

Combined ***Service manual***



FS-1000
FS-1000+



Page printers

FS-1000/1000+ Series Combined Service Manual

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Notice

The information in this manual is subject to change without notification. Additional pages may be inserted in future editions. The reader is asked to excuse any technical inaccuracies or typographical errors in the present edition.

No responsibility is assumed if accidents occur while the service person is following the instructions in this manual.

The contents of this manual are protected by copyright. No part of the manual may be reproduced or copied by any means without the permission of the copyright holder.

Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a

residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver

is connected.

Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.

Important notice to service person

Before attempting service on the equipment, including disassembling, reassembling, troubleshooting, and adjustment, read this manual carefully. During performing service, use extreme care to avoid possible electric shock hazard, burn, and human injuries. Make sure the printer is not provided with any safety facilities other than those primarily intended for the safety of users.

About the chapters

This manual contains informations pertaining to service and maintenance of the laser printers FS-1000/1000+. This manual contains the following chapters:

- Chapter 1: Product Information
- Chapter 2: Installation/Operation
- Chapter 3: Maintenance/Adjustments
- Chapter 4: Operation Overview
- Chapter 5: Disassembly
- Chapter 6: Troubleshooting
- Appendix A: Diagrams
- Appendix B: Status Page
- Appendix C: Interface

REVISION HISTORY

Version	Date	Replaced Pages	Remarks
1.00	10-May-2000	-	
1.0A	25-May-2000	2-10, 3-7, 3-10, 4-5, 4-6, 4-9, 4-11, 4-21, 4-24, 5-25, 5-26, 6-9, 6-10, 6-11, A-8, B-6	
1.0B	14-July-2000	5-31	
2.00	1-Feb-2001	Overall revision	Combined with FS-1000+ model

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PAGE: <http://www.kyocera.com/w2k>



Chapter 1 Product Information

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1-1 Printer specifications

1-1-1 Specifications

(1) Engine

Item	FS-1000	FS-1000+
Print method	Electrophotography laser scan	←
Print speed (when printing multiple page)	10 pages/min.	12 pages/min.
Resolution (dpi)	600 horizontal/600 vertical	←
Smoothing	KIR (2,400 horizontal/600 vertical)	←
First print (A4 or letter, 23 °C), depends on input data	15 seconds or less (42 seconds or when less reverting from sleeping)	←
Warm-up time at 23 °C	25 seconds	←
Maximum duty cycle (A4) Process unit life expectancy	100,000 pages of printing or 3 years, whichever reached first	←
Developing	Mono component developer	←
Laser diode	Visible laser	←
Main charger	Scorotorn positive charging	←
Transferring	Negative charger roller	←
Separation	Curvature separation	←
Drum cleaning	Blade	←
Drum discharging	Eraser lamp (LED array)	←
Fuser	Heat roller and press roller	←
Paper	Plain paper: Legal to A5	←
Capacity of paper feed trays (80 g/m ² [0.11 mm thickness])	Cassette: 250 sheets, MP tray: 50 sheets	←
Capacity of output trays (80 g/m ² [0.11 mm thickness])	Face-up: 30 sheets, Face-down: 150 sheets	←

(2) Controller

Item		FS-1000	FS-1000+
CPU		PowerPC401B2/75MHz	←
System ROM		4 MB MASK DIMM	←
Font ROM		2 MB (16 M bit × 1)	←
Optional font ROM (Dip socket)		1 MB (Optional KPDL2 Upgrade kit)	←
Main (Video) RAM		4 MB (16 M bit × 2)	←
Additional RAM (DIMM slot)		Max. 132 (4 + 128) MB (16/32/64/128 MB DIMM × 1 slot)	←
Host interface	Parallel:	High-speed, bidirectional (IEEE1284)	←
	Serial :	RS-232C/RS-422A, Max. speed: 115.2 Kbps (optional serial interface board IB-10E)	←
	KUIO-LV :	KUIO-LV (3.3 V)	←
Page description language		Prescribe 2e	←
Standard emulation modes		PCL6, Diablo 630, IBM proprinter X24E, Epson LQ850, Line printer, KPDL2 (Optional)	←

(3) Weight and dimensions

Item		FS-1000	FS-1000+
Main unit	Width:	37.76 cm (14.9 inches)	←
	Height:	22.2 cm (8.7 inches)	←
	Depth:	37.45 cm (14.7 inches)	←
	Weight:	9.5 Kg (20.94 lb.)	←

(excl. protrusions)

(4) Power requirements

Item		FS-1000	FS-1000+
Voltage/current	US/Canada:	120 V AC $\pm 10\%$, 60 Hz $\pm 2\%$ / 4.4 A	120 V AC $\pm 10\%$, 60 Hz $\pm 2\%$ / 4.9 A
	Europe/Asia:	220 - 240 V AC $\pm 10\%$, 50/60 Hz $\pm 2\%$ / 2.2 A	220 - 240 V AC $\pm 10\%$, 50/60 Hz $\pm 2\%$ / 2.6 A
Watts	Normal operation:	120 V AC model: 233 W	120 V AC model: 569 W
		220 - 240 V AC model: 506 W	220 - 240 V AC model: 569 W
	Standby (Ready):	41 W	←
		120 V AC model: 6 W	120 V AC model: 5 W
	Sleeping:	220 - 240 V AC model: 6 W	220 - 240 V AC model: 6 W

(5) Environmental requirements

Item	FS-1000	FS-1000+
Operating temperature and humidity	10 to 32.5 °C (50 to 90.5 °F), 20 to 80 %RH	←
Maximum altitude	2,000 m (6,500 feet)	←
Noise emission (Excluding peaks, measured at 1 m from printer, as per ISO7779)	Maximum: 48 dB(A) , Standby: 28 dB(A)	←

1-2 Names of parts

1-2-1 Name of parts

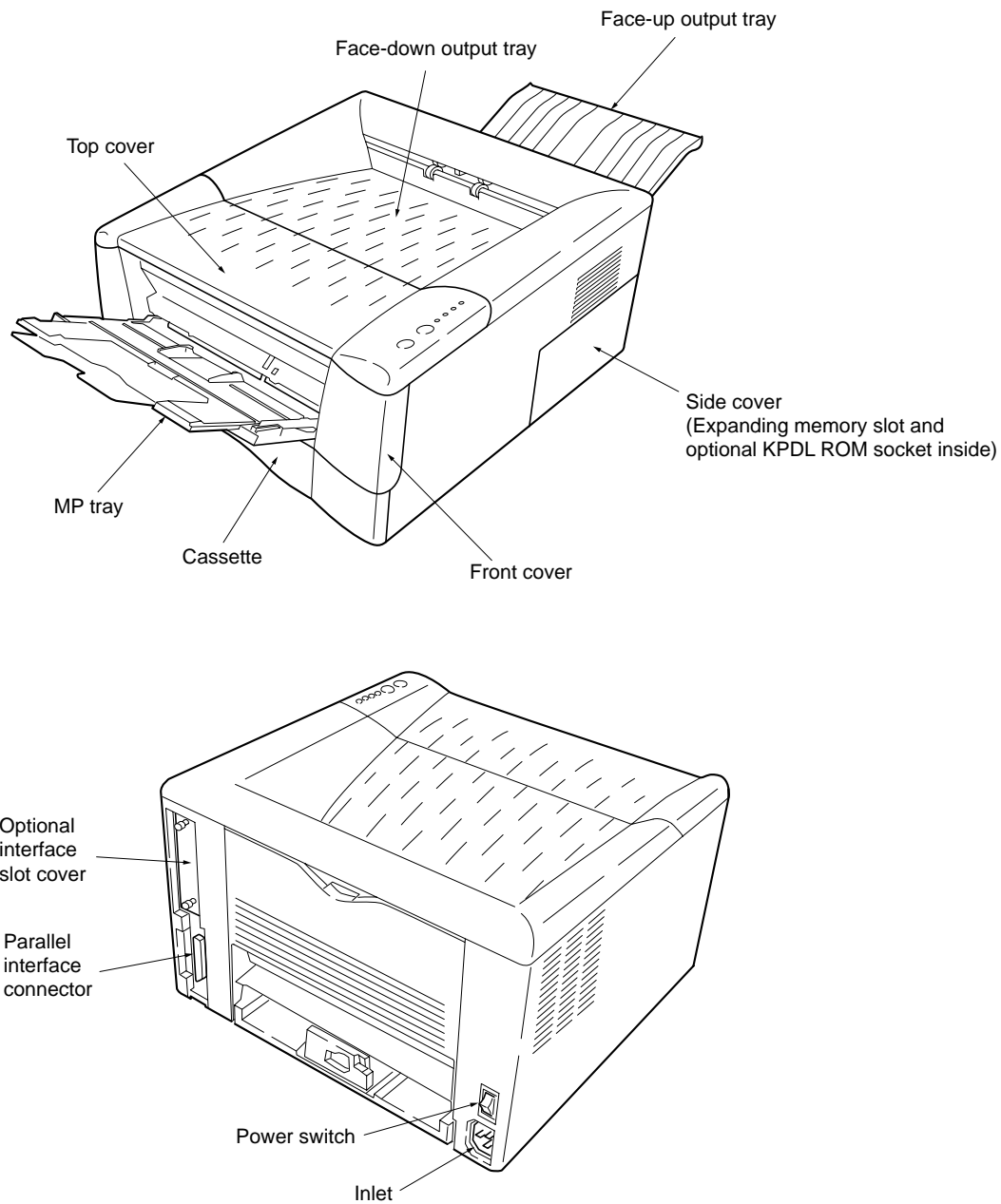


Figure 1-2-1 Name of parts

1-3 Safety information

1-3-1 Safety information

(1) Laser safety

This printer is certified as a Class 1 laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to Radiation Control for Health and Safety Act of 1968. This means that the printer does not produce hazardous laser radiation. Since radiation emitted inside the printer is completely confined within protective housings and external covers, the laser beam cannot escape from the printer during any phase of user operation.

(2) Laser notice

This printer is certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter for Class I (1) laser products, and elsewhere is certified as a Class I laser product conforming to the requirements of IEC 825.

(3) Laser caution label on the scanner unit

The laser scanner unit has the following label affixed atop. Observe these cautionary statements and figures when handling the laser scanner unit.

WARNING

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Laser radiation warning

	DANGER	• INVISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM.
	ATTENTION	• RAYONNEMENT LASER INVISIBLE EN CAS D'OUVERTURE. EXPOSITION DANGEREUSE AU FAISCEAU.
	VORSICHT	• UNSICHTBARE LASERSTRAHLUNG, WENN ABDECKUNG GEÖFFNET. NICHT DEM STRAHL AUSSETZEN.
	ATTENZIONE	• RADIAZIONE LASER INVISIBILE IN CASO DI APERTURA. EVITARE L'ESPOSIZIONE AL FASCIO.
	PRECAUCION	• RADIACIONE LASER INVISIBILE CUANDO SE ABRE. EVITAR EXPONERSE AL RAYO.
	VAROI	• AVATTAESSA OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASERSÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN.
	警告	• このカバーの内部では不可視レーザー光が放射されています。 レーザー光にさらされないようにしてください。
	警告	• 开蓋時, 可能有激光外溢! 应避免激光直接照射。
	警告	• 内部雷射放射中, 請勿隨意打開蓋子。
	위험	• 레이저 광선을 직접 보지 마세요.

KYOCERA FS-1000
120V~ 60Hz 4.4 A
KYOCERA CORPORATION
MIE PLANT TAMAKI BLOCK
704-19 NOJINO, TAMAKI-TOWN
WATARAI-COUNTY, MIE-PREF. JAPAN
MANUFACTURED:RM

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FS-1000+

120V~ 60Hz 4.9A

KYOCERA CORPORATION

MIE PLANT TAMAKI BLOCK
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WATARAI-COUNTY, MIE-PREF. JAPAN
MANUFACTURED:C9

THIS LASER PRODUCT CONFIRMS TO THE APPLICABLE
REQUIREMENTS OF FEDERAL REGULATIONS 21 CFR
CHAPTER 1, SUBCHAPTER J.

FC Tested To Comply
With FCC Standards
FOR HOME OR OFFICE USE



UL 8J68
UL 1950
US LISTED



This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two
conditions: (1) This device may not cause harmful
interference, and (2) this device must accept any
interference received, including interference that
may cause undesired operation.

This Class B digital apparatus complies
with Canadian ICES-003.

Cet appareil numérique de la classe B est
conforme à la norme NMB-003 du Canada.

CAUTION

REMOVE POWER CORD BEFORE SERVICE
AND FUSE REPLACEMENT.

ATTENTION

POUR PRÉVENIR LES CHOCES
ÉLECTRIQUES, COUPER L'ALIMENTATION
AVANT DE REMPLACER LE FUSIBLE.

PRECAUZIONE

PRIMA DI CAMBIARE I FIESIBILI O
DI ESEGUIRE RIPARAZIONI,
STACCATO IL CADO DI ALIMENTAZIONE.

DESIGNED IN JAPAN / ASSEMBLED IN CHINA

KYOCERA FS-1000

220-240V~ 50Hz 2.2 A

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(4) CDRH regulations (U.S.A.)

The Center of Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured after August 1, 1976. Compliance is mandatory for products marketed in the United States. A label indicating compliance with the CDRH regulations must be attached to laser products marketed in the United States.

(5) Ozone concentration

The printers generate ozone gas (O³) which may concentrate in the place of installation and cause an unpleasant smell. To minimize concentration of ozone gas to less than 0.1 ppm, we recommend you not to install the printer in a confined area where ventilation is blocked.

(6) FCC statement (U.S.A.)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interferences to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment. Shielded circular cable should be used for interfacing with the computer.

Any modification without prior permission may cause harmful interference.

If any modification/change is introduced to this equipment without prior permission, Kyocera as the manufacturer cannot guarantee compliance with FCC rules.

To use equipment which does not comply with FCC rules is prohibited.

(7) Optional equipment

The printer may be optionally installed with the following units:

- PK-6 KPDL2 Upgrade kit
- IB-10E Serial interface board kit
- PF-17 Paper feeder (250 sheets)

(8) Important note on the interface connectors

Be sure to turn off printer power before connecting or disconnecting an interface cable to the printer. For protection against static discharge which may be applied to the printer's internal electronics through the interface connector(s), keep any interface connector which is not in use capped using the protective cap supplied.

WARNING

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, etc.) certified to comply with the Class B limits may be attached to this equipment. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

(9) Canadian Department of Communications compliance statement

This Class B digital apparatus complies with Canadian ICES-003.

(10) Avis de conformité aux normes du ministère des Communications du Canada

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

(11) ISO 7779

Maschinenlärminformationsverordnung 3. GSGV, 18.01.1991: Der höchste Schalldruckpegel beträgt 70 dB(A) oder weniger gemäß ISO 7779.

1-4 Environmental requirements

1-4-1 Environmental conditions

The *Environmental requirements* section on page 1-5 should be observed to ensure the optimum operation of the printer. The use of the printer in a location which does not satisfy the requirements may result in troubles and risk shortening its service life.

The printer will work best if it is installed in a location that is:

- Level and well supported (Place the printer on a table or desk.)
- Not exposed to sunlight or other bright light (not next to an uncurtained window). Do not place the printer on an unstable cart, stand or table.
- Near an AC wall outlet, preferably one that can be used for the printer alone. The outlet should have a ground slot, or an adapter should be used. If you use an extension cord, the total length of the power cord plus extension cord should be 17 feet or 5 meters or less.
- Well ventilated, not too hot or cold, and not too damp or dry (See section *Environmental requirements* on page 1-5). If you install the printer where the temperature or humidity is outside the requirements in section Environmental requirements in chapter 1, the best print quality may not be expected and there will be an increased chance of paper jams.
- Provide a sufficient clearances around the printer to ensure ventilation and ease of access. (See section *Clearance* on next page).

(1) Clearance

Allow the necessary minimum clearance on all sides of the printer as diagrammed below.

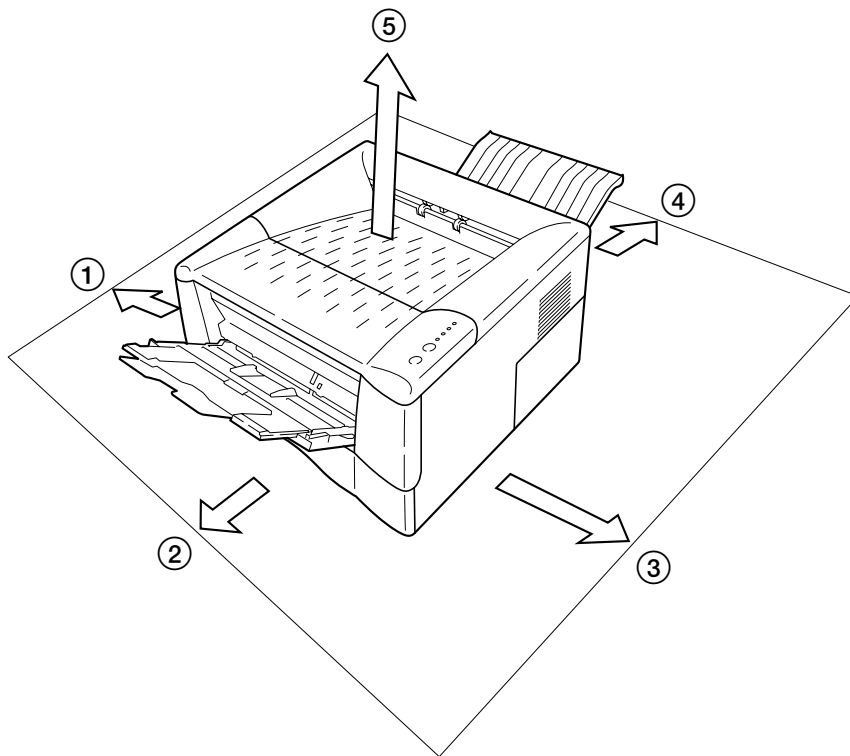


Figure 1-4-2 Clearance

Ref.	Clearance	Dimensions
①	Left	25 cm (9-7/8 inches)
②	Front	50 cm (19-11/16 inches)
③	Right	25 cm (9-7/8 inches)
④	Back	40 cm (15-3/4 inches)
⑤	Above	30 cm (11-13/16 inches)

(2) Places to avoid

Avoid installing the printer in locations exposed to:

- Direct drafts of hot or cold air.
- Direct drafts of outside air. (Avoid locations next to outside doors.)
- Sudden temperature or humidity changes.
- Any source of high heat, such as a radiator or stove.
- Excessive dust. Dust and smoke may cause contamination on the laser scanner window, causing print quality problem.
- Vibration.
- Ammonia fumes or other harmful fumes. (In case of fumigating the room or saturate it with insecticide, remove the printer first.)
- Avoid greenhouse-like rooms. (Because of sunlight and humidity.)
- Avoid enclosed spaces that block ventilation.
- Avoid sites more than 6,500 feet or 2,000 meters above sea level.

(3) Note on power

Use only the power source voltage conforming to the printer's rated power voltage. Do not use other power sources.

- Disconnect the printer from the power source before attempting removal or replacement of an electrical component or a printed-circuit board.
- The printer should not be connected to a power source until the instruction is given to do so when performing tests described in this manual.
- In connecting the printer power, exercise an extreme care in handling the power supply or any other electric parts which may give an electric shock.
- Before performing maintenance or repair, power from both the power source and the associated peripheral devices (computer, sorter, etc.) should be disconnected, unless otherwise specified.
- To avoid possible electrical shock, extreme caution must be exercised in handling the power cord and any other electrical part.
- An easily accessible socket outlet must be provided near the equipment.

WARNING As the disconnect device is not incorporated in the printer's AC primary circuit, an easily accessible socket outlet must be provided near the equipment.

(4) Removing the printer

Observe the following precautions in removal and transportation of the printer.

- Be sure to repack the printer in its original carton.
- Do not leave the printer, toner container, process unit and other printer modules inside a vehicle if the outdoor temperature is more than 25 °C. As unexpectedly high temperature may develop inside when a vehicle is parked for a long period of time, the drum, toner container, process unit and the supplies should be removed from the vehicle. The vehicle during transportation should be parked in the shade or with the window open to allow minimum air circulation or the adequate air conditioning should be made.
- Should the printer be left in a vehicle, it may not be exposed to the temperature change of more than 7 °C within 30 minutes.
- Before removing the printer to a warm place, wrap it in a blanket, etc., before crating it. Allow approximately two to three hours after having moved after uncrated. Failure to observe the above may result in moisture condensation which will affect the performance of the printer.

1-5 About the toner container

1-5-1 Toner container

The printer should use a Kyocera TK-17 toner kit. To ensure the high print quality and long service life, the following handling precautions should apply.

CAUTION As the Ecosys printers are designed to ensure the optimum print quality when used with Kyocera's proprietary toner, Kyocera do not recommend to use any refilled toner containers that may be available commercially. This is because Kyocera have no means of control over how such refilled toner could affect the print quality and the reliability of the printer.

(1) Toner container handling

To loosen and mix the toner inside before use, with the label side down, thoroughly shake the toner container ① horizontally at least five times.

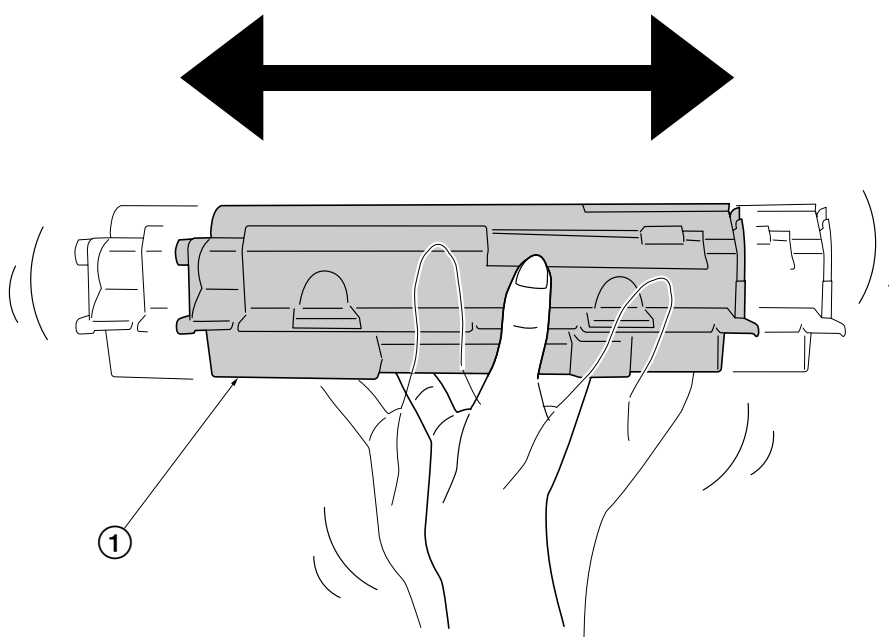


Figure 1-5-1 Toner container handling

CAUTION Do not attempt to disassemble or refill the toner container.

(2) Toner container storage

The toner contained in the container is susceptible to temperature and humidity. To ensure the high print quality, store the toner container in a place that satisfies the following environmental conditions:

Temperature: -20 to 40 °C (-4 to 104 °F)

Humidity: 15 to 90 % RH

NOTE If the toner container is removed from the printer's developer unit, put it in a protective bag and keep it in a dark place.

CAUTION If the printer is shipped for return, etc., do not ship it with the toner container installed. Otherwise, toner may leak and contamination may result in the printer.

Chapter 2 **Installation/Operation**

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2-1 Unpacking

2-1-1 Unpacking and inspection

The package should contain the printer and the accessories as shown in the figure below. Remove the printer and all the accessories from the package.

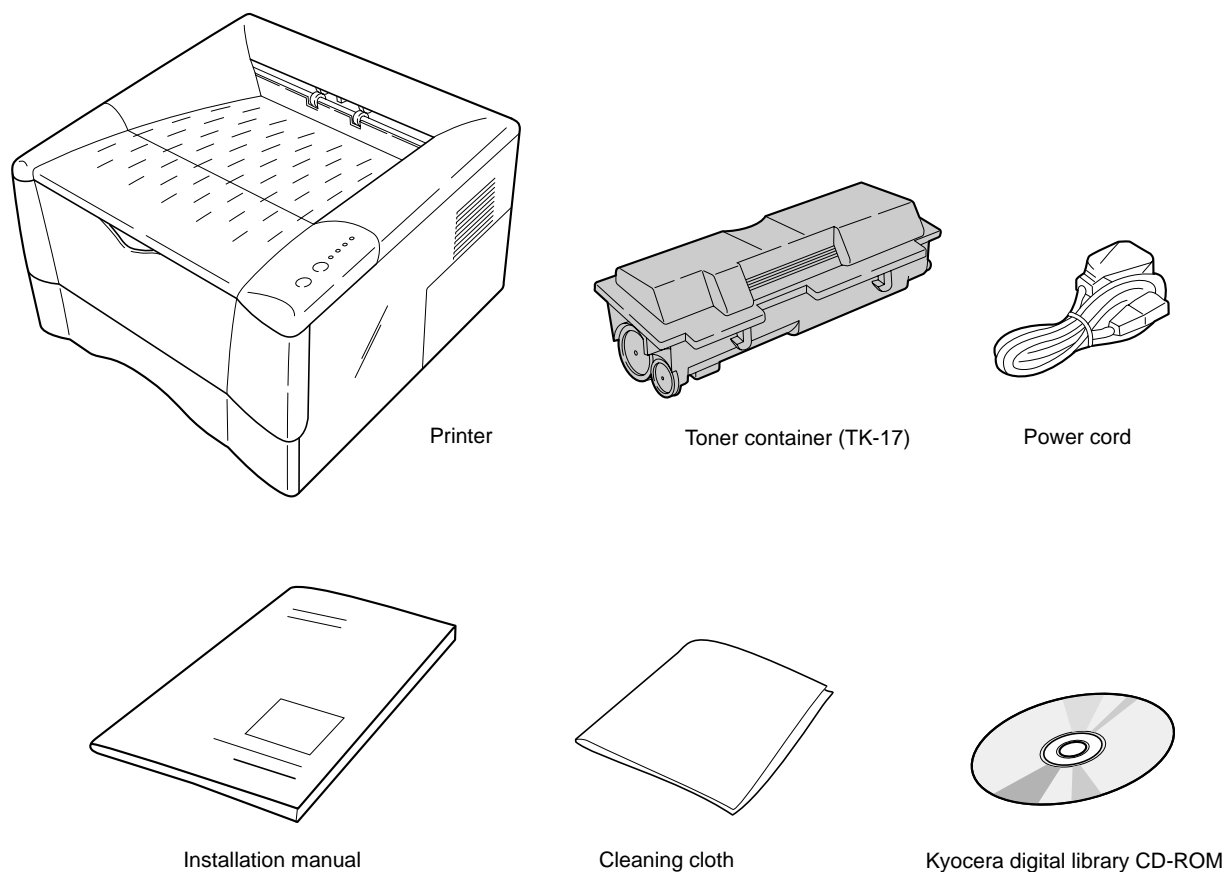


Figure 2-1-1 Unpacking

For unpacking, place the box containing the printer on a flat, stable surface. Remove the manuals, toner kit, and other items located on top of the spacer and remove the spacer. Carefully remove the printer. Obtain help from other persons if necessary.

2-2 Installing the printer

Installing the printer requires several steps. Proceed as follows in sequence. If the option paper feeder is used with the printer, begin installation with connecting the printer and the paper feeder PF-17. For details, refer to the *Paper feeder PF-17 Service Manual*.

2-2-1 Installing the toner container

1. Open the top cover all the way.
2. Confirm that the lock lever #1 ① is in the release (forward) position. If not, pull it forward until it is in the release position.

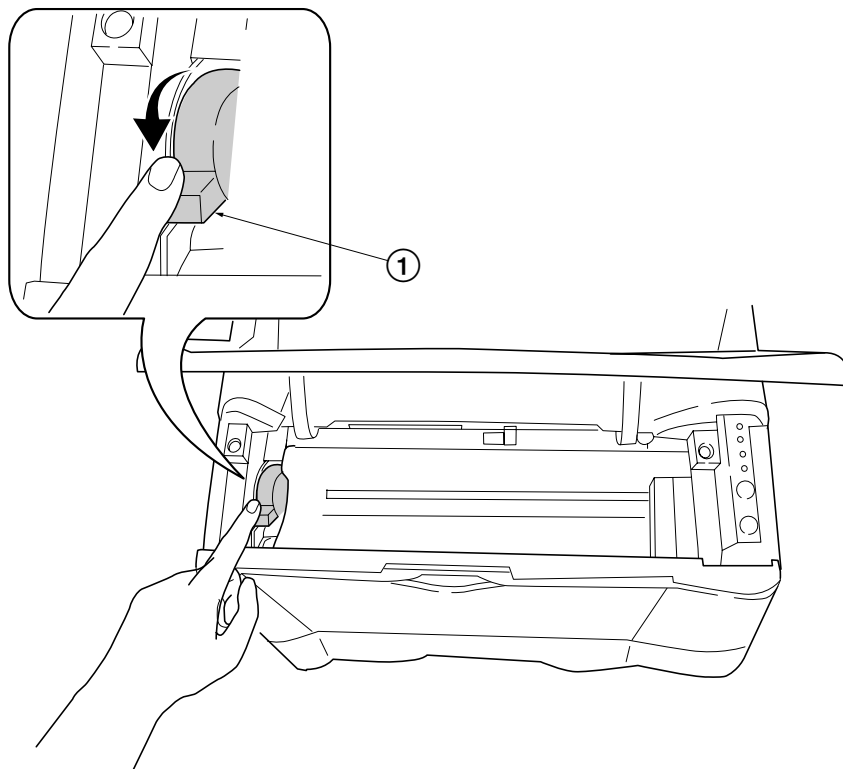


Figure 2-2-1 Confirming the lock lever #1

3. Take the toner container ② from the bag. Hold it with the protective seal (orange-colored) facing up. Shake the toner container ② horizontally at least five times. This ensures that the toner is evenly distributed inside.

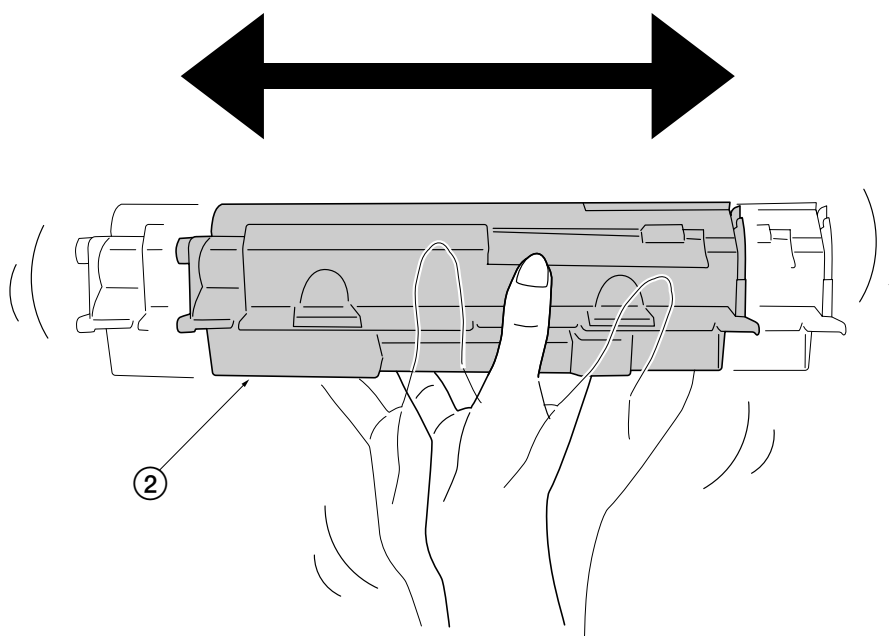


Figure 2-2-2 Shaking the toner container

4. Carefully remove the protective seal ③.

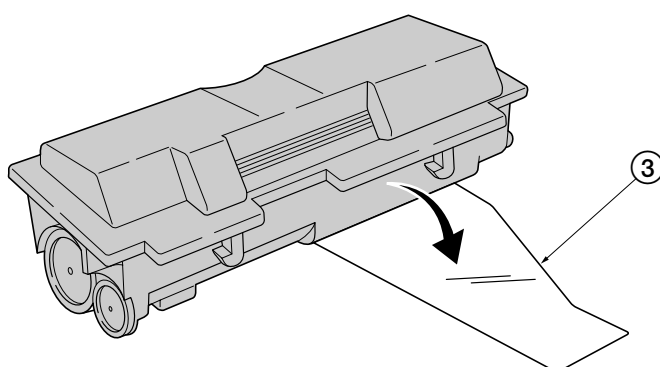


Figure 2-2-3 Removing the protective seal

5. Install the toner container ② into the printer.
6. Push firmly on the top of the toner container ② at the positions marked [PUSH HERE].

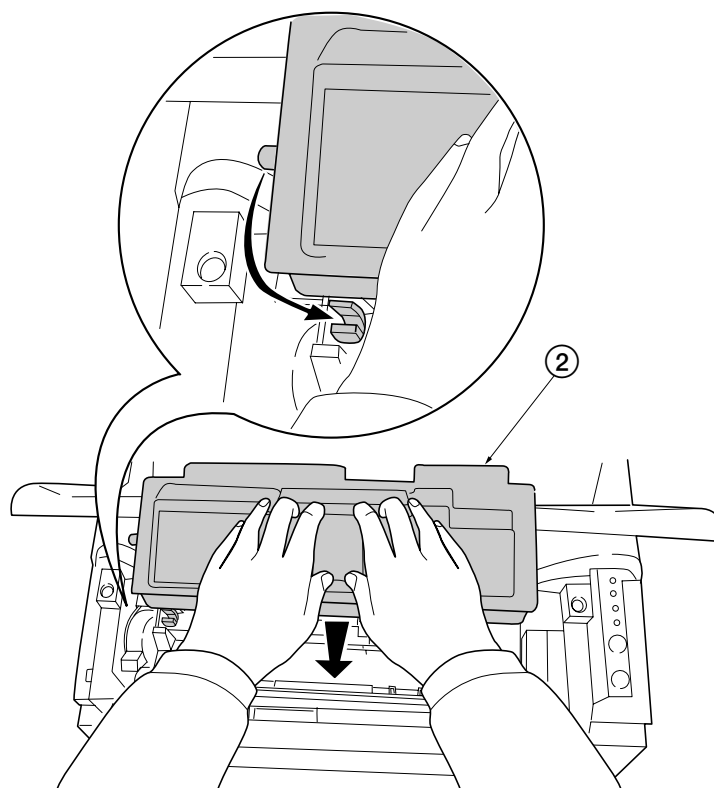


Figure 2-2-4 Installing the toner container

7. Push the lock lever #1 ① to the lock position.
8. Close the top cover ④.

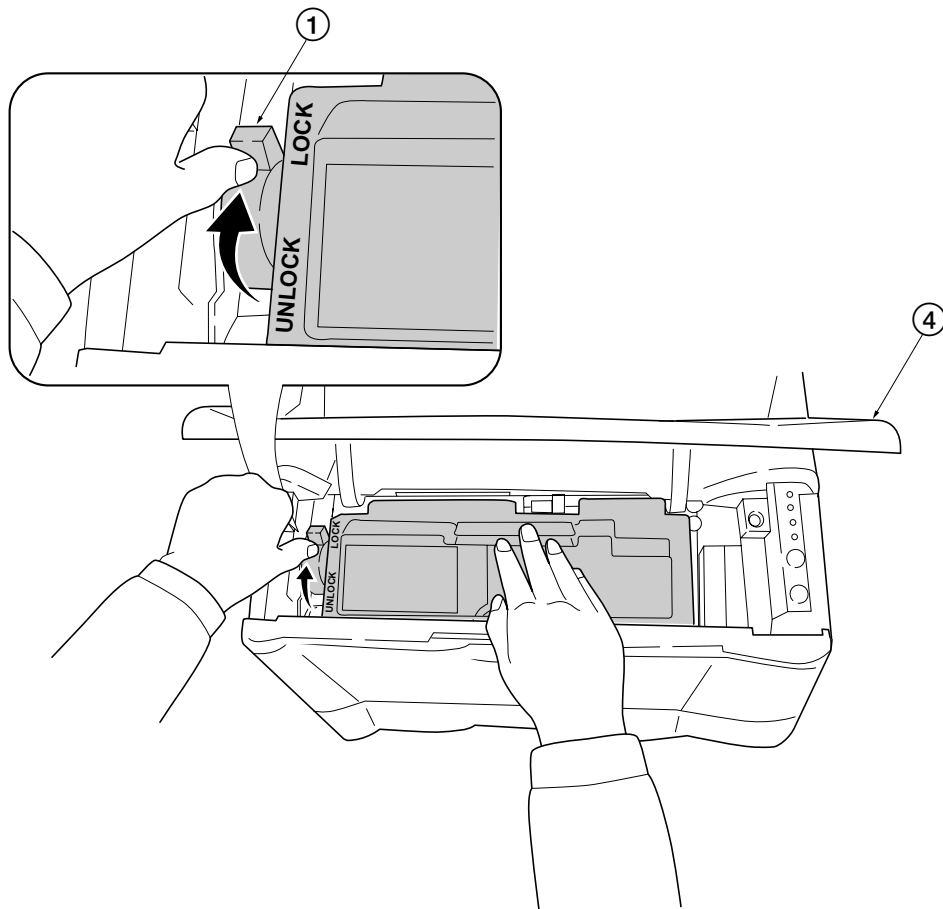


Figure- 2-2-5 Locking the toner container

NOTE

The printer is shipped from the factory with no toner supplied in its developer (Process unit). When the printer is first switched on after the toner container is installed in the manner above, there will be a delay of several minutes before the printer gets ready to print a job.

This delay is necessary for the printer to fill the developer reservoir with a sufficient amount of toner to continuously support a print job. The period of time is approximately 15 minutes.

If the toner low or replace toner indication does not go off after installing the new toner container, take the toner container out once, shake it well, then install again.

2-2-2 Expanding memory

The FS-1000/1000+ comes standard equipped with 4 MB of main memory. Printer memory can be expanded to up to the maximum 132 MB (4 MB + 128 MB) by installing an optional DIMM (Dual In-line Memory Module).

(1) Minimum memory requirements

Refer to the table below for minimum memory requirements in various environments.

Printing environment	Resolution	
	300 dpi	600 dpi
HP LaserJet 5P (factory setting)	2 MB	2 MB
HP LaserJet 5P with resource protection	-	10 MB

(2) DIMM specifications

Memory size in MB	8, 16, 32, 64, 128
Number of pins	72
Access speed	80 ns or faster
Parity	Without
Bus width	32 bits

(3) Notes on handling DIMM

Before proceeding to install DIMM, read the following notes for handling the main board and DIMMs:

- Protect the electronics by taking these precautions:
- Before touching a DIMM, touch a water pipe or other large metal object to discharge yourself of static electricity. While doing the work, it is recommended that you wear an antistatic wrist strap.
- Touch the main board and DIMM only by the edges, not in the middle.

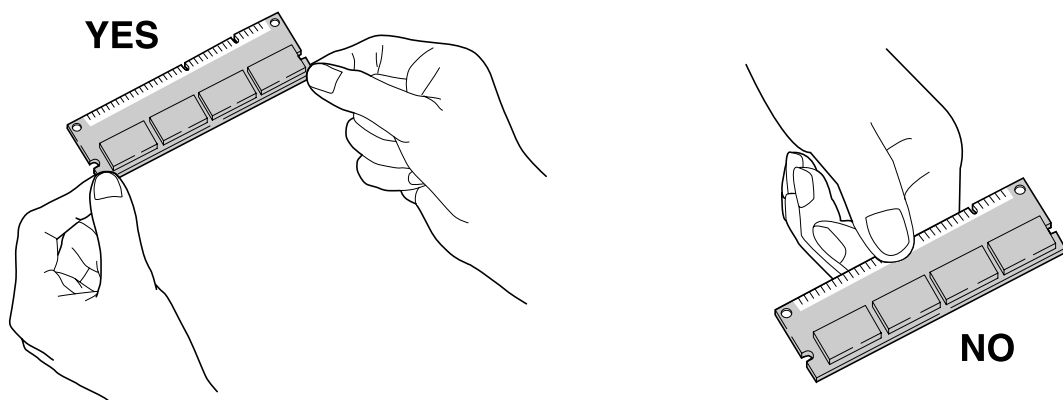


Figure 2-2-6 Handling DIMM

(4) Installing the DIMM

The main board of the printer is equipped with one socket for memory expansion. Expansion memory is available in the form of DIMM (Dual In-line Memory Module).

CAUTION Take precautions that no foreign substances such as metal chips or liquid get inside the printer during the installation process. Operation of the printer during the presence of a foreign substance may lead to fire or electric shock.

WARNING Turn the printer's power switch off. Unplug the printer's power cable and disconnect the printer from the computer or the network.

Remove the side cover ① as shown in the figure below.

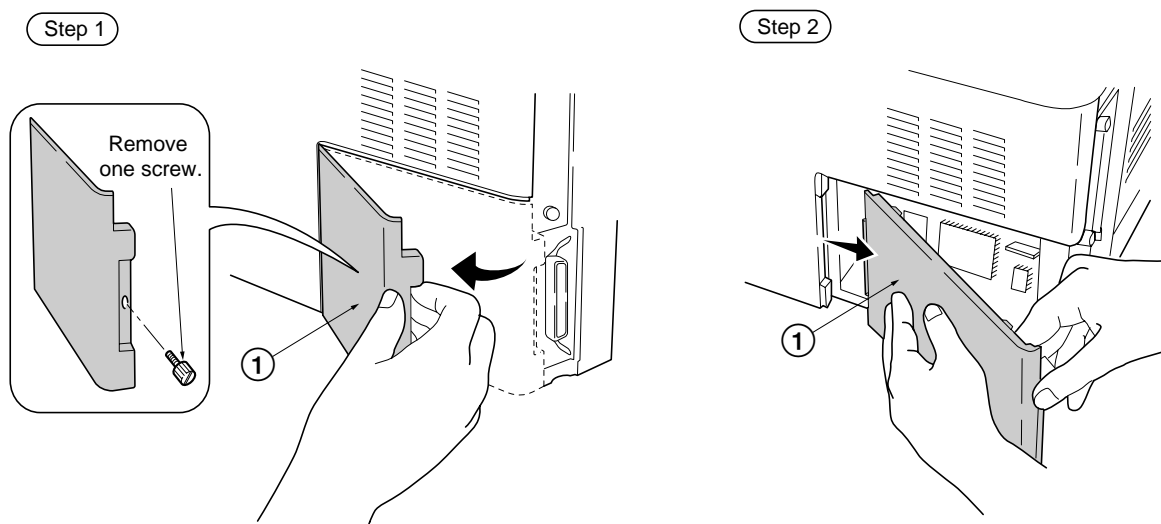


Figure 2-2-7 Removing side cover

Open the clips ② on both ends of the DIMM socket ③. Insert the DIMM ④ into the DIMM socket ③ so that the notches on the DIMM align with the corresponding protrusions in the slot. Close the clips ⑤ on the DIMM slot to secure the DIMM.

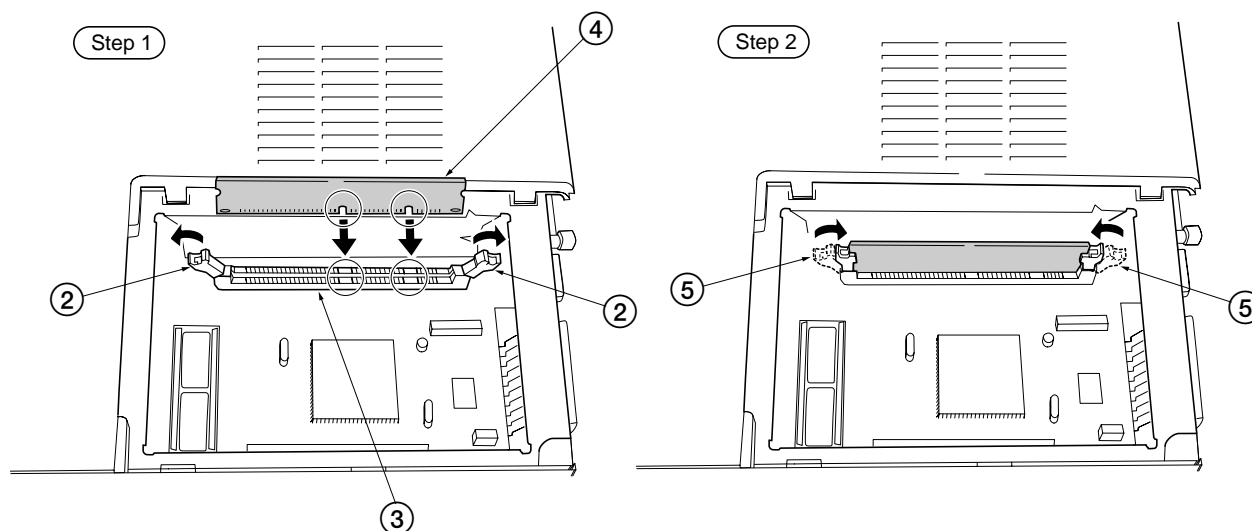


Figure 2-2-8 Inserting the DIMM

(5) Testing the expansion memory

After installing DIMM in the printer, test the printer to see if the installation has been successful. To test the expansion memory, turn printer power on and print a status page. If the installation has been successful, the Available Memory item of the status page will show the expanded memory size corresponding to the amount of memory added.

(6) Installing KPDL

KPDL (Kyocera Printer Description Language) is an upgrade to add the Kyocera's implementation of the PostScript page description language to the printer. Upgrade is done by inserting a KPDL ROM (PK-6) into an empty socket on the printer's main board.

For details on KPDL, refer to the *KPDL Upgrade Kit Installation Manual*.

Installing the KPDL ROM

Before installing the KPDL ROM, carefully straighten the pins as follows.

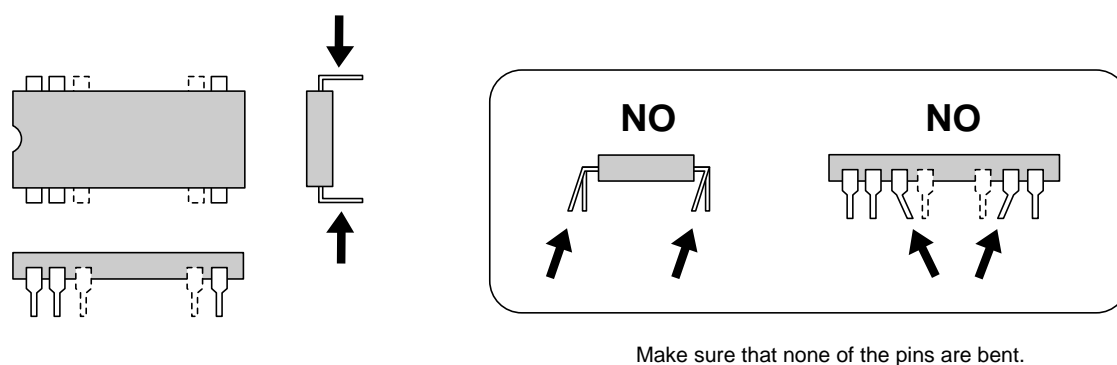


Figure 2-2-9 KPDL ROM

To insert the ROM into its socket, position the ROM in the socket as shown. Make sure that the U-shaped indentation at the end of the ROM is oriented in the same direction as the U-shaped indentation at the end of the socket. Align all pins of the ROM properly with their socket holes.

