



DU-400

SERVICE MANUAL

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Revision history

Version	Data	Replaced pages	Remarks
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Safety precautions


This booklet provides safety warnings and precautions for our service personnel to ensure the safety of their customers, their machines as well as themselves during maintenance activities. Service personnel are advised to read this booklet carefully to familiarize themselves with the warnings and precautions described here before engaging in maintenance activities.

Safety warnings and precautions

Various symbols are used to protect our service personnel and customers from physical danger and to prevent damage to their property. These symbols are described below:

 **DANGER:** High risk of serious bodily injury or death may result from insufficient attention to or incorrect compliance with warning messages using this symbol.

 **WARNING:** Serious bodily injury or death may result from insufficient attention to or incorrect compliance with warning messages using this symbol.

 **CAUTION:** Bodily injury or damage to property may result from insufficient attention to or incorrect compliance with warning messages using this symbol.

Symbols

The triangle (\triangle) symbol indicates a warning including danger and caution. The specific point of attention is shown inside the symbol.



General warning.



Warning of risk of electric shock.



Warning of high temperature.

 indicates a prohibited action. The specific prohibition is shown inside the symbol.



General prohibited action.



Disassembly prohibited.

 indicates that action is required. The specific action required is shown inside the symbol.



General action required.



Remove the power plug from the wall outlet.



Always ground the copier.

1. Installation Precautions

WARNING

• Do not use a power supply with a voltage other than that specified. Avoid multiple connections to one outlet: they may cause fire or electric shock. When using an extension cable, always check that it is adequate for the rated current.



• Connect the ground wire to a suitable grounding point. Not grounding the copier may cause fire or electric shock. Connecting the earth wire to an object not approved for the purpose may cause explosion or electric shock. Never connect the ground cable to any of the following: gas pipes, lightning rods, ground cables for telephone lines and water pipes or faucets not approved by the proper authorities.



CAUTION:

• Do not place the copier on an infirm or angled surface: the copier may tip over, causing injury.



• Do not install the copier in a humid or dusty place. This may cause fire or electric shock.



• Do not install the copier near a radiator, heater, other heat source or near flammable material. This may cause fire.



• Allow sufficient space around the copier to allow the ventilation grills to keep the machine as cool as possible. Insufficient ventilation may cause heat buildup and poor copying performance.



• Always handle the machine by the correct locations when moving it.



• Always use anti-toppling and locking devices on copiers so equipped. Failure to do this may cause the copier to move unexpectedly or topple, leading to injury.



• Avoid inhaling toner or developer excessively. Protect the eyes. If toner or developer is accidentally ingested, drink a lot of water to dilute it in the stomach and obtain medical attention immediately. If it gets into the eyes, rinse immediately with copious amounts of water and obtain medical attention.













• Advise customers that they must always follow the safety warnings and precautions in the copier's instruction handbook.








2. Precautions for Maintenance

WARNING

- Always remove the power plug from the wall outlet before starting machine disassembly. 
- Always follow the procedures for maintenance described in the service manual and other related brochures. 
- Under no circumstances attempt to bypass or disable safety features including safety mechanisms and protective circuits. 
- Always use parts having the correct specifications. 
- Always use the thermostat or thermal fuse specified in the service manual or other related brochure when replacing them. Using a piece of wire, for example, could lead to fire or other serious accident. 
- When the service manual or other serious brochure specifies a distance or gap for installation of a part, always use the correct scale and measure carefully. 
- Always check that the copier is correctly connected to an outlet with a ground connection. 
- Check that the power cable covering is free of damage. Check that the power plug is dust-free. If it is dirty, clean it to remove the risk of fire or electric shock. 
- Never attempt to disassemble the optical unit in machines using lasers. Leaking laser light may damage eyesight. 
- Handle the charger sections with care. They are charged to high potentials and may cause electric shock if handled improperly. 

CAUTION

- Wear safe clothing. If wearing loose clothing or accessories such as ties, make sure they are safely secured so they will not be caught in rotating sections. 
- Use utmost caution when working on a powered machine. Keep away from chains and belts. 
- Handle the fixing section with care to avoid burns as it can be extremely hot. 
- Check that the fixing unit thermistor, heat and press rollers are clean. Dirt on them can cause abnormally high temperatures. 
- Do not remove the ozone filter, if any, from the copier except for routine replacement. 

• Do not pull on the AC power cord or connector wires on high-voltage components when removing them; always hold the plug itself.



• Do not route the power cable where it may be stood on or trapped. If necessary, protect it with a cable cover or other appropriate item.



• Treat the ends of the wire carefully when installing a new charger wire to avoid electric leaks.



• Remove toner completely from electronic components.



• Run wire harnesses carefully so that wires will not be trapped or damaged.



• After maintenance, always check that all the parts, screws, connectors and wires that were removed, have been refitted correctly. Special attention should be paid to any forgotten connector, trapped wire and missing screws.



• Check that all the caution labels that should be present on the machine according to the instruction handbook are clean and not peeling. Replace with new ones if necessary.



• Handle greases and solvents with care by following the instructions below:



- Use only a small amount of solvent at a time, being careful not to spill. Wipe spills off completely.
- Ventilate the room well while using grease or solvents.
- Allow applied solvents to evaporate completely before refitting the covers or turning the main switch on.
- Always wash hands afterwards.

• Never dispose of toner or toner bottles in fire. Toner may cause sparks when exposed directly to fire in a furnace, etc.



• Should smoke be seen coming from the copier, remove the power plug from the wall outlet immediately.



3. Miscellaneous

WARNING

• Never attempt to heat the drum or expose it to any organic solvents such as alcohol, other than the specified refiner; it may generate toxic gas.



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1-1-1 Specifications

Compatible printer	FS-6020
Loadable paper sizes	ISO A3 (297 × 420 mm) JIS B4 (257 × 364 mm) ISO A4R (210 × 297mm) ISO A4 (297 × 210 mm) JIS B5 (257 × 182 mm) ISO A5 (148 × 210 mm) Letter (8 ¹ / ₂ " × 11") Legal (8 ¹ / ₂ " × 14") Ledger (11" × 17") Non-standard size (148 × 210 to 297 × 432 mm)
Loadable paper type	60 to 105 g/m ²
Environmental requirements	Temperature: 10 to 32.5°C/50 to 90.5°F Humidity: 20 to 80% RH Ideal conditions are 23°C/65% RH, altitude under 2000 m.
Power supply	Supplied from printer (5 V DC, 24 V DC)
Dimensions	420 (W) × 460 (D) × 40(H) mm (Rear cover unit: 150mm) 16 ⁹ / ₁₆ " (W) × 18 ¹ / ₈ " (D) × 1 ⁹ / ₁₆ " (H) (Rear cover unit: 5 ¹ / ₈ ")
Weight	3.8 kg/8.36 lbs

1-1-2 Parts names and their functions

(1) Parts names

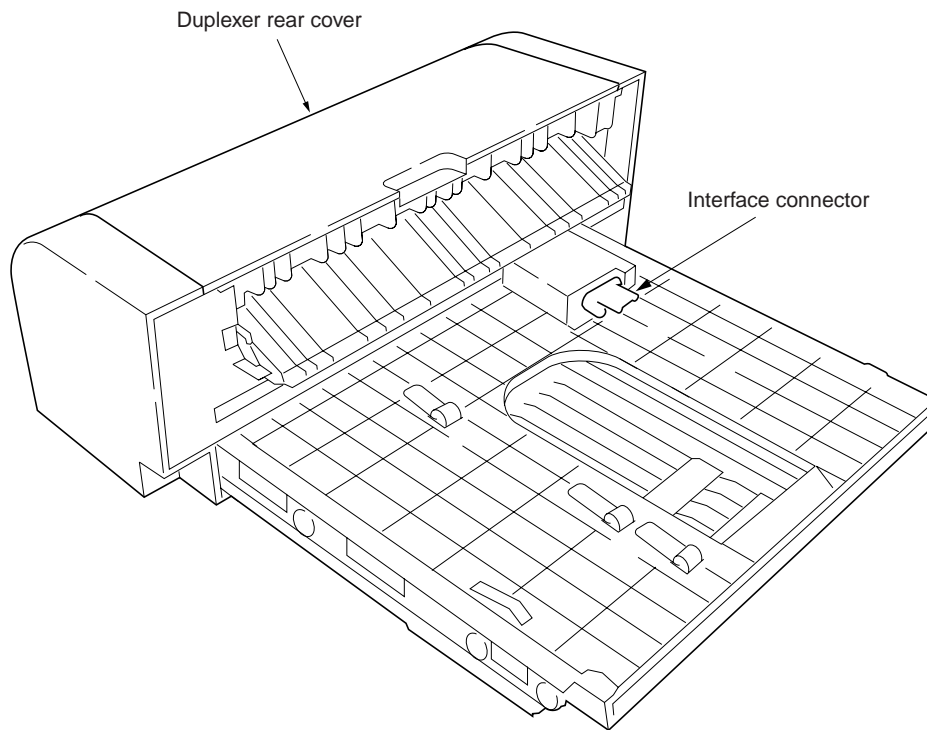


Figure 1-1-1

1-1-3 Machine cross section

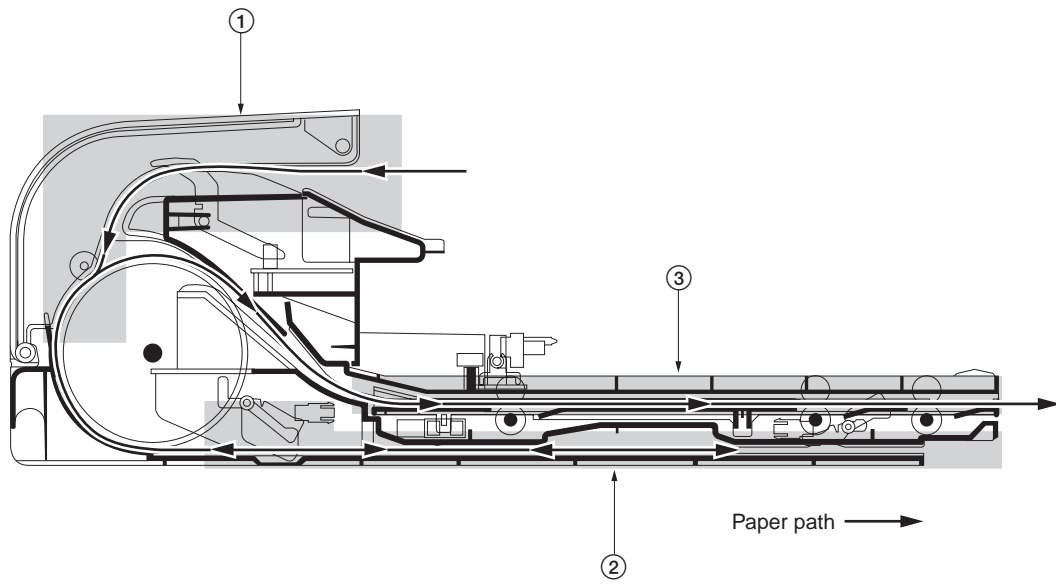


Figure 1-1-2 Machine cross section

- ① Vertical path section
- ② Lower paper path section
- ③ Upper paper path section

