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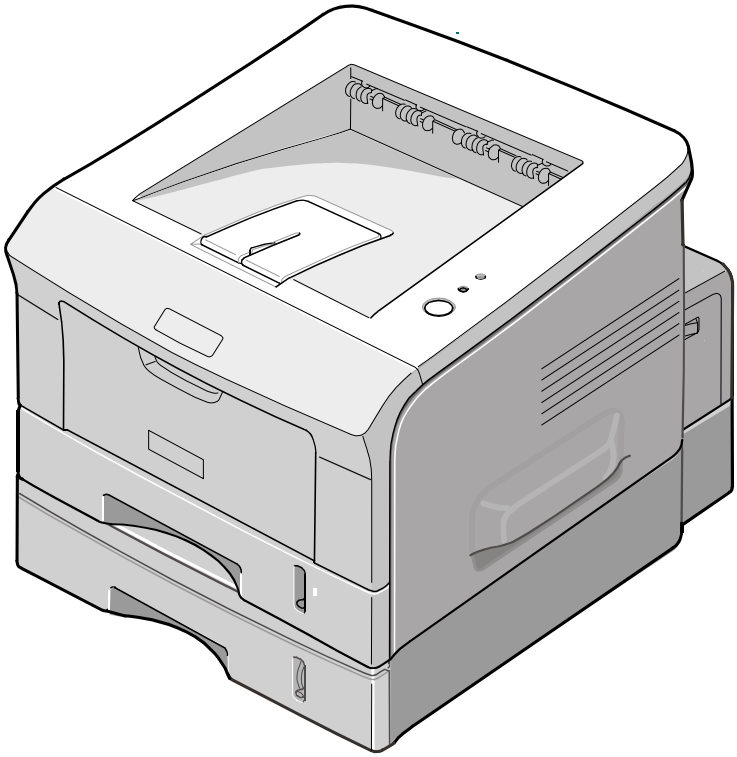

G144/G145
SERVICE MANUAL

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Ricoh Corporation

LEGEND

PRODUCT CODE	COMPANY			
	GESTETNER	LANIER	RICOH	SAVIN
G144	-----	-----	BP20	-----
G145	-----	-----	BP20N	-----

DOCUMENTATION HISTORY

REV. NO.	DATE	COMMENTS
*	10/2005	Original Printing

G144/G145

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PRECAUTIONS

In order to prevent accidents and damage to the equipment, please read the following precautions before you service the machine.

SAFETY WARNING

1. Only qualified service engineers should service this machine. The high voltages and lasers inside this product should be approached with caution.
2. Use only approved replacement parts. There are no user serviceable parts inside the printer. Do not make any unauthorized changes or additions to the printer. This could cause the printer to malfunction and create electric shock or fire hazards.
3. Laser Safety Statement: This machine is certified in the U.S. to conform to the requirements of DHHS 21 CFR, chapter 1 Subchapter J for Class 1(1) laser products and elsewhere. It 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 laser system and printer are designed to prevent access to laser radiation during normal operation, user maintenance, or prescribed service activities.

NOTE: Never operate or service the printer with the protective cover removed from Laser/Scanner assembly. The reflected beam can damage your eyes. When using this product, these basic safety precautions should <u>always</u> be followed to reduce risk of fire, electric shock, and injury to persons.

⚠WARNING

SAFETY PRECAUTIONS

TOXIC MATERIALS

This product contains toxic materials that could cause illness if ingested.

1. If the LCD control panel is damaged, it is possible for the liquid inside to leak out. This liquid is toxic and contact with skin should be avoided. Wash any splashes from eyes or skin immediately for 15 minutes under running water, and contact a doctor. See a doctor immediately if the liquid gets into the mouth or is swallowed.
2. Please keep toner cartridges away from children. The toner powder contained with the toner cartridge may be harmful if swallowed. Contact a doctor immediately if toner powder is swallowed.

ELECTRIC SHOCK AND FIRE SAFETY PRECAUTIONS

Failure to follow the following instructions could cause electric shock or fire.

1. Use only the correct voltage. Failure to do so could damage the printer and potentially cause a fire or electric shock.
2. Use only the power cable supplied with this machine. Use of an incorrectly specified cable could cause the cable to overheat and potentially cause a fire.
3. Do not overload the power socket. This could lead to overheating of the cables inside the wall and could lead to a fire.
4. Do not allow water or other liquids to spill into the printer. This can cause electric shock. Do not let paper clips, pins, or other foreign objects fall into the printer. These could cause a short circuit leading to an electric shock or fire hazard. If foreign objects fall into the machine, power off the machine immediately and disconnect the power cord from the wall outlet.
5. Never touch the plugs on either end of the power cable with wet hands. This can cause electric shock.
6. Remove the power plug from the wall socket when servicing the printer.
7. Use caution when you insert or remove the power plug. The power plug must be inserted completely. Otherwise, a poor contact could cause overheating and lead to a fire. (When removing the power plug, grip the plug firmly and pull. Do not pull the power cable out by pulling on the cord itself.)
8. Do not allow the power cable to become twisted or bent sharply around corners. Do not place objects on top of the power cable. If the power cable is damaged, it could overheat and cause a fire. Exposed cables could cause an electric shock. Replace a damaged power cable immediately. Do not reuse or repair a damaged cable. Some chemicals can also attack the coating on the power cable, weakening the cover or exposing cables. This can cause fire and shock risks.

9. Ensure that the power sockets and plugs are not cracked or broken in any way. Repair such defects immediately. Take care not to cut or damage the power cable or plugs when moving the machine.
10. Use caution during thunder or lightening storms. Disconnect the machine from the power source when such weather conditions are expected. Do not touch the machine or the power cord if it is still connected to the wall socket in these weather conditions.
11. Avoid damp or dusty areas. Install the machine in a clean, well-ventilated location. Do not position the machine near a humidifier. Dampness and dust build-up inside the machine can lead to overheating and cause a fire.
12. Do not position the machine in direct sunlight. This will cause the temperature inside the machine to rise, possibly leading to machine failure and, in extreme conditions, could lead to a fire.
13. Do not insert metal objects into the machine through the ventilator fan or other part of the casing. This could create contact with a high voltage conductor inside the machine and cause an electric shock.

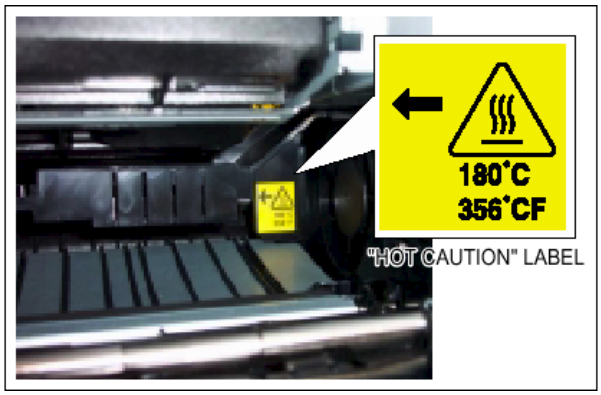
HANDLING PRECAUTIONS

The following instructions are for your own personal safety, to avoid injury and to prevent damage to the machine.

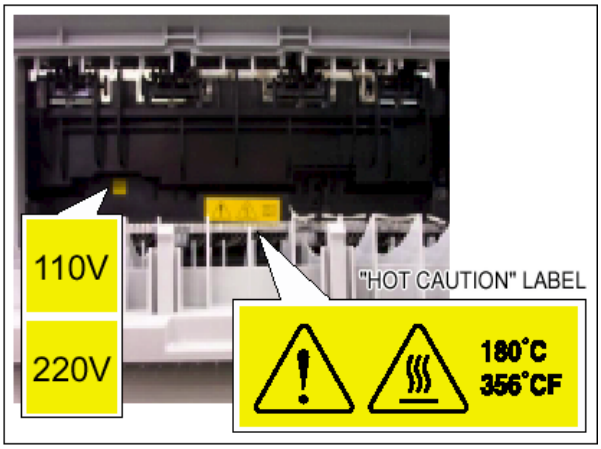
1. Ensure that machine is installed on a level surface, capable of supporting its weight. Failure to do so could cause the machine to tip or fall.
2. Avoid placing fingers or hair in close proximity to any rollers, gears, or fans within this machine while the machine is in operation.
3. Do not place any small metal objects, containers of water, chemicals, or other liquids close to the machine. This can cause damage, shock, or fire if spilled into the machine.
4. Do not install the machine in areas with high dust or moisture levels, beside open windows, or close to a humidifier or heater.
5. Do not place candles, burning cigarettes, etc. on the machine. A fire may occur.

ASSEMBLY/DISASSEMBLY PRECAUTIONS

Replace with approved parts only. Take care to note the exact location of parts and the correct cable routing before you disassemble any part of the machine. Ensure all parts and cables are replaced correctly. Perform the following procedures before you disassemble the machine or replace any parts.



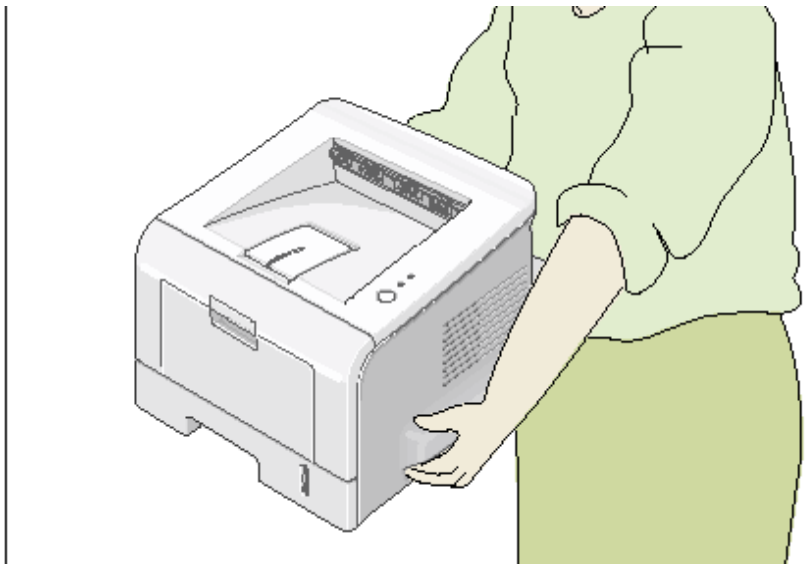
1. Check the contents of the machine memory and make a note of any user settings. These will be erased if the main board or network card is replaced.
2. Ensure that power is disconnected before you service or replace any electrical parts.
3. Disconnect printer interface cables and power cables.
4. Use only approved spare parts. Ensure that part number, product name, voltages, current and/or temperature rating are correct.



5. When removing or re-fitting any parts, do not use excessive force (especially when fitting screws into plastic).
6. Take care not to drop any small parts into the machine.
7. Handling of the OPC Drum:
   - The OPC Drum can be damaged if it is exposed to light.
   - Take care not to expose the OPC Drum either to direct sunlight, or fluorescent light or incandescent lighting. Exposure for as little as 5 minutes can damage the surface's photoconductive properties and will result in print quality degradation. Remove the OPC Drum and store it in a black bag or other lightproof container. Take care when working with the covers (especially the top cover), since light can be admitted to the OPC area and can damage the OPC Drum.
   - Take care not to scratch the green surface of OPC Drum Unit. If the green surface of the Drum Cartridge is scratched or touched, the print quality will be compromised.

ADDITIONAL SAFETY PRECAUTIONS

1. Use caution with high-temperature parts. The fusing unit operates at a high temperature. Use caution when working on this area of the machine. Wait for the fusing unit to cool down before disassembling it.
2. Do not place your fingers or hair near or into the rotating parts and components.
3. This machine weighs 12.7kg, including toner cartridge and cassette. Use safe lifting and handling techniques. Use the lifting handles located on each side of the machine. Back injury could result if you do not lift the unit carefully.



4. Ensure the machine is installed safely on a level surface, capable of supporting its weight. Failure to do so could cause the machine to tip or fall, possibly causing personal injury or damaging the machine.
5. Do not install the machine on a sloping or unstable surface. After installation, double-check that the printer is stable.

ESD PRECAUTIONS

Certain semiconductor devices can be damaged by static electricity. Such components are commonly called “Electrostatically Sensitive (ES) Devices”, or ESDs. Examples of typical ESDs are: integrated circuits, some field effect transistors, and semiconductor “chip” components. The techniques outlined below should be strictly followed to help reduce the incidence of component damage caused by static electricity.

⚠**CAUTION**
Ensure that no power is applied to the chassis or circuit, and observe all other safety precautions.

1. Immediately before handling a semiconductor component or semiconductor-equipped assembly, drain any electrostatic charge on your body by touching a known earth ground. Alternatively, employ a commercially available wrist strap device, which must be removed for your personal safety reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ESDs, place the assembly on a conductive surface, such as aluminum or copper foil, or conductive foam, to prevent electrostatic charge buildup in the vicinity of the assembly.
3. Use only a grounded-tip soldering iron to solder or desolder ESDs.
4. Use only an “anti-static” solder removal device. Some solder removal devices not classified as “anti-static” can generate electrical charges sufficient to damage ESDs.
5. Do not use Freon-propelled chemicals. When sprayed, these can generate electrical charges sufficient to damage ESDs.
6. Do not remove a replacement ESD from its protective packaging until immediately prior to installing it. Most replacement ESDs are packaged with all leads shorted together by conductive foam, aluminum foil, or a comparable conductive material.
7. Immediately before removing the protective shorting material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.
8. Maintain continuous electrical contact between the ESD and the assembly into which it will be installed, until the ESD or assembly is completely plugged or soldered into the circuit.
9. Minimize bodily motions when handling unpackaged replacement ESDs. Normal motions, such as the brushing together of clothing fabric and lifting one’s foot from a carpeted floor, can generate static electricity sufficient to damage an ESD.

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INSTALLATION

1. INSTALLATION

1.1 INSTALLATION PROCEDURE

Refer to the Operating Instructions for full installation procedures.

PREVENTIVE MAINTENANCE

2. PREVENTIVE MAINTENANCE

2.1 PM INTERVALS

The intervals shown below are for maintenance items.

Environmental conditions and machine use may affect these intervals. Adjust as necessary.

NOTE: The intervals shown below are for reference only. The replacement intervals noted here are expected to exceed machine life. However, if the indicated interval is reached, that component should be replaced.

	Component	Replacement Cycle	Done by
Printer	Pick-up Ass'y	150,000 pages	Service
	Transfer Roller	60,000 Pages	Service
	Fuser Unit	80,000 Pages	Service

REPLACEMENT AND ADJUSTMENT

3. REPLACEMENT AND ADJUSTMENT

This manual uses the following symbols.

☛ : See or refer to : Screw : Connector: : C-clamp (snap ring) : E-clamp

3.1 GENERAL PRECAUTIONS

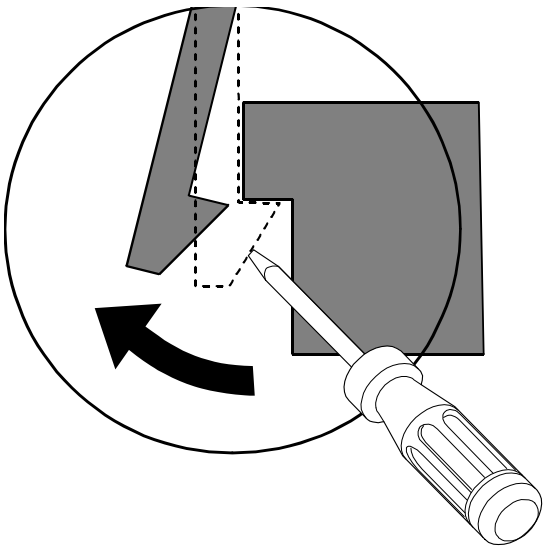
- Use caution when you disassemble and reassemble components.
- Ensure that all cables are correctly routed. Check the correct cable routing before you service the machine. Return all cables to their original position after you service the machine.

3.1.1 SERVICING THE MACHINE

1. Make sure there are no documents stored in memory before you service the machine.
2. Remove the toner cartridge before you disassemble parts.
3. Unplug the power cord before you service the machine.
4. Use a flat, clean surface to service the machine.
5. Use only approved replacement parts. Machine function cannot be guaranteed if unauthorized replacement parts are used.
6. Do not force plastic components. (Refer to 3.1.2)
7. Ensure that all components are in their correct positions.

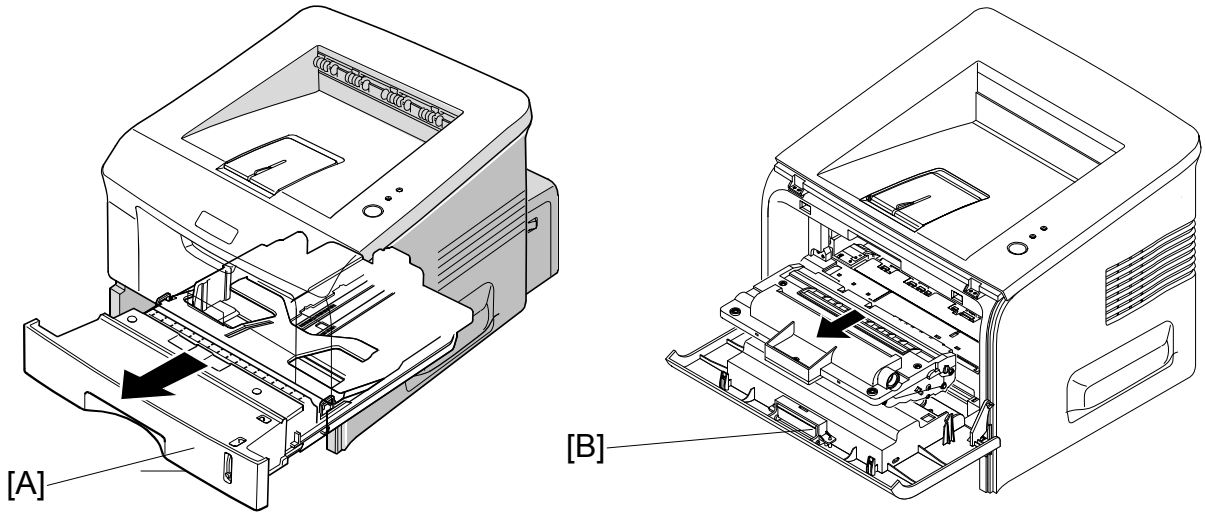
3.1.2 RELEASING PLASTIC LATCHES

Many parts or covers in this machine are held in place with plastic latches. The latches break easily. Release them carefully. To remove these parts, gently press the hook end of the latch away from the part to which it is latched.

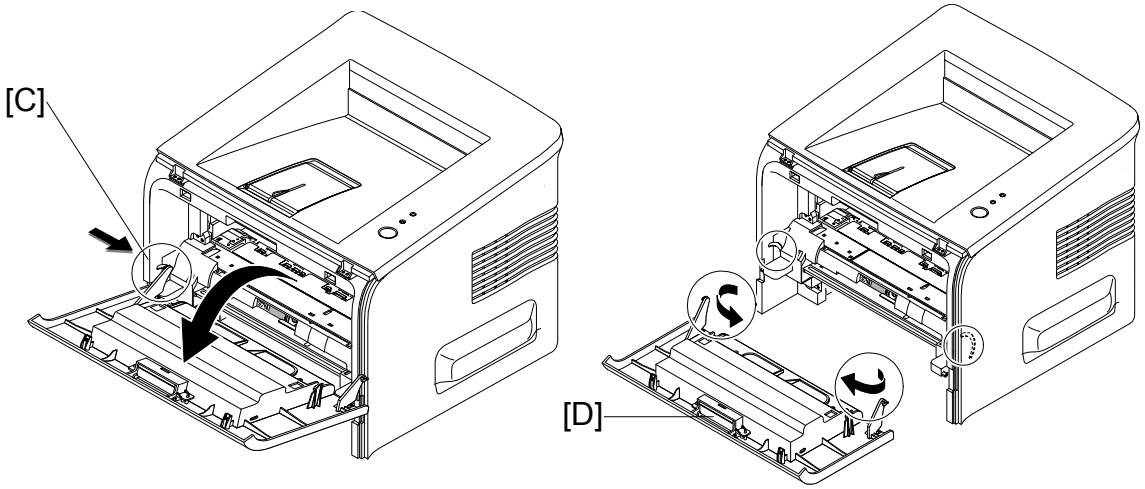


3.2 COVERS

3.2.1 FRONT COVER



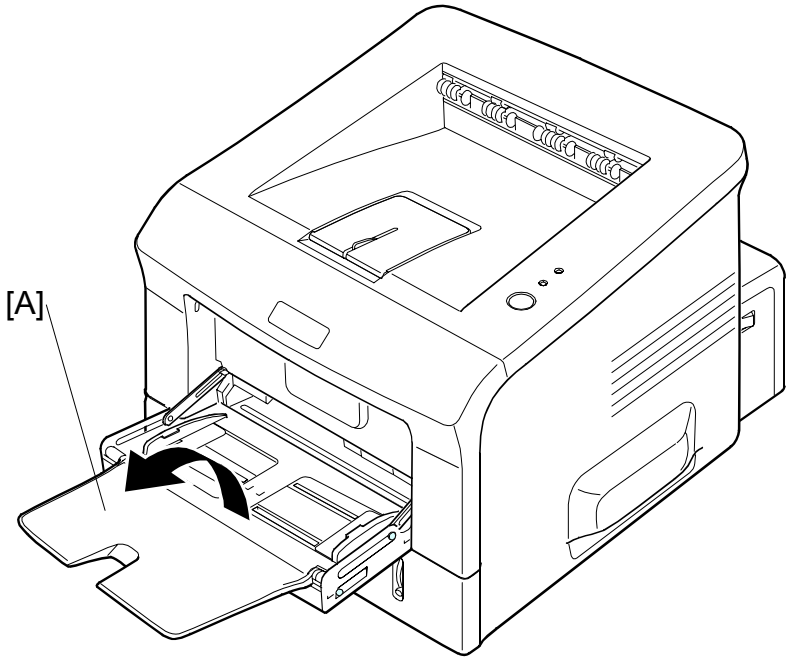
1. Pull the cassette [A] out of the printer.
2. Open the front cover [B] and push the toner cartridge down. Remove it from the machine.



3. Pull inward to release the hinges [C].
4. Pull the front cover [D] away from the machine.

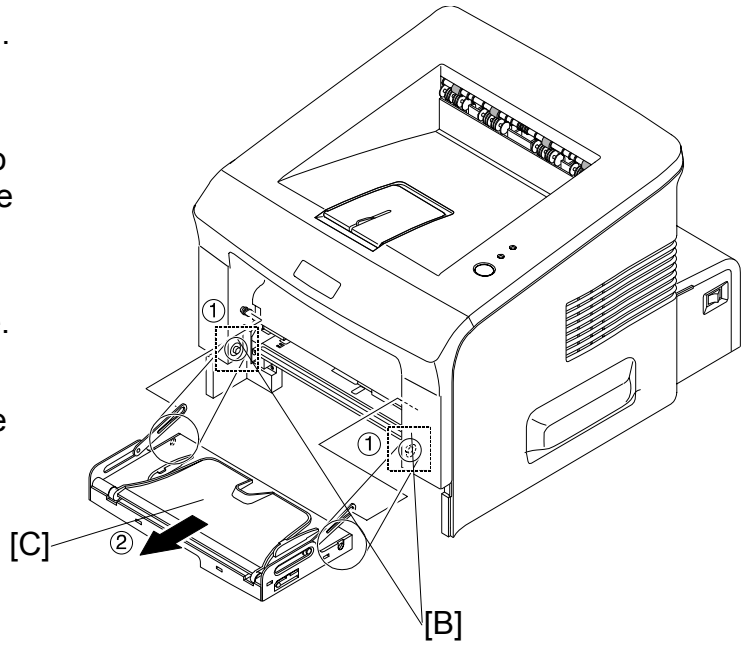
NOTE: To prevent damage to the toner cartridge, do not expose it to direct light for more than a few seconds.

3.2.2 BYPASS COVER

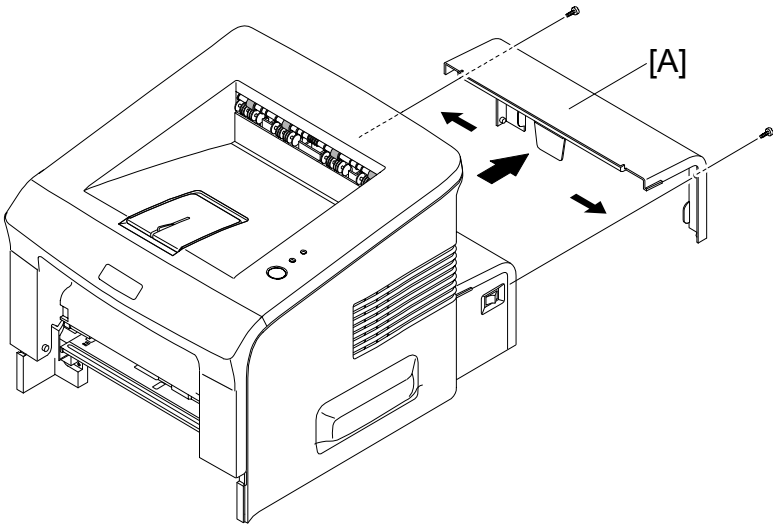


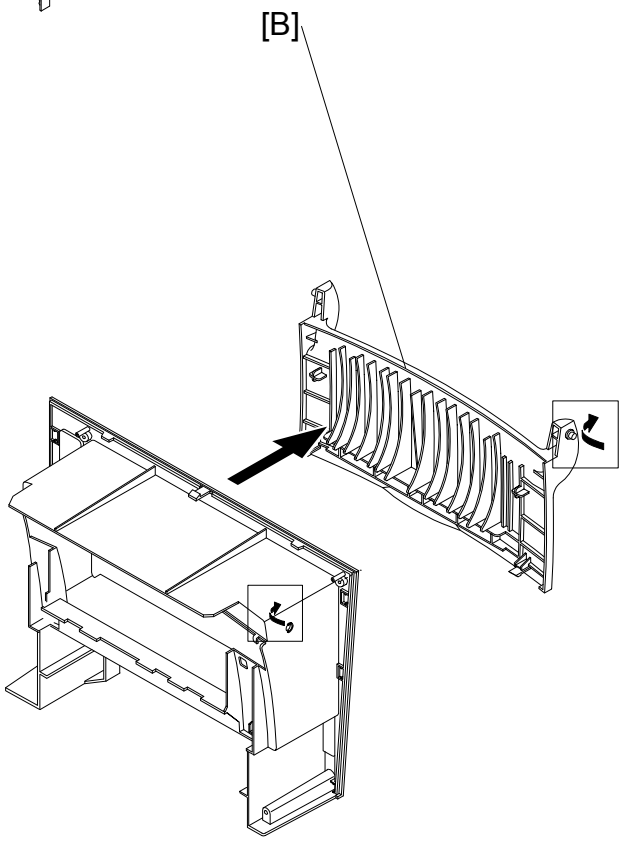
1. Open the tray assembly [A].
2. Carefully bend the plastic hinge supports toward the center of the machine [B] to release them from the guide hooks.
3. Pull the by-pass tray [C] outwards from the machine.

