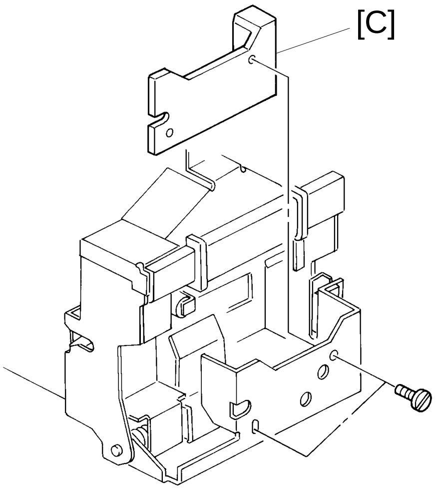
When there is a master on the drum, the black seal [B] is covered and the sensor detects the light reflected from the master [C]. Printing starts when the Print Start key is pressed.

When there is no master on the drum, the black seal is exposed. The black seal does not reflect light back to the sensor. The "M" indicator on the display panel blinks and printing does not start when the Print Start key or the Proof key is pressed. Even if there is no master on the drum, the Master Making key can be pressed after an original is set on the original table.

6.10 DRUM TYPE IDENTIFICATION



Terminal Numbers



The machine identifies the drum type electrically. Depending on which terminal of the drum unit connector [A] is connected to, the corresponding indicator lights up on the operation panel as follows:

Drum Type	Indicator	Terminal Number			
		2	3	4	5
A3/DLT (Original)	A3 or DLT Indicator	1	0	1	0
A3/DLT (Option)	A3 or DLT and Color Indicators	1	1	1	0
A4/LT (Option)	A4 or LT Indicator	1	0	1	1

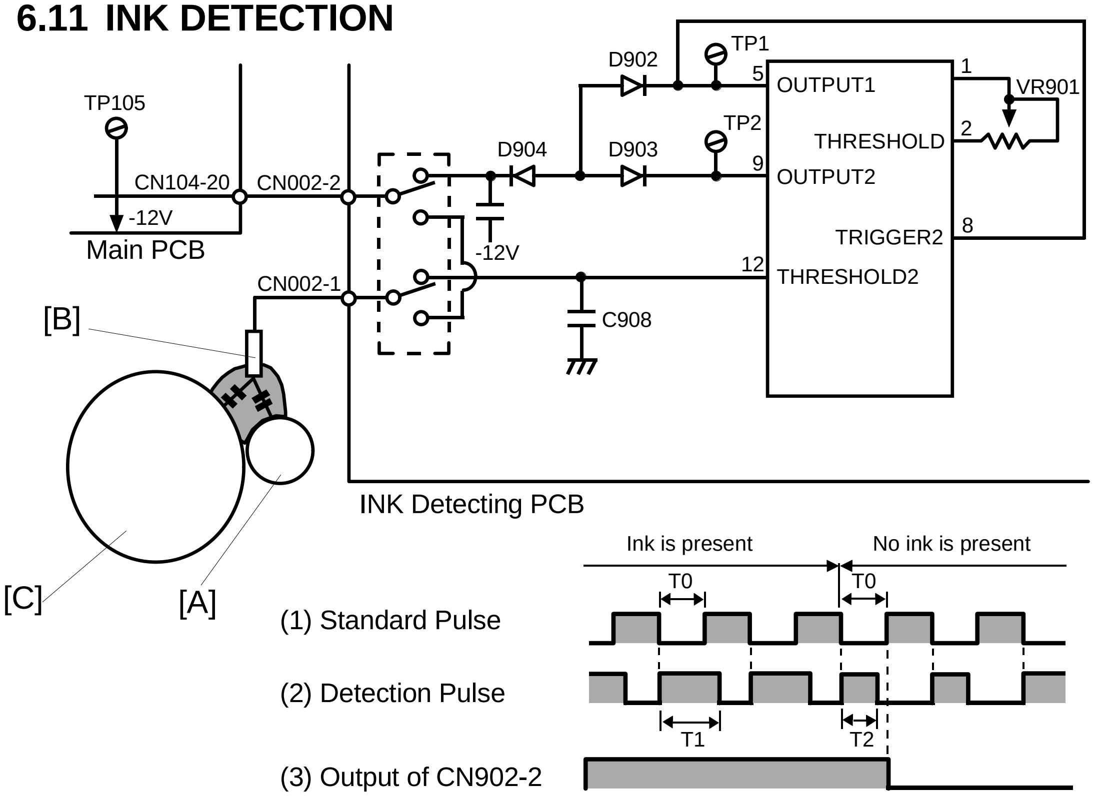
1: Connected, 0: Not connected

To use the A4/LT drum with color ink, terminals no. 2 and no. 3 should be linked using a short connector [B]. This will turn on the color indicator. The short connector is an accessory of the unit, and is included with it.

NOTE: * To use the A4/LT drum with black ink, it is not necessary to use short connector [B].

* To use 800 cc black ink cartridge with the drum, the ink holder spacer [C] must be removed. The ink holder spacer is originally installed in the optional A3/DLT and A4/LT drums and is necessary only for the 500 cc ink cartridges.

6.11 INK DETECTION



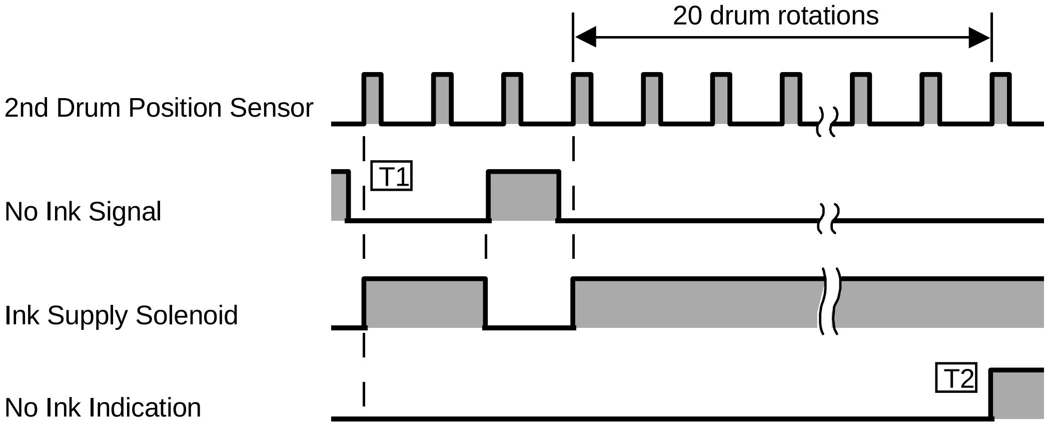
[Ink Detection Circuit]

The detecting pin [B] works like the electrode of a capacitor to detect electrostatic capacity. Through this detecting pin, the time constant of the pulse, which is generated in the ink detection PCB, is different when ink is present and when ink is not present. The detecting pulse is compared to a standard pulse to detect whether there is ink in the drum or not .

(1) The standard pulse is output from OUTPUT 1. The pulse length (T_0) can be adjusted by adjusting VR901.

(2) OUTPUT 2 is the detection pulse. The time constant is determined by C908 and the electrostatic capacity between the detecting pin and the ink roller [C] or doctor roller [A] (ground). The detection pulse is triggered by the dropping edge of the standard pulse that is input from TRIGGER 2. When ink is present, electrostatic capacity increases and the pulse length (T_1) becomes longer. On the other hand, when ink is not present, the pulse length (T_2) becomes shorter as electrostatic capacity decreases.

(3) The pulse length (T_1 or T_2) is compared with the standard pulse (T_0). When the time constant (T_2 = No ink) is shorter than the standard pulse (T_0), the output of CN902-2 goes low.



[Ink Detection Timing]

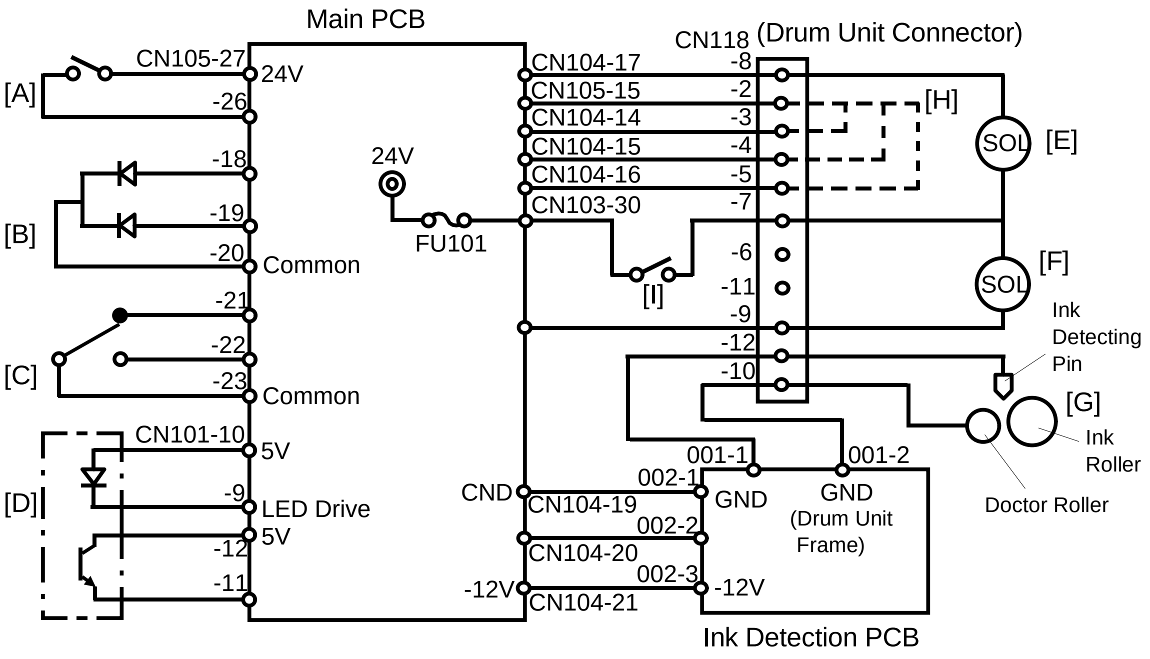
T1: When there is no ink left on the ink roller and the no ink signal (output of CN002-2) is LOW, the ink supply solenoid turns on at the rising edge of the second drum position sensor signal. The ink supply solenoid turns off when the no ink signal goes HIGH.

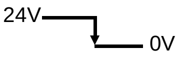
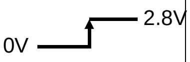
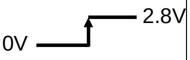
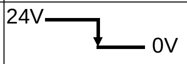
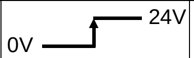
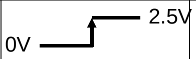
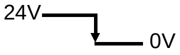
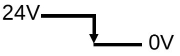
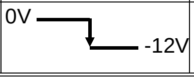
T2: If after the ink supply solenoid turns on the drum turns a further 20 rotations and the no ink signal remains LOW, the No Ink indicator blinks.

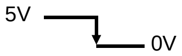
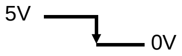
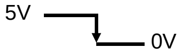
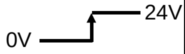
When this happens and when the "Reset" key is pressed the drum turns 40 rotations to supply ink. (When the "0" key is pressed while pressing the "Reset" key, the drum turns 40 rotations even when the No Ink indicator is not blinking.)

When the No Ink Signal goes HIGH during the 40 drum rotations, the indicator goes off and the ink supply solenoid is de-energized.

6.12 CIRCUIT

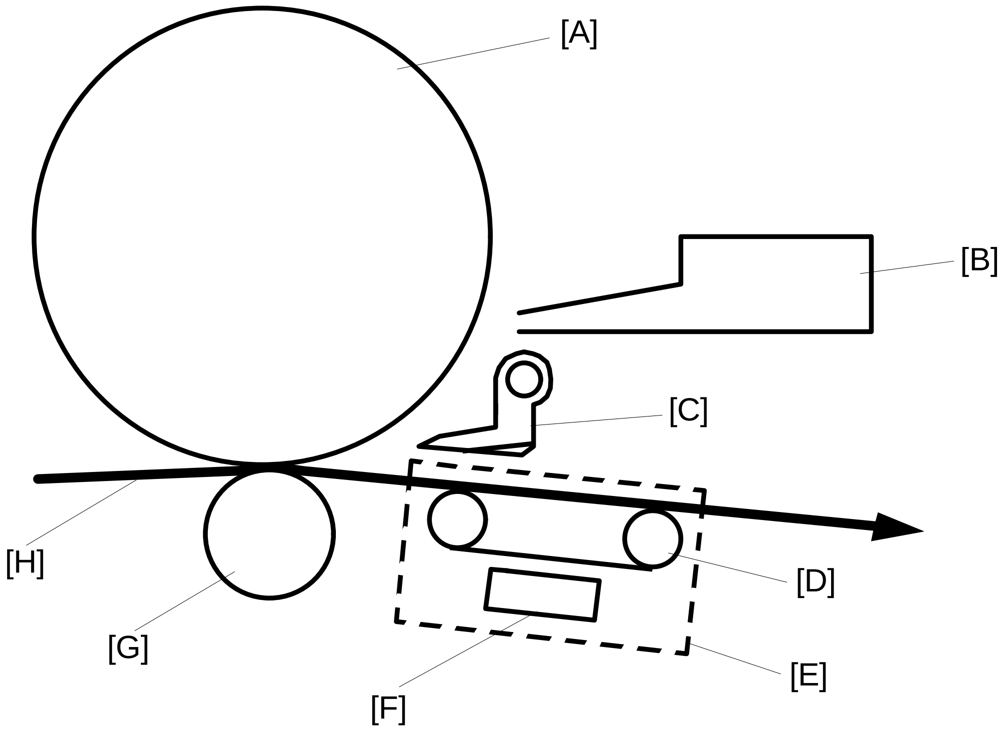


Component Name	In/Out	Main PCB		Description
		CN No.	Signal Level	
Drum Detection Switch [A]	In	105-26		Signal goes Low when the drum unit is slid out.
Drum Rotation LED (Red) [B]	Out	105-18		Signal goes High when the drum is not in the home position. (The LED lights red.)
Drum Rotation LED (Green) [B]	Out	105-19		Signal goes High when the drum is in the home position. (The LED lights green.)
Drum Rotation Button (N.C.) [C]	In	105-21		Signal goes Low when the button is pressed.
Drum Rotation Button (N.O.) [C]	In	105-22		Signal goes High when the main switch is turned on.
Drum Master Detection Sensor [D]	In	TP102		The voltage between TP102 and ground becomes more than 2 volts when a master is on the drum.
Ink Supply Solenoid [E]	Out	104-17		Signal goes Low when the solenoid is energized.
Drum Lock Solenoid [F]	Out	104-18		Signal goes Low when the solenoid is energized.
Ink Detection [G]	In	104-20 (TP105)		Signal goes Low when there is no ink.

Component Name	In/Out	Main PCB		Description
		CN No.	Signal Level	
Color Drum Detection [H]	In	104-14		Signal goes Low when the color drum is installed. (CN118-2 and -3 are shortened.) The Color Drum indicator will light.
Drum Detection [H]	In	104-15		Signal goes Low when the drum is installed. (CN118-2 and -4 are shortened.) The A3 or DLT Drum indicator will light when CN118-2 and -5 are open.
A4/LT Drum Detection [H]	In	104-16		Signal goes Low when the A4/LT drum is installed. (CN118-2 and -5 are shortened.) The A4 or LT Drum indicator will light.
Drum Unit Safety Switch [I]	Out			CN118-7 of the drum unit connector becomes 24 volts when the drum unit is set.

7. DELIVERY SECTION

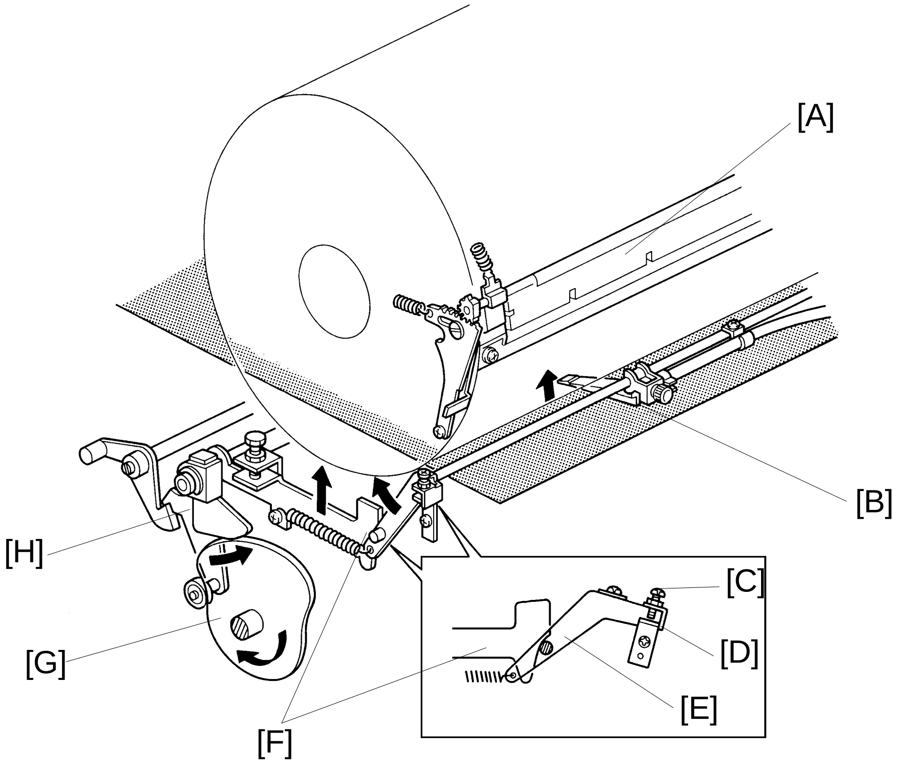
7.1 OVERALL



[D]: Belt
[F]: Vacuum Fan
[G]: Press Roller
[H]: Paper

The exit pawl [C] and the air knife [B] separate the paper from the drum [A] and the vacuum fan [F] in the transport unit [E] pulls the paper against the belt [D] as the belt moves the paper to the delivery table.

7.2 EXIT PAWL DRIVE MECHANISM



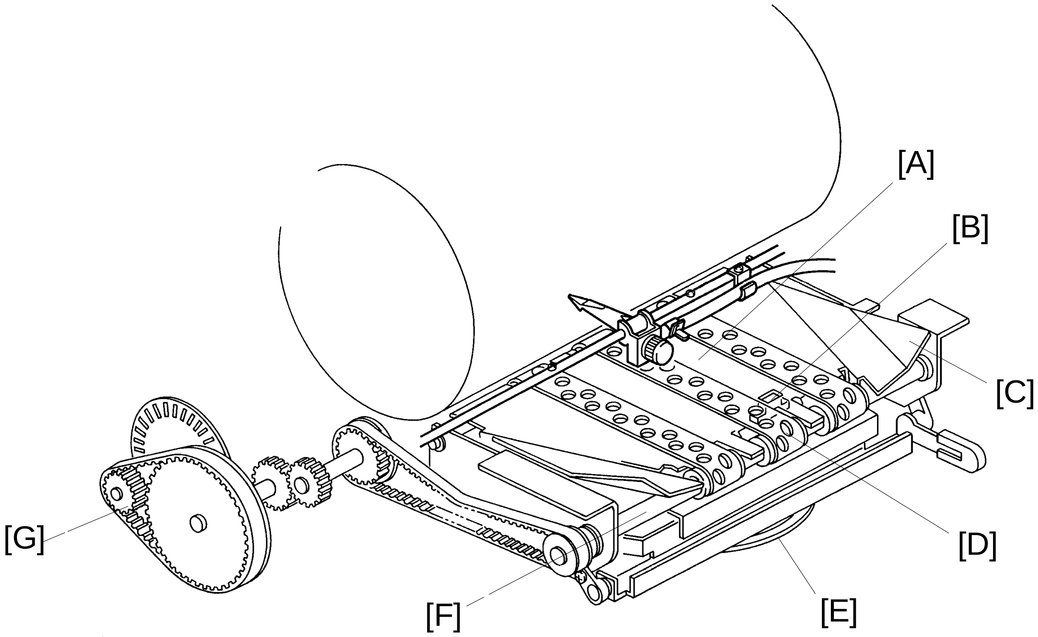
The exit pawl [B] located in the center of the drum, guides the center of the printing paper. As the master clamper [A] approaches the exit pawl, the exit pawl moves away from the drum.

When printing pressure is applied to the drum, the bearing of the pressure ON/OFF lever [H] comes to the bottom of the pressure cam [G] and the lever [H] turns counterclockwise. The exit pawl drive cam [F] is connected to the pressure ON/OFF lever [H] and so the cam [F] moves up. The exit pawl lever [E] then turns clockwise along the surface of the exit pawl drive cam [F]. Therefore, the exit pawl also comes near the drum until the stopper [D] contacts the adjusting screw [C]. This keeps a small clearance between the exit pawl and the drum surface to ensure the printing paper will be fed to the vacuum unit.

As the press roller moves away from the drum (the bearing of the pressure ON/OFF lever [H] comes to the top of the cam [G]), the exit pawl drive cam [F] moves down and the exit pawl lever [E] turns counterclockwise. This causes the exit pawl [B] to separate from the drum.

The exit pawl [B] is held away from the drum when printing pressure is not applied.

7.3 VACUUM UNIT DRIVE MECHANISM



The vacuum fan [E] holds the paper against the transport belts [D]. The transport belts move the paper to the delivery table.

Wing guides [C] at each end of the vacuum unit helps keep the back side of the printing paper clean.

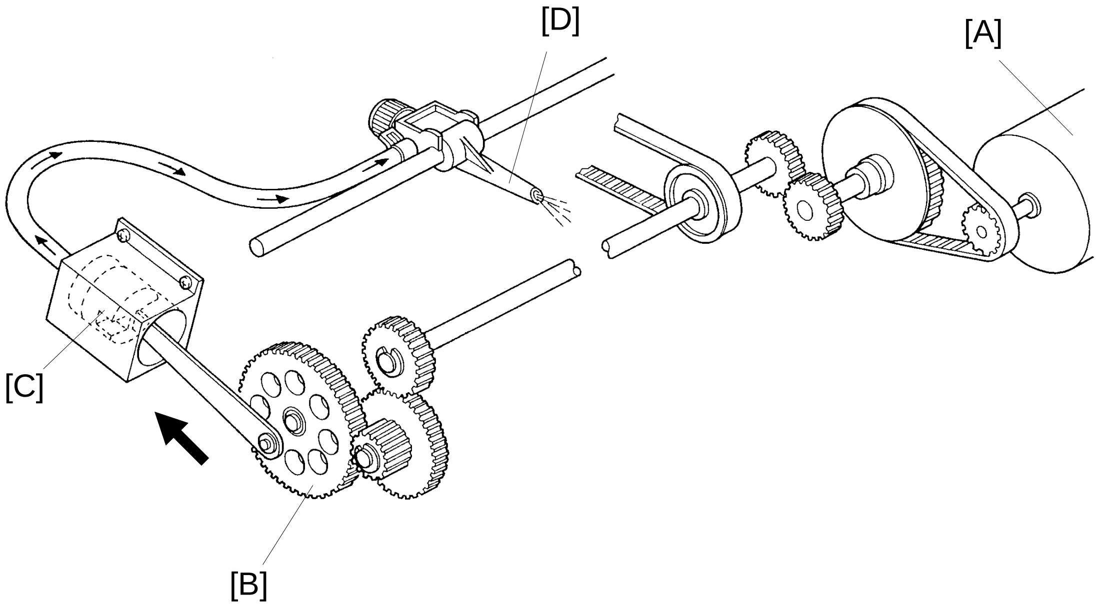
When the main motor turns on, the gear [G] mounted on the main motor shaft drives a drive shaft [F] through gears and belts. This drive shaft turns the transport belts.

The first and second paper exit sensors [A] and [B] check for paper jams.

The paper exit jam check is done when printing pressure is applied and the printing pressure sensor is interrupted.

Jam Condition	Sensor Status
Delivery Misfeed	2nd paper exit sensor is still on when the 2nd drum position sensor turns on.
Paper Wrap	1st paper exit sensor fails to turn on even though the drum has rotated 20° after activating the 2nd drum position sensor.
Paper Wrap	2nd paper exit sensor fails to turn on even though the drum has rotated 25° after activating the 1st drum position sensor.

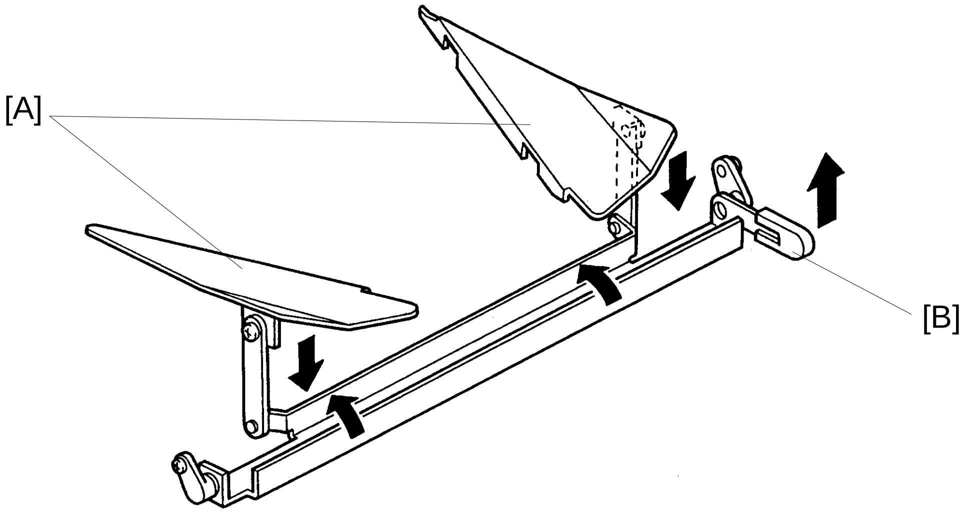
7.4 PAPER EXIT PAWL AIR PUMP MECHANISM



The main motor [A] turns a gear [B] through idle gears, a belt and a shaft. The gear [B] rotates and drives the piston [C] back and forth.

The piston moves forward and pushes a jet of air out through the nozzle [D]. This jet of air helps push down on the paper and separates it from the drum.

7.5 WING GUIDE MECHANISM



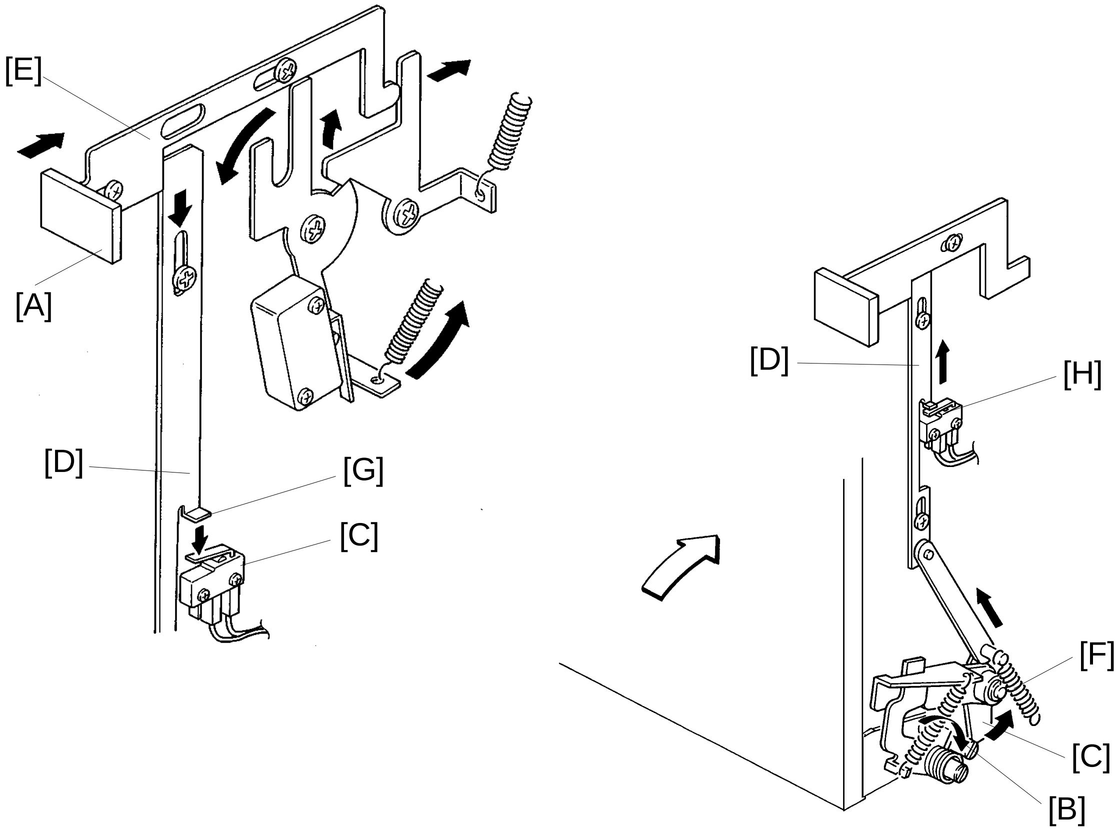
The wing guide[A] lifts up the sides of the paper as it exits the machine.

This stiffens the paper so that the leading edge of thin paper will not sag and brush against the sheets on the delivery table. This prevents the ink on freshly printed sheets from being smeared.

The angle of the wing guide can be changed by moving the guide release lever [B]. Usually, the wing guide release lever is set to the lower position to raise the wings. If printed papers do not stack evenly or if the papers pass over the end fence, raise the lever to the upper position to release the wings.

7.6 PAPER DELIVERY TABLE

7.6.1 Master Eject Unit Lock Mechanism



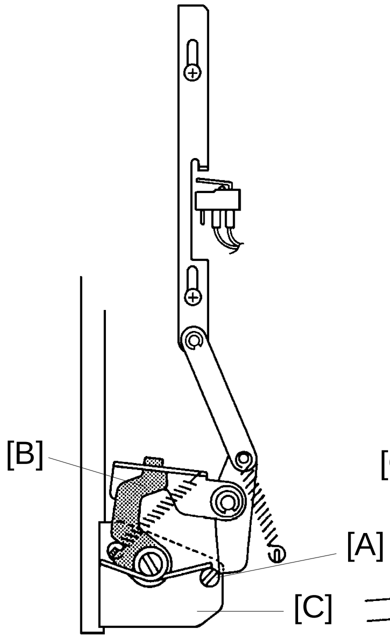
The master eject open button [A] locks when the paper delivery table is closed. This lock mechanism functions as follows:

As the paper delivery table is closed, the pin [B] located on the front side of the paper delivery table, pushes down on lever [C] which raises arm [D]. When arm [D] is in the upper position, lever [E] cannot move forward.

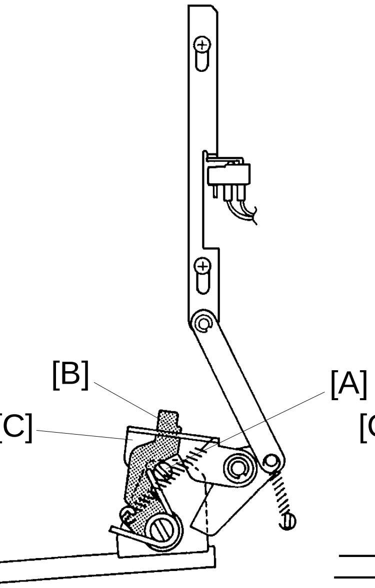
When the delivery table is opened, arm [D] is pulled down by the tension spring [F] and lever [E] can move forward.

The projection [G] on arm [D] contacts the delivery table open switch [H], which sends a signal informing the main PCB the delivery table is open.

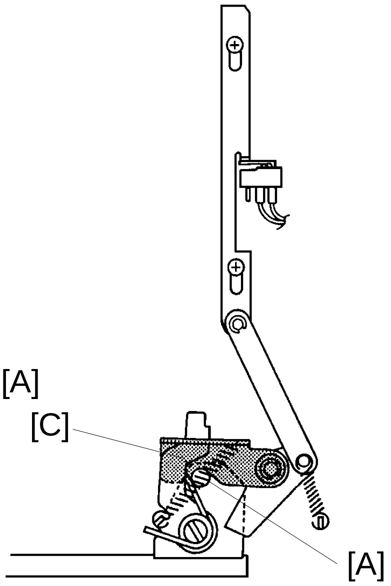
7.6.2 Paper Delivery Table Angle



(Fig.1) closed



(Fig. 2) 10° slant



(Fig. 3) level

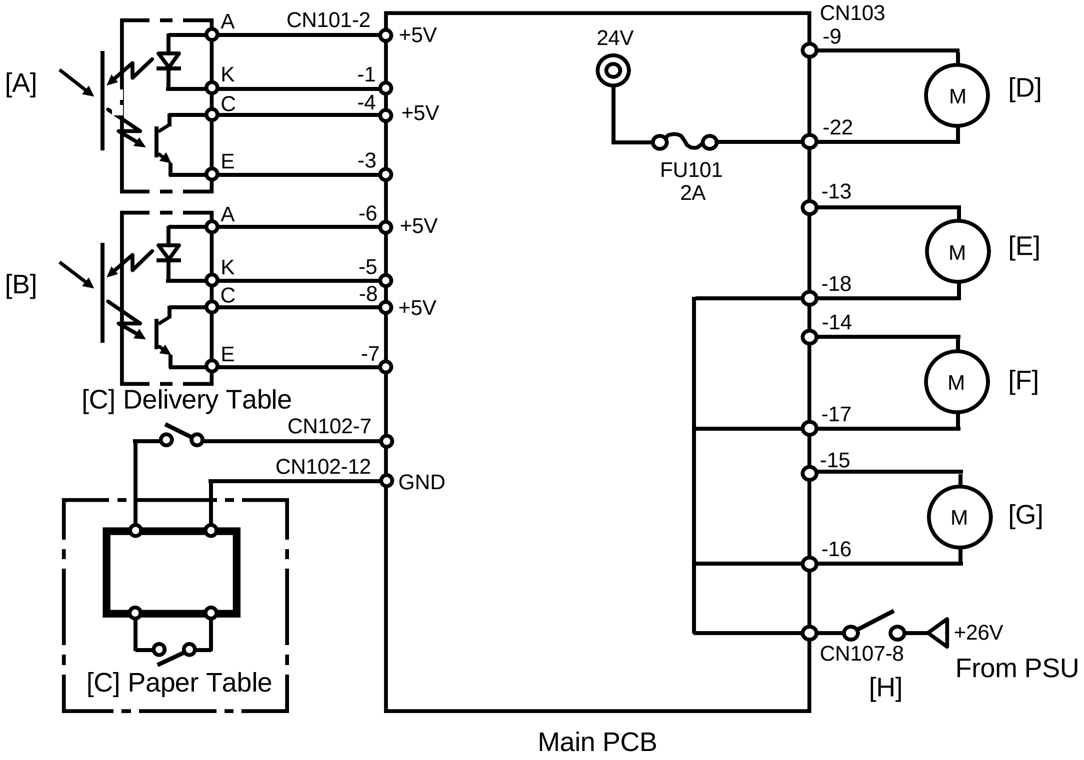
There are two paper delivery table open positions.

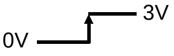
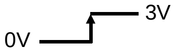
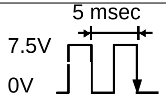
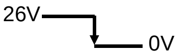
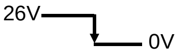
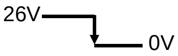
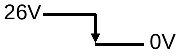
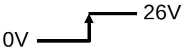
As the paper delivery table is lowered from the closed position (fig. 1), the pin [A] fixed to the table side frame moves forward and pushes the stopper [B] forward. This disengages (clicking noise) the lever [C] from the stopper (fig. 2) and the table stops at a 10° downward slant when the pin reaches the end of the slot cut in the side frame.

As the delivery table is slightly raised up from the 10° downward slant position, spring tension pulls the lever downward and the pin engages the lever. This stops the table at the level position.

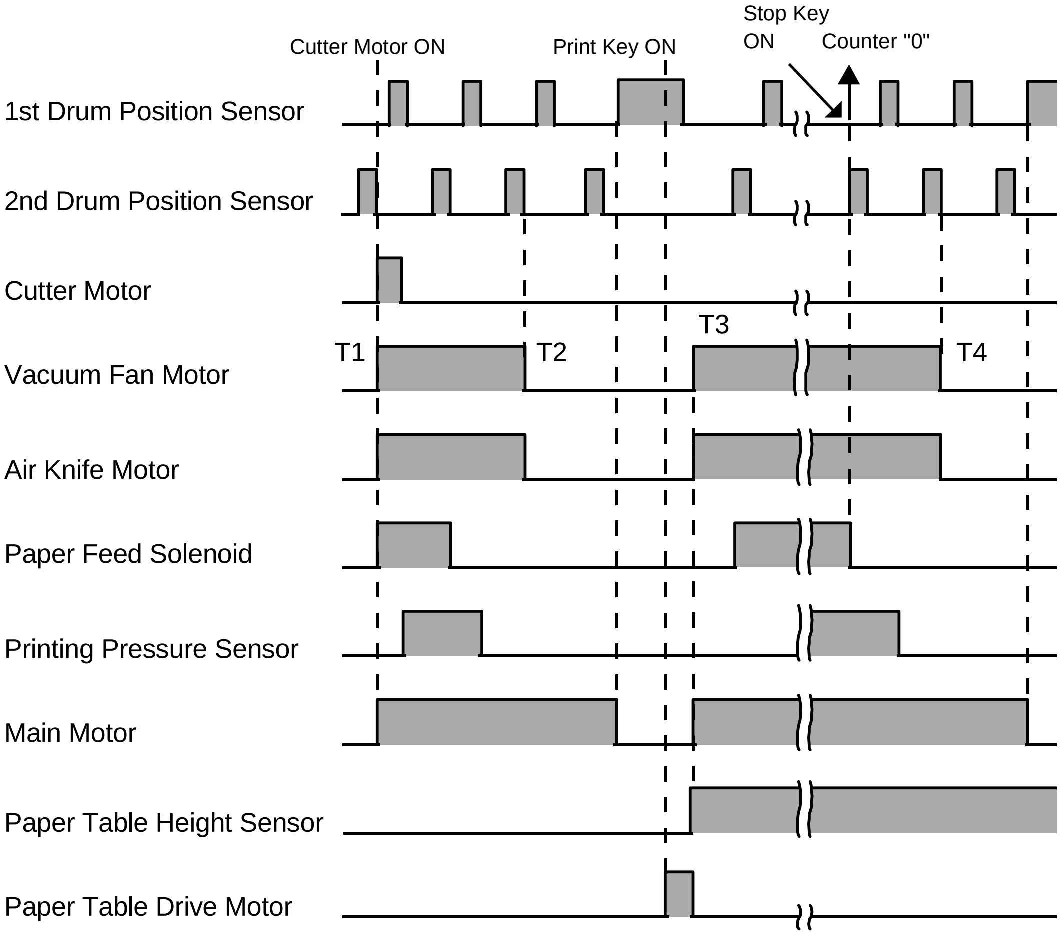
Normally, the table position should be at a 10° downward slant. This prevent the leading edge of each sheet from rubbing against the other sheets on the table as the sheet is fed out, and ensure that the ink on the leading edge is not smeared. However, small paper sheets may pass over the end fence if the table is at the 10° downward slant position. If this happens, raise the table to the level position.

7.7 CIRCUIT



Component Name	In/Out	Main PCB		Description
		CN No.	Signal Level	
1st Paper Exit Sensor [A]	In	TP101	 0V 3V	Signal goes High when the paper is on the sensor.
2nd Paper Exit Sensor [B]	In	TP103	 0V 3V	Signal goes High when the paper is on the sensor.
Delivery/Paper Table Open Switch [C]	In	102-7	 5 msec 7.5V 0V	Pulse signal goes to Low when the paper feed table is opened.
Vacuum Fan Motor [D]	Out	103-9	 26V 0V	Signal goes Low when the motor is energized.
Air Knife Motor [E]	Out	103-13	 26V 0V	Signal goes Low when the motor is energized.
Air Knife Motor [F]	Out	103-14	 26V 0V	Signal goes Low when the motor is energized.
Air Knife Motor [G]	Out	103-15	 26V 0V	Signal goes Low when the motor is energized.
Air Knife Motors Safety Switch [H]	In	107-8	 0V 26V	Signal goes High when the master eject unit is closed.

7.8 ELECTRICAL TIMING



T1: Cutter motor, vacuum fan motor, air knife motor and main motor turn on.

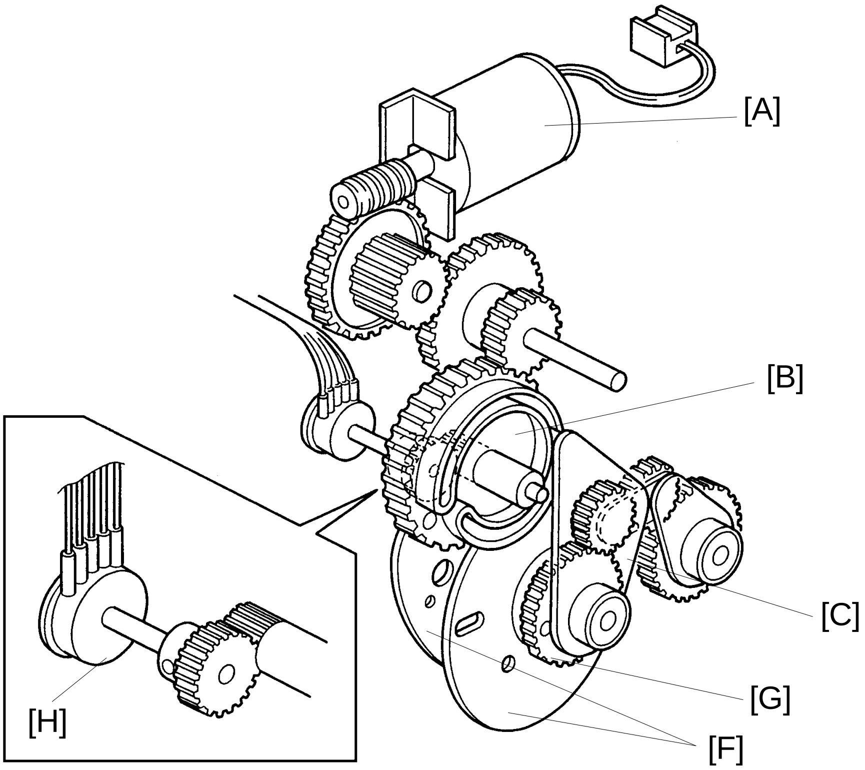
T2: The vacuum fan motor and the air knife motor turn off after the printing pressure sensor is activated and the 2nd drum position sensor is deactivated.

T3: When the Print Start key is pressed and the paper table height sensor is activated, the vacuum fan motor and the air knife motor turn on.

T4: When the counter indicates "0" and the 2nd drum position sensor is activated, the vacuum fan motor and air knife motor turn off.

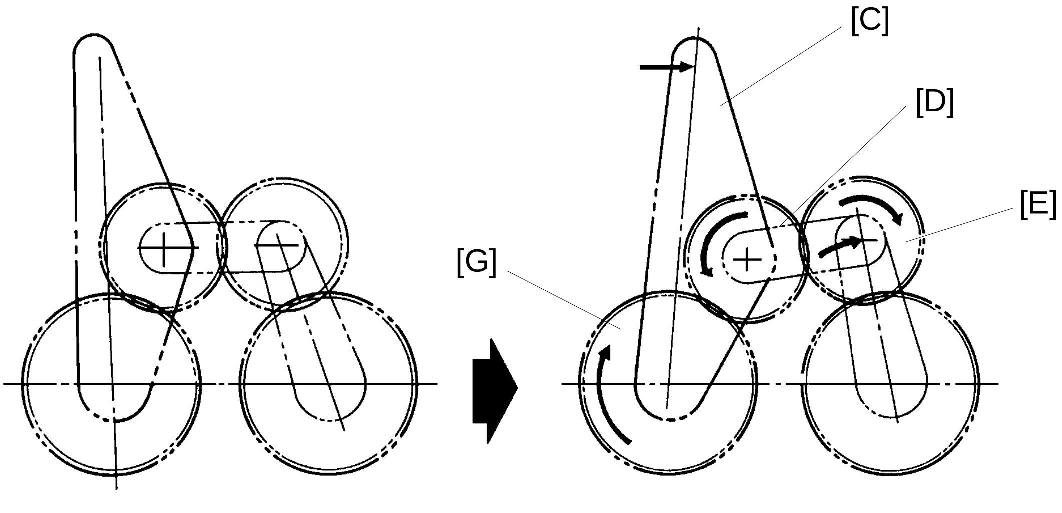
8. IMAGE POSITIONING SECTION

8.1 OVERALL



In image positioning mode, the image can be shifted 20 mm (5 mm steps) up or down on the page by pressing the forward or backward Image Position key on the operation panel. This rotates the first and second paper feed roller cam to change the paper feed timing in relation to the drum rotation timing.

8.2 IMAGE POSITIONING MECHANISM



When the forward Image Position key on the operation panel is pressed, the image positioning motor [A] turns and drives cam gear [B] clockwise through gears.

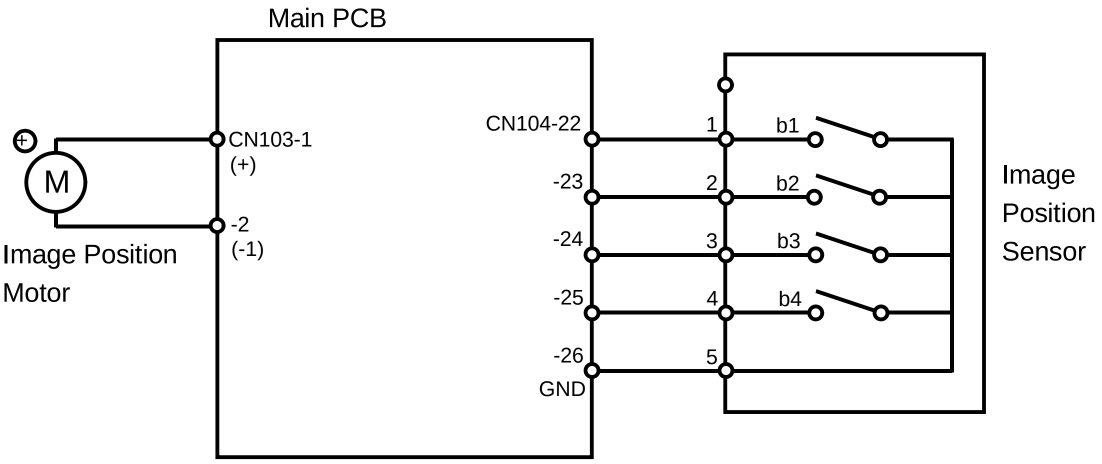
The cam gear has a spiral track along which the lever [C] moves. When the cam gear turns clockwise, the pin of the lever [C] moves towards the outside of the cam gear and the lever turns clockwise.

The lever [C] drives gear [E] clockwise through gear [D] and the first paper feed roller and the second paper feed roller cams [F] mounted on the shaft on gear [G] turn clockwise.

As a result, the paper feed start timing is delayed in relation to the drum rotation timing and the image position is moved in the forward direction.

The image position is detected by the image position sensor [H] which is located behind the cam gear [B].

8.3 CIRCUIT



When the forward Image Position key is pressed, CN103-2 goes to 22 V and CN103-1 goes to 0 V, and the image positioning motor turns to advance the paper feed timing.

When the backward Image Position key is pressed, CN103-1 goes to 22 V and CN103-2 goes to 0 V, and the image positioning motor turns to move back the paper feed timing.

The main PCB detects the image position by means of a 4 bit signal received from the image position sensor. The image positioning motor turns off when the image is at the selected position.

Nine different image position settings can be selected by pressing the Image Position key.

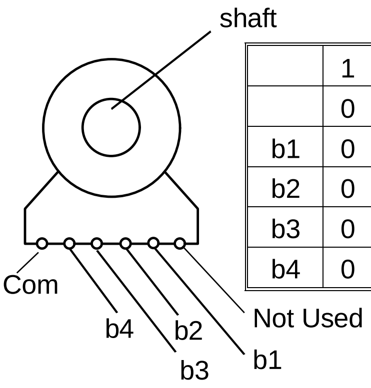


Image Position Area

(+) 0 (+)

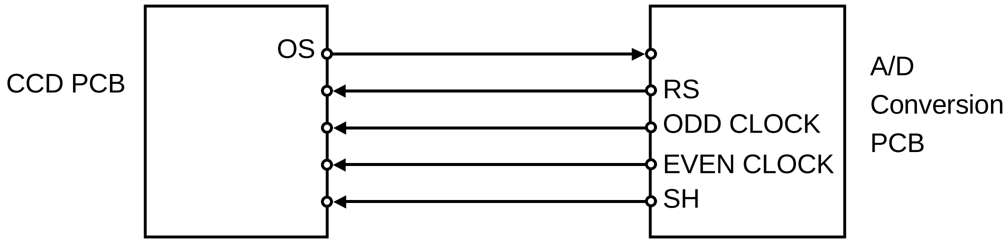
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0	1	3	2	6	7	5	4	C	D	F	E	A	B	9	8
b1	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
b2	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0
b3	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0
b4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0

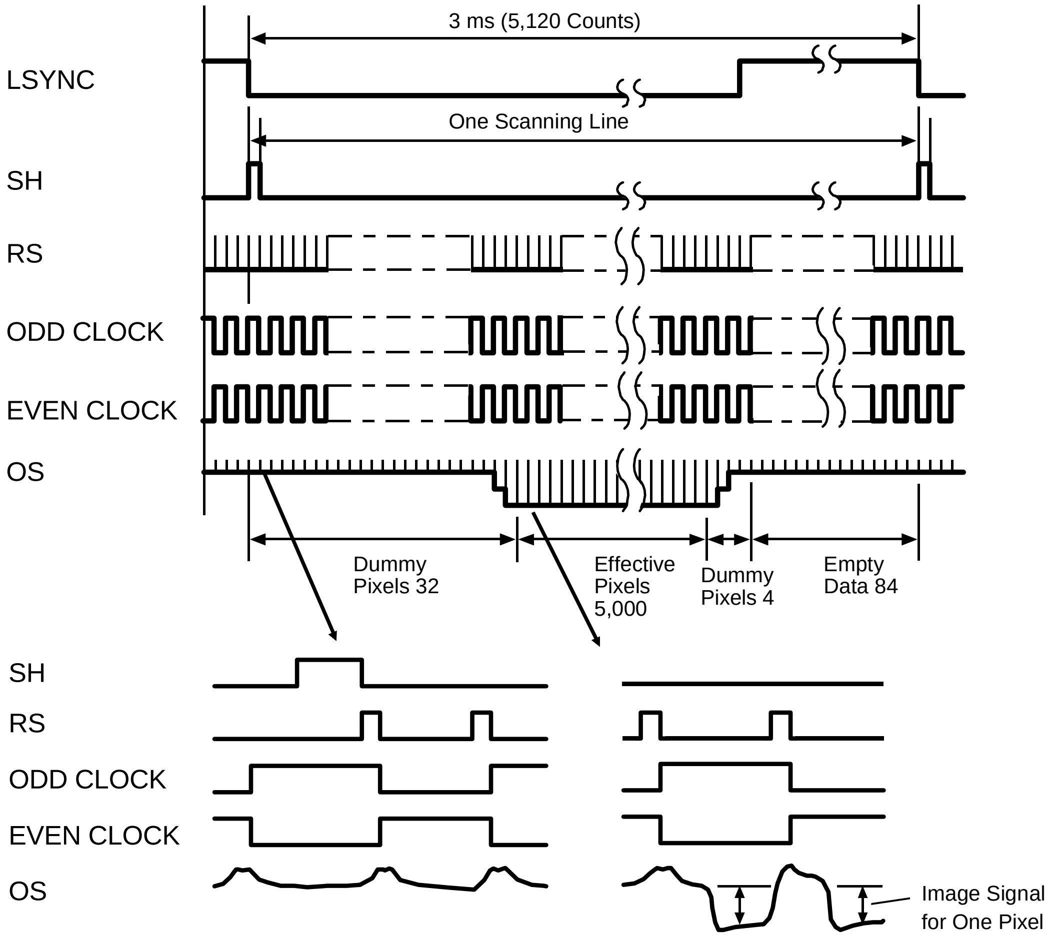
1 = Connection ON

0 = Connection OFF

9. IMAGE PROCESSING

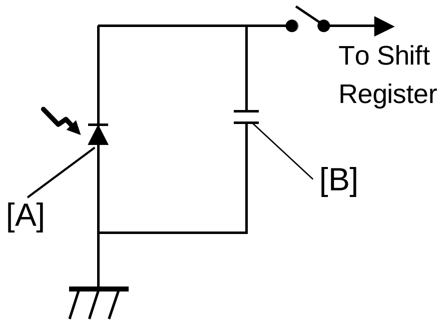
9.1 CCD (CHARGE COUPLED DEVICE)





The light reflected from the original exposes the CCD (Charge Coupled Device). The CCD is a solid-state device similar to a photodiode array, but unlike a photodiode array, a CCD can read one complete scanning line at a time.

The principle circuit of each pixel (picture element) in the CCD is shown on the right. The light reflected from the original is sensed by photodiode [A]. Capacitor [B] stores the electrical charge corresponding to the light intensity. The CCD used in this model has 5036 sets of such photodiodes and capacitors in series (5036 pixels). To increase scanning speed, the odd and even pixel data are handled separately.



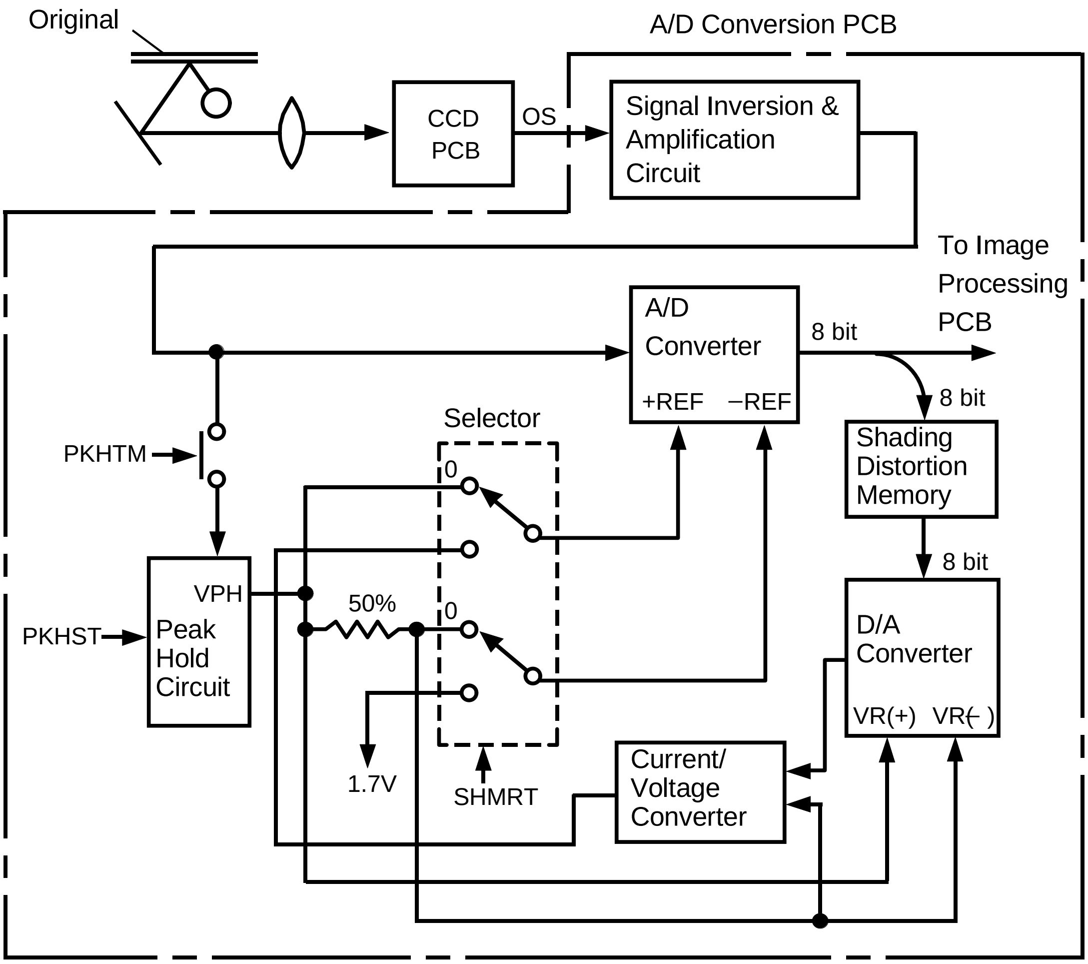
The line synchronizing signal (LSYNC) generated in the image processing PCB turns off to do one line of main scanning. When main scanning for a line starts, the shift signal (SH) is sent from the A/D conversion PCB. The one line image data are stored in the capacitors of each pixel. At the same time, the previous line data stored in the capacitors are transmitted in parallel to two shift registers: one for odd pixels and one for even pixels. Then, the odd and even pixel data are serially output. An output transistor source (OS) synchronizes the odd and even clock pulses. The odd and even clock pulses are activated or de-activated by the dropping edge of the reset signal (RS).

The CCD consists of 5,036 pixels. The first 32 pixels are dummy pixels. The 14 dummy pixels from the 16th are covered with aluminum film. These pixels are used for black limit level data. The following 5,000 pixels are effective pixels. All the data for one line of the original image are converted as electrical charges and stored in a capacitor of effective pixels individually. After the effective pixels, there are 4 more dummy pixels.

Since one line scanning period (3 milliseconds) counts 5,120 clock pulses (a clock pulse corresponds to a pixel data output), there remains time for 84 clock pulses. The scanning position moves to the next line after this period (a sub-scan is completed), and main scanning for the next line starts.

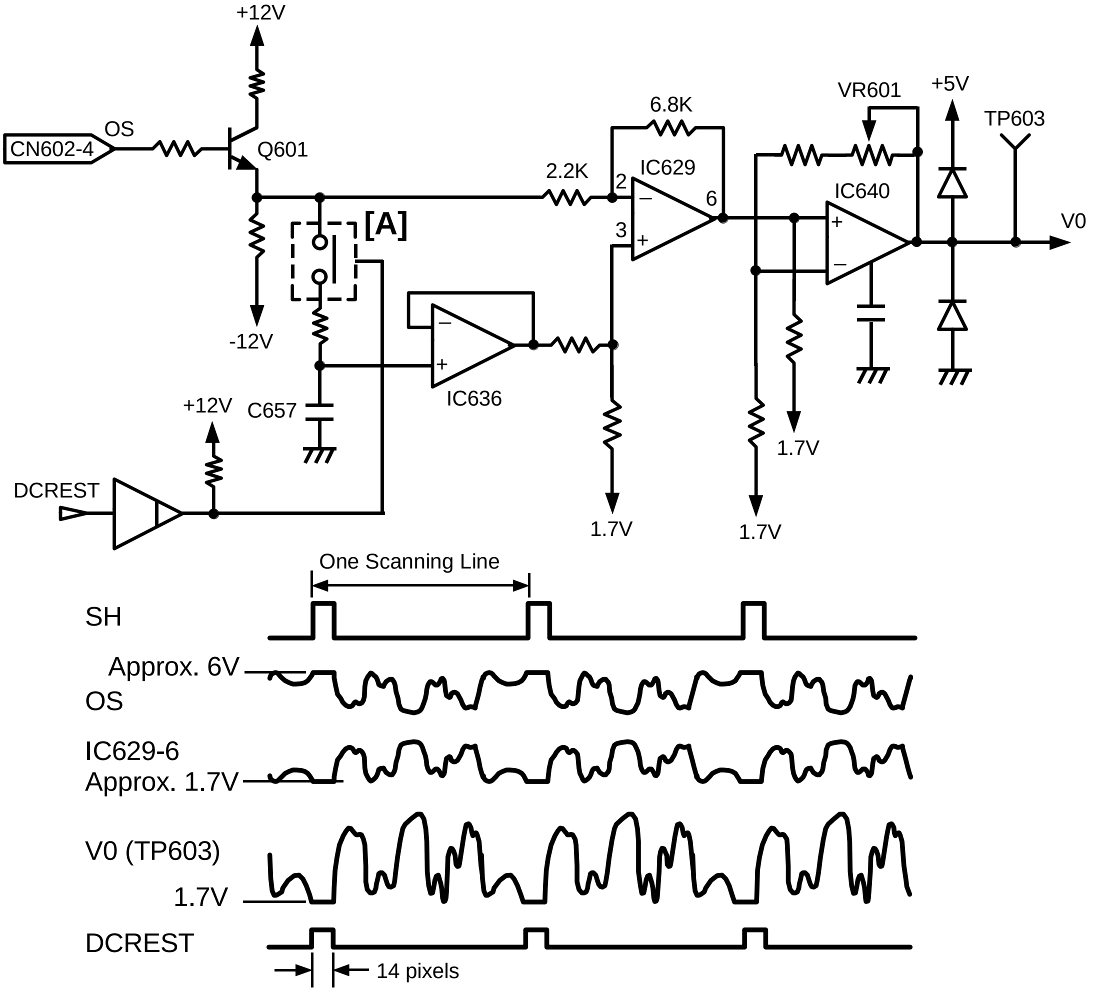
9.2 A/D CONVERSION PCB

9.2.1 Overview



The analog signal generated from the CCD is inverted and amplified in the A/D conversion PCB. Then, the analog signal is converted into an 8-bit digital signal and is sent to the image processing PCB. The original background and the distortion of the light path are monitored to obtain the exact image data.

9.2.2 Inversion and Amplification

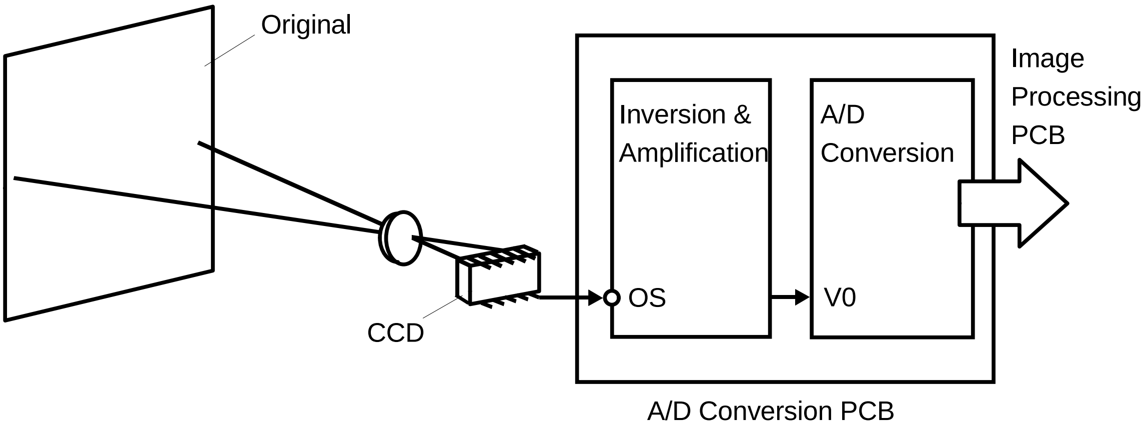


The analog signal (OS) from the CCD is output to the A/D conversion PCB. It is sent in the minus direction under the dc bias voltage (approximate 6 volts).

For every line scanned, 14 dummy pixels produce the black limit level data, while at the same time the DC reset signal (DCREST) is turned on. The DC reset signal turns on the switch [A]. Thus, the CCD output (black limit level) activates Q601, and C657 is charged with the Q601 output. When the switch [A] is turned off, the CCD output (the image data) is sent to IC629-pin 2 while the charged voltage in C657 is applied to IC629-pin 3. Therefore, the difference in voltage between the image data and the black limit level is inverted and output from IC629-pin 6 above the base voltage of 1.7 volts.

The IC640 amplifies the output of IC629-pin 6 above the base voltage of 1.7 volts. The amplification ratio can be changed by VR601. This signal (V0) can be observed through TP603 in the A/D conversion PCB.