1-1-4 Drive system

(1) Drive system

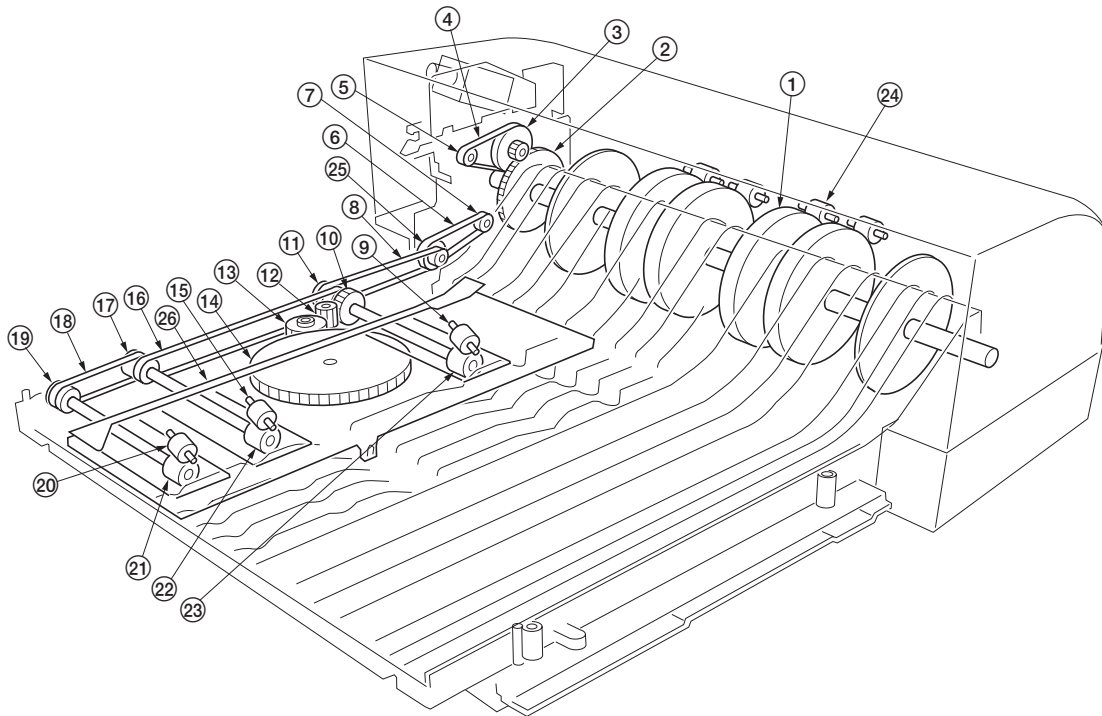


Figure 1-1-3 Drive system

- | | |
|-------------------------|-------------------|
| ① Turn roller | ⑭ Slide gear |
| ② Turn gear 2 | ⑮ Diagonal roller |
| ③ Turn gear 1 | ⑯ Belt S2M308 |
| ④ Belt S2M144 | ⑰ Feed pulley 2 |
| ⑤ Switchback morot gear | ⑱ Belt S2M144 |
| ⑥ Belt S2M134 | ⑲ Feed pulley 1 |
| ⑦ Refeed motor gear | ⑳ Diagonal roller |
| ⑧ Belt S2M192 | ㉑ Feed roller 3 |
| ⑨ Diagonal roller A | ㉒ Feed roller 2 |
| ⑩ Clutch gear | ㉓ Feed roller 1 |
| ⑪ Feed pulley 1 | ㉔ Pinch roller |
| ⑫ Helical gear 1 | ㉕ Idle pulley |
| ⑬ Helical gear 2 | ㉖ Slide guide |

1-2-1 Installation environment

1. Installation location

- Avoid direct sunlight or bright lighting. Ensure that the photoconductor will not be exposed to direct sunlight or other strong light.
- Avoid extremes of temperature and humidity, abrupt ambient temperature changes, and hot or cold air directed onto the machine.
- Avoid dust and vibration.
- Choose a surface capable of supporting the weight of the machine.
- Place the machine on a level surface (maximum allowance inclination: 1°).
- Avoid air-borne substances that may adversely affect the machine or degrade the photoconductor, such as mercury, acidic or alkaline vapors, inorganic gasses, NO_x, SO_x gases and chlorine-based organic solvents.
- Select a room with good ventilation.

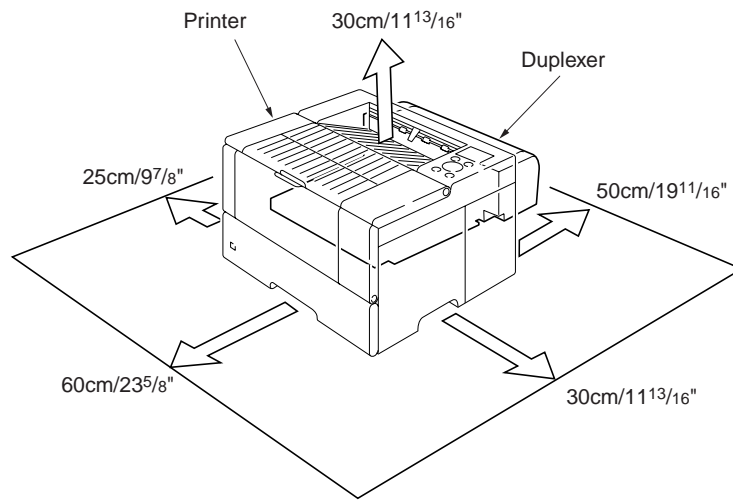


Figure 1-2-1 Installation dimensions

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1-3-1 Unpacking and installation

(1) Installation procedure

Unpacking the machine

Unpack the package of duplexer and check that the contents are sufficient.

- ① Duplexer
- ② Outer package
- ③ Bottom pad
- ④ Top pad
- ⑤ Plastic bag
- ⑥ Rear pad

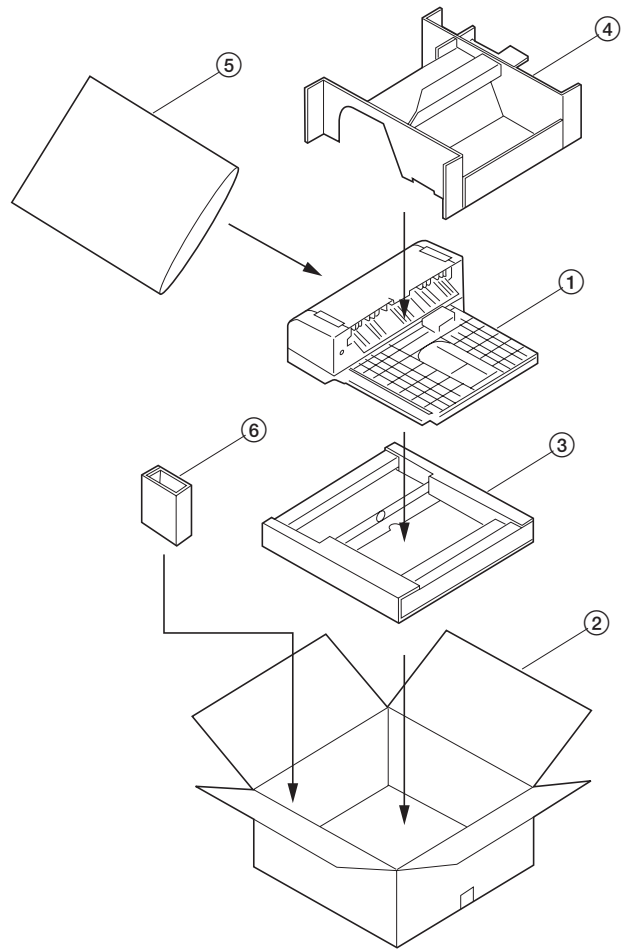


Figure 1-3-1

1. Peel off the tapes and remove the protective pad.

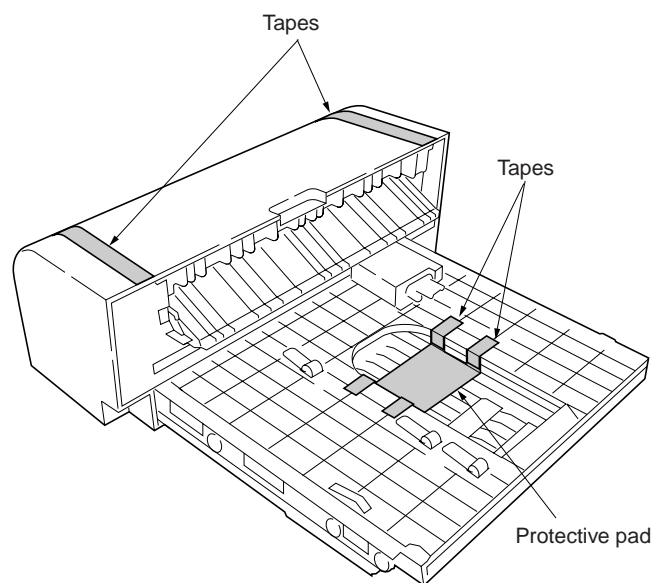


Figure 1-3-2

Attaching the duplexer

1. Attach the duplexer from the rear part of printer.

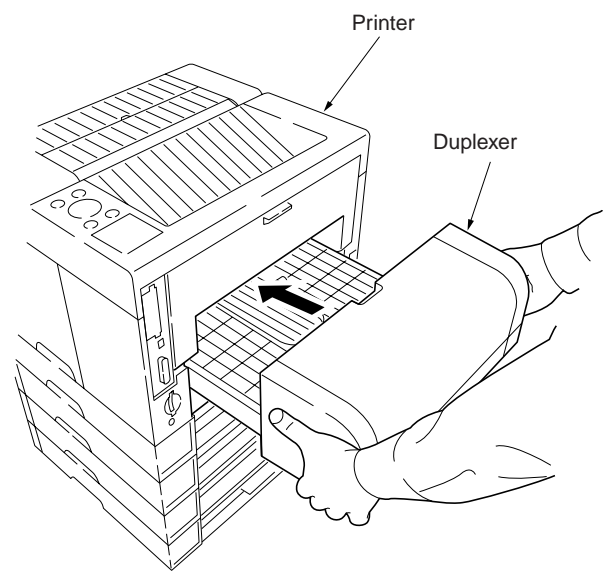


Figure 1-3-3

Completion of the machine installation.

1-4-1 Paper misfeed detection

(1) Paper misfeed indication

When the sensor in the duplexer (Switchback timing sensor, refeed trailing edge detection sensor, refeed eject sensor) cannot be turned ON or OFF because the conveying distance of paper does not reach the specified value even if the switchback motor or the refeed motor is driven by the specified number of pulses while printing on 2 sides, it is judged that paper misfeed occurred in the duplexer and the paper misfeed indication is displayed on the operation panel of the printer and the printer operation will be stopped.

(2) Detecting conditions of paper misfeed

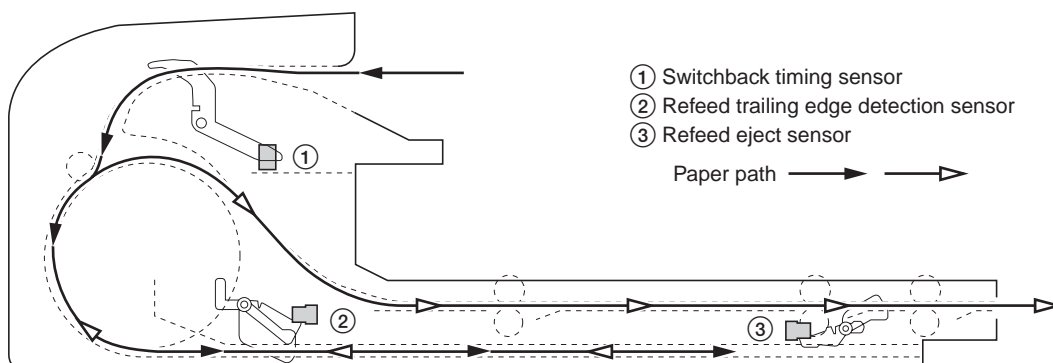


Figure 1-4-1 Paper misfeed detection

* Detecting condition of paper misfeed

- When the printer power supply is turned on, a paper was detected with either of the switchback timing sensor, refeed trailing edge detection sensor or refeeding eject sensor.
- Upon reception of the command of 2 side printing from the printer, the leading edge of paper cannot be detected with the switchback timing sensor. (Vertical path assembly delay)
- After detecting the leading edge of paper with the switchback timing sensor, the trailing edge of paper cannot be detected with the switchback timing sensor. (Vertical path assembly retention)
- After the turn roller started reverse rotation, the trailing edge of paper cannot be detected with the refeed trailing edge detection sensor. (Turn roller delay)
- * After switching back, the leading edge and trailing edge of paper will be reversed.
- After refeeding of paper started, the leading edge of paper cannot be detected with the refeeding eject sensor. (Refeed delay)
- After refeeding of paper started, the trailing edge of paper cannot be detected with the refeeding eject sensor. (Refeed retention)
- The switchback timing sensor detected the leading edge of paper with the inverting paper existed. (Duplexer overflow)

(3) Correcting a paper misfeed

If paper misfeed occurs with the duplexer, reset all conditions to the original state by removing jammed paper by means of following methods; pulling out the paper cassette, opening the duplexer rear cover and dismounting the duplexer, and reset the paper misfeed indication by opening/closing the top cover of the printer once and then printer will resume its operation.