NOTE: A small amount of force can be used when bending the plastic hinges, but do not use excessive force or the hinges could be broken.

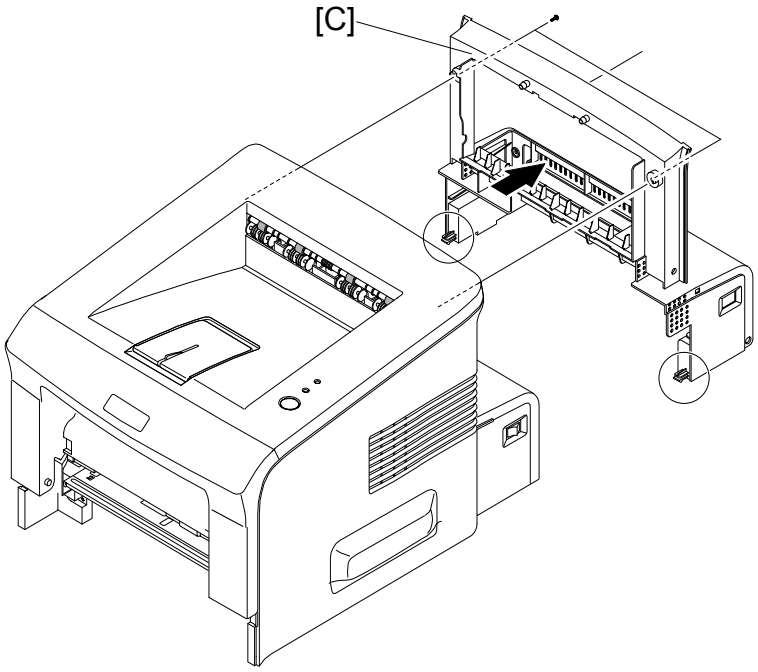


3.2.3 REAR COVER





1. Remove the 2 x ☞ and remove the option cover assembly [A].
2. Remove the cover face [B] in the direction of the arrow as shown above.



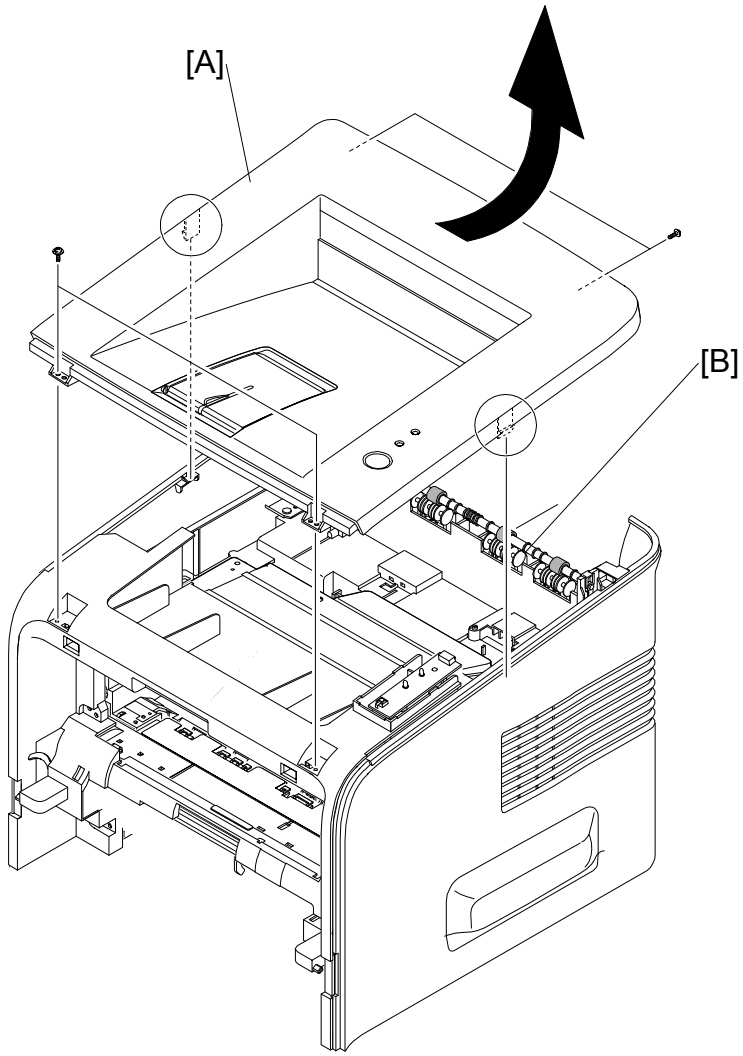
3. Remove the 2 x ☞ as shown above and snap the rear cover [C] out of the machine.

3.2.4 TOP COVER

Remove the following before removing the top cover:

☛ Front Cover 3.2.1

☛ Rear Cover 3.2.3



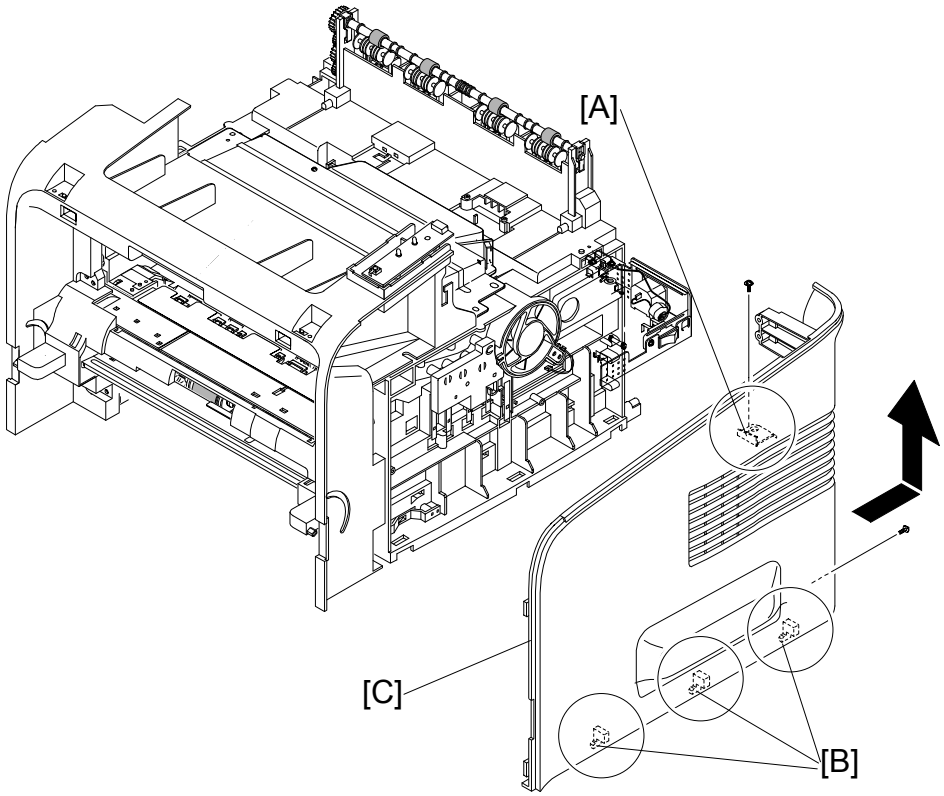
1. Remove the 4 x ☞ as shown above. Lift the top cover [A] from the machine.

NOTE: Ensure that no damage is inflicted upon the exit roller [B] when removing the top cover.

3.2.5 RIGHT SIDE COVER

Remove the following before removing the right side cover:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4



1. Remove the 2 x ☞ as shown above.
2. Release the top latch [A] and the three bottom latches [B] from the frame assembly, in the direction of the arrow.
3. Remove the right side cover [C].

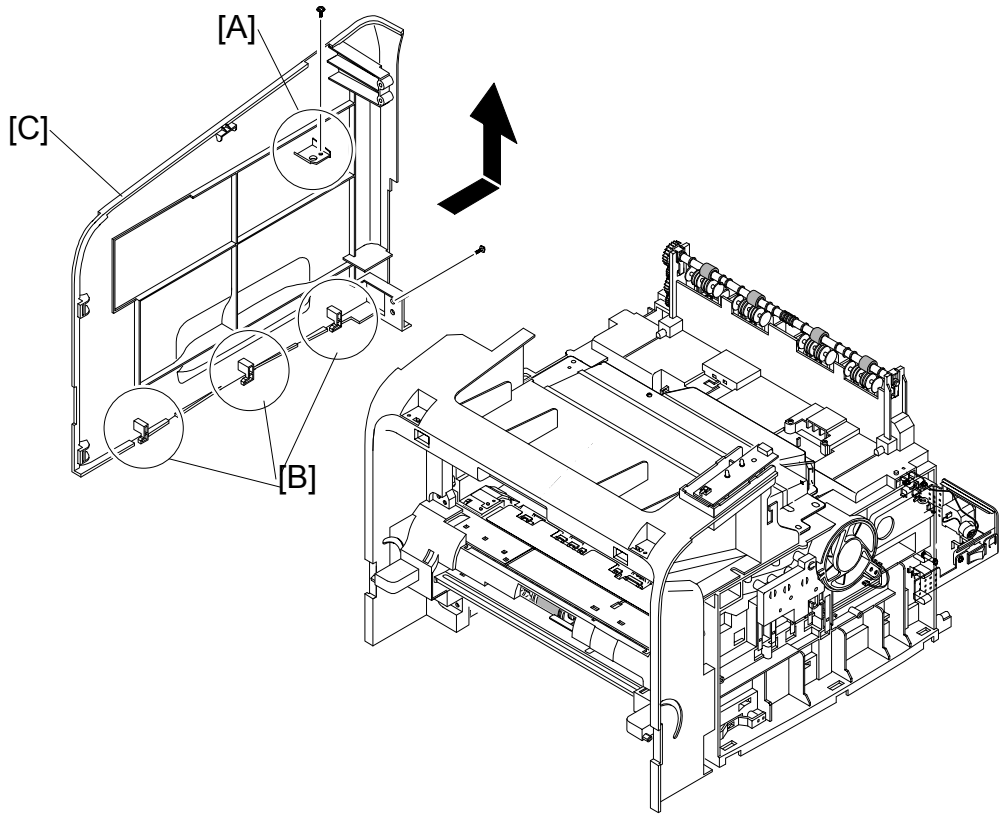
3.2.6 LEFT SIDE COVER

Remove the following before removing the left side cover:

☛ Front Cover 3.2.1

☛ Rear Cover 3.2.3

☛ Top Cover 3.2.4



4. Remove the 2 x 🔩 as shown above.
5. Release the top latch [A] and the three bottom latches [B] from the frame assembly, in the direction of the arrow. Remove the left side cover [C].

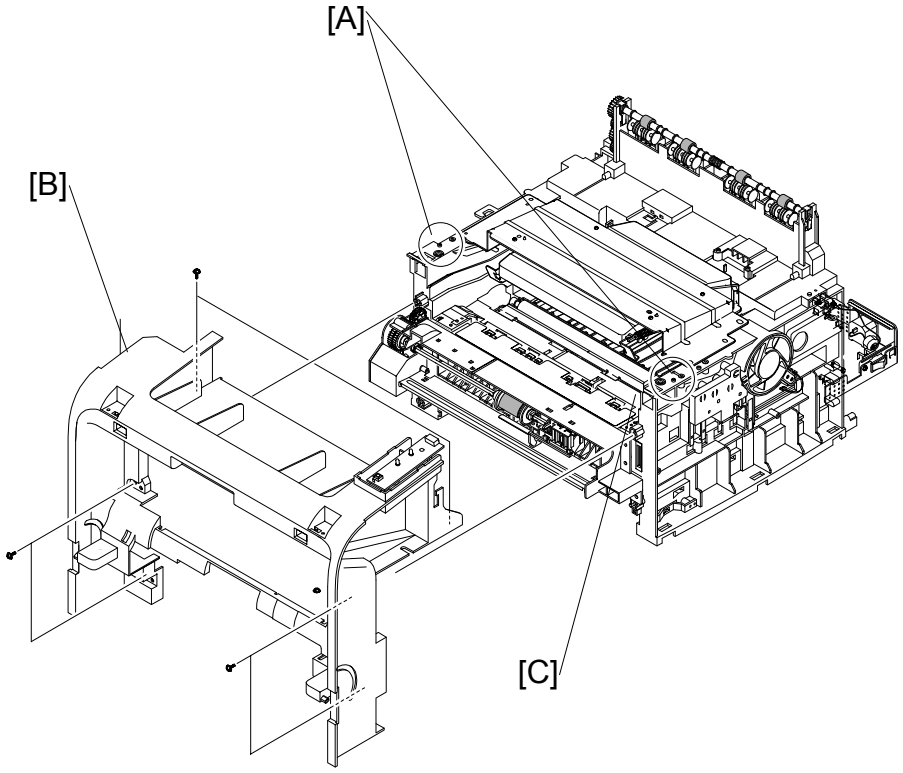
3.2.7 MIDDLE COVER

Remove the following before removing the middle cover:

☛ Front Cover 3.2.1

☛ Rear Cover 3.2.3

☛ Top Cover 3.2.4

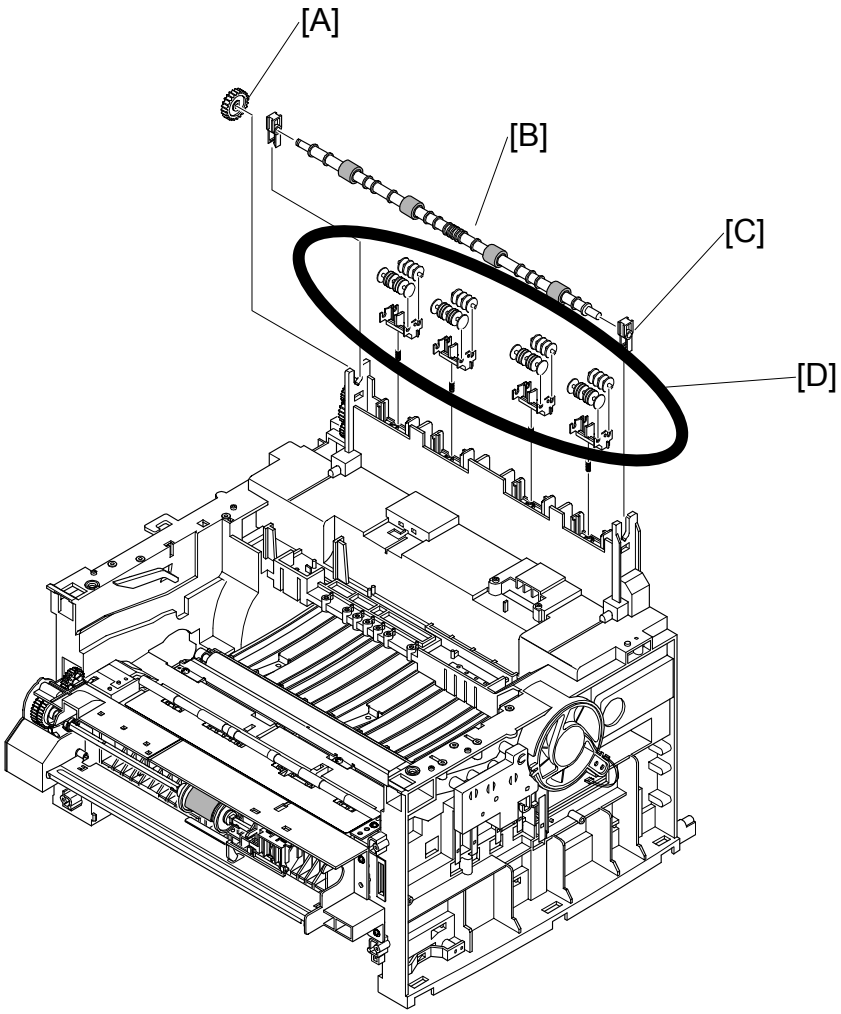


1. Remove the 2 x ☞ from the top of the middle cover [B] (screws are on the inside).
2. Remove the 4 x ☞ from the base frame (screws are outside, at the back bottom, center, left, and right).
3. Disconnect the operation panel harness [C] from the operation panel before you remove the middle cover [B]. Ensure that you do not damage the hook [A].

3.3 EXIT ROLLER

Remove the following before removing the exit roller:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6



1. Gently pull the gear [A] and remove from the exit roller [B].
2. Pull on the latch [C] and slide the exit roller [B] out.
3. Remove 4 bushings [D] and 4 springs from the machine.

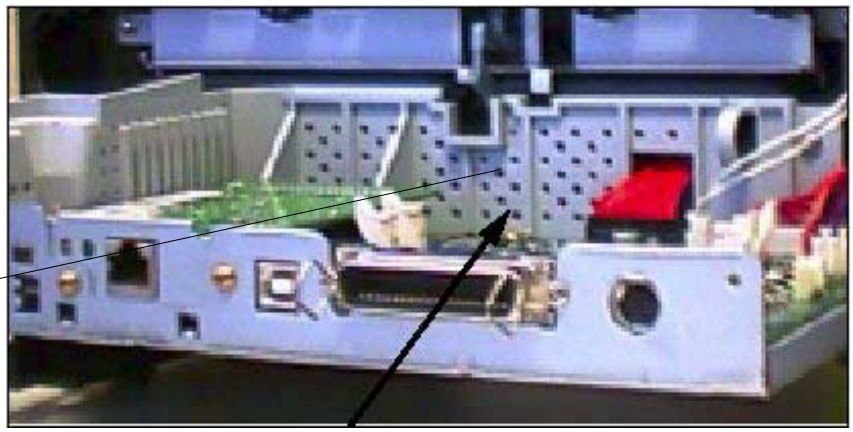
NOTE: The bushings contain grease. Be careful when removing them to prevent this grease from reaching your clothing or the customer's furnishings.

3.4 ENGINE SHIELD ASSEMBLY AND EXIT BOARD

Remove the following before removing the engine shield and exit board:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6

3.4.1 ENGINE SHIELD



Perform the following before removing the engine shield assembly.

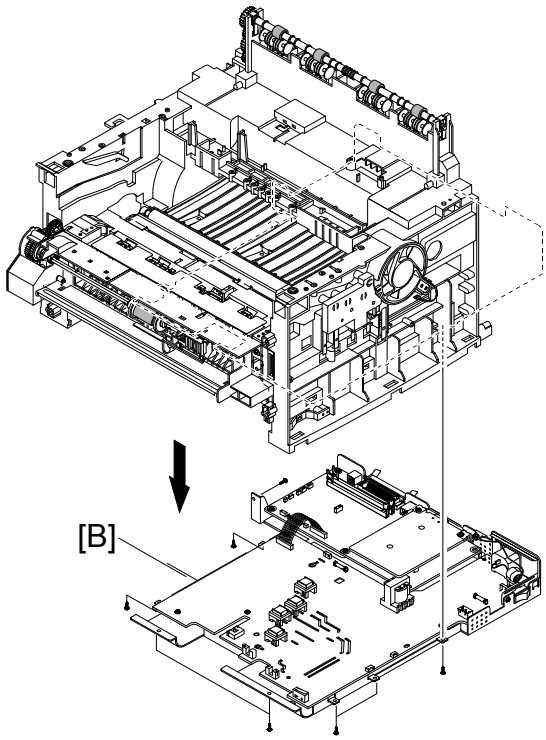
NOTE: The SMPS shield is a safety shield that separates the high voltage area from the rest of the IC chips.

1. Release 1 x ☞ (black arrow) from the SMPS shield [A]. **Do not remove the shield at this time**.

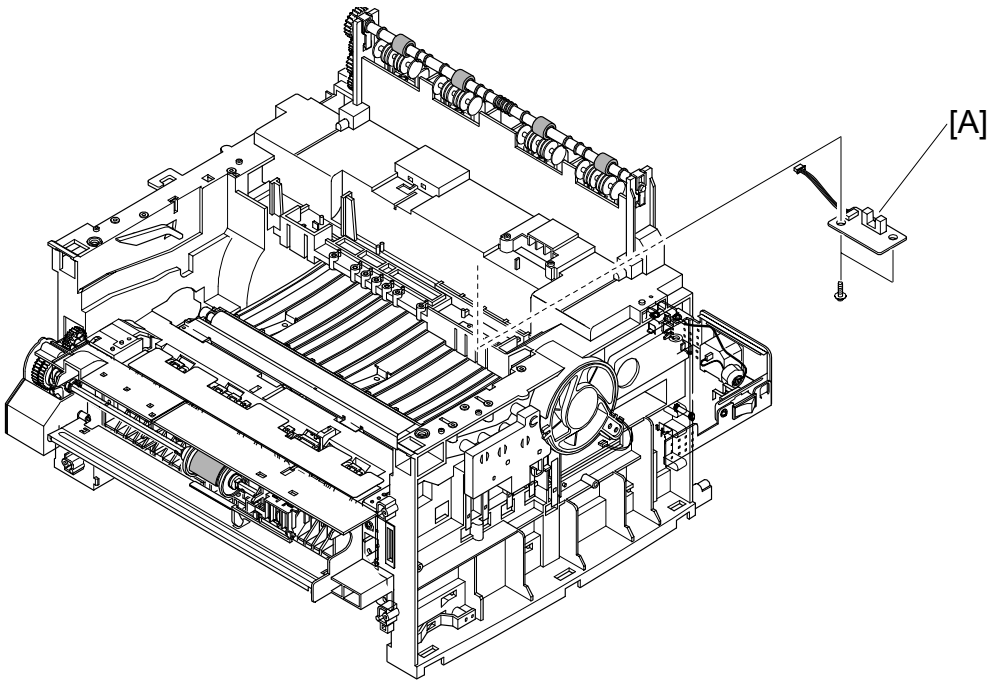
2. Turn the machine on its side and remove the 12 x from the engine shield assembly [B].

   NOTE: All screws must be removed before the safety shield can be removed.

3. Unplug 5x from the operation panel, fan, and fusing unit.
4. Turn the machine back upright and remove the SMPS shield [A].
5. Remove the engine shield assembly [B] from the machine.



