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Service Training
Product Overview

Model MD-P2 (SP C320DN)

Slide 1

Date of change	Version History	Description
16-Aug-10	First release draft	Draft. Several items still TBD.
8-Oct-10	Final release	Completed TTP released.

Training Material Outline - 1/2

- **This training material consists of the following:**
  - Product Overview
    - » Basic introduction to this machine, including Target User information and Product Positioning information.
  - New and Changed
    - » The items which are different from the MD-P1.
  - Installation
    - » Installation procedures are gone over. Note that this and every section should be looked at in conjunction with Operating Instructions (OI) and the service manual (FSM - Field Service Manual), as well as any other relevant documentation.
  - Service Mode
    - » Entering Service Mode, etc., is covered.
  - Updating the Firmware
    - » Firmware update procedures and cautions are gone over.

Slide 2

No additional notes.

Training Material Outline - 2/2

- Maintenance
  - » Maintenance procedures gone over
- Machine Overview
  - » Specifications, Optional Equipment, various mechanical procedures covered.
- Laser Exposure
  - » Laser unit parts, optical path, etc. covered.
- AIO (All-In-One) Cartridge
  - » Detailed explanation of how the AIO cartridge works.
- Paper Feed
  - » Paper feed details (one-sided output, duplex, etc.)
- Image Transfer
  - » Color image transfer process
- Fusing
  - » The fusing process is explained
- Optional Paper Tray Unit
  - » Optional Paper Tray unit explained
- Trouble-Shooting

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No additional notes.

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Product Overview

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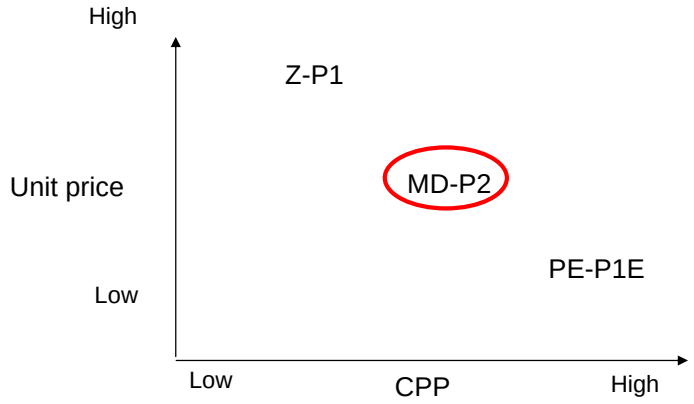
Product Positioning



- **Price and Performance**
  - The MD-P2 falls between the PE-P1E and the Z-P1.
- **MD-P2 Sales Points:**
  - Machine compactness
  - Low CPP
  - Low TCO
  - Workgroup use (3 to 10 share)
  - GW controller
  - ECO product

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- CPP = cost per print
- TCO = Total cost of ownership

The Machine

- **This is how the machine looks.**
- **There is also an optional Paper Tray which goes under the machine (not shown here).**
- **Refer to *Guide to the Printer* in the operating instructions *Hardware Guide* for explanations of the names and functions of the printer's components.**

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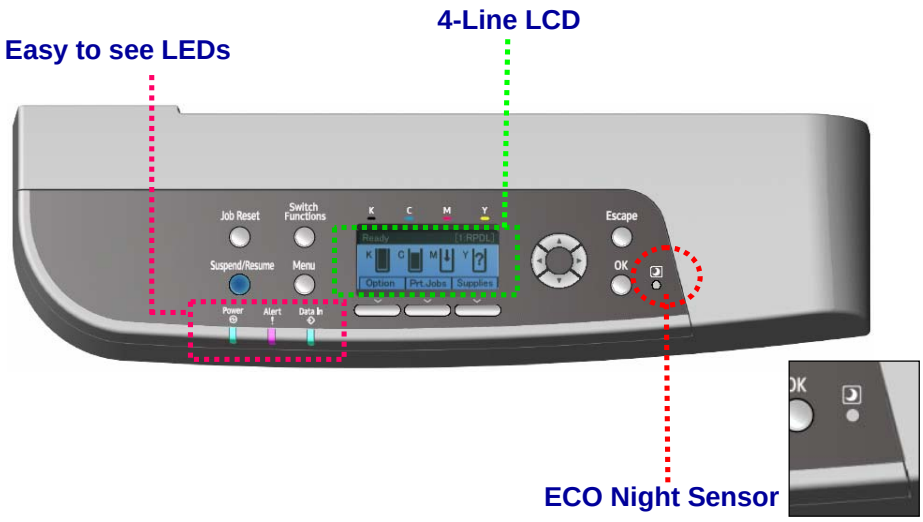
More on the Machine

- The picture shows the machine without the optional paper tray unit attached. Do a full circle check of the machine and locate the various sockets, handles, covers and operation panel.
- The standard paper tray and the optional paper tray have a 500 sheet capacity.
- The output tray has a 150 sheet capacity.
- The by-pass tray can hold 100 sheets.
- The *Guide to the Printer* section of the *Hardware Guide* covers the following:
  - Exterior views (front and rear)
  - User serviceable interior components
  - Control panel
  - Display

Operation Panel



Go to the machine and have a look at the operation panel and familiarize yourself with the various keys, display, and LEDs.

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- Easy to see LEDs
  - The operation panel angle is raised to 13.5 degrees so the users can observe the LED lamps even while seated.
- 4-Line LCD provides an improved user interface.

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New and Changed

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No additional notes.

Items Which Have Changed

- **GW Controller**
  - No SOM application
  - Machine controlled from operation panel.
- **4-Line LCD**
  - Improved user interface
- **Fusing Unit Improved**
  - Thin belt type
  - Quick warm-up
  - Reduced energy consumption
- **Modified Paper Tray**
  - Covered later in the Paper Feed section

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- Previous machine (Md-P1) used the Premax controller.
- The modified paper tray will be applied to the Md-P1 also.

New Items

- **ECO Night Sensor**
  - Ambient light sensor on the operation panel
  - Can turn off the machine if the room becomes dark.
- **Narrow Paper Mode for Bypass**
- **Black Priority Mode**

ECO Night Sensor

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- Energy saving with “ECO Night Sensor”
  - A light sensor can detect when the room becomes dark and automatically turn off the main power after a certain amount of time.
  - The default setting is "Inactive".
  - Activating the ECO Night Sensor:
    - *Menu key → Eco Night Sensor → Auto Power Off Setting*
  - You can also set the off timer and the sensitivity threshold.
    - *Menu key → Eco Night Sensor → Auto Power Off Timer*
    - *Menu key → Eco Night Sensor → Brightness Sensor Level*
  - Refer to the operation manual for details.

- Black Priority Mode
  - *Menu key → B & W print priority (Default off)*

- Narrow Paper Mode for Bypass
  - *Menu key → Bypass print 64-90 mm (Default inactive)*

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Installation

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Before You Start

- **See the Field Service Manual (FSM) for installation requirements before you install the machine. You can find this information in the FSM.**
  - Environment
  - Space requirements
  - Power requirements
- **The installation procedure is in the Quick Installation Guide.**

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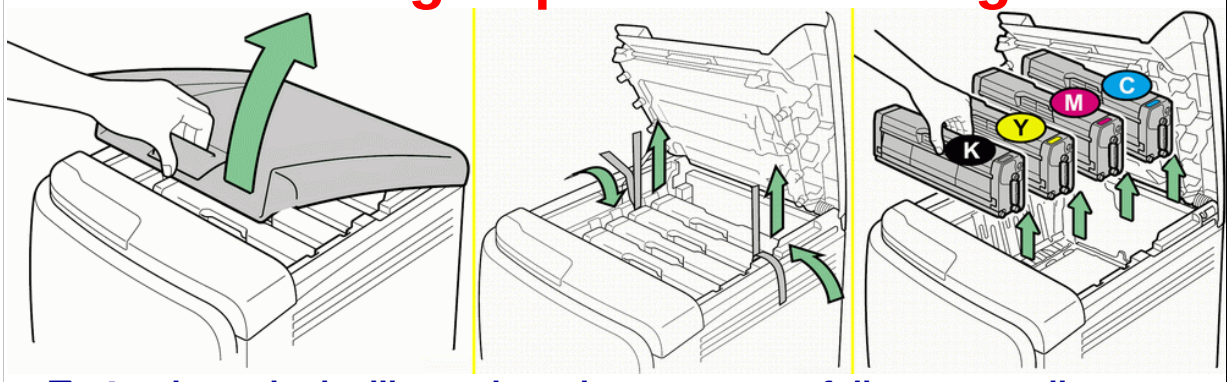
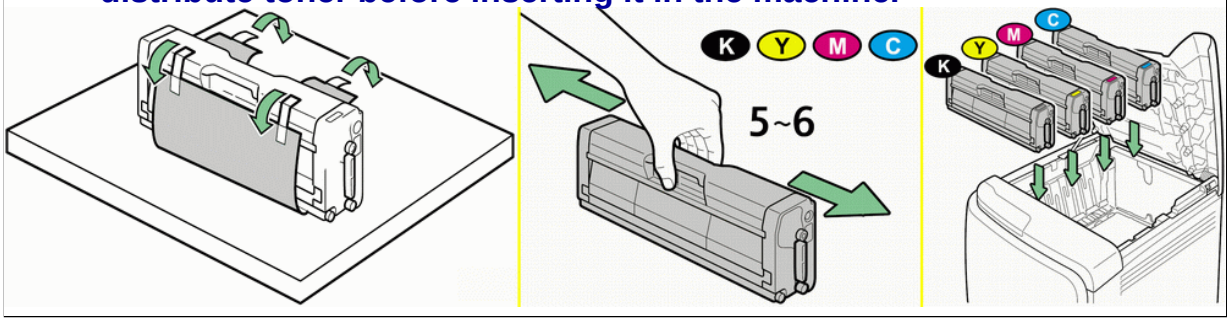
No additional notes.

Removing Tape from Cartridges

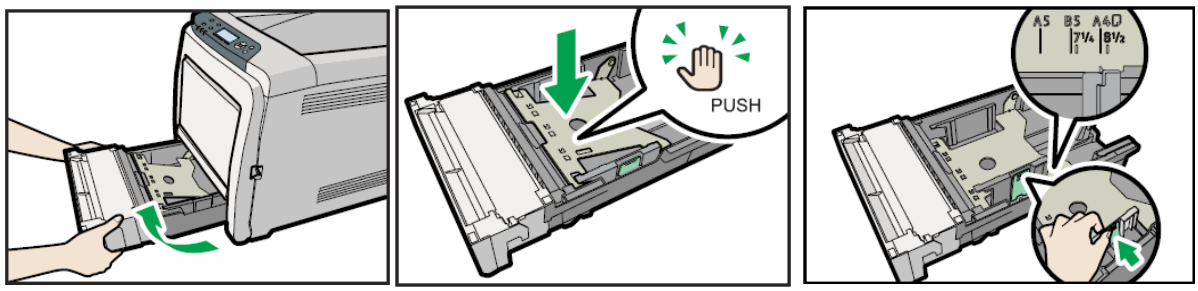


- As shown in the illustrations, be sure to carefully remove all strips of tape from each of the four AIO cartridges.
- Gently shake each AIO cartridge from side-to-side to evenly distribute toner before inserting it in the machine.

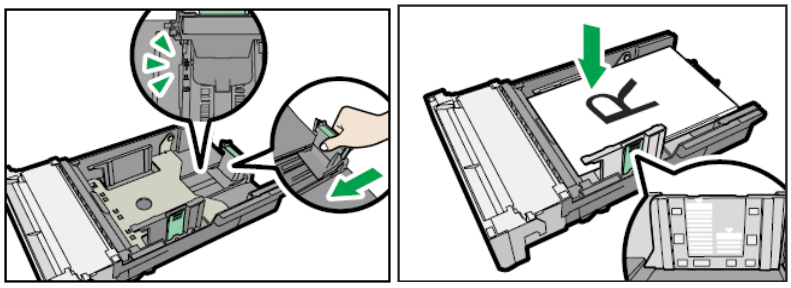


No additional notes.

Setting Paper Guides



- As shown in the illustrations, push the bottom of the paper tray down until it locks flat, then correctly set each of the paper guides and insert paper.



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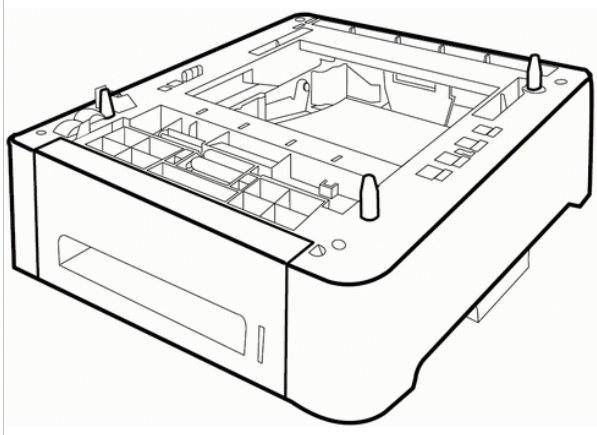
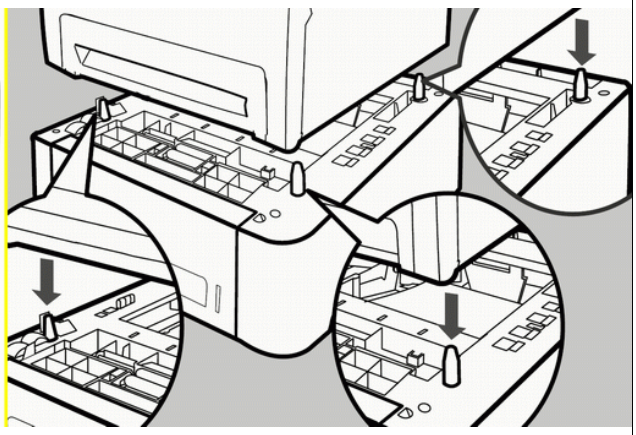
No additional notes.

Optional Paper Tray





- **When installing the optional paper tray, carefully line up the pins (as shown in the above illustration).**

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No additional notes.

Hardware Installation Procedure

- **This is a customer-installed machine.**
- **However, please install the machines, and see what types of errors the customers could make.**
  - Refer to the *Quick Installation Guide*.
  - Detailed installation and setup information is in the *Hardware Guide*.

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No additional notes.

Installing the Options

- **The customer installs the options.**
- **Practice installing the various options.**
  - This product has many controller options because it is a GW controller machine. (See the ***Optional Equipment*** slide later in the course for a full list.)
  - Refer to: *Hardware Guide* → *Installing Options*

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No additional notes.

