SERVICE MANUAL

DUPLEX UNIT

GENERAL PRECAUTIONS FOR INSTALLATION/ SERVICING/MAINTENANCE

1. When installing the Automatic duplexing unit AD470 to the equipment, be sure to follow the instructions described in the “Unpacking/Set-Up Procedure for the AD470” booklet which comes with each unit of the AD470.
2. The AD470 should be installed by an authorized/qualified person.
3. When transporting/installing the AD470, employ one person. The AD470 is fairly heavy and weights approximately 9 kg (19.8 lb.), therefore pay full attention when handing it.
4. Before starting installation, servicing or maintenance work, be sure to turn OFF and unplug the equipment first.
5. The AD470 is supplied with power from the equipment, requiring no additional power source.
6. When servicing or maintaining the AD470, be careful about the rotating or operating sections such as gears, pulleys, sprockets, cams, belts, etc.
7. When servicing the machines with the power turned ON, be sure not to touch live sections and rotating / operating sections.
8. When parts are disassembled, reassembly is basically the reverse of disassembly unless otherwise noted in this manual or other related documents. Be careful not to reassemble small parts such as screws, washers, pins, E-rings, toothed washers to the wrong places.
9. Basically, the machine should not be operated with any parts removed or disassembled.
10. Delicate parts for preventing safety hazard problems (such as thermofuses, door switches sensors, etc. if any) should be handled/installed/adjusted correctly.
11. During servicing or maintenance work, be sure to check the nameplate and other cautionary labels (if any) to see if they are clean and firmly stuck. If not, take appropriate actions.
12. Use suitable measuring instruments and tools.
13. The PC board must be stored in an anti-electrostatic bag and handled carefully using a wristband, because the ICs on it may be damaged due to static electricity.

    Caution: Before using the wrist band, pull the power cord plug of the equipment and make sure that there is no uninsulated objects in the vicinity.
14. For the recovery and disposal of used the large capacity feeder, consumable parts, packing materials, it is recommended that the relevant local regulations rules.

CONTENTS

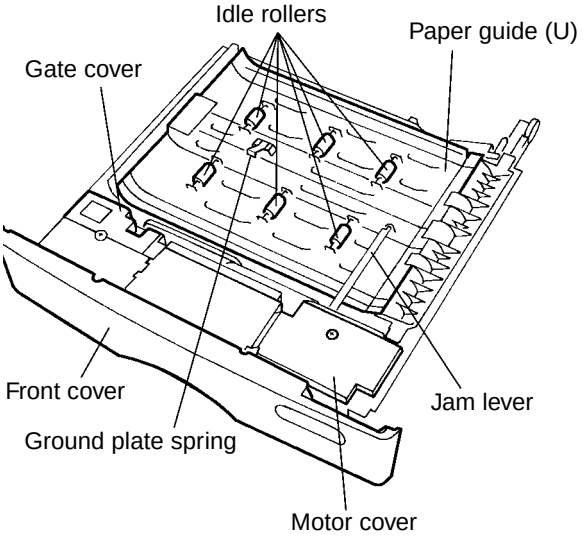
1. Specifications

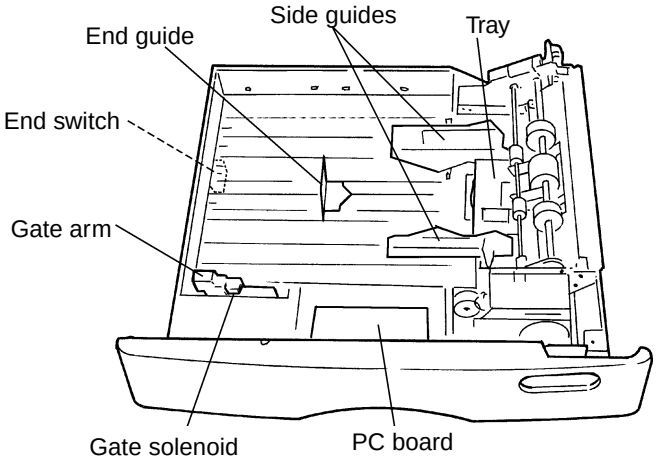
Appliance:	Automatic duplexing unit
Type:	Unit type
Function:	Feeding and stacking for duplex copying
Paper sizes:	30 sheets stackable: A3, B4, A4, B5, A5, Folio (for Europe and other areas) Ledger, Legal, Letter, Computer, Statement (for the North America)
Type of paper:	64~105 g/m^2 (17~28 lb. Bond) (sheets of paper)
Max. number of copies in multicopying:	1~30 sheets
Dimensions:	W633 x D626 x H110 mm
Weight:	Approx. 9 kg (19.8 lb.)
Power Source:	Supplied from the copier

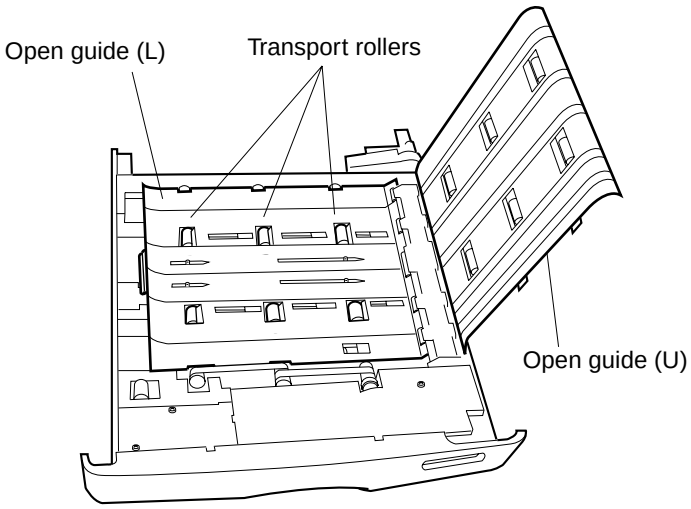
Note: Specifications are subject to change without notice.

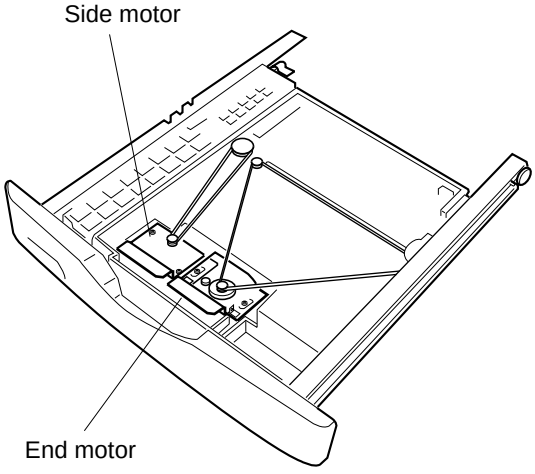
2. Names of Various Components

2.1 Front-side view

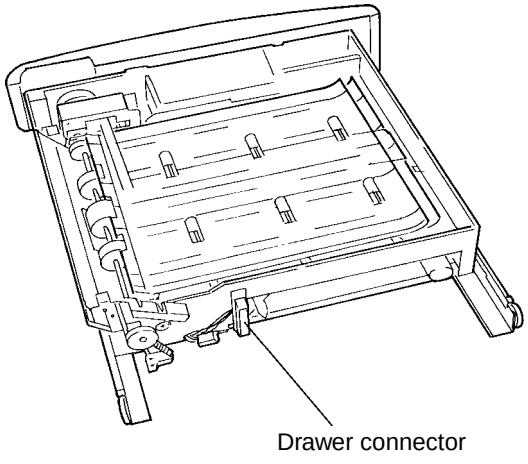




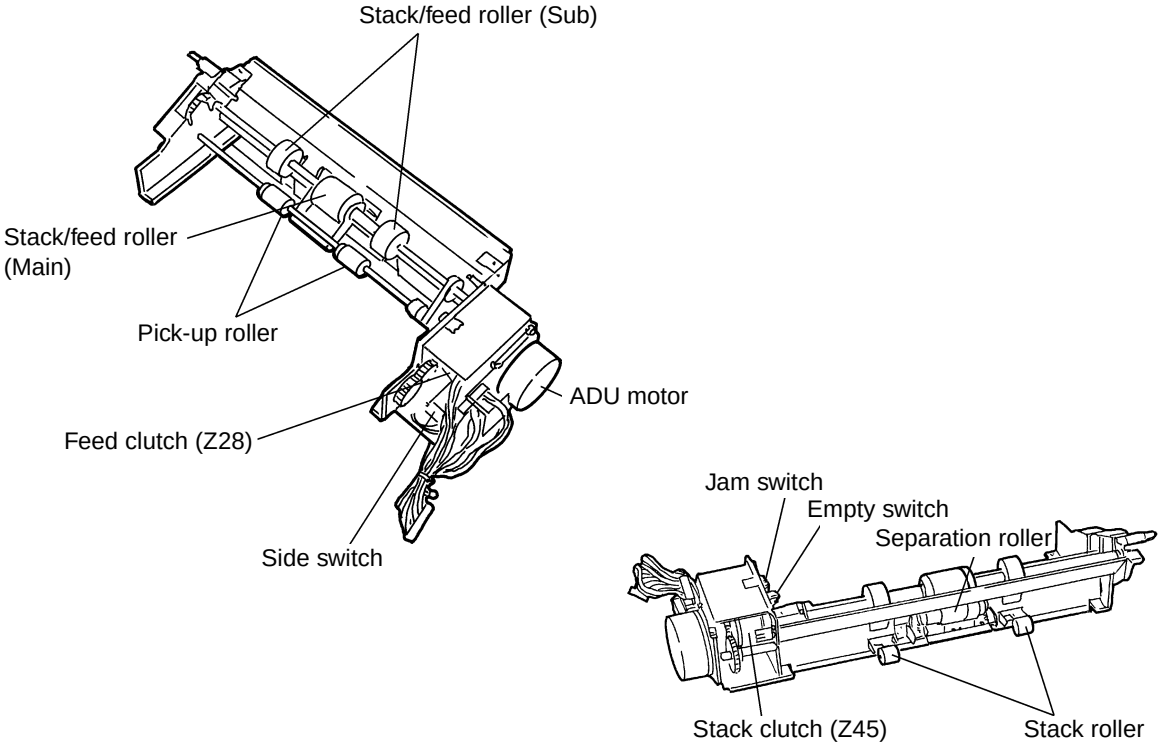




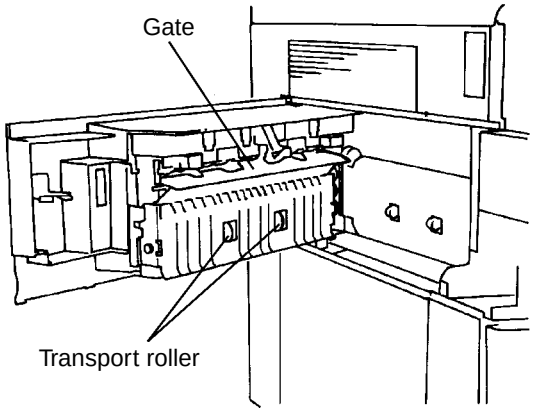
2.2 Rear-side view



2.3 Feed-side section

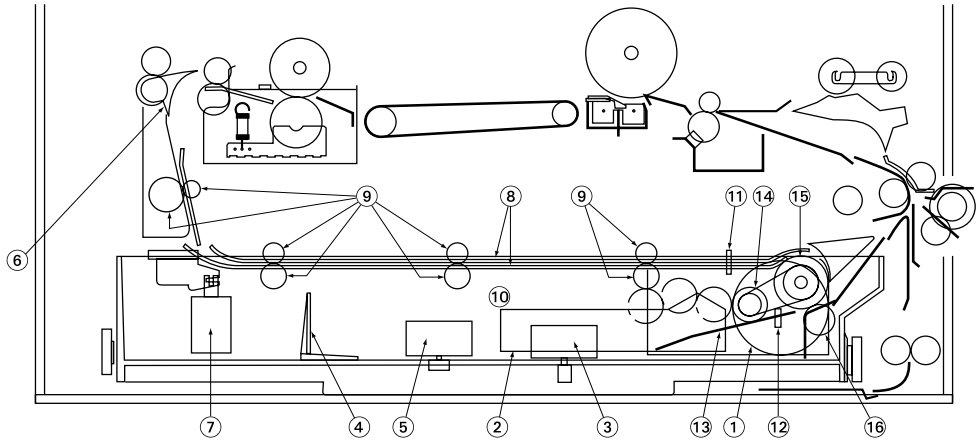


2.4 Copier's exit-side section



* According to the equipment model, this illustration may differ from the appearance.

2.5 Sectional view



[Front side]

1	ADU motor	9	Transport roller
2	Side guide	AT	Stacking section
3	Side motor	AK	Jam switch
4	End guide	AL	Empty switch
5	End motor	AM	Tray
6	EXIT/duplex unit selection gate	AN	Pickup roller
7	Gate solenoid	AO	Stack/feed roller
8	Open guide	AP	Separation roller

* According to the equipment model, this illustration may differ from the appearance.

3. Description of Operation

3.1 Paper stacking operation

When the duplex copying mode is selected and the START key is pressed on the copierís control panel, the duplex unit motor starts rotating, and the side guides and the end guide in the stacking section are moved to the positions corresponding to the selected size of paper by their respective motors. Then, the stack clutch comes on, the transport roller rotates and the EXIT/duplex unit selection gate is switched in the direction of the stacking section by the gate solenoid.

The copy paper which has discharged from the fuser is sent into the duplex unit open guide by the EXIT/duplex unit selection gate. This paper is further carried by transport rollers into the stacking section, where the paper is stacked face up. This operation is repeated until the specified number of sheets are stacked.

At the start of the stacking operation, the side guides are set with a gap of 5 mm relative to each side of the paper, and each time 5 sheets are stacked consecutively during stacking, the side guides perform a paper aligning operation.

A jam switch is provided to have paper jams in the open guide detected. The empty switch is to detect whether or not paper is present in the stacking section.

3.2 Duplex copying

After the paper stacking operation, when a back side original is set and the START key is pressed, the duplex unit motor starts rotating, causing the elevator arm to rotate. This will cause the tray positioned under the stacked sheets of paper to rise, making the sheets come into contact with the rotating pick-up roller and sending the topmost sheet out. The separation roller rotates with the feed roller. At this time, if two or more sheets are sent out, the separation roller stops rotating, causing the lower sheet(s) to stop its movement.

The sheet thus sent out is transported by the copier's transport roller to the copier's registration roller and aligned. The sheet is then copied on the side not copied previously. The sheet copied on both its sides passes through the copier's exit roller and over the EXIT/duplex unit selection gate which is already positioned in the direction of exiting, further passing through the exit roller to exit finally into the receiving tray.