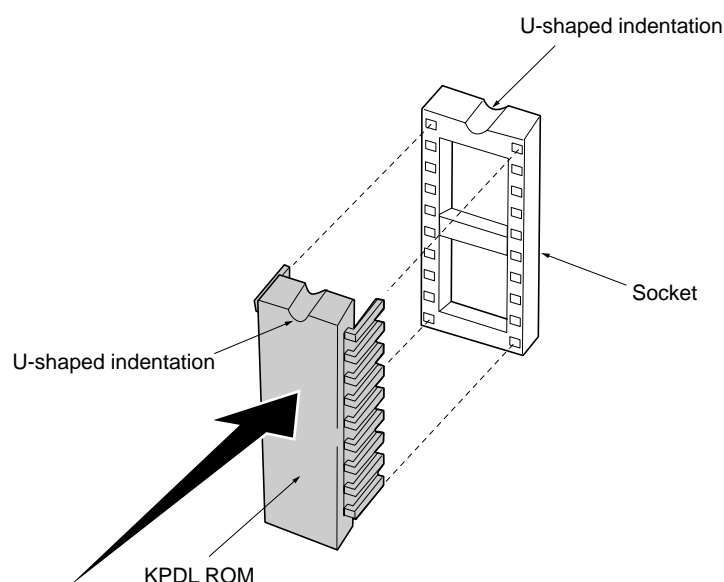


Figure 2-2-10 Inserting the KPDL ROM

Getting access to the KPDL ROM socket

Remove the printer's side cover. Refer to *Installing the DIMM* on page 2-10.

Locate the socket for inserting the KPDL ROM. This socket is marked as U03S.

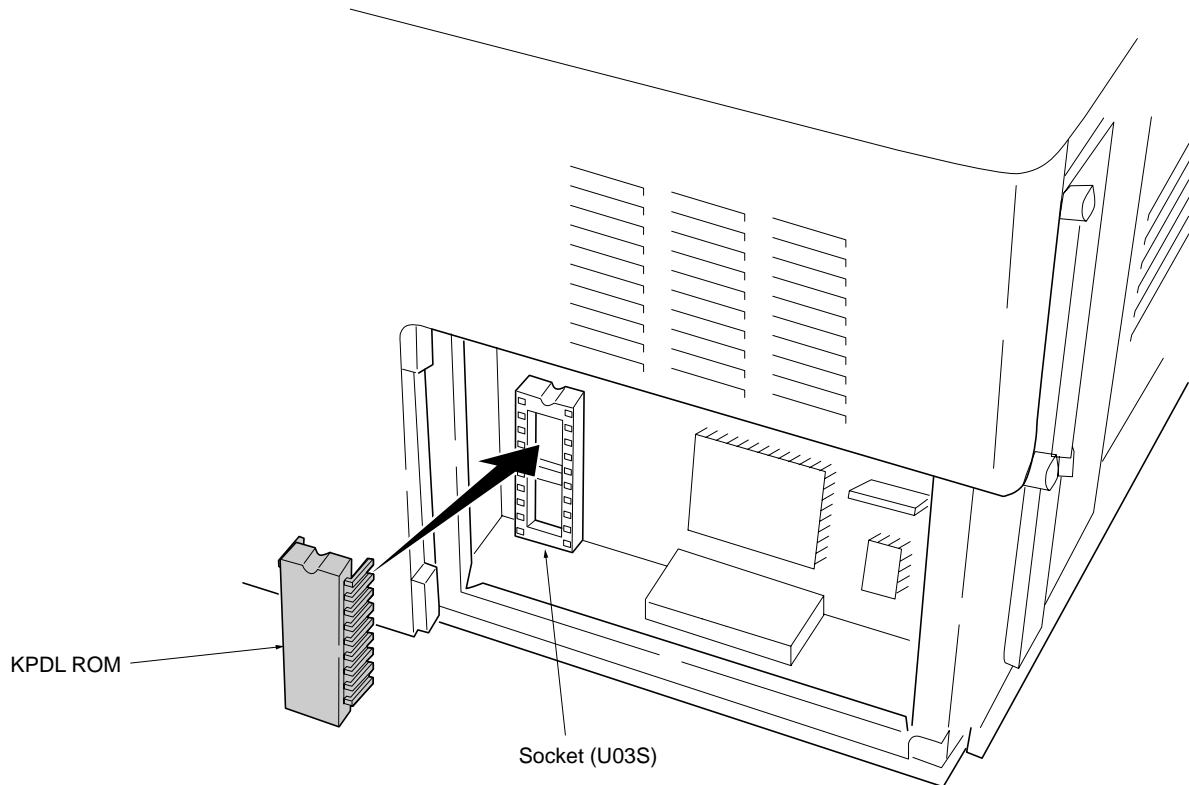


Figure 2-2-11 Getting access to the KPDL ROM socket

2-3 Using the operator panel

This section provides explanation on how to use the printer's operator panel for basic operation. For details, refer to the printer's *User's Manual*.

2-3-1 Operator panel

The printer's operation panel has the following LED indicators and keys. Note that adjustments to the printer parameters made using these keys may be overridden by those made from within the application software.

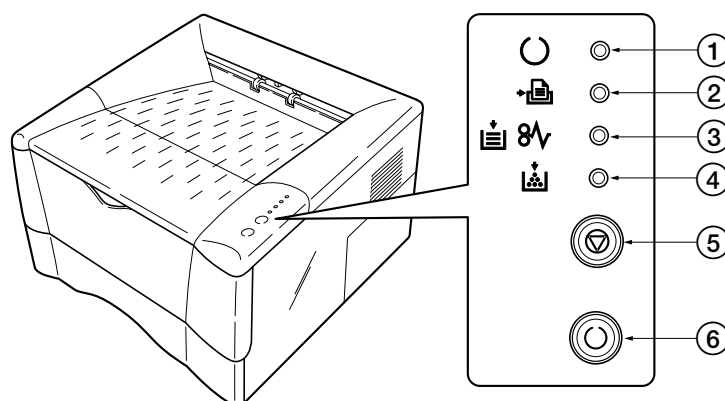


Figure 2-3-1 Operator panel

Table 2-3-1 Operator panel function

No.	Name	Function
①	On line indicator	Indicates whether the printer is on-line or off-line.
②	Data indicator	Indicates that the printer is receiving data.
③	Paper empty/ Paper jam indicator	Indicates whether the paper cassette is empty or a paper jam has occurred.
④	Toner indicator	Flashes when toner is low, and light when toner is exhausted.
⑤	Cancel key	Stops printing when pressed.
⑥	Go key	<ul style="list-style-type: none">• Switches the printer mode between on-line and off-line when pressed. If you continued to press the key for 10 or more seconds, service status page is printed.• Switches between the MP tray and paper cassette when the paper runs out.• Prints out any unprinted page.

2-3-2 Remote operation panel

The remote operation panel is a utility that allows you to make basic printer settings from the computer connected to the printer or the network. For details on installation and usage, see the printer's *User's Manual* contained as an electronic file in the CD-ROM supplied with the printer.

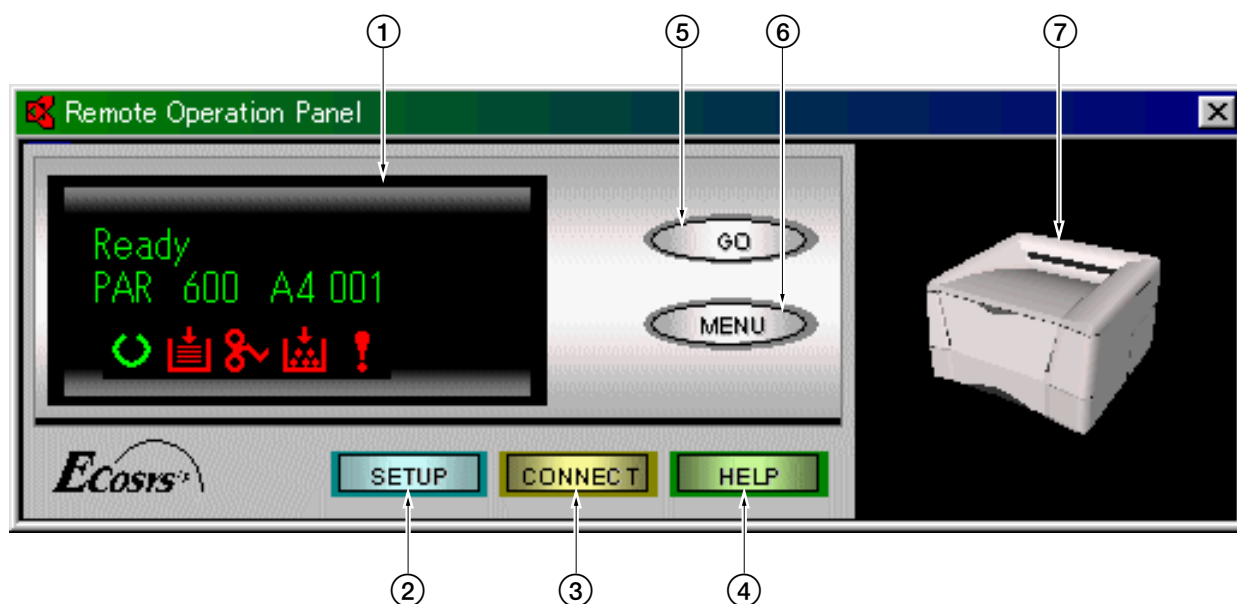


Figure 2-3-2 Remote operation panel

Table 2-3-2 Remote operation panel function

No.	Name	Function
①	Message display	Indicates printer status, the interface currently active, the resolution, the paper size, the number of copies set in the current interface, and error messages.
②	SETUP button	Makes connection settings and operation settings between the printer and the computer.
③	CONNECT button	Makes connection settings for new printers.
④	HELP button	Displays help message.
⑤	GO button	Performs the same function as the printer's Go key. Not displayed with non-network connection.
⑥	MENU button	Displays printer settings and confirmation items. Changes the printer 3D image in real time according to the printer's
⑦	Monitor window	status. For example, if you open the printer's top cover, the top cover on the 3D image else open.

Chapter 3 Maintenance/Adjustments

Chapter 3 Contents

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3-1 Maintenance/Adjustments

3-1-1 Life expectancy of modules

The table below shows the nominal life expectancy for modules. Detailed part information for each module (except toner container) can be found in *Parts Catalog*.

Table 3-1-1 Life expectancy of modules

Kit	Module	Nominal life (pages)	Remarks
TK-17	Toner container	6,000	User-replaceable
PU-40	Process unit	100,000	User-replaceable

3-1-2 Toner container

Assuming an average toner coverage of 5 % with *EcoPrint* mode turned off, the toner container will need replacing approximately once every 6,000 printed pages.

Table 3-1-2 Toner container

Kit	Life in pages
TK-17	6,000

Based on letter or A4 size paper; average print density of 5 %.

NOTE In the case of a new printer in which a toner kit has been installed for the first time, the number of copies that can be printed will be approximately 3,000.

(1) When to replace the toner container

When the printer runs low on toner, the Toner indicator flashes on the operation panel. Be sure to promptly replace the toner container and clean the inside of the printer when this message appears. If the printer stops printing while the Toner indicator is lit, replace the toner container to continue printing.

(2) Notes on changing toner container

Observe the following cautions when replacing the toner container:

- Do not attempt to disassemble the old toner container and reuse the waste toner inside.
- Keep magnetic media such as floppy disks away from the toner container.
- Be sure to clean the parts as instructed in this section at the same timing of replacing toner container.
- Use of the Kyocera toner kit TK-17 is highly recommended for the optimum operation of the printer.

(3) Toner container replacement

To replace the toner container, open the top cover. Pull lock lever #1 ① to the release [UNLOCK] position, then pull lock lever #2 ② to the release (right) position.

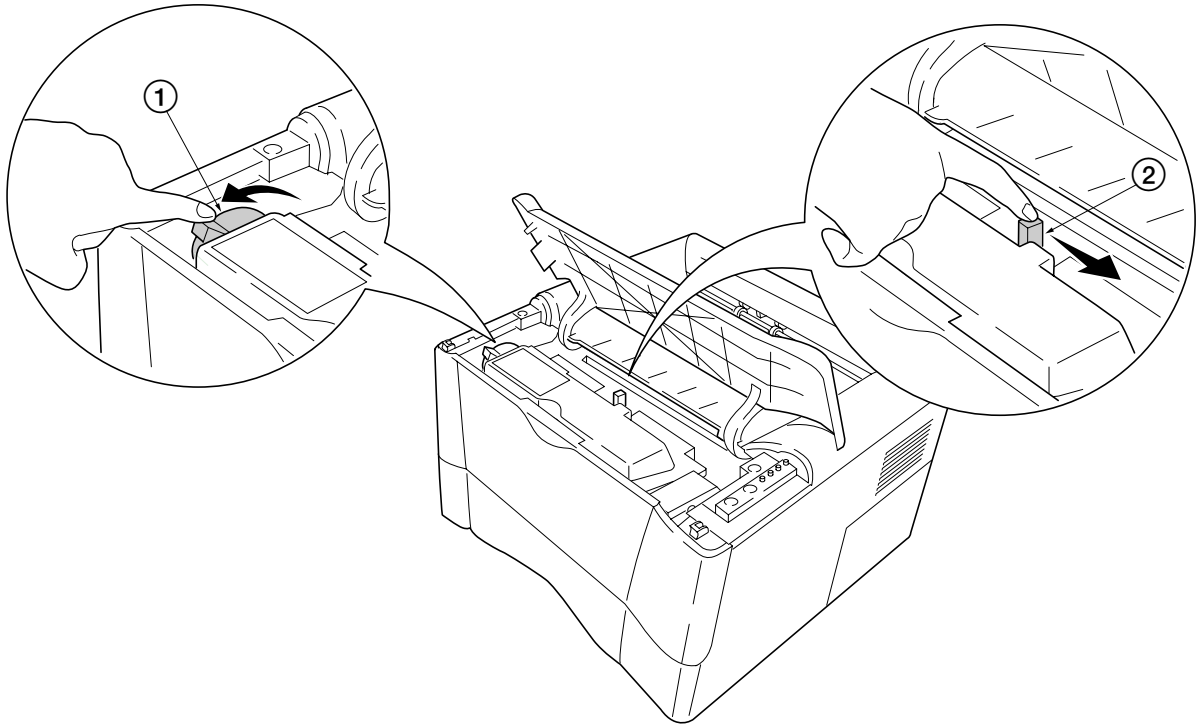


Figure 3-1-1 Releasing Lock lever #1 and #2

Gently remove the old toner container ③.

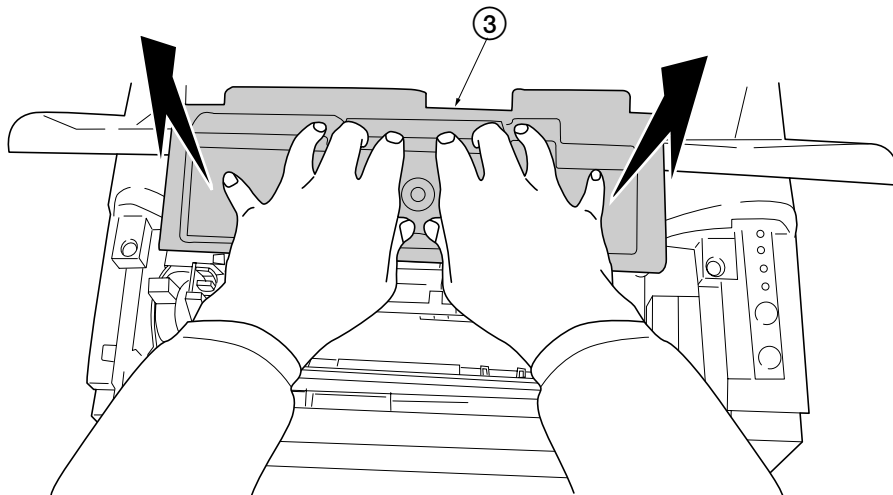


Figure 3-1-2 Removing the old toner container

Put it in the supplied plastic bag ④ and dispose of it.

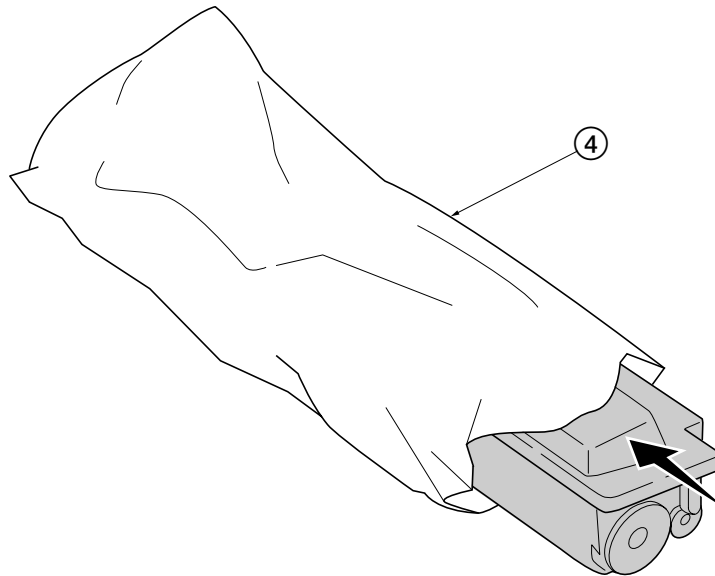


Figure 3-1-3 Disposal of the old toner container

NOTE Although the toner container is made from non-harmful, flammable material, be sure to dispose of it according to laws and regulations.

Proceed with the instructions provided in chapter 2, *Installing the toner container* on page 2-4 to complete installation of the new toner container.

(4) Toner saver mode (*EcoPrint*)

The *EcoPrint* enables to reduce the amount of toner consumed on the page so as to save printing costs by drastically extending the toner container life. *EcoPrint* mode is factory-set to off and turned on by the Print dialog under the File menu in the *Remote operation panel* utility (*Refer to printer's User's Manual*).

3-1-3 Cleaning the printer

To avoid print quality problems, the following printer parts must be cleaned with every toner container replacement.

To clean the printer, first, remove the process unit from the printer.

Open the top cover ① and front cover ②. Lift the process unit ③ together with the toner container out of the printer.

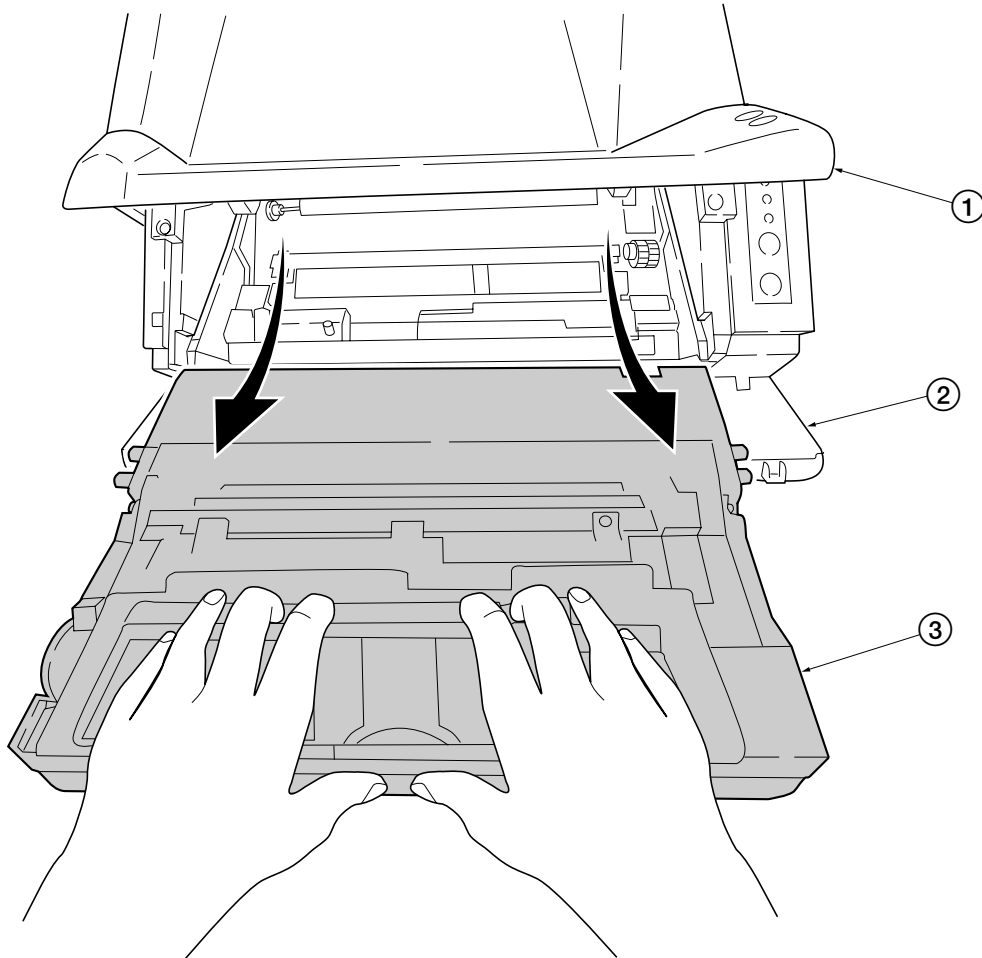


Figure 3-1-4 Removing the process unit

NOTE

The drum in the process unit is sensitive to light. Never expose the drum even to normal office lighting (500 lux) for more than five minutes.

(1) Cleaning the registration roller

Use the supplied wiper cloth ① to clean dust and dirt away from the registration roller ② (metal).

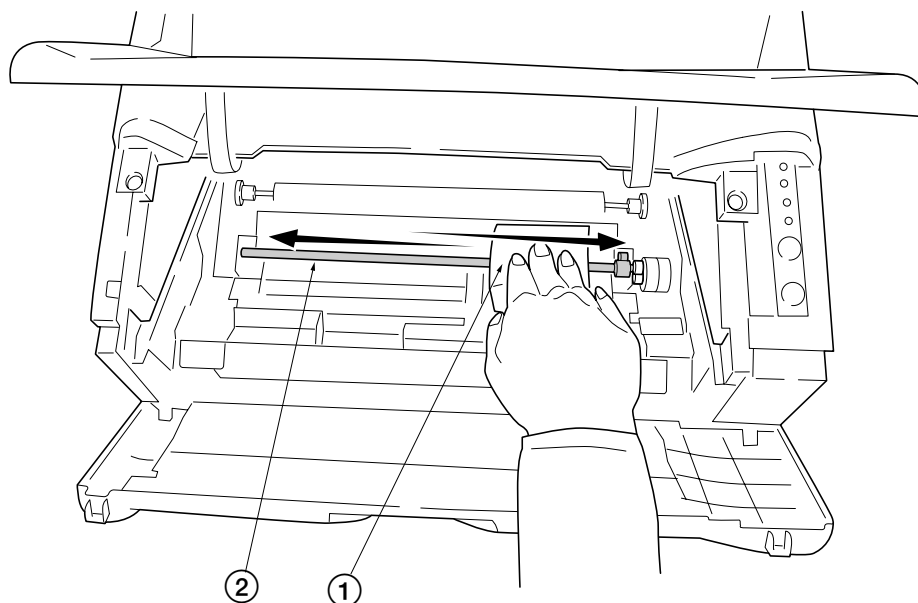


Figure 3-1-5 Cleaning the registration roller

(2) Cleaning the main charger wire

Slide the charger cleaner knob (green colored) back and forth 2 to 3 times, then return it to its [CLEANER HOME POSITION].

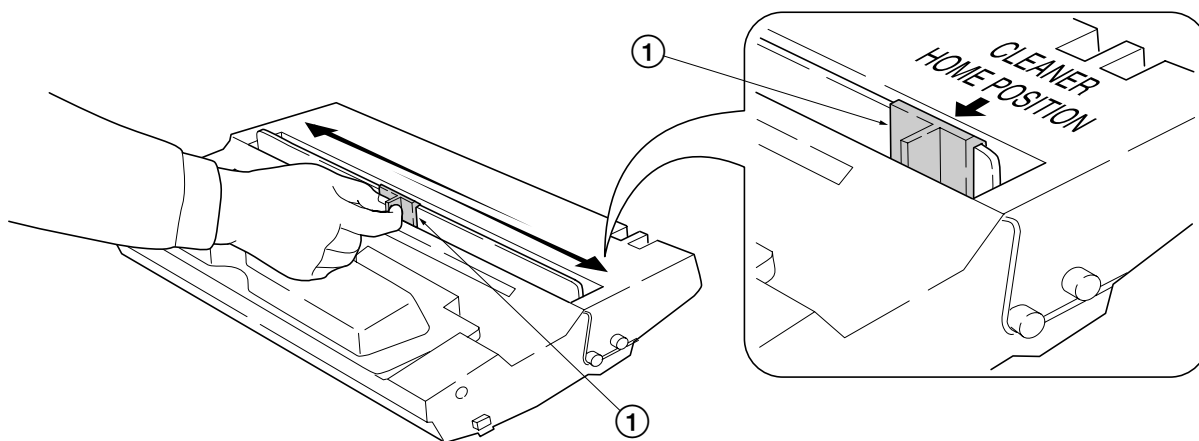


Figure 3-1-6 Cleaning the main charger wire

After cleaning is done, install the process unit in the printer, using the reverse manner as above. Close the front cover and top cover.

3-1-4 Updating the firmware

The printer accepts update of the system firmware sent through the parallel interface. A PC that is connected to the printer's parallel interface and capable of running in DOS mode is required for this purpose.

Updating the firmware is implemented by directly downloading the new firmware data for rewriting the flash memory chip in the printer.

(1) Firmware data format

Kyocera supplies the data to be downloaded in the following file format:

ds8844.dat

① ② ③ ④

Identifies...

-
- | | |
|---|---------------------------------------|
| ① | de: Engine firmware data* |
| | ds: Controller (system) firmware data |
| | dm: Operation panel message data* |
-
- | | |
|---|--------------|
| ② | 49: FS-1000 |
| | 88: FS-1000+ |
-
- | | |
|---|---------------------------------|
| ③ | Version of data (2 to 4 digits) |
|---|---------------------------------|
-
- | | |
|---|---------------------------------------|
| ④ | dat: Engine/controller firmware data* |
| | dan: Panel message data for Danish* |
| | swe: Panel message data for Swedish* |
| | ita: Panel message data for Italian* |
| | spa: Panel message data for Spanish* |
-

*: These are listed for reference purpose and not applicable for models FS-1000/1000+.

CAUTION

Do not turn off printer power while data are being downloaded (approximately one minute).

(2) Downloading controller firmware data

To download controller firmware data, use Prescribe UPGR command as follows.

CAUTION Downloading controller firmware takes several minutes. Do not turn power off during downloading.

Perform in sequence:

Turn printer power on. Make sure the printer is ready.

At the DOS prompt, send the following command to the printer:

```
echo !R! UPGR "SYS";EXIT;>prn
```

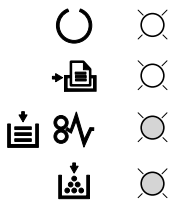


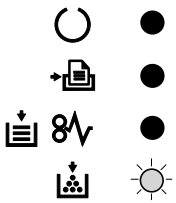










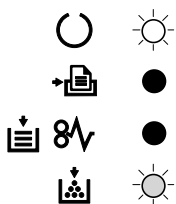






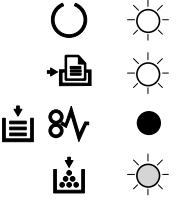




DOS COPY (/b) the data from the host computer to the printer.









Confirm that downloading was finished normally by the LED indicator. (See the table below.)

Turn power off.

Turn power on again. Check the printer gets ready. If the display shows an error, see to the table below.

Confirm the status page shows the new firmware version (See *Service information on the status page* on page B-4). If downloading fails, the printer indicates an error display using the LED indicators. To identify error, refer to the table which follows.

Download finished normally			Download errors			
LED indicators			LED indicators	Description	Cause	Corrective action
				Download data error	Deficit of a file header	Obtain normal firmware.
					Deficit of a data header	
					File checksum error	
					File header version error	
					Data header version error	
				System download error	Incompatibility of firmware and system DIMM board	Confirm whether the firmware conforms to this printer.
					Defective system DIMM board	Replace the system DIMM board.
						
				Download receiving error	Improper connection of parallel cable between PC and printer's interface connector	Check the contact between PC and printer's interface connector.
					Defective parallel cable	Replace parallel cable.
						

Convention		
Red	Green	Meaning
		Slow flashing
		Fast flashing
		Lit
		Off

Chapter 4 Operation Overview

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4-1 Electrophotographic system

Electrophotography is the technology used in laser printing which transfer data representing texts or graphics objects into a visible image which is developed on the photosensitive drum, finally fusing on paper, using light beam generated by a laser diode.

This section provides technical details on the printer's electrophotography system.

4-1-1 Electrophotographic cycle

The electrophotography system of the printer performs a cyclic action made of six steps as follows. Each step is technically explained in the following sections.

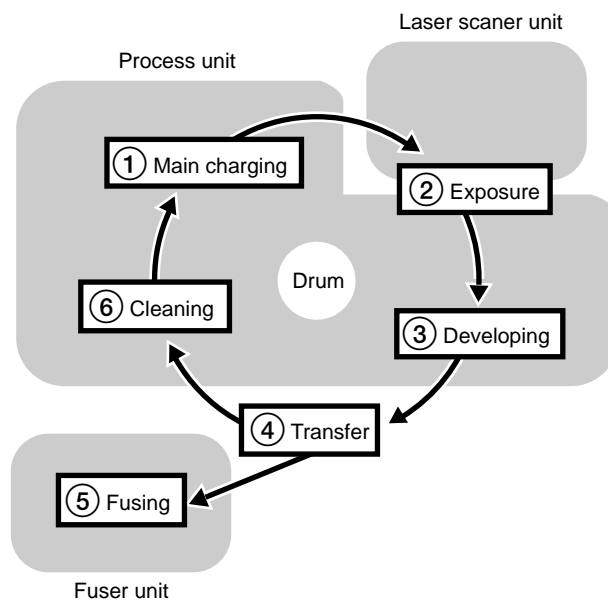
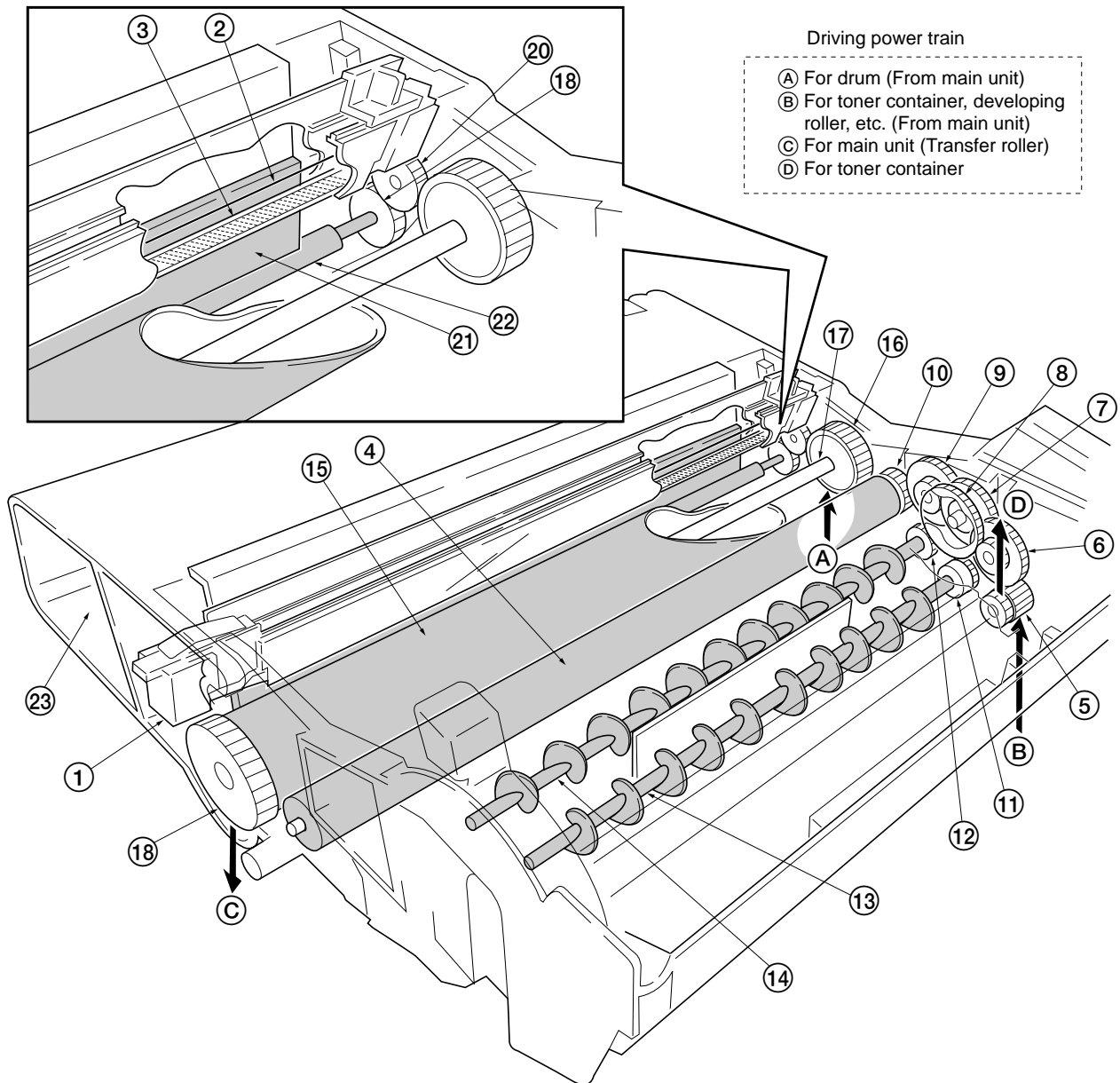


Figure 4-1-1 Electrophotographic cycle

The sections for main charging, exposure (drum), developing, and cleaning are modularized in one Process unit PU-40.

Process unit mechanism



- | | | |
|---------------------|--------------------|-------------------------|
| ① Main charger unit | ⑨ Gear Z18-Z35H | ⑰ Drum shaft |
| ② Charger wire | ⑩ MAG gear Z24H | ⑱ Drum gear Z36 |
| ③ Grid | ⑪ Mixer gear Z20 B | ⑲ Sweep gear Z13 |
| ④ Developing roller | ⑫ Mixer gear Z20 A | ⑳ Idle gear 18H |
| ⑤ Gear Z14-Z18 | ⑬ DLP screw B | ㉑ Cleaning blade |
| ⑥ Gear Z14-Z36 | ⑭ DLP screw A | ㉒ Sweep roller |
| ⑦ Gear Z18-Z36 | ⑮ Drum | ㉓ Waste toner reservoir |
| ⑧ Free gear Z40 | ⑯ Drum gear Z35H | |

Figure 4-1-2 Process unit mechanism

(1) Main charging

Photo conductive drum

The durable layer of organic photoconductor (OPC) is coated over the aluminum cylinder base. The OPC tend to reduce its own electrical conductance when exposed to light. After a cyclic process of charging, exposure, and development, the electrostatic image is constituted over the OPC layer. Since the OPC is materialized by resin, it is susceptible to damage caused by sharp edges such as a screwdriver, etc., resulting in a print quality problem. Also, finger prints can cause deterioration of the OPC layer, therefore, the drum (in the process unit) must be handled with care. Substances like water, alcohol, organic solvent, etc., should be strictly avoided.

As with all other OPC drums, the exposure to a strong light source for a prolonged period can cause a print quality problem. The limit is approximately 500 lux for less than five minutes. If the drum (process unit) remains removed form the printer, it should be stored in a cool, dark place.

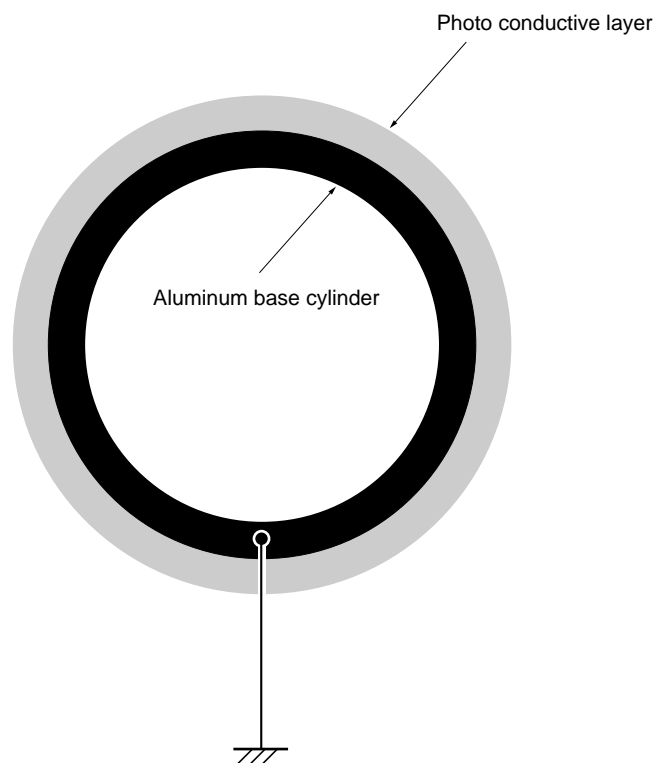


Figure 4-1-3 Photo conductive drum

Charging the drum

The following shows a simplified diagram of the electrophotographic components in relation to the engine system. Charging the drum is done by the main charger unit (A).

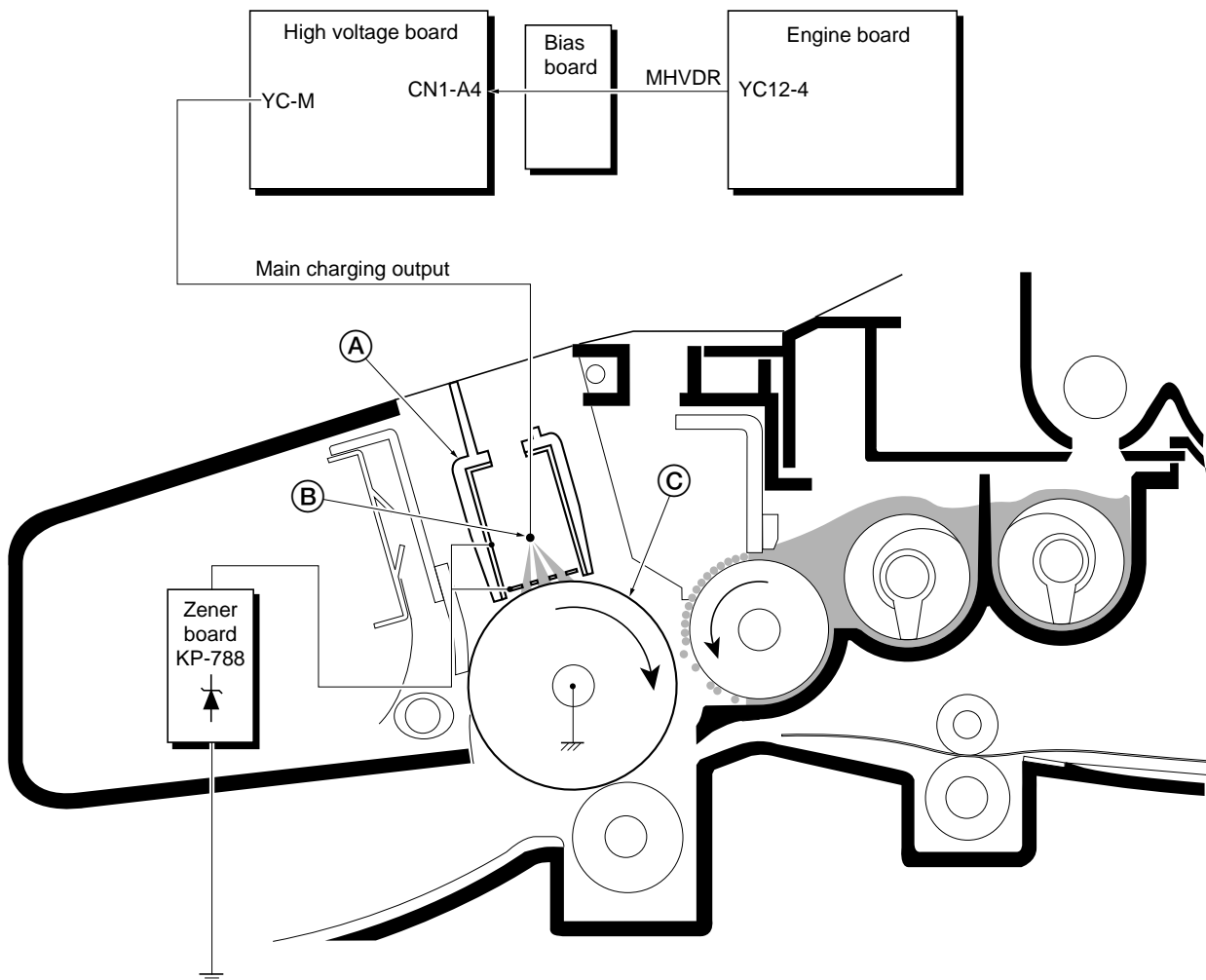


Figure 4-1-4 Charging the drum

As the drum (C) rotates in a “clean (neutral)” state, its photoconductive layer is given a uniform, positive (+) corona charge dispersed by the main charger wire (B).

Due to high-voltage scorotron charging, the charging wire can get contaminated by oxidization after a long run. Therefore, it must be cleaned periodically from time to time using the method explained in chapter 3. Cleaning the charging wire prevents print quality problems such as black streaks.

(2) Exposure

The charged surface of the drum (A) is then scanned by the laser beam from the laser scanner unit (B).

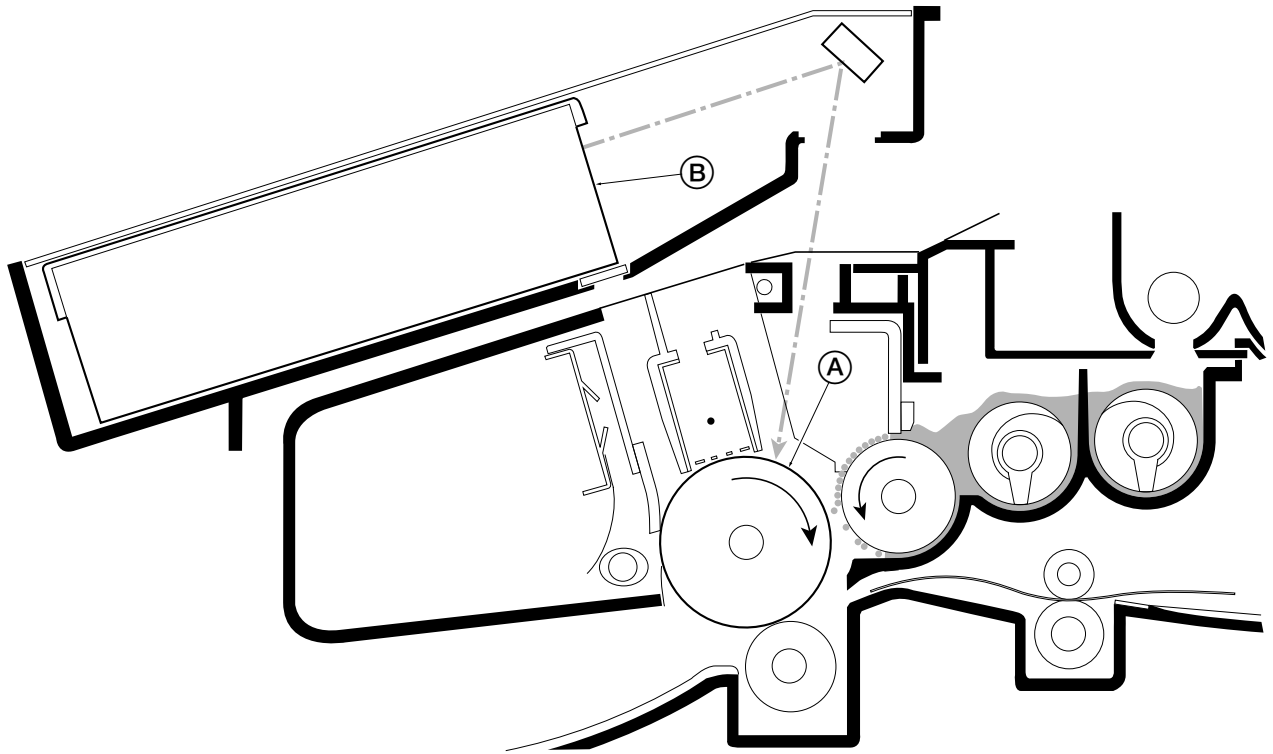


Figure 4-1-5 Exposure

The laser beam (780 nm wavelength) beam is dispersed as the polygon motor (polygon mirrors) revolves to reflect the laser beam over the drum. Various lenses and mirror are housed in the scanner unit, adjust the diameter of the laser beam, and focalize it at the drum surface.

Laser scanner unit

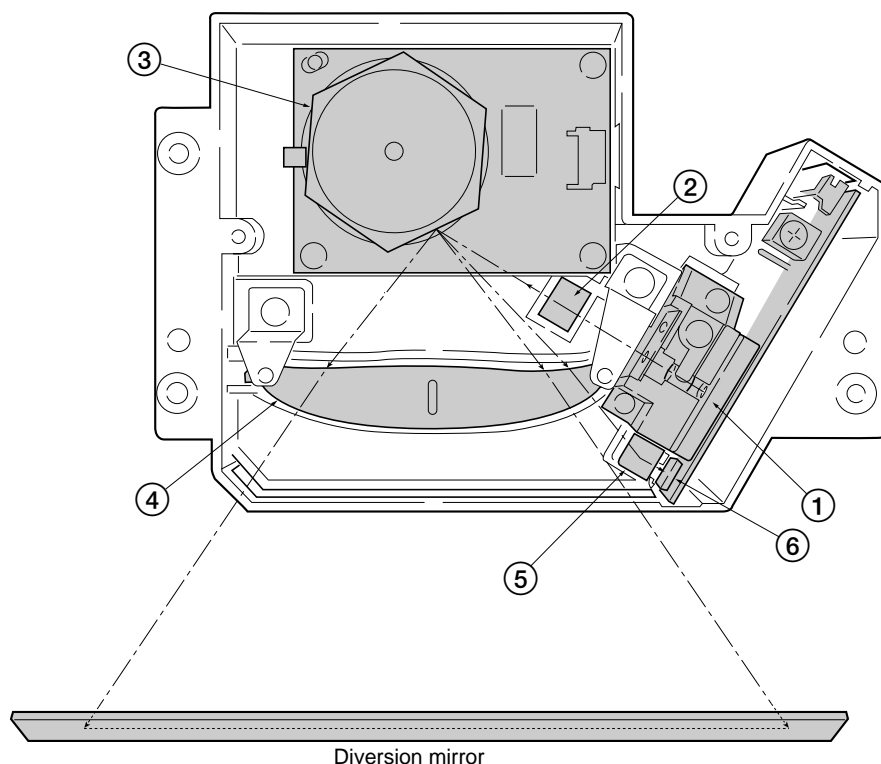


Figure 4-1-6 Laser scanner unit

Name	Description
① Laser diode	Emits diffused, visible laser.
② Cylindrical lens	Compensates the vertical angle at which the laser beam hits a polygon mirror segment.
③ Polygon mirror (motor)	Has six mirror segments around its hexagonal circumference; each mirror corresponding to one scanned line width on the drum when laser beam scans on it.
④ F-theta lens	The f-theta lens equalizes focusing distortion on the far ends of the drum.
⑤ Sensor mirror	Bends the very first shot of a laser scan towards the beam detection sensor (⑥).
⑥ Pin photo sensor	When shone by the sensor mirror above, this photo-sensor generates a trigger signal for the engine controller to start activating the paper feeding system.

Drum surface potential

The laser beam is continually switched on and off depending on the print data. It is on for a black (exposed) dot and off for a white (blank) dot. Since the drum surface is evenly charged, whenever it is illuminated by the laser beam, the electrical resistance of the photoconductor is reduced and the potential on the photoconductor is also lowered. Resulted on the drum surface is an electrostatic image which represents the data to print. Note that the area to be printed black has the low potential, constituting a “positively exposed” image.

