ARDF DF3020
(Machine Code: D330)

SERVICE MANUAL

March, 2007
Subject to change

Safety and Symbols

Replacement Procedure Safety

⚠CAUTION

- Turn off the main power switch and unplug the machine before beginning any of the replacement procedures in this manual.

Symbols Used in this Manual

This manual uses the following symbols.

☛: See or Refer to

: Screws

: Connector

: Clip ring

: E-ring

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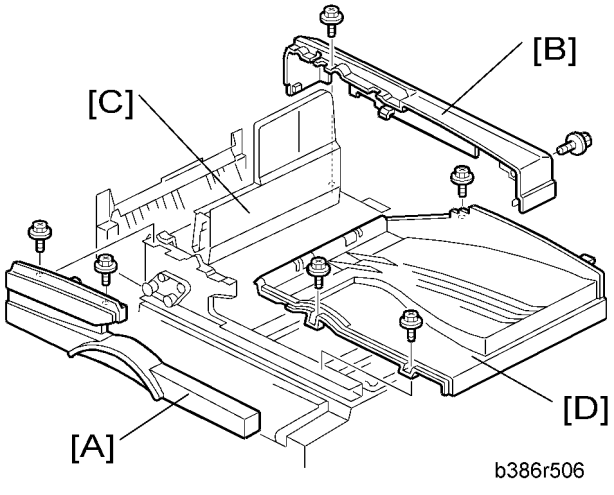
1. Replacement and Adjustment

Covers and Table

⚠CAUTION

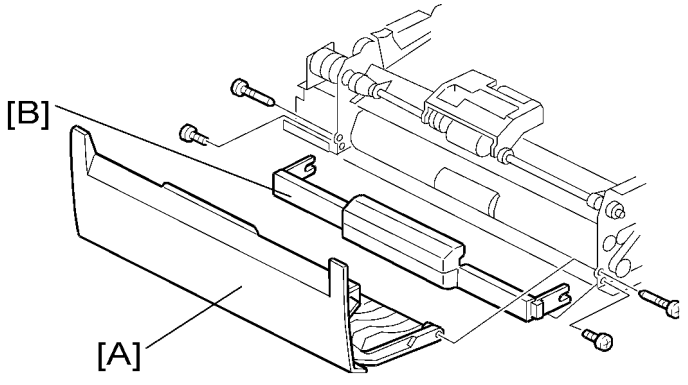
- Turn off the main power switch and unplug the machine before beginning any of the procedures in this section.

DF Exit Table and Covers



1. Open the DF feed cover.
2. Remove the front cover [A] (3 x).
3. Remove the rear cover [B] (3 x).
4. Open the reverse table [C].
5. Remove the original exit table [D] (3 x).

Left Cover



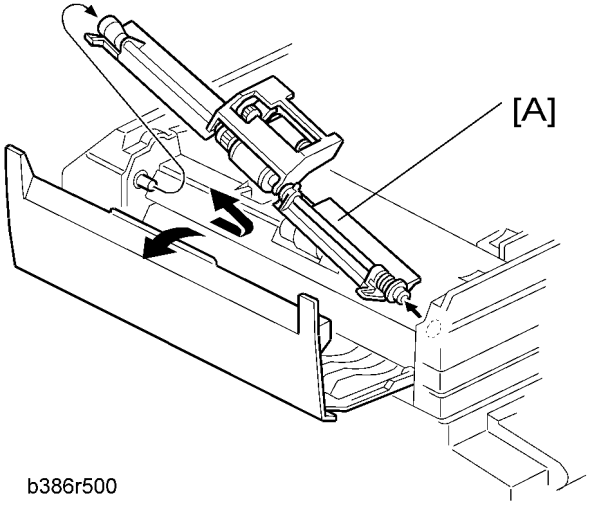
1. Remove the front and rear covers.
2. Remove the left cover [A].
3. Remove the lower left stay unit [B] (2 x).

Document Feed Components

⚠CAUTION

- Turn off the main power switch and unplug the machine before beginning any of the procedures in this section.

Original Feed Unit



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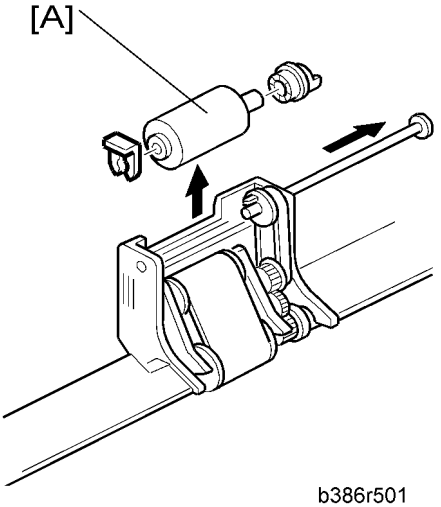
1. Open the left cover.
2. Detach the paper feed unit [A] by sliding it toward the front of the machine (spring-loaded side) and then lifting the far side.

Pick-Up Roller



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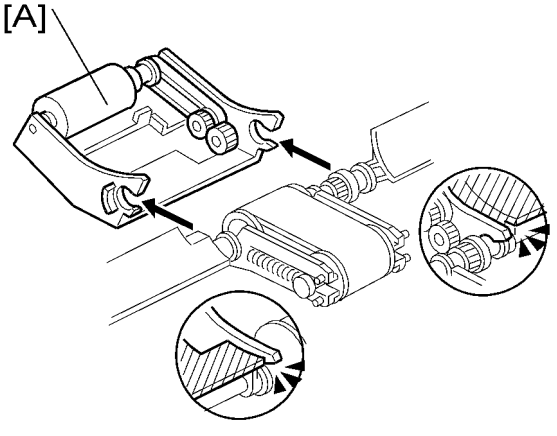
1. Remove the original feed unit.
2. Replace the pick-up roller [A] (1 snap ring).

Feed Belt



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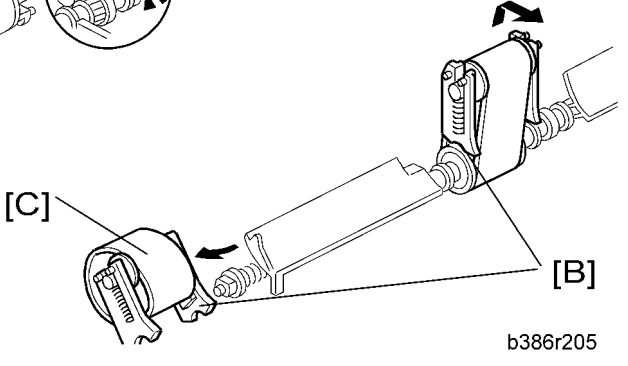