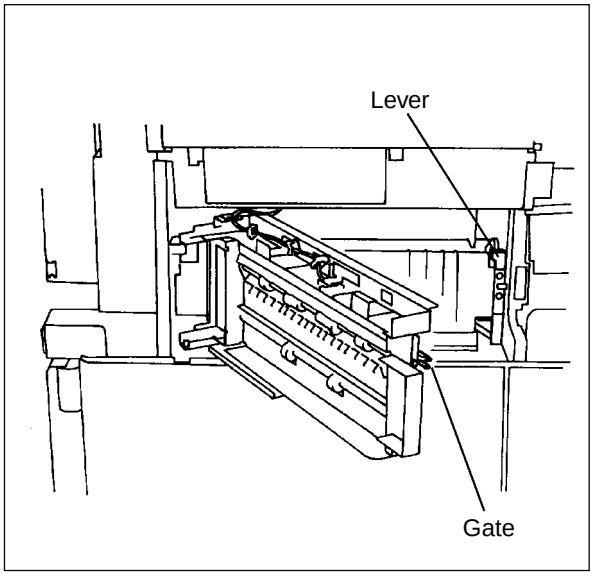
4. Drive System

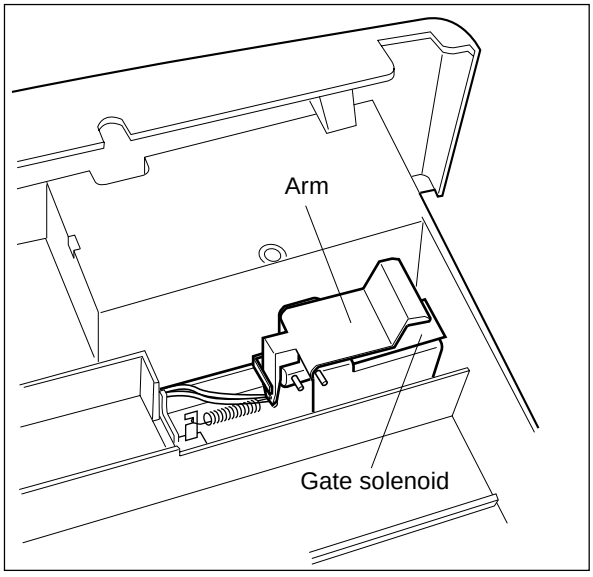
4.1 Driving of the EXIT/duplex unit gate

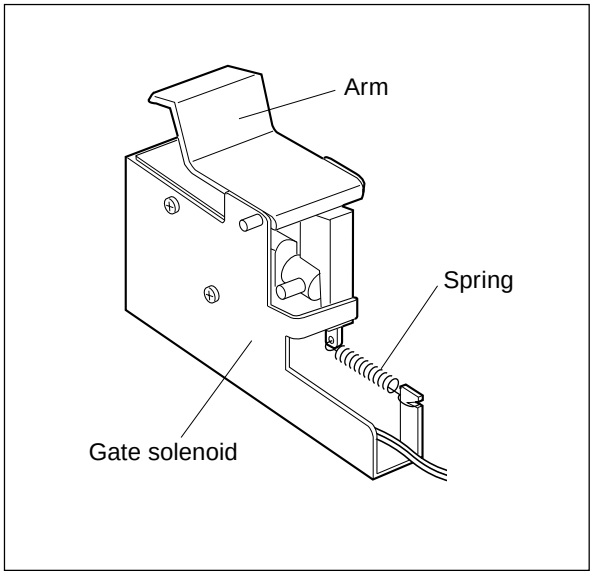
When the gate solenoid is turned on, the arm rotates and pushes up the lever, causing the gate to open. The copied sheet is then transported to the duplex unit stacking section. When the gate solenoid is turned off, the arm is pulled back to its original position by a spring, causing the gate to close, and the copied sheet will exit.

Note:

According to the equipment model, these illustrations may differ from the appearances.

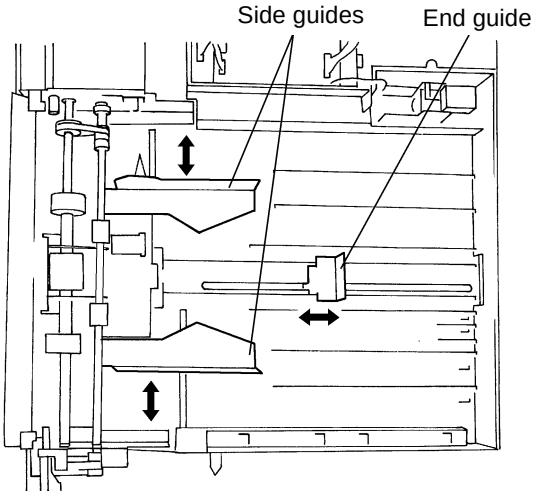


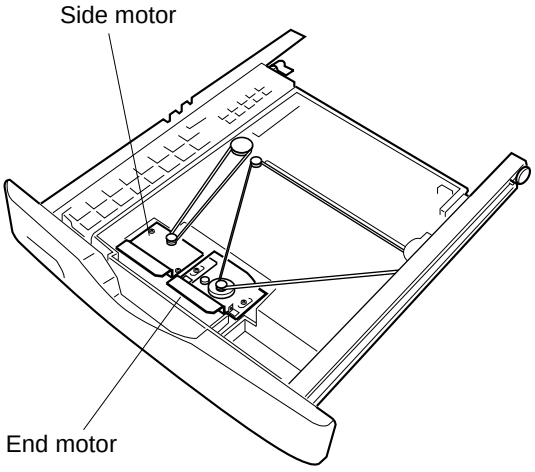




4.2 Driving of the stack guides

(1) Side guides



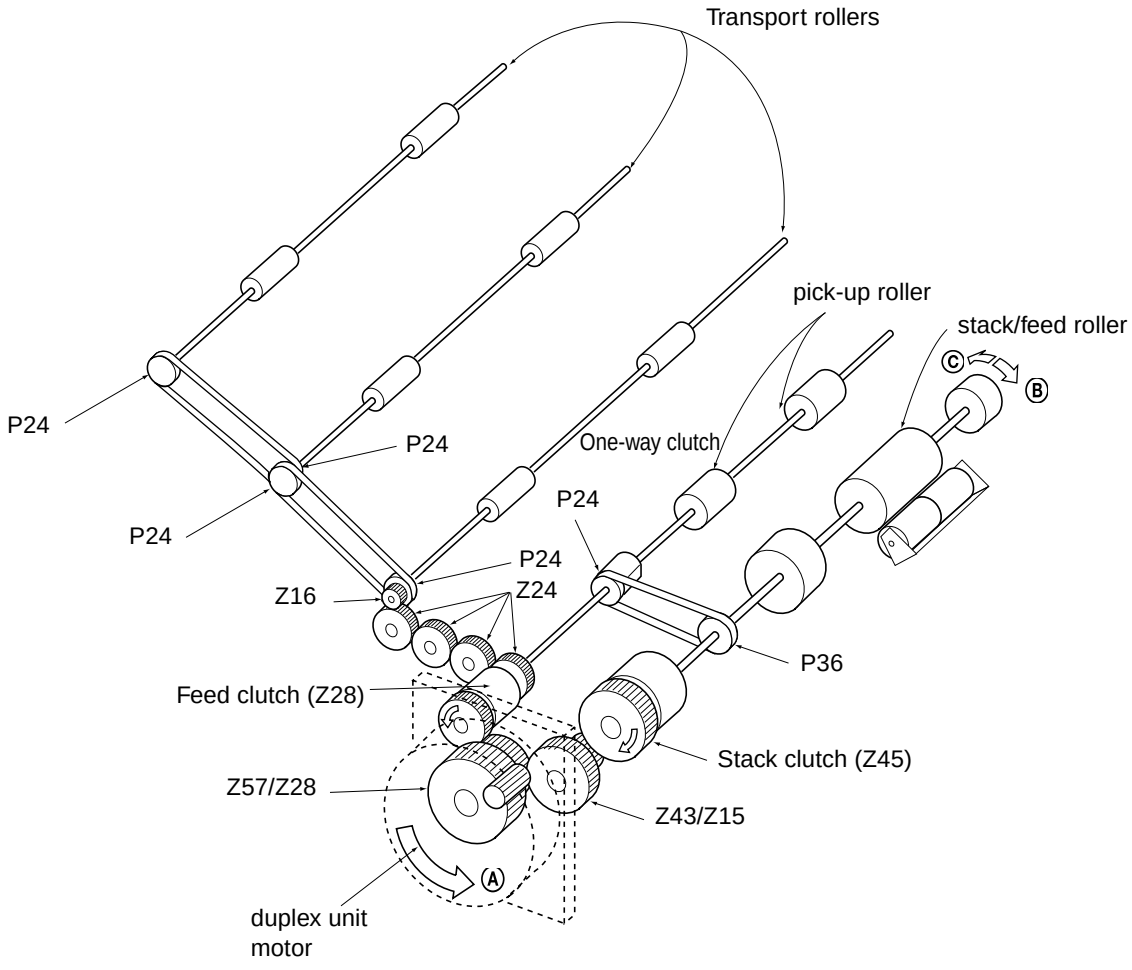


The side motor rotates corresponding to the size of paper selected, causing the side guides to move to the positions specified. In addition, each time five sheets are stacked, the side motor performs paper aligning by moving the side guides to the forward and backward.

(2) End guide

The end motor rotates corresponding to the size of paper selected, causing the end guide to move to the position specified.

4.3 Driving of the pick-up roller, feed roller and transport rollers



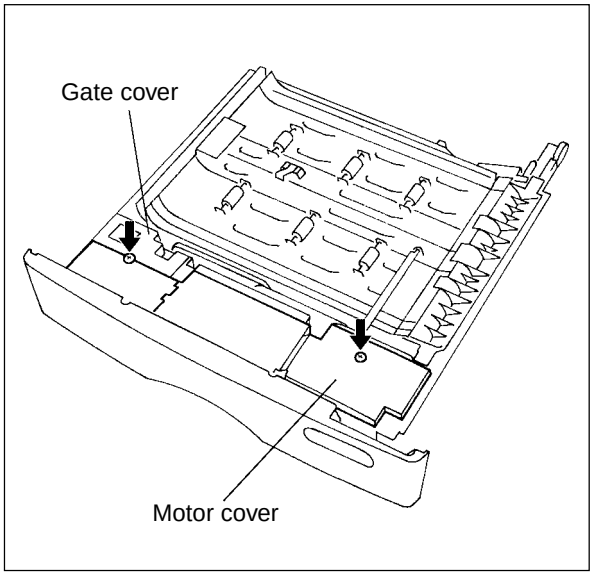
- When the duplex unit motor rotates in the direction of the arrow Ⓐ and stack clutch (Z45) turns ON, the transport rollers are rotated and the stack/feed roller is rotated in the direction of the arrow Ⓑ (in the stacking direction).
- When the duplex unit motor rotates (arrow Ⓐ) and the feed clutch (Z28) turns ON, the pick-up roller and the stack/feed roller are rotated in the feeding direction (arrow Ⓒ).
  At this time, the transport rollers do not rotate since a one-way clutch is contained inside of the gear (Z16) on the transport roller shaft.

5. Disassembly and Replacement

5.1 Removing the duplex unit covers

[A] Motor cover and gate cover

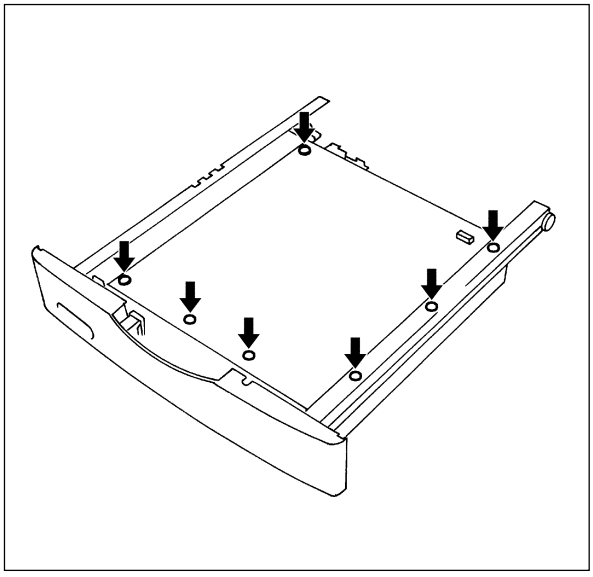
(1) Remove one screw fastening each cover.



[B] Lower cover

(1) Place the duplex unit upside down.

(2) Remove 7 screws fastening the lower cover.

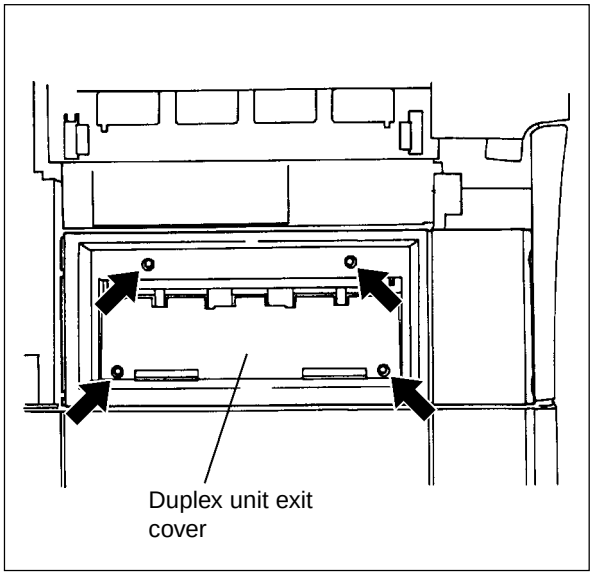


5.2 Transport system

[A] Duplex unit vertical transport roller, exit roller and EXIT/duplex unit selection gate

(1) Remove 4 screws and take off the duplex unit exit cover.

Note:
According to the equipment model, these illustrations may differ from the appearances.



(2) Remove the exit sensor's connector and clamp.
Remove the clip on the pivot shaft.
Take off the duplex unit exit unit lifting up it from the pivot shaft.

