![KYOCERA]

Service manual

L A S E R   P R I N T E R Ecosys FS-600/680

The model FS-600 printer was designed by the world-famous F.A. Porsche consultancy. The FS-600 has 4-ppm and the FS-680 has 8-ppm printing speed.

FS-600/680 Service Manual

Notice

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

No responsibility is assumed if accidents occur while the user is following the instructions in this manual. No responsibility is assumed for defects in the printer's firmware.

The contents of this manual are protected by copyright. No part of this manual may be reproduced or copied by any means without the permission of the copyright holder. The printer's firmware (contents of its read-only memory) is similarly protected by copyright.

This Kyocera printer uses PeerlessPrint5 to provide the HP LaserJet IV compatible PCL5e language emulation. PeerlessPrint5 is a trademark of the Peerless Group, Redondo Beach, CA 90278, U.S.A.

This product was developed using the Tornado™ Real Time Operating System from Wind River Systems.

Trademark Notice

Prescribe is a registered trademark of Kyocera Corporation. PRESCRIBE IIe, KIR, Kyocera Image Refinement, Ecosys, and Ecotone are trademarks of Kyocera Corporation.

Diablo 630 is a product of Xerox Corporation. IBM Proprinter X-24E is a product of International Business Machine Corporation. Epson LQ-850 is a product of Seiko Epson Corporation. HP LaserJet 5Si and HP-7475A are product of Hewlett-Packard Company. Hewlett-Packard, PCL, and HP-GL are registered trademarks of Hewlett-Packard Company. Centronics is a trade name of Centronics Data Computer Corp.

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.

Check that the cable is wired correctly. If an IBM communication adapter cable type 1502067 is used, it will have to be resoldered the wiring at the printer end of the cable. The procedure is as follows.

Conventions

Throughout this manual, the following conventions are used:

Color is available when viewed online to emphasize important notices.

CAPITAL letters are used to name printer parts and assemblies.

Italic letters refer related chapters or sections or documentations.

Bold letters are also used for emphasis wherever italics may cause a confuse.

This symbol followed by Warning denotes that the following paragraph(s) includes precautions which, if ignored, could result in personal injury, and/or irrevocable damage to the printer.

When followed by Caution this symbol denotes that the following paragraph(s) include the precautions which, if ignored, could result in damage to the printer.

About the chapters ...

The service manual applies to the printer models Ecosys FS-600 and FS-680. It provides various information on servicing the printer, divided into the following chapters:

Chapter	Contents
One——Product information	Includes printer specifications, product appearances, safety information, etc.
Two——Installation and operation	Provides how to install and operate the printer.
Three——Maintenance	Instructs maintenance to be conducted periodically on the printer.
Four——Operation overview	Explains basic functions of the printer methcnism including engine and logic controller systems.
Five——Disassembly	Instructs removal of parts for replacing them.
Six——Troubleshooting	Provides countermesure to follow for troubleshooting.
Appendix	Contents
A——Printer interface	Information regarding the printer's parallel and serial interfaces.
B——Status page	Explains detail of the service information on the status page.
Separate	Contents
Parts catalogs	Information of parts for ordering.

The manual will be supplemented with chapters or appendixes accordingly.

REVISION HISTORY

Version	Date	Replaced pages	Remarks
1.00a	31-Oct-97	—	KE distribution only
1.10	15-Dec-97	1-14, 2-10, 4-11, 4-18, 4-19, 4-22—25, 4-27, 4-29, 4-30, 4-34, 4-39, 4-44, 6-3, 6-12, 6-14, 6-16, 6-18, 6-19, 6-21—25	
2.00	22-Dec-98		Inclusion of the FS-680 [8-ppm]

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Chapter One   Product Information

Chapter One Product Information 1

Printer Specifications

Engine

Item	Specification
Print method	Electrophotography laser scan
Print speed (when printing multiple copies of the same page)	FS-600—6 pages/min. FS-680—8 pages/min.
Resolution (dpi)	600 horizontal/600 vertical
Smoothing	KIR 2 (2400 horizontal/600 vertical)
First print (A4 or letter, 23°C), depends on input data	25 seconds or less (55 seconds or less reverting from sleeping)
Warm-up time at 23°	30 seconds or less
Maximum duty cycle (A4)	8,000 pages/month
Process unit life expectancy	100,000 pages of printing or 3 years
Developing	Dual component developer
Laser diode	Invisible laser
Main charger	Roller charger
Transferring	Biased roller
Separation	Curvature separation
Drum cleaning	Blade
Drum discharging	Not used
Fuser	Heat and pressure
Paper	Plain paper: Letter or A4 to A5 universal
Capacity of paper feed trays (80g/m2 [0.11 mm thickness])	Cassette—150 sheets, manual—1 sheet
Capacity of output trays (80g/m2 [0.11 mm thickness])	Face-up—10 sheets, Face-down—150 sheets

Controller

Item	Specification
CPU	PowerPPC401GF/50 MHz
System/font ROM size	4 MB, DIMM
Main (video) RAM	4 MB
Additional RAM (SIMM)	32 MB (72-pin SIMM × 1); max. main RAM—36 MB
Host interface	Parallel: High-speed, bi-directional (IEEE1284), Option, KUIO
Page description language	Prescribe Iie
Standard emulation modes	HP LaserJet 5P, IBM Proprinter X24E, Diablo 630, Epson LQ-850

Weight and dimensions

Item		Specification
Main unit (excl. protrusions)	Width	36.3 cm (14.3")
	Height	22.2 cm (8.7")
	Depth	36.0 cm (14.1")
	Weight	8.5 kg (19 lb.)
Paper feeder PF-16 (excl. protrusions)	Width	56 cm (22")
	Weight	36.3 cm (14.3")
	Height	7.3 cm (2.8")
	Depth	37.0 cm (14.6")
	Weight	1.1 kg (4 lb.)

Power requirements

Item		Specification
Voltage/cur-rent require-ments	**US/Canada**	120V AC ±10%, 60Hz ±2%/4.3A
	Europe/Asia	220-240V AC±10%, 50 or 60Hz ±2%/2.1A
Watts	**Maximum**	485W (230V) or 510W (120V)
	Normal operation	FS-600—175 W FS-680—200 W
	Standby	FS-600—49 W FS-680—62 W
	Sleeping	10 W

Environmental requirements

Item	Specification
Operating temperature and humidity	10°C to 32.5°C (50°F to 90.5°F), 20 to 80% RH
Maximum altitude	2,000 m (6,500 feet)
Noise emission (Excluding peaks, measured at 1m from printer, as per ISO7779)	46 dB (A) maximum/25 dB (A) at standby/unmeasurably low at sleeping)

Names of parts

Face-up output tray

Buttons and indicators

Paper cassette

Manual feed tray

Parallel interface

Slot cover for option interface

Power receptacle

Power switch
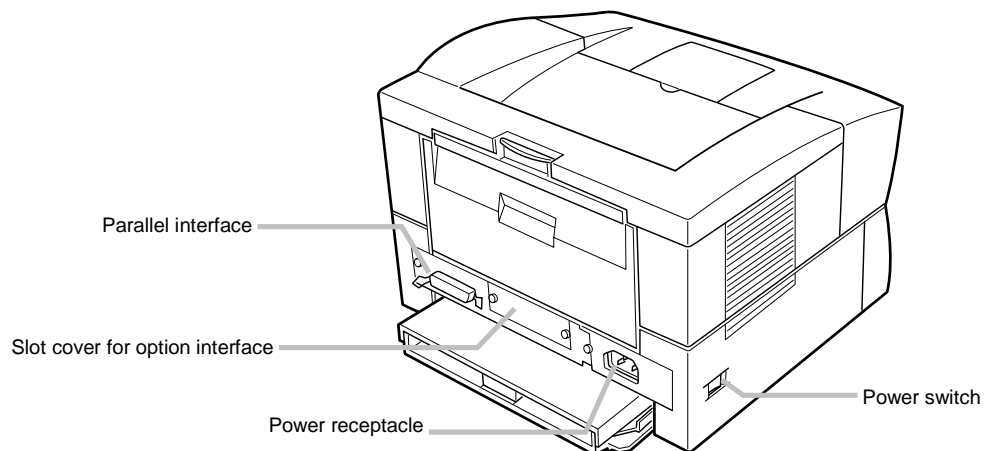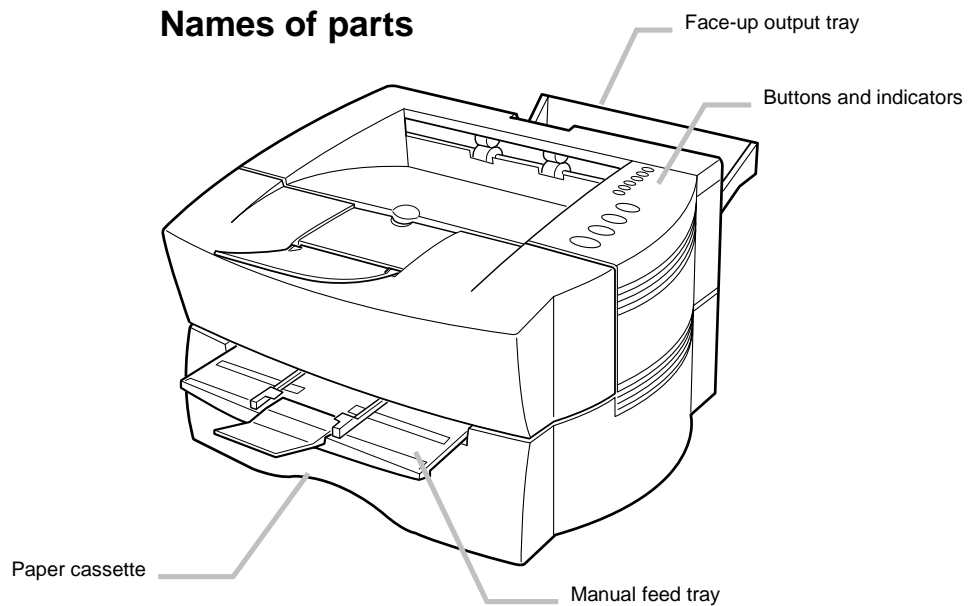
Safety information

Laser notice for service person (U.S.A.)

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.

Class I laser products are not considered to be hazardous. The printer contains internally a Class IIIa (3a) laser that is nominally a 5 milliwatt laser operating in the wavelength region of 780 nano-meters. The laser system and printer are designed so there is never any human access to laser radiation above a Class I level during normal operation, user maintenance, or prescribed service condition.

Laser caution label on the scanner unit

The laser product label is (identification and certification label) is located on the rear side of the printer as below.
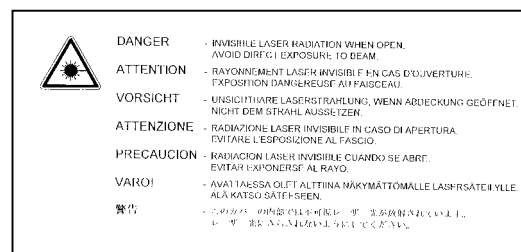
Product ID labels (Ex.—FS-600)

KYOCERA FS-600
220-240V∿   50Hz   2.1A
KYOCERA CORPORATION
MADE IN JAPAN
CLASS 1 LASER PRODUCT TO IEC825
LASER KLASSE 1 NACH IEC825
KLASSE 1 LASER PRODUKT I.H.T IEC825
LUOKAN 1 LASERLAITE
CE   energy ★
ACN003852444   KYOCERA ECO-PRODUCT
TÜV Rheinland   GS   geprüfte Sicherheit

KYOCERA FS-600
120V∿   60Hz   4.3A
KYOCERA CORPORATION
MIE PLANT TAMAKI BLOCK
704-19 NOJINO, TAMAKI-TOWN
WATARAI-COUNTY, MIE PREF. JAPAN
MANUFACTURED : RM
THIS LASER PRODUCT CONFIRMS TO THE APPLICABLE REQUIREMENTS OF FEDERAL REGULATIONS 21 CFR CHAPTER 1, SUBCHAPTER J
FC Tested To Comply With FCC Standards   energy ★
FOR HOME OR OFFICE USE
C (UL) LISTED 8J68 UL 1950 (UL) KYOCERA ECO-PRODUCT
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 meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.
MADE IN JAPAN

Europe/Asia version   US/Canada version

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

See page 5-9 for the location of this label.

	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	- RADIACION LASER INVISIBLE CUANDO SE ABRE. EVITAR EXPONERSE AL RAYO.
	VARO!	- AVATTAESSA OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASERSÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN.

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.

Ozone concentration

Laser printers generate ozone gas (O_3) which may concentrate in the place of installation and cause an unpleasant smell. To minimize the concentration of ozone gas, we recommend that the laser printer not be installed in a confined area lacking ventilation.

FCC notice (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 communication. 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.

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

Interference cable to the computer shall be used with shielded circular cable.

Any modification without prior permission may cause harmful interface. 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.

Option equipment

The printer may be optionally installed with the following units, with compliance with class B limits:

PF-16—250-sheet paper feeder

IB-10—RS-232C/RS-422A serial interface board kit

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.

FS-600/FS-680

Canadian Department of Communications compliance statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité aux normes du ministère des Communications du Canada

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

ISO 7779

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

Environmental requirements

Environmental conditions

The Environmental requirements section on page 1-6 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 sturdy 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 (See section Power requirements on page 1-5). (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 1-6). 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 page 1-15.)

Clearance

Allow the necessary minimum clearance on all sides of the printer (below). A total space of 67 by 126 cm is needed.

Clearance	Dimensions
Left ❶	5 cm (2")
Front ❷	50 cm (19.6")
Right ❸	25 cm (9.8")
Back ❹	40 cm (15.7")
Above ❺	30 cm (11.8")
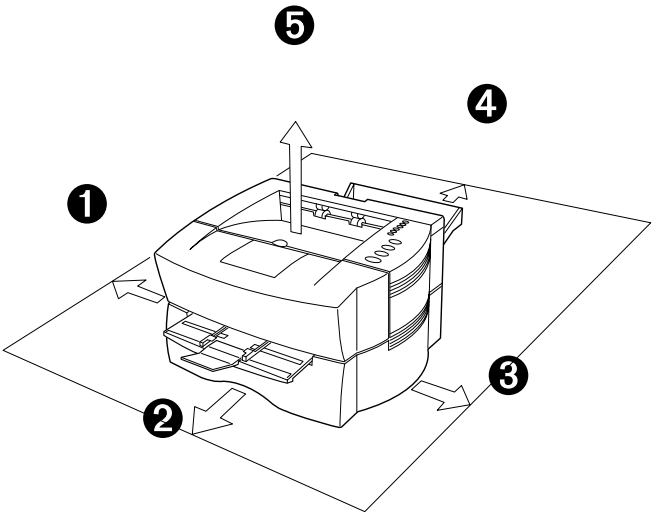
Places to avoid

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 humigating 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 6500 feet or 2000 meters above sea level.

Note on power

Use only the power source voltage conforming to the printer's rated power voltage (See section Power requirements on page 1-5). Do not use other power sources.

Disconnect the printer from the power source before attempting removal or re-placement 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 incocrporated in the printer's AC primary circuit, an easily accessible socket outlet must be provided near the equipment.

Wornung—Da kein Trennschalter in den Wechselstrom-Primärkreis des Druckers eingebaut ist, muß eine leicht zugängliche Steckdose in der Nähe des Gerätes vorhanden sein.

FS-600/FS-680

About the toner

The printer should use Kyocera TK-16 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 the 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 for control over how such refilled toner could affect the print quality and the reliability of the printer.

Toner container handling

To loosen and mix the toner inside before use, with the label side down, thoroughly shake the toner container (in the direction of the arrow) 5 times or more.
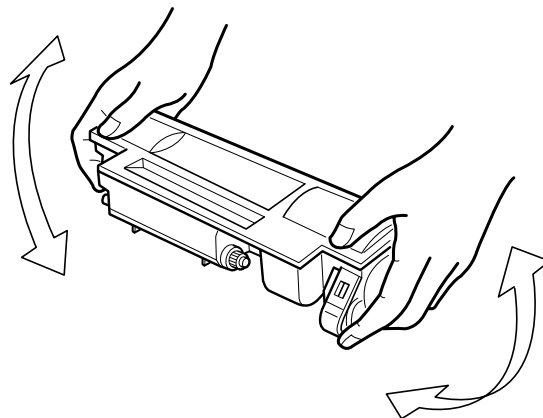
Caution—Do not attempt to disassemble or refill the toner container.

Toner 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 satisfy the following environmental conditions:

Temperature	-20°C to 40°C (-4°F 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 Two   INSTALLATION/OPERATION

Table of Contents

Unpacking

Unpacking and inspection

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

Printer

Power cable

TK-16 toner container

Installation manual

Quick reference

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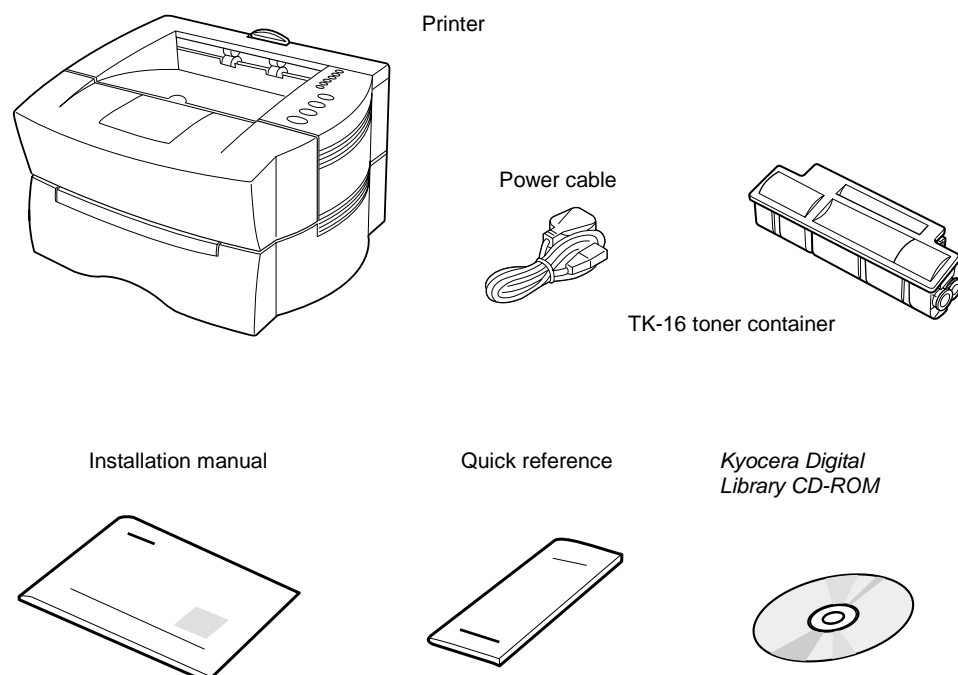
For unpacking, place the box containing the printer on a flat, stable surface. Remove the manuals, toner kit, and other items located on top of the spacer and remove the spacer. Carefully remove the printer. Obtain help from other persons if necessary.

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*, below.

Connecting the printer and the paper feeder

Align the pins ❶ and the connector ❷ on the paper feeder with the matching holes and the connector located at the bottom of the printer, then slowly lower the printer onto the paper feeder.

2-5
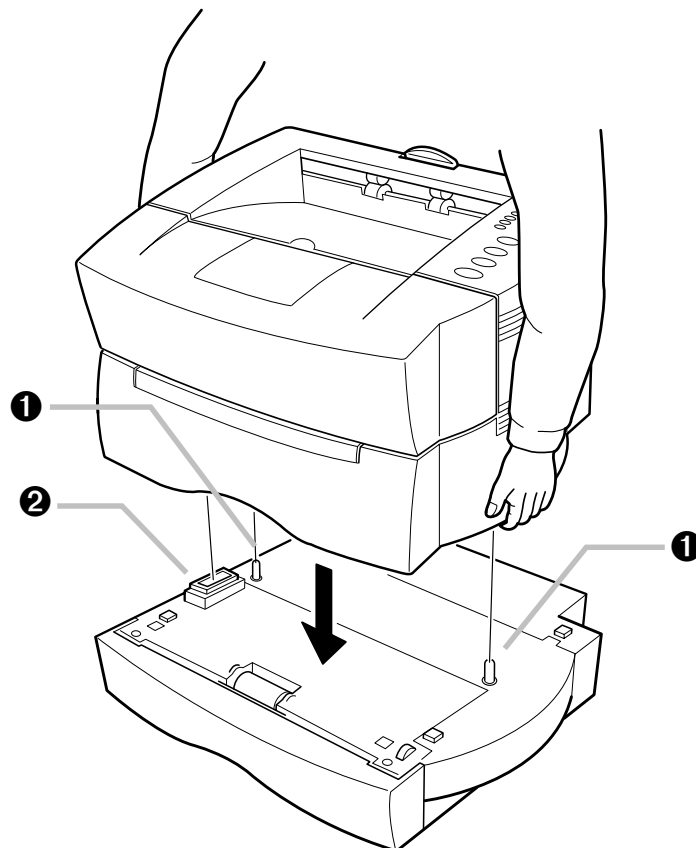
Getting the process unit ready for use

The printer comes with the Process unit (PU-16) factory-installed inside. The Process unit must once be taken out from the printer for a simple treatment that must be done before use. To do this, proceed as follows.

Caution—The drum in the process unit is sensitive to light. Do not expose it even to normal office lighting (500 lux) for more than five minutes.

Caution—Handle the process unit with care. Avoid impact on it. Do not touch the green or blue surface of the drum in the process unit.

Open the top cover. Holding the Process unit like below, take the Process unit carefully out.
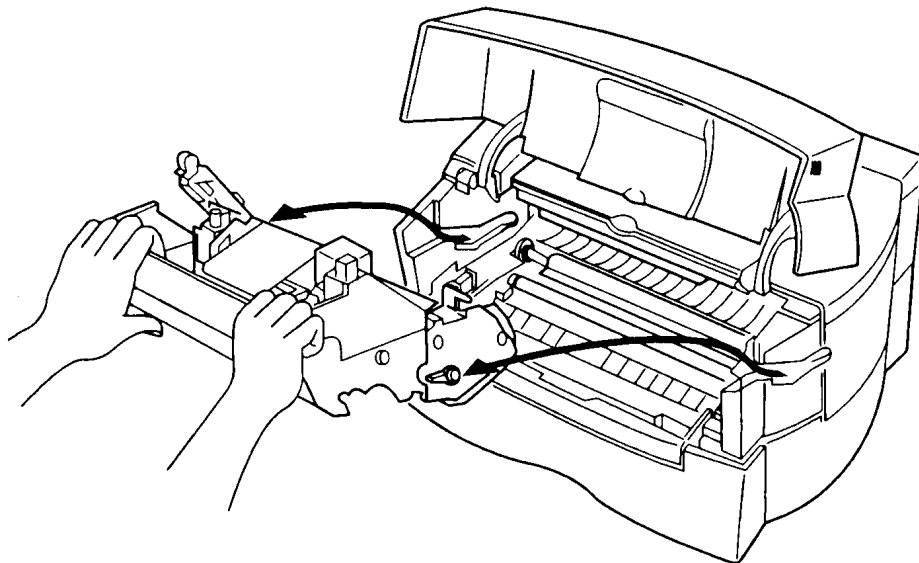
Pull and remove the process unit protective seal.
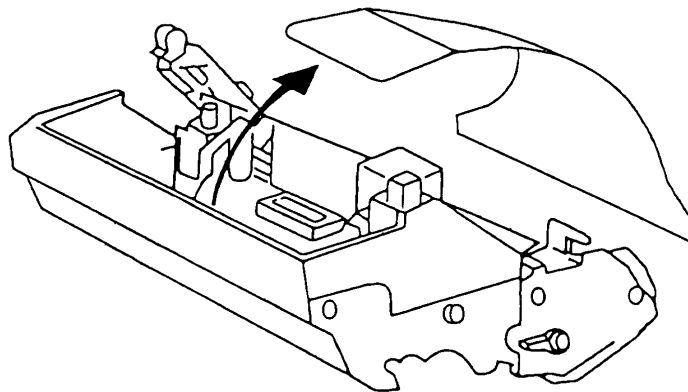
Note——Retain the protective seal. It will be necessary for the possible future shipment of the Process unit.