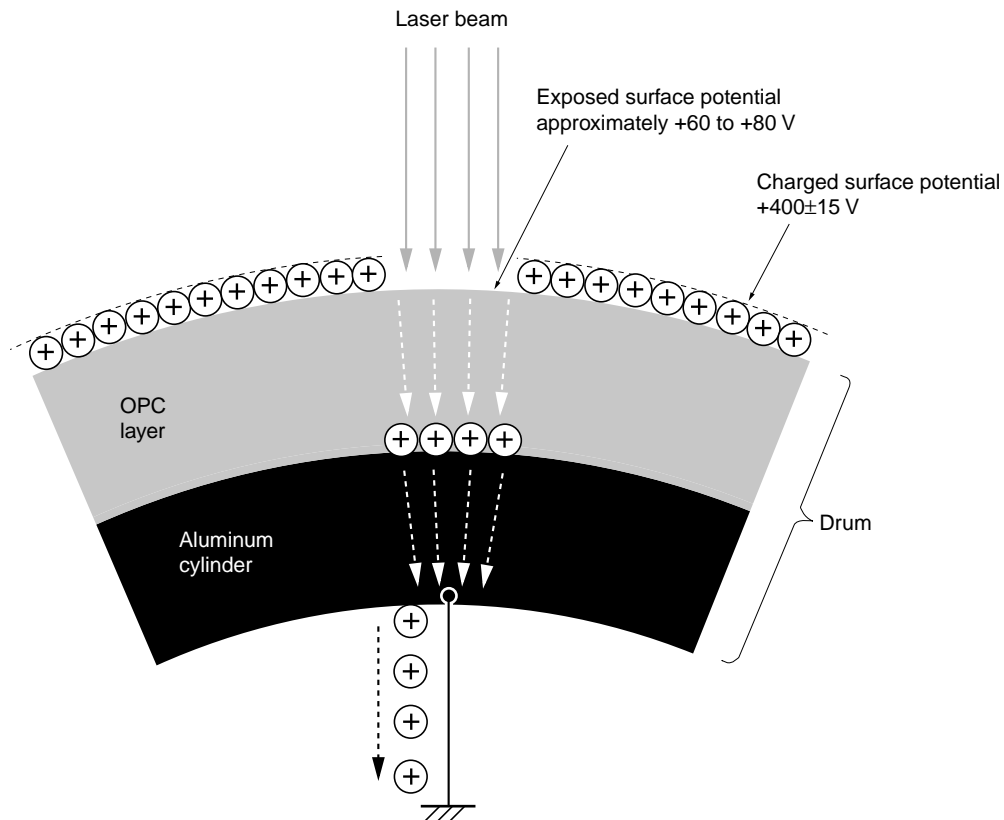


Figure 4-1-7 Drum surface potential

(3) Development

The latent image constituted on the drum is developed into a visible image. The developing roller (A) contains a 3-pole (S-N-S) magnet core (B) and an aluminum cylinder rotating around the magnet core (B). Toner attracts to the developing roller (A) since it is powdery ink made of black resin bound to iron particles. Doctor blade (C), magnetized by magnet (D), is positioned approximately 0.3 mm above the developing roller (A) to constitute a smooth layer of toner in accordance with the roller revolution.

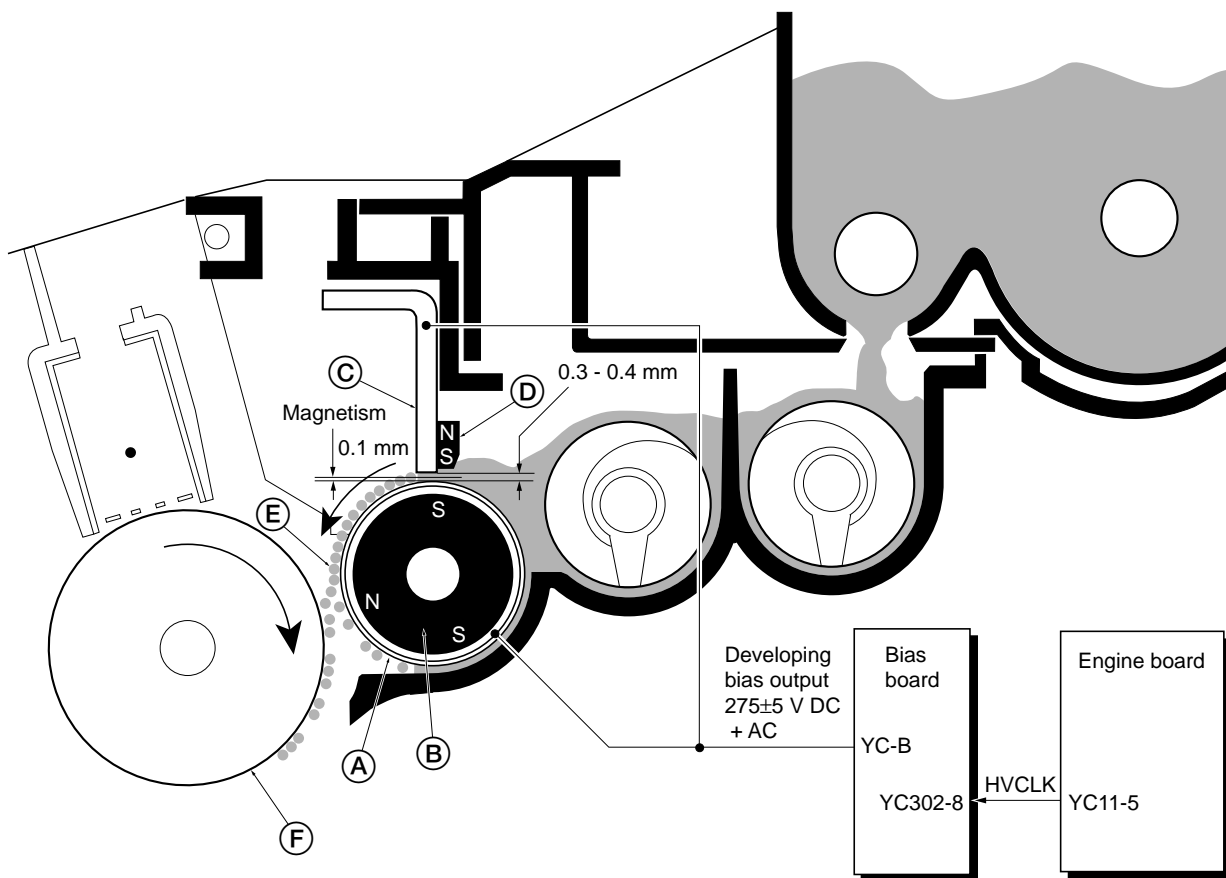


Figure 4-1-8 Development

The developing roller (A) is applied with the AC-weighted, positive DC power source. Toner (E) on the developing roller (A) is given a positive charge. The positively charged toner (E) is then attracted to the areas of the drum (F) which was exposed to the laser light. (The gap between the drum (F) and the developing roller (A) is approximately 0.3 mm.) The non-exposed areas of the drum (F) repel the positively charged toner as these areas maintain the positive charge.

The developing roller ① is also AC-biased to ensure contrast in yielding by compensating the toner's attraction and repelling action during development.

(4) Transfer

The image developed by toner on the drum (A) is transferred onto the paper because of the electrical attraction between the toner itself and the transfer roller (B). The transfer roller is negatively biased so that the positively charged toner is attracted onto the paper while it is pinched by the drum and the transfer roller.

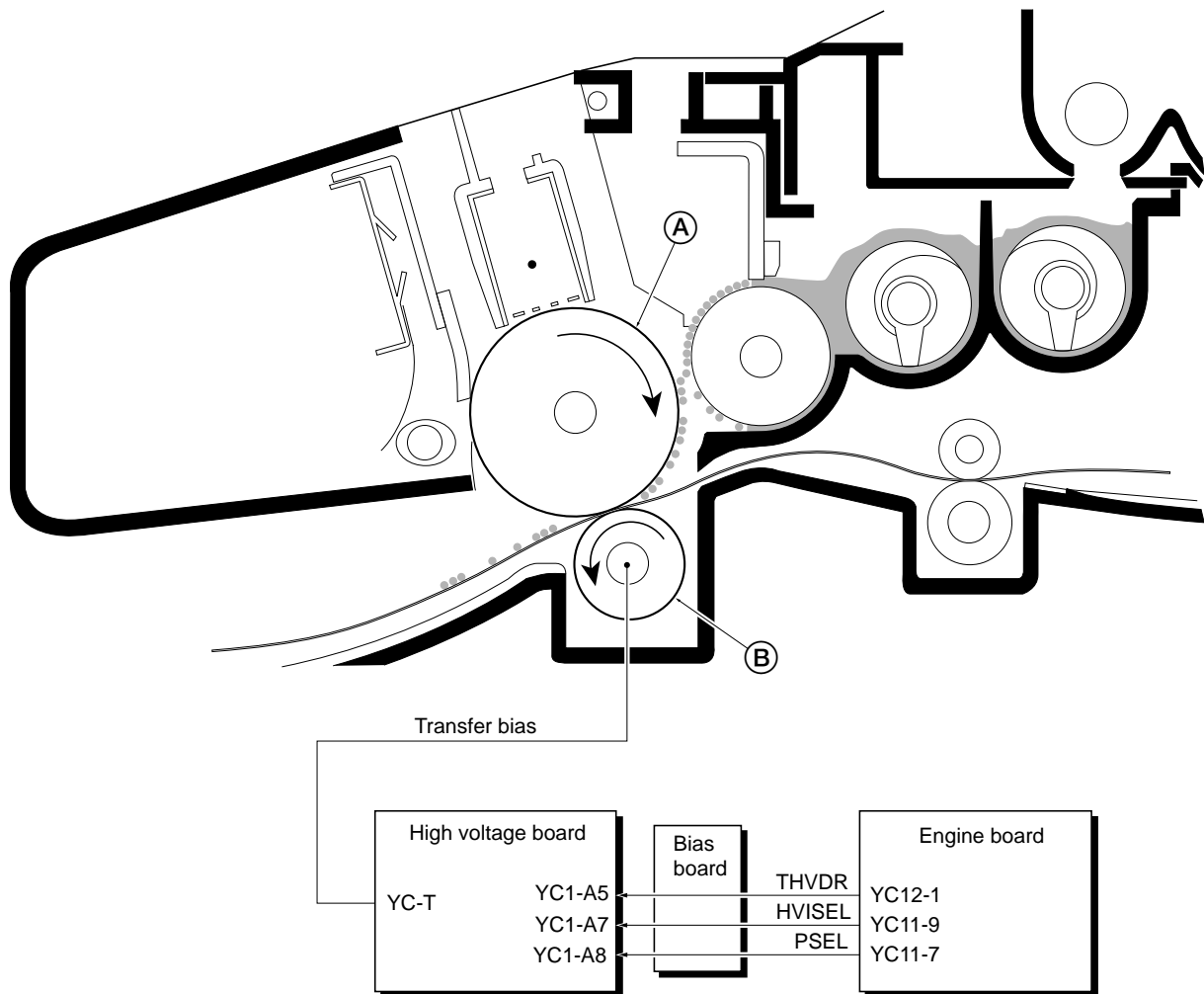


Figure 4-1-9 Transfer

The nominal transfer bias is set to approximately -1.8 kV (limit) with the -6 μ A current. Since the ideal potential of the transfer bias depends on the thickness of paper, the bias is raised to approximately -2.5 kV/-6 μ A for thicker paper. On the other hand, the bias current is reduced to -1.8 kV/-6 μ A for thin paper.

(5) Fusing

The toner on the paper is molten and pressed into the paper as it passes between the heat roller (A) and the press roller (B) in the fuser unit.

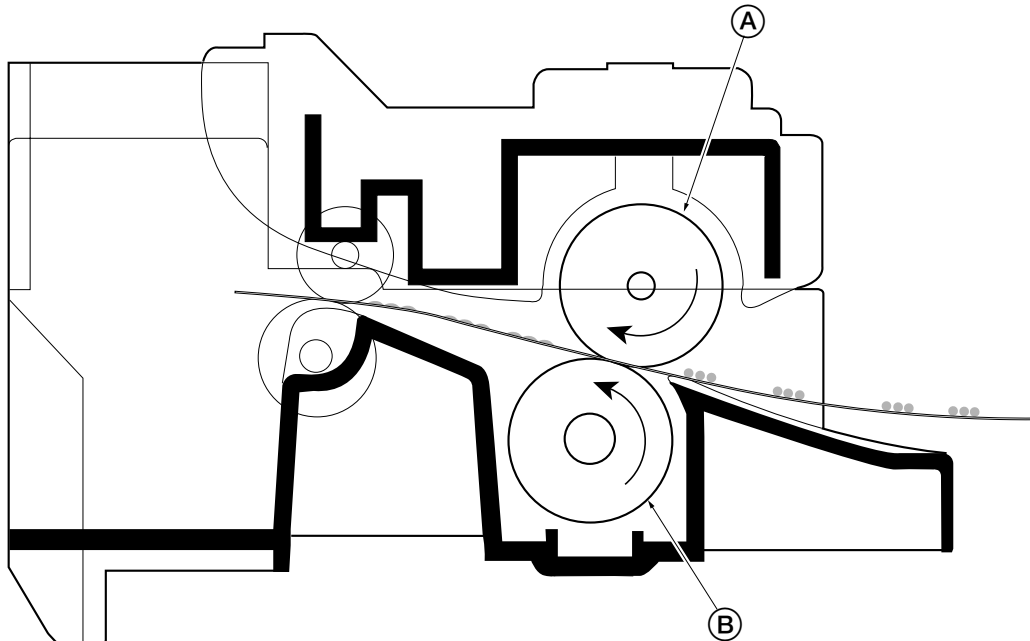


Figure 4-1-10 Fusing

The heat roller has a halogen lamp inside which continuously turns on and off by the thermistor to maintain the constant temperature onto the heat roller surface. The temperature is approximately 160 °C while the printer is idle; approximately 175 °C (Normal paper) and 185 °C (Thick paper) while printing.

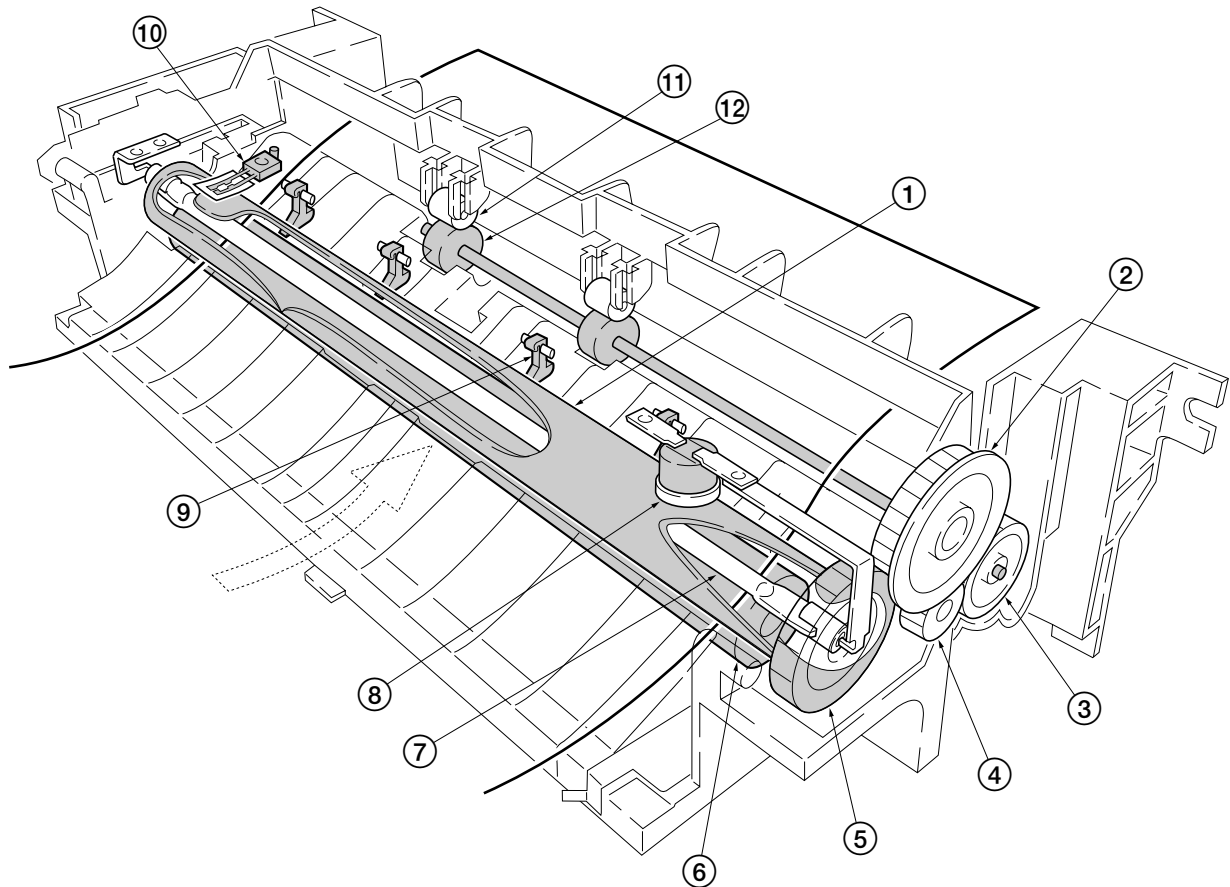
The heat roller is resin coated by fluorine to prevent toner from accumulating on the roller after a long run. Care must be taken while handling the heat roller not to scratch the roller surface as doing so may result in print problems.

The heat roller has four claws which are continuously in contact with its surface. These claws prevent the paper on which toner has been fused from being wound around the heat roller causing paper jam.

The pressure roller is made of the heat-resistant silicon rubber. This roller is used to strongly press the paper towards the heat roller by means of coil springs.

The temperature of the heat roller is constantly monitored by the engine board using the thermistor and triac. Should the temperature of the heat roller exceed the predetermined value, the thermal cutout is activated to effectively disconnect the heater (halogen) lamp from power.

Fuser unit mechanism



- | | | |
|-----------------|------------------|---------------------|
| ① Heat roller | ⑤ Heat gear Z33 | ⑨ Separator(s) |
| ② Idle gear Z34 | ⑥ Press roller | ⑩ Thermistor |
| ③ Exit gear Z23 | ⑦ Heater lamp | ⑪ Exit pulley(s) |
| ④ Idle gear Z18 | ⑧ Thermal cutout | ⑫ Lower exit roller |

Figure 4-1-11 Fuser unit mechanism

(6) Cleaning

After the transferring process, the drum needs to be physically cleaned of toner which is residual after the development process. The cleaning blade (A) is constantly pressed against the drum (B) and scrapes the residual toner off to the sweep roller (C). The waste toner is collected at the output end of the sweep roller (C) and sent back to the toner container, into the waste toner reservoir (D).

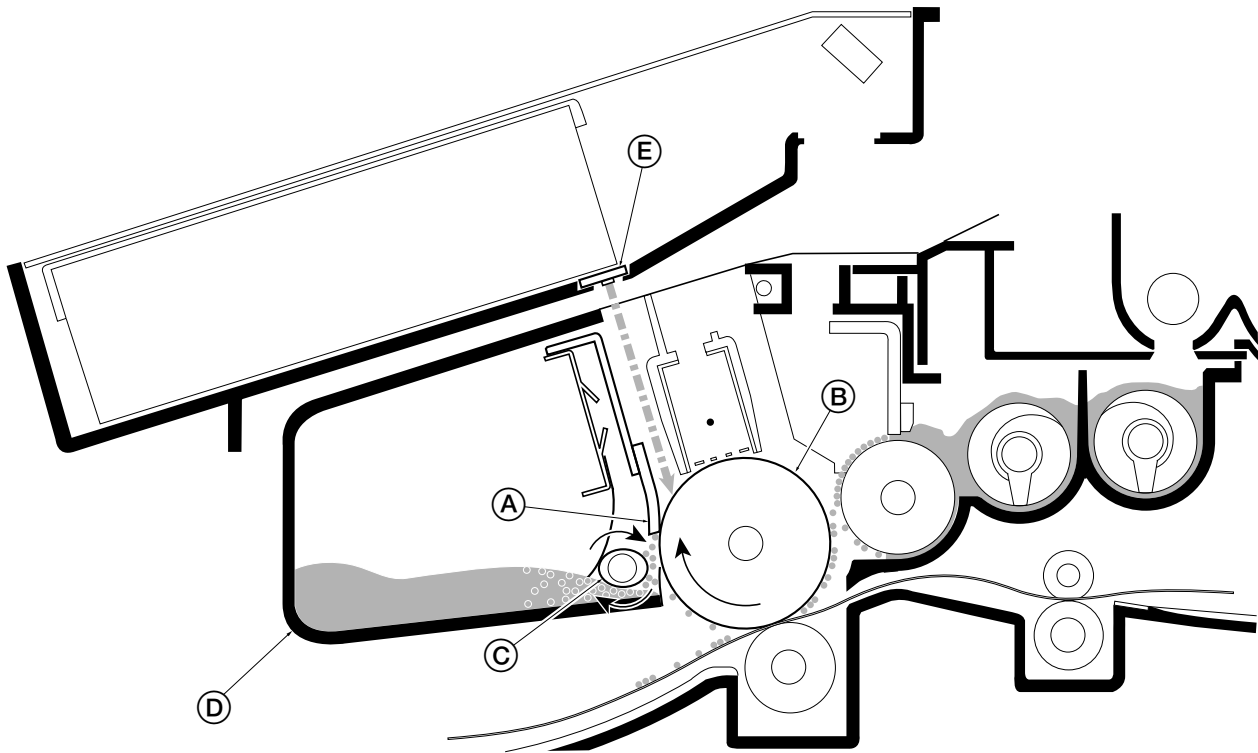


Figure 4-1-12 Drum cleaning and erasing static charge

After the drum (B) is physically cleaned, it then must be cleaned to the electrically neutral state. This is necessary to erase any residual positive charge, ready to accept the uniform charge for the next print process. The residual charge is canceled by exposing the drum (B) to the light emitted from the eraser lamp (E). This lowers the electrical conductivity of the drum surface making the residual charge on the drum surface escape to the ground.

4-2 Paper feeding system

The paper feeding system picks up paper from the cassette, MP tray, or if installed, the paper feeder PF-17, feeds it in the printer, and delivers in the output tray. Paper is fed at the precise timing in synchronization with data processing. The paper feeding system finally delivers the printed page to either the face-down or face-up tray as manipulated by the user.

The figure below shows the components in the paper feeding system and the paths through which the paper travels. The sensors, clutches, etc., are described in the following pages.

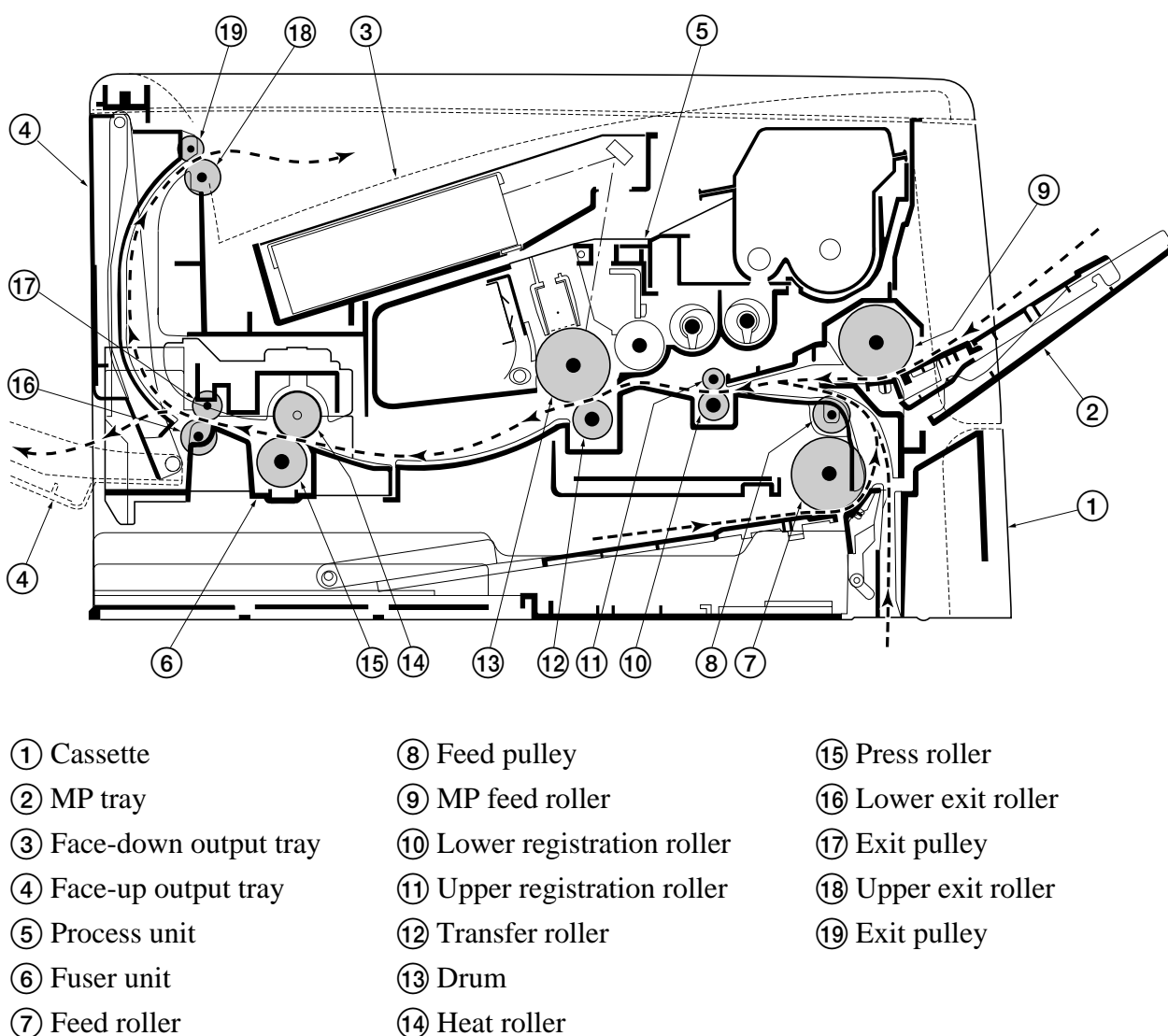


Figure 4-2-1 Paper feeding path

4-2-1 Paper feed control

The following diagram shows interconnectivity of the feeding system components including the sensors and rollers. The engine board provides the signals in conjunction with the electrophotography process that is driven by the main board.

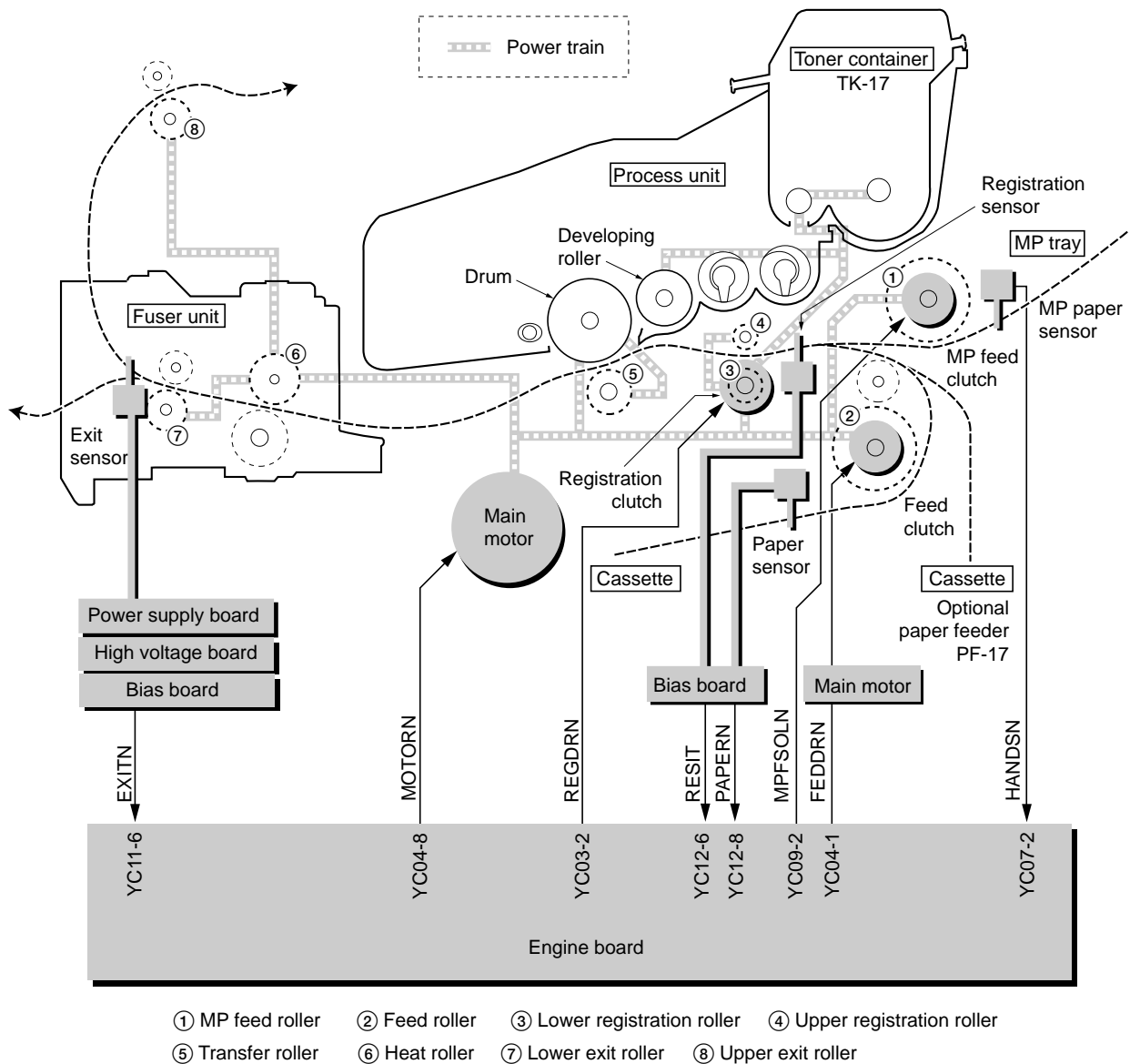


Figure 4-2-2 Paper feed control

Paper feeding mechanism

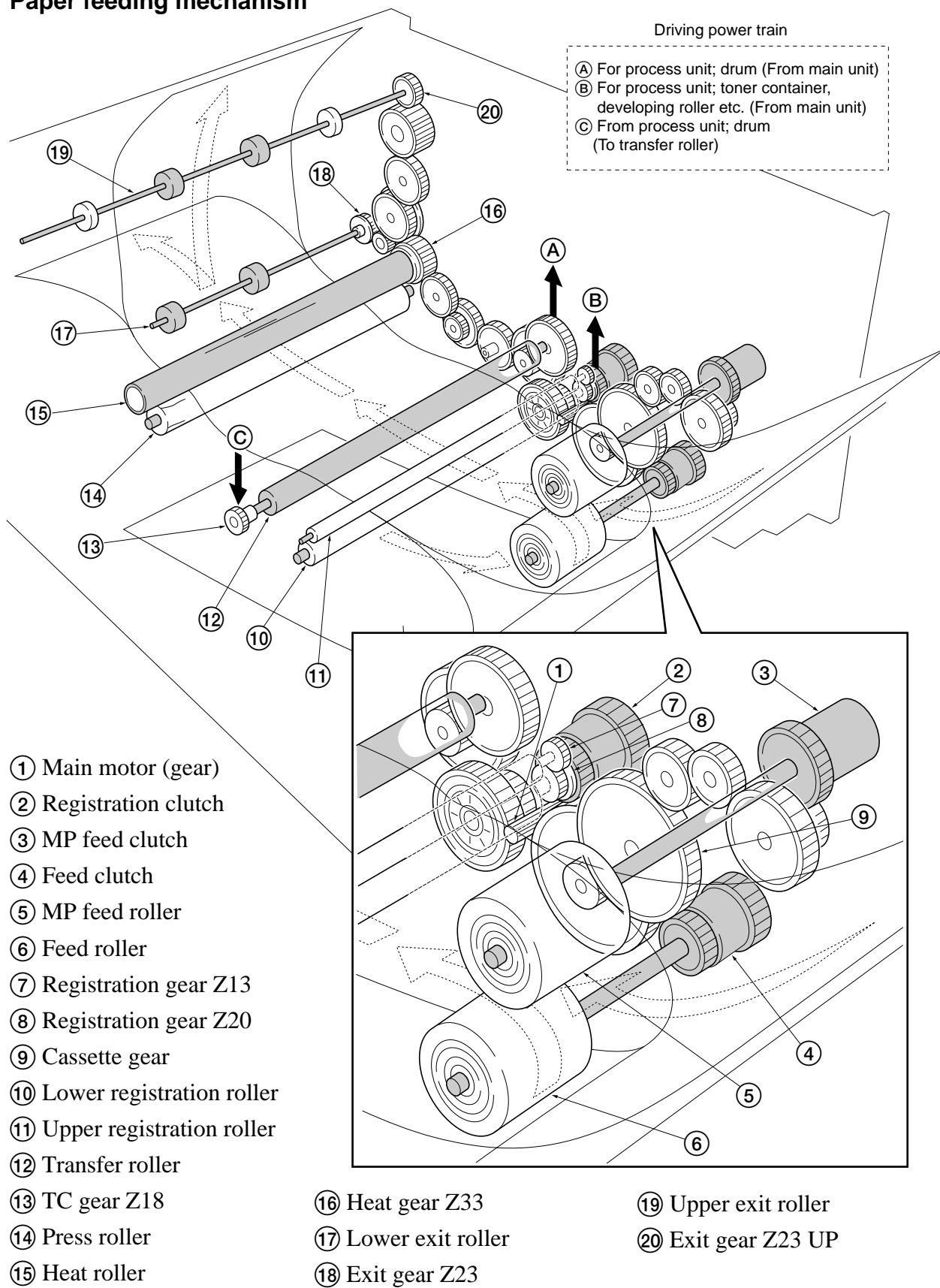


Figure 4-2-3 Paper feeding mechanism

4-3-2 Operation of circuit boards

(1) Main board

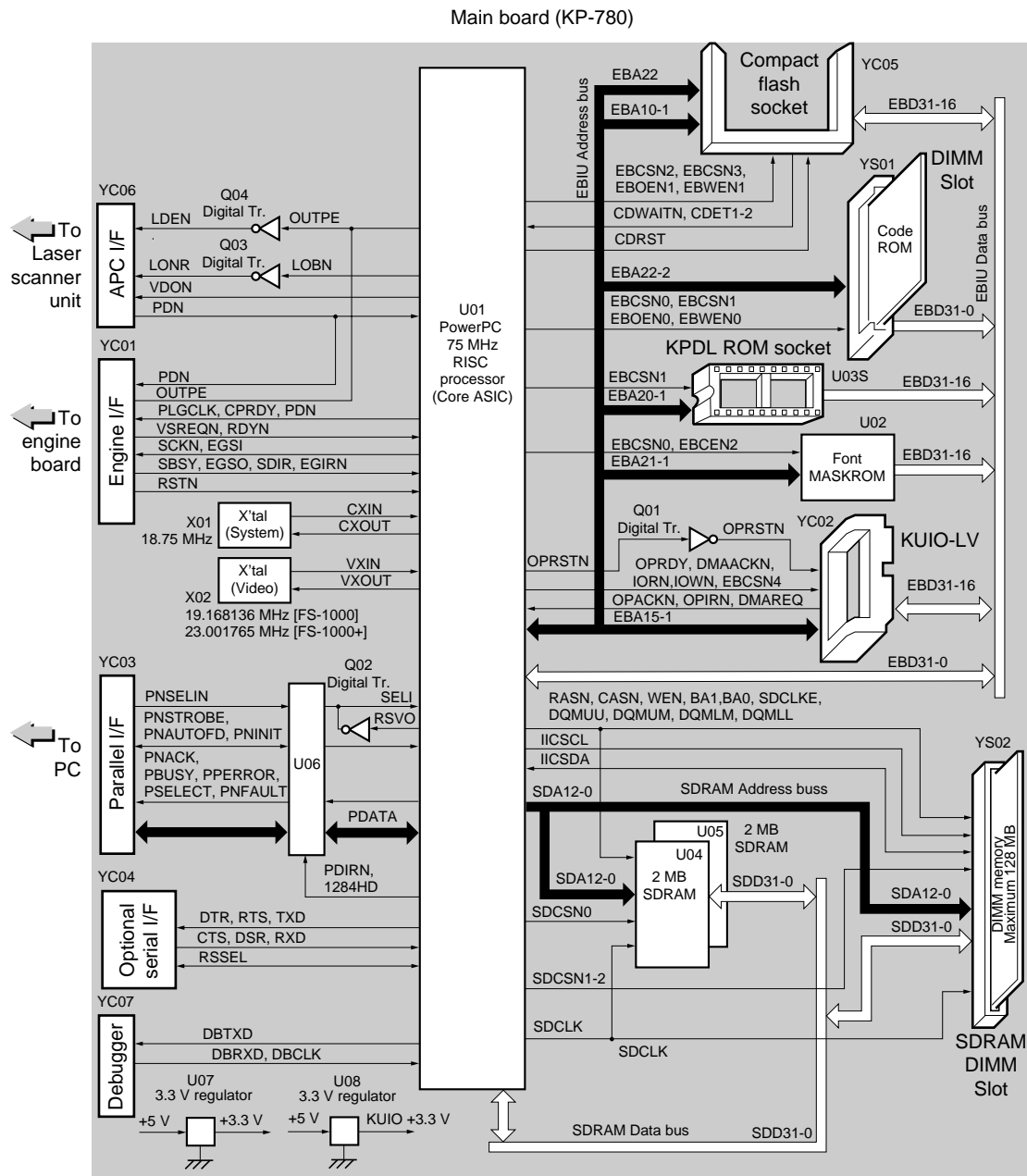


Figure 4-3-2 Main board circuit block diagram

(2) Engine board

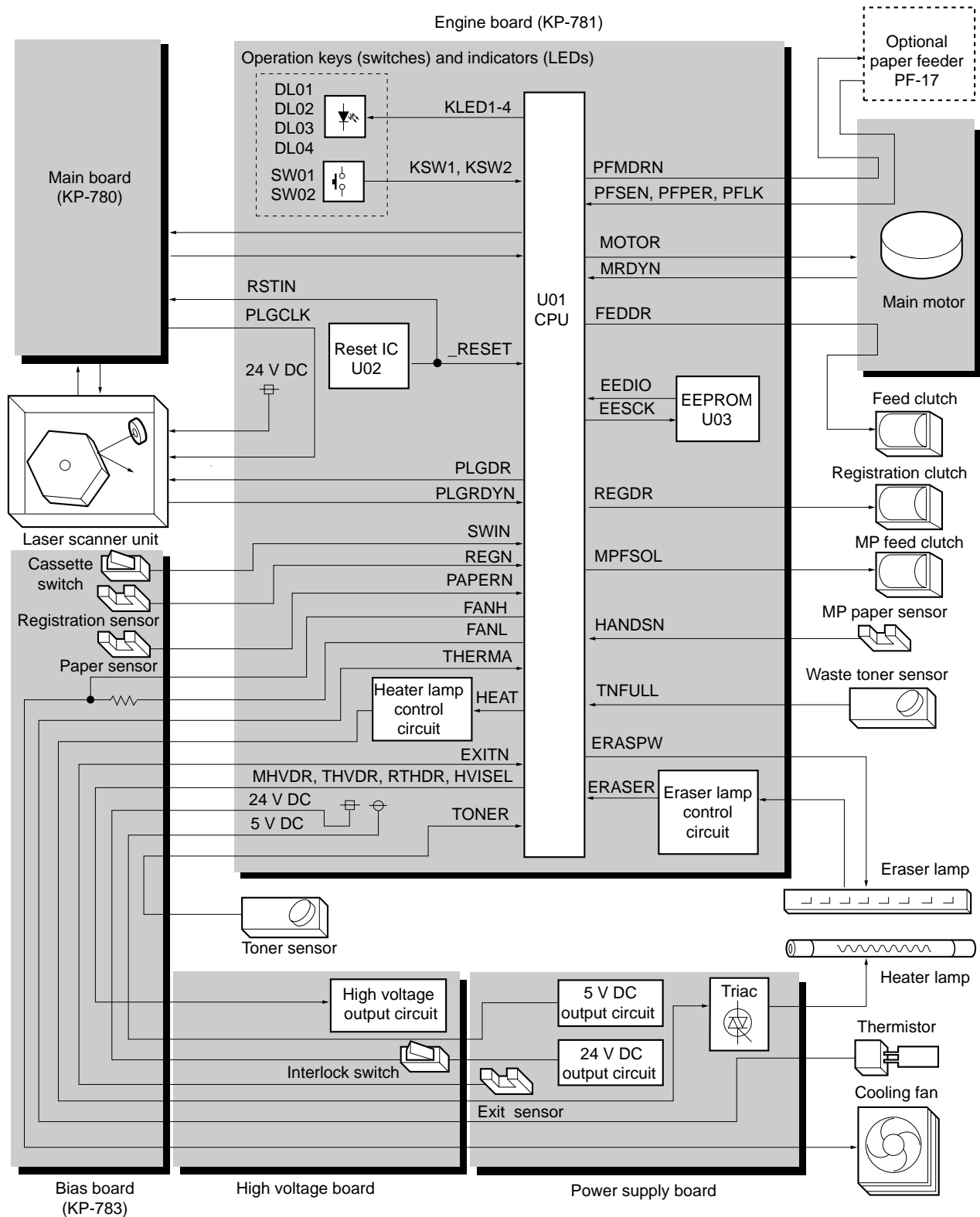


Figure 4-3-3 Engine board circuit block diagram

Eraser lamp control circuit

The CPU turns pin #45 (ERASERN) of U01 to H level, transistors Q12 and Q13 turns on consequently, and the 24 V DC given at pin #1 of YC05 applies to the eraser lamps. The eraser lamps thus illuminate as the current flows through the eraser lamp, the 2nd pin of YC05, resistors R58, R59, and R61, and the ground.

Pin #27 (ERRDYN) of the CPU U01 is wired to the crossing of R59 and R61 via R60. The CPU turns pin #45 (ERASERN) to H level and monitors the input level after one second. If the eraser lamp is normal, the current flowing through R60 also flows DZ02, making the voltage at pin #27 to be approximately 2.7 V. On the contrary, if the level at pin #27 (ERRDYN) is less than 1 V for more than 2 seconds, despite the CPU turns pin #45 (ERASERN) to H level and applying the 24 V DC to pin #1 of YC05, the CPU recognizes that the current is not flowing through the eraser lamp. The message “Call service person E5” is then displayed.

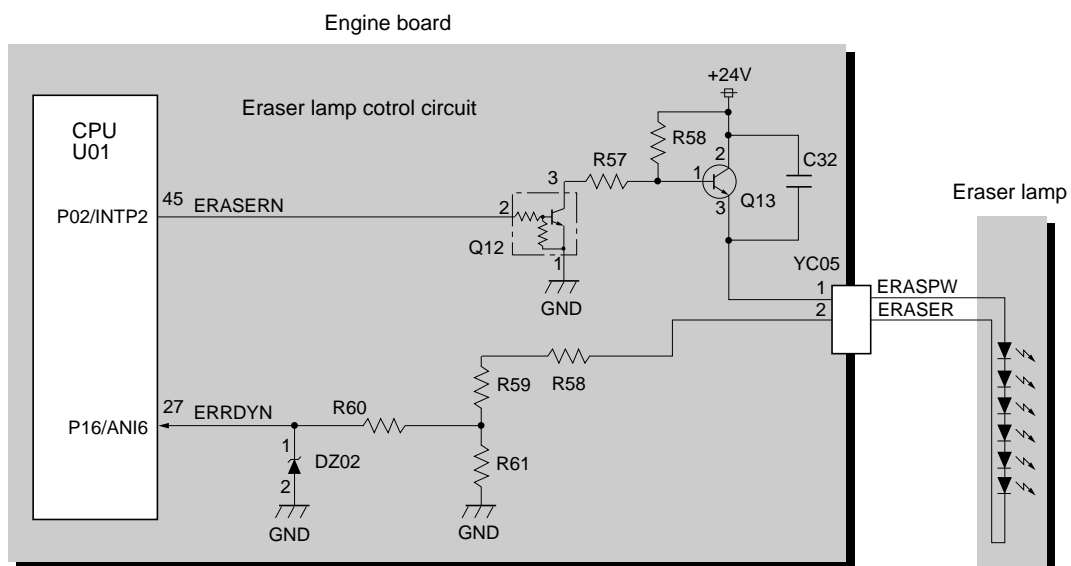


Figure 4-3-4 Eraser lamp control circuit

Heater lamp control circuit

The heater lamp control circuit turns the heater lamp on and off which is located coaxial inside the heat roller, so that the surface of the roller maintains the constant specific, temperature needed to permanently fuse the toner on paper.

The heater lamp is directly fed with AC primary power (120 V or 220 - 240 V) which is supplied from the power supply board.

The CPU U01 detects variation in voltage resultant of change in temperature, given at pin #33 (THERMA) by the thermistor. This voltage is used to effectively switch the fuser lamp on and off. If pin #1 (HEAT) is H level, transistor array QA01 (pin #5) turns on, the photo coupler on the power supply board turns on, and the triac turns on, consequently the heater lamp is AC powered and lights. The heater lamp continuously turns on and off to maintain the temperature on the heater roller at approximately 170 °C (Normal paper) and 185 °C (Thick paper) for printing and approximately 160 °C at stand by.

If the temperature does not decrease more than 1 °C within 20 seconds since the CPU turns pin #1 (HEAT) off to disable the heater lamp, the printer displays “Call service person E4”.

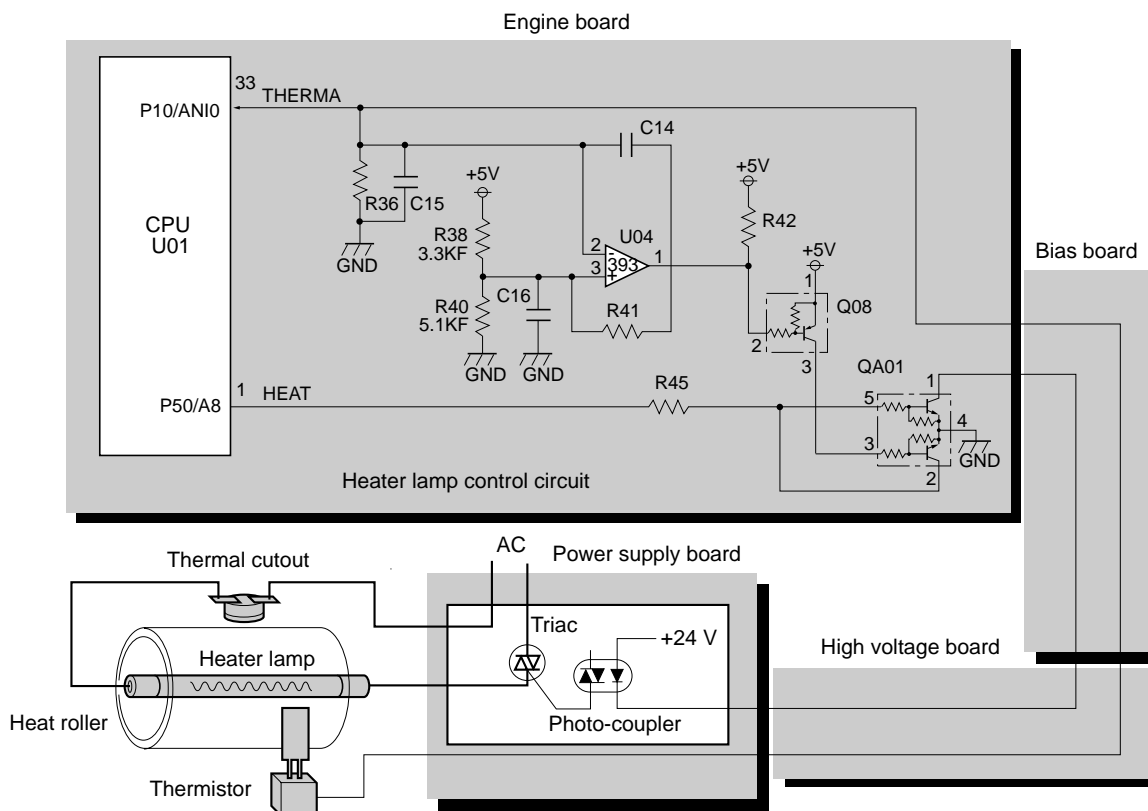


Figure 4-3-5 heater lamp control circuit

Besides the thermal cutout device which is connected in series with the heater lamp, the system includes the abnormal temperature detection circuit comprised of comparator U04, R38, R40, etc. Pin #3 of the comparator is continuously given with the voltage by resistors R38 and R40, which simulates the voltage given if an abnormally high temperature develops. Pin #2 receives the voltage the thermistor detects. For instance such as the heater lamp happens not to switch off, the voltage the thermistor gives at pin #2 will become unusually high, and as soon as it exceeds the voltage at pin #3, pin #1 of the comparator output changes to L level. This in turn turns transistors Q8, transistor array QA01 (pin #3) on, and turns pin #2 to L level. Since pins #2 and #5 are connected to each other, pin #1 of the CPU, even though it is currently at H level, is enforced to be H level, effectively disabling the heater lamp.