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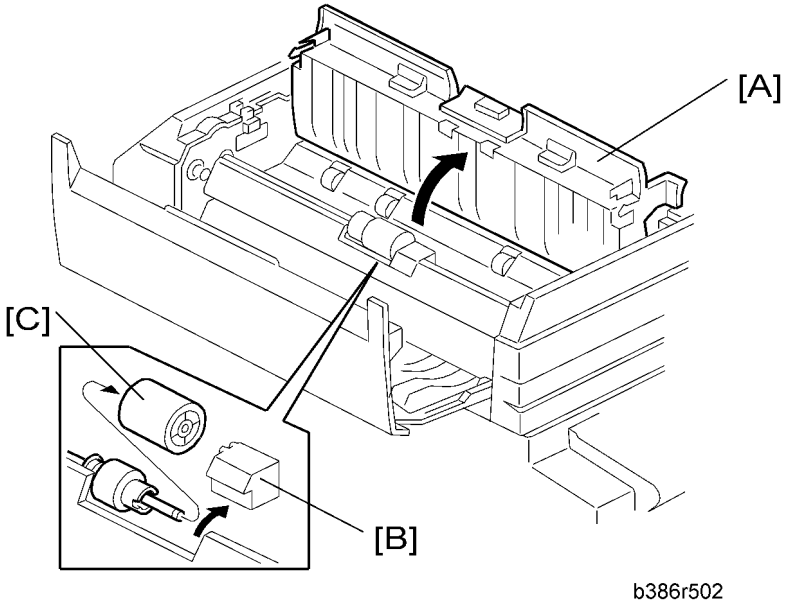
1. Remove the original feed unit.

2. Open the paper feed guide [A].
3. Remove the belt holders [B].
4. Replace the feed belt [C].

Separation Roller



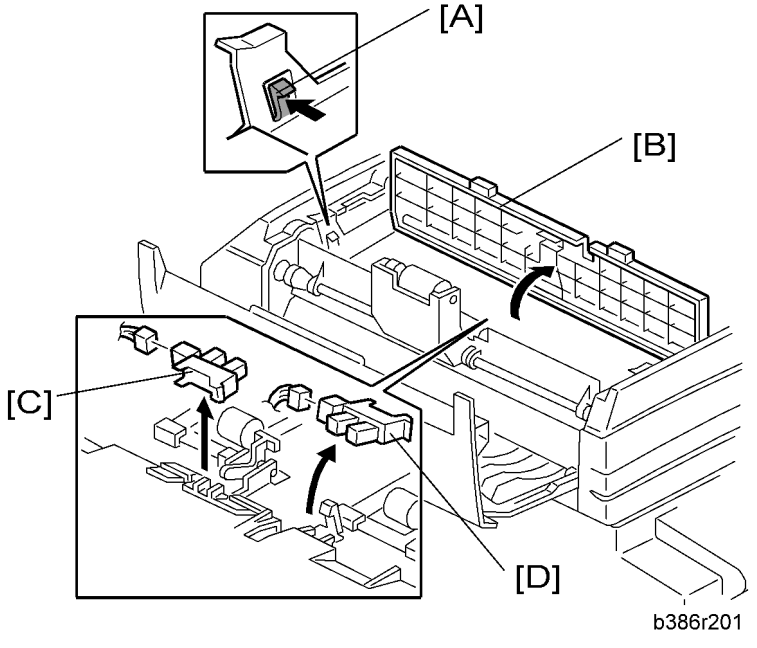
1. Lift the original feed guide [A].
2. Remove the separation roller cover [B].
3. Replace the separation roller [C].

Electrical Components

⚠CAUTION

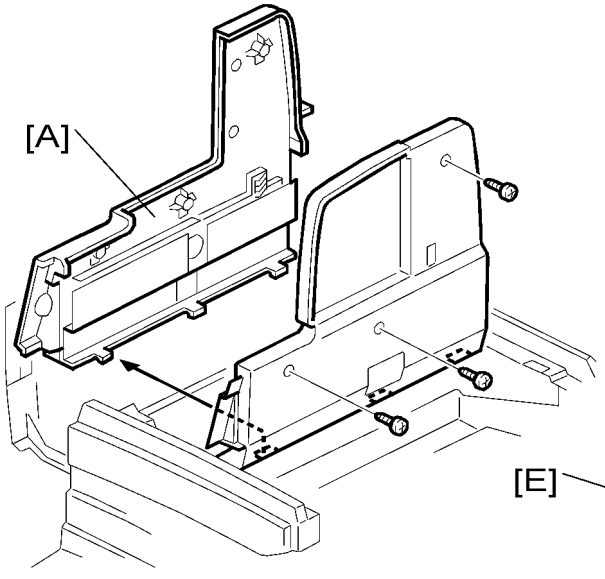
- Turn off the main power switch and unplug the machine before beginning any of the procedures in this section.

Original Set/Original Reverse Sensor



1. Open the left cover.
2. While pushing the left and right pawls [A], open the original feed guide plate [B].
3. Remove the original set sensor [C] (☞ x 1).
4. Remove the original reverse sensor [D] (☞ x 1).

Original Size Sensor



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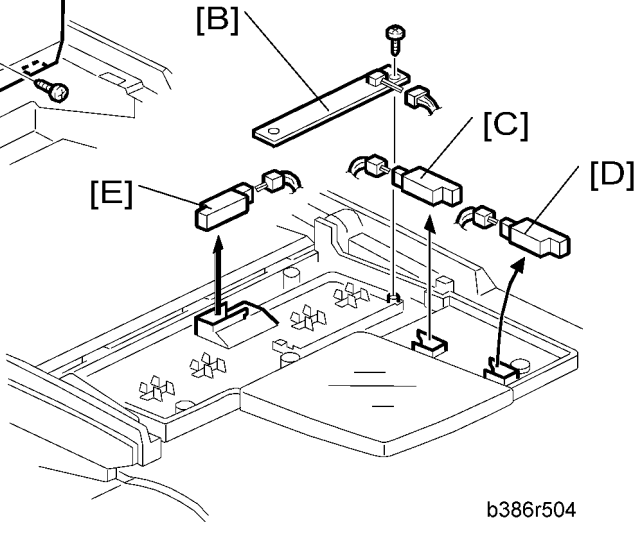
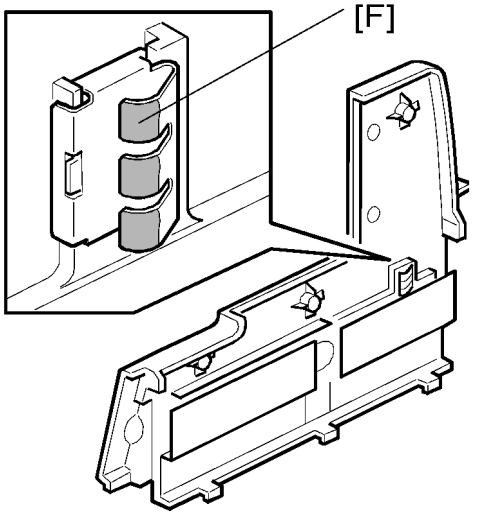


b386r504

1. Open the original table [A].
2. Remove the upper part of the table (3 x).
3. Replace the width sensor board [B], length sensor (–1 [C] and –2 [D]) and trailing edge sensor [E] (x 1 each).