Note:
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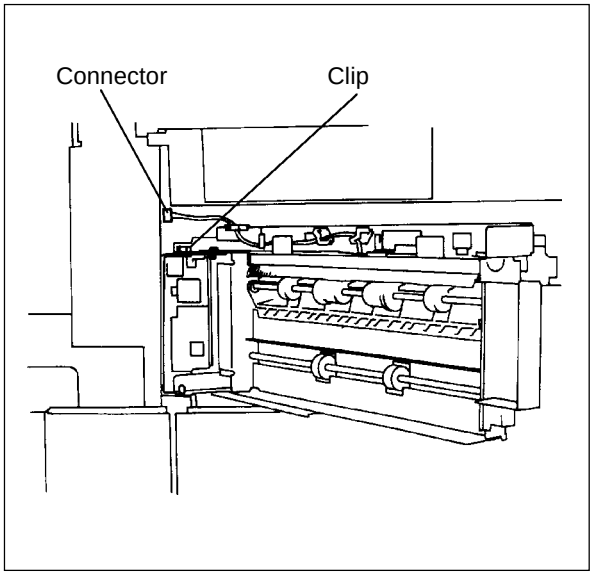
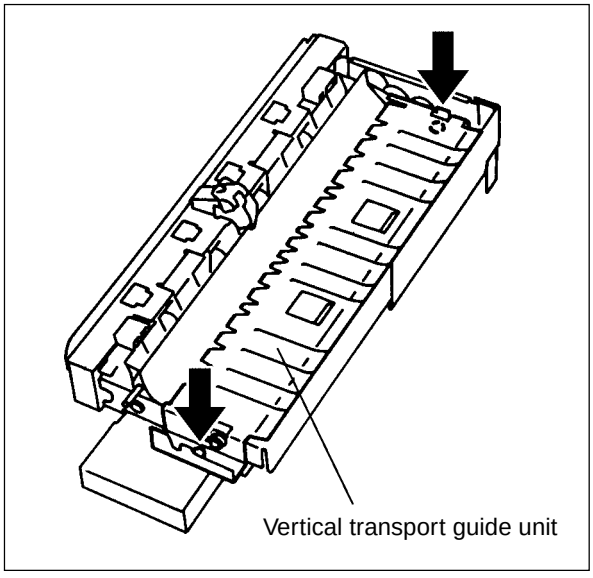
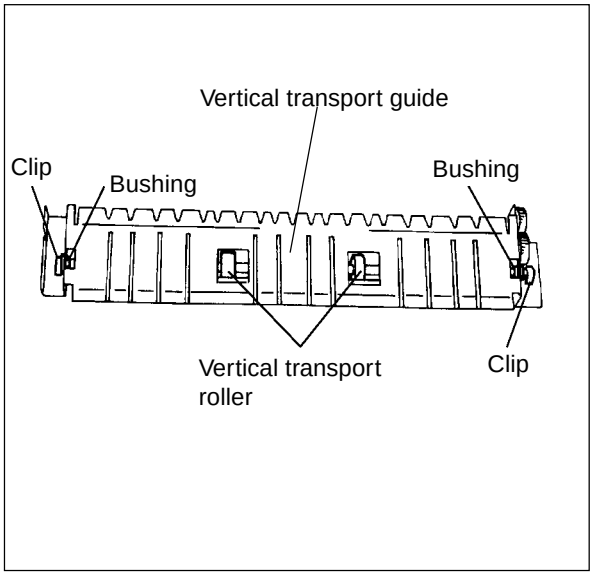


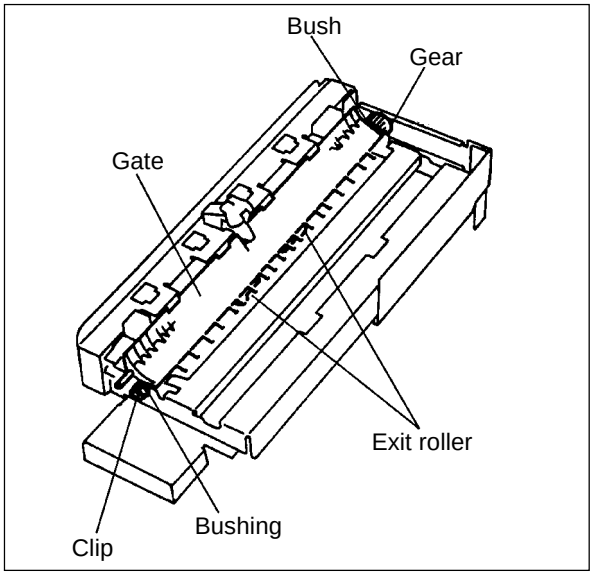
(3) Remove two screws from the duplex exit unit and remove the vertical transport guide unit.



(4) To take out the vertical transport roller, remove the clip and bushing at the front and rear.

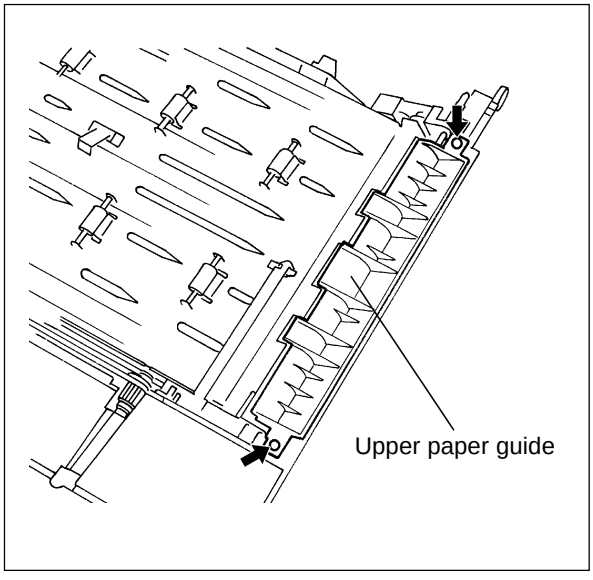


(5) To take off the EXIT/duplex unit selection gate and exit roller, remove the clip and bushing at the front, and the gear and bushing at the rear, from the exit roller of duplex exit unit whose vertical transport guide unit has already been extracted.



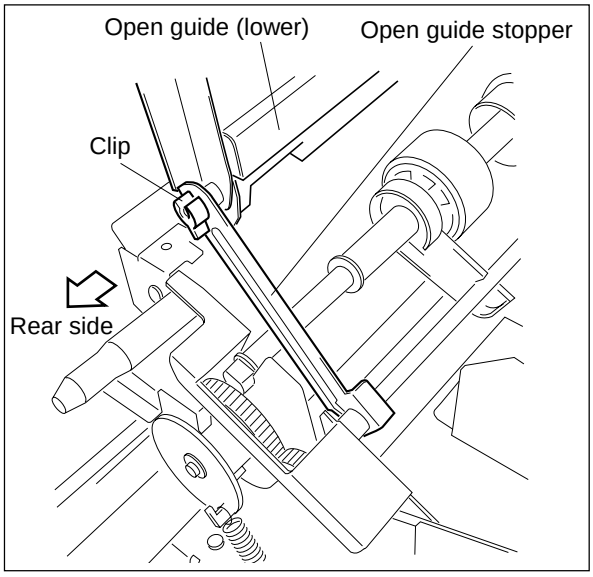
[B] Transport rollers 1, 2 and 3

(1) Take off the upper paper guide by removing two screws.

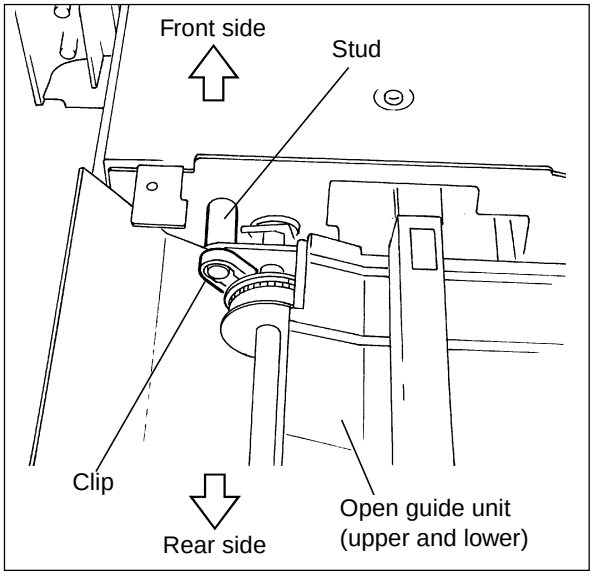


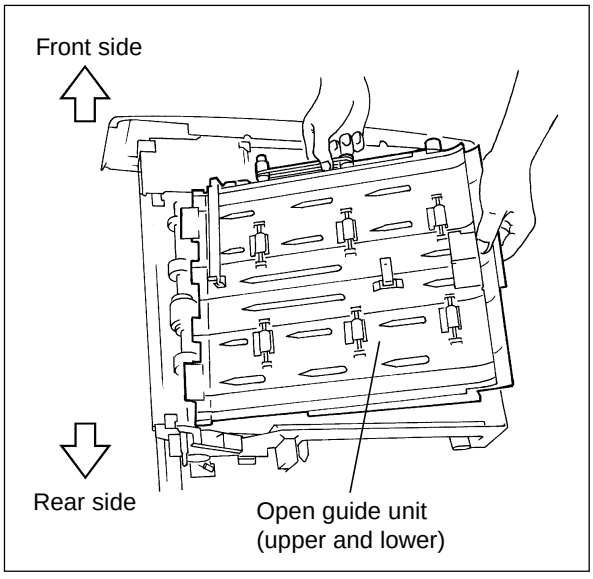
(2) Remove the clip securing the open guide stopper.

Take off the open guide stopper from the open guide (lower) while pushing it toward the rear.



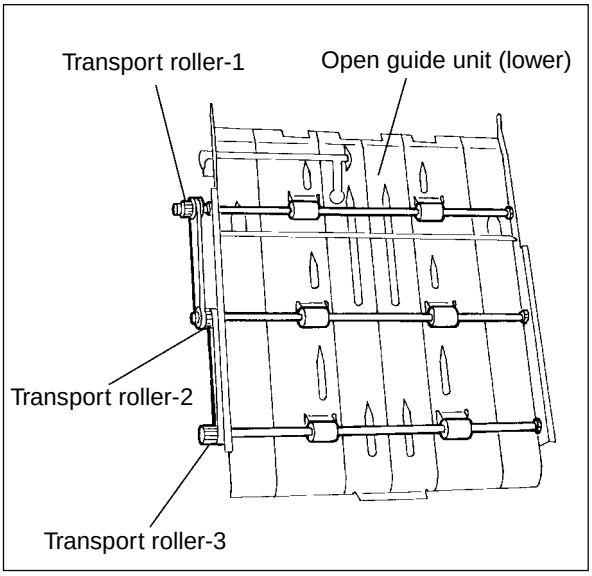
(3) To remove the open guide units (upper and lower), remove the clips (front and rear, 1 each) and the snap pin (rear), push the units toward the rear to have the front stud disengaged, and then take off the units toward the front.

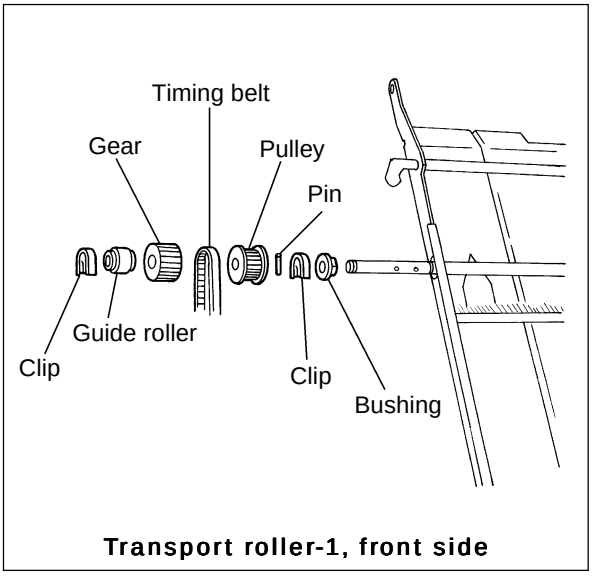




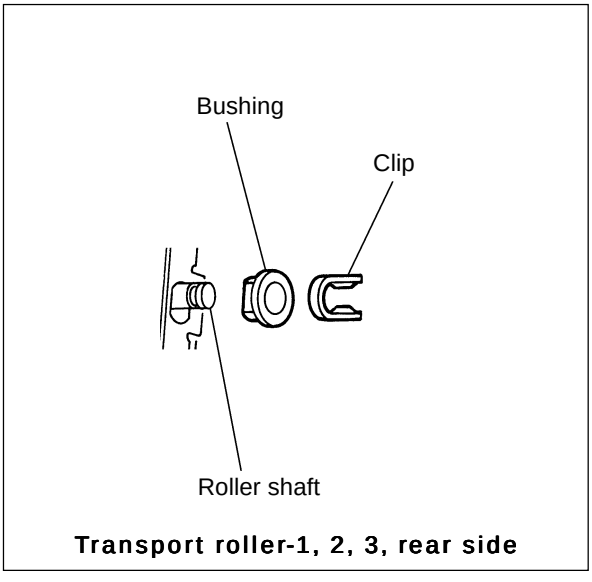
[B-1] Transport roller-1

(1) Remove the open guide unit, and two clips, guide roller, gear, pulley, pin and bushing at the front.
(2) Remove the clip and bushing at the rear.
(3) Remove the timing belt, bring transport roller-1 near to the front and then take it off toward the rear.





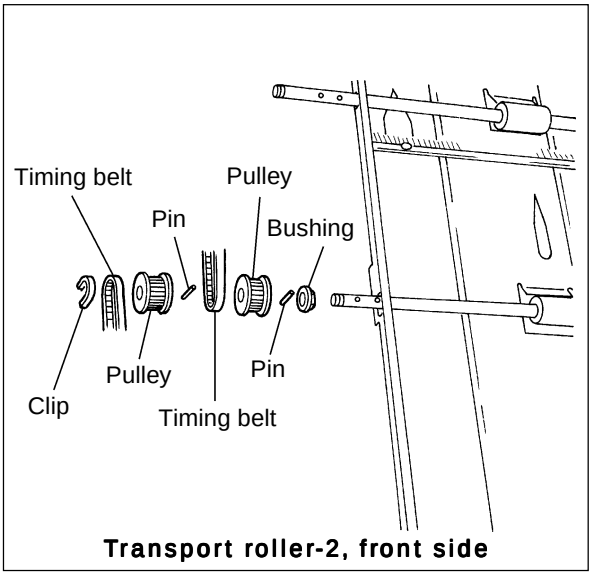
Transport roller-1, front side



Transport roller-1, 2, 3, rear side

[B-2] Removing transport roller-2

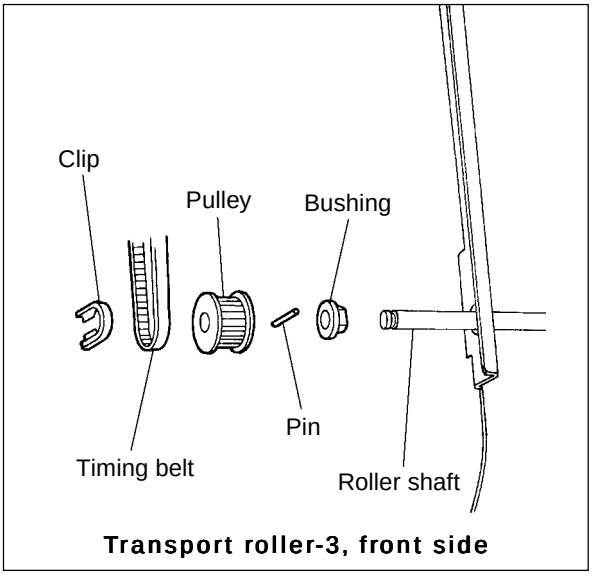
(1) Remove the open guide unit, and the clip, two pulleys, two pins and bushing at the front.
(2) Remove the clip and bushing at the rear.
(3) Remove the timing belt, bring transport roller-2 near to the front and then take it off toward the rear.



Transport roller-2, front side

[B-3] Removing transport roller-3

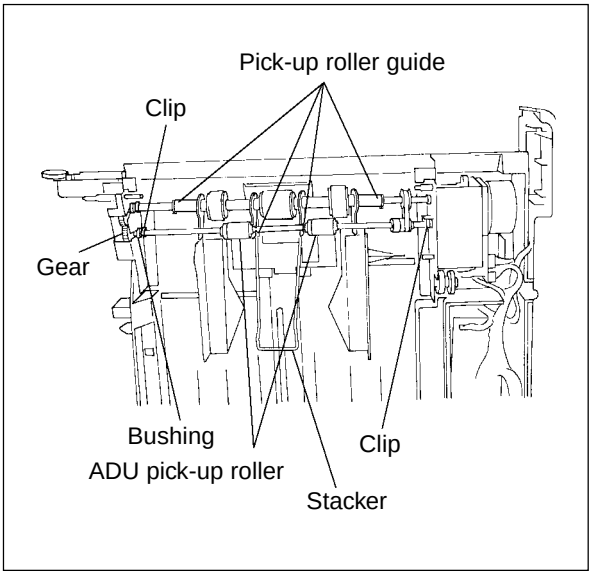
(1) Remove the open guide unit, and the clip, pulley, pin and bushing at the front.
(2) Remove the clip and bushing at the rear.
(3) Remove the timing belt, bring transport roller-3 near to the front and then take it off toward the rear.