Polygon motor control circuit

The main controller board supplies the 1417.3 Hz clock pulse (PLGCLK) via the engine board to the PLL control IC (IC1) for the polygon motor. To begin printing, the engine CPU U01 turns PLGDR to H level, the PLL control IC (IC1) starts to revolve the polygon motor so that the revolution is 14,173 rpm which depends on the PLGCLK clock pulse. When PLL control IC (IC1) finds that the polygon motor is revolving at the rated speed, turns PLGDRN to L level to acknowledge the engine CPU that the rated speed has been achieved.

On the contrary, if PLGRDYN does not turn to L level within 8 seconds since PLGDRN has been L level, the printer displays “Call service person E2”.

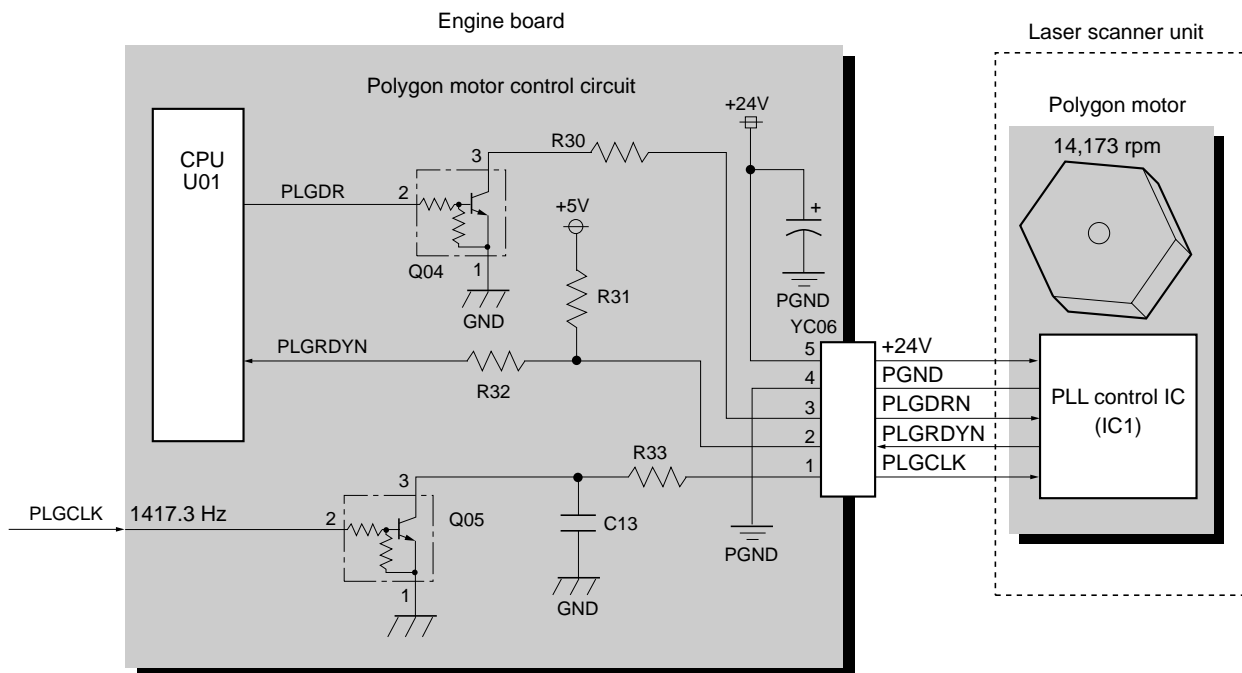


Figure 4-3-6 Polygon motor control circuit

(3) Power supply board

The power supply board provides the AC power input and DC power and outputs. The high voltage bias generator circuit is mounted on a separate board. A simplified schematic diagram is shown below.

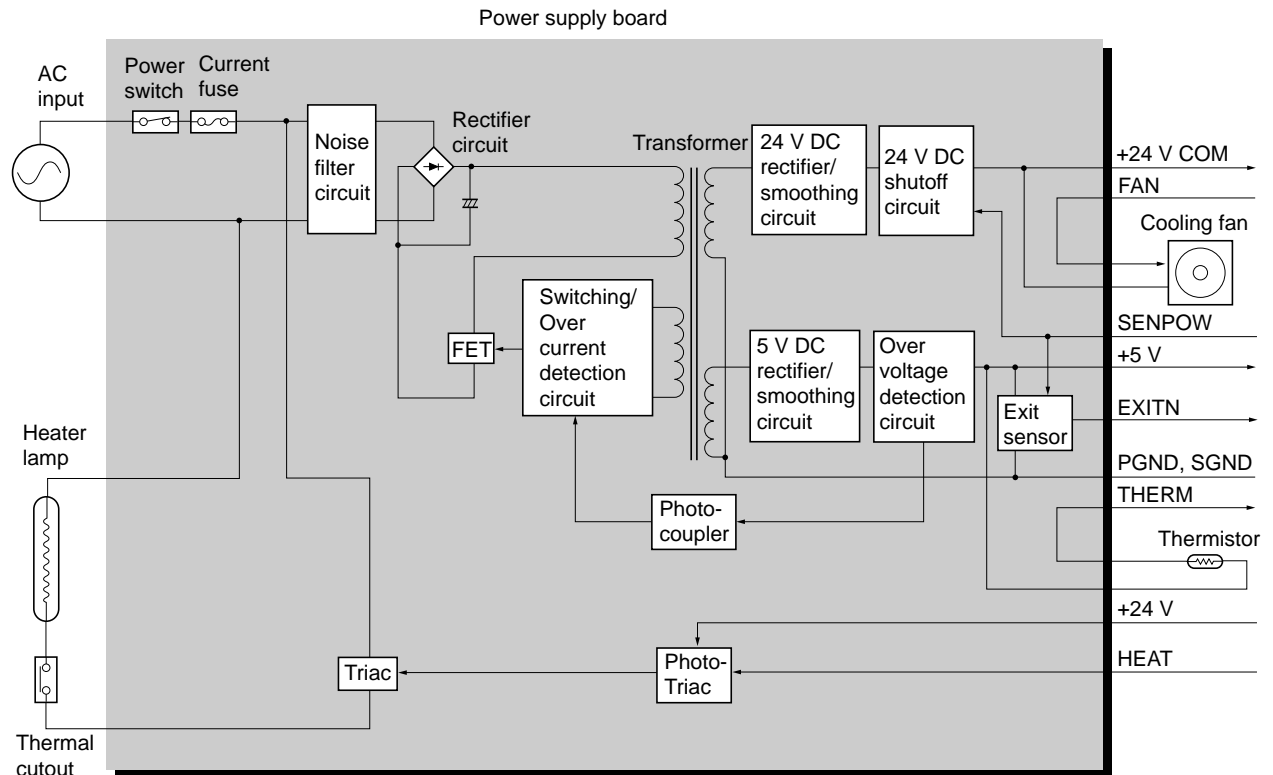


Figure 4-3-7 Power supply board circuit block diagram

(4) Bias board

The bias board contains the developing bias output circuit, registration sensor, paper empty sensor, and the cassette switch. It also provides a liaison connection to the high voltage board, power supply, and the toner sensor.

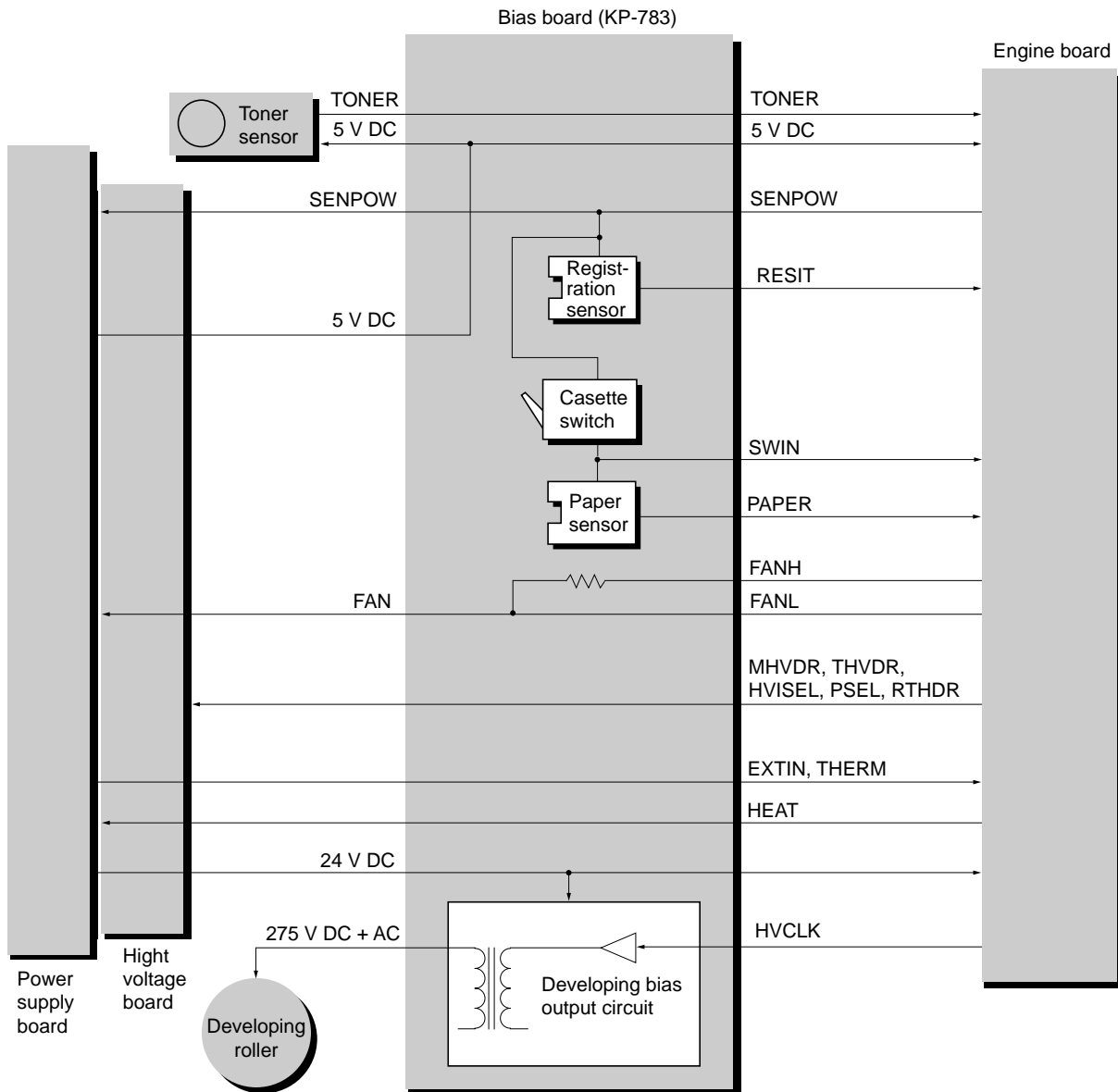


Figure 4-3-8 Bias board circuit block diagram

(5) High voltage board

The high voltage board contains the high voltage output circuit, interlock switch circuit as well as providing a liaison connection with the power supply board, bias board, and the engine board.

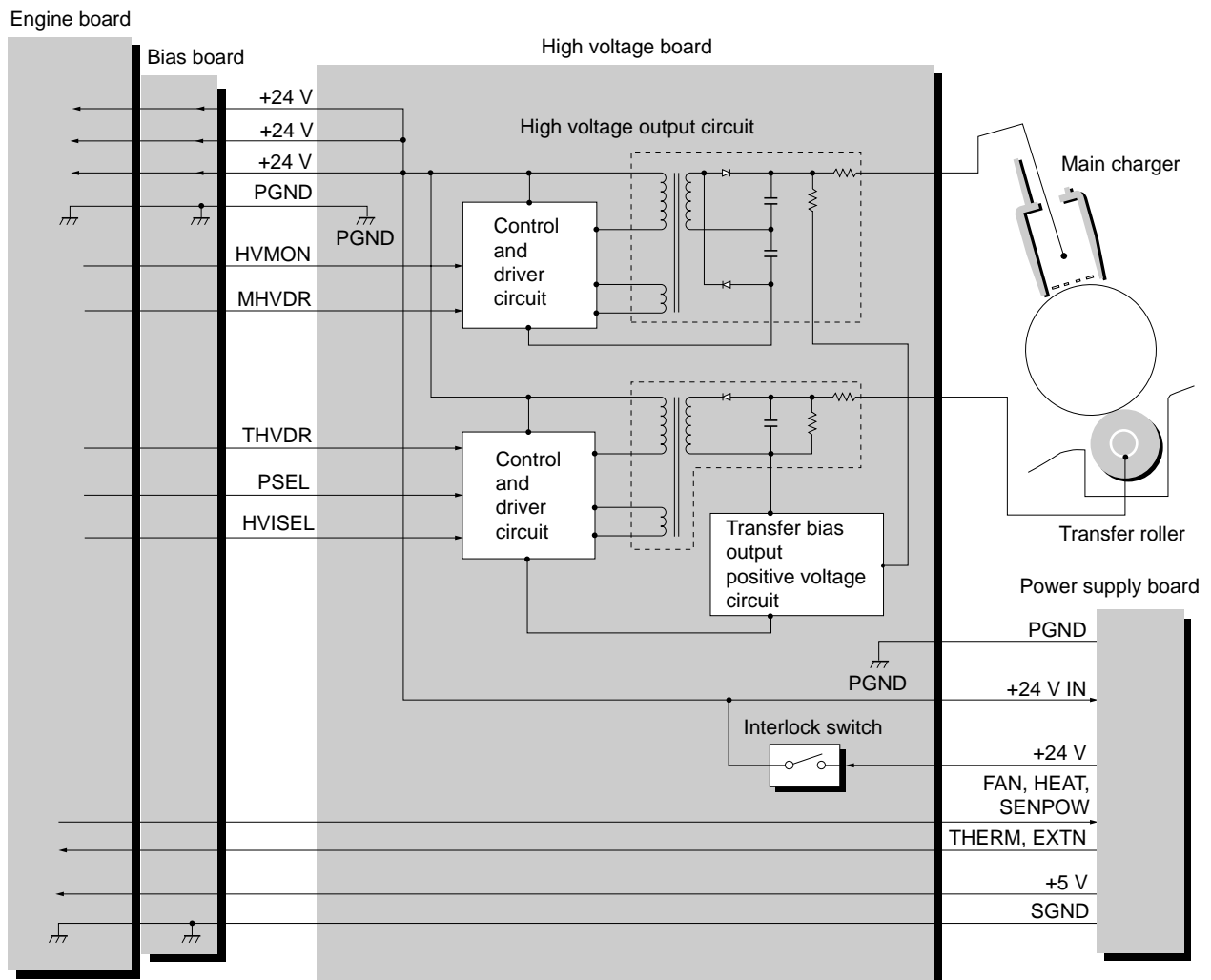


Figure 4-3-9 High voltage board circuit block diagram

Interlock switch

The interlock switch is located on the high voltage board and opened and closed in conjunction with the front cover or the top cover via the interlock lever. This switch connects and disconnects the +24 V DC power supply line. If the front cover or the top cover is open, the interlock switch is open, and the +24 V DC to the high voltage output circuit, bias board, engine board, and the power supply board is disconnected, deactivating the high voltage output, laser output, main motor output for safety.

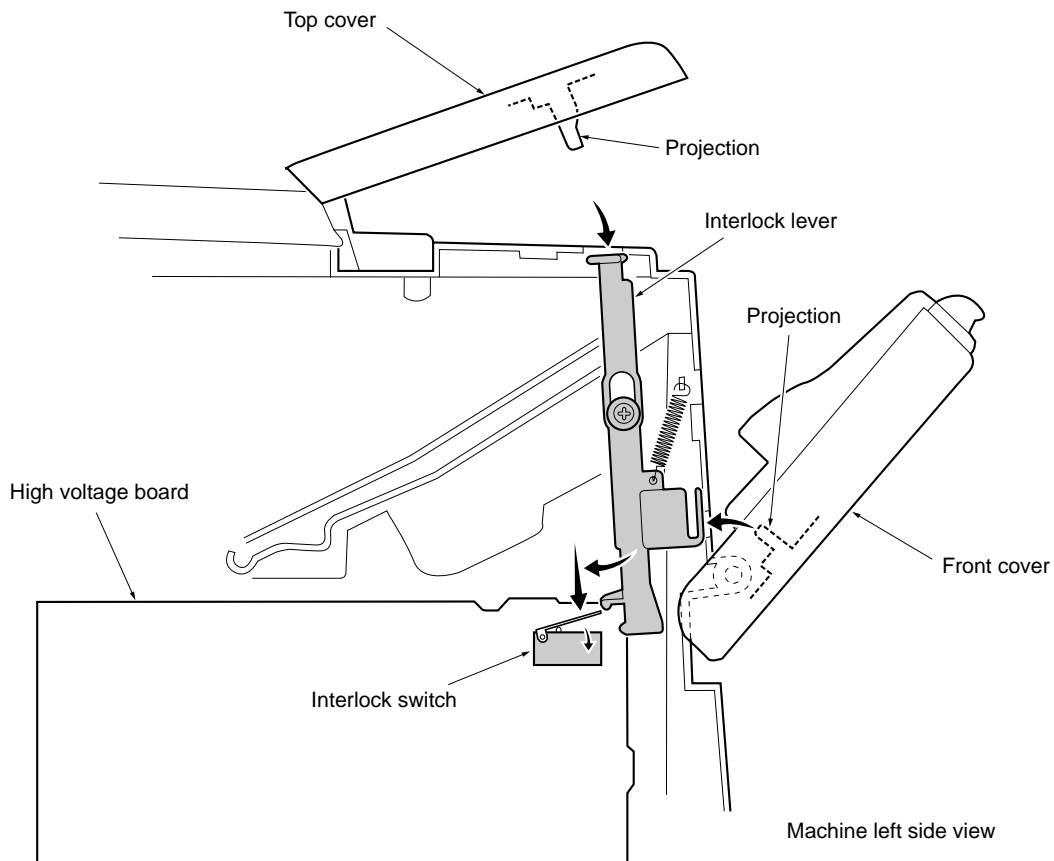


Figure 4-3-10 Interlock switch

Chapter 5 D i s a s s e m b l y

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5-1 General instructions

This chapter provides procedures for removal and replacement of the field replacement components. For other components not explained in this chapter, the diagrams in the *Parts Catalog* attached with this manual will help locate the component.

When replacing of a component, reverse the procedure for the removal procedure explained in this chapter.

WARNING To avoid injury to human bodies, make sure that AC power is removed and the power cord is unplugged from both the power line and the printer.

5-1-1 Screw/hardware

Screws and hardware used in the printer are listed in the *Ecosys Screw catalog*. These screw symbol numbers are universal to most Ecosys printers.

CAUTION When securing a self-tapping screws, align it with the thread carefully. First turn it counterclockwise, then slowly clockwise. Do not overtighten. In case the self-tapped thread is damaged, the affected part must be replaced with a new part.

5-1-2 Before starting disassembly

Before proceeding, unplug the power cord from the printer and the power supply.

WARNING Never attempt to operate the printer with a component removed.

CAUTION The printer use electrostatic sensitive parts inside (on circuit boards, Laser scanner unit, etc.). Provide an antistatic (discharging) device, such as a wrist strap, that can effectively discharge your body before touching the circuit boards, the laser scanner unit, etc.

5-2 Disassembly

Before proceeding, remove the paper cassette and the optional paper feeder PF-17, if installed.

5-2-1 Removing the process unit

1. Open the top cover ①.
2. Open the front cover ②.
3. Lift the process unit ③ together with the toner container out of the printer.

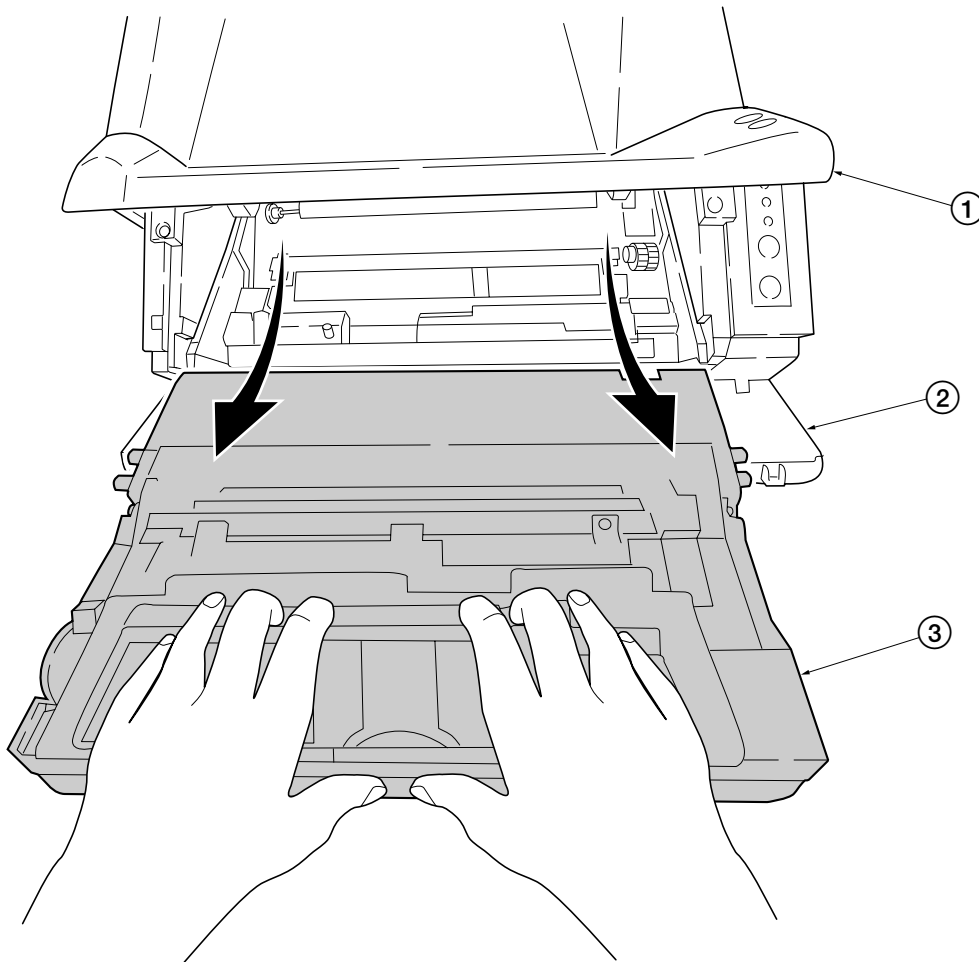


Figure 5-2-1 Removing the process unit

CAUTIONS After removing the process unit, seal it in the protective bag and place it on flat surface. Do not place the process unit in a dusty area.

Do not give impact to the process unit.

Do not place floppy disks near the process unit.

5-2-2 Removing the principal outer covers

(1) Removing the top cover/face-down output tray

1. Open the top cover ①.
2. Remove two screws ②.
3. Remove the top cover/face-down output tray ③.

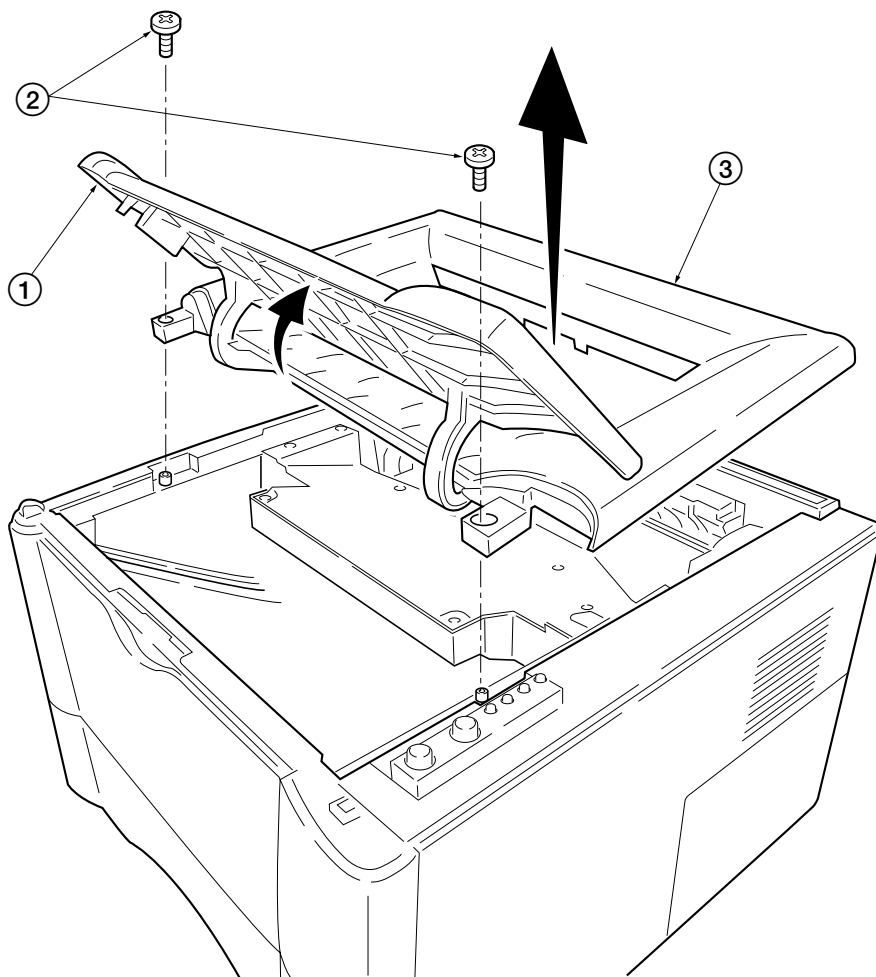


Figure 5-2-2 Removing the top cover/face-down output tray

(2) Removing the right cover

1. Remove one screw (1).
2. Remove the side cover (2) (See page 2-10).
2. Unlatch the five snaps (3) and one hook hole (4) on the chassis, remove the right cover (5).

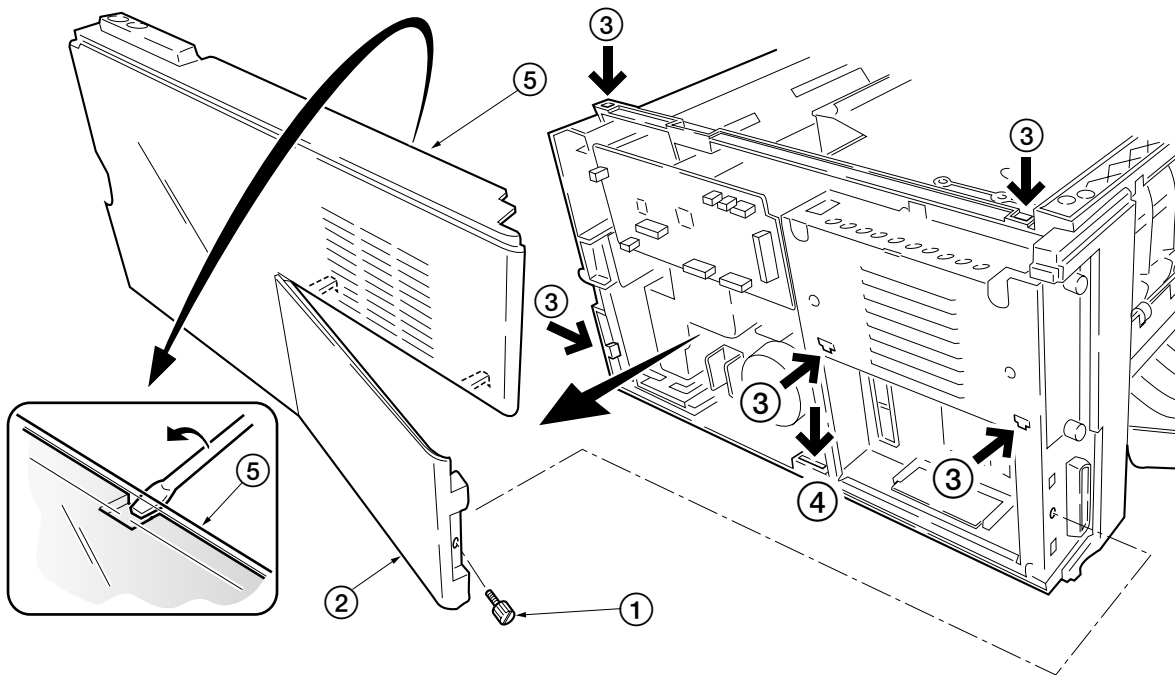


Figure 5-2-3 Removing the right cover

(3) Removing the left cover

1. Unlatch the six snaps (1) and two hook holes (2) on the chassis, remove the left cover (3).

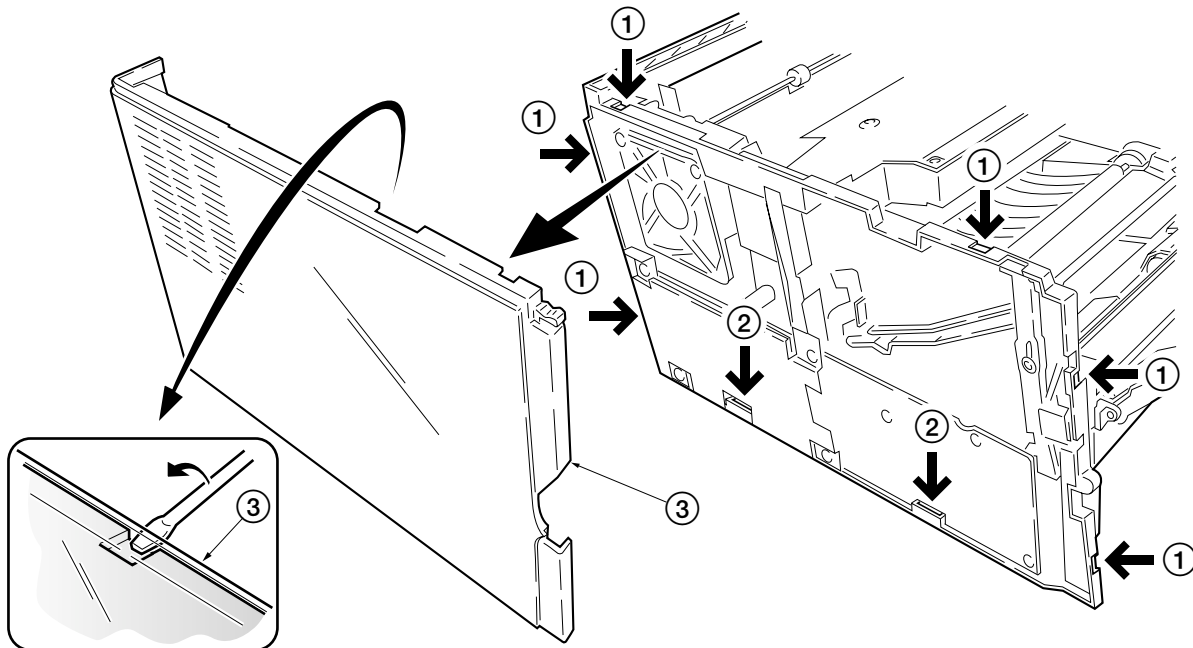


Figure 5-2-4 Removing the left cover

5-2-3 Removing the feed roller

CAUTION When refit the feed roller, fit the D-cut shaft into the D-shape hole of the feed roller.

1. Remove the paper cassette and the process unit. (See page 5-4)
2. Stand the machine the front side up.
3. Move the feed roller in the direction (A), and remove the feed roller (1).

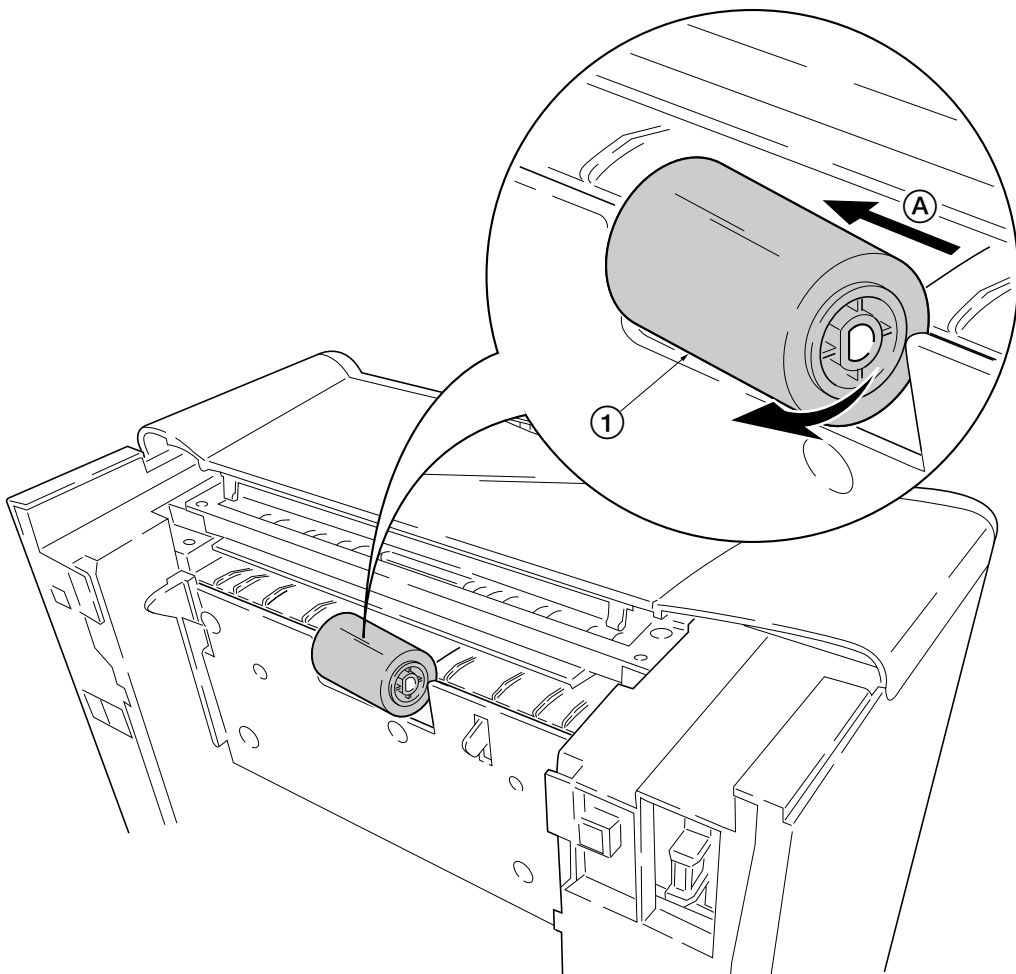


Figure 5-2-5 Removing the feed roller

5-2-4 Removing the MP tray feed roller

1. Remove the engine board. (See page 5-11)
2. Remove one screw ①.
3. Remove the grounding plate ②.
4. Remove one stop ring ③.
5. Remove the MP feed clutch ④.

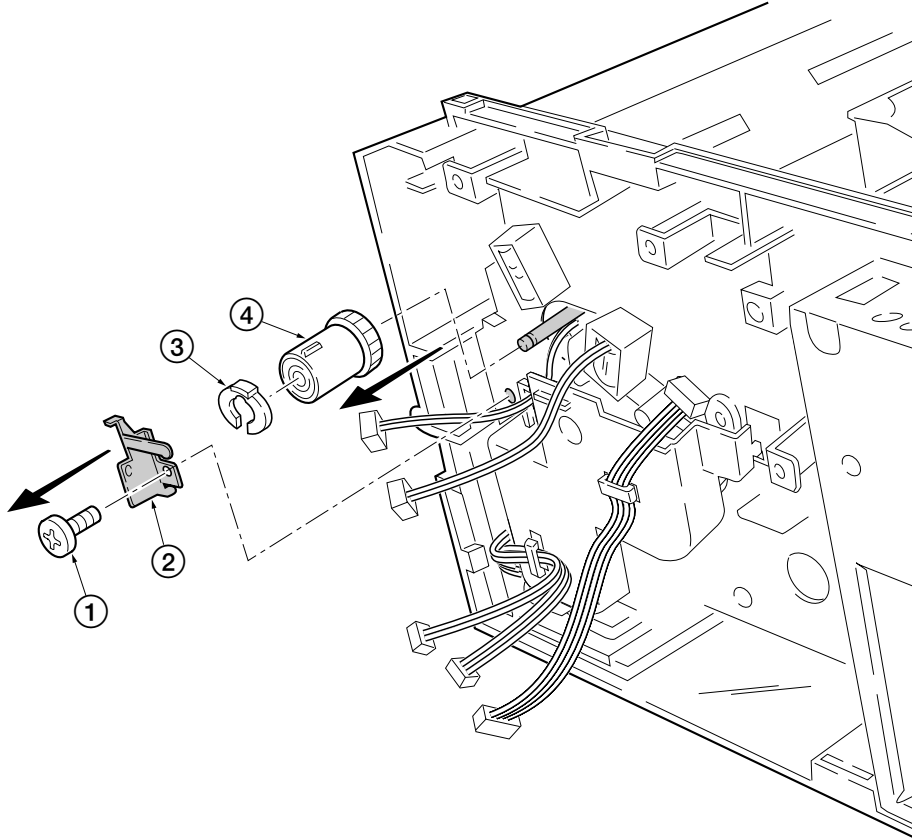


Figure 5-2-6 Removing the MP feed clutch

6. Remove one screw ⑤.
7. Remove the toner sensor ⑥ and spring ⑦.
8. Remove two screws ⑧.
9. While pressing the latch ⑨ by using the driver and then remove the MP feed unit ⑩.

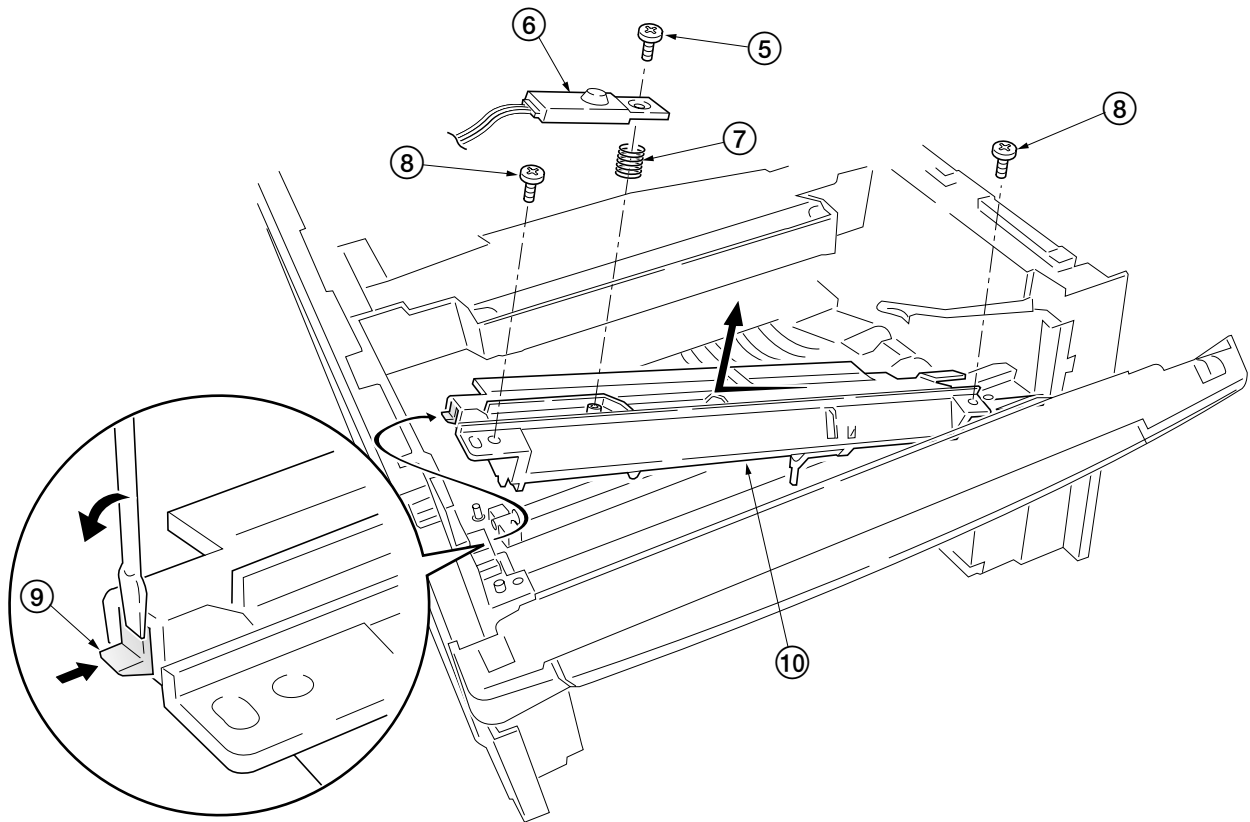


Figure 5-2-7 Removing the MP feed unit

10. Remove the stop ring ⑪ and then remove the MP feed roller ⑫.

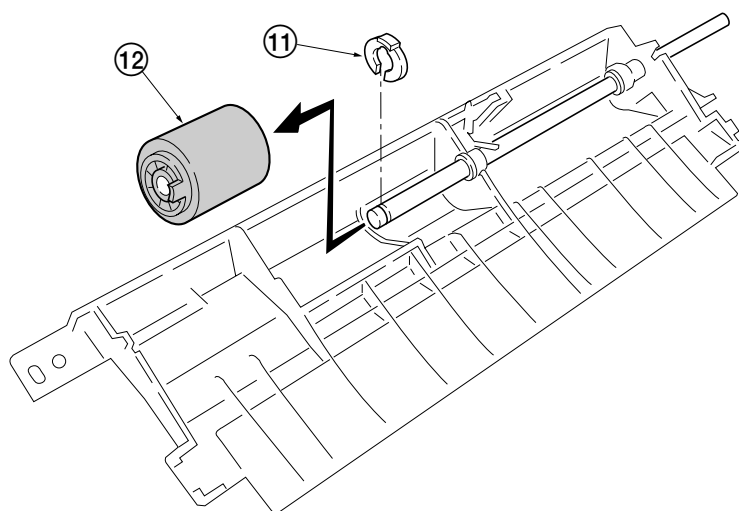


Figure 5-2-8 Removing the MP feed roller

5-2-5 Removing the transfer roller

CAUTION

Do not touch the transfer roller (sponge) surface. Oil and dust (particles of paper, etc.) on the transfer roller can significantly deteriorate the print quality (white spots, etc.).

When refitting the bushes and springs, make sure to refit the black colored bush and spring on the left side. Also, observe the correct direction to which the bush is fit in reference to the paper passing direction.

1. Remove the process unit. (See page 5-4)
2. Remove the transfer roller ① from the both bushes.

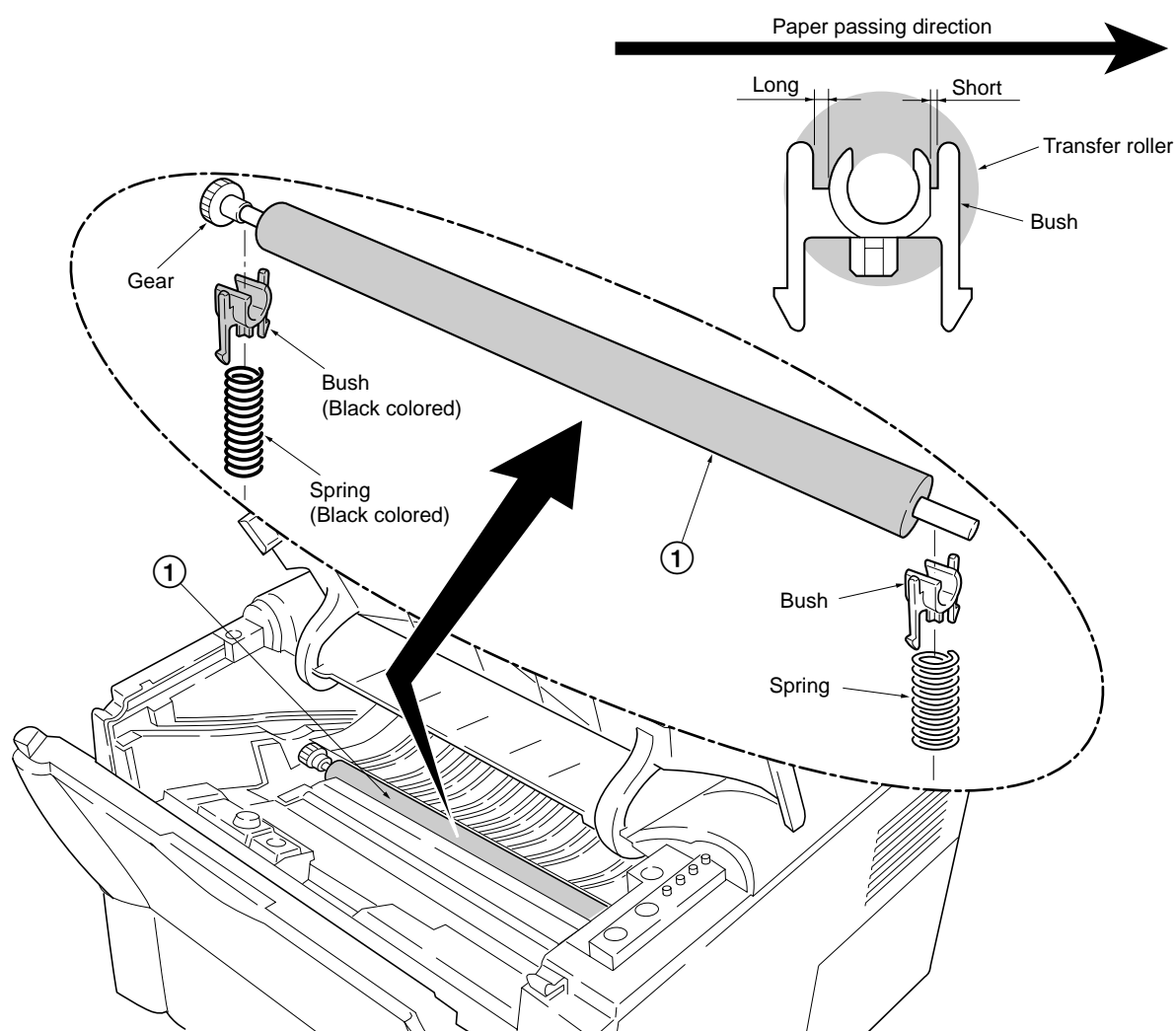


Figure 5-2-7 Removing the transfer roller

5-2-6 Removing the principal circuit boards

(1) Removing the engine board

1. Remove the top cover/face-down output tray and right cover (See pages 5-5 and 5-6).
2. Remove all (ten) connectors from the engine board ①.
3. Remove three screws ②.
4. Remove the engine board ①.