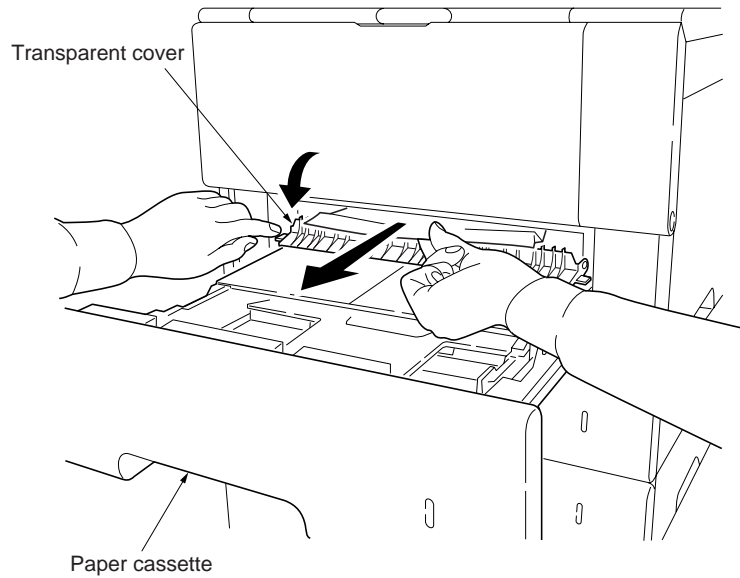


Figure 1-4-2 Correcting a paper misfeed (1)

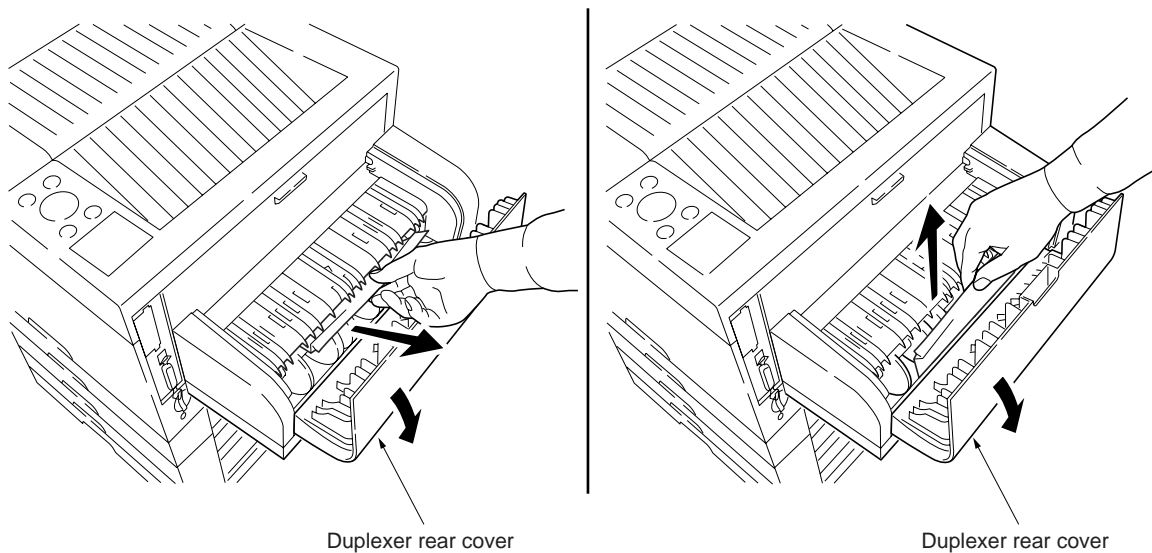


Figure 1-4-3 Correcting a paper misfeed (2)

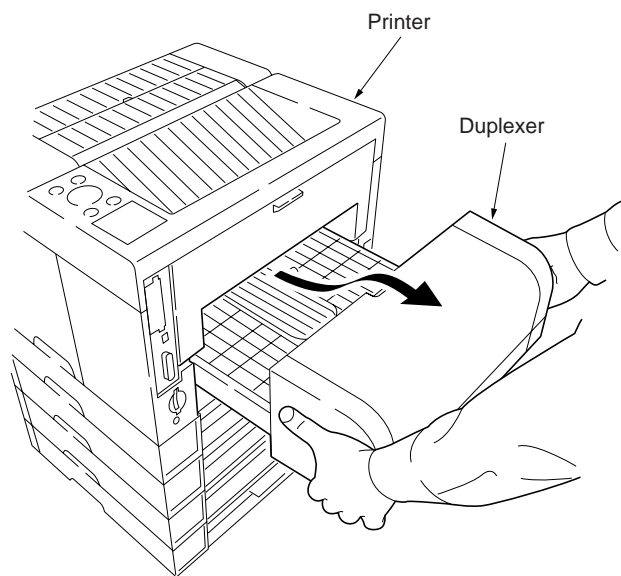


Figure 1-4-4 Correcting a paper misfeed (3)

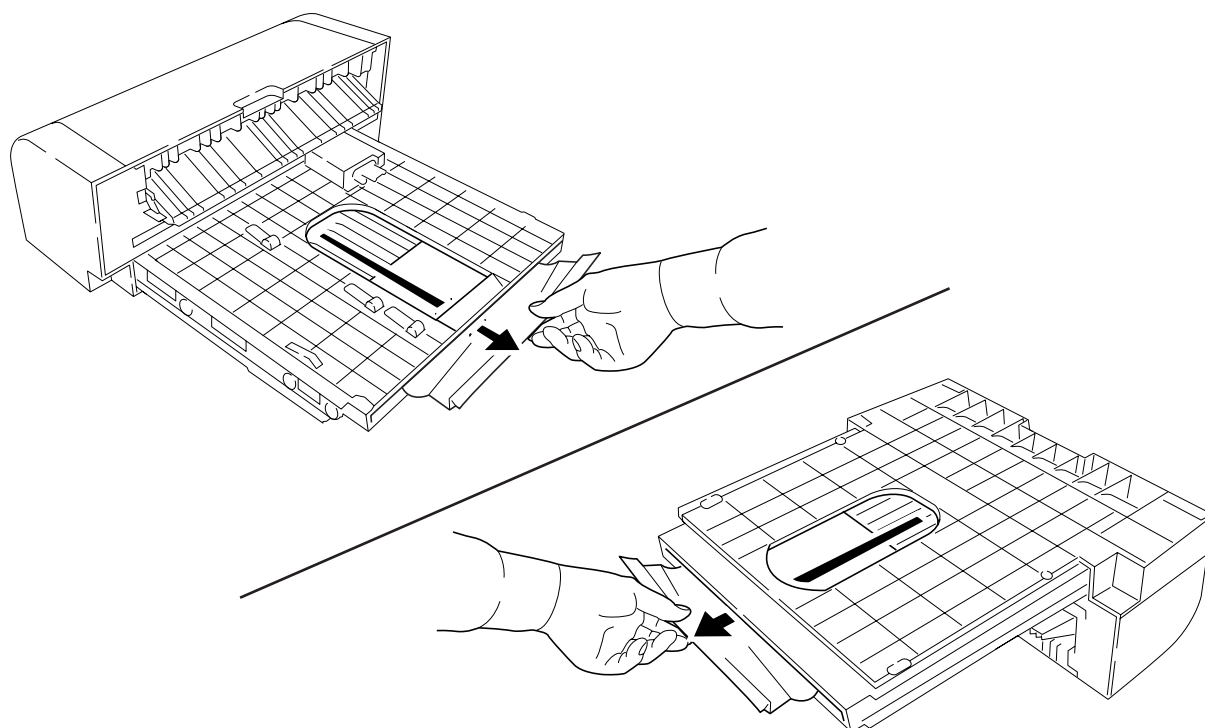


Figure 1-4-5 Correcting a paper misfeed (4)

1-4-2 Self-diagnosis

(1) Self-diagnostic function

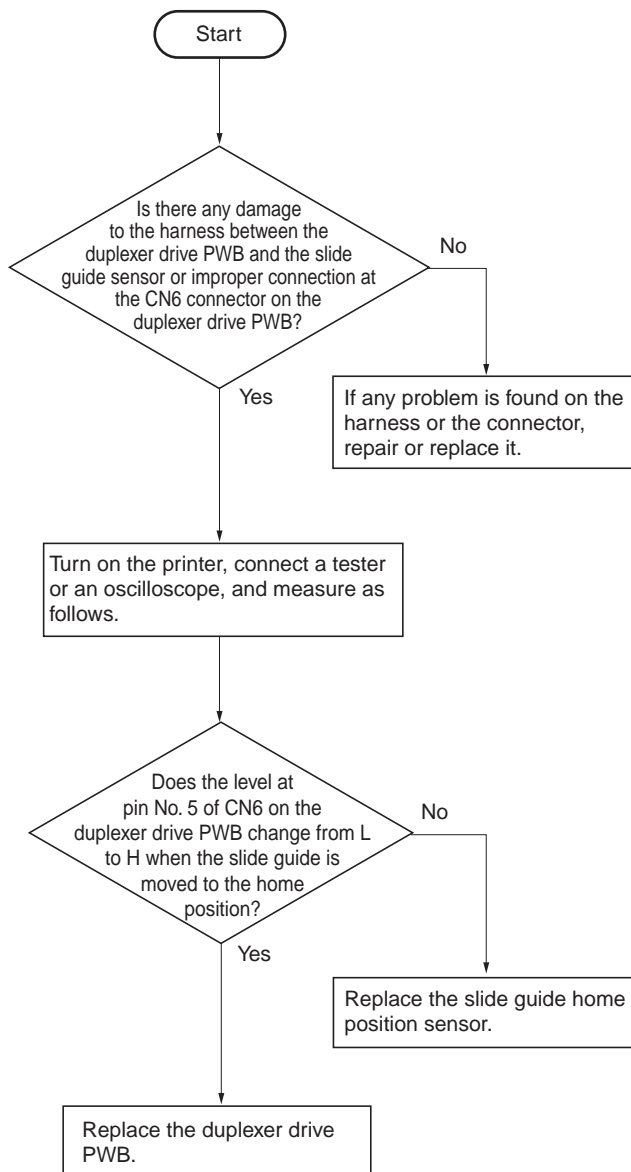
The printer is equipped with a self-diagnostic function. When a problem is detected, the printer stops printing and an error message is displayed on the operation panel. An error message consists of a message prompting contact to service personnel, total print count, and a four-digit error code (2 digits for F0 only) indicating the type of the error.

(1-1) Error code 1210 [C2] (duplexer slide guide home position detection error)

Detection conditions

- The duplexer drive PWB of the optional duplexer cannot detect the home position of the slide guide.

Corrective measures



1-5-1 Precautions for assembly and disassembly

(1) Precautions

- Be sure to turn the main switch off and disconnect the power plug before starting disassembly.
- When handling PCBs, do not touch connectors with bare hands or damage the board.
- Do not touch any PCB containing ICs with bare hands or any object prone to static charge.
- Use the following testers when measuring voltages:

Hioki 3200

Sanwa MD-180C

Sanwa YX-360TR

1-5-2 Duplexer

(1) Detaching and refitting the duplexer rear cover

Procedure

1. Remove the two screws from bottom of the duplexer.
2. Remove the two screws and then remove the duplexer rear cover.

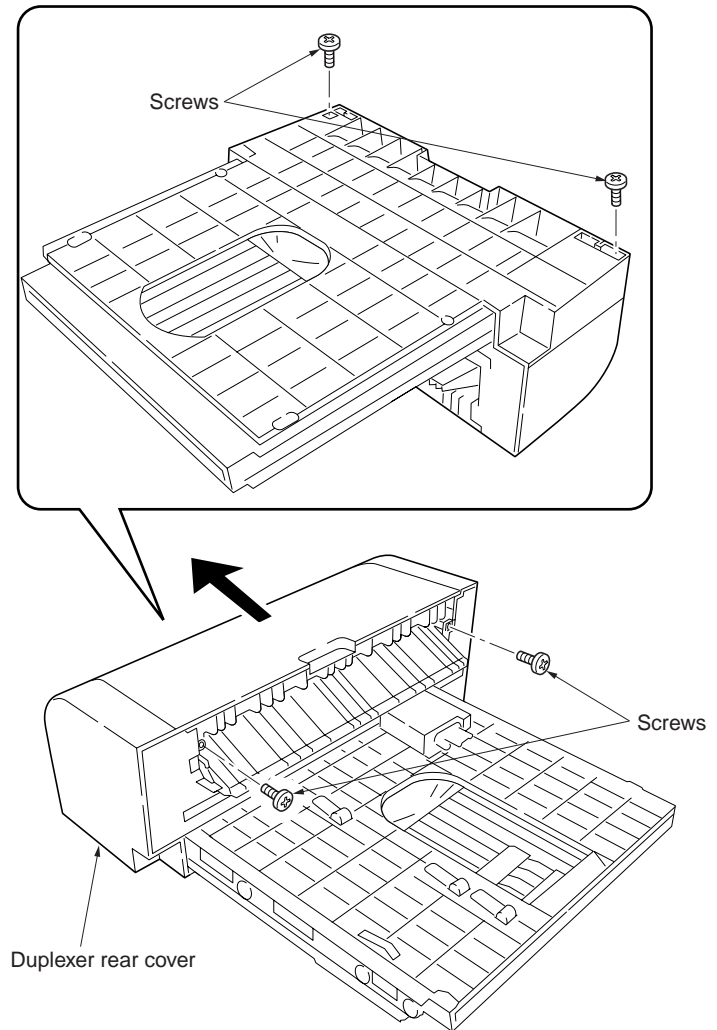


Figure 1-5-1

(2) Detaching and refitting the turn roller

Follow the procedure below to check or replace the turn roller.