Give the process unit a horizontal shake of 5 times or more.
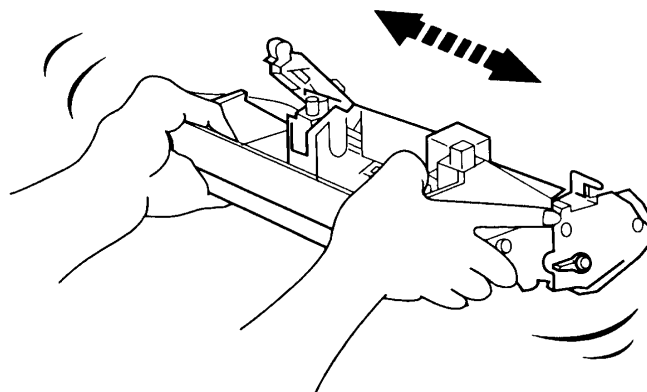
Install the process unit in the printer. In doing so, be sure to align the locating keys on the Process unit with the slots in the printer.
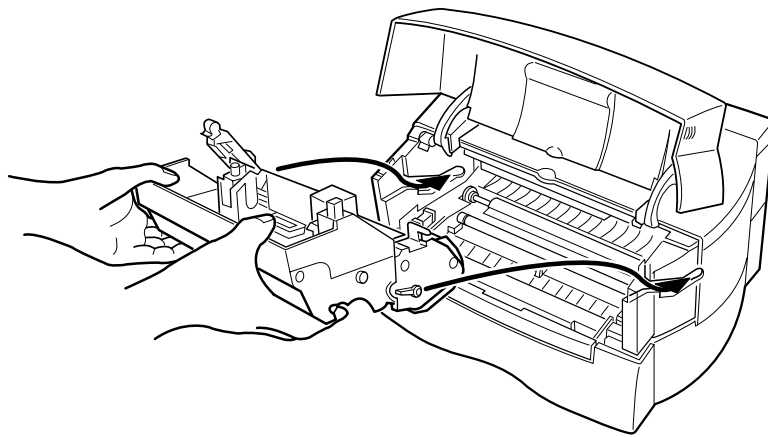
⚠️ *Important note on shipping the printer——If the printer is to be shipped or transported, be sure to replace the (original) protective seal onto the Process unit. If the Protective seal is not available, contact Kyocera. (There will be certain difficulty when removing the Process unit fitted with a protective seal from the printer.)*

Installing the toner container

Take the toner container from the protective bag. Shake the toner container with the protective seal (orange color) ❶ facing up five times or more. This thoroughly mix the toner inside the container.
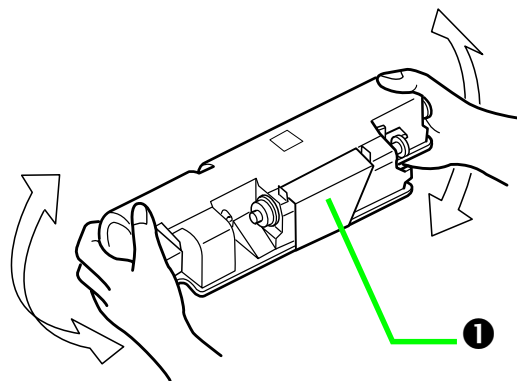
Carefully remove the protective seal.
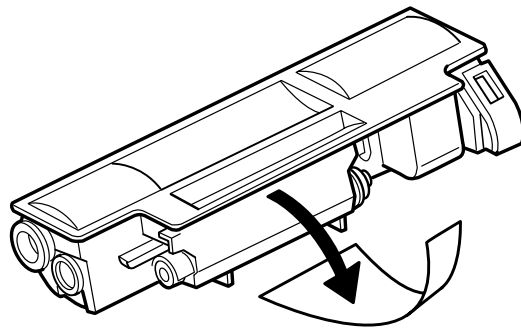
Align the ends of the toner container with the grooves ❷ to the left and right inside the printer and install.
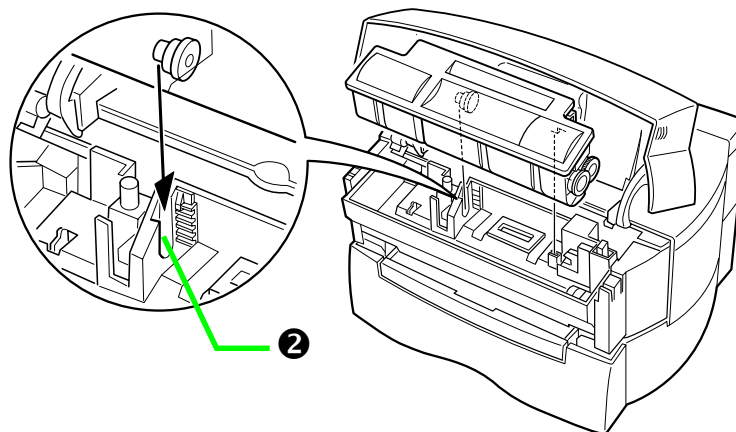
Check that the toner container is installed in the correct position, and push forcedly on the top of the toner container PUSH HERE.
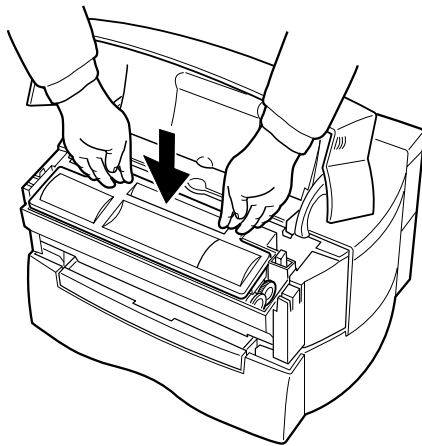
Close the top cover.

Expanding memory

Both printer models come standard-equipped with 4MB of main memory. Printer memory can be expanded to up to the maximum of 36 MB by installing an optional SIMM.

Minimum memory requirements

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

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

SIMM specifications

Memory size in MB	4, 8, 16, 32
Number of pins	72
Access speed	80 ns or faster
Parity	Without
Bus width	32 bits

Notes on handling SIMM

Before proceeding to install SIMM, read the following notes for handling the main circuit board and SIMMs:

- Protect the electronics by taking these precautions:
- Before touching the main circuit 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 circuit board and SIMM only by the edges, not in the middle. See below.
- Follow the instructions the SIMM manufacturer should have provided.
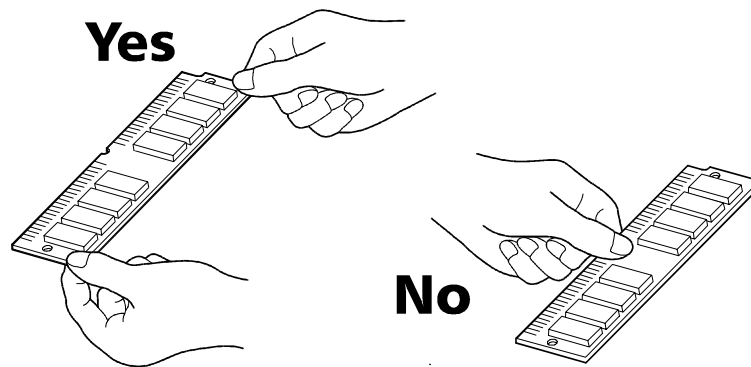
Getting access to the memory sockets

The main circuit board of the printer is equipped with two sockets for memory expansion. Expansion memory is available in the form of SIMM (Single Inline 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 off. Unplug the printer's power cable and disconnect the printer from the computer or the network.

Removing the main circuit board

Turn the power switch off. Unplug the printer's power cable and disconnect it from the host computer or network. Remove two screws ❶ and draw the main circuit board ❷.
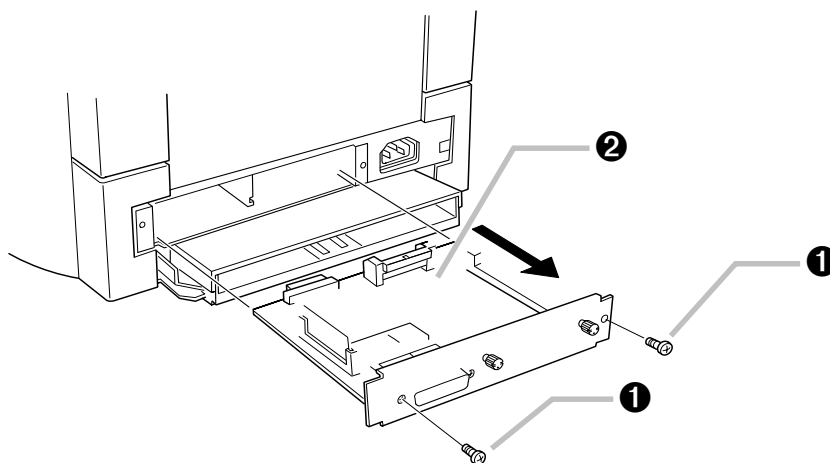
Caution—When the main board is open, use care to avoid foreign objets from entering the main board area. Otherwise, a serious damage to the printer could result.

Locate the socket for expansion SIMM on the main controller board by referring to the diagram on the next page. The socket has 72 pins and the symbolic code of YS02. See diagram on the next page.

FS-600/FS-680

U04: KPDL ROM socket (See page 2-15.)

Rear panel

Expansion SIMM socket

YS02
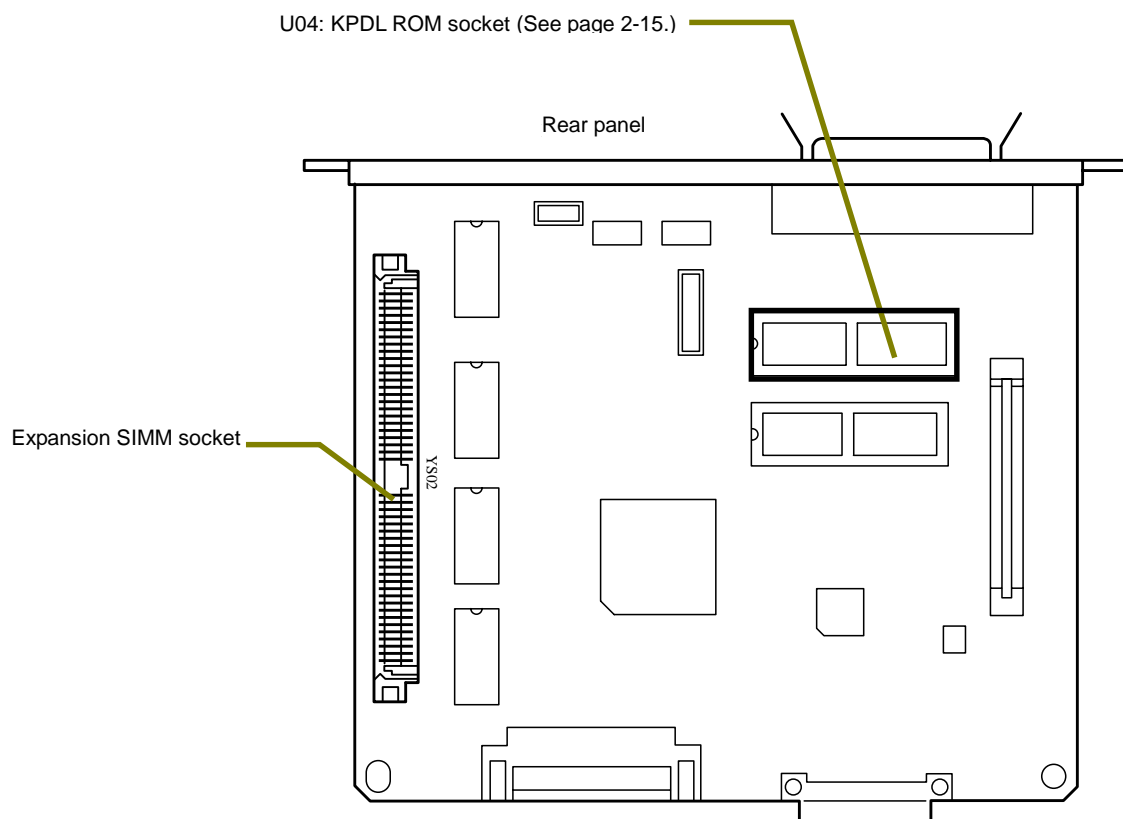
Inserting SIMM

Insert the SIMM ❶ into the socket ❷ as shown. Carefully push the board upright until it snaps into place. Make sure that the catches at the ends of the socket fit into the holes ❸ at the ends of the SIMM board.

To remove SIMM, use the reverse manner.
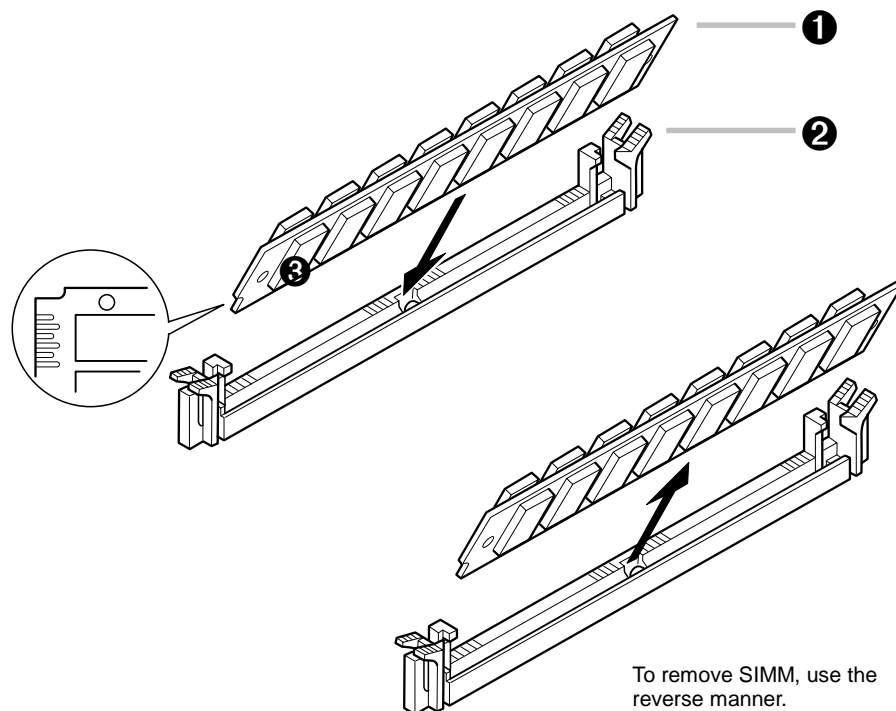
Testing the expansion memory

After installing SIMM 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.

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-1/2/4) into an empty socket on the printer's main circuit board.

For details on KPDL, refer to the *KPDL Upgrade Kit Installation Manual* supplied with PK-1/2/4.

Installing the KPDL ROM

Before installing the KPDL ROM delivered, carefully straighten the pins as follows.
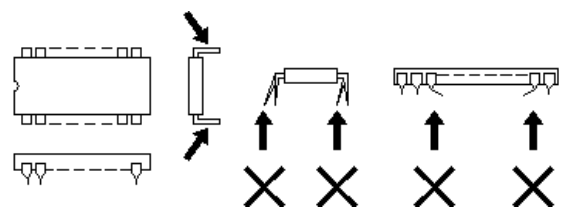
Make sure that none of the pins are bent.

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.

ROM

Socket

"U" indentations
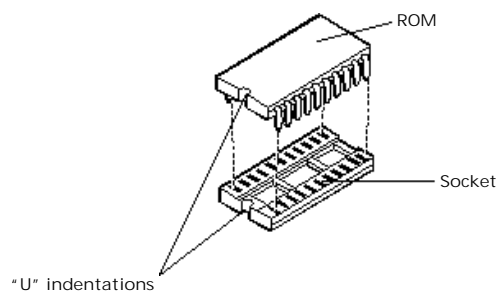
Getting access to the KPDL ROM socket

Refer to the previous section (page 2-11) and remove the printer's rear panel.

Locate the socket for inserting Sthe KPDL ROM. Refer to the diagram on page 2-14. This socket is marked as U04.
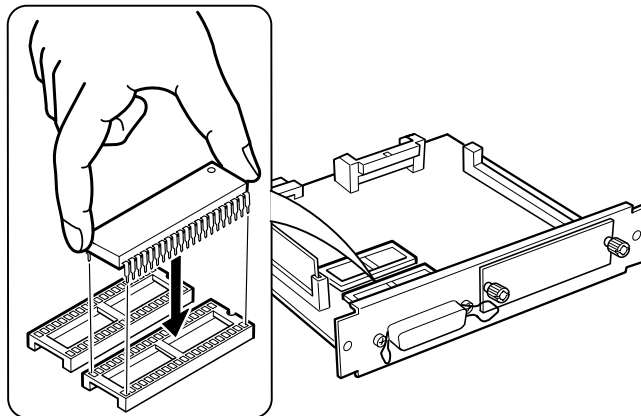
Using the control panel

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

Control panel panel

The printer's control 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.
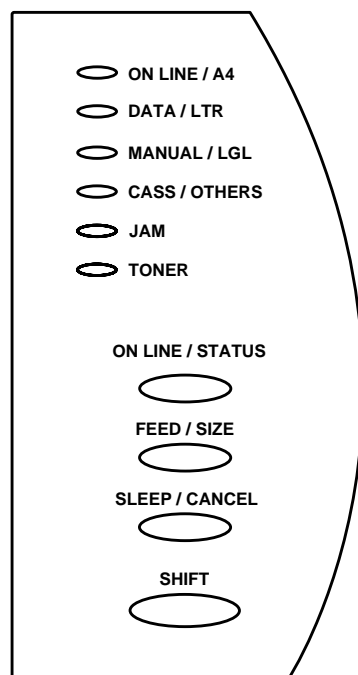
The control panel is detachable and may be replaced to a different language version for local support.

Basic key operation

The control keys are used to configure the printer as follows. For more detailed explanations on these keys, refer to the printer's User's Manual.

Note that these keys have the second function which is invoked when the key is pressed simultaneously with the SHIFT key. See table below.

Key	Function	
	Primary	**Secondary (when pressed with SHIFT key)**
ON LINE/STATUS	Switches the printer online and offline.	Prints a page of status information.
FEED/SIZE	Selects the cassette feed, paper feeder, or manual feed.	Indicates the paper size of the currently selected paper source.
SLEEP/CANCEL	Sets the sleep mode. Pressing this key a second time turns off the sleep mode.	Abandons a printing job, resets numeric values or cancels a setting procedure.
SHIFT	Invokes the secondary functioin of each of the above keys when pressed together.	

Indicators

Indicator	Status	Function
❶—ONLINE/A4	Lit	The printer is on-line and ready to prints received data. Also, indicates that A4 size is selected for the current cassette when the FEED key is pressed together with the SHIFT key.
	Off	The printer is off-line. The printer stores but not prints received data.
❷—DATA/LTR	Flashing	The printer is receiving data from the host computer.
	Lit	The printer is processing the data for printing. Also, indicates that letter size is selected for the current cassette when the FEED key is pressed together with the SHIFT key.
❸—MANUAL/LGL	Flashing	Indicates that there is no paper on the manual feed tray.
	Lit	Indicates that paper is fed from the manual feed tray. (If lit together with CASS/OTHERS, it indicates that paper is fed from the PF-16 paper feeder, if installed.) Also, indicates momentarily that legal size is selected when the SHIFT+FEED/SIZE key is prressed.
❹—CASS/OTHERS	Flashing	Indicates that threre is no paper in the printer's cassette.
	Lit	Indicates that paper is fed from the printer's cassette (If lit together with MANUAL/LGL, it indicates that paper is fed from the PF-16 paper feeder, if installed.) Also, indicates momentarily that A5 [1] size is selected when the SHIFT+FEED/SIZE key is prressed.
❺—JAM	Flashing	Indicates that the top cover is open.
	Lit	Indicates that paper is jammed.
❻—TONER	Flashing	Indicates there is insufficient toner.
	Lit	Indicates that the printer is out of toner. Replace with a new toner container.

---

[1] Factory default. The OTHERS size can be changed by Prescribe FRPO T3 command (0=A5). For details, refer to Presccribe Programming manual in the Kyocera Digital Library CD-ROM.

Replacing the control panel

The control panel is detachable for local language support. Refer to the *Parts Catalog* for availability of the control panel appropriate for your area.

To remove and replace the control panel to a different language version, see next page.

Open the top cover. Insert a small flat blade screw under the control panel at the following point.
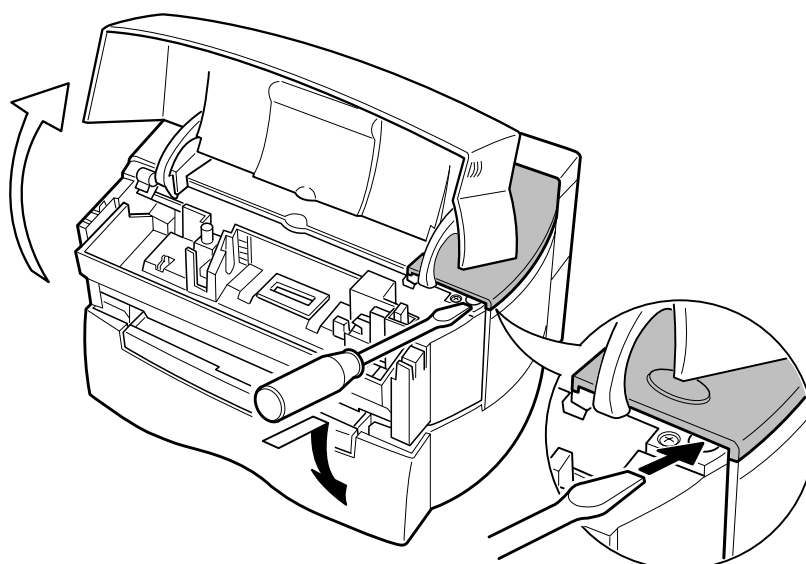
Close the top cover. Remove the control panel by lifting the front side first.
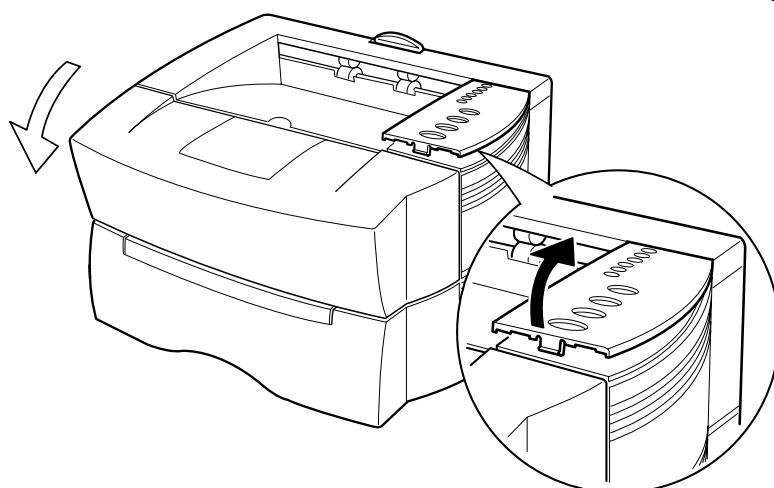
Attach the new control panel with the far end snapped in the printer first, then the front side (using the reverse manner as above).

Chapter Three M A I N T E N A N C E / A D J U S T M E N T S

Chapter three M A I N T E N A N C E / A D J U S T M E N T S

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.

Kit	Module	Nominal life (pages)	Remarks
TK-16	Toner container	3,000	User-replaceable
PU-16	Process unit	100,000	

Toner container

Assuming an average toner coverage of 5% with Ecoprint mode turned off, the toner container will need replacing approximately once every 3,000 printed pages.

Model	Life in pages[1]
TK-16	3,000

When to replace the toner container

When the printer runs low on toner, the TONER indicator flashes on the control panel. Be sure to promptly replace with a new toner kit. Clean the inside of the printer when this initial message appears.

If the printer stops printing while the TONER indicator is lighting, replace with a new toner kit so the printer can continue printing.

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-16 is highly recommended for the optimum operation of the printer.

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

Toner container replacement

To replace the toner container, open the top cover. Pull the toner container release levers to the right position as shown. Lift and pull out the toner container.