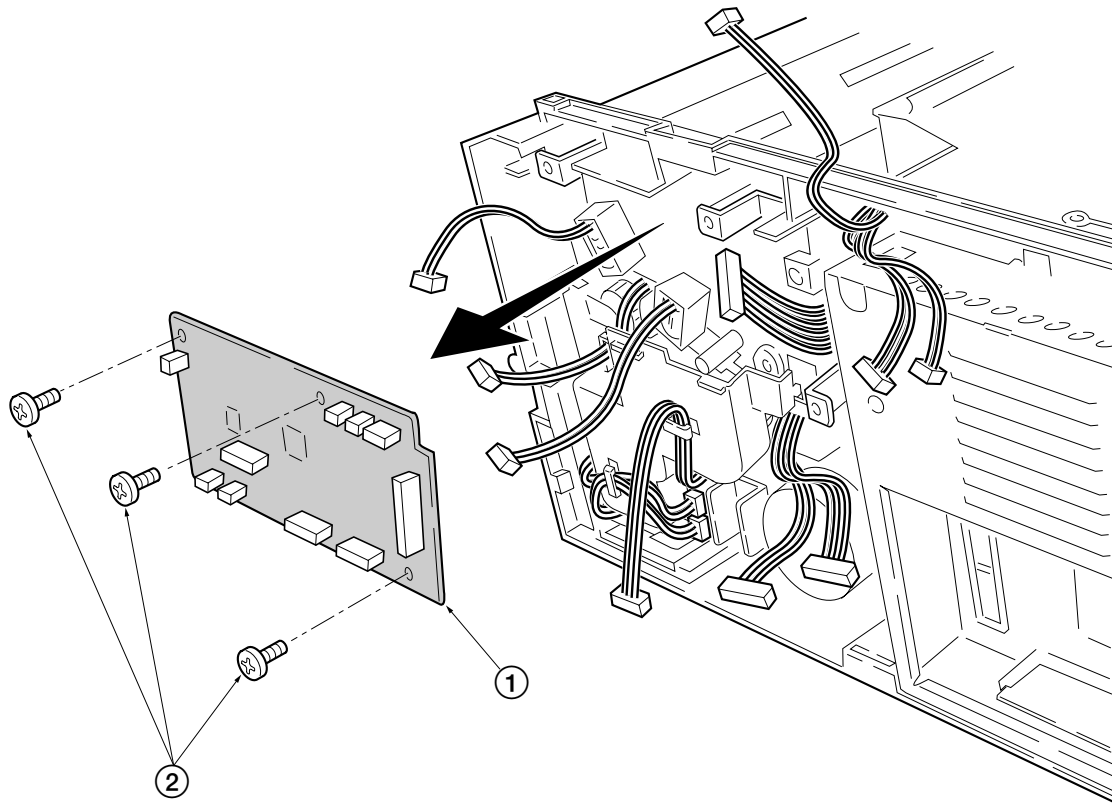


Figure 5-2-8 Removing the engine board

(2) Removing the main board

1. Remove the process unit (See page 5-4).
2. Remove the top/face-down output tray and right cover (See pages 5-4 and 5-5).
3. Remove two connectors ① from main board ②.
4. Remove six screws ③.
5. Remove the controller box (with main board) ④.

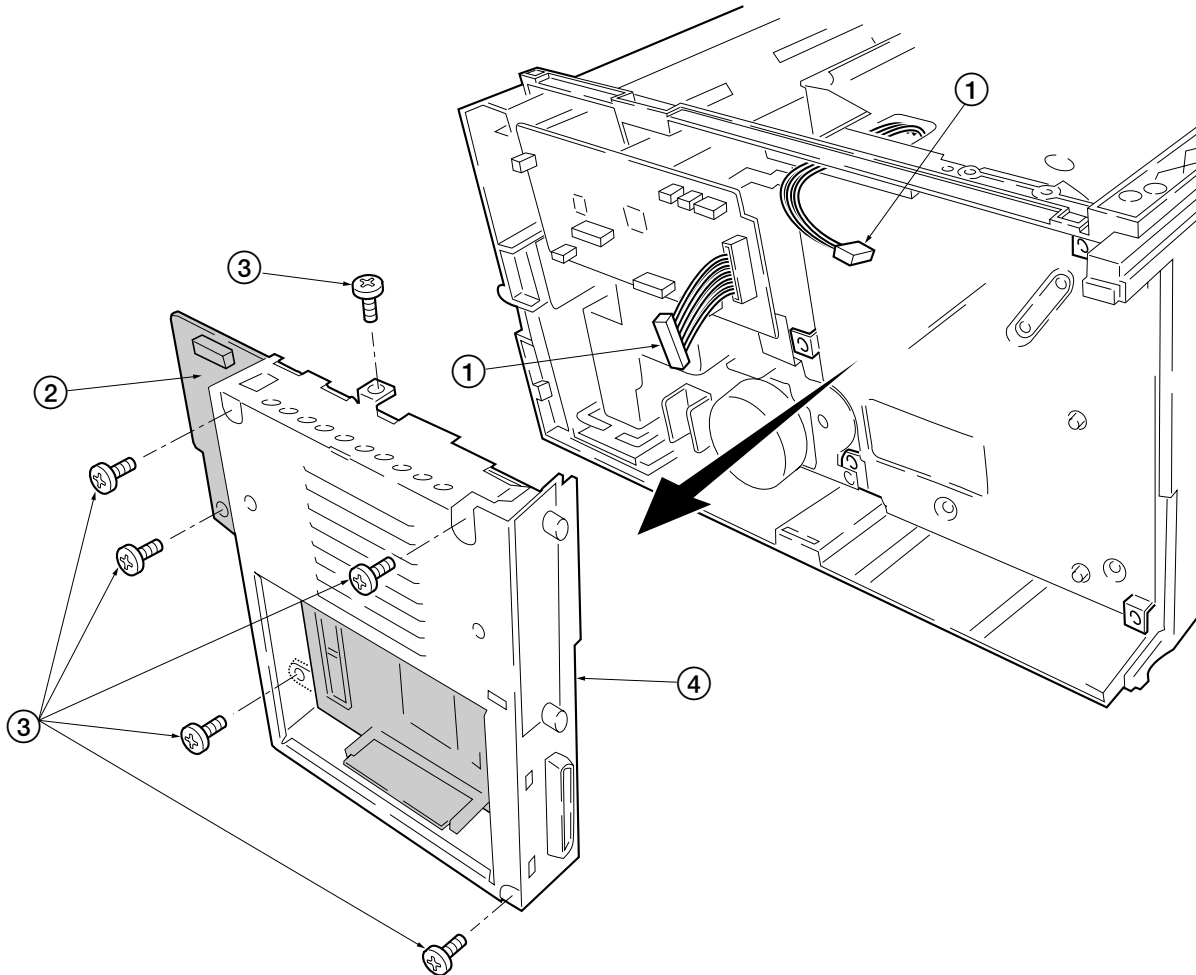


Figure 5-2-9 Removing the controller box (with main board)

6. Remove two screws ⑤ at the back of the main board ②.
7. Remove two screws ⑥ from the parallel interface connector ⑦.
8. Remove the main board ②.

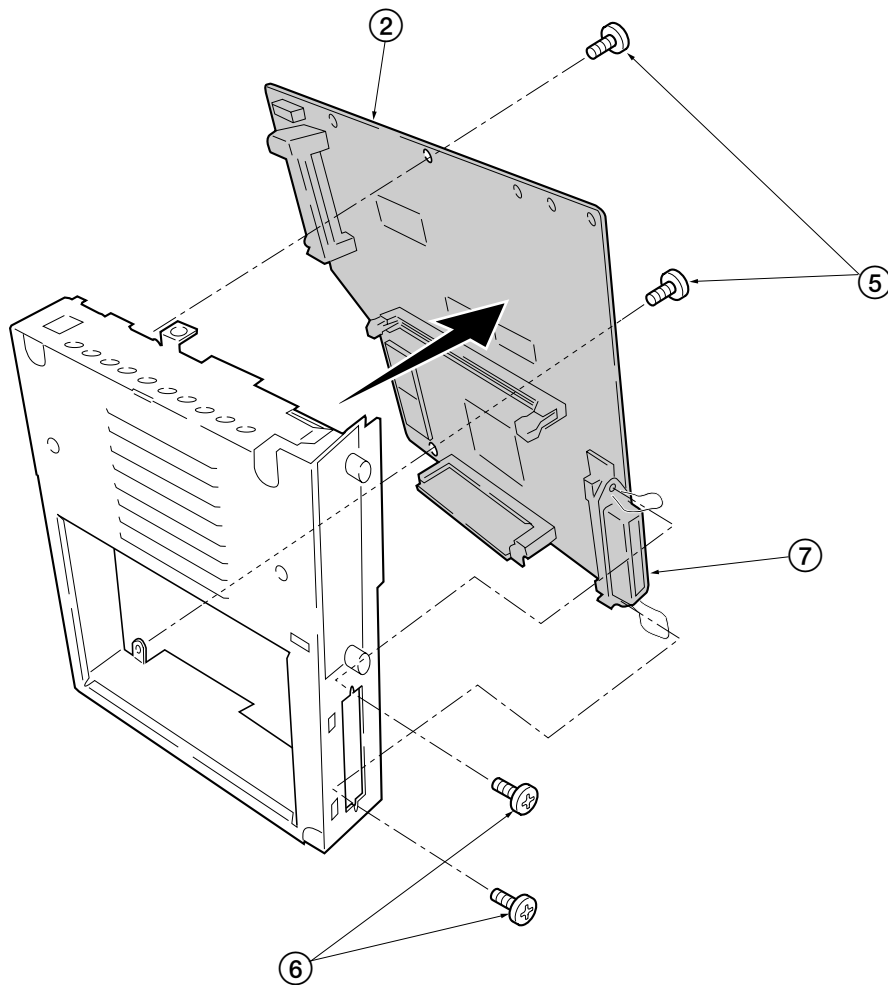


Figure 5-2-10 Removing the main board

(3) Removing the power supply board and high voltage board

1. Remove the process unit (See page 5-4).
2. Remove the top cover/face-down output tray and left cover (See pages 5-5 and 5-6).
3. Remove three connectors ① from the power supply board ②.
4. Remove eight screws ③.
5. Remove the power supply board ② and high voltage board ④. (Note: The high voltage board ① is directly connected to the bias board ⑤.)
6. Separate the high voltage board ④ from the power supply board ②.

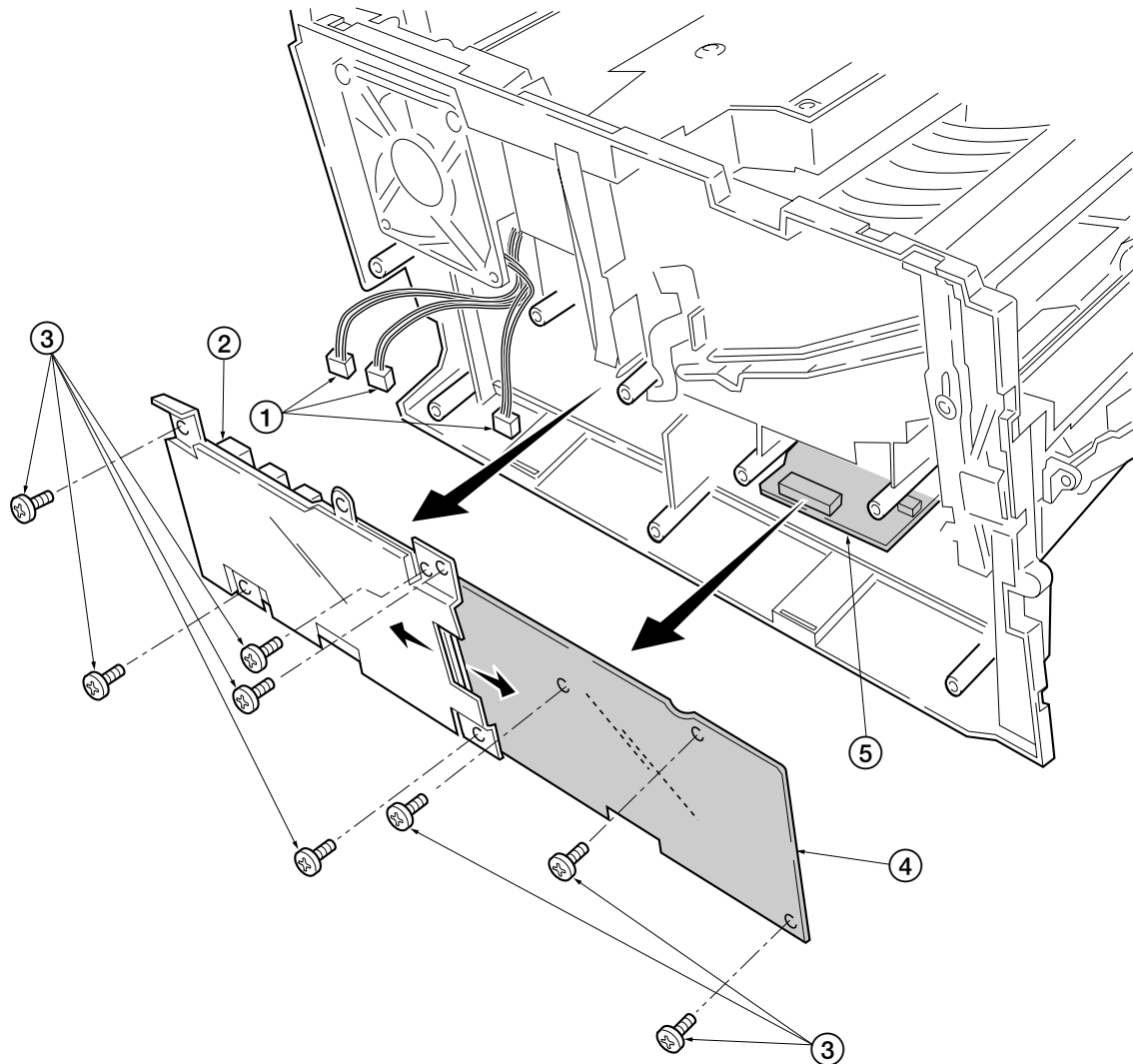


Figure 5-2-11 Removing the power supply board and high voltage board

(4) Removing the bias board

1. Remove the cassette and process unit (See page 5-4).
2. Remove the top cover/face-down output tray and left cover (See pages 5-5 and 5-6).
3. Remove the power supply board and high voltage board (See the previous page).
4. Stand the machine with the front side up.
5. Remove one connector ① from the bias board ②.
6. Remove five screws ③.
7. Remove the bottom cover ④.
8. Remove the two connectors ⑤ from the bias board ②.
9. Remove the bias board ②.

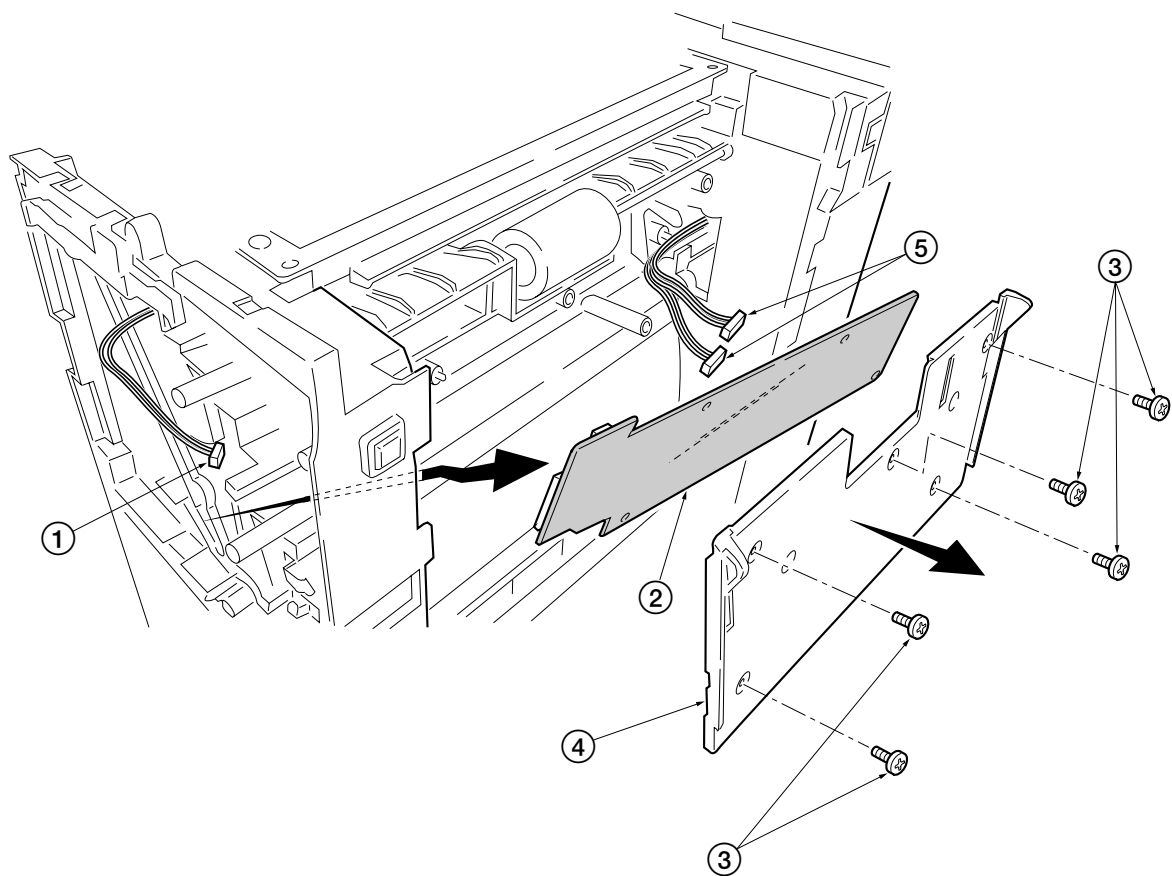


Figure 5-2-12 Removing the bias board

5-2-7 Removing the main motor and drive unit

1. Remove the cassette and process unit (See page 5-4).
2. Remove the top cover/face-down output tray and right cover (See pages 5-5 and 5-6).
3. Remove three connectors ① from the main motor ②.
4. Remove four screws ③.
5. Remove main motor ②.

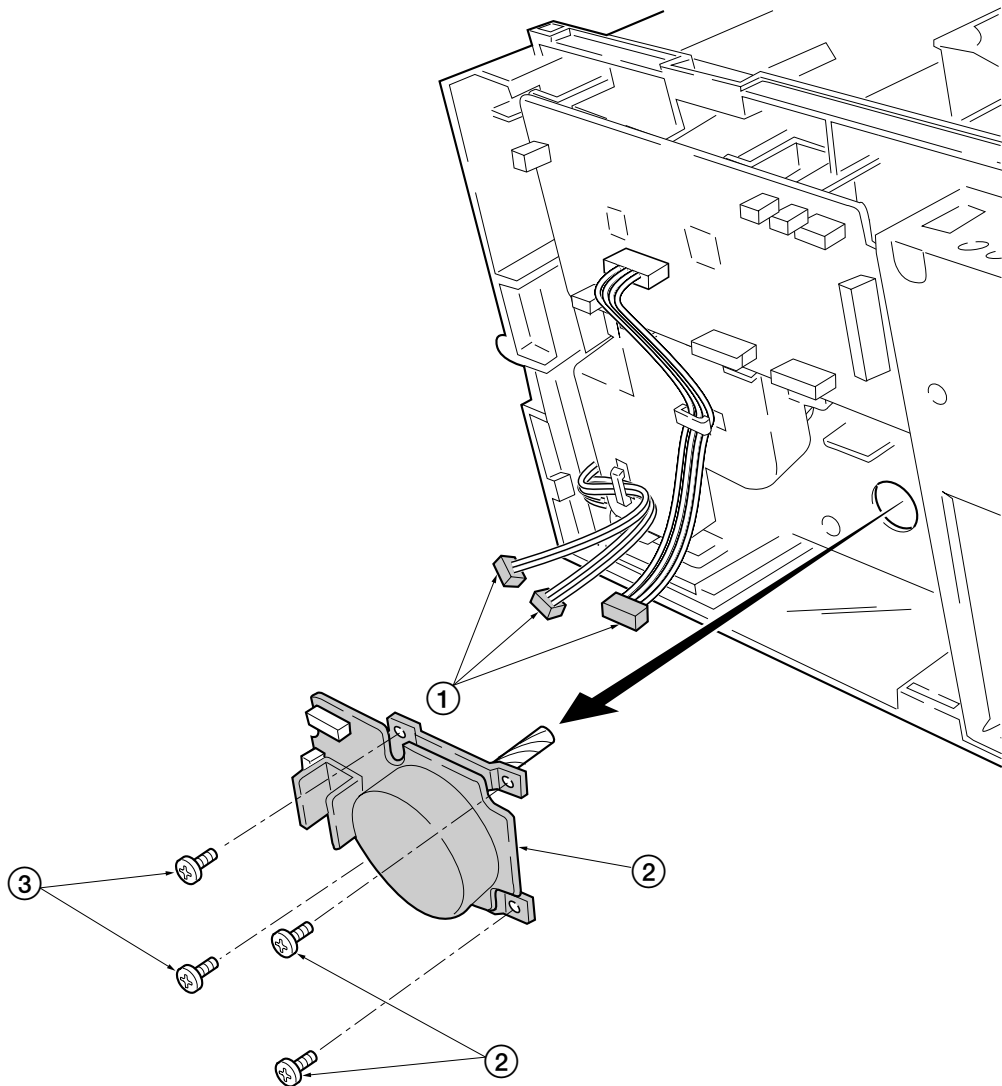
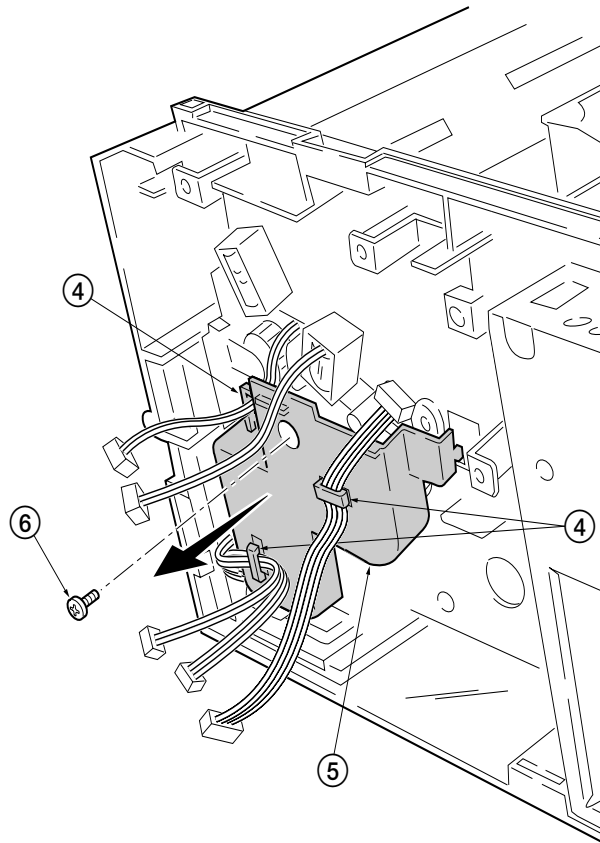


Figure 5-2-13 Removing the main motor

6. Remove the engine board (See page 5-11).
7. Remove wires from wire saddles (4) on the cord cover (5).
8. Remove one screw (6).
9. Remove the cord cover (5).



5-2-14 Removing the cord cover

10. Remove one screw ⑥.
11. Remove the grounding plate ⑦.
12. Remove three stop rings ⑧.
13. Remove MP feed clutch ⑨, feed clutch ⑩, and registration clutch ⑪.

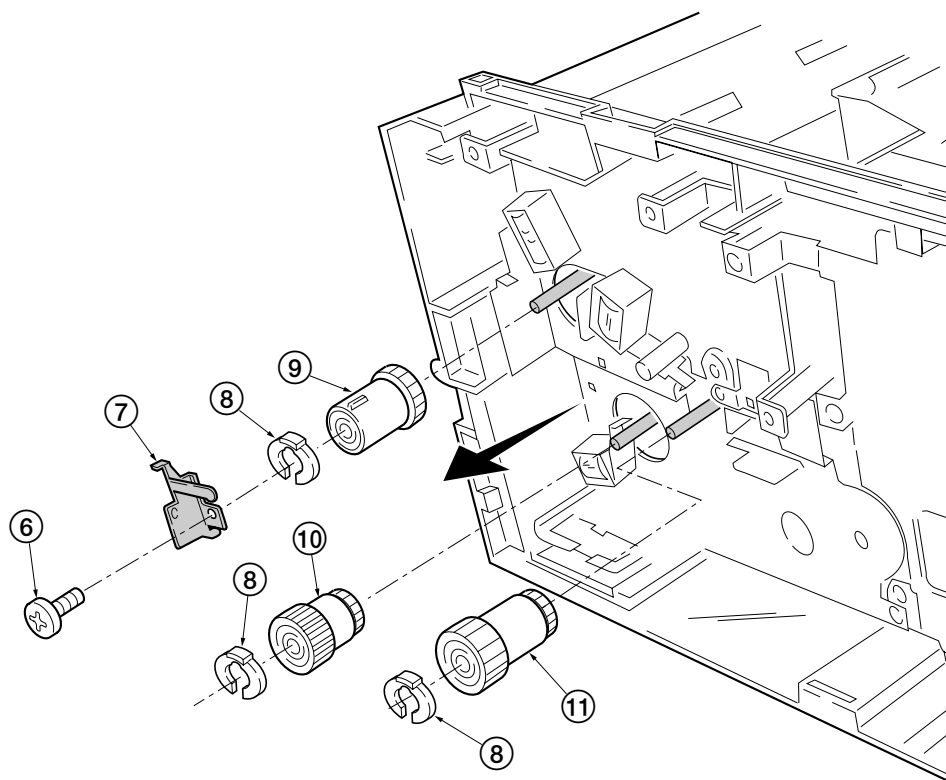


Figure 5-2-15 Removing the clutches

14. Remove the four screws ⑫.

15. Remove the drive unit ⑬.

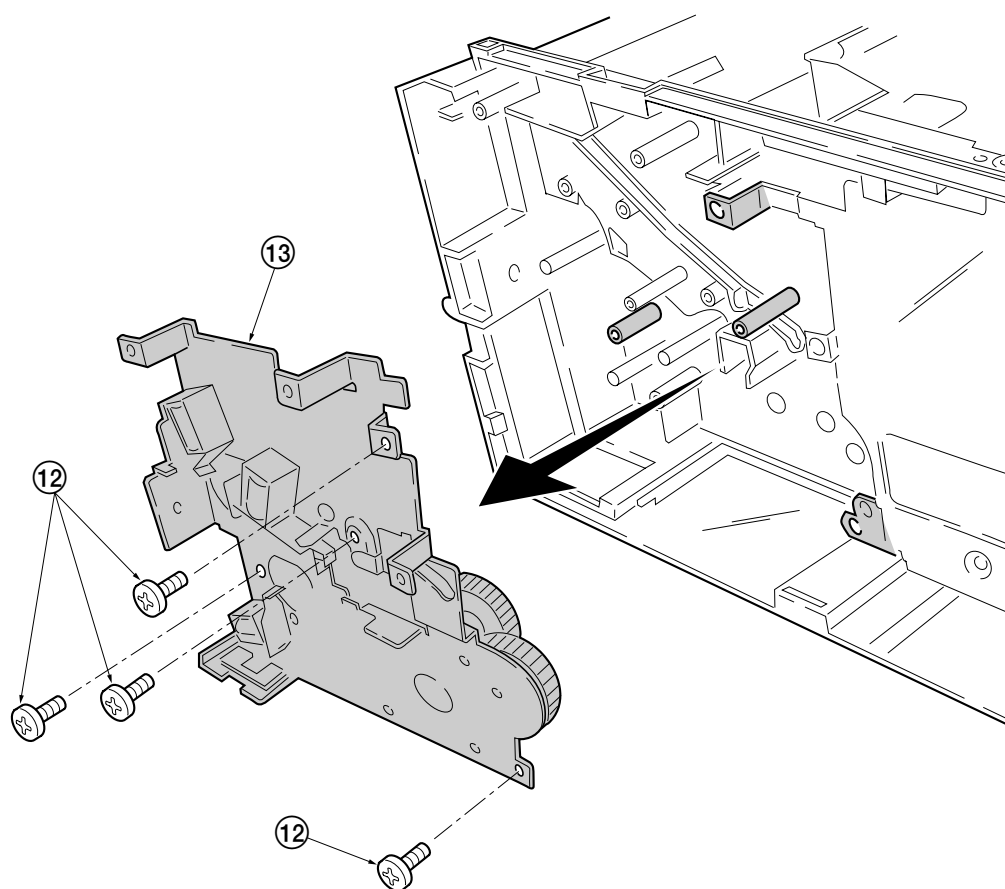


Figure 5-2-16 Removing the drive unit

5-2-8 Removing and splitting the fuser unit

WARNING The fuser unit is hot after the printer was running. Wait until it cools down.

CAUTION When refitting the fuser unit, make sure the fuser unit gear and the printer's drive gear are properly meshed with each other. For this, rotate the main motor several turns before fixing screws.

1. Remove the process unit. (See page 5-4)
2. Remove the top cover/face-down output tray, right and left covers. (See page 5-5, 5-6)
3. Remove the rear side cover ①.
4. Remove the two connectors ②.
5. Remove two screws ③.
6. Remove the fuser unit ④.

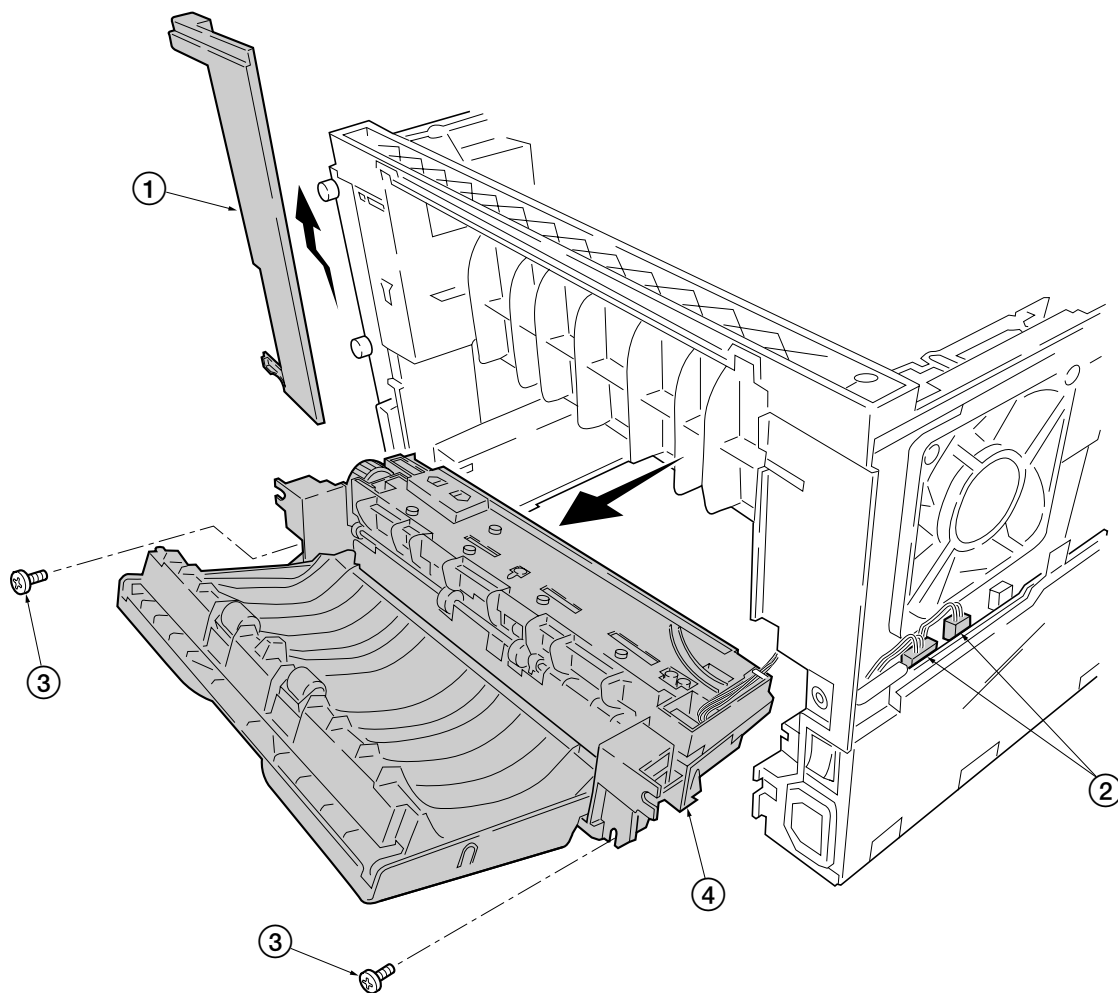


Figure 5-2-17 Removing the fuser unit

7. Remove two screws (5).
8. Open and split the fuser unit (4).

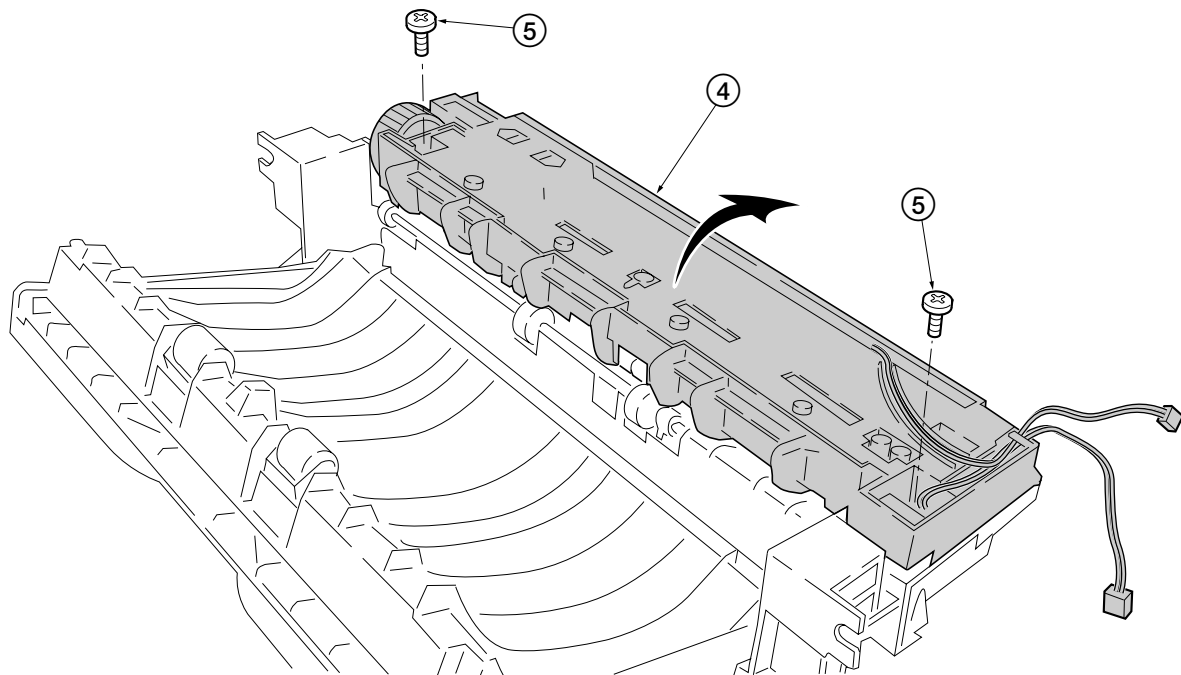


Figure 5-2-18 Splitting the fuser unit

(1) Removing the separators

WARNING The separation claws are extremely hot immediately after the printer was running. Allow substantial period of time until it cools down.

1. Remove and split the fuser unit (See page 5-20).
2. Loosen the stopper screws ①.
3. Hold the separators ② upright, and remove the separators ② and separator springs ③.

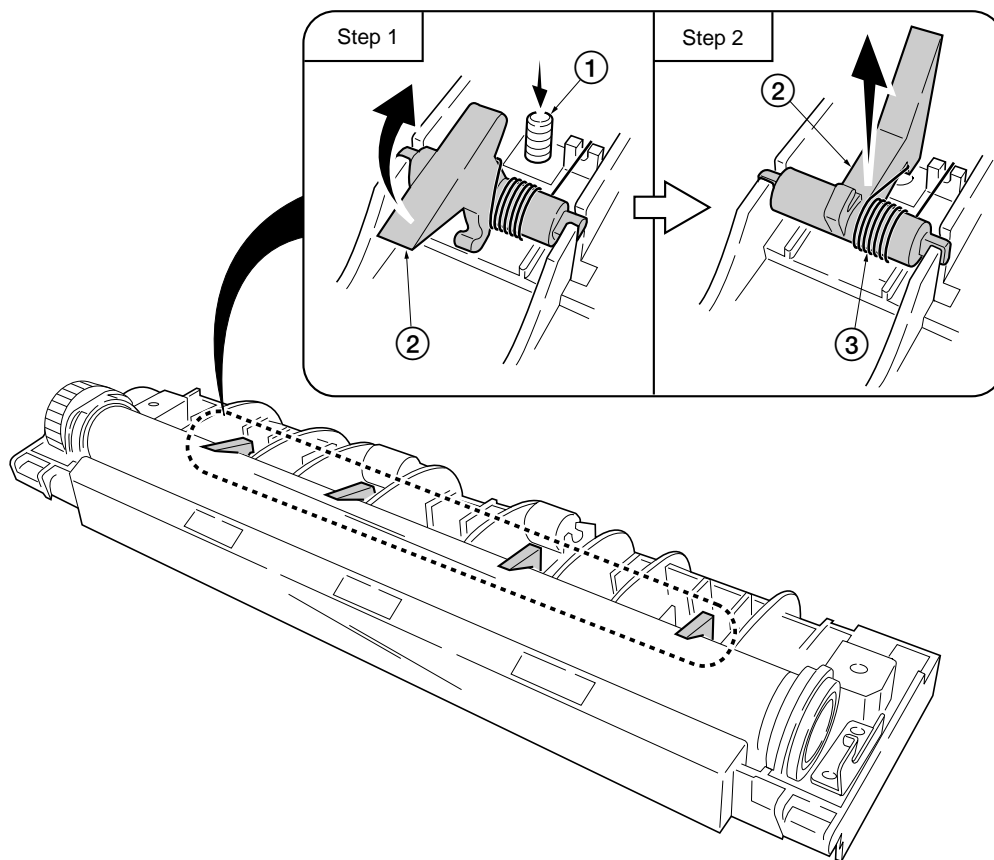


Figure 5-2-19 Removing the separators

(2) Removing the heater lamp

WARNING The heater lamp is extremely hot immediately after the printer was running. Allow substantial period of time until it cools down. Also, the heater lamp is fragile: Handle it with great care.

CAUTION The heater lamps are fragile. Use extreme care when handling not to drop or break.

Do not directly touch on the heater lamp. Finger prints on the heater lamp's outer surface can prevent proper fusing of toner on paper. When holding the heater lamp, hold the ceramic parts of heater lamp at both ends.

When refitting the heater lamp, direct the short distance side from the projection in the middle of the lamp facing the machine's left side.

1. Remove and split the fuser unit (See page 5-20).
2. Remove all (four) separators (See previous page).
3. Remove one screw ①, release the tension of lamp A holder ②.
4. Remove the heater lamp ③ from the lamp B holder ④.
5. Remove the heater lamp ③ from the heat roller ⑤.

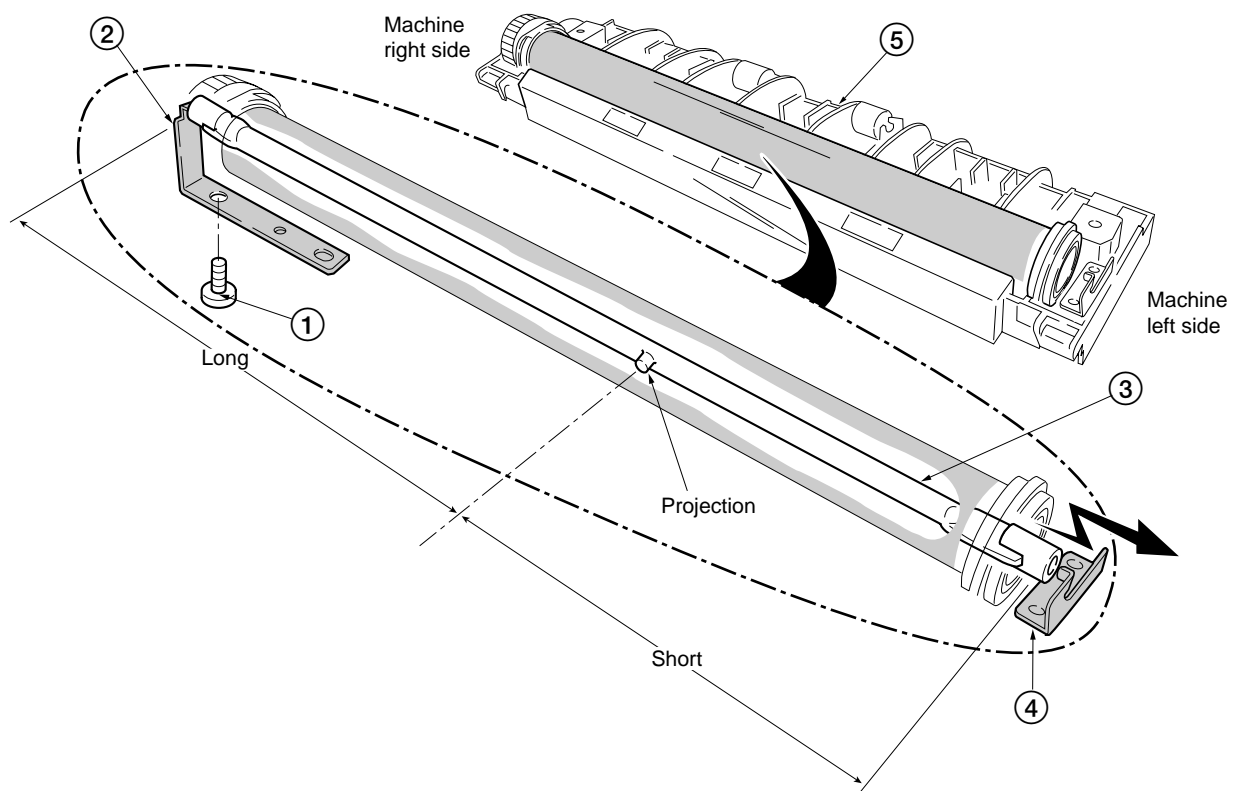


Figure 5-2-20 Removing the heater lamp

(3) Removing the heat roller

WARNING The heat roller is extremely hot immediately after the printer was running. Allow substantial period of time until it cools down.

1. Remove and split the fuser unit (See page 5-20).
2. Remove the heater lamp (See previous page).
3. Press the lamp A holder ① away from the heat roller. Pull up both heat R bush ② and heat L bush ③ at the same time.

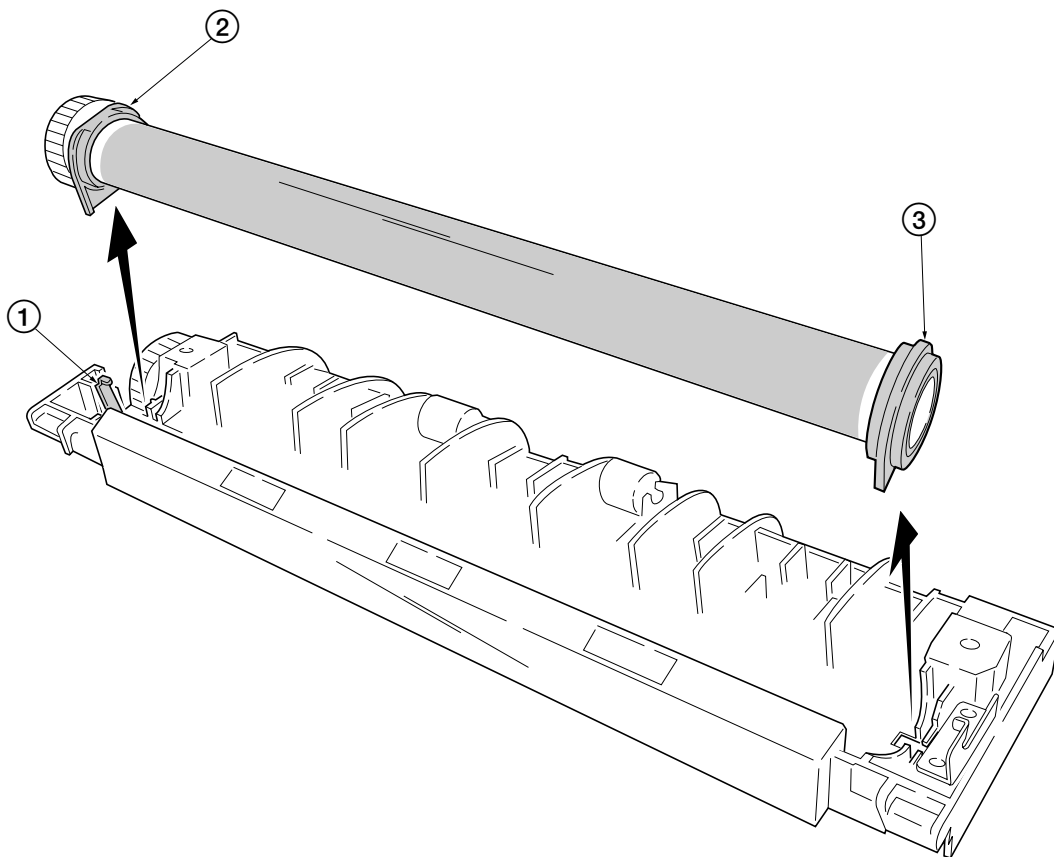


Figure 5-2-21 Removing the heat R bush and heat L bush

3. Remove the heat gear Z33 ④, heat R bush ②, and heat L bush ③ from the heat roller ⑤.

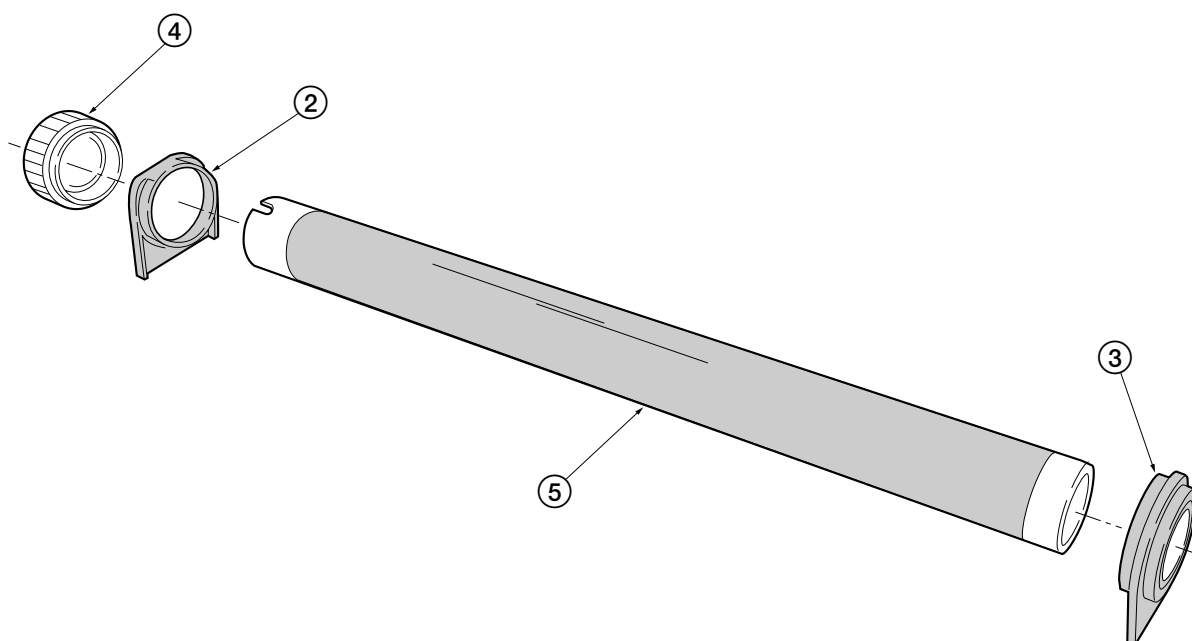


Figure 5-2-22 Removing the heat roller

(4) Removing the thermistor

1. Remove and split the fuser unit (See page 5-20).
2. Remove the heater lamp (See page 5-23).
3. Remove the heat roller (See page 5-24).
4. Remove one screw ①.
5. Remove the thermistor ②.