3.4.2 EXIT BOARD

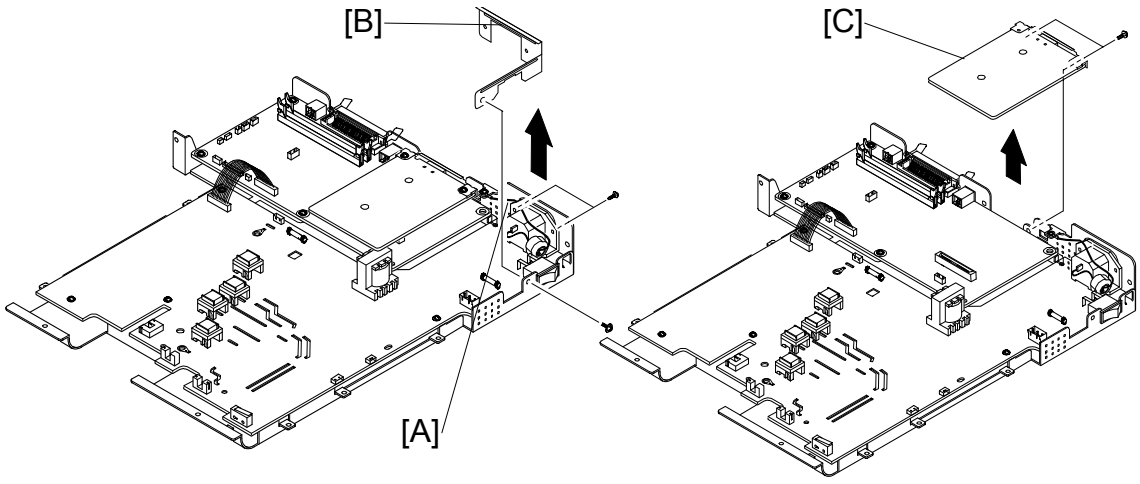


1. Remove the 2 x ☞ as shown above.
2. Remove the exit board [A].

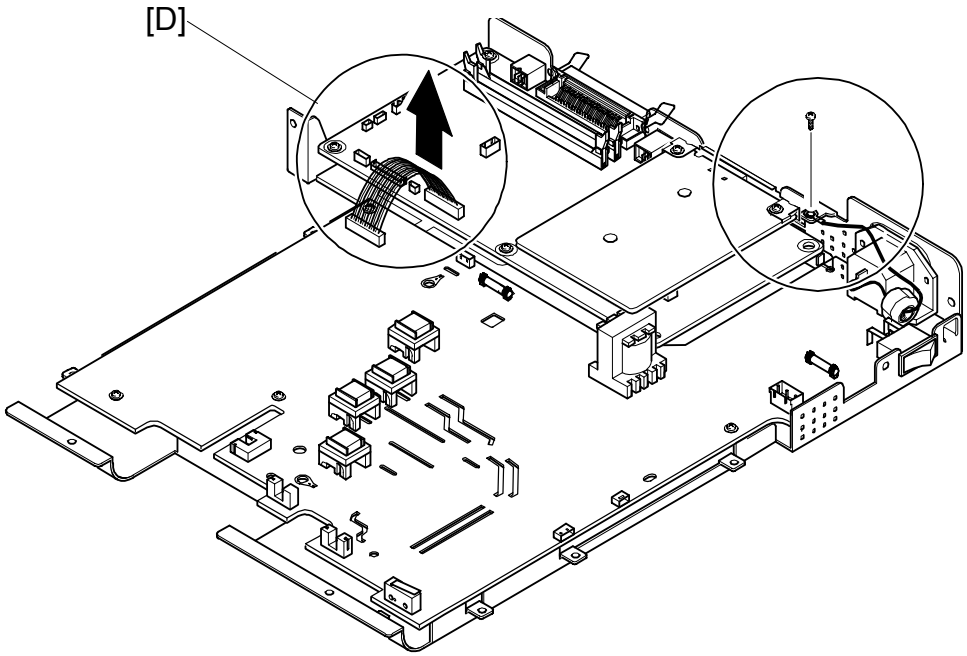
3.5 SMPS

Remove the following before removing the SMPS:

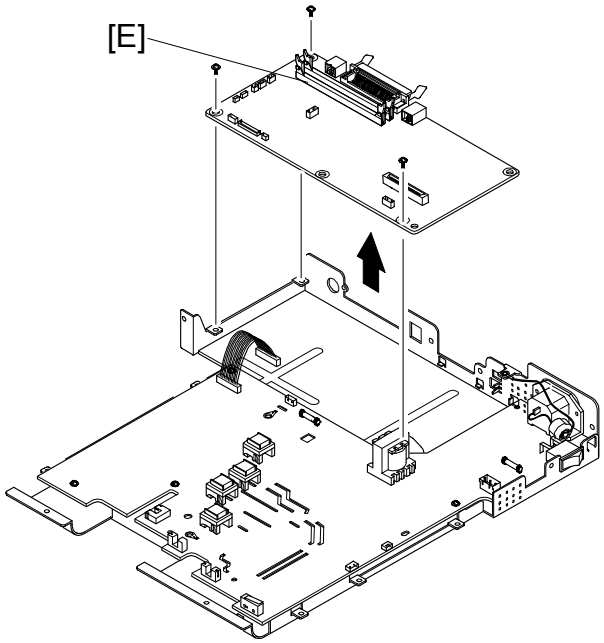
- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6



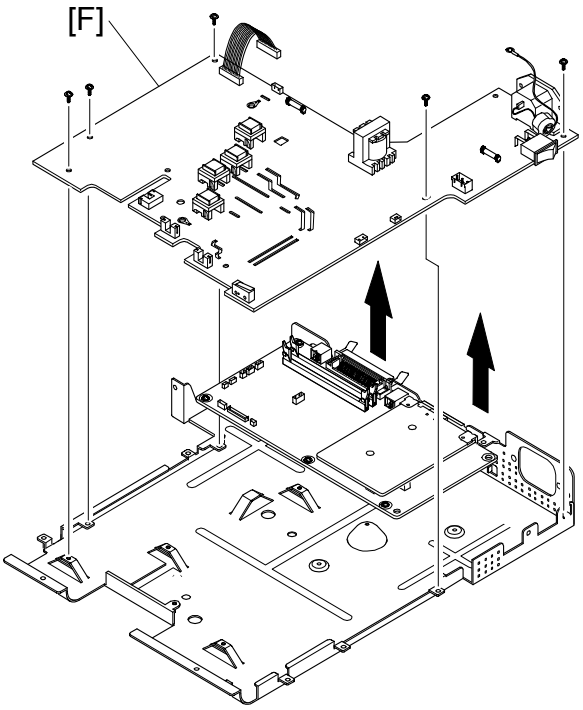
1. Unplug one wire [A].
2. Remove the 3 x ☞ and remove the inlet bracket [B].
3. Remove the 2 x ☞ and remove the network board [C].



4. Unplug the engine harness [D].



5. Remove 2 x from the IEEE1284 port and the main PBA [E].



6. Remove 6 x and remove the SMPS [F].

NOTE: If you need only to remove the optional memory units or the network card, remove the optional cover only. ☛ 3.2.3

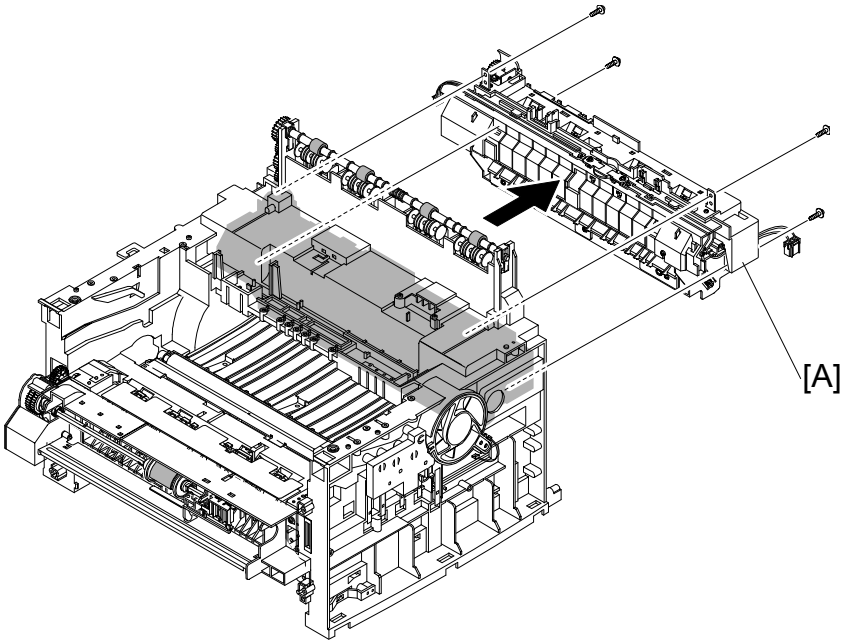
3.6 FUSING UNIT

Remove the following before removing the fusing unit:

☛ Rear Cover 3.2.3

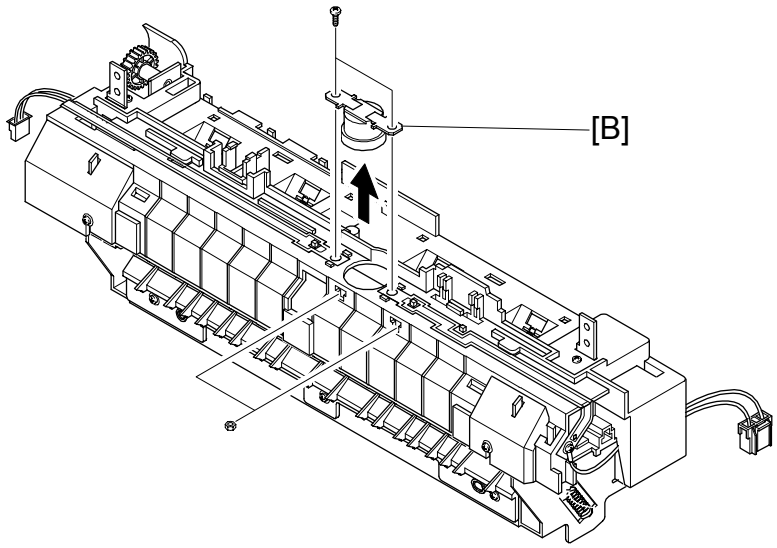
3.6.1 FUSING UNIT ASSEMBLY

NOTE: Perform the following procedure only if it is necessary to remove the entire fusing unit assembly. Otherwise, use the individual component procedures.



1. Unplug the 2 x from the main PBA and the SMPS.
2. Remove 4 x . Remove the fusing unit assembly [A].

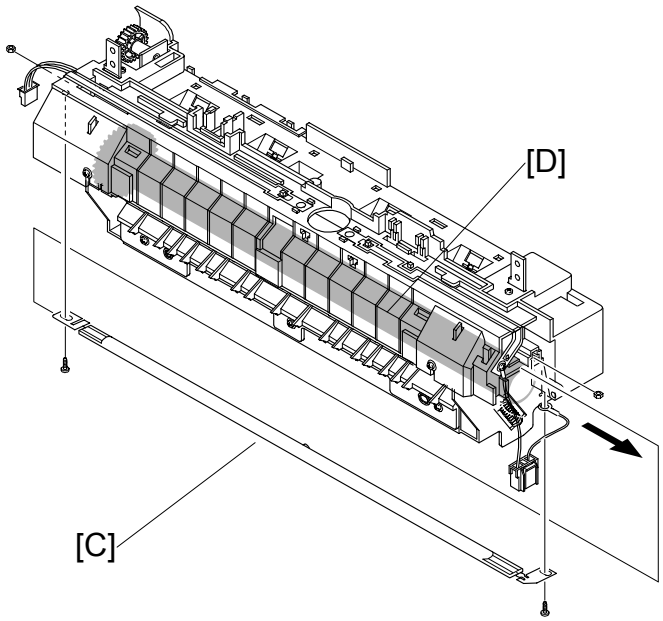
3.6.2 THERMOSTAT



3. Remove the 2 x . Remove the thermostat [B].

NOTE: Both screws have a nut and a bolt.

3.6.3 FUSING LAMP

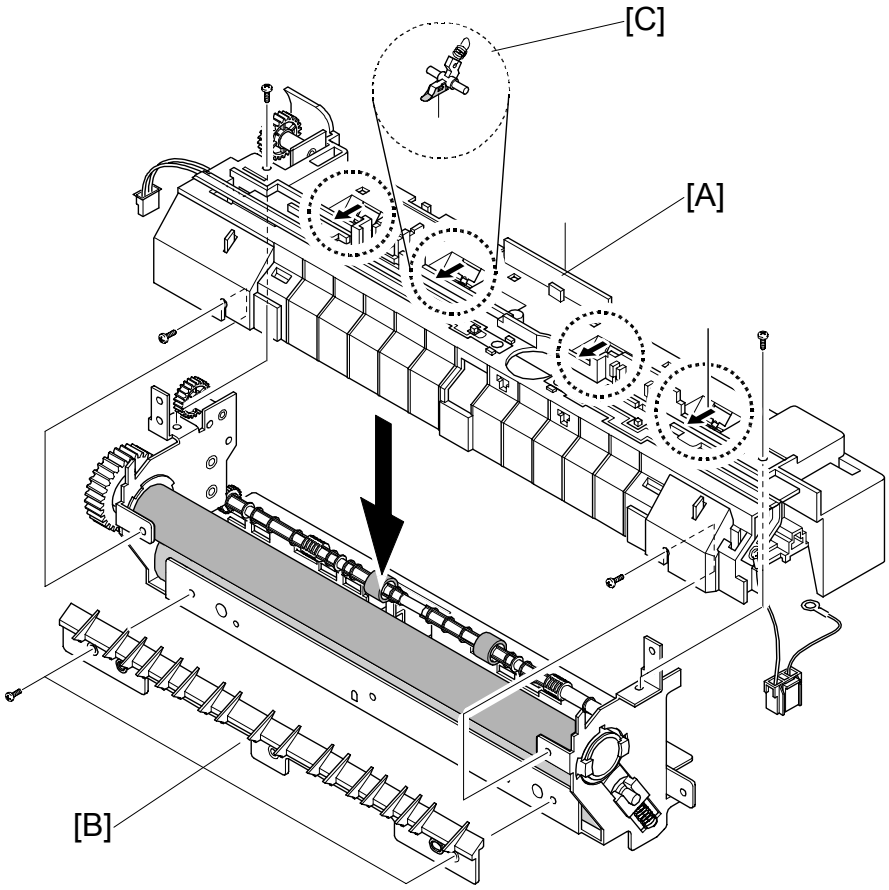


4. Remove the 2 x securing the fusing lamp [C].

NOTE: Both screws have a nut and a bolt.

5. Slide the fusing lamp [C] out from the hot roller [D] in the direction of the arrow as shown above.

3.6.4 STRIPPER PAWLS

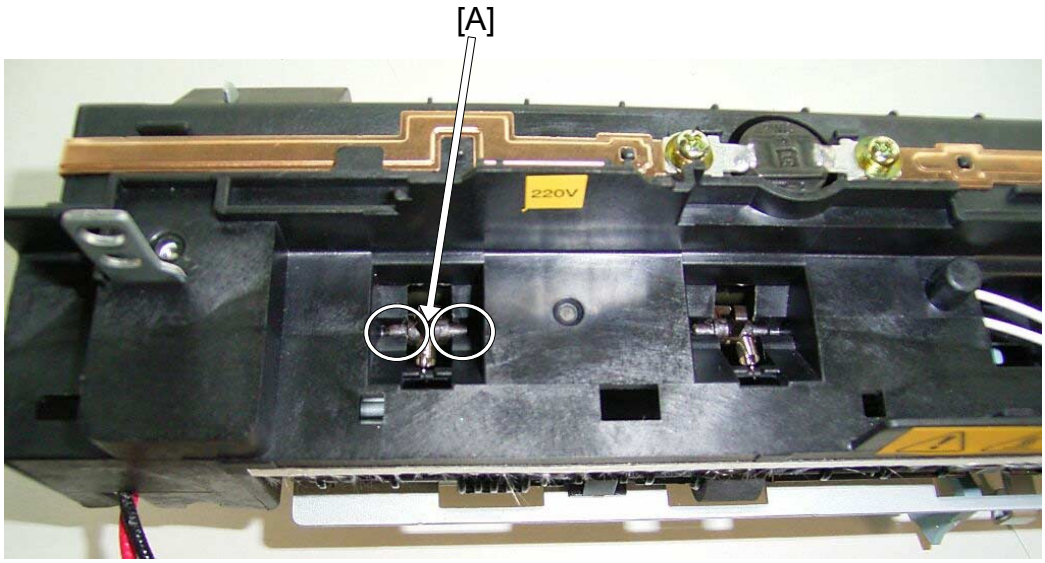


[A]: Remove the 4 x ☞ securing the fusing unit cover [A].
[B]: Remove the 2 x ☞ securing the guide input [B].
[C]: Disassemble the fusing unit.

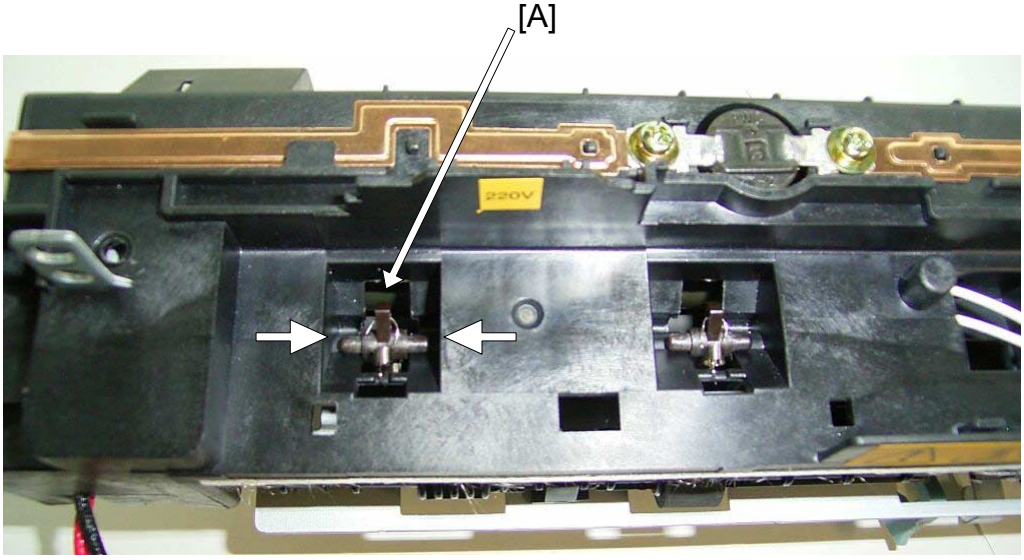
Reassembling the Fusing Unit

The 4 x stripper pawls must be put in the correct position before you can reassemble the fusing unit. Perform the following procedure before you put the fusing unit back to the fusing unit assembly.

1. Snap the 4 x stripper pawls [A] out of the left and right side stripper pawl holder slots (shown in white circles below).



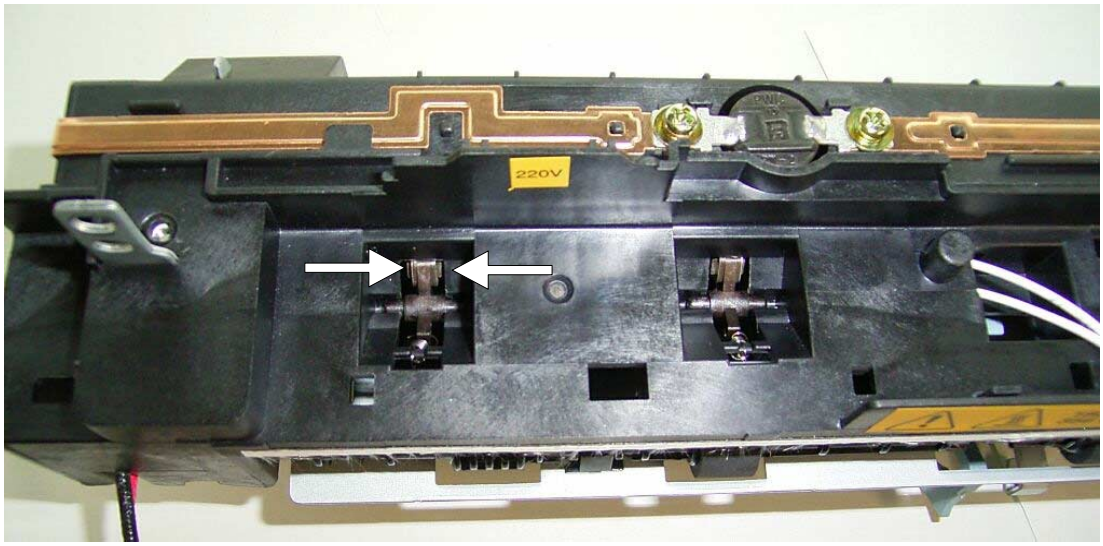
2. Place the top part of the fusing unit onto the bottom part of the fusing unit.
3. Place the 4 x stripper pawls [A] back into the stripper pawl holder slots (shown with two white arrows in the illustration below).
4. Push the sides of the stripper pawls securely into the stripper pawl holder slots.
5. Reassemble the rest of the fusing unit and set it back into the machine.



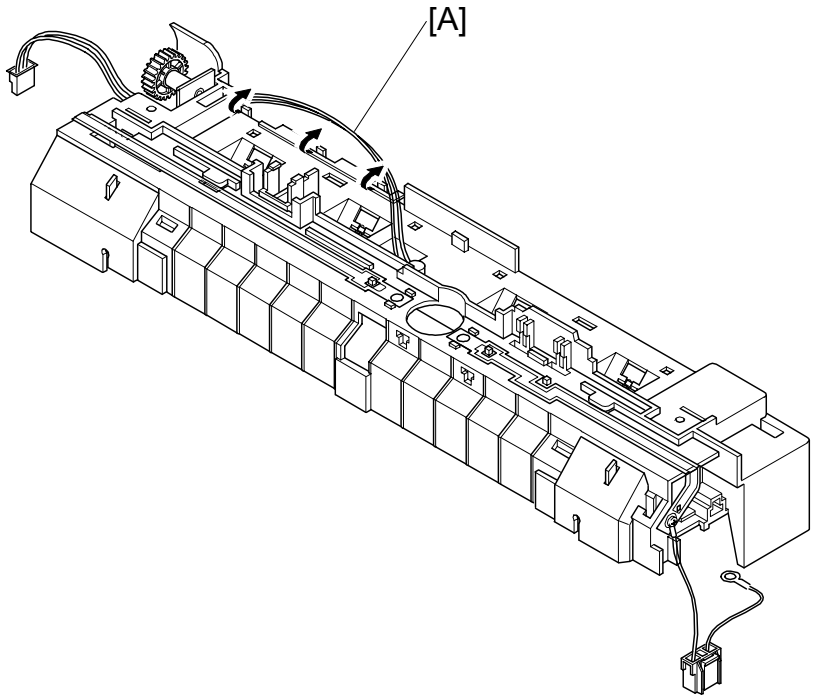
Note:

The illustration below shows the stripper pawls in the incorrect position.

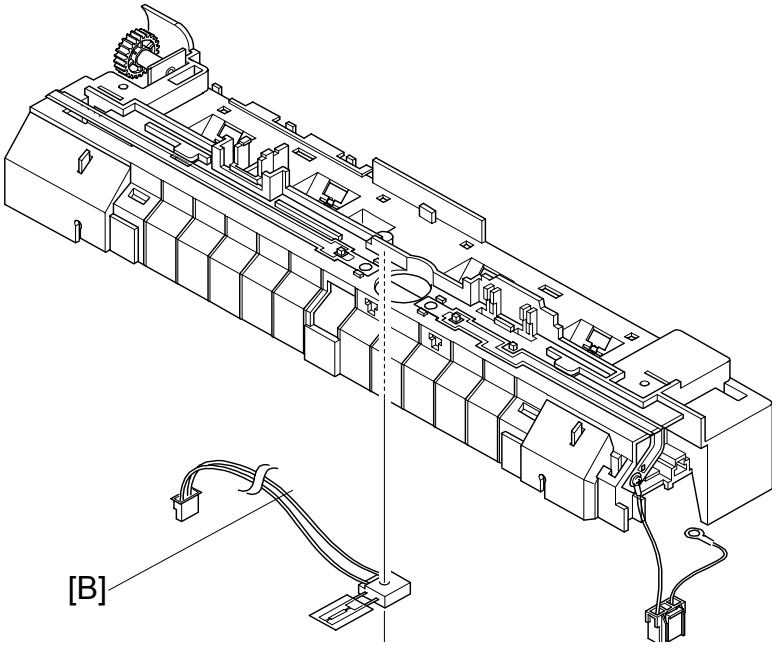
Note that the stripper pawls are not correctly set into the stripper pawl holder slots. **Do not place the fusing unit back into the machine with the stripper pawls in the wrong position.**



3.6.5 THERMISTOR



Unwrap the thermistor harness [A] as shown above.

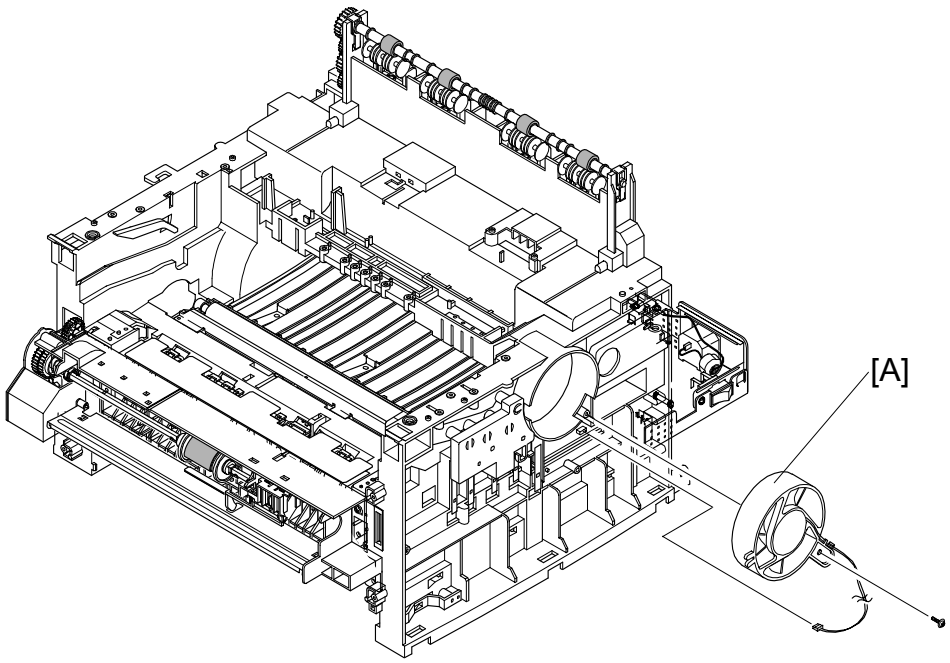


Remove 1 x 🔩 securing the thermistor [B] and remove it

3.7 UNPLUG FAN

Remove the following before removing the fan:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6

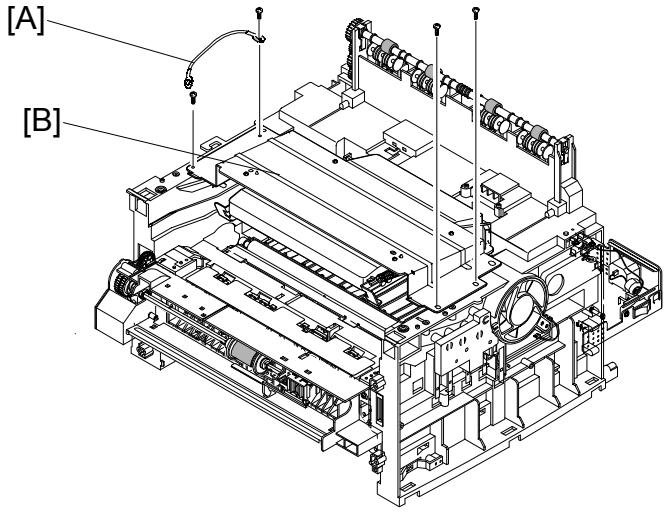


1. 1 x 🖑 from the SMPS.
2. Remove 1 x 🔧. Remove the Fan [A].