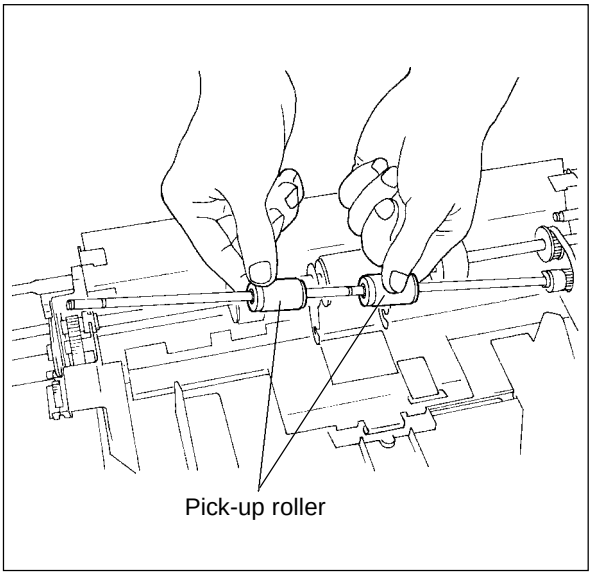
Transport roller-3, front side

[C] ADU pick-up roller

(1) Take off the upper paper guide by removing two screws.
Take off the open guide stopper from the open guide after removing one clip.
(2) Take out the open guide unit (upper and lower) by removing two clips and one snap pin.
(3) Remove the stacker from the pick-up roller shaft.
(4) Remove the clips on each end of the ADU pick-up roller shaft and the gear at the front, and push the bushing to the inside.
(5) Remove the four pick-up roller guides from the pick-up roller shaft by pushing them downward, and lift the rear end of the shaft.



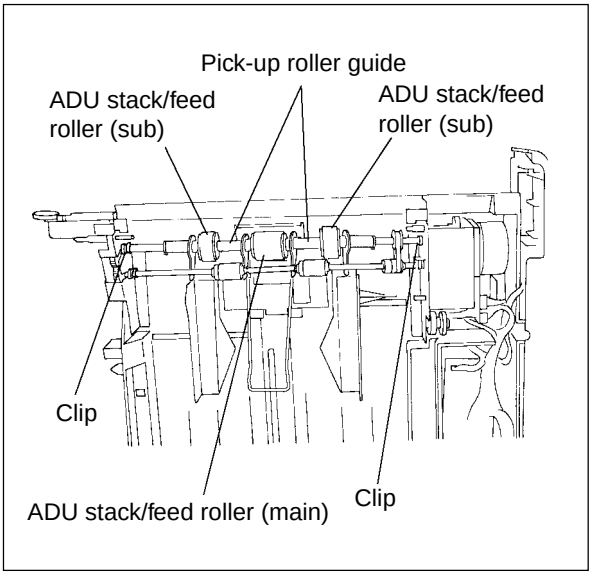
(6) Remove the bushing from the rear end of the pick-up roller shaft and the clip at the rear of the pick-up roller. Then, take the pick-up roller out toward the rear.



[D] ADU stack/feed rollers (Main and sub)

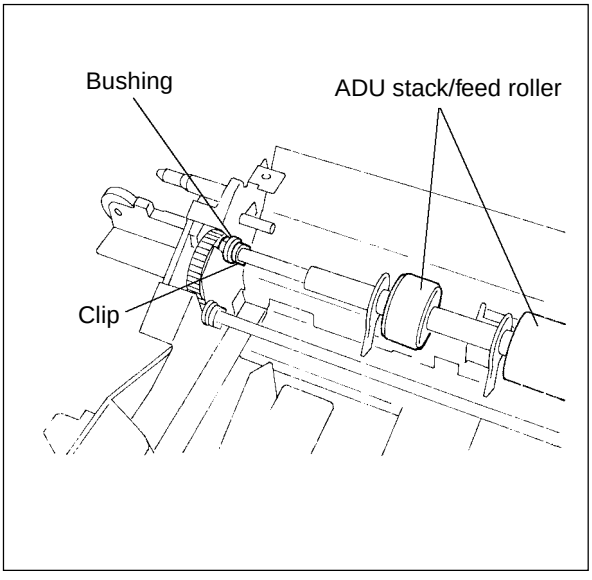
(1) Take out the upper paper guide by removing two screws.
Take out the open guide stopper from the open guide (lower) after removing one clip.

(2) Remove the open guide units (upper and lower) by removing two clips and one snap ring.

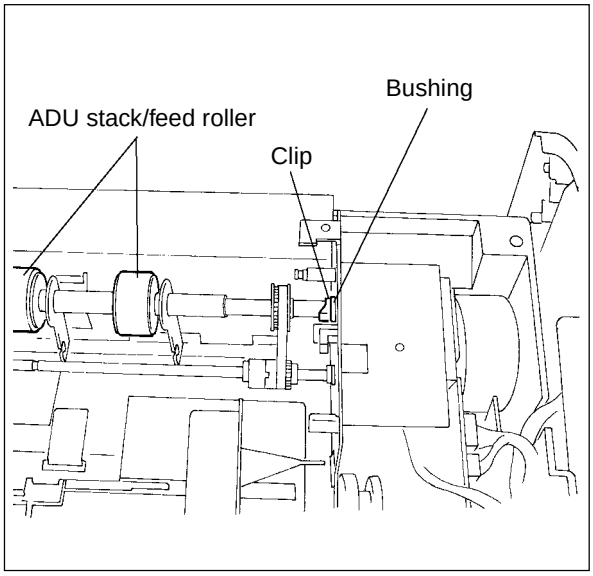


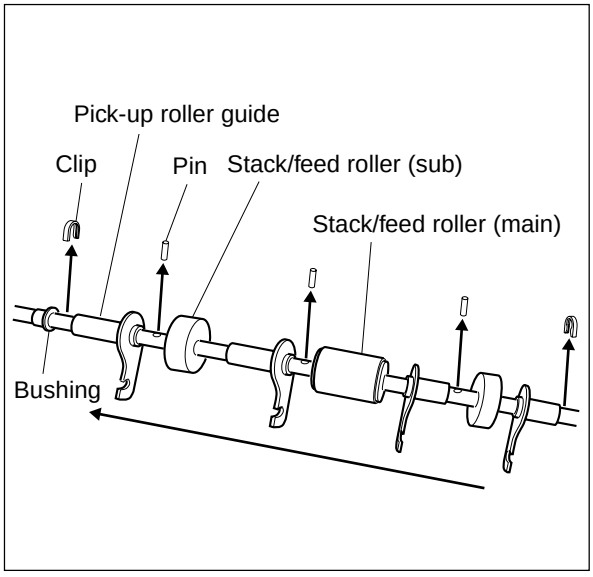
(3) Remove the clip on each end of the ADU stack/feed roller shaft, and push the bushing toward the inside.

(4) Remove the four pick-up roller guides from the pick-up roller shaft by pushing them downward. Then, lift the rear end of the shaft.



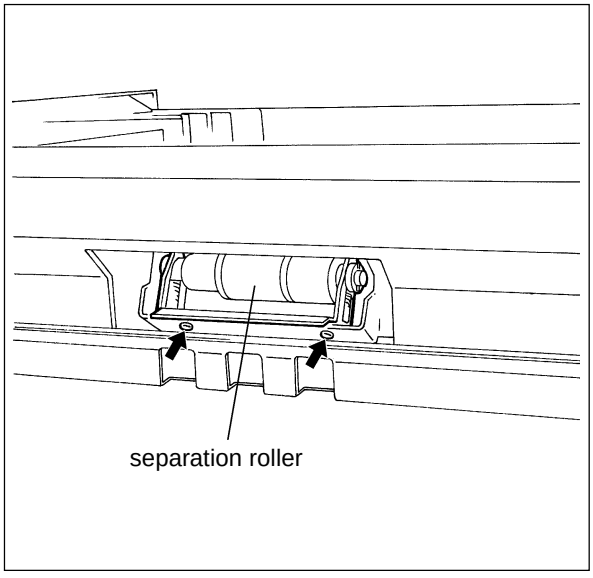
(5) Remove the bushing from the rear end of the stack/feed roller shaft, and the clip and pick-up roller guide at the rear.
(6) After removing the front clip, move the roller and the entire guide toward the front and remove the pin.
(7) From the rear, take off the sub-stack/feed roller, pick-up roller guide, pin and main stack/feed roller, pick-up roller guide, pin and sub-stack/ feed roller in this order.



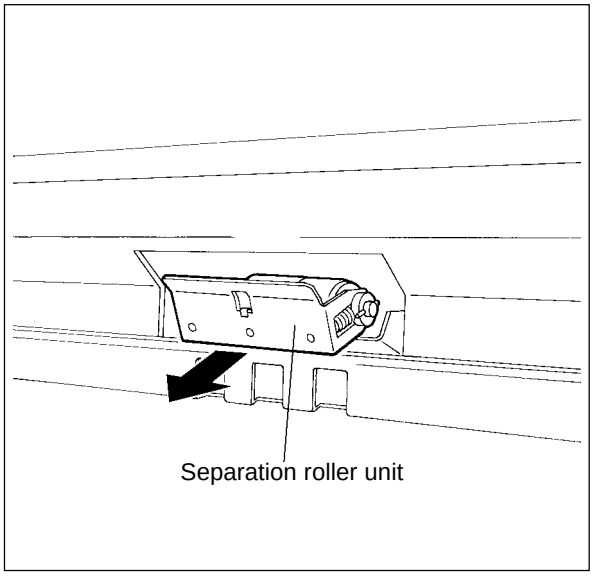


[E] ADU separation roller

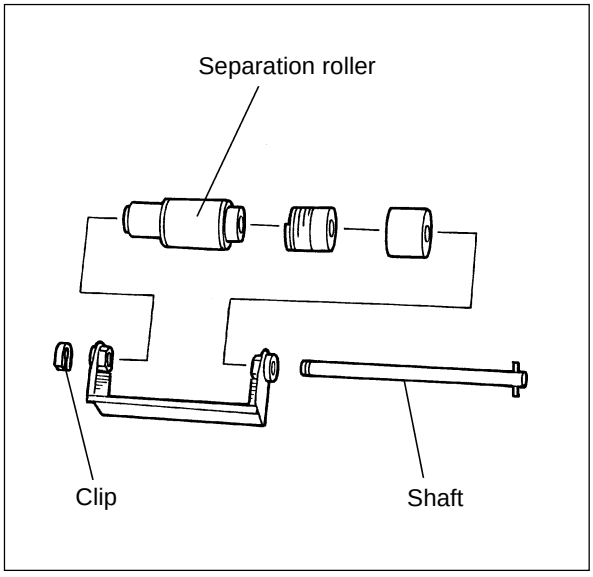
(1) Remove the two screws of the separation roller.



(2) Take off the unit toward the feed side.



(3) Remove the clip, pull out the shaft, and take out the separation roller.



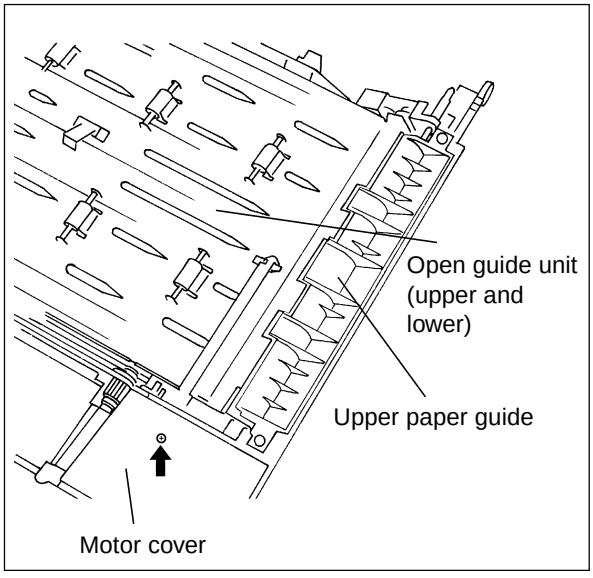
5.3 Drive system

[A] ADU motor

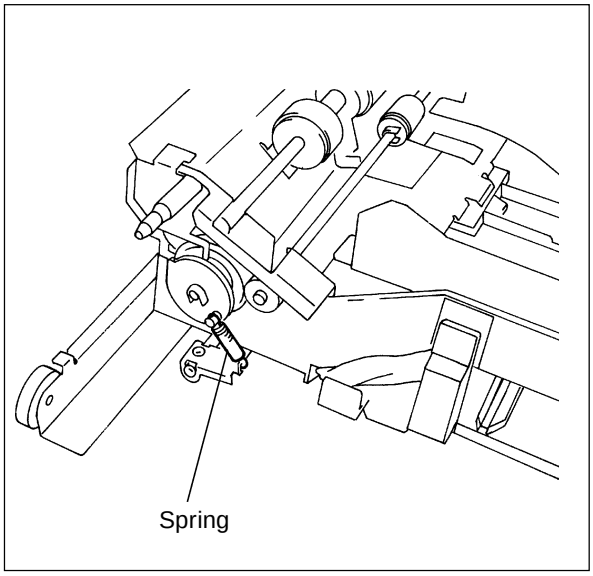
(1) Remove the upper paper guide by removing two screws.
Take off the open guide stopper from the open guide (lower) after removing one clip.

(2) Take off the open guide unit (upper and lower) by removing two clips and one snap pin.

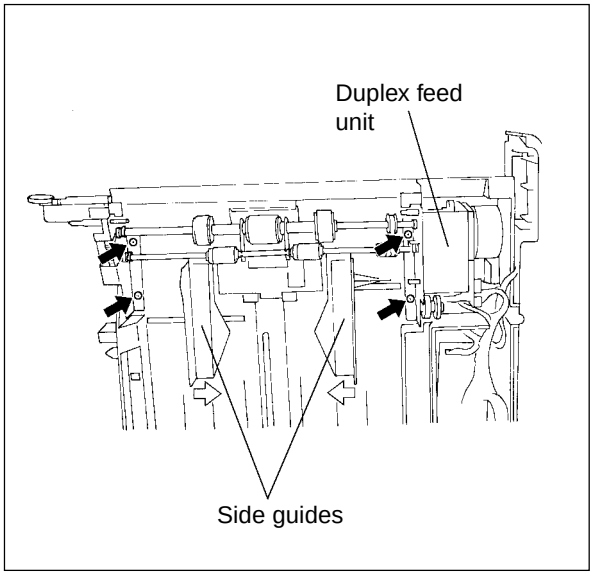
(3) Remove the motor cover by removing one screw.