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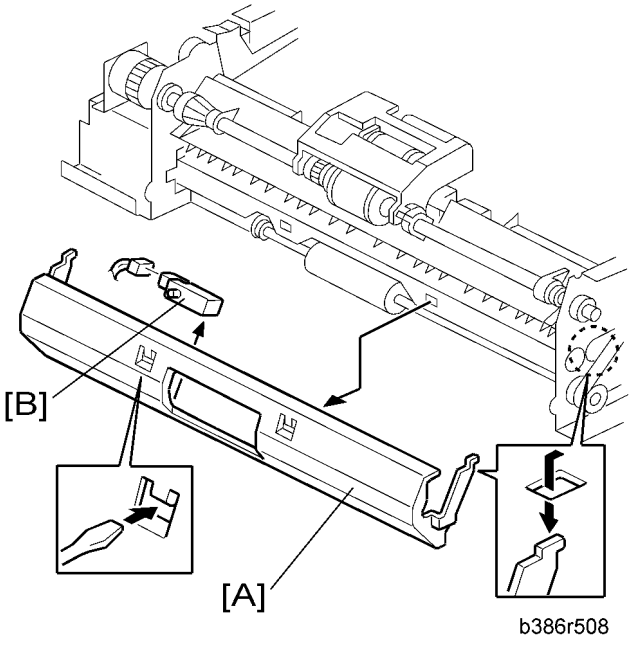
Note

- To ensure proper detection of paper size, after wiping off the sensor board and terminal plate with a dry cloth (or cloth with alcohol), apply silicone grease (KS-660) to the terminal plate [F].

Registration Sensor



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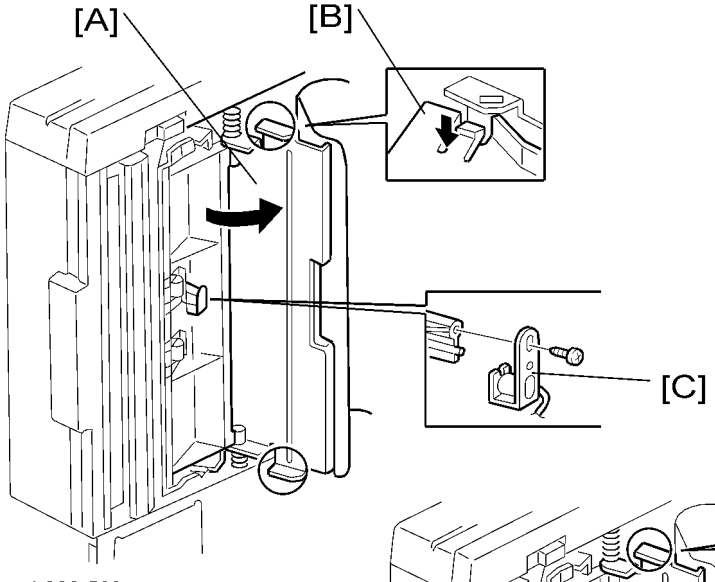
1. Remove the front and rear covers.
2. Remove the transport guide plate [A].
3. Replace the registration sensor [B] (x 1).

Stamp Solenoid and Original Exit Sensor



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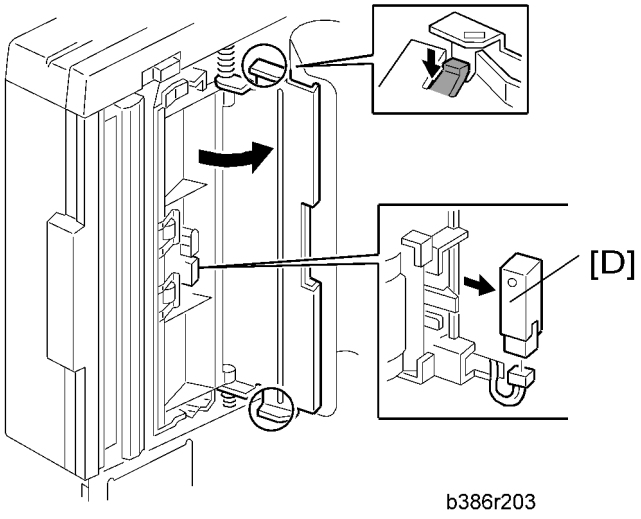


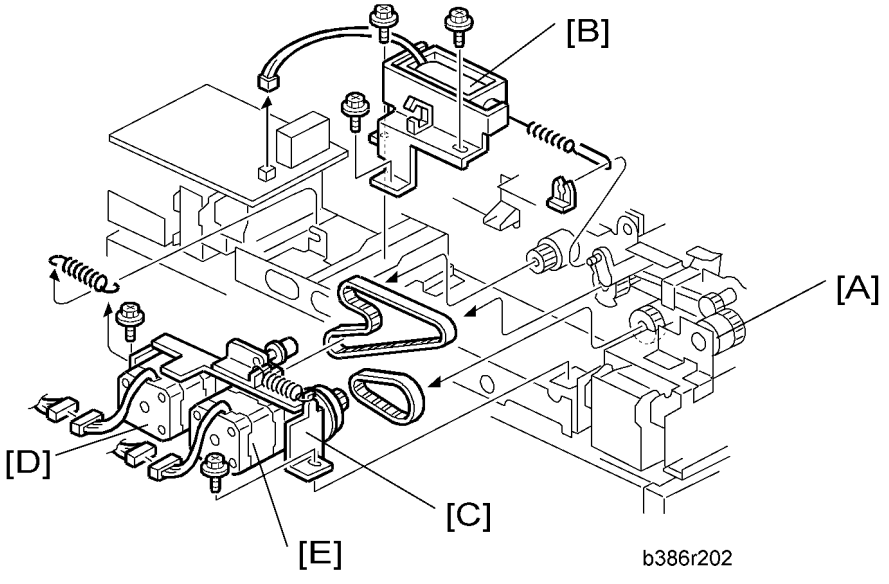
b386r203

1. Remove the rear cover (1 connector). Also remove the upper cover (the exit tray).
2. Open the exit guide plate [A]. Next, detach the unit by inserting a screwdriver or other tool into one of the small openings [B] on either side of the guide plate holder and pushing firmly.
3. Remove the stamp solenoid [C] (1 x , x 1).
4. Remove the original exit sensor [D] (x 1).

Original Feed Drive

⚠CAUTION

- Turn off the main power switch and unplug the machine before beginning any of the procedures in this section.