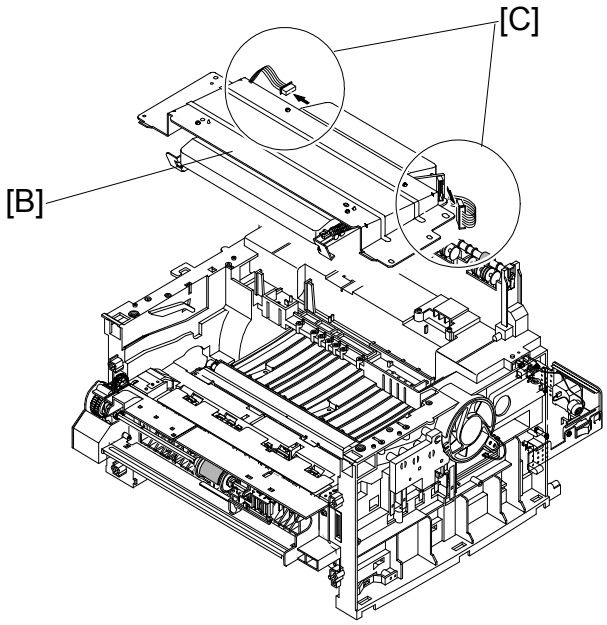
3.8 LASER SCANNING UNIT

Remove the following before removing the laser scanning unit:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6



1. Remove one ground wire [A].
2. Remove the 4 x securing the laser scanning unit [B].



3. Unplug 2 x [C] as shown above. Remove the laser scanning unit [B].

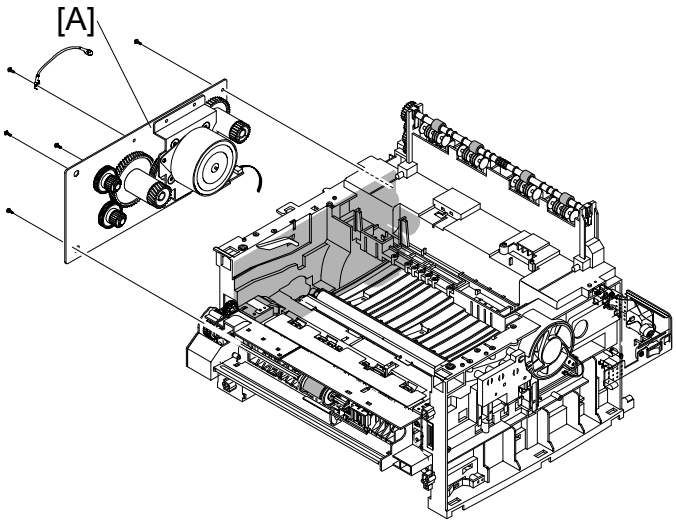
NOTE: Do not touch the plastic shield of the laser scanning unit.

NOTE: The screw slots on the laser scanning unit are numbered. Use the following order when you disassemble/reassemble it:
1) Disassemble: 4-3-2-1
2) Reassemble: 1-2-3-4

3.9 DRIVE UNIT

Remove the following before removing the drive assembly:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6



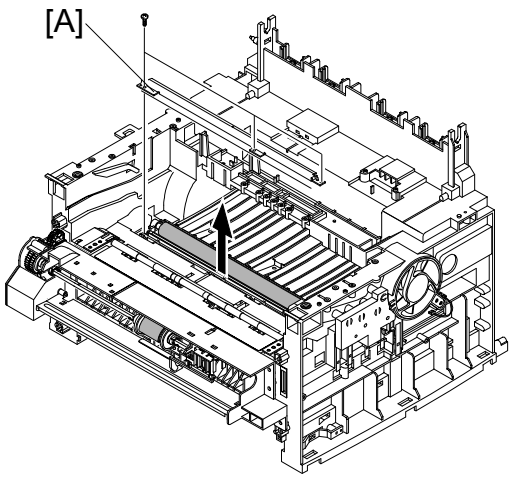
1. Unplug 1 x 🔌 from the drive assembly board [A].
2. Remove the 6 x 🔩 (white screws) and 2 x ground wires. Remove the drive assembly board [A].

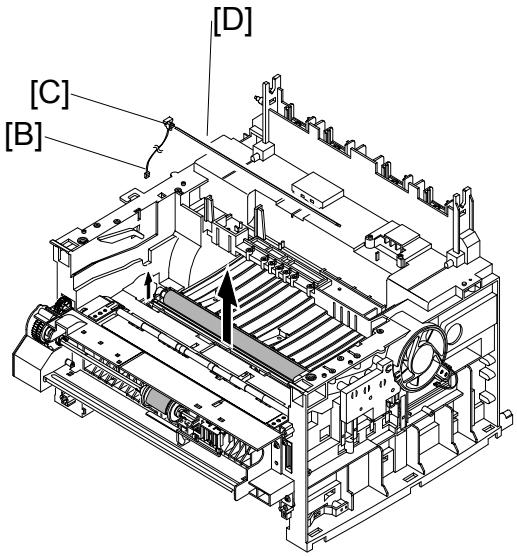
NOTE: The screws and the screw slots on the drive assembly board are numbered. Use the order shown on the board when you disassemble/reassemble it.

3.10 TRANSFER UNIT

Remove the following before removing the transfer assembly:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Middle Cover 3.2.7
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6

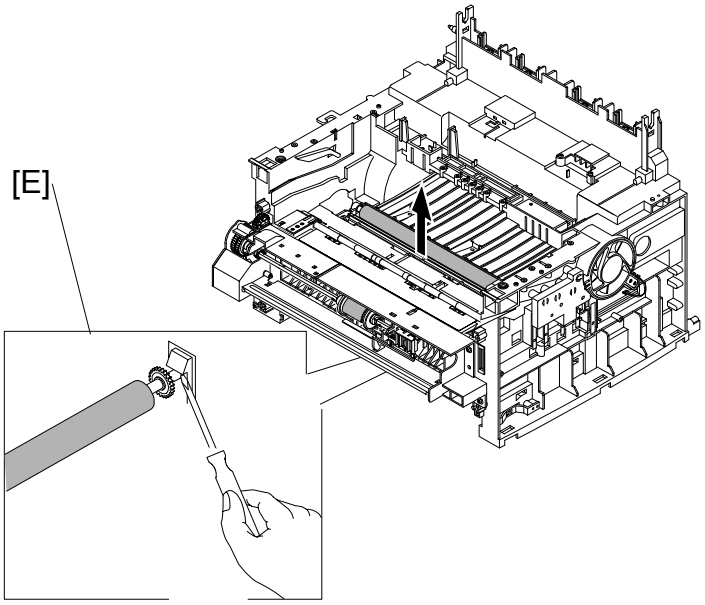




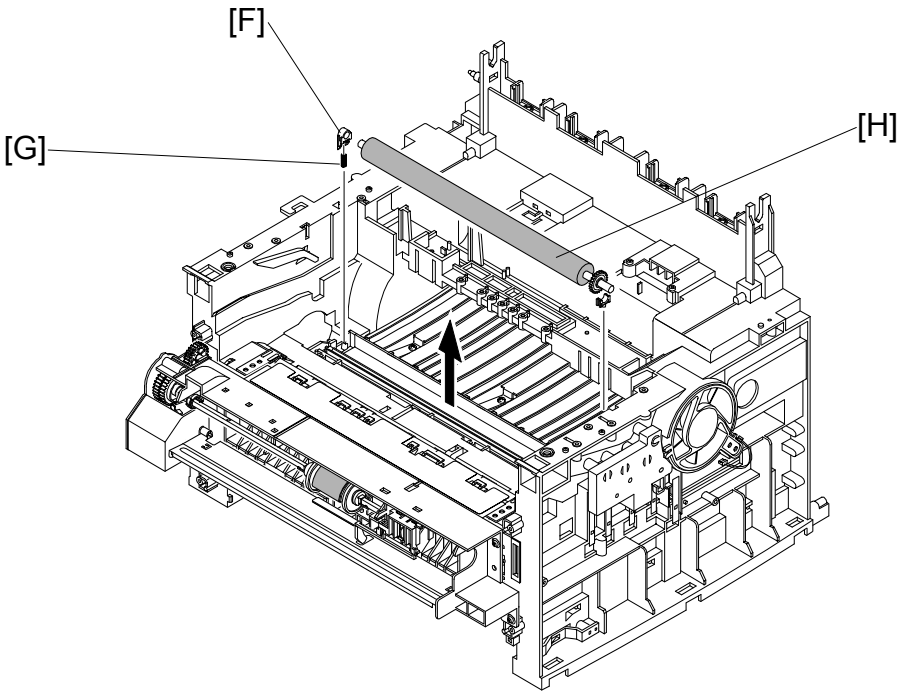
1. Remove the 3 x . Remove the transfer ground [A].

NOTE: The transfer ground is designed to prevent unwanted particles from adhering to the transfer roller.

2. Unplug 1 x [B].
3. Remove the PLT holder [C] and the PTL lens [D].



4. Unlatch the transfer roller [E] as shown above.



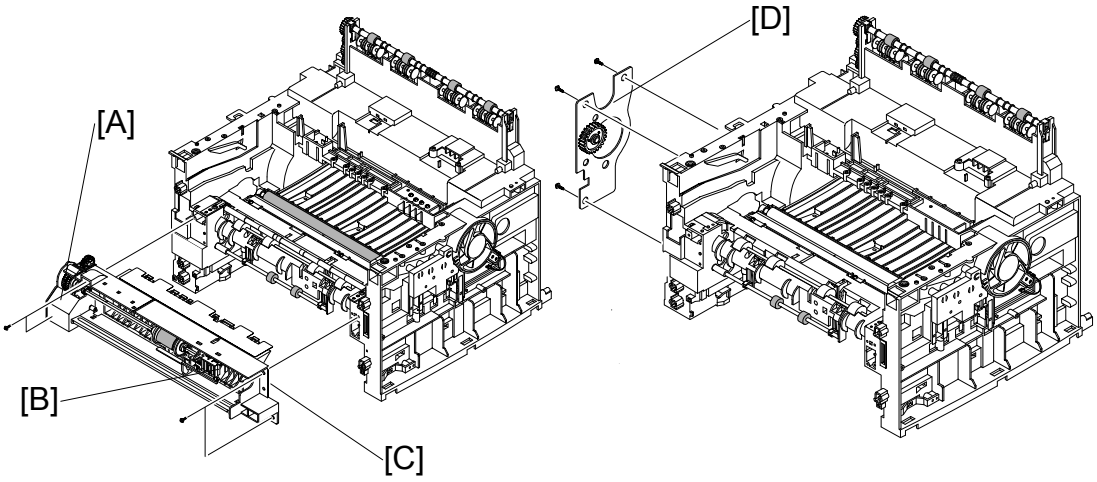
5. Unlatch two bushes (both sides) [F] and two springs (both sides) [G] and remove them.
6. Remove the transfer roller [H] from the machine.

3.11 BYPASS TRAY UNIT AND FEED ROLLER

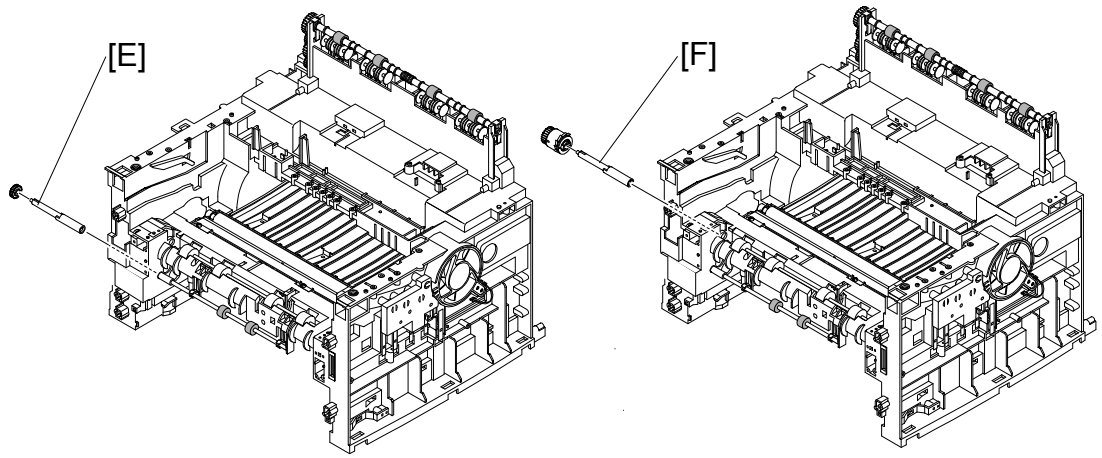
Remove the following before removing the bypass tray and feed roller:

- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Middle Cover 3.2.7
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6

3.11.1 BYPASS TRAY UNIT

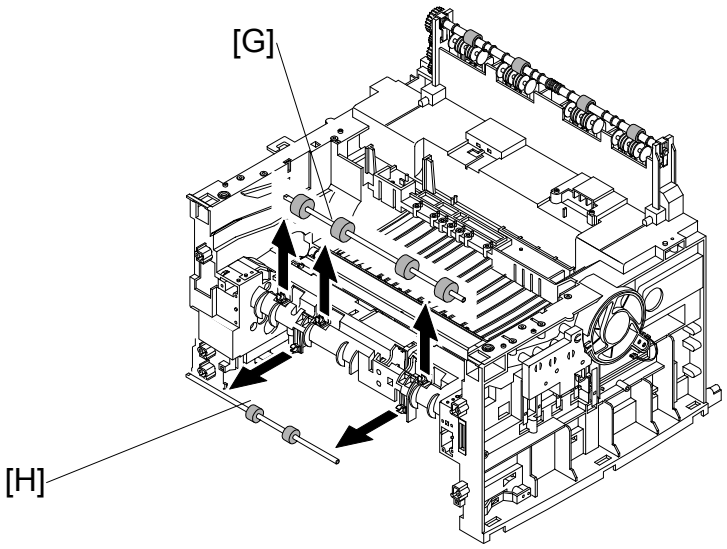


1. Disconnect 1 x 🖑 for the MP solenoid [A] and 1 x 🖑 for the MP sensor [B].
2. Remove the 4 x 🔩. Remove the by-pass assembly. (Ensure that the cables are threaded through the frame.)
3. Remove the 2 x 🔩 from the feed bracket [D]. Remove it from the machine.



4. Remove feed gear 2 [E] from the machine.
5. Remove feed gear 1 [F] from the machine.

NOTE: Feed gear 1 has a bigger bushing than feed gear 2. This will let you know which gear is feed gear 1 and which gear is feed gear 2.



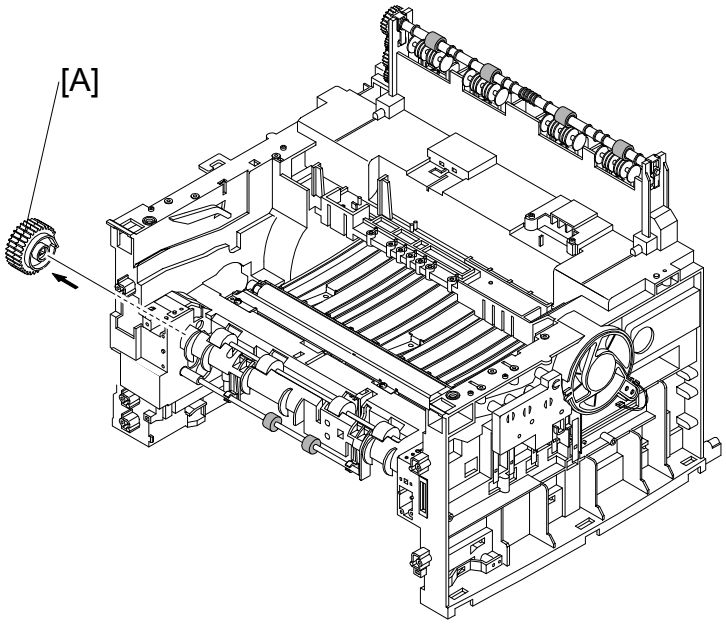
6. Remove the feed roller [G] from the machine.
7. Remove feed roller 1 [H] from the machine.

3.12 PICK-UP ASSEMBLY AND SOLENOID

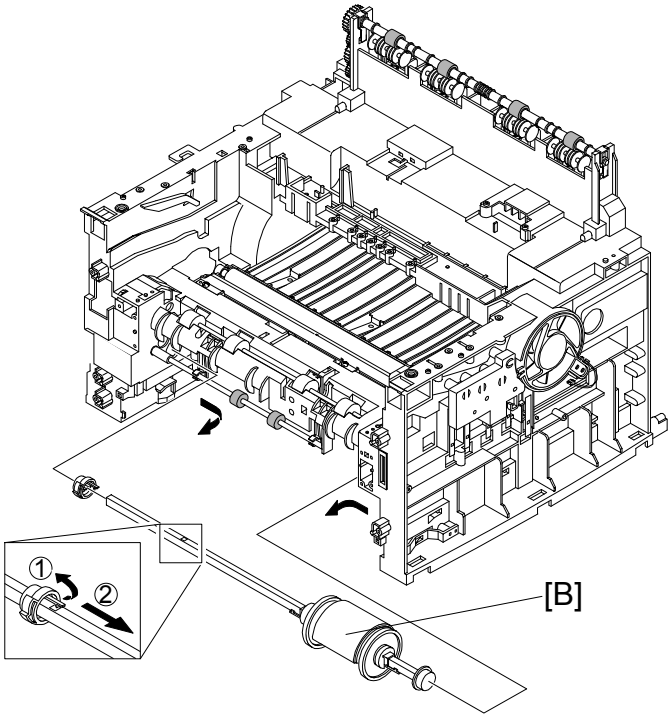
Remove the following before removing the pick-up assembly and solenoid:

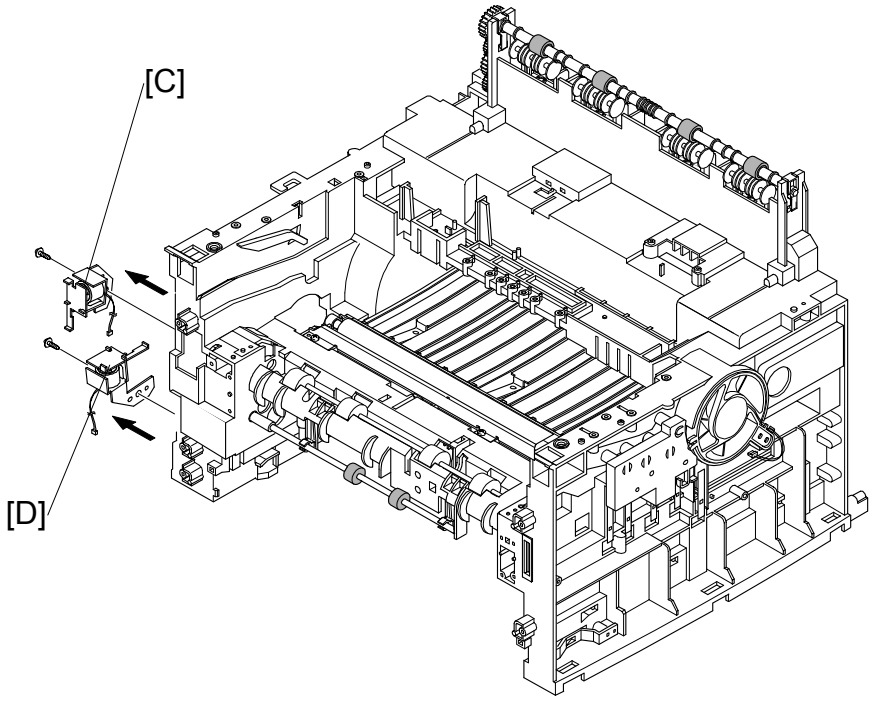
- ☛ Front Cover 3.2.1
- ☛ Rear Cover 3.2.3
- ☛ Middle Cover 3.2.7
- ☛ Top Cover 3.2.4
- ☛ Left and Right Side Cover 3.2.5, 3.2.6

1. Remove the pick-up gear [A].

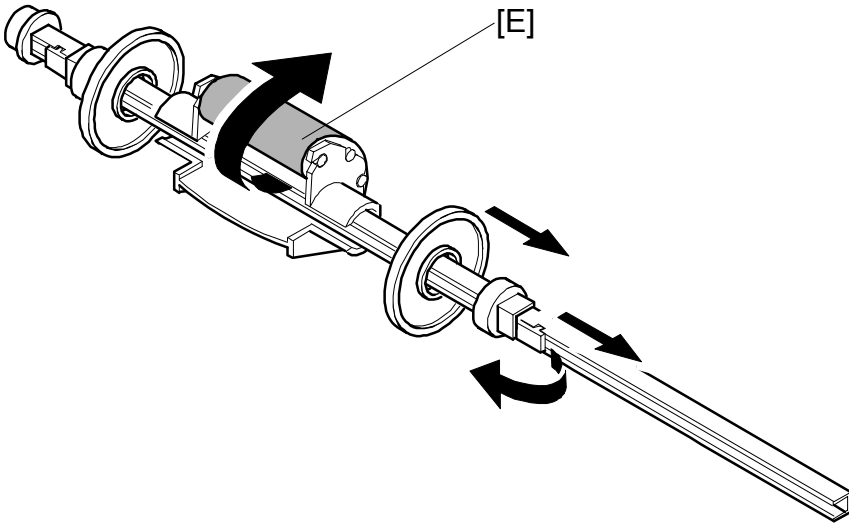


2. Remove the pick-up assembly [B] as shown.





3. Disconnect 2 x from the main board.
4. Remove the 2 x . Remove the pick-up solenoid [C] and the manual solenoid [D]. (Ensure that you thread the cables through the frame.)

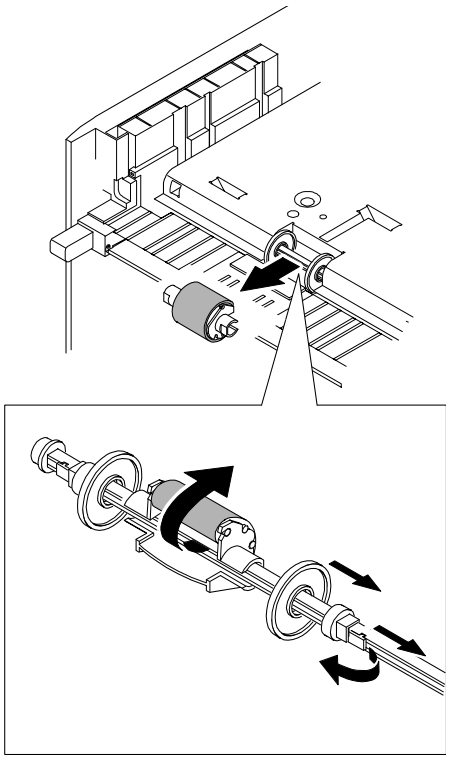


5. Remove the rubber pick-up [E] from the pick-up roller as shown above.

Pick-up Roller and By-pass Pick-up Roller

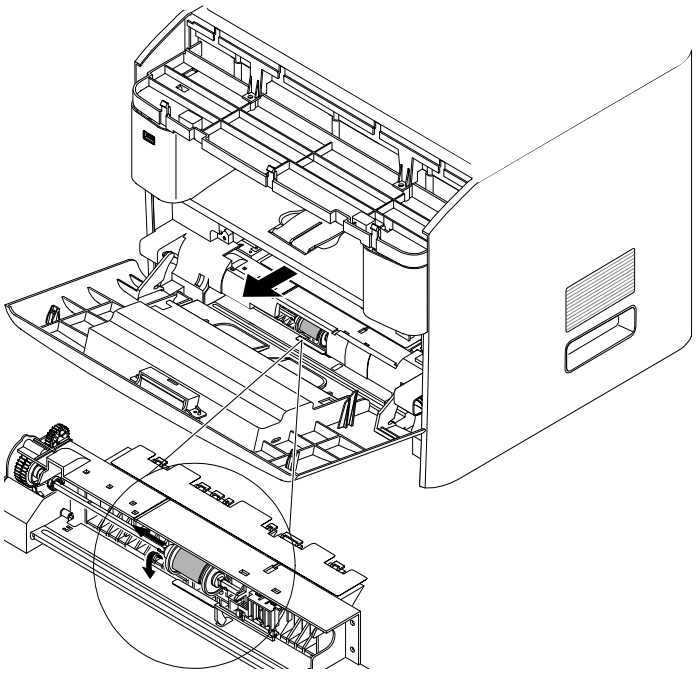
It is not necessary to disassemble the main cassette if you only want to replace the pick-up roller and/or the by-pass pick-up roller. The following procedures show how to replace these two rollers only.

Paper Feed Unit Pick-up Roller



1. Turn the machine upside down.
2. Release the white catch. Slide the locking piece as far to the side as possible.
3. Slide the white collar as far to the side as possible.
4. Slide the pick-up roller to the side until it gets free from the white collar.
5. Rotate the pick-up roller around the drive until it can be removed.

By-pass pick-up roller

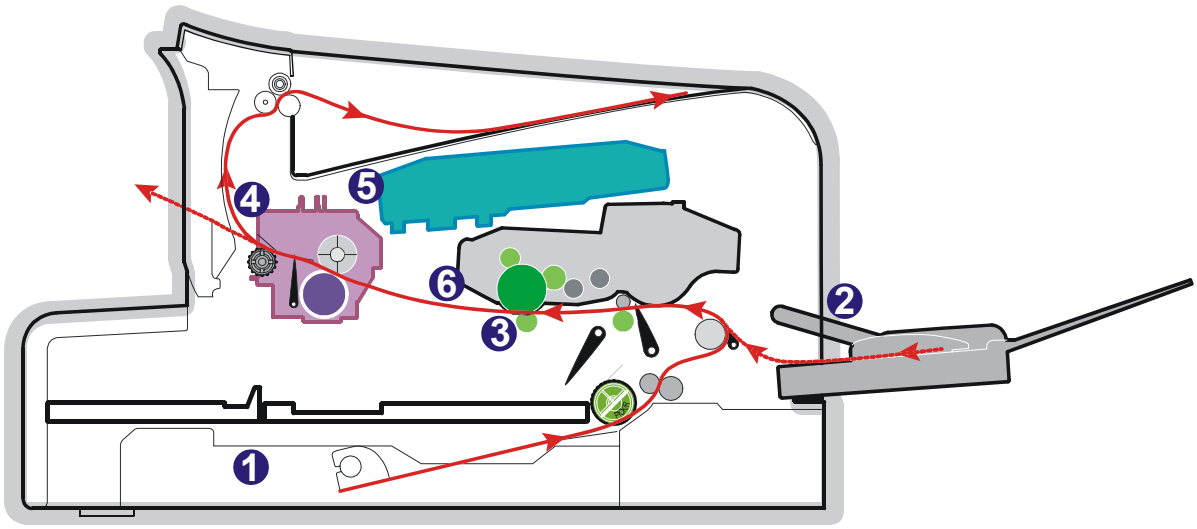


1. Release the white catch and slide the locking piece as far to the side as possible.
2. Slide the white collar as far to the side as possible.
3. Slide the pick-up roller as far as possible to the side until it is free from the white collar.
4. Rotate the pick-up roller around the drive shaft until it can be removed.