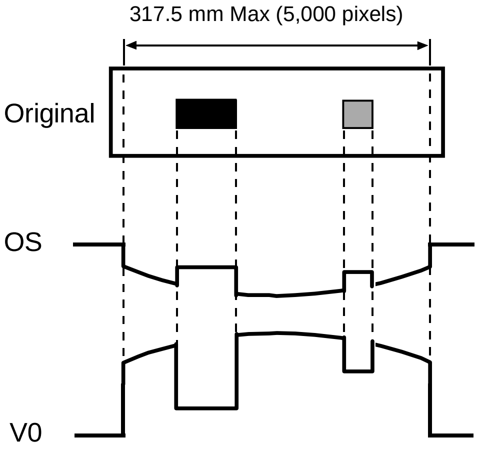
9.2.3 A/D Conversion

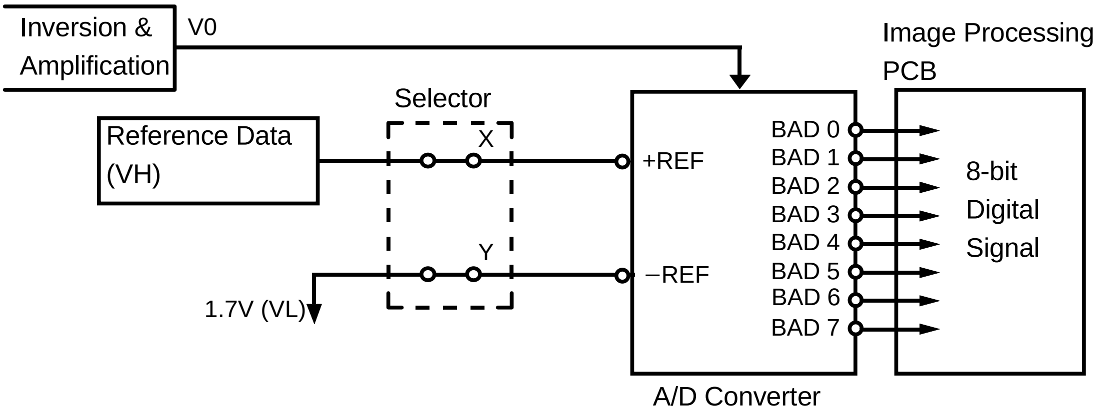


This system converts analog image data into digital form. It then alters the data to correct for image intensity distortions caused by uneven light intensity.

The image data are inverted and amplified and then they are digitalized in an A/D converter. From there, the data go to the image processing PCB as 8-bit digital signals. The digital signal for each pixel is determined as follows:

1. The CCD converts the scanned image to an analog video signal, and sends it to the A/D conversion PCB as an OS signal.(See figure on the right, top.) The OS signal is then inverted and amplified, and finally it is output as a V0 signal.(See figure on the right, bottom.)

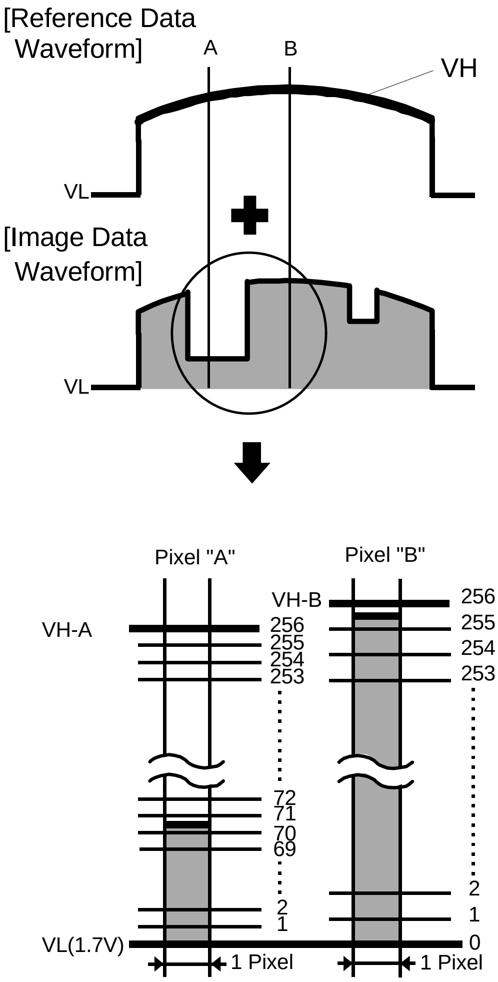




2. Before scanning the original, the white platen cover is scanned and this data is stored in memory as reference data. The reference data show the white peak level (VH) for each pixel. VH varies for each pixel due to distortions of the light path. The black peak level (VL) is fixed at 1.7 volts for all pixels.

3. While scanning the image, the image data (V0) are input to the A/D converter. The reference data are picked from memory and applied to the high reference voltage (+REF) of the A/D converter. The black peak level (VL = 1.7 volts) is applied to the low reference voltage terminal (–REF). The low reference voltage terminal stays constant at 1.7 volts. Only the high reference terminal voltage varies.

   In the A/D converter, the difference in voltage between the "+REF" voltage and the "–REF" voltage is divided into 256 steps. The analog image data (V0) is digitized based on these steps.
   For example, pixel data "A" and "B" are converted into digital signals as shown right. The pixel value of "A" is determined as "70" based on the value of VH-A and that of "B" is determined as "255" based on the value of VH-B.



4. The digitized pixel data are sent serially to the image processing PCB. For example, data "A" (70) and "B" (255) are expressed in 8-bit form and sent through the eight terminals (BAD 0 to BAD 7) shown in the table on the right.

Data Pixel		A	B
Decimal		70	255
8-bit Output	BAD0	0	1
	BAD1	1	1
	BAD2	1	1
	BAD3	0	1
	BAD4	0	1
	BAD5	0	1
	BAD6	1	1
	BAD7	0	1

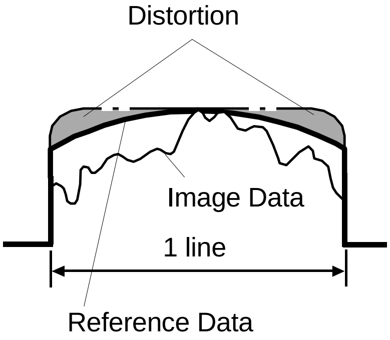
9.2.4 Reference Data Correction

[Overview]

The reference data, which are used to digitalize the image data, are compensated by the following corrections:

1. The image data sent from the CCD do not exactly represent the image for the following reasons:

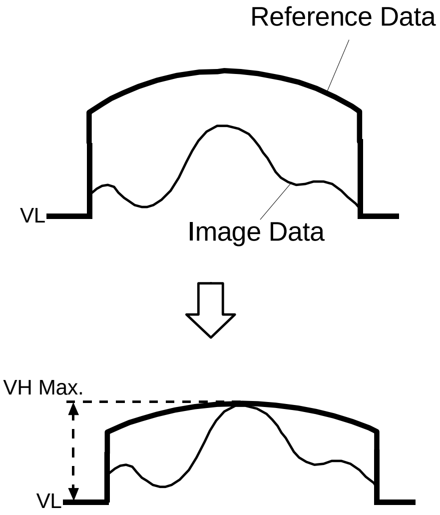
- Because of loss of brightness towards the ends of the fluorescent lamp and the edge of lens.
- Because of variations in sensitivity among pixels of the CCD.
- Because of distortions of the light path. (Stains and/or variations in reflectivity of reflectors, exposure glass, mirrors, etc.)

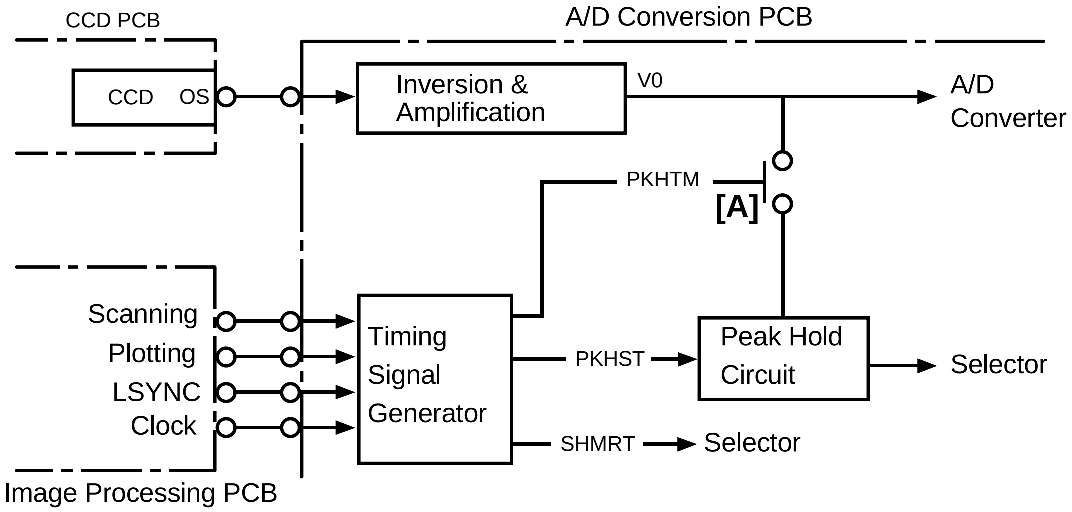


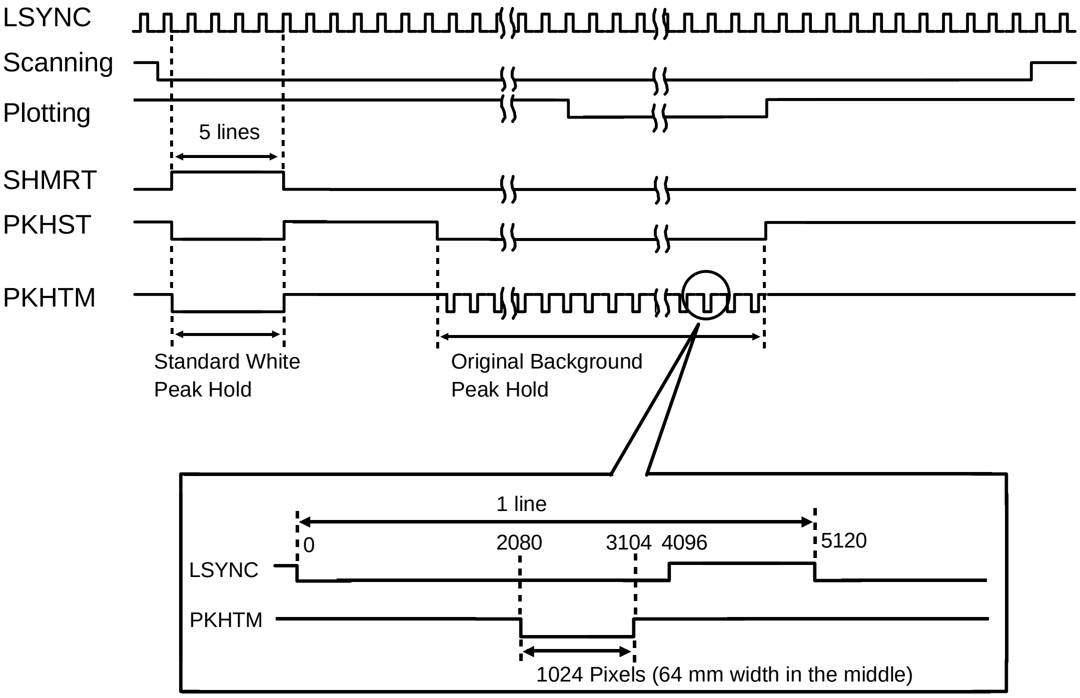
To eliminate such distortions from the image data, the distorted data are applied to the reference data. Thus, the image data are corrected when they are converted into digital data.

2. Original Background Correction

The white peak levels (VH) for each pixel are determined by the reference data. If a newspaper or blue print is scanned as an original, the whitest image datum is much lower than the white peak level of the white platen cover. The image datum is close to the black peak level (VL). As a result, a dirty background may appear on prints. To prevent this, the whitest image datum of the scanned image is used as the maximum white peak level (VH Max.) of the reference data.




CCD PCB
A/D Conversion PCB
CCD
OS
Inversion & Amplification
V0
A/D Converter
PKHTM
[A]
Scanning
Plotting
LSYNC
Clock
Timing Signal Generator
PKHST
Peak Hold Circuit
Selector
SHMRT
Selector
Image Processing PCB


LSYNC
Scanning
Plotting
5 lines
SHMRT
PKHST
PKHTM
Standard White Peak Hold
Original Background Peak Hold
1 line
0
2080
3104
4096
5120
LSYNC
PKHTM
1024 Pixels (64 mm width in the middle)

[Peak Hold]

1. Standard White Peak Hold

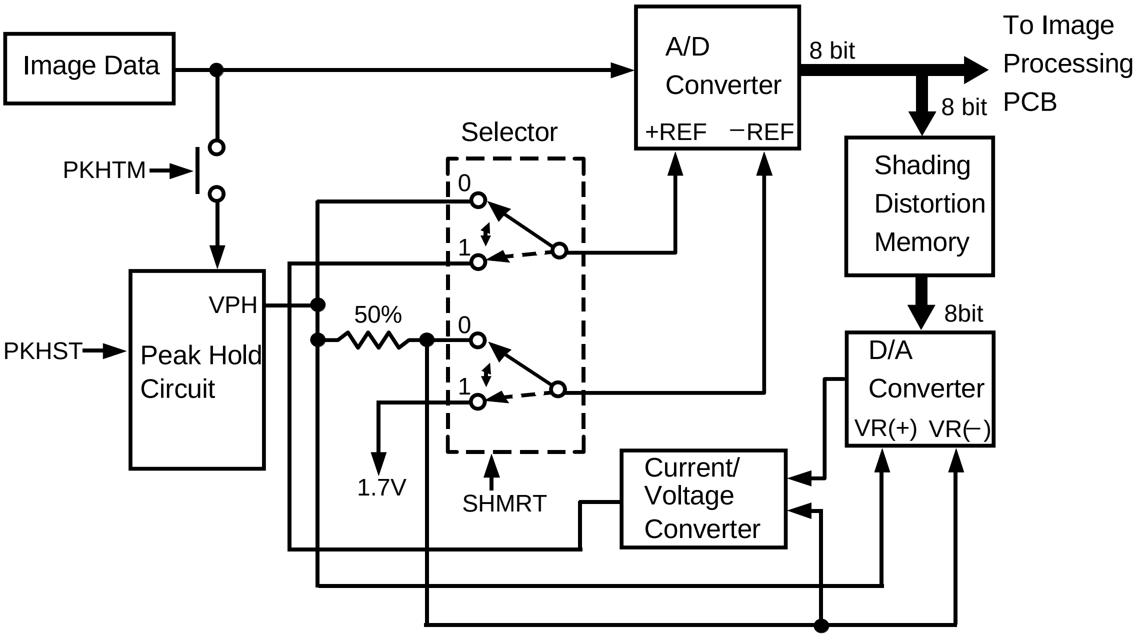
Before scanning the document image, the white platen cover is scanned. While the first five lines are scanned, the peak hold timing signal (PKHTM) turns off and so the switch [A] on the A/D conversion PCB turns on. This allows the V0 signal to reach the peak hold circuit. Since the peak hold set signal (PKHST) also turns off in this period, the whitest datum of each pixel is stored as a standard white peak voltage (VPH-SW). Since the shading distortion memory reset signal (SHMRT) also turns on in this period, switches in the selector are switched to "0". Therefore, white peak voltage (VPH-SW) is sent to the A/D converter as a "+REF" voltage. The A/D converter changes the analog image data of the white platen cover to a digital signal and this digital signal is stored in memory as the shading distortion data.

2. Original Background Peak Hold

After the five lines of the platen cover have been scanned, the peak hold set signal (PKHST) turns on to clear the standard white peak voltage (VPH-SW) in the peak hold circuit.

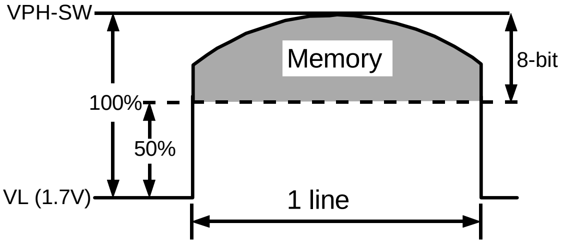
While the 64 millimeter width (1,024 pixels) in the middle of the original is scanned, the peak hold timing signal (PKHTM) turns off to send the image data to the peak hold circuit. (This is done about 1 millimeter from the leading edge of original.) The peak hold circuit holds the whitest (lightest) image voltage in 1024 pixels as an original background peak voltage (VPH-OB). This is because the peak hold set signal (PKHST) turns off while the original image is scanned.

Since the scanning process starts before the light intensity of the fluorescent lamp stabilizes, the light intensity tends to increase for a little while. The image signal from the CCD increases until the light intensity stabilizes. As a result, lighter image densities may not appear on prints after the light stabilizes. To prevent this, the original background peak voltage (VPH-OB) is changed when a higher (lighter) image signal is applied to the peak hold circuit.



[Reference Data Correction]

1. Shading Distortion Memory



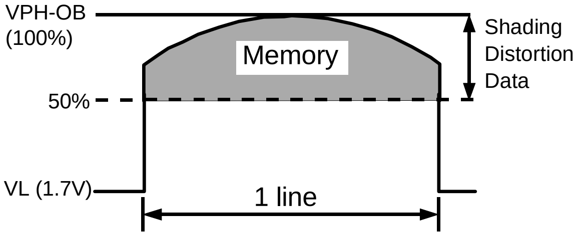
The platen cover is uniform in color and in reflection. However, the waveform of the white platen cover from the CCD shown on the right, is due to distortions of the light path.

During the first five line scans, the selector flips the switches to the "0" position. The standard white peak voltage (VPH-SW) in the peak hold circuit is applied to the high reference voltage terminal (+REF) of the A/D converter. 50 percent of the difference in voltage between the peak voltage and the black peak level voltage (VL, 1.7 volts) is applied to the low reference voltage terminal (–REF). Also during this period, the platen cover white data are directly sent to the A/D converter. Then, the upper 50 percent of the platen white cover data is digitalized into 8-bit signal form. This corrects the data which is distorted by more than 50 percent of peak voltage. They are stored in memory as the shading distortion data.

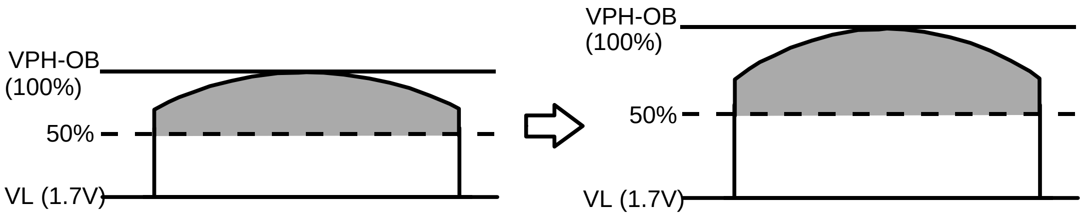
2. Shading Distortion Correction

While an original image is scanned, the shading distortion datum for each pixel is sent from memory to the D/A converter. The original background peak voltage (VPH-OB) is applied to the high reference voltage terminal (VR+) of the D/A converter. 50 percent of the difference in voltage between the original background peak voltage and the black peak voltage is applied to the low reference voltage terminal (VR–). The D/A converter converts the upper 50 percent of the shading distortion data to electrical current (analog signal).

[Reference Data Waveform]



3. Original Background Correction



50 percent of the difference in voltage between the original background peak voltage (VPH-OB) and the black peak voltage (VL = 1.7 volts) is also applied to the current/voltage converter. In the current/voltage converter, the analog shading distortion data are changed from an electrical current to a voltage and added on to the 50 percent of the difference voltage.

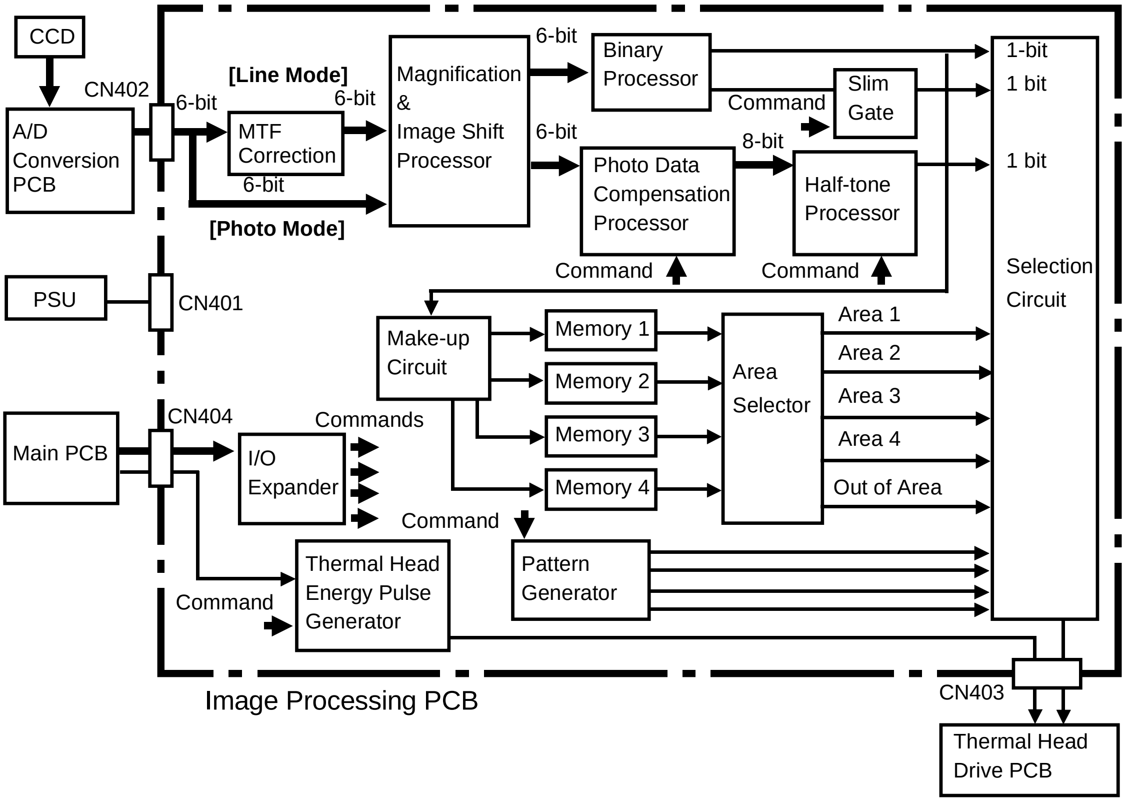
When the original image is being scanned, the selector flips the switches from "0" position to "1" position. The output voltage from the current/voltage converter is applied to the high reference voltage terminal (+REF) of the A/D converter. 1.7 volts is applied to the low reference voltage terminal (–REF). Also, the image datum of each pixel sends to the A/D converter directly, the image datum is then digitized to an 8-bit signal.

Since the peak hold set signal (PKHST) is low while the image is being scanned, the lightest background datum is always held in the peak hold circuit. This converts image analog signals to digital signals properly, even when the light intensity of the fluorescent lamp becomes high.

NOTE: If the platen cover is dirty, lower image data is stored as a white peak voltage due to the less reflection from the platen cover. This means that distorted data is lower than normal data (pure white data). As a result, white (lighter image) band will appear on prints.

9.3 IMAGE PROCESSING PCB

9.3.1 Overview



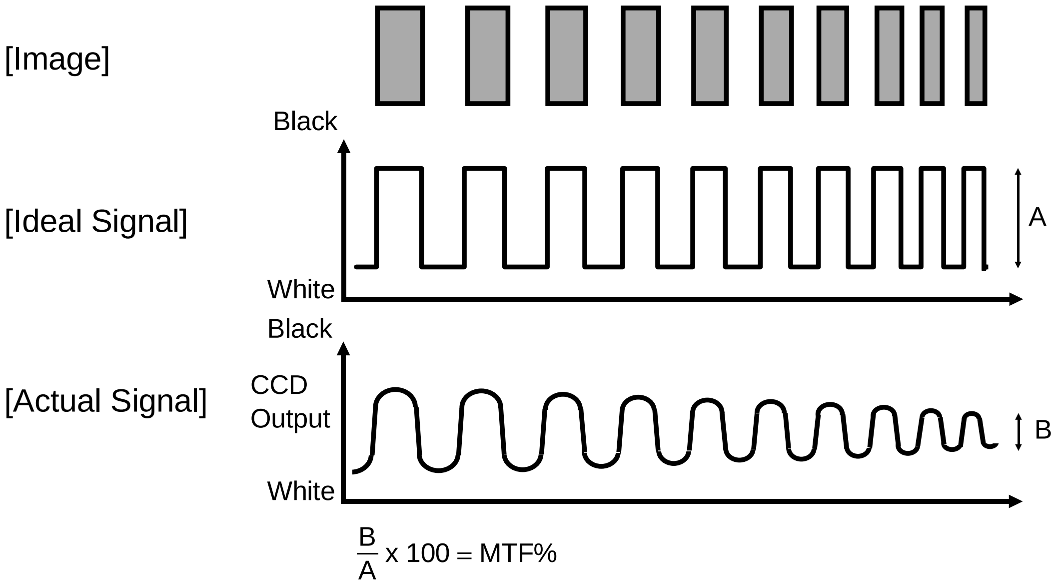
The upper 6 bits of the 8 bits from the A/D conversion PCB are used by this board. (The other 2 bits are not needed and are discarded.) The digital data are inverted to match with the circuit of the image processing PCB. Therefore, the white peak level becomes 0, and the black peak level becomes 63.

In the line mode, the 6-bit image data are compensated by the MTF correction. Then if necessary, they are discarded or repositioned by the magnification and image shift processor. Next the 6-bit image data which gives 64 graduation steps (64 level grayscale) are converted to single-bit image data (white or black) by the binary processor. In this step, the image density is determined according to the level selected by the Image Density key (Lighter, Normal, Darker 1, or Darker 2). The single-bit image data are modified in the slim gate if the sharpen image mode is selected by the Image Mode key.

In the photo mode, the 6-bit image data first go to the magnification and image shift processor. The 6-bit data are compensated and converted into 8-bit image data. This gives a 256 level grayscale used by the photo data compensation processor. This step determines the image density and contrast (in the make-up mode only) which is selected by the Contrast key (Normal, Light Tone, or Dark Tone). Then, the 8-bit image data are converted to single-bit white or black data by the half-tone processor. There are three kinds of the half-tone processing for the photo mode of the make-up mode, selected by the Screen key: Normal, Fine, or Coarse.

When the make-up mode is selected, the single-bit image data are combined in the selection circuit and are output to the thermal head drive PCB.

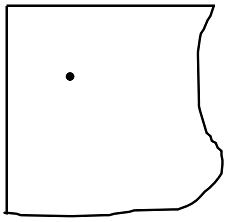
9.3.2 MTF Correction



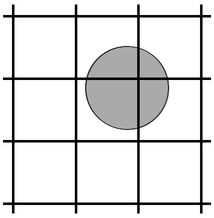
When the original image is converted to electrical signals by the CCD, the signal deteriorates and contrast is reduced. This is because neighboring black and white parts of the image influence each other. The lens' characteristics are the main reason for this. This phenomenon is typical when the width and spacing of the black and white areas are narrower. The ratio of the difference between the black and white levels of the electrical signal (an actual difference) and the difference between that of the original (an ideal difference) is called the Modulation Transfer Function (MTF).

If the MTF is too low, edges of the image tend to be lost. In this model, the MTF correction is used to emphasize 6-bit image data in the line mode. This helps to better reproduce characters.

A target pixel datum is compared with the surrounding pixel data and is compensated. If the surrounding pixels are very different (compared with the target pixel) then the target value will be more influenced by them. This step is repeated for all pixels of the original.



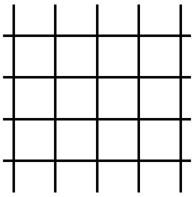
(a) Section of document



(b) Enlarged view of dot

0	0	0	0
0	12	4	0
0	30	12	0
0	0	0	0
0	0	0	0

(c) Image data after
A/D conversion



(d) Print without MTF correction
(threshold level: 32)

Consider a small black point on a original as shown in the illustration (a) and (b). The 6-bit image data (range 0 to 63) for this section of the original is shown in (c). If the the threshold level is 32, all the pixels in this area will becomes single-bit white data and the image will not be reproduced (d).

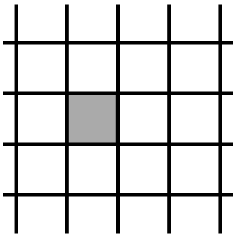
The MTF correction prevents this image loss this way:

		–1/2		
–1/8	–3/8	3 X	–3/8	–1/8
		–1/2		

The value of the target pixel is multiplied by 3. Then, 3/8 of the values of the pixels to the left and right, 1/8 of the values of the pixels two steps to the left and right, and 1/2 of the values of the pixels above and below are subtracted from the new value of the target pixel. (If the result is less than zero, then the pixel datum is set to zero.)

0	0	0	0
0	19.5	1.5	0
0	63	22.7	0
0	0	0	0
0	0	0	0

(e) Image data after
MTF correction



(f) Print after MTF correction

After the MTF correction is applied, the image data of the example is as shown in (e) and (f) above. The small black point is reproduced on the print.

The correction value in the sub-scanning direction can be changed by using SP mode no. 31. The correction values for each setting of SP no. 31 are as follows:

SP31-0: Low

		–1/4		
–1/8	–3/8	2 1/2	–3/8	–1/8
		–1/4		

SP31-1: Standard

		–1/2		
–1/8	–3/8	3	–3/8	–1/8
		–1/2		

SP31-2: High

		–1		
–1/8	–3/8	4	–3/8	–1/8
		–1		

SP31-3: Maximum

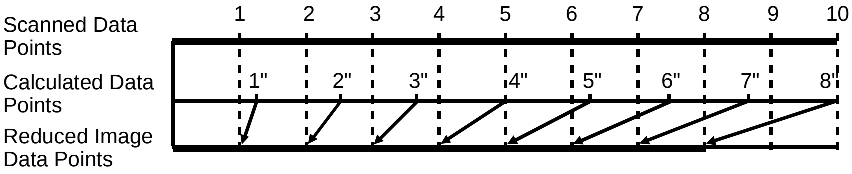
		–2		
–1/8	–3/8	6	–3/8	–1/8
		–2		

The SP mode is normally set at 0 (factory setting). Setting it at 1, 2 or 3 will help to better reproduce low contrast originals.

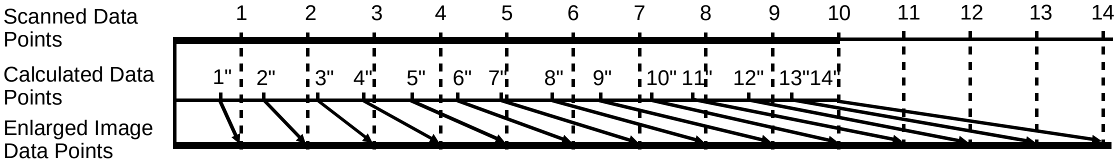
NOTE: If SP31 is set to a higher level (2 or 3), stains, scratches etc. in the light path will appear on prints more easily.

9.3.3 Main Scan Magnification And Image Shift Processing

[80% Reduction]



[140% Enlargement]



[Main Scan Magnification]

Reduction and enlargement in the sub-scanning direction is done by changing the original transport motor speed (see picture). Reduction and enlargement in the main scanning direction is handled by the magnification and image shift processing.

Scanning and plotting are done at fixed intervals (CCD and thermal head elements’ interval). The image is scanned at the CCD elements’ interval. If the master is plotted at the same interval (by the thermal head elements) then the master image is the same size as the original.

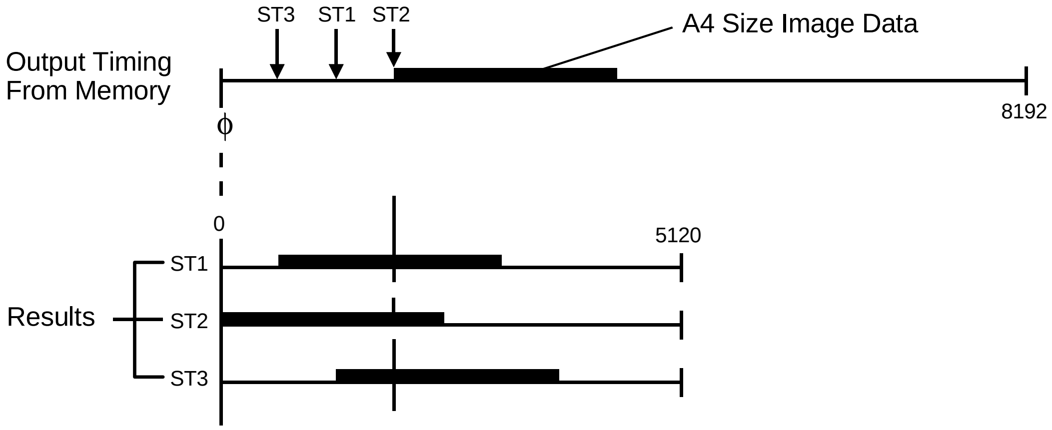
[80 % Reduction]

For example, data for 10 pixel elements in a main scanning line are scanned by the CCD. Those data are compressed into data for 8 pixel elements (data for imaginary points) by the magnification processor. As a result, the image is reduced to 80 %.

[140 % Enlargement]

Data for 10 pixel elements of a main scanning line are expanded into data for 14 pixel elements (data for imaginary points). As a result the image is enlarged at 140 % magnification ratio.

When actual pixel elements are divided in accordance with a magnification ratio, the value of the imaginary points that would correspond to new pixel elements are calculated by the magnification processor. The proper value for each imaginary point is calculated based on the image data of the surrounding pixels’ values.

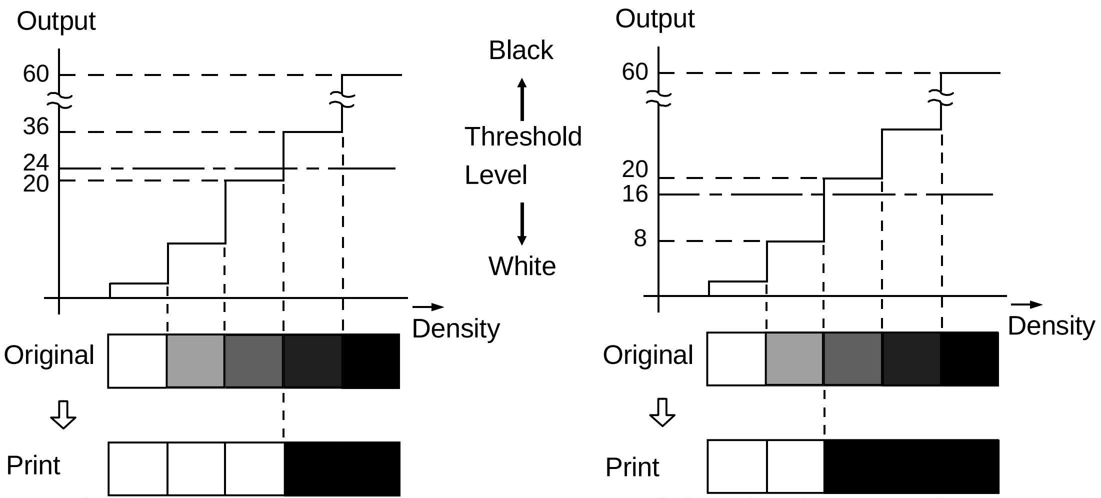


[Image Shift]

This model can reposition the image of the original by using the image shifting mode. The image position change in the sub- scanning direction is done by changing the timing of the original scanning or of the master plotting. In the main scanning direction, it is done by the magnification and image shift processor, simultaneously with the magnification process.

Data for one main scanning line are once stored in a line memory. This memory has enough room to hold one main scanning line, and it has a little extra capacity. When the data is output from memory, the output timing can be adjusted by entering the desired value in the image shifting mode.

9.3.4 Binary Processing



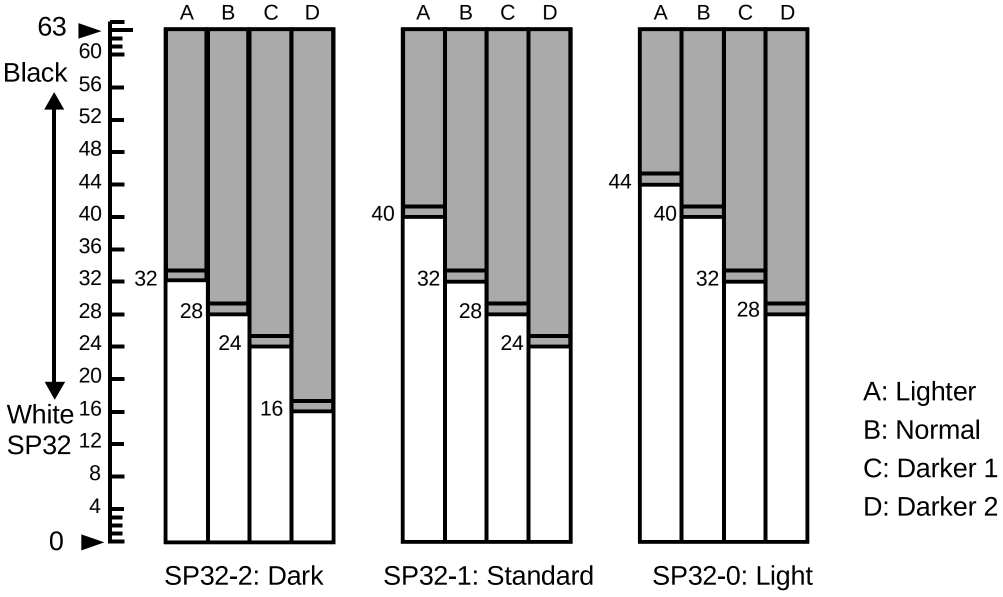
[Threshold Level 24]

[Threshold Level 16]

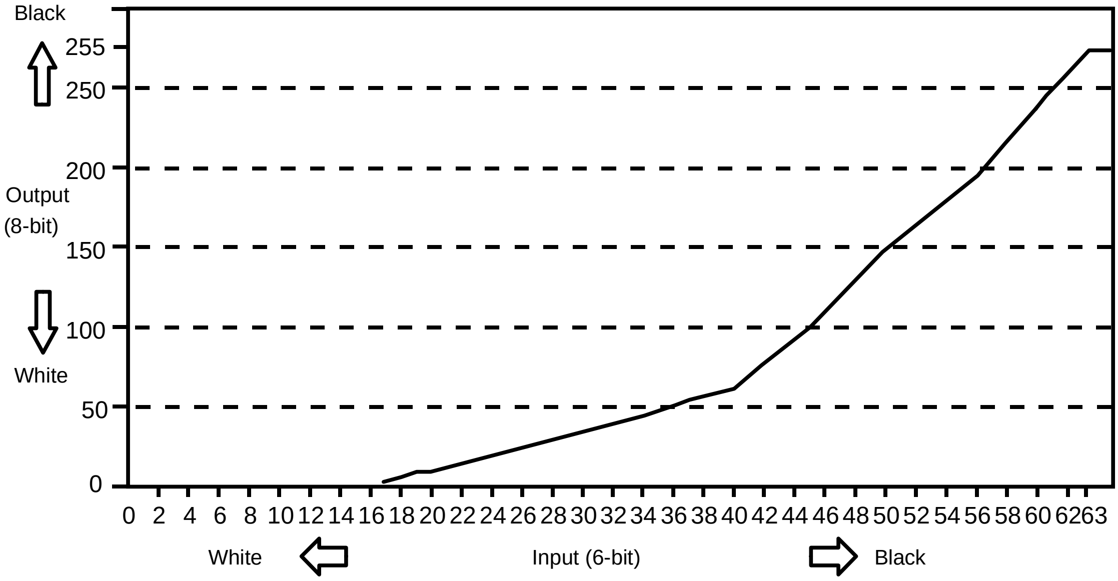
The binary processor converts 6-bit image data to single-bit white or black data to send it to the thermal head. This processor is used only for the line mode. (The binary processing for the photo mode is done by the half-tone processor.)

In this process, all pixel image data are compared with a single threshold level. A pixel datum is set to black if it is above the threshold level, or it is set to white if it is equal or below the threshold level. (See the above figure.)

The threshold level varies according to the image density level. This level is selected by the Image Density key (Lighter, Normal, Darker 1, and Darker 2). The image can also be darkened or lightened by SP mode no. 32 as shown below:

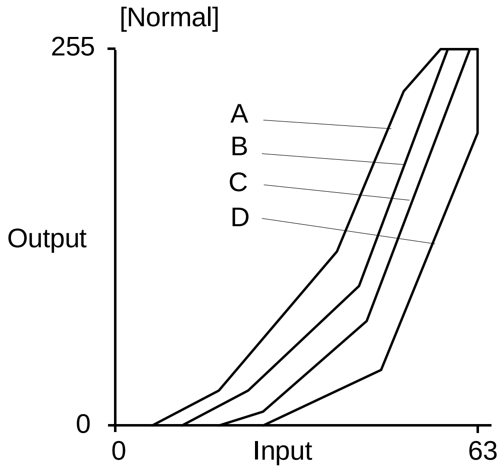


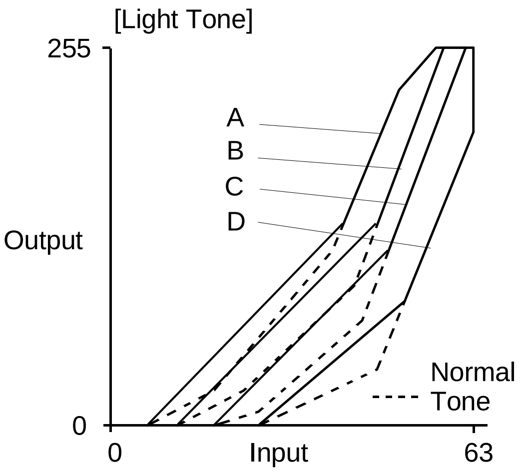
9.3.5 Photo Data Compensation Processing

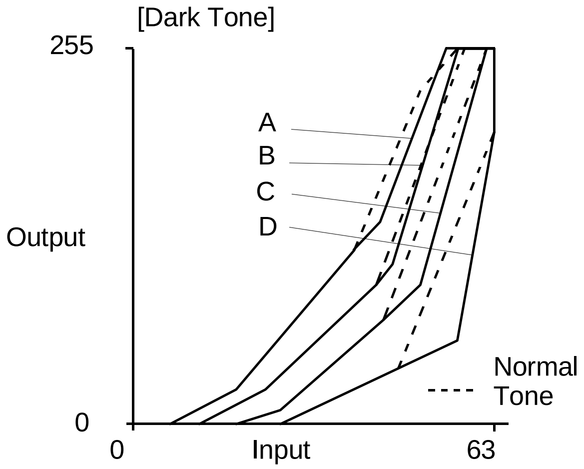


The photo data compensation process is used only when the photo mode is selected.

In this process, 6-bit image data are compensated based on the selected image density. Select density with the Image Density key (Lighter, Normal, Darker 1, or Darker 2). When the photo mode is selected with the make-up mode, the contrast can also be changed by changing the compensation ratio (Normal, Light Tone, or Dark Tone). (The normal contrast setting is also applied for the photo mode without the make-up mode.) The compensated image data is output as an 8-bit signal to obtain more graduation steps. Therefore, this increases resolving power for half-tone images. The above graph shows one of the compensation ratios for input and output.







A: Darker 2
B: Darker 1
C: Normal
D: Lighter

The compensation ratio varies according to which image density and contrast are selected. For example when Darker 1 key is selected the output value of the image data is increased slightly (i.e. it is slightly higher than the output obtained when Normal density is selected).

When Light Tone key is selected, the 8-bit output concentrates on the light tone part of the image (the low input value). This helps better reproduce the lighter parts of the image and the whole image will darken a bit. On the other hand, when Darker Tone key is selected, the 8-bit output concentrates on the dark tone parts of the image. This helps better reproduce the darker parts of the image and the whole image will lighten a bit.

The above graphs show the compensation ratios for each contrast and image density setting.

9.3.6 Half-tone Processing

In photo mode, the 8-bit image data from the photo data compensation processor are converted into single-bit white or black data in the half-tone processor. This helps reproduce half-tone images (such as photographs). For half-tone images, this process works better than the binary process.

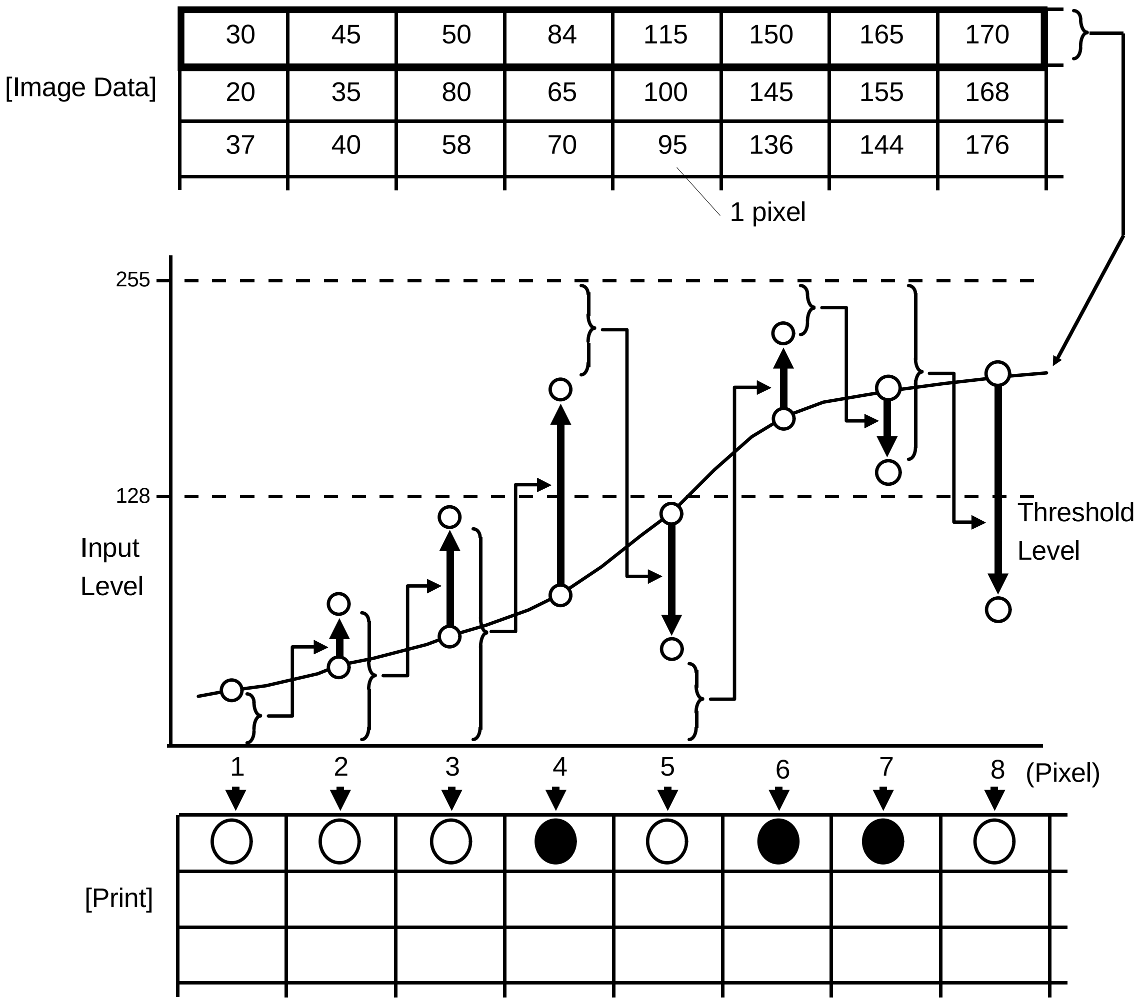
When the photo mode is selected in the make-up mode, three kinds of half-tone processing can be selected by the Screen key (Normal, Fine, and Coarse). The normal level (non-screen) is selected when the photo mode is on and the make-up mode is off.

[CAPIX]

CAPIX (Correlative-density-Assignment of adjacent pixels) is used when the screen mode is not selected (normal level).

When an image signal converted into a single-bit (white or black) signal based on a threshold level, a difference is yielded between the image signal value and the complete white value (255 in 8-bit signal) or black value (0). With CAPIX, the difference is distributed to surrounding pixel data and scattered. (The binary process simply erases these differences.)

For example, when considering a one dimensional CAPIX, the image data shown in the figure (next page) produces white and black data as outputs as follows on the next page.

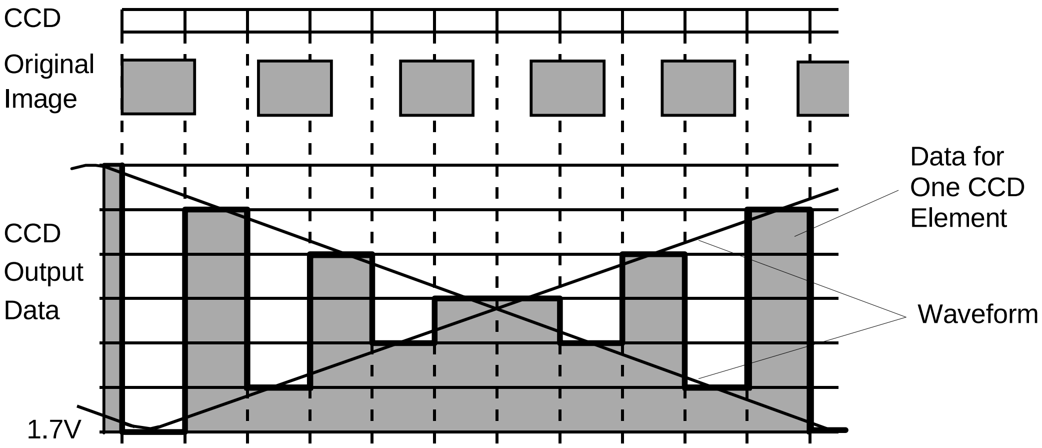


30	45	50	84	115	150	165	170
20	35	80	65	100	145	155	168
37	40	58	70	95	136	144	176

0: White Pixel
255: Black Pixel

In this model, the errors are distributed in three dimensions. The error is preferentially distributed to darker pixels in higher ratio and to lighter pixels in lower ratio. CAPIX has the following advantages:

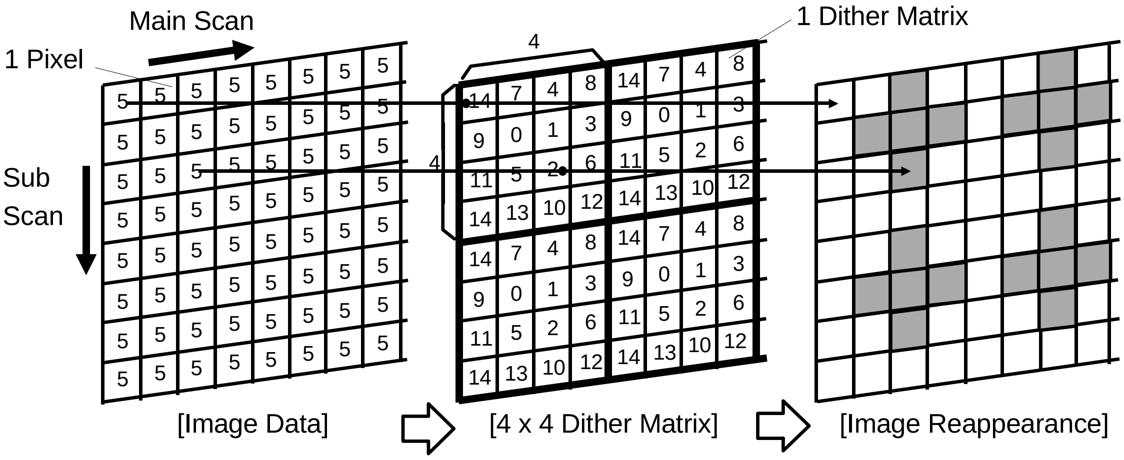
1. Moire patterns are not produced (as in the binary process of the line mode) since here the differences of the binary process are scattered.
2. With CAPIX both half-tone and solid images are well reproduced, but with dithering, solid images do not come out as well. This is because dithering uses more graduation steps than a solid image (such as a simple diagram or a character) will need.
3. Because of CAPIX's high resolving power, the texture pattern does not appear. (With dithering, it does appear.)



[Moire]

When the CCD scans an image made up of regular lines such as a resolution chart, the output image may have another regular pattern over the regular lines. This is called "moire".

The above illustration shows one of the moire mechanism. In this case, the pixel density of the CCD is the same as the density of the regular lines of the original. However, the regular lines are slightly out of step with the CCD pixel elements due to some magnification error when they were scanned. As a result, each CCD pixel has a different value (as shown in the above figure). Since the length of a CCD pixel is very short, the waveform from the CCD output looks like the cross lines in the figure. The moire pattern appears when prints are made from this signal. The moire pattern typically appears when the CCD pixel density is a multiple of the regular lines density.



5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5

14	7	4	8	14	7	4	8
9	0	1	3	9	0	1	3
11	5	2	6	11	5	2	6
14	13	10	12	14	13	10	12
14	7	4	8	14	7	4	8
9	0	1	3	9	0	1	3
11	5	2	6	11	5	2	6
14	13	10	12	14	13	10	12

All pixels' values from
4-bit data are at 5.
(Gray Image)

The number shows
the threshold level
for each pixel.

Shaded pixels show
black dots.

[Dithering]

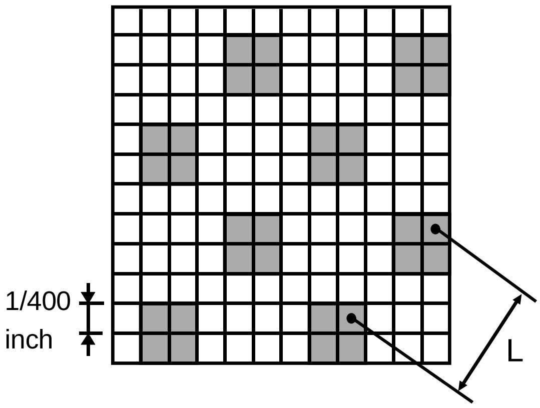
Dithering is used when the screen mode is selected in make-up photo mode. Two kinds of dither matrices are used for the fine and coarse screen level.

Dithering converts 8-bit image data into single-bit white or black data.

A dither matrix contains various threshold levels (Vthn) for the locations which correspond to some pixels of an original image. Each pixel datum of the scanned image (En) is compared with the corresponding fixed threshold level (Vthn) in the dither matrix. Then, each pixel datum is converted to either black or white depending on whether the image data is greater or less than the threshold level. This procedure is repeated for the whole area of the original. The thresholds of the dither matrix are determined so that half-tone graduations are introduced on prints using only black and white pixels. This is done by changing the ratio of black pixels to white pixels.

The figures above show an example of a 4 x 4 (16 pixels) dither matrix and dithering for 4-bit data scanned from an imagined gray image. The result of dithering (image reappearance) shows the pattern of white and black dots, which appears gray to the human eye.

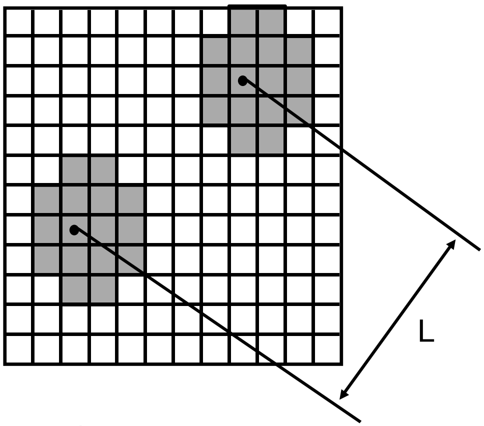
[Fine Screen]



$L = \frac{1}{400} \text{ x } 3 \text{ x } \sqrt{2}$ inches

(100 Lines/inch)

[Coarse Screen]



$L = \frac{1}{400} \text{ x } 6 \text{ x } \sqrt{2}$ inches

(50 Lines/inch)

In this model a 12 x 12 dither matrix is used to convert 8-bit image data into single-bit data. There are two kinds of dither matrices to allow for the fine and coarse screen modes.

A uniform gray area of an original is scanned, and the pixel datum is set at 55. It then goes through the dithering process and the results (both for coarse screen and fine screen) are shown above.

9.3.7 Make-up Processing

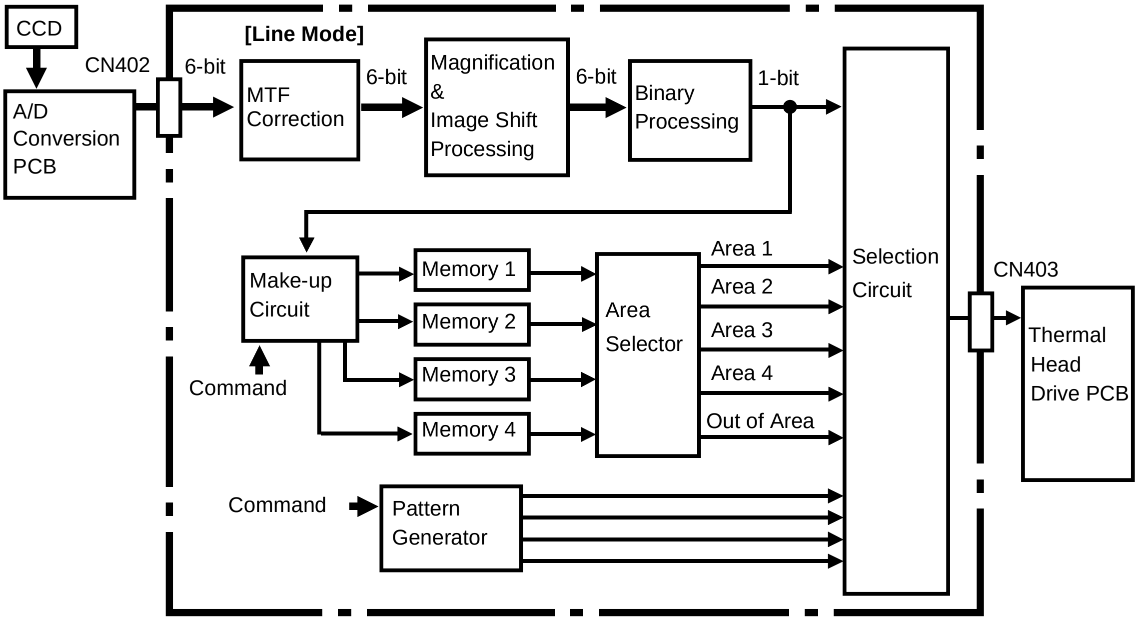


Image Processing PCB

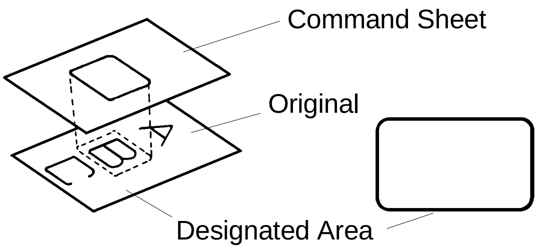
[Overall Operation]

The command sheet is scanned twice as fast as the original. The image data for the command sheet are digitized and converted to single-bit white or black data. They also go through normal image processing in the line mode. The image data for a command sheet are reduced to 1/80 and stored in the corresponding area memory (Memory 1 to 4).

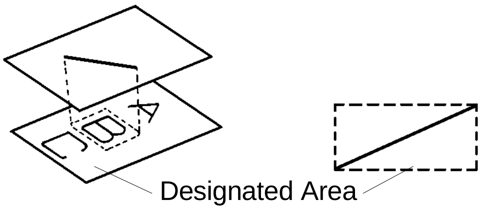
The command sheets data are picked out of memory through the area selector when image data of an original are sent to the selection circuit. When the areas designated by two or more command sheets overlap, the data from the last command sheet are picked out from the corresponding memory by the area selector.

The image data of the original and command sheet data are combined and edited in the selection circuit. When a pattern mode is selected, the pattern generator sends the selected background pattern(s) to the selection circuit. The image data of the original, the command sheet data, and the pattern data are combined and edited in the selection circuit as ordered.

[Closed Line Method]



[Diagonal Line Method]



[Make-up Mode]

A variety of editing functions can be selected in the make-up mode as follows:

Step 1 Make command sheet(s) to designate the areas to be edited. The diagonal line method or closed area method can be used for a command sheet to designate areas. Up to four command sheets can be used at a time to designate areas for an original. If designated areas on two or more command sheets overlap, the data from the last command sheet will apply for the overlapped portion.

Step 2 Select the appropriate command number for the designated areas using the number keys. Only one command can be selected for each command sheet (up to four sheets) from seven modes. (See the following table of modes for designated area.) When two or more command sheets are used, select a appropriate mode for each command sheet.

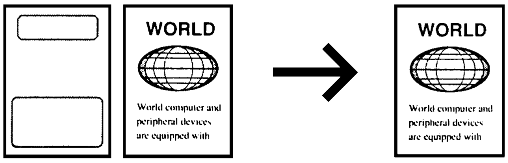
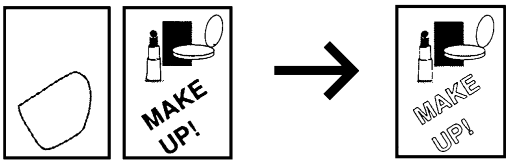
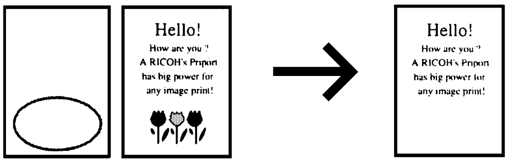
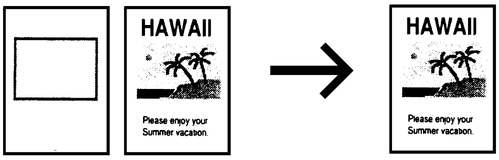
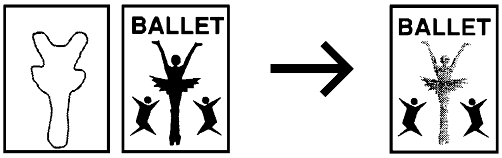
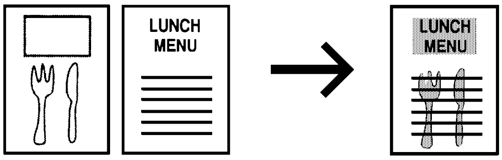
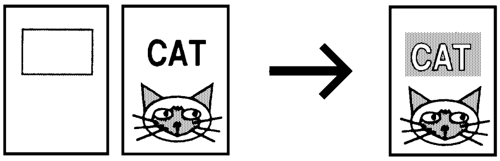
When a pattern mode is selected, also select an appropriate background pattern using the Number keys. There are 40 patterns from no. 1 to 40. (See the following list of background patterns.) Patterns no. 51 to 90 are the same as patterns no. 1 to 40 but the pattern elements are twice as large. By adding 100 on the pattern numbers of no. 1 to 40 and no. 51 to 90, the patterns rotate 90°. Therefore, there are 180 patterns in all.

Step 3 Select an appropriate command number for the outside of the designated areas using the number keys. Even if two or more command sheets are used at a time, only one command can be selected for all command sheets from four modes. (See the following table of modes for outside designated area.)

Step 4 Set the command sheets and original in the ADF so that the command sheets are scanned prior to the original.

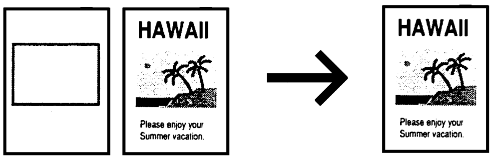
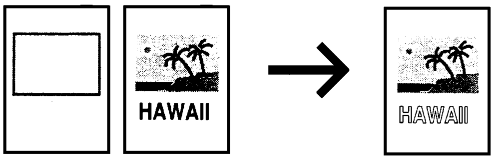
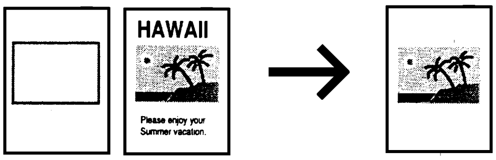
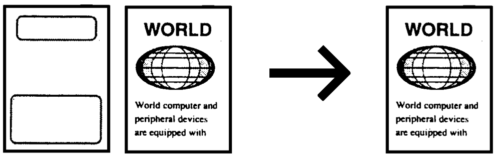
[Modes for Designated Area(s)]

The following commands are for the designated area(s).