Procedure

1. Remove the duplexer rear cover (see page 1-5-2).
2. Remove the eight screws and then remove the bottom base.

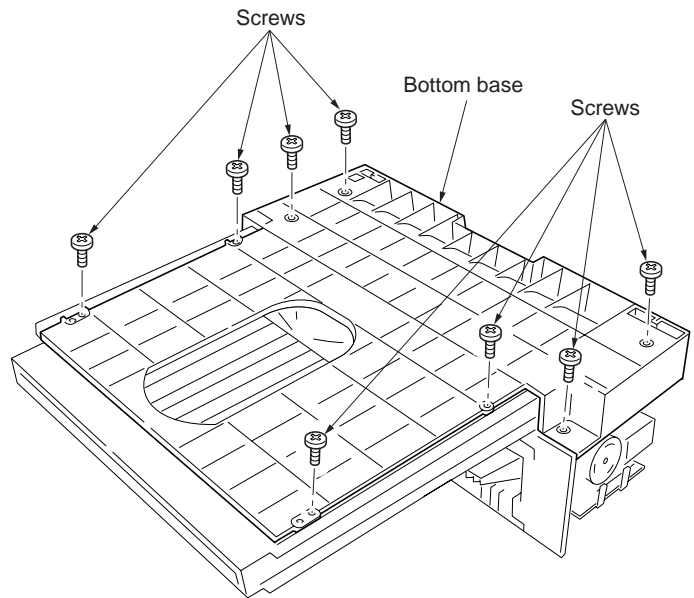


Figure 1-5-2

3. Remove the two E-rings and two bearings and then remove the turn roller.
4. Remove the turn gear 2 from the turn roller.
5. Check or replace the turn roller.
6. Refit all the removed parts.

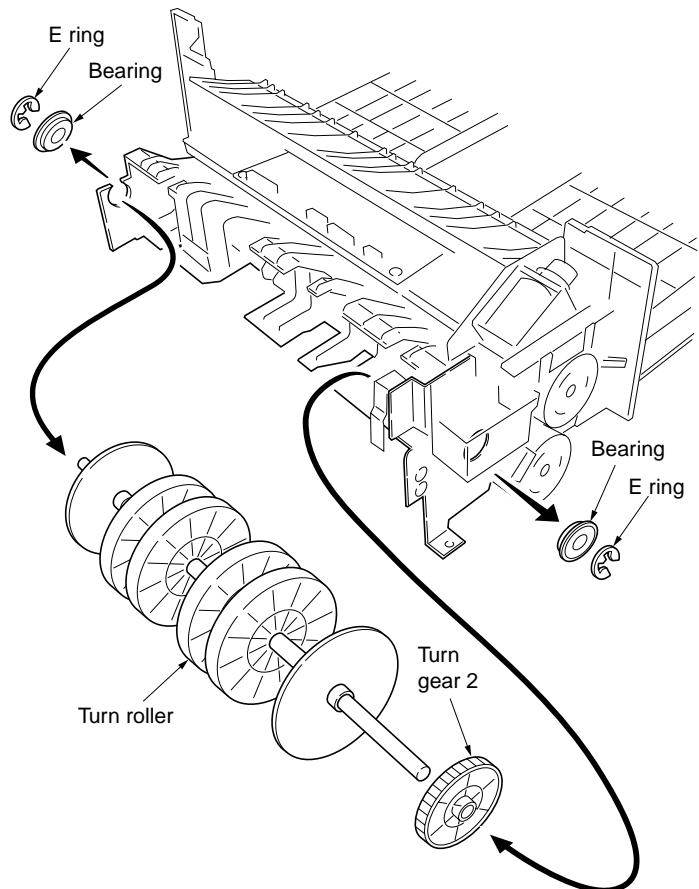


Figure 1-5-3

(3) Detaching and refitting the feed roller 1, 2 and 3

Follow the procedure below to check or replace the feed roller 1, 2 and 3.

Procedure

1. Remove the duplexer drive PWB (see page 1-5-6).
2. Remove the four screws and then remove the PWB cover.

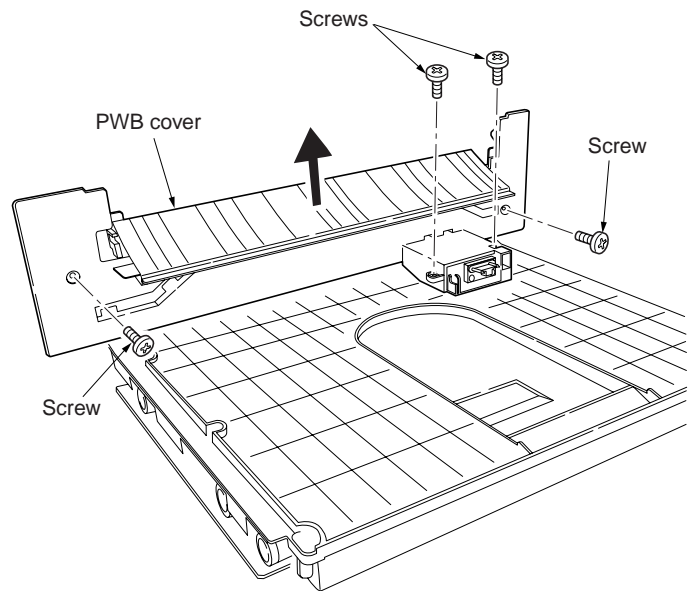


Figure 1-5-4

3. Remove the screw and then remove the ground terminal.
4. Remove the four hooks and then remove the ground wire from wire saddles.
5. Remove the one screw.

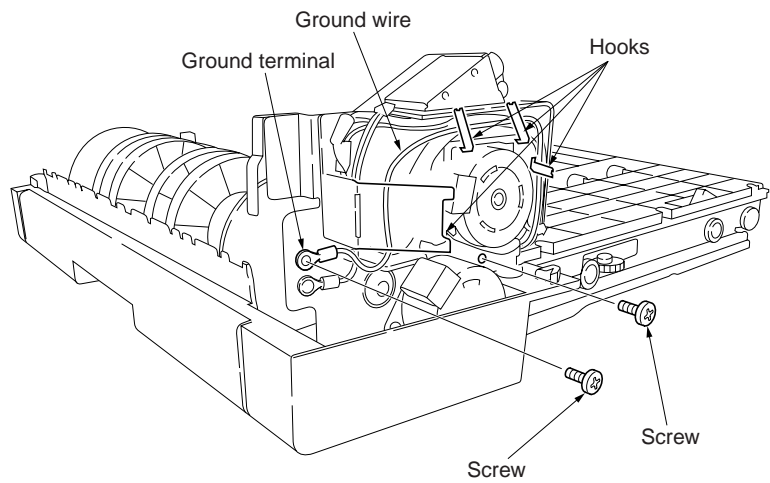


Figure 1-5-5

6. Remove the five screw and then remove the top base.

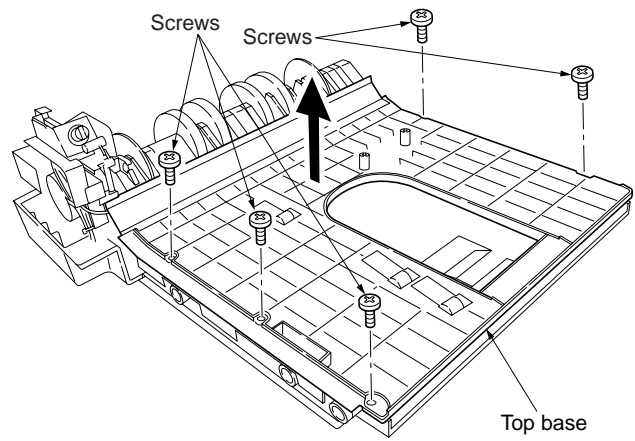


Figure 1-5-6

7. Remove the slide shaft and then remove the slide guide.
 8. Remove the three belts from the feed pulley 1 and 2.
 9. Open the latches of feed pulley 1 and 2 respectively. And then remove the pulleys from feed roller 1, 2 and 3.
 10. Remove the bushes, clutch gear and spacer.
 11. Check or replace the feed roller 1, 2 and 3.
 12. Refit all the removed parts.
- * When fitting the clutch gear, put the one-way clutch located with the gear face to the spacer.
- * When fitting the bushes and spacers, ensure that the projection of bushes is inserted into the notch of spacers.

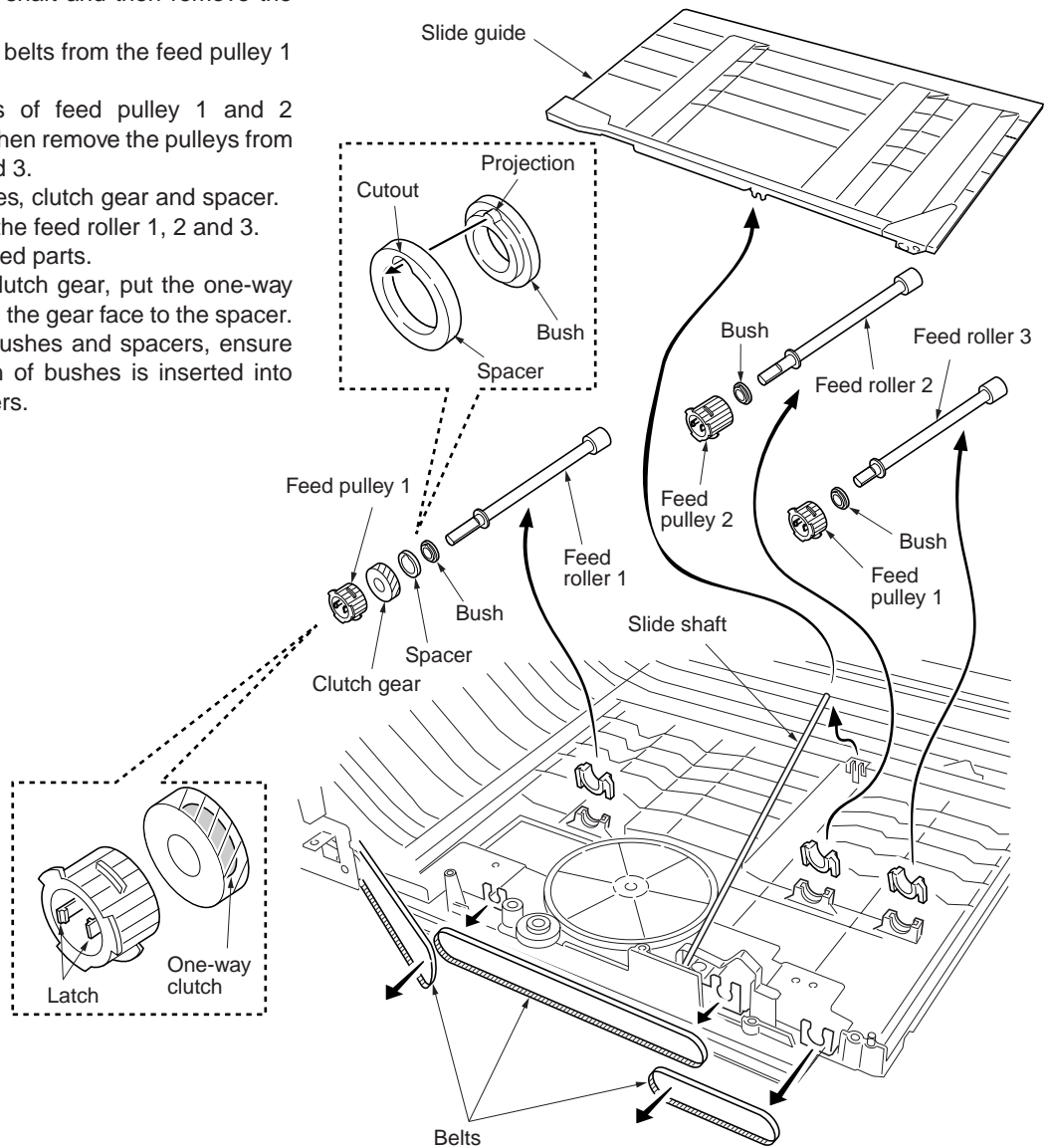


Figure 1-5-7

(4) Detaching and refitting the duplexer drive PWB

Follow the procedure below to check or replace the duplexer drive PWB.