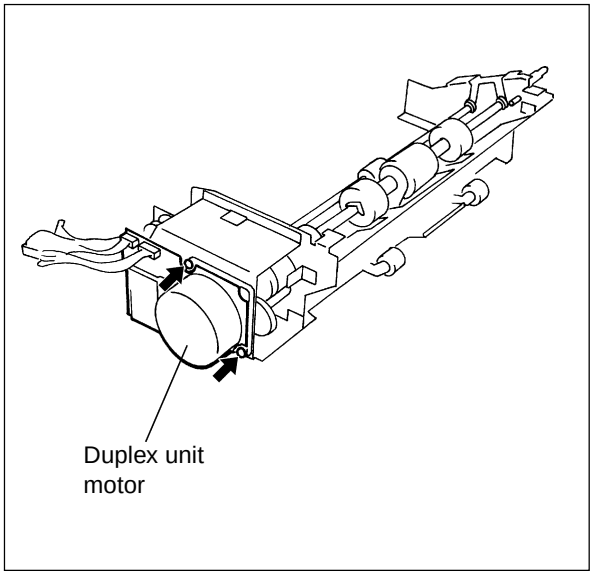
(4) Remove the spring on the rear.



(5) Move the side guides toward the center. Take off the duplex feed unit by removing four screws.

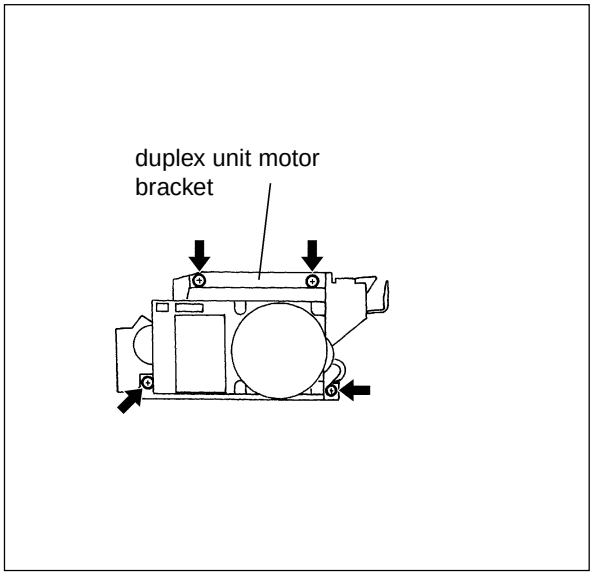


(6) Remove two screws and take off the duplex unit motor.

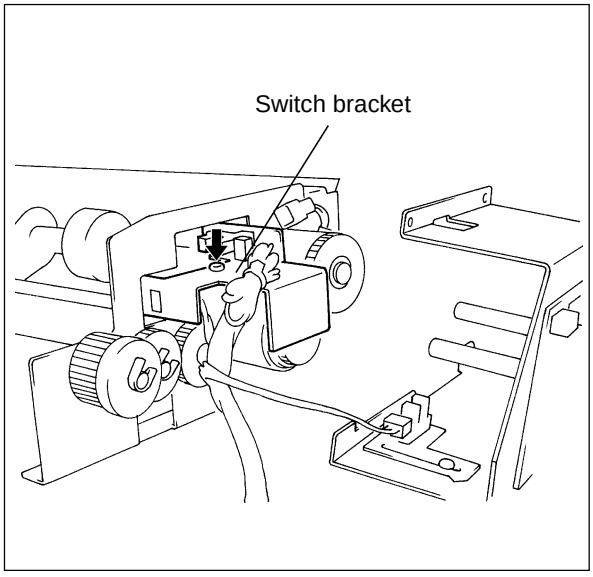


[B] Feed clutch and stack clutch

(1) Remove the duplex unit motor bracket from the feed unit by removing four screws.



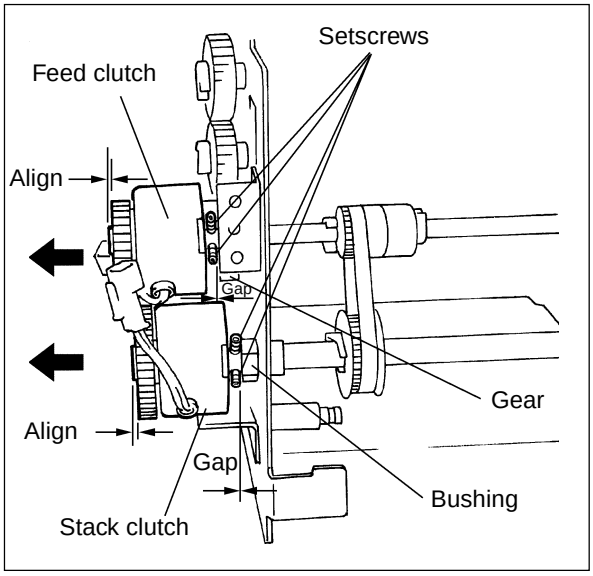
(2) Remove the switch bracket by removing a screw.



(3) Disconnect the connectors of the feed clutch and stack clutch. Loosening two setscrews of each of the feed and stack clutches, take them out from their shafts.

(4) Align the end surface of the shaft and clutch, then securely tighten the two setscrews at this position when reassembling the feed and stack clutches.

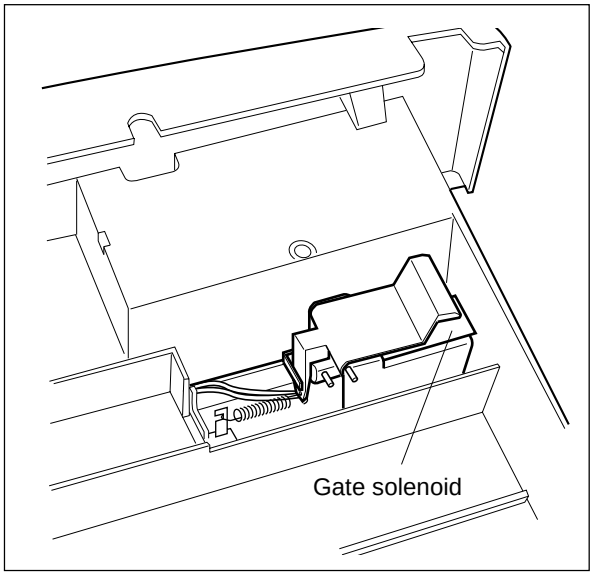
Note) Make a gap of approx. 0.5 mm between the feed clutch and the gear, and also between the stack clutch and the bushing.



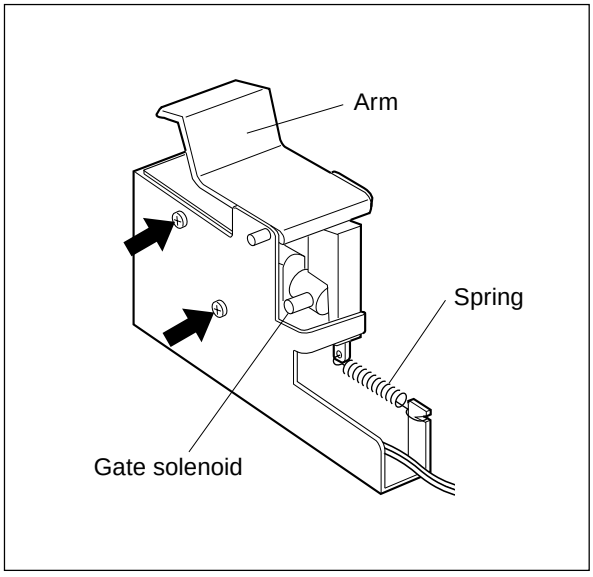
[C] Gate solenoid

(1) Remove the gate cover and motor cover by removing each screw.

(2) Disconnect the gate solenoid connector and take off the gate unit by removing two screws.



(3) Remove the gate solenoid by removing two screws.



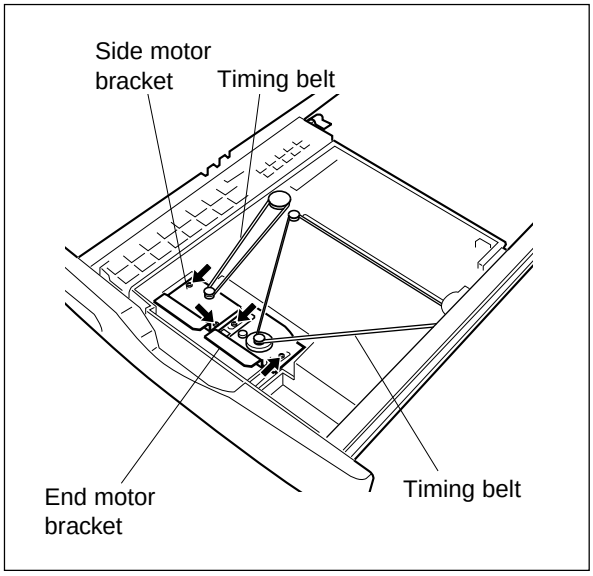
[D] Side motor and end motor

(1) Place the duplex unit upside down.

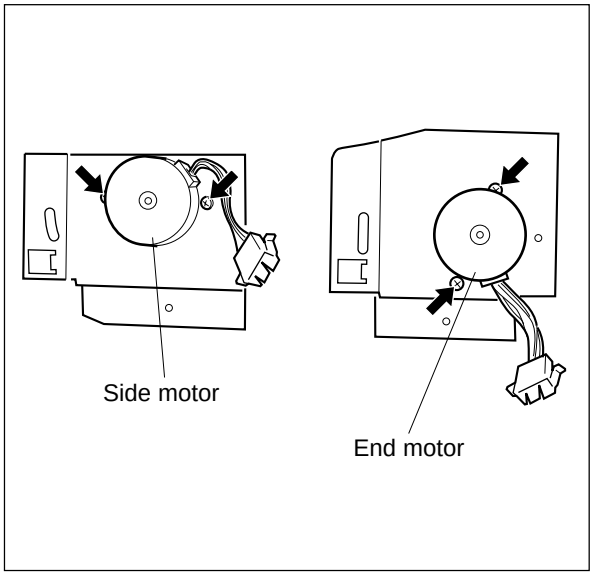
(2) Remove the lower cover by removing seven screws.

(3) Remove two screws, take off the timing belt and the side motor bracket.

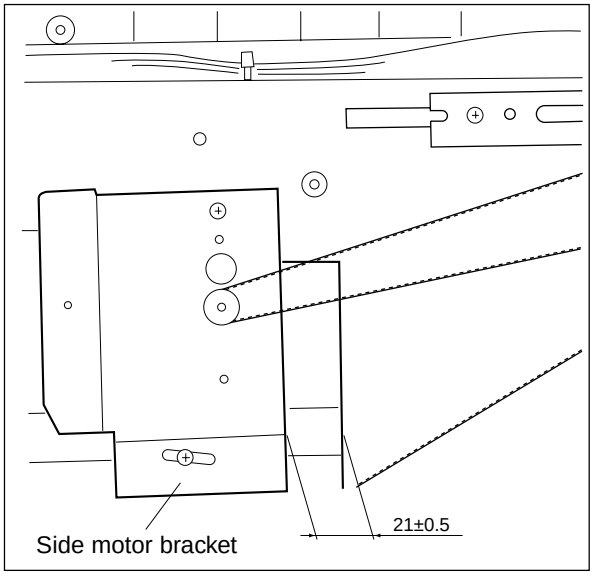
(4) The end motor can be removed by the same procedure.



(5) Remove the side motor and the end motor from their brackets by removing two screws for each.



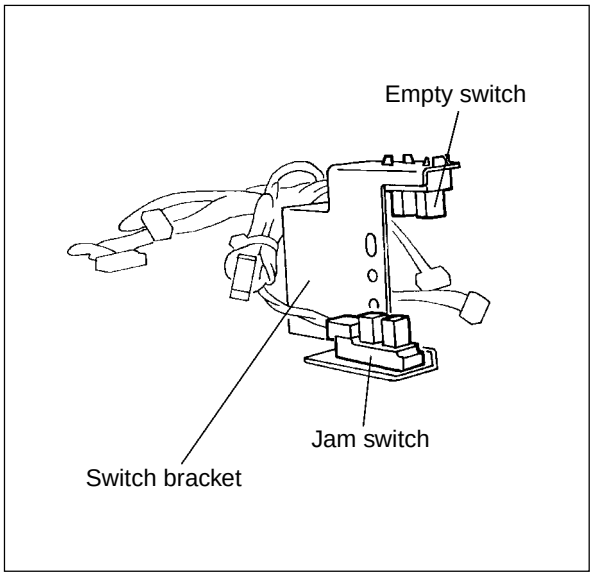
(6) Fix the side motor bracket at the position of 21 ± 0.5 mm from the case when reassembling.



5.4 Various switches

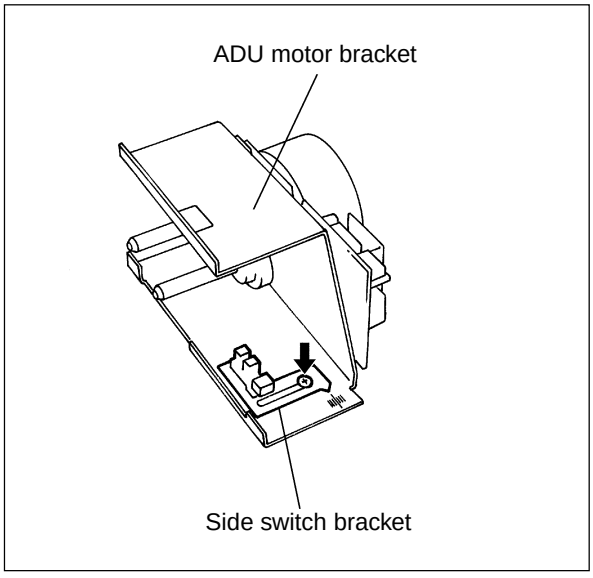
[A] Jam switch and empty switch

(1) Remove the duplex feed unit.
(2) Remove the switch bracket.
(3) Release the hatches of the switches.
(4) Disconnect the connector.

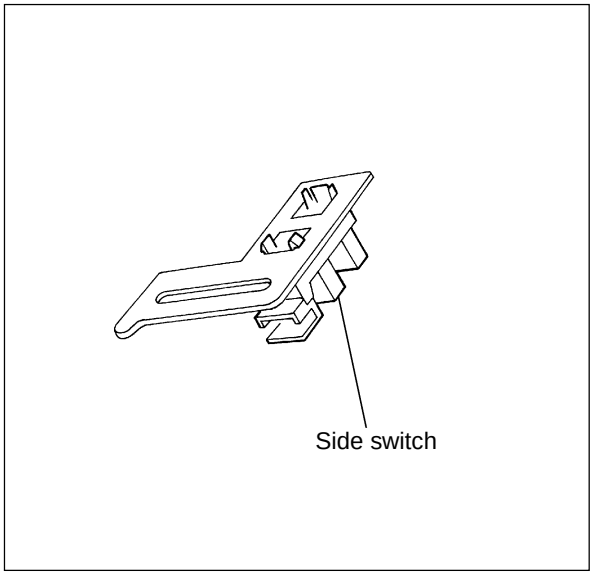


[B] Side switch

(1) Remove the duplex feed unit.
(2) Remove the duplex unit motor bracket.
(3) Disconnect the connector.
(4) Remove the side switch bracket from the duplex unit motor bracket by removing one screw.