MODE Designated Area		SAMPLE Command sheet / Original (closed area method) Print	COMMAND NO.	
			Closed area method	Diagonal line method
1.	Line mode		**Fn 1**	**Fn 11**
2.	Outline mode		**Fn 2**	**Fn 12**
3.	Delete mode		**Fn 3**	**Fn 13**
4.	Photo mode		**Fn 4**	**Fn 14**
5.	Image pattern mode		**Fn 5**	**Fn 15**
6.	Area pattern mode		**Fn 6**	**Fn 16**
7.	Image outline & Area pattern mode		**Fn 7**	**Fn 17**

[Modes for Outside Designated Area(s)]

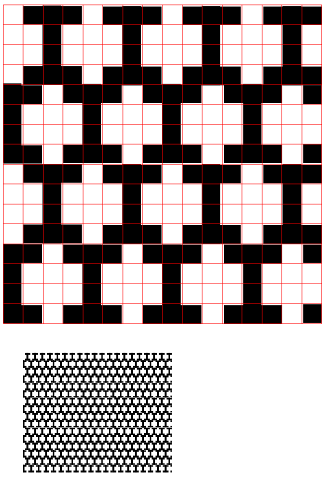
The following commands are for the area outside the designated area(s).

MODE Undesignated Area		SAMPLE Command sheet / Original Print	COMMAND NO.
1.	Line mode		**Fn 1**
2.	Outline mode		**Fn 2**
3.	Delete mode		**Fn 3**
4.	Photo mode		**Fn 4**

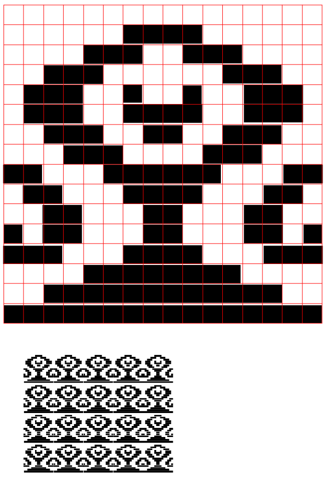
[Background Patterns]

The 40 background patterns shown below can be selected.

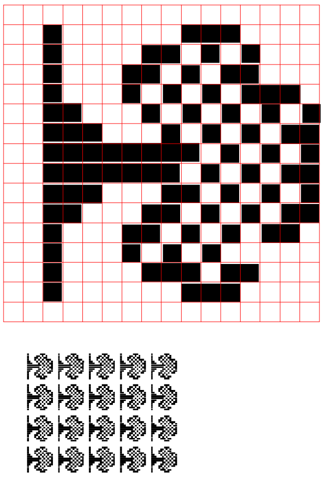
1



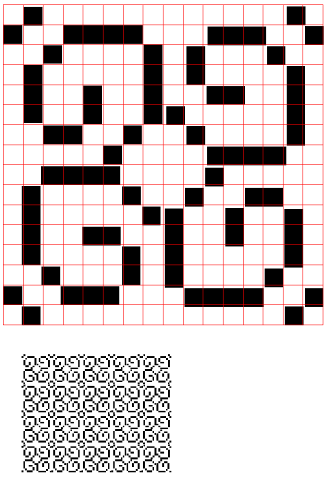
2



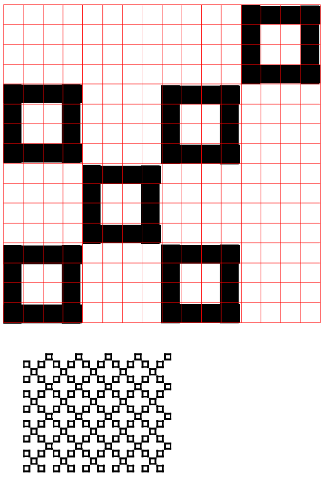
3



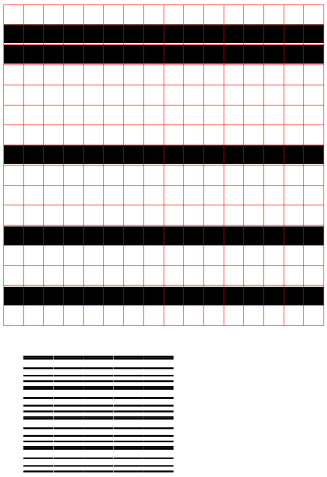
4



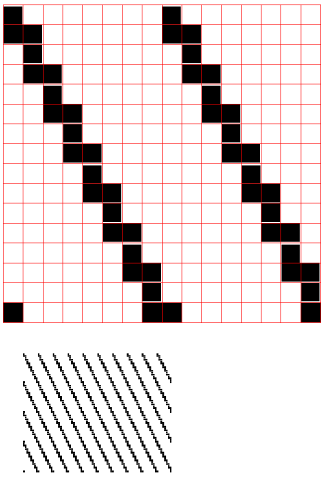
5



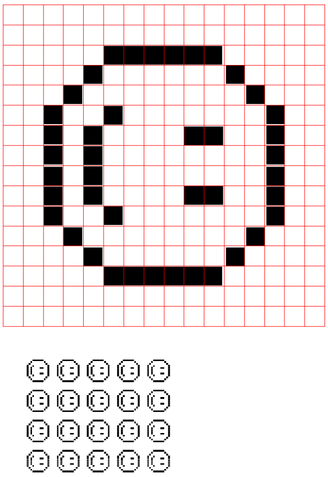
6



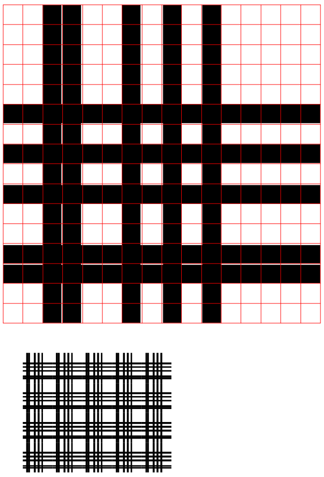
7



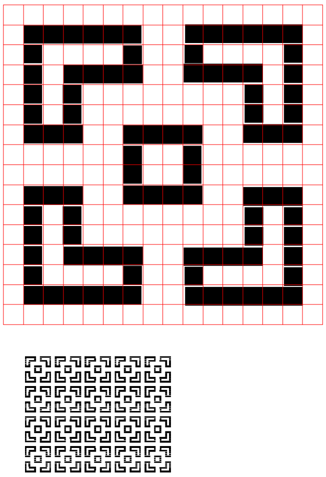
8



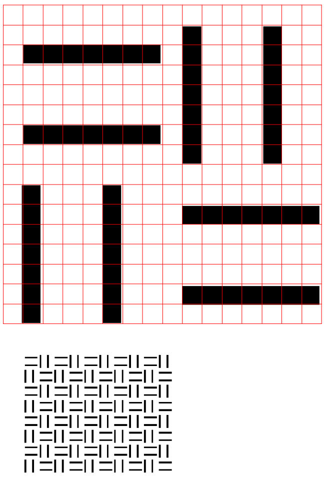
9



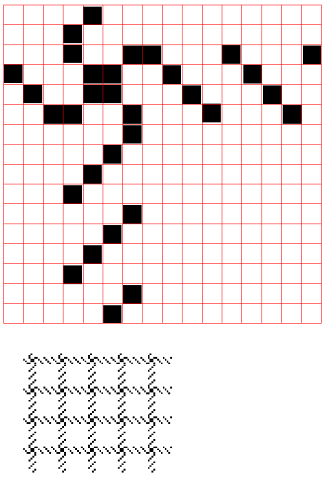
10



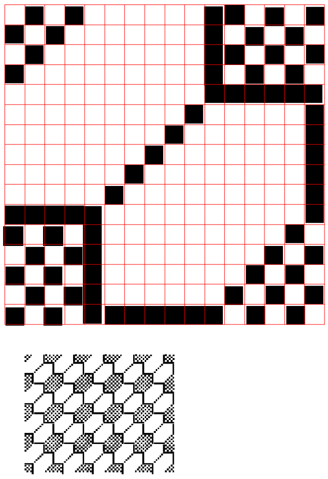
11



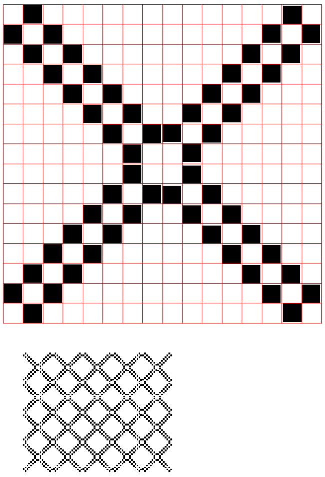
12



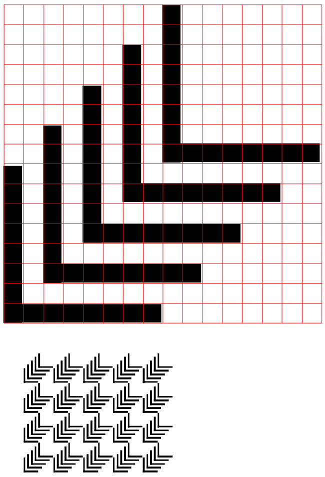
13



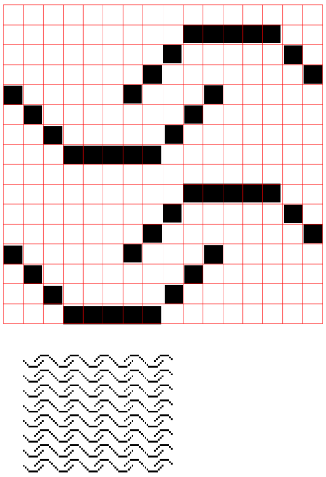
14



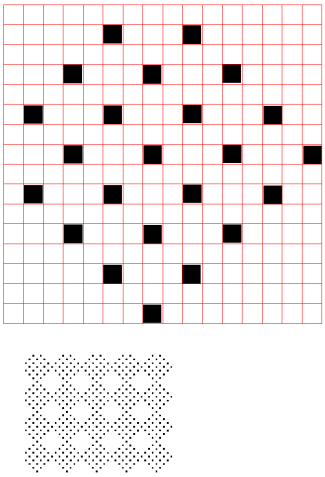
15



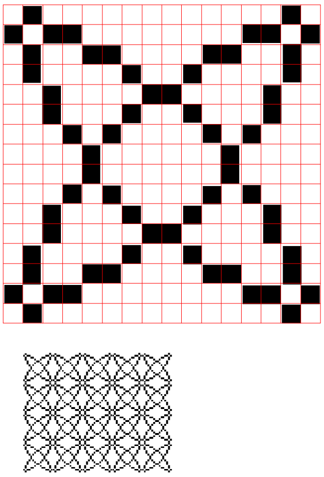
16



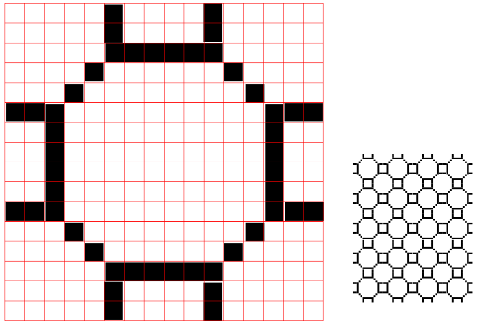
17



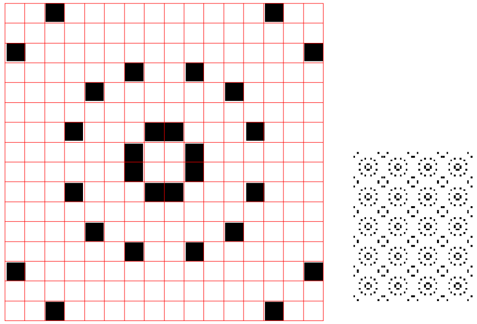
18



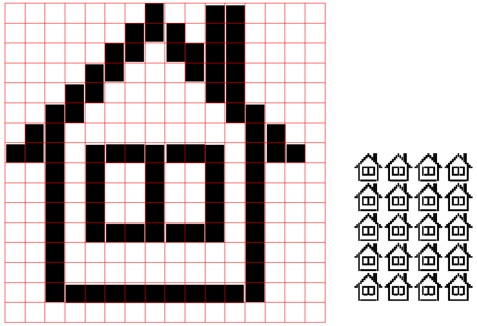
19



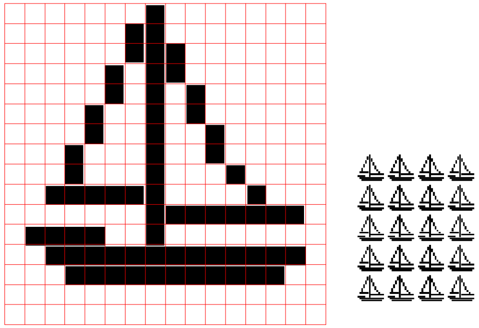
20



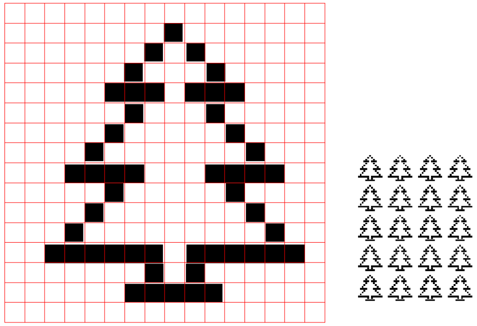
21



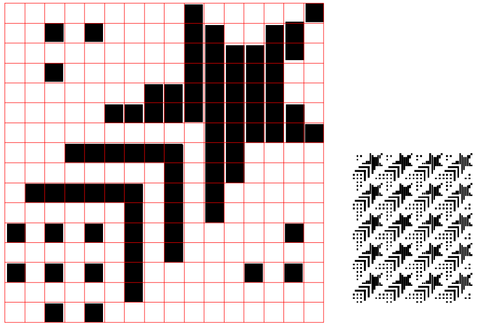
22



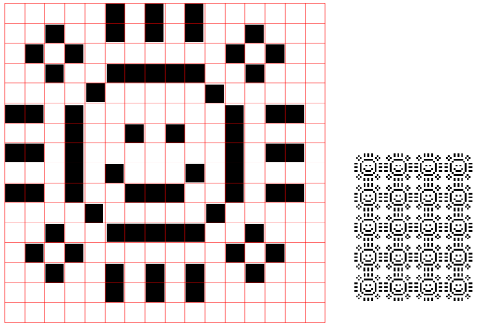
23



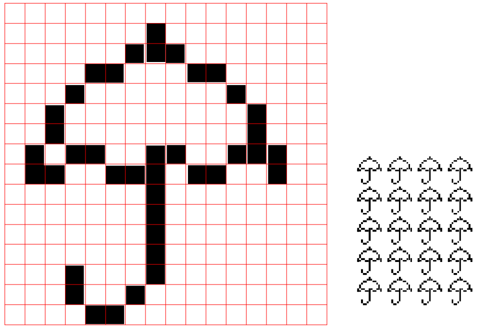
24



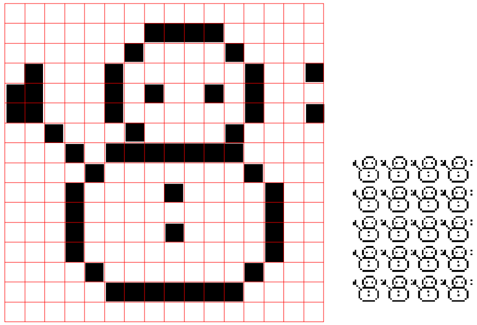
25



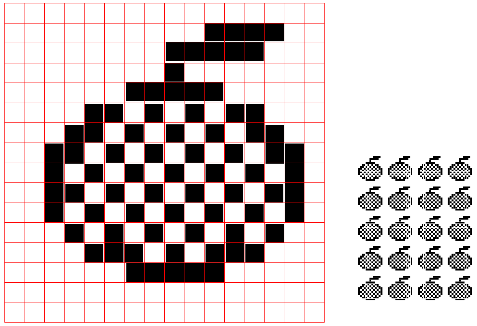
26



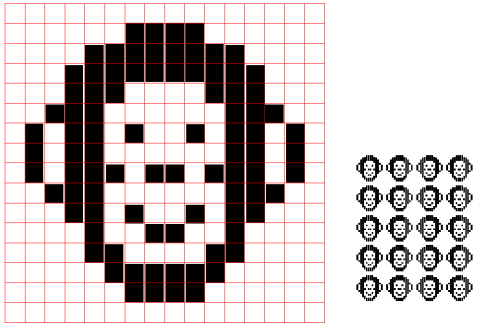
27



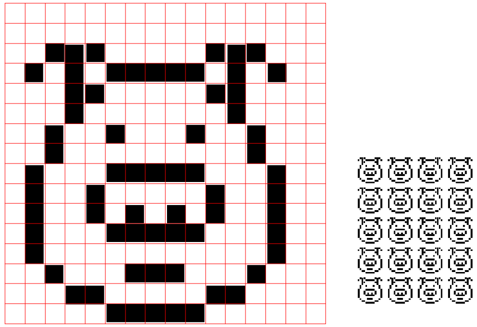
28



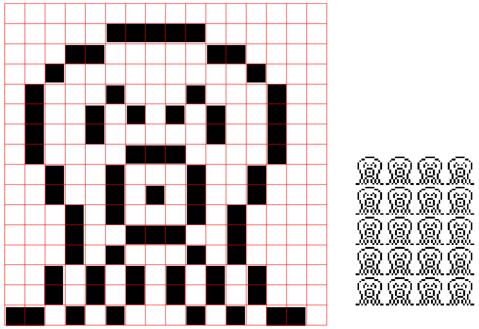
29



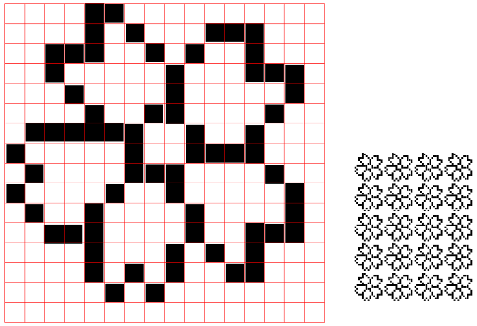
30



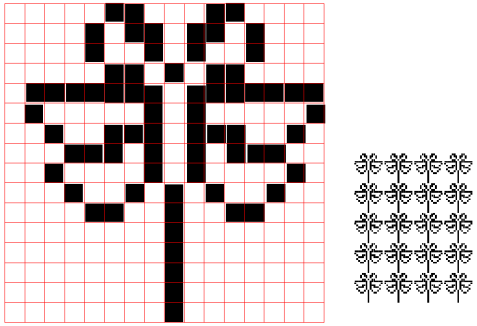
31



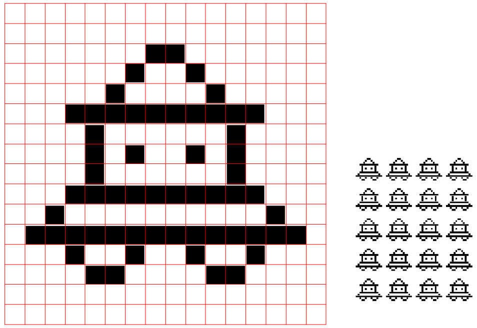
32



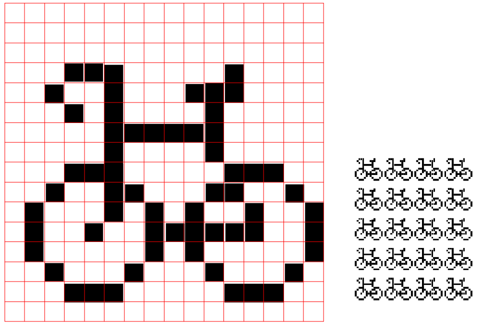
33



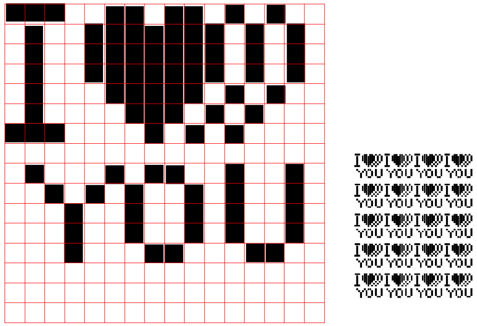
34



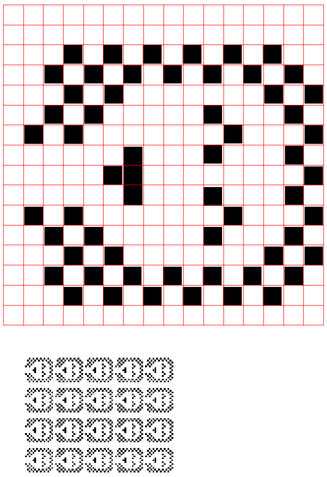
35



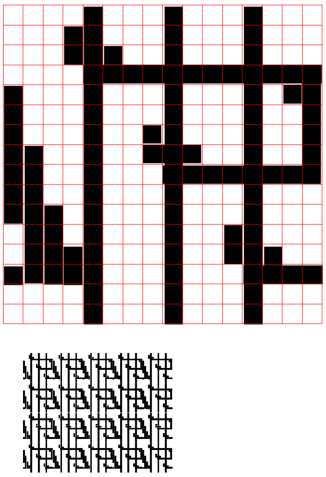
36



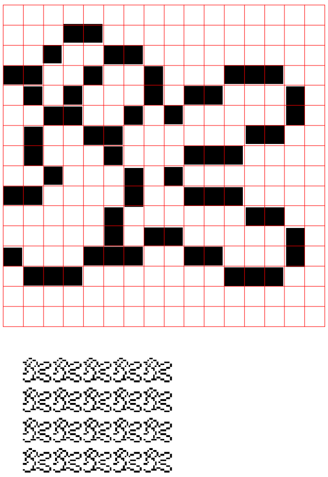
37



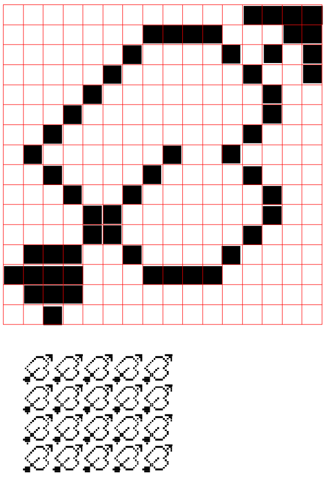
38



39

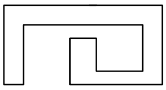
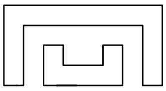
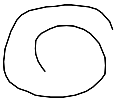
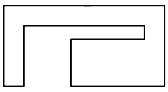
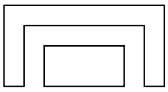
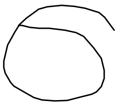
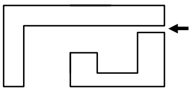
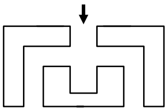
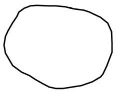
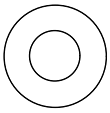
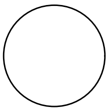
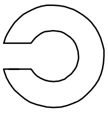
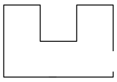
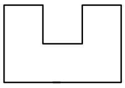


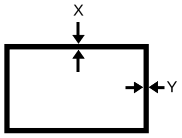
40

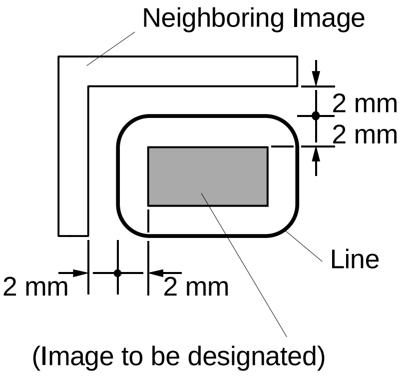


[Recognition of Designated Area]

How you enter the designated area will affect the final result, therefore refer to the following table when you make the command sheet.

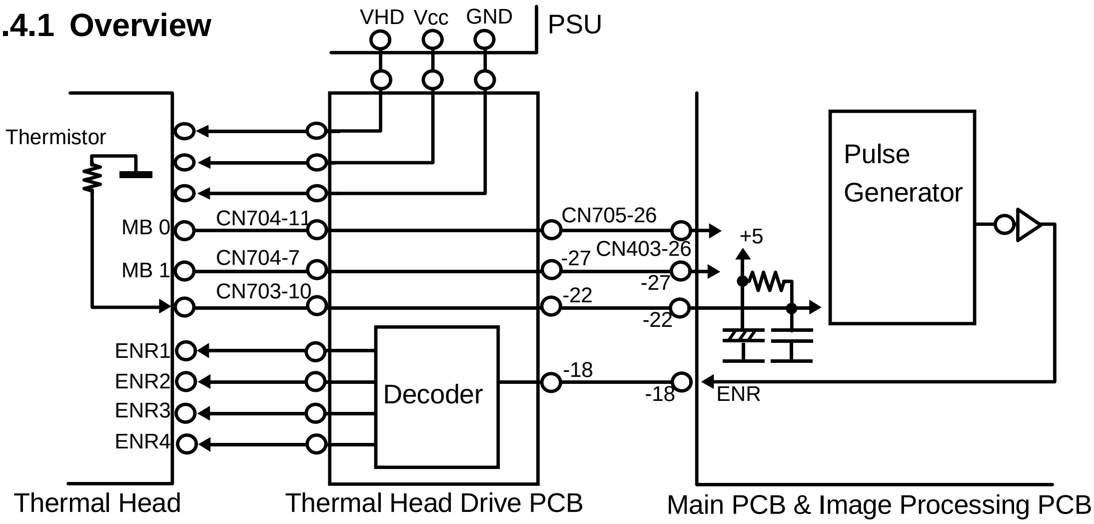
No.	Item	Typical Problems		Preferred designated area
		Designated area	Area recognized	
1	Form of the designated area	Serial pattern   	The designated area is recognized as follows:   	Separation the area to be designated as follows:  Make a space more than 2 mm.  Make a space more than 2 mm.  Designate area by a closed line.
		Double circle pattern. 	Only the outer circle will be recognized as follows: 	1) Make a gap in the pattern.  2) Use one command sheet for the one circle pattern. The smaller circle must be read as the designated area after the larger circle is read.
2	Non-closed line	The designated area is not a closed loop. 	The designated area is not recognized.	Designate the area by a closed loop. 

No.	Item	Typical Problems		Preferred designated area
		Designated area	Area recognized	
3	Thickness of the designating line.	The thickness of the line as follows: $X \leq 1$ mm $Y \leq 0.6$ mm (In Full Size Mode) 	As the line of the designated area is too thin, no designated area is recognized.	Mark with a line more than 1 mm in width. (More than 2 mm in 50% reduction mode.)
4	Density of the designated line.	When using a pencil or a color pen. (The line has low image density.)	As the designating line is too light, no designated area is recognized.	Mark using a black pen.
5	Type of command sheet.	1) Rough paper is used as a command sheet. 2) If the command sheet has a different friction coefficient from the original.	1) Any fibrous black spots will be read as a designated area. 2) Due to different registration of the original and the command sheet, the designated areas will be different from the imagined positions.	1) Use white paper (65 g/m^2). 2) Use the same paper as the original.

No.	Item	Typical Problems		Preferred designated area
		Designated area	Area recognized	
6	Gap between the designated area and neighboring image, or gap between two designated areas.	When the gap between the designated area and neighboring image is too small.	Depending on the original feed condition (registration and skewing) or handwriting ability the designated area, the neighboring image may or may not be recognized as a designated area.	 1) There should be more than 2 mm clearance between the line and image. 2) Mark the line away from the image in the designated area move than 2 mm to recognized the image completely. 3) For consideration of the handwriting ability, approximately 5 mm is needed between the neighboring image and image to be designated as a clearance.

9.4 PLOTTER

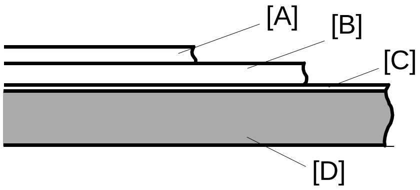
9.4.1 Overview



A thin-film type thermal heating element is used by the thermal head. The thermal heating elements melt the over-coating and polyester film layers of the master according to the image signals for each pixel. The specifications are as follows:

Maximum Plotting Width:	292.6 mm
Number of Thermal Heating Elements:	4608 pieces
Density of Thermal Heating Elements:	400 dots/inch
Size of Thermal Heating Element:	45 x 60 µm
Average Resistance of Thermal Heating Elements:	1520 to 2300 Ω
Power Source:	15.1 to 18.6 V

[Section Plan for Master]

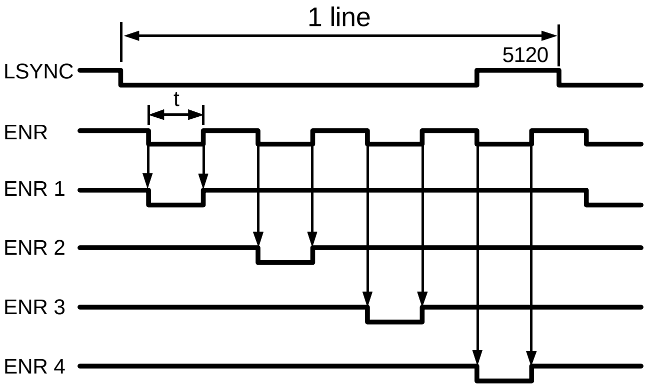


[A]: Over-coating
[B]: Polyester film
[C]: Adhesive
[D]: Base paper

The power source (VHD) is applied to the thermal heating elements through the thermal head drive PCB. The power source (VHD) varies from one head to another since the average resistance (AVR) of the elements varies. Therefore, when the thermal head or power supply unit is replaced, it is necessary to readjust the applied voltage with the particular value indicated on each thermal head.

NOTE: $VHD = (0.15 \times AVR)^{0.5}$

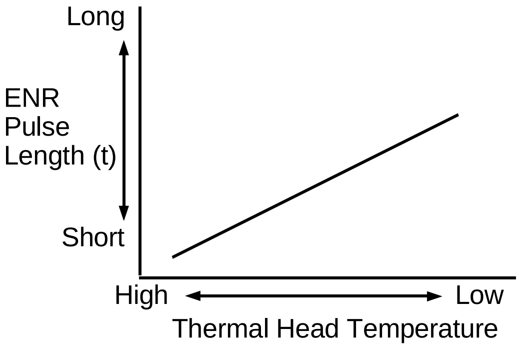
The thermal head sends the identification signal to the main PCB by using a combination of High and Low signals of MB 0 and MB 1.



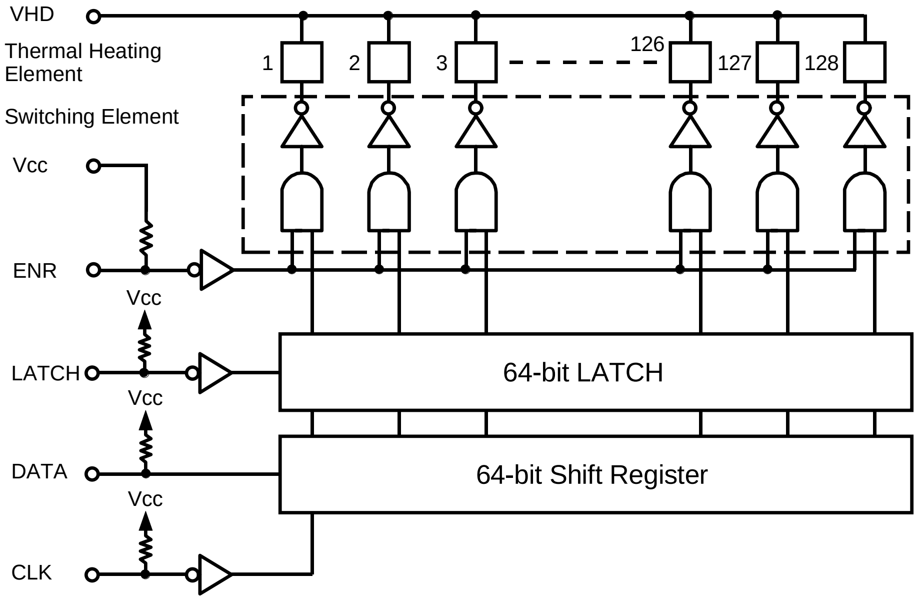
The power source (VHD) is supplied to the thermal head when the plotting signal turns on. When the plotting signal turns off, a relay (RA701) on the thermal head drive PCB cuts the power line.

The energy applied to the thermal heating elements is determined by the length of the time (t) when power is applied. This time in turn is controlled by the pulse (ENR) length generated in the main PCB. The pulse signal (ENR) is sent to the thermal head drive PCB through the image processing PCB. The pulse signal is split into four pulse signals (ENR 1 to 4) in the thermal head drive PCB. Then, they are separately applied to the four blocks (1152 elements each) of the thermal head.

The thermistor on the thermal head detects the thermal head temperature. The detected temperature is sent to the pulse generator in the main PCB, and the pulse generator controls the length of the pulse (ENR) based on the temperature. (See graph.)



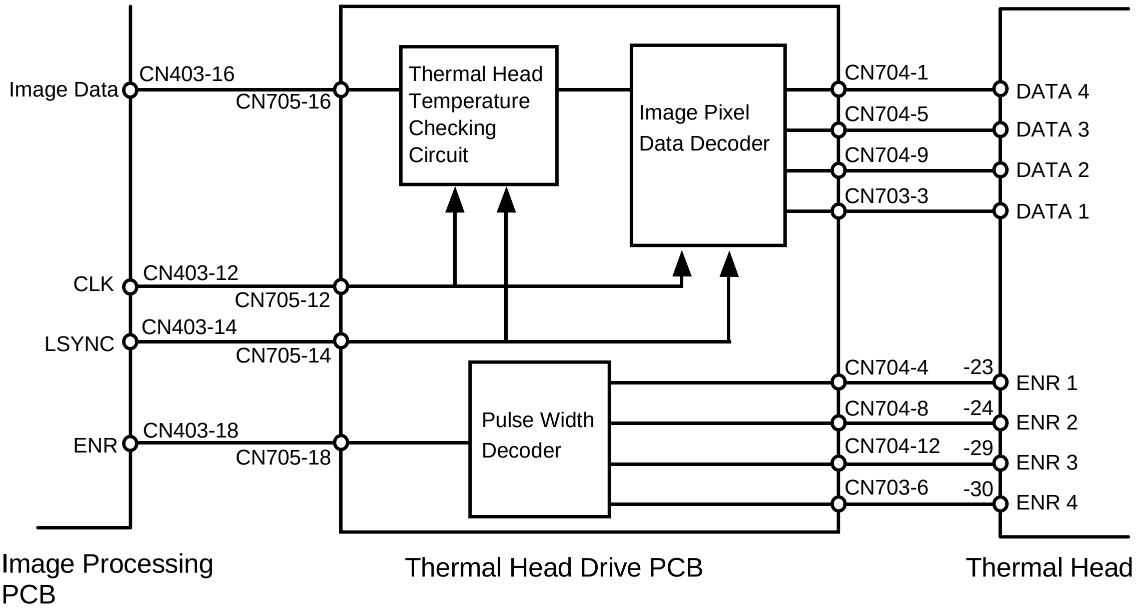
9.4.2 Thermal Head Description



VHD:	Power source
Vcc:	Power source for ICs
ENR 1 to 4:	Signal for supplying VHD to each elements block
LATCH 1 to 4:	Signal to pick out data from the shift register for each elements block
DATA 1 to 4:	White/black pixel data for each elements block
CLK:	Clock pulse from the image processing PCB

The thermal head consists of 72 sets of circuits as shown in the figure. The 72 sets are divided into four blocks which are separately driven. Each thermal heating element is directly activated by its corresponding switching element.

9.4.3 Thermal Head Drive

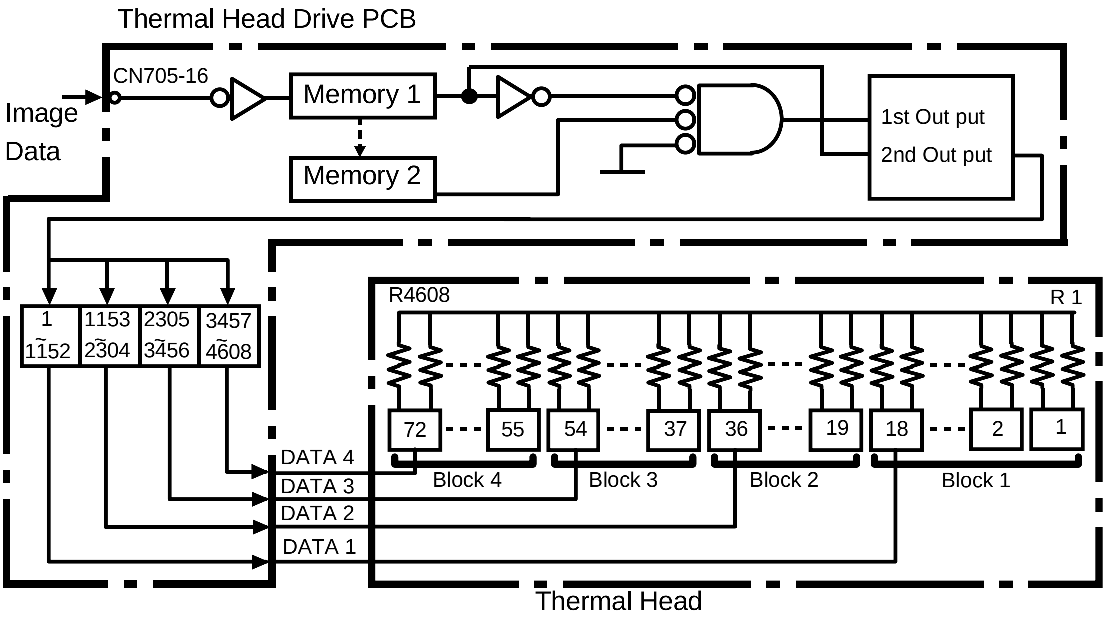


A thermal heating element may get too hot when there are consecutive black pixel data in the sub-scanning direction. Conversely, a thermal heating element may not get hot enough to plot on a master when there are consecutive white pixel data in the sub- scanning direction.

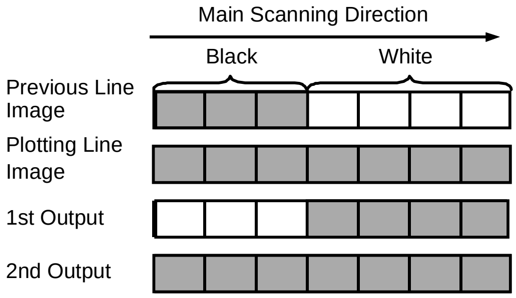
To remedy this, each thermal element receives data twice for one plotting:

1. Data for the line previous is monitored by the thermal head temperature checking circuit. Then, based on the datum obtained, the opposite datum is sent to the thermal heating element. This either heats or cools the element (as required).

2. The actual plotting data is sent to the element. This plots the pixel on the master.



For example, if all of one line data are black, the first and second outputs are as follows:



[Previous Line's Pixel is White]

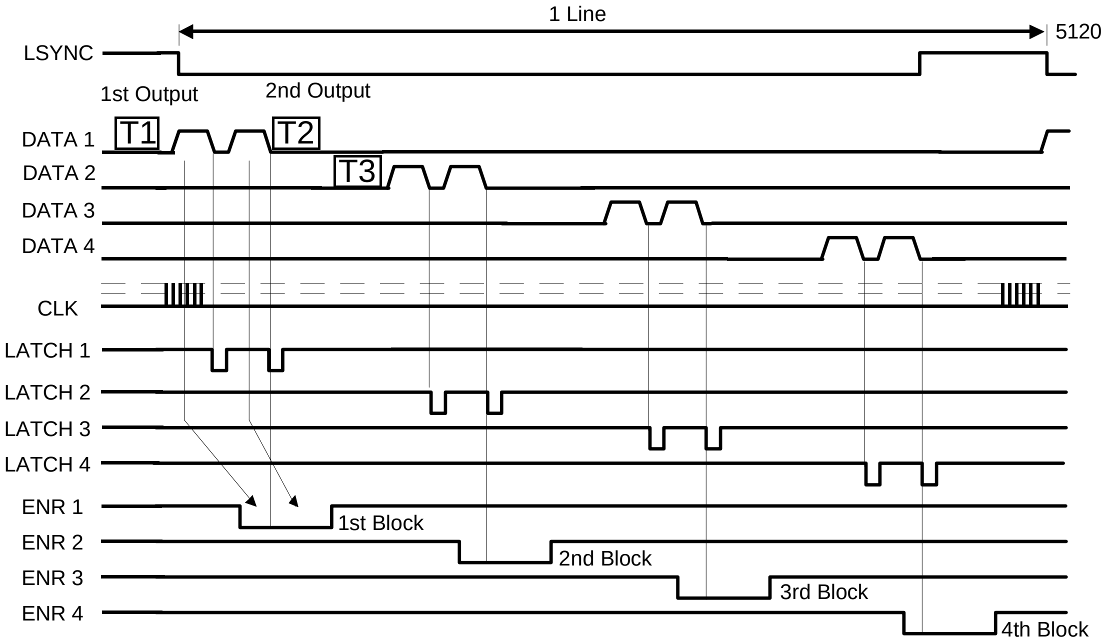
A black datum is sent to the corresponding thermal heating element as the first output. The applied energy to plot the pixel increases.

[Previous Line's Pixel is Black]

A white datum is sent as the first output. The applied energy to plot the pixel decreases.

The line data sent to the thermal head drive PCB are stored in a line memory (Memory 1). When the image data of the following scanning line are sent and stored in the line memory, the previous line data move to another memory (Memory 2). The line data and previous line data are compared, and the pre-heat and/or cool data for each thermal heating element are serially sent to the thermal head as the first output. The line data to plot the master are picked out from the line memory (Memory 1) and are sent following the first output.

The outputs are divided into four (DATA 1 to 4) in the image pixel data decoder and are sent separately to the four blocks of the thermal head.



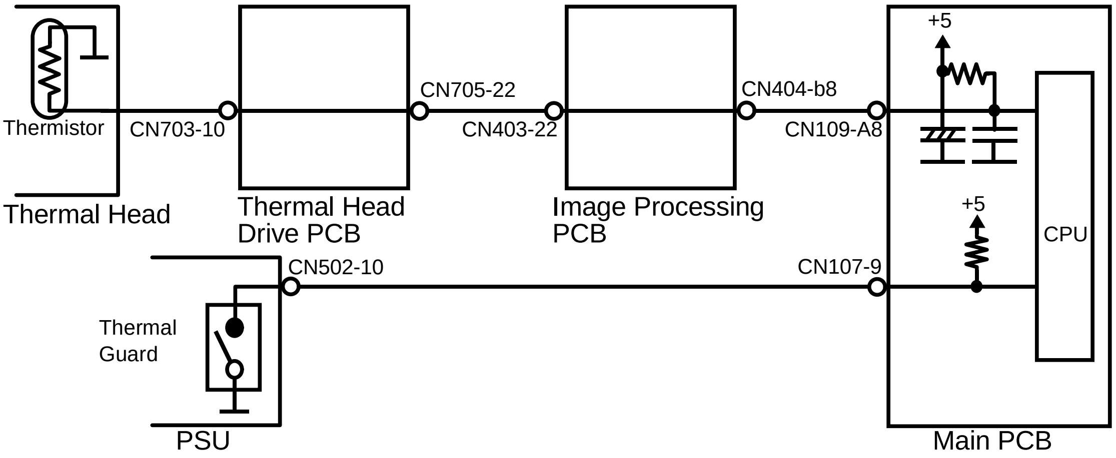
[Timing Chart]

T1: When the first output data (the first half of DATA 1) for the first one block (1152 pixels data) have been stored in the shift register, the latch signal (LATCH 1) is activated. Then, the switching elements for each thermal heating element are activated according to the first output data. If the datum for a pixel is black, the first part of the energy will be applied to the corresponding thermal heating element. The total energy (ENR 1, 2, 3, or 4) for one pixel plotting is fixed based on the thermal head temperature. The DATA, LATCH, and ENR signals are triggered by the rising edge of the clock pulse (CLK).

T2: When the second output data (the last half of DATA 1) for the first one block (1152 pixels data) have been stored in the shift register, the latch signal (LATCH 1) is again activated. If a pixel datum in the second output is black, the second part of the energy will be applied to the corresponding thermal heating element. One line for the first block is then completely plotted.

T3: The second, third, and fourth lines are plotted immediately after the first, with no interruption.

9.4.4 Thermal Head Protection



A thermistor on the thermal head and a thermal guard (a thermostat) on the power supply unit 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 and lights the SC code on the operation panel as follows:

Detecting Component	Detecting Temperature	Signal Level	SC Code
Thermistor	54°C	1.17 V CN109-A8	E-04
Thermistor	Under 54°C	Over 1.17 V	Recovery
Thermal Guard	85°C	0 V CN107-9	E-08
Thermal Guard	Under 85°C	5 V	Recovery

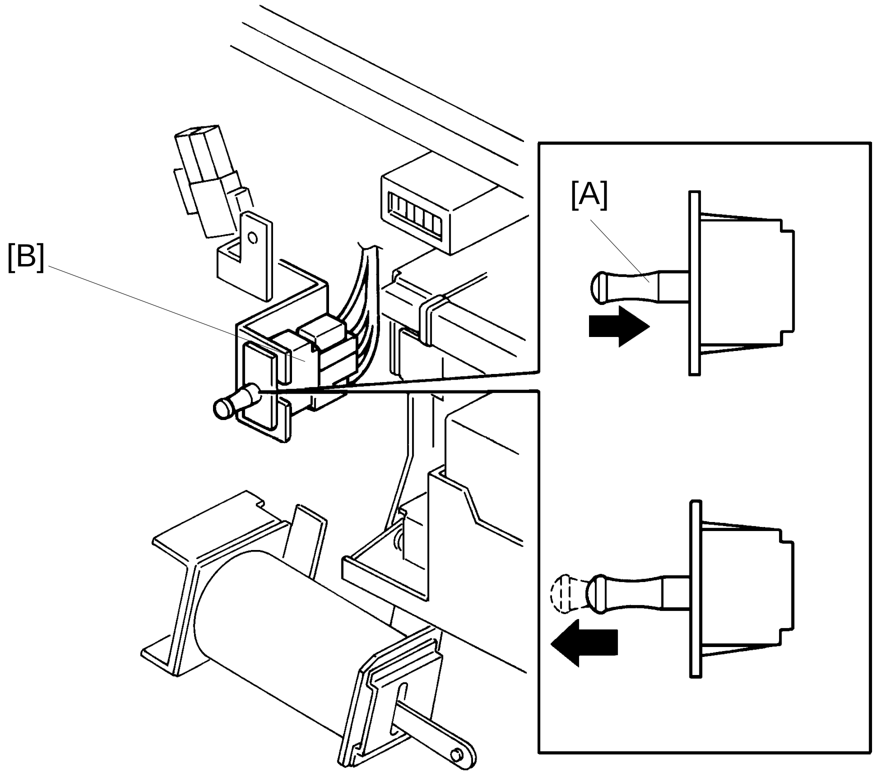
The CPU also lights SC code in the following conditions:

Conditions	Possible Cause	SC Code
The signal level between CN109-A8 and GND is over 4.9 volts.	1) Thermistor open. 2) Related connectors are not connected. (See the above figure.)	E-09

Conditions	Possible Cause	SC Code
The CPU detects an abnormal condition in the pulse from the thermal head drive PCB (ENR 1 to 4). This pulse determines the energy applied to the thermal heating elements.	1) Defective thermal head drive PCB or image processing PCB. 2) Disconnection of the related connector. (Main PCB CN109-A7, image processing PCB CN404-b7/CN403-20, or thermal head drive PCB CN705-20) 3) No power for ICs (Vcc) from power supply unit to image processing PCB. (Disconnection of image processing PCB CN701-7/14, or power supply unit CN503-12/13.)	E-10

10. OTHERS

10.1 INTERLOCK SWITCH



Pull out the actuator [A] of the interlock switch [B] located inside of the inner cover to disable the front door, paper table, master eject unit, and scanner unit safety switches. The interlock switch remains activated as long as the actuator is pulled out.

NOTE: 1. The ADF safety switch can be disabled using SP mode No. 146. Make sure to return the SP mode to its original setting after disabling the safety switch.

2. The cover open indicator can be canceled by turning on the DIP switch 101 on the main PCB. When this switch is turned on, the Print Start and Master Making keys will be accepted. However, this will light SC code E-02 or E-06 if the interlock switch is not activated and a safety switch is turned off (e.g. the front door safety switch). This is because the power line of the paper table drive and main motors remain cut. The DIP switch is for factory use only.

10.2 MONITOR INDICATION

10.2.1 Cover Open Indicator

Condition	Guidance Display Message
The drum has not been inserted all the way into the machine.	SET THE DRUM COMPLETELY
Front door is open, master eject unit is open, or original table (scanner unit) is open.	CLOSE THE COVER
Paper table is closed, or paper delivery table is closed.	OPEN THE PAPER FEED/DELIVERY TABLE
ADF cover is open.	CLOSE THE ADF COVER

NOTE:

1. The above guidance messages are not displayed in the following modes:
   - Make-up mode
   - User program mode
   - Image shifting mode
   - Directional magnification mode

2. The cover open indicator turns off when a cover is closed, or the paper table and paper delivery table are opened.

10.2.2 Key Counter Indicator: 123

Condition	Guidance Display Message
Key counter is not set (SP mode data of address 3 is 1)	SET THE KEY COUNTER

NOTE:

1. If the key counter is taken out during master making, the key counter indicator does not turn on until master making is completed.

2. If the key counter is taken out while prints are being made, paper feeding stops, the above message is displayed, and the key counter indicator turns on.

3. The above message is not displayed in the following cases:
   - The machine is in make-up mode, user program mode, image shifting mode, or directional magnification mode.
   - Cover open indicator is on.
   - Machine is in operation.

4. Key counter indicator turns off when the key counter is inserted.

10.2.3 Master Eject Box Indicator

Condition	Guidance Display Message
The master eject box is not set.	SET THE MASTER EJECT BOX
The master eject box is full. (When the pressure plate is lowered, the full master detection sensor does not turn on.)	EMPTY MASTER EJECT BOX

NOTE:

1. The Master Eject Box indicator does not turn on during machine operation.
2. When this indicator turns on, masters cannot be made, but prints can be made.
3. The above message is not displayed in the following cases:
   - The machine is in make-up mode, user program mode, image shifting mode, or directional magnification mode.
   - Cover open indicator is on.
   - Machine is in operation.
4. The master eject box indicator turns off when the master eject box is set or the Reset key is pressed after the master eject box is removed.

10.2.4 Ink Supply Indicator

Condition	Guidance Display Message
During the printing process, the ink detecting pin does not detect ink on the ink roller for 20 drum rotations.	LOAD NEW INK CARTRIDGE

NOTE:

1. In the following cases the above message is not displayed:
   - Cover open indicator ON
   - Key counter indicator ON
   - Master box indicator ON
   - Machine is in operation
2. When the Reset key is pressed after the ink supply indicator turns on, the drum rotates 40 times. When ink is detected during drum rotation, the drum stops rotating and the ink supply indicator turns off.

10.2.5 Master Supply Indicator

Condition	Guidance Display Message
Master paper is running out, or the master roll is not set.	LOAD NEW MASTER ROLL

NOTE:

1. When this indicator turns on, a new master cannot be made but prints can be made.
2. When the machine is in operation this indicator does not turn on.
3. In the following cases, the above guidance message is not displayed:
   - The machine is in make-up mode, user program mode, image shifting mode or directional magnification mode.
   - Cover open indicator, master eject box indicator, key counter indicator or ink supply indicator turns on.
4. When the master roll is set, this indicator turns off.

10.2.6 Paper Supply Indicator

Condition	Guidance Display Message
Paper is not on the paper table.	LOAD MORE PAPER

NOTE:

1. In the following cases, the above guidance is not displayed:
   - The machine is in make-up mode, user program mode, image shifting mode or directional magnification mode.
   - Cover open indicator, master eject box indicator, key counter indicator, ink supply indicator or master supply indicator is on.
   - Machine is in operation.
2. The paper supply indicator turns off when paper is placed on the paper table.

10.2.7 Master Eject Error Message F +

Condition	Guidance Display Message
Master is not ejected.	MASTER EJECT JAM REMOVE JAMMED MASTER
The master eject sensor is ON when the main SW is turned on.	

NOTE:

When the Reset key is pressed, if the master eject sensor is OFF, the jam indicator turns off.

10.2.8 Paper Misfeed Message B +

Condition	Guidance Display Message
Paper does not reach the paper detecting feeler. (The printing pressure sensor is not activated.)	PAPER FEED JAM REMOVE JAMMED PAPER

NOTE:

When the Reset key is pressed, if the 1st and 2nd paper exit sensors are OFF, jam indicator turns off.

10.2.9 Paper Delivery Error Message G +

Condition	Guidance Display Message
Paper does not exit to the delivery table.	DELIVERY JAM REMOVE JAMMED PAPER
1st and/or 2nd paper exit sensor is ON when the main SW is turned on.	

NOTE:

When the Reset key is pressed, if the 1st and 2nd paper exit sensors are OFF, the jam indicator turns off.

10.2.10 Paper Wrap Message 1 B + E +

Condition	Guidance Display Message
1st paper exit sensor does not turn ON after printing pressure sensor turns on.	PAPER WRAP JAM REMOVE JAMMED PAPER
Printing pressure sensor is on (printing pressure is applied) when the main SW is turned on.	

NOTE:

When the Reset key is pressed, if both the printing pressure sensor and the 1st Paper Exit sensors are OFF, the jam indicator turns off.

10.2.11 Paper Wrap Message 2 E +

Condition	Guidance Display Message
2nd paper exit sensor does not turn on after the 1st paper exit sensor turns on.	PAPER WRAP JAM REMOVE JAMMED PAPER

NOTE:

When the Reset key is pressed, if both printing pressure sensor and 1st paper exit sensors are OFF, jam indicator turns off.

10.2.12 Master Clamp Error Message C +

Condition	Guidance Display Message
When the main SW is turned on, master buckle sensor is ON.	MASTER FEED JAM REMOVE JAMMED MASTER
Master clamper fails to clamp the master.	
During master making process, cover is opened or Stop key is pressed before master is clamped.	

NOTE:

When the Reset key is pressed, if the master buckle sensor is OFF, the jam indicator turns off.

10.2.13 Original Misfeed Indication A +

Condition	Guidance Display Message
When the main SW is turned on, the 2nd original sensor or original registration sensor is ON.	ORIGINAL JAM REMOVE ORIGINAL
The original is not fed.	
During the master making process, cover is opened or Stop key is pressed while original is being fed.	
The ADF cover is opened when the original is set in SADF mode. (The 2nd original sensor is ON.)	

NOTE:

When the Reset key is pressed, if the 1st or 2nd original sensor is OFF, the jam indicator turns off.

10.2.14 Other Guidance Displays

Condition	Guidance Display Message
When more than one command sheet is used in make-up mode: after a command sheet is read, the following command sheet is not present on the original table.	SET THE COMMAND SHEET/S
In combine 2 originals mode, if the make-up mode is selected, the command sheet for the 2nd original is not placed on the original table after the 2nd original is read.	
In make-up mode, the original is not placed on the original table after the command sheet is read.	SET THE ORIGINAL 1)
In combine 2 originals mode, the 2nd original is not placed on the original table after the 1st original is read.	
The original width exceeds the print paper width when multiplied by a magnification ratio.	CHECK THE PAPER SIZE PRESS MASTER KEY 2)

NOTE:

1) When this message is displayed, input from the Make-up key, Image Positioning key, Fixed Magnification key and Program key are not accepted.

2) This message is displayed for 3 seconds after the master making key is pressed. "READY TO START" is then displayed.

If the operator does not change the paper size, the print paper size detected on the paper table is valid for master making.

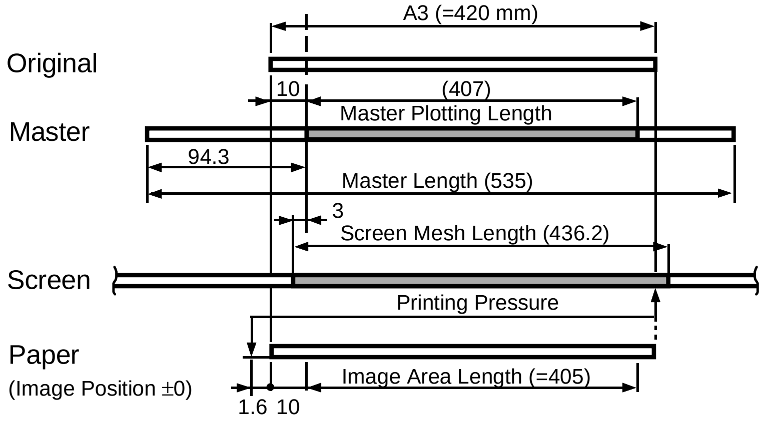
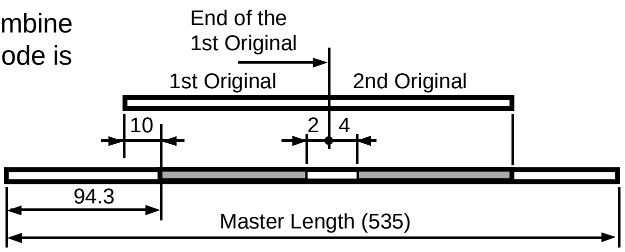
In the following cases, the guidance message is not displayed when the Master Making key is pressed. Master Making starts as soon as the Master Making key is pressed.

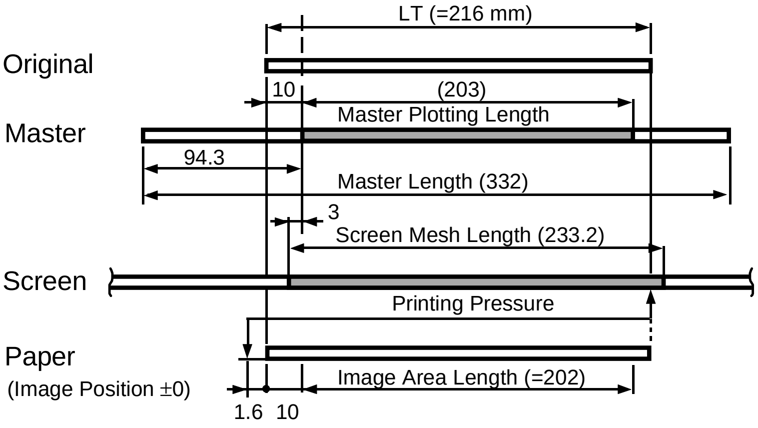
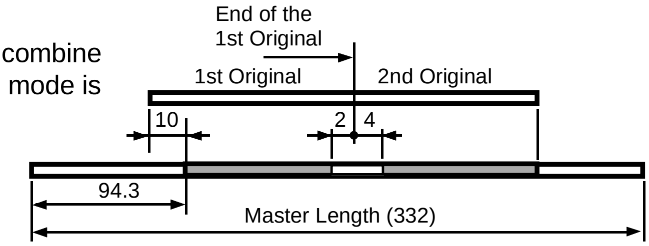
- In zoom mode
- In directional magnification mode
- In image shift mode
- For reading the 2nd and following command sheets.
- For reading the 2nd original in the combine 2 original mode.

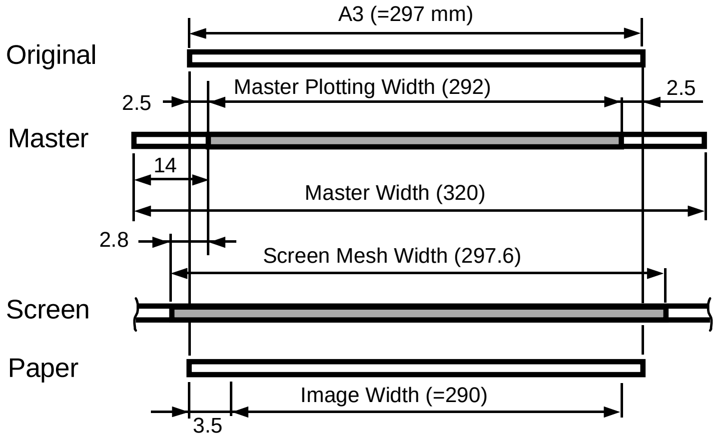
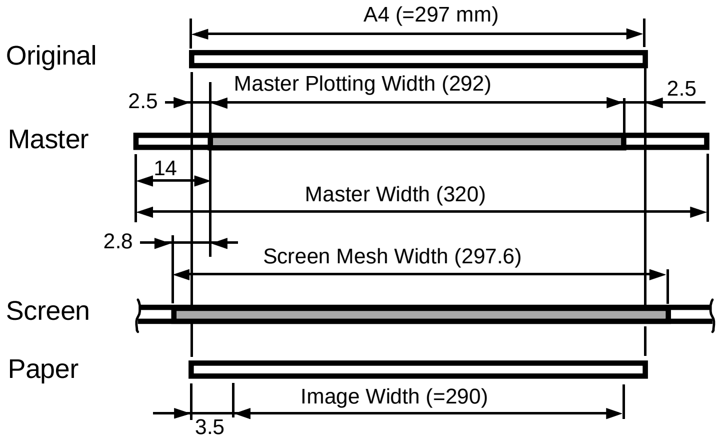
10.2.15 Other Monitor Indications

1. If the original is not set on the original table when the Master Making key is pressed, "A" on the misfeed location indicator lights and "SET THE ORIGINAL" is displayed for 2 seconds. They then turn off and " READY TO START" is displayed.
2. If there is no master on the drum when the Print Start key is pressed, "M" indicates and "MASTER NOT WRAPPED is displayed. The display message changes to "READY TO START" 2 seconds later, but "M" stays lit until the cover is opened or the Master Making key is pressed.
3. When the drum is not set in the machine, both drum size indicators are off and "SET THE DRUM COMPLETELY" is displayed.

10.3 MASTER PLOTTING AND PRINTING AREA

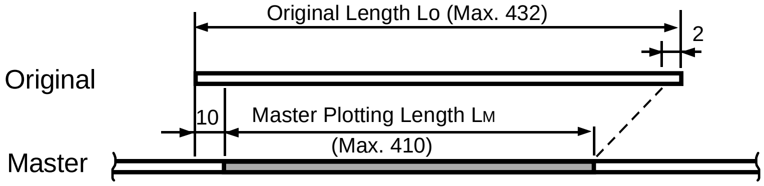
Items	Standard	Note
[A3/DLT Drum: Length]		1) Master plotting area changes according to paper size. 2) In enlarge or reduce mode, the 10 mm margin is not enlarged or reduced. 3) If the machine knows the paper size, it allows for a 3 mm blank margin at the paper's trailing edge. If paper size detection is cancelled through the SP mode, the machine will not plot the last 2 mm of the original on the master.
When the combine 2 originals mode is selected.		4) In combine 2 originals mode, the trailing edge of the 1st image has a 2 mm margin and the leading edge of the 2nd image has a 4 mm margin. (These margins vary according to the magnification ratio.)
	Maximum Image Length: 405 mm Maximum Master Plottingng Length: 410 mm Screen Mesh Length: 436.2 mm Master Cut Length: 535 mm	

Items	Standard	Note
[A4/LT Drum: Length]  		1) Master plotting area changes according to paper size. 2) In enlarge or reduce mode, the 10 mm margin is not enlarged or reduced. 3) If the machine knows the paper size, it allows for a 3 mm blank margin at the paper's trailing edge. If paper size detection is cancelled through the SP mode, the machine will not plot the last 2 mm of the original on the master.
When the combine 2 originals mode is selected.  		4) In combine 2 originals mode, the trailing edge of the 1st image has a 2 mm margin and the leading edge of the 2nd image has a 4 mm margin. (These margins vary according to the magnification ratio.)
	Maximum Image Length: 202 mm	
	Maximum Master Plotting Length: 206 mm	
	Screen Mesh Length: 233.2 mm	
	Master Cut Length: 332 mm	

Items	Standard	Note
[A3/DLT Drum: Width]  	Maximum Image Width: 290 mm Master Plotting Width: 292 mm Screen Mesh Width: 297.6 mm Master Width: 320 mm	In enlarge or reduce mode, the center of the image does not shift.
[A4/LT Drum: Width]  	Maximum Image Width: 290 mm Master Plotting Width: 292 mm Screen Mesh Width: 297.6 mm Master Width: 320 mm	In enlarge or reduce mode, the center of the image does not shift.