Procedure

1. Remove the duplexer rear cover (see page 1-5-2).
2. Remove the two screws and then remove the ground terminal and duplexer drive PWB.
3. Remove all (six) connectors from the duplexer drive PWB.
4. Check or replace the duplexer drive PWB.
5. Refit all the removed parts.

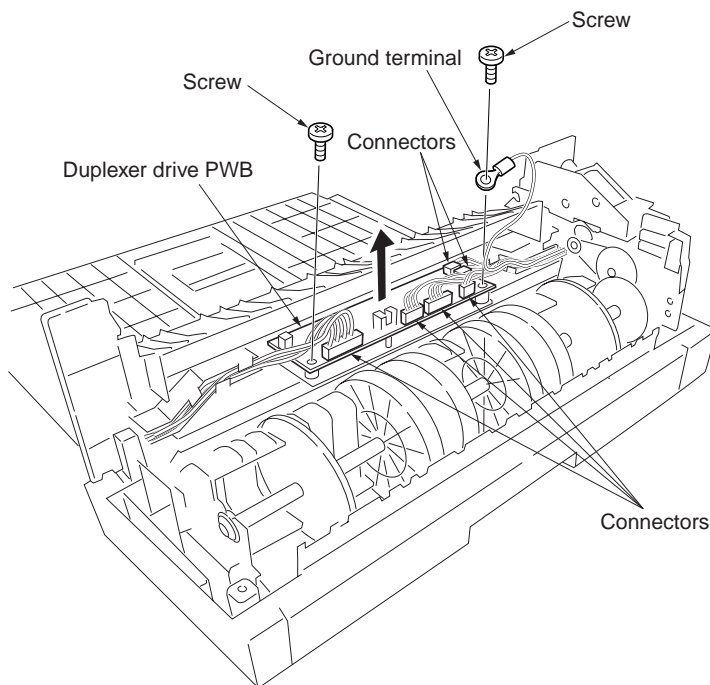


Figure 1-5-8

2-1-1 Duplexer

Duplexer consists of the following parts and it refeeds the paper after switchback, which is ejected from the printer. The paper with the first side printed after fixing in the printer unit is guided to the vertical path assembly of the duplexer by the feedshift guide activated by the feedshift solenoid in the printer. The paper that is guided to the vertical path assembly is conveyed to the lower paper path of the duplexer by the forward rotation of the turn roller, and the turn roller reverses its rotation when the refeed trailing edge detection sensor detected the trailing edge of paper and then the paper is conveyed to the upper paper path. The paper conveyed to the upper paper path strikes the slide guide according to the action of diagonal roller and it is conveyed by the feed roller 1, 2 and 3 while creating the skew compensation. Slide guide have been moved in advance by the refeed motor according to the paper width specified from the printer so that the paper can be conveyed on the basis of center line. At the time as the paper leading edge is detected by the refeed sensor, the unit waits for the refeed command from the printer and the paper is refeed to the printer with its second surface positioned upward by the command of refeed. After refeed, the paper that finished fixing and 2 sides are printed is ejected to the face-up tray side because the feedshift solenoid does not activate the feedshift guide.

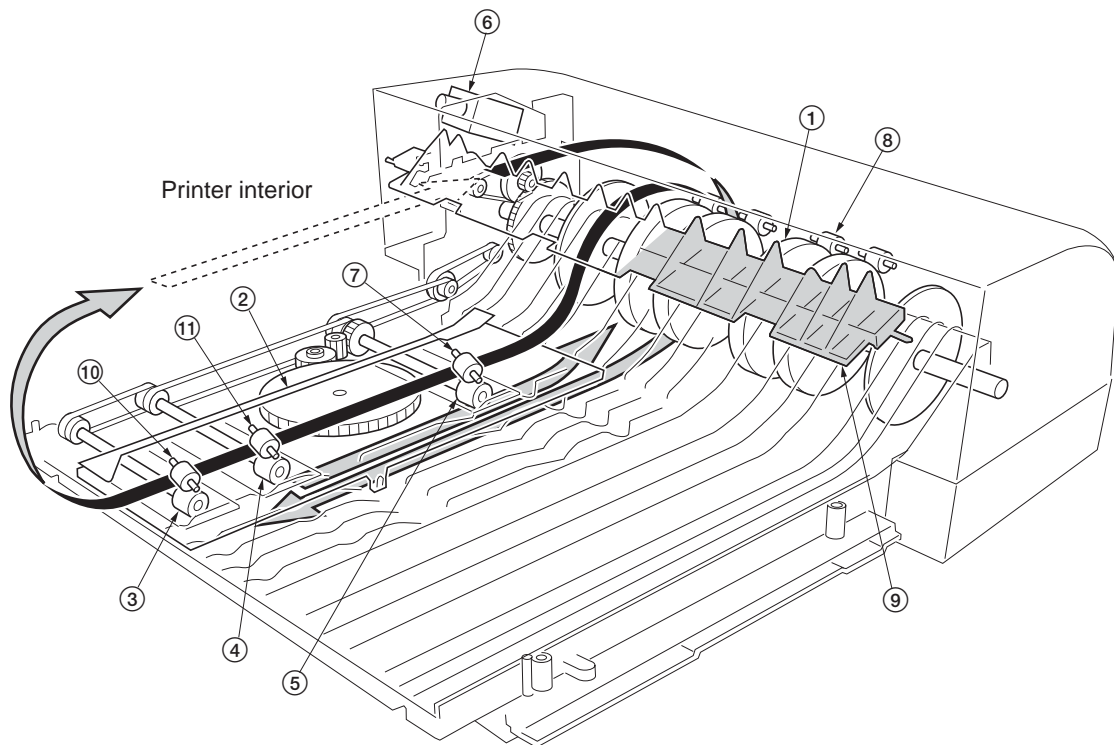


Figure 2-1-1 Duplexer

- | | |
|----------------------|-----------------------------|
| ① Turn roller | ⑦ Diagonal roller A |
| ② Slide guide | ⑧ Pinch roller |
| ③ Feed roller 3 | ⑨ Feedshift guide (Printer) |
| ④ Feed roller 2 | ⑩ Diagonal roller |
| ⑤ Feed roller 1 | ⑪ Diagonal roller |
| ⑥ Feedshift solenoid | |

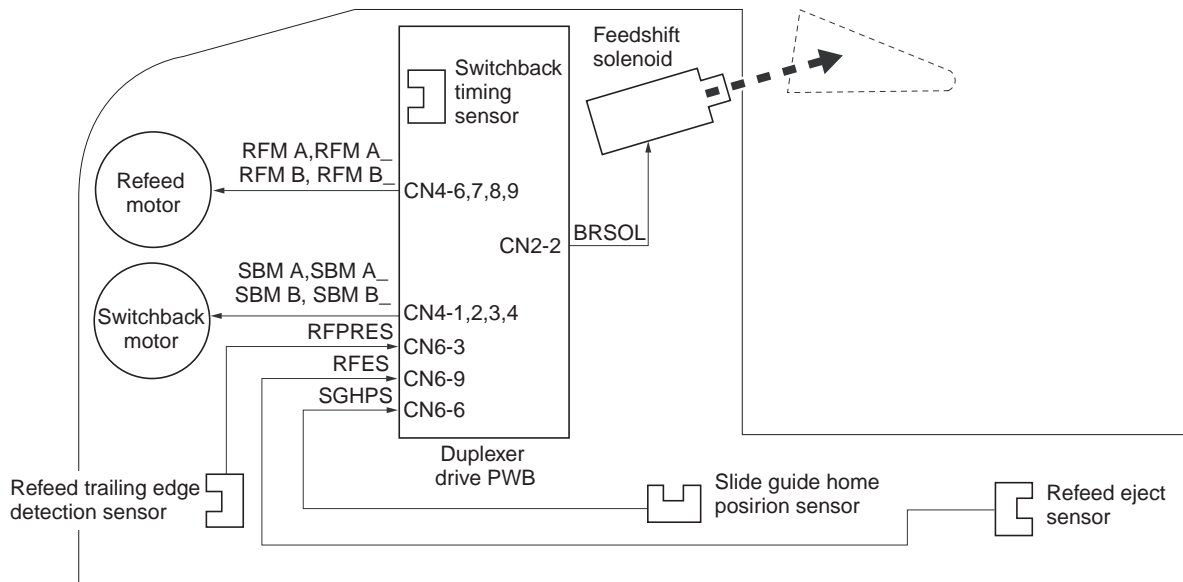


Figure 2-1-2 Duplexer block diagram

2-2-1 Electrical parts layout

(1) Electrical parts

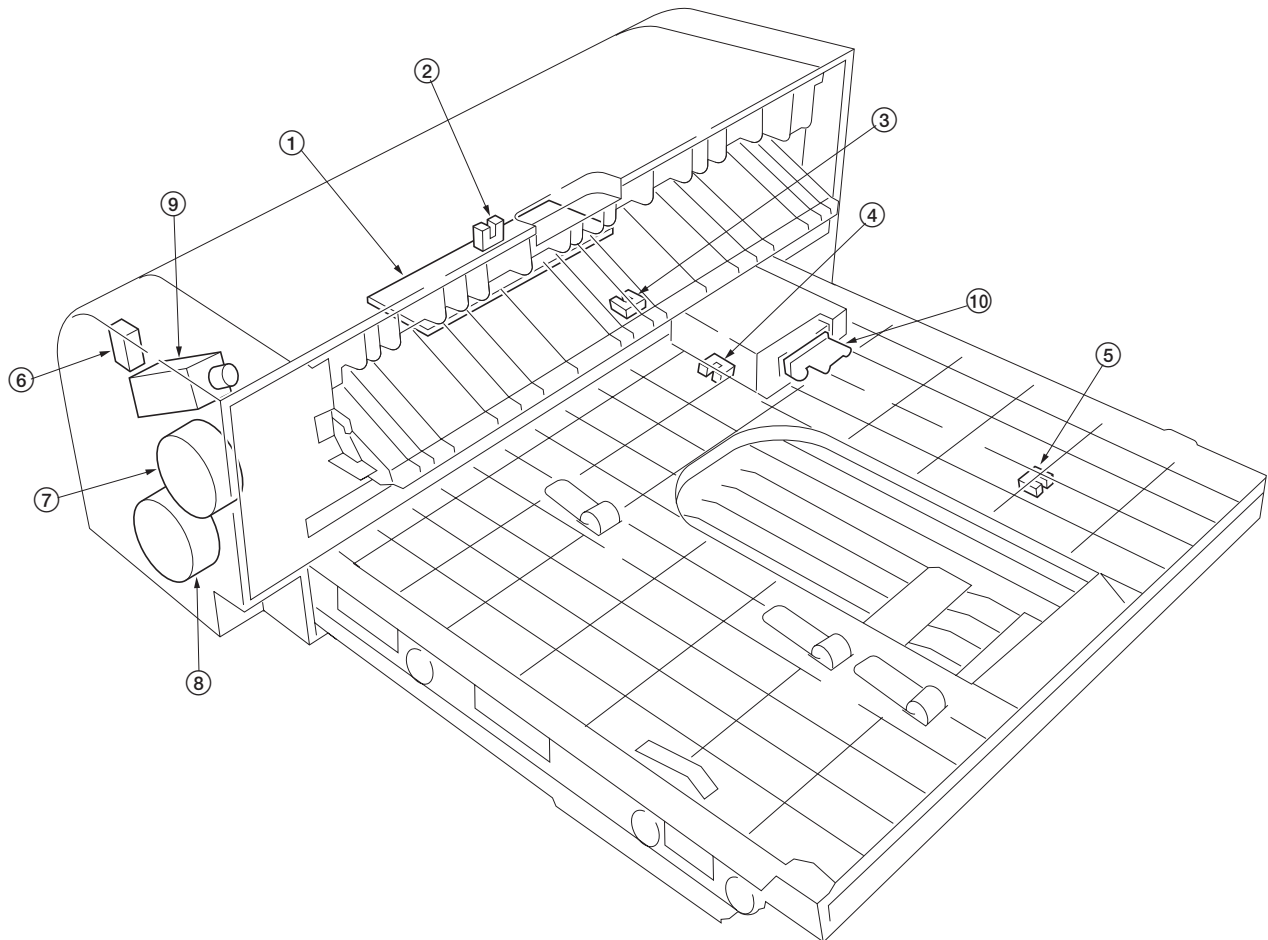


Figure 2-2-1 Electrical parts

- | | |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1. Duplexer drive PWB | Controls the input/output of electrical parts in the duplexer. |
| 2. Switchback timing sensor | Detects timing of the leading and trailing edges of paper at the vertical path assembly. Detects paper misfeed. |
| 3. Refeed trailing edge detection sensor | Detects timing of the trailing edge of paper when switched back. Detects paper misfeed. |
| 4. Slide guide home position sensor | Detects the slide guide home position. |
| 5. Refeed eject sensor | Detects the leading edge of paper on the upper paper path. Detects paper misfeed. |
| 6. Rear cover interlock switch | Shuts off 24 V DC power line when the duplexer rear cover is opened. |
| 7. Switchback motor | Drives forward/reverse rotation of the turn roller. |
| 8. Paper refeed motor | Drives the feed rollers 1, 2 and 3 and activates the slide guide. |
| 9. Feedshift solenoid | Activates the feedshift guide of the printer. |
| 10. Interface connector | Connects the signal wire of the printer to the power source. |