Setup Options

- Refer to the operator's manuals for details on setting up the printer.

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No additional notes.

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Service Mode

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No additional notes.

Using the SP Mode

- **Entering the SP Mode:**
  - Method 1:
    Turn the machine on while pressing Suspend/Resume and Escape.
  - Method 2:
    Press the ▲▼ keys simultaneously for 5 seconds and press the Enter key.
- **Using the SP Mode:**
  - Scroll through the menus with the ▲▼ keys.
  - Press the Enter key to go to a sub menu or select an item.
  - Escape key takes you to the next higher level.
  - To exit the SP mode select "End" at the top level and press Enter.
- **Practice entering and using the SP mode. (Refer to the FSM for details.)**

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No additional notes.

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Updating the Firmware

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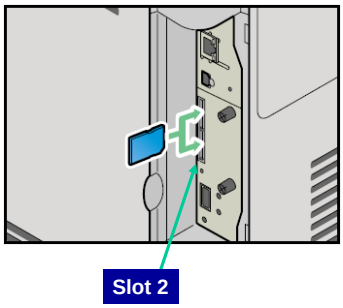
No additional notes.

Downloading New Firmware



- **The firmware SD card plugs into SD card slot 2.**
  - Do not use slot 1 to update the firmware. If slot 2 is occupied, ask the customer to temporarily remove the SD card in slot 2.
- **The FSM has a detailed procedure for updating firmware. Follow it carefully.**
- **When you update the firmware:**
  - It is recommended to update only one module at a time.
  - Verify the update was successful. (Print the Self – Diagnosis Report by SP 5990-005.)

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- Make sure that you read the ‘Before you Begin’ section, which explains how to handle SD cards.

Firmware Update Problems

- **Error handling**
  - An error code shows if an error occurs during the download. Error codes have the letter “E” and a number. If an error occurs, the firmware is not correctly downloaded. At this time examine the error code table and do the necessary steps. Then download the firmware again.
- **Power Failure**
  - If firmware update is interrupted by power failure, the firmware is not correctly downloaded.
  - Machine operation is not guaranteed.
  - Do the procedure again.

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No additional notes

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Maintenance

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No additional notes.

Procedures

- **The following maintenance procedures are done by the user. (Refer to the Hardware Guide for the consumable replacement procedures.)**
  - Replacing the Print Cartridges
    - » There are two types of print cartridges: Short Life & Long Life
  - Replacing the Waste Toner Tank
  - Image Transfer Belt unit
  - Fusing Unit and Image Transfer Roller unit
- **To see the current status of the consumables:**
  - Select “Supplies” on the operation panel.
- **There are no PM procedures for the technician to do.**

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- "Supplies" is shown on the Display Panel when the machine is turned on. Use the right Selection Key to select it.

Meter Click Charge Mode

- **Meter Click Charge mode**

  By SP5930-01 this mode is available.

- **Related SP Settings: SP5930-02 Supply End option**

- **Related Menu settings**

  Menu > Maintenance > General Settings > Replacement Alert > Print Cartridge: Notify sooner / Normal / Notify later

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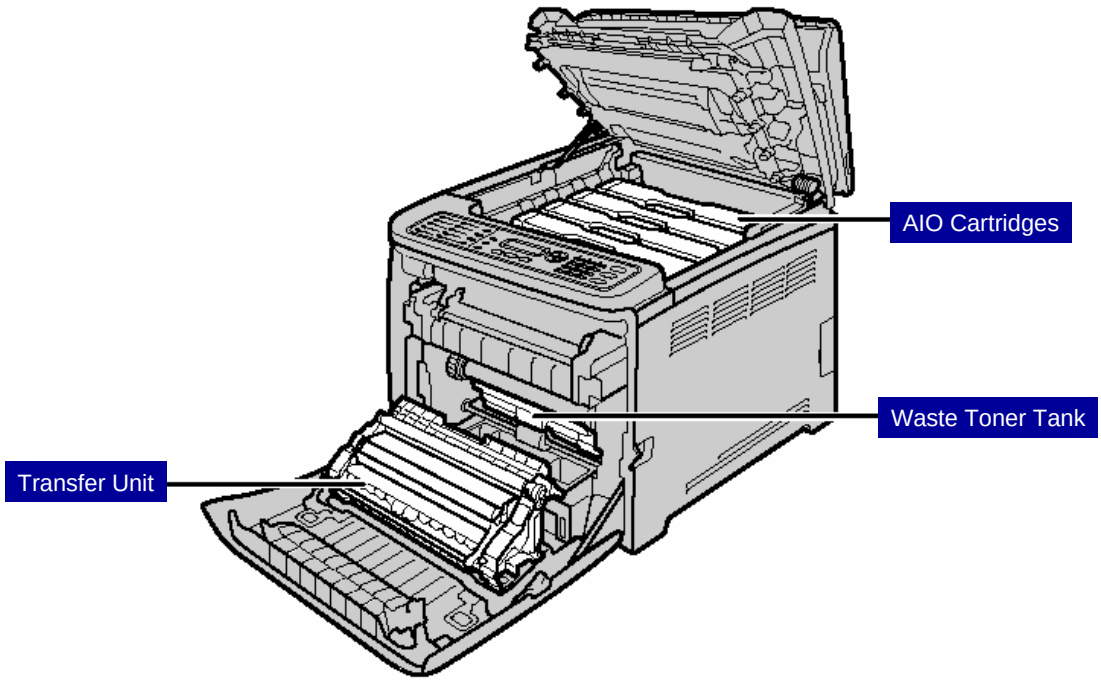
- Supply End Options:
  - Image Transfer Belt Unit
  - Maintenance kit
- Replacement Alert: Print Cartridge:
  - Notify sooner (600 sheets before toner end)
  - Normal (400 sheets before toner end)
  - Notify later (200 sheets before toner end)

Interior of Machine



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- 1. AIO Print Cartridges: Load from the machine rear, in the order of cyan (C), magenta (M), yellow (Y), and black (K). Messages appear on the screen on the operation panel when print cartridges need to be replaced.
- 2. Waste Toner Tank: Collects excess toner during printing. Messages appear on the screen when the waste toner tank needs to be replaced.
- 3. Transfer Unit: Remove this unit when replacing the waste toner tank.

Optional Equipment

- **TK1010 Paper Feed Unit G849**
- **Controller Options**
  - HDD 80G (Type C320)
    (HDD + SD Card containing Data Overwrite Security and Encryption software)
  - IEEE802.11a/b/g (US: Type L/ EU,AA: Type M)
  - PictBridge (Type H)
  - 256 MB Memory (Type G)
  - 512 MB Memory (Type I)
  - VM Card (Type O) (512MB Memory is required)
  - IEEE1284 (Type A)
  - Gigabit Ethernet Board (Type A)
  - NetWare (Type F)

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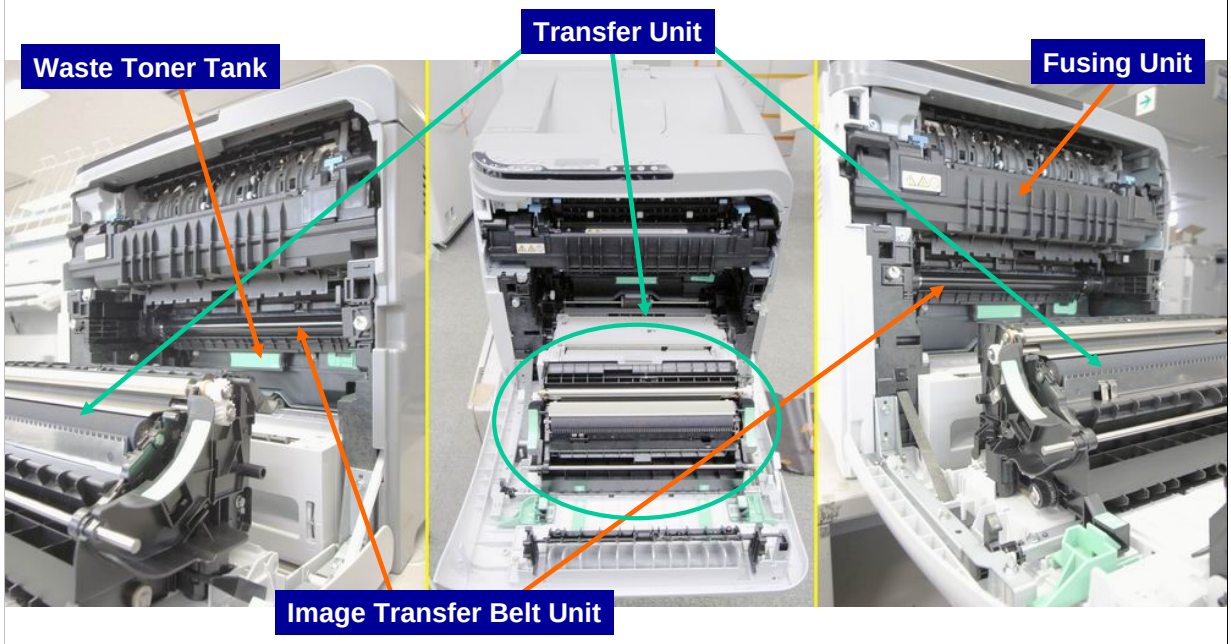
No additional notes.

View of Machine - Front Door Open



- The Transfer Unit, Fusing Unit, Image Transfer Belt Unit, and Waste Toner Tank are all easily removed from the front of the machine - as illustrated in the following slides.

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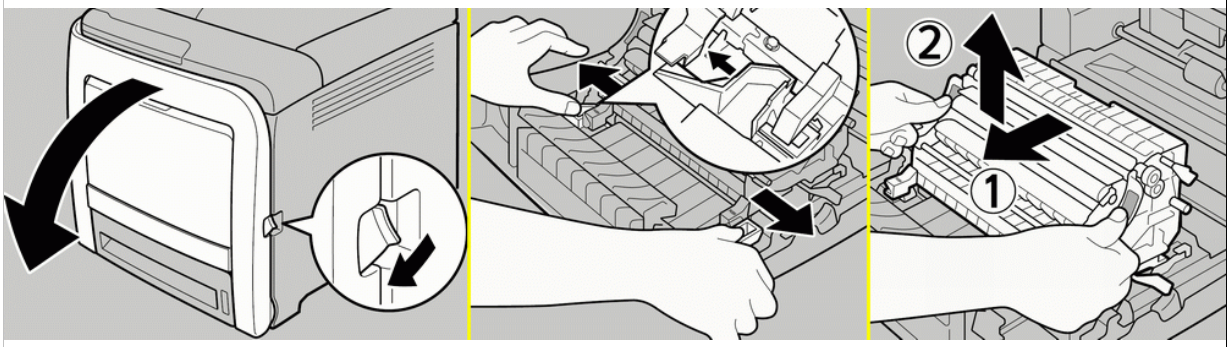
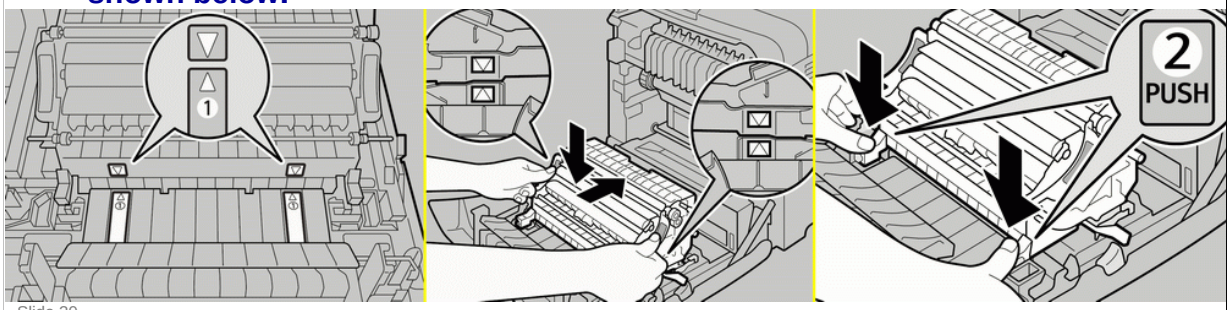
No additional notes.

Removal & Installation of Transfer Unit



- The Transfer Unit is easy to remove and to install - as shown in the above illustrations.
- When reinstalling the Transfer Unit, carefully align with guide marks, as shown below.



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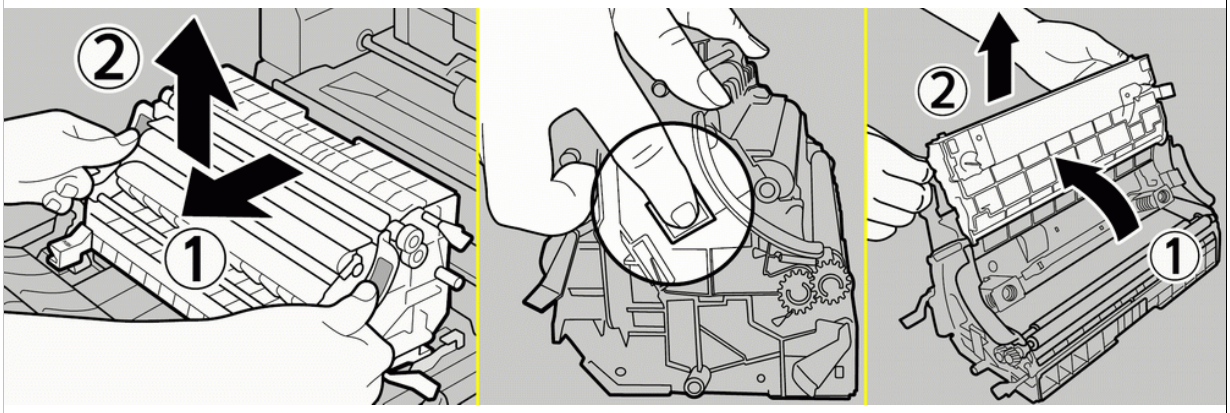
No additional notes.