First remove the rear cover. Then follow the instructions below for each part replacement:

DF Feed Clutch

1. Replace the DF feed clutch [A] (1 E-ring, 1 x).

Pick-up Solenoid

1. Replace the pick-up solenoid [B] (3 x , 1 snap ring, 1 x).

Transport Motor

1. Remove the bracket [C] (2 x).
2. Replace the transport motor [E] (2 x , 1 x).

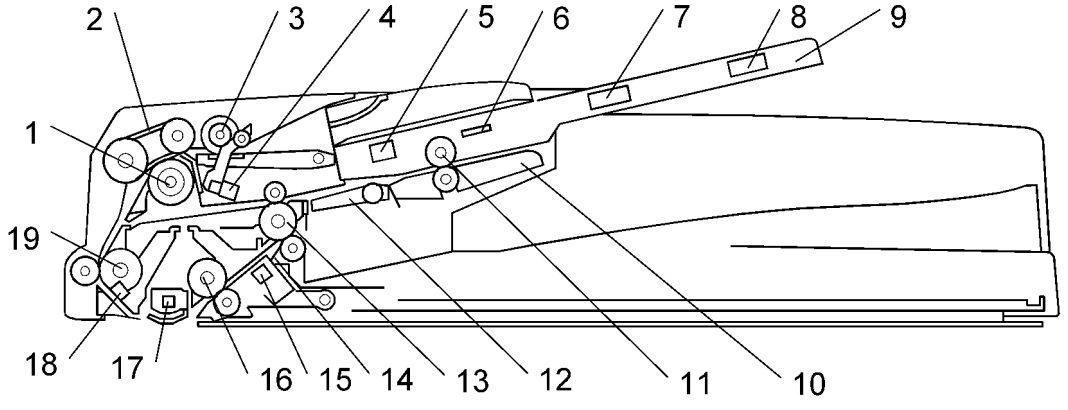
DF Feed Motor

1. Remove the bracket [C] (2 x).
2. Replace the DF feed motor [D] (2 x , 1 x).

2. Detailed Section Descriptions

Component Layout

Mechanical Component Layout



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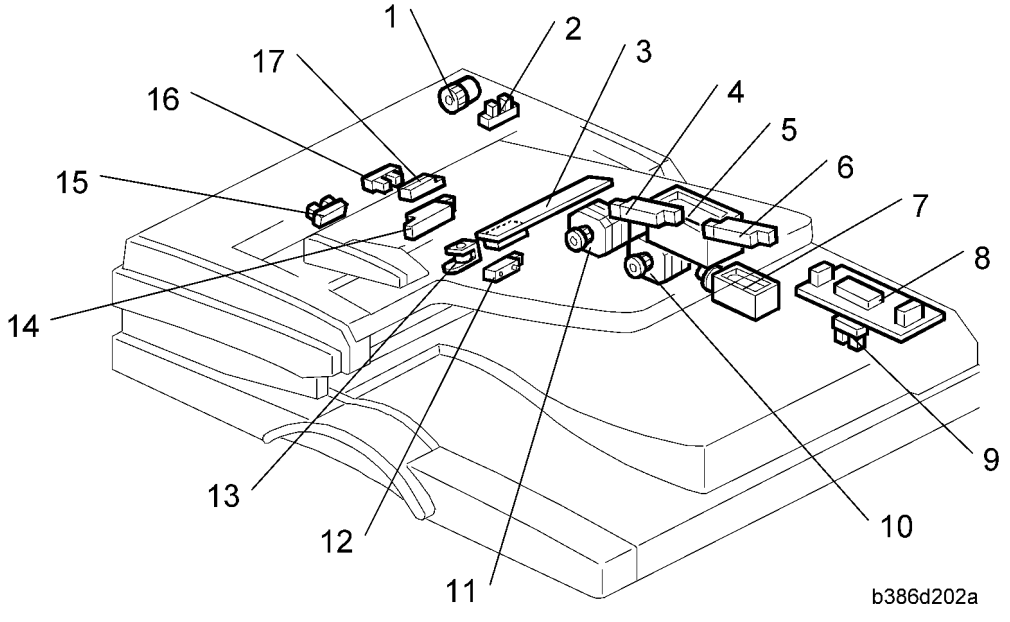
1. Separation Roller	11. Reverse Roller
2. Paper Feed Belt	12. Junction Gate
3. Pick-up Roller	13. Exit Roller
4. Original Set Sensor	14. Original Exit Sensor
5. Original Trailing Edge Sensor	15. Stamp
6. Original Width Sensor Board	16. 2nd Transport Roller
7. Original Length Sensor 1	17. Original Exposure Guide
8. Original Length Sensor 2	18. Registration Sensor
9. Original Table	19. 1st Transport Roller
10. Reverse Table	

Electrical Component Layout



1. DF Feed Clutch 2. Feed Cover Sensor 3. Original Width Sensor Board 4. Original Length Sensor 1 5. DF Pick-up Solenoid 6. Original Length Sensor 2 7. Junction Gate Solenoid 8. DF Drive PCB 9. DF Position Sensor	10. DF Feed Motor 11. DF Transport Motor 12. Original Exit Sensor 13. Stamp Solenoid 14. Original Trailing Edge Sensor 15. Original Set Sensor 16. Original Reverse Sensor 17. Registration Sensor

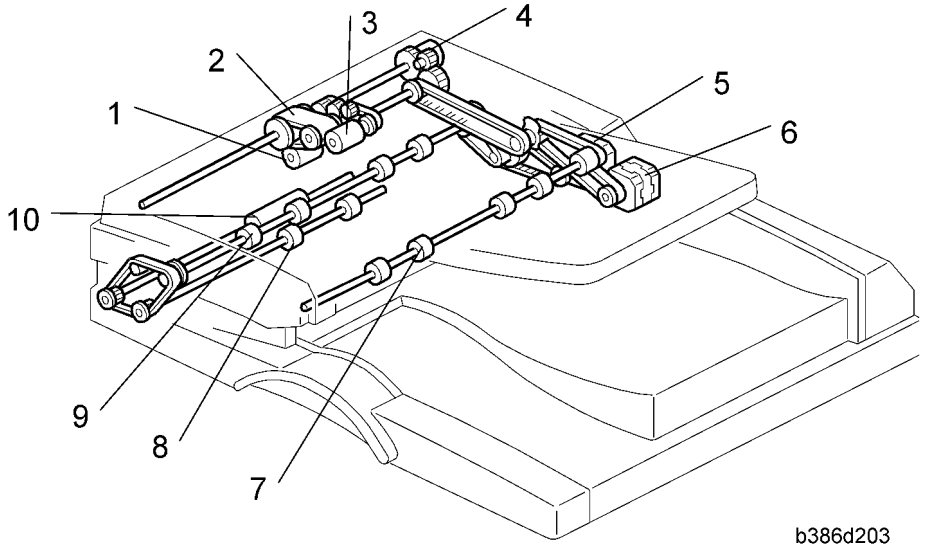
Electrical Component Description

Symbol	Name	Function	Index No.
Motors			

M1	DF Feed	Drives the feed belt, separation, pick-up, and reverse table rollers.	10
M2	DF Transport	Drives the transport and exit rollers	11
Sensors			
S1	DF Position	Detects whether the DF is lifted or not.	9
S2	Registration	Detects the leading edge of the original to turn off the DF feed and transport motors, detects the original exposure timing, and checks for original misfeeds.	17
S3	Feed Cover Open Sensor	Detects whether the feed-in cover is opened or not.	2
S4	Original Width Sensor Board	Detects the original width.	3
S5	Original Length - 1	Detects the original length.	4
S6	Original Length - 2	Detects the original length.	6
S7	Original Set	Detects if an original is on the feed table.	15
S8	Original Exit	Detects the leading edge of the original to turn on the junction gate solenoid and checks for original misfeeds. Detects the trailing edge of the original to turn off the transport and feed motor and junction gate solenoid. In single-sided mode, used to detect original misfeeds.	12
S9	Original Trailing Edge	Detects the trailing edge of the last original to stop copy paper feed and to turn off the transport motor, and checks for original misfeeds.	14
S10	Original Reverse Sensor	Detects when the original is fed from the reverse area during duplex scanning.	16
Solenoids			
SOL1	DF Pick-up	Controls the up-down movement of the original table.	5
SOL2	Stamp	Energizes the stamper to mark the original.	13
SOL3	Junction Gate	Opens and closes the junction gate.	7
Clutches			