Toner container

Use the cap provided in the new toner kit to seal the removed toner container.
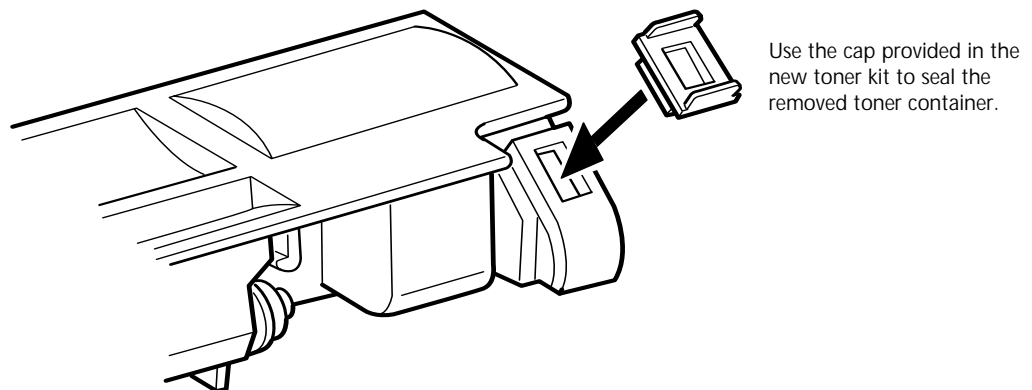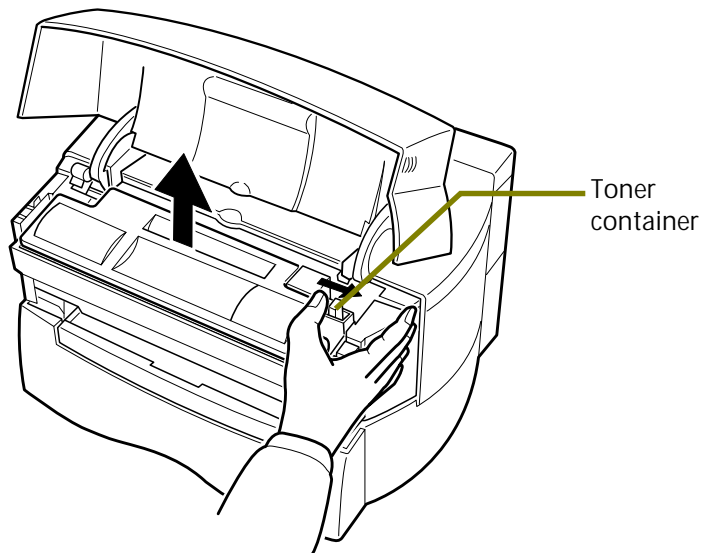
Dispose of the old toner container in the plastic bag supplied in the new toner kit.

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 2-8 to complete installation of the new toner container.

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 application software (when the printer is installed under Microsoft Windows).

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.
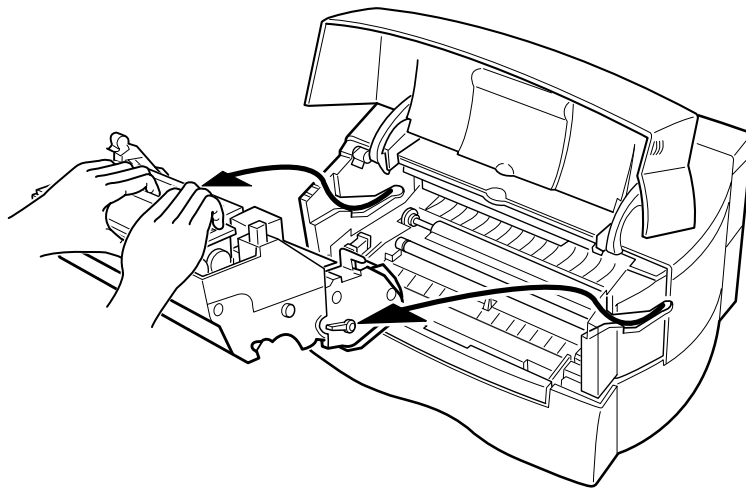
Cleaning the registration roller

Use the cleaning cloth ❶ supplied with the new toner kit. Clean dust and dirt away from the registration roller ❷.
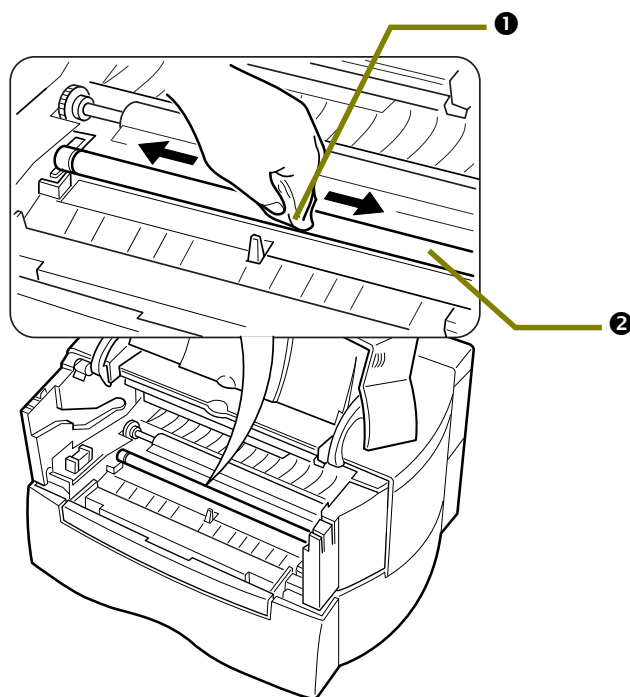
Use the cleaning cloth, clean the laser scanner cover glass ❸ from the bottom side.

BOTTOM VIEW
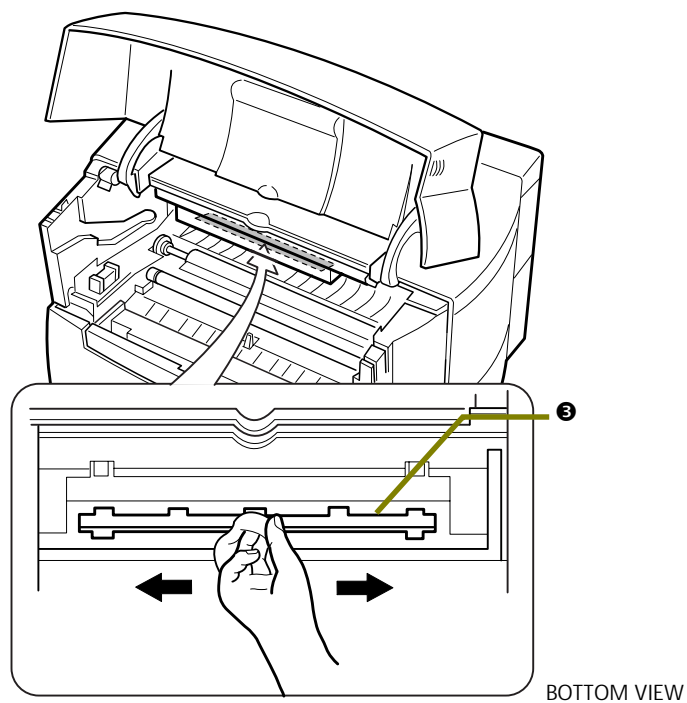
After cleaning is done, install the process unit in the printer, using the reverse manner as above.

Close the top cover.

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 flush memory chip in the printer.

Firmware data format

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

$$ds\underset{\text{\textcircled{1}}}{\boxed{02}}\underset{\text{\textcircled{2}}}{\boxed{44}}.\underset{\text{\textcircled{4}}}{\boxed{dat}}$$

ds ❶ 02 ❷ 44 ❸ .dat ❹

	Identifies…
❶	*de:* Engine firmware data (*) *ds*: Controller (system) firmware data *dm*: Front panel message data (*)
❷	*19*: FS-600 *44*: FS-680
❸	Version of data (2 to 4 digits)
❹	*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-600/FS-680.

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

Downloading controller firmware data

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

Perform in sequence:
Turn printer power on. Make sure the printer is ready.
At the DOS prompt, send the following command to the printer: `!R! UPGR "SYS";` Note—Do not add an EXIT; command in the above.
DOS COPY (/b) the data to download from the host computer.
Turn power off.
Turn power on again. Check the printer gets ready. If not, refer to the section which follows.

Caution—Downloading controller firmware takes several minutes (depending on the processing speed of the computer used). Do not turn power off during downloading.

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

Errors during downloading

The following messages may be indicated by the LED indicators when an error has occurred during downloading firmware data. Take the appropriate corrective action. If the corrective action does not terminate the error, contact Kyocera.

Error message	Meaning	Corrective action
`D0` - Checksum error	Checksum error occurred during downloading. The engine ROM is empty.	Turn printer power off once, then on again. Try downloading again.
`D1` - Machine compatibility error	The data to be downloaded is not compatible with the printer.	Obtain correct data for the printer model.
`D2` – Version compatibility error	The version of the data does not match the current engine version.	Obtain the correct version of data.
`D3` – Data error	The data to be downloaded is corrupted.	Obtain the correct data.

Chapter Four   OPERATION OVERVIEW

Chapter Four   O P E R A T I O N   O V E R V I E W

Electrophotographics system

Electrophotography is the technology used in laser printing which transfers 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 electrophtography system.

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.

- Step 1. Main charging
- Step 2. Exposure
- Step 3. Developing
- Step 4. Transfer
- Step 5. Fusing
- Step 6. Cleaning

Photoconductive drum

The durable layer of organic photoconductor (OPC) is coated over the aluminum cylinder base. The OPC tends 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 unit (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 souce for a prolonged period can cause a print quality problem. The limit is approximately 500 lux for less than five minutes. If the drum unit (process unit) remains removed from the printer, it should be stored in a cool, dark place.

Photoconductive layer

Aluminum base cylinder

4-5
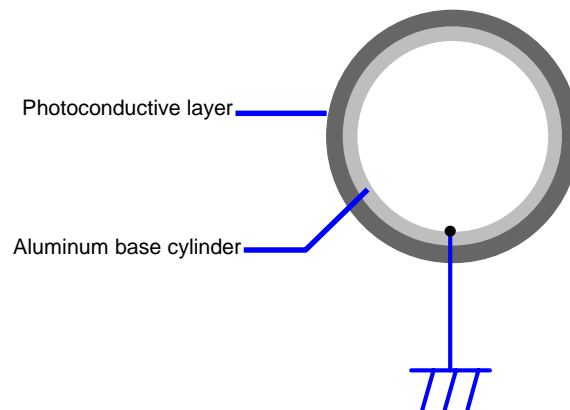
Charging the drum

Figure below is a simplified diagram for explaining how the drum is electrically charged.

The roller charging system that gives electrical charge on the photoconductive drum using an electroconductive rubber roller is used. The rubber roller is pressed against the drum by means of the pressure given by coil springs and rotates following the drum's revolution. The axle of the rubber roller is connected to the high-voltage power supply via the electrically conductive (resin) axle holder. The rubber roller is thus supplied with the AC-bised DC voltage for charging the drum.

The OPC material needs to be negatively charged so as to function as a photo conductor. The negative DC is therefore used for the charging high voltage bias.

The surface of the rubber roller is delicate and should not be touched by hand.

Charger roller
(-680V DC+1.8kV/380Hz AC)

Drum surface potential
(Vo)=-680V±25V

4-6
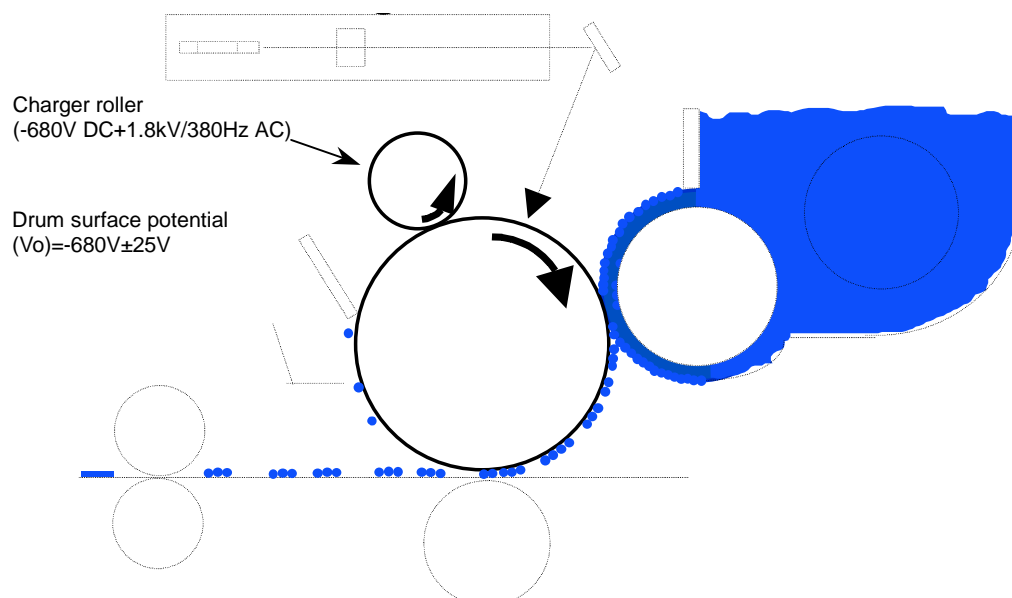
The diagram below is to explain how the DC bias is weighted by AC. Note that the bias is increased to erase the residual latent image while the paper does not exists below the drum unit.

Main motor activation

Paper (length)

1.8 kVp-p (380 Hz)

0.9 kV

0V

-0.9 kV

-1.8 kV

220V

-680V

-1580V
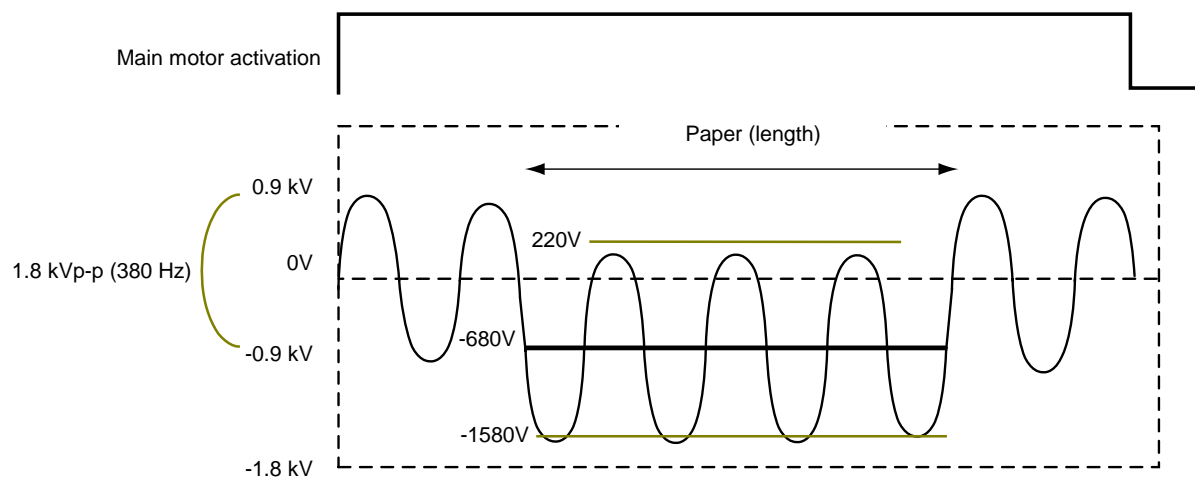
Exposure

The exposure process is done by emitting the laser light onto the photoconductive drum. The laser light (780 nm wavelength) beam is dispersed by scanning use of the polygon motor and polygon mirrors perpendicular to the (portrait) image. Various lenses and mirrors are housed in the scanner unit and used to adjust the diameter of the laser beam and focalize it at the drum surface.
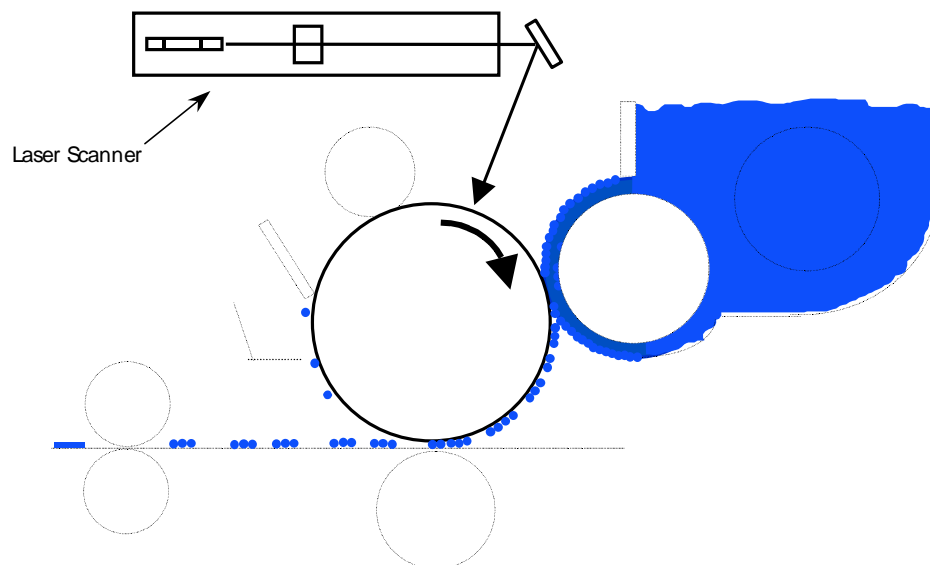
Laser Scanner

A simplified diagram of the laser scanner is depicted as follows.

SCANNER DIAGRAM

Automatic power controller

Downverting mirror

F-theta lens

Towards the drum

Pin photo detector

Cylindorical lens

Laser diode

g
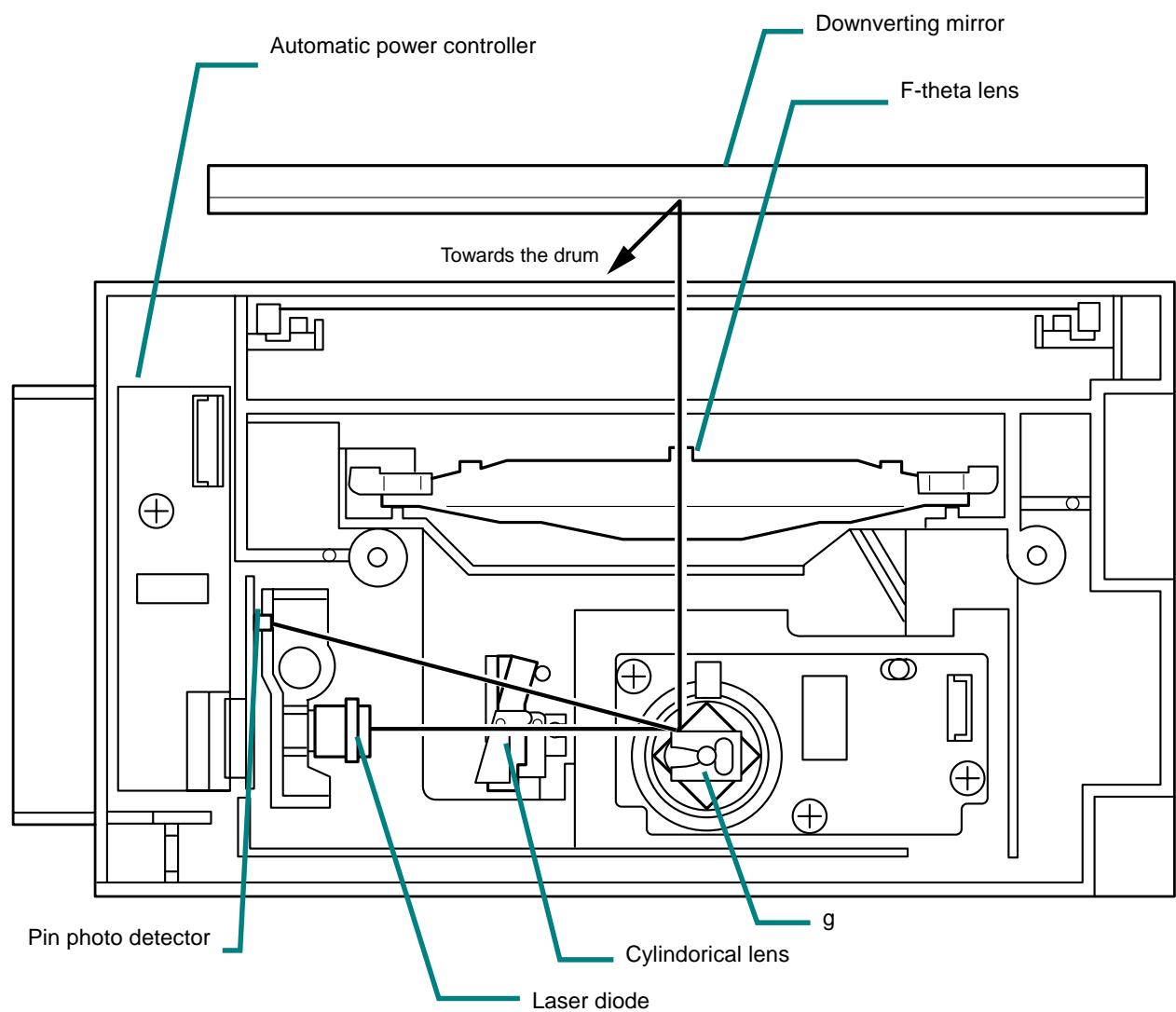
SURFACE POTENTIAL

The laser beam is continually switched 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, 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 "negatively exposed" image.
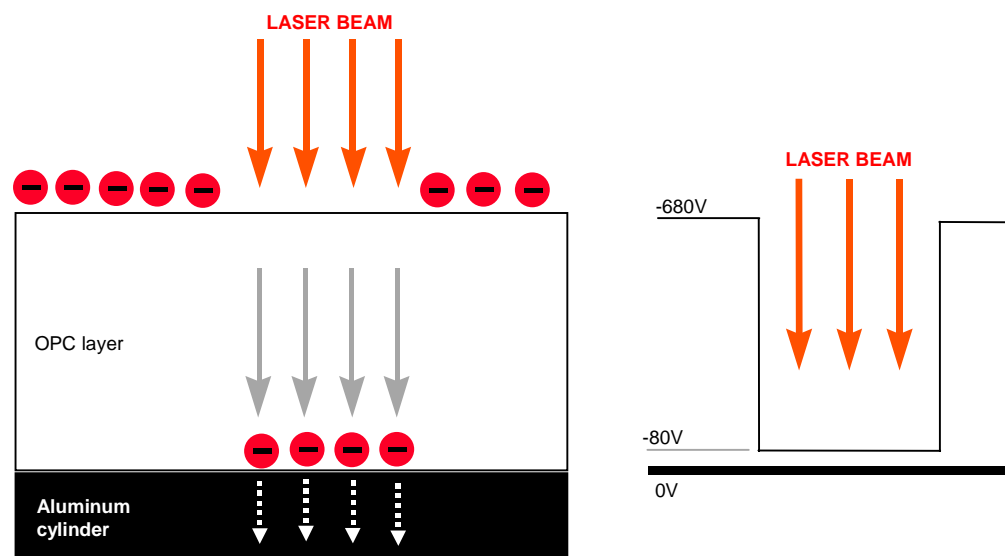
Development

The development process visualizes the electrostatic image on the drum using toner. The dual component development system is used in the printer that uses a mixture of ferrite carrier and toner as the developer powder. These two developing powder are constantly agitated within the developer unit for uniform mixture by the mixers. The mixing ratio (T/C) is monitored by the toner sensor.

As the toner supply dwindles, it is automatically supplied from the toner container (TK-16). Toner is fed from the container when the sponge roller revolves as driven by the toner motor in the developer unit.

The developing powder is adhered on the magnet roller in a constsant thickness. The magnet roller, as it rotates following the drum unit, applies the toner so that it fills the "developing gap" between the drum and the magnet roller.

The toner in the developing powder filling the developing gap is attracted onto the area on the drum that is exposed to the laser light (low potential) and is rapelled in the area not exposed to the laser light. Thus this mechanism develops the toner image on the photoconductive drum according to the print data.

The amount of the carrier powder in the developing powder remains permanently constant as it is caught by the magnetism on the magnet roller.