Removing and Opening the Transfer Unit



- **The Transfer Unit can be opened by pushing buttons on both sides of the unit (as shown above).**

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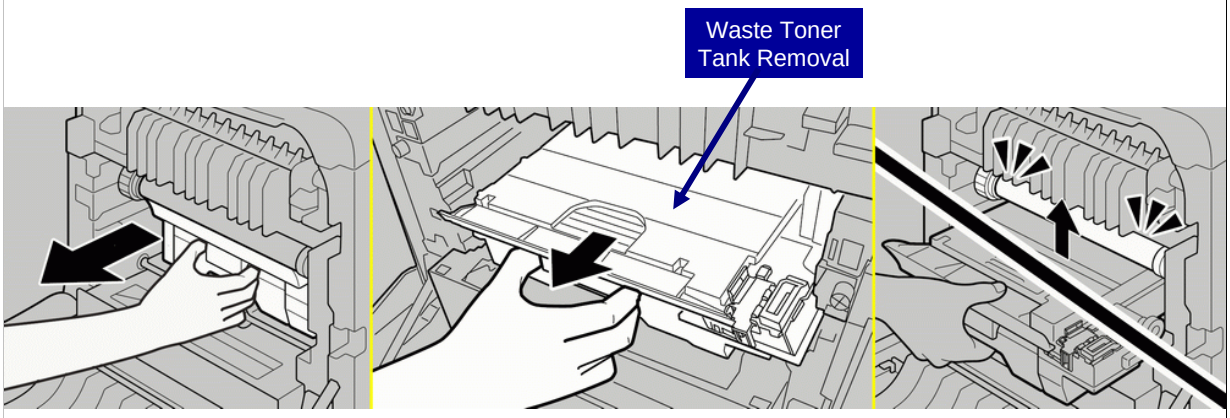
No additional notes.

Waste Toner Tank Removal



- **When removing (and also installing) Waste Toner Tank, be careful not to let it come into contact with Image Transfer Belt, which could damage the belt.**

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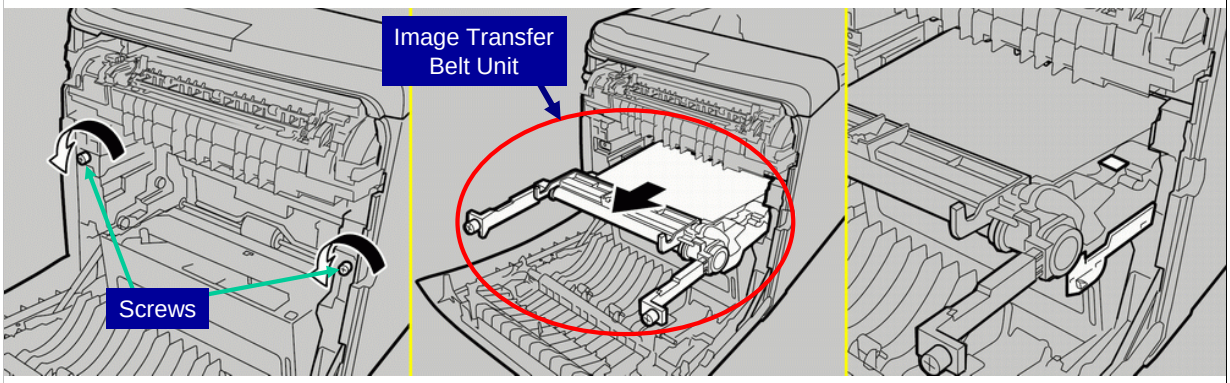
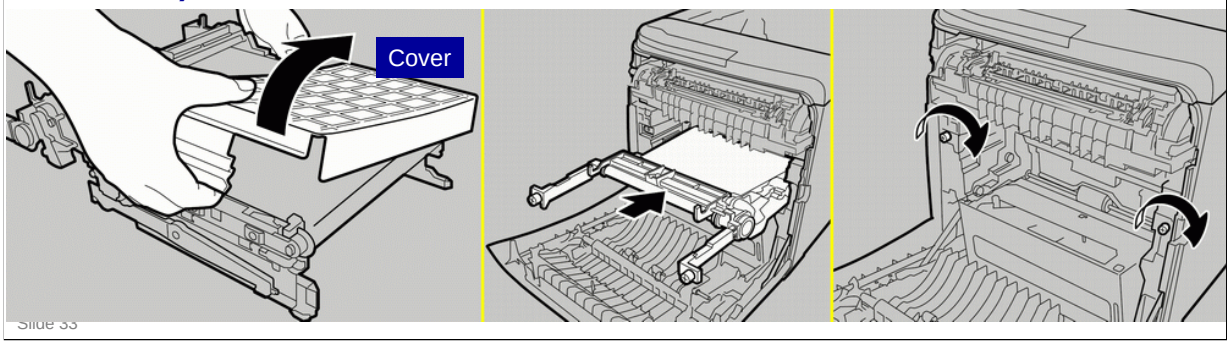
No additional notes.

Removal & Replacement of Image Transfer Belt Unit



- Remove two screws and then pull the Image Transfer Unit straight out.
- First remove the cover of the new unit before reinstalling (as shown below).



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No additional notes.

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Machine Overview

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No additional notes.

Main Specifications 1/3

- **Technology**
  - Laser beam scanning & electro-photographic printing
  - Mono-component toner development
  - Four-drum tandem method
- **Warm-up time: 20 seconds or less**
- **First print speed: 13.5 seconds or less (600 x 600 dpi)**
- **Recovery from energy saver mode**
  - Panel off: 10 seconds
  - Sleep mode: 15 seconds
- **Paper Input Capacity:**
  - 500 sheets (standard tray)
  - 100 sheets (bypass tray)
  - 500 sheets (optional paper tray unit)
- **Paper Output Capacity: 150 sheets**

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No additional notes.

Main Specifications 2/3

- **Paper Weight**
  - Standard tray: 60 – 163 g/m^2, 16 lb – 43 lb
  - Bypass tray : 60 – 220 g/m^2, 16 lb – 59 lb
  - Optional paper tray unit: 60 – 105 g/m^2, 16 lb – 28 lb
  - Duplex : 60 – 90 g/m^2, 16 lb – 24 lb
- **Resolution:**
  - 600 x 600 dpi
  - 600 x 600 2-bit [also called 1200 x 600 dpi]
  - 1200 x 1200 dpi
- **Memory: 384 MB standard, Upgradeable to 512 MB or 768 MB**
- **Printing speed:**
  - 600 dpi – A4 25 ppm, LT 26 ppm
  - 1200 dpi – A4 12.5 ppm, LT 13 ppm
- **Dimensions (WxDxH): 400 x 480 x 387 mm (15.8 x 18.9 x 15.2 inches)**

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- Duplex printing cannot be done for thick paper (more than 90 g/m^2, 24 lb Bond).
- Printing on OHP transparencies is not possible.
- Memory Upgrade:
  - First the 128 MB DIM must be removed from the main controller board.
  - Then either the 256 MB (Type G) or 512 MB (Type I) optional DIM can be installed. This will bring total memory to either 512 MB or 768 MB.

Main Specifications 3/3

- **Weight: 29.0 kg (64 lb) or less**
  - (Including consumables)
- **Interface**
  - Ethernet 10/100 T
  - USB 2.0
  - PictBridge
- **Power Consumption**
  - Maximum: 1300 W or less
  - Energy Saver (sleep mode): 5.5 W or less
- **Refer to the FSM for more detailed specifications.**

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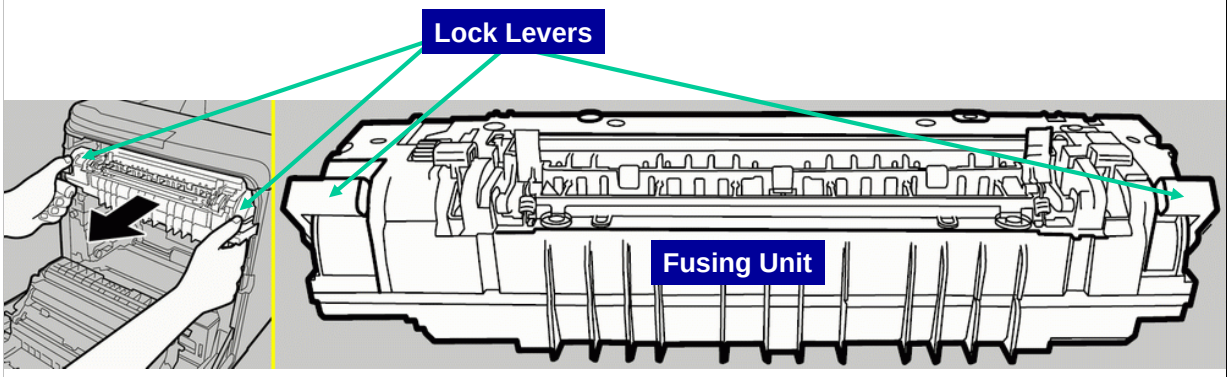
No additional notes.

Fusing Unit Removal



- Removal of the Fusing Unit is easy and straightforward.
- Pull the Lock Levers down with thumbs (as shown in illustration), and then pull straight back.
- Caution: Allow fusing unit to cool for several minutes before removing. Also hold the unit firmly to handle the weight (the Fusing Unit is heavy).

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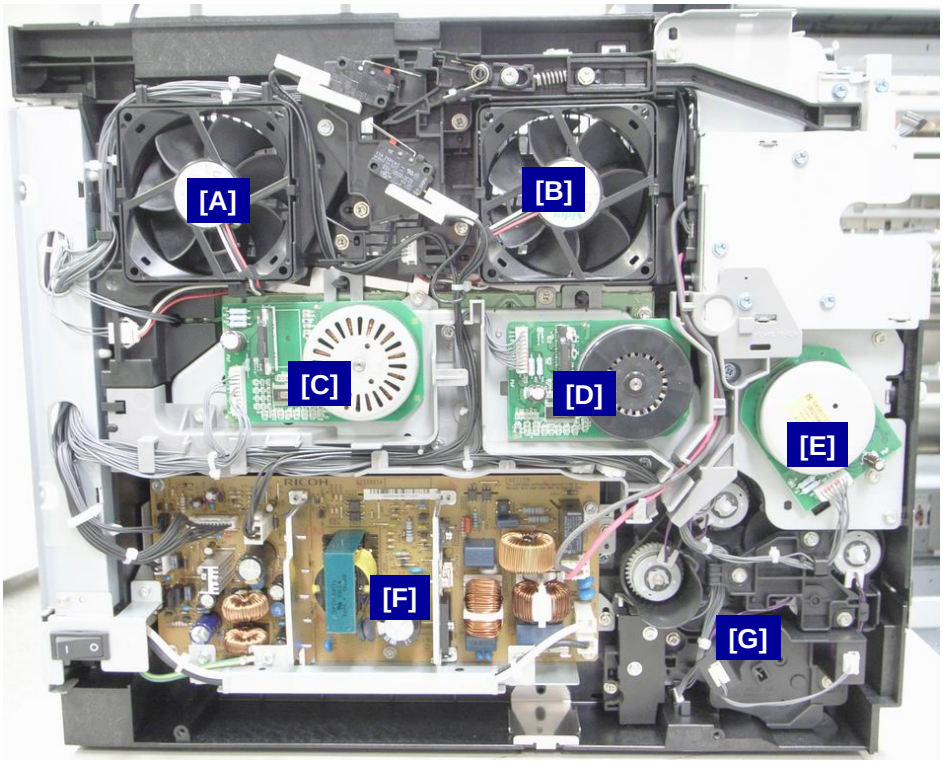
No additional notes.

Left Side of Machine (Cover Off)



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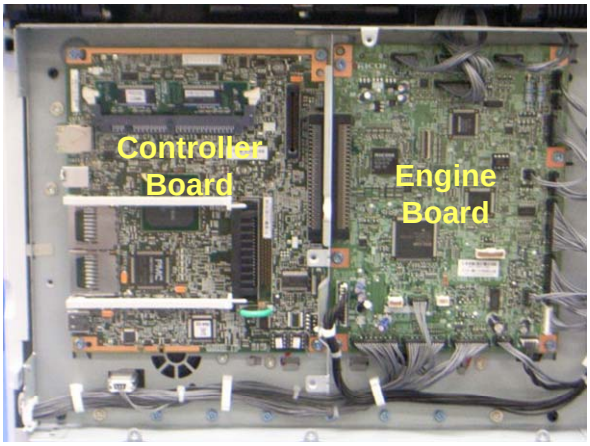
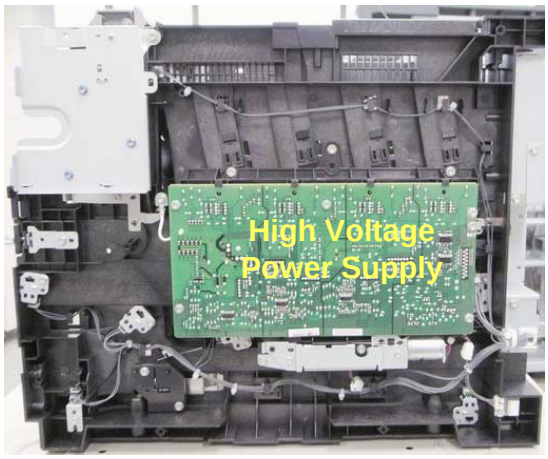
- [A] : Laser unit fan
  [B] : Fusing fan
  [C] : Color AIO motor
  [D] : Black AIO motor
  [E] : Transport fusing duplex motor
  [F] : Power supply board
  [G] : Clutch assembly

Rear & Right Sides (Covers Off)



Rear



Right

- View of the inside of the machine (rear & right sides)
- For view of left side of machine with the cover off, see previous slide.

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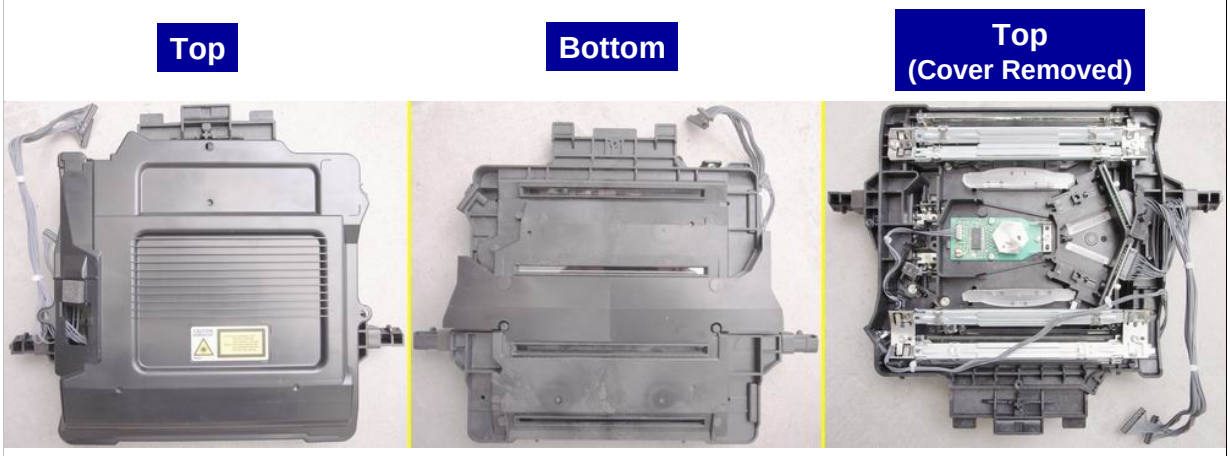
No additional notes.