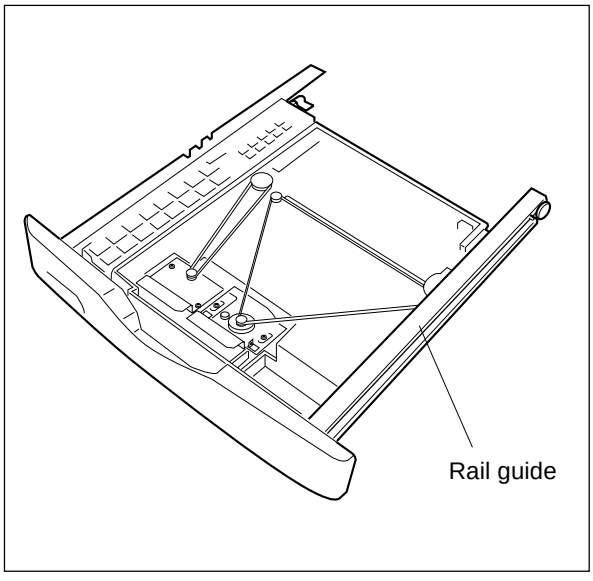


(5) Release the latchs of the side switch.

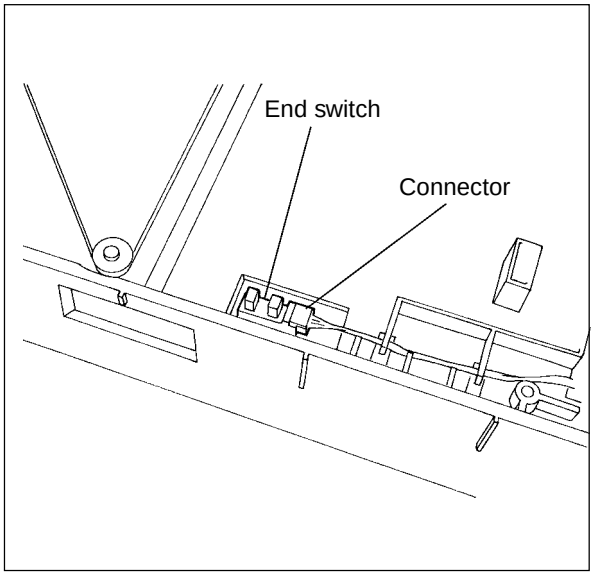


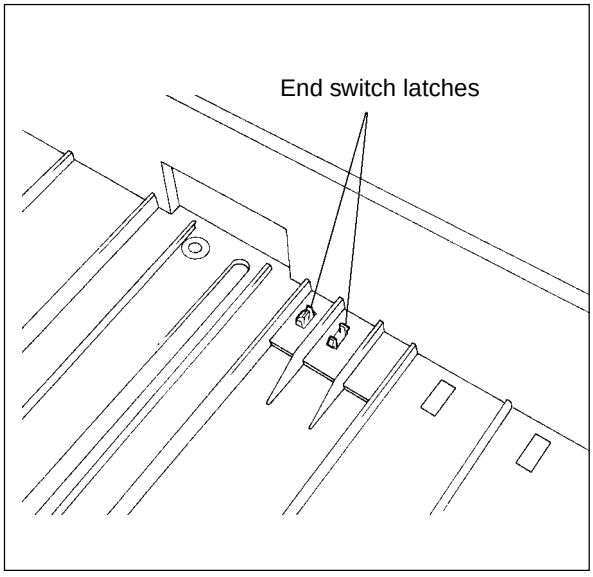
[C] End switch

(1) Remove the upper paper guide and the open guide units (upper and lower).
(2) Place the duplex unit upside down and remove the lower cover.
(3) Remove the rail guide.



(4) Disconnect the switch connector and release the latches of the end switch.





6. Symbols and Functions of Electrical Parts

6.1 Motors (M)

Symbol	Abbreviation	Function	Remarks
DM1	Duplex unit motor	Drives paper transport rollers.	Brushless motor
DM2	End motor	Drives the end guide in the stack section.	Pulse motor
DM3	Side motor	Drives the side guides in the stack section.	Pulse motor

6.2 Solenoids

Symbol	Abbreviation	Function	Remarks
SOL1	Gate solenoid	Used to open and close the gate.	

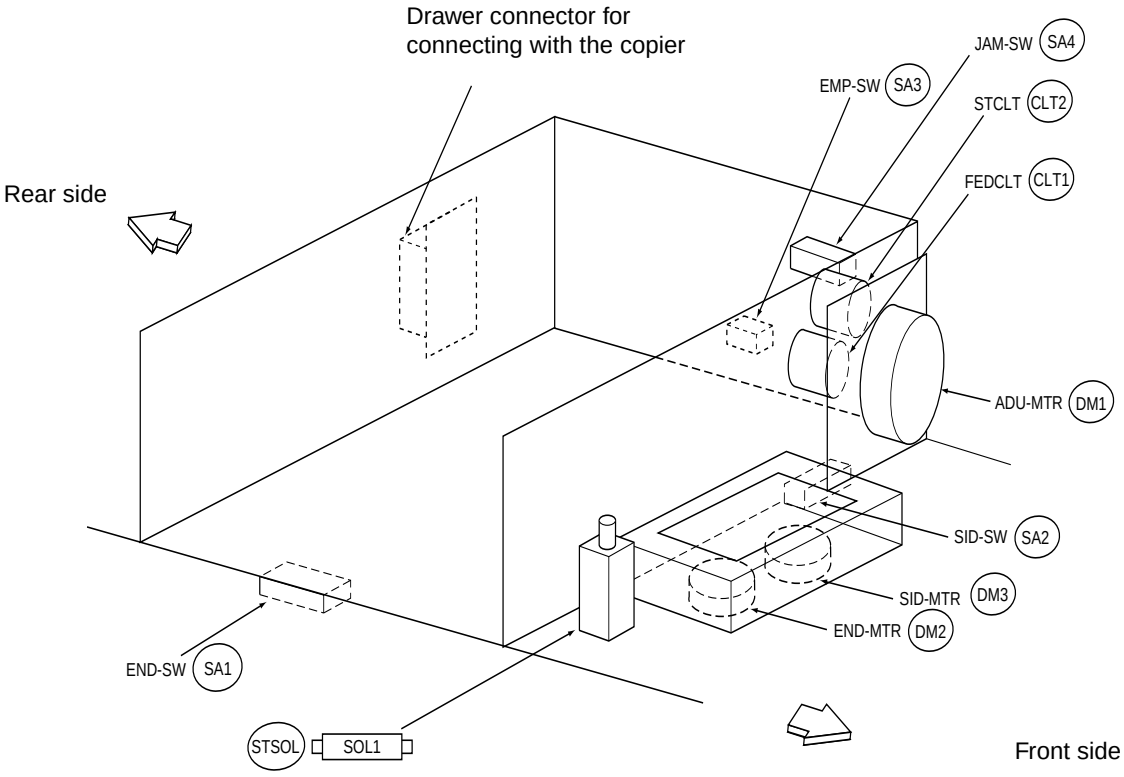
6.3 Clutches

Symbol	Abbreviation	Function	Remarks
CLT1	Feed clutch	Used for paper re-feeding.	
CLT2	Stack clutch	Used for stacking operation.	

6.4 Switches and sensors

Symbol	Abbreviation	Function	Remarks
SA1	End switch	Detects the end guide position in the stacking section.	Semiconductor sensor
SA2	Side switch	Detects the side guide position in the stacking section.	Semiconductor sensor
SA3	Empty switch	Detects when the ADU cassette runs out of paper.	Semiconductor sensor
SA4	Jam switch	Detects the passage of paper through the guide up to the stacking section.	Semiconductor sensor

7. Layout for Electrical Parts



8. Description of Operation

8.1 General operation

(1) Initializing

When the power switch is turned on or when the front cover is opened/closed or when the duplex unit is pulled out/pushed in, this operation is performed.

(2) Stacking operation

This is an operation in which sheets of paper fed from the cassette and copied on their surface (first side) are sent into the duplex unit stacking section and stacked there.

(3) Duplex copying

Sheets of paper which have been copied on their first sides are automatically sent into the copier and copied on their reverse surface (second side).

(4) ADU paper feeding

This operation causes sheets of paper to be fed from the duplex unit into the copier.

8.2 Description of each operation

[A] Initializing

[A-1] Initializing when the power switch is turned on

(1) When the power switch is turned on, the end motor (DM2) rotates to move the end guide in the stacking section to its home position.

(2) The side motor (DM3) rotates to move the side guides to their home position.

[A-2] Initializing when the copierís front cover is opened/closed

(1) The operation in step (1) above is performed.

[A-3] Initializing when the duplex unit is pulled out/pushed in

(1) The end motor (DM2) rotates to move the end guide to its home position once, then moves it to the position corresponding to the selected size of paper.

(2) The side motor (DM3) rotates to move the side guides to their home position once, then moves them to the position corresponding to the selected size of paper.

[B] Stacking operation

(1) When the [START] key is pressed, the side motor (DM3) and end motor (DM2) are rotated to move the side and end guides to the position corresponding to the specified size of paper, and the duplex unit motor (DM1) is rotated clockwise to transport the paper. The gate solenoid [SOL1] is energized to position the EXIT/duplex unit selection gate in the direction of stacking, and stack clutch (CLT2) is energized to rotate the duplex unit transport rollers in the direction of stacking.

(2) Jam detection inside the duplex unit is performed as follows:

The jam switch (SA4) is checked if it is turned on within a specified period of time after the copied paper has turned on the copier's exit switch. The switch is also checked if it is turned off within a specified period of time after the exit switch was turned off by the paper.

(3) Each time five sheets of paper are stacked in the duplex unit, the side motor (DM3) is rotated to move the side guides so that the sheets stacked are aligned, then the side guides are returned to their previous position.

(4) The above procedure (2)~(3) is repeated until the specified number of copies are made.

(5) After the final sheet is stacked in the duplex unit stack section, the gate solenoid [SOL1], stack clutc (CLT2) and duplex unit motor (DM1) are turned off.

[C] Feeding from duplex unit

(1) When the [START] key is pressed, the side motor (DM3) is rotated to move the side guides to the specified size of paper and duplex unit motor (DM1) is rotated clockwise and feed clutch (CLT1) is turned on, causing the duplex unit feed roller and pick-up roller to rotate.

(2) Due to the operation in (1), the duplex unit tray is raised, causing the copy paper to come into contact with the pick-up roller for paper feeding.

(3) A sheet of paper is fed out of the duplex unit and transported toward the copier's registration roller.

(4) When the sheet pushes the copier's paper transport switch on, the feed clutch (CLT1) is turned off, causing the pick-up roller and feed roller to stop rotating.

(5) Then, the copier's registration roller starts rotating, and the copying process commences.

(6) The above procedure (2)~(5) is repeated until the specified number of copies are made. When copies are finished, the duplex unit motor (DM1) is stopped rotation.

[D] Duplex copying

(1) When the first-side copying operation is started, the duplex unit motor (DM1) is rotated, and the side and end guides are moved to the position of specified paper size by the side motor (DM3) and end motor (DM2).

Additionally, the gate solenoid (STSOL) [SOL1] and the stack clutch (CLT2) are turned on in the same way as the [B] Stacking operation.

(2) The first-side copied sheet is transported into the duplex unit from the copier exit switch and gate sections, and then stacked through the jam switch (SA4).

The duplex unit inside jam symbol comes on when the jam switch (SA4) is not turned on within a specified time after the copier exit switch is turned on, or the jam switch is not turned off within a specified time after the copier exit switch is turned off.

(3) Each time five sheets of paper are stacked, the stacked sheets are aligned by the side motor (DM3) moving the side guides.

(4) The above procedure (2)~(3) is repeated until the specified number of sheets are stacked.

(5) The final sheet is stacked in the duplex unit, and then the gate solenoid [SOL1] and stack clutch (CLT2) are turned off.

(6) When the ADF is not used, the duplex unit motor (DM1) is stopped once to turn over the original. After the original has been turned over, the duplex unit motor (DM1) is rotated again to make a copy of the next original in step (7) or later.

When the ADF is used, the duplex unit motor (DM1) is not stopped since the original is turned over continuously.

(7) When the second-side copying is started, the side guides are moved by the side motor (DM3) to the specified size position.

(8) When the feed clutch (CLT1) is turned on, the duplex unit paper feed tray is lifted up, and also the pickup and feed rollers are driven, then one sheet of paper is separated and fed.
When the sheet reaches the copier's transport switch, the feed clutch (CLT1) is turned off.
The duplex unit feed jam symbol comes on when the copier's transport switch is not turned on within a specified time after the feed clutch (CLT1) is turned on.

(9) The above step (8) is repeated until the specified number of copies are made. After copying has been finished, the duplex unit motor (DM1) is stopped.

8.3 Meaning of signals

Signal name	Meaning of signals		Remarks
	"L" LOW level	"H" HIGH level	
FEDCLT	Paper feeding from duplex unit	–	
STCLT	Paper stacking in duplex unit	–	
STSOL (Gate solenoid)	duplex unit stacking Sending paper into duplex unit	Normal paper discharging	
JAM-SW (Jam switch)	No paper on duplex unit paper path	Paper on duplex unit paper path	
EMP-SW (Empty switch)	No paper in duplex unit stack section	Paper in duplex unit stack section	
SID-SW (Side switch)	–	Side guide home position (Photosensor shielded)	L: Off H:On
END-SW (End switch)	–	End guide home position (Photosensor shielded)	L: Off H: On

8.4 Detection of abnormal status

When an abnormal condition is detected inside the duplex unit, a symbol corresponding to the condition is shown on the copier's control panel. The following kinds of abnormal statuses may be encountered:

(1) Abnormal statuses which can be cleared without pulling out/pushing in the duplex unit:
- Paper misfeeding which occurs while paper is being fed from the stacking section.

(2) Abnormal statuses which can be cleared by pulling out/pushing in the duplex unit:
- Paper misfeeding in the paper stacking section.

(3) Abnormal statuses which can be cleared only by turning Off/On the copier's power switch:
- When the side guides or end guide cannot be initialized to their correct positions.

[A] Paper misfeeding

(1)Paper misfeeding during duplex copying:

While paper is fed from the duplex unit, if the copier's transport sensor is not turned On within a specified period time after the feed clutch (CLT1) was energized, it is judged that paper misfeeding has occurred during duplex unit paper feeding, and a paper misfeed symbol is displayed. This condition can be cleared by opening/closing the copier's side cover.

(2)Paper misfeeding during paper stacking:

During paper stacking, if the duplex unit jam switch (SA4) is not turned On within a specified period time after the copier's exit sensor was turned On/Off, it is judged that paper misfeeding has occurred inside the duplex unit. To clear this condition, pull out the duplex unit, remove the misfed sheet, then push in the duplex unit. (If necessary, open/close the copier's front cover.)

[B] Abnormal statuses at power on

(1)Paper remaining in the stacking section at power On:

If a sheet of paper is left in the stacking section when the power is turned On, a symbol indicating that paper is still there is displayed on the copier's control panel when the duplexing mode is selected. This mode cannot be started until the paper is removed.