Anti-background
effect bias

Vo=-680V DC+1.8kVp-p AC (380Hz)

Vd=-450V

Development

-70V
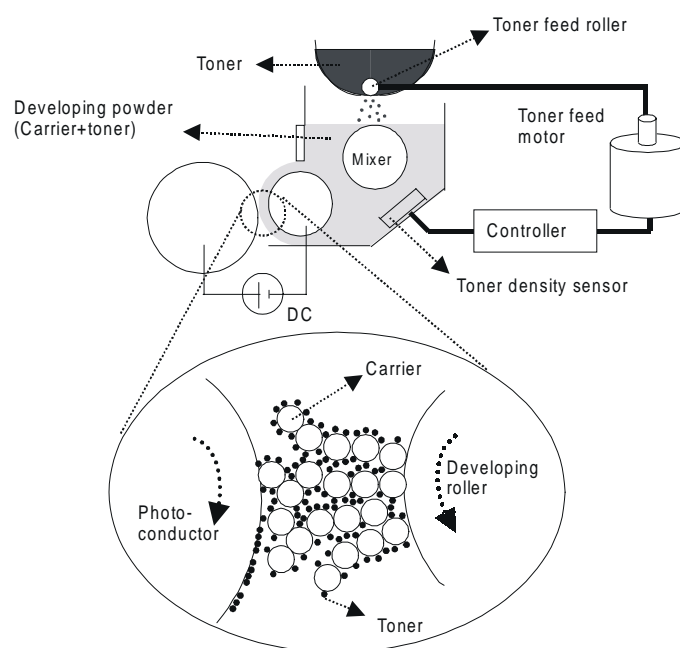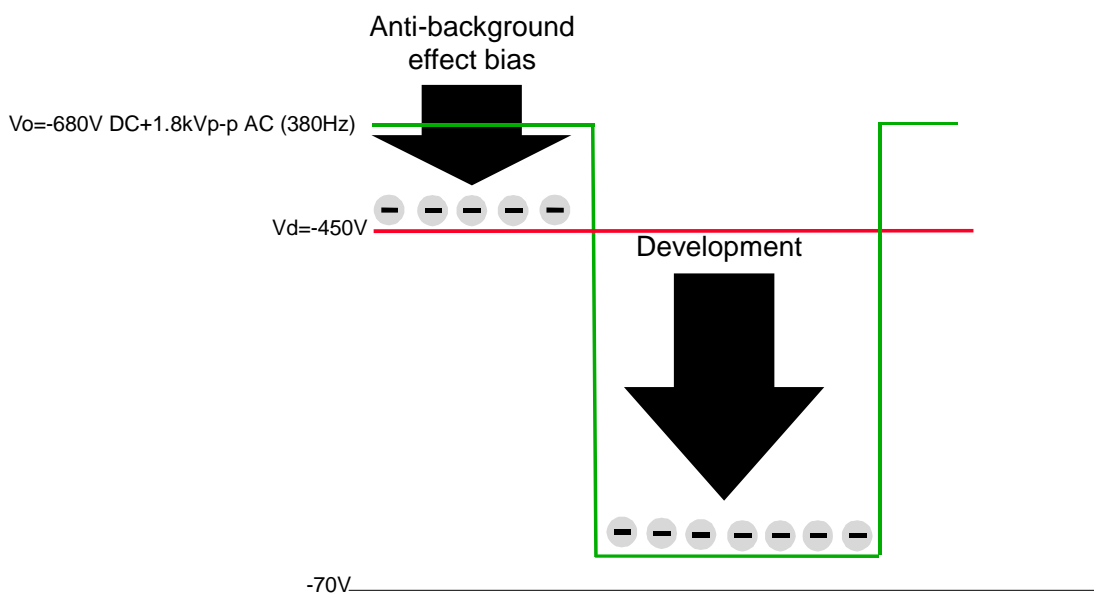
The toner sensor is fit inside the developer unit (process unit) and has the following components. The decrease in the toner-to-carrier mixture ratio at the developer bottom is detected by the toner sensor at its diaphragm. The toner sensor then generates the request the engine controller to drive the toner motor. Subsequently, when the toner-to-carrier mixture is restored, the toner motor stops.

If the sensor's request for feeding toner does not succesfully restore the toner-to-carrier mixture ration, the treatment mode is introduced. Nonetheless the treatment mode is not able to restore it, the printer indicates the message that the toner is run out.

Transfer

The transfer process lets the image developed by the toner on the photoconductive drum electrically transferred onto paper. The conductive rubber roller applies the positive bias at the back side of paper, allowing the negatively charged toner transferred onto the paper. The transfer roller must be handled with great care because oily substances such as grease can harm not only the transfer roller but the photoconductive drum and other components in the general proximity.

Paper

Max. 2.3 kV

Transfer roller
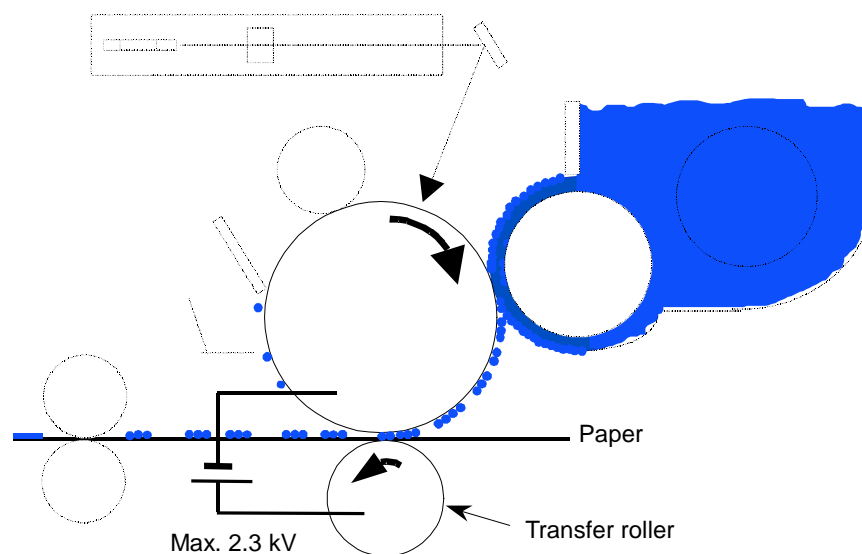
Fusing

The toner on the paper is permanently fused onto the paper as it passes between the heat roller and the pressure roller in the fuser unit. The toner is molten and pressed into the paper.

The heat (top) roller has the halogen lamp which is continuously turned on and off by the thermistor (temperature sensor) to maintain the constant temperature on the heat roller

surface. The temperature is approximately 150°C for model FS-600 and 160°C for model FS-680 while the printer is adle; approximately 165°C for model FS-600 and 182°C for model FS-680 while printing.

The heat roller is resin coated by florin to prevent toner from accumulating on the roller. Care must be taken while handling the heat roller not to scratch the roller surface as doing so may result in print problems. The pressure (bottom) 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.

Fuser
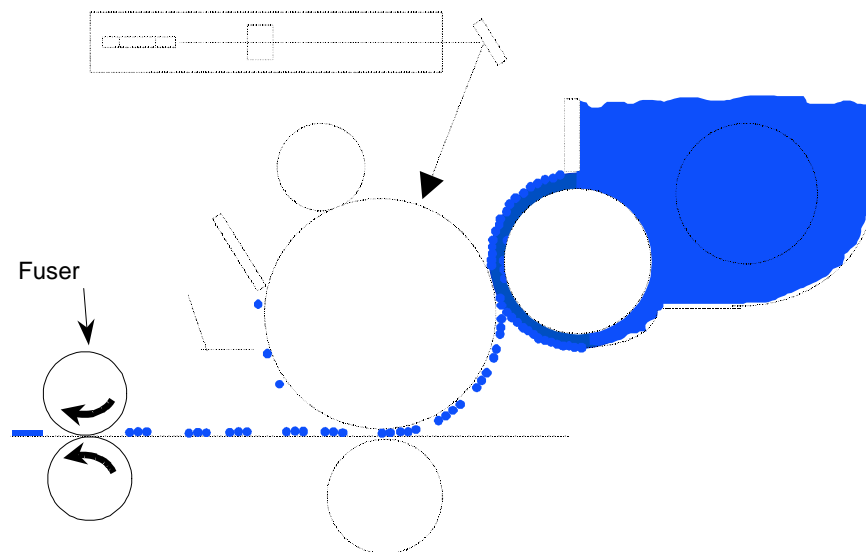
The temperature of the heat roller is constantly monitored by the engine controller using the thermistor and triac. Should the temperature of the heat roller excess the predetermined value, the thermo-cutout is activated to effectively disconnect the power to the halogen heater.

Drum cleaning

After the transferring process, the excessive toner remaining on the drum surface is scraped off by the cleaning blade. The toner is conveyed through the drum unit conveyer for collection in the waste toner reservoir inside the toner container. The maximum capacity of the waste toner reservoir exceeds the amount of the toner inside the toner container, making the chance of toner overfilling unlikely.

The drum surface can be uniformly recharged by the charging roller without requiring the explicit erasure of the residual charge (remaining latent image) for the next electrophotographic cycle.

Cleaning blade
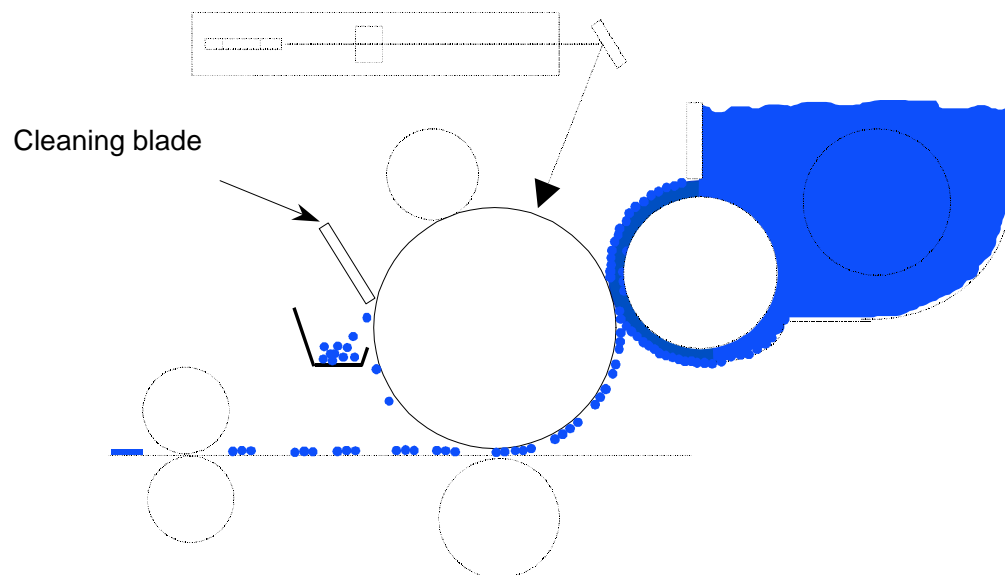
Typical photo process timing chart

The following chart shows the signals used for photo processing. These signals activate the corresponding device in the following timing sequences. A simple description for these signals follows.
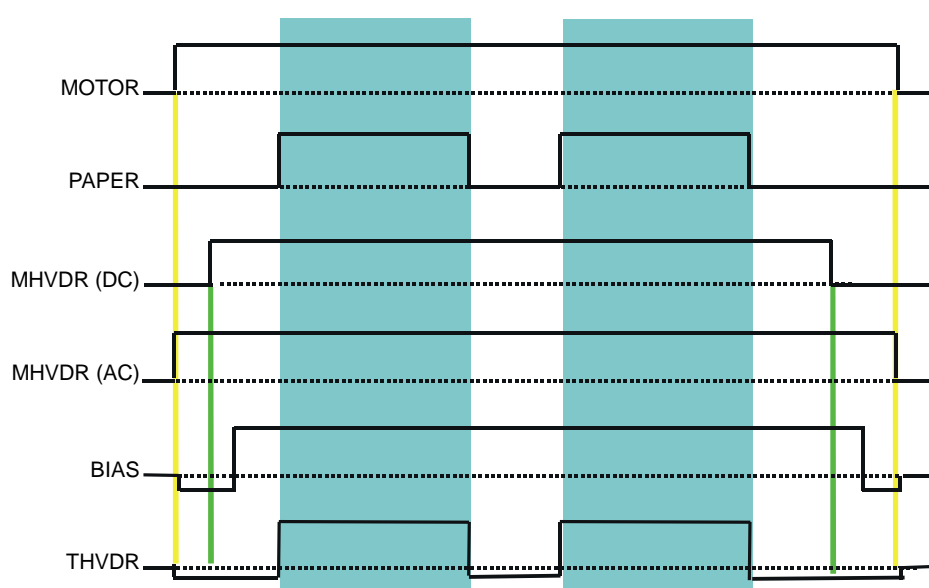
MHVDR (Main High Voltage DRive)——Turns the main charger voltage on and off. The drum is charged when both AC and DC biases are on.

BIAS——Turns the developer bias on in synchronization with charging the drum. The difference of the chargring and developing biases results in the time phase. The reverse bias is applied in other processes than the charging process.

THVDR (Transfer High Voltage Drive——Turns the transfer bias on. The reverse bias is applied while the paper is not present on the transfer roller, preventing contamination at the back of the paper.

Paper feeding system

The paper feeding system picks up paper from the cassette, manual feed tray, or, if installed, the papper feeeder PF-16. Paper is fed at a 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 comprising the paper feeding system and the paths through which the paper travels. The sensors, solenoids, etc., are described in the following pages.

PAPER FEEDING DIAGRAM
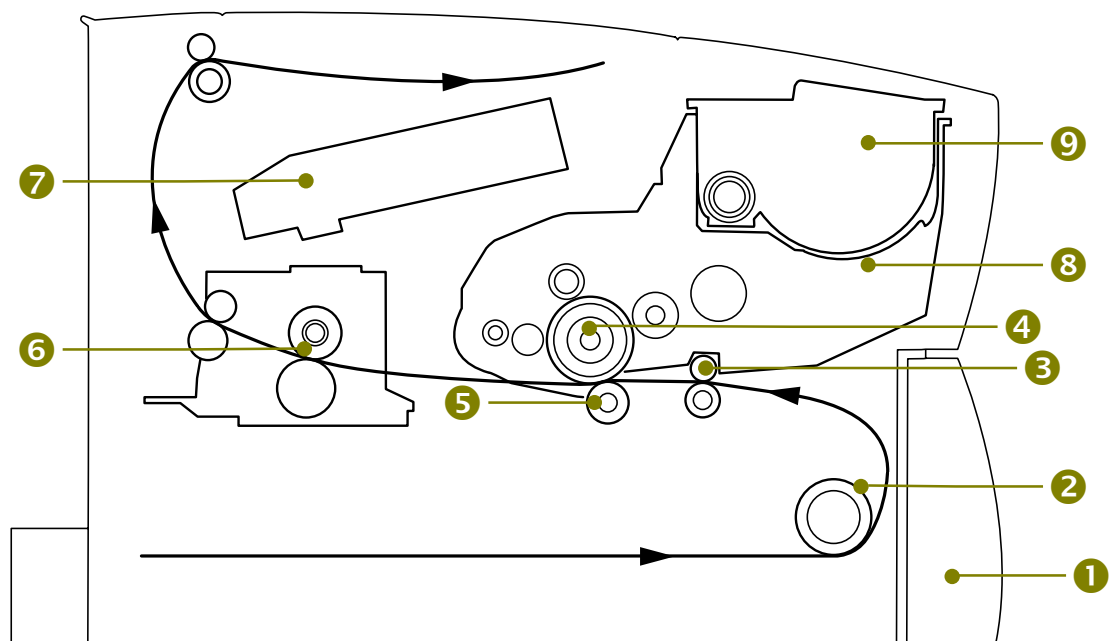
❶ Paper cassette. ❷ Paper feed roller. ❸ Registration rollers+clutch. ❹ Drum. ❺ Transfer roller. ❻ Fuser rollers. ❼ Laser scanner unit. ❽ Process unit [PU-1]. ❾ Toner container [TK-16].

Paper control signals

The following diagram shows signals for controlling sensors and rollers during guiding paper. The engine controller provides these signals in conjunction with the electrophotography process that is driven by the main logic controller system.
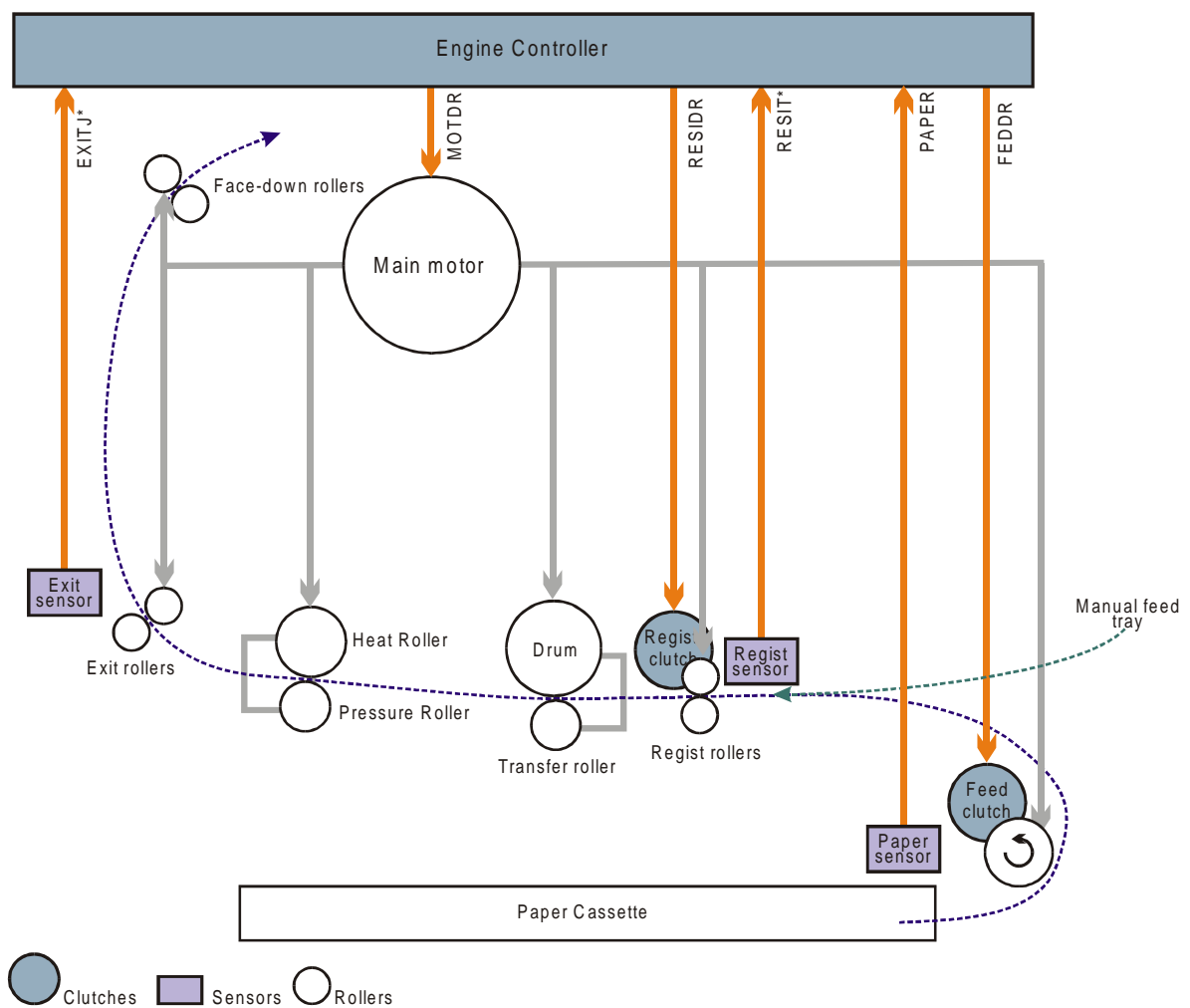
Sensors

A photo penetration type sensor is used for the paper feed sensor, registration sensor, and the exit sensor (fuser).

While paper is not present as shown in ❶, the reflector at one end of the sensor's actuator is normally seated inbetween the photo transmitter and the sensor.

While the paper is present, the reflector is pushed up by the paper and the light is interrupted as shown in ❷, thus triggering the sensor.
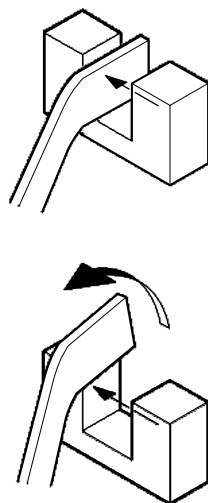
Paper jam sensing

The registration sensor and the exit sensor (at the fuser) keep track of the paper passing through the paper path by metering the time of period elapsed since the registration sensor is triggered.

Paper must also pass the registration sensor when it comes from the paper cassette in a predetermined period of time that begins with energizing of the feed clutch (FEDDR).

In case the trailing edge does not release the sensor at the exit sensor in the predetermined period of time, the engine controller determines that paper is jammed. The engine controller stops printing and call the user's attention by flashing the JAM indicator. When the jammed paper is removed and the top cover or the paper cassette is closed, the printer resumes printing. If paper was jammed after clearing the exit sensor, the same page will not re-printed.

Cassette feeding

The main logic controller sends the PRINT* signal to the engine controller after it has finished processing data. The engine controller CPU then starts the main motor (MOTDR), polygon motor, registration rollers, and the fuser heater. The engine controller then issues the FEDDR signal which connects the main motor power to the paper feed tire. The tire feeds the top sheet in the paper stack in the cassette towards the registration rollers until the paper reaches the registration sensor (RESIT*). As the engine controller sends VSREQ* to the main logic controller, the main logic controller subsequently issues VSYNC* to activate the registration rollers, thus starting to feed paper forwards to the drum.

The paper is advanced to the drum, to the fuser unit, triggering the exit sensor (EXITJ*), and finally delivered either to the face-down or face-up tray as manipulated by the user.

Manual paper feeding

The printer is set to manual feeding mode when the FEED[/SIZE] key is manipulated together to light the MANUAL indicator. In the manual feed more, the paper placed on the manual feed tray is detected by the registration sensor (RESIT*) and the printer does not attempt to feed the paper in the paper cassette.

The printer is also featured with the *automatic manual feed* mode. In the automatic manual feed mode, the printer automatically switches to feeding the paper on the manual feed tray regardless of the current paper feed source. This mode is activated by simply setting the printer off-line and placing the paper on the manual feed tray. Then, when the DATA indicator begins flashing, the ONLINE[/STATUS] key must be pressed to bring the printer back on-line to start printing.

4-21

Basic engine functions

This section presents a general functional overview of the engine system of the printer. It was intended to provide a comprehensive knowledge on basic functions that the engine system performs during printing. The following printer functions are covered:

- Engine controller system
- Main logic controller system
- Paper feed system
- Power supply system

Engine controller system

The engine controller provides control over all print engine activities. It drives laser depending on the video data transmitted from the main controller, provides control over the devices for paper transportation, such as motors, clutches, solenoids, the heater lamp, the eraser, etc., and collects information given by the sensors.

The engine controller is also responsible for the following systems, explained step by step through the following pages:

Laser scanner control

In order to activate the laser scanner, the engine controller does the following tasks:

- Generation of timing to forcibly turn on laser

- Laser diode current limit
- Output for laser power control
- Output for beam detection (photo sensor)
- Polygon motor activation
- Detection of polygon motor readiness
- Control for polygon motor output frequency (multi steps)

Polygon motor control

The output frequency signal to the polygon motor is generated by the main logic controller system clock (36.52456 MHz [FS-600] or 45.95012 MHz [FS-680]). The polygon motor has the revolution of 13571 rpm [FS-600] or 17142 rpm [FS-680] and the input frequency is 1357.1 Hz [FS-600] or 1714.2 Hz [FS-680].

As the laser beam reaches the beam detector sensor, the sensor board generates the horizontal synchronous signal (PD*). This signal makes the main logic controller consequently turn the video output signal (VDO*) and the APC signal (LONB*) high which respectively activate the laser light and the APC controller.

The engine CPU attempts to detect the horizontal synchronization signal so that the laser diode is normally triggered. If the horizontal synchronization output is not found after the laser driving current control (LENB*) is set low, the engine CPU recognizes it as the failure on the APC board and gives the E3 error.

Safety interlock

For the safety purpose, and in order for the product to conform to the safety standards required by the U.S. FDA and several European regulations (IEC 825), the printer is facilitated with the safety interlock circuit.

When the top cover is open, the interlock microswitch disconnects DC power (+24V). This causes the engine CPU to forcibly turn down the laser emission.[1] At the same time, the shatter mechanism is activated to block the laser beam not to reach the drum unit.
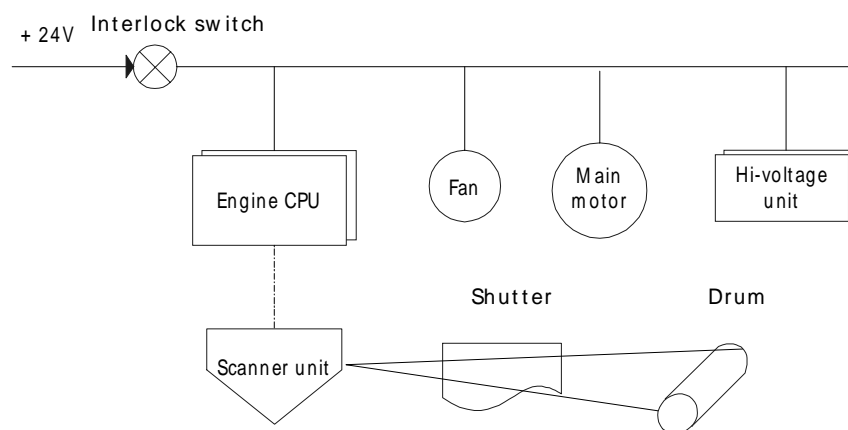
Total page counter and permenent parameters strorage

An EEPROM (Electrically Erasable Memory) is used to retain those information that should be intact even while the printer power is off—total page count and permanent parameters such as margins, fonts, etc.

This EEPROM also keeps information such as the printer's ID (serial number) which should be kept belonging to the printer. Therefore, if the engine controller board (KP-589 [FS-600] or KP-717 [FS-680]) is changed during service, the EEPROM, U202, should be removed from the old board and fit on the new board. Otherwise, all statistic information will be lost.

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[1] The interlock microswitch, when activated as above, disconnects also the high-voltage output, main motor, fan motor, and the semiconductor switch for the fuser heater.