<table>
<tr><th>Items</th><th>Standard</th><th>Note</th></tr>
<tr><td colspan="2">

[Master Plotting Length in Relation to Paper Size]



</td><td rowspan="2">The machine will not plot the last 2 mm of the original on the master.</td></tr>
<tr><td></td><td>

Master Plotting Length

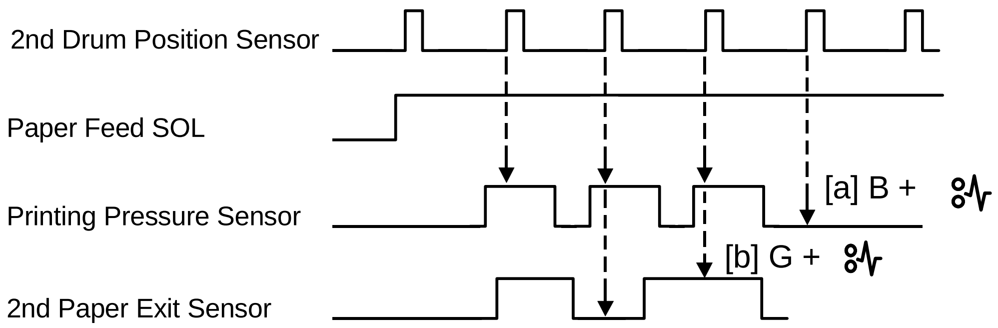
$L_M = (L_O - 10 - 2) \times \frac{\alpha}{100}$

$\begin{cases} \text{A3/DLT} & L_M \le 410 \\ \text{A4/LT} & L_M \le 206 \end{cases}$

α: Magnification Ratio (%)

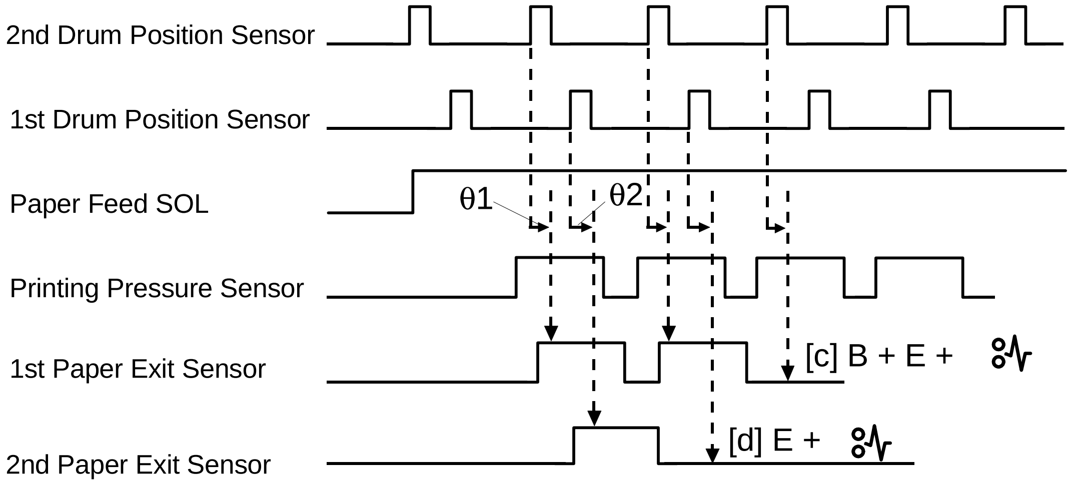
</td></tr>
</table>

10.4 PAPER MISFEED DETECTION



[a] When the 2nd drum position sensor turns on, if the printing pressure sensor is still OFF, the main PCB detects a paper misfeed.

[b] When the 2nd drum position sensor turns on, if the 2nd paper exit sensor remains ON, the main PCB detects a paper misfeed.

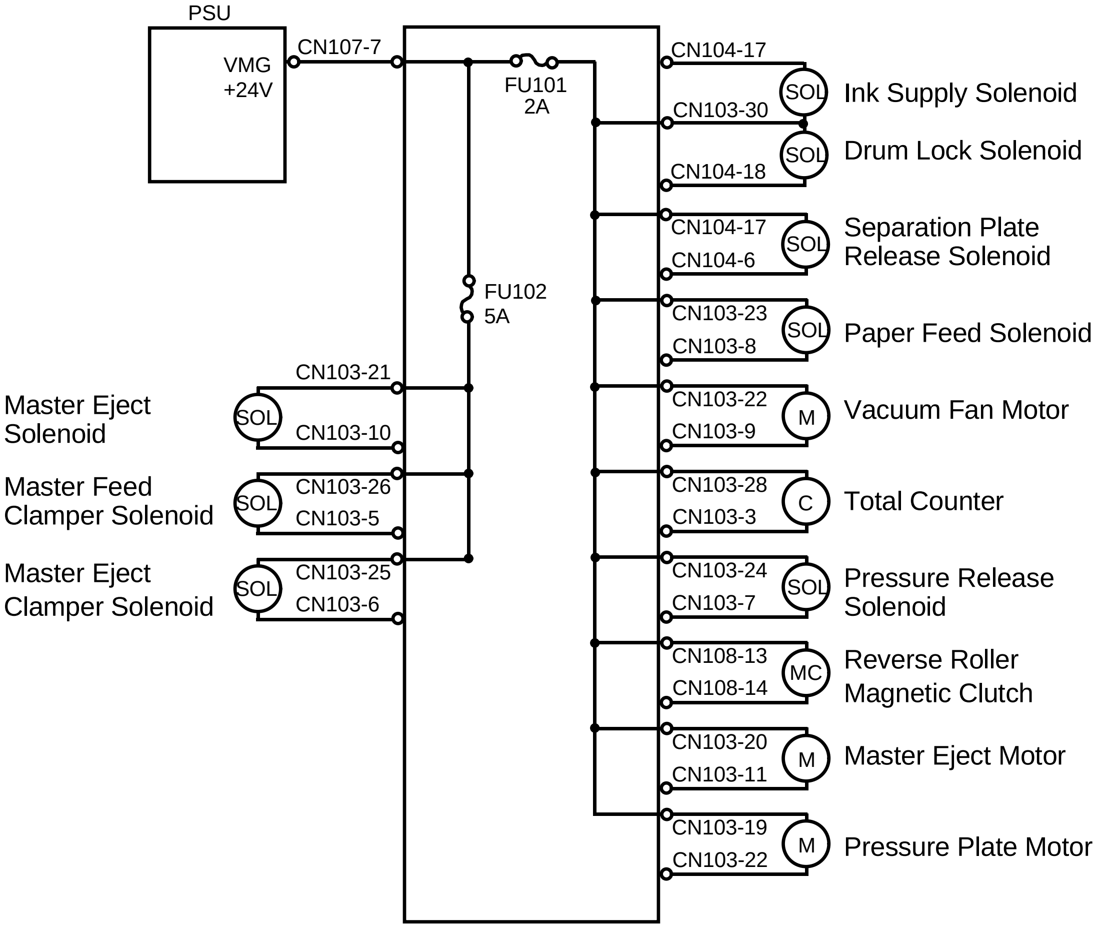


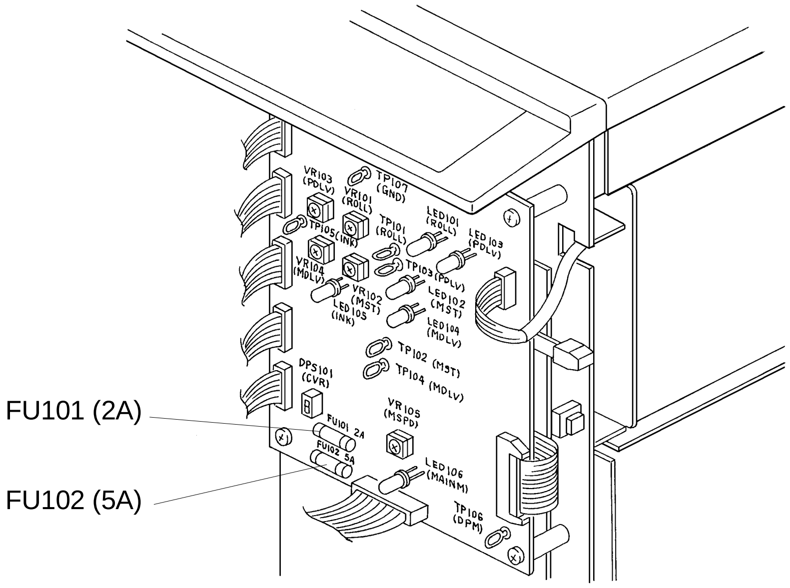
[c] When the drum has rotated 20° (θ1)after activating the 2nd drum position sensor, if the 1st paper exit sensor is still OFF, the main PCB detects a paper misfeed.

[d] When the drum has rotated 25° (θ2) after activating the 1st drum position sensor, if the 2nd paper exit sensor is still OFF, the main PCB detects a paper misfeed.

10.5 PROTECTION FROM OVERCURRENT

To protect solenoids and motors from overcurrent, 2 fuses are located in the 24 V line.





SECTION 3

INSTALLATION

1. INSTALLATION REQUIREMENTS

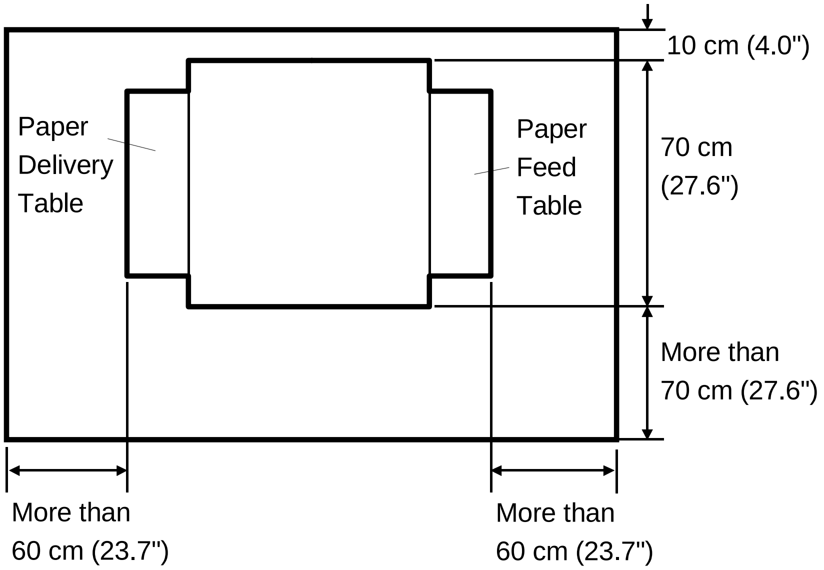
1.1 ENVIRONMENT

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

1. Temperature Range: 10°C to 30°C (50°F to 86°F)
2. Humidity Range: 20% to 90% RH
3. Ambient Illumination: Less than 1,500 lux. (Do not expose to direct sunlight.)
4. Ventilation: Room air should turn over at least 3 times an hour. (Avoid dusty areas.)
5. If the location is air-conditioned or heated, place the machine:
    a) where it will not be subjected to sudden temperature changes from low to high, or vice versa.
    b) where it will not be directly exposed to cool air from an air conditioner.
    c) where it will not be directly exposed to reflected heat from a heater.
6. Avoid placing the machine in an area filled with corrosive gas.
7. Place the machine 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 ACCESS TO THE MACHINE

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

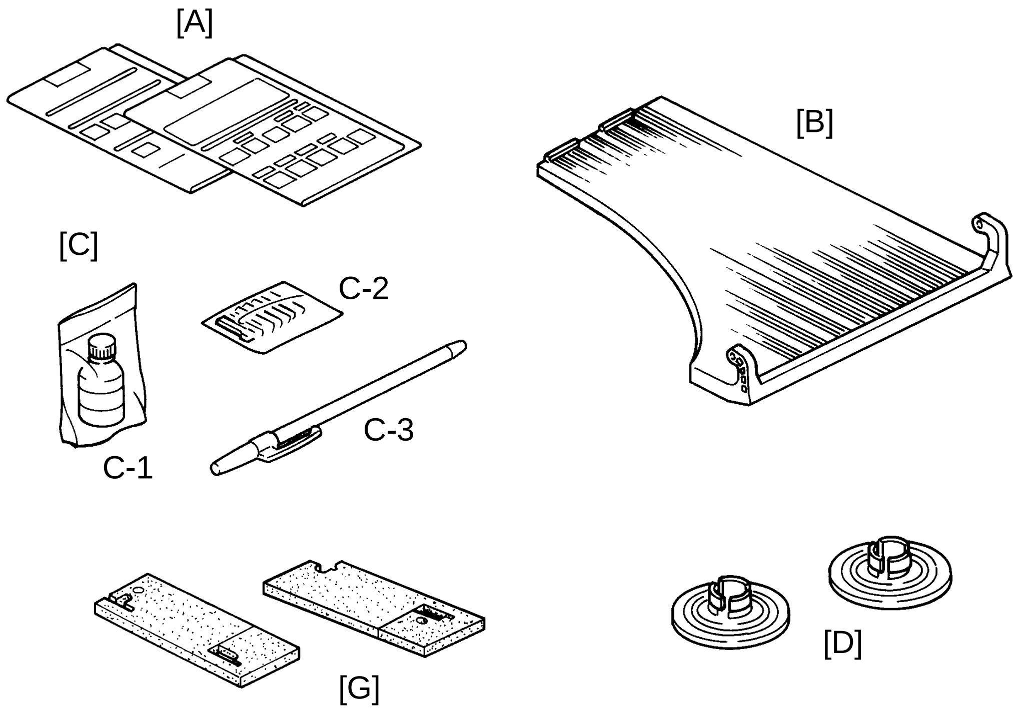


1.3 POWER SOURCE

1. Input Voltage Level
   a) 115 V, 60 Hz: 5.5 A
   b) 220 V 240 V, 50 Hz: 2.7 A
2. Voltage must not fluctuate more than 10%.
3. Make sure the plug is firmly inserted in the outlet.
4. Avoid multiwiring.
5. Do not pitch the power cord.

2. ACCESSORY CHECK

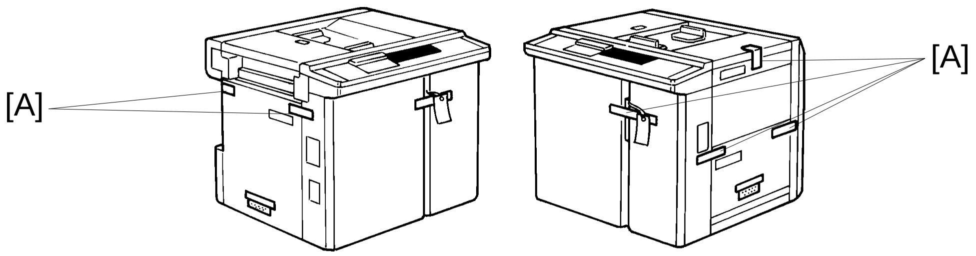
Make sure that you have all the accessories listed below.

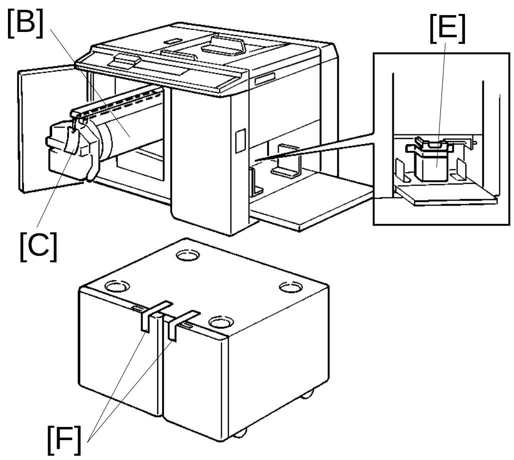


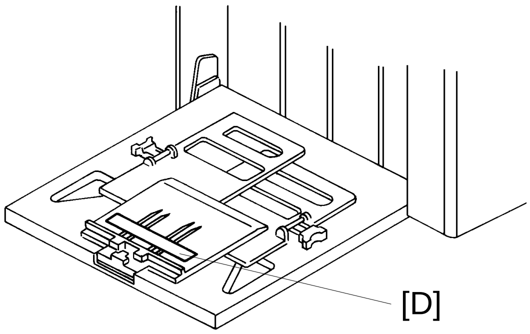
A. Operation Instructing Cards	2
B. Original Exit Tray	1
C. Thermal Head Cleaner Set	1
C-1 Cleaner bottle	1
C-2 Replacement felt	10
C-3 Cleaner pen	1
D. Master Spool	2
E. Base Pad	2
Editing Sheet	1
Operating Instructions (Except for the European version machines)	2

3. INSTALLATION PROCEDURE

3.1 MAIN BODY



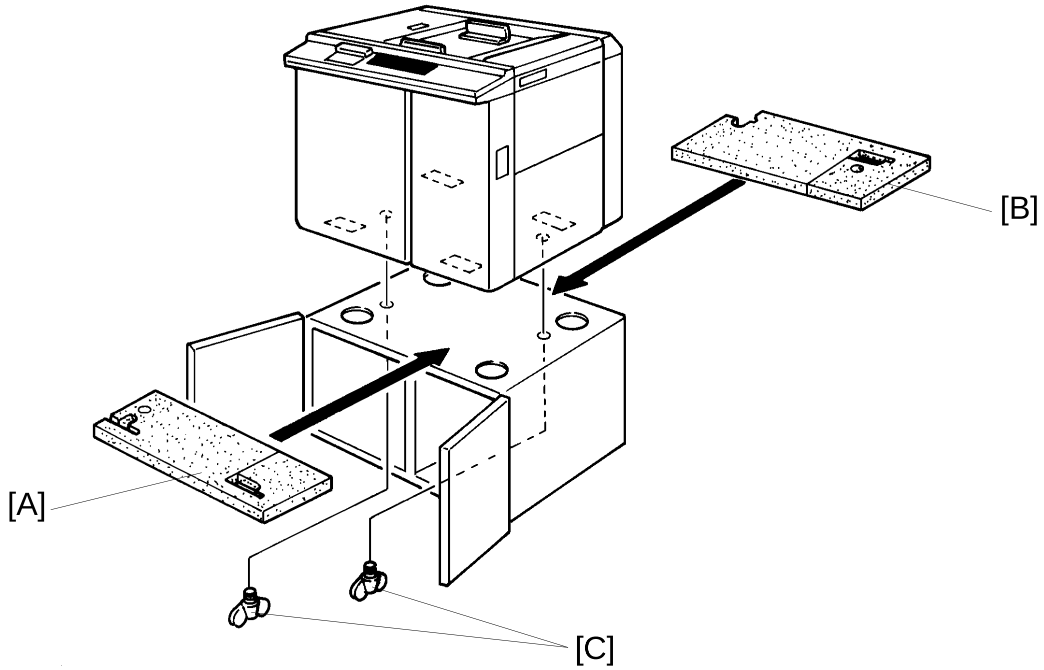




1. Place the machine on the table.

NOTE: The screw holes in the bottom plate of the machine must line up with the screw holes in the table.

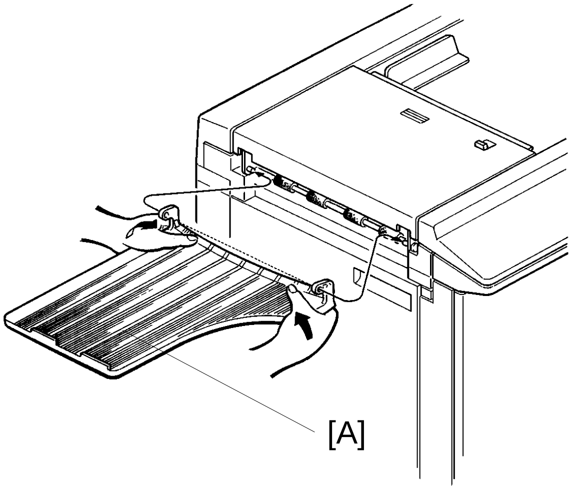
2. Remove the strips of tape [A] securing the covers and units shown above.
3. Open the front door and slide out the drum unit [B].
4. Open the master clamper and remove the clamp [C].
5. Open the paper delivery table and remove the strip of tape [D] protecting the end fence.
6. Open the paper feed table and remove the cardboard cover [E] protecting the paper feed roller.
7. Remove the 2 strips of tape [F] and open the doors of the optional table and take out the plastic bag containing 2 screws.



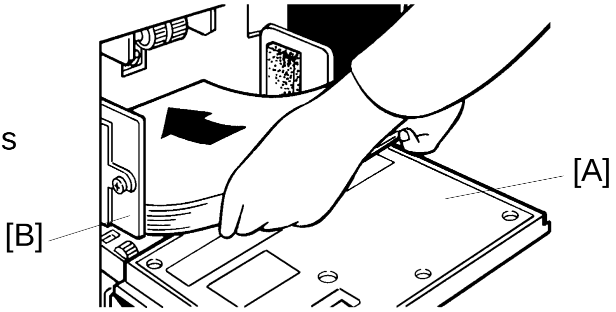
8. Raise the front side of the machine and position the base pad [A] under the machine. Then raise the rear side of the machine and position the other base pad [B] under the machine.
9. Secure the machine to the table with the two screws [C] packed with the table.

NOTE: Make sure the machine legs fit through the cutouts in the base pads.

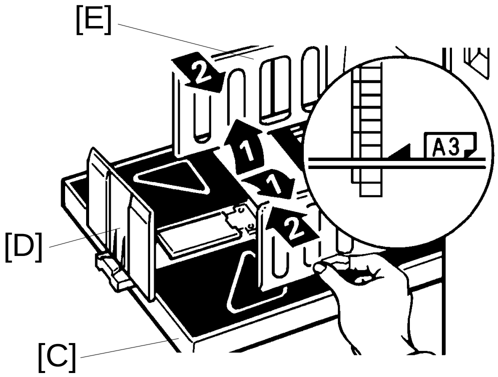
10. Install the original exit tray [A] while bending the side edges of the original exit tray as shown.



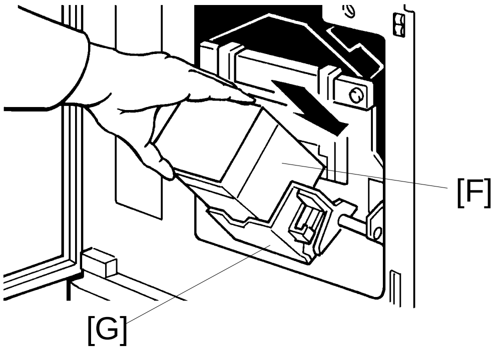
11. Open the paper feed table [A] and neatly stack the printing paper on the table.
12. Slide the paper feed side plates [B] lightly up against the paper stack.



13. Open the paper delivery table [C] and adjust the position of the end plate [D] and the side plates [E] according to the printing paper size. Refer to the paper size scale on the table.



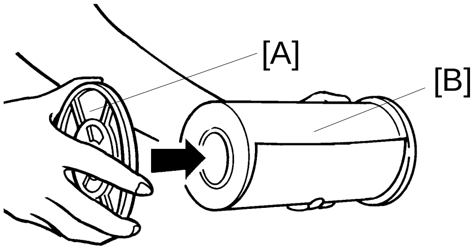
14. Install the ink cartridge [F].
    a. Open the front door and lower the ink holder [G].
    b. Remove the ink cartridge cap.
    c. Insert the ink cartridge in the ink holder and raise the ink holder to the original position.
    d. Close the front door.



15. Install the master roll.

    a. Slide the scanner unit all the way to the left.

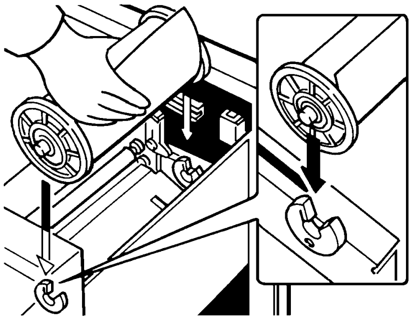
    b. Attach a spool [A] to each end of the master roll [B].



    c. Push the pressure release lever [C] to the left.

    d. Set the master roll in the machine as shown in the illustration.

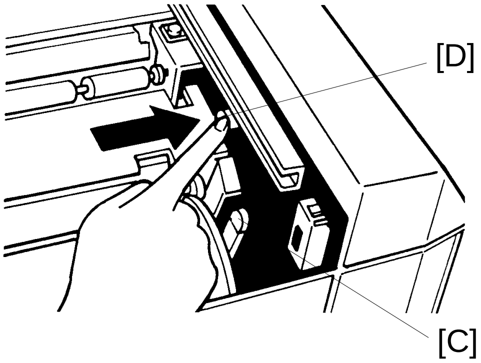
    e. Insert the leading edge of the master roll under the platen roller.



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

    g. Plug in the power cord and turn on the main switch.

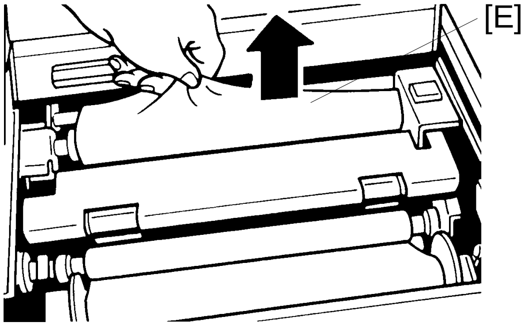
    h. Press the master cut button [D].

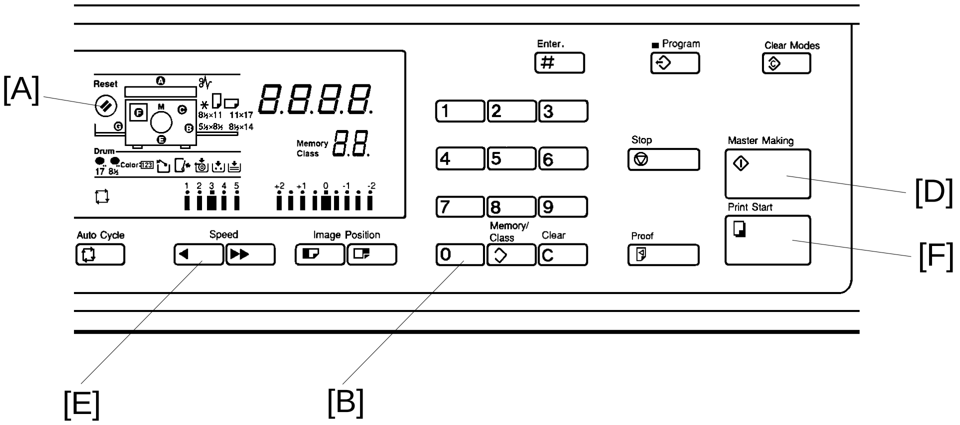


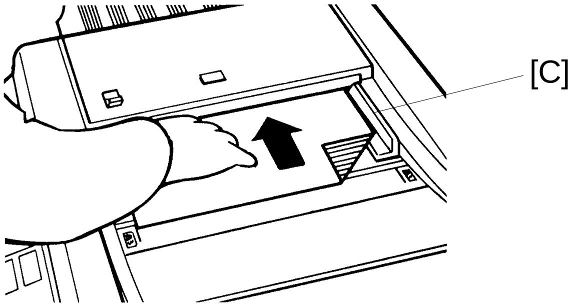
    i. Remove the cut strip [E] of master paper.

NOTE: Confirm that the paper on the master roll is not bent or creased.

    j. Close the scanner unit.







16. Distribute ink on the drum.

    a. Press the Reset key [A] while holding down the "0" key [B] on the operation panel.

    b. If 📥 blinks on the operation panel when the machine stops, press the Reset key again.

17. Make test prints once the machine is installed.

    a. Adjust the original guide [C] to match the original size.

    b. Set the original face down on the original feed table.

    c. Press the Master Making key [D].

    d. Select the lowest print speed (1) with the Speed key [E] and press the Print Start key [F]. Make prints at this speed until the print image density stabilizes.

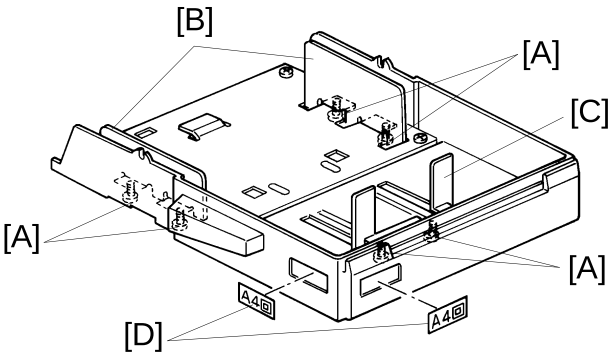
NOTE: 1. Usually, about 100 prints are made before the image fully stabilizes.

2. Check image quality after the print image density is stabilized.

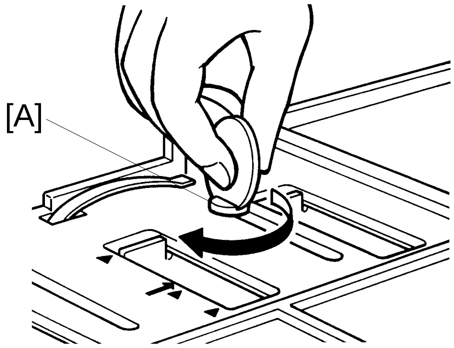
18. Enter telephone number using SP mode No. 152. The number will be displayed when a Service Call Code is lit.

3.2 PAPER CASSETTE

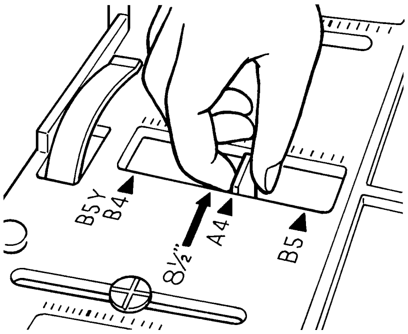
1. Loosen the 6 screws [A] securing the side fences [B] and the rear fence [C].



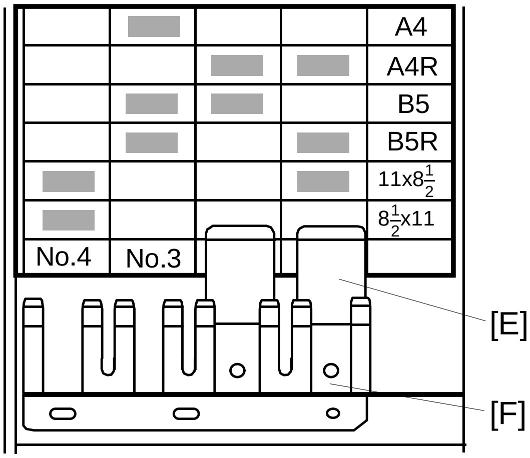
2. Move the 3 fences to the desired paper size position and tighten the 6 screws.



NOTE: The paper size positions are marked on the cassette.



3. Affix the proper paper size decals [D] to the cassette at the positions shown.
4. Slide the sensor actuator [E] into the slot [F] that corresponds to the paper size. (Refer to the chart.)

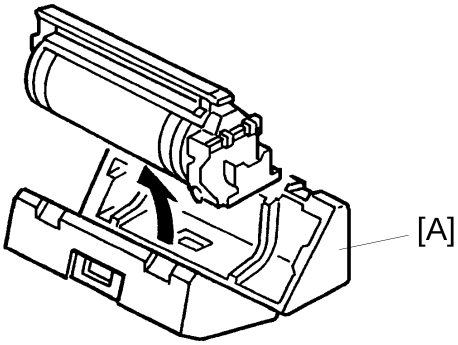


	▨			A4
		▨	▨	A4R
	▨	▨		B5
	▨		▨	B5R
▨			▨	11x8½
▨				8½x11
No.4	No.3			

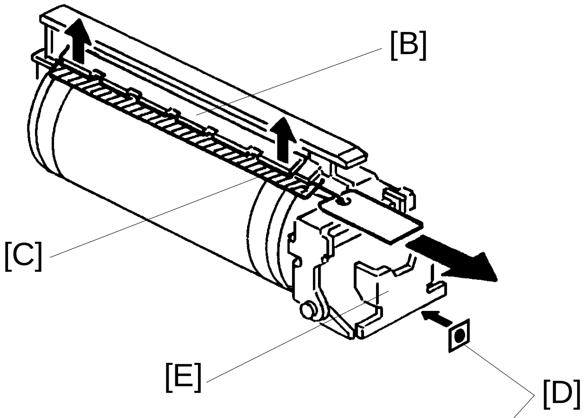
3.3 COLOR DRUM UNIT

Install the color drum unit according to the following procedure.

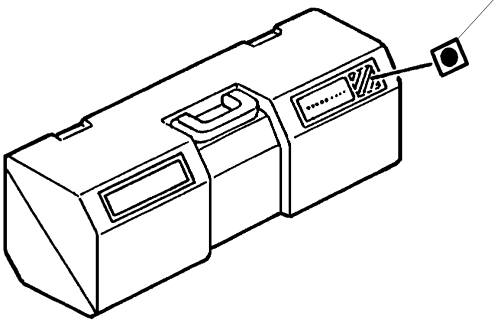
1. Open the drum case [A] and remove the red cushion.

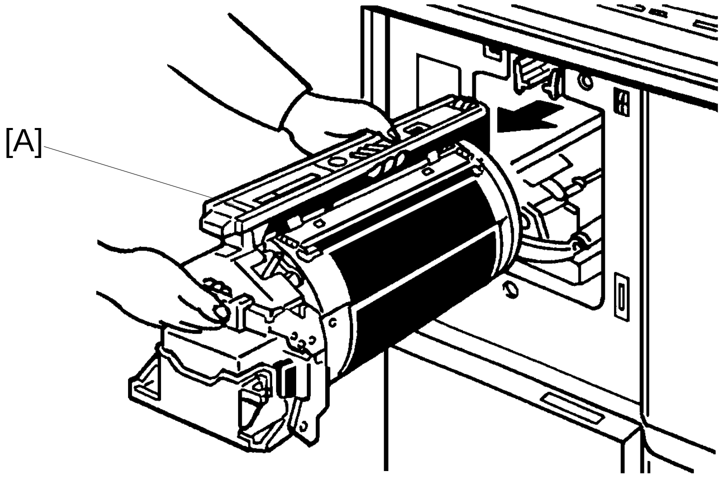


2. Open the master clamper [B] and remove the paper [C] protecting the drum surface.



3. Stick color seals [D] on the ink holder [E] and on the drum case.





4. Remove the drum unit [A] currently set in the machine.

5. Install the new color drum unit.

NOTE: 1. Keep the removed drum unit in the drum case.

2. The color indicator on the operation panel lights to indicate that the color drum unit is installed.

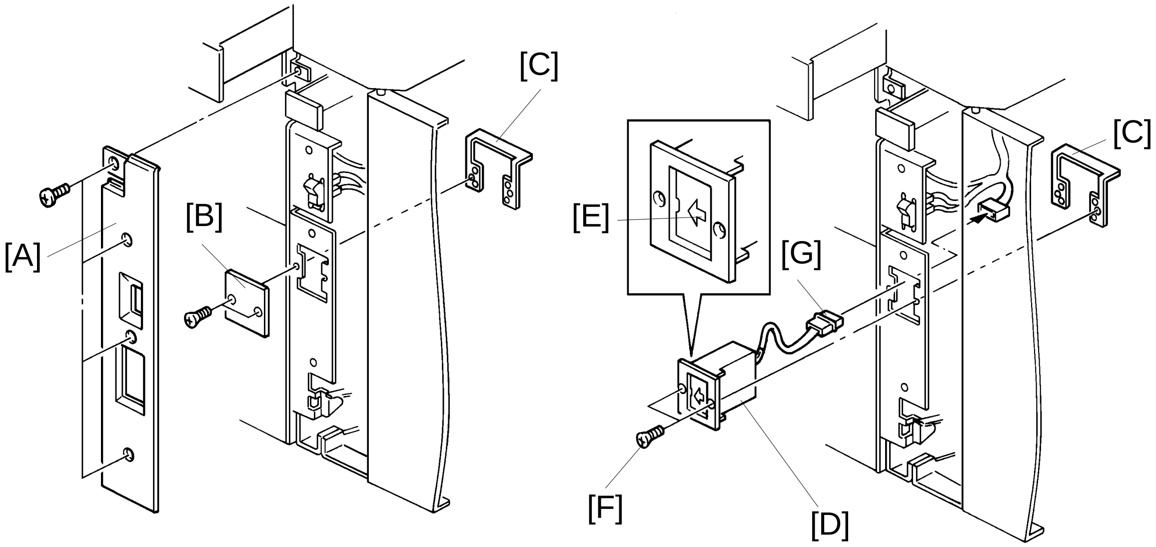
6. Set the color ink cartridge in the ink holder.

7. Press the Reset key once while holding down the "0" key to start the machine idle cycle.

NOTE: If 📥 blinks on the operation panel when the machine stops, press the Reset key again.

8. Make a 100 prints, then check the quality of the print image.

3.4 KEY COUNTER



1. Remove the main switch cover [A] (4 screws).
2. Remove the key counter cover [B] and the fixing plate [C] (2 screws).
3. Hold the fixing plate [C] in position inside the key counter bracket and insert the key counter holder [D].

NOTE: When installing the key counter holder, make sure that the arrow [E] points toward the rear side of the machine.

4. Align the holes in the fixing plate with the mounting holes of the key counter holder and secure them with 2 screws [F] packed with the key counter holder.
5. Connect connector [G] and reinstall the main switch cover [A].
6. Access the service program mode by pressing the operation panel keys in the following order:
   Clear Modes key – Clear key – Combine 2 Originals key – Enter key
7. Enter 3 with the number keys and then press the Enter key to access key counter mode.
8. Change the data of key counter mode from 0 to 1 with the number keys.
9. Press the Clear Modes key to leave SP mode.

SECTION 4

SERVICE TABLES

1. SERVICE TABLES

1.1 MAINTENANCE TABLES

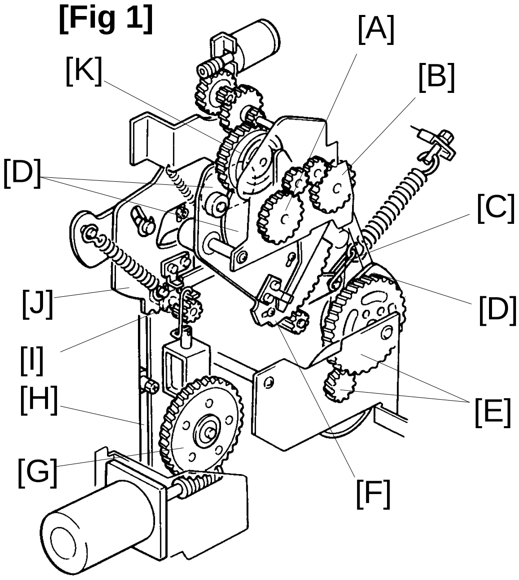
1.1.1 Lubrication Points

Lubricate after removing adhering ink and paper dust at yearly interval.

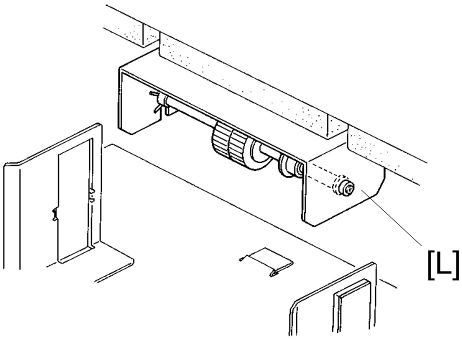
Section	Lubrication Point	Type	Location
Drive	Speed Reduction Gears of the Main Motor	Grease (Shell Albania No. 2)	(Fig.1- E)
	Gears of the Drum Drive Shaft		Inside and outside of the machine (Fig.1- B)
Image Positioning	Spiral Track of the Cam Gear		(Fig.1- K)
Paper Feed	Paper Feed Sector Gear		(Fig.1- J)
	Second Feed Sector Gear		(Fig.1- F)
	Gear of the Paper Feed Cam Shaft		(Fig.1- A)
	Paper Table Slide Groove		Both front side and rear side (Fig.1- H)
	Paper Table Drive Gear		(Fig.1- G)
	Bearings for the Upper Separation Roller Shaft	Motor oil (SAE No. 20)	(Fig.1- I)
	Bearings for the Paper Feed Roller Shaft		(Fig.2- L)
Drum	Drum Drive Gear	Grease (Shell Albania No. 2)	(Fig.3- N)
	Master Clamper Sector Gear		(Fig.3- O)
	Master Clamper Pinion Gear		(Fig.3- P)
	Ink Pump Drive Gear		(Fig.3- M)
Printing Pressure	Printing Pressure Arm and Printing Pressure Stay		Both front side and rear side (Fig.4- Q)
	Pressure Spring Link		(Fig.1- C)

Section	Lubrication Point	Type	Location
Master Eject	Master Pressure Plate Grooves	Grease (Shell Albania No. 2)	Both front side and rear side (Fig.5- S)
	Edges of the Master Pressure Plate Drive Arms		(Fig.5- R)
Paper Exit	Air Pump Drive Gears		(Fig.6- T)
	Inside of the Air Pump Piston	Grease (Mobil Ep-1)	(Fig.6- U)
ADF	Bearings for the Separation Roller Shaft	Grease (Shell Albania No. 2)	Both front and rear side (Fig.7- V)
Others	Edge of Each Cam		(Fig.1- D)

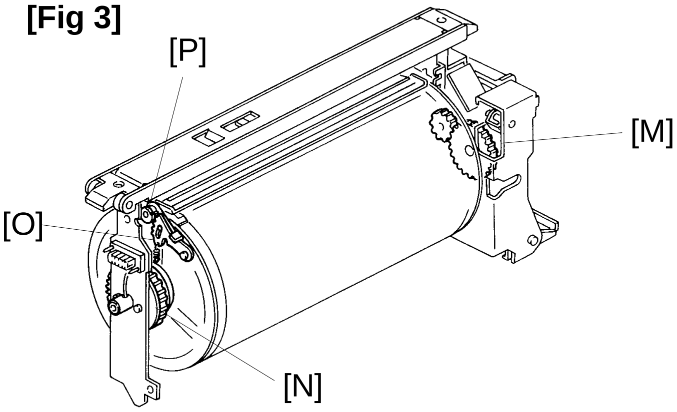
[Fig 1]



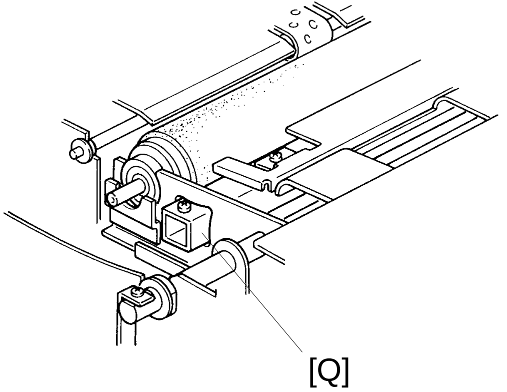
[Fig 2]



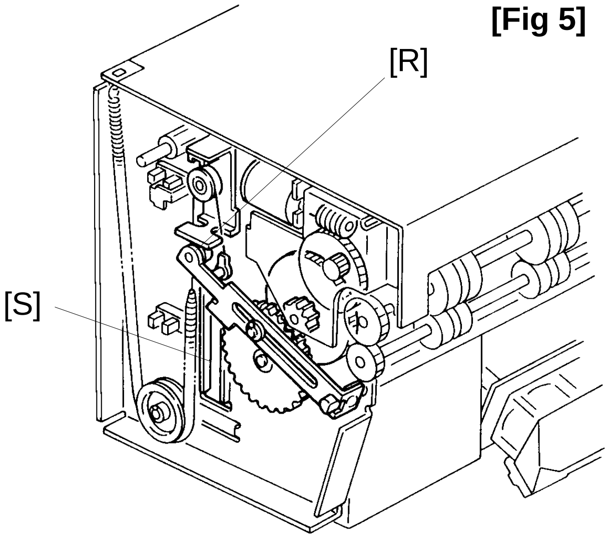
[Fig 3]



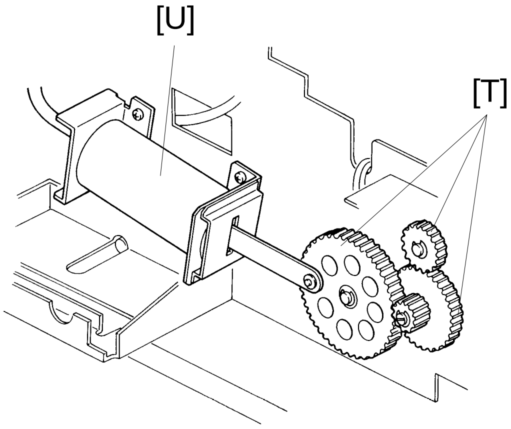
[Fig 4]



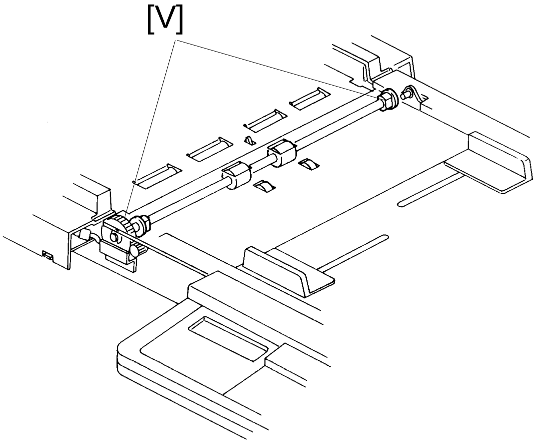
[Fig 5]



[Fig 6]



[Fig 7]



1.1.2 User's Maintenance

Advise the customer to clean each item regularly. Clean the following items at every EM call if necessary.

Section	Cleaning Point	Cleaner	Interval
Optics	Original Platen Cover	Cloth and water	At every EM call
	Exposure Glass	Cloth and glass cleaner	
Paper Feed	Paper Feed Roller	Cloth and soap and water	
	Paper End Sensor	Dry cloth	
	Paper Length Sensor		
Printing	Press Roller	Cloth and soap and water	
ADF	Original Feed Rollers		
Plotter	Thermal Head	Thermal head cleaner	500 masters

1.1.3 Table of Periodic Inspection (every 6 months)

Section	Item	Standard Procedure
Optics	Original Platen Cover	Wipe off the stains using a soft cloth damped with ethyl alcohol.
	Exposure Glass	Wipe with a dry cloth.
Paper Feed	Paper Feed Roller	Wipe off the ink and paper powder using a cloth damped with ethyl alcohol.
	Upper and Lower Second Feed Rollers	
	Upper and Lower Separation Rollers	
Printing	Press Roller	
ADF	Pull-out Rollers	Wipe off paper powder using a cloth damped with water.

1.1.4 Table of Periodic Inspection (every 12 months)

Section	Item	Standard Procedure
Optics	Back side of Exposure Glass	Wipe with a dry cloth.
	Back side of Mirror and Sub Mirror	Use a blower brush.
	Back side of Fluorescent Lamp	Wipe with a dry cloth.

Master Eject	Upper and Lower Master Eject Rollers	Wipe off the ink and paper powder using a cloth damped with ethyl alcohol.
	Master Eject Box	Wipe off the ink using a cloth damped with ethyl cohol.
Drum	Inside and outside of Drum	Wipe off the built up ink and paper powder using a cloth damped with ethyl alcohol.
	Ink Holder	
Plotter	Platen Roller	Wipe off the paper powder using a cloth damped with water.
Others	First and Second Paper Exit Sensors Master Eject Sensor Drum Master Detection Sensor	Check the performance of all the sensors. Remove the stains from the sensors using a dry cloth.

1.2 TABLE OF SERVICE CALL INDICATIONS

Indication	Trouble	Possible Causes
E-01	Neither the right nor the left cutter switch turns off within 3 seconds of the cutter motor starting.	1) Drive wire cut 2) Drive section malfunction 3) Defective cutter switch
E-02	Malfunction in the paper table drive section. The lower limit sensor or paper table height sensor does not turn on within 7 seconds.	1) Drive worm gear broken 2) Mounting screw of the worm gear broken 3) No power supply
E-04	Temperature of the thermal head is greater than 54°C when the Master Making key is pressed.	1) Excessive thermal head temperature 2) Thermistor short
E-05	Malfunction in the image shifting section.	1) Image position sensor connector disconnected 2) Defective image position sensor
E-06	The drum rotation sensor detects an incorrect motor speed.	1) Drum lock 2) No power supply
E-07	Malfunction in the program. When the main SW is turned on, "E-07" lights up if the ROM is defective.	Defective ROM
E-08	Temperature of the power supply unit is greater than 85°C when the Master Making key is pressed.	Excessive power supply unit temperature
E-09	The signal level between CN109-A8 and GND is over 4.9 volts.	1) Thermistor open. 2) Related connectors are not connected. (Main PCB CN109-A8, image processing PCB CN404-b8/ CN403-22, or thermal head drive PCB CN705-22/ CN703-10.)

Indication	Trouble	Possible Causes
E-10	The CPU detects an abnormal condition in the pulse from the thermal head drive PCB (ENR 1 to 4). This pulse determines the energy applied to the thermal heating elements.	1) Defective thermistor 2) Related connectors are not connected. (Main PCB CN109-A7, image processing PCB CN404-b7/ CN403-20, or thermal head drive PCB CN705-20.) 3) No power supply for ICs (Vcc) from power supply unit to image processing PCB. (Disconnection of image processing PCB CN701-7/14, or power supply unit CN503-12/13.)
E-11	Encoder output does not change within 3 seconds of the main switch being turned on or the Clear Mode key being pressed.	1) Defective image position motor 2) No power supply
E-12	1. The upper or lower pressure plate sensor remains activated for more than 4 seconds after the pressure plate motor starts turning. 2. The lower pressure plate sensor is not activated within 8 seconds of the pressure plate motor starting to turn even though the upper pressure plate sensor is de-activated. 3. The upper pressure plate sensor is not activated for more than 8 seconds of the pressure plate motor starting to turn even though the lower pressure plate sensor is de-activated.	Pressure plate drive mechanism malfunction.

1.3 TABLE OF DIP SW, LED, VR, TP (ON THE MAIN CONTROL PCB)

1.3.1 DIP SW

No. DIP SW	Function	Remarks
DIP SW101	—	Not used. Must be OFF.

1.3.2 Photodiode

No. LED	Component	Remarks
LED101	1st Paper Exit Sensor	When a paper is detected, the LED lights.
LED102	Drum Master Detection Sensor	When the master is on the drum, the LED lights.
LED103	2nd Paper Exit Sensor	When a paper is detected, the LED lights.
LED104	Master Eject Sensor	When the master is under the master eject sensor, the LED lights.
LED105	Ink Detection	When ink is present, the LED lights.
LED106	Main Motor	When the main motor turns on, the LED lights.

1.3.3 VR

No. VR	Function
VR101	1st Paper Exit Sensor Adjustment
VR102	Drum Master Detection Sensor Adjustment
VR103	2nd Paper Exit Sensor Adjustment
VR104	Master Eject Sensor Adjustment

1.3.4 TP

No. TP	Function	Standard Voltage
TP101	1st Paper Exit Sensor Voltage	ON: More than 2 V OFF: 0.9 V
TP102	Drum Master Detection Sensor Voltage	ON: More than 2 V OFF: 0.9 V
TP103	2nd Paper Exit Sensor Voltage	ON: More than 2 V OFF: 0.9 V
TP104	Master Eject Sensor Voltage	ON: More than 2 V OFF: 0.9 V
TP105	Ink Detection Voltage	ON (ink is present): 0 V OFF: – 12 V
TP106	Drum Rotation Sensor Voltage	ON: 0 V OFF: 5 V
TP107	GND	

1.4 EXPECTED LIFE of PARTS

Section	Part Description	Expected Life
Scanner	Fluorescent Lamp	15,000 originals
	1st and 2nd Lower Original Transport Rollers	1 year or 6,000 originals
Plotter/Master Feed	Thermal Head	30,000 masters
	Platen Roller	30,000 masters
	Upper Master Feed Roller	1 year or 6,000 masters
Drum	Drum Tetron Screen	2 years or 1,200,000 prints
Paper Feed	Paper Feed Rubber Side Plate	1,200,000 prints
	Paper Feed Roller	6 months or 300,000 prints
	Upper Separation Roller	1 year or 600,000 prints
	Lower Separation Roller	2,000,000 prints
	2nd Feed Roller Brake Belt	1,000,000 prints
	Separation Plate	1 year or 600,000 prints
Printing	Press Roller	2 years or 1,200,000 prints
Delivery	Transport Belt	2 years or 1,200,000 prints
ADF	Pull-out Roller	60,000 originals
	Original Feed Roller	"
	Separation Blade	"
	Right and Left Original Pressure Plate	"

1.5 SPECIAL TOOLS

Description	Part Number
Test Chart R-21	99992131
Resolution Chart	A0129110
Drum Gauge	C2009001
Image Shifting Gauge	C2009002

2. SERVICE PROGRAM MODE

2.1 SERVICE PROGRAM MODE OPERATION

The service program (SP) mode is used to check electrical data and change modes or change adjustment values.

2.1.1 Service Program Mode Access Procedure (for engineers)

All service program modes can be accessed with this procedure.

1. Press the keys on the operation panel in the following order:
   a) Clear Modes key
   b) Clear key
   c) Combine 2 Originals key
   d) Enter key

2. The following menu is displayed on the LCD when the SP mode is accessed.

```
SP–MODE
  PROGRAM No.       0
```

3. Using the number keys, enter the desired SP mode number (listed in the service program table.)

NOTE: SP mode number can be shifted up or down by pressing the Zoom key ("+" or "–").

4. To cancel the SP mode, press the Clear Modes key.

2.1.2 Service Program Mode Access Procedure (for users)

This procedure allows users to access only the service program modes that are marked with an asterisk in the service program table.

1. Press the keys on the operation panel in the following order:
   a) Clear Modes key
   b) Clear key
   c) Enter key

2. The following menu is displayed on the LCD when the SP mode is accessed.

```
SP–MODE
  PROGRAM No.       0
```

3. Using the number keys, enter the desired SP mode number (listed in the service program table.)

4. To cancel the SP mode, press Clear Modes key.

2.1.3 Change Adjustment Values or Modes

1. After entering the desired SP mode number, press the Enter key. The value or mode set at the factory will be displayed on the LCD (at the end of the second line).
2. Enter the desired value or mode using the number keys (listed in the service program table).
3. Press Enter key to store the desired value or mode.
4. To cancel the SP mode, press Clear Modes key.

2.2 SERVICE PROGRAM TABLE

*: Accessible by a customer ♥: A4 version ♦: LT version

No.	Display	Function	Data	Factory Setting	Comments
1.	On line	Enables on line operation.	0: No 1: Yes	0	Not used
2.	FDC Type 10	Enables FDC operation.	0: No 1: Yes	0	Not used
3.	Key Counter	Enables key counter operation.	0: No 1: Yes	0	
4.	Key Card	Enables key card operation.	0: No 1: Yes	0	Not used
*10.	Min. Print	Limits the minimum print quantity that can be entered.	0 to 9999	0	
*11.	Max. Print	Limits the maximum print quantity that can be entered.	0 to 9999	9999	
*12.	A4 → A3 Mag. Ratio	Adjusts fixed magnification ratio. A4 version: From A4 to A3 LT version: From 51/2" x 81/2" to 81/2" x 14"	50 to 200%	♥: 141% ♦: 155%	
*13.	A4 → B4 Mag. Ratio	Adjusts fixed magnification ratio. A4 version: From A4 to B4 LT version: From 51/2" x 81/2" to 11" x 17"	50 to 200%	♥: 122% ♦: 129%	
*14.	B4 → A3 Mag. Ratio	Adjusts fixed magnification ratio. A4 version: From B4 to A3 LT version: From 81/2" x 14" to 11" x 17"	50 to 200%	♥: 115% ♦: 121%	
*15.	Full Size	Adjusts full size magnification ratio.	50 to 200%	100%	
*16.	Page Margin	Adjusts create margin magnification ratio.	50 to 200%	93%	

No.	Display	Function	Data	Factory Setting	Comments
*17.	A3 → B4 Mag. Ratio	Adjusts fixed magnification ratio. A4 version: From A3 to B4 LT version: From 81/2" x 14" to 81/2" x 11"	50 to 200%	♥: 87% ♦: 77%	
*18 .	B4 → A4 Mag. Ratio	Adjusts fixed magnification ratio. A4 version: From B4 to A4 LT version: From 11" x 15" to 81/2" x 11"	50 to 200%	♥: 82% ♦: 74%	
*19.	A3 → A4 Mag. Ratio	Adjusts fixed magnification ratio. A4 version: From A3 to A4 LT version: From 11" x 17" to 81/2" x 11"	50 to 200%	♥: 71% ♦: 65%	
*20.	Buzzer On	Turns beeper ON or OFF	0: No 1: Yes	1	
*21.	Prints/Master Cost	Adjusts the ratio of masters to prints. For accounting purposes.	0 to 50	0	The set number (0 to 50) is automatically added to the key counter each time a master is used.
22.	Read Image	—	—	0	Not used
30.	Sub Scan Mag. Adjust	Adjusts sub-scan magnification.	–1.9 to +1.9%	(0)	The factory setting depends on the machine.
31.	MTF Level	Adjusts MTF level.	0: Low 1: Standard 2: High 3: Maximum	0	Refer to page 2-109
32.	Image Density Rank	In line mode, adjusts the image density level.	0: Light 1: Standard 2: Dark		Refer to page 2-112
33.	Top Margin	Adjusts the lead edge margin.	4 to 10 mm	10 mm	
35.	Head Energy Adjust	Adjusts thermal head energy.	0 to –99%	–5%	1% step
*40.	Original	Specifies the image mode at power on.	0: Photo 1: Line 2: Sharpen	1	

No.	Display	Function	Data	Factory Setting	Comments
*41.	Image Density	Specifies the image density at power on.	0: Light 1: Standard 2: Dark 3: Darker	1	
42.	Print Speed	Specifies the printing speed at power on.	0: 40 rpm 1: 60 rpm 2: 80 rpm 3: 100 rpm 4: 120 rpm	2	
*43.	Auto Cycle Mode	Specifies whether auto cycle mode is selected at power on.	0: No 1: Yes	0	
*44.	Memory/Class Mode	Specifies Memory or Class mode at power on.	0: Class 1: Memory	1	
45.	Std. Image Position	Specifies the image position at power on.	0: –20 mm 1: –15 mm 2: –10 mm 3: –5 mm 4: 0 mm 5: +5 mm 6: +10 mm 7: +15 mm 8: +20 mm	4	
*46.	Make-Up	Specifies which make-up background pattern is selected when make-up pattern mode is selected.	1 to 40 51 to 90 101 to 140 150 to 190	0	0: No background pattern is selected
*47.	Contrast	Specifies which contrast is selected when make-up Photo mode is selected.	0: Standard 1: Light 2: Dark	0	
*48.	Photo	Specifies which screen is selected when make-up photo mode is selected.	0: Standard 1: Fine 2: Coarse	0	
*50.	Direction Mag. Mode	Specifies whether % or mm input when directional magnification mode is selected.	0: % input mode 1: mm input mode	0	
60.	Clear All Memory	Returns all SP modes to the factory setting.	0: No 1: Yes	0	
70.	Original Feed Jams (A)	Displays the total number of original jams.		0	

No.	Display	Function	Data	Factory Setting	Comments
71.	Paper Feed Jam (B)	Displays the total number of paper feed jams.		0	
72.	Paper Wrap Jam (E)/(B)/(E)	Displays the total number of times that paper has wrapped around the drum.		0	
73.	Paper Delivery Jam (G)	Displays the total number of paper delivery jams.		0	
74.	Master Feed Jam (C)	Displays the total number of master feed jams.		0	
75.	Master Delivery Jam (F)	Displays the total number of master delivery jams.		0	
76.	Clear Jam Counter	Clears all jam counters.	0: No 1: Yes	0	
81.	Proof Print No.	Specifies how many trial prints are made after making the master.	0 to 2 sheets	1	
*82.	Skip Feed No.	Selects the feed interval.	1 to 5	1	1: Normal operation 2: One sheet fed every two drum rotations 5: One sheet fed every five drum rotations
*83.	Auto Reset Time	Specifies the auto reset time.	0: No 1: 3 min. 2: 5 min.	0	
90.	Thermal Head Test	Selects the background pattern for the copy made in the thermal head test; performs the test.	1 to 40 51 to 90 101 to 140 150 to 190	7	See Thermal Head Test section.
91.	Command Sheet Check	Prints the command sheet image (designated area) together with the original image.	0: No 1: Yes	0	See Command Sheet Check section.
100.	Combine 2 Originals	Displays the total number of masters made in combine 2 original mode.		0	

No.	Display	Function	Data	Factory Setting	Comments
101.	Make-Up Count	Displays the total number of masters made in make-up mode.		0	
102.	Make-Up Photo Count	Displays the total number of masters made in make-up photo mode.		0	
103.	Diagonal Shift Count	Displays the total number of masters made in image shift mode.		0	
104.	On line Count	Displays the total number of masters made in on line mode.		0	Not used
105.	Overlay Count	Displays the total number of masters made in overlay mode.		0	Not used
106.	Enlarge Count	Displays the total number of masters made in fixed enlargement mode.		0	
107.	Reduction Count	Displays the total number of masters made in fixed reduction mode.		0	
108.	Zoom Count	Displays the total number of masters made in zoom mode.		0	
109.	Directional Mag. Count	Displays the total number of masters made in directional magnification mode.		0	
110.	Power ON Time	Displays the total amount of time the machine has been turned on.		0	
111.	Total Count	Displays the total number of masters and prints.		0	M: Master count P: Print count
112.	Clear Total Count	Clears the total masters/print counter.	0: No 1: Yes	0	
*113.	Resetable Count	Used by the customer to display the total number of masters and prints.		0	M: Master count P: Print count

No.	Display	Function	Data	Factory Setting	Comments
*114.	CLR Reset table Count	Clears the resetable total master/print counter.	0: No 1: Yes	0	
*120.	User Code Mode	Selects user code mode.	0: No 1: Yes	0	See user-code mode section.
*121.	UC Count	Displays the total number of masters and prints made by each user code.		0	Press # key to shift to another user code.
*122.	Clear UC Count	Clears every user code counter.	0: No 1: Yes	0	
*123.	Total UC Count	Displays the total number of masters and prints for up to 20 user codes.		0	
*124.	Clear Total UC Count	Clears the total user code counter.	0: No 1: Yes	0	
130.	Input Check Mode	Displays the input from sensors and switches.			See the input check table.
131.	Output Check Mode	Turns on electrical components.			See the output check table.
132.	All Indicators ON	Turns on all the indicators on the operation panel.			Press # key to light all the indicators.
140.	Ink Detection	Specifies whether ink detection is done.	0: No 1: Yes	1	
141.	Paper Detection	Specifies whether paper end detection is done.	0: No 1: Yes	1	
*142.	Paper Size Detection	Selects paper size detection.	0: Yes 1: Width detection only 2: Length detection only 3: No detection	0	
*143.	Orig. Size Detection	Specifies whether the original size detection is done.	0: No 1: Yes	1	
145.	Drum Mast. Detection	Specifies whether the drum master detection is done.	0: No 1: Yes	1	

No.	Display	Function	Data	Factory Setting	Comments
146.	ADF Cover Detection	Specifies whether the ADF safety switch is effective.	0: No 1: Yes	1	
150.	Control ROM No.	Displays the ROM part number and the ROM manufacturing date.			1990 / 10 / 07 Year Month Day
151.	Machine No.	Displays the machine serial number and the installation date.			Input the serial number and the installation date.
152.	Service Tel. No.	Input the service representative’s telephone number, which is displayed with service call code.			Use the number keys to input the telephone number at installation. Press the Memory/Class key to add a space between the digits.
153.	Last Service Code	Displays the last service call.			