MC1	DF Feed	Transfers transport motor drive to the pick-up roller and feed belt.	1
PCBs			
PCB1	DF Drive	Interfaces the sensor signals with the copier, and transfers the magnetic clutch, solenoid and motor drive signals from the copier.	8

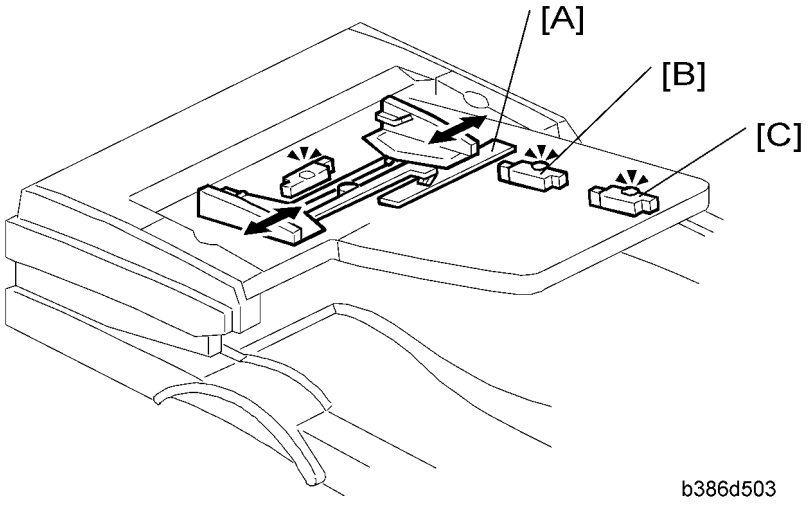
Drive Layout



1. Separation Roller	6. DF Feed Motor
2. Original Feed Belt	7. Reverse Table Roller
3. Pick-up Roller	8. 2nd Transport Roller
4. DF Feed Clutch	9. Exit Roller
5. DF Transport Motor	10. 1st Transport Roller

Overview

Original Size Detection



The original size detection mechanism consists of the original width sensor board [A] and two original length sensors-1 [B] and -2 [C]. Based on the combined output of the length sensors and the width sensor board, the machine can detect the size of the original. This integrated detection mechanism is detailed in the table on the next page.

Note that the width sensor's terminal plate is attached to the original guide, so the widths of the originals must all be the same.

	NA	EU	Original Width-1	Original Width-2	Original Width-3				Original Length-1	Original Length-2
					P4	P3	P2	P1		
A3 (297 x 420)	✗	❍	L	L	ON	–	–	–	ON	ON
B4 (257 x 364)	✗	❍	L	H	–	ON	–	–	ON	ON
A4 (Lengthwise) (210 x 297)	✗	❍	H	L	–	–	ON	–	ON	–
A4 (297 x 210) (Sideways)	✗	❍	L	L	ON	–	–	–	–	–
B5 (182 x 257)	✗	❍	H	H	–	–	–	ON	ON	–

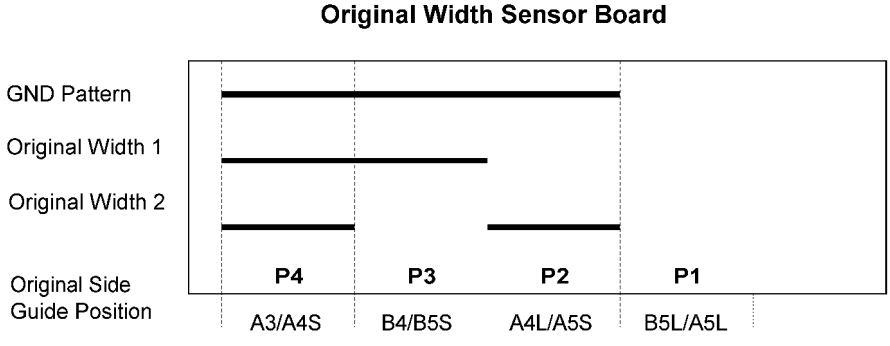
(Lengthwise)										
B5 (257 x 182) (Sideways)	✗	❍	L	H	—	ON	—	—	—	—
A5 (148 x 210) (Lengthwise)	✗	✗	H	H	—	—	—	ON	—	—
A5 (210 x 148) (Sideways)	✗	❍	H	L	—	—	ON	—	—	—
11" x 17" (DLT)	❍	✗	L	L	ON	—	—	—	ON	ON
11" x 15"	❍	✗	L	L	ON	—	—	—	ON	ON
10" x 14"	❍	✗	L	H	—	ON	—	—	ON	—
8.5" x 14" (LG)	❍	✗	H	L	—	—	ON	—	ON	—
8.5" x 13" (F4)	✗	❍	H	L	—	—	ON	—	ON	—
8" x 13" (F)	❍	❍	H	L	—	—	ON	—	ON	—
8.5" x 11" (Lengthwise)	❍	✗	H	L	—	—	ON	—	ON	—
8.5" x 11" (Sideways)	❍	✗	L	L	ON	—	—	—	—	—
10" x 8" (Lengthwise)	❍	✗	L	H	—	ON	—	—	ON	—
5.5" x 8.5" (Lengthwise) (HLT)	❍	✗	H	H	—	—	—	ON	—	—
5.5" x 8.5" (Sideways) (HLT)	❍	✗	H	L	—	—	ON	—	—	—

Key

✗: No, ❍: Yes
ON: Paper present
NA: North America, EU: Europe

Note

- P1-P4 represent the four positions on the width sensor board. ON indicates the presence of the terminal plate in a given position. "Original Width-1" and "Original Width-2" are the outputs from the sensor board to the DF main board. The state of these outputs (L or H) depends on the position of the terminal plate on the sensor board (P1, P2, P3, or P4). For example, if the terminal plate is at P4, both outputs are L.
- A reading of "L" on either of the width sensor outputs indicates that the terminal plate is connecting the GND pattern with the width sensor output signal line.
- The machine cannot detect more than one size of originals in the same job.



Mixed Original Size Mode

This section explains what happens when the user selects mixed original size mode.

Because this ADF is a sheet-through document feeder, the method for original document width detection is the same as when the originals are the same size, but the document length detection method is different. Therefore, the scanning speed is slightly slower.

Document length detection

From when the registration sensor switches on until it switches off, the CPU counts the transport motor pulses. The number of pulses determines the length of the original.

Feed-in cycle

When the original size for the copy modes listed below cannot be determined, the image cannot be correctly scaled (reduced or enlarged) or processed until the original's length has been accurately detected. The length must be determined before the image is scanned.