Engine CPU pin assignment

This is a 4 bit CPU, HD404369. The pin assignment is tabled below. The device in the **Related device …** column means those which the signal is forwarded to.

Note that only the pins with meaningful assignment are shown below and those for the power line and ground are excluded.

ENGINE CPU PINS

Pin No	Signal name	Port ID	Direction	Description	Logic	Related device under control
1	LASER*	R60	OUT	Laser emission permission	Negative	Scanner
2	OUTPE	R61	OUT	Video I/F control	Positive	Controller
3	RDY*	R62	OUT	Video I/F control	Negative	Controller
4	VSREQ*	R63	OUT	Video I/F control	Negative	Controller
5	VSYNC*	R70	IN	Video I/F control	Negative	Controller
6	CPRDY	R71	IN	Video I/F control		Controller
7	PRINT*	R72	IN	Video I/F control	Negative	Controller
8	SYSCLK	SCK	IN	Video I/F control		Controller
9	CBSY*	SI	IN	Video I/F control	Negative	Controller
10	SC	SO	IN/OUT	Video I/F control		Controller
11	EGIR*	R03	OUT	Video I/F control	Negative	Controller
20	THERM	R30	IN	Fuser temperature control	Negative	Fuser unit
21	ILOCK*	R31	IN	Interlock detection	Negative	
22	PFPER*	R32	IN	PF-16 paper-empty detection	Negative	PF-16
23	PFSEN*	R33	IN	PF-16 presence detection	Negative	PF-16
24	SBSY*	R40	OUT	Video I/F control	Negative	Controller
25	CINH*	R41	OUT	Video I/F control	Negative	Controller
26	THSBY	R42	OUT	Fuser temperature control		Fuser unit
27	HEAT	R43	OUT	Fuser heater control	Positive	Fuser unit
28	HVON	R50	OUT	High-voltage control	Positive	High-voltage unit
29	MDCON	R51	OUT	High-voltage control	Positive	High-voltage unit
30	VHVDR	R52	OUT	High-voltage control	Positive	High-voltage unit
31	THVDR	R53	OUT	High-voltage control	Positive	High-voltage unit
34	PD*	INT0	IN	Pin photo-sensor input	Negative	Scanner

Pin No	Signal name	Port ID	Direction	Description	Logic	Related device under control
35	MMTCLK	INT1	IN	Main motor clock input	Positive	Main motor
36	PLGRDY*	ENVB	IN	Polygon motor readiness	Positive	Scanner
37	EECS	D3	OUT	E^2PROM chip select	Positive	E^2PROM
38	EESK	D4	OUT	E^2PROM clock	Positive	E^2PROM
39	EEDIO	D5	IN/OUT	E^2PROM data	Positive	E^2PROM
40	KLED1	D6	OUT	Front panel LED control	Positive	Front panel
41	KLED2	D7	OUT	Front panel LED control	Positive	Front panel
42	KLED3	D8	OUT	Front panel LED control	Positive	Front panel
43	KLED4	D9	OUT	Front panel LED control	Positive	Front panel
44	KLED5	D10	OUT	Front panel LED control	Positive	Front panel
45	KLED6	D11	OUT	Front panel LED control	Positive	Front panel
46	EXITJ*	D12	IN	Exit sensor input	Negative	
47	RESIT*	D13	IN	Registratioin sensor input	Negative	
48	FANLOW	R80	OUT	Fan motor revolution control	Positive	Fan motor
49	FANDR*	R81	OUT	Fan motor on/off control	Negative	Fan motor
50	PLGDR*	R82	OUT	PLG motor on/off control	Negative	Scanner
51	PFMDR*	R83	OUT	PF motor on/off control	Negative	PF-16
52	MOTDR	R90	OUT	Main motor on/off control	Positive	
53	FEDDR	R91	OUT	Feed clutch activation	Positive	
54	RESIDR	R92	OUT	Registration clutch activation	Positive	
55	TNMDR	R93	OUT	Toner motor on/off control	Positive	
56	KSW1*	R10	IN	Front panel SW1	Negative	Front panel
57	KSW2*	R11	IN	Front panel SW2	Negative	Front panel
58	KSW3*	R12	IN	Front panel SW3	Negative	Front panel
59	KSW4*	R13	IN	Front panel SW4	Negative	Front panel
60	TNMER*	R20	IN	Toner motor error signal	Negative	Toner motor
61	TONER	R21	IN	Toner sensor signal		
62	TNCON*	R22	IN	Toner container presence	Negative	
63	PAPER	R23	IN	Papser cassette open/close	Positive	
64	THMER	RA1	IN	Thermistor disconnection detection	Positive	

Power supply

The power supply contains the AC and DC power inputs and outputs. The high voltage bias generator circuit is mounted on a separate board. A simplified schematic diagram is shown on a following page.

AC INPUT AND RECTIFIER

The primary AC input power arrives at CN0 and enters AC line filter circuit (L1, C3, C4, etc.). BD1 rectifies it to DC; Q1 provides switching on it for downverting by T1 to develop +24V and +5V AC.

24V DC POWER LINE

The 24V AC appearing at the secondary side of T1 is rectified by D2, smoothed by C15, and distributed through CN1. The 24V DC line is represented as V_{DD} or V_{DDCOM} and used to feed the following engine component:

- Clutches (registration, paper feed)
- Fans
- High-voltage generator (board)
- Main motor
- Motor within the option unit

The 24V DC power is forcibly interrupted for safety whenever the printer's top cover is open. For details, see the **Safety interlock** section, page 4-23.

5V DC POWER LINE

The 5V AC at the secondary output of T1 is rectified by D3 and C17 to smooth DC, then delivered to CN1. The +5V DC power is referred to as VCC and is comprehensively utilized by the main controller, sensors, engine controller, etc.

POWER PROTECTION CIRCUIT

A fraction of the +5V DC power is connected to the protection diode PC1 to render protection in the power supply. In case the output of the +5V DC line is short-circuited, the diode segment of PC1 drives the transistor segment of PC1 to turn on Q2 which in turn disconnects the output of switching regulator Q1.

FUSER HEATER POWER CONTROL

In the primary circuit, the fuser heater and thermo-cut device are wired in series across CN2. The heater is switched on and off as being controlled by TRIAC TRC1. TRC1 turns on the heater when HEAT* (pin 5) at CN1 is energized by a command from the enginen controller.

The diagram on the next page shows a simplified diagram for the power supply circuit, exampled by the U.S. version unit.

For details on the fuser function, refer to **Fusing** on page 4-13.

POWER SUPPLY CIRCUIT
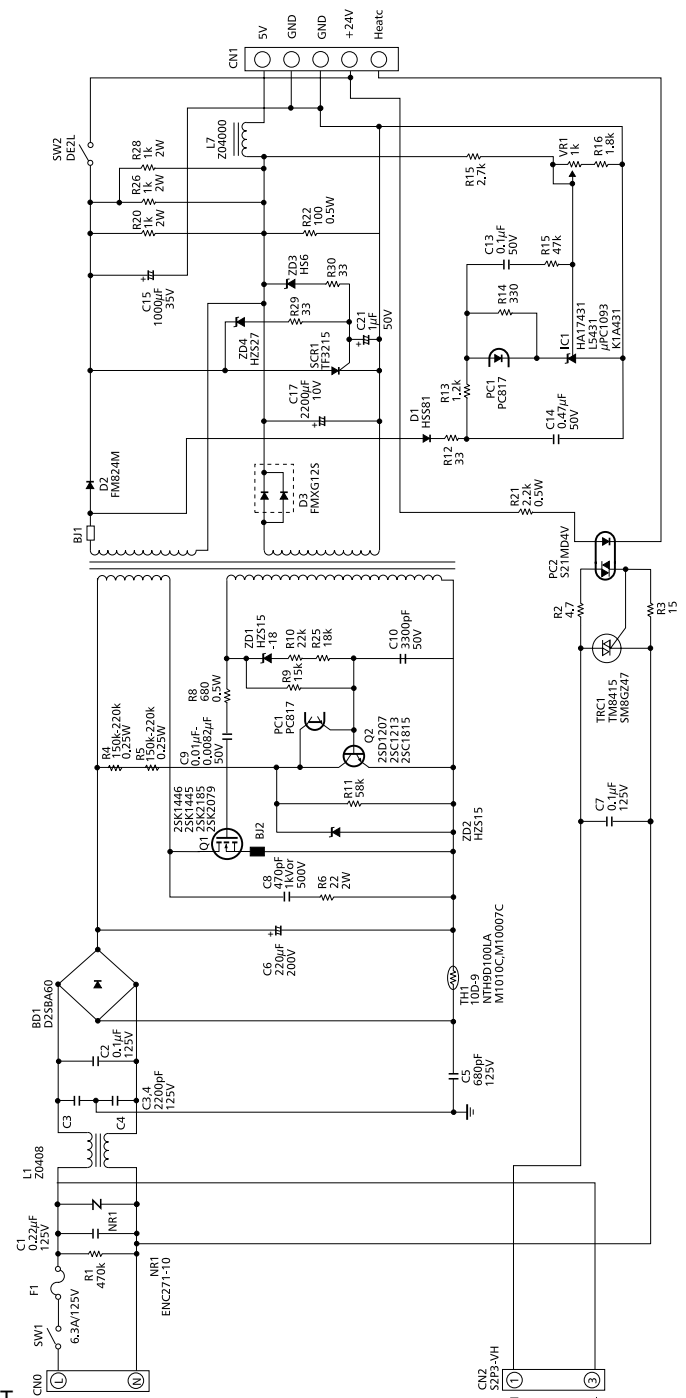
Main logic controller system

The main logic controller system does the following:

- Communicates with the host computer to receive data at one of the printer's interface
- Analyzes and translates the print data to be the dot data in the raster memory
- Communicates with the engine system to discern readiness for printing
- Stores fonts and macro information

The main logic controller has specifications as shown in the following section. A simplified diagram is illustrated on page 4-31.

Main logic controller overview

Item		Specification
CPU		PowerPPC401GF/50 MHz
System+font ROM size		4 MB (DIMM slot)
RAM size	Standard	4 MB
	Option	4 to 32 MB (one PC SIMM socket)
KPDL font size		2 MB [PK-4]
Application program interface		512 kB
Interface	Parallel	High-speed bi-directional [IEEE 1284]
	Option	See appendix *Interface*.
Engine communication		Serial interface (Kyocera's original)
Other features	Smoothing	KIR2 (Vector compensation method)
	Toner saver	EcoPrint [On/Off]
	Enlarge/reduction	Main scan/sub scan
	Video clock	FS-600: 36.524560 MHz FS-680: 45.95012 MHz

Controller block diagram
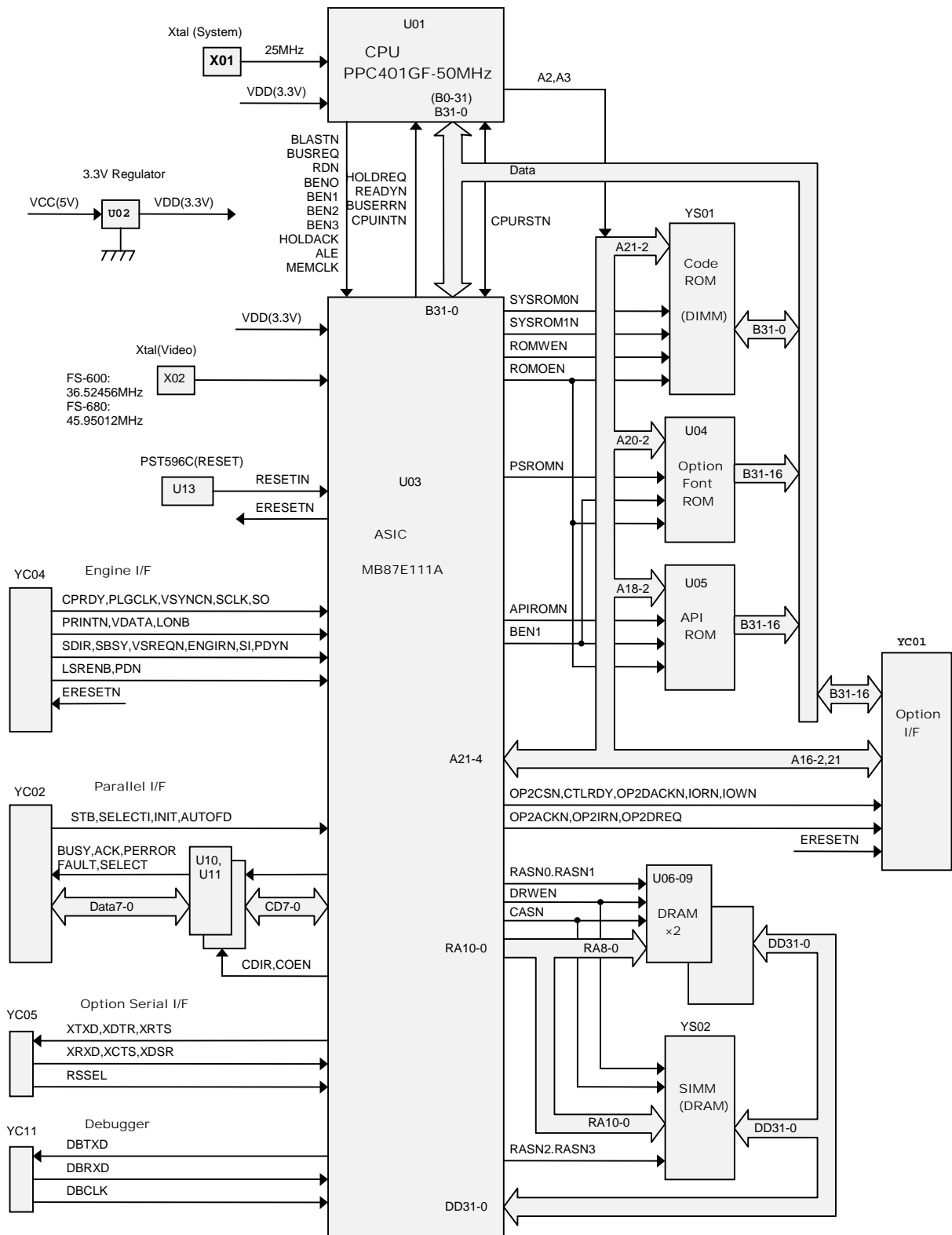
Printing data processing

The printer communicates with the host computer for receiving the print data at one of the printer's interfaces and temporarily store them in the interface buffer. The main logic controller analyzes the data for translating them into the dot data according to the original print image. The resultant dot data are depicted in the raster memory (DRAM's).

While data processing is in course, on the other hand, the main logic controller CPU talks to the engine CPU via the engine interface, to discern the readiness of the printer's engine for printing.

If the engine is ready to start printing, the main controller issues print signal towards the engine controller which request the paper feed. In synchronization with the procession of the paper within the printer, U03 releases video data in the raster memory. Thus the video data are transferred to the laser scanner together with the horizontal synchronization signal and the video clock.

On reception of the video data, the laser diode turns on and off to constitutes the print image over the drum. The image on the drum, referred to as the static latent image, is applied with toner, transferred onto the paper, and finally fused permanently on the paper by means of heat and pressure.

API ROM socket (U05)

Socket U05 is for an API (Application Program Interface) ROM. The API ROM to be used should be a JEDEC-conforming EPROM, and have the following specifications:

Socket No.	U05
Number of pins	40
Size	4 Mbits
Composition	256 k by 16 bits
Access speed	<120 ns

The number of clocks should be 19. Data are read in a 32-bit mode expanded using hardware.

The following table shows the pin-to-signal assignments for the ROM to be used.

API ROM socket pin assignment

Pin No.	Terminal description	Signal name	Pin No.	Terminal description	Signal name
1	AVpp	VCC (fixed)	21	A0	BEN1
2	CE*	APIROMN*	22	A1	A2
3	D15	B15	23	A2	A3
4	D14	B14	24	A3	A4
5	D13	B13	25	A4	A5
6	D12	B12	26	A5	A6
7	D11	B11	27	A6	A7
8	D10	B10	28	A7	A8
9	D9	B9	29	A8	A9
10	D8	B8	30	GND	GND
11	GND	GND	31	A9	A10
12	D7	B7	32	A10	A11
13	D6	B6	33	A11	A12
14	D5	B5	34	A12	A13
15	D4	B4	35	A13	A14
16	D3	B3	36	A14	A15
17	D2	B2	37	A15	A16
18	D1	B1	38	A16	A17
19	D0	B0	39	A17	A18
20	OE*	ROMOEN*	40	VCC	VCC

* Negative logic

System ROM module (YS01)

The system ROM module contains information for controlling the controller CPU. This ROM is served by the controller CPU PPC401GF (50MHz). This module incorporated the following features:

DIMM socket No.	YS01
Number of pins	72
Size	4 MB
Composition	128 k by 32 bits
Access speed	<100 ns

RAM (U6 and U9)

The RAM temporarily holds print data and font information transferred from the host buffers. The size of the RAM is expandable using PC SIMM's of comprehensive type. The standard RAM size is 4MB. The maximum expanded RAM size is 34 MB.

Number of RAM's	4
Socket Nos.	U6 and U7
Number of pins	40, SOJ
Size	4 MB
Composition	512 kB
Access speed	≤70 nS

The expansion SIMM should incorporate the following features:

Number of socket	1
Socket No.	YS02
Number of pins	72
Size	4/8/16/32 MB
Access speed	<80 nS

4-36

KUIO interface

This is the interface for a slot-in option device conforming to the KUIO interface specifications. This interface is not supported for the earlier versions of the FS-600. For details, contact the nearest Kyocera regional office.

The pin assignment for the connector is given below.

Pin No.	Terminal	Signal	Pin No.	Terminal	Signal
A1	VCC (+5V)	VCC	A16	CTLRDY	CTLRDY
B1	VCC (+5V)	VCC	B16	OP2DREQ	OP2DREQ
A2	VCC (+5V)	VCC	A17	GND	GND
B2	NC	NC	B17	OP2DACKN	OP2DACKN
A3	GND	GND	A18	IOR*	LIORN
B3	NC	NC	B18	IOW*	LIOWN
A4	NC	NC	A19	RESET*	RESETN3
B4	A16	IOA16	B19	NC	NC
A5	GND	GND	A20	D15	LD15
B5	A15	IOA15	B20	D14	LD14
A6	A14	IOA14	A21	GND	GND
B6	A13	IOA13	B21	D13	LD13
A7	A12	IOA12	A22	D12	LD12
B7	A11	IOA11	B22	D11	LD11
A8	A10	IOA10	A23	D10	LD10
B8	A9	IOA9	B23	D9	LD9
A9	GND	GND	A24	D8	LD8
B9	A8	IOA8	B24	D7	LD7
A10	A7	IOA7	A25	GND	GND
B19	A6	IOA6	B25	D6	LD6
A11	A5	IOA5	A26	D5	LD5
B11	A4	IOA4	B26	D4	LD4
A12	A3	IOA3	A27	D3	LD3
B12	A2	IOA2	B27	D2	LD2
A13	GND	GND	A28	D1	LD1
B13	NC	NC	B28	D0	LD0
A14	OP2CS	OP2CSN	A29	GND	GND
B14	OP2ACK	OP2ACKN	B29	VCC (+5V)	VCC
A15	OP2IRN	OP2IRN	A30	VCC (+5V)	VCC
B15	NC	NC	B30	VCC (+5V)	VCC

Parallel interface

The printer has a port for the parallel interface that is compatible with the current line-up of the Ecosys series printers. The parallel interface supports the protocols defined by the IEEE 1284 standards. To gain conformity to these standards, the printer supports the ECP and nibble modes.

Details on the signals on the parallel interface are described in the appropriate appendix in this manual.

Serial interface (IB-10 option)

The printer is not standard-equipped with a serial interface. In order to use the RS-232C or RS-422A protocol for conencting the printer to the host, an IB-10 serial interface kit is required. Contact the nearest Kyocera regional office for availability.

The RS-232C and RS-422A protocol modes can be toggled by changing a jumper wire arrangement on the IB-10 board. A 25-pin D-sub connector is used for the serial port. The RS-422A's extra signal lines are assigned to some of the vacant RS-232C terminals. (See *Appendix A* for the interface later in this manual for details.)

The serial interface has the following features:

Connector type	25-pin, D-sub
Option interface kit	Kyocera IB-10
Baud rates/sec.	1200/2400/4800/9600/19200/38400/57600/115200
Protocol	RS-232C/RS-422A (switchable)

Debugging output

Connector YC11 on the logic board provides the following signals for debugging:

Pin No.	Signal	Direction of flow	Definition
2	DBTXD	Printer to host	Transmission data
3	DBRXD	Host to printer	Reception data
4	DBCLK	Host to printer	Transfer clock

Engine interface

The interface to the engine system is based on the serial interface, not the parallel interface that was used with the previous line-up of the Ecosys printers. The serial-to-parallel conversion is executed on a hardware basis.

The engine board is detachable from the printer at its interface connector. The engine interface connector has the following pin assignments:

Engine interface connector assignment

The following signals are assigned on the logic controller side.

Pin No.	Terminal	Signal
A1	GND	GND
A2	CPRDY	CPRDY
A3	SDIR	SDIR
A4	GND	GND
A5	SBSY	SBSY
A6	NC	NC
A7	GND	GND
A8	PLGCLK	PLGCLK
A9	VSREQN	VSREQ*
A10	GND	GND
A11	VSYNCN	VSYNC*
A12	+5V	+5V
A13	GND	GND
B1	+5V	+5V
B2	ERESETN	RST*
B3	ENGIRN	EGIR*
B4	SCKN	SCK*
B5	SO	SO
B6	SI	SI
B7	RDYN	RDY*
B8	PRINTN	PRINT*
B9	LSRENB	OUTPE
B10	VDATA	VDO*
B11	LONBN	LONB*
B12	PDN	PD*
B13	+5V	+5V

* Means negative logic.

Signals used for the engine interface

The following signals are used on the logic controller side for the engine interface communication. Figure on next page shows a simplified function diagram of the engine interface and the signals.

Signal	Meaning	Active	Definition
SBSY	Status-BuSY-signal	High	This signal is "low" if communication is feasible.
SI	Serial-In	—	This is the input of serial data which are received in the order of MSB down to LSB.
SO	Serial-Out	—	This is the output of serial data which are sent in the order of MSB down to LSB.
SCKN	Serial-CLocK	Low	This signal samples the SI and SO signals at its rising edge.
SDIR	Serial-DIRection	—	This signal determines the direction of communication. The direction is from the engine to the logic controller when SDIR is "high," and from the logic controller to the engine when "low."

Engine interface signals
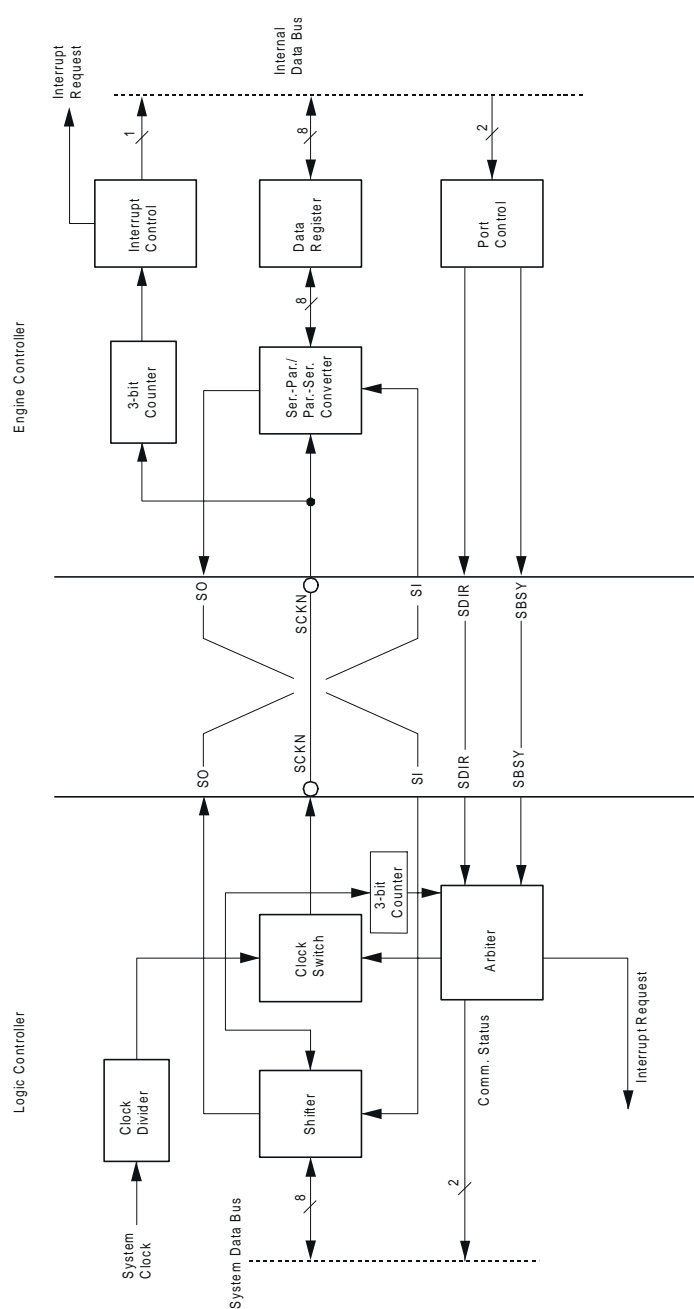
Chapter Five D I S A S S E M B L Y

Chapter Five D I S A S S E M B L Y

General Instructions

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

For replacement of a component, use the reverse of the removal procedures explained in this chapter.