(2)Misfed paper remaining inside the duplex unit when the power is turned On:

If a misfed sheet of paper remains on the Aduplex unit paper path when the power is turned On, the duplex unit misfeed symbol is shown. To clear this condition, pull out the duplex unit, remove the misfed sheet and then push in the duplex unit. (If necessary, open/close the copier's front cover.)

[C] "Serviceman Call" errors

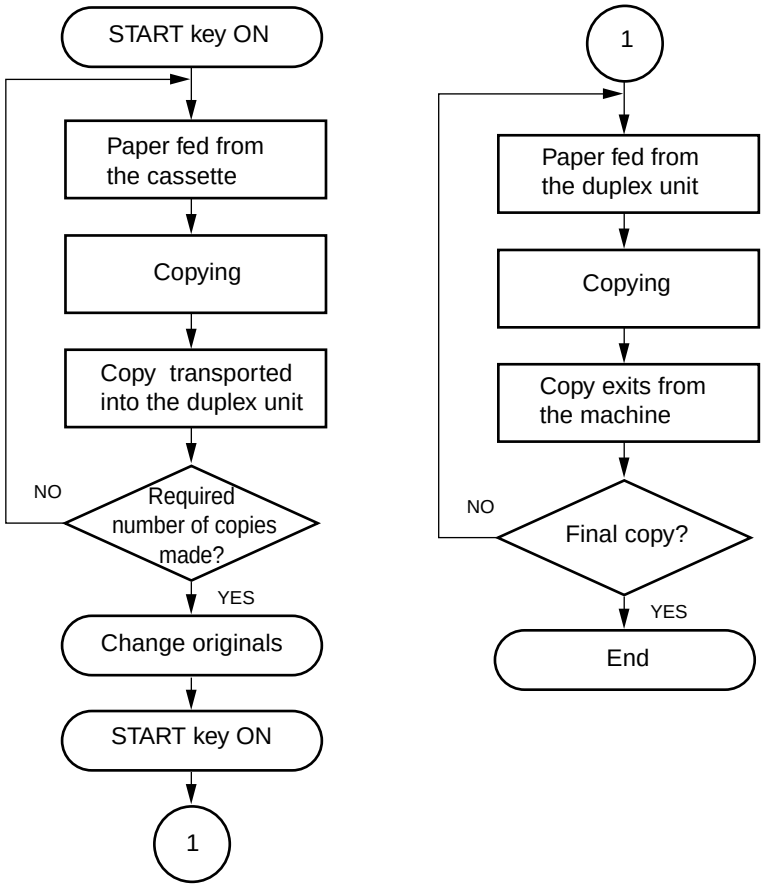
(1)The paper side guides and end guide cannot be initialized :

During the initialization of the side motor (DM3) and end motor (DM2) , if the respective home switch positions are not detected, a message will be displayed indicating that the duplex unit cannot function.

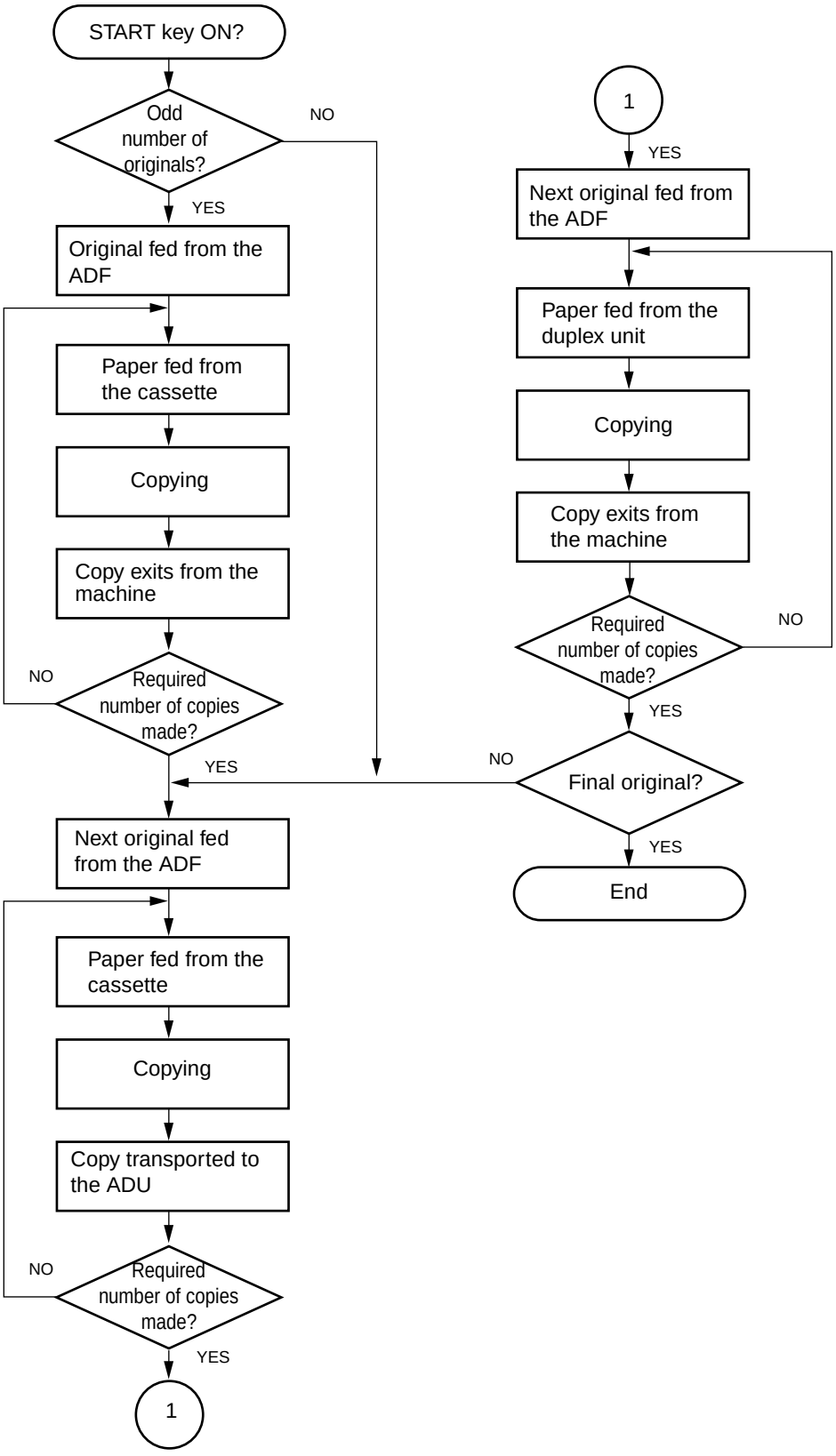
8.5 Flow charts

[A] General flow charts

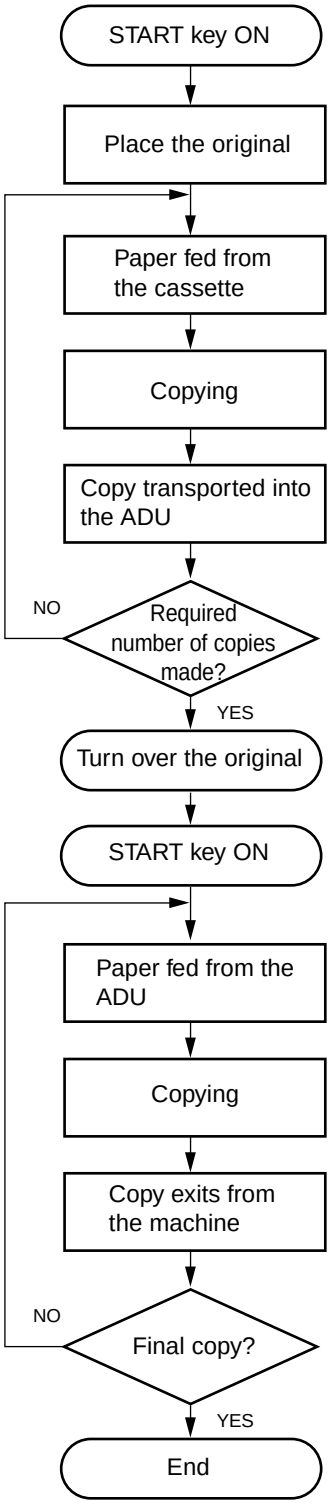
(1) Duplex copying from single-sided originals



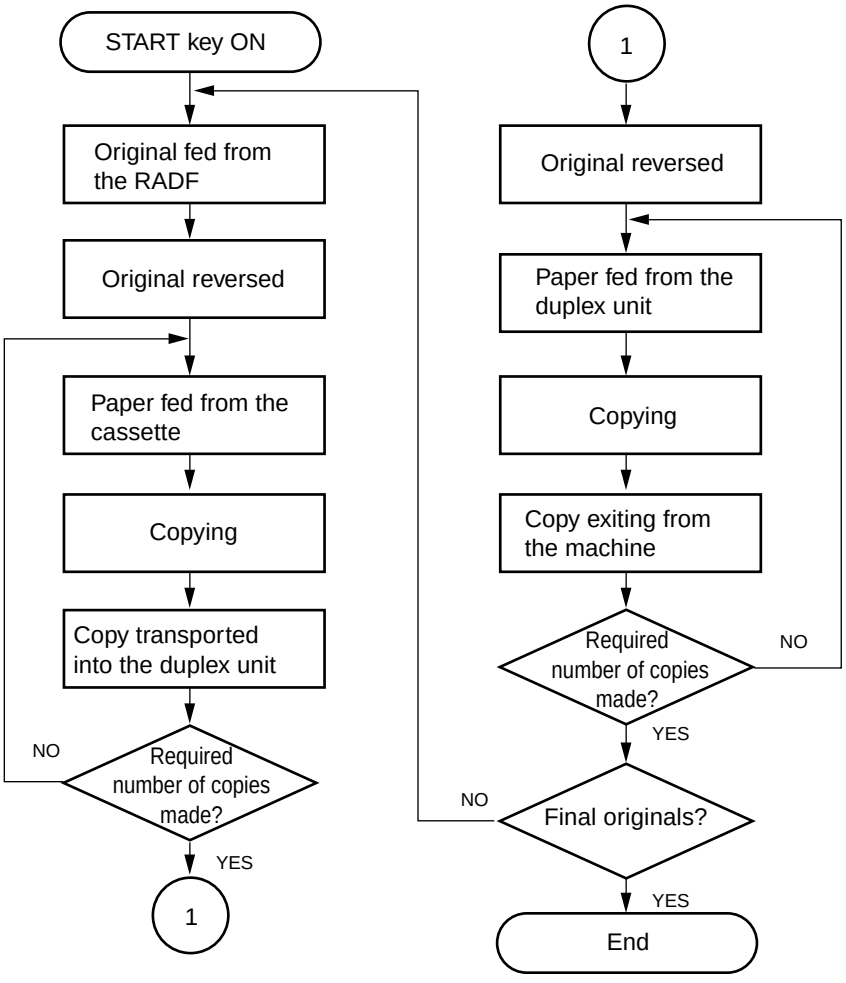
(2) Duplex copying from single-sided originals through ADF