TROUBLESHOOTING

4. TROUBLESHOOTING

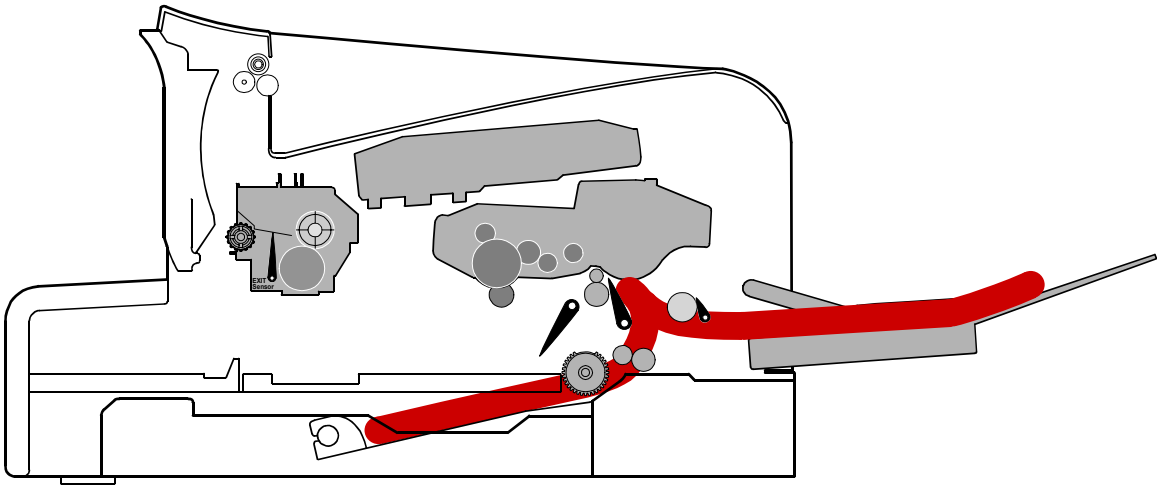
4.1 PAPER PATH



1. Paper feed cassette
2. By-pass tray
3. Transfer roller
4. Fusing unit
5. Laser scanning unit
6. Toner cartridge

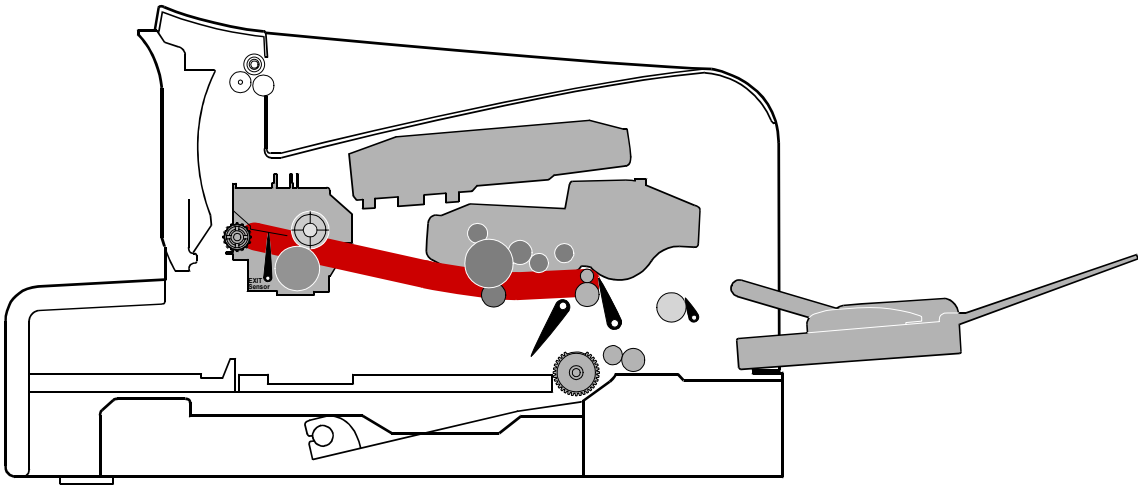
4.1.1 PAPER JAM CONDITIONS

Jam 0



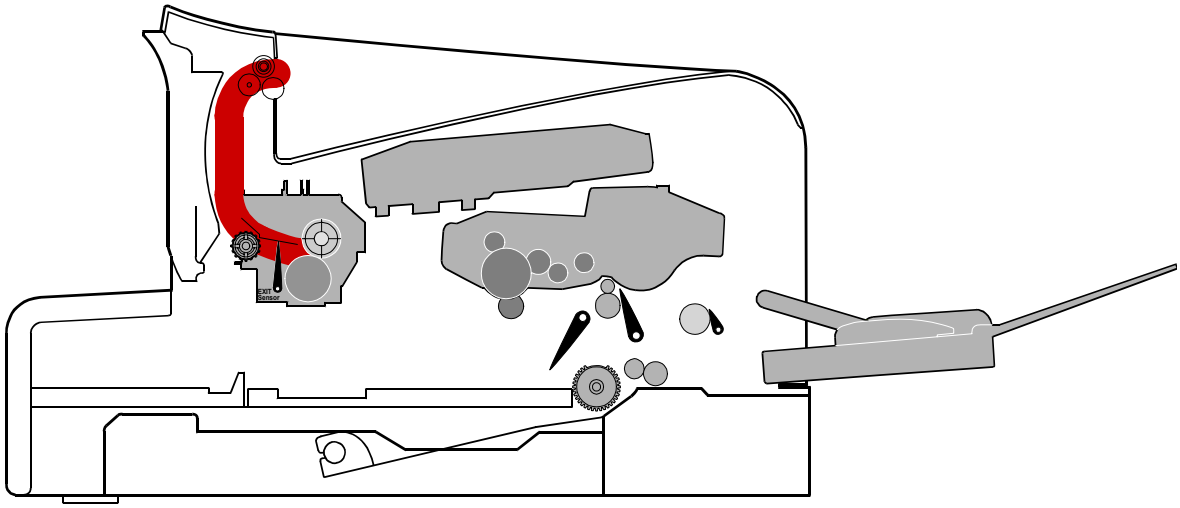
The printer feeds paper from the main/optional paper feed unit or by-pass tray after it receives the print command. The fed paper passes over the paper feed sensor. Jam 0 occurs if the sensor is not actuated within a specific time interval.

Jam1



The paper moves to the paper exit sensor after it passes the paper feed sensor. Jam1 occurs if the sensor is not actuated within a specific time interval.

Jam2



The paper passes through the paper exit sensor and out of the machine. Jam2 occurs if the trailing edge of the paper does not actuate the exit sensor within a specific time interval of the paper's leading-edge activating the exit sensor.

4.2 CLEARING PAPER JAMS

Paper jams can occur under the following the conditions:

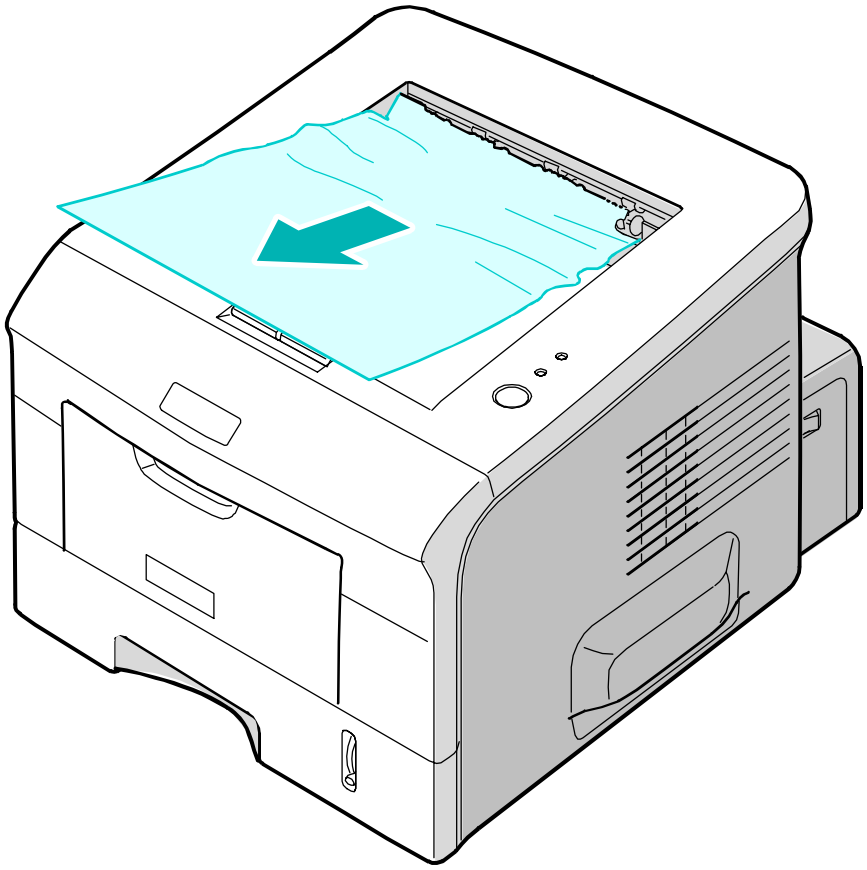
- The tray is loaded incorrectly or overfilled.
- The tray has been pulled out during a print job.
- The front cover has been opened during a print job.
- Incorrect paper type or size has been used.

The On Line/Error LED on the control panel lights red if a paper jam occurs. Find and remove the jammed paper. Look inside the printer if no paper jam is visible. **Do not use tweezers or other sharp metal tools to remove jammed paper.**

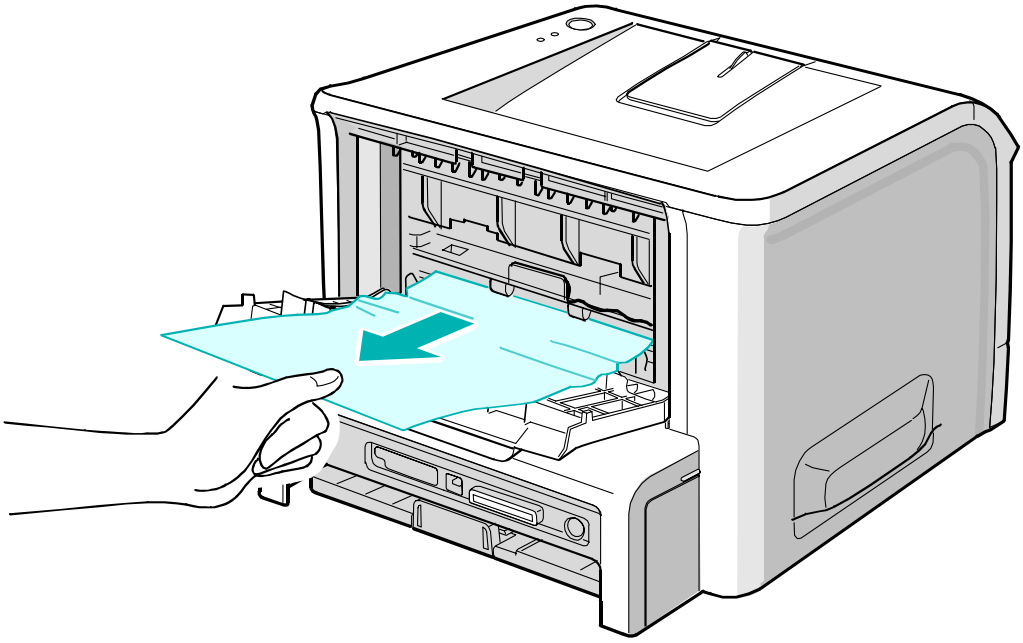
NOTE: Ensure that you remove all paper fragments from the machine, if the paper tears as you remove the jam from the machine. Otherwise, a jam will occur again.

4.2.1 JAM2 (PAPER EXIT AREA)

Perform the following procedure to solve this paper jam type.



1. Pull the paper straight out if paper becomes jammed as it exits to the output tray. **Do not continue to pull the paper if there is resistance and the paper does not move. In this situation, proceed to step 2 of this procedure.**

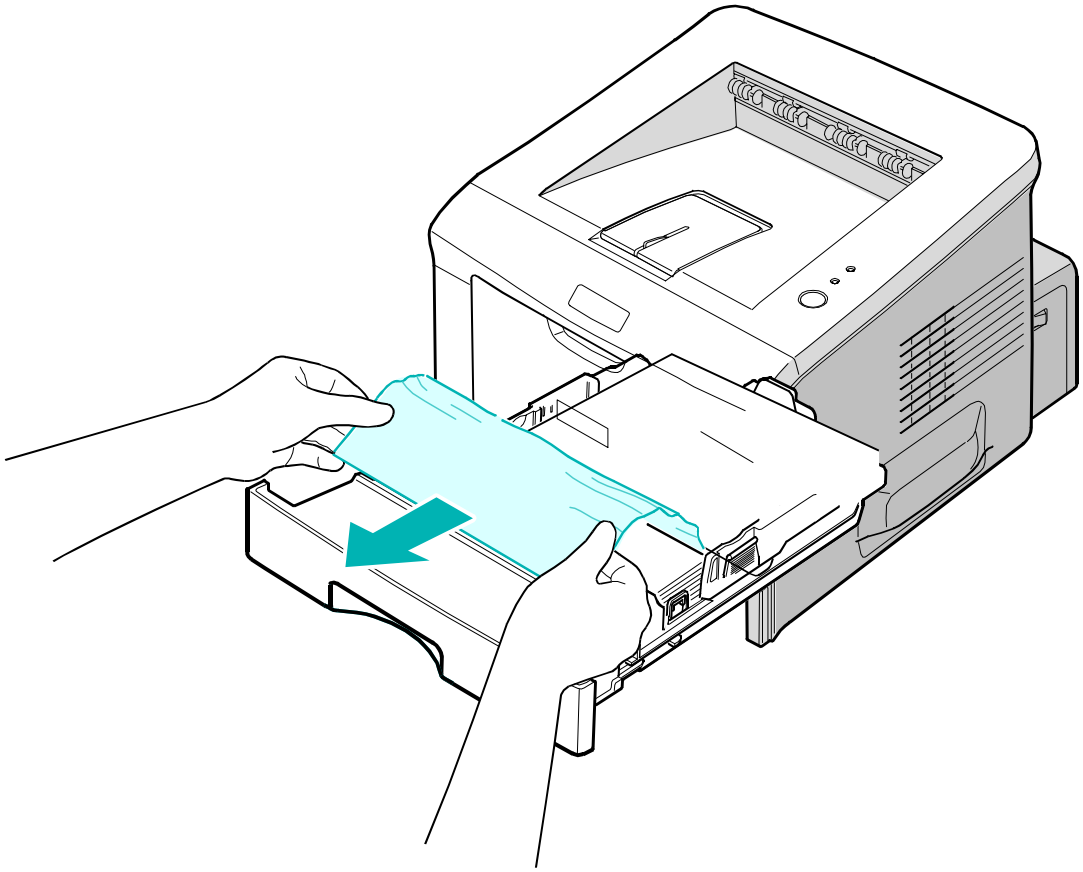


2. Open the rear output tray.
3. Loosen the paper if it is caught in the feed rollers. Gently pull the paper out.
4. Close the rear output tray. Open and close the front cover. Printing should begin again automatically.

NOTE: Paper jammed in this area is very close to the fusing unit. The fusing unit can become very hot. Use caution when removing paper in this area.

4.2.2 JAM0 (PAPER FEED AREA)

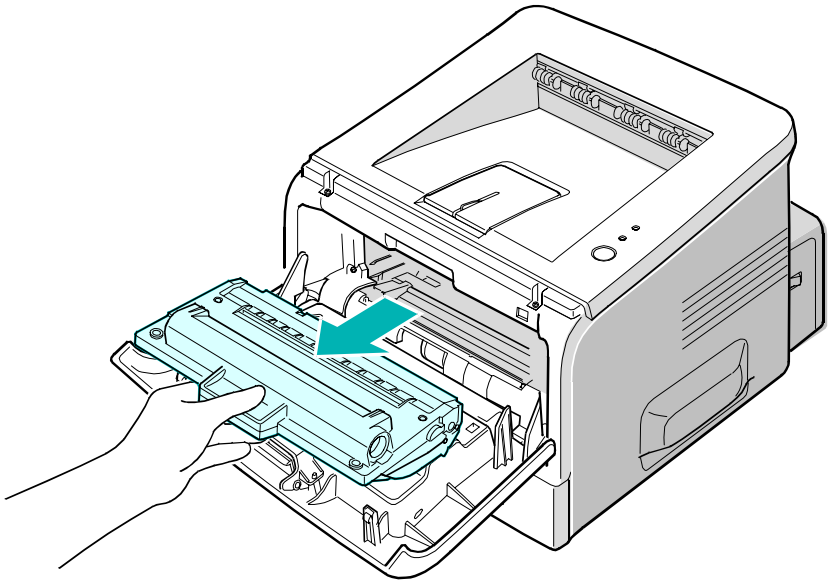
Perform the following procedure to solve this paper jam type:



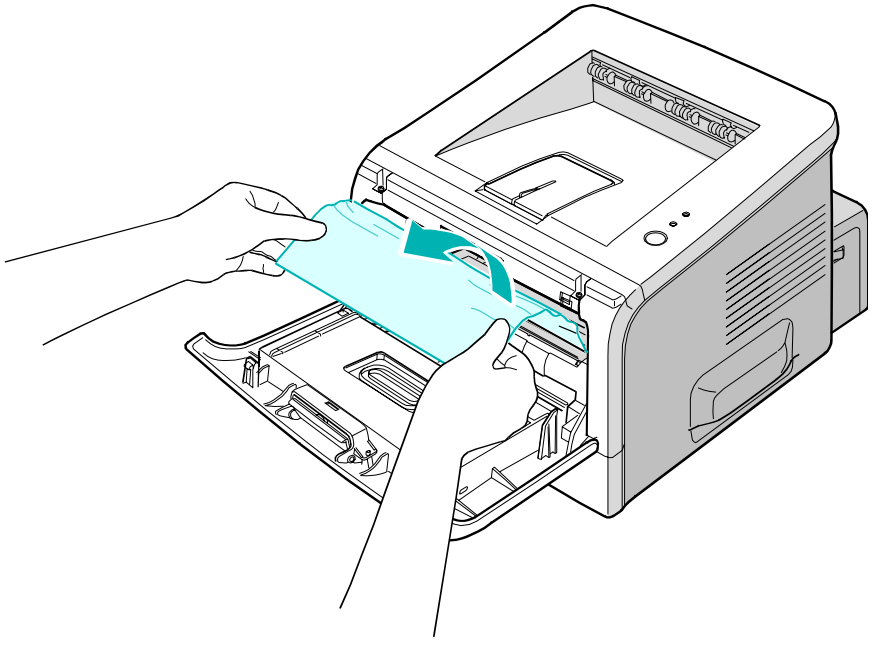
1. Slide out the paper tray unit.
2. Grab the visible edge of the paper and gently pull it out of the paper tray as shown above. Ensure that the remaining paper in the paper tray unit is correctly aligned.
3. Slide the tray back into the machine. Open and close the front cover. Printing should begin again automatically.

4.2.3 JAM1 (TONER CARTRIDGE AREA)

Perform the following procedure to solve this paper jam type.



1. Open the front cover and remove the toner cartridge.



2. Gently pull the paper toward you as shown above.
3. Ensure that there is no more paper in the machine path(s).
4. Re-install the toner cartridge and close the cover. Printing should begin again automatically.

4.2.4 TIPS TO AVOID PAPER JAMS

Perform the following to reduce paper jam occurrences:

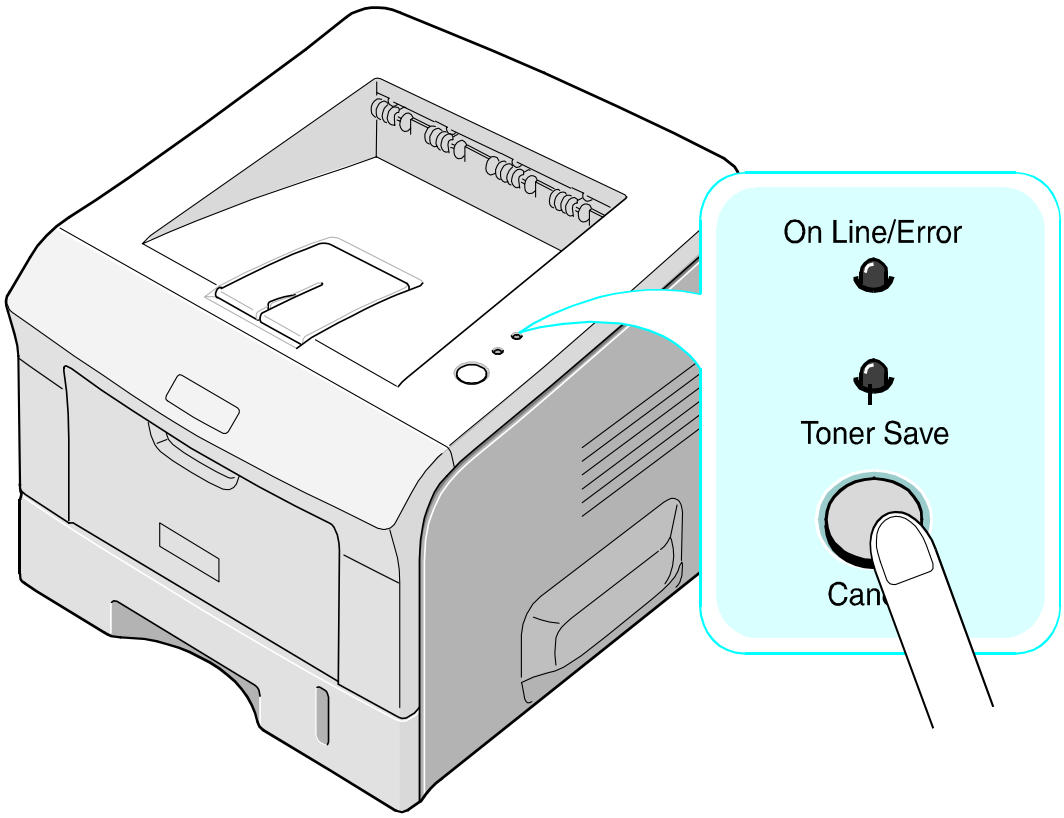
- Ensure that the adjustable guides are positioned correctly.
- Do not overload the tray. Ensure that the paper is below the paper capacity mark on the right-inside of the tray.
- Do not remove the paper from the tray if the machine is printing.
- Flex, fan, and straighten the paper before you load it into the paper feed unit.
- Do not use creased, damp, or highly curled paper.
- Do not mix paper types.
- Use only recommended print media.
- Ensure that the recommended print side is facing down when you load paper into the input tray.

4.3 SAMPLE PATTERN

The sample pattern assists in maintaining the machine and checking for abnormal conditions.

4.3.1 PRINTING A DEMO PAGE AND CONFIGURATION PAGE

The demo page and configuration sheet can test whether or not the machine is operating correctly.



1. Press and hold the cancel button for approximately 2 seconds to print the “Demo page”.
2. Press and hold the cancel button for approximately 6 seconds to print the “Configuration page”.

4.3.2 PRINTING A CLEANING SHEET

You should print a cleaning sheet if printed images are blurred, faded, or smeared. The machine cleans the drum inside the toner cartridge when you print a cleaning sheet. A page with toner debris is output when you print the cleaning sheet. Ensure that you discard this sheet.

Perform the following procedure to print the cleaning sheet:

1. Ensure that the machine is turned on and in the 'Ready Mode', and that paper is loaded in the paper tray unit.
2. Press and hold the cancel button for approximately 10 seconds. The machine automatically prints out the cleaning sheet.

NOTE: It will take 15-20 seconds, after you release the cancel button, for the cleaning sheet to print.

4.4 OPERATION PANEL DISPLAY

The table below shows error messages that appear on the operation panel.

Error	LED Status
Open fusing unit error	The [Error] LED (red) and the [Toner Save] LED flash simultaneously at 1 second intervals.
Overheat error	The [Error] LED (orange) and the [Toner Save] LED flash simultaneously at 1 second intervals.
Low heat error	The [Error] LED (red) and the [Toner Save] LED flash simultaneously at 4 second intervals.
LSU not ready error (polygon motor error)	The [Error] LED (green) and the [Toner Save] LED flash simultaneously at 1 second intervals.
LSU not ready error (HSYNC error)	The machine stops printing and the [Error] LED (green) and the [Toner Save] LED flash simultaneously at 4 second intervals.

4.5 PERIODIC DEFECTIVE IMAGE

Number	Roller	Defective Image	Description
1	OPC drum	75.5 mm	White spots on black image, or black spots.
2	Charge roller	37.7 mm	Black spots
3	Supply roller	44.9 mm	Light or dark horizontal bands
4	Developing roller	35.3 mm	Horizontal image band
5	Transfer roller	47.1 mm	Ghosting
6	Hot roller	78 mm	Black spot and ghosting
7	Pressure roller	75.5 mm	Black spots on the rear side of the printout

4.6 PRINTOUT PROBLEMS

4.6.1 INCORRECT PRINT POSITION

Description: The print job starts even though the paper is not in the correct feed position.

Cause	Solution
Defective feed sensor actuator	Replace the defective actuator

4.6.2 VERTICAL BLACK LINE AND BAND

Description: Straight, thin, or dark-black vertical lines are visible on the output print.

Cause	Solution
1. Damaged developer roller, or defective doctor/cleaning blade in the toner cartridge. 2. Charge roller surface is scratched. 3. Damage to the surface of the transfer roller.	1. Replace the toner cartridge and test again. 2. Replace the toner cartridge and test again. 3. Replace the transfer roller and test again.

4.6.3 VERTICAL WHITE LINE

Description: White vertical lines are visible on the output print.

Cause	Solution
1. Window or internal lenses of LSU mirror are contaminated. 2. Particles inside the toner cartridge or low toner. 3. Particles, contamination, or burr on the edge of the toner cartridge window. 4. Fusing unit is defective if voids periodically show on the top of black images. 5. OPC drum is contaminated. 6. Depression or deformation on the surface of the transfer roller.	1. Clean the LSU window with isopropyl alcohol. Replace the LSU if there are unwanted particles inside the unit. 2. Replace the toner cartridge. 3. Clean the exposure window. 4. Check the ribs of the fusing unit and remove any particles found. 5. Replace the toner cartridge. 6. Replace the transfer roller.

4.6.4 HORIZONTAL BLACK BANDS

Description: Dark or blurry horizontal stripes are periodically visible on the output print.