Before proceeding, make sure printer power is switched off and the power cord is unplugged from the printer. See Warning below.

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.

Screws/hardware

Screws and hardware used in the printer are listed in the Ecosys screw catalog. Symbol numbers also given in the list for these screws are referred to in the disassembling instructions in the following pages. These screw symbol numbers are universal to most Ecosys printers.

Caution——To secure a self-tapping screws, align it with the thread carefully. First turn it counterclockwise, then slowly clockwise. Do not over-tighten. In case the selftapped thread is damaged, the affected part must be replaced with a new part.

FS-600/FS-680

Before starting disassembly

Warning——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 uses electrostatic-sensitive parts inside (on boards, laser scanner, etc.). Provide an antistatic (discharging) device, such as a wrist strap, that can effectively discharge your body before touching boards, laser scanner, etc.

Disassembly

Before proceeding, remove the paper cassette and the optional paper feeder (PF-16), if installed.

Removing the Process unit

First, the toner container must be removed.

Open the top cover. The toner container ❶ must be removed first: Pull the toner container release lever ❷ as below. Pull the toner container slowly up, keeping it as level as possible.
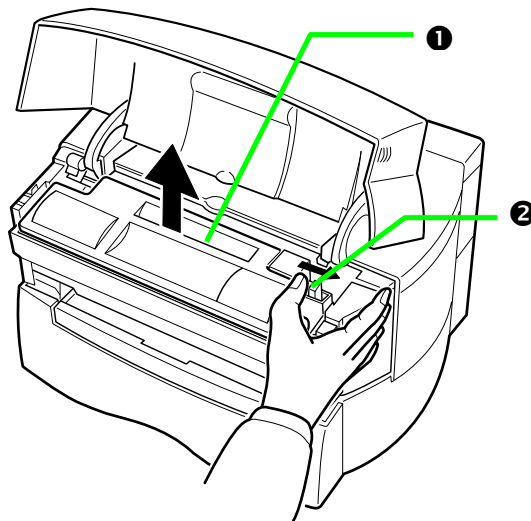
Grasp the Process unit ❶ by the both hands and slowly lift it off the printer.
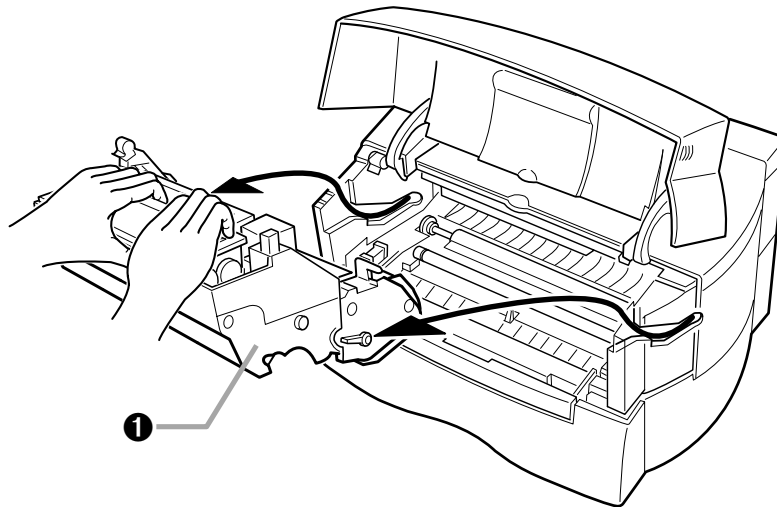
Note——After removing the developer, seal it in the protective bag and place it on a flat surface. Do not place the developer in a dusty area.

Note——Do not place floppy disks near the developer.

REPLACING THE PROCESS UNIT

To replace the Process unit in the printer, be sure to align the guides and rails on the unit with each other. Do not force to slide the Process unit in unless they are properly aligned with each other.

Removing the top cover

Open the top cover. Remove the two screws ⊇ (nickel-plated) at the near end. The far end of the top cover is held in place by two catches each at the left and right side.
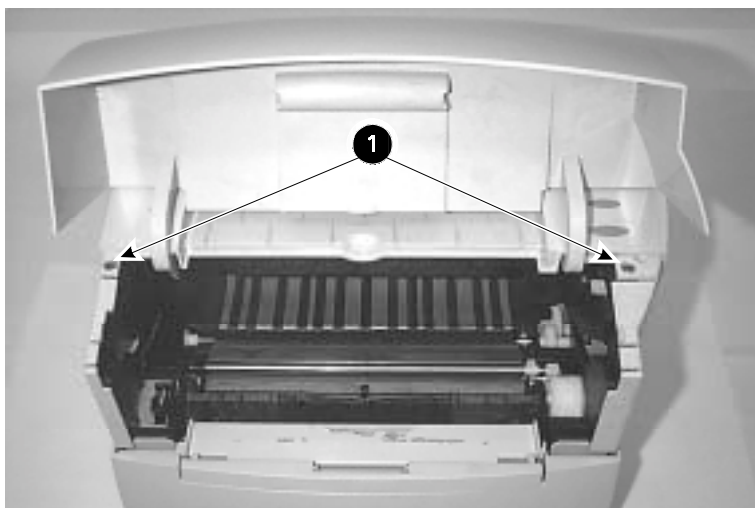
Removing the scanner unit

Caution——Do not attempt to loosen the screws shown below unless you are going to replace the scanner unit.

To remove the scanner unit, remove four (10-mm long) screws ❶. Remove ground wires at screw ❷. Detach other connectors as required. Carefully lift and remove the scanner unit from the printer.
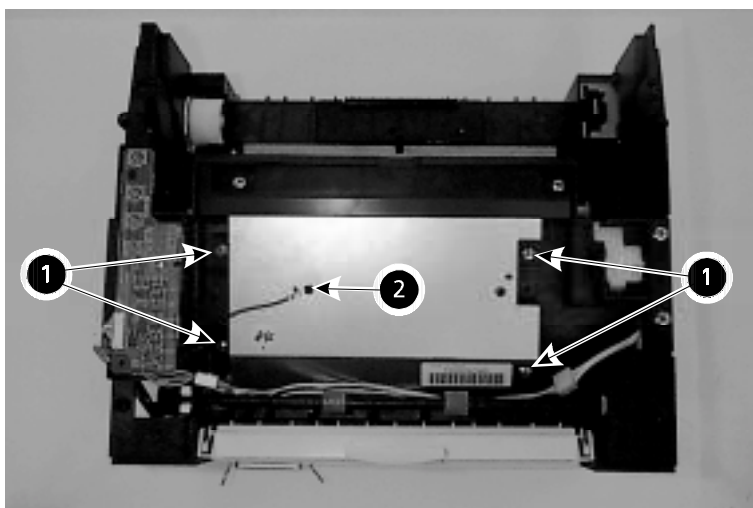
Removing the left and right covers

The left and right side covers are snapped onto the chassis by the following typical parts. To unlatch the snaps, use a small flat blade screwdriver to pick in the indentation at these parts.
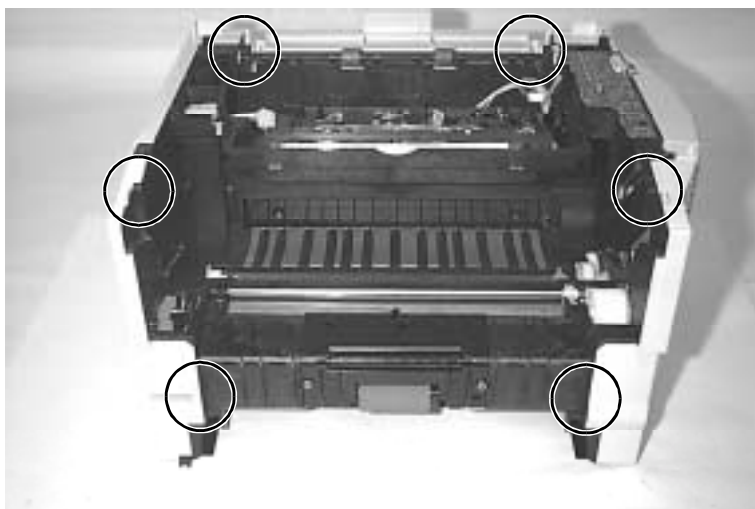
Removing the main motor

The right side chassis mounts the main motor and drive unit.

To remove the main motor, remove the two screws ❶ below. Detach four screws on the main motor board. The connector ❷ carries control signals from the engine board.
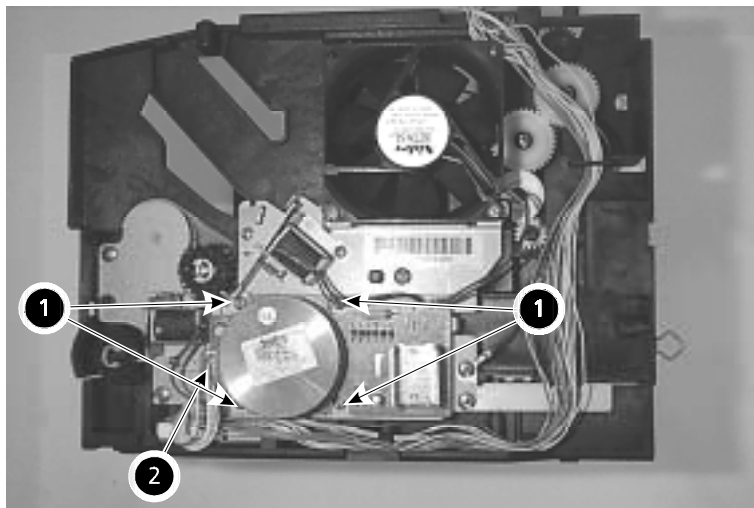
Removing the drive unit

To remove the drive unit, remove screw ❶ below. The main motor may or may not be removed in prior.

Ground wire
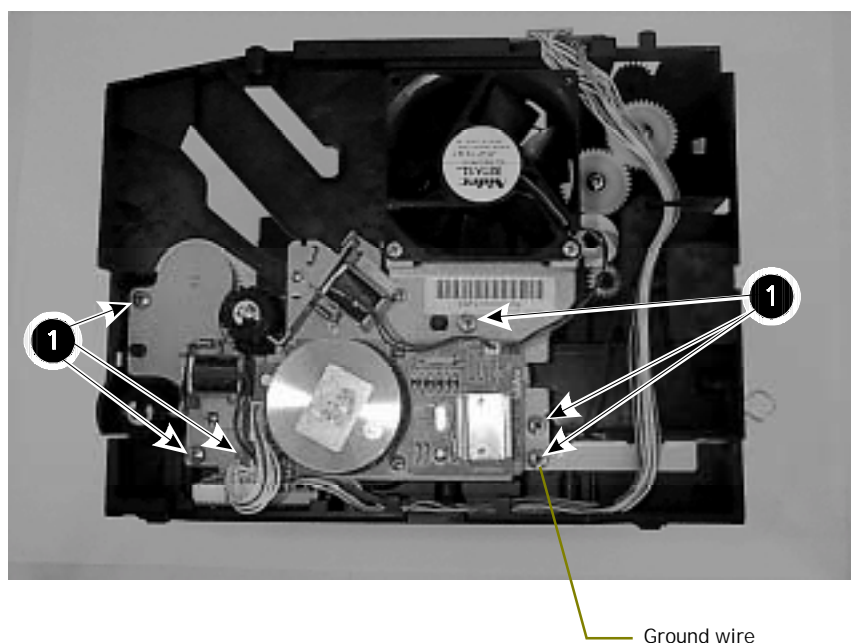
Removing the high-voltage board

The right side chassis mounts the high-voltage board. To remove the high-voltage board, remove four (chrome-plated) screws ❶, detach connectors ❷, ❸, and ❹; and pull the board making sure that connector ❺ is disconnected first.
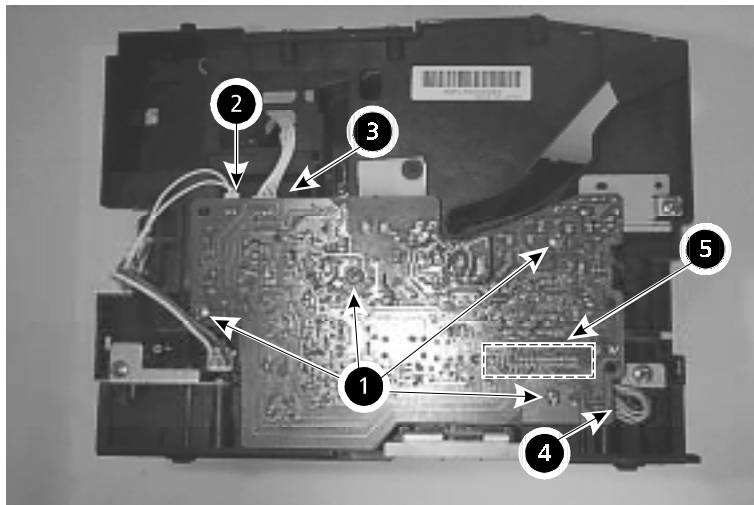
Removing the controller board

To remove the controller board, remove two screws ❶ at the back plane below.
Pull out the board to remove.
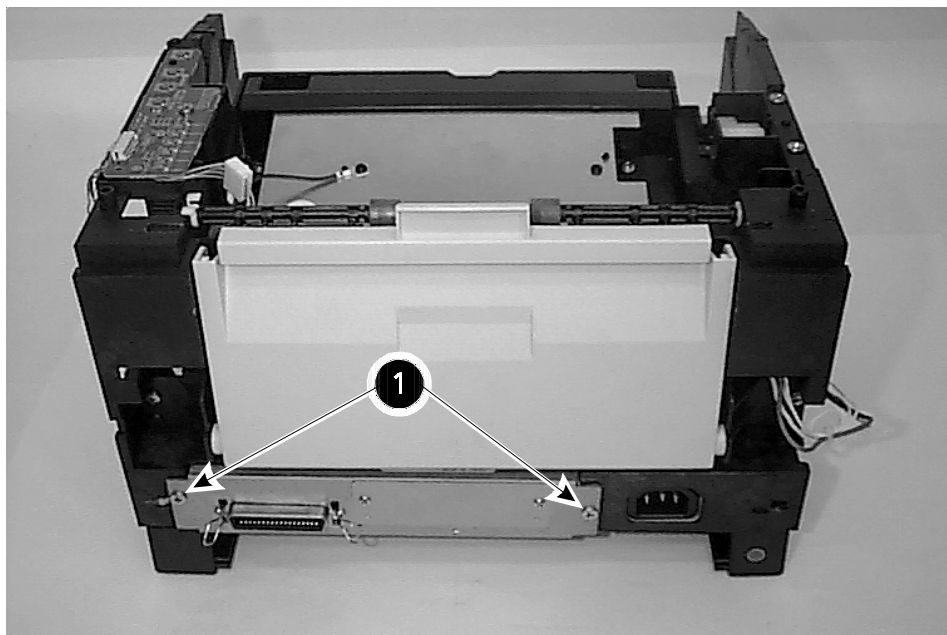
Removing the fuser unit

To remove the fuser unit, remove two screws ❶ at the back of the printer. Detach connectors ❷ and ❸.
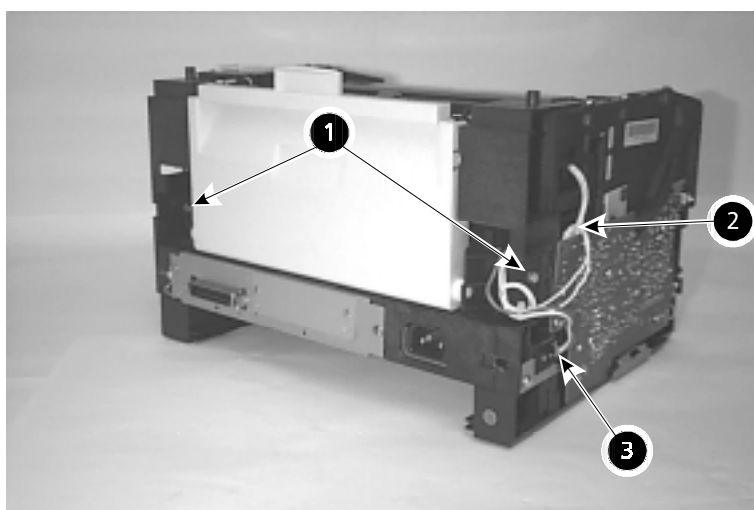
Removing the fuser halogen lamp
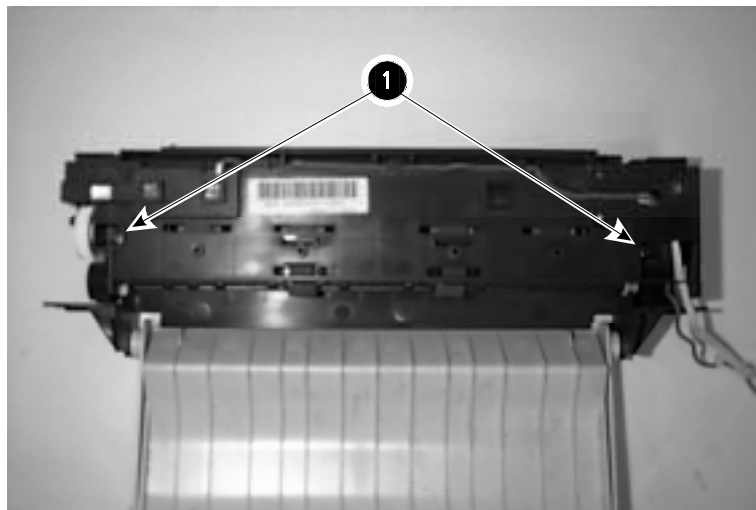
To remove the halogen lamp inside the fuser, first remove the cover by removing two screws ❶.
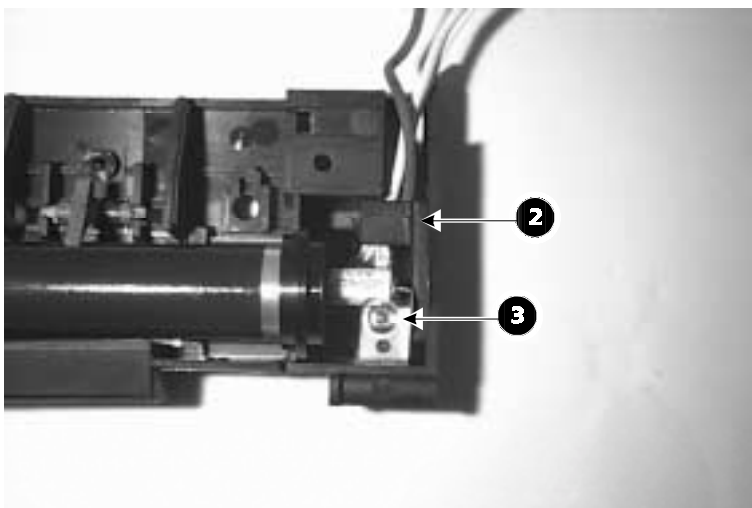
⚠️ *Caution*—The halogen lamp is fragile. Use extreme care when handling. Do not touch directly on its glass surface. Blurred printing problem will result.

Removing the transfer roller unit

⚠️ *Caution*—–Do not touch the sponge part of the transfer roller. Oil and dust (particles of paper, etc.) on the transfer roller can significantly deteriorate the print quality (white spots, etc.).

The transfer roller is held in place by an axle holder at the two ends. To remove the transfer roller unit, pick the metal shaft of the roller from the axle holder using a small flat blade screwdriver. Carefully lift the one end, then, remove the other end to remove the entire transfer roller from the printer.
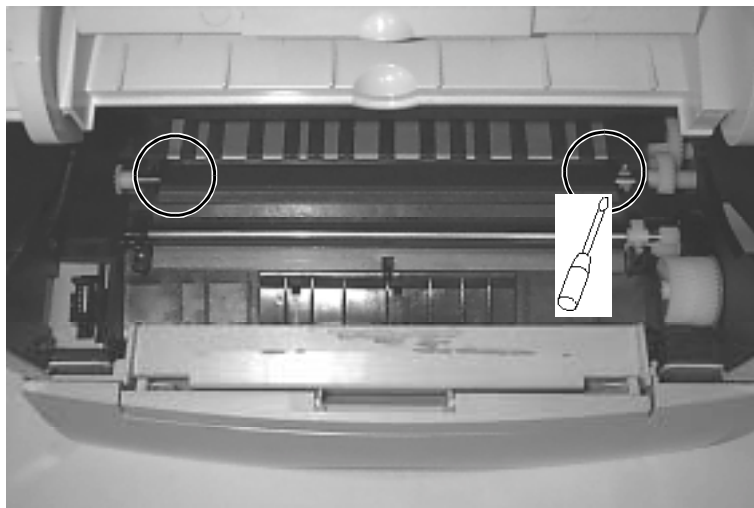
INSTALLING THE TRANSFER ROLLER UNIT

To install the (new) transfer roller unit, use the reverse manner of above.

CLEANING THE TRANSFER ROLLER UNIT

To clean the transfer roller, remove the transfer roller from the feed unit as shown on page 5-16. Use a vacuum cleaner, moving nozzle along the roller, but do not let the nozzle directly touch on the roller, while rotating the transfer roller by the gear. Thoroughly clean the entire surface of the roller.

Removing the engine board/power supply

Removing these parts requires separation of the top and bottom frames. First, remove all covers, high-voltage board, drive unit, and the controller board referring the above procedures.

The top and bottom frames are secured to each other by the screws at the left, right, and the rear side of the printer.

Begin by removing screws on the right side of the printer. Remove screw ❶. Detach connectors ❷ and ❸.
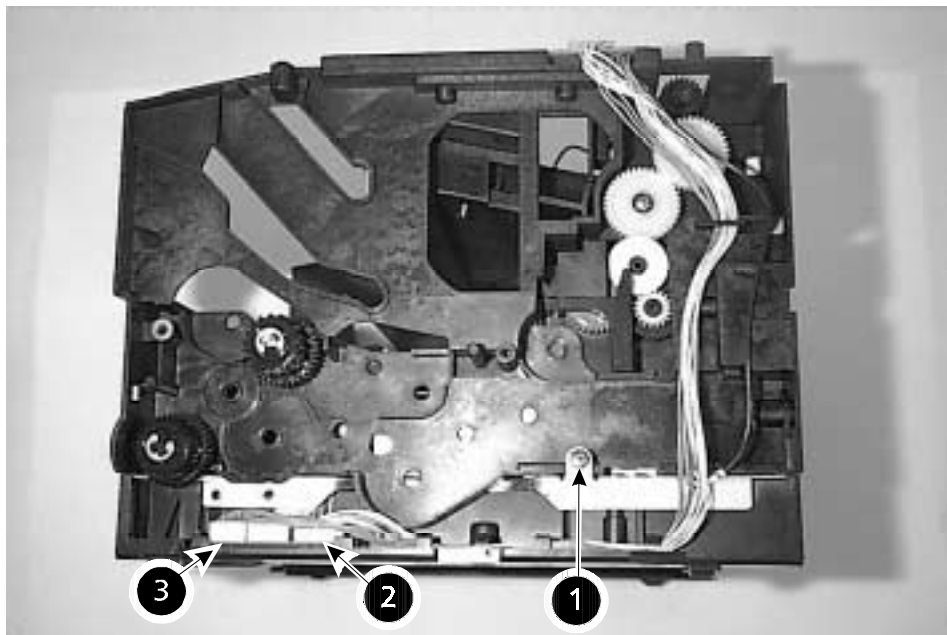
On the left side of the printer, remove two screws ❶.
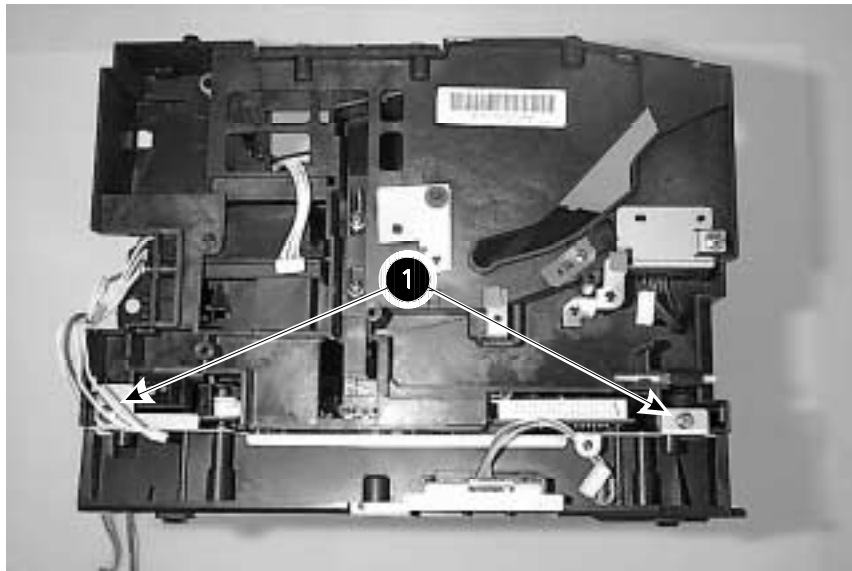
Lift the top frame slowly to separate the top frame and the controller box. Detach connectors as required.