2.3 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. Place paper on the paper table.

NOTE: To reduce thermal head load, use the smallest paper size possible, i.e. the smallest size on which the area with the image problem can be printed.

2. Access SP mode.
3. Input No. 90 and press the Enter key.

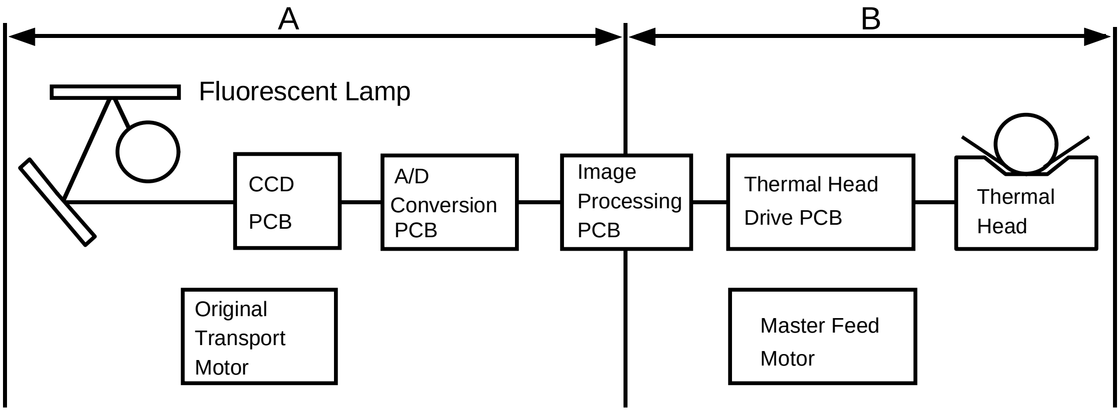
NOTE: The factory setting is pattern No. 7. If necessary, input another background pattern with the Number keys.

4. Press the Master Making key. (original is not necessary.)
5. 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.



2.4 COMMAND SHEET CHECK

Normally, Fn 9 or Fn 19 cannot be input in Make-up mode.

By changing the data of SP mode #91 from 0 to 1, Fn 9 or Fn 19 can be input.

Command No.	Display	Function
Fn 9	🗋 OVERLAY	Prints both the original image and designated area of the command sheet on the paper.
Fn 19	＼ OVERLAY	

This function is used to check the position of the designated area on the command sheet. It is checked in relation to the original image to make sure that the command sheet is being read correctly.

<Procedure>

1. Access SP mode.
2. Input 91 and press the Enter key.
3. Input 1 with the number keys and press the Enter key.
4. Press the Clear Modes key to leave SP mode.
5. Place the command sheet and the original on the ADF.
6. Press the Make-up key and input Fn 9 or Fn 19. (these command have the same function.)
7. Input 1 for the undesignated area.
8. Press the Master Making key and then check the print to make sure that the area designated by the command sheet is in the correct position on the original image.

NOTE: 1. Only one command sheet can be stored in memory. If 2 or more command sheets are read, only the last command sheet is output.

2. Make sure to return the SP mode to its original setting after checking the designated area position.

2.5 INPUT/OUTPUT CHECK MODE

This program checks electrical components. The procedure for accessing the program is as follows:

2.5.1 Input Check Mode Access Procedure

1. Access SP mode. (See the SP mode access procedure.)
2. Enter 130 (SP mode number) with the number keys.
3. Press the Enter key.
4. Enter the desired input number. (See the input check table.)

NOTE: The input number can be shifted up or down by pressing the Zoom key

5. Press the Enter key.

NOTE: In the input check mode, all image position LEDs and printing speed LEDs turn on when a sensor or switch that is being tested is actuated. A beep will also be heard.

6. Press the Enter key to return the display to the initial input check menu.
7. Press the Clear Modes key to leave SP mode.

2.5.2 Output Check Mode Access Procedure

1. Access SP mode. (See the SP mode access procedure.)
2. Enter 131 (SP mode number) with the number keys.
3. Press the Enter key.
4. Enter the desired output number. (See the output check table.)

NOTE: The output number can be shifted up or down by pressing the Zoom key ("+" or "–").

5. Press the Enter key.
6. Press the Print Start key to turn on the component.
7. Press the Enter key to return the display to the initial output check menu.
8. Press the Clear Modes key to leave the SP mode.

2.5.3 Input Check Table

Code	LCD Display	Component Checked
1.	SW: ADF Cover In- 1	ADF Safety Switch.
2.	SN: 1st Original In- 2	First Original Sensor.
3.	SN: 2nd Original In- 3	Second Original Sensor.
4.	SN: 3rd Original In- 4	Original Registration Sensor.
5.	SN: Original Size 0 In- 5	Original Size Sensor – 0.
6.	SN: Original Size 1 In- 6	Original Size Sensor – 1.
7.	SN: Original Size 2 In- 7	Original Size Sensor – 2.
8.	SN: Original Size 3 In- 8	Original Size Sensor – 3.
9.	SN: Cassette Size 0 In- 9	Cassette Size Switch – 4.
10.	SN: Cassette Size 1 In-10	Cassette Size Switch – 3.
11.	SN: Cassette Size 2 In-11	Cassette Size Switch – 2.
12.	SN: Cassette Size 3 In-12	Cassette Size Switch – 1.
13.	SN: Paper Size 0 In-13	Paper Width Sensor – 0.
14.	SN: Paper Size 1 In-14	Paper Width Sensor – 1.
15.	SN: Paper Size 2 In-15	Paper Width Sensor – 2.
16.	SN: Paper Size 3 In-16	Paper Width Sensor – 3.
17.	SN: Paper Size 4 In-17	Paper Length Sensor.
18.	SN: Paper End In-18	Paper End Sensor.
19.	SW: Paper Table Safety In-19	Paper and Delivery Table Open Switches.
20.	SN: Paper Table Low Limit In-20	Paper Table Lower Limit Sensor.
21.	SN: Paper Table Height In-21	Paper Table Height Sensor.
22.	KEY: Lower Paper Feed Table In-22	Paper Table Down key.

Code	LCD Display	Component Checked
23.	SW: Right Cutter In-23	Right Cutter Switch.
24.	SW: Left Cutter In-24	Left Cutter Switch.
25.	SN: Master Buckle In-25	Master Buckle Sensor.
26.	SN: Master End In-26	Master End Sensor.
27.	SIG: Ink In-27	When Ink Detecting Pin detects ink.
28.	SIG: Color Drum In-28	When color drum is set.
29.	SIG: Drum Size 0 In-29	When A3/DLT or A4/LT drum is set.
30.	SIG: Drum Size 1 In-30	when A4/LT drum is set.
31.	SN: Pressure Plate High Position In-31	Upper Pressure Plate Sensor.
32.	SN: Pressure Plate Low Position In-32	Lower Pressure Plate Sensor.
33.	SW: Master Eject Box In-33	Master Eject Box Switch.
34.	SN: Full Master In-34	Full Master Detection Sensor.
35.	SN: Printing Pressure In-35	Printing Pressure Sensor.
36.	SN: 1st Drum Position In-36	First Drum Position Sensor.
37.	SN: 2nd Drum Position In-37	Second Drum Position Sensor.
38.	SW: Manual Master Cut In-38	Master Cut Switch.
39.	SIG: Key Counter In-39	When key counter is set.
40.	SIG: Power Supply Temp. Detect In-40	When power supply unit temperature is over 85°C.
41.	SN: 1st Paper Exit In-41	First Paper Exit Sensor.
42.	SN: 2nd Paper Exit In-42	Second Paper Exit Sensor.
43.	SN: Master Eject In-43	Master Eject Sensor.
44.	SN: Drum Master In-44	Drum Master Detection Sensor.

2.5.4 Output Check Table

Code	LCD Display	Description
1.	SOL: ADF Original Pressure Out- 1	Turns on the ADF original pressure solenoid.
2.	MOTOR: ADF Drive Out- 2	Turns on the ADF drive motor.
3.	MOTOR: Master Eject Out- 3	Turns on the master eject motor.
4.	MOTOR: Pressure Plate Up/Down Out- 4	Turns on the pressure plate up/down motor.
5.	MC: Master Reverse Roller Out- 5	Turns on the master reverse roller magnetic clutch.
6.	MOTOR: Vacuum Out- 6	Turns on the vacuum fan motor.
7.	MOTOR: Air Knife Out- 7	Turns on the air knife motor.
8.	SIG: Key Counter Out- 8	Increments key counter.
9.	COUNTER: Master Out- 9	Not used.
10.	COUNTER: Paper Out-10	Increments total counter.
11.	SOL: Paper Separation Release Out-11	Turns on the separation plate release solenoid.
12.	SOL: Ink Supply Out-12	Turns on the ink supply solenoid.
13.	SOL: Drum Lock Out-13	Turns on the drum lock solenoid.
14.	SOL: Paper Feed/Print Pressure Out-14	Turns on the paper feed solenoid and the printing pressure solenoid.
15.	SOL: Master Feed Clamper Out-15	Turns on the master feed clamper solenoid.
16.	SOL: Master Eject Clamper Out-16	Turns on the master eject clamper solenoid.
17.	SOL: Master Eject Out-17	Turns on the master eject solenoid.
18.	RELAY: Paper Table Down Out-18	Turns on the paper table drive motor (down).
19.	RELAY: Paper Table Up Out-19	Turns on the paper table drive motor (up).
20.	RELAY: Main Motor Out-20	Turns the drum in the direction opposite to the printing direction.
21.	SIG: Fluorescent Lamp Out-21	Turns on the fluorescent lamp.

Code	LCD Display	Description
22.	MOTOR: Cutter + Direction Out-22	Turns on the cutter motor (moves it to the rear of the machine).
23.	MOTOR: Cutter – Direction Out-23	Turns on the cutter motor (moves it to the front of the machine).
24.	MOTOR: Image Shift + Direction Out-24	Turns the image position motor in the "+" direction.
25.	MOTOR: Image Shift – Direction Out-25	Turns the image position motor in the "–" direction.
26.	MOTOR: Main (10 rpm) Out-26	Turns on the main motor (10 rpm).
27.	MOTOR: Main (30 rpm) Out-27	Turns on the main motor (30 rpm).
28.	MOTOR: Main (1st Speed) Out-28	Turns on the main motor (1st speed).
29.	MOTOR: Main (2nd Speed) Out-29	Turns on the main motor (2nd speed).
30.	MOTOR: Main (3rd Speed) Out-30	Turns on the main motor (3rd speed).
31.	MOTOR: Main (4th Speed) Out-31	Turns on the main motor (4th speed).
32.	MOTOR: Main (5th Speed) Out-32	Turns on the main motor (5th speed).
33.	MOTOR: Original Feed Out-33	Turns on the original transport motor.
34.	MOTOR: Master Feed Out-34	Turns on the master feed motor.
35.	MOTOR: Paper Reverse Out-35	Turns on the paper return motor.
36.	Turn on drum, feed/ pressure SOLs Out-36	Turns on the main motor (10 rpm), the paper feed solenoid and the printing pressure solenoid.

2.6 USER CODE MODE

2.6.1 User Codes

With the user code function, operators must input an authorized code before the machine will operate. The machine keeps track of the number of prints made under each code.

There are 20 user codes as follows:

No.	User Code No.
1	100
2	191
3	182
4	173
5	164
6	155
7	146
8	137
9	128
10	119
11	200
12	291
13	282
14	273
15	264
16	255
17	246
18	237
19	228
20	219

2.6.2 How To Use a User Code

1. Enter the user code (3 digits) with the number keys.
2. Press the Enter key.
3. Press the Master Making key to start printing.

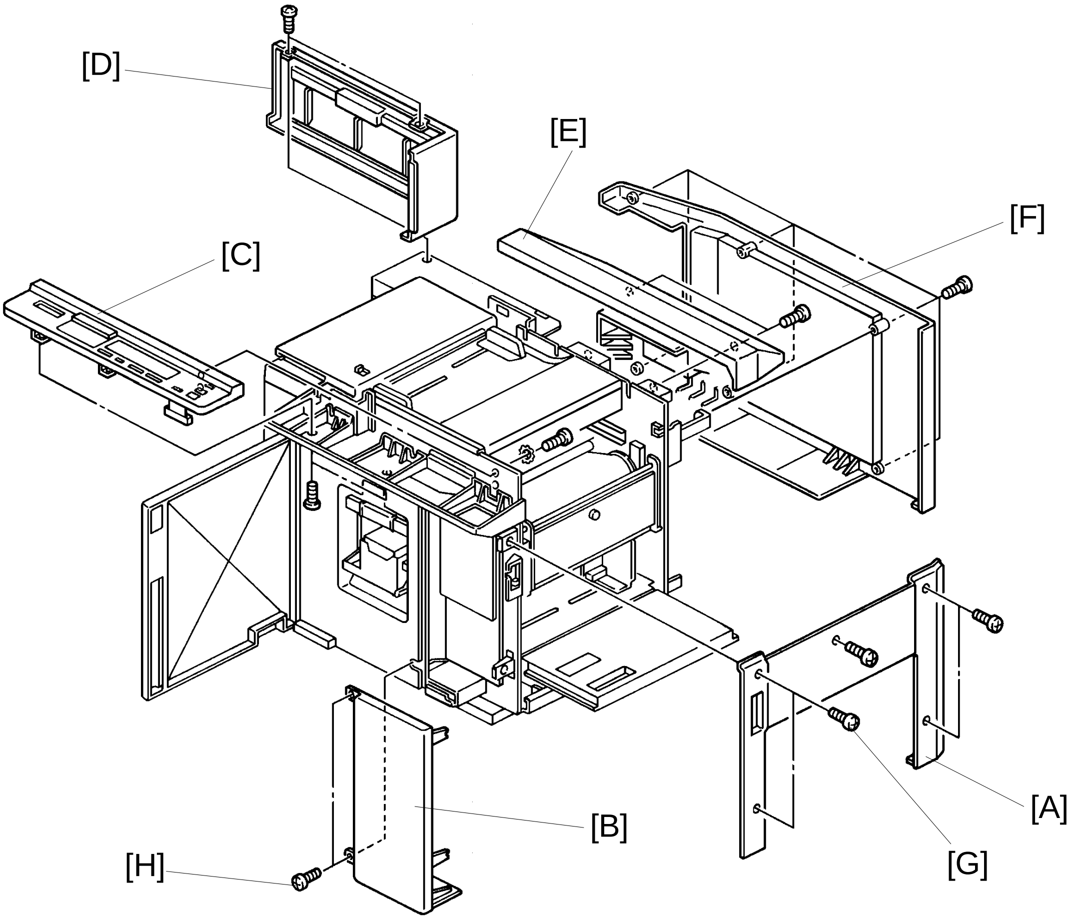
NOTE: The user code mode is reset if the Clear Modes key and the Stop key are pressed together.

SECTION 5

REPLACEMENT AND ADJUSTMENT

1. EXTERIOR SECTION

1.1 EXTERIOR COVERS



When adjusting or disassembling each section, refer to the following procedures on how to remove exterior covers.

[A] Right Cover (5 screws)

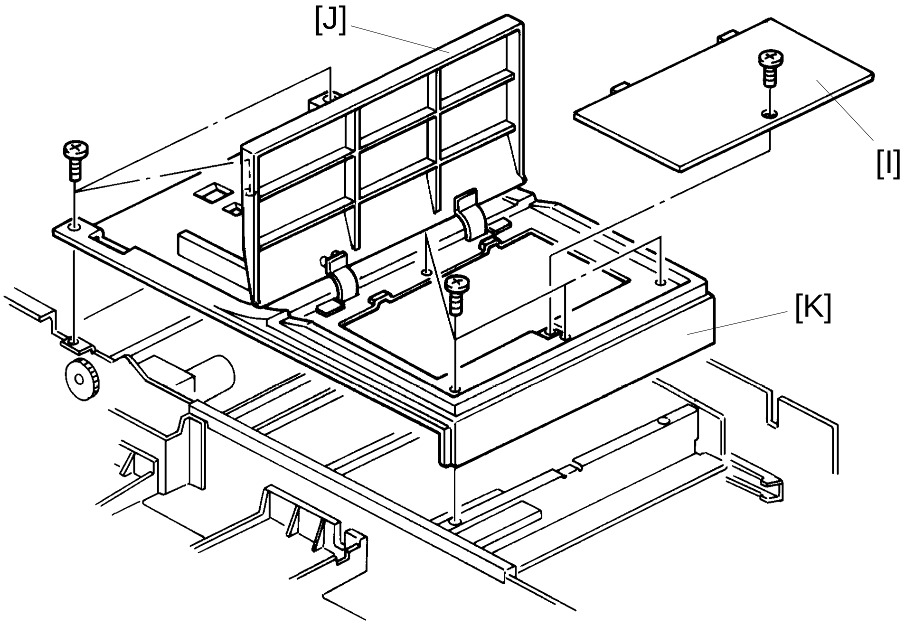
[B] Right Front Cover: open the front door, loosen the 2 screws [G], remove the 2 screws [H].

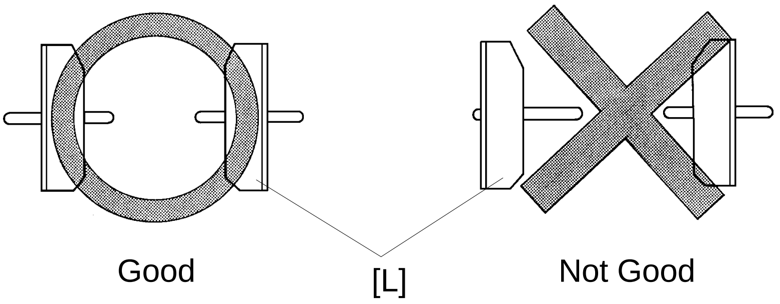
[C] Operation Panel: open the front door, slide the scanner unit to the left and remove the 4 screws.

[D] Master Eject Cover: open the master eject unit and remove the 2 screws.

[E] Upper Rear Cover: remove the 3 screws.

[F] Rear Cover: remove the upper rear cover [E] and remove the 7 screws.





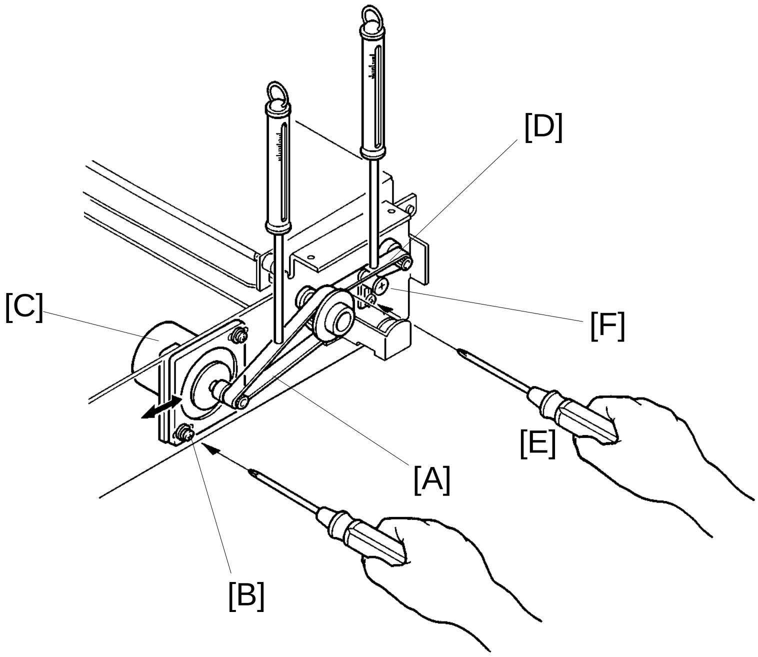
[I] A/D Conversion PCB Cover: open the operating instruction cover [J] and remove 1 screw.

[K] Original Table: remove the 7 screws.

NOTE: When installing the original table, make sure both original guides [L] are set in the same position in the grooves (see illustrations).

2. SCANNER SECTION

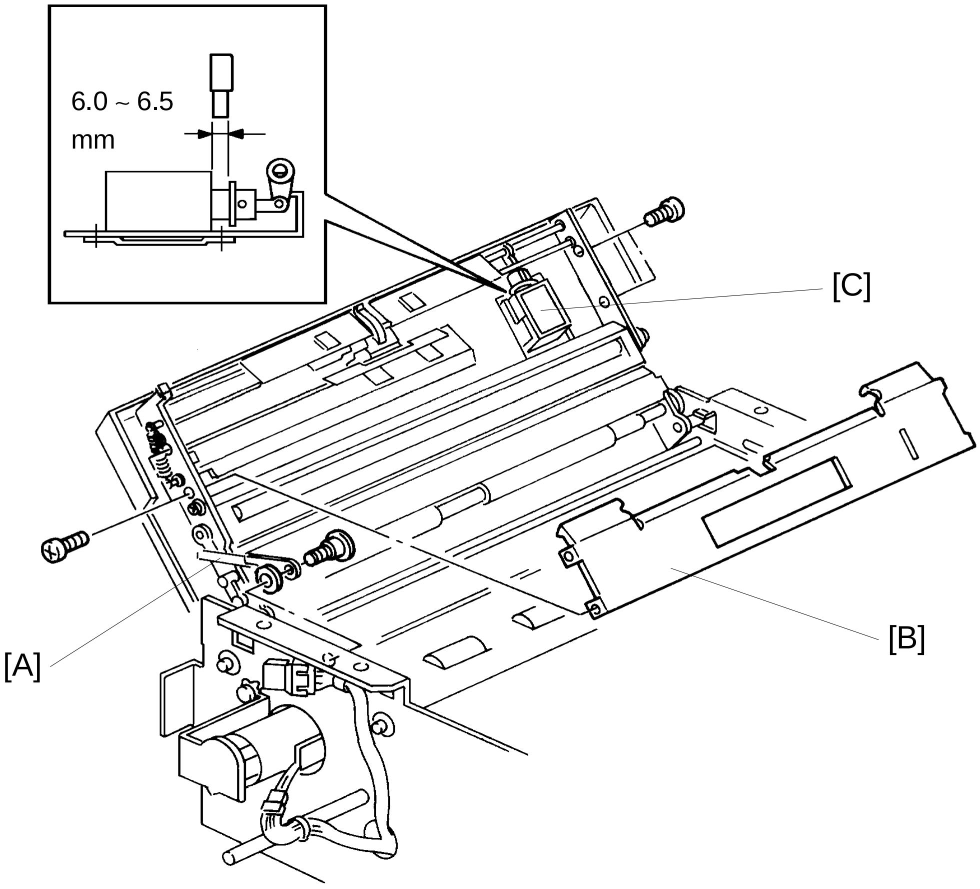
2.1 ADJUSTING THE TENSION OF THE ORIGINAL FEED ROLLER DRIVE BELT



Purpose: To ensure that the originals are fed properly.
Adjustment Standard: 2 to 3 mm

1. Slide the scanner unit to the left.
2. Remove the rear cover of the fluorescent lamp.
3. Using a tension gauge, apply a 110-gram load at the center of the belt [A]. Make sure that the belt deflects 2 to 3 mm.
4. If it does not, loosen the mounting screws [B] of the original feed motor [C] and adjust the belt tension by sliding the original feed motor as shown above.
5. Using a tension gauge, apply a 110-gram load at the center of the belt [D]. Make sure that the belt deflects 1.1 ± 0.2 mm.
6. If it does not, loosen the mounting screw [E] and adjust belt tension by moving the belt tensioner [F].
7. After adjustment, retighten the mounting screws.

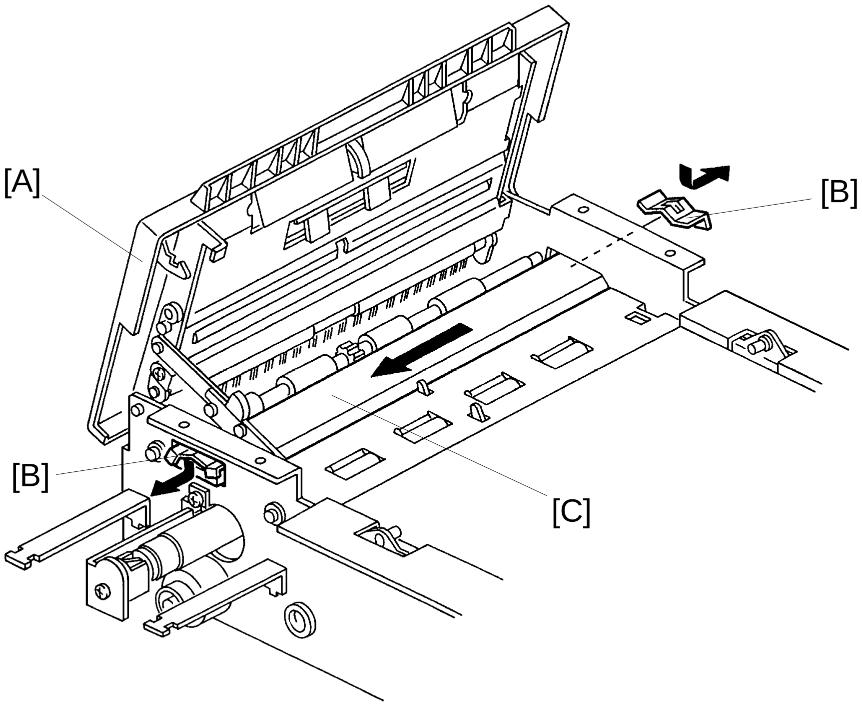
2.2 ADJUSTING THE ORIGINAL PRESSURE SOLENOID



Purpose: To ensure that the originals are separated properly.
Adjustment Standard: 6.0 to 6.5 mm

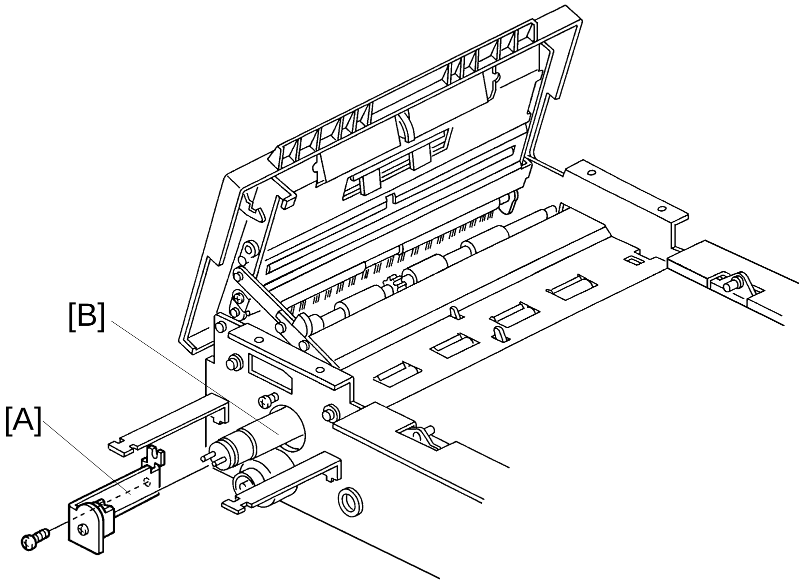
1. Remove the screw securing stopper [A].
2. Remove the separation guide plate [B] (4 screws).
3. Adjust the position of the original pressure solenoid [C]. This way, when the solenoid is turned off, the space between the E-ring and the rubber cushion is between 6.0 and 6.5 mm.

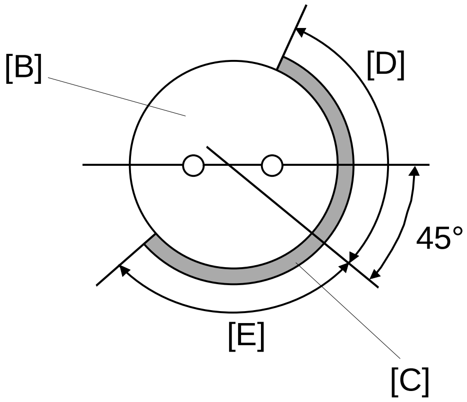
2.3 EXPOSURE GLASS



1. Move the scanner unit to the left.
2. Open the ADF unit [A].
3. Remove both fluorescent lamp covers.
4. Remove both exposure glass leaf springs [B].
5. Carefully remove the exposure glass [C].

2.4 EXPOSURE LAMP/HEATER

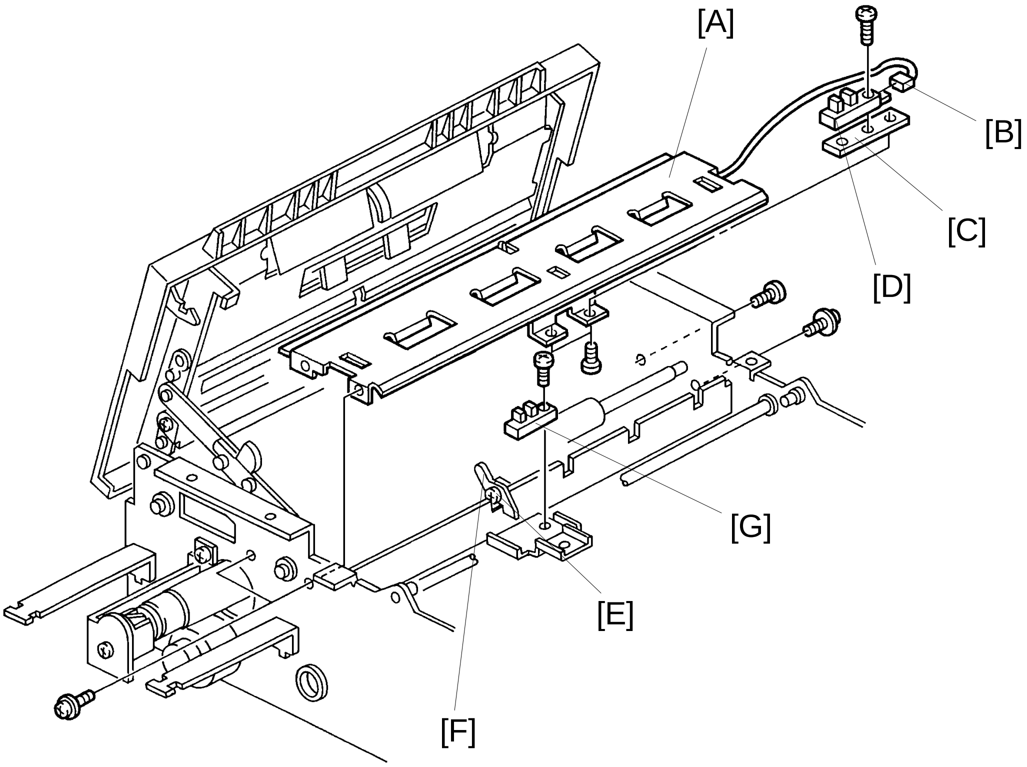




1. Move the scanner unit to the left.
2. Remove the front fluorescent lamp cover.
3. Disconnect the 4P heater connector.
4. Remove the front fluorescent lamp holder [A] (2 screws).
5. Carefully remove the fluorescent lamp [B] so that it does not touch the exposure glass.
6. Remove the heater [C] from the fluorescent lamp.

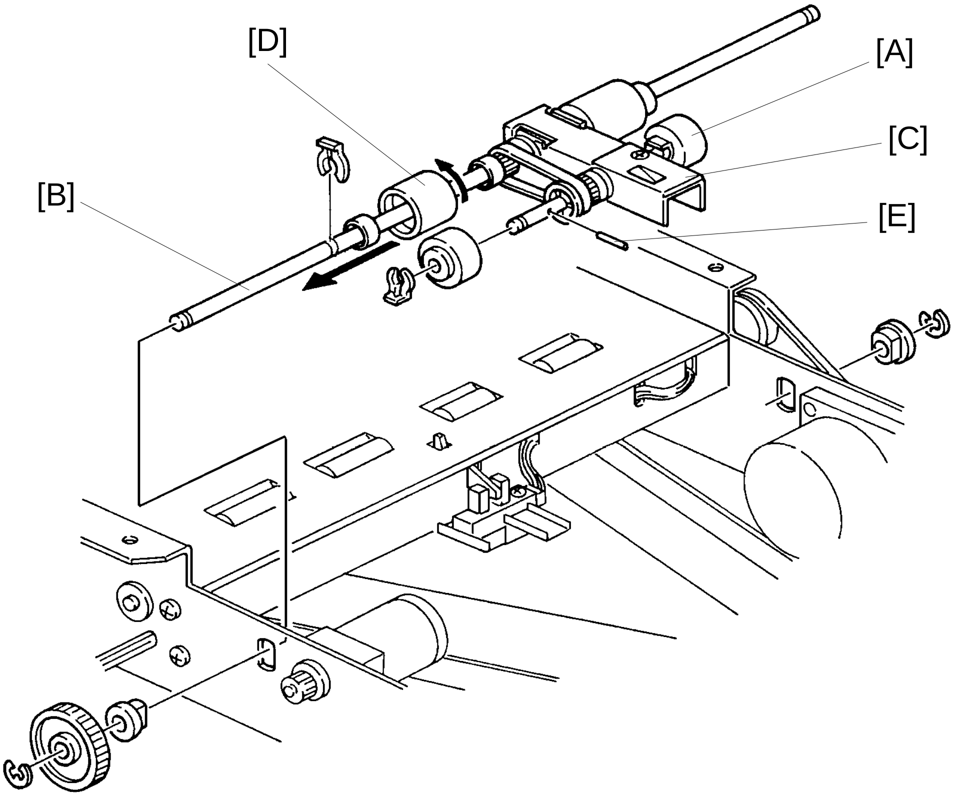
NOTE: When you reassemble the heater, make sure that [D] and [E] have same length.

2.5 ORIGINAL REGISTRATION SENSOR/2ND ORIGINAL SENSOR



1. Remove the exposure glass. (See Exposure Glass section.)
2. Remove the screw supporting the locking arm.
3. Remove the guide plate [A].
4. Disconnect the original registration sensor connector [B].
5. Remove the sensor along with the securing plate [C].
6. Remove the original registration sensor [D] from the securing plate.
7. Remove the original table (7 screws).
8. Remove the screw [E] supporting the actuator [F].
9. Remove the 2nd original sensor [G].

2.6 ORIGINAL FEED ROLLERS/PULL-OUT ROLLERS



1. Remove the original table (7 screws) and open the ADF unit.
2. Replace the pull-out rollers [A] (1 snap ring, 1 pin).
3. Remove the E-rings at both ends of the feed roller shaft [B].
4. Remove the original feed roller assembly [C].
5. Replace the original feed rollers [D] (1 snap ring).

NOTE: 1. A one-way clutch is installed in the feed roller. Confirm that the roller can rotate only in the direction shown above.

2. Be careful not to lose the pin [E].

3. OPTICS SECTION

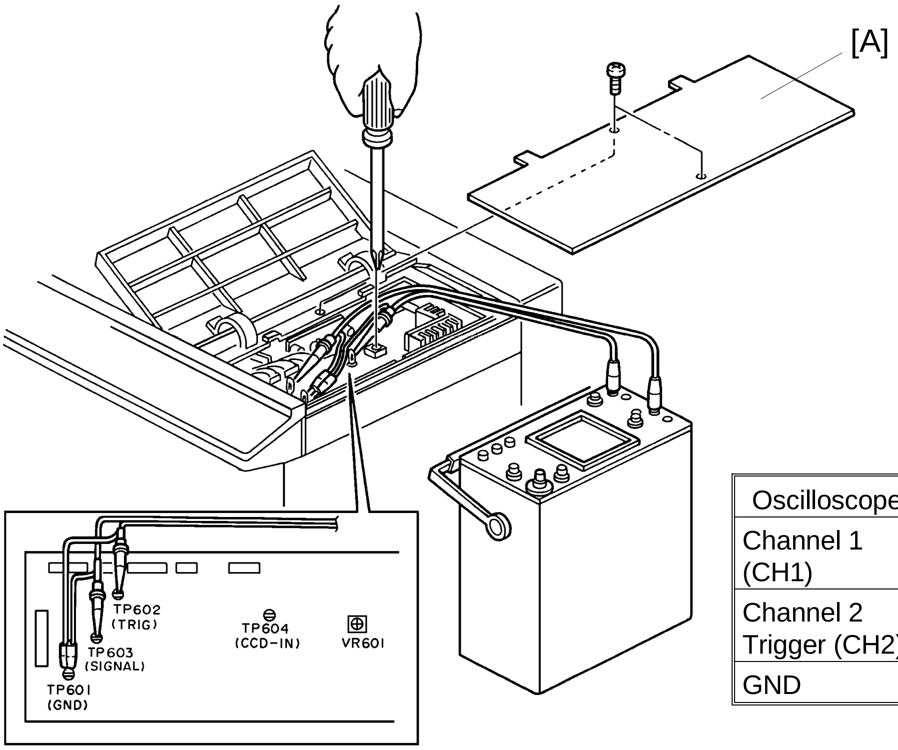
3.1 OVER VIEW

Double check all optical component adjustments, because these adjustments influence each other.

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

Check Item / Adjustment Item	Output of White Level	Shading	Scan Line Position	Reading Start Position of Main Scan	Focus (MTF)	Reduction Ratio (Moire)
Output of White Level						
Shading	**O**					
Scan Line Position	**O**	**O**		**O**		
Reading Start Position of Main Scan	**O**	**O**	**O**			
Focus (MTF)						**O**
Reduction Ratio (Moire)	**O**	**O**	**O**	**O**	**O**	

* Necessary Tools
1) Facsimile Test Chart R-21 (P/N 99992131)
2) Resolution Chart (P/N A0129110)
3) Oscilloscope



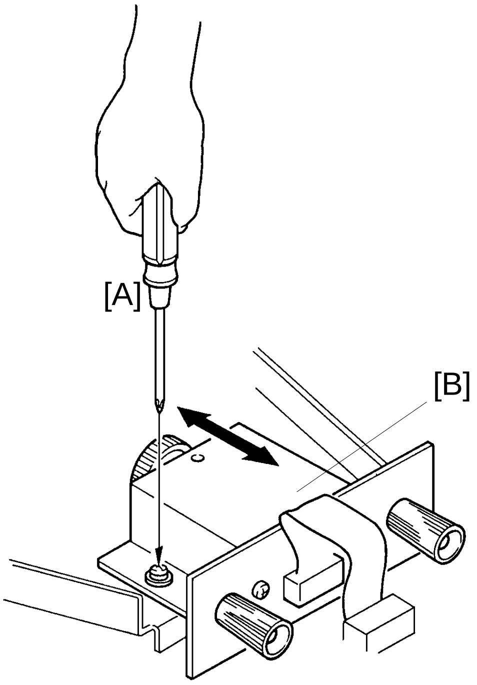
Oscilloscope	Test pin
Channel 1 (CH1)	TP603
Channel 2 Trigger (CH2)	TP602
GND	TP601

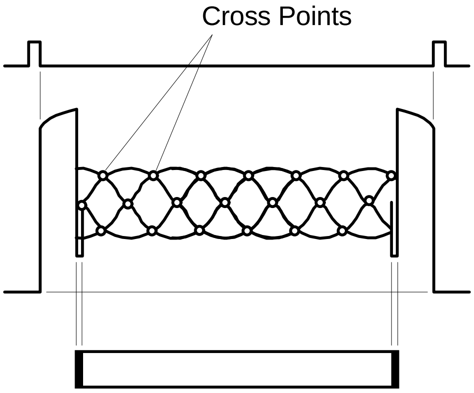
[Preparation for Adjustment]

1. Remove the A/D conversion PCB cover [A] (1 screw).
2. Connect the terminals of the oscilloscope to the following test pins on the A/D conversion PCB.
3. Turn on the main switch and access the service program mode.
4. Enter 131 with the number keys to access the output check mode.
5. Enter 21 with the number keys and then press the Print Start key to turn on the fluorescent lamp.

NOTE: Before adjusting, leave the fluorescent lamp on for 5 minutes to stabilize the light intensity.

3.2 ADJUSTING THE REDUCTION RATIO (MOIRE ADJUSTMENT)





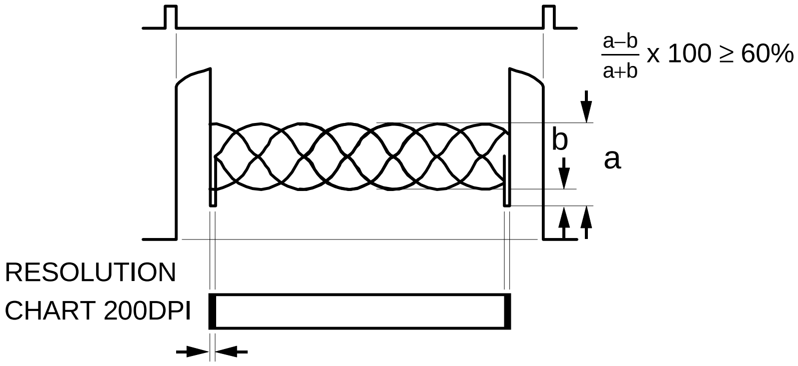
Cross points must be less than 33.

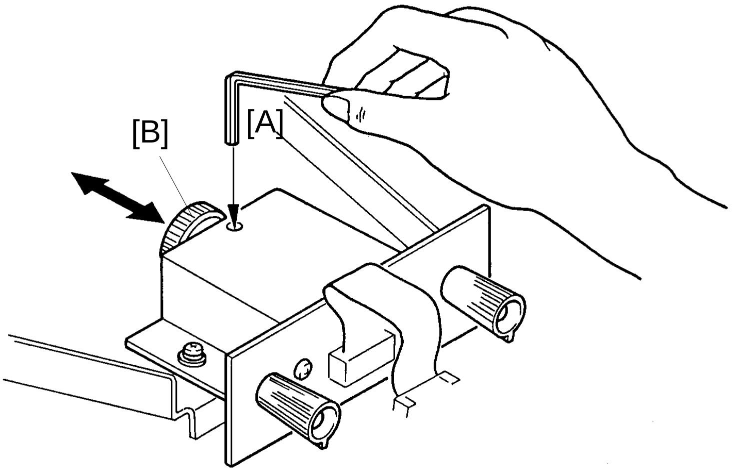
Purpose: To adjust the focus (to set distance between the lens and the original).

Adjustment Standard: There must be 32 cross points or less.

1. Position the resolution chart so that the area containing 200 dpi on the test chart can be read.
2. Press the Print Start key to turn on the fluorescent lamp.
3. At the same time, check if the waveform looks like the one in the illustration above.
4. If it does not, loosen the mounting screws [A] and adjust the position of the lens block [B] as indicated by the arrows.
5. After the adjustment, retighten the mounting screw [A].

3.3 ADJUSTING THE FOCUS (MTF ADJUSTMENT)

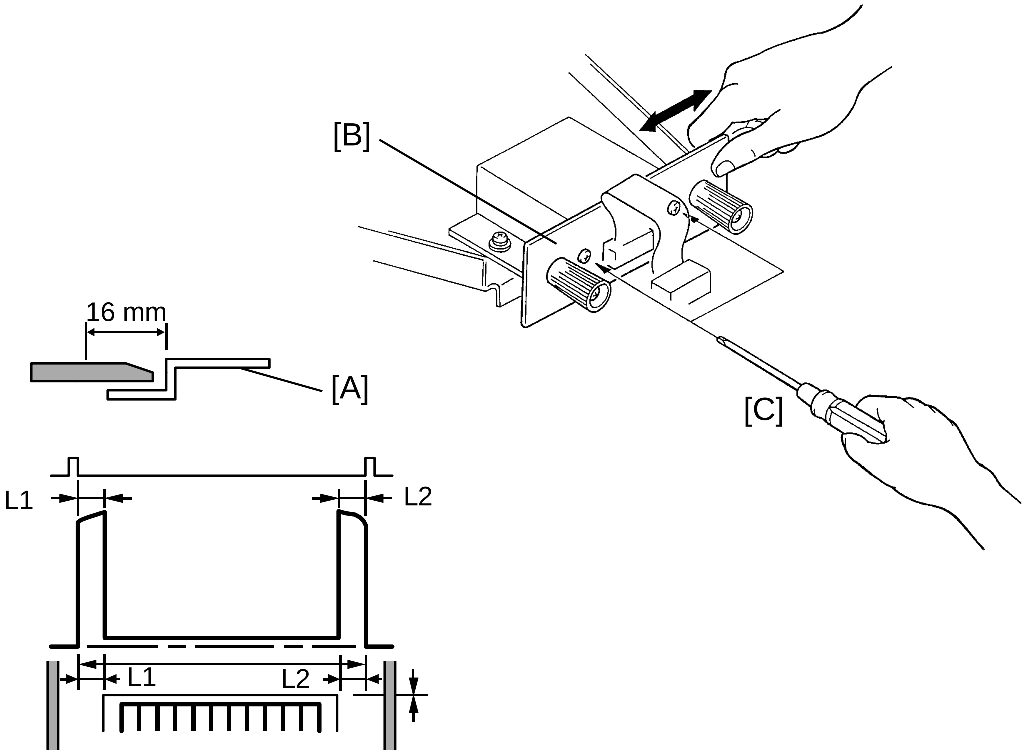




Purpose: To adjust the focus distance between the CCD and the lens.
Ajustment Standard: $\frac{a-b}{a+b}$ x 100 ≥ 60 %

1. Position the resolution chart so that the 200 dpi area on the test chart can be read.
2. Press the Print Start key to turn on the fluorescent lamp.
3. Check if the waveform looks like the one you see in the illustration above.
4. If it does not, loosen the Allen screw [A] and adjust the position of the lens [B] by moving it as shown by the arrow.
5. After the adjustment, retighten the Allen screw [A].

3.4 ADJUSTING THE READING START POSITION IN THE MAIN SCAN DIRECTION

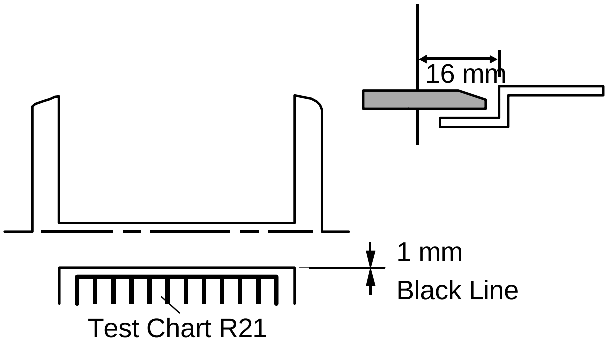


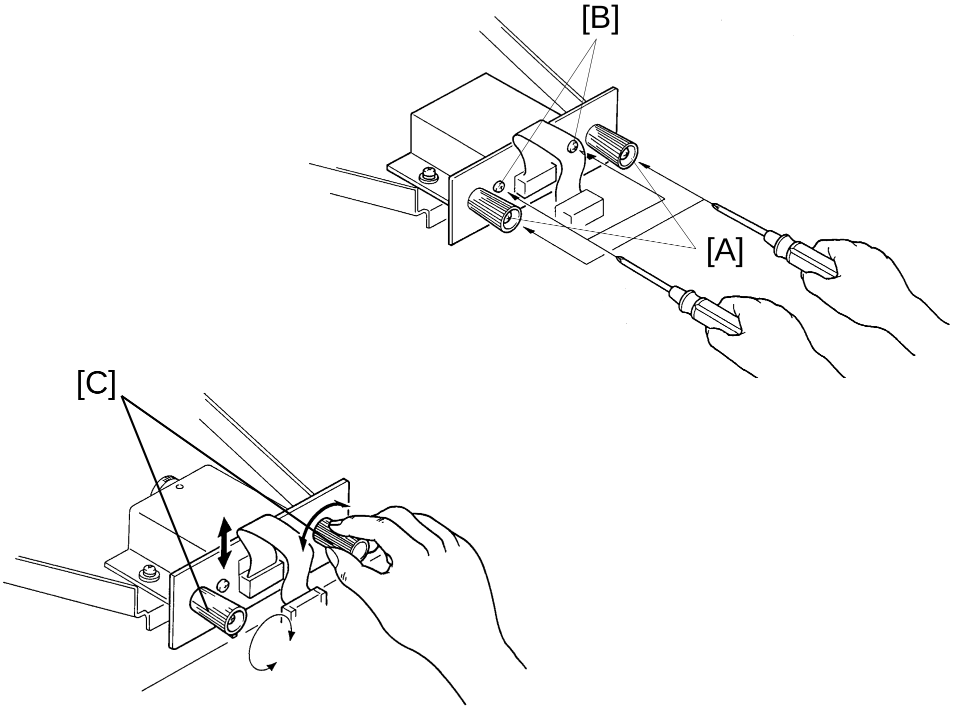
Purpose: To align the center of the original with the center of the CCD.
This will center the image on the master.

Adjustment Standard: L1 – L2 is less than 6 µs.

1. Open the ADF unit.
2. Set the test chart so that the center line is positioned above the original registration sensor actuator. The center line is located at the leading edge of the test chart. At the same time the black line should be 16 mm away from the edge of the lower original guide plate [A].
3. Close the ADF unit.
4. Press the Print Start key to turn on the fluorescent lamp and feed the test chart.
5. Confirm that L1 – L2 is less than 6 µs.
6. If it is more than 6 µs, loosen the mounting screws [C] of the CCD board [B] and adjust the CCD horizontal position.
7. After the adjustment, retighten the mounting screws [C].

3.5 ADJUSTING THE SCAN LINE POSITION



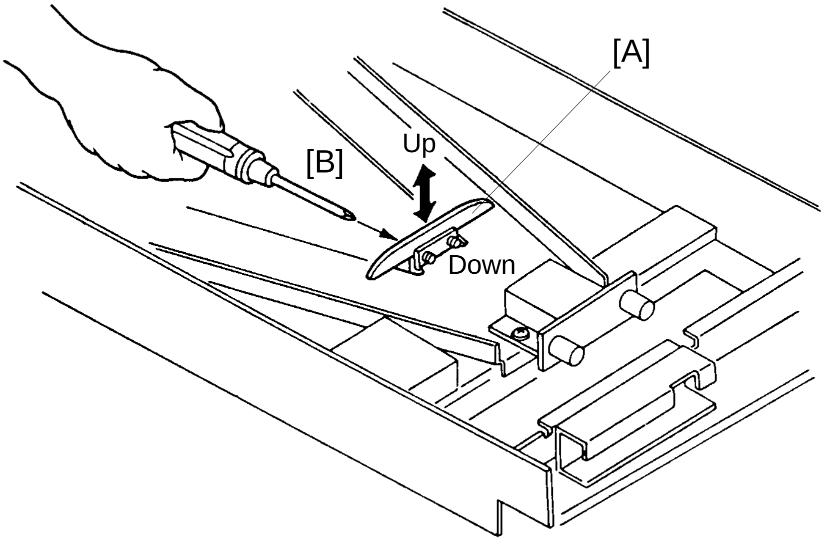


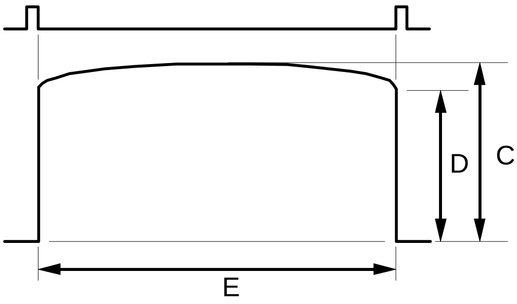
Purpose: To ensure that the CCD alignment is perpendicular to the original feed direction.

Adjustment Standard: See the above illustration.

1. Set the test chart so that the black line is positioned 16 mm away from the edge of the lower original guide plate.
2. Press the Print Start key to turn on the fluorescent lamp and confirm that the waveform looks like the one in the above illustration.
3. If it does not, loosen the screws [A] holding the adjusting knobs in place. Then, loosen the screws [B] of the CCD board.
4. Adjust the CCD board height by turning the adjusting knobs [C].

3.6 ADJUSTING THE SHADING PLATE





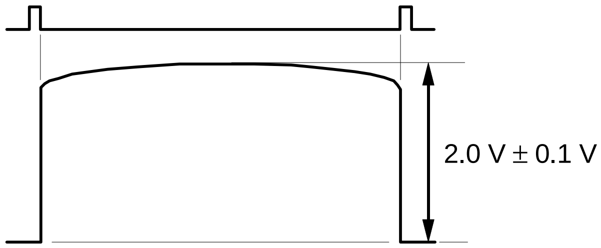
D > 0.6 C   C < 1.0 V   E < 3 ms

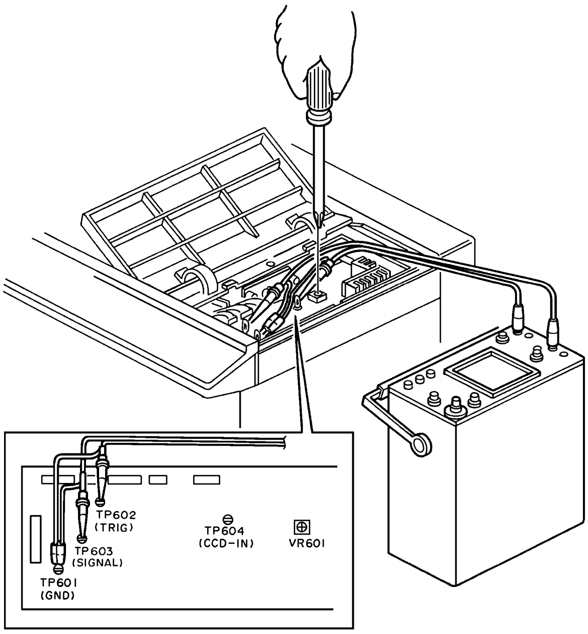
- The middle of the waveform should be higher than the ends.

Purpose: To correct light intensity distortion properly.
Adjustment Standard: See the above illustration.

1. Close the ADF unit.
2. Turn VR601 counterclockwise until it stops.
3. Press the Print Start key and leave the fluorescent lamp on for 5 minutes to stabilize the light intensity.
4. Confirm that the above white level form is displayed.
5. If it is not, move the shading plate [A] vertically (up or down) to have the waveform match the one above.
6. After adjusting, retighten the mounting screw [B] of the shading plate.

3.7 ADJUSTING THE WHITE LEVEL





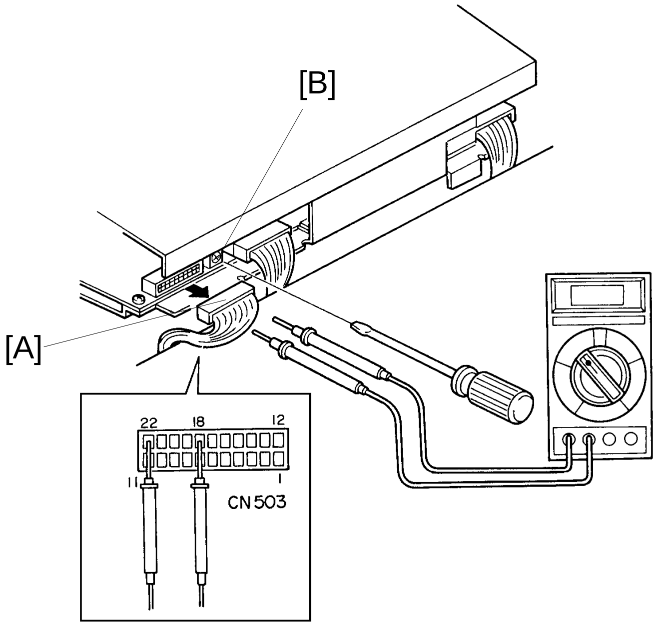
Purpose: To set the white level so that the background of the test chart is not copied.

Adjustment Standard: 2.0 V ± 0.1 V

1. Close the ADF unit.
2. Press the Print Start key to turn on the fluorescent lamp and leave it on for 5 minutes.
3. Adjust VR on the A/D conversion PCB so that the maximum level is 2.0 ± 0.1 V.

4. MASTER FEED SECTION

4.1 ADJUSTING THE THERMAL HEAD VOLTAGE



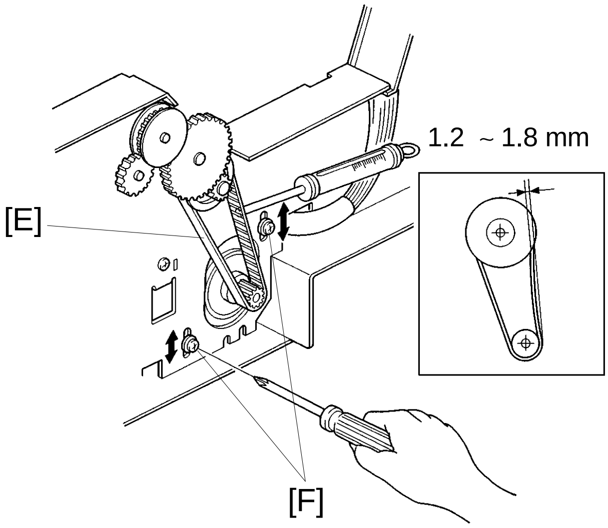
Purpose: To maintain quality when making masters and to extend the lifetime of the thermal head.

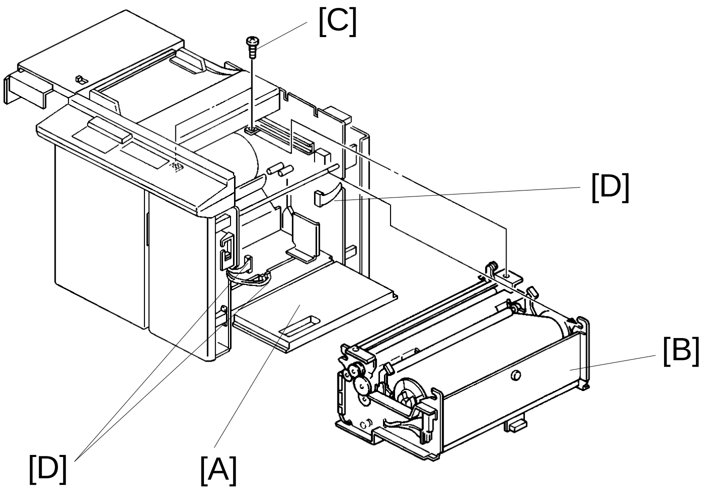
Adjustment Standard: Refer to the voltage value (X) on the thermal head decal of each machine. The adjustment voltage should be between "X – 0.1" and "X".

NOTE: This adjustment is always required when the thermal head or power supply unit is replaced.

1. Turn off the main switch and remove the paper exit cover plate (4 screws).
2. Check the voltage on the thermal head decal. (The voltage varies according to the individual thermal head.)
3. Turn on the main switch.
4. Confirm that the voltage between pin 22 and pin 18 of CN-503 [A] on the power supply unit is the correct voltage. Refer to the thermal head decal of each machine for the maximum voltage value. (0.1 volts less than the maximum voltage value is also acceptable.)
5. If it is not, adjust VR1 [B].

4.2 ADJUSTING THE BELT TENSION



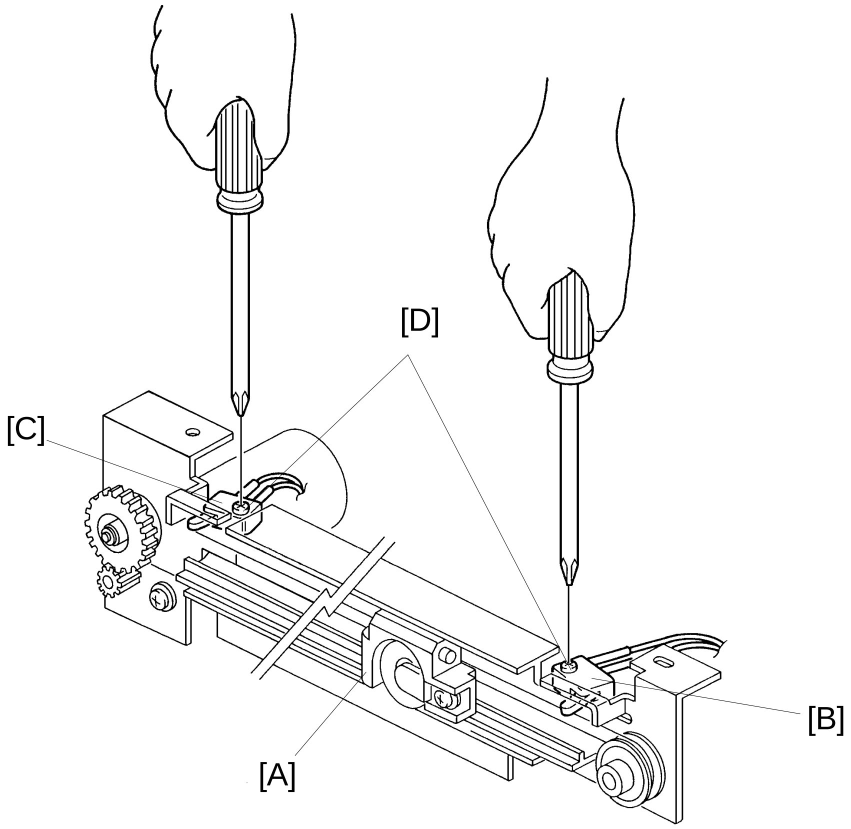


Purpose: To ensure that proper rotation for the master feed is transmitted to each roller.

Adjustment Standard: 1.2 to 1.8 mm

1. Lower the paper table [A].
2. Remove the plotter unit cover (5 screws).
3. Remove the plotter unit [B] (2 screws [C] and 4 connectors [D]).
4. Using a tension gauge, apply a 110-gram load to the center of the belt [E]. Make sure that the belt deflects 1.2 to 1.8 mm.
5. If it does not, adjust the master feed motor position (2 screws [F]).

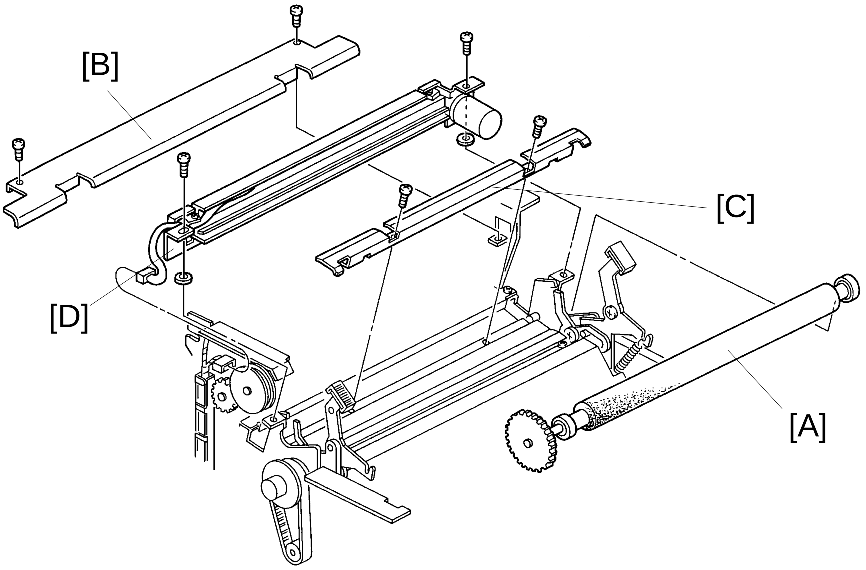
4.3 ADJUSTING THE RIGHT AND LEFT CUTTER SWITCHES

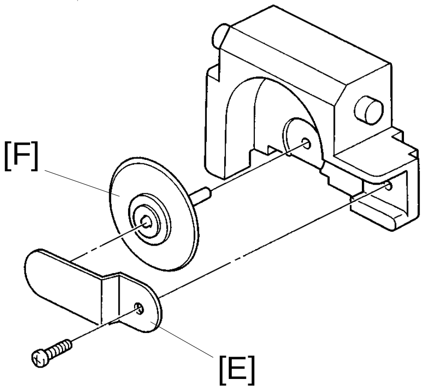


Purpose: To ensure that the cutter slider stops properly.
Adjustment Standard: Confirm that the cutter holder activates the switches.