- Auto Reduce/Enlarge
- Centering
- Erase Center/Border
- Booklet
- Image Repeat

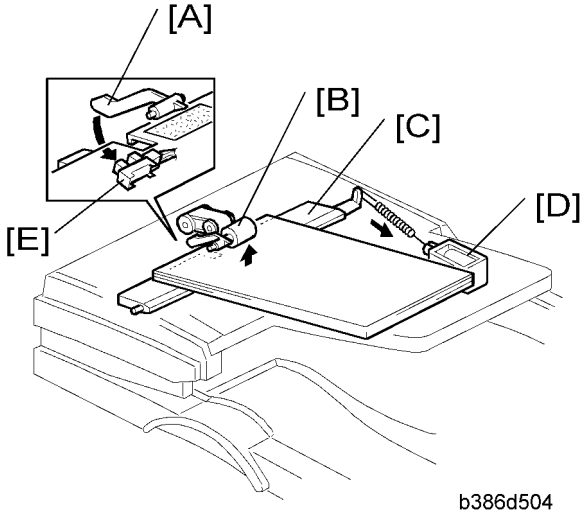
The originals follow this path:

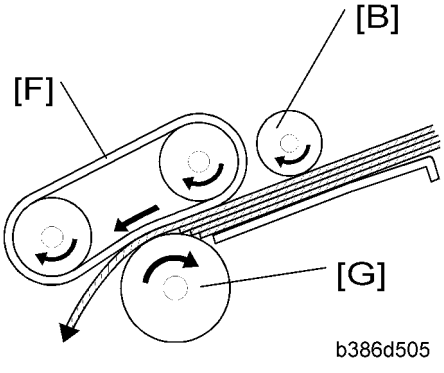
1. Length detection ➜ Scanning glass ➜ Inverter table
2. Inverter table ➜ Scanning glass ➜ Inverter table (restores the original order)
3. Inverter table ➜ Scanning glass (image scanned) ➜ Exit tray

Normal feed-in

In a copy mode other than those listed above, when the reduction/enlargement ratio has been determined, the originals are scanned normally. In order to store the scanned images, a large area of memory (the detected original width x 432 mm length) is prepared. Next, only the portion of the image up to the detected original length is read from memory and printed.

Pick-Up and Separation





The original is set with the image facing up. The original pushes actuator [A] and the original set sensor [E] is activated.

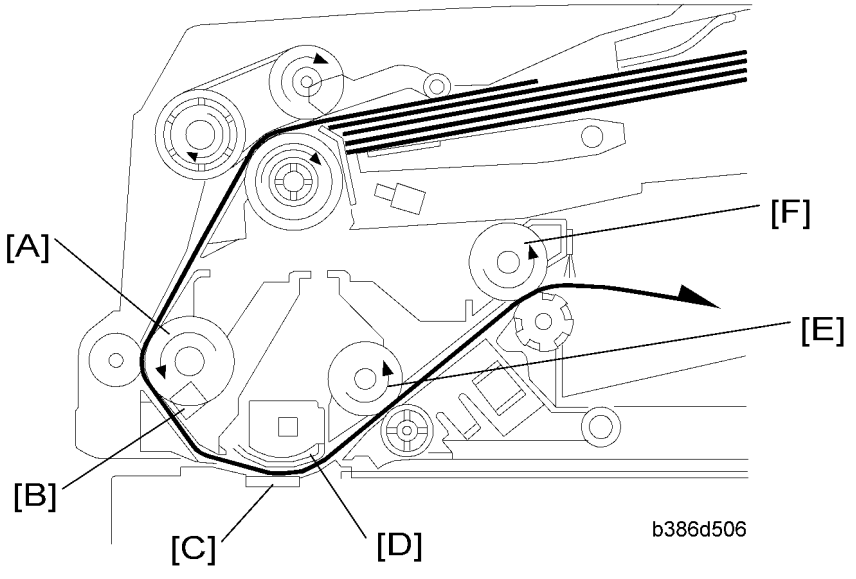
After pressing the start button, the pick-up solenoid [D] is activated and the lift plate [C] lifts the original up until it comes in contact with the pick-up roller [B]. The pick-up roller then feeds the top sheet of paper.

After being fed from the pick-up roller, the topmost sheet is separated from the stack by the separation roller and sent to the first transport roller.

The mechanism is an FRR system, consisting of the original feed belt [F] and separation roller [G].

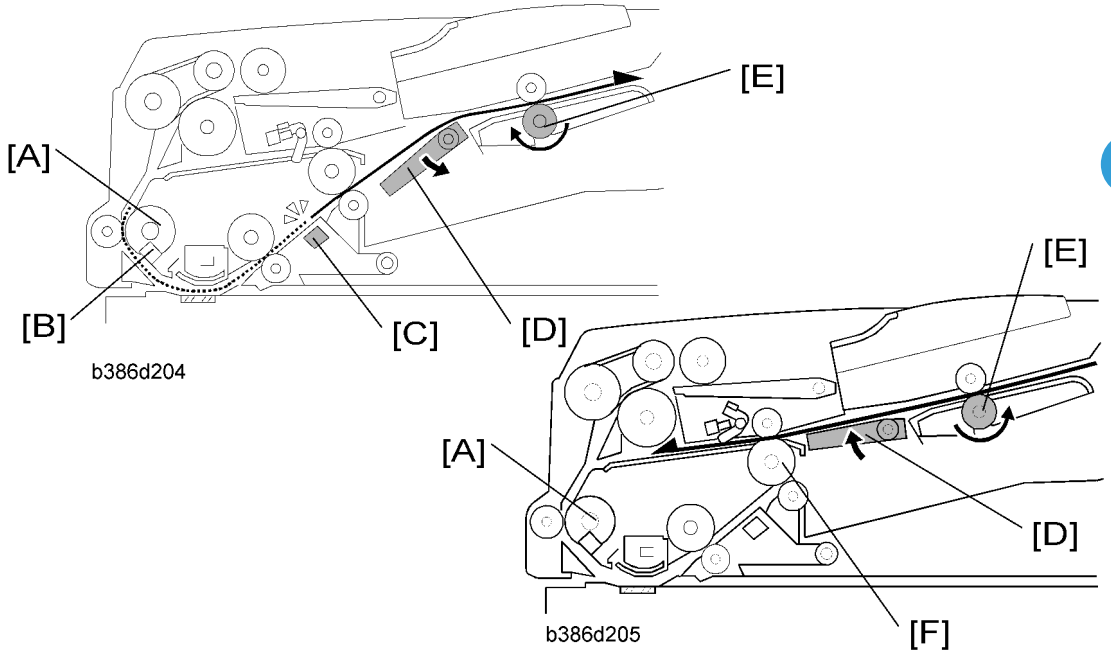
Original Transport and Exit

Single-Sided Originals



The DF feed motor feeds the separated original to the first transport roller [A] at maximum speed. When the registration sensor [B] detects the leading edge, the motor stops for a short while. Then the feed and transport motors turn on again, and feed the original through scanning area at a lower speed (the scanning area contains the original exposure guide [D] and DF exposure glass [C]). After scanning, the original is fed out by the second transport roller [E] and exit roller [F].