Laser Unit



- Laser Unit - upper view, bottom view, and upper view with cover removed.

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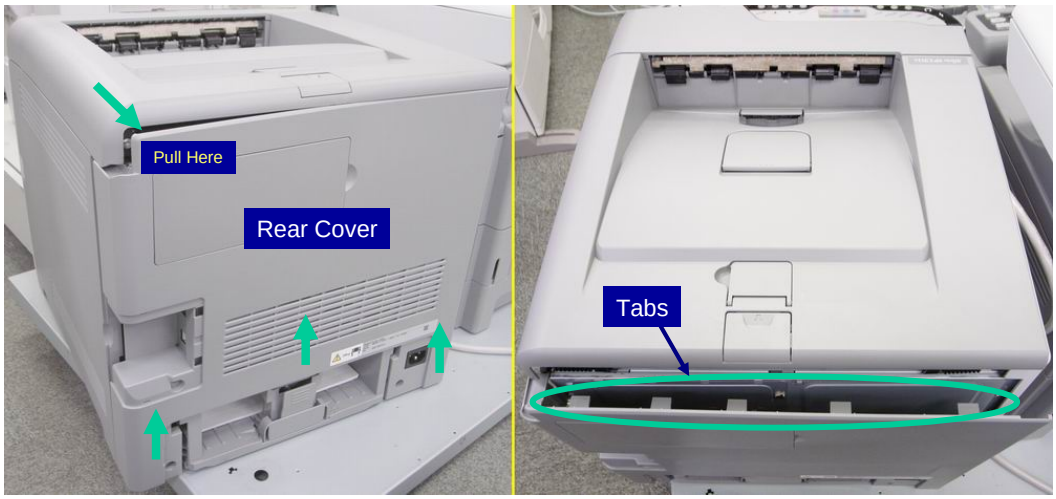
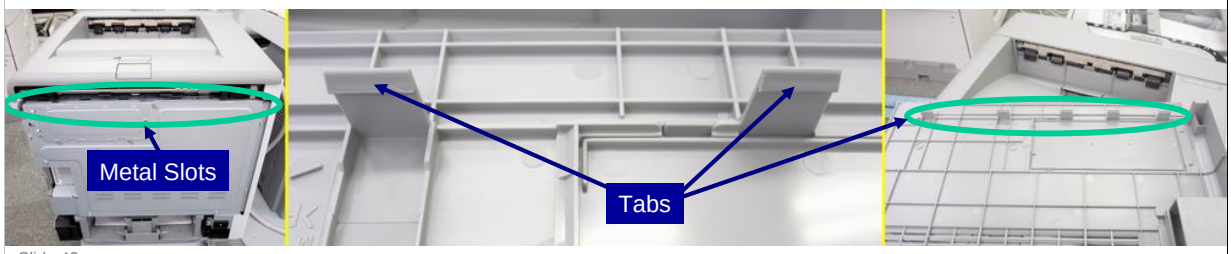
No additional notes.

Removal of Rear Cover



- **Push up on lower edge of cover, and - starting with the left upper cover - carefully pull the tabs out of the metal slots.**



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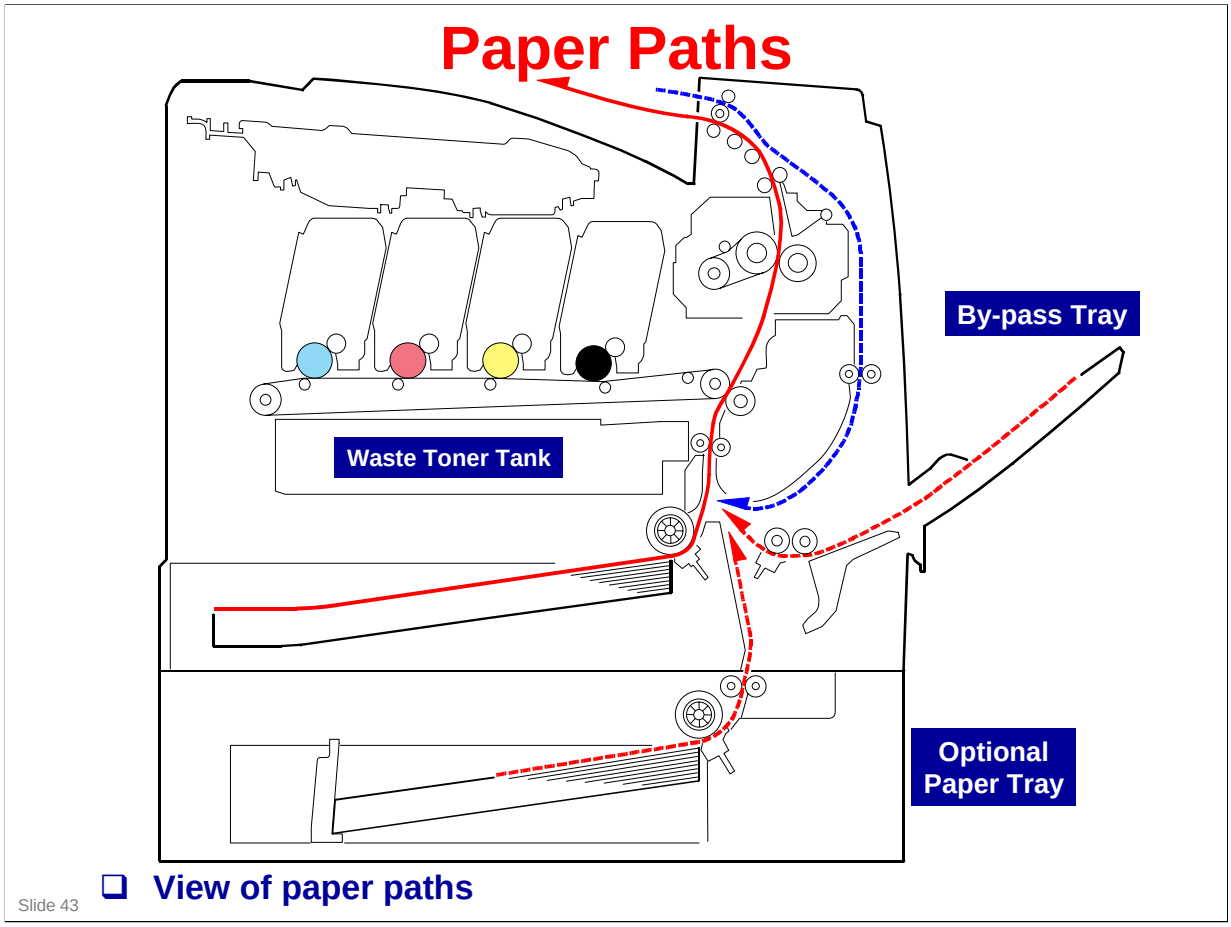
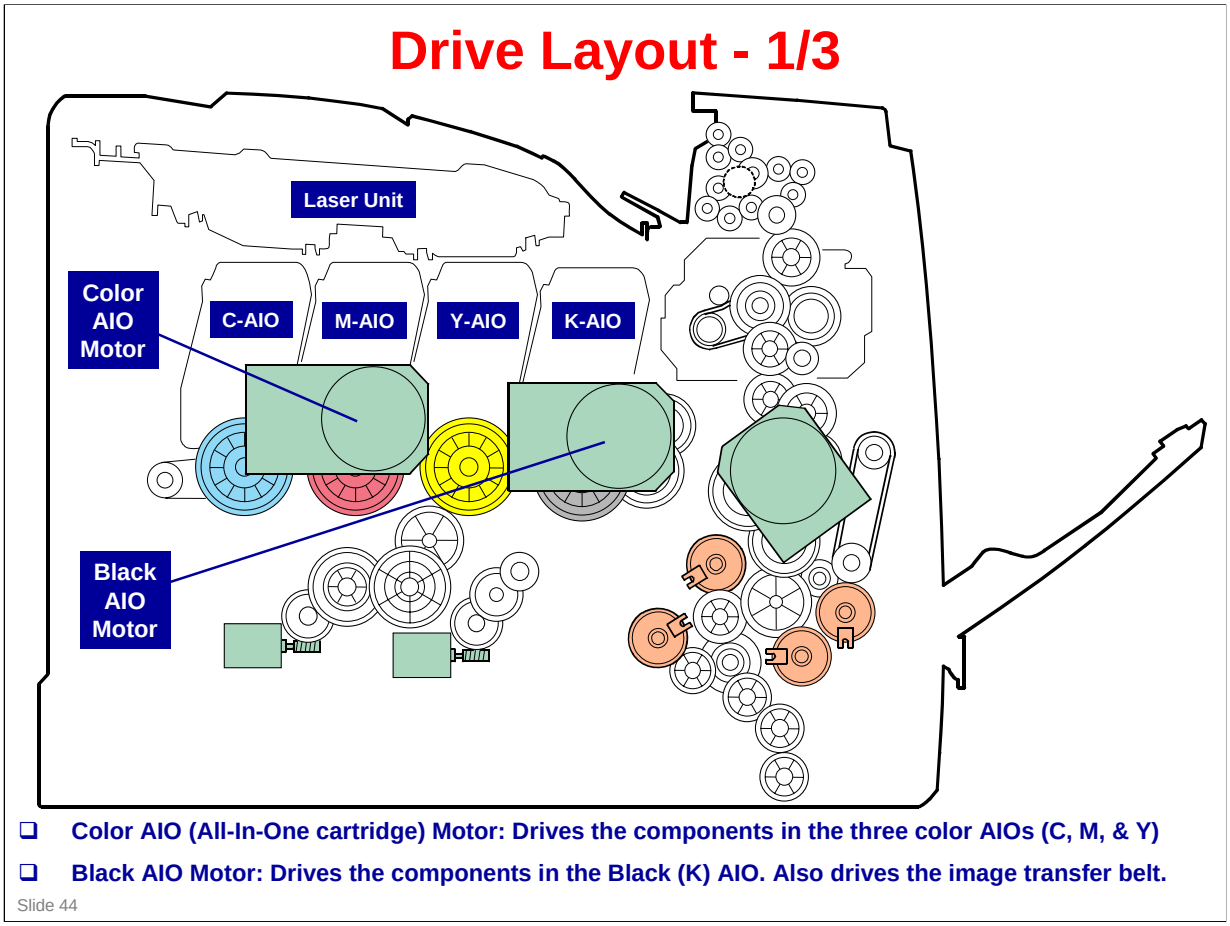
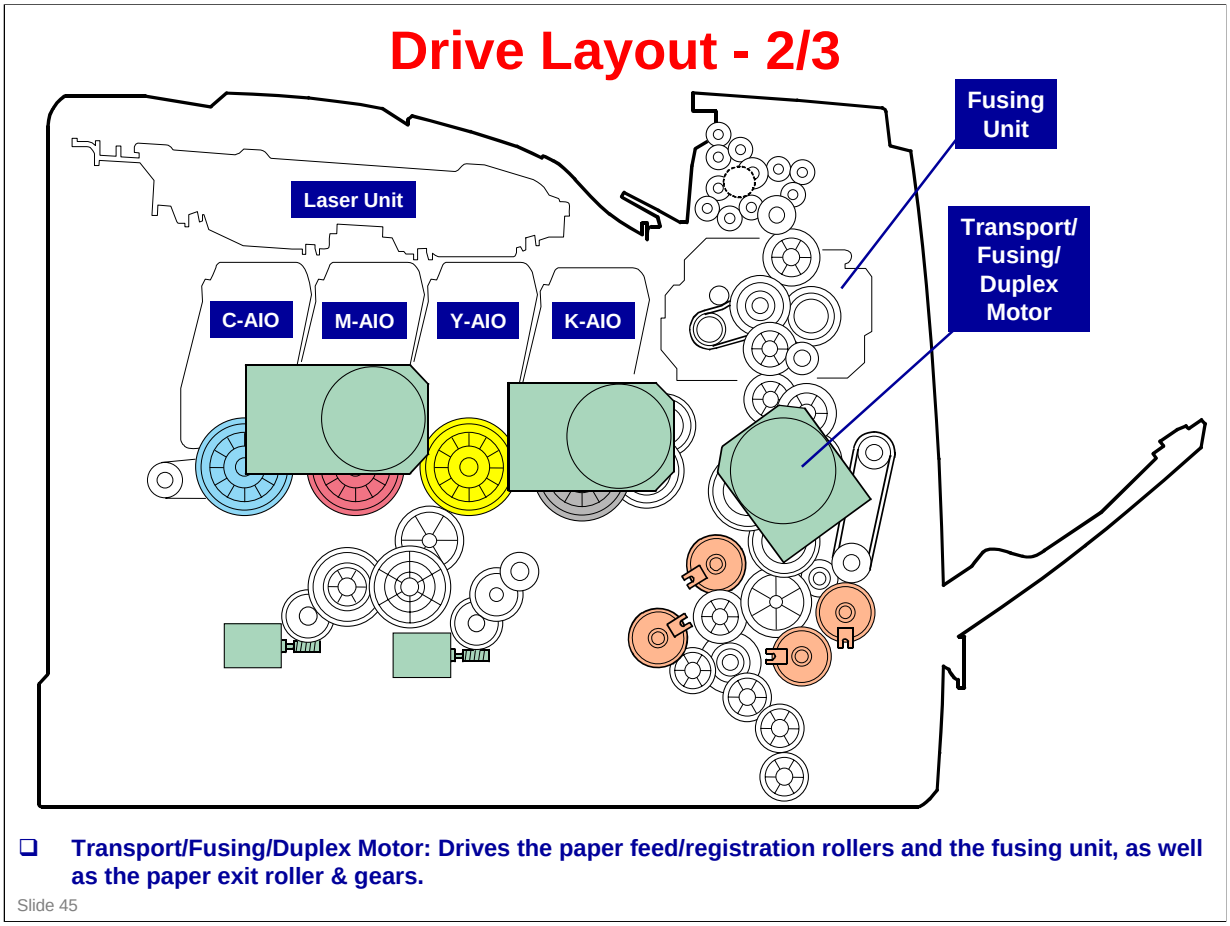
Note that the top cover must be closed in order to remove the rear cover.