Removing the registration rollers

The (top and bottom) registration rollers are seated in the printer by means of the axle holders shown below.
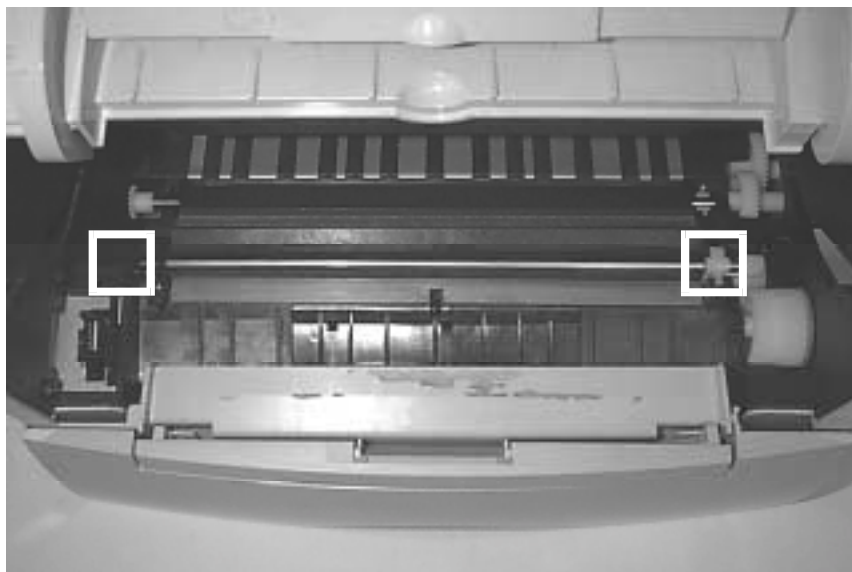
Note——These holders are fixed to the printer at the bottom side. The registration rollers are removable only at the back side. Do not attempt to remove the holders from the top side nor the coil springs hooked with these holders. If you remove the registration rollers, first separate the top frame from the controller unit, following instructions above.

Separate the top frame and the controller box, following instructions starting on page 5-19.

Turn the top frame upside down. Remove the gear at the end of the registration roller by removing the stopping ring. Use a ring remover. (Protect your eyes with goggles.)

Stopping ring
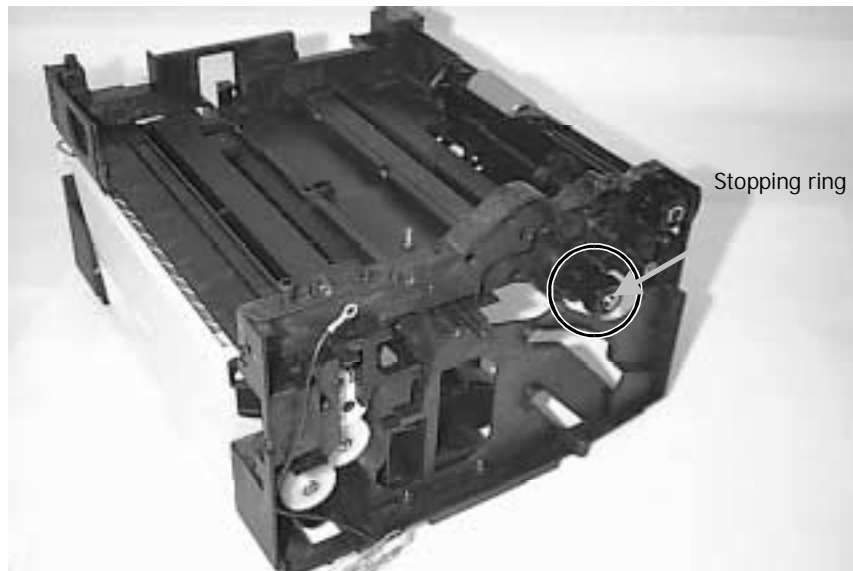
Squeeze the legs of the holder protruding onto the back side of the chassis using a pair of needle nose pliers. While doing so, pull the axle holder (and the roller) to remove it from the fore side.

Remove the other holder using the same procedure as above.

Remove the registration rollers entirely.
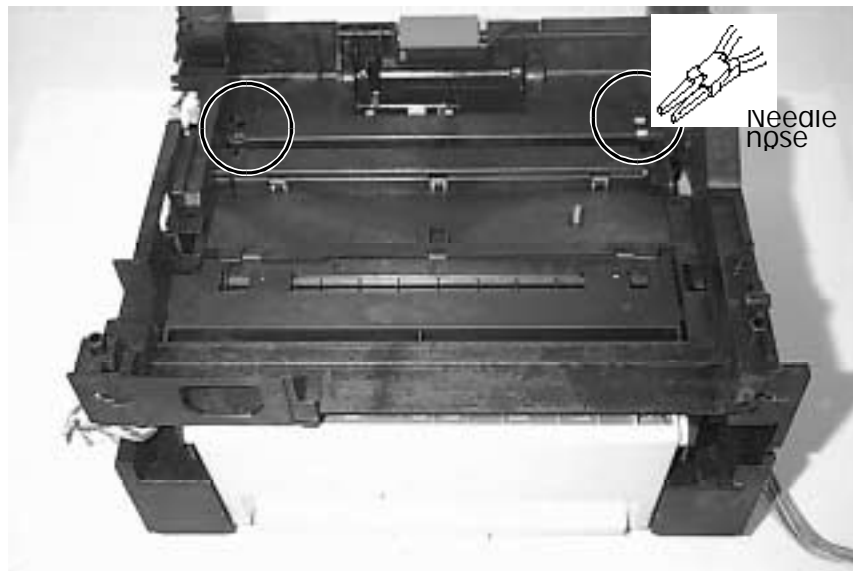
Removing the paper feed roller

To remove the paper feed roller, use two steps as follows: ❶Slide the roller leftwards. Note that the roller is spring-loaded. This disengages the right end of the roller from the holding ledge in the printer. ❷While holding the roller in the place, pull the right end towards you.
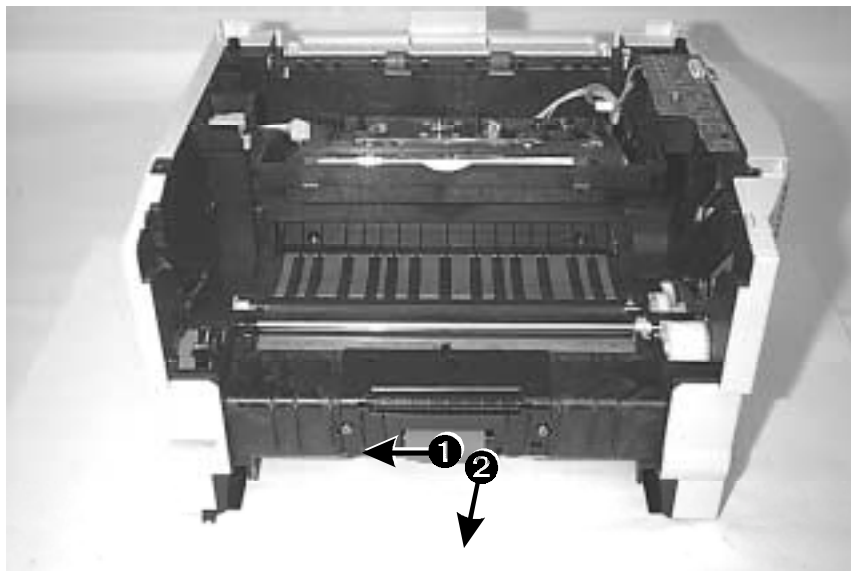
To reseat the paper feed roller, fit the left end hole (⊙-shaped) of the roller onto the holding ledge in the printer. Press and hold the roller to the left side. Then align the right end hole of the roller (γ-shaped) with the right-hand sledge in the printer. Let go off of the roller.

Removing the engine ROM

To remove the engine controller ROM, first remove the paper feed roller, referring to the previous section. Remove two screws ❶ below. Rotate the cover downward to gain access to the engine ROM. Note that the cover is not fully removed because of the existence of the paper feed roller shaft.

To remove the ROM, discharge yourself by an antistatic wrist band wrapped around your wrist (and its ground wire connected to the printer's metal chassis). Use a ROM extractor tool to remove the engine ROM.
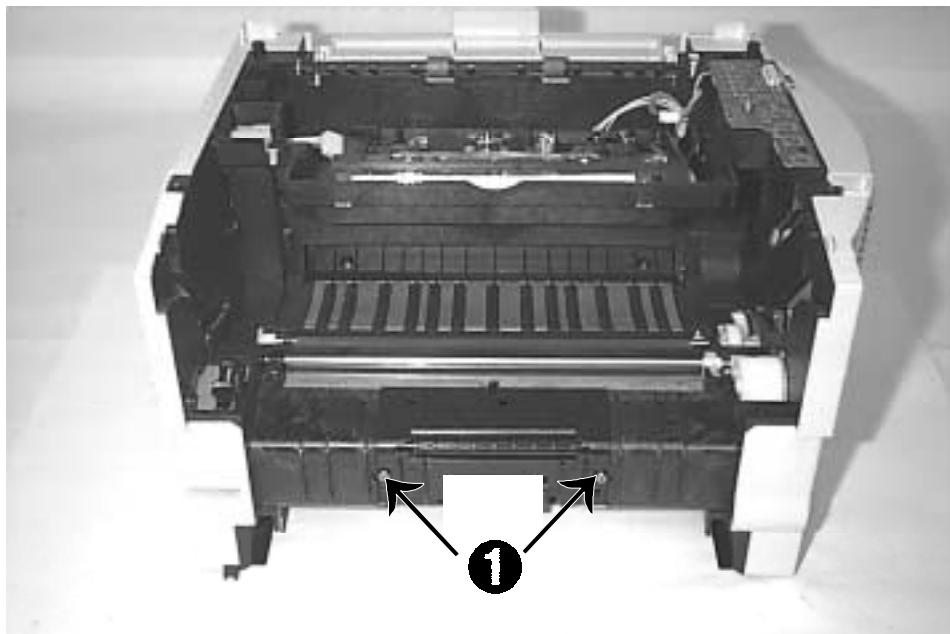
Chapter Six   TROUBLESHOOTING

Chapter Six T R O U B L E S H O O T I N G 6-1

Overall wiring diagram

Error messages

The printer indicates various messages using the LED indicators at its top in combination of lighting and flashing. The following diagram depicts these indicators and the control keys.
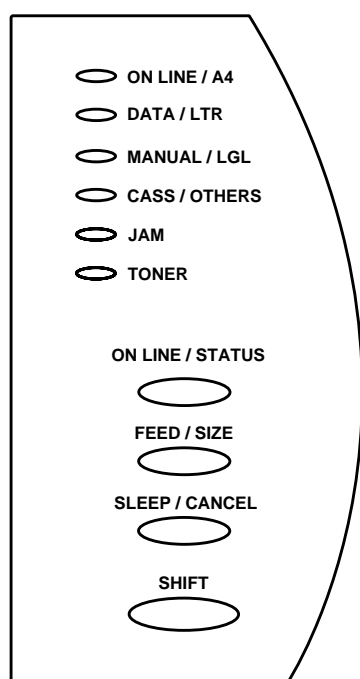
For explanation on the basic function of the indicators and the keys, refer to pages 2-16 and 2-17 in Chapter 2.

Messages

Whether the indicator is lit, flashing or off is indicated as shown in the following diagram.

⬯ Lit

⬯ Flashing

⬭ Off

Warming-up[1]

⬯ ON LINE / A4	The six indicators flash in sequence:
⬯ DATA / LTR	The printer is warming up after power is turned on.
⬯ MANUAL / LGL	
⬯ CASSETTE / OTHERS	
⬯ JAM	
⬯ TONER	

Ready (On-line)

⬯ ON LINE / A4	The printer is ready to print.
⬛ DATA / LTR	(In this example, the printer's cassette is selected as the current paper source).
⬛ MANUAL / LGL	
⬯ CASSETTE / OTHERS	
⬛ JAM	
⬛ TONER	

---

[1] See page for details on self-diagnostics.

Off line

⬛ ON LINE / A4	The printer is off-line. The printer stores but does not print received data. (In this example, the printer's cassette is selected).
⬛ DATA / LTR	
⬛ MANUAL / LGL	
⬭ CASSETTE / OTHERS	
⬛ JAM	
⬛ TONER	

Receiving data

⬭	ON LINE / A4	The printer is receiving data.
☀	DATA / LTR	(In this example, the printer's cassette
⬬	MANUAL / LGL	is selected as the current paper source).
⬭	CASSETTE / OTHERS	
⬬	JAM	
⬬	TONER	

Processing data

⬭	ON LINE / A4	The printer is processing data, or the
⬭	DATA / LTR	printer is waiting for a code or command
⬬	MANUAL / LGL	that the job is over.
⬭	CASSETTE / OTHERS	(In this example, the printer's cassette
⬬	JAM	is selected as the current paper source).
⬬	TONER	

Paper empty

⬭	ON LINE / A4	The cassette is empty. Add paper to the
⬬	DATA / LTR	paper cassette or add a sheet of paper
⬬	MANUAL / LGL	to the manual feed tray.
☀	CASSETTE / OTHERS	
⬬	JAM	
⬬	TONER	

Selecting paper size

|	
ON LINE / A4 DATA / LTR MANUAL / LGL CASSETTE / OTHERS JAM TONER	The ON LINE/A4, DATA/LTR, MANUAL/LGL, and CASSETTE/OTHERS indicators are toggled to light one after another as the SHIFT+FEED/SIZE key is pressed repeatedly.

Sleeping

|	
ON LINE / A4 *(blinking)*	The printer is *sleeping* (in the sleep mode). The normal mode is restored when any of the keys is pressed or data is sent to the printer.
DATA / LTR	
MANUAL / LGL	
CASSETTE / OTHERS	
JAM	
TONER	

Manual feeding

ON LINE / A4 *(blinking)*	Set paper on the manual feed tray. Data is arriving at the printer. To start printing, press the ON LINE/STATUS key (twice).
DATA / LTR	
MANUAL / LGL *(blinking)*	
CASSETTE / OTHERS	
JAM	
TONER	

ON LINE / A4 *(blinking)*	Set paper on the manual feed tray. Data is not arriving at the printer. To start printing, press the ON LINE/STATUS key (twice).
DATA / LTR	
MANUAL / LGL *(blinking)*	
CASSETTE / OTHERS	
JAM	
TONER	

Paper jam

ON LINE / A4	Paper jam. Refer to section Removing paper jam in this chapter and remove the jammed paper. (In this example, the printer's cassette is selected as the current paper source).
DATA / LTR	
MANUAL / LGL	
CASSETTE / OTHERS *(blinking)*	
JAM	
TONER	

Top cover open

● ON LINE / A4	The printer's top cover is open: Close firmly. (In this example, the printer's cassette is selected as the current paper source).
● DATA / LTR	
● MANUAL / LGL	
⬭ CASSETTE / OTHERS	
☼ JAM	
● TONER	

Toner status

⬭ ON LINE / A4	Toner is almost exhausted. (In this example, the printer's cassette is selected as the current paper source).
● DATA / LTR	
● MANUAL / LGL	
⬭ CASSETTE / OTHERS	
● JAM	
☼ TONER	
● ON LINE / A4	Toner is exhausted. Replace the toner container using a new toner kit. The printer does not operate. (In this example, the printer's cassette is selected as the current paper source).
● DATA / LTR	
● MANUAL / LGL	
⬭ CASSETTE / OTHERS	
● JAM	
⬭ TONER	

Memory overflow

☼ ON LINE / A4 ● DATA / LTR ☼ MANUAL / LGL ☼ CASSETTE / OTHERS ● JAM ● TONER	The total amount of the data received by the printer exceeds the printer's internal memory. Try adding more memory (expansion RAM). Press the ON LINE/STATUS key to resume printing. You can abandon printing by the SLEEP/CANCEL key.
☼ ON LINE / A4 ● DATA / LTR ● MANUAL / LGL ☼ CASSETTE / OTHERS ● JAM ● TONER	The data transferred to the printer was too complex to print on a page. Press the ON LINE/STATUS key to resume printing. (The page may break in some pages.) You can abandon printing by the SLEEP/CANCEL key. ***Note:*** Send the following command to the printer after this error has occurred: `!R! FRPO R5, 0; EXIT;` to release the page protect mode.

Service errors

Service errors are represented by the alternating flashing of the LEDs. Kyocera has been using the notation of "E" and "F" codes for those information: e.g. E1 for the main motor error, F1 for the controller checksum error, etc.

The first time flashing of the top three LEDs indicates either the letter E or F; the second time flashing indicates the number that should follow the code, counting 1 for the CASSETTE (4th) LED, 2 for MANUAL (3rd), 4 for DATA (2nd), and 8 for ONLINE (top). Adding up these four LEDs enable to obtain the number for the E and F errors.

For example, the E or F number for the following error is 1+2=3.

	"E"	"F"		
ONLINE/A4	●	●	●	"8"
DATA/LETTER	●	●	●	"4"
MANUAL/LEGA	●	●	●	"2"
L	●	●	●	"1"
CASSETTE/OT	●	●	●	
HER	●	●	●	
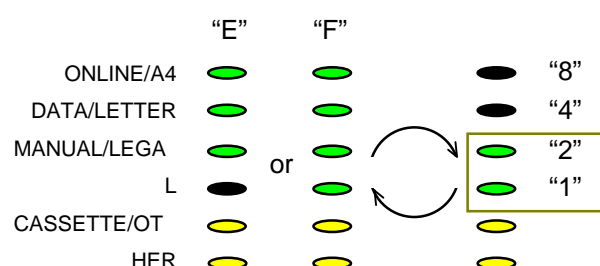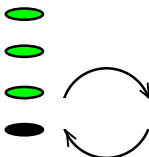
Main motor error (E1 error)

Indication	Suggested causes	Corrective action
	• Overcurrent in the main motor circuitry due to an excessive torque. • Loose connector. • Defective CPU on the engine board. • No response from the main motor due to the defective motor driver (transistor). • Loose CN1 connector on main motor board.	**Follow the flowchart on below.**

```
        ┌──────────────────────┐
        │  Call Service person  │
        │          E1           │
        └──────────┬───────────┘
                   │
        ┌──────────▼───────────┐
        │ Connect circuit tester│
        │ to pin 2 of YC-603 on │
        │  engine relay board.  │
        └──────────┬───────────┘
                   │
        ┌──────────▼───────────┐
        │  Turn printer power   │
        │    off, then on.      │
        └──────────┬───────────┘
                   │
             Is pin 2 (MOTOR*) of  ──No──▶  Connect circuit tester
             YC-603 at low ?                 to pin 8 of YC-203 on
                   │                          engine board.
                  Yes                            │
                   │                     Is pin 8 (MOTOR*)   ──No──▶ Replace engine
        ┌──────────▼───────────┐          of YC-203 at low ?         board.
        │  Turn printer power   │              │
        │  off, then on again.  │             Yes
        └──────────┬───────────┘              │
                   │                    Replace engine
             Square-wave signal          relay board.
             at pin 3 of YC-603?  ──No──┐
                   │                     │
                  Yes              + 24V at pin 1 of
                   │               YC-603 on engine   ──No──▶ Replace engine relay
        Replace engine relay       relay board.               board. If not solved,
        board. If not solved,          │                      replace engine board.
        replace engine board.         Yes
                                       │
                              Replace main motor. If not
                              solved, replace harness between
                              engine relay board and main
                              motor.
```

FS-600
Engine   board: KP-589
Engine relay board: KP-601
FS-680
Engine   board: KP-717
Engine relay board: KP-718

Note—For replacing the engine board, read Note on page 4-22.

Scanner motor error (E2 error)

Indication	Suggested causes	Corrective action
	• Scanner motor speed (PLGRDY*) did not reach the predetermined value.	**Follow the flowchart below.**
	• Connector insertion error.	
	• Defective CPU on the engine board.	
	• Time out due to the defective scanner motor driver (transistor).	
	• Loose YC302 connector on KP-683.	

Call Service person
E2

Connect circuit tester
to pin 4 of YC-302 on
KP-683.

FS-600
Engine   board: KP-589
Engine relay board: KP-601
FS-680
Engine   board: KP-717
Engine relay board: KP-718

Is pin 4 (PLGDR*)
at low ?

No → Connect circuit tester
to pin B16 of YC-205
on engine board.

→ Turn printer power
off, then on again.

Yes

Turn printer power
off, then on again.

Is pin B16
(PLGDR*) of
YC-205 at low ?

No →

Yes

Square-w ave
signal at pin 5 of
YC-302 on
KP-683 board?

No → Turn printer power off,
then on again.

Yes

Square-w ave signal
at pin A16 of
YC-205 on engine
board?

No →

Yes

+ 24V at pin 1 of
YC-302 on
KP-683?

No →

Yes

Replace scanner unit.

+ 24V at pin A1 of
YC-205 on engine
board?

No →

Yes

Replace engine
board. See Note
below .

Replace harness (S02210)
betw een KP-683 board and
scanner unit.

Note—For replacing KP-589, read Note on page 4-22.

Scanner pin-photo error (E3 error)

Indication	Suggested cause	Corrective action
	• No beam hit the photo detector due to the laser diode defect (PD*).	**Follow the flowchart below.**
	• Improper connector insertion.	
	• Soiled or defective beam detector (pin-photo diode) sensor.	
	• Defective safety lock.	
	• Unoperative engine CPU.	
	• Loose YC604 connector on engine board.	

```
┌─────────────────────┐
│ Call Service person │
│ E3                  │
└─────────────────────┘
```

FS-600
Engine   board: KP-589
Engine relay board: KP-601
FS-680
Engine   board: KP-717
Engine relay board: KP-718

Connect circuit tester to pin 3 of YC-604 of engine relay board.

Turn printer power on, then on.

Print a status page.

Is pin 3 (LASER*) at low? — No → Connect circuit tester to pin 3 of YC-203 on engine board. → Turn printer power off, then on again. → Print a status page.

Yes

Turn printer power off, then on again.

Print a status page.

Is pin 3 (LASER*) at low? — No → Replace engine board. See Note below.

Yes → Replace harness between engine board and scanner unit.

Low-level pulse at pin 6 of YC-604 on engine relay board? — No → Replace scanner unit.

Yes

Turn printer power off, then on again.

Print a status page.

Low-level pulse at pin 6 of YC-203 on engine board? — No → Replace harness between engine board and scanner unit.

Yes → Replace engine board. See Note below.

Fuser error (E4 error)

Indication	Suggested causes	Corrective action
	• Blown-out thermistor.	**Follow the flowchart below.**
	• Improper connector insertion.	
	• Blown-out halogen heater.	
	• Comparator defect on the engine board.	
	• Defective engine CPU.	
	• Loose connection between the fuser unit and CN2 of switching power supply.	

Call Service person
E4

"E4" shown immediately after power up?

No

Yes

FS-600
Engine board: KP-589
Engine relay board: KP-601
FS-680
Engine board: KP-717
Engine relay board: KP-718

Turn printer power off and remove power cable.

Detach connector YC-305 on KP-683.

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

Open (infinite)?

No

Yes

Turn printer power off and remove power cable.

Remove CN2 on power supply.

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

Open (infinite)?

No

Yes

Replace engine board. If not solved, replace KP-683 board. See Note below.

Replace fuser unit.

Replace fuser unit.

Replace power supply. If not solved, replace engine board. See Note below.

Note—For replacing the engine board, read Note on page 4-22.