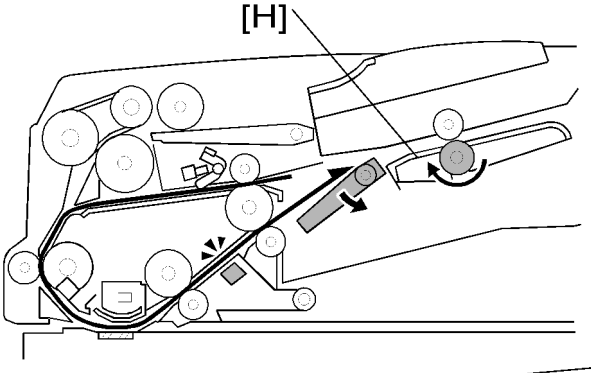
Double-Sided Originals



When the registration sensor [B] detects the leading edge of the original, the DF feed motor (which drives the feed roller) and transport motor (which drives the transport roller) both switch off. After a brief interval, the transport motor alone reactivates to drive the first [A] and second transport roller [G] and the exit roller [F]. The front side of the original is then scanned.

When the original exit sensor [C] detects the leading edge of the original, the junction gate solenoid is activated and the junction gate [D] opens. The original is then transported towards the reverse table [H].

Soon after the trailing edge of the original passes the exit sensor [C], the junction gate solenoid switches off and the junction gate [D] is closed. When the original has been fed onto the reverse table, the DF feed motor switches on in reverse. The original is then fed by the reverse roller [E] and then by the exit roller [F] and first transport roller [A] to the scanning area (where the reverse side will be scanned).



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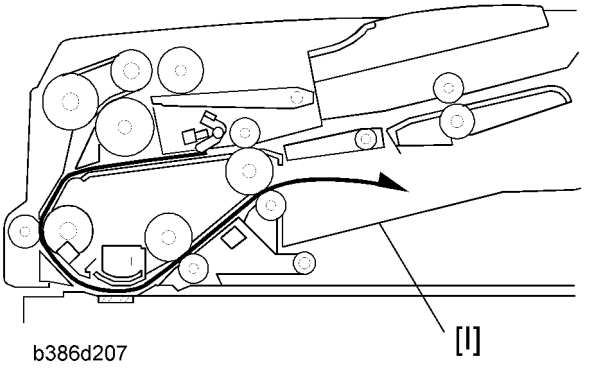

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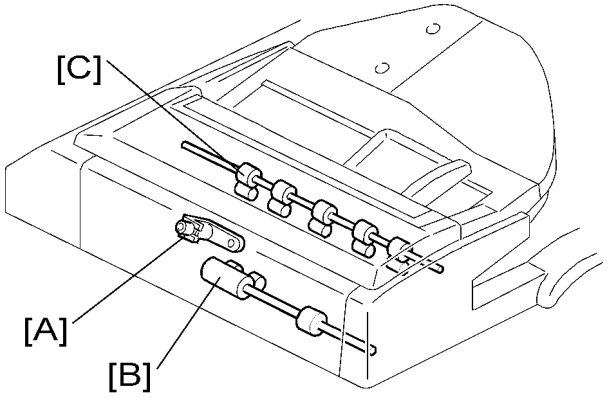
The original is then sent to the reverse table [H] a second time to be turned over. This is done so that the duplex copies will be properly stacked front side down in the exit tray [I] in the correct order.

Original Trailing Edge Sensor

During one-to-one copying, copy paper is fed to the registration roller in advance (while the original is still being scanned), to increase the copy speed. The trailing edge sensor monitors the stack of originals in the feeder, and detects when the trailing edge of the last page has been fed in. The main CPU then stops the copier from feeding an unwanted extra sheet of copy paper.

Stamp



This function is only for fax mode.

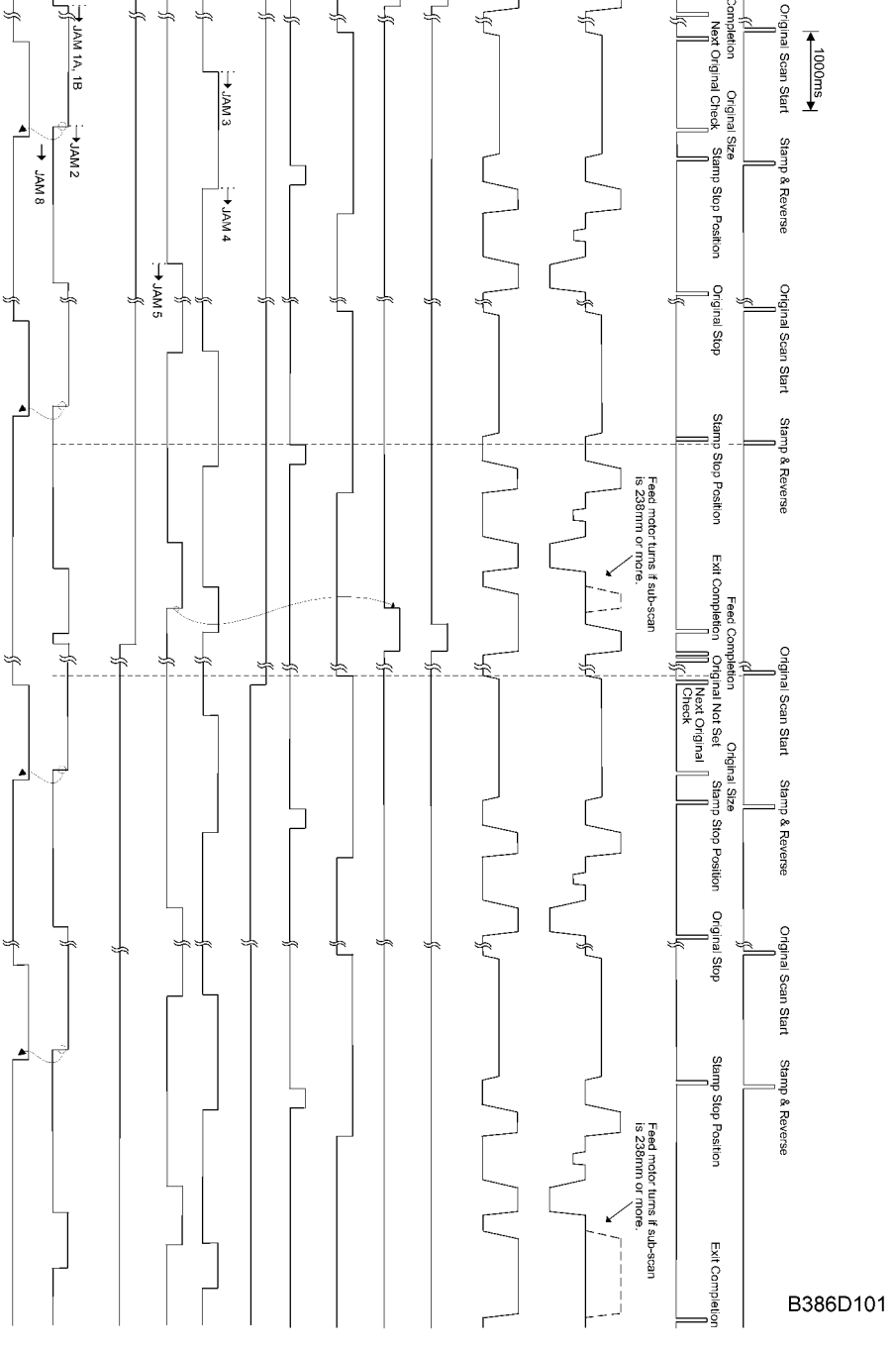
There is a stamp [A] between the 2nd transport roller [B] and the exit roller [C], and its solenoid is controlled by the copier directly.