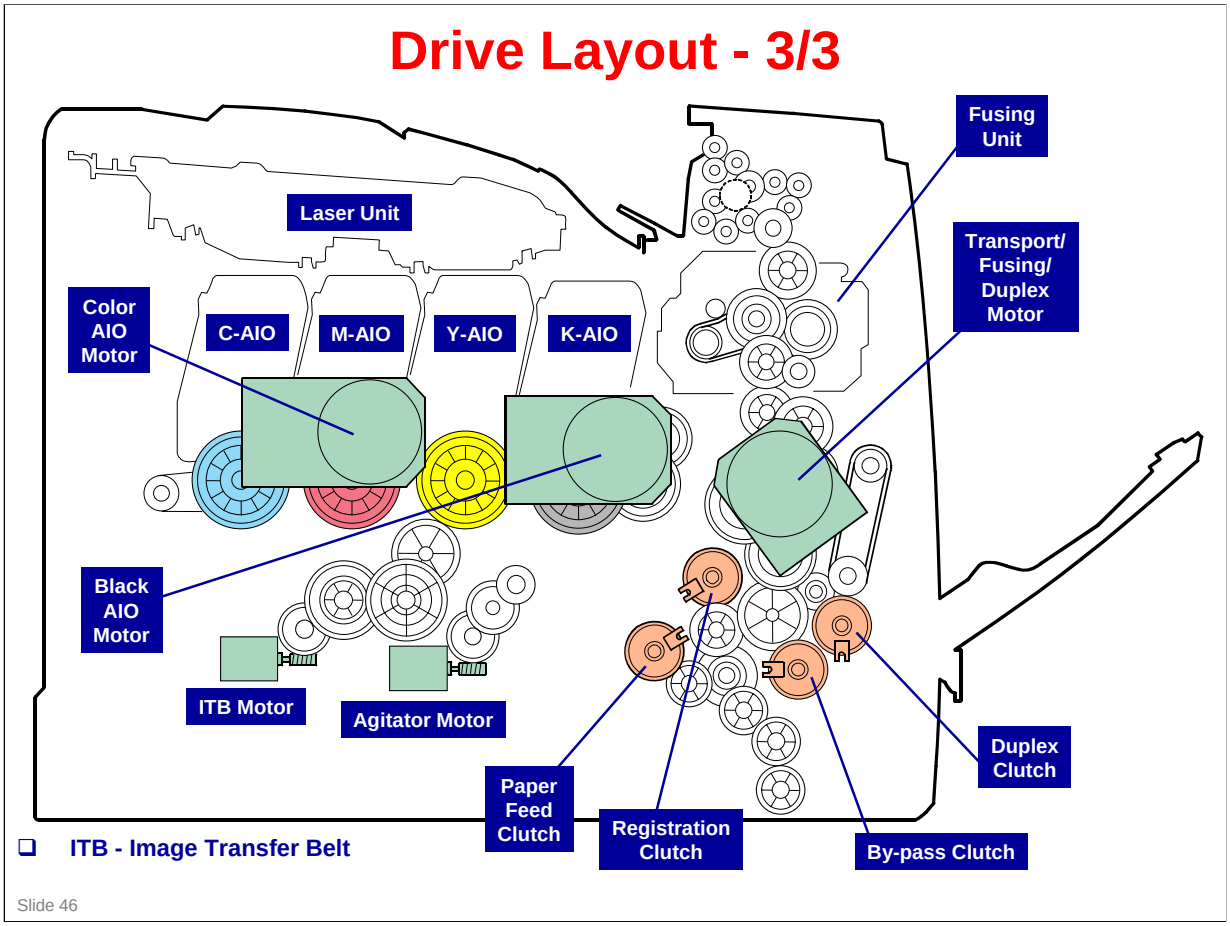
No additional notes.



❑ The diagram shows the most important motors. For others, see the field service manual.

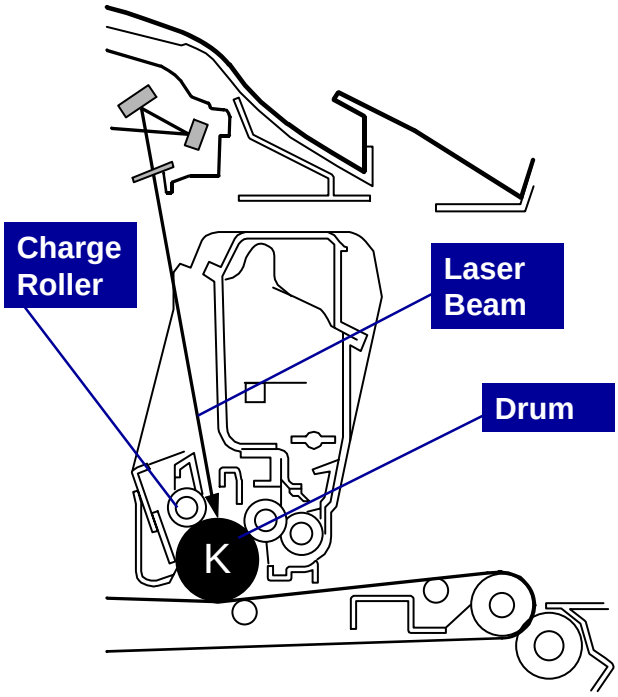


❑ The diagram shows the most important motors. For others, see the field service manual.



No additional notes.

Printing Process - 1



- The charge roller gives the drum a negative charge.
- The laser beam writes the latent image on the drum.

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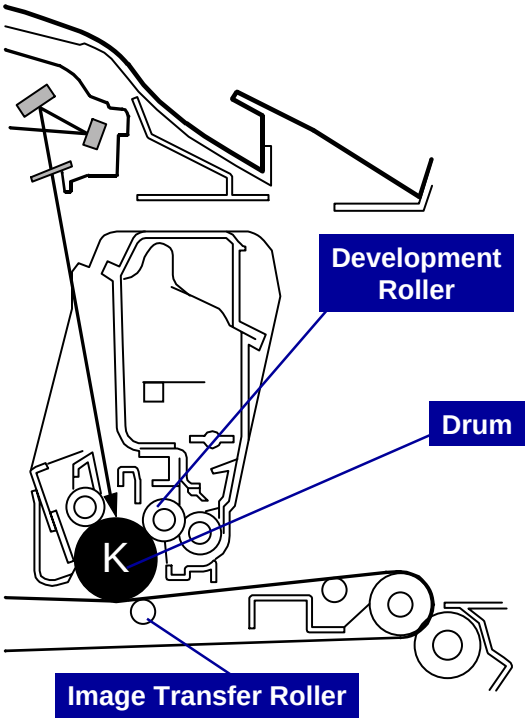
No additional notes.

Printing Process - 2

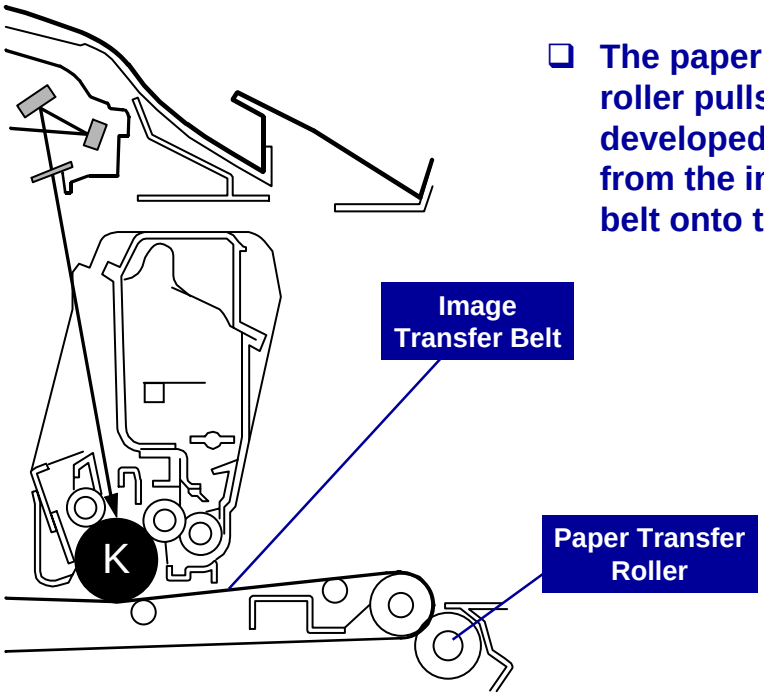


- The development roller applies toner to the latent image on the drum.
- The image transfer roller pulls the developed toner image onto the image transfer belt.

Slide 48

No additional notes.

Printing Process - 3

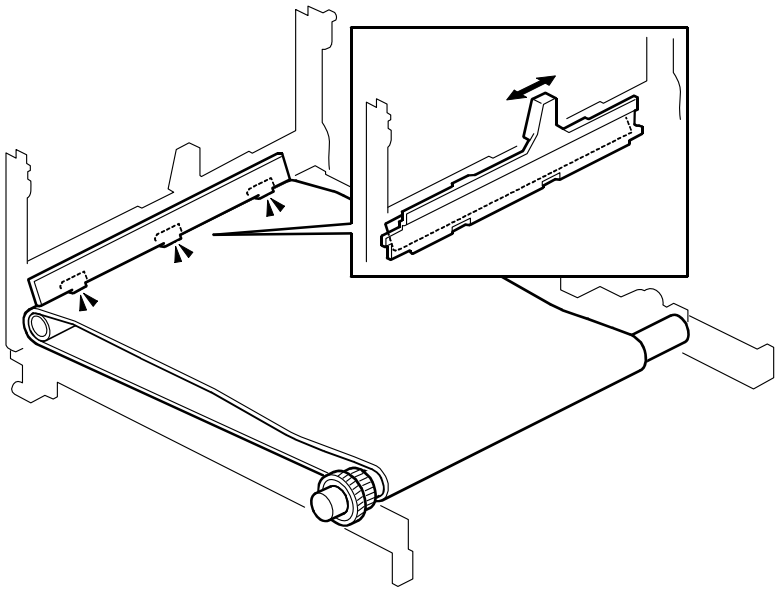


- The paper transfer roller pulls the developed toner image from the image transfer belt onto the paper.

Slide 49

No additional notes.

TM Sensors



- **The central TM (Toner Mark) sensor is used for process control.**
- **The other two TM sensors are used for MUSIC and other internal adjustments.**

Slide 50

- The TM sensor board contains three TM sensors (one at the left, one at the center, and one at the right).
- The center TM sensor detects the density of the sensor patterns on the transfer belt. The TM sensor output is used for process control and for automatic line-position adjustment, skew, and color registration adjustments for the latent image.
- MUSIC: This is the internal process used by the machine to automatically correct for color registration errors (to make sure that the colors are deposited in the exact positions on the transfer belt).

Process Control Summary

- **What is done?**
  - The machine calibrates the TM sensors
  - The machine makes a 9-grade pattern on the belt, and the central TM sensor scans these patterns.
  - The machine can then calculate the correct development bias and laser diode power.
  - MUSIC: The machine then checks for color registration errors. To do this it makes lines at the left, center, and right of the transfer belt and scans these lines with the TM sensors.

Slide 51

No additional notes.

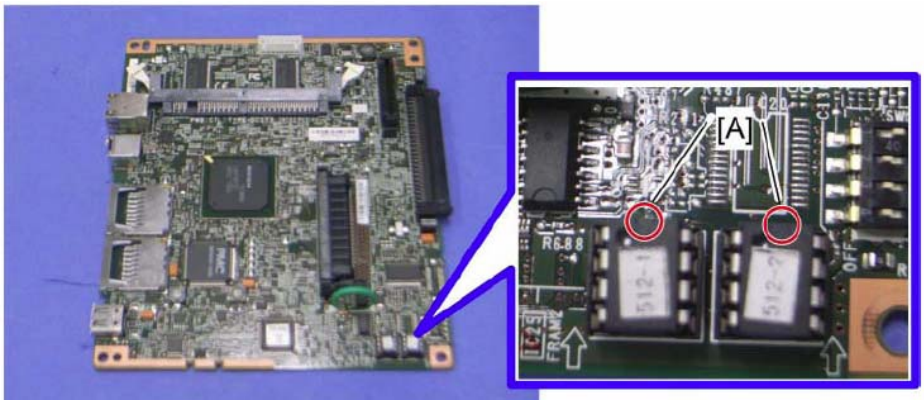
Boards

- The engine board (also referred to as the "EGB") controls the engine.
- Controller: Controls the interface with the operation panel, and controls applications
- ID Chip Board: Relays data about the AIOs to/from the engine board.
- PSU: Supplies DC power for the EGB, fusing unit and interlock switches.
- High Voltage Power Supply Board: supplies the charge to the image transfer roller and high voltage for the charge roller, transfer roller and the development roller.

Slide 52

No additional notes.

When Replacing the Controller Board

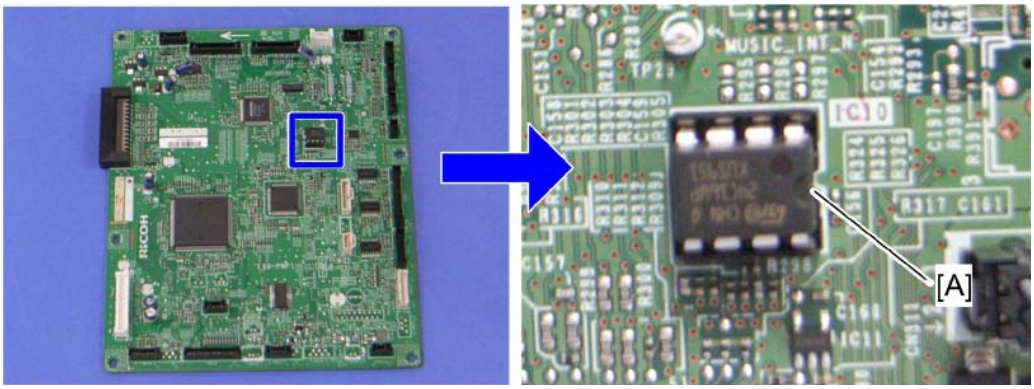


- When replacing the controller board, remove the two NVRAM chips from the old board.
- Install the NVRAM chips on the new controller board with the mark [A] pointing to the upward.

Slide 53

No additional notes.

When Replacing the EGB



- When replacing the controller board, remove the NVRAM chip from the old board.
- Install the NVRAM chip on the new EGB with the mark [A] pointing to the right.

Slide 54

No additional notes.