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2-3-1 Duplexer drive PWB

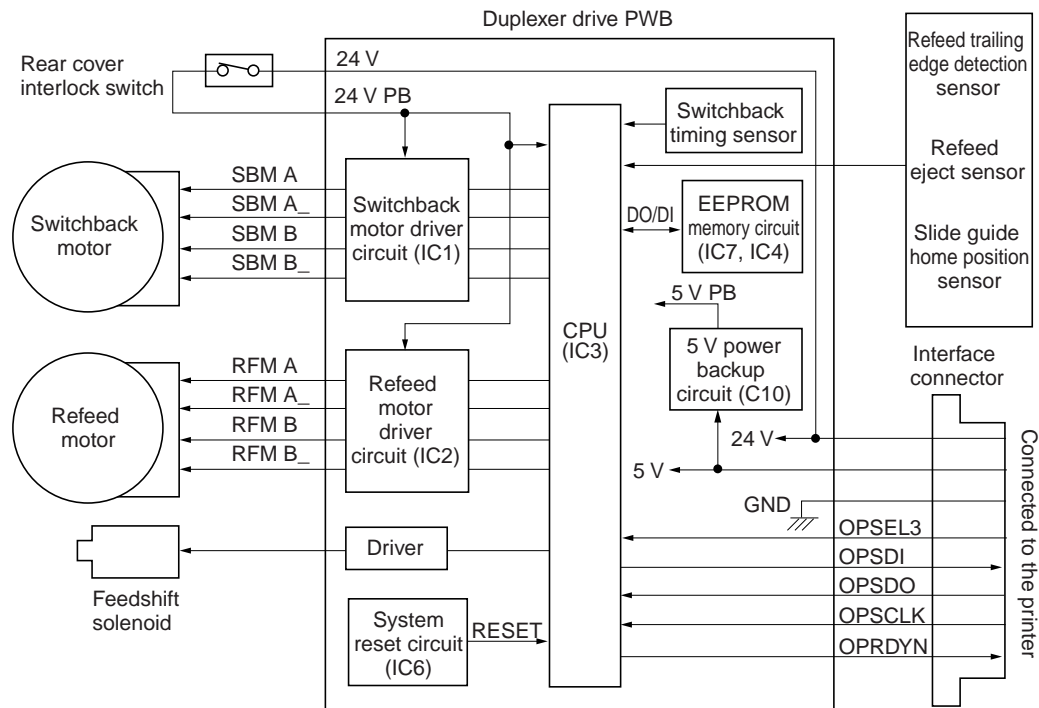


Figure 2-3-1 Duplexer drive PWB block diagram

Duplexer drive PWB consists of the switchback motor driver circuit (IC1), refeed motor driver circuit (IC2) and other peripheral circuits with a central focus on CPU (IC3) and it is controlled by the engine/high voltage PWB of the printer. Sending/receiving of the control signal is carried out in the serial communication between the duplexer drive PWB and the engine/high voltage PWB of the printer. The CPU (IC3) drives the refeed motor via the refeed motor driver circuit (IC2) while it drives the switchback motor via the switchback motor driver circuit (IC1). The CPU (IC3) controls forward/reverse rotation of the switchback motor and detects paper misfeed by receiving the detection signal input from the switchback timing sensor, refeed trailing edge sensor and refeed eject sensor, and it detects the slide guide home position according to the detection input from the slide guide home position sensor. System reset circuit monitors the 5 V DC power supply voltage by the operation of power supply detection/system reset IC (IC6), therefore this circuit outputs the RESET signal to the CPU (IC3) to prevent the system malfunction when the power is turned on or if the power voltage drops. The EEPROM memory circuit detects the voltage drop by the operation of the power supply detection IC (IC4) before the RESET signal is output, and activates the CPU (IC3) to perform the memory backup (the number of total paper feed) operation to EEPROM (IC7). The 5 V power voltage backup circuit discharges the charged current in the capacitor (C10) when the power voltage drops in order to feed to the circuits required for the memory backup operation and holds the 5 V DC power supply for a certain period of time. The printer supplies the 24 V DC and 5 V DC power and this 24 V DC is applied for the drive power source of the switchback motor, refeed motor and feedshift solenoid. The 24 V DC power is supplied via the rear cover interlock switch, so the supply of 24 V DC is shut off when the duplexer rear cover is opened. 5 V DC is the power supply to operate the circuits and sensors.

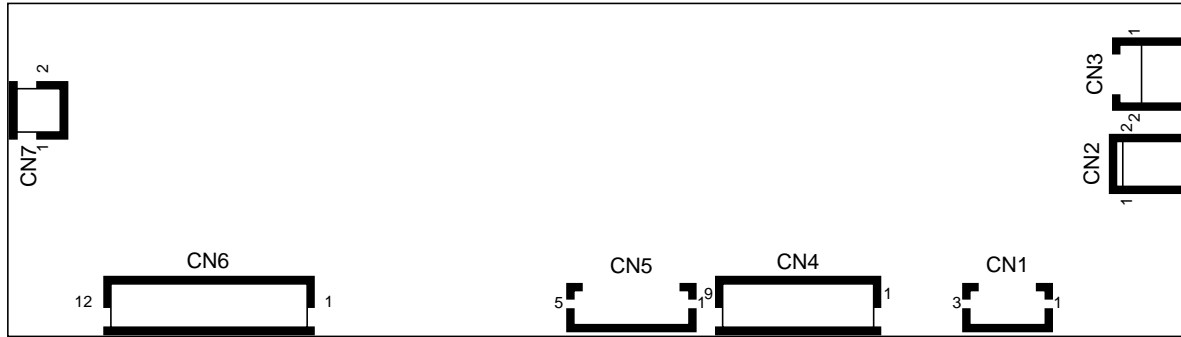
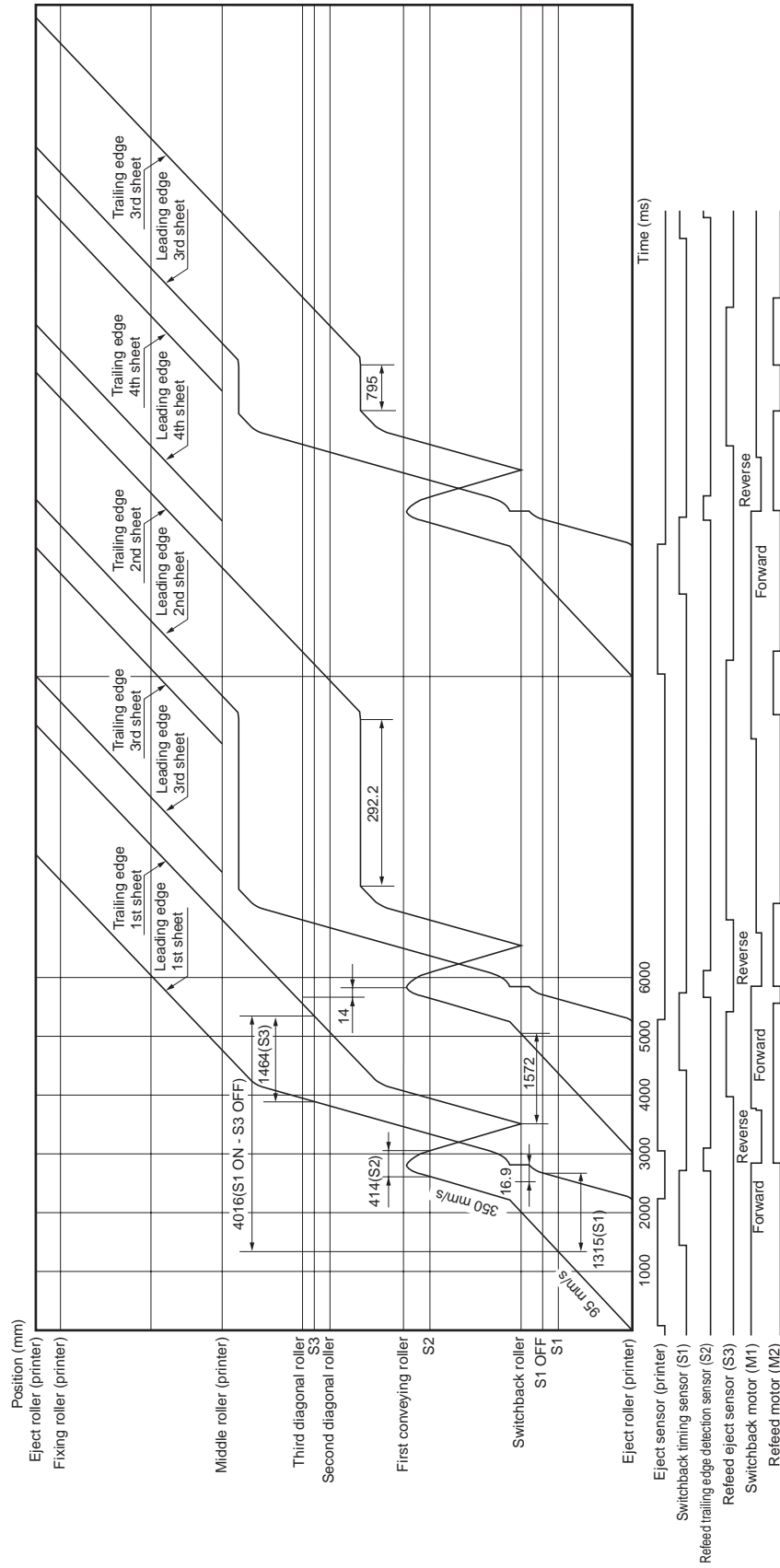