When the original reaches the stamp position, the DF feed motor stops. At 300 milliseconds after stopping the DF feed motor, the stamp solenoid turns on if the page was sent successfully (immediate transmission) or stored successfully (memory transmission). After stamping, the DF feed motor starts again to feed out the document, and its speed is about 1.3 times the normal speed.

The stamping position on the original can be changed by adjusting SP6-010.

Timing Chart

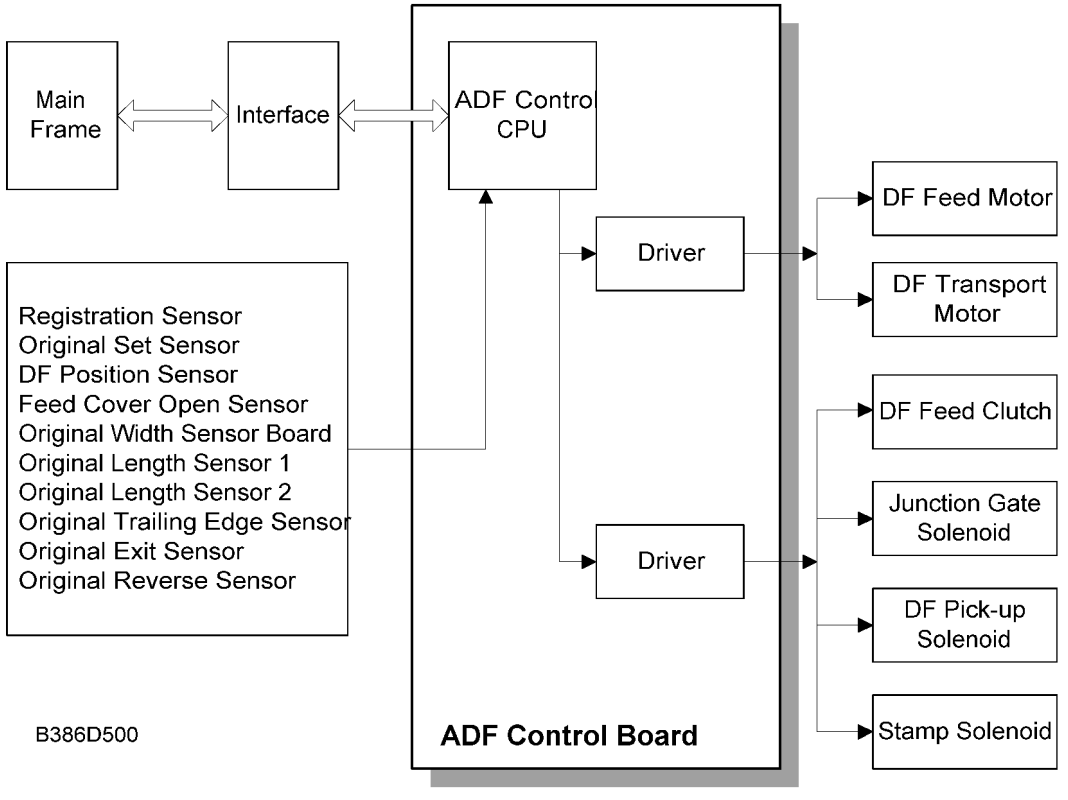
LT Sideways Stamp Mode (Double-Sided Original Mode)


1000ms
Original Feed
Original Scan Start
Stamp & Reverse
Original Scan Start
Stamp & Reverse
Original Scan Start
Stamp & Reverse
RXD
Feed Completion
Original Size
Stamp Stop Position
Original Stop
Stamp Stop Position
Feed Completion
Original Size
Stamp Stop Position
Original Stop
Stamp Stop Position
Original Set Size Code
Next Original Check
Original Not Set
Next Original Check
Exit Completion
TXD
Feed Motor
MAX
READ
OFF
Feed motor turns if sub-scan is 238mm or more.
Feed motor turns if sub-scan is 238mm or more.
Transport Motor
DF Feed Clutch
DF Pick-up Solenoid
Rreverse Solenoid
Stamp Solenoid
Original Set Sensor
Exit Sensor
Reverse Sensor
Trailing Edge Sensor
Registration Sensor
FGATE
ON
OFF
ENABLE
DISABLE
JAM 1A, 1B
JAM 2
JAM 8
JAM 3
JAM 4
JAM 5
B386D101

Condition of Jam Detection

JAM 1A:	If the registration sensor does not turn on within 114 mm x 2 since the feed motor started (twice the distance between the original set position and the (registration sensor).
JAM 1B:	Duplex mode only: If the registration sensor does not turn on within 161 mm x 1.5 since the feed motor started (1.5 times the distance between the original reverse position and the registration sensor).
JAM 2:	If the registration sensor does not turn off within 1260 mm x 1.1 since the feed motor started (1.1 times the distance between the paper stop position at registration and the maximum original length).
JAM 3:	If the original exit sensor does not turn on within 92 mm x 1.5 since the feed motor started (1.5 times the distance between registration sensor and exit sensor)
JAM 4:	If the original exit sensor does not turn off within original length + 120 mm since the transport motor started after the exit sensor turns on
JAM 5:	Duplex mode only: If the original reverse sensor does not turn on within 161 mm x 1.4 since the feed motor started (1.4 times the distance between the original reverse position and the registration sensor).
JAM 6:	If the feeding original is removed.
JAM 7:	If the cover is opened or the ADF is lifted while the ADF is in operation.
JAM 8:	If an area outside the maximum scannable area is selected.
JAM 9:	If scanning of the previous original is not completed when the registration sensor detects the leading edge of the current original.

Overall Electrical Circuit



The DF CPU controls the transport motor, DF feed motor, DF feed clutch, junction Gate solenoid, stamp solenoid, and pick-up solenoid. The DF CPU also monitors all DF sensors and provides updated status information when prompted at regular intervals by the mainframe, which may then take action based on this information. The DF–mainframe connection is checked automatically just after power is supplied to the mainframe.

3. Service Tables

Dip Switches

SW100				Description
1	2	3	4	
0	0	0	0	Normal operating mode (Default)
0	0	0	1	No function
0	0	1	0	Free run with two-sided original 100%
0	0	1	1	DF feed clutch operates
0	1	0	0	Free run with one-sided original 32.6%
0	1	0	1	DF pick-up solenoid operates
0	1	1	0	Motors rotate
0	1	1	1	No function
1	0	0	0	Free run with one-sided original 100%
1	0	0	1	Junction gate solenoid operates
1	0	1	0	Free run without two-sided original 100%
1	0	1	1	No function
1	1	0	0	Free run without one-sided original 100%
1	1	0	1	Stamp solenoid operates
1	1	1	0	Free run with two-sided original 32.6%
1	1	1	1	Free run without two-sided original 100%

MEMO