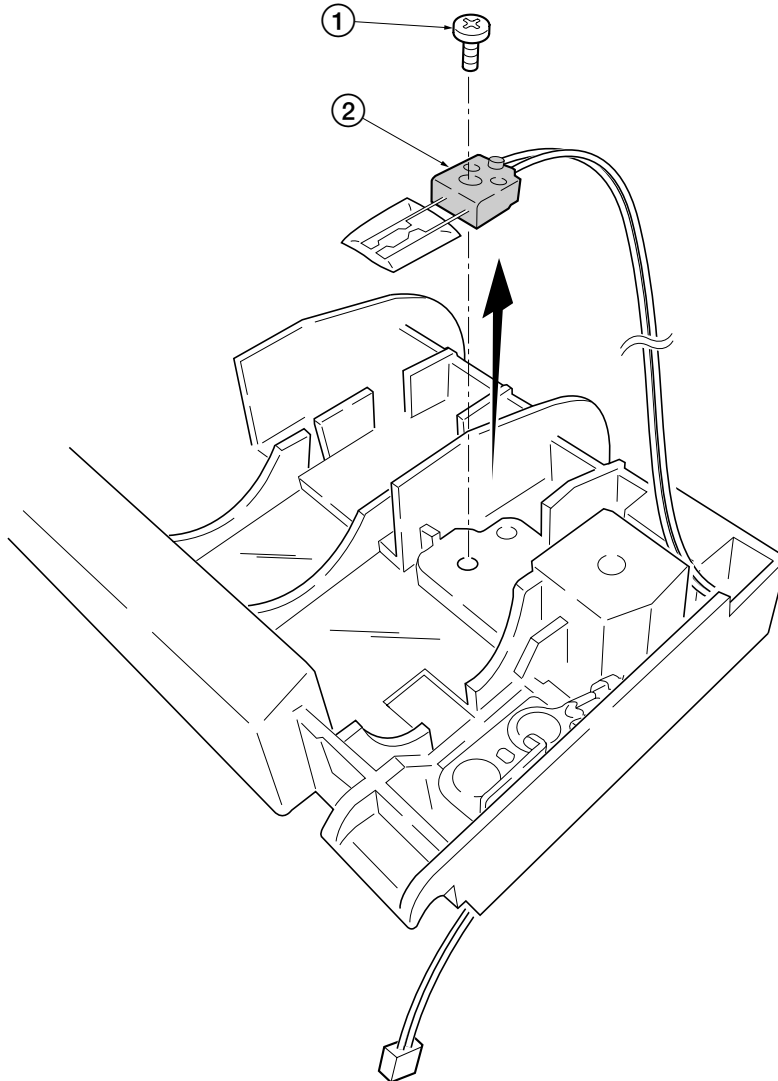


Figure 5-2-23 Removing the thermistor

(5) Removing the thermal cutout

CAUTION Do not bend the terminals of the thermal cutout.

1. Remove and split the fuser unit (See page 5-20).
2. Remove the heater lamp (See page 5-23).
3. Remove the heat roller (See page 5-24).
4. Remove the two screws ①.
5. Turn the thermal cutout ② counterclockwise slightly, then lift the thermal cutout ②.

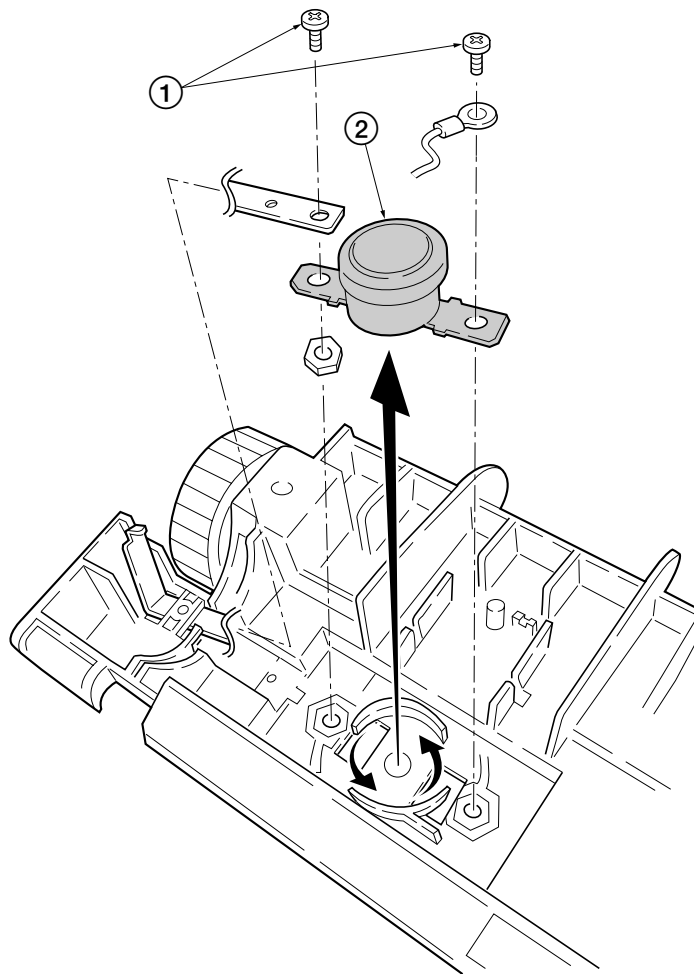


Figure 5-2-24 Removing the thermal cutout

(6) Removing the press roller

WARNING The press roller is extremely hot immediately after the printer was running. Allow substantial period of time until it cools down.

1. Remove and split the fuser unit (See page 5-20).
2. Remove the press roller ① from the fuser unit ②.

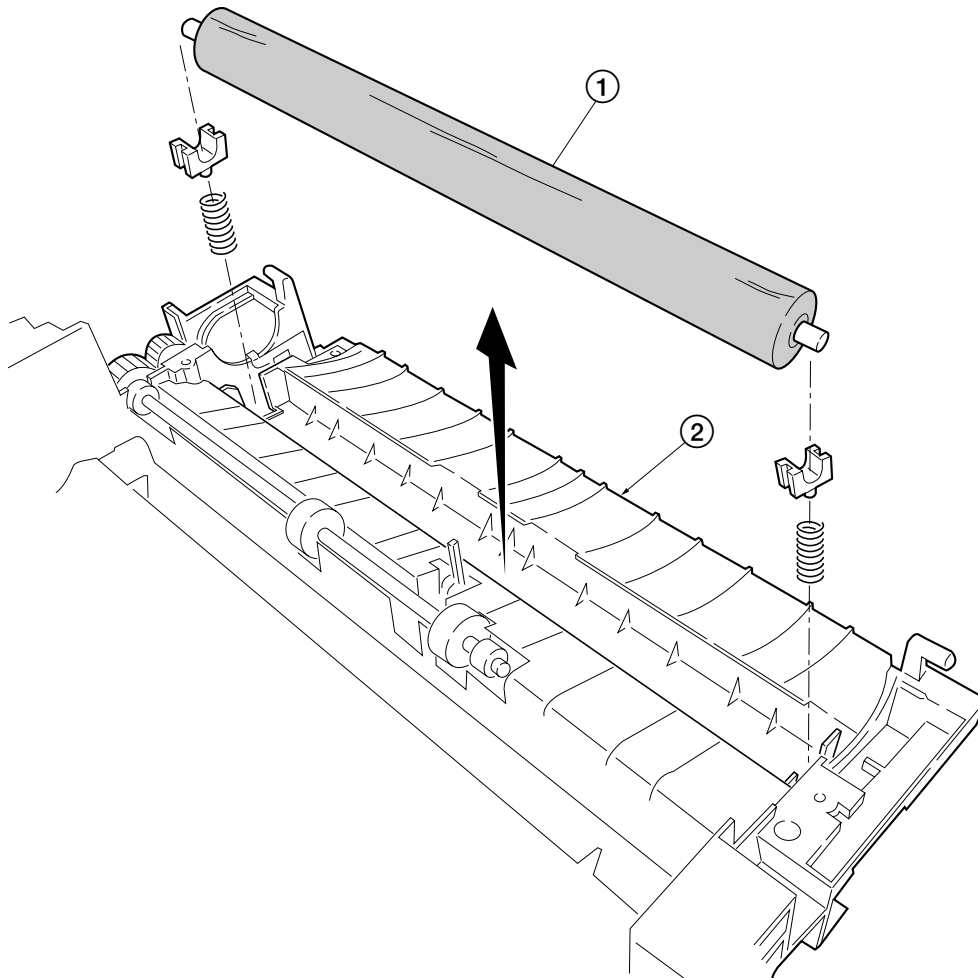


Figure 5-2-25 Removing the press roller

5-2-9 Removing the laser scanner unit and the eraser lamp

1. Remove the process unit (See page 5-4).
2. Remove the top cover/face-down output tray, right cover, and the left cover (See pages 5-5 and 5-6).
3. Remove four connectors ①.
4. Remove five screws ② and four screws ③.
5. While keeping the ground joint plate ④ away from the LSU plate ⑤, remove the LSU plate.

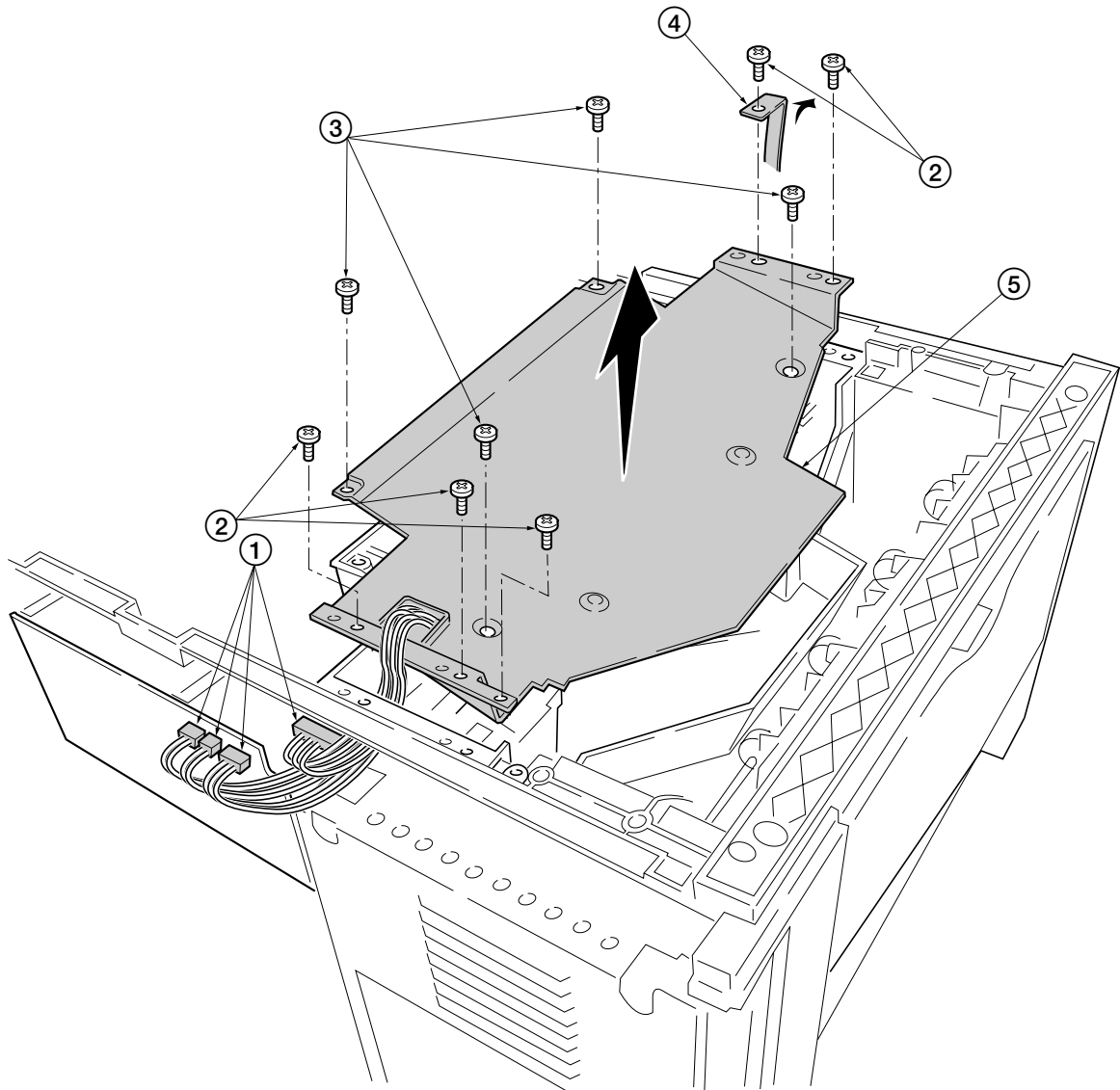


Figure 5-2-26 Removing the LSU plate

5. Remove three screws ⑥.
6. Remove one connector ⑦ from the laser scanner unit ⑧.
7. Remove the laser scanner unit ⑧.

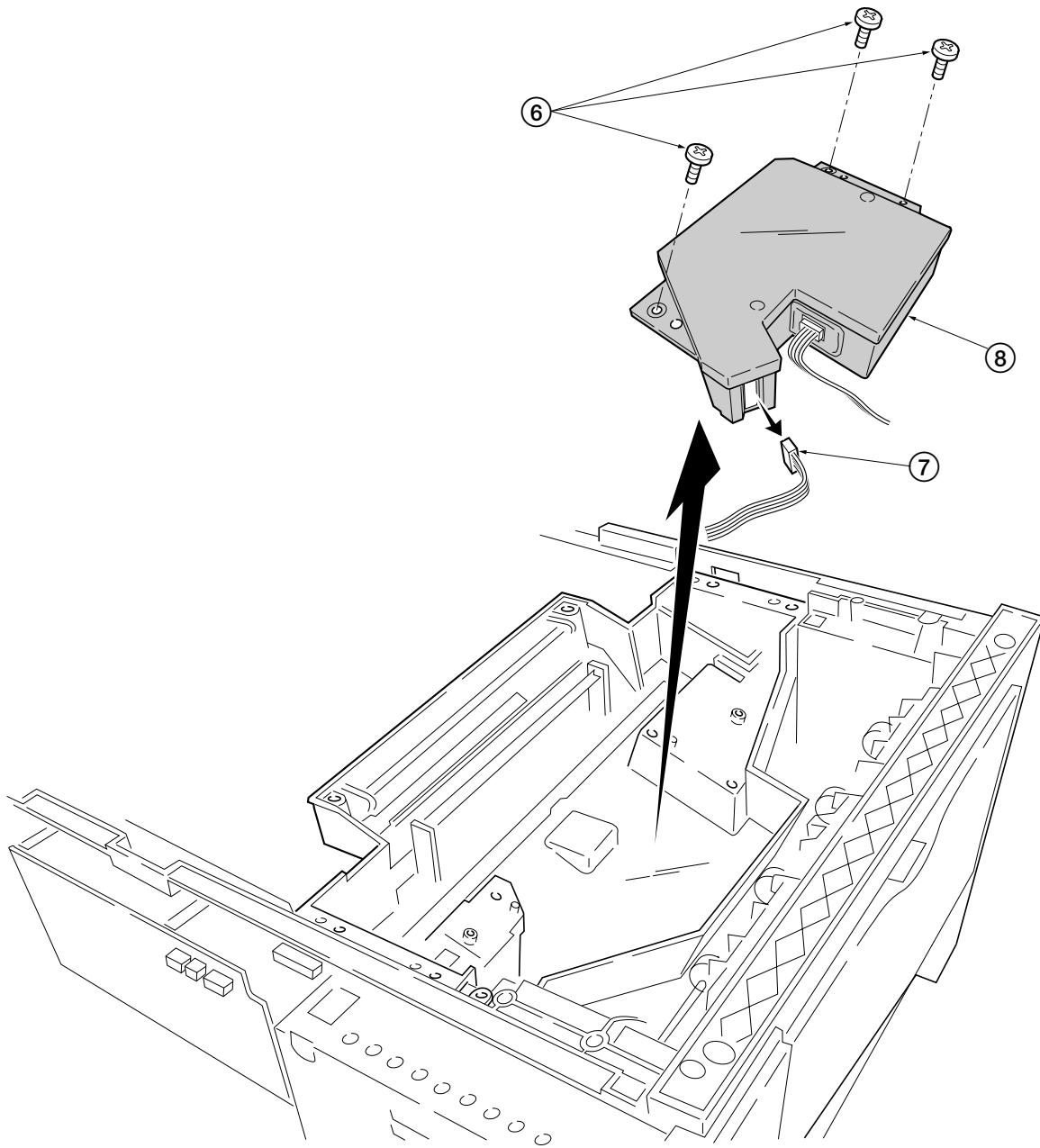
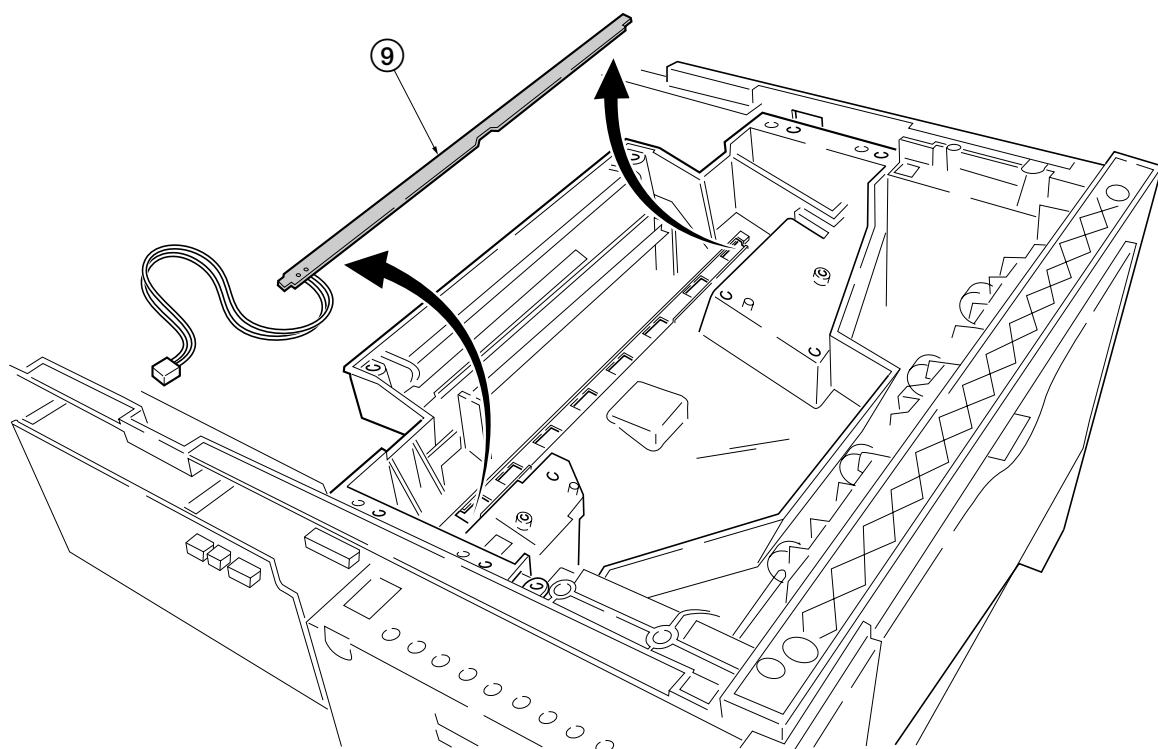


Figure 5-2-27 Removing the laser scanner unit

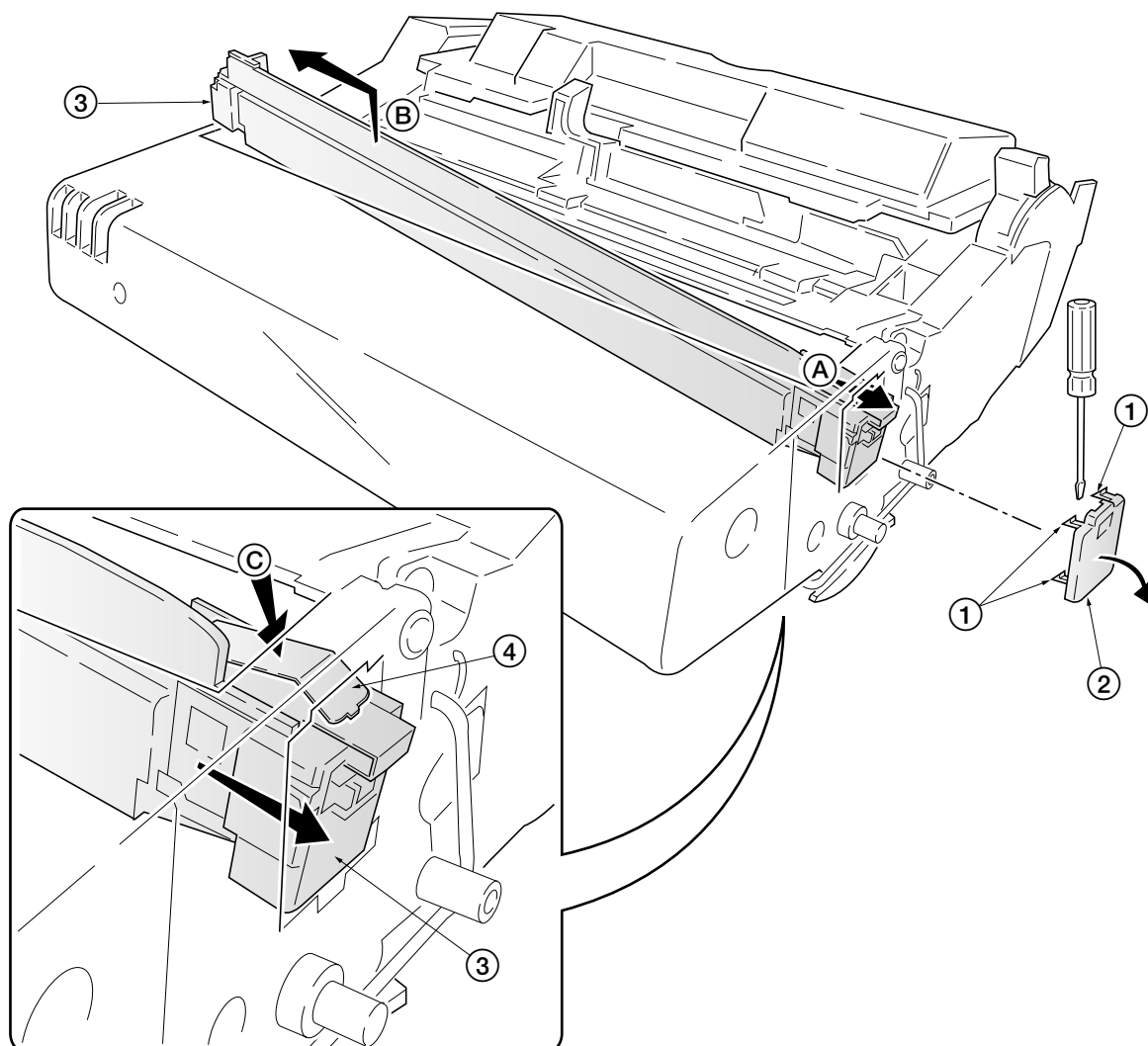
8. Remove the eraser lamp ⑨.



5-2-28 Removing the eraser lamp

5-2-10 Removing the main charger unit

1. Remove the process unit from the printer (See page 5-4).
2. Unlatch the three snaps (1), and remove the main charger cap (2).
3. Draw the main charger unit (3) in the direction of arrow (A), then pull it out in the direction of arrow (B).



5-2-29 Removing the main charger unit

CAUTION When refitting the main charger unit (3), hold terminal (4) down (C), then push frontwards. Use care not to deform the terminal (4).

Chapter 6 **T r o u b l e s h o o t i n g**

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6-1 Troubleshooting

This chapter explains procedures for identifying and correcting problems. Topics covered are:

6-1-1 Error messages

The printer indicates various messages using the LED indicators at its top. The indicators are lit, fast flashing, slow flashing, and off in combination to describe a specific message. The following diagram depicts these indicators and the control keys.

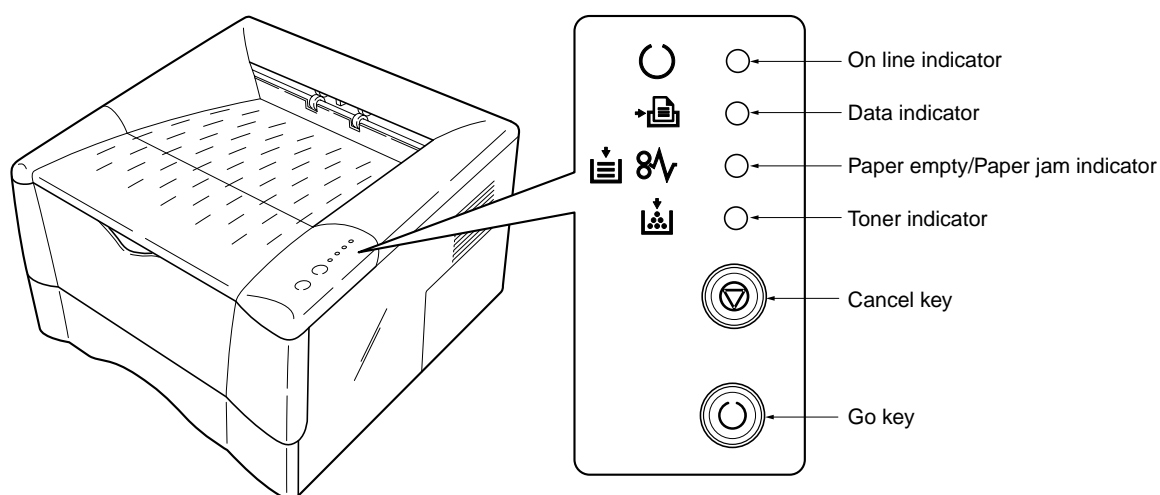









Figure 6-1-1 Indicators and control keys

For explanation on the basic function of the indicators and the keys, refer to pages 2-14.



































(1) Messages

In the explanation that follows, the following diagrams are used to describe whether the indicator is lit, fast flashing, slow flashing or off.
















Red	Green	
		Slow flashing
		Fast flashing
		Lit
		Off














By using the *Remote Operation Panel* utility to monitor the printer's status from the computer, the error message can be displayed on the computer's screen when an error occurs.

Normal messages





Indicator	<i>Remote Operation Panel</i> display	Description
 	Processing	The printer is receiving data.
 		The printer is processing data, or the printer is waiting for a code or command signalling that the job is finished.
 	Ready	The printer is ready to print.
 		The printer is off-line. The printer stores but does not print received data.
 		The printer is in sleep mode. The On line
       	Sleeping	indicator flashes at 5 second intervals and all other indicators go off. The printer wakes from Sleep mode whenever a key on the operator panel is pressed, the cover is opened or closed, or data is received. The printer then warms up and goes on-line. (By using the <i>Remote Operation Panel</i> , setting the amount of time before the printer enters sleep mode.)
       	Cancelling data	Data inside the printer is being canceled. The indicators light in sequence from the top, then go off in sequence from the bottom. This process is repeated twice.
       	Please wait	The printer is warming up and is not ready to print. The indicators light in sequence twice from top to bottom.









Maintenance messages

Indicator	Remote Operation Panel display	Description
 ●  ●  8V  ●  ●	Add paper <paper source> <size>	<p>The paper has run out. Add paper to the cassette or MP tray.</p> <p>The paper source and paper size are displayed in the <i>Remote Operation Panel</i>. Press the Go key to switch, the paper source between the MP tray, the cassette, and the paper feeder (optional) in that order.</p> <p>The cassette is not closed securely.</p> <p>Close the cassette property.</p>
—	Call service person ##:nnnnnn	<p>An error requiring attention by service personnel has occurred. Refer to <i>Service error indications</i>, See page 6-9.</p> <p>An error requiring attention by service personnel has occurred and the printer has stopped. An error code is displayed in ##, and the current number of copies to be printed is displayed in n.</p>
   ●  8V ●  ●	Load MP tray <paper size>	<p>The cassette paper size and data paper size are not the same.</p> <p>Set paper of the size specified in the print data into the MP tray, then press the Go key to resume printing. The printer feeds from the MP tray when the page in the cassette is a different size than that specified in the print data.</p> <p>When your want to feed from a source other than the MP tray, make sure there is no paper in the MP tray, then press the GO key to switch the paper source. The printer prints on the paper size set in that particular paper source.</p>
 ●  ●  8V  ●  ●	Paper jam	<p>Open the printer and clear the paper jam.</p> <p>For details on how to correcting paper jams (See page 6-29).</p>

Indicator	Remote Operation Panel display	Description
 ●  ●  ●  ○	Replace Toner TK-17	<p>There is no more toner in the toner container.</p> <p>Replace with a new toner kit. The printer has stopped because there is no more toner. After replacing, be sure to clean the printer (See page 3-5).</p>
 ○	Toner low TK-17	<p>There is not enough toner inside the toner container.</p> <p>Promptly replace with a new toner as the printer will stop printing before long. Clean the printer after replacement (See page 3-5).</p>
 ●  ●  ○  ●	Top cover Open	<p>The top or front cover is open.</p> <p>Close the cover properly.</p>
 ○  ●  ●  ●	Warning Waste toner bottle	<p>The waste toner reservoir (in process unit) is almost full.</p> <p>Shake the process unit horizontally. Turn power off and on If the same occur, refer to section 6-1-2 <i>Service error indications</i>.</p>

Error messages

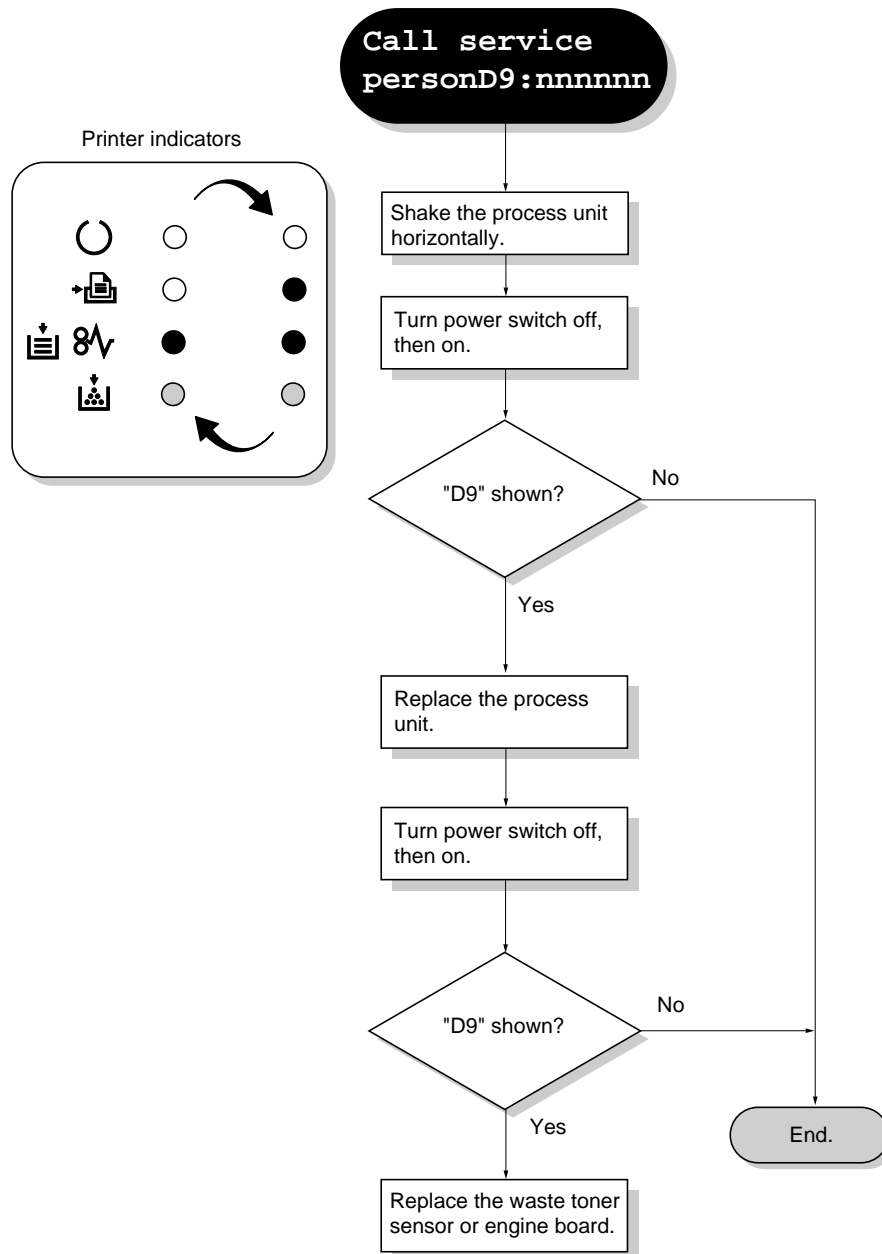
Indicator	Remote Operation Panel display	Description
 ●  ●  ○  ●	<p>KPDL Error</p> <p>Press GO</p>	<p>Current print processing cannot continue. (This occurs only if the optional KPDL2 Upgrade kit [PK-6] is installed.)</p> <p>Press the Go key to resume printing. Press the Cancel key to abandon printing.</p>
	<p>Memory overflow</p> <p>Press GO</p>	<p>Printing cannot continue because there is not enough memory.</p> <p>Press the Go key to resume printing. Press the Cancel key to abandon printing.</p>

Indicator	Remote Operation Panel display	Description
       	Print overrun Press GO	<p>Current print processing cannot continue due to complex data.</p> <p>The data transferred to the printer was too complex to print on a page. Press the Go key to print data as far as it was stored. Press the Cancel key to abandon printing.</p> <p>NOTE: To release the page protect mode, send the following command to the printer from the <i>Remote Operation Panel</i> utility after this error occurs:</p> <pre>!R! FRPO R5, 1; EXIT;</pre>
	RAM disk err ## Press GO	<p>Check the error code displayed in ## and refer to the appropriate description below.</p> <p>01: Abnormal format. Try turning the power off and on again.</p> <p>02: RAM disk mode is off. Turn RAM disk mode on.</p> <p>03: Cannot write to the disk system because it is write protected. Remove the write protection.</p> <p>04: No disk space. Clean up files.</p> <p>05: Specified file not on disk.</p> <p>06: No memory for use by disk system. Expand printer memory.</p> <p>10: Cannot format disk because host data is spooled there. Format the disk after Ready is displayed.</p> <p>98: Unable to read files during sorting (file does not exist, or is corrupted).</p>

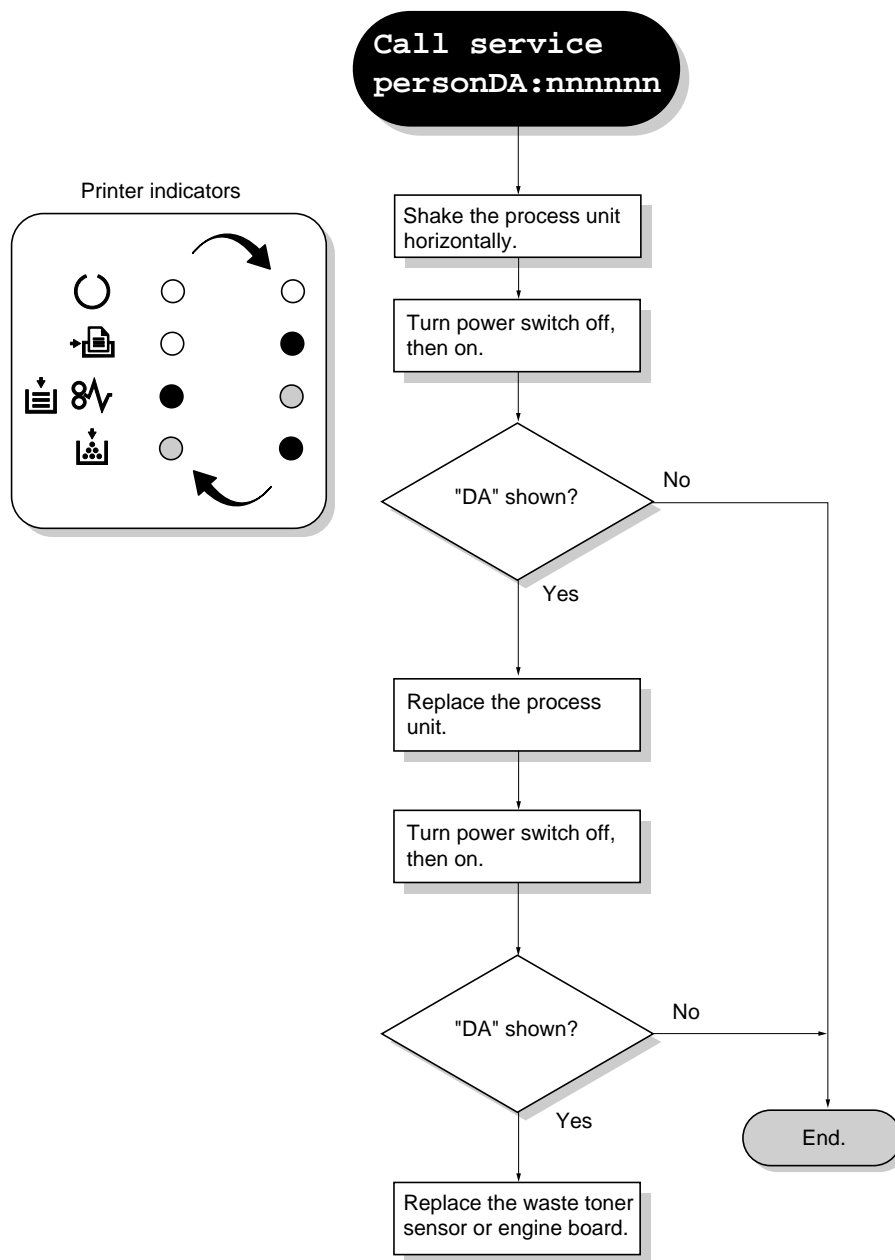
6-1-2 Service error indications

Service errors are represented by the alternating flashing of the indicators (LEDs). Each error is represented by the notation of “D”, “E” and “F” and can be monitored on the *Remote Operation Panel* utility. e.g. E1 is for the main motor error.

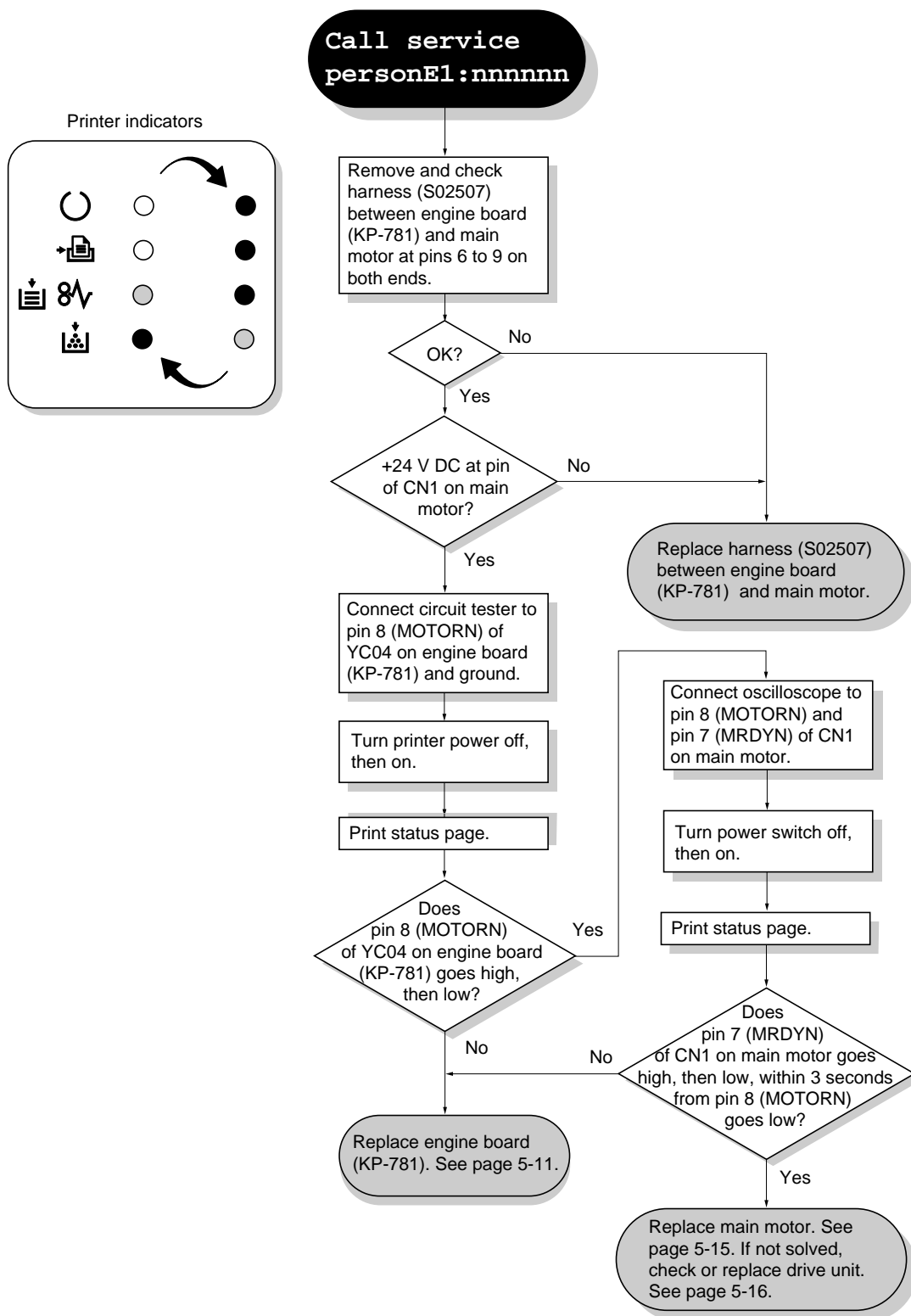
(1) D9 —Waste toner full [Total page count less than 100,000 pages of printing]



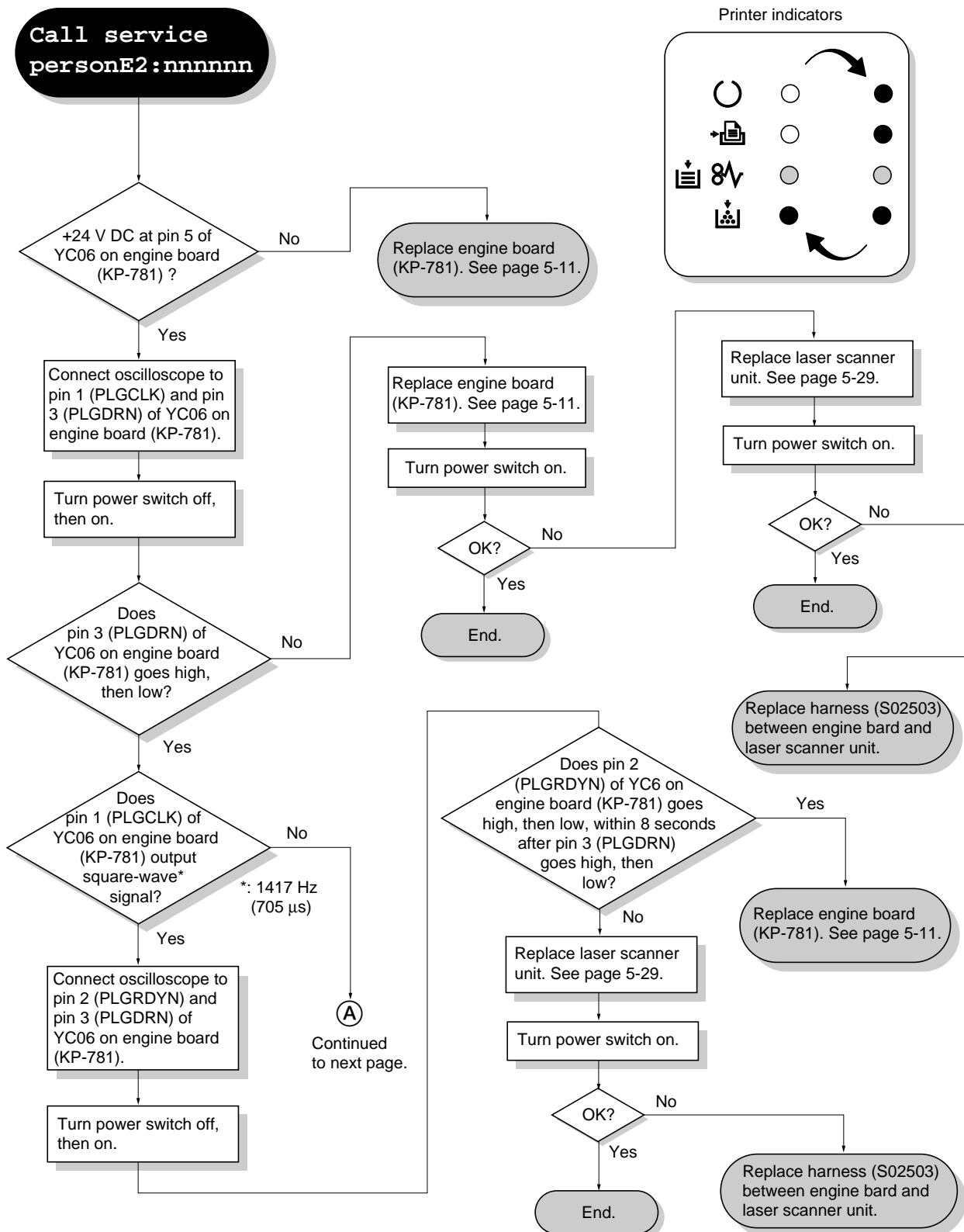
(2) DA —Waste toner full [Total page count more than 100,000 pages of printing]



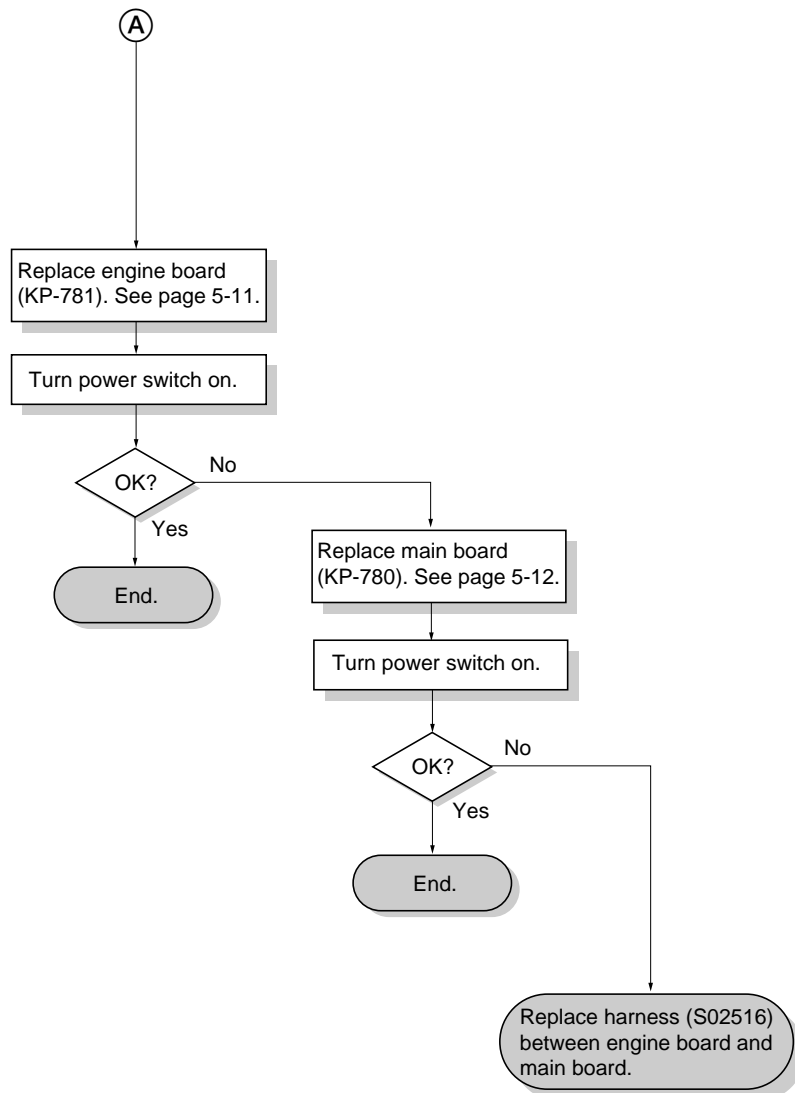
(3) E1 —Main motor error



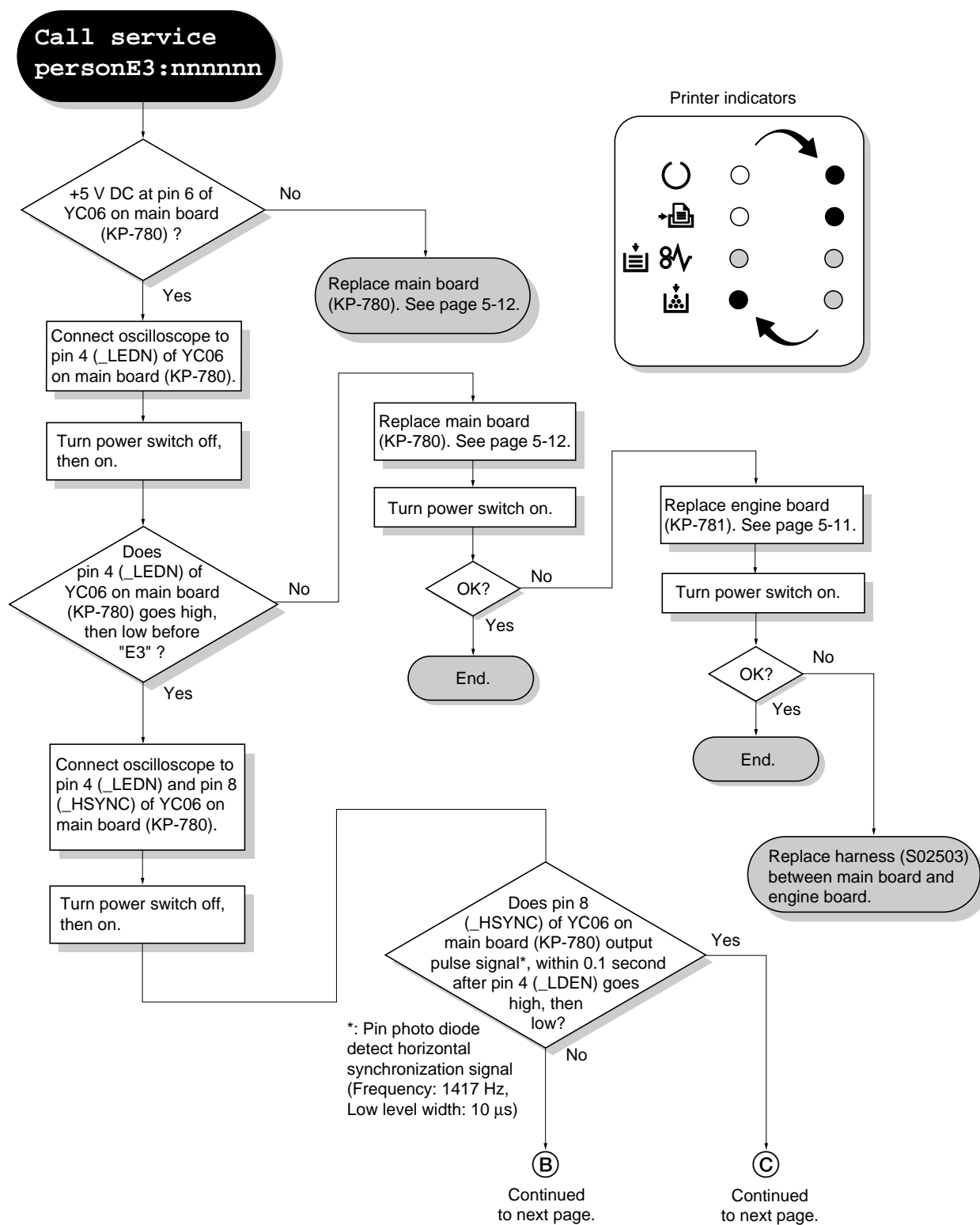
(4) E2 —Laser scanner unit [Polygon motor] error



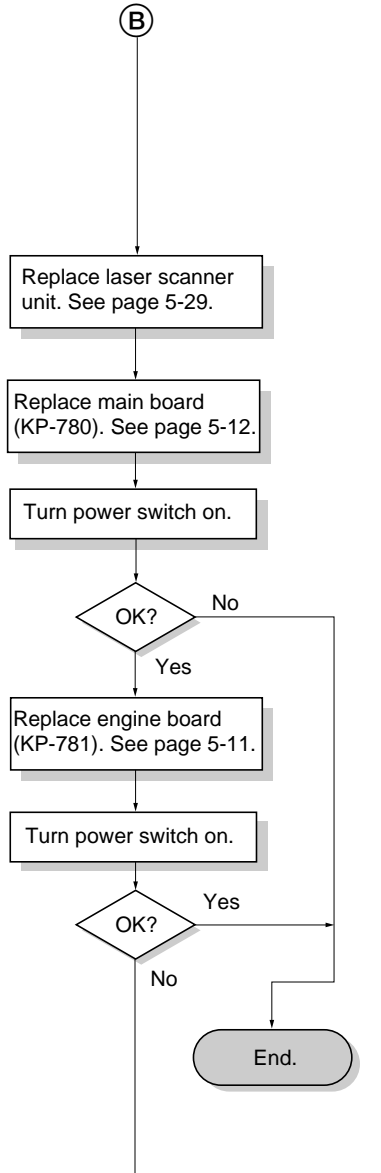
Continued
from previous page.