Figure 2-3-2 Duplexer drive PWB silk-screen diagram

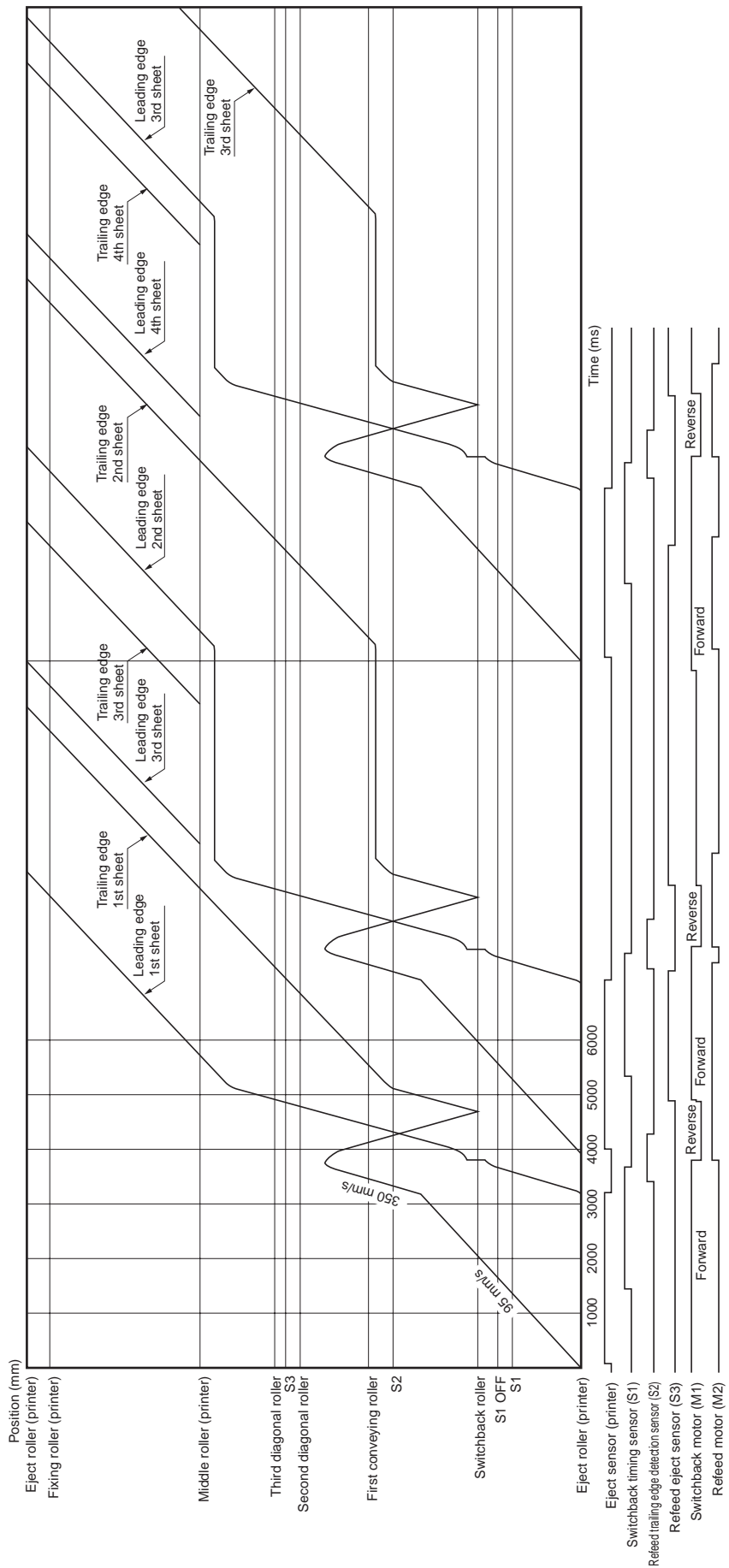
Connector	Pin No.	Signal	I/O	Voltage	Description
CN1 Connected to the interface connector.	1	24 V	I	24 V DC	24 V DC power input
	2	5 V	I	5 V DC	5 V DC power input
	3	GND	-	Ground	Signal ground
CN2 Connected to the feedshift solenoid.	1	24 V	O	24 V DC	24 V DC power supply for feedshift solenoid
	2	BRSOL	O	0/24 V DC	Feedshift solenoid: On/Off
CN3 Connected to the rear cover interlock switch.	1	24 V	O	24 V DC	24 V DC power
	2	24 V PB	I	0/24 V DC	Rear cover interlock switch: Off/On
CN4 Connected to the switchback motor and refeed motor.	1	SBM A_	O	0/24 V DC (pulse)	Switchback motor coil energization pulse (A_)
	2	SBM A	O	0/24 V DC (pulse)	Switchback motor coil energization pulse (A)
	3	SBM B_	O	0/24 V DC (pulse)	Switchback motor coil energization pulse (B_)
	4	SBM B	O	0/24 V DC (pulse)	Switchback motor coil energization pulse (B)
	5	NC	-	-	Not used
	6	RFM B_	O	0/24 V DC (pulse)	Refeed motor coil energization pulse (B_)
	7	RFM A_	O	0/24 V DC (pulse)	Refeed motor coil energization pulse (A_)
	8	RFM B	O	0/24 V DC (pulse)	Refeed motor coil energization pulse (B)
	9	RFM A	O	0/24 V DC (pulse)	Refeed motor coil energization pulse (A)
CN5 Connected to the interface connector.	1	OPSEL3	I	0/5 V DC	Duplexer select signal
	2	OPSDI	O	0/5 V DC (pulse)	Serial communication data, output
	3	OPSDO	I	0/5 V DC (pulse)	Serial communication data, input
	4	OPSClk	I	0/5 V DC (pulse)	Clock pulse for serial communication
	5	OPRDYN	O	0/5 V DC	Duplexer ready signal
CN6 Connected to the refeed trailing edge detection sensor, slide guide home position sensor and refeed eject sensor.	1	5 V	O	5 V DC	5 V DC power supply for refeed trailing edge detection sensor
	2	GND	-	Ground	Signal ground
	3	RFPRES	I	0/5 V DC	Refeed trailing edge detection sensor: On/Off
	4	SGHPSW	I	0/5 V DC	Slide guide home position sensor: On/Off
	5	5 V	O	5 V DC	5 V DC power supply for slide guide home position sensor
	6	GND	-	Ground	Signal ground
	7	5 V	O	5 V DC	5 V DC power supply for refeed eject sensor
	8	GND	-	Ground	Signal ground
	9	RFES	I	0/5 V DC	Refeed eject sensor: On/Off
CN7 Not used	1	24 V PB	O	-	Not used
	2	-	O	-	Not used

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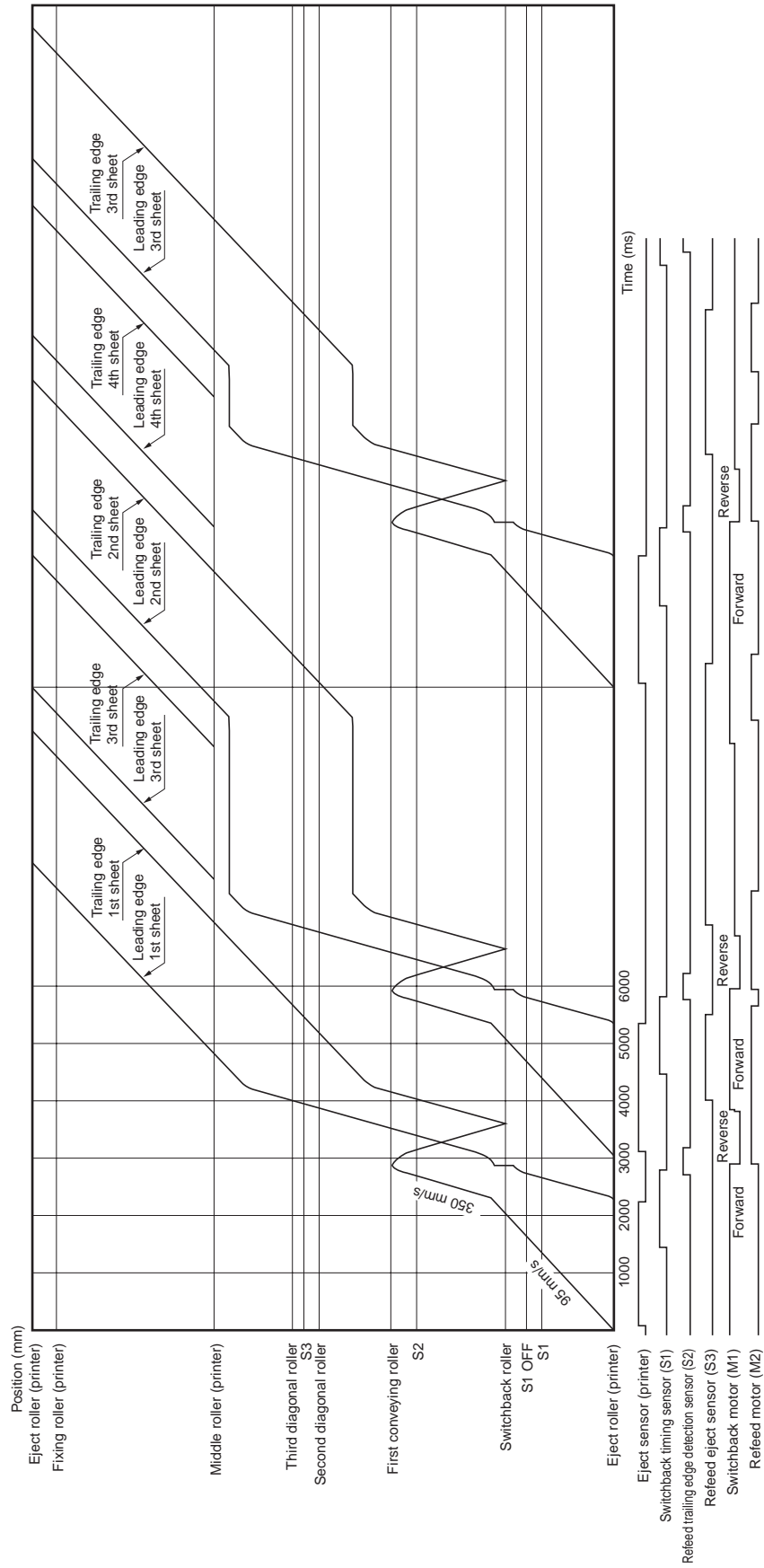
Timing chart No. 1 Paper size: A4 (horizontal)



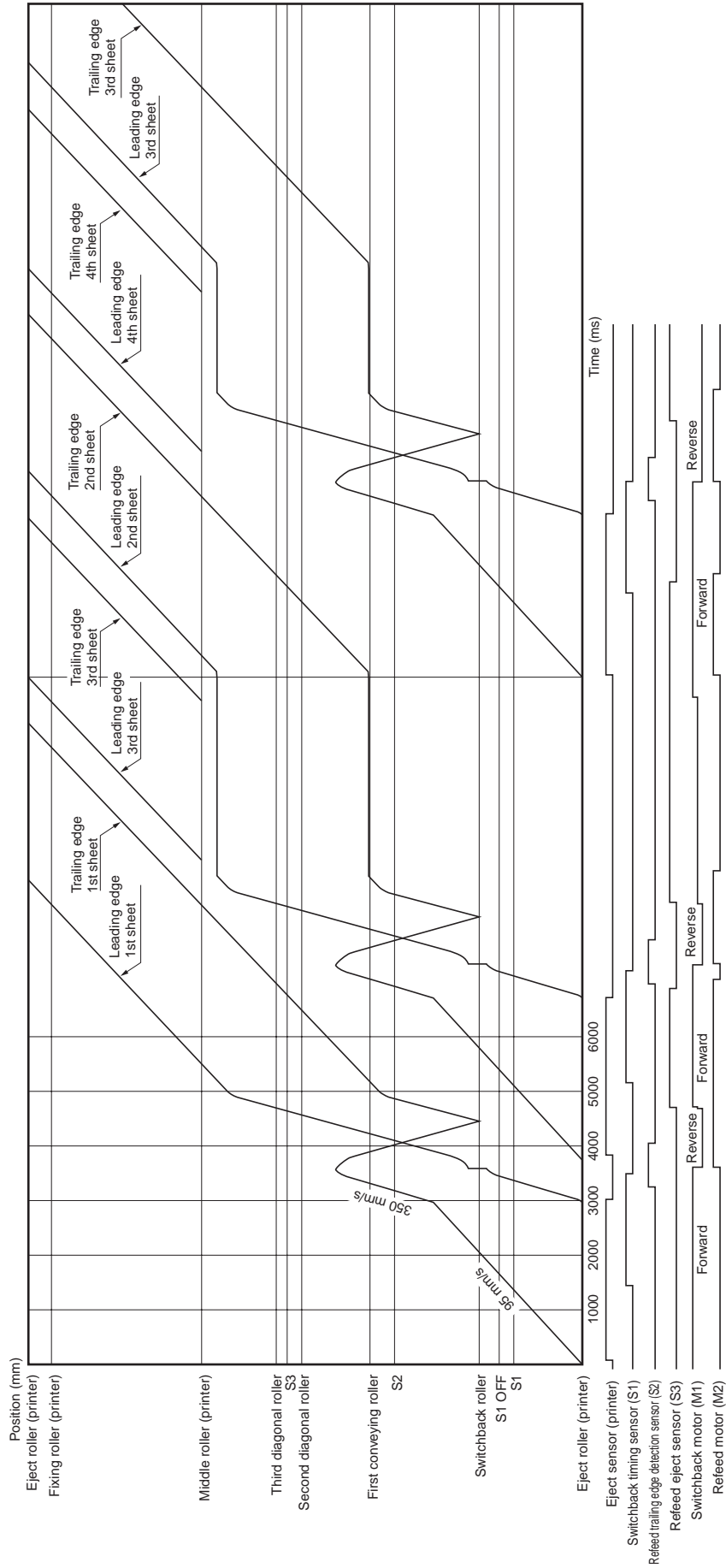
Timing chart No. 2 Paper size: A4 (vertical)