Cause	Solution
1. Bad contacts on the toner cartridge high voltage terminals. 2. The following rollers in the toner cartridge are damaged: • Charge roller • Supply roller • Development roller • Transfer roller	1. Clean all high voltage terminals on the toner cartridge and set frame. Remove toner and dust particles. 2. Clean the gear on the OPC. Replace the toner cartridge if the problem persists.

4.6.5 BLACK/WHITE SPOTS

Description: Dark, white, or blurry spots are periodically visible on the output print.

Cause	Solution
1. Developer material is coated with matter or paper dust. 2. The OPC drum surface is damaged. 3. Transfer roller has reached end of life.	1. Print several OPC cleaning mode prints. Then run the self-test 2-3 times. 2. Examine the OPC drum surface and remove any particles with a soft, lint free cloth. Replace the toner cartridge if the problem persists. 3. Replace the toner cartridge if print count has exceeded the 60 K PM interval.

4.6.6 LIGHT IMAGE

Description: Printed image is light. (No ghosting effect visible.)

Cause	Solution
1. Toner save mode is enabled. 2. Developer roller is contaminated or the toner cartridge is almost empty. 3. Ambient temperature is below 10 C. 4. Bad contact due to dirty terminals on the toner cartridge set. 5. Abnormal output from the HVPS.	1. Turn the toner save mode off. 2. Replace the toner cartridge. 3. Turn the machine off. Wait 30 minutes and turn the machine on again. Attempt to print. 4. Clean dirt from the toner cartridge and cartridge set contacts. 5. Replace the HVPS.

4.6.7 DARK/BLACK IMAGE

Description: Printed image is dark.

Cause	Solution
1. No charge voltage from the engine board. 2. Charge voltage fault due to bad contact between toner cartridge and cartridge set. 3. VD0 signal from main PBA is low.	1. Check the connector that connects the HVPS and the engine board. 2. Clean the high voltage charge terminals. Replace the HVPS if the problem persists. 3. Replace the LSU or main PBA.

4.6.8 UNEVEN DENSITY

Description: Side-to-side print density is uneven.

Cause	Solution
1. Pressure force on the left and right springs of the transfer roller is not even, springs are damaged, transfer roller is not correctly installed, transfer roller bushings or holders are damaged. 2. Toner cartridge has reached end of life. 3. Toner inside the cartridge is not level due to damaged blade or low toner.	1. Replace both the left and right bushings and spring assemblies. 2. Replace the toner cartridge. 3. Gently shake the toner cartridge side to side 5-6 times and try to print again. Replace the toner cartridge if the problem persists.

4.6.9 BACKGROUND

Description: A faint, “background” type of imaging defect is visible throughout the output print.

Cause	Solution
1. The machine has not printed large quantities of low coverage pages, or the machine has not been used for an extended period. 2. A recycled toner cartridge is being used. 3. The toner cartridge has reached end of life. 4. The up/down movement of the transfer roller is not smooth. 5. HVPS is not functioning normally.	1. The toner cartridge is designed to print 3,000 sheets with 5% coverage. Background can appear if the machine prints more than 3,600 pages with only 2% coverage. 2. Machine operation is not guaranteed when using recycled toner cartridges. Gently shake the toner cartridge side to side 5-6 times and try to print again. Replace the toner cartridge if the problem persists. 3. Replace the toner cartridge. 4. Clean the transfer roller bushings. 5. Clean the high voltage charge terminals. Replace the HVPS if the problem persists.

4.6.10 GHOST 1

Description: “Ghosting” image defect is visible on the output print at 75.5 mm intervals.

Cause	Solution
1. Bad contacts caused by toner particles between the high voltage terminal in the main body, and the electrode of the toner cartridge. 2. Bad contacts caused by toner particles between the high voltage terminal in the main body, and in the HVPS board. 3. The toner cartridge has reached end of life. 4. Transfer roller has reached end of life. 5. Ambient temperature is below 10 C. 6. Damaged cleaning blade in the toner cartridge.	1. Clean all HV contacts. Replace the HVPS if the problem persists. 2. Clean all HV contacts. Replace the HVPS if the problem persists. 3. Replace the toner cartridge. 4. Replace the transfer roller. 5. Turn the machine off. Wait 30 minutes and turn the machine on again. Attempt to print. 6. Replace the toner cartridge.

4.6.11 GHOST 2

Description: “Ghosting” image defect is visible on the output print at 75 mm intervals.

Cause	Solution
Higher voltage required when printing on card stock, thick paper, or OHP sheets.	Set the machine to print for these media types, via the printer driver or application software.

4.6.12 GHOST 3

Description: “Ghosting” image defect is visible on the output print at 66.3 or 75.5 mm intervals.

Cause	Solution
Fusing unit is contaminated.	Disassemble the fusing unit and remove any matter from the rollers. Clean particles between the thermistor and the hot roller. (Use extreme caution to avoid damaging the rollers.)

4.6.13 GHOST 4

Description: White “ghosting” defect is visible on output prints at 32 mm intervals.

Cause	Solution
1. Developer has reached end of life. 2. Abnormal output from the HVPS.	1. Replace the toner cartridge. 2. Check the HVPS supply voltage. Clean the HV terminals on the cartridge and cartridge set. Replace the HVPS if the problem persists.

4.6.14 “STAINS” ON FRONT OF PAGE

Description: Uneven-background defects are visible on the output print.

Cause	Solution
1. Toner leakage due to incorrectly sealed toner cartridge. 2. Transfer roller is contaminated.	1. Replace the toner cartridge. 2. Perform PC cleaning mode 2-3 times. Then perform the self-test 2-3 times.

4.6.15 “STAINS” ON BACK OF PAGE

Description: Uneven background defects are visible on backside of the output print at 47.1 or 75.4 mm intervals.

Cause	Solution
1. Transfer roller is contaminated 2. Pressure roller is contaminated.	1. Perform the PC cleaning mode 2-3 times. Then perform the self-test 2-3 times. Replace the transfer roller if the problem persists. 2. Disassemble the fusing unit and clean the hot roller and the pressure roller. Clean the area between the hot roller and the thermistor. (Use extreme caution to avoid damaging the rollers.)

4.6.16 BLANK PAGE 1

Description: Blank page is printed.

Cause	Solution
Bad ground contacts in the OPC and/or toner cartridge.	Check if the ground OPC or the OPC ground Zener diode is defective. Clean the terminals on the toner cartridge and cartridge set.

4.6.17 BLANK PAGE 2

Description: A blank page, or several blank page (s) are printed [OR] several blank pages are printed when the machine is turned on.

Cause	Solution
1. Bad ground contacts in the OPC and/or toner cartridge. 2. Solenoid is not functioning correctly.	1. Check if the ground OPC or the OPC ground Zener diode is defective. Clean the terminals on the toner cartridge and cartridge set. 2. Perform the engine self-test mode in Tech Mode to check if the solenoid is functioning normally. Replace the main PBA if the problem persists.

4.7 PAPER FEED PROBLEMS

4.7.1 INCORRECT PRINT POSITION

Description: The print job starts even though the paper is not in the correct feed position.

Cause	Solution
Defective feed sensor actuator	Replace the defective actuator

4.7.2 JAM 0

Description:

1) Paper does not exit from the feed cassette.
2) Jam 0 appears when the paper feeds into the printer.

Cause	Solution
1. Defective solenoid. Check the solenoid in Tech Mode. 2. Defective cassette/by-pass knock-up plate and springs. 3. Defective paper separator pad. 4. Pick-up roller may be contaminated or incorrectly installed. 5. The area between the pick-up roller and registration sensor may be contaminated. 6. Feed sensor may be defective. Verify in Tech Mode.	1. Replace the solenoid. 2. Repair/replace as required. 3. Clean with a soft cloth dampened with isopropyl alcohol or water. Replace if necessary. 4. Clean with a soft cloth dampened with isopropyl alcohol or water. Replace if necessary. 5. Ensure all rollers are clean. 6. Check the SMPS PBA, Main PBA, and all connectors. Replace any faulty components.

4.7.3 JAM 1

Description:

1) Paper becomes jammed in front of, or inside, the fusing unit.
2) Paper becomes jammed in the discharge roller and in the fusing unit, after it passes through the actuator feed.

Cause	Solution
1. Paper becomes jammed in front of, or inside, the fusing unit. 2. Feed actuator may be defective.	1. Replace the SMPS. 2. Disassemble and then reassemble the actuator feed and spring.

4.7.4 JAM 2

Description:

1) Paper becomes jammed in front of, or inside, the fusing unit.
2) Paper becomes jammed in the discharge roller and in the fusing unit, after it passes through the actuator feed.

Cause	Solution
1. Jam 2 can appear even if the paper is completely fed out of the printer. The exit sensor may be defective. This sensor should return to its original position, to close/block the photosensor. It may remain open due to debris.	1. Check if the exit sensor or actuator exit is damaged. • Check if burrs appear on the assembly area of the exit actuator. • Check if particles or debris prevent correct operation of the actuator.
2. Paper remains rolled around the hot roller. The guide claw could be broken or damaged.	2. Disassemble the fusing unit and remove the jammed paper. Then, clean the surface of the pressure roller with dry gauze. Check all ribs, claws, and springs.

4.7.5 MULTI-FEEDING

Description: Multiple sheets of paper are fed at the same time.

Cause	Solution
1. Paper size guides may not be set correctly (main paper tray unit and by-pass tray). 2. Solenoid does not operate correctly. 3. Friction pad is contaminated. 4. Paper has a rough surface edge.	1. Adjust the paper guides. 2. Replace the solenoids or PBA. 3. Clean the friction pad with a soft cloth dampened with isopropyl alcohol or water. 4. Use paper with a smoother surface.

4.7.6 PAPER ROLLED IN THE FUSING UNIT

Description: Paper remains rolled around the rollers in the fusing unit.

Cause	Solution
1. Pressure roller or hot roller may be contaminated. 2. Ribs, claws, or springs may be damaged or deformed.	1. Clean the roller surfaces and the area between the hot roller and thermistor with isopropyl alcohol or water. 2. Check for damage. Replace the fusing unit if necessary.

4.7.7 PAPER REMAINS ROLLED ON THE OPC DRUM

Description: Paper remains rolled on the OPC drum.

Cause	Solution
1. Paper is too thin. 2. The face of the paper is curled.	1. Use paper supported by the machine specifications. 2. Ensure paper is stored correctly. To remove paper in the OPC: 1) Remove the toner cartridge from the machine (do not touch the green OPC drumnsurface with bare hands). 2) Rotate the gear wheel and remove the paper from the cassette. 3) Clean all fingerprints from the OPC with a soft tissue. Ensure no scratching occurs to the drum surface.

4.8 SET MALFUNCTIONS

4.8.1 ALL LEDS BLINK (FUSING ERROR)

Description: All LEDs on the operation panel blink.

Cause	Solution
1. Thermostat, fusing power cable or heat lamp circuit is open. 2. Defective thermostat. 3. Drive gear melted.	1. Replace the heat lamp or cable harness, or replace the entire fusing unit if necessary. 2. Examine the thermistor mounting. If there is no heat damage, replace the thermistor. Otherwise, replace the entire fusing unit. 3. Replace the fusing unit.

4.8.2 ALL LEDS BLINK (SCAN ERROR)

Description: All LEDs on the operation panel blink.

Cause	Solution
1. Defective LSU cable or faulty connector. 2. LSU motor is defective. 3. Check the HSYNC signal.	1. Replace the LSU. 2. Replace the main board. If the problem persists, replace the LSU.

4.8.3 PAPER EMPTY

Description: The paper empty lamp remains on, with paper still remaining in the paper feed cassette.

Cause	Solution
1. Defective paper sensor actuator or faulty sensor. 2. Defective PBA. 3. Defective cables or connectors.	1. Replace defective actuator or sensor. 2. Replace the main PBA.

4.8.4 PAPER EMPTY (WITHOUT INDICATION)

Description: The paper empty lamp does not light when the paper cassette is empty.

Cause	Solution
1. Defective paper sensor actuator or faulty sensor. 2. Defective PBA. 3. Defective cables, connectors, or lamp.	1. Replace defective actuator. 2. Replace the main PBA. 3. Check and replace the cable harness, or OPC if necessary.

4.8.5 FUSING GEAR MELTS (OVERHEATS)

Description: Constant jams when paper enters the fusing unit, or the fusing unit rollers do not turn.

1. Paper constantly becomes jammed in the fusing unit.
2. Fusing unit rollers do not turn.

Cause	Solution
Fusing lamp, thermostat, or thermistor are damaged.	1. Replace the fusing unit. 2. Replace the main PBA.

4.8.6 COVER OPEN

Description: The error LED remains on when the cover is closed.

Cause	Solution
1. Hook lever or actuator may be stuck. 2. Hook lever on the front cover may be damaged or broken. 3. Sensor switch on the main PBA may be defective.	1. Check and replace the actuator if necessary. 2. Replace the front cover. 3. Replace the main PBA if necessary.

4.8.7 NO ERROR LAMP WHEN COVER IS OPENED

Description: The error LED does not light when the print cover is opened.

Cause	Solution
1. Hook lever or actuator may be stuck. 2. Operation panel LED may be faulty. Check the connector and cables between the PBA and the operation panel. 3. Sensor switch on the main PBA may be defective.	1. Check and replace the actuator if necessary. 2. Replace the cable or operation panel if necessary. 3. Replace the main PBA if necessary.

4.8.8 NO POWER

Description: LEDS on the operation panel do not light when the power is turned on.

Cause	Solution
1. Check if the power input and SMPS operate correctly. 2. Normal sounds are heard but lamps do not come on. 3. No sounds are heard and lamps do not come on after you replace the SMPS.	1. Replace the power supply cord or SMPS. Replace the power or SMPS fuses if necessary. 2. Check the operation panel connector. Replace if necessary. 3. Replace the main PBA.

4.8.9 PRINTED VERTICAL LINES ARE CURVED

Description: Vertical lines on the output print are not straight.

Cause	Solution
Check the +24V power supply to the LSU.	Replace the LSU if +24 is stable. Replace the SMPS if +24V is not stable. If the problem persists, replace the main PBA.

4.9 TONER CARTRIDGE

Ensure that toner cartridges approved for use by the manufacturer are used in this machine. Machine operation is not guaranteed if toner cartridges not approved by the manufacturer are used in this machine.

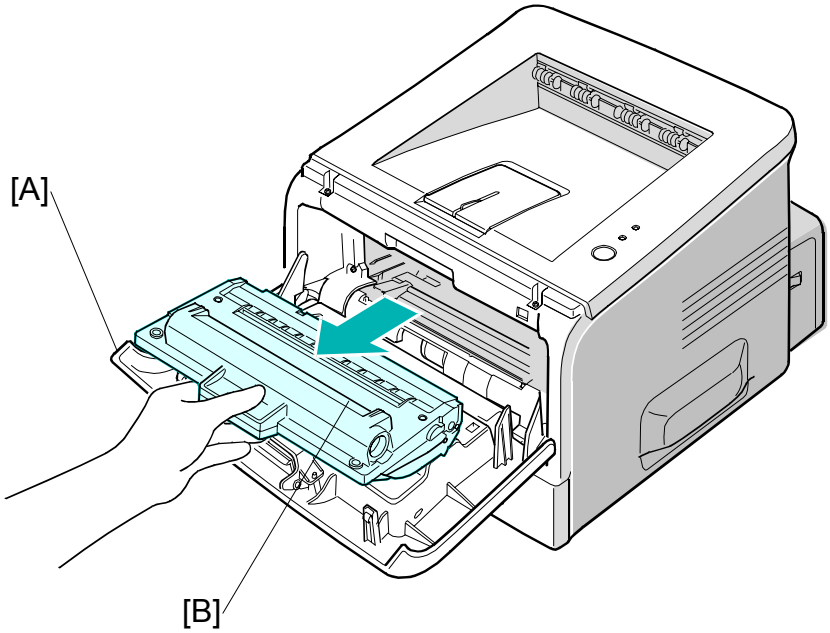
4.9.1 TONER CARTRIDGE PRECAUTIONS

Do not expose the toner cartridge to direct light for more than a few minutes.

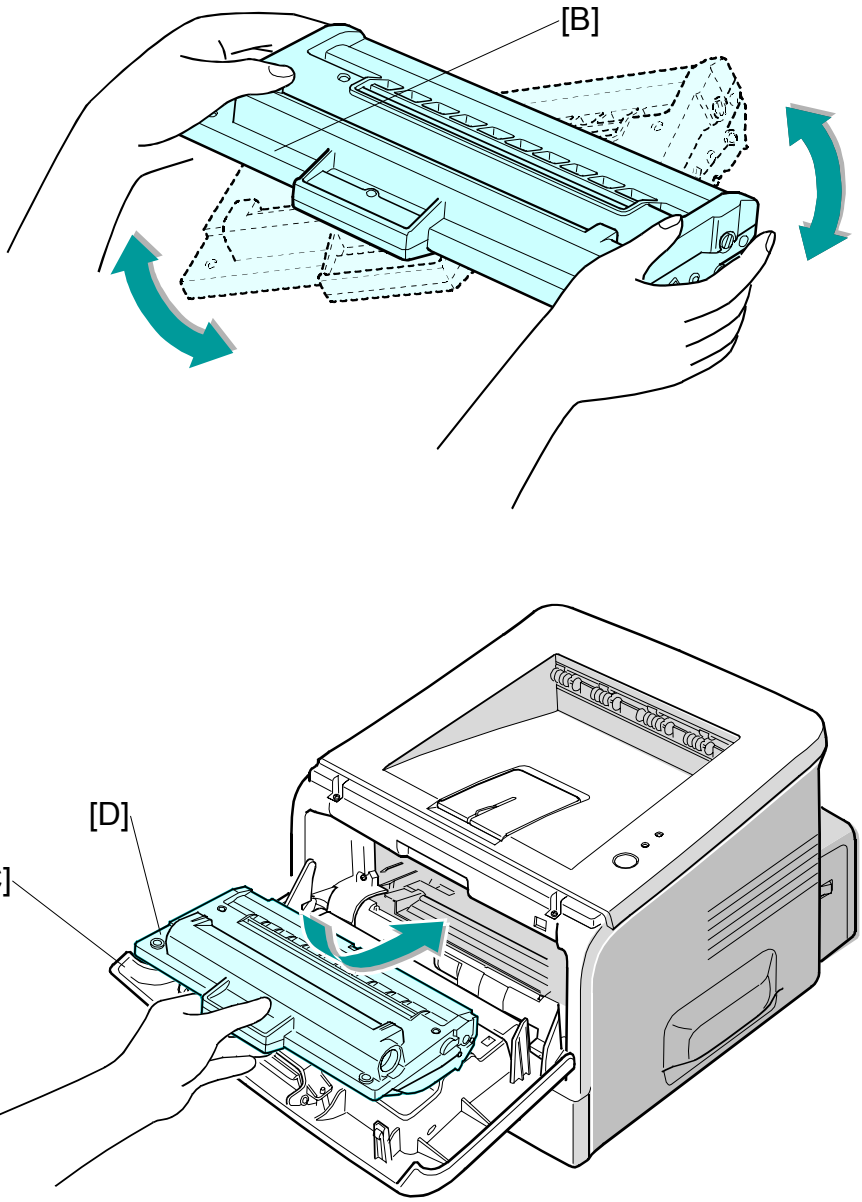
Print quality may be temporarily improved by redistributing the toner, if the printed image is light due to low toner supply. In this situation, shake the toner cartridge side-to-side 5 to 6 times. However, to ensure high quality printouts, the toner cartridge should be replaced.

4.9.2 REDISTRIBUTING TONER

White streaks or light output prints are visible when the toner cartridge is near end of life. At this time, the LCD display, shows the 'Toner Low' message. To temporarily resolve this problem, redistribute the toner remaining in the cartridge (see 4.9.1).



1. Open the front cover [A]. Gently push the toner cartridge [B] down and remove it from the machine.



2. Gently shake the toner cartridge [D] in the direction of the arrow as shown above. Put the toner cartridge [D] back into the machine and close the front cover [C].

4.9.3 TONER CARTRIDGE DETAILS

Description	Signs	Cause and Check and Solution
Light image/partially blank image (cartridge has reached end of life)	• Printed image is light, dirty, or not clear. • Parts of the image are not printed. • A 'tick-tick' noise is periodically heard within the machine.	1. If the image is light, shake the toner cartridge and try to print again. If the problem persists, the cartridge has reached end of life. Replace the toner cartridge. 2. Shake the toner cartridge, if some parts of the image do not get printed. If the problem persists, clean the LSU window and try to print again. If the problem still persists, the cartridge has reached end of life. 3. Measure the time between 'ticks', if you hear this sound. If the time interval is about 2 seconds, the toner has almost reached end of life. Replace the toner cartridge. 4. Shake the toner cartridge, if white vertical bands show, and try to print again. If the problem persists, the cartridge has reached end of life. Replace the toner cartridge.
Toner contamination	• Toner contamination is visible at regular intervals on the output print. • Toner contamination is visible at random intervals over the whole, or parts, of the output print.	1. Contamination at regular intervals • A) Check the distance between contamination marks. • B) Check both ends of the toner cartridge OPC drum. If both ends are contaminated with toner, the waste toner collector is full. 2. Random page contamination. • A) Ensure that the terminal contact points of the toner cartridge are clean. Clean all HV contacts if they are dirty. Replace the toner cartridge if the problem persists. • B) Ensure that the terminal contact points of the toner cartridge are not damaged. Replace the toner cartridge if there is damage to the contact terminals.

White/Black Spot	• Light black or dark black dots are visible periodically on the image. • White spots are visible periodically on the image.	1. Toner cartridge rollers are contaminated with unwanted particles if light black or dark black dots show periodically on the image. In this condition perform the OPC clean mode print 4-5 times. Check for unwanted matter on the OPC surface. Clean with isopropyl alcohol if necessary. 1) 38 mm interval: Charge roller 2) 95 mm interval: OPC cycle 2. The OPC drum is damaged or unwanted matter stays on the drum if white spots are visible at 95 mm intervals in a black image, or, if black spots are visible in areas where they should not show. Perform the following if running the OPC clean mode print 4-5 times does not solve the problem. 1) 37.7 mm intervals: Replace the toner cartridge. 2) 75.5 mm intervals: Clean the OPC drum. 3. The transfer roller's life has expired if a black or white image is broken at irregular intervals. In this condition, replace the transfer roller. Also, check the transfer voltage and readjust it if necessary.
Recycled Product	• Toner cartridge appears to be in poor condition. • Dirty or rough texture on output prints. • Poor background in the image.	1. The toner cartridge is recycled if the following are true: 1) There is evidence that the toner cartridge has been disassembled. 2) Materials that are not approved by the manufacturer have been added or substituted to the toner cartridge. • Check the toner cartridge for the following. Replace the toner cartridge if necessary. 1) Check the toner cartridge for damage. 2) Check the appearance of the following toner cartridge parts: • Frame, hopper, screws. 2. Check the following if the output prints are not clear, or are rough in texture. 1) Ensure that the terminal contact points are clean and the set is not damaged. Clean the terminal points if the problem persists. The above problems can happen if the toner cartridge is recycled 2 times or more.

"Ghost" image and other contamination	• Print out is too light or dark, or, partially contaminated. • A completely black page is printed out. • Printout density is too dark and "ghosting" occurs.	1. Check the following if the printout is too light, too dark, or partially contaminated: 1) Check if unwanted matter remains on terminal contact points of the cartridge set. 2) Ensure that the terminal is correctly assembled. • Perform the following, if the above are true: 1) Clean the contacts on the toner cartridge. 2) Clean the contact points on the set. 3) Repair or replace the terminals if they are damaged. Replace the toner cartridge if the problem persists. 2. Check the following if a black image is printed out: 1) Check if unwanted matter remains on terminal contact points of the cartridge set. 2) Check if the terminal and charge roller contacts are correctly assembled. • Perform the following if the above are true: Examine the charge roller contacts. Clean them if they appear dirty or contaminated. Replace the toner cartridge if the problem persists. 3. Check the following if the printouts are too dark and ghosting occurs: 1) Check if unwanted matter remains on terminal contact points of the cartridge set. 2) Check if the terminal and developer roller contacts are correctly assembled. • Perform the following if the above are true 1) Check the developer bias voltage contact. Clean it if it appears dirty or contaminated. 2) Examine the charge roller contacts. Clean them if they appear dirty or contaminated.

4.10 SOFTWARE PROBLEMS

4.10.1 PRINTER DOES NOT OPERATE CORRECTLY 1

Description: The printer does not operate in printing mode when the power is turned on.

Description	Solution
Perform the self-test mode. Use the menu buttons (menu, enter, enter) and print the test page.	There are no problems with the machine if the test print works correctly. The machine is faulty if the test print does not work correctly. In this condition, the problem is not due to computer software or printer driver settings. Investigate other possible machine problems.
Ensure that the PC and the printer are correctly connected. Make sure the toner cartridge is correctly installed.	Replace the printer cable. Check the amount of remaining toner if the problem persists. Replace the toner cartridge if necessary.
Printing does not work in the Windows operating system.	Check that the connection between the PC and printer. Check the following if you use Windows: 1) Check that the printer driver in the controller is correctly set up. 2) Ensure that the correct port is selected and 'Use On-line' is selected in the driver. Print a test page from the driver properties, if the printer driver is correctly set up. Check with which application that printing does not work. Open 'Memo Pad' and try to print. Adjust the setup within that program if the printer does not work in a certain program. Sometimes the printout is normal within Windows basic programs, but does not print in other programs. In this condition, uninstall and re-install the new driver. Check the following if the printer does not work in Windows basic programs, and you are using the parallel port: • Check that the port setting in CMOS is on ECP and that the address is IRQ 7 and 378 (for parallel port 1). • Try using USB instead of parallel port, or vice-versa.
Ensure the printer cable is directly connected to the printer.	Uninstall other devices that share the printer port and check if the printer works as a standalone device. Connect directly to the back of the PC if you are using a USB hub.

4.10.2 PRINTER DOES OPERATE CORRECTLY 2

Description: After receiving the print command there is either no response from the printer, or the print speed is slow. Incorrect machine set-up and/or printer malfunction are the cause of this condition.