Toner motor error (E9 error)
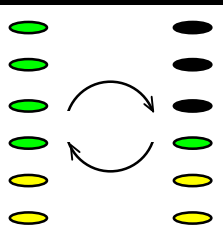
Indication	Suggested causes	Corrective action
	• Overcurrent in the toner motor circuitry due to an excessive torque. • Loose connector. • Defective engine CPU. • Defective toner motor overcurrent detector.	**Follow the flowchart below.**
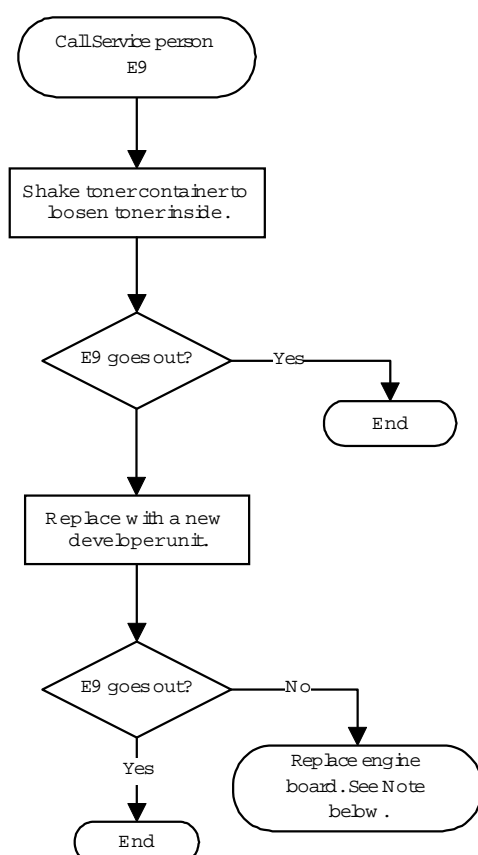
Call Service person
E9

Shake toner container to loosen toner inside.

E9 goes out? —Yes→ End

Replace with a new developer unit.

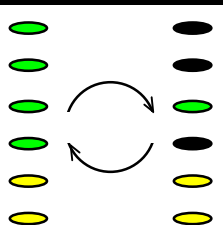E9 goes out? —No→ Replace engine board. See Note below.

Yes→ End

FS-600
Engine board: KP-589
Engine relay board: KP-601
FS-680
Engine board: KP-717
Engine relay board: KP-718

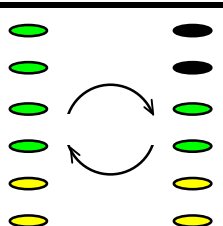Note—For replacing the engine board, read Note on page 4-22.

Controller check sum error (F1 error)

Indication	Suggested causes	Corrective action
	Checksum is failed with system ROM (DIMM) on the main controller board.	Replace the main controller board. To remove the main controller board, see page 5—14.

Controller RAM read/write error (F2 error)

Indication	Suggested causes	Corrective action
	Checksum is failed with the RAM on the main controller board.	Replace the main controller board. To remove the main controller board, see page 5—14.

Controller system error (F3 error)

Indication	Suggested causes	Corrective action
	Miscellaneous failure with the main controller, other than F1 and F2.	Turn printer power off, then on again. If not solved, replace the main controller board. To remove the main controller board, see page 5—14.

Power-up diagnostics sequence

The printer automatically performs the self-diagnostics sequence in several checkpoints at power up. Each step of checkpoints is confirmed by the combined indication of LED indicators on the control panel.

Printer power-up

⬇

❶ Engine controller initialization—#1

Indication	Suggested cause if the indication fails (Corrective action)
All LEDs lit for 0.5 sec. ◯ ONLINE/A4 ◯ DATA/LTR ◯ MANUAL/LGL ◯ CASSETTE/OTHERS ◯ JAM ◯ TONER	• Engine board error (Check KP-589 [FS-600] or KP-717 [FS-680] board). • LED board error (Check KP-591 board). • LED cable error (Check cable between KP-591 and YC401). • Power supply error (Check +5V output at power supply).

⬇

❷ Engine controller initialization—#2

Indication	Suggested cause if the indication fails (Corrective action)
All LED off for 0.5 sec. ⬤ ONLINE/A4 ⬤ DATA/LTR ⬤ MANUAL/LGL ⬤ CASSETTE/OTHERS ⬤ JAM ⬤ TONER	• Engine board error (Check KP-589 [FS-600] or KP-717 [FS-680] board). • LED board error (Check KP-591 board). • LED cable error (Check cable between KP-591 and YC401).

⬇

❸ Main logic controller initialization

Indication	Suggested cause if the indication fails (Corrective action)
○ ONLINE/A4 ● DATA/LTR ● MANUAL/LGL ● CASSETTE/OTHERS ● JAM ● TONER	Main logic board error if the indication freezes (Replace main logic board).

↓

❹ Main logic controller ROM checksum

Indication	Suggested cause if the indication fails (Corrective action)
○ ONLINE/A4 ○ DATA/LTR ● MANUAL/LGL ● CASSETTE/OTHERS ● JAM ● TONER	ROM checksum error (F1). See page 6-21.

↓

❺ Main logic controller RAM read/write

Indication	Suggested cause if the indication fails (Corrective action)
⬭ ONLINE/A4 ⬭ DATA/LTR ⬭ MANUAL/LGL ⬬ CASSETTE/OTHERS ⬬ JAM ⬬ TONER	RAM read/write error (F2). See page 6-21.

⬇

❻ Main logic controller initialization—#2

Indication	Suggested cause if the indication fails (Corrective action)
⬭ ONLINE/A4 ⬭ DATA/LTR ⬭ MANUAL/LGL ⬭ CASSETTE/OTHERS ⬬ JAM ⬬ TONER	—

⬇

❼ Main logic controller initialization—#3

Indication	Suggested cause if the indication fails (Corrective action)
⬭ ONLINE/A4 ⬭ DATA/LTR ⬭ MANUAL/LGL ⬭ CASSETTE/OTHERS ⬭ JAM ⬛ TONER	EEPROM (U202 on engine board) error if the indication takes 10 seconds to show (Check U202). **Note—**10 seconds is normal if printer is power-up first time after EEPROM was changed.

⬇

❽ Diagnostics finished

Indication	Suggested cause if the indication fails (Corrective action)
⬭ ONLINE/A4 ⬭ DATA/LTR ⬭ MANUAL/LGL ⬭ CASSETTE/OTHERS ⬭ JAM ⬭ TONER	—

⬇

❾ Printer readied

Indication	Suggested cause if the indication fails (Corrective action)
ONLINE/A4 DATA/LTR MANUAL/LGL CASSETTE/OTHERS JAM TONER	If the indication persists too long, fuser error. See page 6-18.

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.

Completely blank printout

Symptom	Suggested remedy
Check the developer unit.	• Check that the process unit is seated correctly • Check that the process unit's connector is connected properly.
Check main charging potential.	Check the main charging output on the high-voltage (KP-683) board. For detailed information, contact Kyocera. Replace the HV board if the high voltage potential is not available on the board.
Check the laser scanner.	The scanner components within the scanner may be disordered. Note that the laser scanner is concealed to protect the components which are susceptible to dust. It should not be disassembled except within a dust-free chamber. Replace the scanner unit if necessary.

All-black printout

Symptom	Suggested remedy
Check the main charger roller (in the process unit).	Open the printer top cover and check that the process unit is correctly seated.
Check the drum bias.	Make sure the bias from the high-voltage (KP-683) board is correctly arrived at the drum unit.
Check high voltage potential at the high-voltage (KP-683) board.	Check the high-voltage output on the high-voltage (KP-683) board. For information, contact Kyocera. Replace the high-voltage board if high voltage potential is not available on the board.

Dropouts

Symptom	Suggested remedy
Note the spacing of the defects. Use the *Repetitive defect gauge* on page6-43.	• If the defects occur at regular intervals of 19.96 mm, the problem may be a damaged magnet roller (in the Process unit). Replace the Process unit. • If the defects occur at regular interval of 94.25 mm, the problem may be a damaged drum in the Process unit; and the fuser unit if the intervals is 56.10 or 62.82 mm. Replace the drum unit or fuser unit accordingly. Refer to page 6-33 for details.
Check paper for property.	Paper with rugged surface or dump tends to cause this type of failure.
Check the paper chute installation.	The paper chute (the metallic fixture provided between the transfer roller and the fuser unit for antistatic purpose) must not be fit loose. Press the paper chute down firmly if necessary.
Check the transfer roller installation.	The transfer roller must be supported by the axle holders at two ends. Clean the axle holder to remove oil and debris. Replace the transfer roller if necessary.
Check the transfer bias potential.	Check the transfer bias output on the high-voltage (KP-543) board. This requires removal of the left side cover and the test equipment: For information, contact Kyocera. Replace the high-voltage board if high voltage potential is not available on the board.

Black dots

Symptom	Suggested remedy
Note the spacing of the defects. Use the Repetitive defects gauge on page6-33.	• If the defects occur at regular intervals of 94.25 mm, the problem may be a damaged drum unit 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.

Horizontal streaks

Symptom	Suggested remedy
Check the Proces 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. See Kyocera for the proper type of grease to use.
Check main charger contacts.	Take out the process unit; check the main charger inside.
The drum unit may be defective.	Replace the process unit.

Black vertical streaks

Symptom	Suggested remedy
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 drum unit is not working properly. Replace the cleaning blade; or replace the Process unit.
Defective developer unit.	Replace the Process unit.

Non-sharp printing

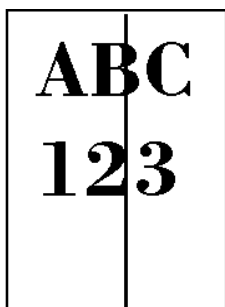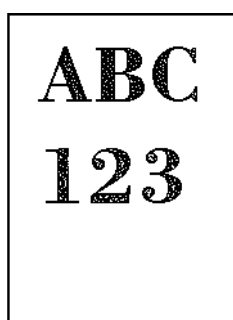| Symptom	Suggested remedy
Check paper for property.	Paper with rugged surface or dump tends to cause this type of failure.
Check the paper chute installation.	The paper chute (the metallic fixture provided between the transfer roller and the fuser unit for antistatic purpose) must not be fit loose. Press the paper chute down firmly if necessary.
Check the transfer roller installation.	The transfer roller must be supported by the axle holders at two ends. Clean the axle holder to remove oil and debris. Replace the transfer roller if necessary.
Check the transfer bias potential.	Check the transfer bias output on the high-voltage (KP-543) board. This requires removal of the left side cover and the test equipment: For information, contact Kyocera. Replace the high-voltage board if high voltage potential is not available on the board.
Check *EcoPrint* setting.	The EcoPrint mode can provide faint, non-sharp printing because it acts to conserve toner for draft printing purpose. For normal printing, turn the EcoPrint mode off by using the print menu from the application software.

Grey background

Symptom	Suggested remedy
Check the print density setting.	The print density may be set too high. Try adjusting the print density using the print menu from the application software.
Check the surface potential of the drum (process unit).	The drum potential should be approximately 260V. (This value may vary depending on production.) Measurement is possible only by using the jig and tool specifically designed for this purpose: See Kyocera for details. The process unit will have to be replaced if it will bear the values far out of the allowable range.
The developer in the process unit may be defective.	If a process unit which is known to work normally is available for check, replace the process unit currently used in the printer with it. If the symptom disappears, replace the process unit with a new one.

Dirt on the top edge or back of the paper

ABC
123
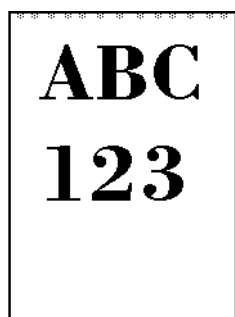
Symptom	Suggested remedy
Check toner contamination in various parts.	Dirty edges and back of the paper can be caused by toner accumulated on such parts as the paper chute, paper transportation paths, the bottom of the Process unit, and the fuser inlet. Clean these areas and parts to remove toner.
Check 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.

First occurrence of defect

19.96 mm—Magnet roller (Process unit)

24.86 mm—Top registration roller

38.80 mm—Bottom registration roller

45 mm—Transfer roller

56.10 mm—Fuser heat roller

62.82 mm—Fuser press roller

94.25 mm—Drum unit (Process unit)

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Appendix A   P R I N T E R   I N T E R F A C E

Appendix A P R I N T E R   I N T E R F A C E

Parallel interface

The printer uses a bi-directional 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 prompe ...
Normal	`echo !R! FRPO O0, 0; EXIT; lpt1:`
High-speed	`echo !R! FRPO O0, 1; EXIT; lpt1:`
Nibble[1]	`echo !R! FRPO O0, 5; EXIT; lpt1:`
Automatic	`echo !R! FRPO O0, 70; EXIT; lpt1:`

---

[1] 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 (1kΩ)
16	Logic ground	GND	34	Not defined	NC
17	Chssis ground	(GND)	35	Not defined	Pull-up (1kΩ)
18	Peri-logic H	(VCC)[2]	36	nSelect In	(SELECTI*)

---

[2] Maximum rated current for pin 18 is 0.25A (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.

Note - 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.
+5V DC (pin 18)	This line is connected to the printer's +5V DC line (+5V±0.5V, 250 mA 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—Option (IB-10)

The printer is equipped with an option slot for adding a serial port. To add a serial portr, the IB-10 serial interface kit is required.

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 controller 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 prorocol, 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-10 board must be taken out from the printer. Protect the electronics by taking these precautions:

Before touching the main circuit 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 circuit board only by the edge.

Removing the IB-10 board

Remove these
thumb screws.
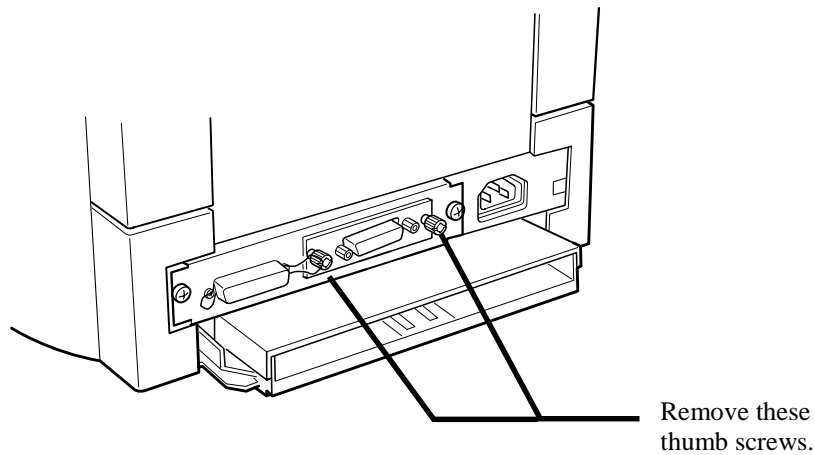
To change the serial protocol from RS-232C to RS-422A, for example, carefully remove the jumper connector on the IB-10 board. Reconnect to the pin position as shown in the diagram.

RS-232C
position

RS-422A
position
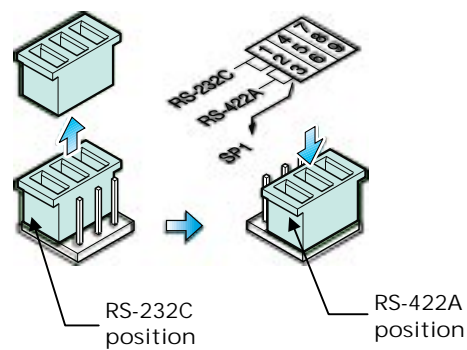
Replace the IB-10 board back into the printer. Secure the board by the thumb screws.

Serial interface pin assignment

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

No.	Signal	Flow	Definition
1	FG		Frame ground
2	TxD	Printer ➔ host	Transmit data: RS-232C
3	RxD/RDA	Host ➔ Printer	Receive data/receive data (RS-232C/RS-422A)
4	RTS	Printer ➔ host	Transmit request
5	CTS	Host ➔ printer	Transmit permitted
6	DSR	Host ➔ printer	Data-set-ready
7	SG		Signal ground
9	SDA	Printer ➔ host	Transmit data: RS-422A
10	SDB	Printer ➔ host	Transmit data: RS-422A
18	RDB	Host ➔ printer	Receive data: RS-422A
20	DTR	Printer ➔ host	Data-terminal-ready
Other	Not connected		Undefined

Serial interface signals

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

Signal	Meaning
FG (Pin 1)	This pin is connected directly to the printer frame.
T_XD (Pin 2)	RS-232C only: This output carries asynchronous data sent by the printer to the computer. It is used mainly in handshaking protocols.
R_XD/RDA (Pin 3)	This input carries serial asynchronous data sent by the computer to the printer. In RS-422A, this carries the inversed differential data (RDA).
RTS (Pin 4)	This output is always held high (above 3 V).
CTS (Pin 5)/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)	This output transmits asynchronous inversed form of differential data from the printer to the computer.
SDB (Pin8)	This output carries asynchronous non-inversed form of differential data from the cmputer to the printer.
DTR - Data Terminal Ready (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 6V.

Connector configurations

The printer uses a DB-25 connector for the serial interface. Depending on the computer configuration 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:
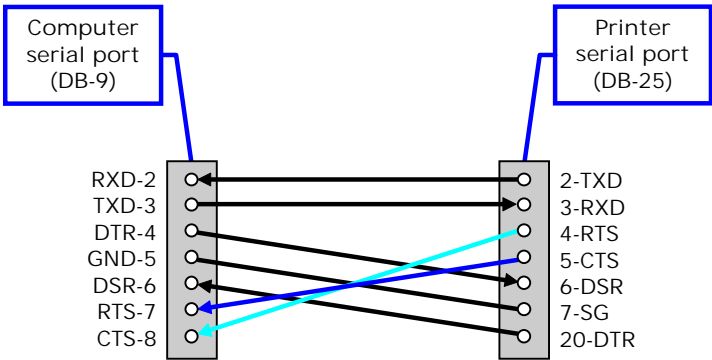
RS-232C - FOR COMPUTERS WITH A DB-25 CONNECTOR:

RS-422A

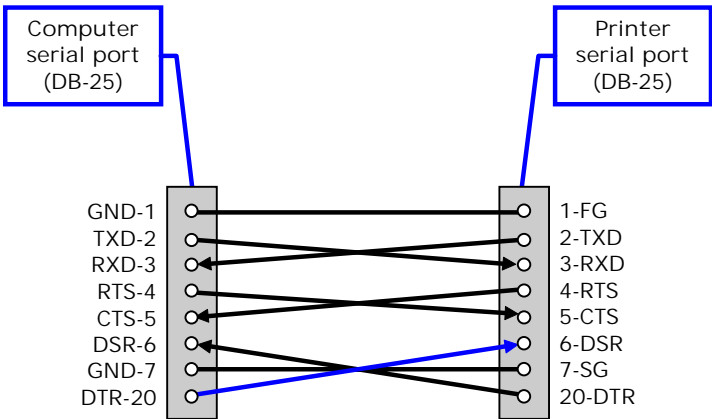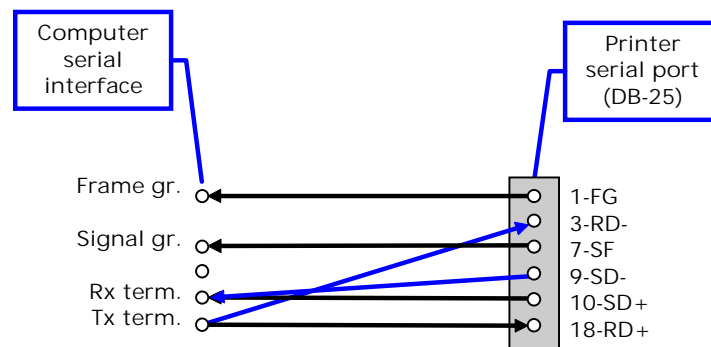On the computer serial port, investigate pin assignments depending on the computer manufacturer's instruction. Since the RS-422A configuration does not employ control lines except for data transmisstion/reception, select a mode in which signals such as DTR are not used.

Protocol

The serial interface supports the full baud rates of: 1,200, 2,400, 4,800, 9,600, and 19,200, 38,400, 57,600, and 115.2k (bps). For adjusting serial interface parameters including baud rate, parity, etc., refer to the *IB-10 User's Manual.*

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Appendix B STATUS PAGE

Appendix B S T A T U S   P A G E

Status page

The printer can print different types of the status page—the *user* status page and the *service* status page. This section exclusively describes the service status page. For information on the user status page, refer to the printer's *User's Manual*. Information obtainable on the service page include various settings for the printer, service statistics, etc.

To print a service status page, press and hold the STATUS key on the control panel for more than 3 seconds. Or, have a PC running MS-DOS and proceed as follows:

❶   Connect the printer to the PC via the parallel interface.

❷   Ensure that the printer is ready to print.

❸   At the DOS prompt, type:

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

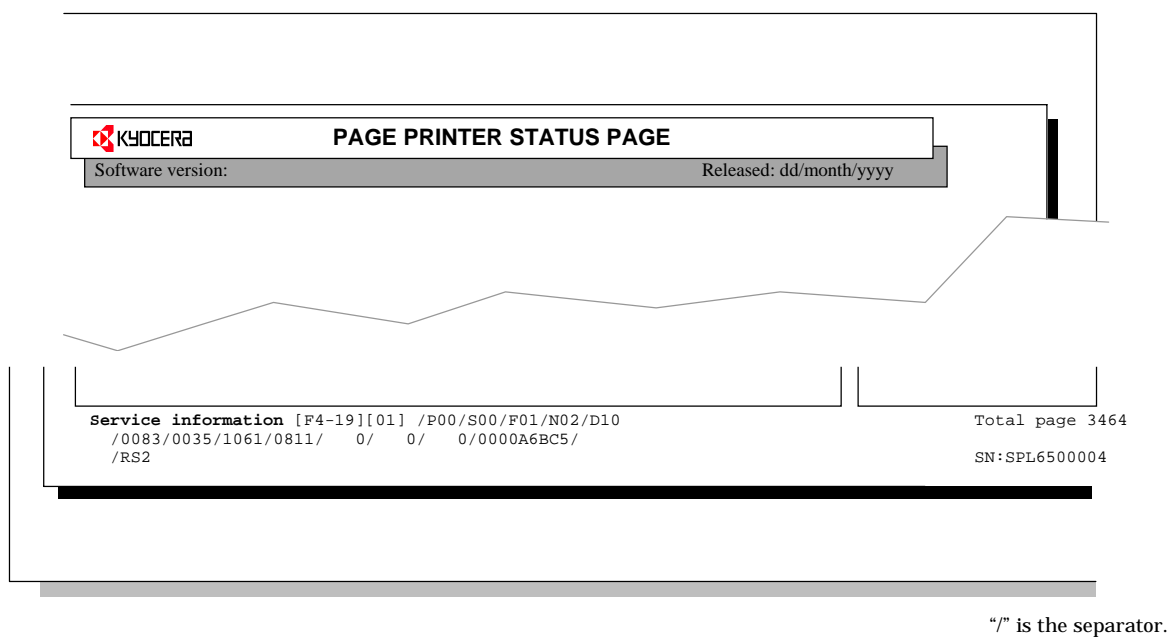   The service status page is printed. (If you omit '1,' a user status page is printed.)

Service information on the status page

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

The status page exampled in the following pages is of model FS-600.

Example of the service status page

![KYOCERA] **PAGE PRINTER STATUS PAGE**	
Software version:	Released: dd/month/yyyy

```
Service information [F4-19][01] /P00/S00/F01/N02/D10          Total page 3464
   /0083/0035/1061/0811/   0/   0/   0/0000A6BC5/
   /RS2                                                       SN:SPL6500004
```

"/" is the separator.

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

Service information on the service status page

Example	Meaning	Description
Top of the page		
Software version:	Controller firmware version [1]	
Released:	Released date of the firmware (above) dd/*month*/yyyy	
Bottom of the page, Upper line		
[F4-19]	Engine ROM version-product ID (19=FS-600, 44=FS-680)	
[01]	Destination	0=Europe, 1=U.S.A./Canada
/P00	Parallel interface mode	00=Bidirectional mode disabled, 04=Nibble (Normal), 05=Nibble (High-speed), 07=ECP
/S00	Serial interface error	00=Normal, bit0=Framing error, bit1=Overrun, bit2=Parity error
/F01	Front control panel lock (Shown only during locking)	01=Partially locked, 02=Fully locked
/N02	NVRAM error (Shown only if error has occurred)	01=ID error, 02=Version error, 03=Checksum error, 04=NVRAM error
/D10:*DM301.DAN*	NVRAM download information: *file-name*	00=None downloaded, bit4=Front panel message data name, bit7=Error
Total page 3464	Total page count	—
Bottom of page, middle line		
/0083	Top margin	Inches+$^1/_{100}$ inches (FRPO L1/L2)
/0035	Left margin	Inches+$^1/_{100}$ inches (FRPO L3/L4)
/1061	Page length	Inches+$^1/_{100}$ inches (FRPO L5/L6)
/0811	Page width	Inches+$^1/_{100}$ inches (FRPO L7/L8)
/0...	Left margin offset for paper sources (Manual tray/printer's cassette/paper feeder's cassette)	in $^1/_{600}$ inch
Bottom of page, lower line		
/RS2	Serial interface mode	RS2=RS-232C, RS4=RS-422A
SN:SPL6500004	Serial number for the printer	—

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[1] The firmware information also appear on the normal status page.

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