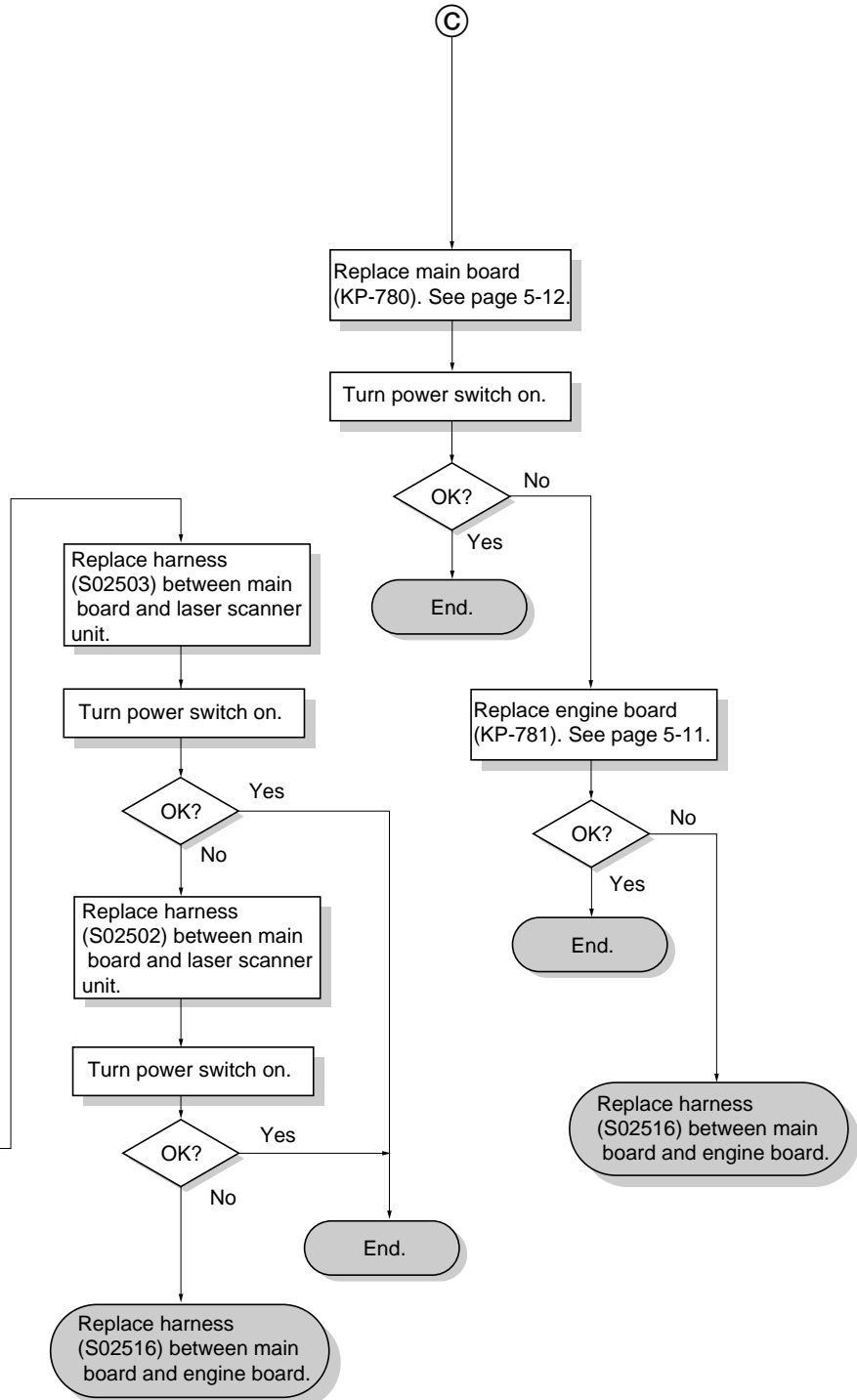
(5) E3 —Laser scanner unit [Pin photo diode] error



Continued
from previous page.



Continued
from previous page.



(6) E4 —Fuser unit error

**Call service
personE4:nnnnnn**

Turn power switch off,
and remove power
cable.

Detach connector CN4
on power supply board.

Measure resistance
between pins 1 and 2
of the detached
connector.

Open (infinite)?

Yes

Replace thermistor.
See page 5-26.

No

Measure resistance
between pins 1 and 3
of the detached
connector.

No

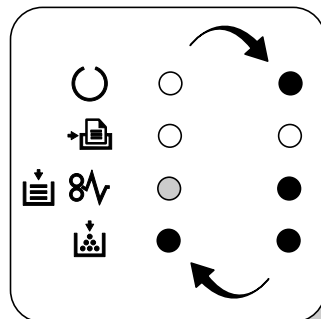
Open (infinite)?

Yes

Replace thermal cutout
or heater lamp.
See page 5-26 or 5-23.

No

Printer indicators



Replace engine board
(KP-781). See page 5-11.

"E4" shown?

No

Yes

Replace harness
(S02500) between
engine board (KP-781)
and bias board (KP-783).

"E4" shown?

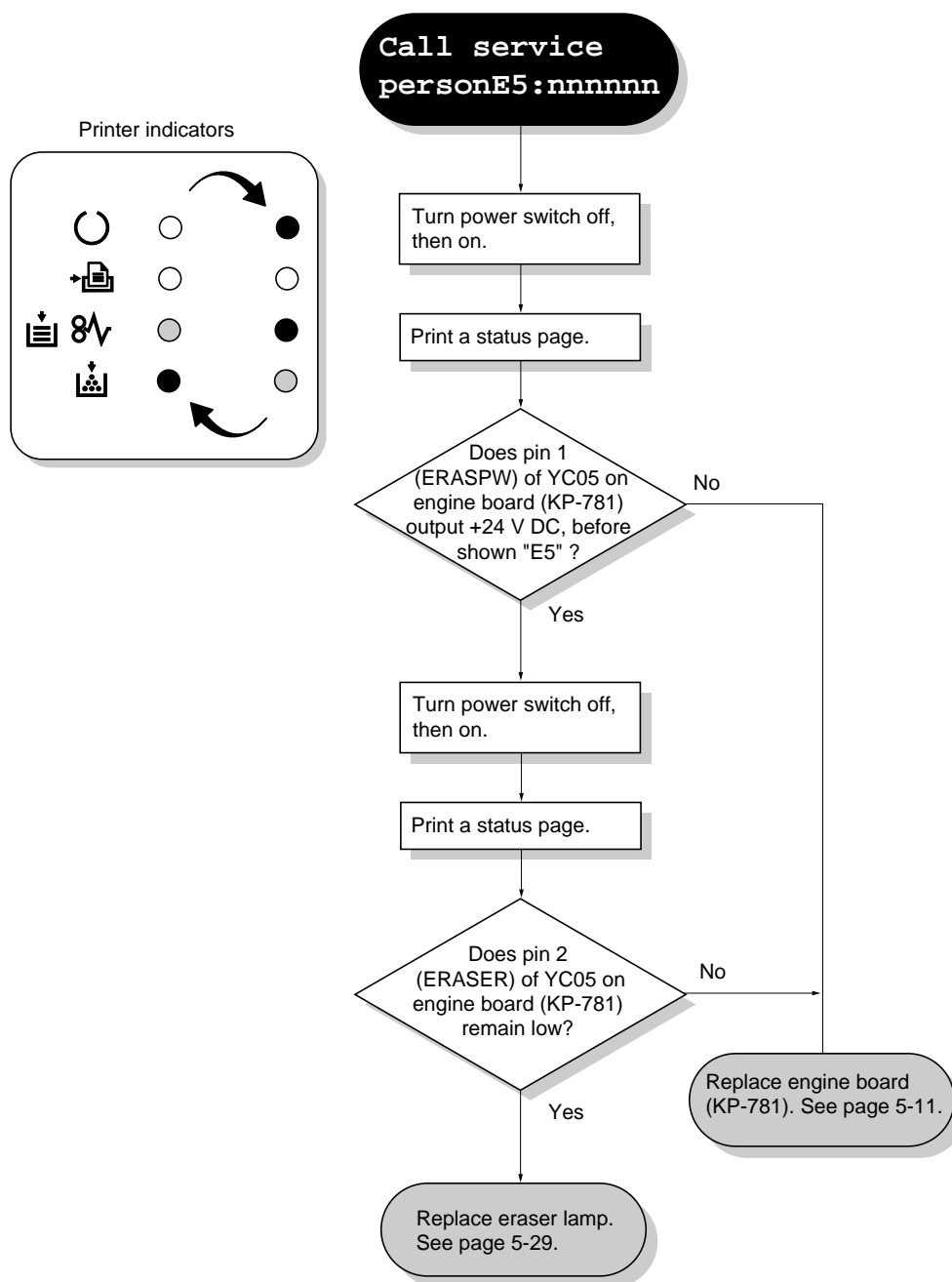
No

Yes

Replace bias board or high
voltage board or power
supply board. See page 5-15
or 5-14.

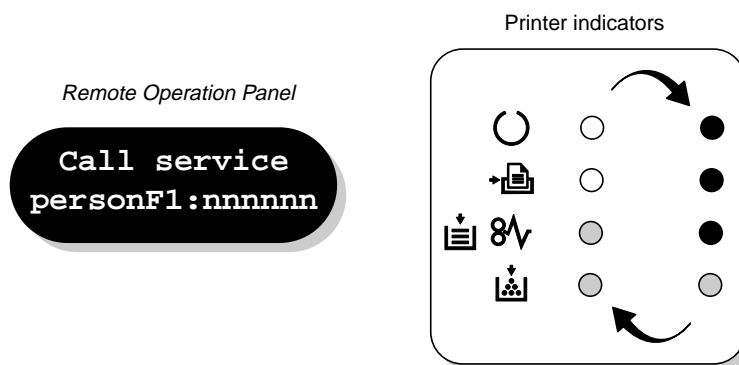
End.

(7) E5 —Eraser lamp error



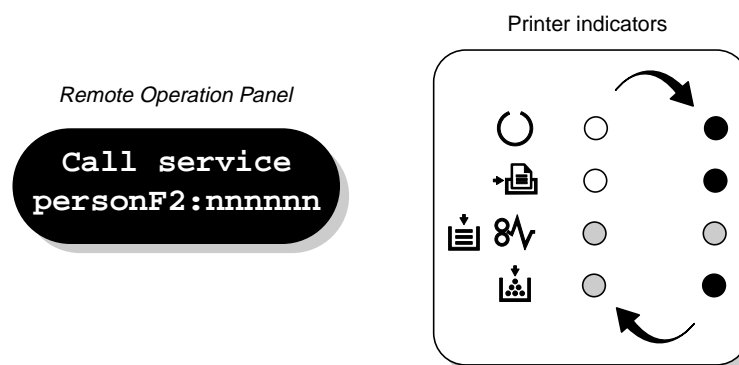
(8) F1 —Controller checksum error

Turn power switch off, then on. If not solved, replace the main board (See page 5-12).



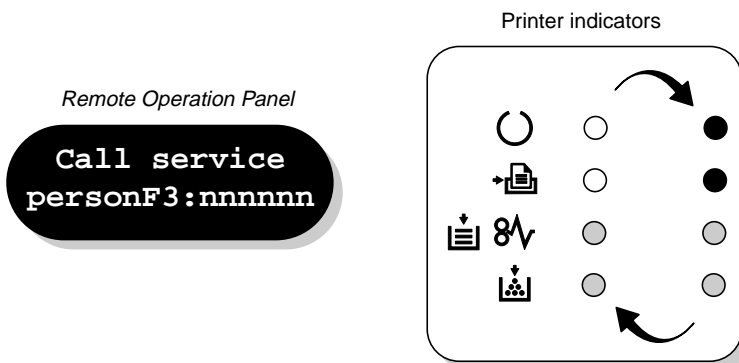
(9) F2 —Controller RAM read/write error

Remove the expansion memory (DIMM). Turn power switch off, then on. If not solved, replace the main board. If solved, replace the expanding memory (See pages 2-8 and 5-12).



(10) F3 —Controller system error

Turn power switch off, then on. If not solved, replace the main board (See page 5-12).



6-1-3 Print quality problems

Print quality problems range from uneven tone to completely blank output. The troubleshooting procedure for each type of problem is given below.

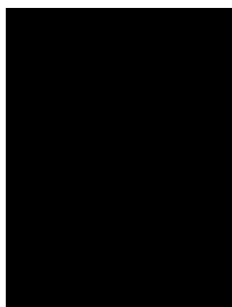
(1) Completely blank printout

See page 6-20.



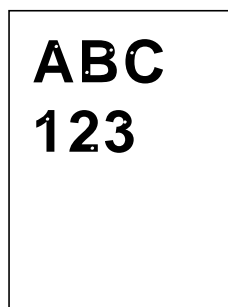
(2) All-black printout

See page 6-21.



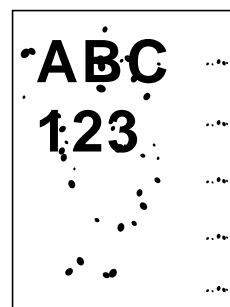
(3) Dropouts

See page 6-22.



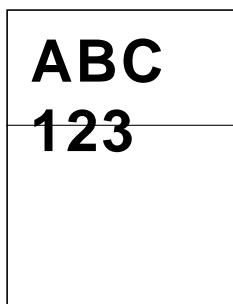
(4) Black dots

See page 6-23.



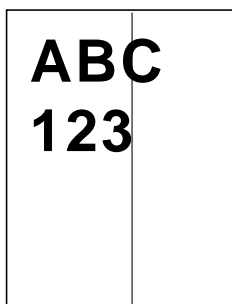
(5) Black horizontal streaks

See page 6-23.



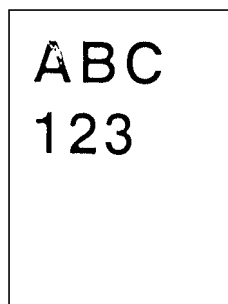
(6) Black vertical streaks

See page 6-24.



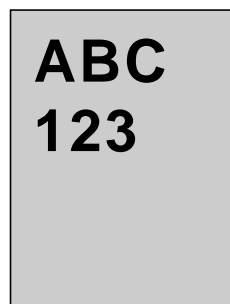
(7) Unsharpness

See page 6-25.



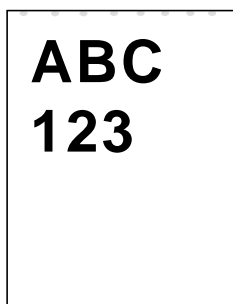
(8) Gray background

See page 6-26.

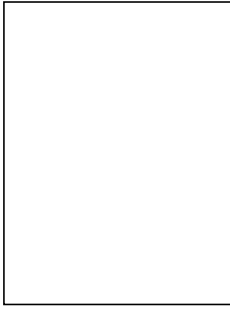


(9) Dirt on the top edge or back of the paper

See page 6-27.



(1) Completely blank printout



Check the process unit.

- Check that the process unit is inserted correctly.

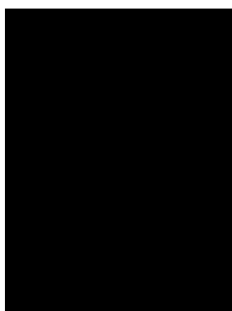
Check the transfer bias potential.

- Check the transfer bias output on the high voltage board. This requires removal of the left cover and the test equipment. Replace the high voltage board if high voltage potential is not available on the board (See page 5-14).

Check the laser scanner unit.

- The scanner components within the scanner may be disordered. Replace the laser scanner unit if necessary (See page 5-29).

(2) All-black printout



Check the main charger.

- Open the printer top cover and check that the process unit is correctly seated. Poor contact main charger terminal between the process unit and the printer main unit.

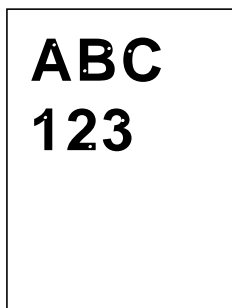
Check the drum bias.

- Make sure the bias from the high voltage board correctly arrives at the process unit.

Check high voltage potential at the high voltage board.

- Check the high voltage output on the high voltage board. Replace the high voltage board if high voltage potential is not available on the board.

(3) Dropouts



Note the spacing of the defects. Refer to *Repetitive defects gauge* (See page 6-29).

- If the defects occur at regular intervals of 63 mm, the problem may be the damaged developing roller (in the process unit). Replace the process unit.
- If the defects occur at regular intervals of 94 mm, the problem may be the damaged drum (in the process unit). Replace the process unit.
- If the defects occur at regular intervals of 61 mm, the problem may be the damaged fuser unit. Replace the press roller or heat roller (See page 5-28 or 5-14).

Check paper for property.

- Paper with rugged surface or dump tends to cause dropouts. Replace paper with the one that satisfies the paper specifications.

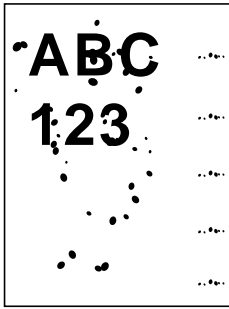
Check the transfer roller installation.

- The transfer roller must be supported by the bushes at the both ends. Clean the bush to remove oil and debris. Replace the transfer roller if necessary (See page 5-10).

Check the transfer bias potential.

- Check the transfer bias output on the high voltage board. This requires removal of the left cover and the test equipment. Replace the high voltage board if high voltage potential is not available on the board (See page 5-10).

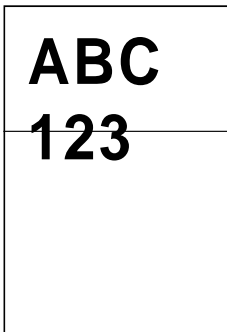
(4) Black dots



Note the spacing of the defects. Use the *Repetitive defects gauge* (See page 6-28).

- If the defects occur at regular intervals of 94 mm, the problem may be the damaged drum (in the process unit). Replace the process unit.
- If the defects occur at random intervals, the toner may be leaking from the process unit. Replace the process unit.

(5) Black horizontal streaks



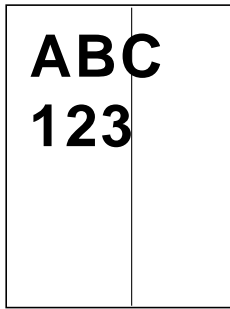
Check the process unit's ground of the process unit.

- The drum axle in the process unit and its counter part, the grounding tab in the printer, must be in a good contact. If necessary, apply a small amount of electro-conductive grease onto the tab.

The drum may be defective.

- Replace the process unit.

(6) Black vertical streaks



Contaminated main charger wire.

- Clean the main charger wire by pulling the green colored cleaning knob in and out several times.

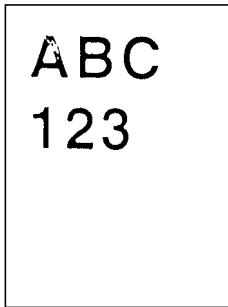
Check the drum surface for a streak of toner laying lengthwise.

- A streak of toner remaining on drum after printing means that the cleaning blade (in the process unit) is not working properly. Replace the process unit.

Defective magnet roller (in the process unit).

- Replace the process unit.

(7) Unsharpness



Check paper for property.

- Paper with rugged surface or dump tends to cause unsharp printing. Replace paper with the one that satisfies the paper specifications.

Check the transfer roller installation.

- The transfer roller must be supported by the bushes at the both ends. Clean the bush to remove oil and debris. Replace the transfer roller if necessary (See page 5-10).

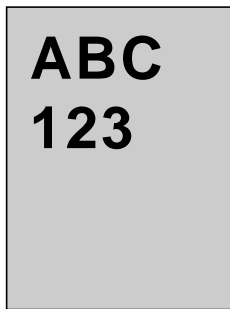
Check the transfer bias potential.

- Check the transfer bias output on the high voltage board. This requires removal of the left cover and the test equipment. Replace the high voltage board if high voltage potential is not available on the board (See page 5-14).

Check *EcoPrint* setting.

- The *EcoPrint* mode can provides faint, unsharp printing because it acts to conserve toner for draft printing purpose. For normal printing, turn the *EcoPrint* mode off by using the *Remote operation panel*. For details refer to the printer's *User's Manual*.

(8) Gray background



Check the print density setting.

- The print density may be set too high. Try adjusting the print density using the *Remote operation panel* utility. For details refer to the printer's *User's Manual*.

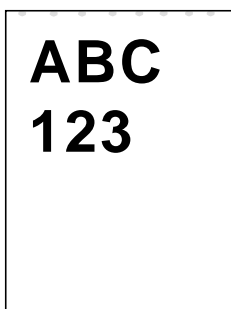
Check the surface potential of the drum (in the process unit).

- The drum potential should be approximately 400 V. This may vary depending on production lots. Measurement is possible only by using the jig and tool specifically designed for this purpose. The drum unit will have to be replaced if it bears values far out of the allowable range.

The developing roller (in the process unit) may be defective.

- If a process unit which is known to work normally is available for check, replace the current process unit in the printer with the normal one. If the symptom disappears, replace the process unit with a new one.

(9) Dirt on the top edge or back of the paper



Check toner contamination in various parts.

- Dirty edges and back of the paper can be caused by toner accumulated on such parts as the paper chute, paper transportation paths, the bottom of the process unit, and the fuser unit inlet. Clean these areas and parts to remove toner.

Check the transfer roller.

- If the transfer roller is contaminated with toner, clean the transfer roller using a vacuum cleaner; or by continuously printing a low-density page until the symptom has faded away.

Repetitive defects gauge

Use the following measurements for checking repetitive occurrences on the printed page. See the above section for details.

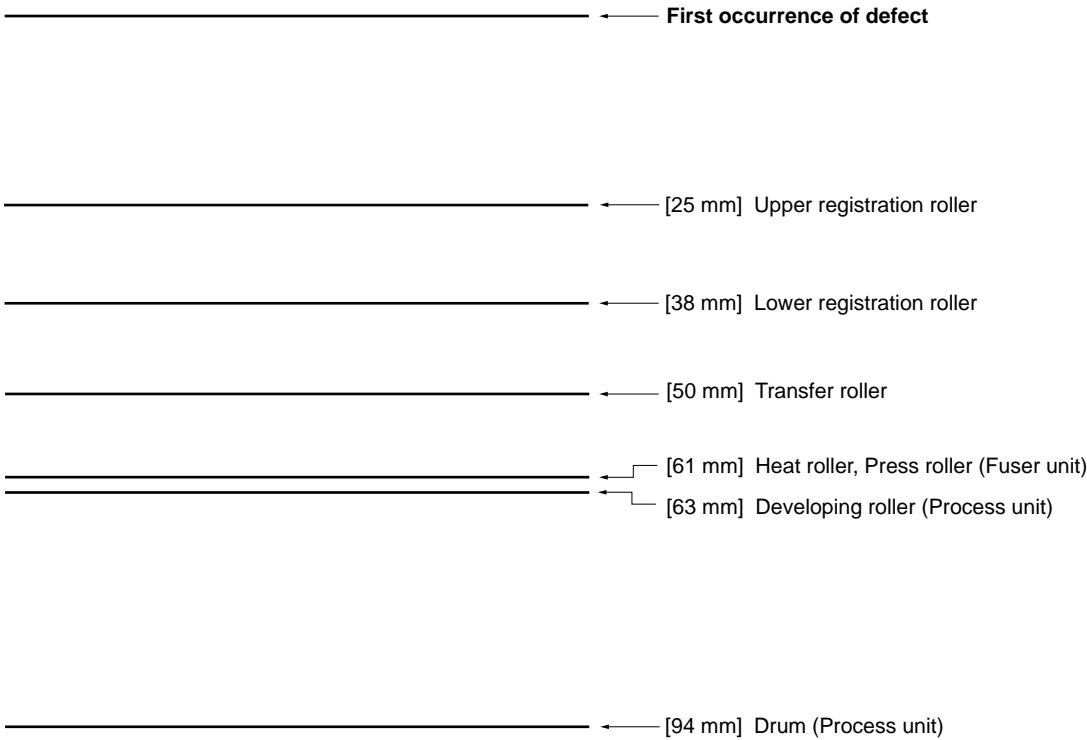


Figure 6-1-2 Repetitive defects gauge

6-1-4 Correcting a paper jam

If a paper jam occurs while you are printing, remove the jammed paper as described below. After you have removed the jammed paper, open and close the top cover once.

(1) Jam at the face-down and face-up trays

1. Open the face-up tray and remove the jammed paper as shown in the figure.

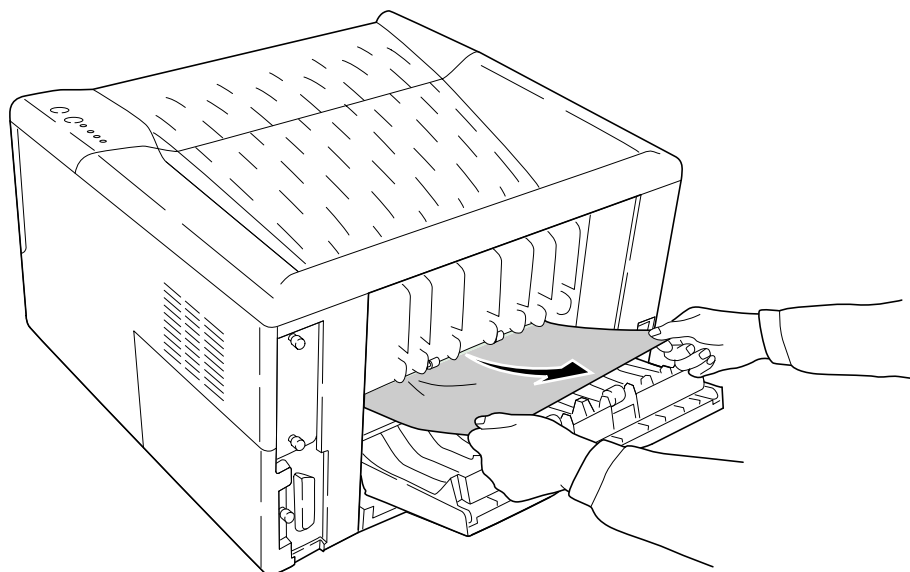


Figure 6-1-3 Jam at the face-down and face-up trays

(2) Jam at the paper cassette

1. Pull out the paper cassette and remove the jammed paper.

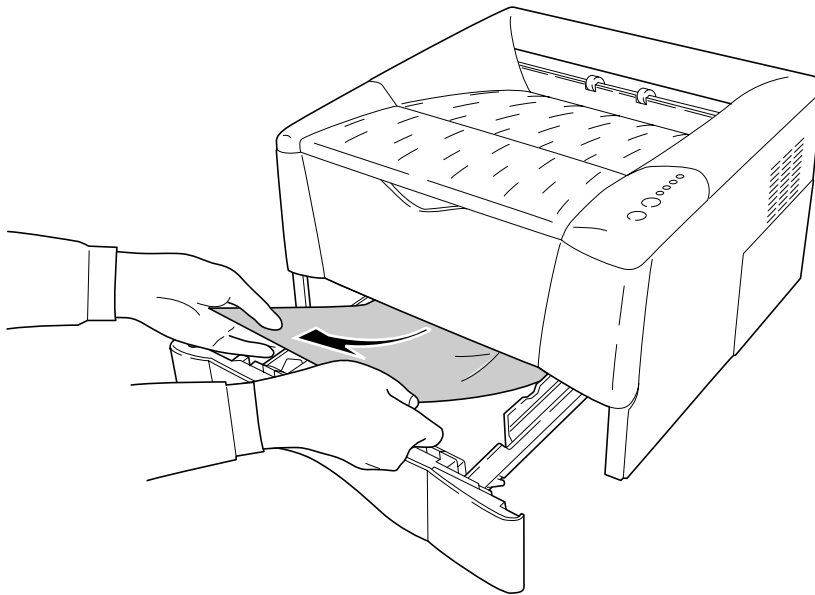


Figure 6-1-4 Jam at the paper cassette

(3) Jam inside the printer

1. Open the top cover and front cover.
2. Take the process unit together with the toner container out of the printer.
3. Remove the jammed paper.

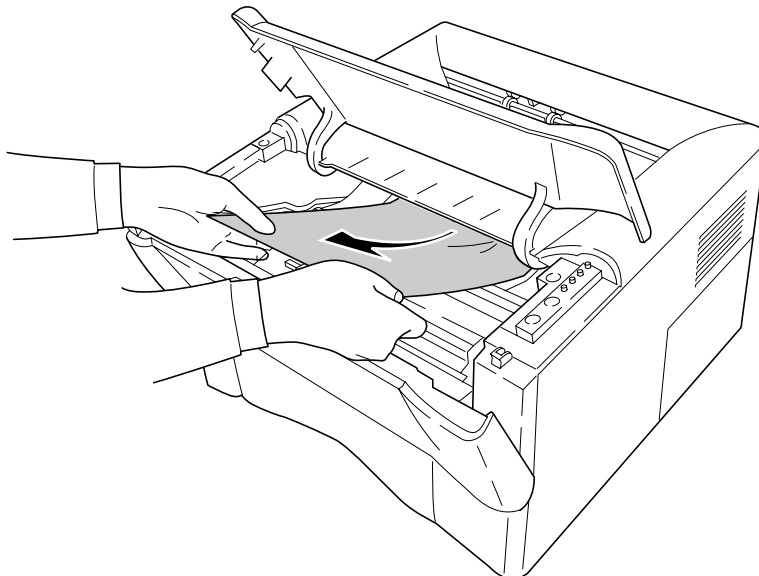


Figure 6-1-5 Jam inside the printer

Appendix A D i a g r a m s

Appendix A Contents

Timing charts A-3

1. Cassette feeding, Legal size [FS-1000] A-3

2. Cassette feeding, A4 and others (excluding Legal size) [FS-1000] A-4

3. MP tray feeding, Legal size [FS-1000] A-5

4. MP tray feeding, A4 and others (excluding Legal size) [FS-1000] A-6

5. Cassette feeding, Legal size, A4 and others [FS-1000+] A-7

6. MP tray feeding, A4 and others (excluding Legal size) [FS-1000+] A-8

8. MP tray feeding, Legal size [FS-1000+] A-9

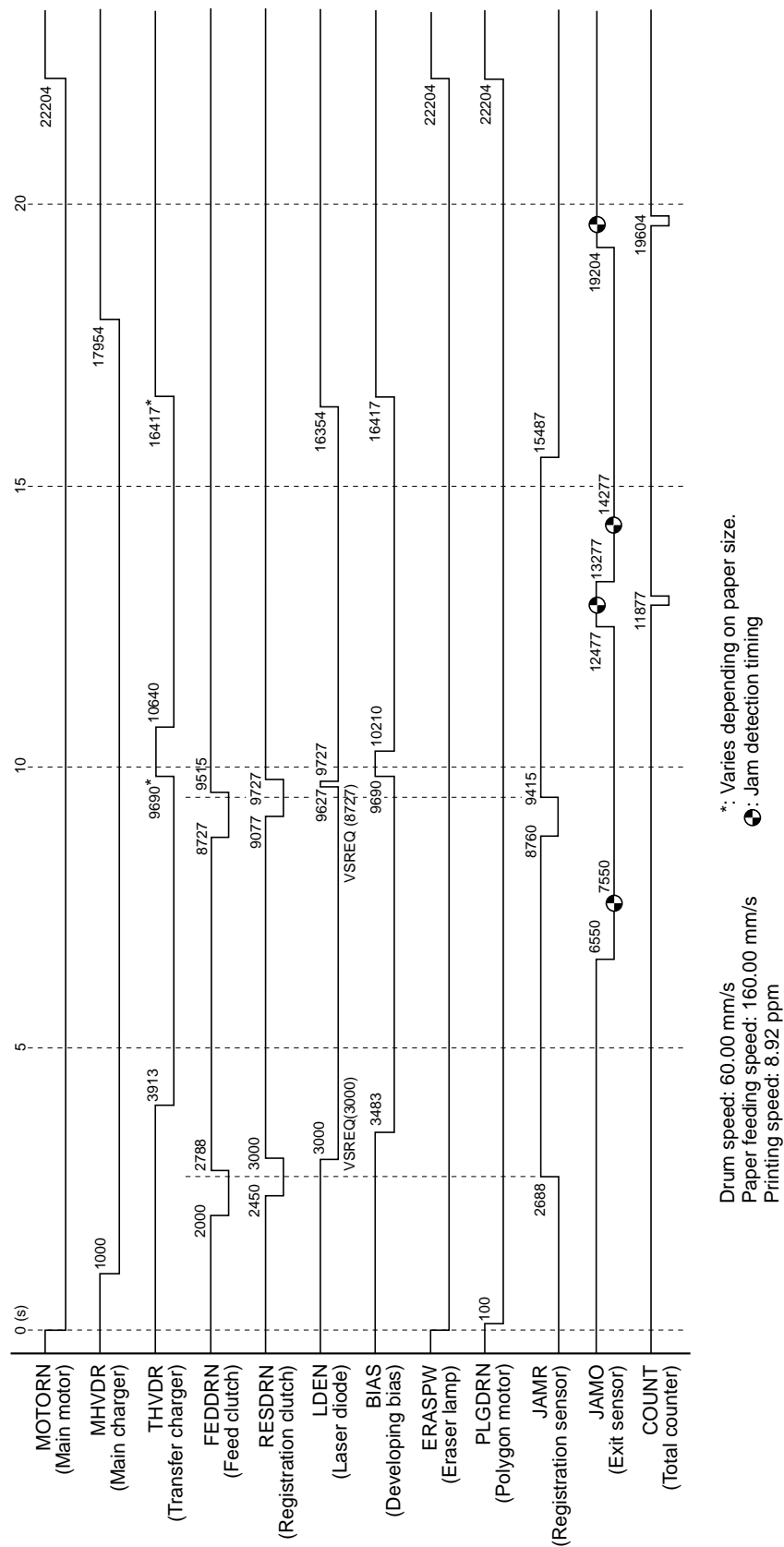
9. Option paper feeder feeding, A4 and others (excluding Legal size) [FS-1000+] A-10

10. Option paper feeder feeding, Legal size [FS-1000+] A-11

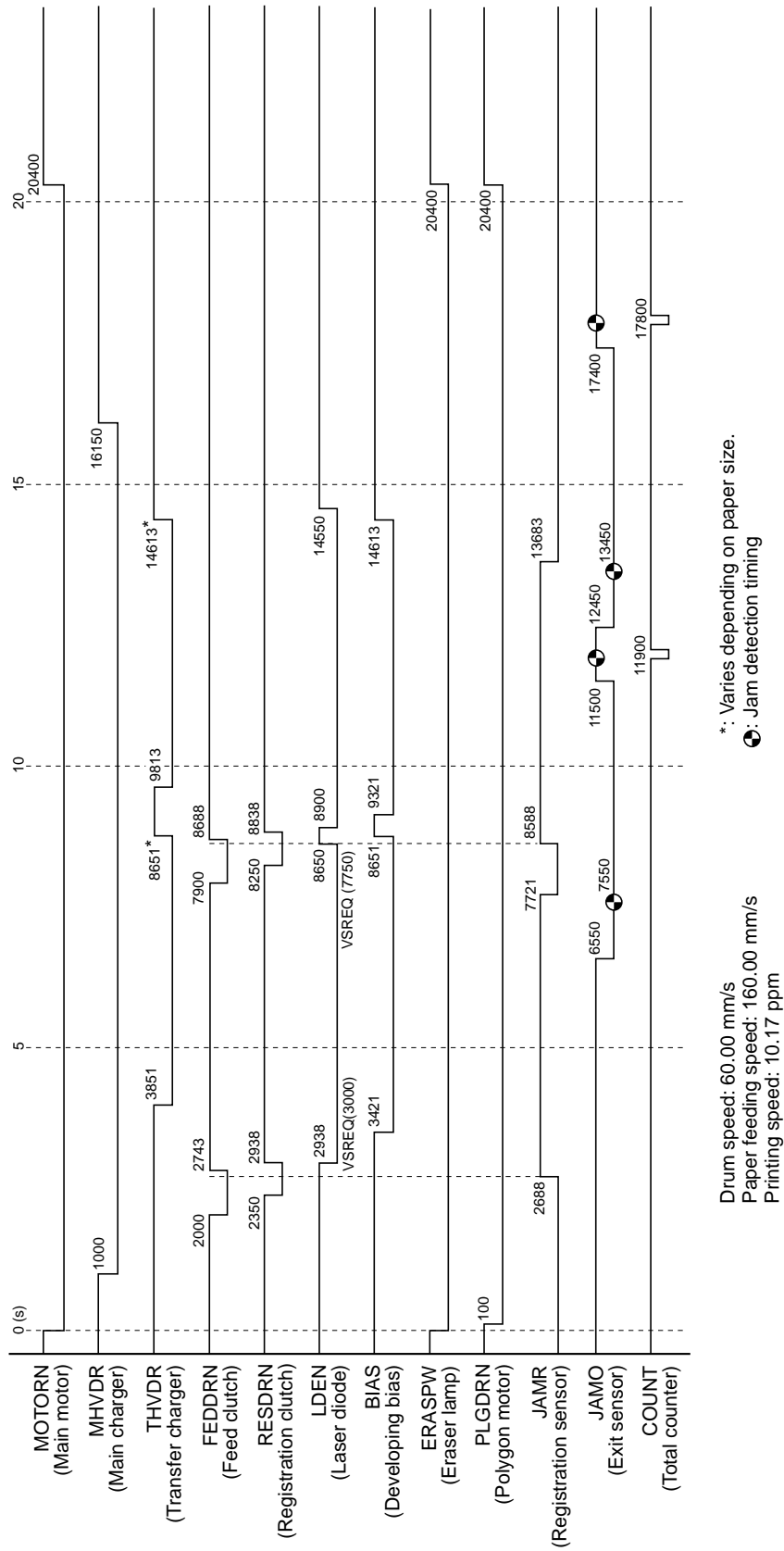
Wiring diagram A-12

Timing charts

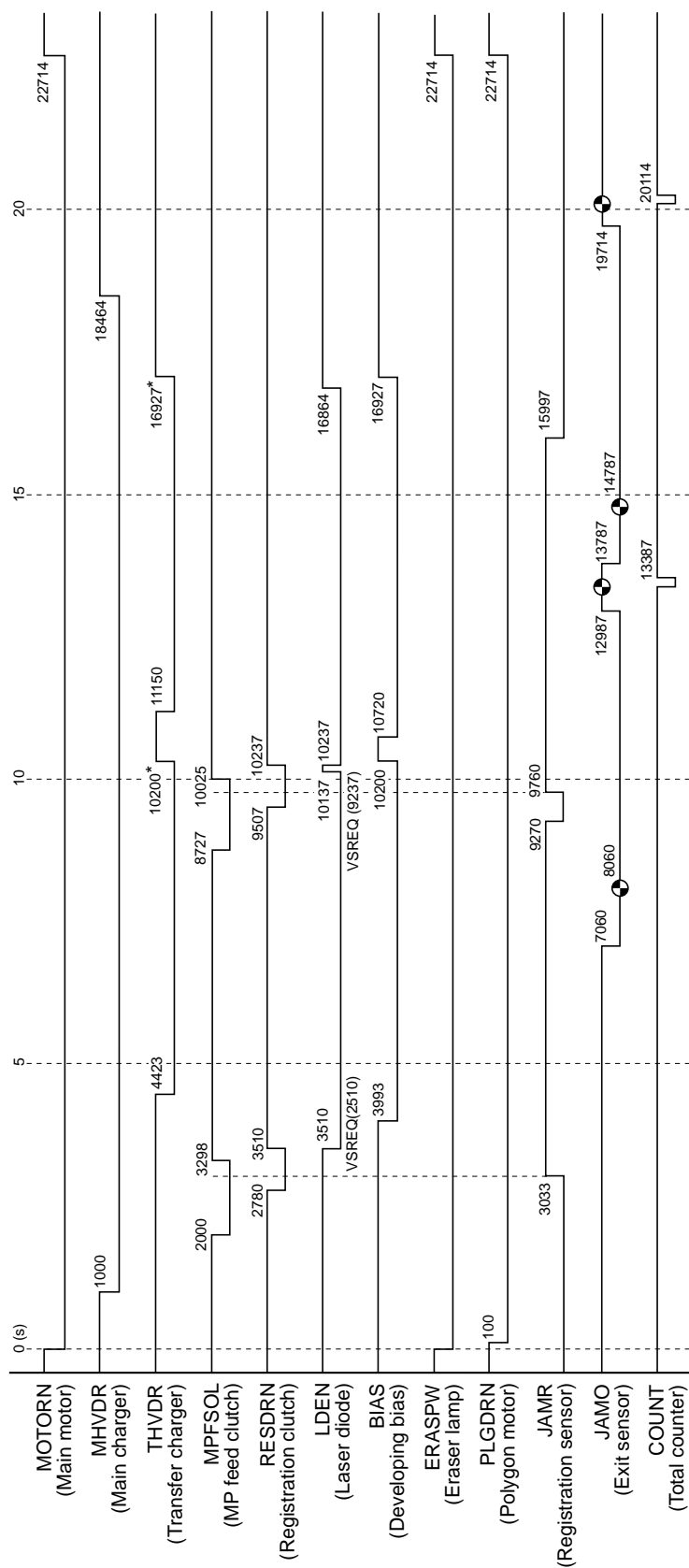
1. Cassette feeding, Legal size [FS-1000]



2. Cassette feeding, A4 and others (excluding Legal size) [FS-1000]



3. MP tray feeding, Legal size [FS-1000]

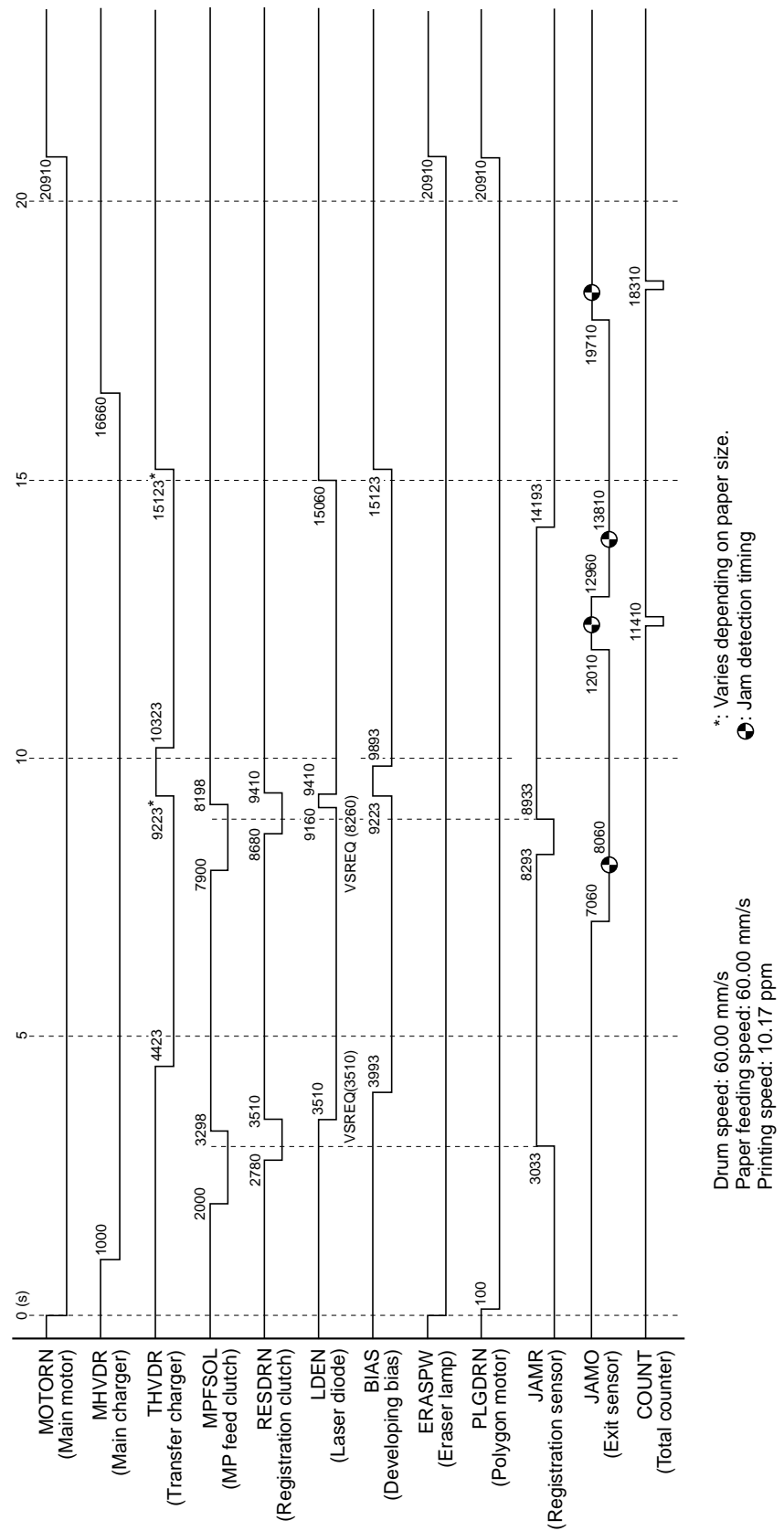


*: Varies depending on paper size.