Description	Solution
Not enough free hard disk space to accommodate temporary work files created during printing.	'Insufficient Printer Memory' message means there is a hard disk space problem, rather than a printer RAM problem. In this condition, provide more space on the hard disk with the disk utilities program.
Printer error occurs even if there is enough space in the hard disk.	Ensure the connection between the cable and printer port is correct. Ensure the port settings in CMOS are correct, if you use the parallel port.
Parallel port related problems in the CMOS set-up.	Select ECP for the printer port. SPP and normal modes support 8-bit data transfer. ECP mode supports 12-bit data transfer.
System needs to reboot in order to print.	The printer cable may be defective if regular fonts cannot be printed. At this time, turn off the PC and reboot the system. If the problem persists, double-click the printer icon in "My Computer". Replace the cable if the regular fonts are still not printed.

4.10.3 ABNORMAL PRINTING

Description: The printer does not work despite replacement of the cable(s), or unusual fonts are printed.

Description	Solution
Parallel port problem with CMOS set-up	Ensure that ECP (recommended), or SPP is selected in the CMOS (BIOS) set-up.
Printer driver error	Ensure that the correct driver is loaded. Use the driver supplied on the CD, or download the correct driver from the Ricoh web site. DO NOT use the Microsoft driver supplied with the Windows operating system. If the printer is a GDI or SPL type printer, ensure that ALL OTHER GDI or SPL drivers are uninstalled, as Windows allows only one of this type of driver to be loaded.
'Insufficient Memory' message shows. Print jobs may suddenly stop due to insufficient space on the hard disk.	Delete unnecessary files to free up space on the hard disk. Try to print again.

4.10.4 SPOOL ERROR

Description: Jobs are processed and stored on the hark disk until the printer is ready to accept them.

Description	Solution
Insufficient space on the hard disk, in the directory assigned for the basic spool.	Delete unnecessary files to free up space for spool storage.
Previous printing errors were not resolved.	Delete '.jnl' files. Reboot Windows and attempt to print again.
There may be a conflict with other drivers or programs.	Close all programs except the one you need to use.
An application program or printer driver are damaged.	Delete the printer driver completely. Reinstall it.
OS-related files are damaged, or virus infected.	Reboot the computer. Check for viruses. Restore damaged files and reinstall application programs that do not operate correctly.
Not enough memory exists.	Add more memory to the PC.

How to Delete Data in the Spool Manager

The installed drivers and the list of the documents waiting to be printed show in the spool manager. Select the document you want to delete and check delete in the menu. If the job you want to delete is the current job, data that has already been transferred to the printer's memory will still be printed. The job may take a long time to delete. It must wait for a time-out if there is a problem with the printer, such as out of toner, offline, out of paper, etc.

SERVICE PROGRAM MODE

5. SERVICE PROGRAM MODE

5.1 FIRMWARE DOWNLOAD

5.1.1 DOWNLOAD PROCEDURE

There are two ways to upgrade the machine firmware:

1. Command Prompt
2. EWS (Embedded Web Server)

Connect the machine to a PC via a parallel cable for the “Command Prompt” firmware download procedure, or through the network for the “EWS” method , before performing the firmware upgrade procedure.

NOTE: It is very rare to lose data and settings after the firmware program has downloaded. However, as a precaution, print the configuration page before beginning the download procedure. In the case of catastrophic data loss, this page will serve as a record of the printer settings.

NOTE: Do not turn off the machine power while updating the firmware.

DOS Command Mode

Firmware for this machine can be upgraded by connecting to a PC via a parallel cable. A command to upgrade the program must be entered.
You must save the correct firmware file to the PC.

The following operating systems can be used to upgrade firmware on this machine:

1) Windows NT
2) Windows 2000
3) Windows XP

1. Print out the configuration page as a backup reference of the data and settings.
2. In the PC’s Command prompt window, type *copy /b* filename *lpt1*:, then press Enter.
3. The firmware upgrade procedure should begin automatically.

EWS (Embedded Web Server) Mode

Firmware for this machine can be upgraded by connecting to a PC through a network. A command to upgrade the program must be entered.
You must save the correct firmware file to the PC.

1. Print out the configuration page as a backup reference for the data and settings.
2. Download the firmware to the PC.

NOTE: Download both the “Printer Firmware” and “Network Firmware” if you want to upgrade both.

3. Access the “EWS” with the correct IP address.
4. Select ‘Maintenance’, as shown below.

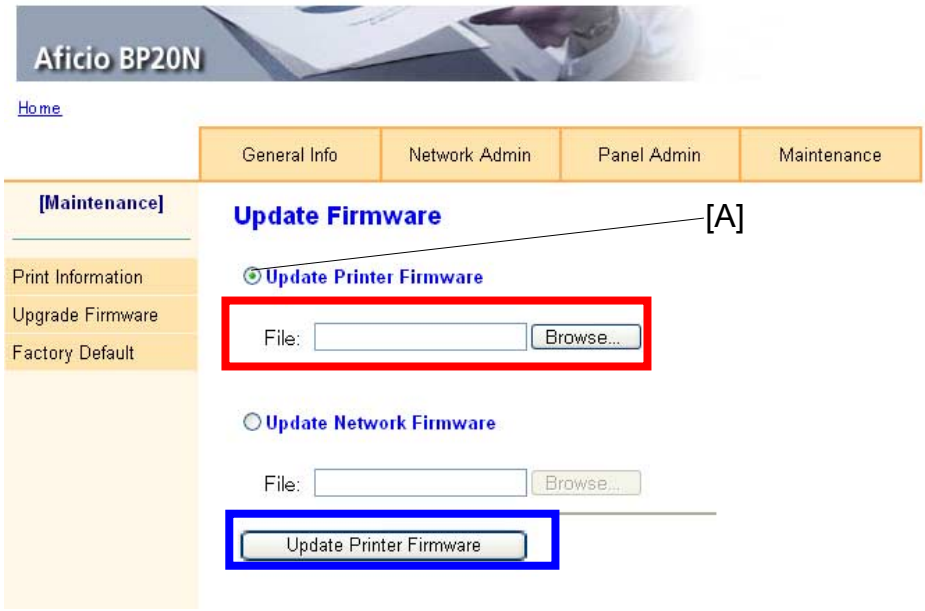
(continued on next page)

5. Ensure that 'Upgrade Firmware' is selected, as shown below.

6. Select "Upgrade Printer Firmware" [A], as shown below. Click the browse button and select the Printer Firmware file you saved in the PC.

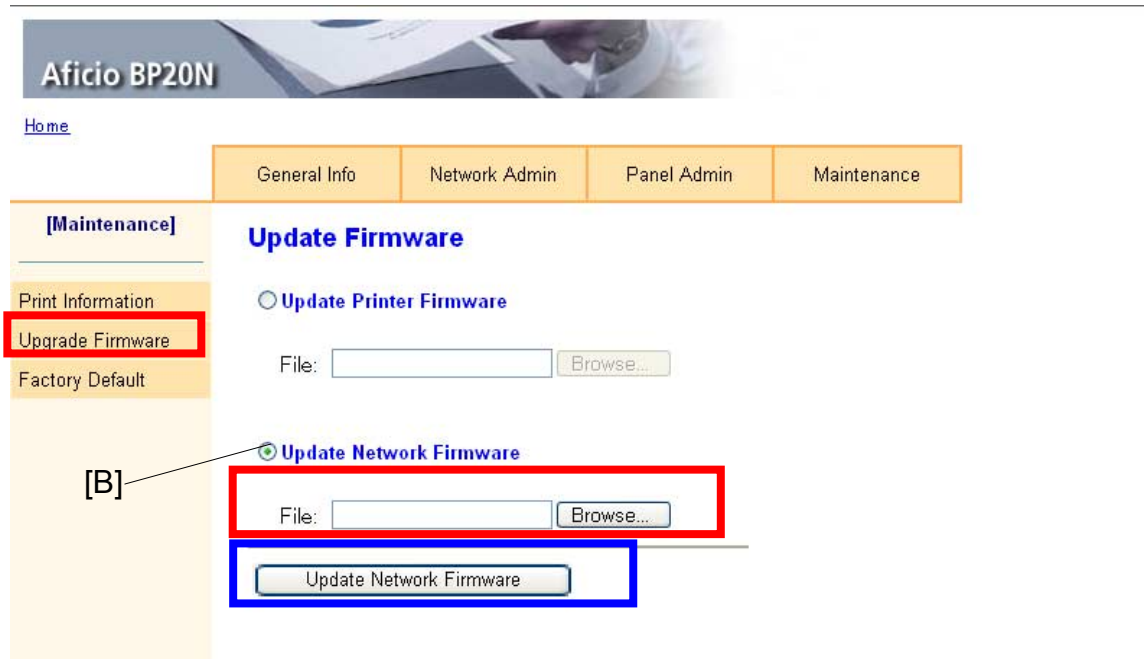
NOTE: Proceed to step 9 only if you want to upgrade the "Network Firmware" also.

7. Click the 'Update Printer Firmware' button.



8. Ensure that the firmware has been completely updated.

9. Ensure that “Upgrade Firmware” is selected, as shown below.
10. Select “Upgrade Network Firmware”, [B] as shown below. Click the browse button and select the network firmware file you saved in the PC.
11. Click the “Update Network Firmware” button.
12. Ensure that the firmware has been completely updated.



5.1.2 FIRMWARE RECOVERY PROCEDURE

The machine will not operate if the update procedure did not successfully complete. In this case, perform the following steps:

1. Turn the machine power off and then on.
2. Perform the steps in download procedure 5.1.1.

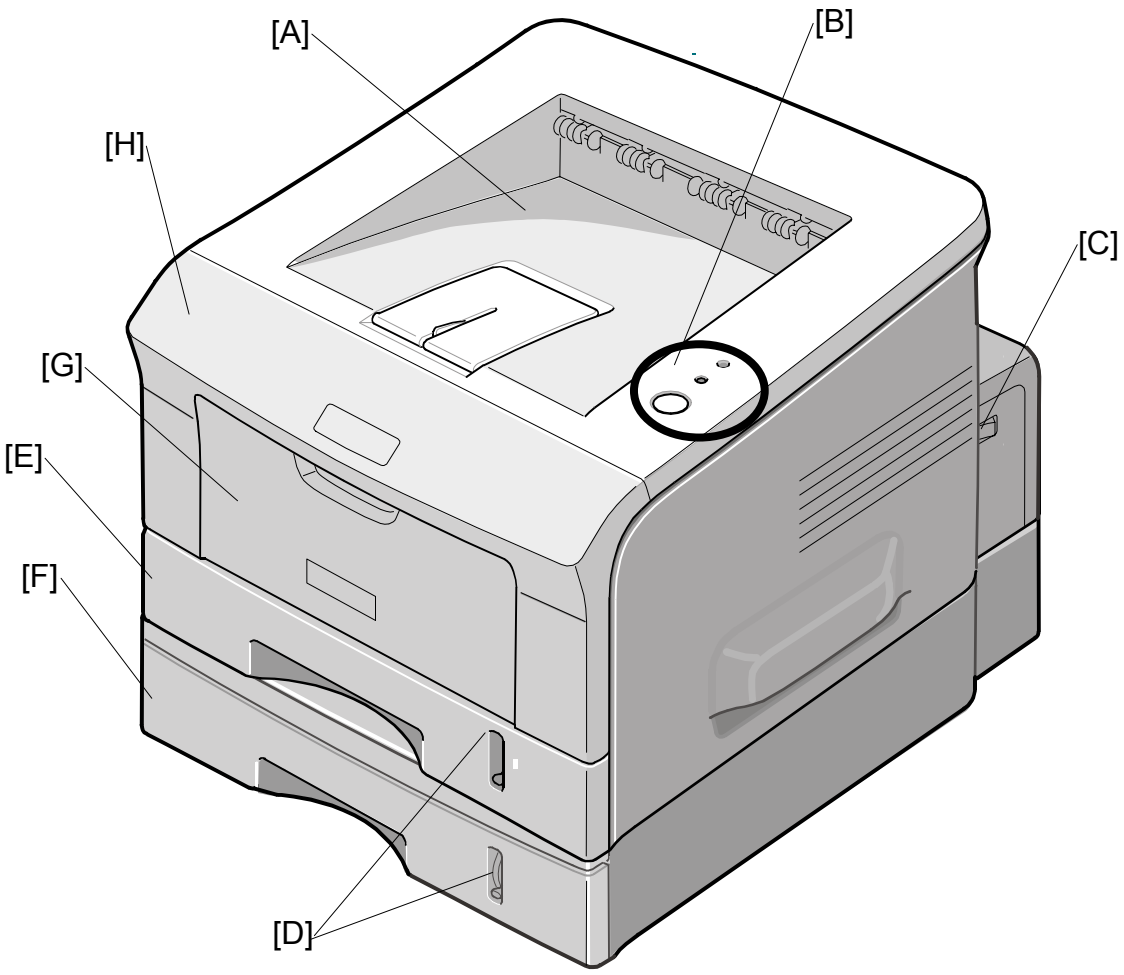
The machine will restart the upgrade activity.

DETAILED DESCRIPTIONS

6. DETAILED DESCRIPTIONS

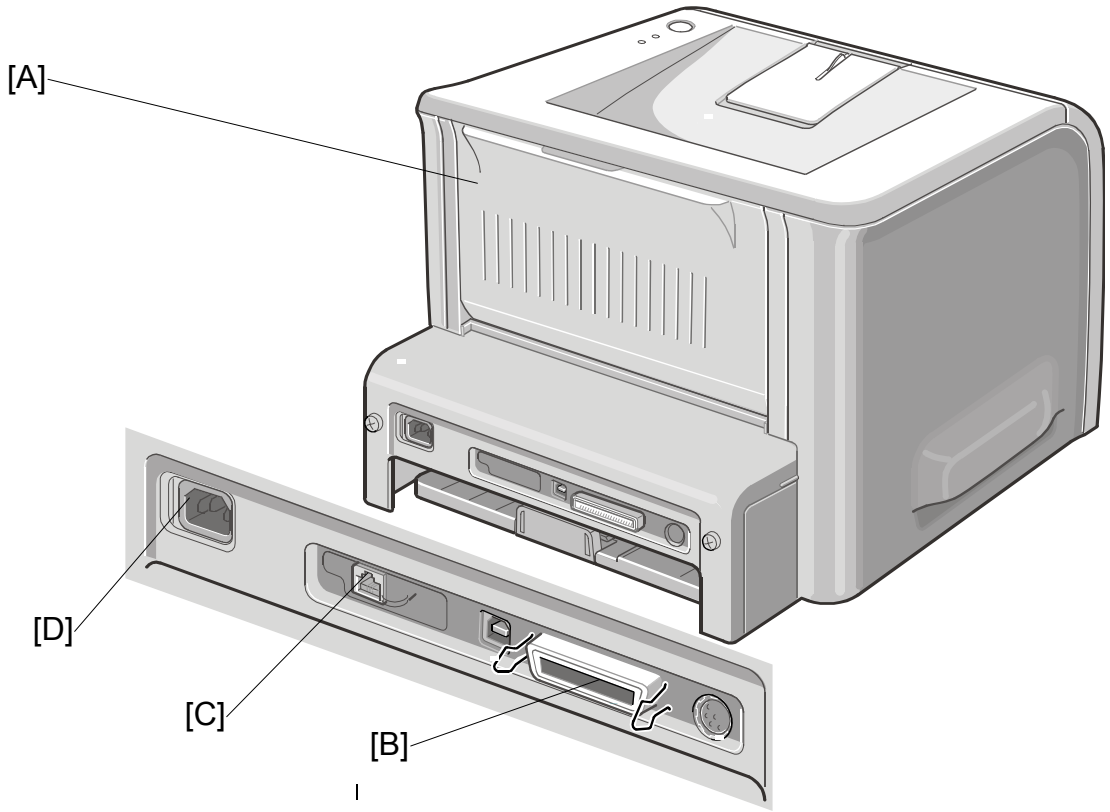
6.1 MACHINE OVERVIEW

6.1.1 FRONT VIEW



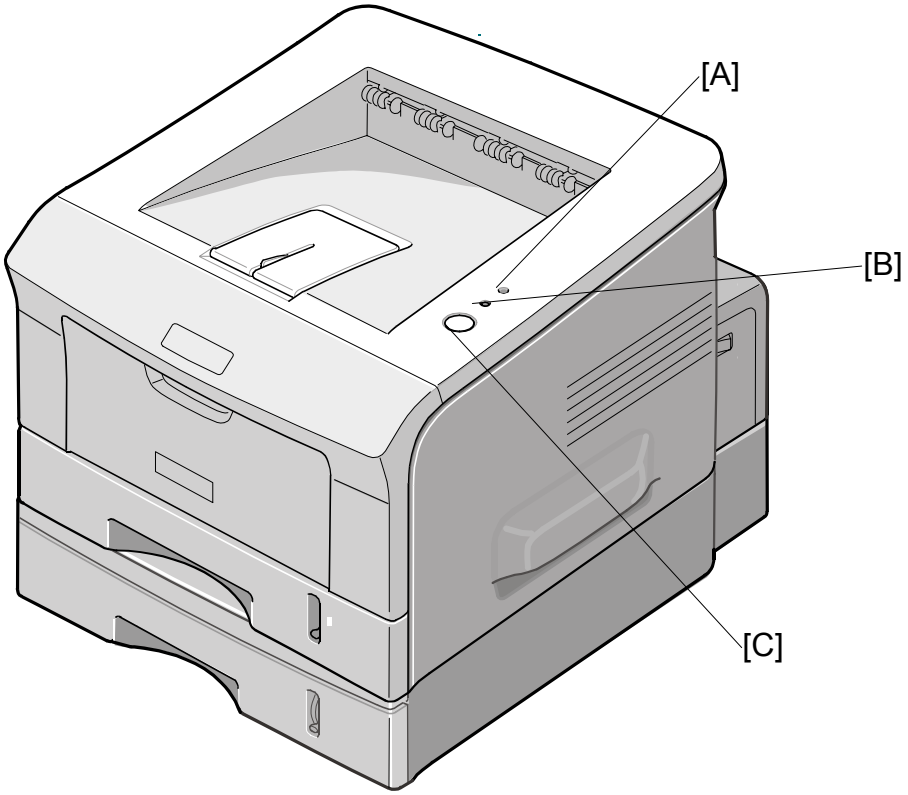
[A] Paper output tray
[B] Operation panel
[C] Power switch
[D] Paper level indicator
[E] Standard paper feed unit
[F] Optional paper feed unit
[G] Bypass tray
[H] Front cover

6.1.2 REAR VIEW



[A] Face up door
[B] Parallel port
[C] USB port
[D] Power receptacle

6.1.3 OPERATION PANEL



The machine has the following buttons on the operation panel.

[A]: On line/error

[B]: Toner save

[C]: Cancel

On Line/Error Button:

- The machine is ready to print when this button is green.
- The machine is experiencing an error such as jammed paper, cover open or empty toner cartridge when this button is red.
- If you press the cancel button when the printer is receiving data, the button blinks red and cancels the print job.
- The button blinks red if there is no paper in the paper feed unit. Load paper to the paper feed to resolve the error condition.
- The button blinks green slowly when the printer receives print data. The button blinks green quickly when the machine prints the received data.

Toner Save Button

This LED goes on and the toner save mode is enabled when you press the cancel button for 0.5 sec. The LED goes off and toner save mode is disabled when you press the cancel button again.

On Line/Error Button and Toner Save Button

The machine experiences internal problems if On Line/Error and Toner Save button LEDs blink at the same time.

Cancel Button

The cancel button provides the following functions:

1. Print demo page: In Ready mode, press and hold this button for about 2 seconds, until all LEDs blink slowly. Then release the button.
2. Print configuration page: In Ready mode, press and hold this button for about 6 seconds, until all LEDs blink quickly. Then release the button.
3. Clean inside of the printer: In Ready mode press and hold this button for about 10 seconds, until all LEDs turn on. Release the button. The machine prints one cleaning sheet after this procedure.
4. Cancel a print job: Press this button during printing. The On Line/Error LED blinks while the print job is cleared from both the printer and the computer. Then the machine goes back Ready mode. This may take some time (30 seconds or more), depending on the size of the print job. You cannot perform this procedure in Manual Feed mode.
5. Toner save mode on/off: In Ready mode, press this button to turn the Toner Save mode on or off (about 0.5sec).

6.2 MACHINE OVERVIEW

6.2.1 FIRMWARE

The machine firmware controls the printing process.

6.2.2 PRINT ENGINE

Paper Feed Mechanism

The paper feed mechanism consists of the following:

1) 250 sheet paper feed unit
2) By-pass tray
3) Pick-up rollers, friction pads and feed rollers.

Together with sensors in the feed path, these mechanisms serve to control paper registration and guide the paper through the image transfer, image development, image fusing and exit assemblies. The paper path has an anti-static connection to ground, which eliminates paper feed problems due to static charge on the paper.

Drive Mechanism

The main drive mechanism uses a 2-phase motor. It drives the OPC, paper pick-up, and paper feed rollers using a gear train mechanism.

Laser Scanning Unit

The machine uses the laser scanning unit (LSU) of the mechanism to create images on the OPC drum.

Laser Scanning Unit

The machine uses the laser scanning unit (LSU) of the mechanism to create images on the OPC drum.

Development Unit

The development unit adds toner to the latent image on the OPC drum.

Fusing Unit

The fusing unit bonds the toner image onto the paper. This is achieved with a temperature controlled heating unit.

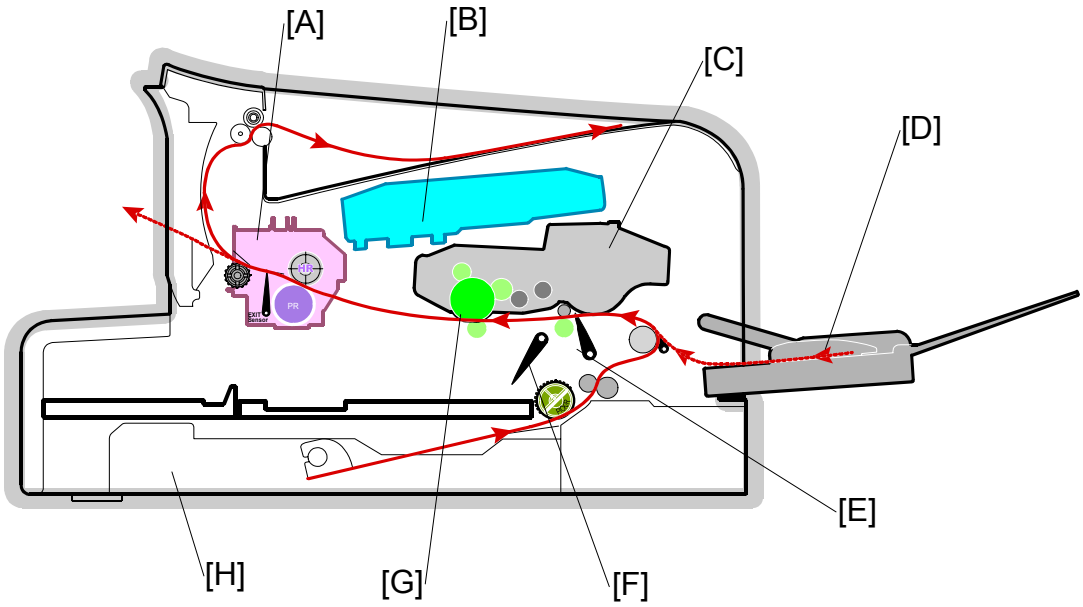
Electrical Components (PBA)

The main control board consists of the following:

1. Main Processor ASIC (166MHz SPGPm)
2. Memory Components (Flash Rom, Control Program, and DRAM)
3. Engine interface components (motor control, fusing unit control, HVPS control, sensors etc)
4. PC Interface (USB , Parallel, wired and wireless Network)
5. Bus, DMA and I/O handling

The operation panel is also included as part of the electrical components.

6.3 SYSTEM LAYOUT



[A] Fusing unit
[B] Laser scanning unit
[C] Toner cartridge
[D] By-pass tray
[E] Paper feed sensor
[F] Paper empty sensor
[G] OPC
[H] Paper feed unit

6.3.1 PAPER FEED UNIT

The paper feed unit consists of the following.

- Standard paper tray unit
- Optional paper feed unit
- By-pass tray

Paper Separation Method

Individual sheets are separated in the paper feed unit via the feed/friction pad method. Paper passes over a spring loaded friction pad that separates the sheets of paper as they are fed into the machine.

Paper Tray

The paper cassette uses a center loading method. The machine does not have a paper size sensor. Software detects the size of the first sheet of paper as it is fed through the machine. Both the rear and side paper guides can be adjusted to handle the various paper sizes.

A paper empty sensor detects the presence of paper (capacity: 250 sheets). An indicator flag on the front of the paper tray unit shows the amount of paper remaining in the tray.

Pick-up roller

The pick-up roller picks up and feeds paper into the printer. It also removes static charge on the paper.

By-pass tray

The by-pass tray holds non-standard paper sizes and special media (envelopes, transparencies etc.). Unlike the paper cassette, the by-pass tray does have a paper empty sensor. A friction pad ensures that paper separates correctly. The by-pass tray holds a maximum of 50 sheets of paper or envelopes.

Optional Paper Feed Unit

The optional paper feed unit is the same as the standard paper tray unit and has a capacity of 250 sheets.

6.3.2 TRANSFER UNIT

A PTL (Pre-transfer Lamp) and a transfer roller migrate toner from the OPC drum onto the paper. The PTL shines additional light onto the OPC, which reduces the electrical charge on the surface of the OPC drum and improves the transfer efficiency. The transfer roller then migrates the toner from the OPC drum to the paper.

6.3.3 DRIVE

The main board supplies power to the paper drive assembly. The main motor supplies power to the following:

- Paper feed unit
- Toner cartridge
- Fusing unit
- Pick-up, feed and exit rollers

6.3.4 FUSING UNIT

The fusing unit consists of the following:

- Fusing lamp
- Hot roller
- Pressure roller
- Thermistor and thermostat.

The fusing unit uses pressure and heat to melt and bond toner into the paper.

Thermostat

The thermostat cuts off the power to the fusing lamp, which prevents machine overheating. Power to the fusing lamp is cut when the thermostat temperature reaches 160 C.

Thermistor

The thermistor detects the surface temperature of the hot roller. This information goes to the main processor, which uses this information to regulate the temperature of the hot roller.