1. Remove the cutter unit. (See Cutter section.)
2. After moving the cutter holder [A] fully to the left, make sure that the left cutter switch [B] is turned on. Make sure that the right cutter switch [C] is also turned on.
3. If not, loosen the mounting screws [D] and adjust the switch position.

4.4 CUTTER



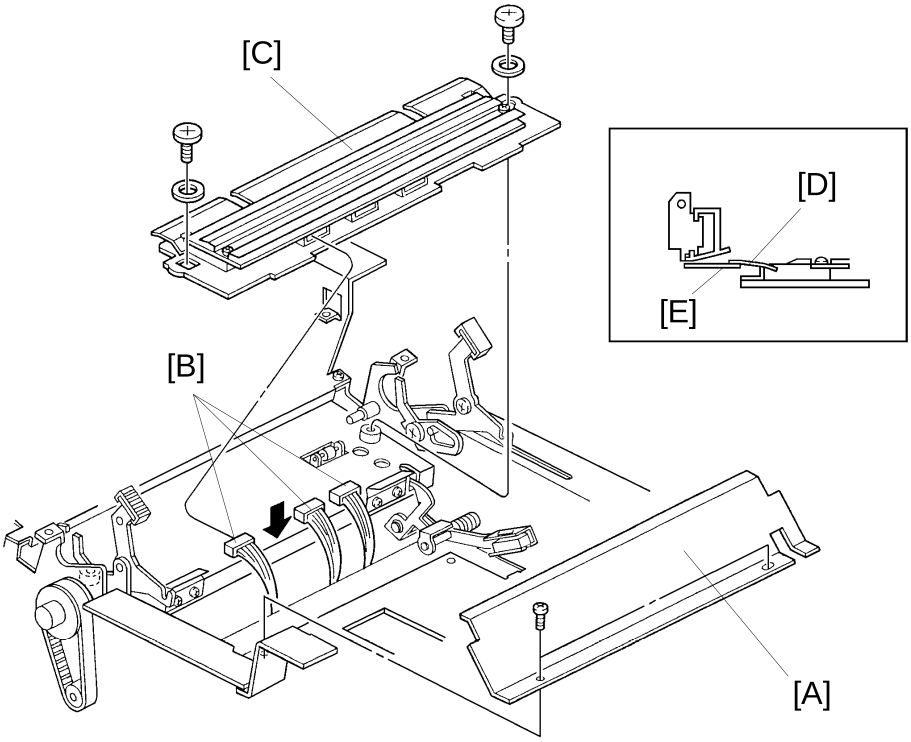


NOTE: Be careful not to damage the thermal head.

1. Lower the paper table.
2. Remove the plotter unit. (See Adjusting the Belt Tension section.)
3. Remove the platen roller [A].
4. Remove the cutter unit cover [B] (2 screws).
5. Remove the thermal head guide plate [C] (2 screws).
6. Remove the cutter unit [D] (2 screws).
7. Remove the holder plate [E] (1 screw) and remove the cutter [F].

WARNING: Do not touch the cutter with bare hands.

4.5 THERMAL HEAD

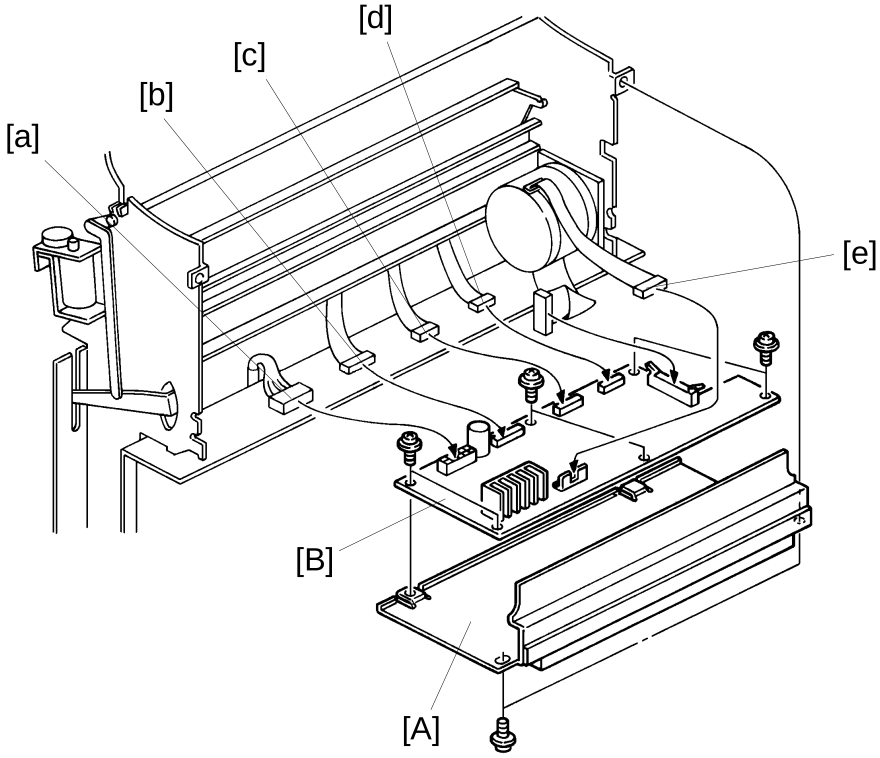


1. Slide the scanner unit to the left.
2. Remove the platen roller and remove the master roll.
3. Remove the thermal head cover [A] (2 screws).
4. Disconnect the three thermal head connectors [B].
5. Remove the thermal head [C] (2 screws).

NOTE: 1. Make sure the thermal guide plate [D] is positioned above the lower cutter unit guide plate [E].

2. Make sure none of the 3 connectors are loose.

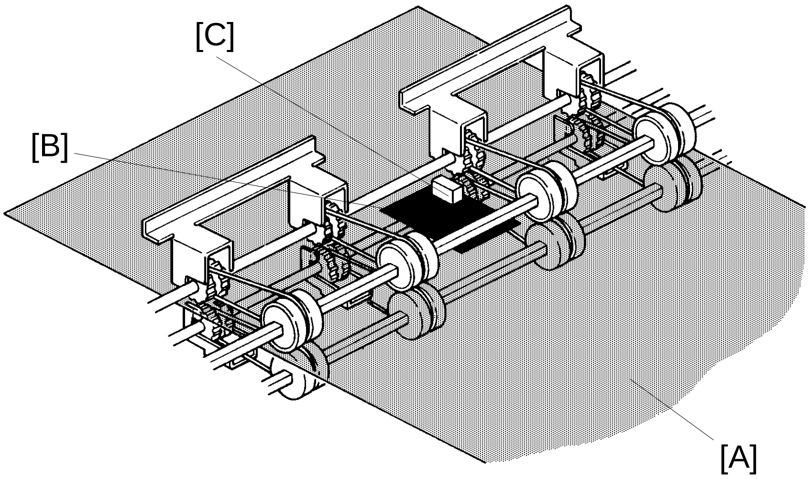
4.6 THERMAL HEAD DRIVE PCB



1. Remove the plotter unit.
2. Open the bottom plate [A] of the plotter unit (2 screws).
3. Disconnect the 5 connectors (a to e).
4. Remove the thermal head drive PCB [B] (6 screws).

5. MASTER EJECT SECTION

5.1 ADJUSTING THE MASTER EJECT SENSOR



Purpose: To ensure that the sensor detects the ejected master.
Adjustment Standard: 0.8 to 0.9 V when no master is detected.

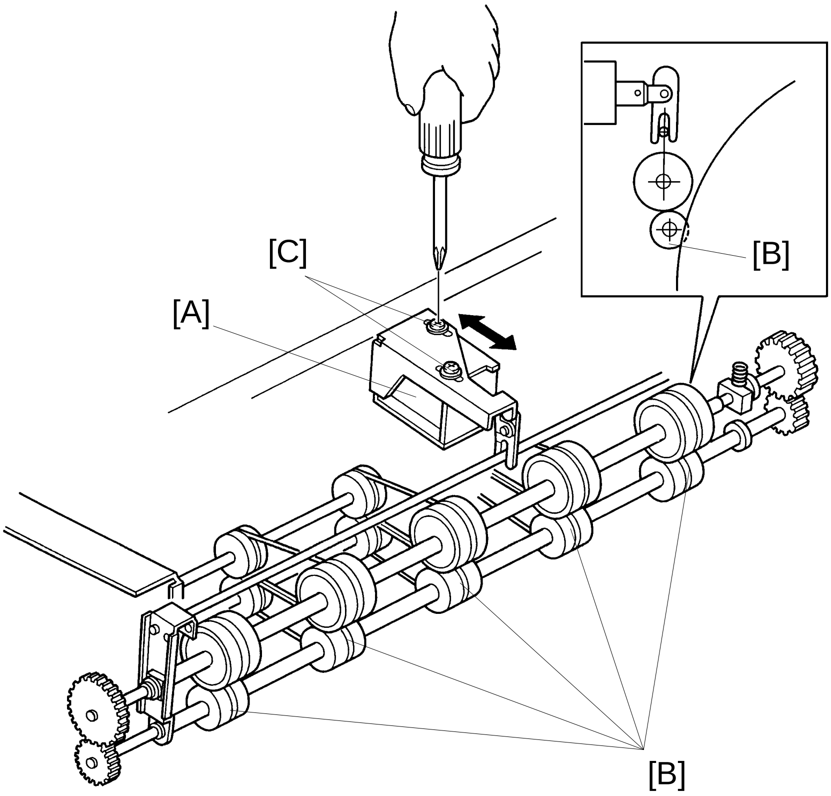
1. Make a master that has a solid black area as follows. The solid black area should be about size A7 (74 x 105 mm/3" x 4"). Using a solid black test master ensures testing the sensor under worst case condition.

   a. Set the original with the solid black area on the original table.
   b. Make some prints.
   c. Stop printing when the image density of the solid black area on the print stabilizes.
   d. Remove the master from the drum.

NOTE: To prevent the thermal head from overheating, do not use a large solid black original.

2. Set the drum unit and the master eject box.
3. Confirm that the voltage between TP104 and the GND line TP107 on the main PCB is 0.8 to 0.4 V when the master is not under the master eject sensor.
4. If it is not, adjust it by truning VR104 on the main PCB.
5. After adjusting, insert the master [A] between the upper and the lower eject rollers with the master film side up and position the solid black area under the sensor. Then confirm that LED104 turns on.

5.2 ADJUSTING THE MASTER EJECT SOLENOID

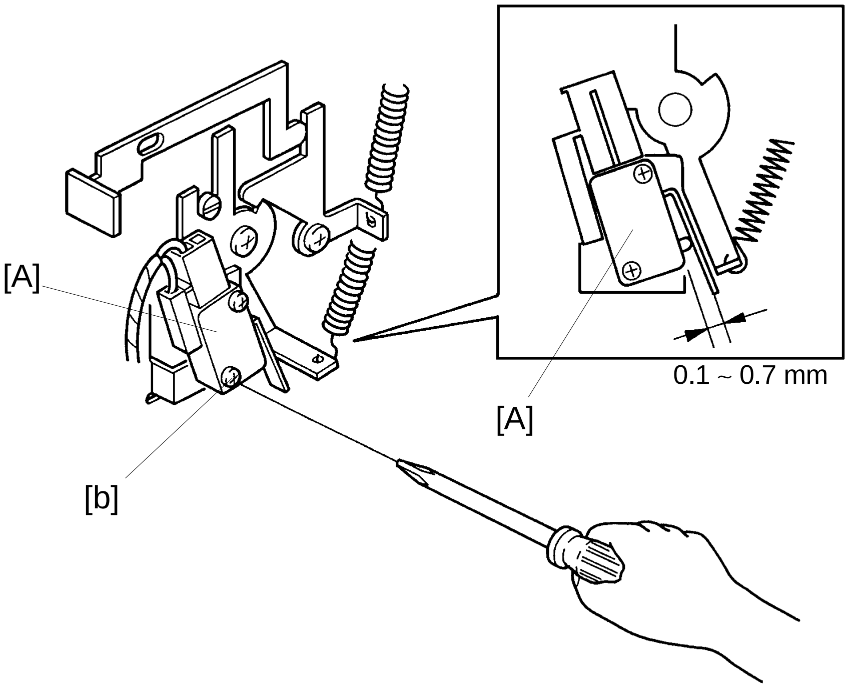


Purpose: To ensure that the master is ejected.

1. Open the master eject unit and remove its upper cover (4 screws).
2. Check if the lower rollers [B] touch the drum surface or not. If the solenoid [A] is on, then the rollers should touch, and if the solenoid is off, the rollers should not touch. The solenoid will be energized by enabling output check mode number 17.
3. If the rollers are not adjusted well, loosen the screws [C] and adjust the mounting position of the master eject solenoid [A].
4. After adjusting, retighten the screws [C].

NOTE: To easily check if the lower roller touches the drum surface: wrap the drum with blank paper. Then check the paper for roller marks.

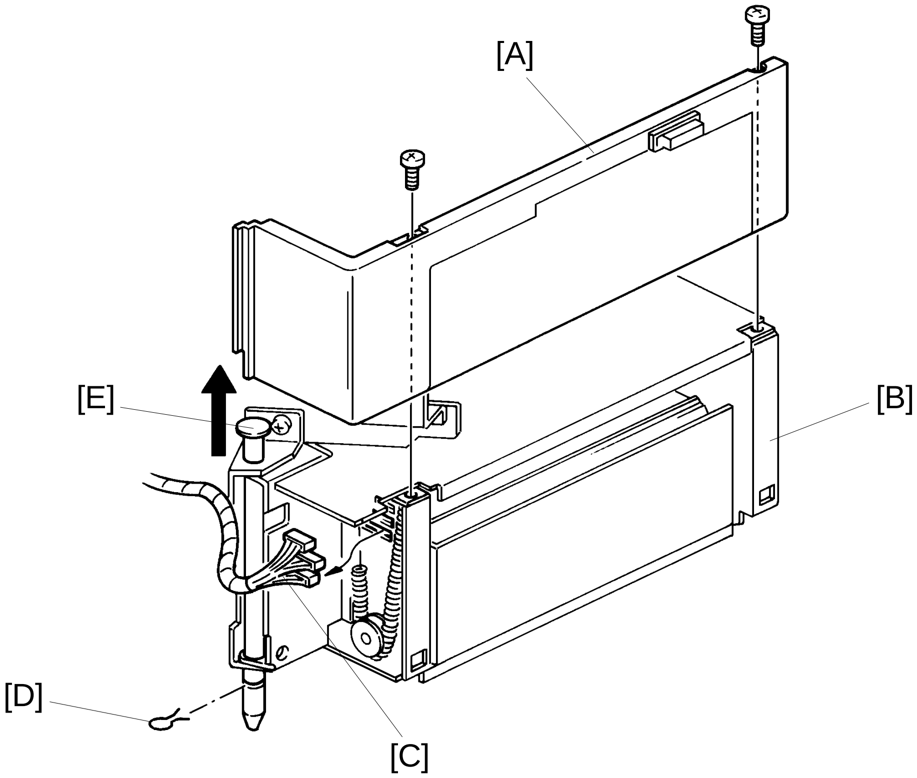
5.3 ADJUSTING THE AIR KNIFE MOTOR SAFETY SWITCH



Parpose: To ensure that the safety switch turns on and stops the air knife motor when the master eject unit is opened.
Adjustment Standard: 0.1 to 0.7 mm

1. Open the front door, then remove the right front cover and inner cover.
2. Confirm that the safety switch [A] turns off when you open the master eject unit.
3. Confirm that the distance between the safety switch and the actuator is 0.1 ~ 0.7 mm when the master eject unit is closed.
4. If not, loosen the screw [B] and adjust the position of the switch [A].
5. After adjusting, tighten the screw [B] and check the function of the safety switch.

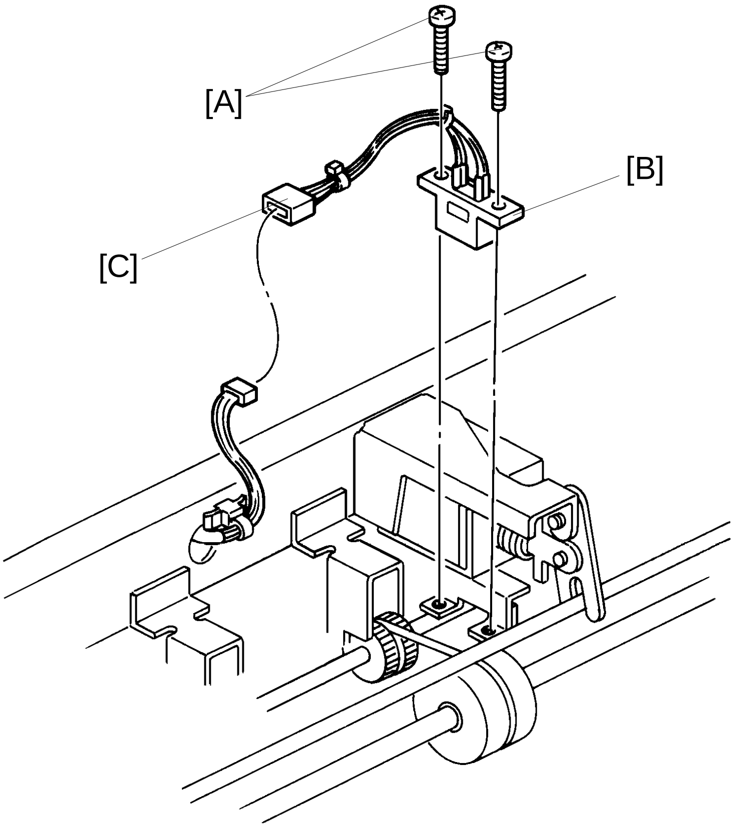
5.4 MASTER EJECT UNIT



1. Remove the upper rear cover (3 screws).
2. Remove the master eject unit cover [A] (2 screws).
3. Disconnect the 3 connectors [C].
4. Remove the clamper [D].
5. While supporting the master eject unit [B], slide out the shaft [E].

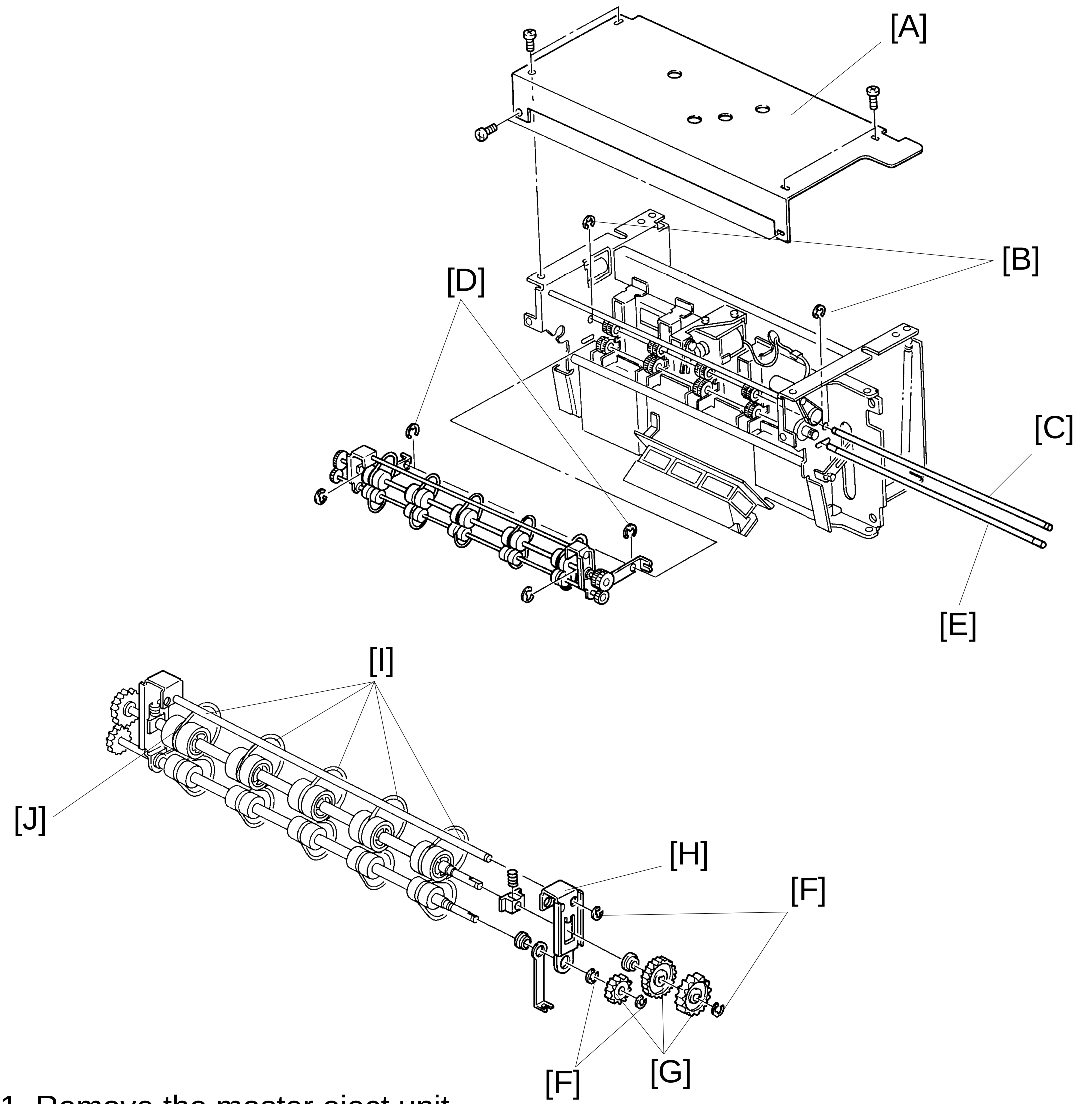
NOTE: Be careful not to drop the master eject unit.

5.5 MASTER EJECT SENSOR



1. Remove the master eject unit.
2. Remove the upper master eject unit cover.
3. Remove the 2 screws [A].
4. Disconnect the connector [C] and remove the master eject sensor [B].

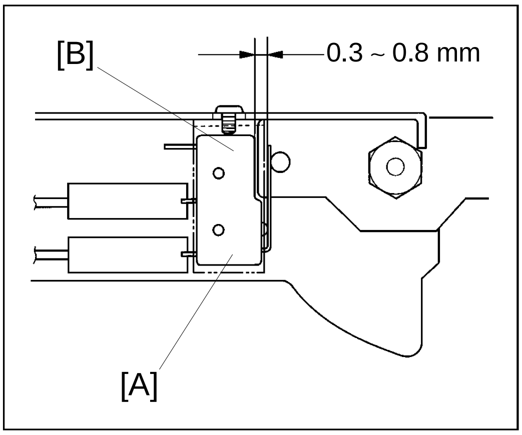
5.6 MASTER EJECT BELT/ROLLER

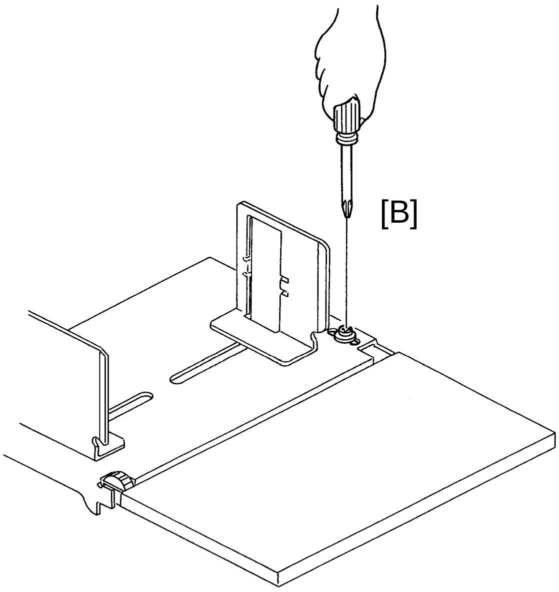


1. Remove the master eject unit.
2. Remove the unit cover [A] (6 screws).
3. Remove the 2 E-rings [B] and remove the upper pulley shaft [C].
4. Remove the 2 E-rings [D] and remove the roller unit from the master eject unit.
5. Remove the 4 E-rings [F] and 3 gears [G].
6. Remove the supporter [H].
7. Remove the 8 belts [I].
8. Remove the rubber rollers [J].

6. PAPER FEED SECTION

6.1 ADJUSTING THE PAPER TABLE OPEN SWITCH

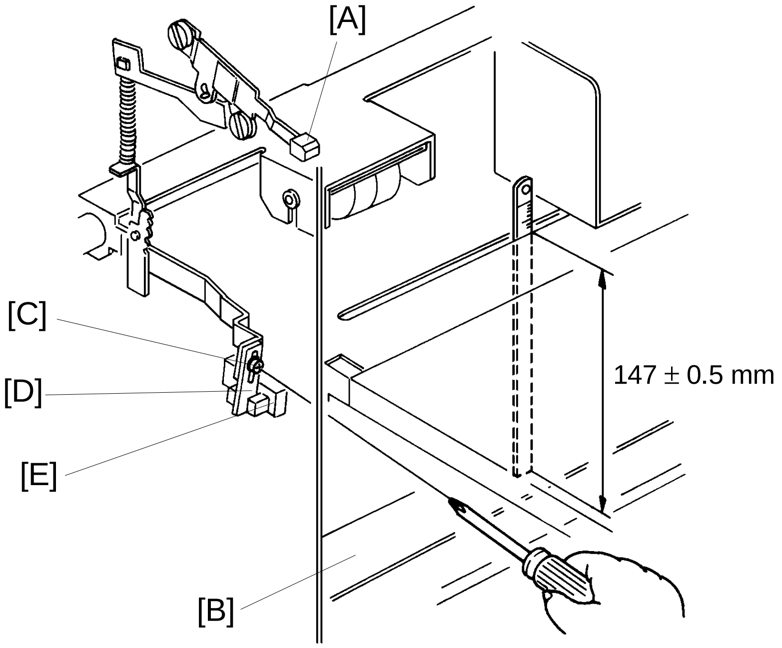




Purpose: To ensure that the paper table open switch turns on to prevent the paper table from going up when the paper table is closed.
Adjustment Standard: 0.3 to 0.8 mm

1. Make sure that the switch [A] turns off when the paper table is opened and that the switch turns on when the paper table is closed.
2. If this is not the case, loosen the screw [B] and adjust the switch bracket position.
3. After adjustment, repeat step 1 again.

6.2 ADJUSTING THE PAPER TABLE HEIGHT

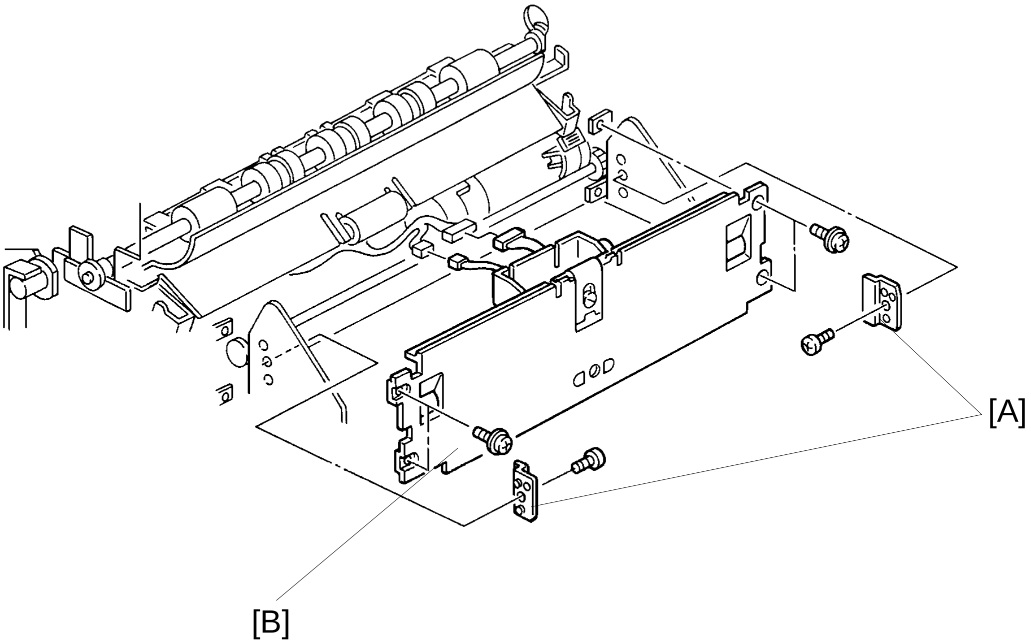


Purpose: To ensure smooth paper feed.
Adjustment Standard: 147 ± 0.5 mm

1. Set the paper feed pressure adjusting lever [A] to the upper position.
2. Remove the right front cover of the machine.
3. Turn on the main switch and access the service program mode.
4. Enter 131 with the number keys to access the output check mode.
5. Enter 19 with the number keys and then press the Print Start key to raise the paper table.
6. After the paper table stops, insert a scale into the slot at the end of the paper table. Make sure that the distance between the lower stay [B] and the upper face of the table is between 146.5 and 147.5 mm.
7. If it is not, loosen the screw [C] and adjust the position of the actuator [D].
8. After adjusting, repeat step 5 again by lowering and raising the paper table several times.

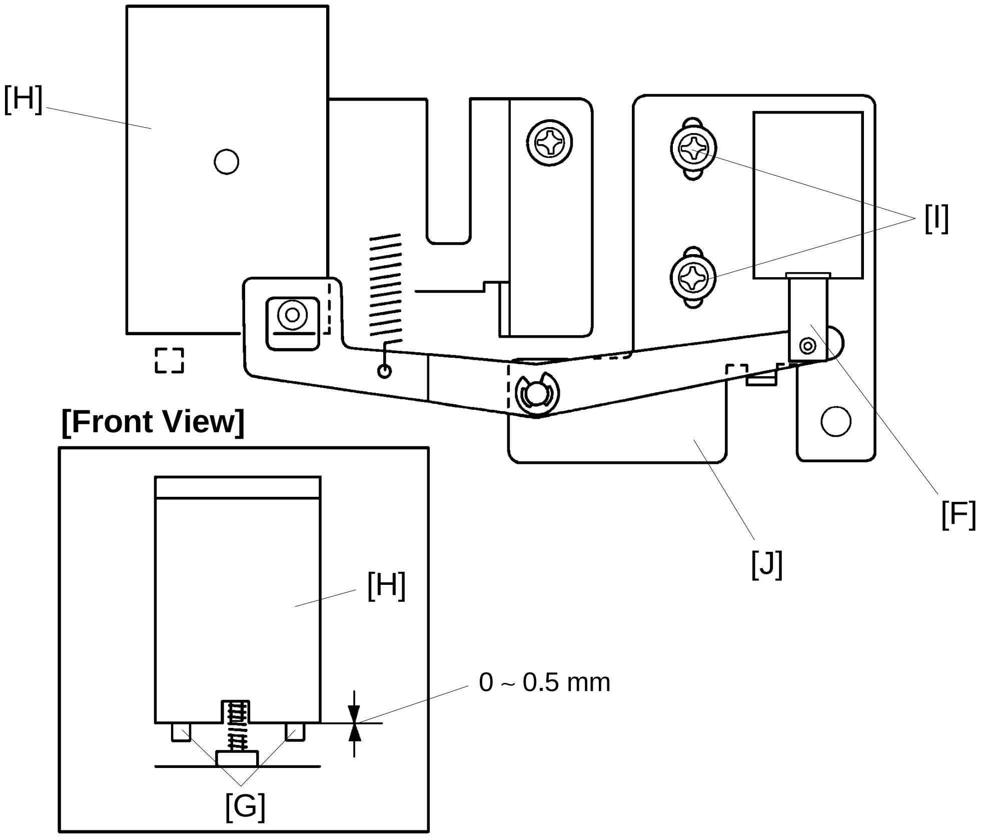
NOTE: When mounting the actuator, make sure that the actuator [D] does not touch the paper table height sensor [E].

6.3 ADJUSTING THE SEPARATION PLATE RELEASE SOLENOID



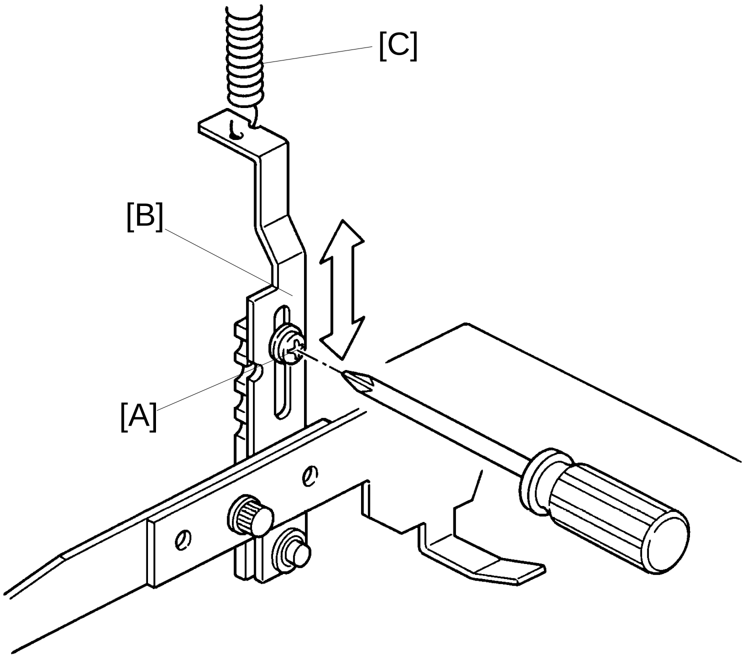
Purpose: To ensure that the separation plate is released from the upper separation roller when the paper table lowers.
Adjustment Standard: 0 to 0.5 mm

1. Lower the paper table.
2. Remove the plotter unit.
3. Remove the paper feed roller unit. (See Paper Feed Roller Unit section.)
4. Remove the two brackets [A].
5. Remove the front plate [B] from the machine (4 screws).



6. Push up the plunger [F] by hand. Check the distance between the bottom of the separation plate [H] and stoppers [G]. The distance should be between 0 and 0.5 mm. The stoppers [G] are on the front side of the plate [E].
7. If the distance is more than 0.5 mm, then loosen the 2 screws [I] and adjust the position of the bracket [J].

6.4 ADJUSTING THE PAPER FEED ROLLER PRESSURE



Purpose: To ensure that the paper feed roller exerts sufficient pressure for a smooth paper feed (printing paper weight range of 50 g/m^2 to 215 g/m^2).

NOTE: 1. If paper isn't feeding properly or isn't feeding at all, follow procedure 1. If procedure 1 fails to correctly adjust the feed roller pressure, follow procedure 2 (next page).

2. After replacing the paper feed pressure spring [C], follow procedure 2 to adjust the roller pressure.

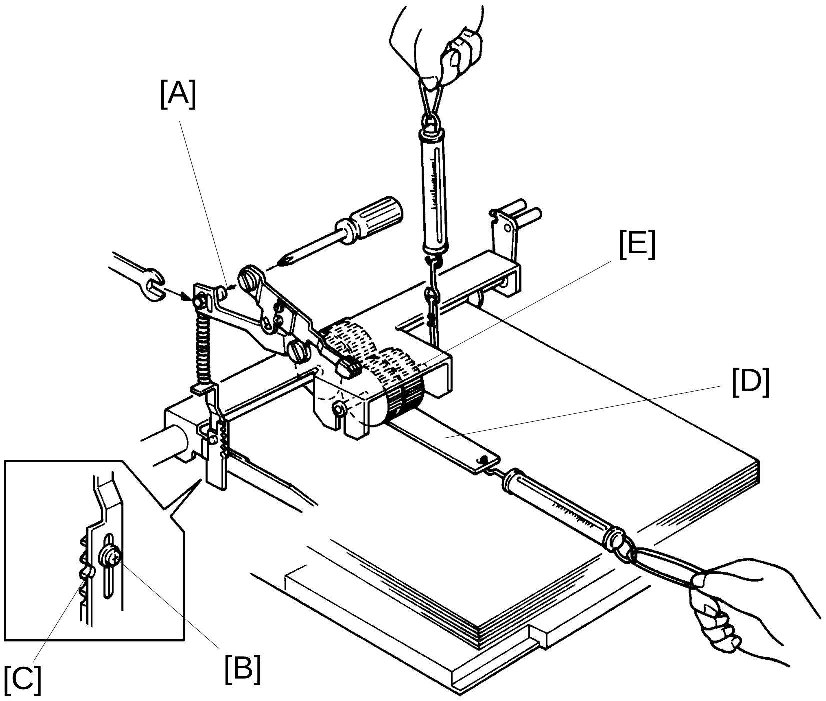
[Procedure 1]

1. Loosen the screw [A] securing the lower adjusting plate [B].

NOTE: When loosening the screw [A], hold the lower adjusting plate [B] in the original position for a fine adjustment.

2. Adjust the paper feed roller pressure by moving the lower adjusting plate [B] up or down.

Up to increase the pressure
Down to reduce the pressure

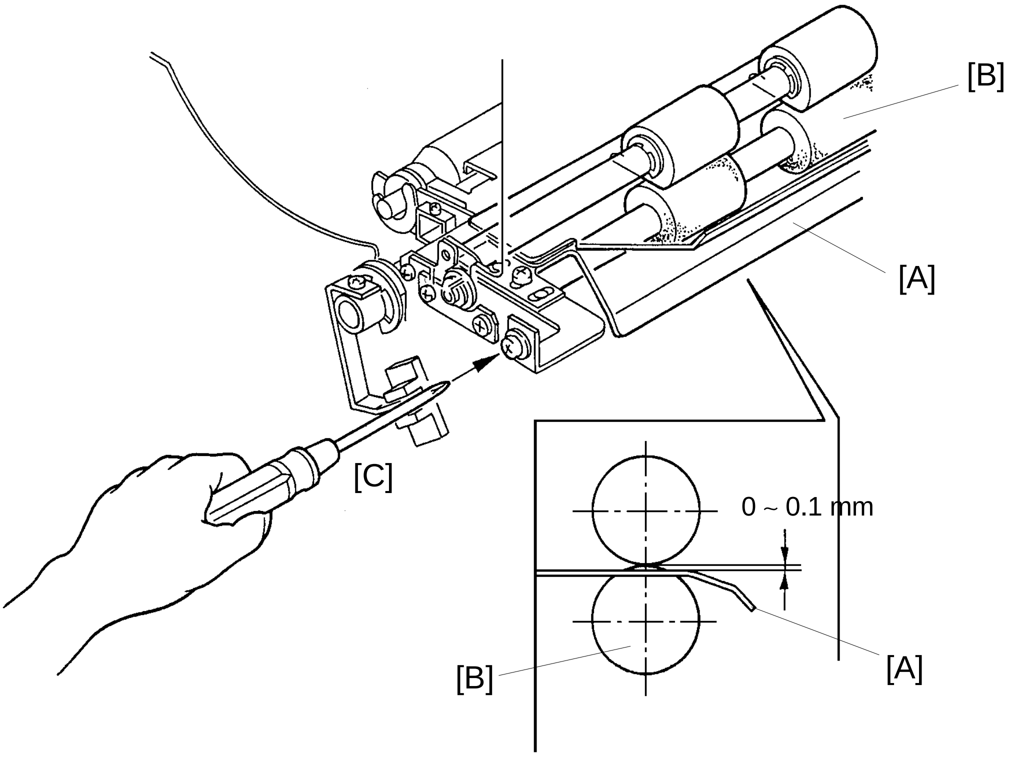


[Procedure 2]

This procedure should only be used when the proper pressure cannot be achieved with procedure 1.

1. Remove the plotter unit.
2. Set the lever for adjusting the paper feed roller pressure up.
3. Remove the right front cover, main PCB, and image processing PCB.
4. Manually rotate the paper table drive gear to raise the paper table to the paper feed position. (Paper table height sensor is interrupted.)
5. Align the lower adjusting plate notch with the center notch of the link [C] and tighten the screw [B].
6. Hook a tension gauge (500-gram range) to the paper feed roller shaft [E]. Insert a strip of paper [D] between the paper feed roller and the sheets of paper. Then hook a tension gauge (100-gram range) to the paper strip and apply a 100-gram load. Now gradually pull up the tension gauge hooked to the shaft and make sure that the paper strip can be pulled out when the tension gauge shows 250 ± 5 grams.
7. If this is not the case, adjust the pressure by moving the mounting position of the shaft [A].

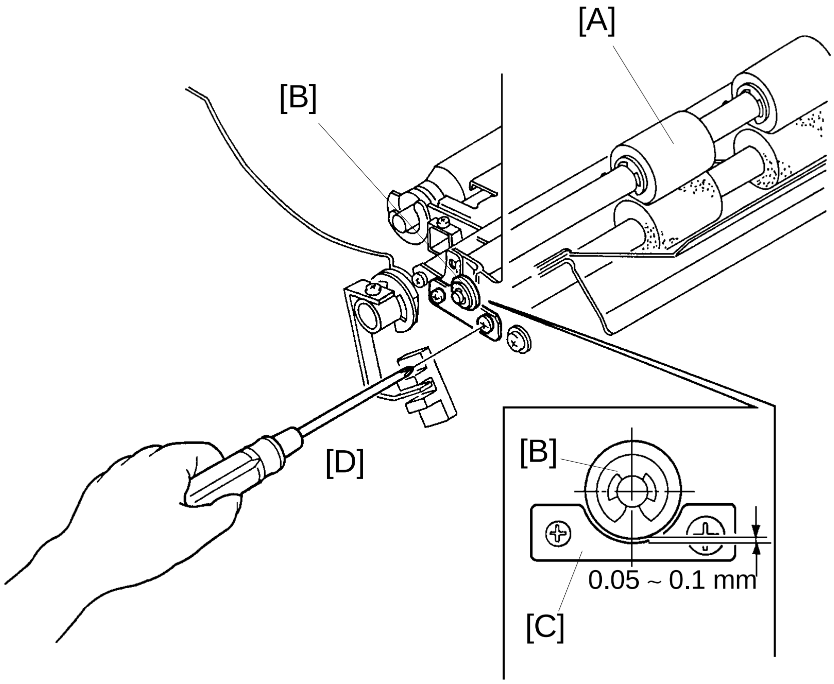
6.5 ADJUSTING THE LOWER GUIDE PLATE



Purpose: To ensure a smooth paper feed, and to prevent paper jams, folds, or wrinkles.
Adjustment Standard: 0 to 0.1 mm

1. Make sure that the distance between the lower guide plate [A] and lower second feed roller [B] is between 0 and 0.1 mm as shown.
2. If it is not, remove both the front and rear covers and loosen the screw [C] (front and rear, one each). Then, adjust the position of the guide plate [A].
3. After adjustment, retighten the screw [C].

6.6 ADJUSTING THE UPPER SECOND FEED ROLLER

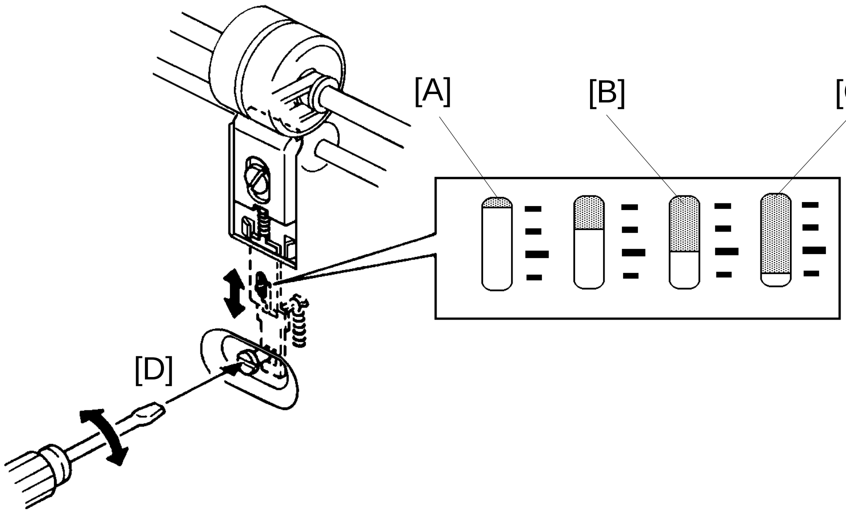


Purpose: To ensure that paper is fed straight between the drum and the press roller.

Adjustment Standard: 0.05 to 0.1 mm

1. Remove both front and rear covers.
2. Turn the second feed sector gear fully clockwise, so that the upper second feed roller [A] touches the lower second feed roller.
3. Make sure that the clearance between the bushing [B] and bushing supporter [C] is between 0.05 and 0.1 mm as shown. Also, manually rotate the left and right upper second feed rollers and confirm that they experience the same friction when they rotate.
4. If it is not, loosen the screw [D] and adjust the clearance by moving the bushing supporter.
5. After adjusting, make sure that the feed length of the second feed roller is correct. (The feed length varies with the position of the bushing supporter.)

6.7 ADJUSTING THE SEPARATION PLATE PRESSURE



[A]: Strong
[B]: Factory Setting
[C]: Weak

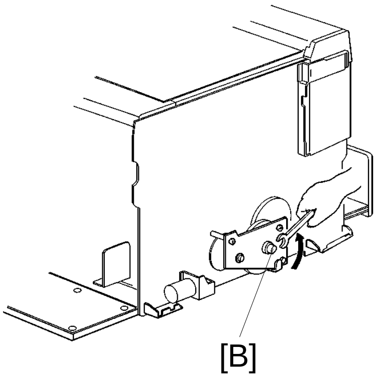
Purpose: To adjust the separation plate pressure for the type of paper being used by the customer.
Adjustment Standard: See the above illustration.

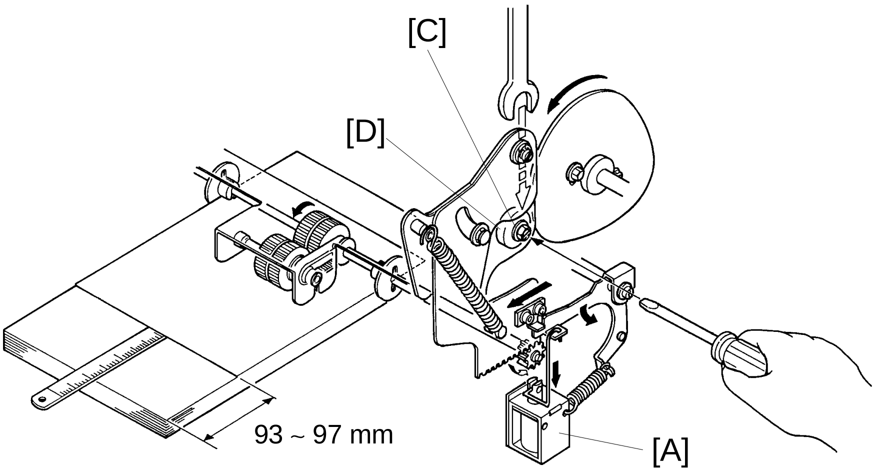
1. Adjust the separation plate pressure by turning the adjusting screw [D].

NOTE: Position the minus groove on the screw head vertically ⦶ or horizontally ⊖ . Otherwise, vibrations may cause the screw to turn.

2. After adjusting, make copies to check that the paper feeds smoothly without jamming, folding, or wrinkling. Use all the types of paper that the customer uses.

6.8 ADJUSTING THE FEED-LENGTH OF THE PAPER FEED ROLLER

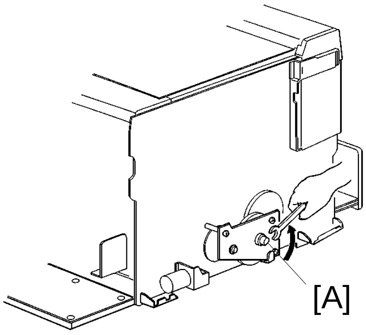


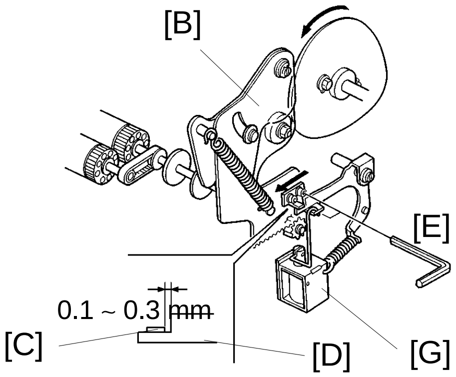


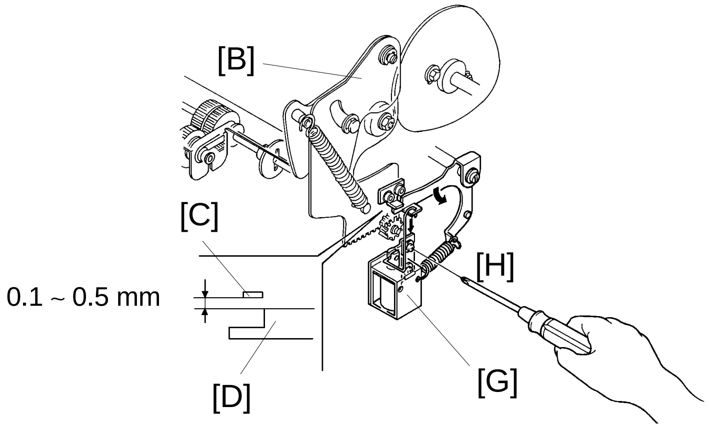
Purpose: To ensure paper feed to the second paper feed roller.
Adjustment Standard: 93 to 97 mm

1. Stack about 100 sheets of 65 g/m^2 paper on the paper table.
2. Set the lever for adjusting the paper feed roller pressure up.
3. Remove the rear cover.
4. Turn on the paper feed solenoid [A] manually. Then, turn the rollers counterclockwise by rotating the shaft [B] with a 10 mm spanner.
5. Measure the length of paper fed. Measure from the time the paper feed roller starts rotating until it stops rotating. This feed-length should be between 93 and 97 mm.
6. If it is not, adjust the feed-length by loosening the hexagon nut [C] mounted on the sector gear. Then shift the bearing [D] up or down.
7. After adjusting, repeat steps 5 and 6 again.

6.9 ADJUSTING THE CLEARANCE OF THE PAPER FEED SECTOR GEAR STOPPER





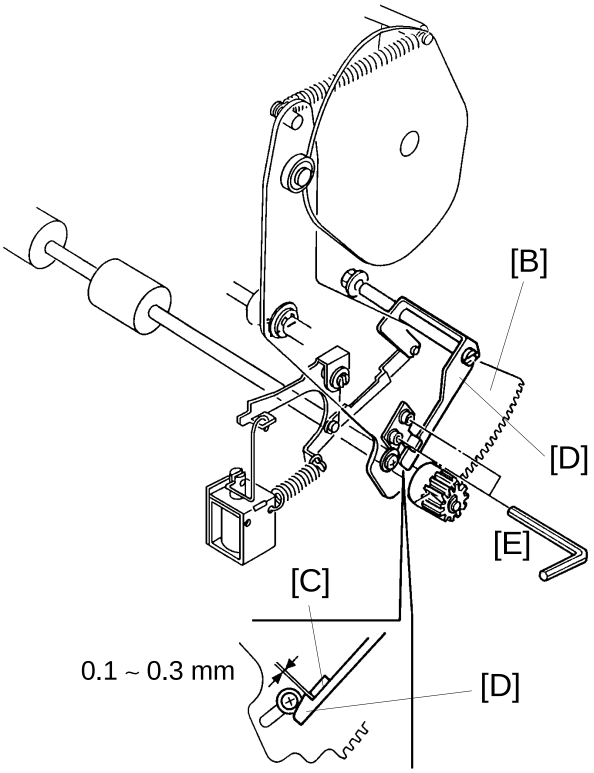


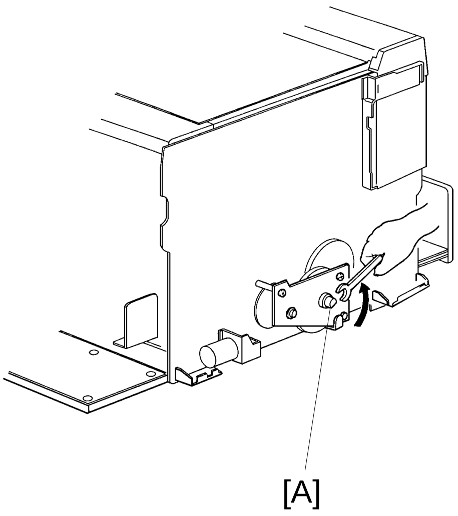
Purpose: To ensure that the paper feed roller starts rotating when the paper feed solenoid turns on and stops rotating when the paper feed solenoid turns off.

Adjustment Standard: See the above illustrations.

1. Remove the rear cover.
2. With a 10 mm spanner, gradually turn the shaft [A] counterclockwise.
3. When the sector gear [B] fully turns clockwise, make sure that the clearance between the pin [C] and sector stopper [D] is between 0.1 and 0.3 mm.
4. If it is not, loosen the hexagon nut [E] and adjust the clearance by shifting the sector stopper [D].
5. Push down the plunger of the paper feed solenoid [G] by hand. Make sure that the clearance between pin [C] and stepper [D] is between 0.1 and 0.5 mm.
6. If it is not, loosen the screw [H] and adjust it by shifting the bracket for the solenoid [G] up or down.

6.10 ADJUSTING THE CLEARANCE OF THE SECOND FEED ROLLER SECTOR STOPPER



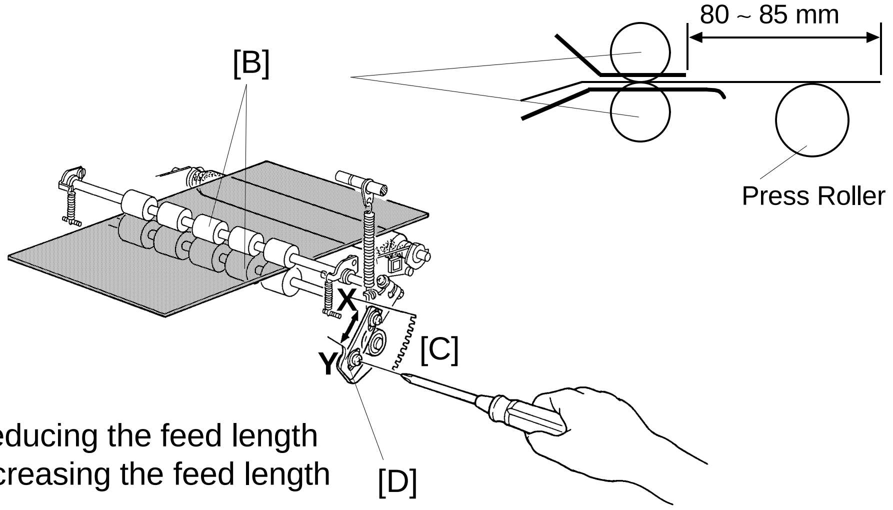


Purpose: To ensure that the second feed roller starts rotating when the paper feed solenoid turns on and stops rotating when the paper feed solenoid turns off.

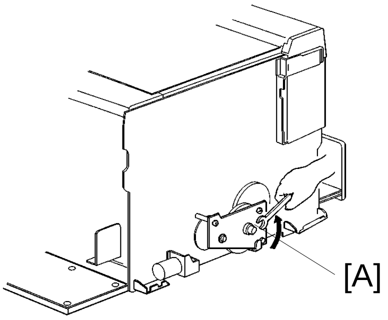
Adjustment Standard: 0.1 to 0.3 mm

1. Remove the rear cover of the machine.
2. Gradually turn the drum rotating shaft [A] counterclockwise with a 10 mm spanner.
3. Turn the sector gear [B] counterclockwise until it stops. Make sure that the clearance between the pin [C] and the sector stopper [D] is between 0.1 and 0.3 mm.
4. If it is not, loosen the Allen screws [E] and adjust the clearance between the pin and the sector stopper.
5. Retighten the screws [E].

6.11 ADJUSTING THE FEED-LENGTH OF THE SECOND FEED ROLLER



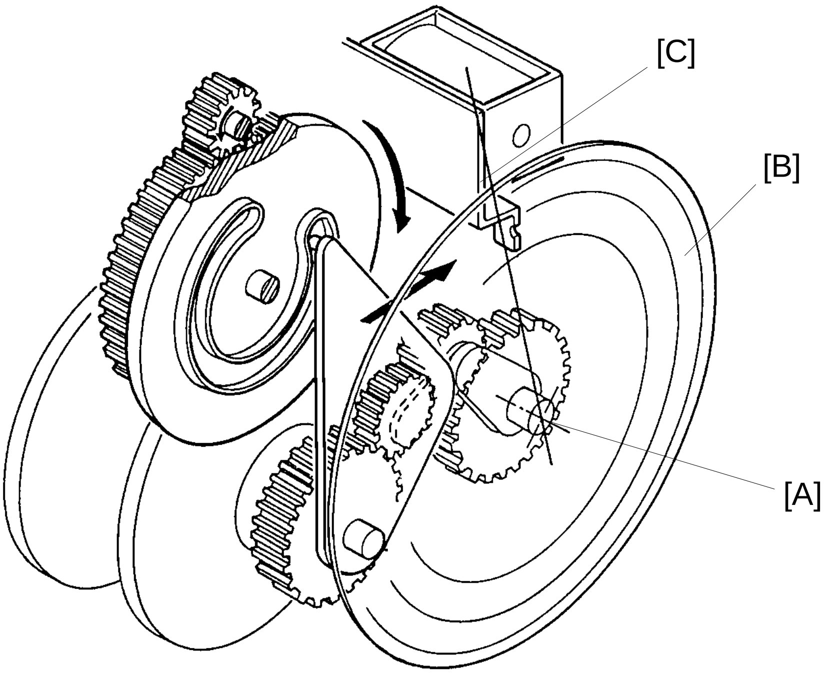
X: Reducing the feed length
Y: Increasing the feed length



Purpose: To ensure proper paper feed by the second feed rollers.
Adjustment Standard: 80 to 85 mm

1. Remove the drum unit and the rear cover from the machine.
2. Stack about 100 sheets of 65 g/m^2 paper on the paper table.
3. Set the paper table in the paper feed position. (Use Output Check mode number 19.)
4. Turn on the paper feed solenoid manually. Then, gradually turn the drum rotation shaft [A] with a 10 mm spanner.
5. Measure the paper feed length from the time the second feed roller [B] starts rotating until it stops rotating. This feed length should be between 80 and 85 mm.
6. If it is not, adjust the feed length by loosening the screw [C] and by shifting the cam [D] up or down.
7. Check the adjustment by repeating steps 4 and 5.

6.12 ADJUSTING THE FEED TIMING OF THE SECOND FEED ROLLER

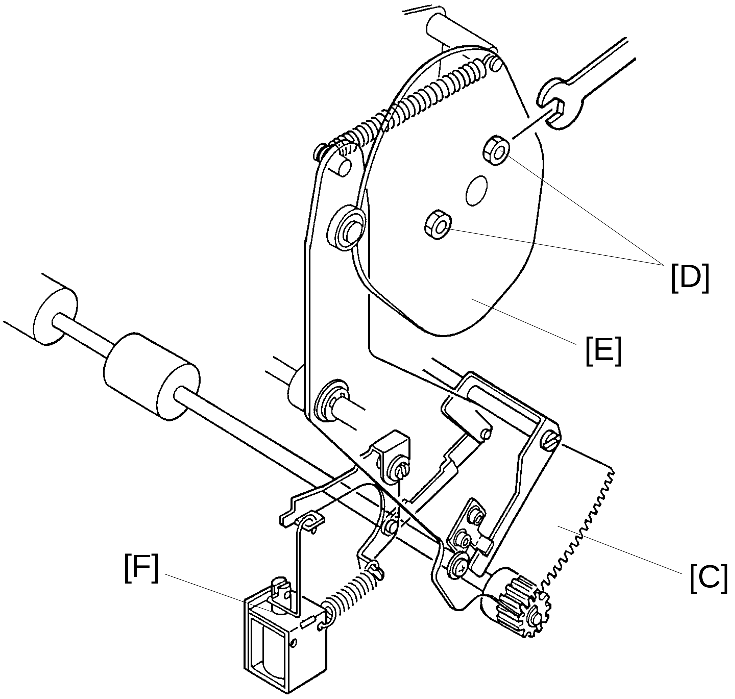


Purpose: To ensure paper feed by regulating the timing to start the second feed roller.

Adjustment Standard: 178°

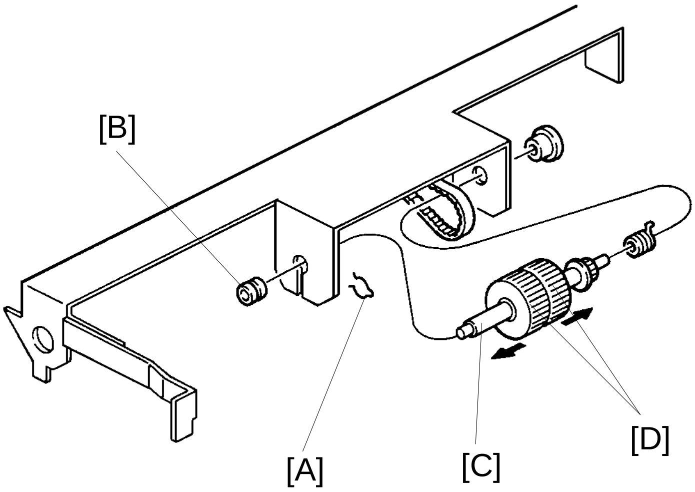
1. Set the Image Position indicator to the "0" position and return the drum to the home position by turning off and on the main switch.
2. Remove the rear cover of the machine.
3. Set a protractor [B] on the image shifting shaft [A].

NOTE: Align the origin of the protractor with the edge of the solenoid bracket [C].



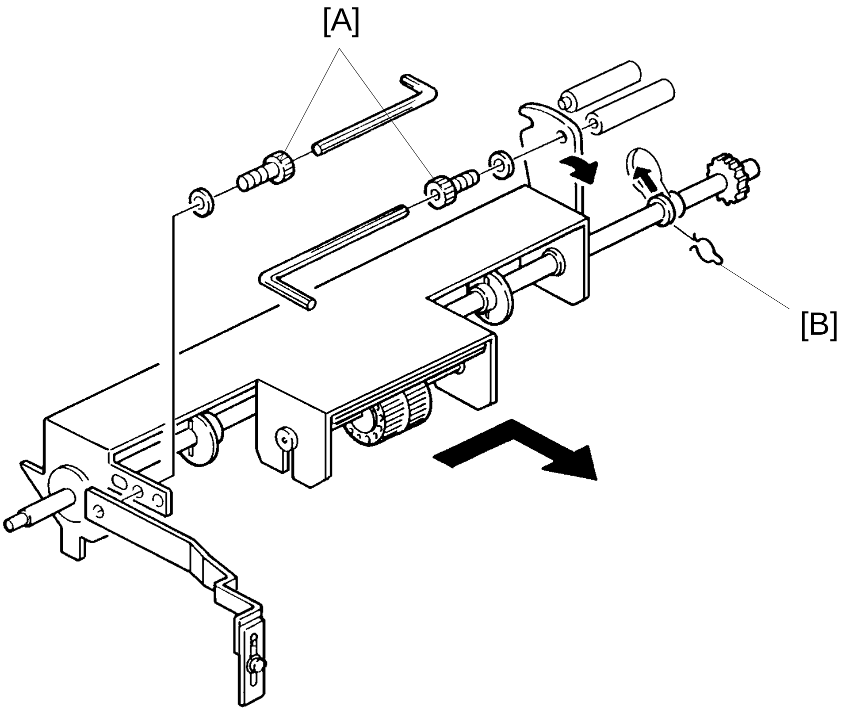
4. Turn on the paper feed solenoid [F] manually and, using a 10 mm spanner, gradually turn the drum rotation shaft.
5. Measure the degrees turned when the second feed roller sector gear [C] starts returning counterclockwise. (The second feed rollers start rotating.) This should be 178°.
6. If it is not, loosen the 2 bolts [D] and adjust the second feed rollers rotation timing by turning the cam [E].