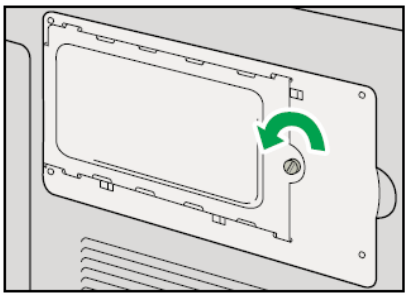
Removals - Covers

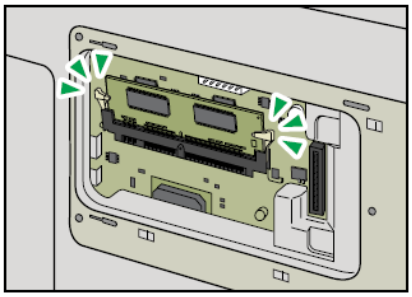
- **Practice removing the following covers/units. Follow the procedures in the FSM.**
  Replacement and Adjustment → Exterior Covers
  - Rear Cover
  - Operation Panel
  - Right Cover
  - Left Cover
  - Front Cover Unit
- **Practice removing the Laser Optics Housing Unit.**

Slide 55

No additional notes.

Memory Slot





- **The machine has one memory expansion slot, accessed from the rear of the machine, as shown above.**

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- Refer to "*Installing the Memory Expansion Unit*" in the *Hardware Guide* for detailed instructions.

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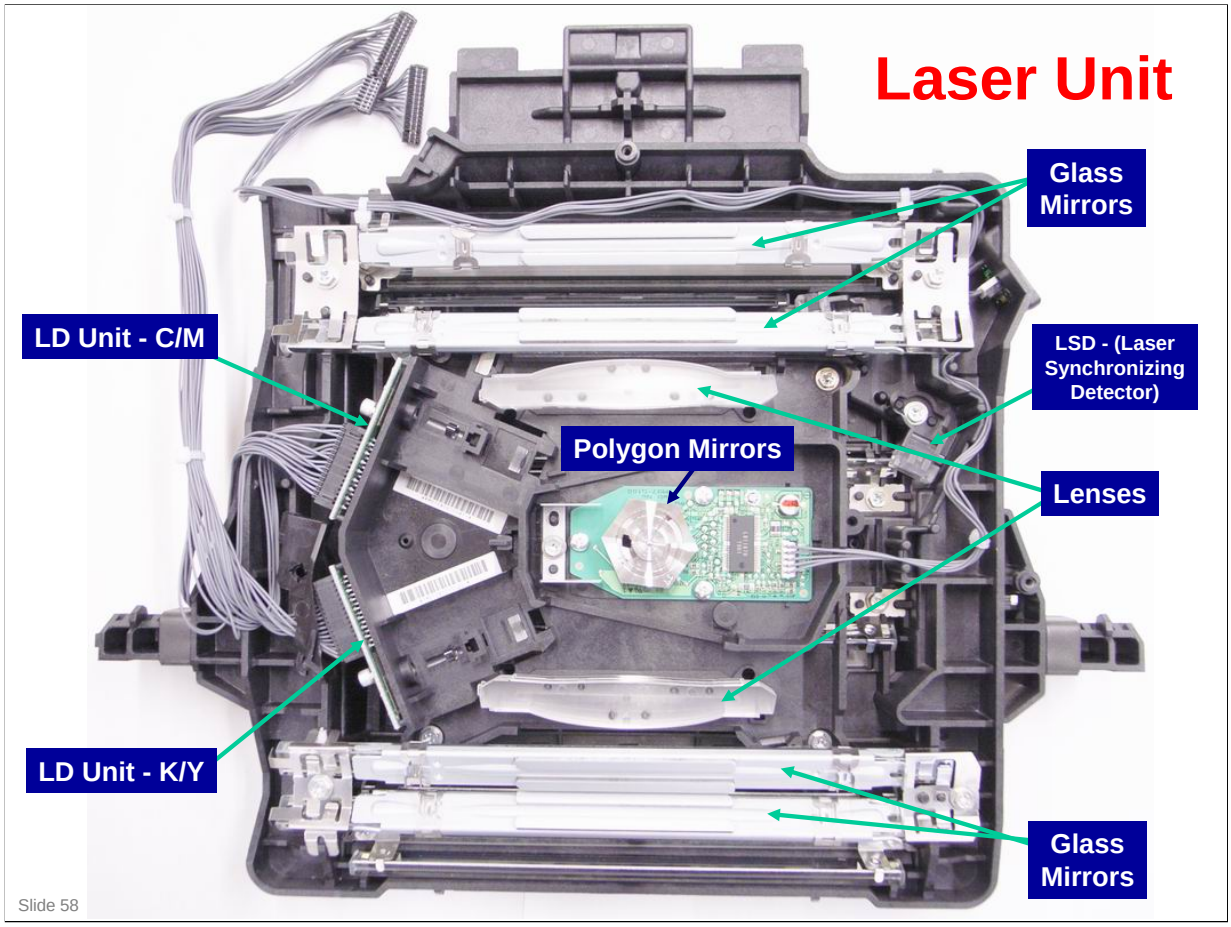
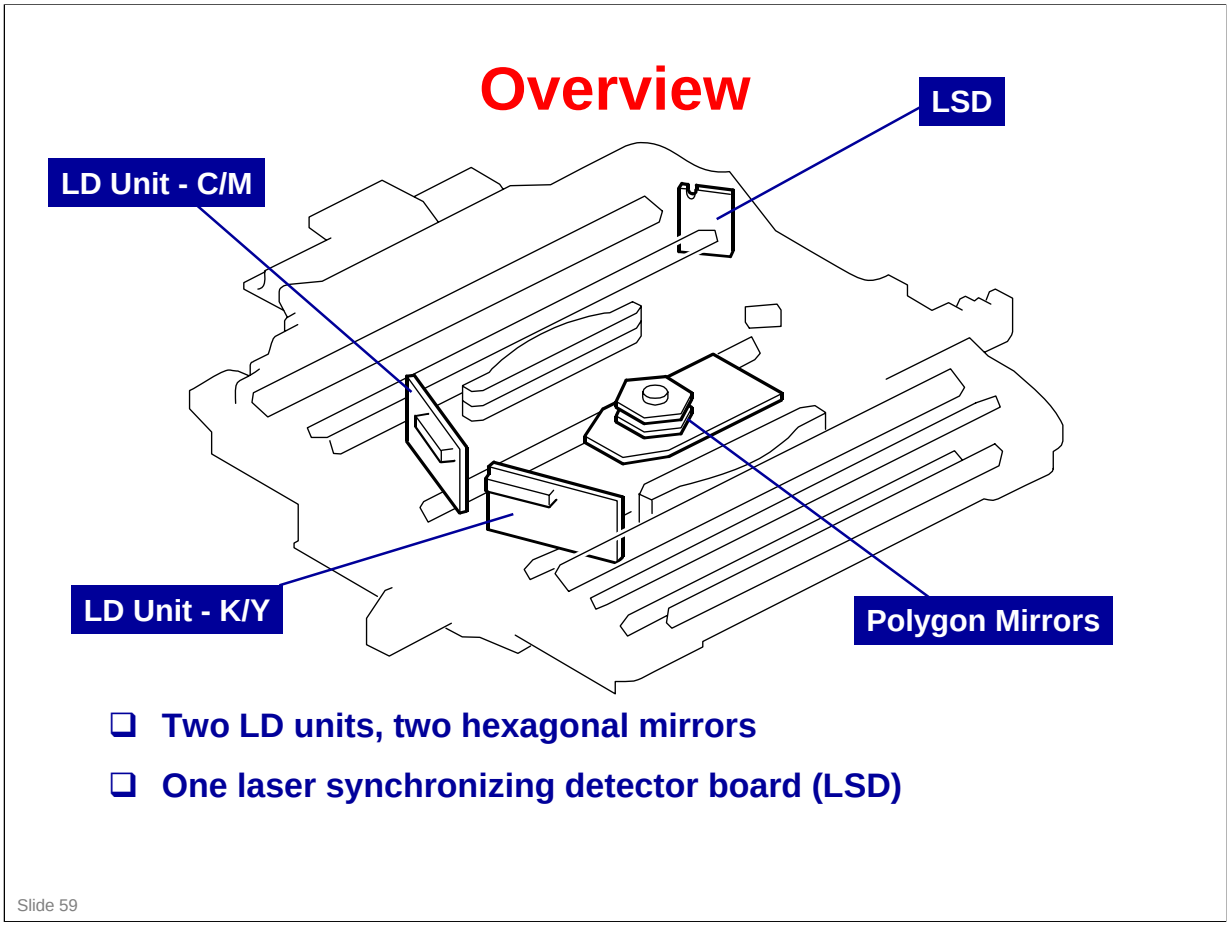
Laser Exposure

Slide 57

No additional notes.

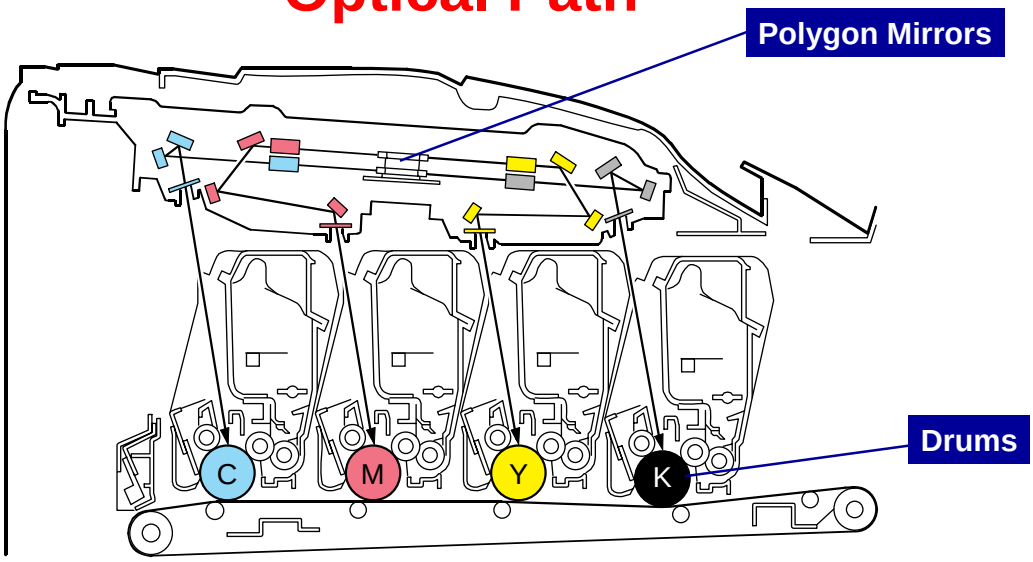


❑ The slide shows the major components of the laser unit.



- Laser exposure for magenta and cyan starts from the left side of the drum, but for yellow and black it starts from the right side of the drum.
- This is because the components for magenta and cyan are on the other side of the polygon mirror from the components for yellow and black.

Optical Path

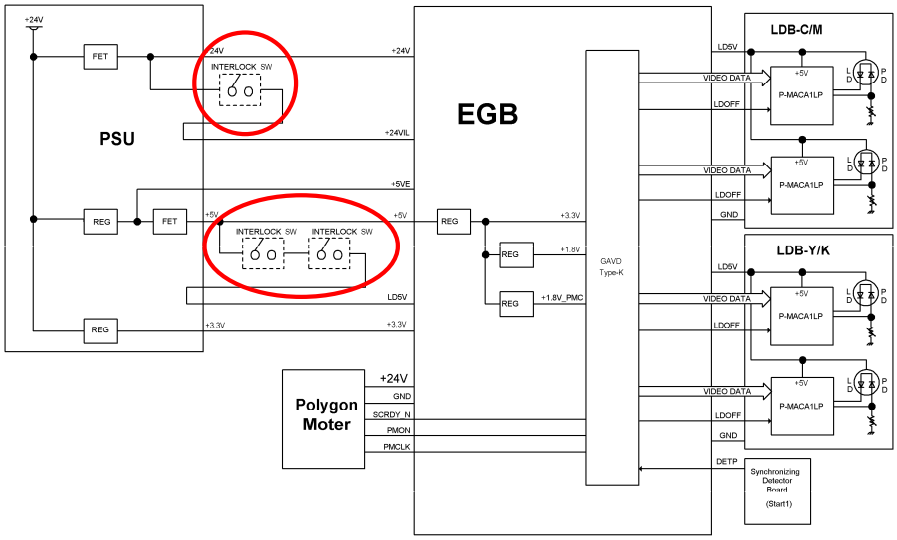


- The laser beams for magenta and yellow are sent to the upper part of the polygon mirror.
- The laser beams for cyan and black are sent to the lower part of the polygon mirror.

Slide 60

No additional notes.

Safety Switches



g165d505

- **A safety switch disconnects power to the laser diodes when the front cover or the top cover is opened.**

Slide 61

No additional notes.

General Caution

- **Turn off the main power switch and unplug the printer before you start to work on the laser unit. Laser beams can cause serious eye injury.**

Slide 62

No additional notes.

Laser Optics Housing Unit

g165r519

- **Always use two hands when carrying the laser optics housing unit, exercising care not to drop it.**

Slide 63

No additional notes.

After Replacing Laser Optics Housing Unit

- Execute “LPos.Adj:Rough" with SP2-120-001.
- Then execute "LPos.Adj:Fine" with SP2-120-002.
- Adjust the registration settings for each tray and for the front and rear sides of the paper with SP1-001 and SP1-002 if necessary.

Slide 64

No additional notes.

Replacement

- **Do the procedures in these sections of the service manual.**
  - Replacement and Adjustment → Laser Optics
- **Follow all notes and cautions in the manual.**

Slide 65

No additional notes.