Hot Roller

The fusing lamp heats the surface of the hot roller. Toner is melted and adheres to the surface of the paper as the paper passes between the hot roller and pressure roller. The surface of the hot roller is coated with Teflon to ensure that toner does not remain on the roller surface.

Pressure Roller

The pressure roller is mounted under the hot roller. The roller itself is made of a silicon resin, while the surface of the roller is coated with Teflon. This ensures that toner does not remain on the roller surface.

Safety Features

The machine has the following countermeasures to prevent overheating:

1. 1st protection device: Hardware shuts down when the machine temperature reaches 207 C.
2. 2nd protection device: Software shuts down when the machine temperature reaches 220 C for 3 seconds
3. 3rd protection device: The thermostat measures the temperature of the hot roller and cuts off main power to the fusing lamp when the temperature reaches a pre-determined level.

Safety Devices

1. Fusing power is cut when the front cover is opened.
2. LSU power is cut when the front cover is opened.

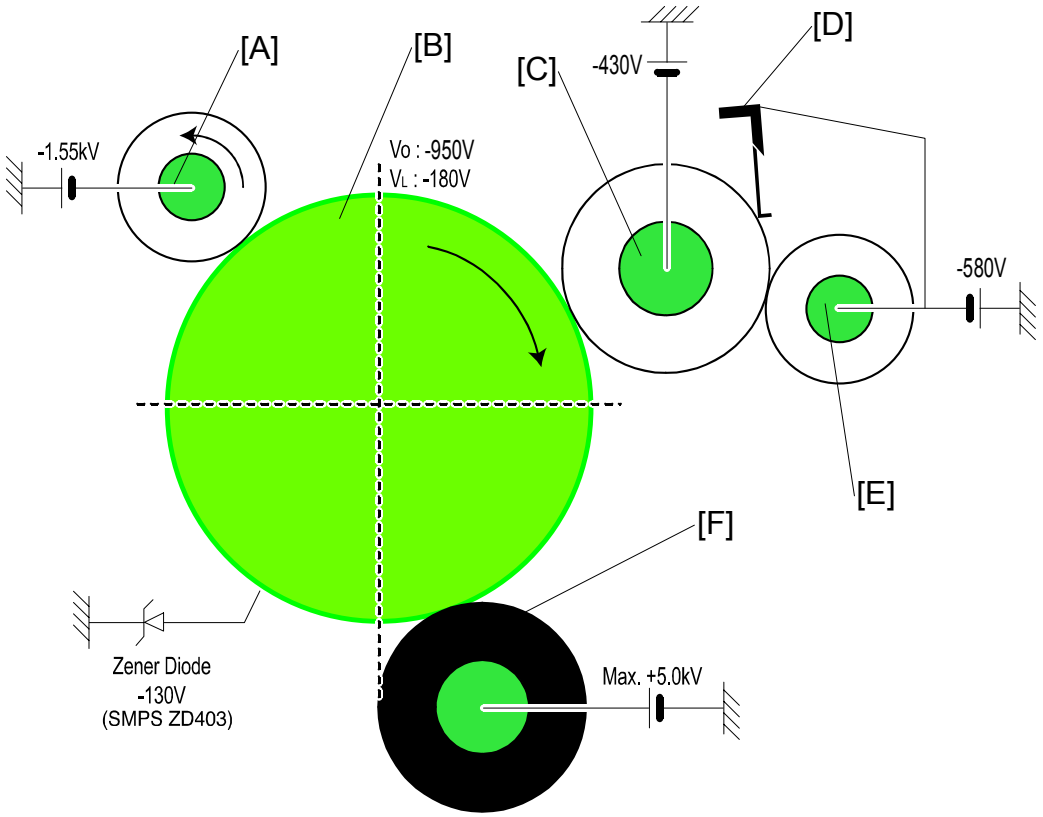
The temperature of the fusing unit's cover surface remains at less than 80ºC. This protects the user. A caution label is attached where the customer can see it easily when the rear cover is opened.

6.3.5 LASER SCANNNING UNIT (LSU)

The LSU converts video data into an electrostatic latent image on the surface of the OPC drum. This is accomplished by controlling the laser beam and exposing the surface of the OPC drum with the laser light. A rotating polygon mirror reflects the laser light onto the OPC drum. Each side of the polygon mirror equals one scan line.

The OPC drum turns as the paper feeds, to scan the image down the page. A /HSYNC signal is created when the laser beam from LSU reaches the end of the polygon mirror. The signal then goes to the controller. The controller detects the /HSYNC signal and adjusts the vertical line of the image on paper. In other words, after the /HSYNC signal is detected, the image goes to the LSU to adjust the left margin on the paper.

6.3.6 TONER CARTRIDGE



[A]: Charging roller
[B]: OPC drum
[C]: Developing roller
[D]: Doctor blade
[E]: Supply roller
[F]: Transfer roller

The toner cartridge contains the OPC unit and toner unit. The OPC unit consists of the OPC drum and charging roller. The toner cartridge unit consists of the toner, supply roller, developing roller, and doctor blade.

There is no toner near-end sensor in the machine. However, the machine has a toner-remaining amount sensor.

A cleaning blade is used to collect the used toner.

- Developing method: Non-magnetic one-element contact method
- Toner: non-magnetic one-element shatter-type toner
- Toner life span: 3,000 sheets (IDC Pattern/A4 standard)
- OPC cleaning: Electrostatic process

6.3.7 NEW AIO DETECTION

A new supply AIO cartridge has a ID chip. The machine detects that a new cartridge has been installed when the chip is detected.

The machine then resets the total dot counter (TOTAL TONER COUNT) and CRU print counter (Cru Prints). The counter for counting the number of CRU replaced (Replaced Toner Counts) is also incremented. Only in the case of the “Replaced Toner Counts” being at 0, the CRU currently installed is regarded as the starter CRU. In this condition, the threshold to detect toner-end is shorter than that for the supply CRU.

6.3.8 TONER END DETECTION

The machine does not have a toner end sensor. The amount of toner is checked via software. The machine counts and adds up black dots as toner consumption. For example, the following occurs when the machine prints 5% of black rate chart:

- Starter cartridge: Approx. 4, 750, 000, 000 dots will be added.
- Supply cartridge: Approx. 7, 500, 000, 000 dots will be added.

When the total number of dots reaches a pre-programmed figure (as for toner near-end), the machine shows “TONER LOW”. After another period of dots has been counted up, the machine finally shows “TONER EMPTY” (as for toner-end), and the machine stops printing.

You can check the total dot counts from the current cartridge via the Configuration page in TECH mode.

6.4 ASIC(SPGP)

- ARM946ES
  - 32-bit RISC embedded processor core
  - 6KB instruction cache and 16KB data cache
  - No tightly coupled memory
  - Memory protection unit & CP15 control program
- Dual bus architecture for bus traffic distribution
  - AMBA high performance bus (AHB)
  - System bus with SDRAM
- IEEE1284 compliant parallel port interface
- Printer video controller for LBP engines
- Graphic execution unit for banding support of printer languages
- Printer video controller for LBP engines
  - PVC : Printer video controller without RET algorithm
  - HPVC : Printer video controller with RET algorithm. (Line Memory & Lookup Table Memory : 512 x 8 , 4096 x 16)
- Engine controller
  - Motor control unit
  - Motor speed lookup table memory (128 x 16 x 2)
  - Pulse width modulation unit
  - 4 channels are supported
  - ADC Interface unit
  - 3 ADC channels are available
  - ADC core (ADC8MUX8) maximum clock frequency :3 MHz
- USB 2.0 interface
- Package: 272 pins PBGA
- Power : 1.8V(Core), 3.3V(IO) power operation
- Speed : 166MHz core (ARM946ES) operation, 60MHz bus operation

6.4.1 MEMORY

This machine has flash ROM and DRAM memory units. There are 2-SODIMM sockets to allow for extra DRAM or Flash ROM (Postscript Option) being added.

6.4.2 FLASH MEMORY

- Record/download system program from the PC Interface
- Fax for journal list
- Memory for one touch dial
- Speed dial list:
  - Size : 2M Byte
  - Access Time : 70 nsec

6.4.3 SDRAM

SDRAM is used for the following:

- Swath buffer in printing
- Scan buffer in scanning
- ECM buffer in fax receiving
- System working memory area:
    - Size: 16MB
    - Max Frequency: 100MHz

6.4.4 SENSOR INPUT CIRCUIT

Paper Empty Sensor

The CPU monitors the paper empty sensor (photointerrupter). The printer flashes the red ERROR LED when the paper feed unit is empty.

By-pass Tray Sensor

Paper in the by-pass tray is detected by the by-pass sensor (photointerrupter) on the frame. The CPU monitors this sensor to detect if paper is in the by-pass tray. Paper is fed from the by-pass tray if the CPU detects paper is present.

Paper Feeding

Paper is detected by the photointerrupter when it passes the actuator on the feed sensor. The CPU monitors the signal and creates the image after a specific interval of time. Jam0 shows (red ERROR LED) if the feed sensor is not detected within 1 second after paper is fed.

Paper Exit Sensor

The exit sensor on the engine board, along with the actuator on the frame detect when paper exits from the machine. The CPU detects the on/off time of the exit sensor and reports normal operation or jam status. The red ERROR LED lights if Jam 2 error occurs.

Cover Open Sensor

The cover open sensor is located on the power supply board and is operated by a molded tab on the front cover. Power (+24V and +5V) to the following is cut when the front cover is open:

- DC fan
- Solenoid
- Main motor
- Polygon motor
- HVPS and LSU

DC Fan/Solenoid Driving Circuit

The CPU uses a transistor to control the fan driving circuit. The fan is automatically turned off when a machine enters energy saver mode.

Two solenoids are driven by signals from the CPU (by-pass and paper pick-up).

Motor Drive Circuit

The main motor drives the following:

- Paper feed unit
- Developing unit
- Fusing unit
- Exit assembly

Software controls the acceleration, constant speed, and deceleration. An A3977 driver IC drives the motor.

Transfer

PWM (Pulse Width Modulation) controls the charging voltage, developing voltage, and the transfer voltage. The output voltage changes according to the PWM duty cycle. Environment recognition detects the transfer voltage used when the paper passes the transfer roller. The surrounding environment in the room or within the machine changes the resistance value of the transfer roller. This change in resistance in turn changes the value of the voltage due to loading. This voltage is fed back into the machine through the A/D converter. The PWM cycle changes to maintain the required transfer voltage based on this value.

Fusing

The resistance value of the thermistor detects the temperature of the heat roller's surface. The A/D converter measures the thermistor resistance and lets the CPU determine the temperature of the heat roller. The AC power is controlled by comparing the target temperature to the value from the thermistor. An error shows if the value from the thermistor is out of the controlling range during the fusing process.

Error Type

Error	Description	LED Display
Open heat error	Temperature remains lower than 68 C for more than 28 seconds during warm-up.	All LEDs flash
Low heat error	Standby: Temperature remains lower than 80 C for more than 10 seconds. Printing: Temperature remains lower than 145 C for more than 4 seconds, for up to two consecutive print jobs. Temperature remains 25 C lower than the fixed fusing temperature for more than 4 seconds, for up to two consecutive print jobs. Temperature remains higher than 220 C for more than 3 seconds.	All LEDs flash
Over heat error	Temperature remains higher than 220 C for more than 3 seconds.	All LEDs flash

LSU

The LSU consists of the laser diode and the polygon motor control. When the printing signal is detected, the laser diode turns on and the polygon motor is enabled. HSync occurs when the light sensor detects the beam, and LReady occurs when the polygon motor speed reaches normal. The LSU is ready when these two conditions are satisfied. The errors in the table below show the possible error types when one or both of the two conditions is not satisfied.

Error Type	Description
Polygon motor error	The polygon motor speed does not become stable.
Hsync error	The polygon motor speed is steady, but the Hsync is not generated.

6.5 SMPS AND HVPS

The SMPS and HVPS are on the same board. The SMPS supplies DC power to the system. It takes either 110V or 220V and outputs the +5V and +24VS to the main and other circuit boards.

The HVPS creates the high voltage for the THV/MHV/Supply/Dev circuits and supplies it to the toner cartridge. The CPU modifies the voltage settings to provide ideal voltages to create images. The HVPS uses the 24V to output the high voltage for the THV/MHV/BIAS circuitry. Then the high voltage output is supplied to the toner, OPC cartridge, and transfer roller.

6.5.1 HVPS (HIGH VOLTAGE POWER SUPPLY)

1. Transfer High Voltage (THV+)

- Input voltage: 24 V DC ± 15%
- Output voltage: Max +5.0KV ± 5 %, (duty variable, no loading). 1.2KV ±15%
- Output voltage trigger: 6.5 uA
- Input contrast of the voltage stability degree: under ± 5 % (fluctuating input 21.6V~26.4V)
- Loading contrast: ± 5 % or less
- Output voltage rise time:100 ms max
- Output voltage fall time: 100 ms max
- Transfer voltage range as environment varies: +650 V(duty 10%) ~ 5 KV (duty 90%)
- Environment recognition: THV-PWM is a transfer active signal. It detects the resistance of the transfer roller/OPC with the THV voltage (fixed value). Then it measures the OPC voltage to determine the resistance. The resistance is affected by changes in temperature and humidity. The control program is then used to enable the THV voltage. The voltage is adjusted to compensate for the environmental conditions.
- Output voltage control method : Transfer output voltage is sourced and controlled by changing the duty cycle of the THV PWM signal.

2. Charge Voltage (MHV)

- Input voltage: 24 V DC ± 15%
- Output voltage: -1.3KV ~-1.8KV DC ± 50V
- Output voltage rise time: 50 ms max
- Output voltage fall time: 50 ms max
- Output loading range: 30 MΩ~1000 MΩ
- Output control signal (MHV-PWM): CPU = HV output when PWM is low

3. Cleaning Voltage (THV-)

- The (+) transfer voltage is not output because the THV PWM is high.
- The (-) transfer voltage is output because the THV-enable signal is low.
- The output fluctuation range is large because there is no Feedback control.

4. Developing Voltage (DEV)

- Input voltage: 24 V DC ± 15%
- Output voltage: -200V ~ -600V DC ±20V
- Output voltage fluctuation range: PWM control
- Input contrast of the output stability degre :±5 % or less
- Loading contrast: ± 5 % or less
- Output voltage rise time: 50 ms max
- Output voltage fall time: 50 ms max
- Output loading range: 10MΩ~ 1000 MΩ
- Output control signal (BIAS-PWM): CPU output = HV output when PWM is low.

5. Supply

- Output voltage:-400 V ~-800V DC ±50 V (ZENER with DEV)
- Input contrast of the output stability degree:under ± 5%
- Loading contrast: ± 5% or less
- Output voltage rise time: 50 ms max
- Output voltage fall time: 50 ms max
- Output loading range: 10 MΩ.~ 1000 MΩ
- Output control signal (BIAS-PWM): CPU = HV output when PWM is low.

6.5.2 SMPS (SWITCHING MODE POWER SUPPLY)

The SMPS powers the entire system and is assembled by an independent module, so it is possible to employ it for common use. It is mounted at the bottom of the set and consists of the AMPS part, which supplies the DC power for driving the system, and the AC heater control part, which supplies the power to fuser. The SMPS has two output channels (3.3V and +24V):

1. AC Input

- Input Rated voltage: AC 220V ~ 240V AC 120V / AC 220V (EXP version)
- Input Voltage range: AC 198V ~ 264V AC 90V ~ 135V / AC 198V ~ 264V (EXP version)
- Rated Frequency: 50/60 Hz
- Frequency range: 47 ~ 63 Hz
- Input Current: Under 4.0A/2.0A. (When the fuser lamp is off and input/output voltages are in range)

2. Rated Output Power

No.	Item	CH1	CH2	CH3	Remark
1	Channel name	+3.3V	+5V	+24V	
2	Connector pin	CON 3 3.3V Pin: 3,4 GND Pin: 5.6	CON 3 5V Pin: 8 GND Pin: 7	CON 3 24V Pin: 11-13 GND Pin: 9-10	
3	Rated output	3.3 V ± 5% (3.2-3.4 V)	5 V ± 5% (4.75-5.25 V)	24 V ± 10% (21.6-26.4 V)	
4	Maximum output current	1.0 A	0.14 A	2.0 A	
5	Peak loading current	1.5 A	0.14 A	2.5 A	1 ms
6	Ripple noise voltage	Less than 100 mV	100 mV	Less than 500 mV	
7	Maximum output	3.3 W	0.35 W	48 W	
8	Peak output	4.95 W	0.7 W	60 W	1 ms
9	Overflow current protection	---	---	---	---

3. Consumption Power

No.	Item	CH1-+3.3V	CH2-+5V	CH3-+24V	Remark
1	Stand-by	1.0 A	0.07 A	0.4 A	Ave: 55W
2	Printing	1.0 A	0.14 A	2.0 A	Ave: 55W

6.6 ENGINE

6.6.1 PAPER FEED

Pick-up roller drive is controlled by the pick-up solenoid, if paper is fed from the paper tray unit. The on/off of the solenoid is controlled by the general output port or the external output port. The machine feeds the paper based upon the operation of the manual sensor and the main motor.

The machine shows the following jam conditions when paper feed troubles occur:

Item	Description
Jam0	• Paper does not enter the unit due to a paper misfeed after a page was picked up. • Paper entered, but did not get to the feed sensor within a certain time due to slip, etc after a page was picked up. • A page was picked up, but the feed sensor has not actuated. Jam0 shows if the feed sensor remains off after a certain time, the feed sensor tries again. This means that the leading edge of the paper doesn't pass the feed sensor within a certain time. • The feed sensor does not actuate even though the paper has reached the feed sensor. This means that the sensor is faulty.
Jam1	• The trailing edge of the paper does not pass the feed sensor within a certain time once the leading edge of the paper has passed the feed sensor. (During this time the feed sensor cannot be Off) • The paper does not reach the exit sensor within a certain time once the leading edge of the paper has passed the feed sensor. (The exit sensor cannot be On during this time) • There is already paper between the feed sensor and the exit sensor.
Jam2	• The trailing edge of the paper does not pass the exit sensor within a certain time once the trailing edge of the paper has passed the feed sensor.

SPECIFICATIONS

SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

Configuration	Desktop	
Paper size	A4/Lt	
Print Resolution	Maximum	1200 x 1200 dpi
	Default	600 x 600 dpi
	RET Chip	Supported
	Gray Scale Level	128 Gray
Print Speed	A4-20 ppm	
	Letter-22 ppm	
Duplex Print Speed	Not Supported	
First Print Speed	Stand-by: 10 seconds	
	Energy saver mode: 50 seconds	
Copy Paper Weight	Paper Tray	60-105 g/m² (16-28 lb.)
	By-pass tray	52-162 g/m² (14-43 lb.)
	Optional paper tray	60-105 g/m² (16-28 lb.)
	Duplex	64-105 g/m² (17-28 lb.)
Warm-up Time	42 seconds from energy saver mode	
Paper Input Size	Standard tray	A3/DLT – A5
	By-pass tray	A3/DLT – A6, Free size
	By-pass tray-Custom size paper	Length: 160 - 432 mm (5.8" - 17"), Width: 90 - 305 mm (3.5" - 12"), Com#10, C5, C6, DL. Monarch
	Optional Envelope Feeder	Com#10, C5, C6, DL. Monarch
	Optional paper tray unit Up to 2 units can be installed.	A3/DLT – A5
Paper Input Capacity	Standard/Optional paper trays	2 x 250 sheets (80 g/m², 20 lb.)
	By-pass tray	Normal paper: 50 sheets (80 g/m², 20 lb.)
		Special paper: 5 sheets
Output Capacity (Maximum 151 sheets)	150 sheets (face down)	
	1 sheet (face up)	
Total Counter	Electric Counter	
Environmental Standard	US version: Energy Star Tier 1	
	EU version: BAM specifications	
Energy Saver Mode	Selectable 1/5/**15**/30/45/60 minutes (15=default)	
Supply	5K AIO toner supply cartridge	
	3.5 K starter toner supply cartridge	

1.2 CONTROLLER

CPU	SPGPm 166 MHz	
Printer Languages	Standard	PCL6
	Auto Emulating Sensing	Supported
Interfaces	Standard	IEEE1284, USB 2.0
Memory (1 slot)	Standard/Max	16MB/144MB
	Type	SDRAM
Font	Type-Flash Memory Number- 45 Scalable, 1 Bitmap	
Network	10/100 Base TX	

1.3 SOFTWARE SPECIFICATIONS

OS	Windows 95/98/NT4.0/2000/Me/XP Linux OS including Red Hat, Caldera, Debian, Mandrake, Slackware, SuSE, and Turbo Linux	
Printer driver	Compatibility	SPL
	Default	SPL
	Remote control panel	Supported
	Status monitor	USB: Supported Network: Supported Parallel: Not supported
	Languages	English, Korean, German, French, Spanish, Italian, Dutch, Portuguese, Russian, Swedish, Norwegian, Finish, Danish, Chinese. Taiwanese
	Contents	Printer driver, Acrobat reader, Manual, SM, Electronic registration.
Driver Function	Layout	1. Orientation: Portrait, Landscape, Rotate 180 degrees 2. Layout options: Type, pages per slide, page order. 3. Favorites
	Paper	1. Copies 2. Paper options: Size, source, type 3. Favorites
	Graphics	1. Resolution: 1200 dpi, 600 dpi 2. Toner save: Printer setting (on/off) 3. Advanced options 4. Favorites
	Extras	1. Watermark 2. Overlay 3. Output options (Print order, re-print when jammed) 4. Favorites
	Printer	1. Printer configuration: High altitude correction

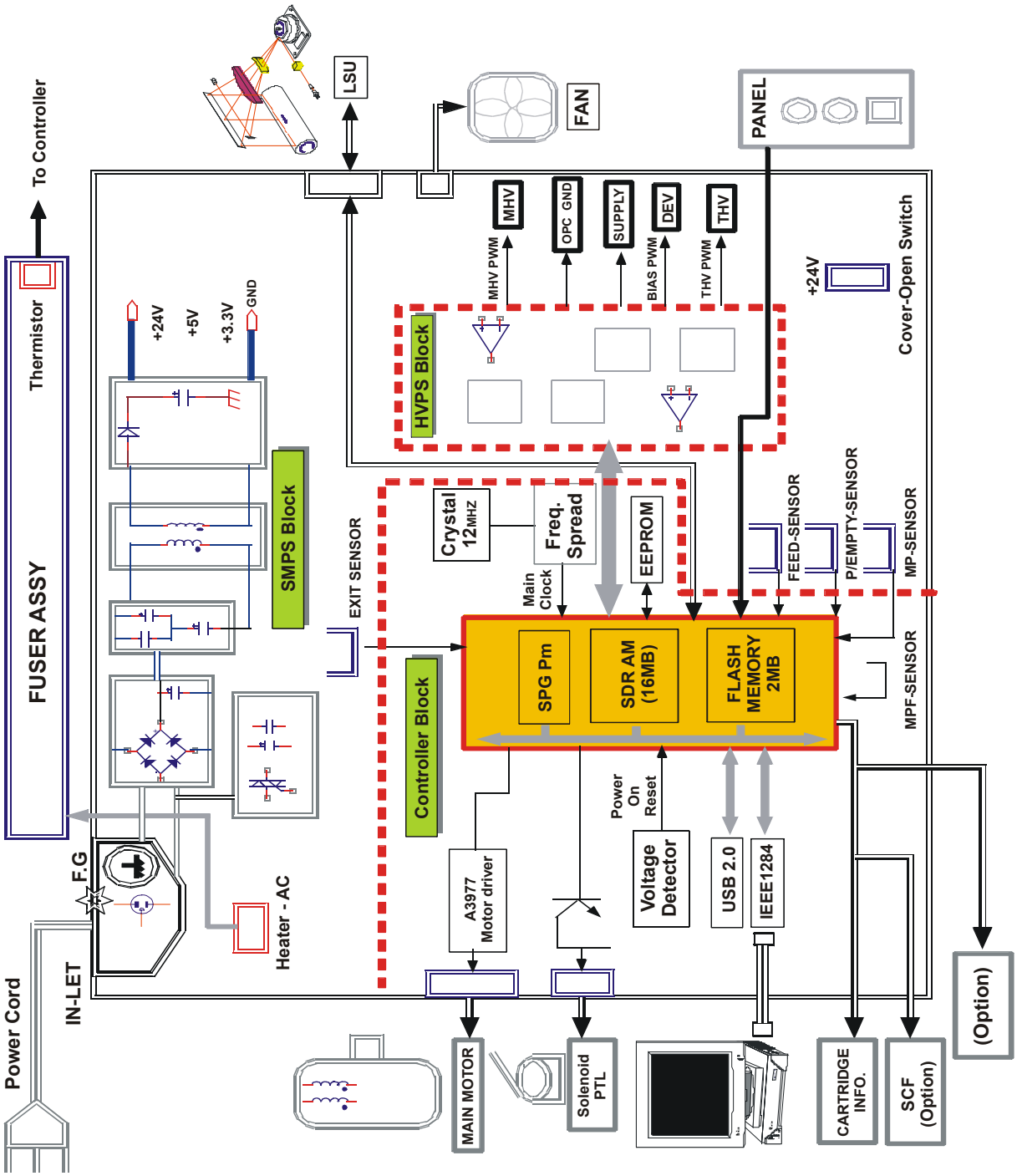
1.4 OPTIONAL UNIT SPECIFICATIONS

Paper tray unit	Capacity	250 sheets (Life: 150 K)
	Media	A4, A5, Letter, Legal, Executive, Oficio, Folio, ISO, B5, JIS B5
	Paper weight	16-24 lb (60-90 g/m²)
Memory	Memory upgrade	Supported
	Memory type	SDRAM
	Memory unit	32 MB, 128 MB
Network	Option	10/100 Base Tx
	Protocol	SPX/IPX, TCP/IP, Ethertalk, SNMP, HTTP 1.1, DLC/LLC
	Operating system	MS Windows 98/NT/ME/2000/XP, SUN Solaris, HP-UX, SCO, Novell Netware, Macintosh
Hard Disk	Not Supported	
Mailbox	Not Supported	
Serial	Not Supported	
Local talk	Not Supported	

APPENDIX

APPENDIX

BLOCK DIAGRAM



CONNECTION DIAGRAM