6.13 PAPER FEED ROLLER



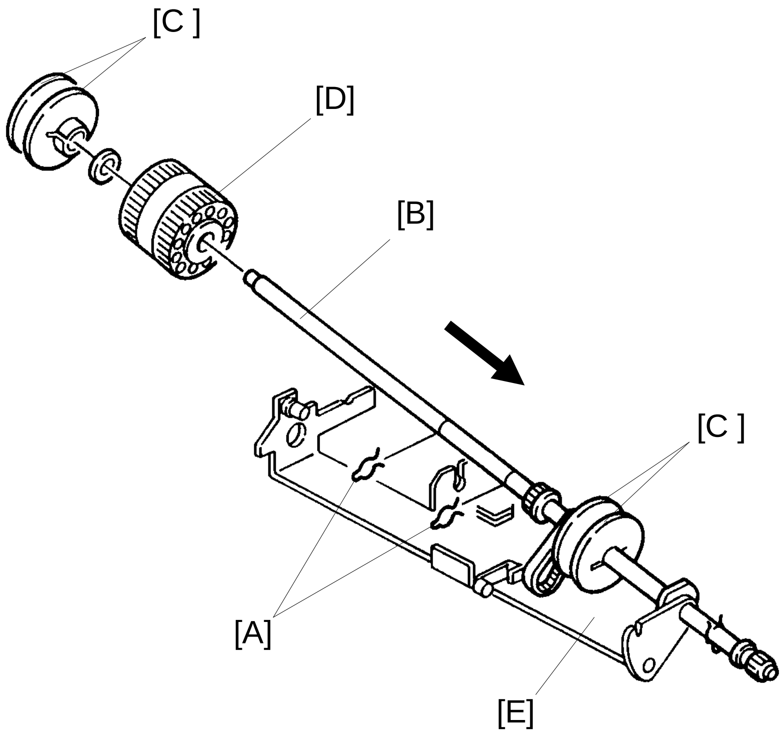
1. Remove the left clamper [A].
2. Remove the left bushing [B].
3. Remove the paper feed roller shaft [C].
4. Remove the 2 paper feed rollers [D].

6.14 PAPER FEED ROLLER UNIT



1. Remove the plotter unit.
2. Remove 2 hexagon screws [A].
3. Remove the clamper [B].
4. Remove the paper feed roller unit from the machine by sliding the shaft to the rear.

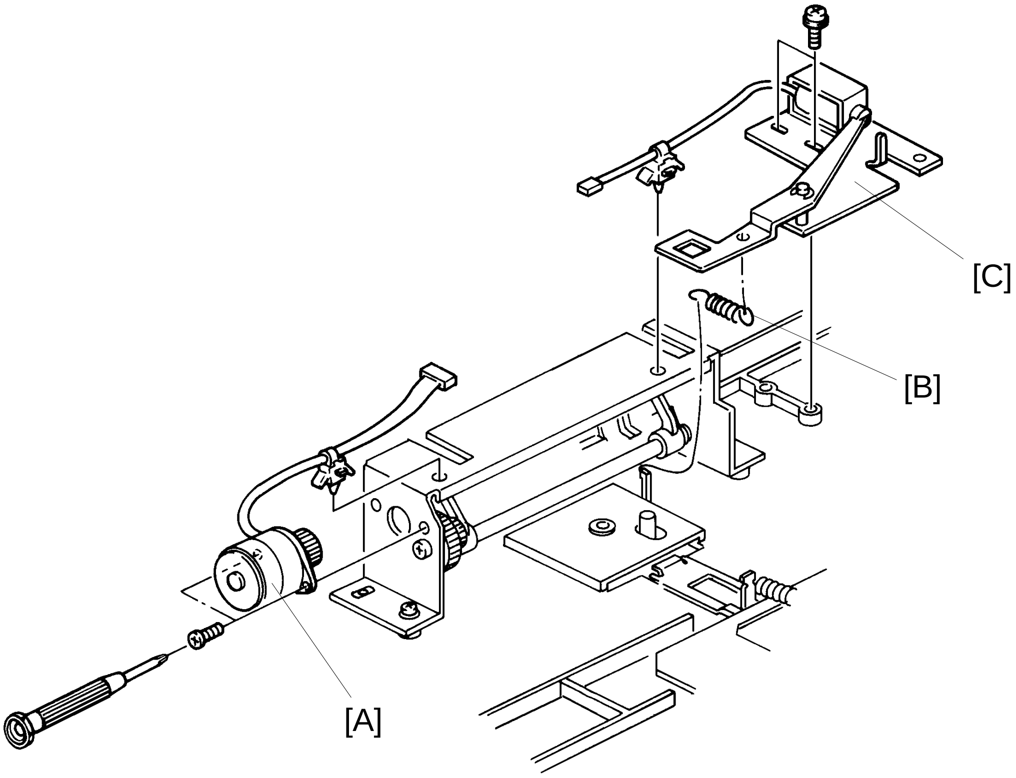
6.15 UPPER SEPARATION ROLLER



1. Remove the paper feed roller unit.
2. Remove the clamps [A] from both sides of the upper separation roller.
3. Slide the shaft [B] in the direction of the arrow.
4. Remove the guide disks [C] and remove the upper separation roller [D].

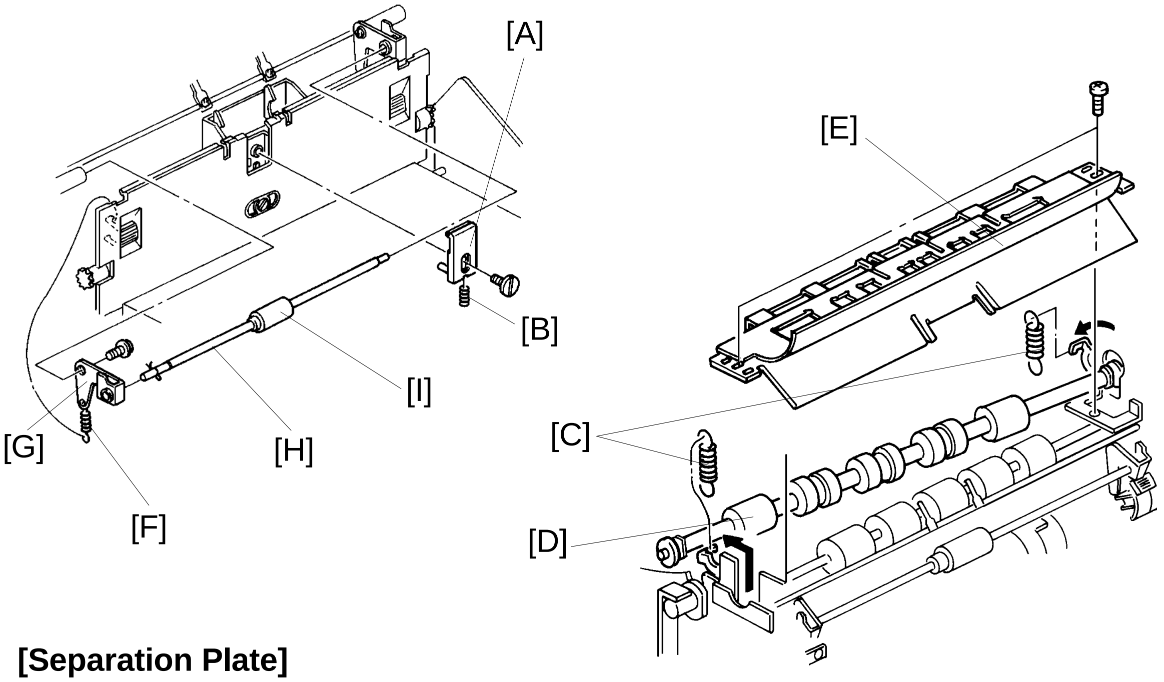
NOTE: When reassembling the paper feed roller unit, position the guide disks [C] under the cuts of the feed roller holder [E].

6.16 SEPARATION PLATE RELEASE SOLENOID AND PAPER RETURN MOTOR



1. Remove the front plate. (See Adjusting the Separation Plate Release Solenoid section.)
2. Remove the paper return motor [A] using a small plus screwdriver.
3. Remove the spring [B], then remove the separation plate release solenoid assembly [C] (2 screws).

6.17 SEPARATION PLATE/LOWER SEPARATION ROLLER



[Separation Plate]

1. Remove the separation plate [A] with the spring [B] (1 screw).

[Lower Separation Roller]

1. Remove the plotter unit, paper feed roller unit and drum unit.
2. Remove the 2 springs [C] and slide the upper second feed roller [D] in the direction of the arrow.

NOTE: Use a spring hook. That way the spring will not drop into the machine.

3. Remove the upper and lower guide plates [E] (2 screws).

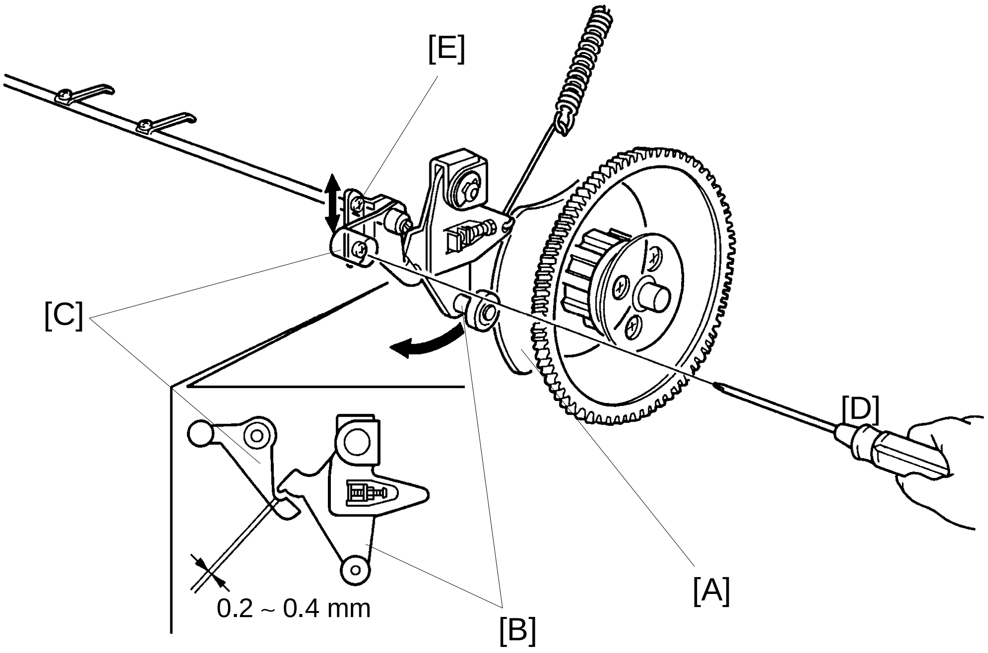
NOTE: When reassembling the guide plates, make sure that the guide plates do not touch the lower second feed roller.

4. Remove the spring [F] hooked on the front separation lever [G].
5. Remove the front separation lever [G] (1 screw).
6. Remove the lower separation roller shaft [H].
7. Remove the lower separation roller [I] from the shaft (one Allen screw).

NOTE: When reassembling the lower separation roller, confirm that the front and rear separation levers [G] move smoothly.

7. PRINTING SECTION

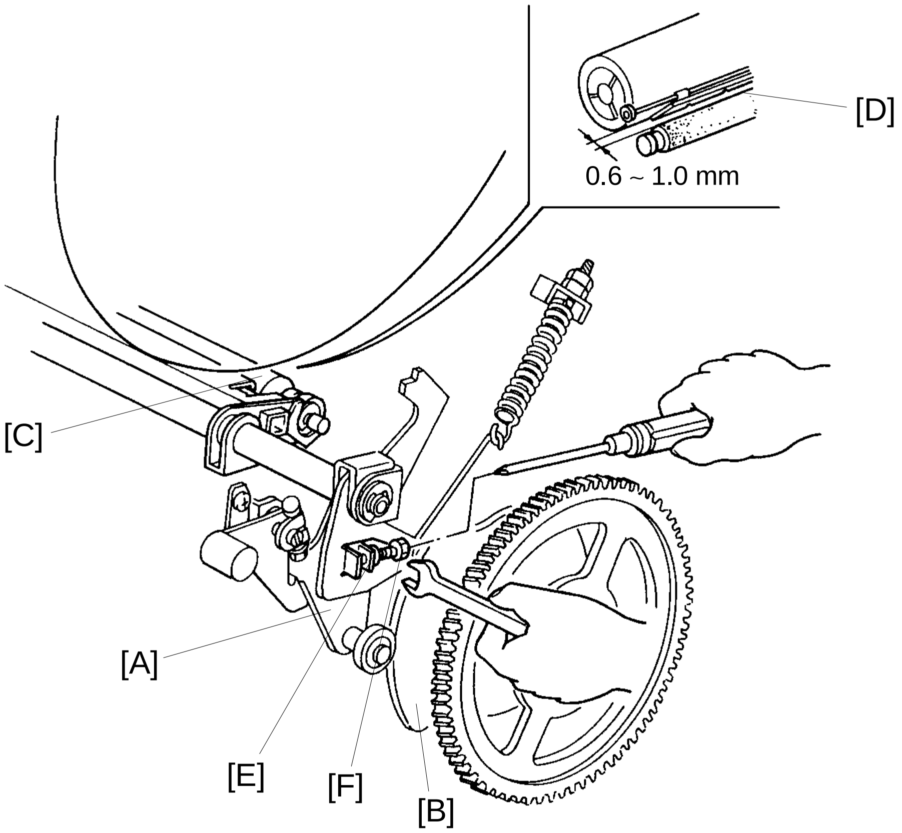
7.1 ADJUSTING THE CLEARANCE OF THE PAPER DETECTING ARM



Purpose: To ensure that printing pressure is applied during paper feed, and is released correctly afterwards.
Adjustment Standard: 0.2 to 0.4 mm

1. Remove the rear cover of the machine.
2. Using a 10 mm spanner, gradually turn the drum rotation shaft counterclockwise to position the bearing of the pressure release arm [B] on the top of the pressure cam [A].
3. Make sure that the clearance between the paper detecting arm [C] and the pressure release arm [B] is 0.2 to 0.4 mm.
4. If it is not, loosen the screws [D] and adjust the clearance by shifting the paper detecting bracket [E] up or down.
5. After adjusting, confirm that the printing pressure ON/OFF mechanism is working properly. To do this, monitor a print run.

7.2 ADJUSTING THE PRESS ROLLER POSITION 1

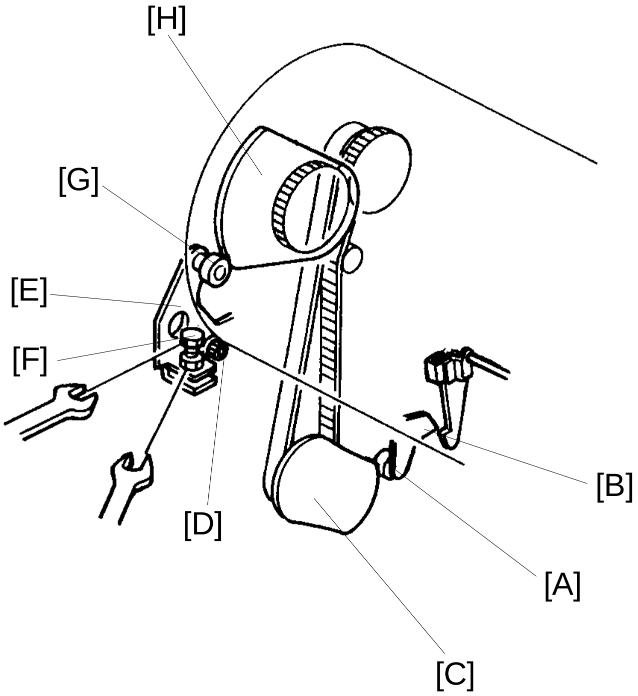


Purpose: To ensure that the press roller does not touch the clamper section of the drum.

Adjustment Standard: 0.6 to 1.0 mm

1. Remove the rear cover of the machine.
2. Using a 10 mm spanner, turn the drum rotation shaft counterclockwise and position the bearing of the pressure release arm [A] on top of the pressure cam [B].
3. While the arm is on top of the cam, make sure that the distance between the press roller [C] and the tip of the clamper [D] is 0.6 to 1.0 mm.
4. If it is not, loosen the hexagon nut [E] and adjust the clearance by turning the bolt [F].

7.3 ADJUSTING THE PRESS ROLLER POSITION 2 (FOR THE A4/LT DRUM)

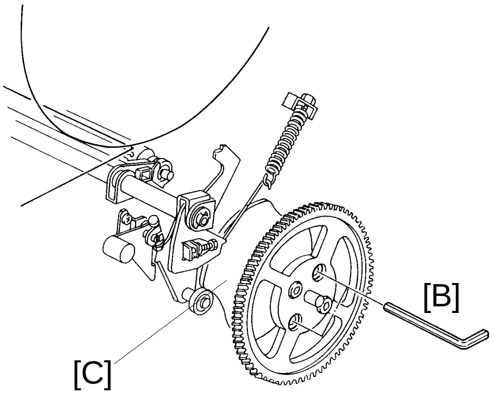


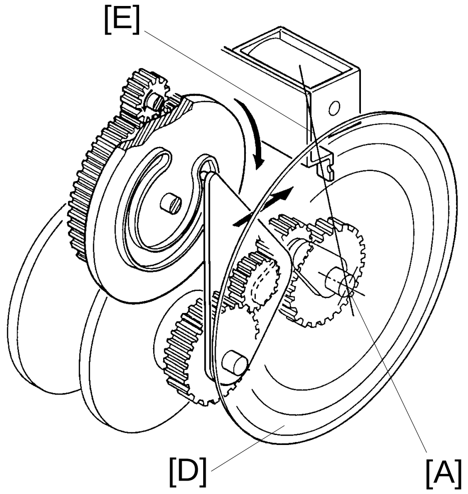
Purpose: To keep the distance between the press roller and the drum constant while the printing pressure is released.

NOTE: Perform this adjustment after adjusting the press roller position 1.

1. Remove the master eject unit.
2. Using a 10 mm spanner, turn the drum rotation shaft counterclockwise and position the bearing [A] of the pressure ON/OFF lever [B] on top of the pressure cam [C].
3. Loosen the bolt [D] fixing the arm [E].
4. Adjust the position of the bolt [F] using a 7 mm spanner so that the bearing [G] of the arm just touches the top of the A4 cam [H].
5. Rotate the bearing [G] manually. If there is no friction between the bearing and the cam, turn the bolt [F] clockwise.
6. Retighten the bolt [D].

7.4 ADJUSTING THE PRESSURE TIMING

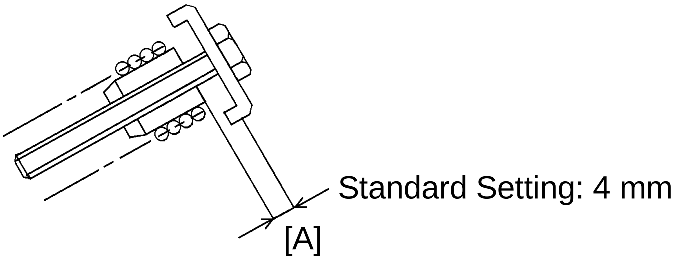


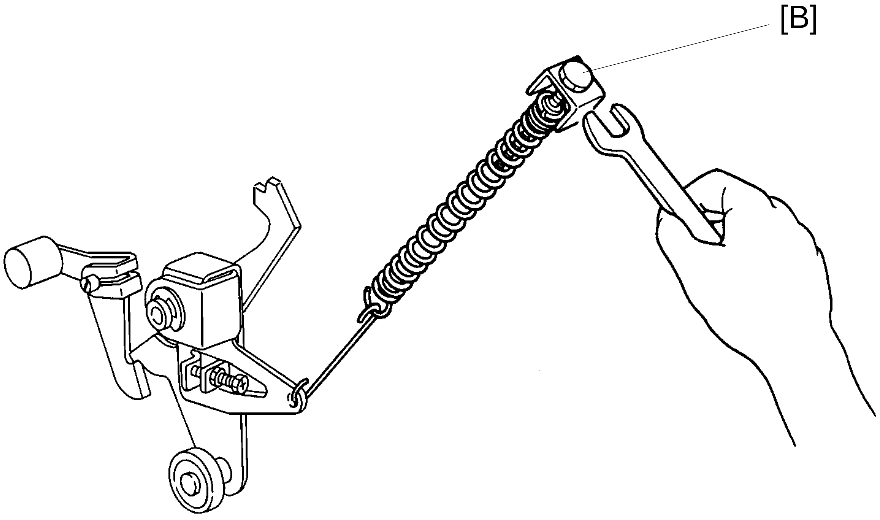


Purpose: To ensure that the maximum printing area is within specifications, and that the ink does not stain the trailing edge.
Adjustment Standard: 229°

1. Stack about 100 sheets of 65 g/m^2 paper on the table.
2. Set the Image Shifting indicator to the "0" position and return the drum to the home position by turning off and on the main switch.
3. Set the paper table in the paper feed position. (Use Output Check mode number 19.)
4. Remove the rear cover of the machine.
5. Set a protractor [D] on the image shifting shaft [A]. Align the origin of the protractor with the edge of the solenoid bracket [E].
6. Using a 10 mm spanner, turn the drum rotation shaft counterclockwise while pressing in the plungers of the paper feed solenoid and of the printing pressure solenoid by hand.
7. Turn the drum rotation shaft a little further, and stop it when the press roller begins to touch the drum surface.
8. In the above condition, measure the degrees turned, this should be 229°.
9. If it is not, loosen the screw [B] of the pressure cam [C] and adjust the pressure timing by turning the cam [C].

7.5 ADJUSTING THE PRINTING PRESSURE

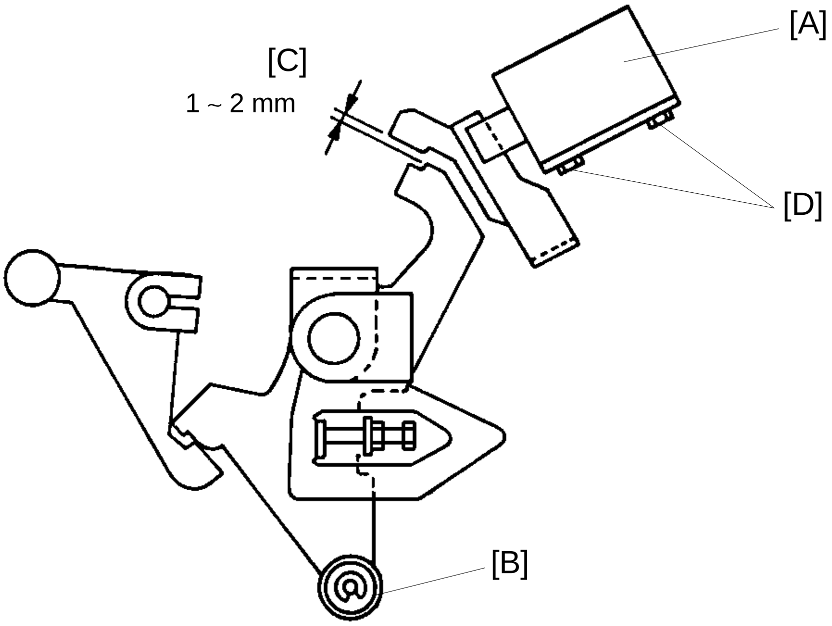




Purpose: To apply the proper printing pressure to the press roller.
Adjustment Standard: 4 mm

1. Remove the rear cover of the machine.
2. Adjust the clearance [A] to be 4 mm by turning the adjusting bolt [B].

7.6 ADJUSTING THE CLEARANCE OF THE PRINTING PRESSURE SOLENOID



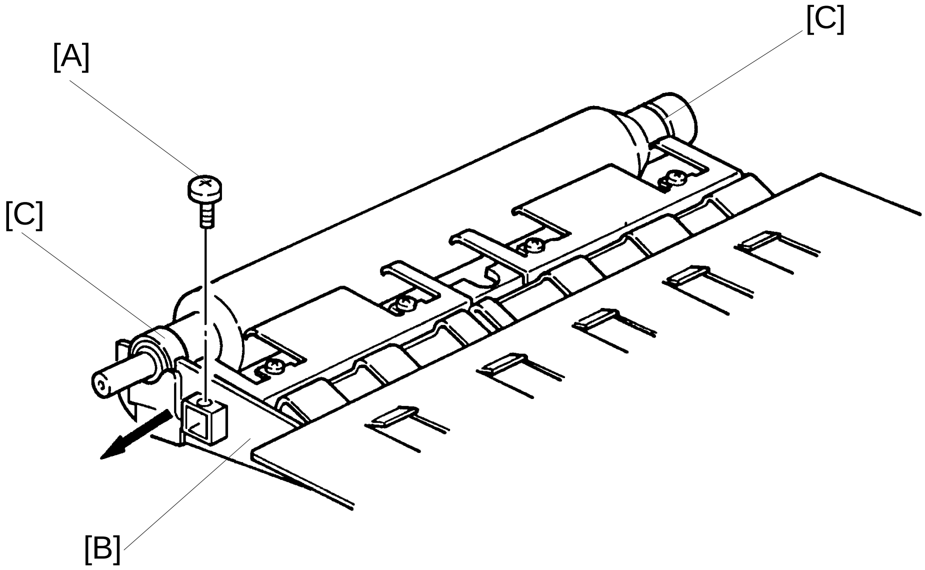
Purpose: To ensure that the printing pressure stopper is released when the paper feed starts, and that the stopper is locked within one drum rotation when a paper jam occurs.

Adjustment Standard: 1 to 2 mm

NOTE: Perform this adjustment after adjusting the clearance of the paper detecting arm.

1. Manually press in the plunger of the printing pressure solenoid [A]. At this time rotate the drum rotation shaft with a 10 mm spanner until the bearing [B] rides on top of the printing pressure cam.
2. Confirm that the clearance [C] is between 1 and 2 mm.
3. If it is not, loosen the hexagon head screws [D] and adjust the clearance by moving the printing pressure solenoid.

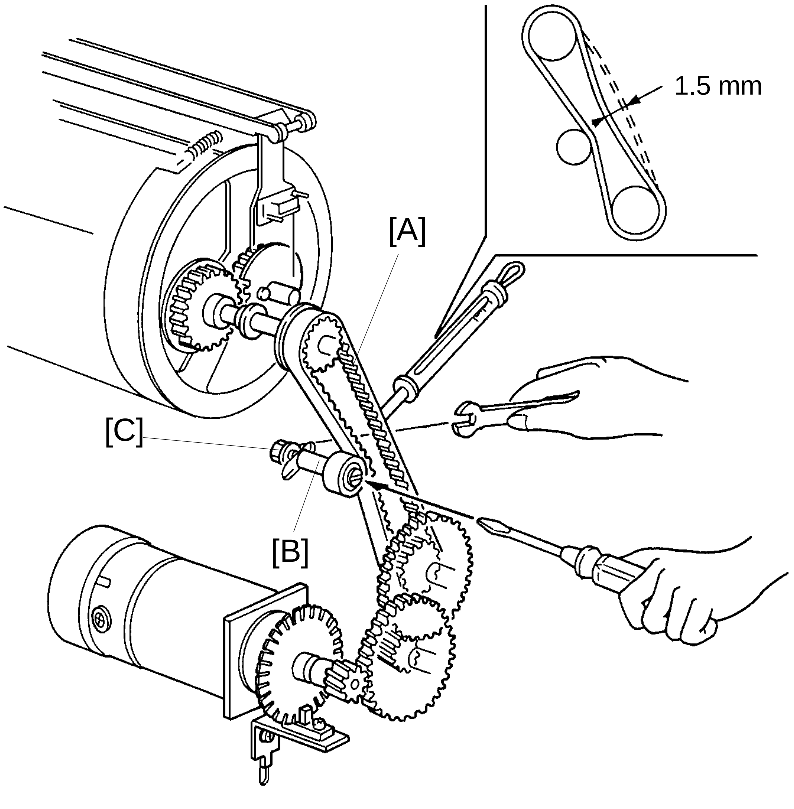
7.7 PRESS ROLLER



1. Remove the screw [A].
2. Slide the holding plate [B] to the front side of the machine.
3. Remove the press roller.
4. Remove both right and left bearings [C] (2 E-rings).

8. DRUM SECTION

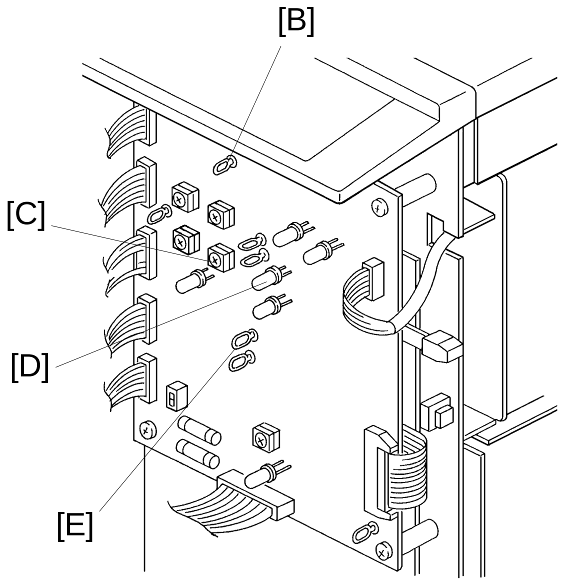
8.1 ADJUSTING THE MAIN DRIVE BELT TENSION

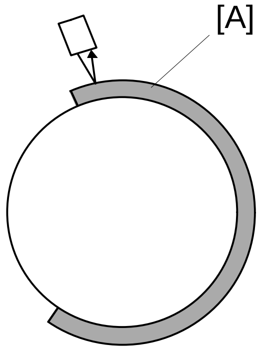


Purpose: To ensure that the main motor rotation is correctly transmitted to the drum.
Adjustment Standard: 1.5 mm

1. Remove the rear cover of the machine.
2. Apply a 1000-gram load (using a tension gauge) to the center of the main drive belt [A]. Make sure that the belt deflects 1.5 mm.
3. If it does not, remove the drum unit and adjust the belt tension by moving the tensioner shaft [B] after loosening the nut [C].
4. After adjusting, tighten the nut [C] very securely.

8.2 ADJUSTING THE DRUM MASTER DETECTION SENSOR





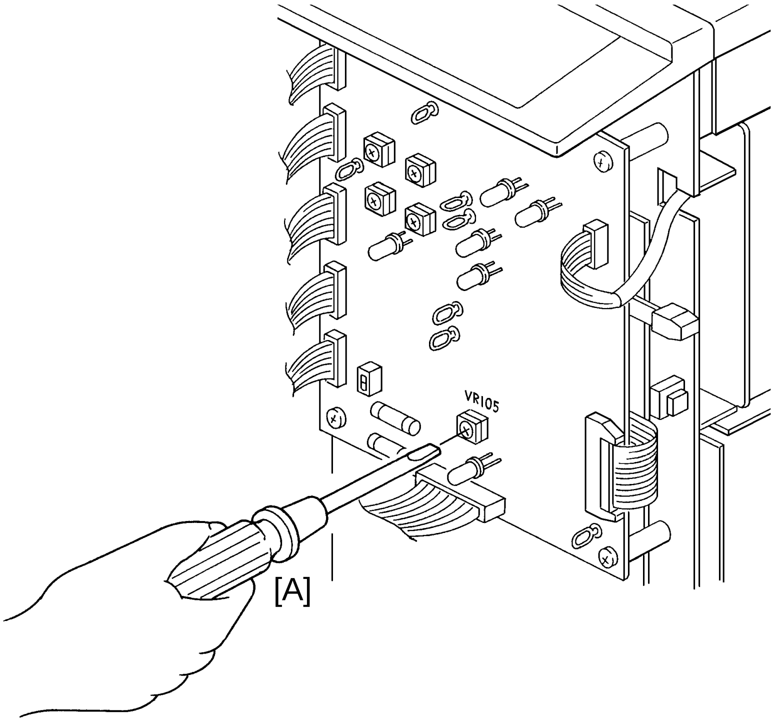
Purpose: To ensure that the drum master detection sensor correctly detects the master on the drum.
Adjustment Standard: 0.9 to 1.0 V when the sensor is activated, and 2.0 V or higher when it is not activated.

1. Slide out the drum unit and remove the master [A] from the drum.
2. Reinstall the drum unit. Press and hold down the Drum Rotation button until the drum reaches the home position.
3. Remove the right front cover. Then, confirm that the voltage between TP102 [E] and TP107 [B] on the main PCB is between 0.9 and 1.0 V.
4. If the voltage is outside the specified range, adjust VR102 [C] on the main PCB.
5. Make a master with a plain original.

NOTE: Make sure the master leading edge is clamped to the drum clamper and that the master [A] is wrapped correctly on the drum.

6. Make sure that the voltage between TP102 [E] and TP107 [B] on the main PCB is 2.0 V or higher. At this time, LED102 will light.

8.3 ADJUSTING THE PRINTING SPEED

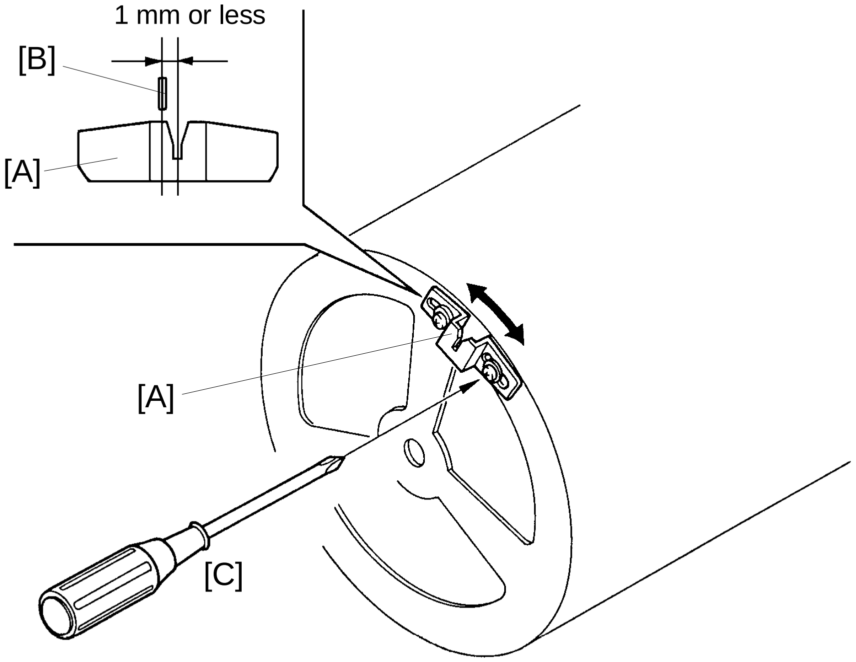


Purpose: To ensure the correct main motor speed.

Adjustment Standard: 120^{+10}_{-1} rotations/minute at the maximum printing speed.

1. Press the Speed Change key to set the speed at the maximum level.
2. Make prints. After the first print, the machine should produce 120 prints every minute.
3. If it does not, adjust the speed of the main motor by turning VR105 [A].

8.4 ADJUSTING THE DRUM STOPPER

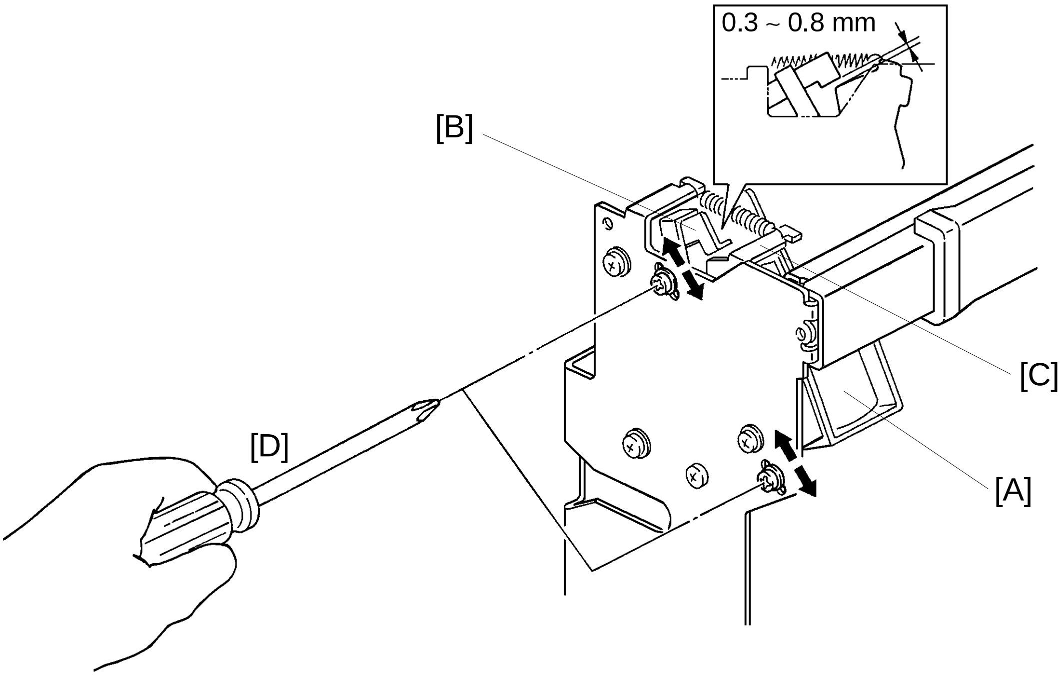


Purpose: To ensure that the drum is securely locked when the drum unit is pulled out.

Adjustment Standard: 1 mm or less

1. Remove the drum unit from the machine.
2. Make sure that the distance between the center of the drum lock [A] and the center of the drum stopper [B] is less than 1 mm.
3. If it is more than 1mm, loosen the screws [C] and adjust the distance by moving the drum lock [A].

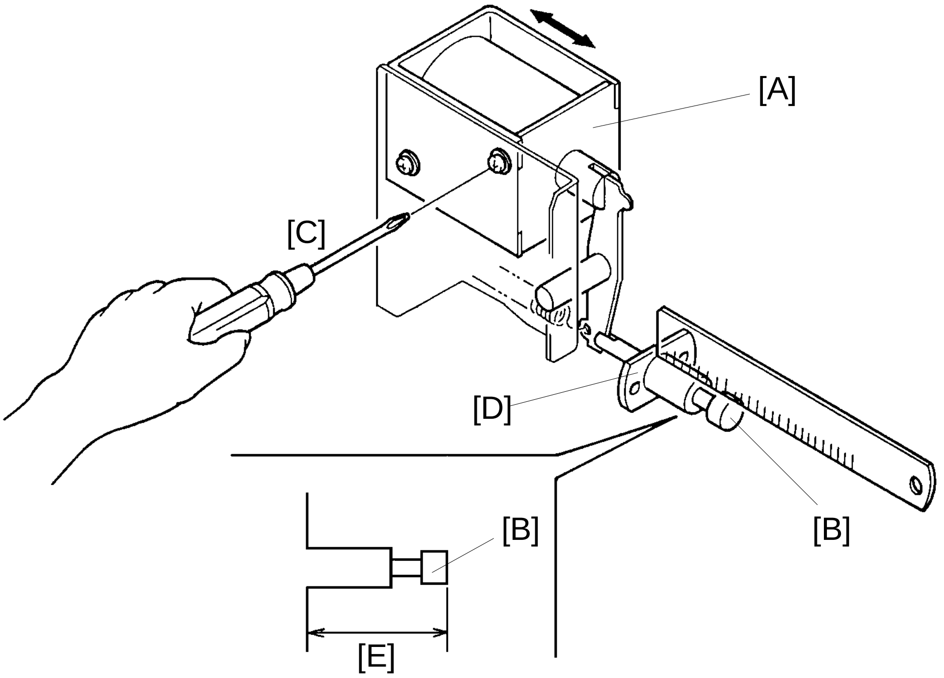
8.5 ADJUSTING THE DRUM LOCK SOLENOID



Purpose: To ensure that the drum can be removed only when it is in the home position.
Adjustment Standard: 0.3 to 0.8 mm

1. Remove the drum unit from the machine.
2. Remove the upper cover of the drum lock solenoid [A] (3 screws).
3. Make sure that the distance between the lock lever [B] and the stopper [C] is between 0.3 and 0.8 mm.
4. If the distance is not correct, loosen the two screws [D] and adjust the position of the solenoid bracket.
5. Set the drum back in the machine and press the drum rotation button. Make sure that the drum lock solenoid turns on and that the drum handle cannot be moved when the drum is not in the home position.

8.6 ADJUSTING THE MASTER FEED CLAMPER CAM



Purpose: To ensure that the master feed clamper is open during the master feed process and is closed during other processes.

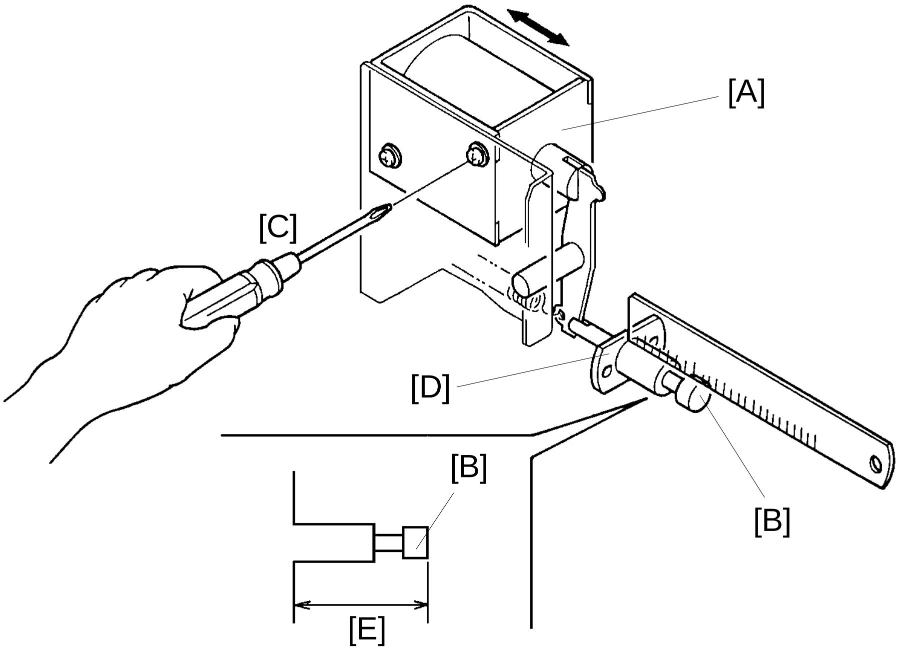
Adjustment Standard: 29 ± 0.5 mm when the solenoid is energized, and less than 25 mm when it is de-energized.

1. Remove the drum unit and open the master eject unit.
2. Turn on the master feed clamper solenoid [A]. (Use Output Check mode number 15.)
3. Confirm that the distance [E] between the bushing [D] and the edge of the opening cam [B] is 29 ± 0.5 mm when the solenoid is turned on.
4. If it is not, loosen the mounting screw [C] and adjust the solenoid position.

CAUTION: Do not leave the solenoid on longer than 10 seconds.

5. After adjusting, retighten the mounting screws [C].

8.7 ADJUSTING THE MASTER EJECT CLAMPER CAM



Purpose: To position the master eject clamper cam [B] so that the master clamper opens correctly during the master eject process and closes correctly for all other processes.

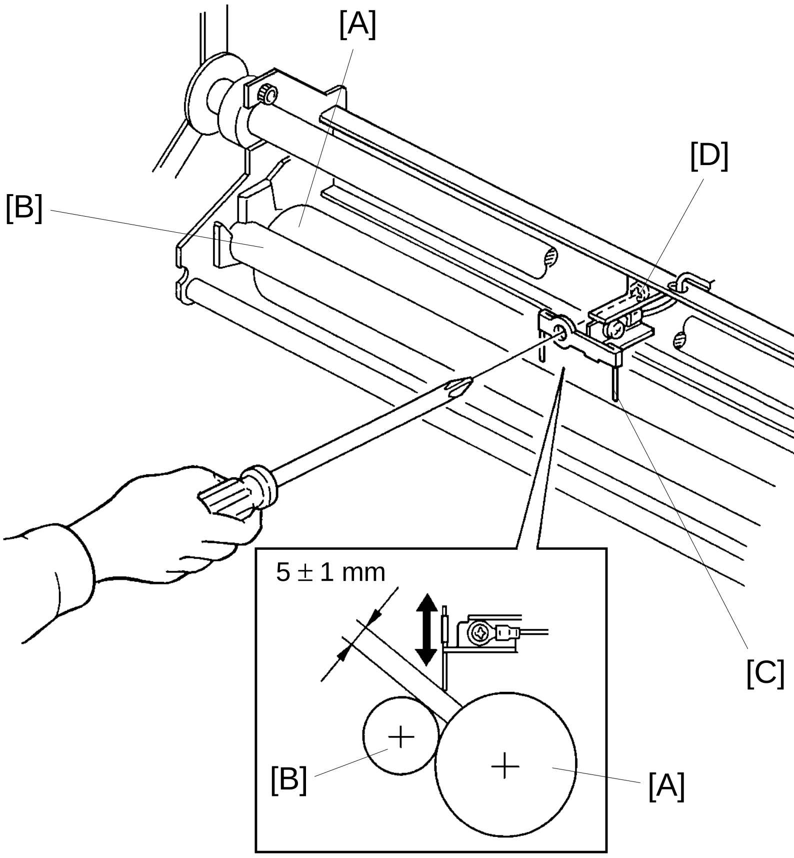
Adjustment Standard: 29 ± 0.5 mm when the solenoid is energized, and less than 25 mm when it is de-energized.

1. Remove the drum unit and open the master eject unit.
2. Turn on the master eject clamper solenoid [A]. (Use Output Check mode number 16.)
3. Confirm that the distance [E] between the bushing [D] and the edge of the opening cam [B] is 29 ± 0.5 mm when the solenoid is turned.
4. If not, loosen the mounting screws [C] and adjust the solenoid position.

CAUTION: Do not leave the solenoid on longer than 10 seconds.

5. After adjusting, retighten the mounting screws [C].

8.8 ADJUSTING THE POSITION OF THE INK DETECTING PIN

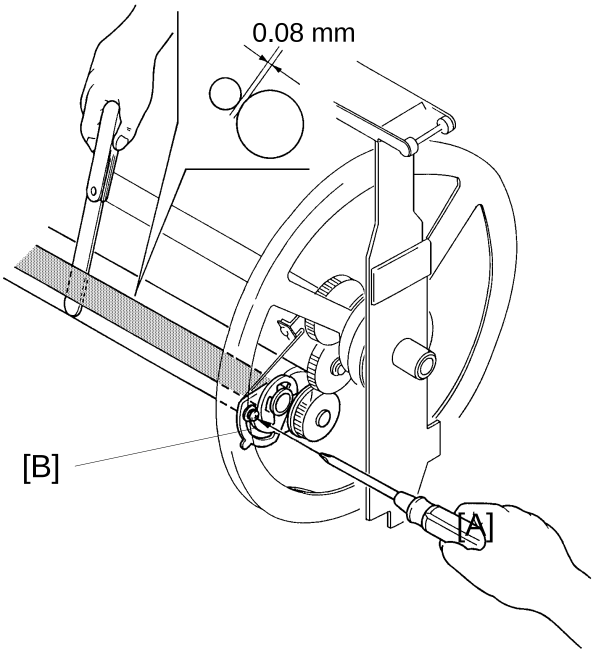


Purpose: To ensure detection of ink built-up between the ink roller and the doctor roller.

Adjustment Standard: 5 ± 1 mm

1. Remove the drum unit.
2. Remove the tetron screen and the metal screen from the drum unit.
3. Remove the ink distributer (2 screws).
4. Wipe off the ink around the ink roller [A] and the doctor roller [B].
5. Make sure that the distance between the end of the ink detecting pin [C] and the doctor roller [B] surface is 5 ± 1 mm.
6. If it is not, loosen the screw [D] and adjust the distance by moving the ink detecting pin [C].
7. After adjusting, retighten the screw [D].

8.9 ADJUSTING THE CLEARANCE OF THE DOCTOR ROLLER



Purpose: To equalize the ink thickness around the ink roller and prevent an uneven image.

Adjustment Standard: 0.08 mm

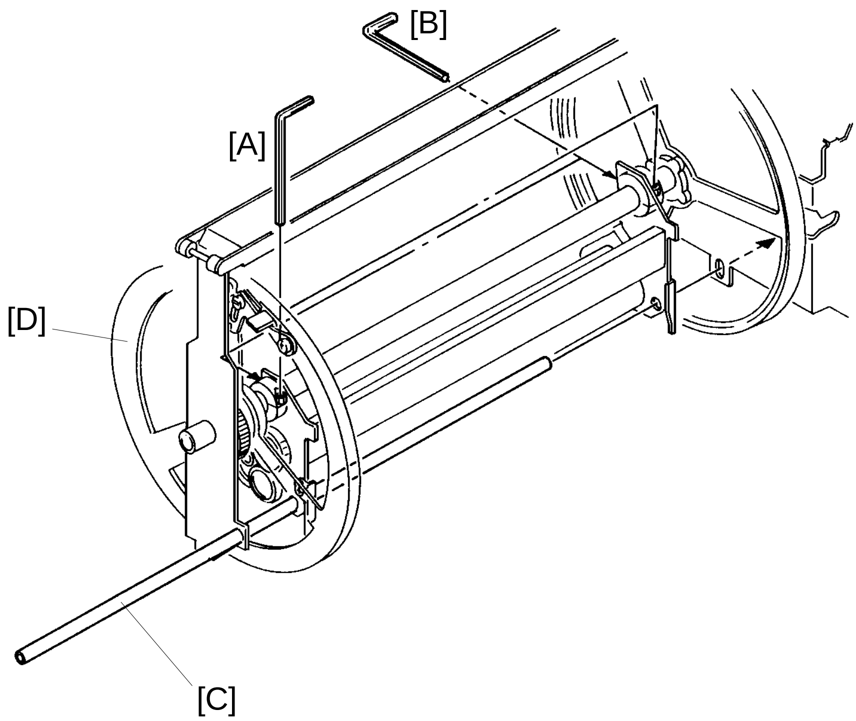
1. Remove the drum unit.
2. Remove the clamper.
3. Remove the tetron screen and the metal screen from the drum unit.
4. Remove the ink distributer.
5. Wipe off the ink around the ink roller and the doctor roller.
6. Insert a 0.08-mm gap gauge between the doctor roller and the ink roller. Then make sure that a 0.1-mm gauge can not penetrate the gap.

NOTE: Check the gap at the right, center, and left positions.

7. If the gap is not within specifications, loosen the screw [A] and adjust the gap by turning the eccentric bushing [B].

NOTE: Before adjusting, remove the drive gear located on the operation side of the doctor roller because the drive gear restricts the adjustment.

8.10 ADJUSTING THE INK ROLLER WITH THE DRUM UNIT

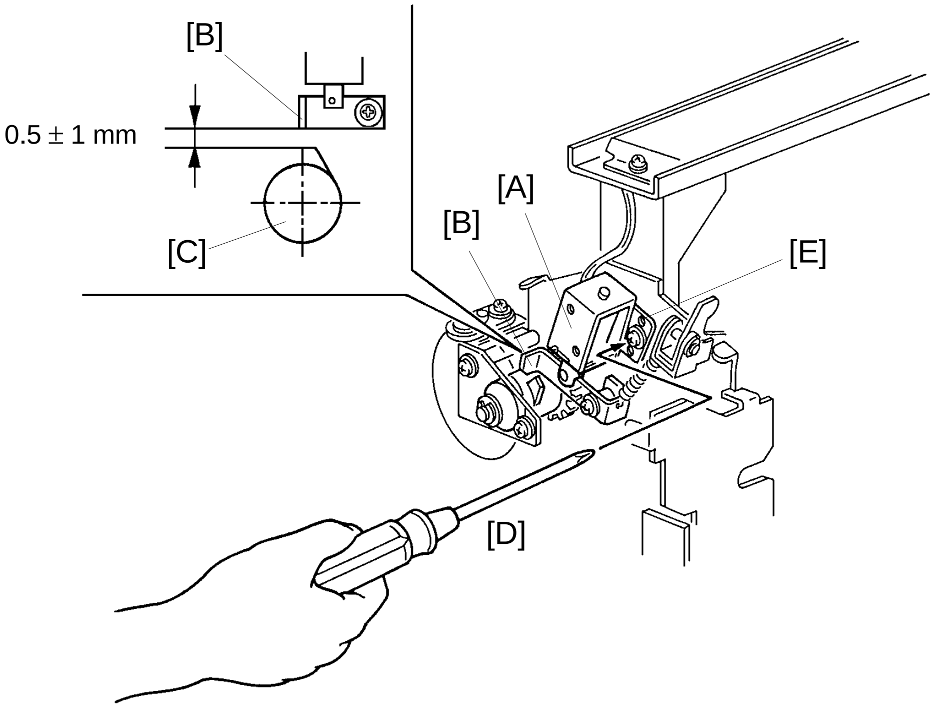


Purpose: To ensure that the pressure of the press roller is applied evenly to the ink roller.

Adjustment Standard: The drum gauge must be inserted.

1. Remove the drum unit from the machine.
2. Remove the tetron screen and the metal screen from the drum unit.
3. Loosen the bolts [A] and [B] that secure the ink roller unit to the drum shaft.
4. Insert the drum gauge [C] (P/N C2009001) in the holes in both side plates of the drum unit and in both side plates of the ink roller unit.
5. With the gauge in the holes, tighten the bolts [A] and [B] so that the thrust play of the flange [D] is between 0.05 and 0.2 mm.

8.11 ADJUSTING THE POSITION OF THE INK SUPPLY SOLENOID

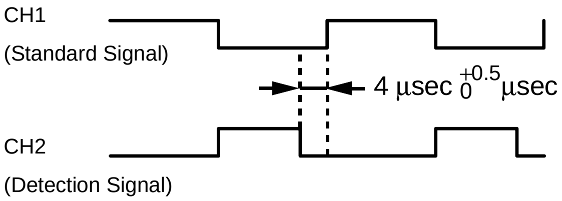


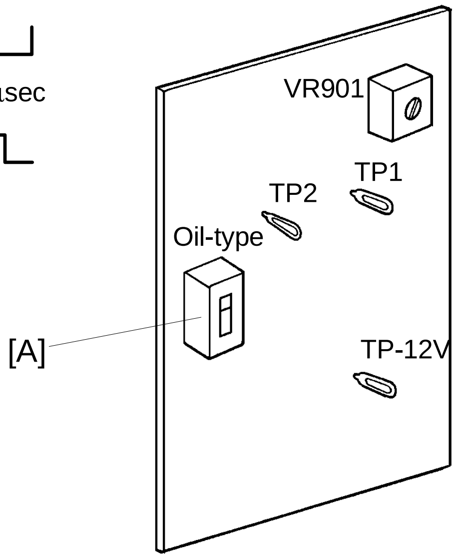
Purpose: To ensure total clutch-sleeve release by the stopper when the ink supply solenoid [A] turns on and complete clutch-sleeve locking by the stopper when the ink supply solenoid turns off.

Adjustment Standard: 0.5 ± 1 mm

1. Remove the drum unit from the machine.
2. Remove the upper ink supply solenoid cover and remove the front cover of the drum unit.
3. Press in the solenoid plunger by hand and make sure that the distance between the stopper [B] and the clutch sleeve [C] is between 0.5 mm and 1.0 mm as shown.
4. If it is not, loosen the screw [D] and adjust the distance by moving the solenoid bracket [E].
5. After adjusting, retighten the screw [D].

8.12 ADJUSTING INK DETECTION





Purpose: To ensure that the ink detection PCB detects a no ink condition when the ink is running out.

Adjustment Standard: See the Above illustration.

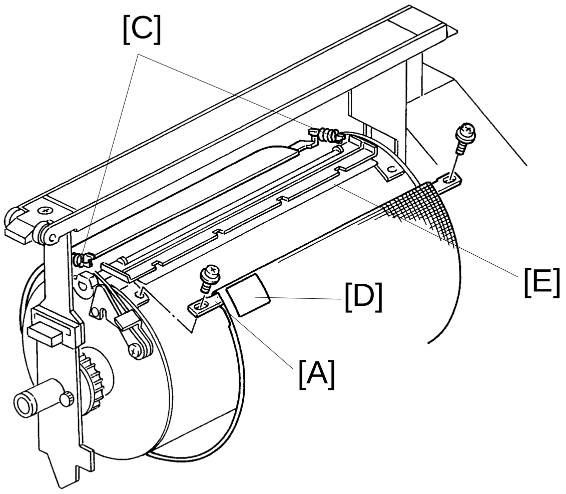
1. Remove the rear cover of the machine.
2. Position SW901 [A] on the ink detection PCB to the oil type (upper) position.
3. Connect the CH1 probe of an oscilloscope to TP1, the CH2 probe to TP2 and the GND lead to TP-12 V. Select the 5 microsecond range.
4. Turn on the main switch and install a drum with no ink. Or instead remove the ink bottle and make prints until the Add Ink indicator lights.
5. Make sure that the waveform is as shown.

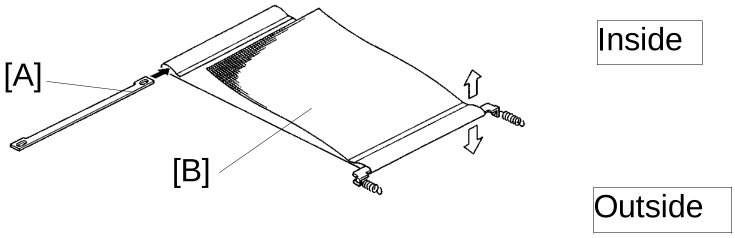
NOTE: 1. This adjustment should be made under normal conditions (20°C/65 % RH).

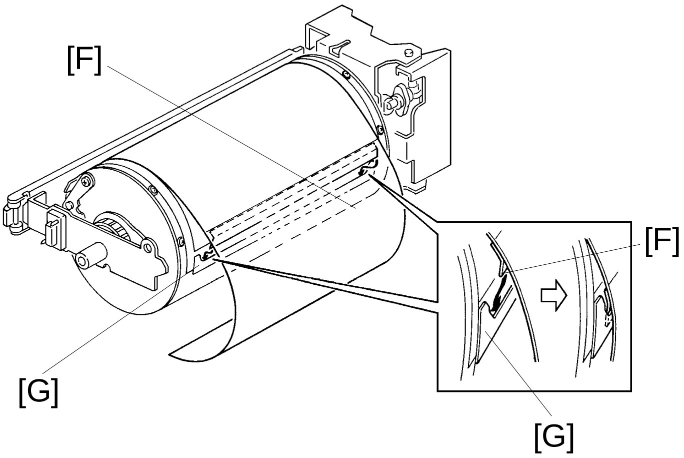
2. The period of the waveform varies inversely with temperature. (High temp. → reduced period, Low temp. → increased period)

6. If it is not, adjust the ON timing of the detection signal using VR901 on the ink detection PCB.

8.13 SCREEN







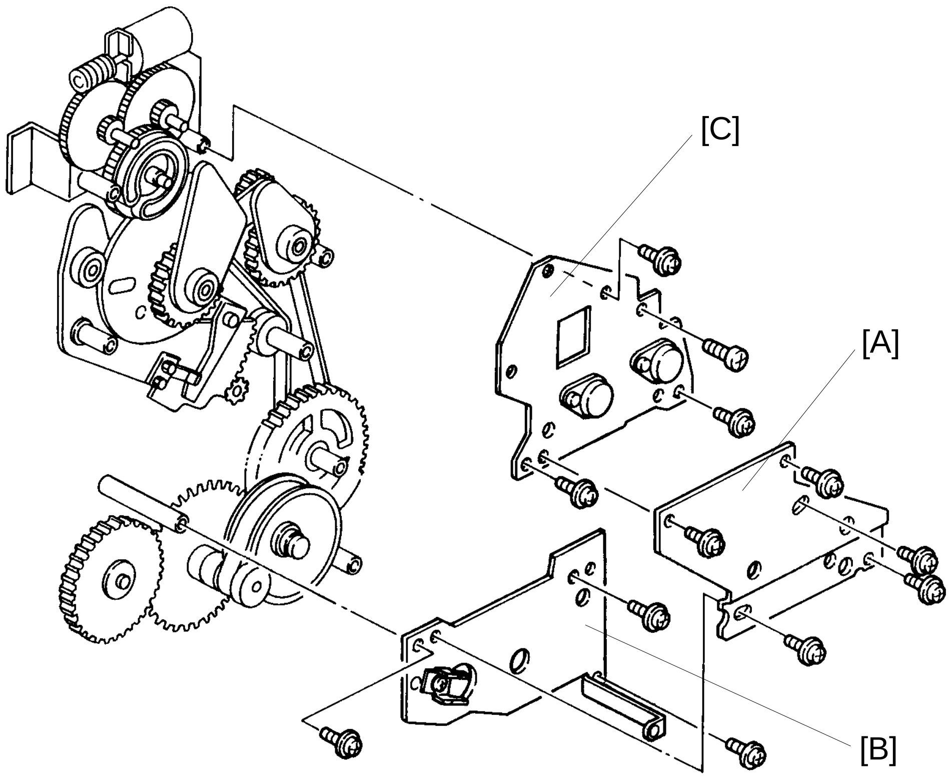
1. Remove the drum unit from the machine.
2. Remove the front stay [A] of the screen [B] (2 screws).
3. Remove the 2 springs [C].
4. Remove the screen [B].

NOTE: 1. Make sure that the black seal [D] is on the front side (outside) of the screen when reinstalling it.

2. Make sure that the front stay [A] comes under the clamper plate [E] when reinstalling it.

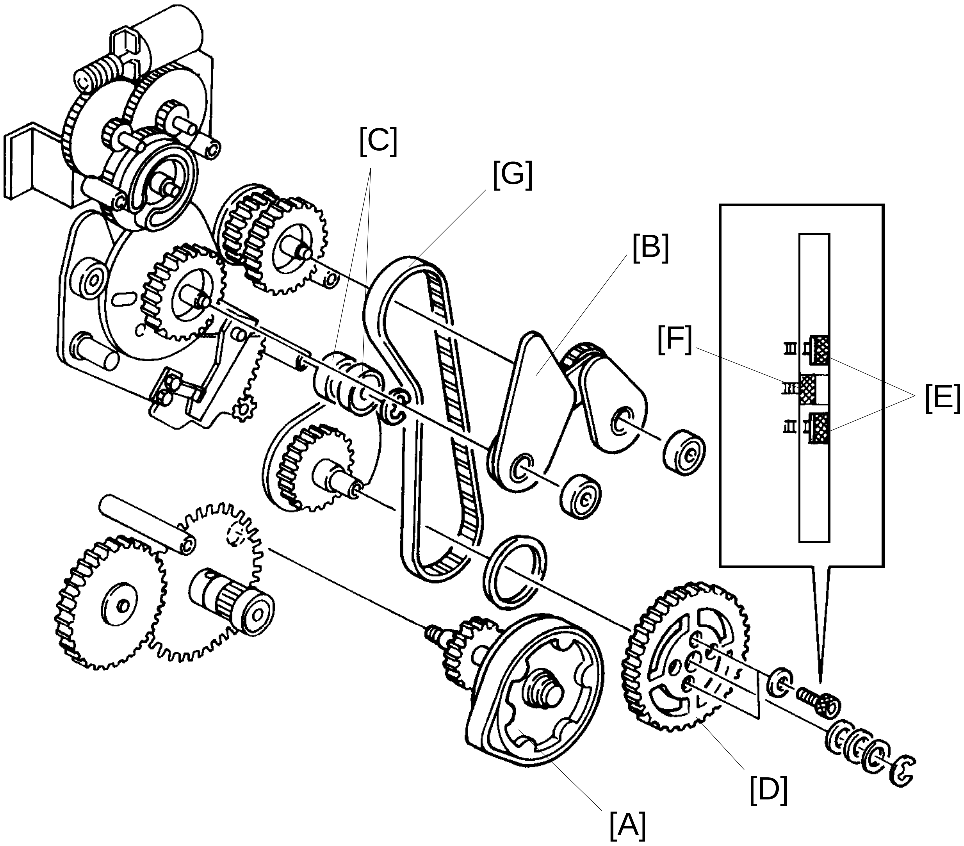
3. Make sure that the mylar [F] of the screen is correctly inserted into the pocket [G] on the drum.