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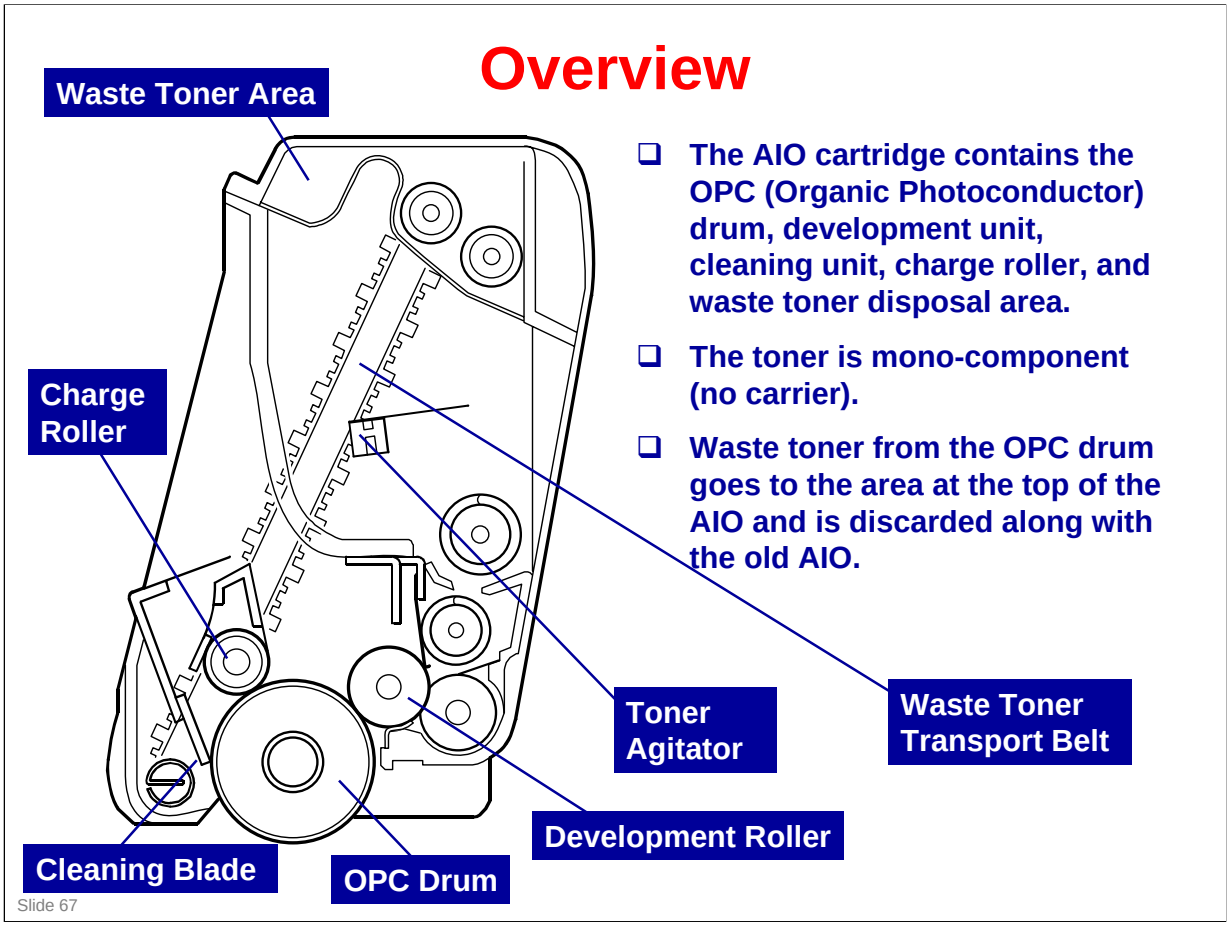
Service Training

AIO Cartridge

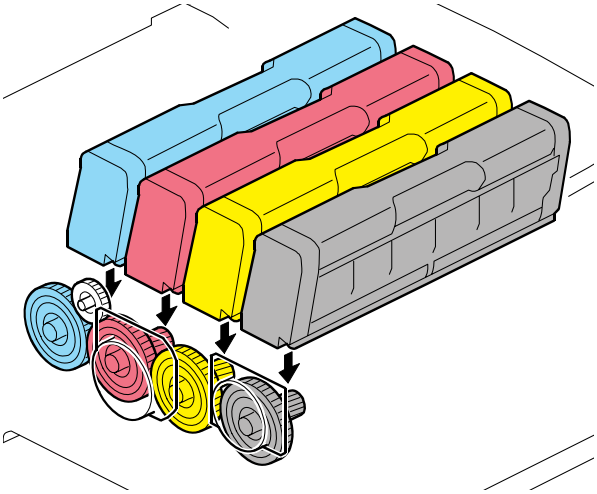
Slide 66

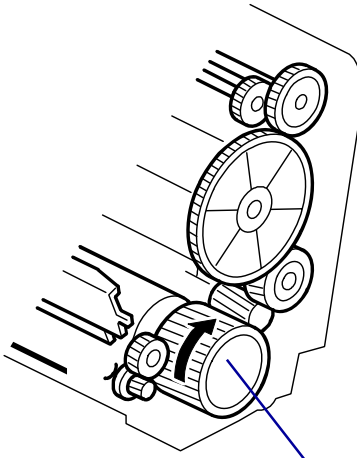
No additional notes.



- The term AIO means 'All-in-One'. All image creation components are in one easily-replaceable unit.

Drive



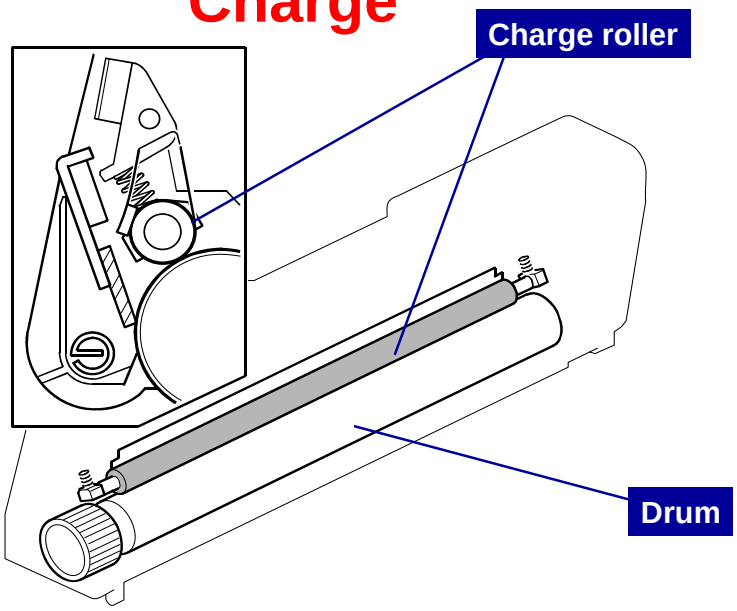


- The black AIO is driven by the black AIO motor.
- The three color AIOs are driven by the color AIO motor.
- A gear transmits drive from the motor to the other gears and rollers in the AIO.
- No adjustment is needed after replacing the motors.

Slide 68

No additional notes.

Charge

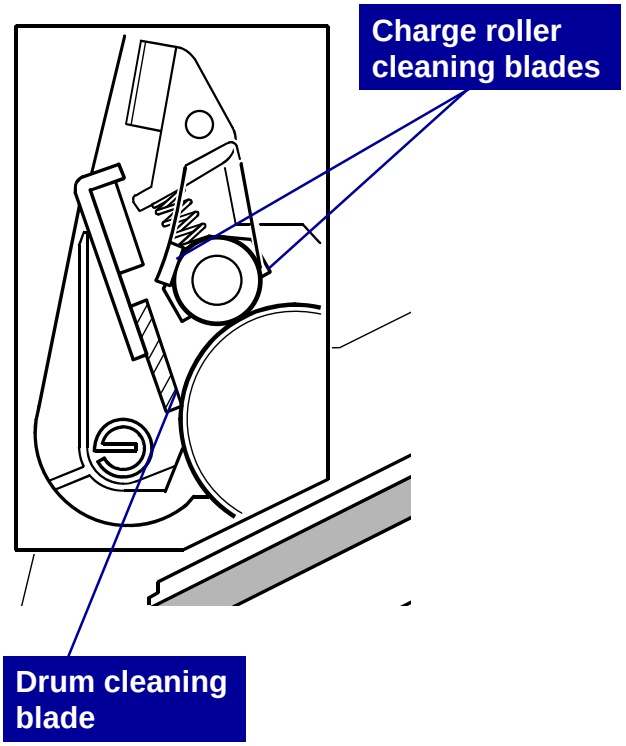


- The charge roller gives the drum a negative charge.

Slide 69

No additional notes.

Cleaning



- The drum and the charge roller both have cleaning blades.
- Waste toner from cleaning goes to the toner collection coil.
- The toner collection coil moves the toner to the waste toner transport belt.

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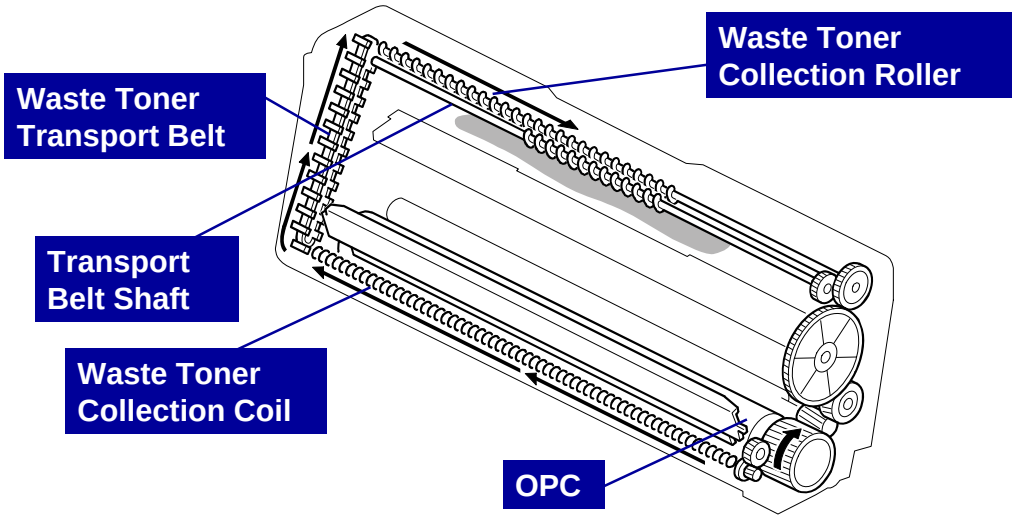
- We will see the toner transport belt on the next slide.

Waste Toner Collection - 1



- The waste toner collection coil moves waste toner from the OPC to the right side of the AIO.
- Then, the waste toner transport belt lifts the waste toner up to the waste toner tank (at the top of the AIO).
- The collected waste toner is moved to the left side of the AIO by the waste toner collection roller and transfer belt roller.

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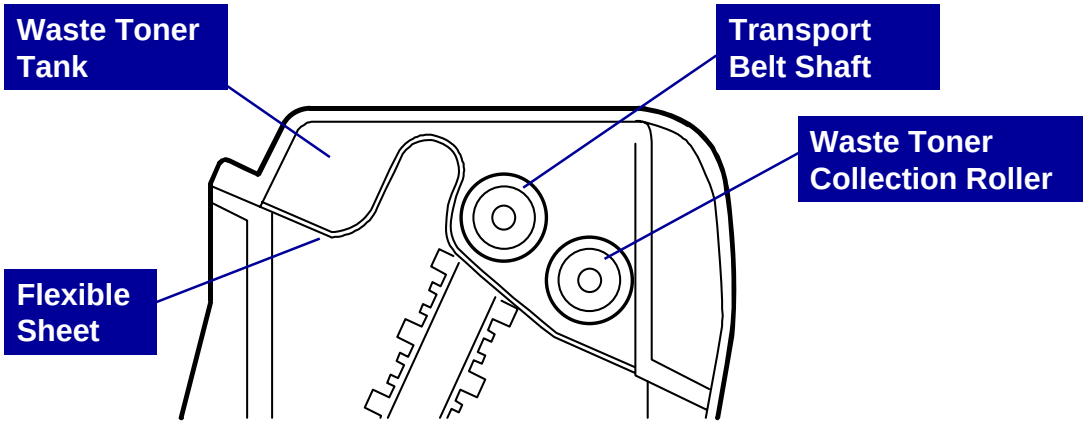
- See the next slide for more about the waste toner tank.
- There is another toner collection mechanism for the image transfer unit, and a separate collection tank. This is explained in another section.

Waste Toner Collection - 2

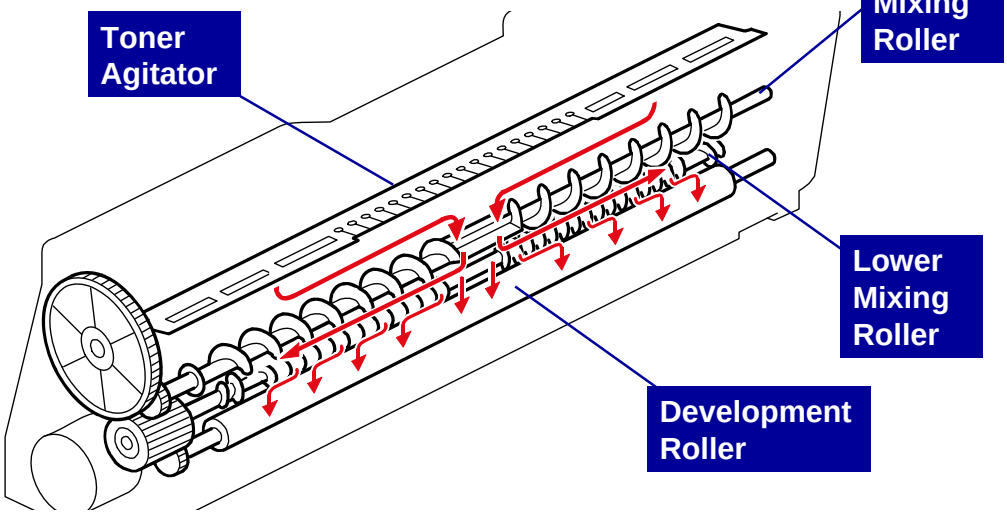


- A flexible sheet separates the unused toner area from the waste toner area.
- The waste toner area becomes larger as toner is consumed.
- This toner is not recycled.

Slide 72

No additional notes.