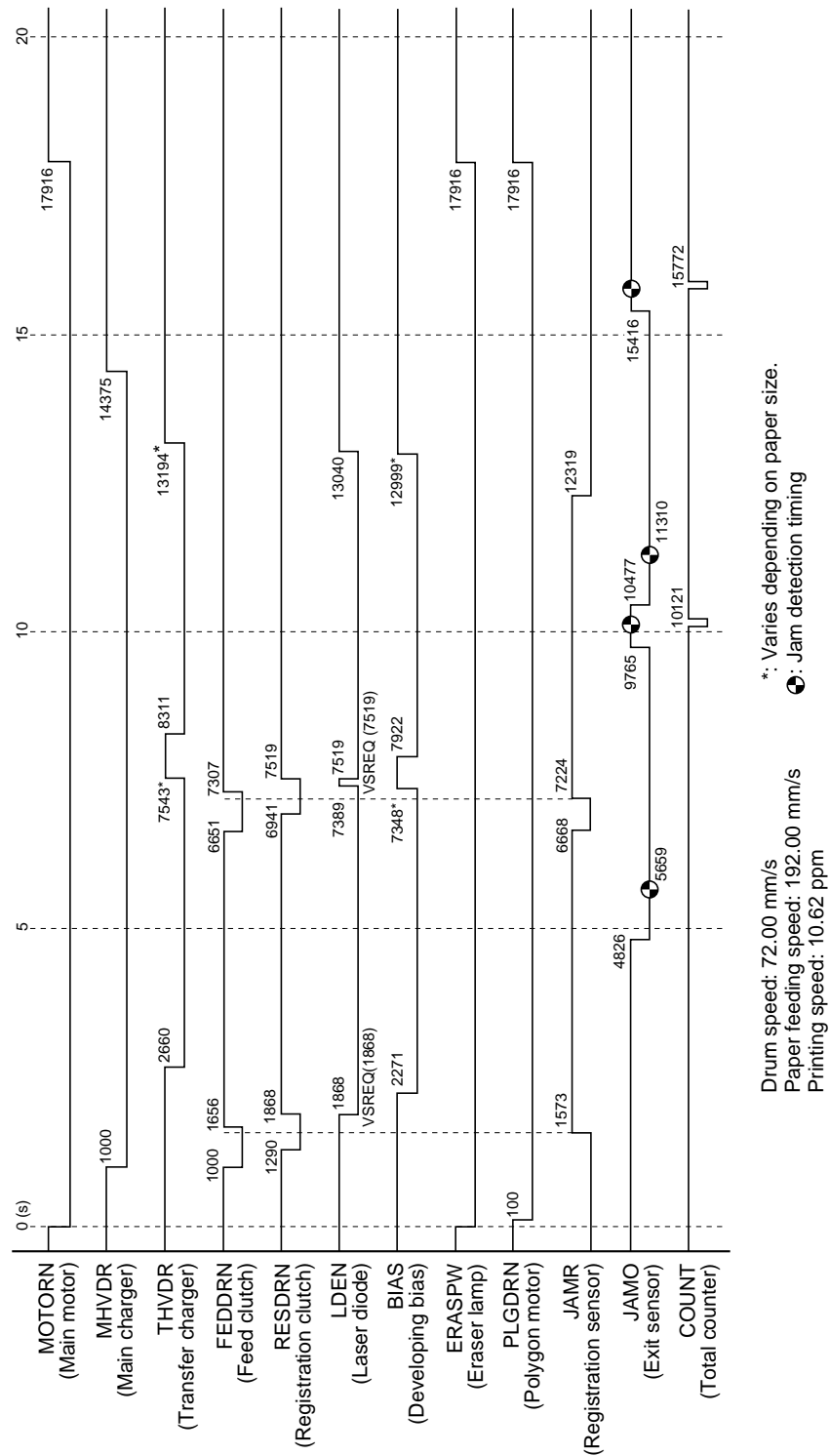
☐: Jam detection timing

Drum speed: 60.00 mm/s
Paper feeding speed: 60.00 mm/s
Printing speed: 8.92 ppm

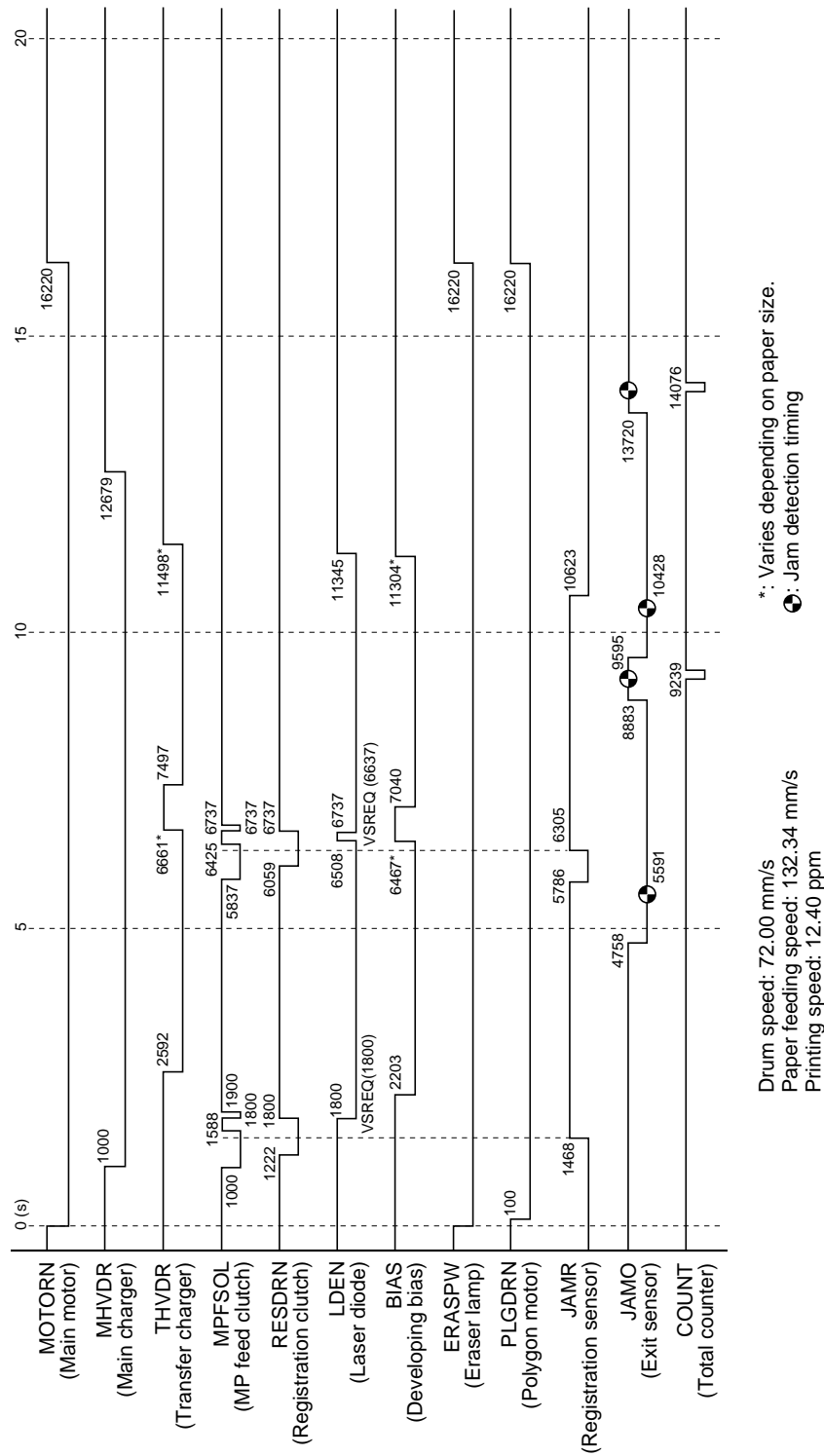
4. MP tray feeding, A4 and others (excluding Legal size) [FS-1000]



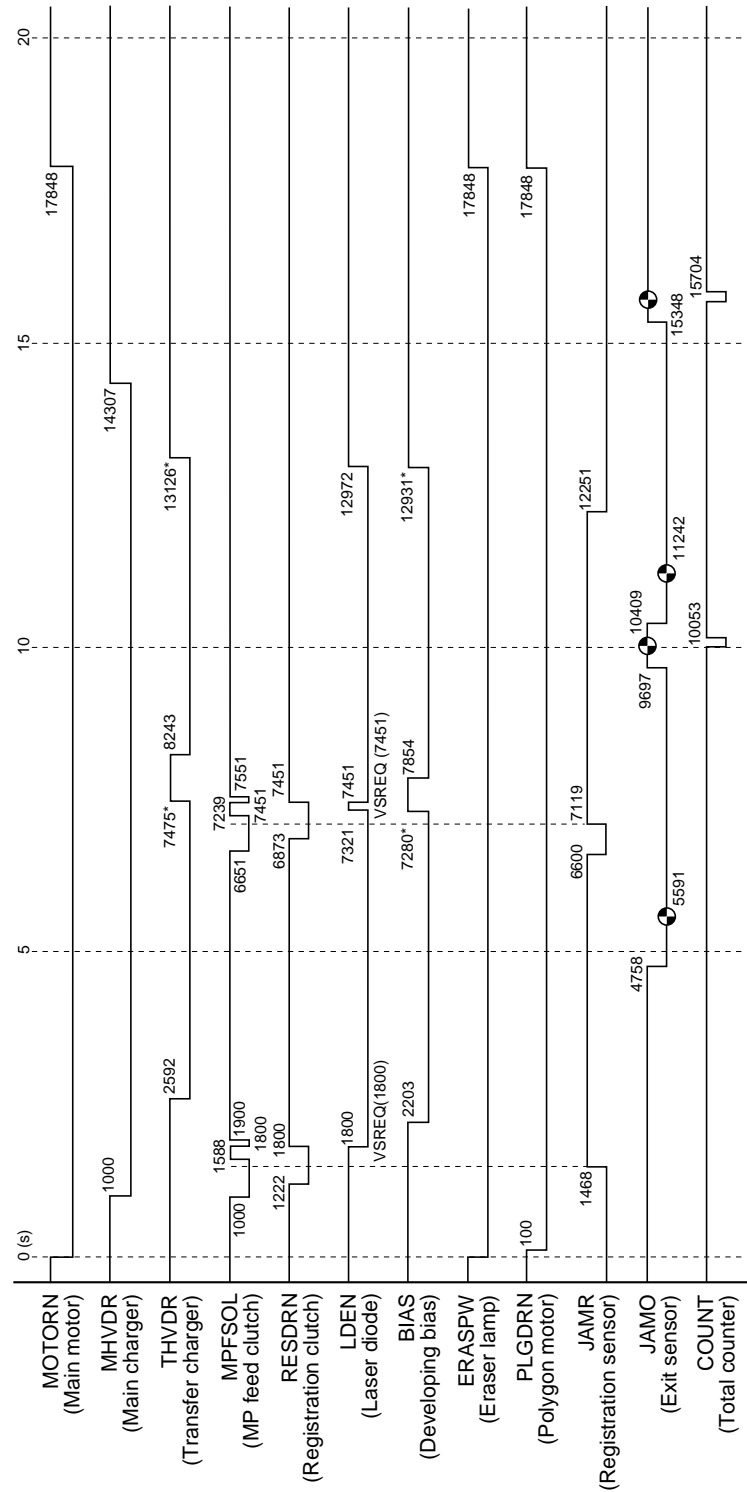
5. Cassette feeding, Legal size, A4 and others [FS-1000+]



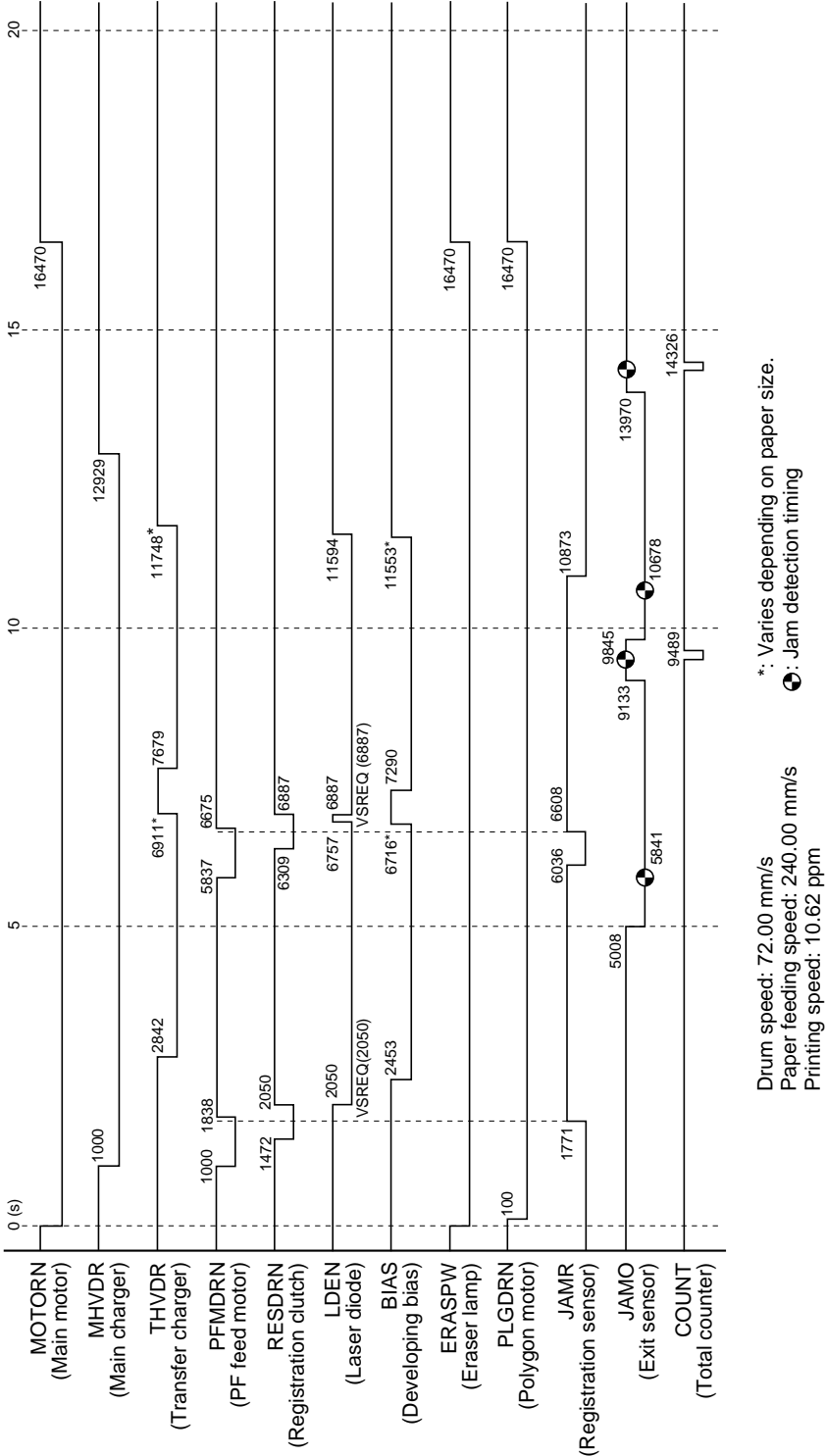
6. MP tray feeding, A4 and others (excluding Legal size) [FS-1000+]



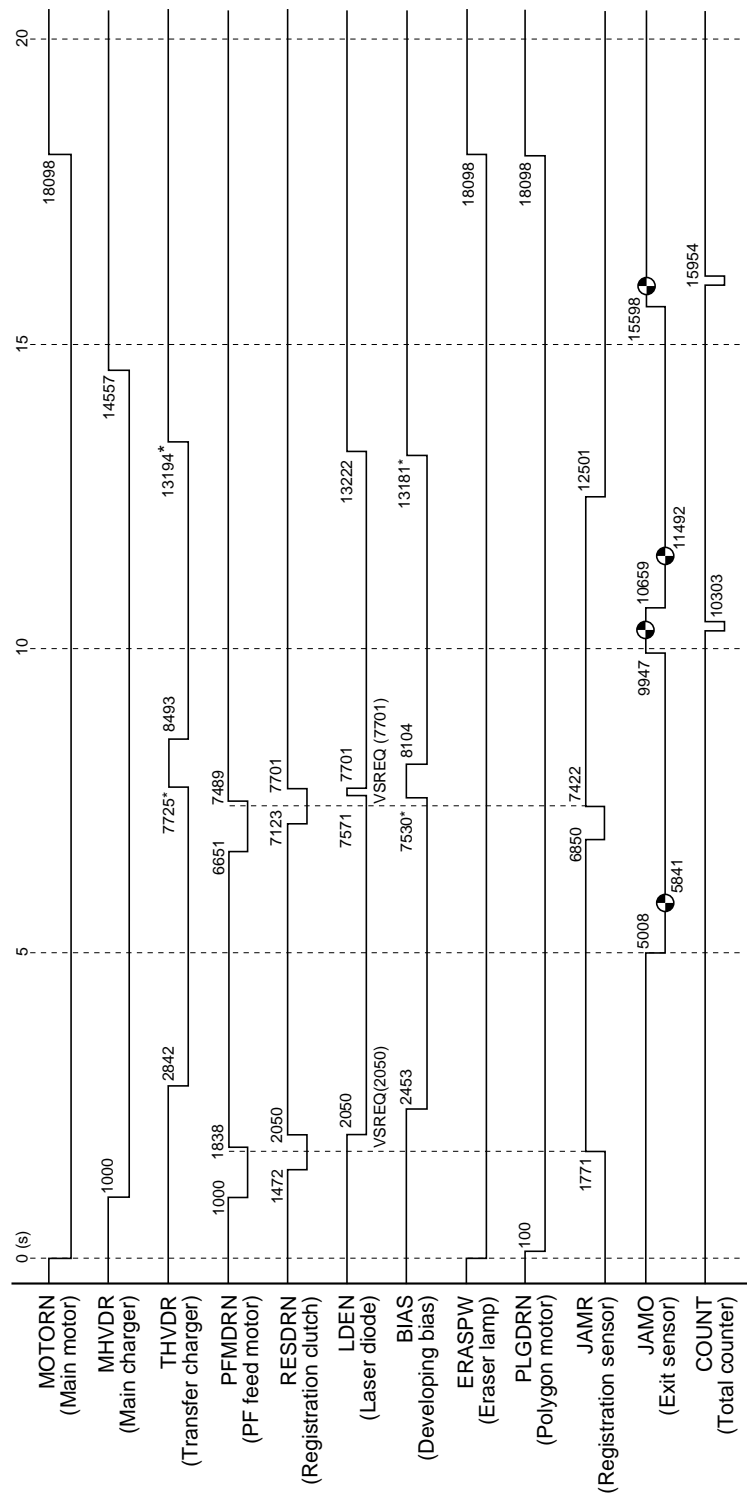
8. MP tray feeding, Legal size [FS-1000+]



9. Option paper feeder feeding, A4 and others (excluding Legal size) [FS-1000+]



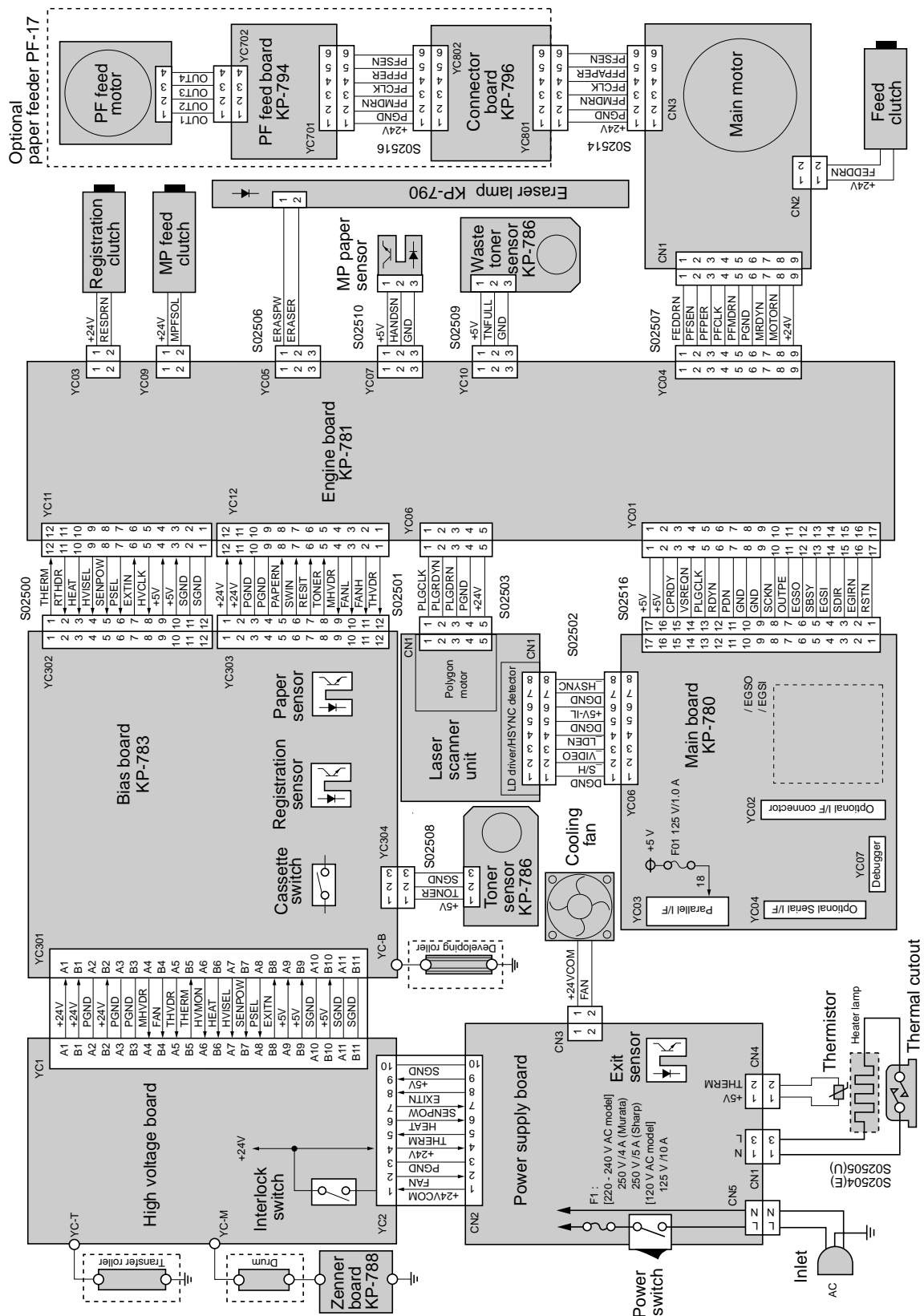
10. Option paper feeder feeding, Legal size [FS-1000+]



Drum speed: 72.00 mm/s
Paper feeding speed: 240.00 mm/s
Printing speed: 10.62 ppm

*: Varies depending on paper size.
●: Jam detection timing

Wiring diagram



Appendix B S t a t u s P a g e

Appendix B Contents

Status page	B-3
Printing the service status page	B-3
Service information on the status page	B-4
Details of service information	B-4

Status page

The printer can print different types of the status page—the user (normal) status page and the service status page. This section exclusively describes information obtainable with the service status page. For information on the user (normal) status page, refer to the printer's *User's Manual*.

Information on the service page include various settings for the printer, service statistics, etc. To print a service status page, proceed as follows:

Printing the service status page

To print a service status page, press the Go key on the operation panel for more than 10 seconds and the indicators light in sequence from top to bottom. Or, have a PC running MS-DOS and proceed as follows:

1. Connect the printer to the PC via the parallel interface.
2. Ensure that the printer is ready to print.
3. At the DOS prompt, type:

```
echo !R! STAT 1; EXIT; >lpt1:
```

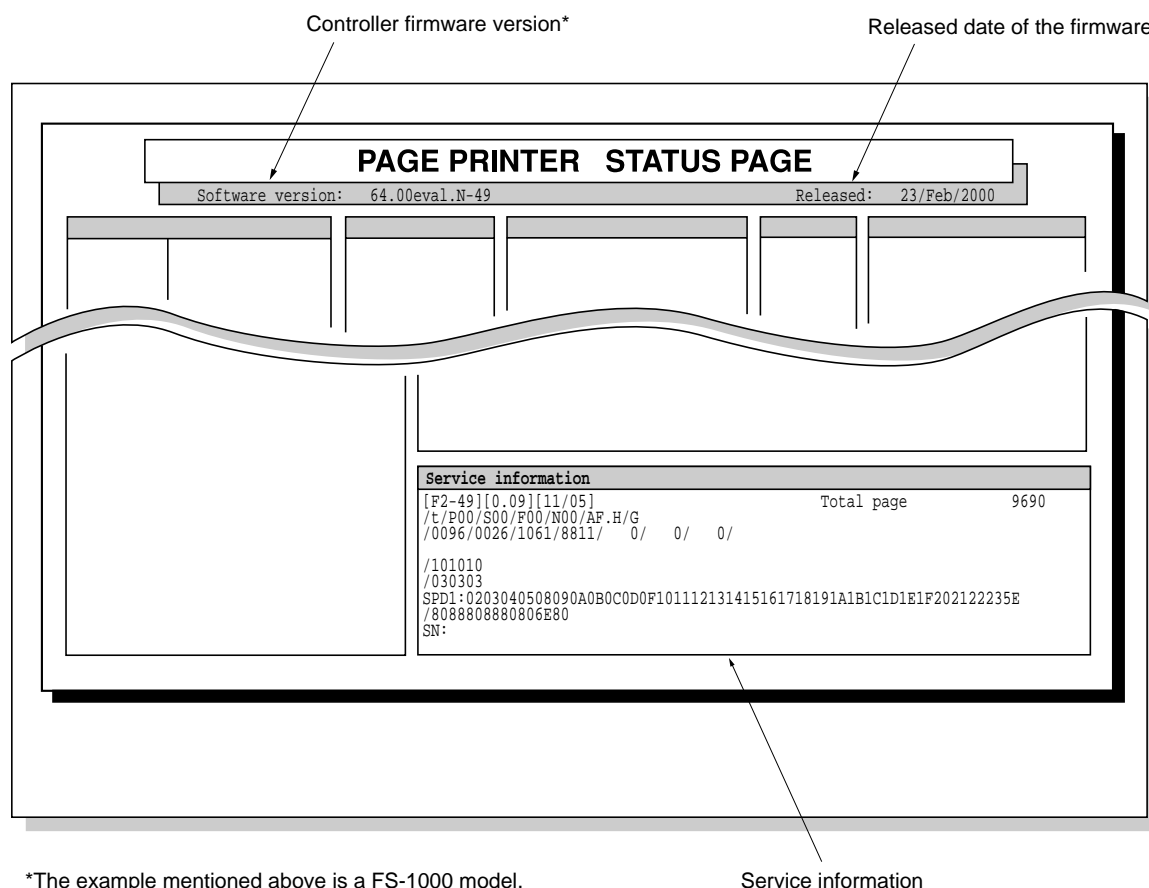
The service status page is printed. (If you omit '1,' a user status page is printed.)

Service information on the status page

An example of the service status page is shown below. (Note the details born by status page my differ from a firmware version to another.) Most of the service information is located under *Service information*.

Most of these service information on the status page are alphanumerically-coded. Each item is explained next page.

Details of service information



*The example mentioned above is a FS-1000 model.

Service information

Service information	
[F2-49][0.09][11/05]	Total page 9690
① ② ③	④
/t/P00/S00/F00/N00/RS2/AF.H/G	
⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫	
/0104/0026/1061/8811/ 0/ 0/ 0/	
⑬ ⑭ ⑮ ⑯ ⑰	
/101010	
⑱	
/030303	
⑲	
SPD1:0203040508090A0B0C0D0F101112131415161718191A1B1C1D1E1F202122235E	
	⑳
/8088808880806E80	
	㉑
SN: _____	
	㉒

Example	Meaning	Description
① [F2-49]	Engine ROM version-Product ID	49= FS-1000, 88= FS-1000+
② [0.09]	Boot ROM version	-
③ [11/05]	Internal use	-
④ Total page 9690	Total count page	-
⑤ t/	Internal use	-
⑥ P00/	Parallel interface mode	bit 7= 0: No error with bidirectional communication, 1: Error with bidirectional communication bit 6= 0: No ECP communication, 1: ECP communication had occurred, at least one bit 0 to 5= History of printer parallel port directional communication.
⑦ S00/	Serial interface error	05= Nibble (High-speed), 07= ECP 00= Normal, bit 0= Framing error bit 1= Overrun, bit 2= Parity error

Example	Meaning	Description
⑧ F00 /	Operator panel lock (Shown only during locking)	01= Partially locked 02= Fully locked
⑨ N00 /	NVRAM error (Shown only if error has occurred)	01= ID error, 02= Version error, 03= Checksum error, 04= NVRAM error
⑩ RS2	Serial interface mode (Shown only optional serial interface board IB-10E is installed)	RS2= RS-232C, RS4= RS422A
⑪ / AF . H	Average print coverage (total)	Two digits for integer part; one digit for decimal; unit is in percent
⑫ G	Average print coverage (most recent 20 pages)	B= Level 1 (Less than 0.5 %) C= Level 2 (0.6 to 1.0 %) D= Level 3 (1.1 to 2.0 %) E= Level 4 (2.1 to 3.0 %) F= Level 5 (3.1 to 4.0 %) G= Level 6 (4.1 to 5.0 %) H= Level 7 (5.1 to 10.0 %) I= Level 8 (More than 10.0 %)
⑬ / 0104	Top margin	Inches+ ¹ / ₁₀₀ inches (FRPO L1/L2)
⑭ / 0026	Left margin	Inches+ ¹ / ₁₀₀ inches (FRPO L1/L2)
⑮ / 1061	Page length	Inches+ ¹ / ₁₀₀ inches (FRPO L1/L2)
⑯ / 0811	Page width	Inches+ ¹ / ₁₀₀ inches (FRPO L1/L2)
⑰ / 0 / 0 / 0 /	Left margin offset for paper source (MP tray/Printer's cassette/Optional paper feeder's cassette)	in ¹ / ₆₀₀ inch
⑱ / 000000	Paper type setting	Paper type for trays 0, 1, and 2
⑲ / 030303	Print density setting	Print density for trays 0, 1, and 2
⑳ SPD	DRAM SPD (slot 1)	
㉑ 4044404480806E80	Engine parameter information	Hexadecimal, 8 bytes (16 digits)
㉒ SN :	Serial number for the printer	

Appendix C I n t e r f a c e

Appendix C Contents

- Parallel interface C-3**
 - Selecting the parallel interface mode C-3
 - Parallel interface pin assignment C-4
 - Parallel interface signals C-5
- Serial interface (Optional) C-6**
 - Changing the serial interface configuration C-6
 - Serial interface signals C-8
 - RS-232C interface voltage levels C-8
 - RS-422A interface voltage levels C-8
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 - RS-422A C-10
 - Protocol C-10

Parallel interface

The printer uses a bidirectional parallel interface for high-speed data transmission for the host computer. This interface includes the buffers which are compatible with the IEEE 1284 standards. The parallel interface provides support for the ECP and nibble modes in this standards. The parallel interface mode can be changed by commanding Prescribe commands on a PC.

Selecting the parallel interface mode

To change the parallel interface mode, a PC running MS-DOS is needed. Connect the printer to the PC via the parallel interface. Then, at the DOS prompt, type a FRPO O0 (the letter O and the number zero) command as follows depending on the desired parallel mode:

To set the parallel interface mode...	Type at the DOS prompt...
Normal	<code>echo !R! FPRO O0, 0; EXIT; lpt1:</code>
High-speed	<code>echo !R! FPRO O0, 1; EXIT; lpt1:</code>
Nibble*	<code>echo !R! FPRO O0, 5; EXIT; lpt1:</code>
Automatic	<code>echo !R! FPRO O0, 70; EXIT; lpt1:</code>

*: Factory-set default.

Parallel interface pin assignment

The pins of the parallel interface connector carry the signals listed below. The function for each signal is detailed on the following page.

No.	Terminal	Signal	No.	Terminal	Signal
1	nStrobe	(STBIN1/2*)	19	Ground	GND
2	Data1	(PAD0)	20	Ground	GND
3	Data2	(PAD1)	21	Ground	GND
4	Data3	(PAD2)	22	Ground	GND
5	Data4	(PAD3)	23	Ground	GND
6	Data5	(PAD4)	24	Ground	GND
7	Data6	(PAD5)	25	Ground	GND
8	Data7	(PAD6)	26	Ground	GND
9	Data8	(PAD7)	27	Ground	GND
10	nAck	(ACKOUT)	28	Ground	GND
11	Busy	(BUSYOUT)	29	Ground	GND
12	PError	(PERROR)	30	Ground	GND
13	Select	(SELECT)	31	nInit	(INIT*)
14	nAutoFd	(AUTOFD*)	32	nFault	(FAULT*)
15	Not defined	NC	33	Not defined	Pull-up (1k Ω)
16	Logic ground	GND	34	Not defined	NC
17	Chassis ground	GND	35	Not defined	Pull-up (1k Ω)
18	Peri-logic H	(VCC)	36	nSelect In	(SELECTI*)

Maximum rated current for pin 18 is 1.0 A (fused).

Parallel interface signals

The following table provides details for the signals used on the printer's parallel interface. Note descriptions in [] are for high-speed mode of the parallel interface.

Signal	Meaning
Strobe* [nStrobe] (Pin 1)	A negative-going Strobe* pulse causes the printer to read and latch the data on the Data 0 [1] to Data 7 [8] signal lines.
Data 0 [1] to Data 7 [8] (Pins 2 to 9)	These eight signals form the data byte sent from the host computer to the printer. Data 7 [8] is the most significant bit and Data 0 [1] is the least significant bit.
Acknowledge* [nAck] (Pin 10)	This signal is returned to the host computer. This negative-going pulse acknowledges the previous character received by the printer. Acknowledge* pulses are sent only when Busy is low.
Busy [Busy] (Pin 11)	This signal is returned to the host computer. This signal is high when the printer is busy and low when it is able to accept more data. Every high-to-low transition is followed by an Acknowledge* pulse.
Paper Empty [PError] (Pin 12)	This signal is returned to the host computer. This signal goes high when the printer runs out of paper.
On-Line [Select] (Pin 13)	This signal is returned to the host computer. This signal is high when the printer is on-line and low when the printer is off-line. It goes low when the upper unit is raised, or when the ON LINE key is pressed to set the printer off-line. <i>Note:</i> The Paper Empty and On-Line signals are not used unless enabled by the FRPO command (O2 parameter).
Auto-Feed [nAutoFd] (Pin 14)	This signal is used in the Epson version of the Centronics interface to receive a carriage return. In high-speed mode, it is used as an interrupt.
+5 V DC (pin 18)	This line is connected to the printer's +5 V DC line (+5 V \pm 0.5 V, 1.0 A maximum, fused).
Prime [nInit] (Pin 31)	This signal is used in the standard Centronics interface to enable the computer to reset the printer. It is ignored by the printer.
Error* [nFault] (Pin 32)	When the high-speed parallel line control is on (FRPO O2 = 2), this line returns error status to the host computer.
Auxiliary output 1 (Pin 33)	This signal line is not used.
Power Ready (Pin 35)	This signal is high when the printer's power is on.
Select In [NSelectIn] (Pin 36)	This signal is used in some versions of the Centronics interface to enable the computer to force the printer on-line. In high-speed mode, it is used as an interrupt.

Serial interface (Optional)

The printer is equipped with an optional slot for adding a serial port. To add a serial port, the serial interface board IB-10E is equipped.

The device responsible for controlling the serial interface is integrated in the gate array in the controller system. The serial interface supports both protocols of RS-232C and RS-422A.

Toggling the protocol between RS-232C and RS-422A is made by a shorting jumper socket that is accessible on the main board. (The jumper wire arrangement, that used to be provided for the succeeding models to switch the DTR polarity is not used with these models.) To change the serial interface protocol, refer to *Changing the serial interface configuration* section which follows.

A 25-pin D-sub connector is used for the serial interface. The extra signals used for RS-422A are assigned to these pins that are not used for RS-232C according to the IBM pin assignment scheme.

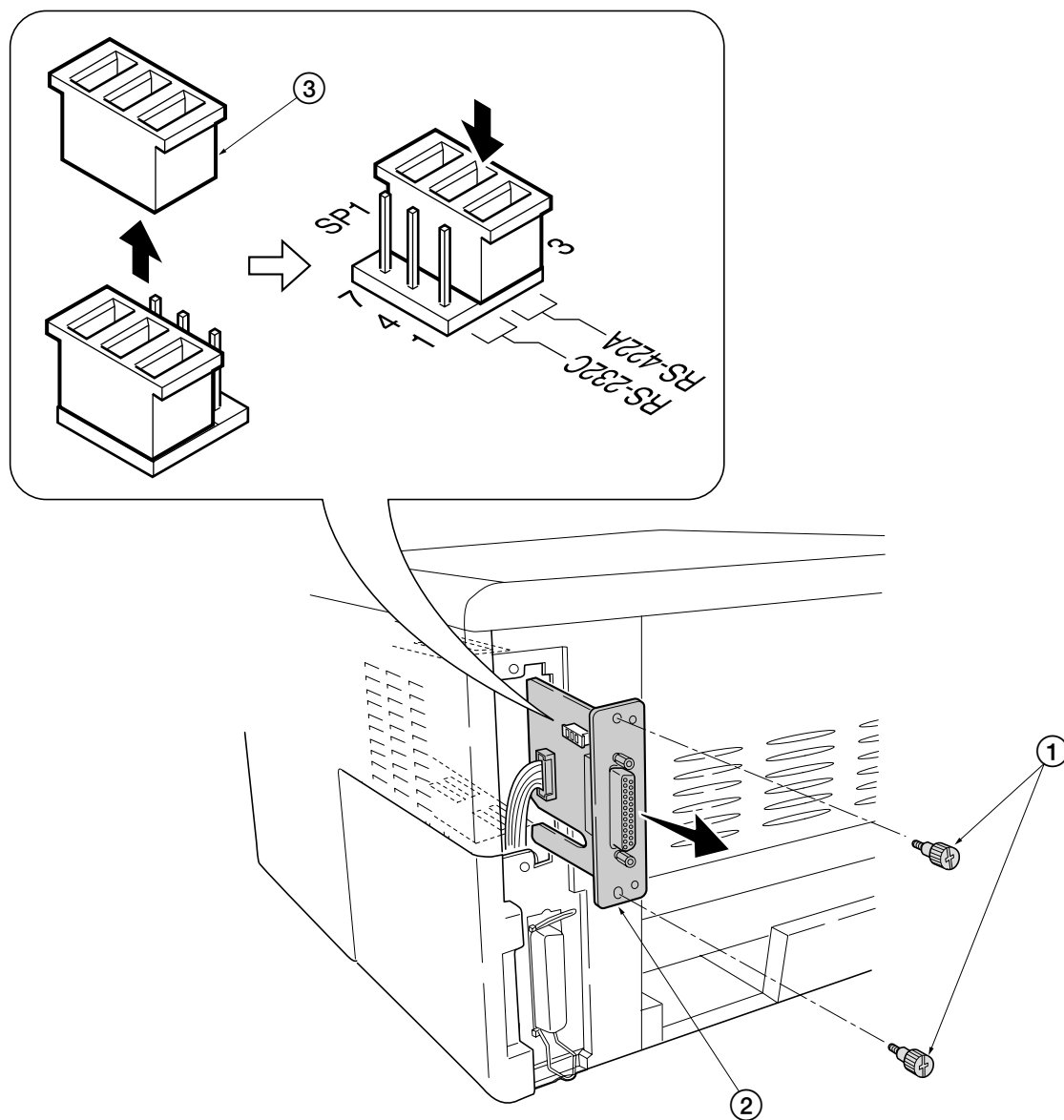
Changing the serial interface configuration

To change the serial interface protocol from RS-232C to RS-422A, or vice versa, the IB-10E board must be taken out from the printer. Protect the electronics by taking these precautions:

CAUTION Before touching the main board, touch a water pipe or other large metal object to discharge yourself of static electricity. While doing the work, it is recommended that you wear an antistatic wrist strap.

Touch the main board only by the edge.

Remove two thumb screws ① then draw the serial interface board IB-10E ②. To change the serial protocol from RS-232C to RS-422A, for example, carefully remove the jumper connector ③ on the serial interface board IB-10E ②. Reconnect to the pin position as shown in the diagram. Replace the serial interface board IB-10E ② back into the printer. Secure the board by the thumb screws.



Serial interface signals

The following table provides details for the signals used on the serial interface board IB-10E.

Signal	Meaning
FG (Pin 1)	This pin is connected directly to the printer frame.
TxD (Pin 2)	RS-232C only: This output carries asynchronous data sent by the printer to the computer. It is used mainly in handshaking protocols.
RxD/RDA (Pin 3)	This input carries serial asynchronous data sent by the computer to the printer. In RS-422A, this carries the inverted differential data (RDA).
RTS (Pin 4)	This output is always held high (above 3 V).
CTS (Pin 5)	Unused.
DSR (Pin 6)	Unused.
SG (Pin 7)	All signals can transmit between the printer and the host computer to send each signals with a signal ground.
SDA (Pin 8, 9)	This output transmits asynchronous inverted form of differential data from the printer to the computer.
SDB (Pin 8, 10)	This output carries asynchronous non-inverted form of differential data from the computer to the printer.
DTR (Pin 20)	This output is used as a buffer nearly-full handshake line. It is held high (above 3 V) when the buffer can accept more data.

RS-232C interface voltage levels

The voltage levels of the RS-232C signals conform to EIA RS-232C specifications. FALSE is from 3 volts to 15 volts. TRUE is from -3 volts to -15 volts. Voltages between -3 volts and 3 volts are undefined. The voltage levels of the RS-422A signals are equivalent to those of the RS-232C signals except the signals used for transmission and reception.

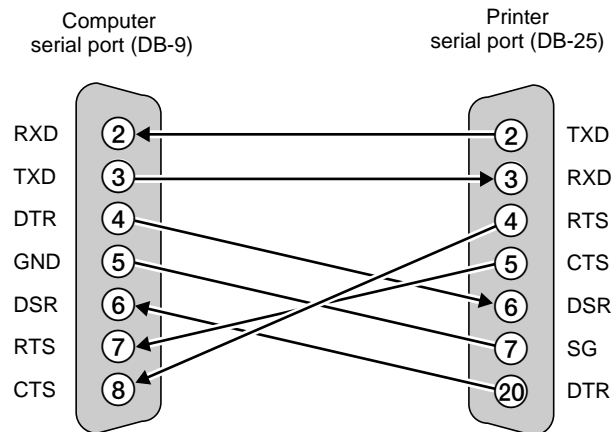
RS-422A interface voltage levels

The interface signal voltage levels for RS-422A conforms with the EIA RS-422A standards. The differential voltage ranges is from 200 mV to 6 V.

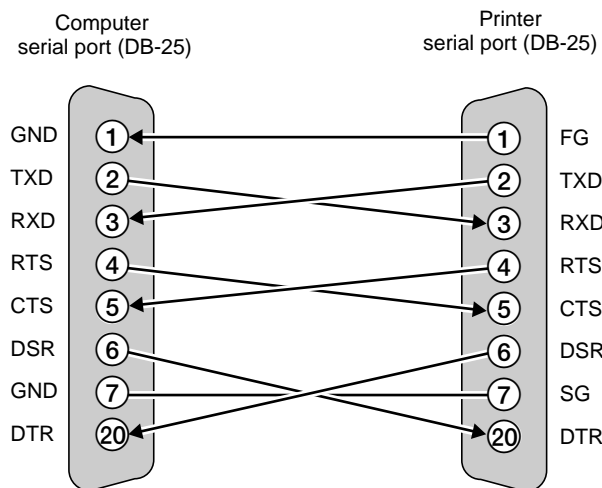
Connector configurations

The printer uses a DB-25 connector for the serial interface. Depending on the computer configurations for serial interface, use either of the appropriate configurations. A special cable must be prepared or obtained for the RS-422A configuration by referring to the diagram (last) below.

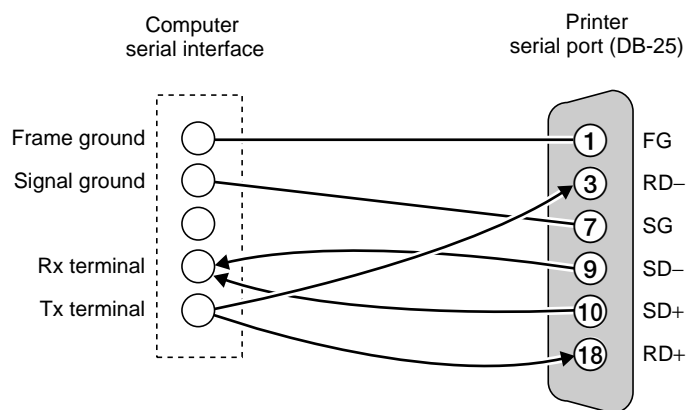
RS-232C - For computers with a DB-9 connector



RS-232C - For computers with a DB-25 connector



RS-422A



On the computer serial port, investigate pin assignments depends on the computer manufacture's instruction. Since the RS-422A configuration does not employ control lines except for data transmission/reception, select a mode in which signals such as DTR are not used.

Protocol

The serial interface supports the full baud rate of: 1200, 2400, 4800, 9600, and 19200, 38400, 57600 and 115.2 k (bps). For adjusting serial interface parameters including baud rate, parity, etc., refer to optional *Serial interface board IB-10E User's Manual*.