8.14 DRUM DRIVE BELT



Removal:

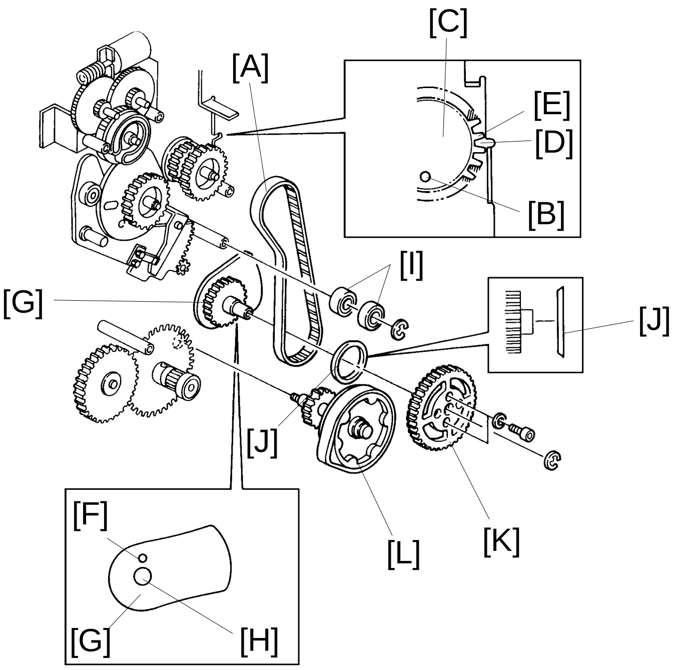
1. Set the image position to "0" by turning the main switch off and on.
2. Turn off the main switch and unplug the power supply cord.
3. Remove the drum unit.
4. Remove the rear cover.
5. Remove the center support plate [A] (5 screws).
6. Remove the lower support plate [B] (3 screws).
7. Remove the upper support plate [C] (4 screws).



8. Remove the relay gear assembly [A].
9. Remove the timing gear assembly [B].
10. Remove two belt tension bearings [C].
11. Remove the pressure cam drive gear [D] (2 hexagon bolts [E] and 1 E-ring).

NOTE: Four hexagon bolts secure the gear [D]. Do not loosen the two deeply recessed bolts [F].

12. Remove the drum drive belt [G].



Assembly:

1.Install a new drum drive belt [A].

2. Adjust the drum drive belt position.
   1) The hole [B] in the drum drive gear [C] is aligned with the hole in the rear side plate. At this time, the notch cut [D] in the plate lines up with the center of the drum drive gear cutout [E].
   2) The hole [F] on the pressure cam [G] should be right over the pressure cam shaft [H].
3. Install two belt tension bearings [I] (1 E-ring).

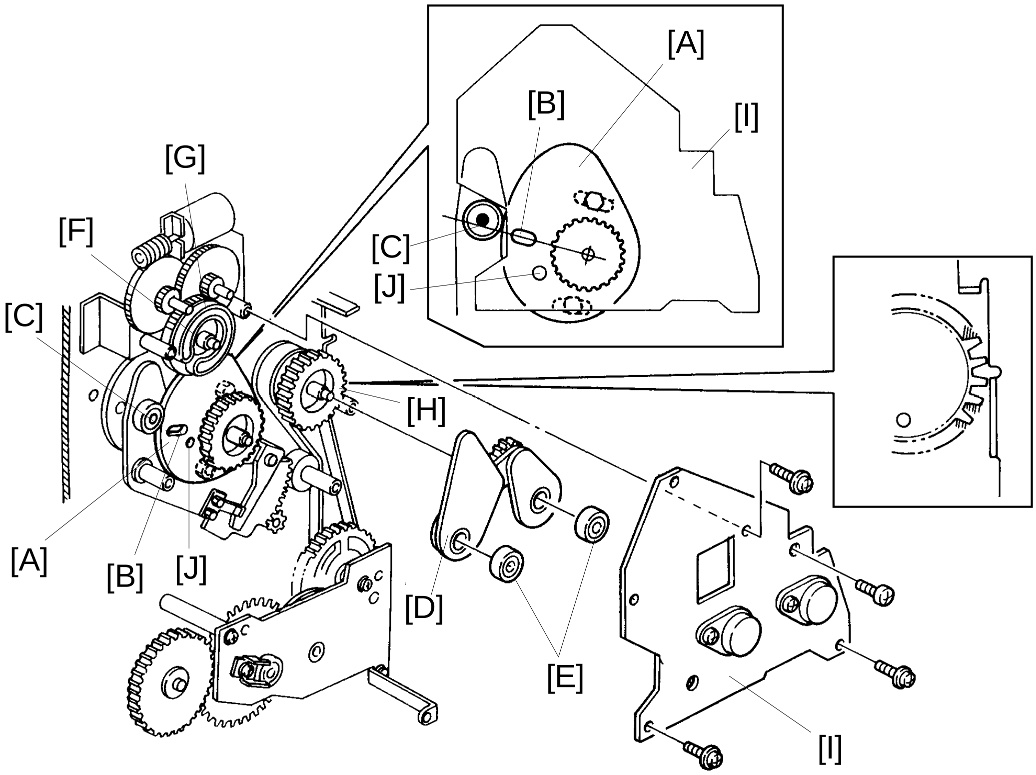
NOTE: Make sure that the drum drive gear and the pressure cam are in proper position as explained above.
If the relation between the printing pressure cam [G] position and the drum drive gear [C] position is wrong, printing pressure will be applied too late or too early. For each misaligned tooth between the cam and the gear, the print will appear 23 mm too far up or too far down.

4. Install the white spacer [J] and the pressure cam drive gear [K] (2 hexagon bolts).

NOTE: Take care to install the white space [J] with the correct face towards the gear. (See figure.)

5. Install the relay gear assembly [L] and the relay belt.

6. Install the lower support plate (3 screws).



7. Adjust the position of the second feed cam [A] so that the center of the slot [B] in the second feed cam is aligned with the bearing shaft [C].

8. Install the timing gear assembly [D] with the two bearings [E].

NOTE: Make sure that the pin on the timing gear assembly is in the groove [F] of the cam gear [G].
Make sure that the drum drive gear [H] is at the home position.

9. Install the upper support plate [I] (4 screws).

10. Push down lightly on the second feed cam [A] to hold it firmly in place. While still holding it, make sure that the hole [J] in the second feed cam is aligned with the upper support plate [I]. If it is not, repeat steps 7 to 10.

11. Make prints to check the registration.

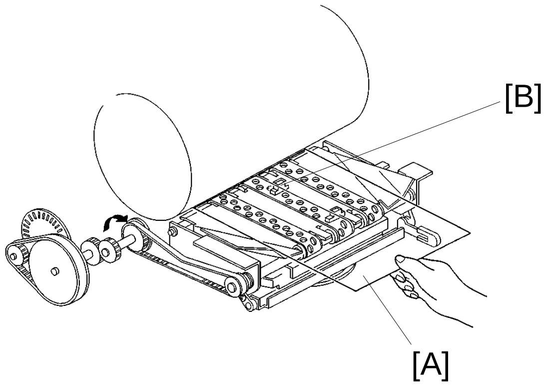
12. If the registration is off by more than 12 mm, repeat step 7 to 11. If the registration is less than 12 mm, adjust the relation between the feed rollers and the gear according to the "Adjusting the feed timing of the second feed roller" section.

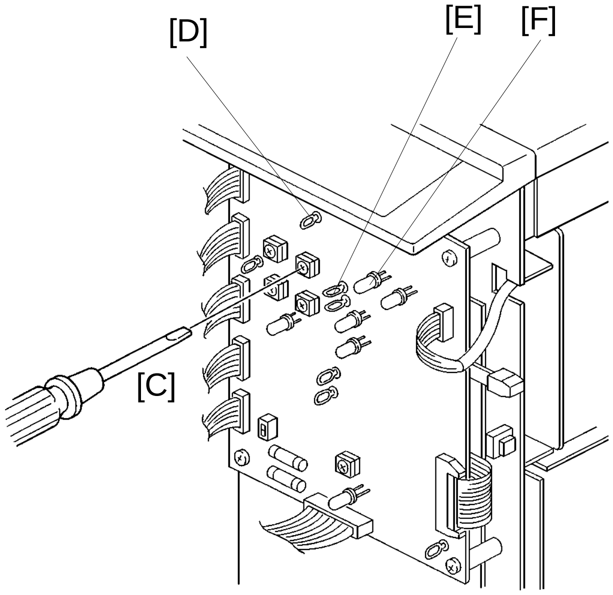
NOTE: For each misaligued tooth of the feed cam gear, the registration is changed approximately 12 mm.

13. Install the center support side plate (5 screws).

9. DELIVERY SECTION

9.1 ADJUSTING THE FIRST PAPER EXIT SENSOR



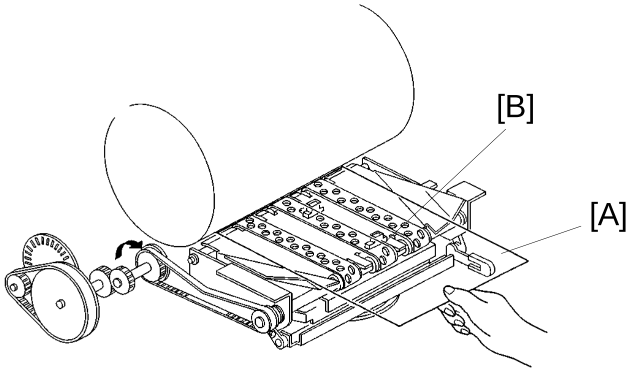


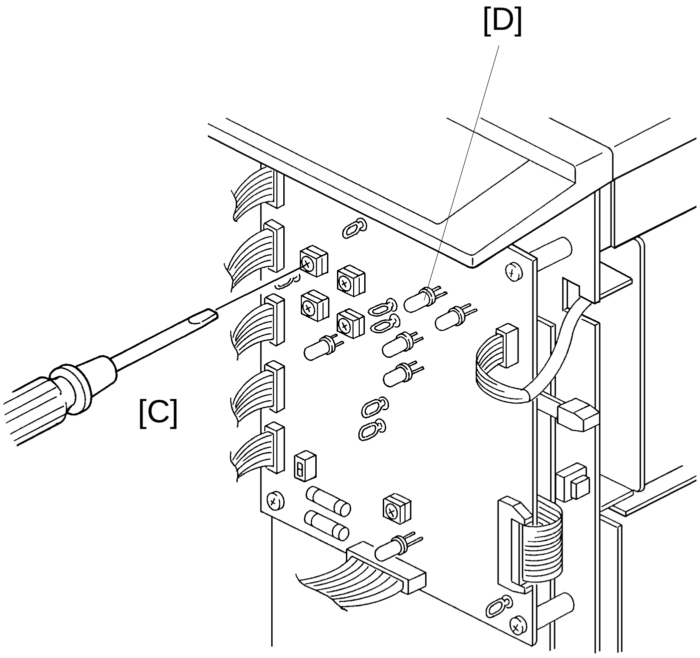
Purpose: To ensure that the sensor detects correct paper delivery, and to ensure that the jam indicator blinks properly after an exit misfeed or a paper wrap occurs.

Ajustment Standard: 0.8 to 0.9 V

1. Remove the right front cover of the machine.
2. Wrap a sheet of 65 g/m^2 paper [A] around the drum.
3. Measure the voltage between TP101 [E] and TP107 (GND) [D]. It should be between 0.8 and 0.9 volts.
4. If it is not, adjust the sensor sensitivity by turning VR101 [C] on the main PCB.
5. To confirm that LED 101 [F] turns ON and OFF, activate the first paper exit sensor [B]. Use a sheet of paper to activate the sensor.

9.2 ADJUSTING THE SECOND PAPER EXIT SENSOR



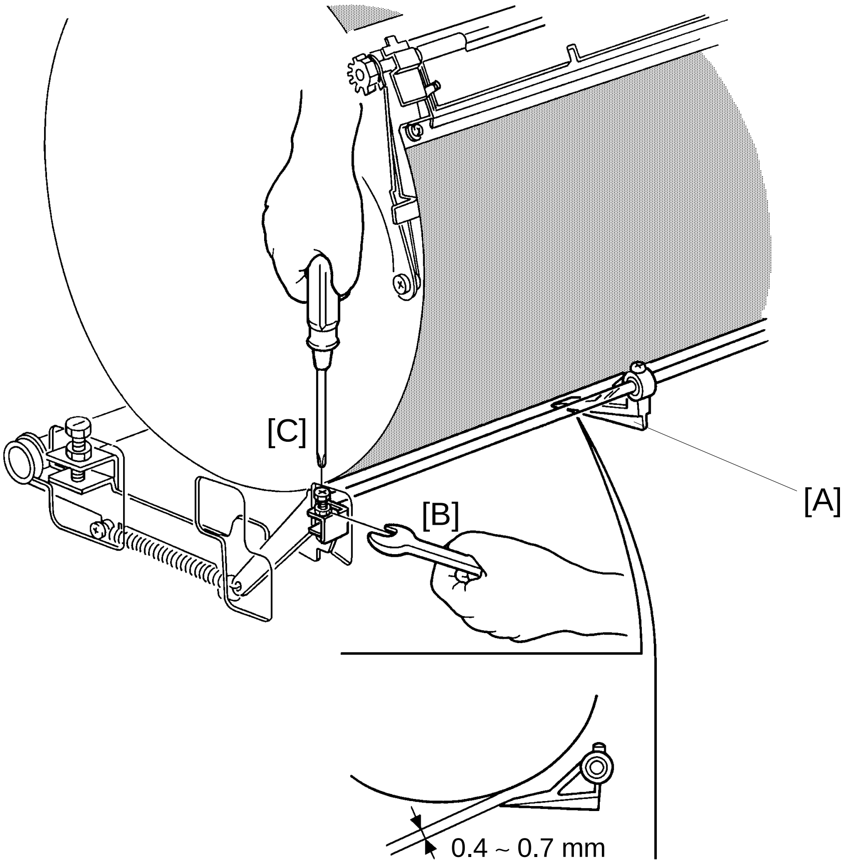


Purpose: To ensure correct sensor detection of printing paper, and to ensure that the jam indicator blinks and the machine stops when a paper wrap or an exit misfeed occurs.

Adjustment Standard: VR103 is set at the ON/OFF threshold of LED103 [D].

1. Remove the right front cover of the machine.
2. Place a sheet of 65 g/m^2 paper [A] 15 mm away from the second paper exit sensor [B]. Make sure that VR103 [C] is set at the ON/OFF threshold of LED103 [D].
3. If it is not, adjust the sensor sensitivity by turning VR103 [C] on the main PCB.

9.3 ADJUSTING THE CLEARANCE OF THE EXIT PAWL

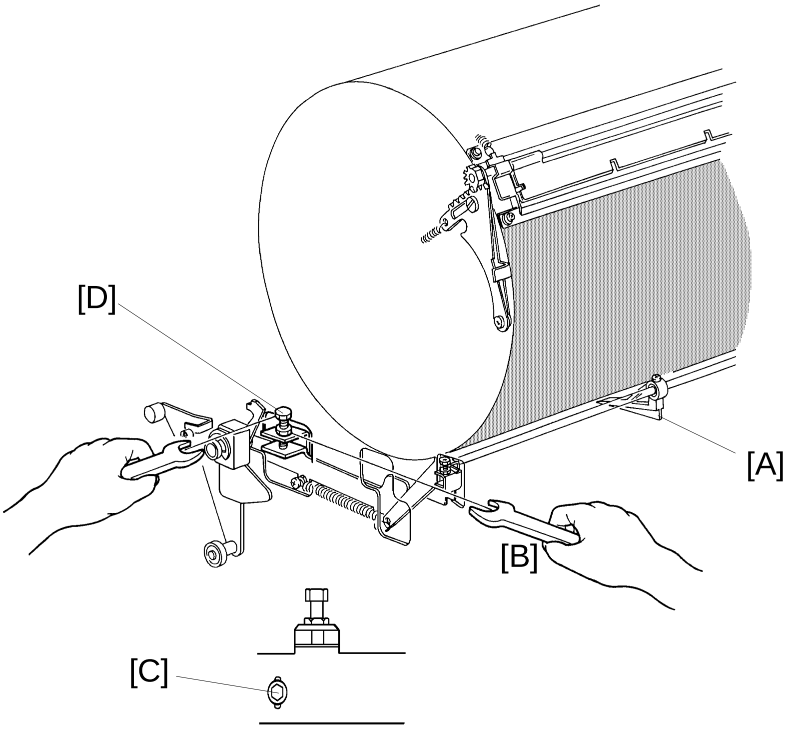


Purpose: To ensure that the printing paper is delivered without a paper wrap problem or damage to the screen.

Adjustment Standard: 0.4 to 0.7 mm

1. Remove the rear cover of the machine and open the master eject unit.
2. Set a few sheets of paper on the paper table. Then, set the paper table in the paper feed position. (Use Output Check mode number 19.)
3. To feed a sheet of paper, turn on the paper feed solenoid by hand, and using a 10 mm spanner, gradually rotate the drum rotation shaft and at the same time manually turn on the printing pressure solenoid to move the exit pawl [A] to the drum.
4. Make sure that the clearance between the drum and the exit pawl between 0.4 and 0.7 mm when the exit pawl is closest to the drum.
5. If it is not, loosen the hexagon nut [B] of the exit pawl drive arm. Then adjust the clearance by turning the screw [C].
6. Check adjustment by repeating steps 3 and 4.

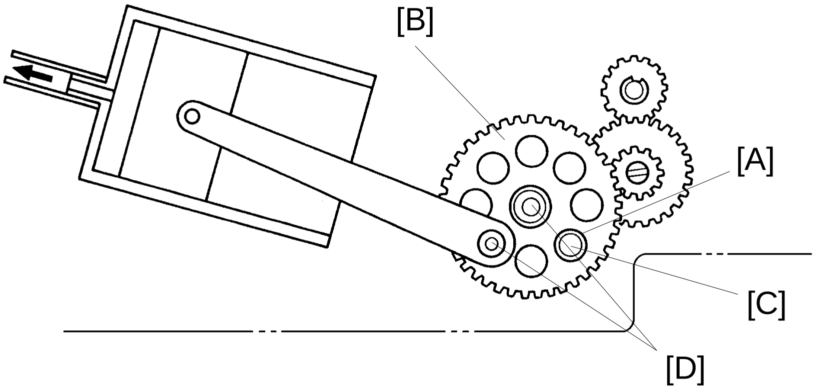
9.4 ADJUSTING THE EXIT PAWL TIMING



Purpose: To ensure that the exit pawl does not touch the master clamper.
Adjustment Standard: 232 ± 3°

1. Remove the rear cover of the machine.
2. Press and hold down the Drum Rotation button until the drum reaches the home position.
3. Set the protractor on the image shifting shaft. Position the origin of the protractor at the bracket of the master feed clamper solenoid.
4. Manually press in the plunger of the printing pressure solenoid. Release the paper detecting arm manually by rotating the drum rotation shaft with a spanner (10 mm).
5. Measure the degrees turned when the exit pawl [A] comes closest to the drum. This must be 232 ± 3°.
6. If it is not, loosen the hexagon nut [B] and screw [C] , then adjust the exit pawl position by turning the hexagon bolt [D].
7. Check the adjustment by repeating step 4 to 6.

9.5 ADJUSTING THE PAPER EXIT PAWL AIR PUMP

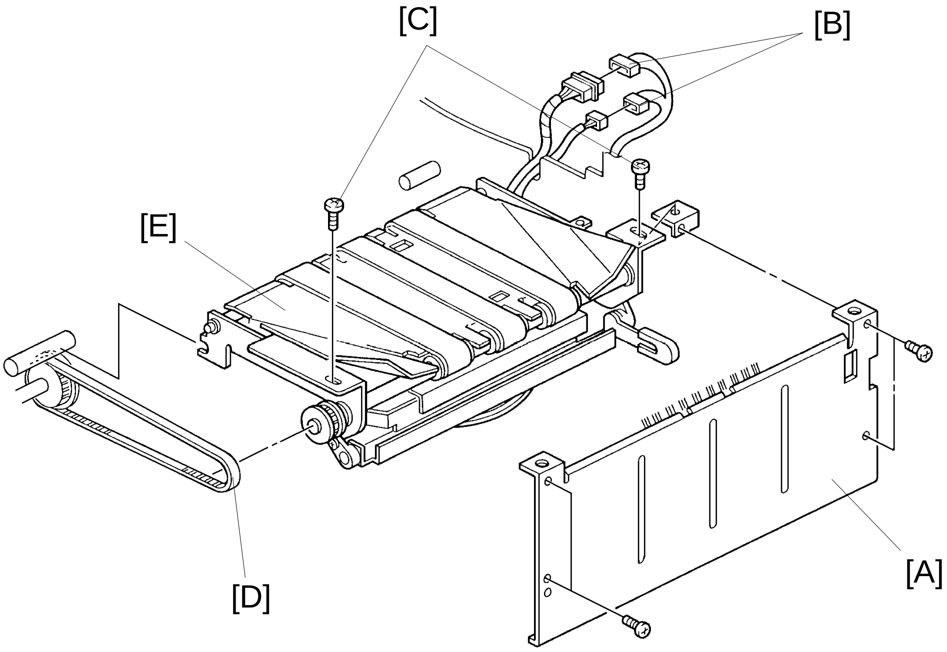


Purpose: To ensure that the paper exit pawl air pump produces a jet of air when the paper exit pawl is in the upper position (near the drum surface).

Adjustment Standard: When the drum has rotated 303 ± 3 degrees, the pump piston position is at the upper dead point.

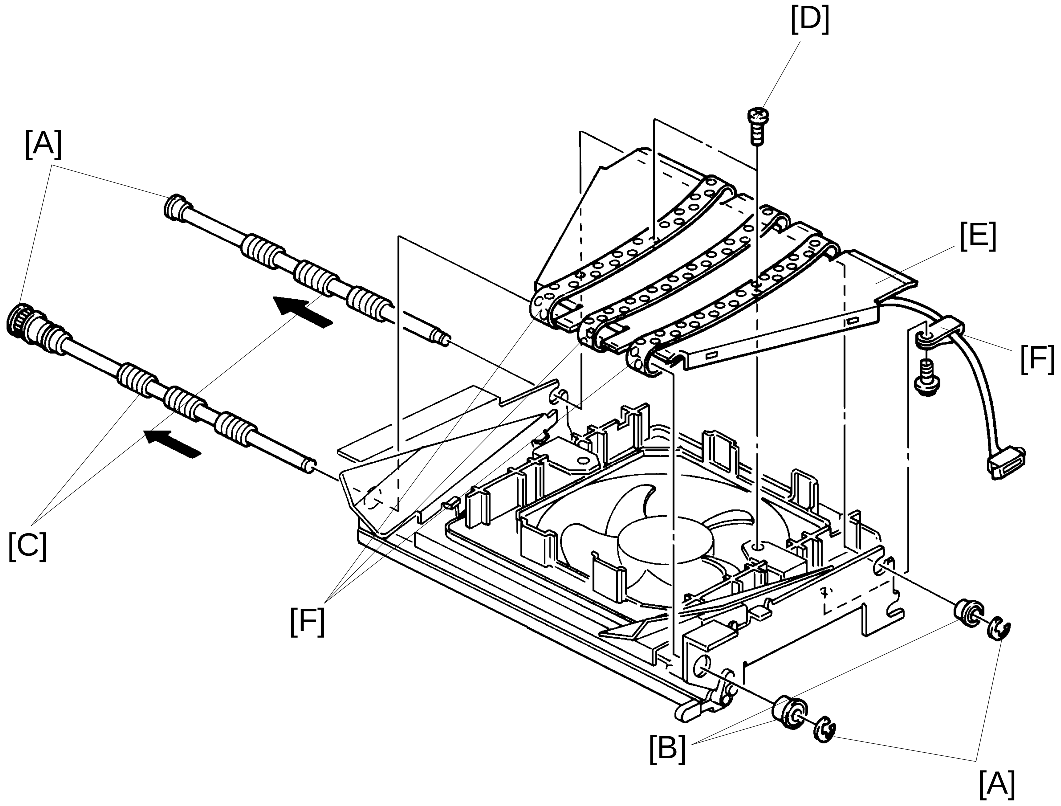
1. Open the front door and remove the inner cover.
2. Press and hold down the Drum Rotate button until the drum reaches the home position.
3. Confirm that the 13 mm diameter hole [A] in the gear [B] and the 8 mm diameter hole [C] in the side plate are lined up.
4. If the holes are not lined up, remove the E-rings [D] and reposition the gear.
5. Rotate the drum to the home position and confirm step 3 again.

9.6 TRANSPORT UNIT



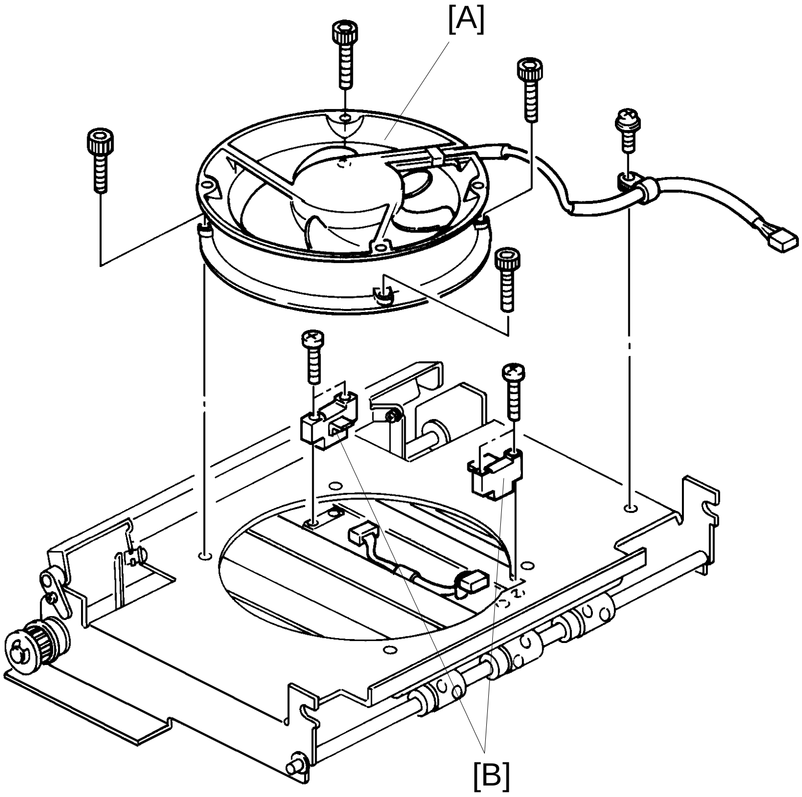
1. Remove the right front cover and remove the inner cover.
2. Remove the exit side plate [A] (4 screws).
3. Remove the harness clamp and disconnect the two connectors [B].
4. Remove the two screws [C].
5. Take off the belt [D] from the pulley and remove the transport unit [E].

9.7 DELIVERY BELT



1. Remove the transport unit. (See Transport Unit section.)
2. Remove the E-rings [A] and bushings [B]. Then, slide out the rollers [C].
3. Remove the two screws [D] securing the transport guide plate [E].
4. Remove the screw securing the harness clamp [F] and then remove the transport guide plate [E].
5. Remove the transport belts [F].

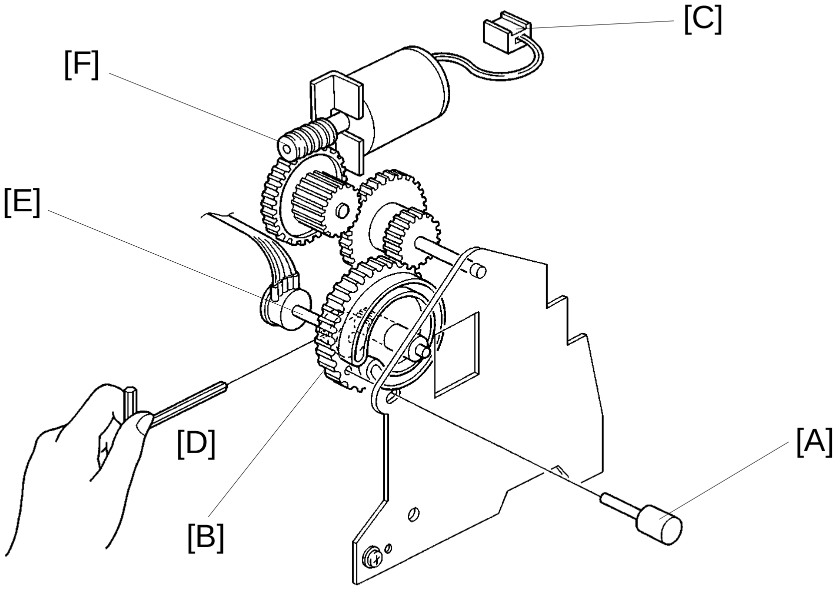
9.8 TRANSPORT VACUUM FAN AND PAPER EXIT SENSORS



1. Remove the transport unit. (See Transport Unit section.)
2. Turn the transport unit over.
3. Remove the transport vacuum fan motor [A].
4. Remove the first and second paper exit sensors [B].

10. IMAGE POSITIONING SECTION

10.1 ADJUSTING THE IMAGE POSITION



Purpose: To ensure that the image is well centered when the Image Position key is set to "0".

Adjustment Standard: The gauge [A] must be inserted.

1. Remove the rear cover.
2. Turn on the main switch. This way, the image position is returned exactly its initial position. (The image position indicator shows "0".)
3. Make sure that it is possible to insert the gauge [A] (P/N C2009002).
4. If the gauge [A] cannot be inserted into the hole of the gear [B], move the gear [B] to enable the gauge to be inserted into the hole as follows:
   a) Disconnect the image positioning motor connector [C].
   b) Loosen the Allen screw [D] so that the gear at the end of the image position sensor shaft [E] rotates freely.
   c) Turn the gear [B]. To do this, turn the worm gear [F] manually until the gauge [A] can be inserted into the hole of the gear [D].

NOTE: Do not turn the image position sensor shaft [E]. If the shaft is turned, the image position indicator will be affected. If the indicator is affected, turn off the main switch, then turn it on again. This returns the indicator to "0".

5. Make prints to check the image position.

CAUTION: Do not keep on pressing the Image Position key if the image position sensor is broken or removed. The plastic gears between the worm gear [F] and gear [D] may break if the pin which moves along the spiral track of the gear [D] hits the end of the track.

SECTION 6

TROUBLESHOOTING

1. ELECTRICAL COMPONENT TROUBLE

Component	Condition	Phenomenon
FU1 (Power Supply Unit)	Open	Machine does not work. (No indicators on the operation panel turn on.)
FU2 (Power Supply Unit)	Open	When the main switch is turned on, "E-11" is displayed.
FU101 (Main PCB)	Open	When the Print Start key is pressed, paper is not fed and jam indicators "B" and ϟ blink. When the Master Making key is pressed, master is not ejected and jam indicators "F" and ϟ blink.
FU102 (Main PCB)	Open	If the master is wrapped around the drum, when the Master Making key is pressed, the master is not ejected and jam indicators "F" and ϟ blink. If the master is not wrapped around the drum, when the Master Making key is pressed, master is not wrapped around the drum and jam indicators "C" and ϟ blink.
FU301 (AC drive PCB)	Open	When the Print Start key or Master Making key is pressed, "E-02" is displayed and machine does not work.
First Original Sensor	ON condition (Not interrupted)	An original is not fed in ADF mode. When the Master Making key is pressed, indicator "A" blinks.
	OFF condition (Interrupted)	Jam indicators "A" and ϟ blink after the last sheet of original has been fed.
Second Original Sensor	ON condition (Not interrupted)	An original is not fed.
	OFF condition (Interrupted)	When the main switch is turned on, jam indicators "A" and ϟ blink.
Original Registration Sensor	ON condition (Not interrupted)	An original does not Stop at the original registration sensor. It stops when the trailing edge has passed the 1st original sensor.
	OFF condition (Interrupted)	When the main switch is turned on, jam indicators "A" and ϟ blink.
Master Eject Sensor	ON condition (Activated)	When the main switch is turned on, jam indicators "F" and ϟ blink.
	OFF condition (Not activated)	When the master is being ejected, the jam indicators "F" and ϟ blink.
Full Master Detecting Sensor	ON condition (Not interrupted)	When the master eject box is full, indicator 📥 does not blink.
	OFF condition (Interrupted)	After master ejecting is finished, indicator 📥 blink.

Component	Condition	Phenomenon
Paper Table Lower Limit Sensor	ON condition (Interrupted)	The paper table does not go down.
	OFF condition (Not interrupted)	When the paper feed table goes down and stops, the cover open indicator blinks.
Paper Table Safety Switch	ON condition (Feeler is actuated)	When the main switch is turned on, the cover open indicator blinks.
	OFF condition (Feeler is not actuated)	Paper feed safety bar does not work. If paper table lower limit sensor is faulty, the paper table moves all the way down and locks.
Paper Table Height Sensor	ON condition (Interrupted)	When the paper feed table goes up, it does not stop at the proper position and E-02 lights.
	OFF condition (Not interrupted)	The paper feed table does not go up. Jam indicators "B" and ϟ blink when the Print key is pressed.
Paper End Sensor	ON condition (Activated)	When there is no paper on the paper feed table, the Print Start key can be activated, but jam indicators "B" and ϟ blink.
	OFF condition (Not activated)	Though there is paper on the paper table, paper end indicator ϟ blinks.
Printing Pressure Sensor	ON condition (Interrupted)	Drum rotates continuously (does not stop) after a trial printing.
	OFF condition (Not interrupted)	Jam indicators "B" and ϟ blink after a trial printing and the paper stops on the transport unit.
First Paper Exit Sensor	ON condition (Activated)	When the main switch is turned on, jam indicators "G" and ϟ blink.
	OFF condition (Not activated)	Jam indicators "B", "E", and ϟ blink after one sheet of paper has been fed out.
Second Paper Exit Sensor	ON condition (Activated)	When the main switch is turned on, jam indicators "G" and ϟ blink.
	OFF condition (Not activated)	Jam indicators "E" and ϟ blink after one sheet of paper has been fed out.
Paper Feed Solenoid	OFF condition	When the Print Start key is pressed, paper is not fed and jam indicators "B" and ϟ blink.
Drum Rotation Sensor	ON condition (Interrupted)	When the main switch is turned on, the drum rotates several times and stops. When the Master Making key is pressed, the drum continues to rotate in high speed.
	OFF condition (Not interrupted)	Same as above phenomenon.

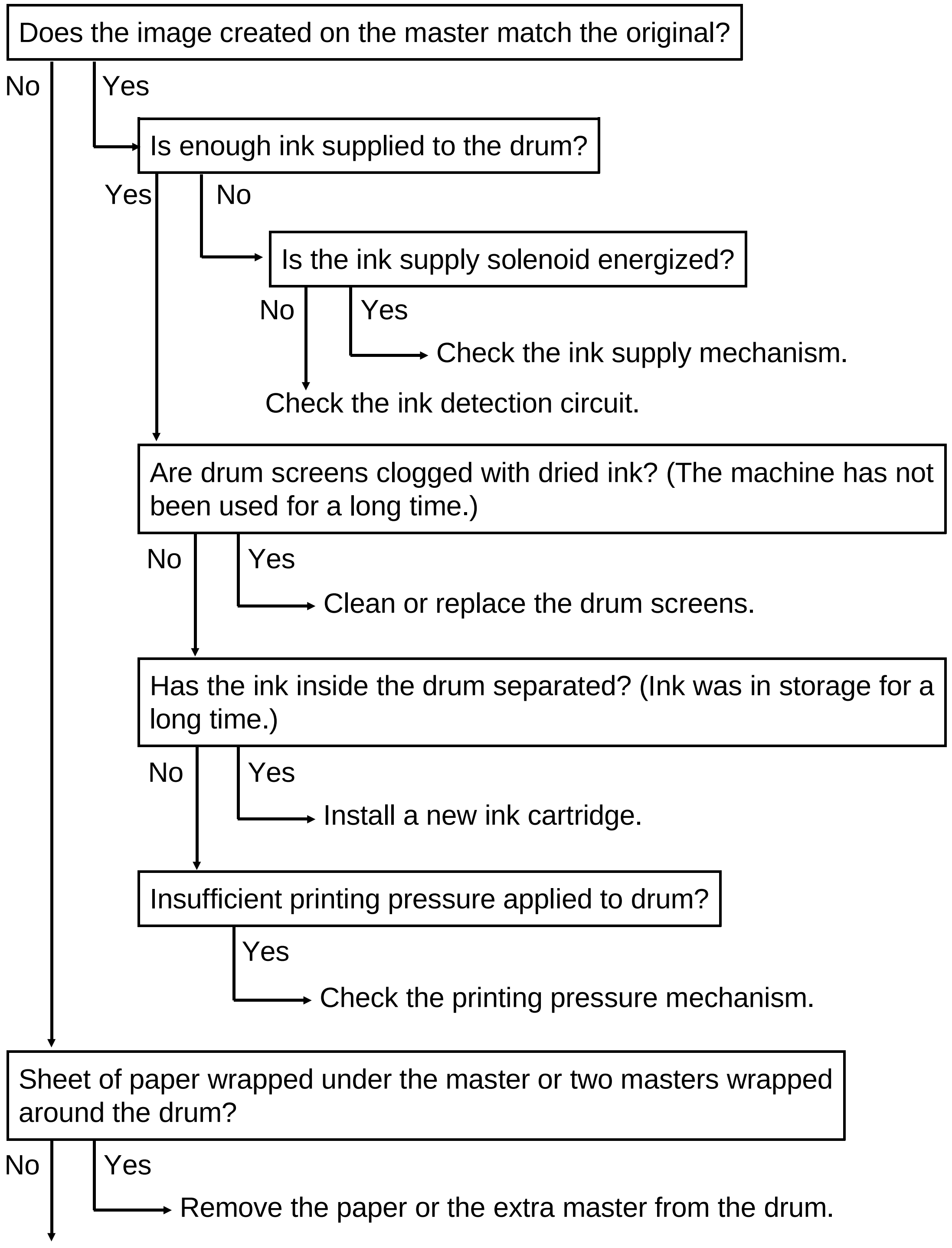
Component	Condition	Phenomenon
Master End Sensor	ON condition (Activated)	Normal operation when master is present. Master end is not detected; Master End indicators "C" and 📥 do not blink and jam indicators "C" and ⚡ blink.
	OFF condition (Not activated)	Even if the master is present, the Master End indicators "C" and 📥 blink.
Right Cutter Switch (Rear)	ON condition (Feeler is actuated)	Master is not cut. (Cutter unit does not move at all.)
	OFF condition (Feeler is not actuated)	When the master is cut, indicator "E-01" lights. At that time the cutter does not return to the front.
Left Cutter Switch (Front)	ON condition (Feeler is actuated)	Master is not cut. (Cutter unit does not return from the rear.)
	OFF condition (Feeler is not actuated)	When the main switch is turned on, indicator "E-01" lights.
First Drum Position Sensor	OFF condition (Not interrupted)	When the main switch is turned on, the drum starts rotating and it cannot be stopped.
	ON condition (Interrupted)	1) Jam indicators "E" and ⚡ blink when the Print key is pressed. 2) The drum starts rotating and it cannot be stopped when the Master Making key is pressed.
Second Drum Position Sensor	OFF condition (Not interrupted)	1) When the Print key is pressed, the drum continues to rotate. However, paper is not fed from the paper feed table. 2) When the Master Making key is pressed, the drum continues to rotate after the wrapped master has been ejected. An original stops at the original sensor.
	ON condition (Interrupted)	When the Print key is pressed, paper feeding starts. When paper is out on the paper feed table, the paper feed table goes down. However, paper feeding still continues.
Master Buckle Sensor	ON condition (Activated)	When the main switch is turned on, jam indicators "C" and ⚡ blink and cannot be reset.
	OFF condition (Not activated)	When the Master Making key is pressed, an original stops halfway, and jam indicators "A", "C", and ⚡ blink.
Upper Pressure Plate Sensor	ON condition (Not interrupted)	When the main switch is turned on, pressure plate keeps moving up and down. Then "E-12" is displayed.
	OFF condition (Interrupted)	After master making process is finished and one sheet of paper is delivered, 📤 indicates. Pressure plate stops at the lowner position.

Component	Condition	Phenomenon
Lower Pressure Plate Sensor	ON condition (Interrupted)	After master making process is finished and one sheet of paper is delivered, ⊔ indicates.
	OFF condition (Not interrupted)	Pressure plate does not stop at the lower position.
Paper Width Sensor 0	ON (Activated)	" ⚹ " Indicates ever thongh standard paper is set on the paper table.
	OFF (Not activated)	
Paper Width Sensor 1	ON (Activated)	" ⚹ " Indicates ever thongh standard paper is set on the paper table.
	OFF (Not activated)	
Paper Width Sensor 2	ON (Activated)	" ⚹ " Indicates ever thongh standard paper is set on the paper table.
	OFF (Not activated)	
Paper Width Sensor 3	ON (Activated)	A5 lengthwise paper is detected even though LT sideways paper is set on the paper table.
	OFF (Not activated)	LT lengthwise paper is detected even though A5 sideways paper is set on the paper table.
Paper Length Sensor [G]	ON (Activated)	A3 paper is detected even though A4 side ways paper is set on the paper table.
	OFF (Not activated)	A4 sideways paper is detected ever though A3 paper is set on the paper table.
Drum Master Detection Sensor	Always ON (Sensor always detects white)	**Master is on the drum:** machine works correctly. **Master is not on the drum:** indicators "F" and ⚡ blink during the master eject process. Printing starts when the Print Start key is pressed, but indicators "E", "B", and ⚡ soon turn on and the machine stops.
	OFF (Sensor always detects black)	**Master is on the drum:** two masters are wrapped on the drum. **Master is not on the drum:** master is wrapped correctly on the drum, but the "M" indicator blinks when the Print Start key is pressed.

2. TROUBLESHOOTING

2.1 IMAGE TROUBLE

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



Does the image created on the master match the original?

Is enough ink supplied to the drum?

Is the ink supply solenoid energized?

Check the ink supply mechanism.

Check the ink detection circuit.

Are drum screens clogged with dried ink? (The machine has not been used for a long time.)

Clean or replace the drum screens.

Has the ink inside the drum separated? (Ink was in storage for a long time.)

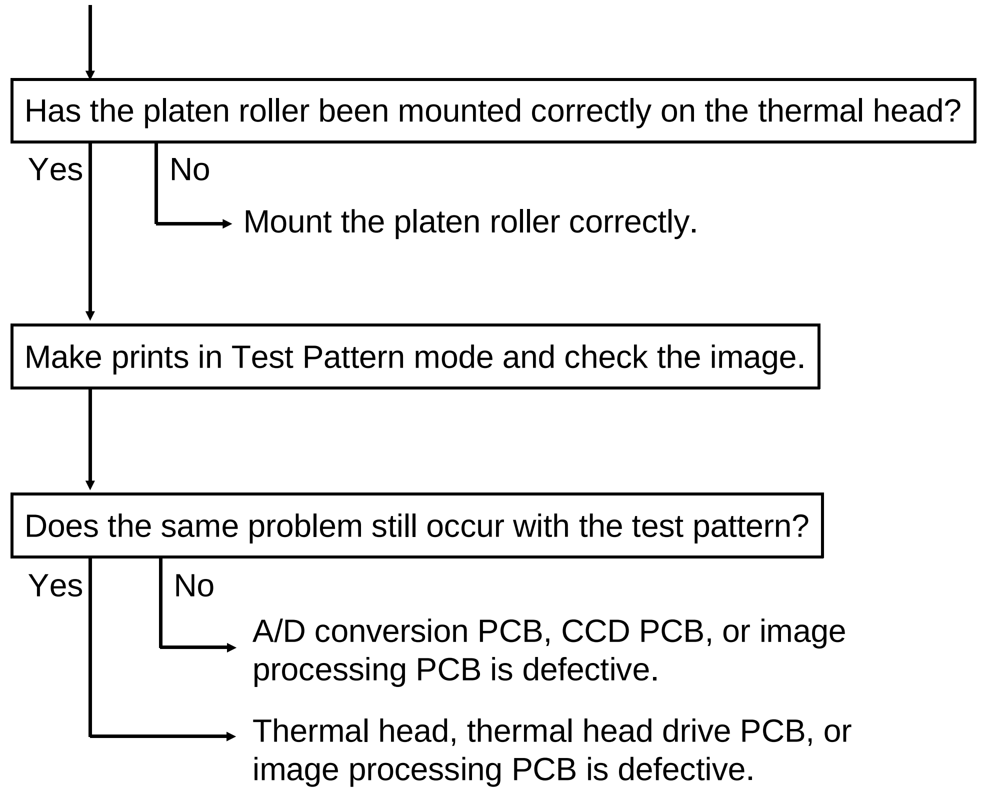
Install a new ink cartridge.

Insufficient printing pressure applied to drum?

Check the printing pressure mechanism.

Sheet of paper wrapped under the master or two masters wrapped around the drum?

Remove the paper or the extra master from the drum.



Has the platen roller been mounted correctly on the thermal head?

Mount the platen roller correctly.

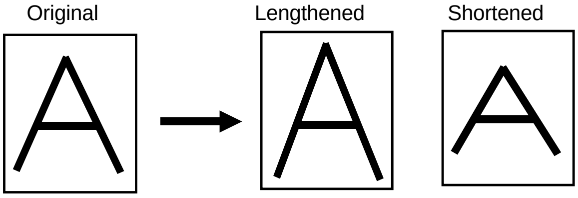
Make prints in Test Pattern mode and check the image.

Does the same problem still occur with the test pattern?

A/D conversion PCB, CCD PCB, or image processing PCB is defective.

Thermal head, thermal head drive PCB, or image processing PCB is defective.

2. Print image is enlarged or reduced in the paper feed direction



Is the print image larger than the original in the paper feed direction?

No

Yes

Is the original transport motor functioning normally?

Yes

No

Check the original transport motor.

Are the drive belts in the original feed section adjusted to the correct tension?

Yes

No

Adjust the belt tension.

Are any of the pulleys and/or gears in the original feed section loose?

No

Tighten the screws securing the pulleys and/or gears.

Is the print image smaller than the original in the paper feed direction?

Yes

Is the master feed motor functioning normally?

Yes

No

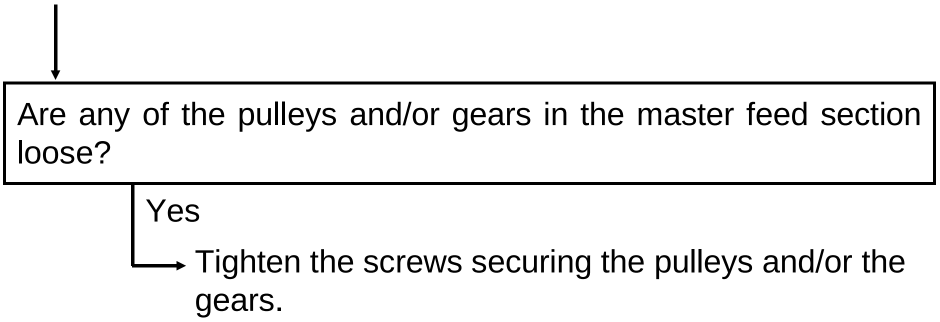
Check the master feed motor.

Are the drive belts in the master feed section adjusted to the correct tension?

Yes

No

Adjust the belt tension.



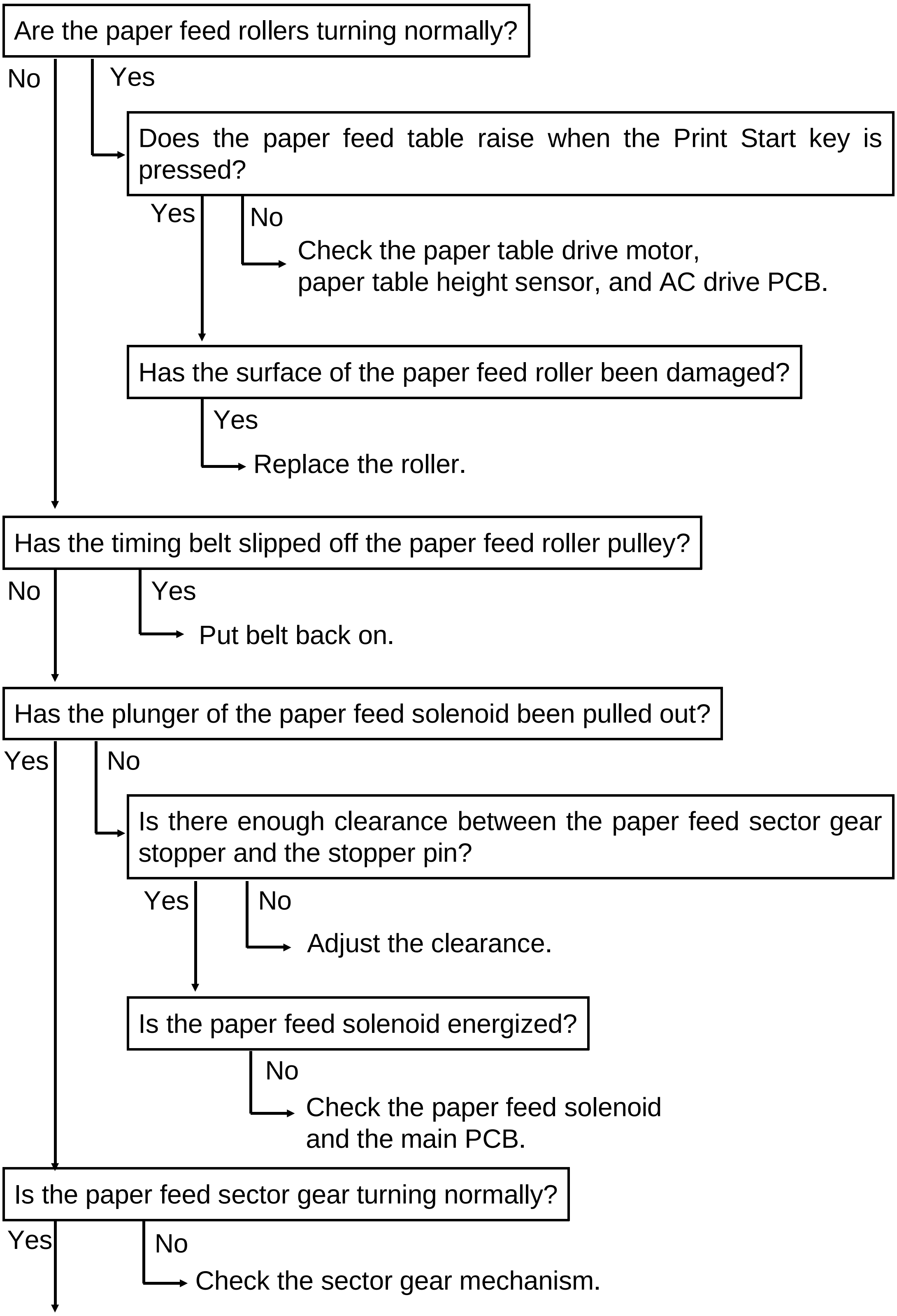
Are any of the pulleys and/or gears in the master feed section loose?

Yes

Tighten the screws securing the pulleys and/or the gears.

2.2 PAPER FEED TROUBLE

1. No paper is fed from the paper table.

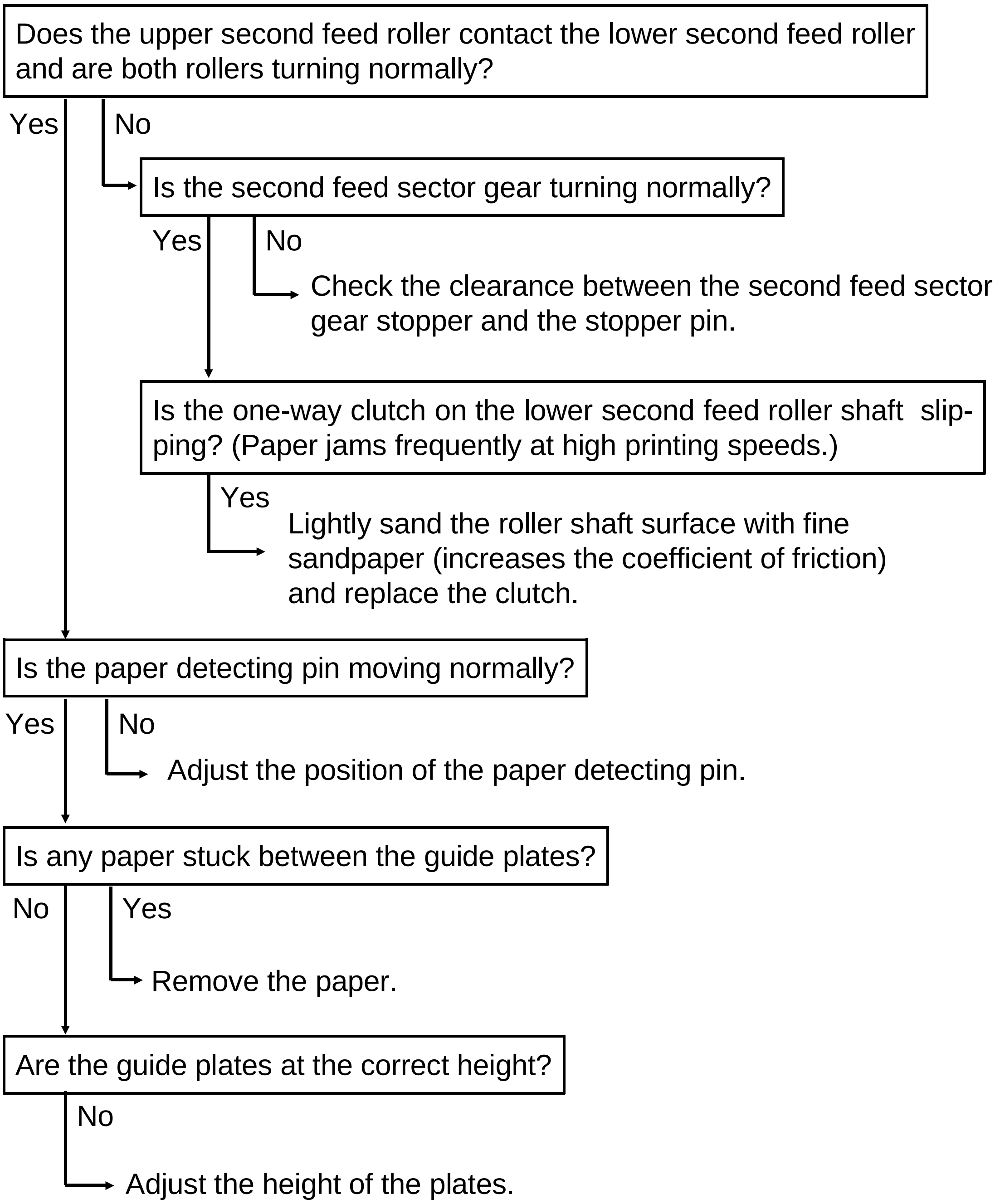


Is the one-way clutch on the paper feed roller shaft slipping? (Paper is often not fed forward at high printing speeds.)

Yes

→ Lightly sand the roller shaft surface with fine sandpaper (increases the coefficient of friction) and replace the clutch.

2. Paper leading edge jams under the second feed roller.



Does the upper second feed roller contact the lower second feed roller and are both rollers turning normally?

Yes

No

Is the second feed sector gear turning normally?

Yes

No

Check the clearance between the second feed sector gear stopper and the stopper pin.

Is the one-way clutch on the lower second feed roller shaft slipping? (Paper jams frequently at high printing speeds.)

Yes

Lightly sand the roller shaft surface with fine sandpaper (increases the coefficient of friction) and replace the clutch.

Is the paper detecting pin moving normally?

Yes

No

Adjust the position of the paper detecting pin.

Is any paper stuck between the guide plates?

No

Yes

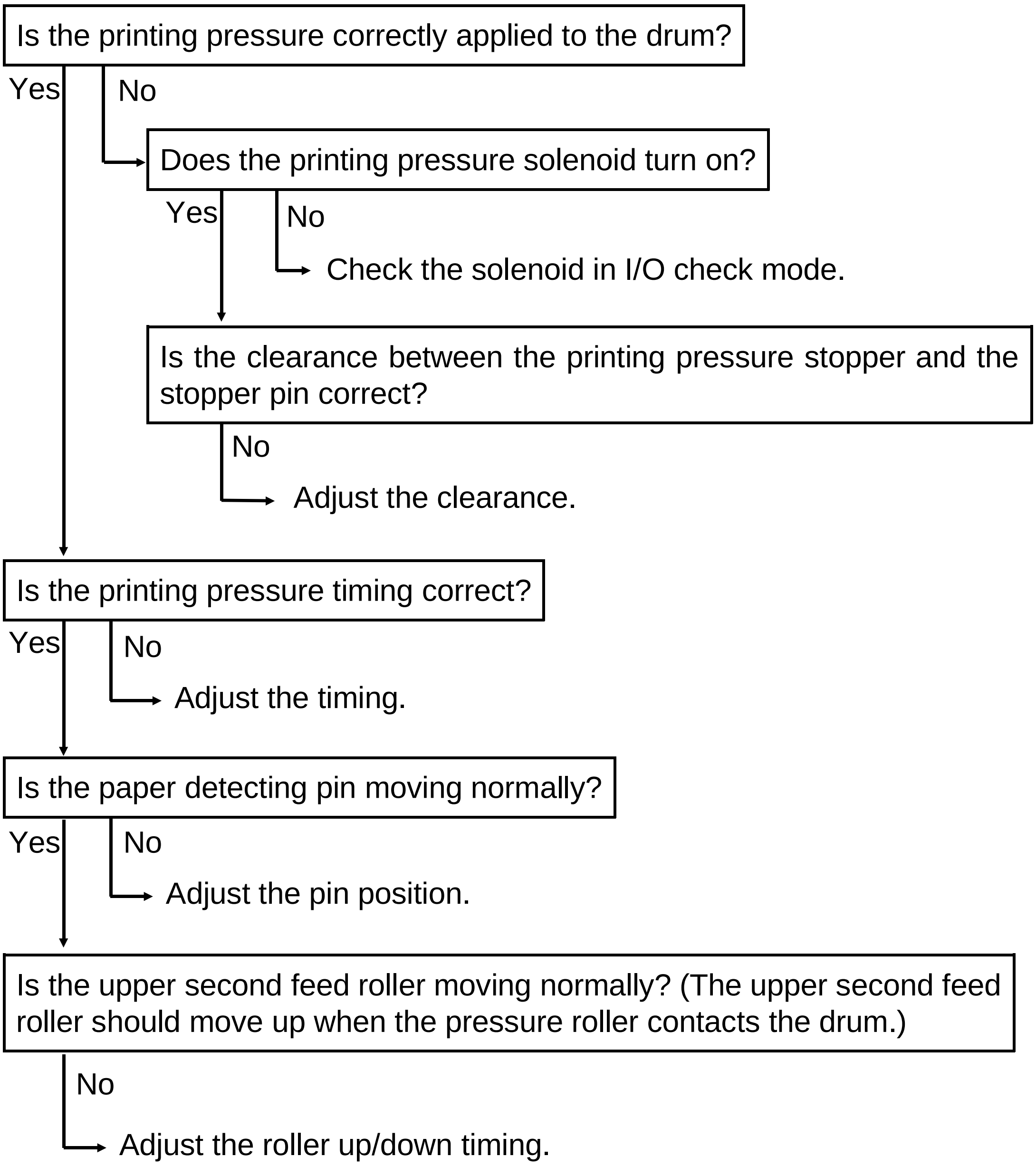
Remove the paper.

Are the guide plates at the correct height?

No

Adjust the height of the plates.

3. Paper leading edge jams under the drum.



Is the printing pressure correctly applied to the drum?

Does the printing pressure solenoid turn on?

Check the solenoid in I/O check mode.

Is the clearance between the printing pressure stopper and the stopper pin correct?

Adjust the clearance.

Is the printing pressure timing correct?

Adjust the timing.

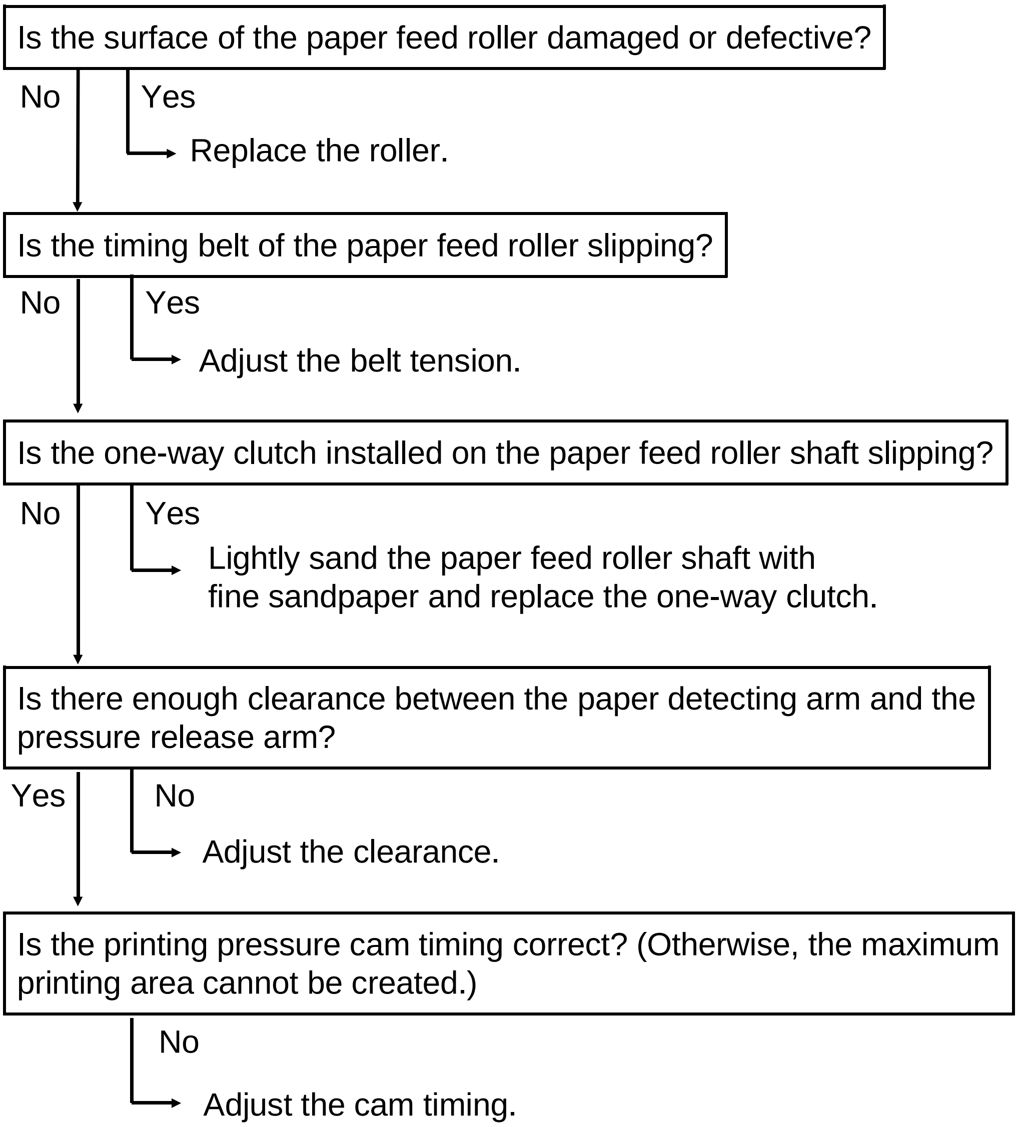
Is the paper detecting pin moving normally?

Adjust the pin position.

Is the upper second feed roller moving normally? (The upper second feed roller should move up when the pressure roller contacts the drum.)

Adjust the roller up/down timing.

4. Paper frequently jams or is not fed during high speed printing. (Does not occur at low printing speeds.).



Is the surface of the paper feed roller damaged or defective?

No

Yes → Replace the roller.

Is the timing belt of the paper feed roller slipping?

No

Yes → Adjust the belt tension.

Is the one-way clutch installed on the paper feed roller shaft slipping?

No

Yes → Lightly sand the paper feed roller shaft with fine sandpaper and replace the one-way clutch.

Is there enough clearance between the paper detecting arm and the pressure release arm?

Yes

No → Adjust the clearance.

Is the printing pressure cam timing correct? (Otherwise, the maximum printing area cannot be created.)

No → Adjust the cam timing.