(3) Duplex copying from two-sided originals

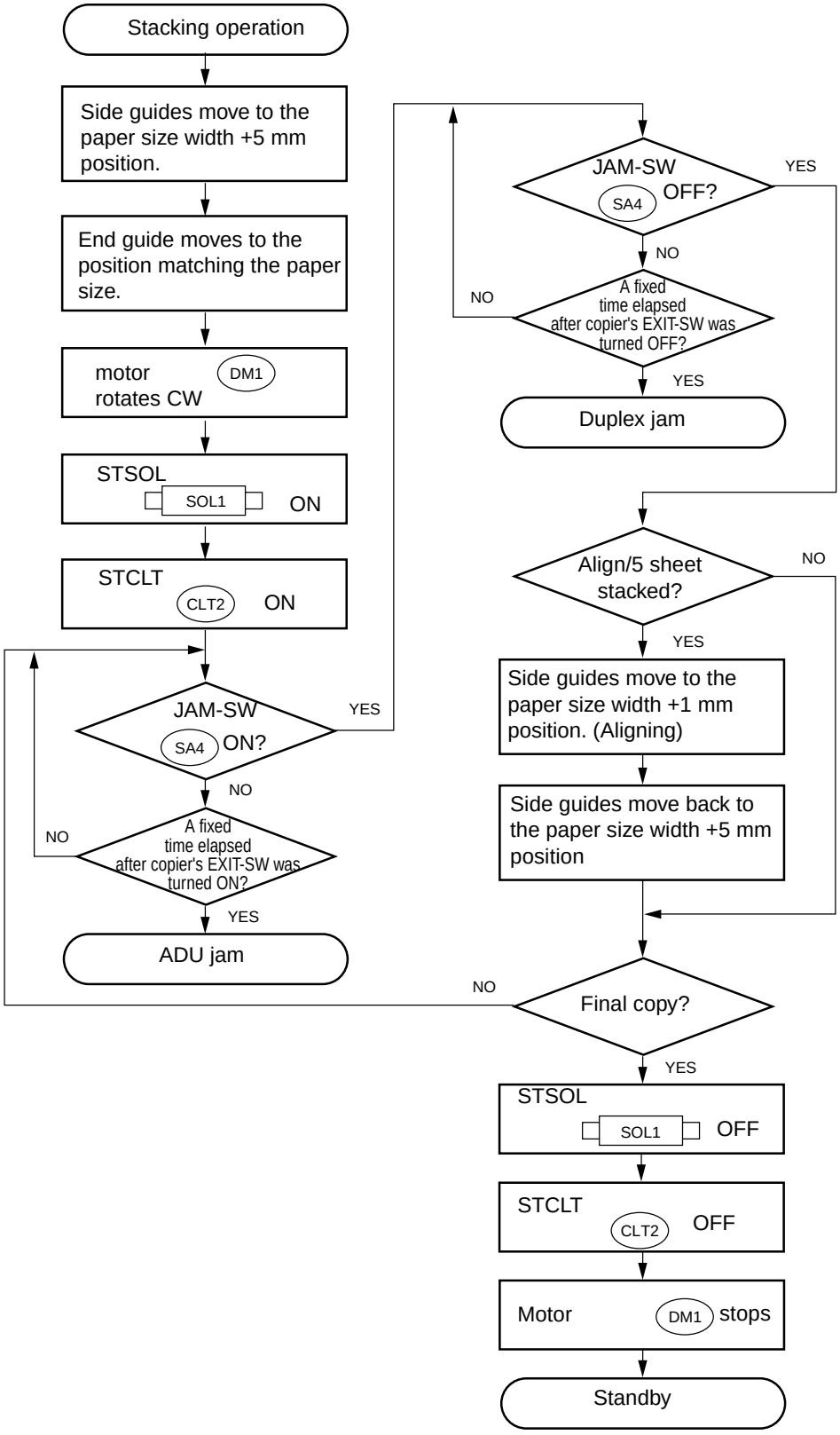


(4) Duplex copying from two-sided originals through RADF

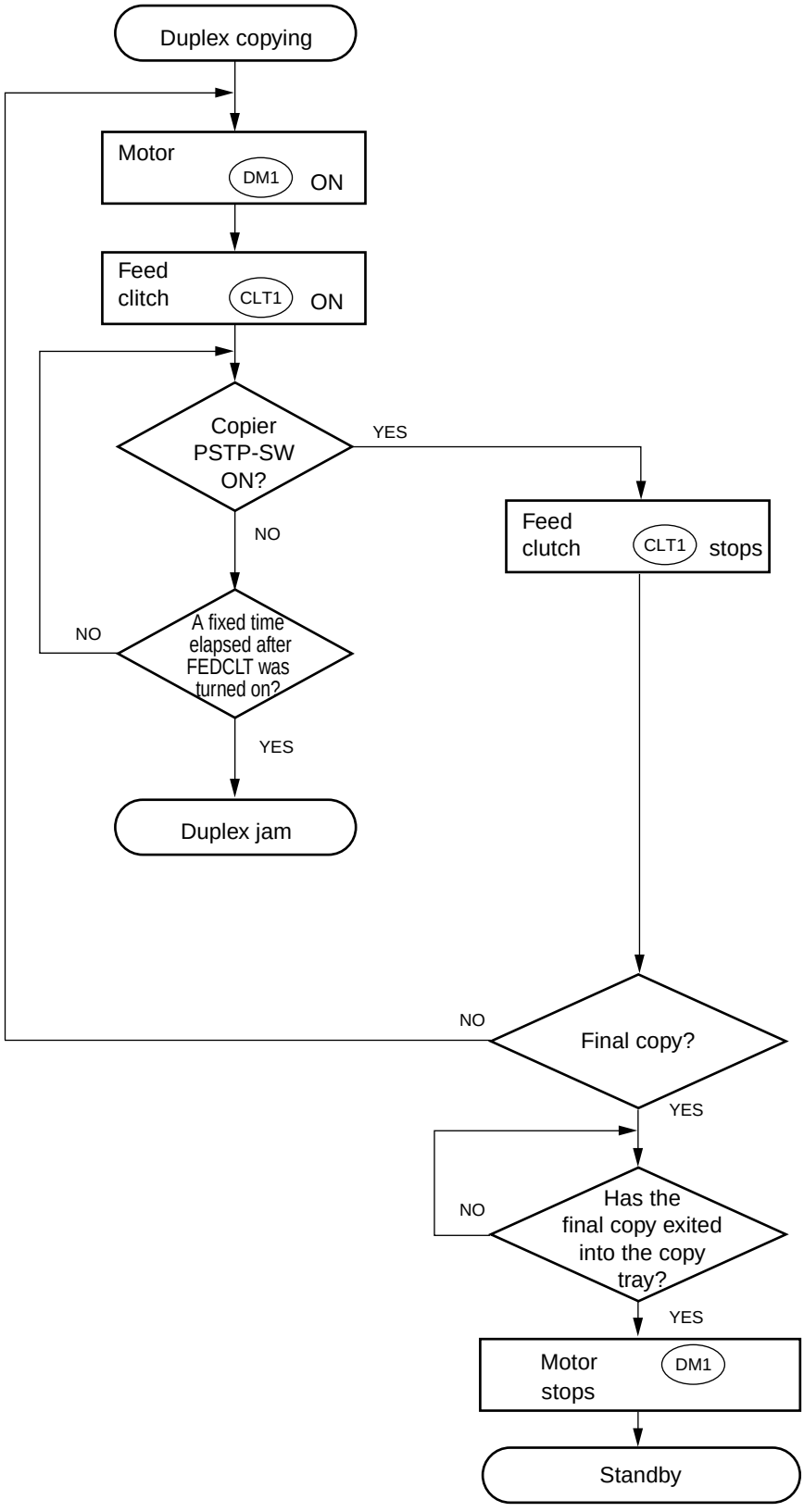


[B] Control flow charts

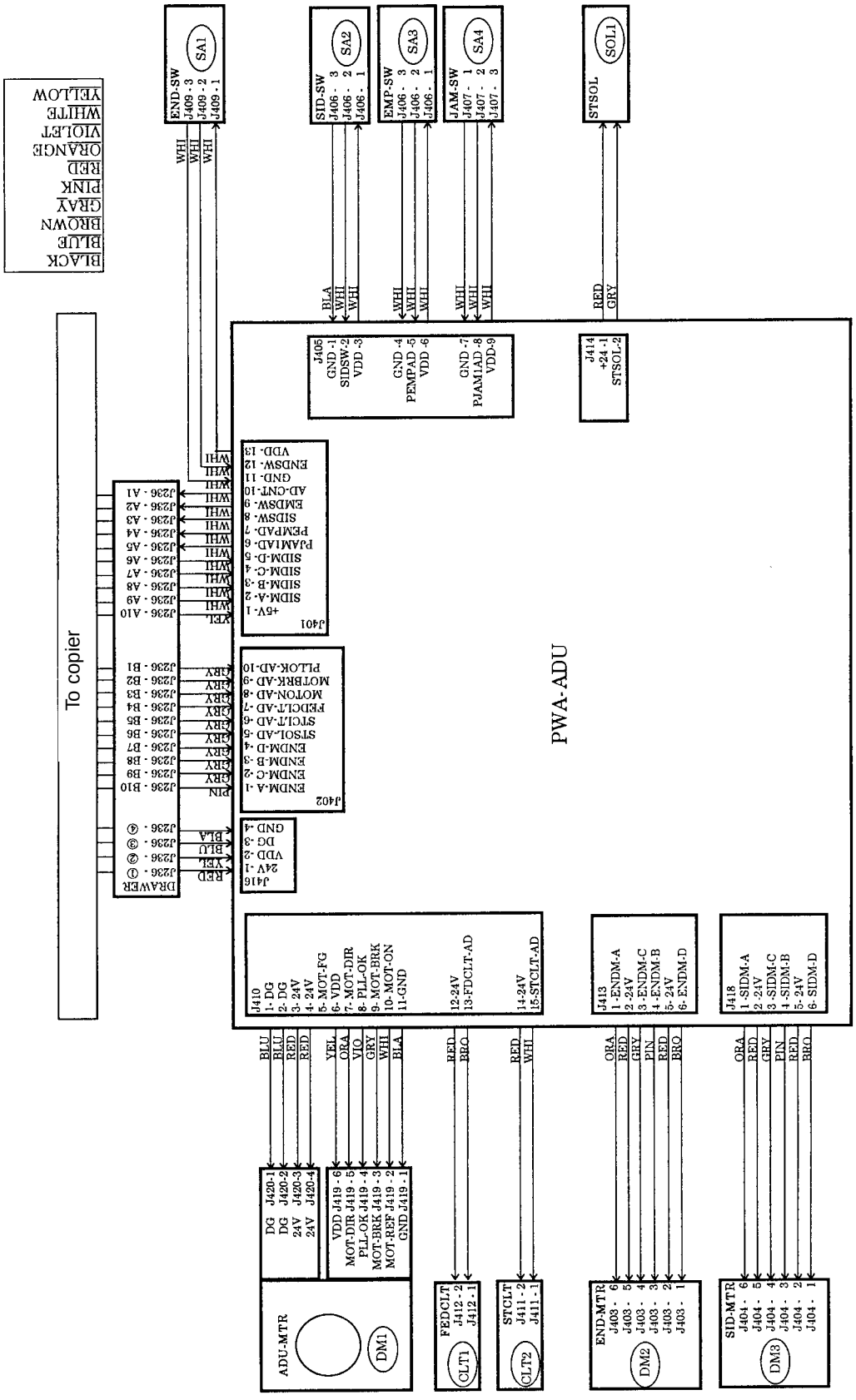
(1) Stacking operation



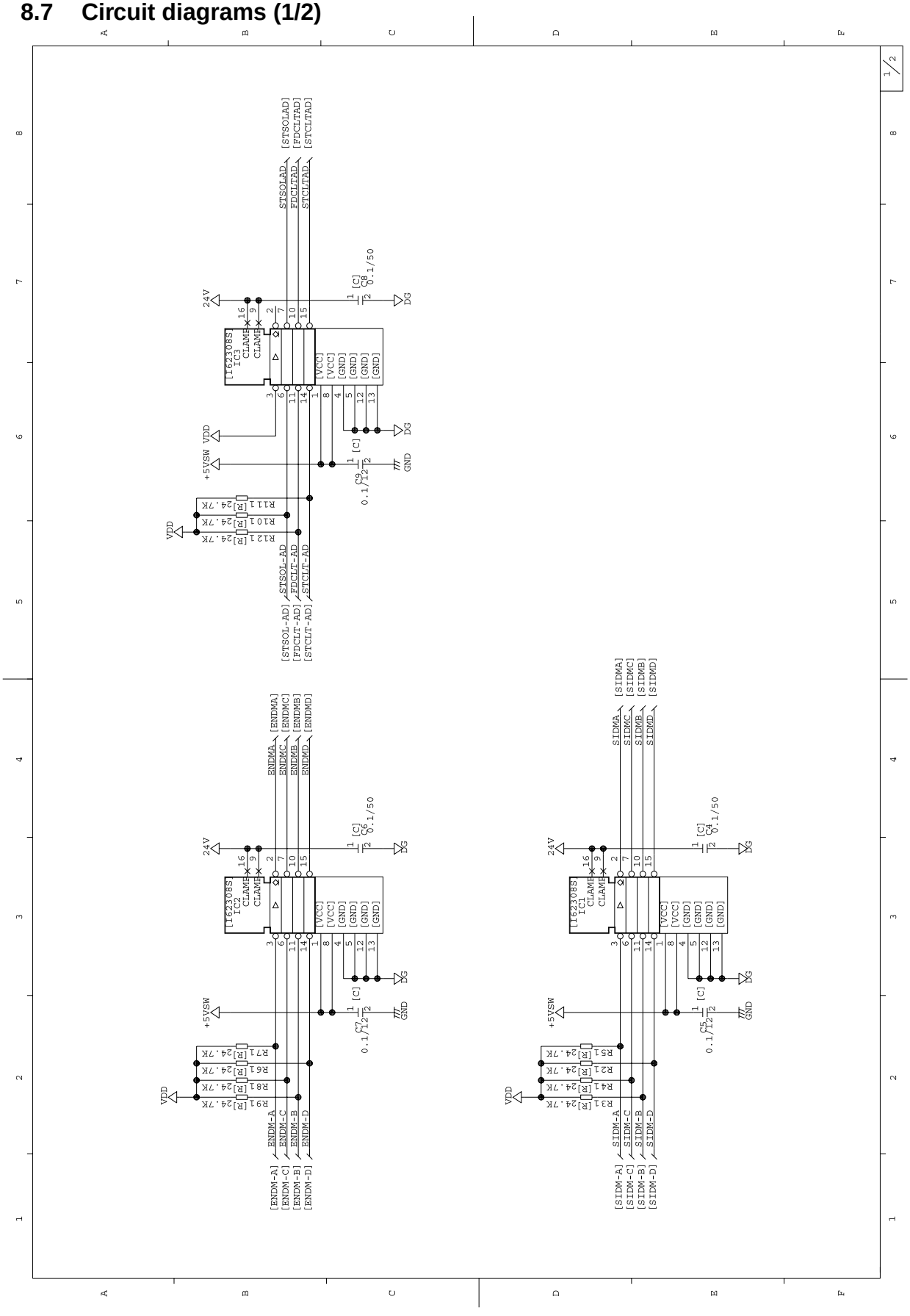
(2) Duplex copying operation



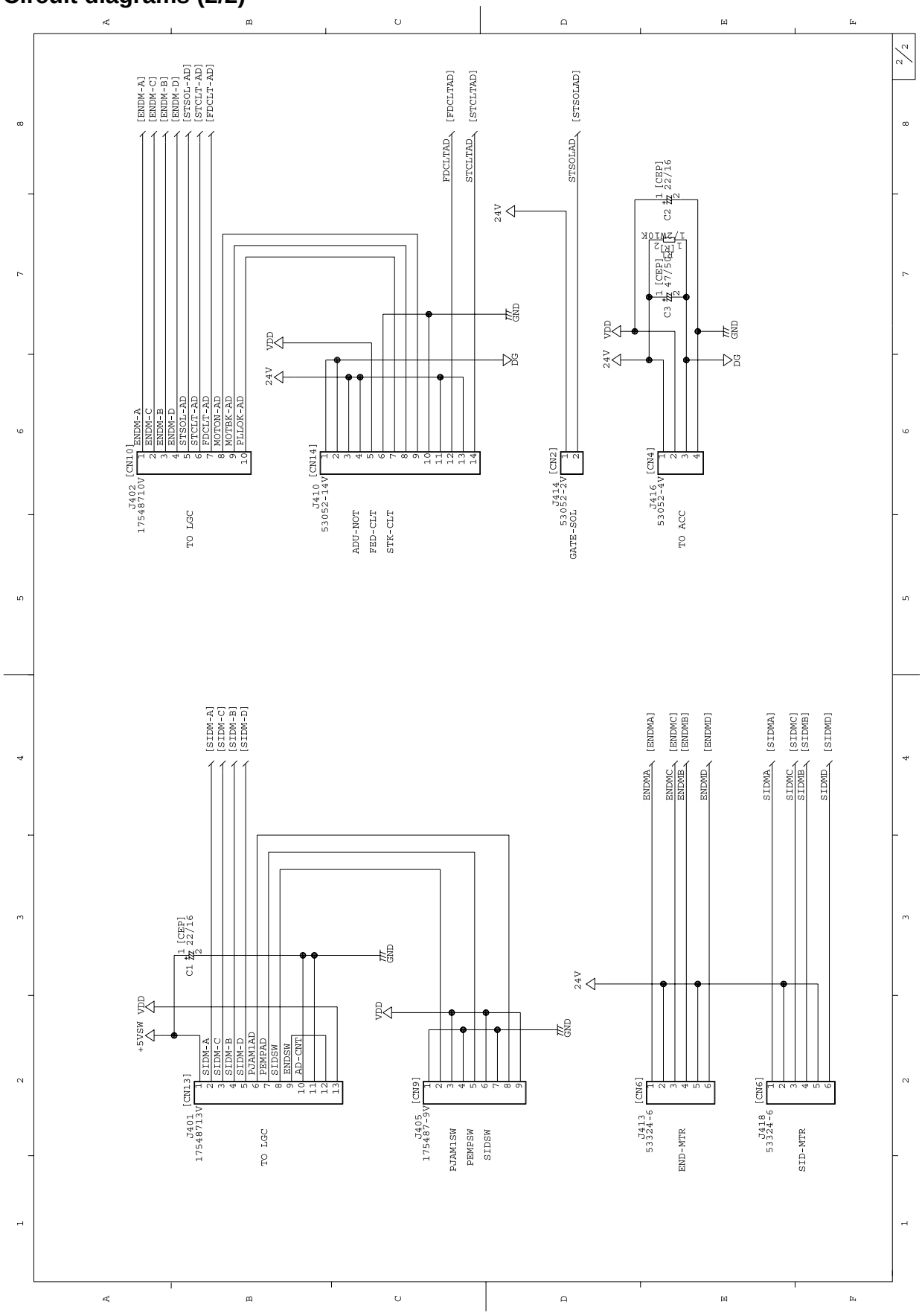
8.6 Harness connection diagram



8.7 Circuit diagrams (1/2)



Circuit diagrams (2/2)



8.8 PC board assembly