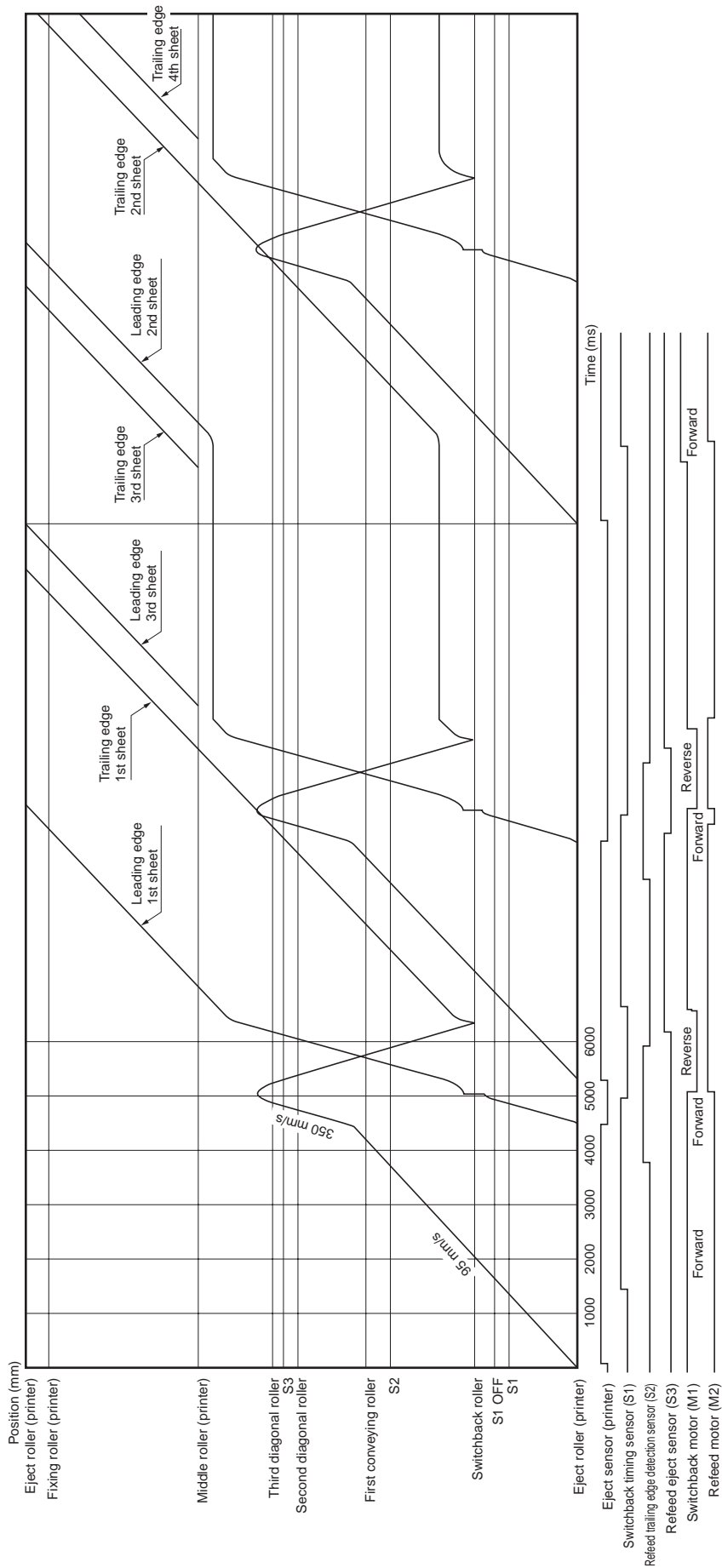
Timing chart No. 3 Paper size: Letter (horizontal)



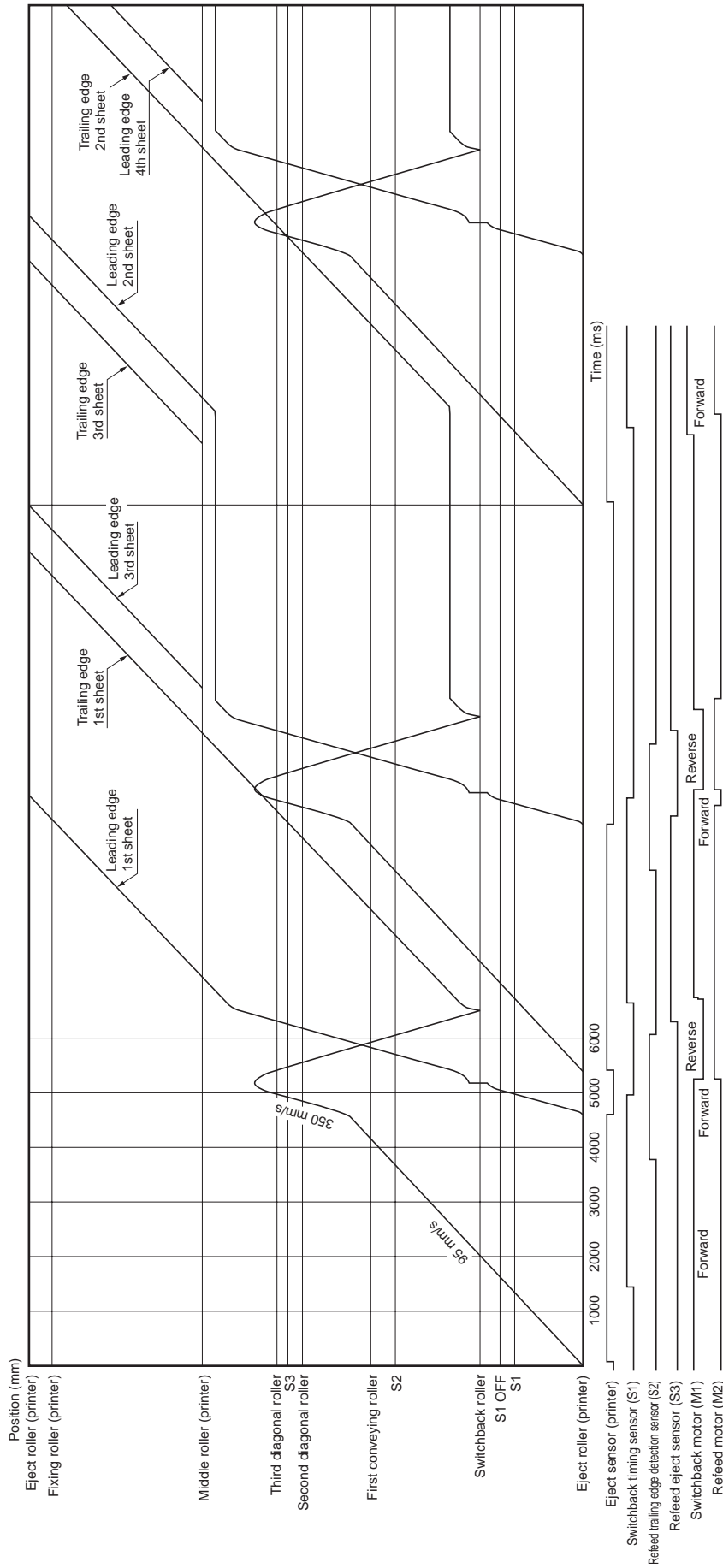
Timing chart No. 4 Paper size: Letter (vertical)



Timing chart No. 5 Paper size: A3



Timing chart No. 6 Paper size: Ledger



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KYOCERA MITA EUROPE B.V.

Hoeksteen 40, 2132 MS Hoofddorp,
The Netherlands
Phone: (020) 6540000
Home page: <http://www.kyoceramita-europe.com>
Email: info@kyoceramita-europe.com

KYOCERA MITA NEDERLAND B.V.

Hoeksteen 40, 2132 MS Hoofddorp,
The Netherlands
Phone: (020) 5877200

KYOCERA MITA (UK) LIMITED

8 Beacontree Plaza
Gillette Way,
Reading RG2 0BS UK
Phone: (0118) 931 1500

KYOCERA MITA ITALIA S.P.A.

Via Verdi 89/91 20063 Cernusco sul Naviglio
(Milano) Italy
Phone: 02-92179 1

S.A. KYOCERA MITA BELGIUM N.V.

Hermesstraat 8A, 1930 Zaventem, Belgium
Phone: (02) 7209270

KYOCERA MITA FRANCE S.A.R.L.

Parc les Algorithmes
SAINT AUBIN
91194 GIF-SUR-YVETTE
France
Phone: (01) 69852600

KYOCERA MITA ESPAÑA S.A.

Edificio Mita, Avda. De Manacor Nº2,
Urb. Parque Rozas, Apartado de Correos 76,
28230 Las Rozas, Madrid, Spain
Phone: (91) 631-8392

KYOCERA MITA FINLAND OY

Kirvesmiehenkatu 4, 00810 Helsinki,
Finland
Phone: (09) 478-05200

KYOCERA MITA (SCHWEIZ) AG

Holzliwisen Industriestrasse 28,
8604 Volketswil, Switzerland
Phone: (01) 908 4949

KYOCERA MITA DEUTSCHLAND GMBH

Mollsfeld 12 40670 Meerbusch,
(Osterath) Germany
Phone: 02159-918120

KYOCERA MITA GMBH AUSTRIA

Eduard-Kittenberger-Gasse 95,
1230, Wien, Austria
Phone: (01) 86338-0

KYOCERA MITA SVENSKA AB

Vretenvagen 2
171 54 Solna, Sweden
Phone: (08) 546 550 00

KYOCERA MITA NORGE

Postboks 150 Oppsal, NO 0619 Oslo
Olaf Helsetsvai 6, NO 0694 Oslo
Phone: (22) 62 73 00

KYOCERA MITA DANMARK A/S

Industrivej 11, DK-4632 Bjæverskov,
Denmark
Phone: (56) 871100

KYOCERA MITA PORTUGAL LDA.

Rua de Campolide,
nº56-5º dto,
1070-026, Lisbon, Portugal
Phone: (21) 09-00

KYOCERA MITA SOUTH AFRICA (PTY) LTD.

UNIT 3, "Kyalami Crescent,"
Kyalami Business Park,
1685 Midrand, South Africa
Phone: (11) 466-3290

KYOCERA MITA AMERICA, INC.

Headquarters:

225 Sand Road, P.O. Box 40008,
Fairfield, New Jersey 07004-0008,
U.S.A.
Phone: (973) 808-8444

KYOCERA MITA AUSTRALIA PTY. LTD.

Level 3, 6-10 Talavera Road, North Ryde,
N.S.W. 2113 Australia
Phone: (02) 9888-9999

KYOCERA MITA NEW ZEALAND LTD.

1-3 Parkhead Place,
Albany, Auckland,
New Zealand
Phone: (09) 415-4517

KYOCERA MITA (THAILAND) CORP., LTD.

9/209 Ratchada-Prachachem Road,
Bang Sue, Bangkok 10800, Thailand
Phone: (02) 586-0320

KYOCERA MITA SINGAPORE PTE LTD.

121 Genting Lane, 3rd Level,
Singapore 349572
Phone: 67418733

KYOCERA MITA HONG KONG LIMITED

11/F., Mita Centre,
552-566, Castle Peak Road,
Tsuen Wan, New Territories,
Hong Kong
Phone: 24297422


KYOCERA MITA TAIWAN CORPORATION

7F-1~2, No.41, Lane 221, Gangchi Rd.
Neihu District, Taipei, Taiwan, 114. R.O.C.
Phone: (02) 87511560

KYOCERA MITA CORPORATION

2-28, 1-chome, Tamatsukuri, Chuo-ku
Osaka 540-8585, Japan
Phone: (06) 6764-3555

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 **KYOCERA** is a trademark of Kyocera Corporation

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KYOCERA MITA AMERICA, INC.

Headquarters:

225 Sand Road, P.O. Box 40008
Fairfield, New Jersey 07004-0008
TEL : (973) 808-8444
FAX : (973) 882-6000

New York Show Room:

1410 Broadway 23rd floor
New York, NY 10018
TEL : (917) 286-5400
FAX : (917) 286-5402

Northeastern Region:

225 Sand Road, P.O. Box 40008
Fairfield, New Jersey 07004-0008
TEL : (973) 808-8444
FAX : (973) 882-4401

Midwestern Region:

201 Hansen Court Suite 119
Wood Dale, Illinois 60191
TEL : (630) 238-9982
FAX : (630) 238-9487

Western Region:

14101 Alton Parkway,
Irvine, California 92618-7006
TEL : (949) 457-9000
FAX : (949) 457-9119

Southeastern Region:

1500 Oakbrook Drive,
Norcross, Georgia 30093
TEL : (770) 729-9786
FAX : (770) 729-9873

Southwestern Region:

2825 West Story Road,
Irving, Texas 75038-5299
TEL : (972) 550-8987
FAX : (972) 570-4704

Dallas Parts Distribution Center & National Training Center:

2825 West Story Road,
Irving, Texas 75038-5299
TEL : (972) 659-0055
FAX : (972) 570-5816


KYOCERA MITA CANADA, LTD.

6120 Kestrel Road, Mississauga,
Ontario L5T 1S8, Canada
TEL : (905) 670-4425
FAX : (905) 670-8116

KYOCERA MITA MEXICO, S.A. DE C.V.

Av. 16 de Septiembre #407
Col. Santa Inés,
02130 Azcapotzalco
México, D.F. México
TEL : (55) 383-2741
FAX : (55) 383-7804

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