Toner Mixing



- **The toner agitator mixes the toner so that it is transported evenly to the mixing rollers.**
- **The upper mixing roller moves toner to the center, then the lower mixing roller moves toner to the right and left sides.**
- **Finally, the toner supply roller supplies toner to the development roller.**

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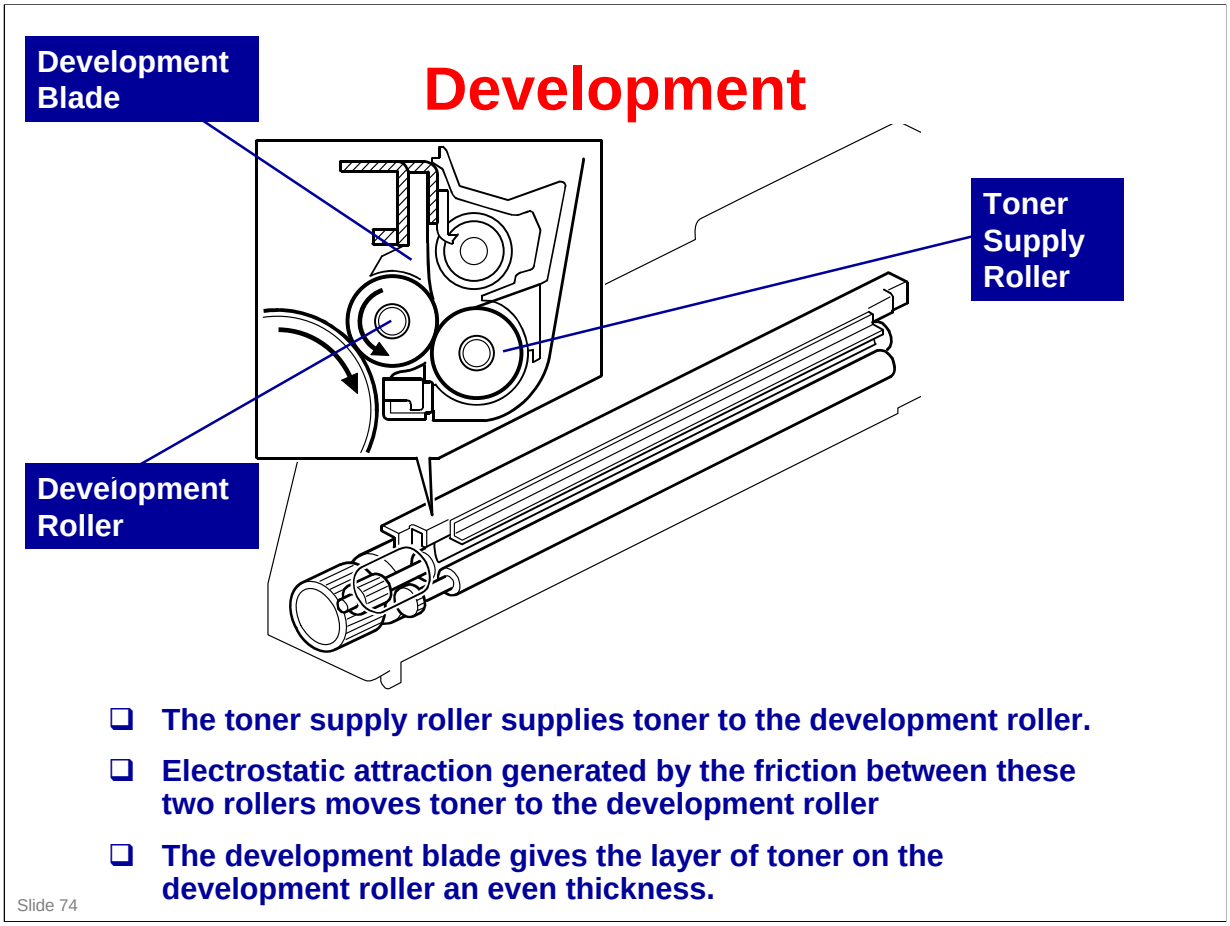
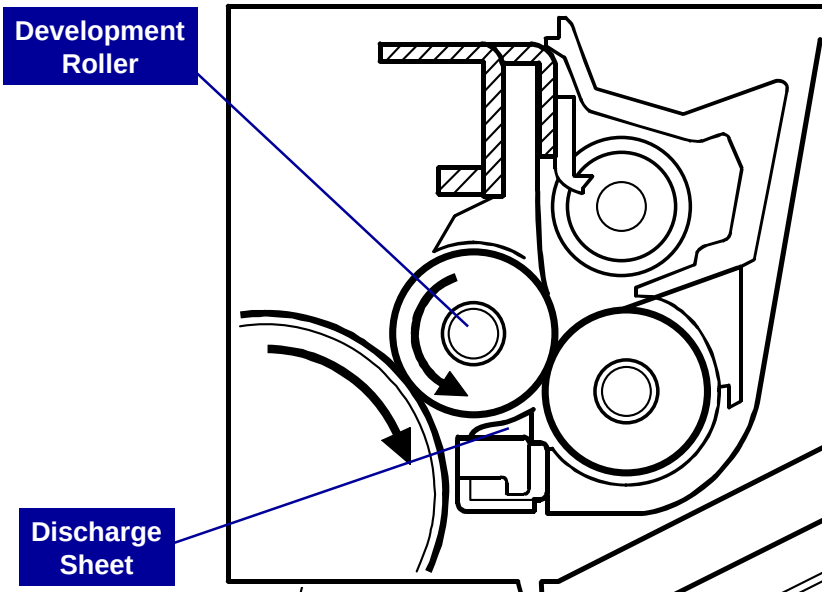
- This mixing mechanism prevents toner hardening and uneven image density in the outputs.



- This machine uses mono-component toner, with no carrier, so a TD sensor is not necessary.

Development Roller Discharge



- **The discharge sheet removes charge from the development roller after it has turned past the drum.**

Slide 75

- This system is used instead of a quenching lamp.

Toner Near-end & End Detection

- **The machine uses the following to detect toner near-end and end:**
  - Pixel count since the new toner was installed.
  - AIO rotation distance (machine copy speed x rotation time)
- **After toner near-end, about 400 sheets can be printed (A4, 5% coverage) until toner end occurs.**

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- These two figures are stored in the memory chip in the AIO.

New AIO Detection

- There is a new unit detection mechanism for the AIO. It uses an ID chip that is built into each AIO.
- There are also new detection mechanisms for:
  - ITB (Image Transfer Belt)
  - Fusing Unit

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No additional notes.

Replacement

- **Do the procedures in these sections of the service manual.**
  - Replacement and Adjustment → AIO Cartridge
- **Follow all notes and cautions in the manual.**

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No additional notes.

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Service Training

Paper Feed

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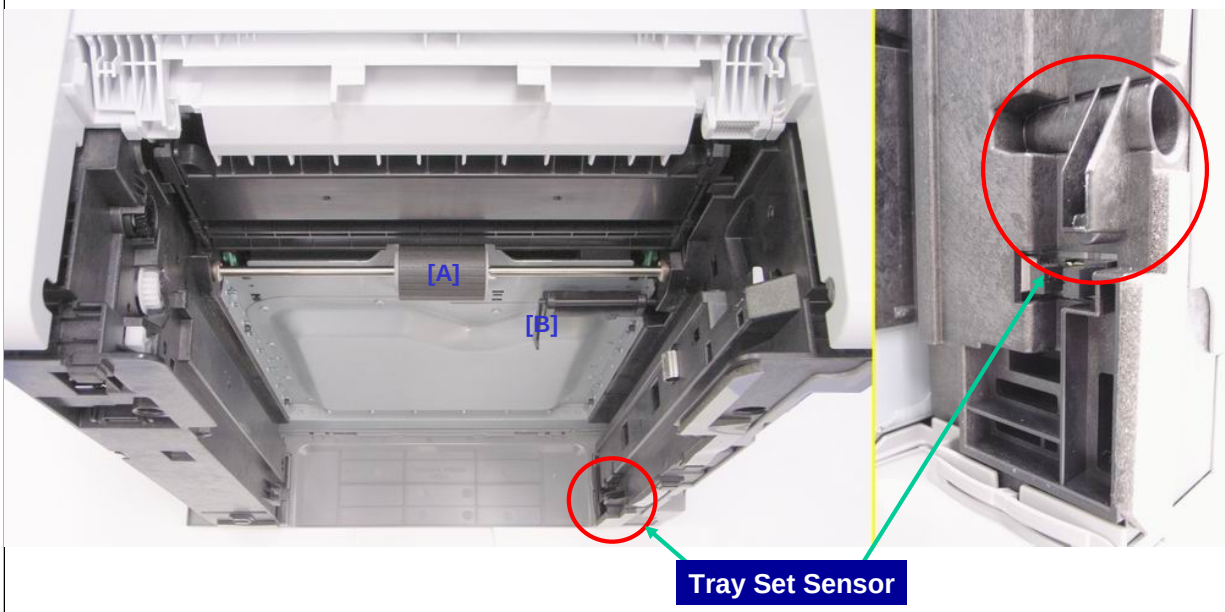
Tray Set Sensor - 1/2



- **The Tray Set Sensor detects when the paper drawer is inserted into the machine.**

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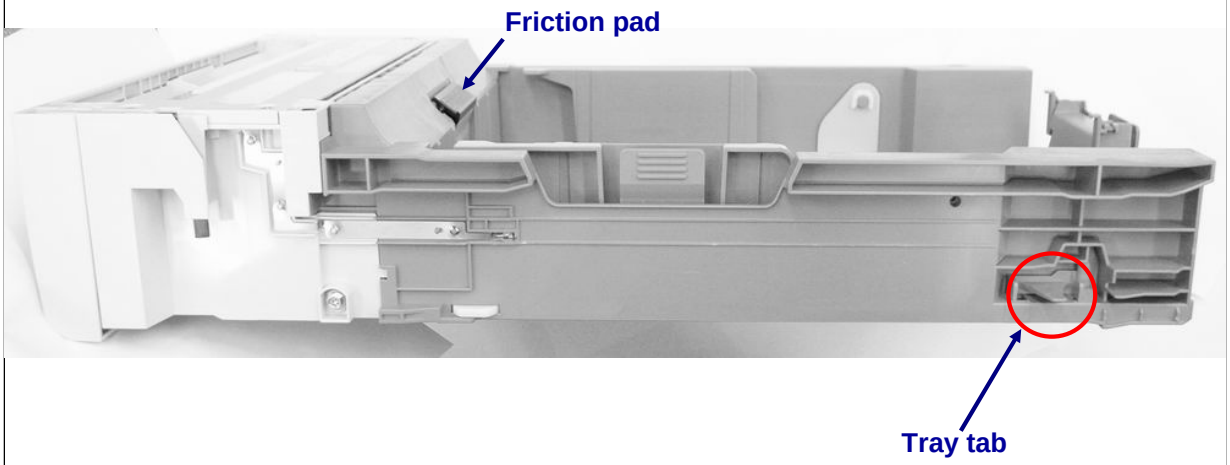
- The photo shows the interior of the paper tray docking area.
- The feed roller [A] contacts the friction pad when the tray is inserted (see next slide). The paper end sensor feeler [B] is just to the right of the feed roller.

Tray Set Sensor - 2/2

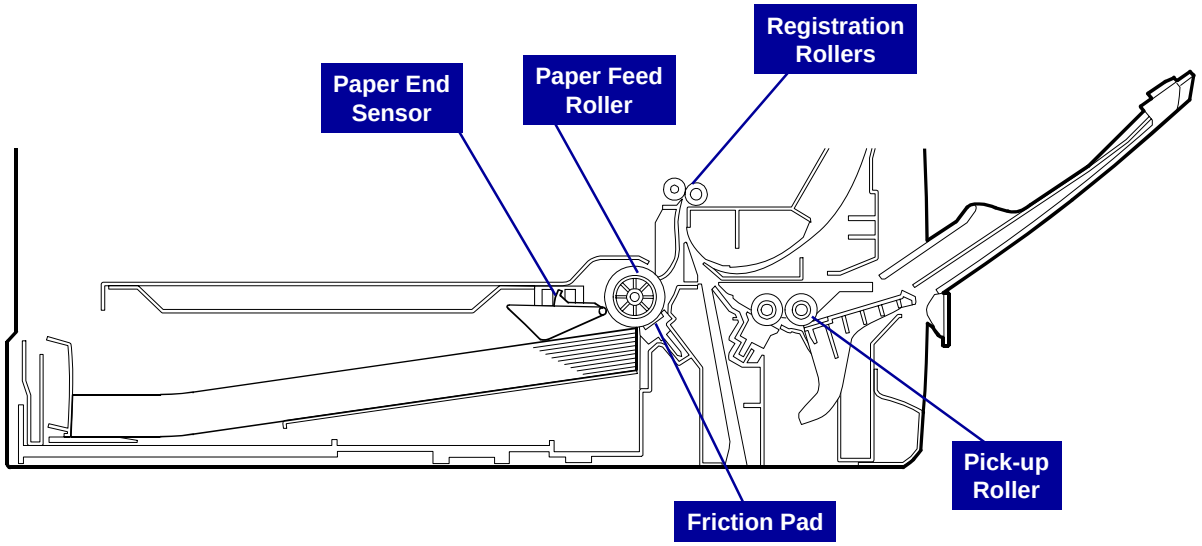


- The tray tab interacts with the tray set sensor for paper tray detection.

Slide 81

No additional notes.

Overview



- **This machine uses a friction pad and feed roller system.**
- **The tray can hold 500 sheets.**
- **The bypass can hold 100 sheets.**
- **When the tray is not pushed in fully, the by-pass tray cannot feed. For this reason, the tray set sensor is used for the tray setting.**

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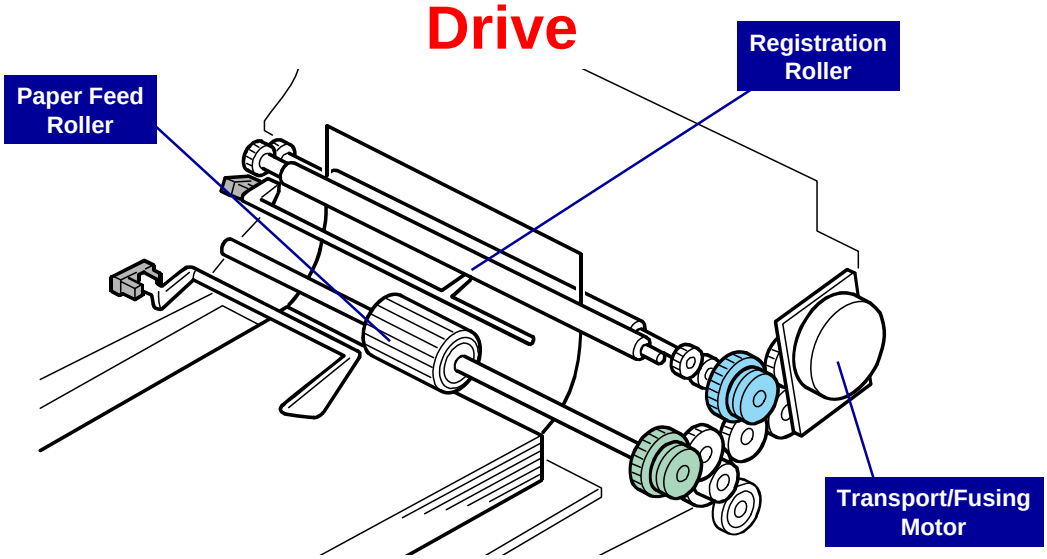
- The paper end sensor detects whether paper is installed in the tray and whether the tray is set in the machine.
- This machine also does not have automatic paper size detection.
  - The machine determines the paper size from the on-off timing of the registration sensor.
  - If the set paper size does not match the paper size measured by the registration sensor, the machine issues a paper jam alert and stops the motors.
- Narrow bypass print
  - When bypass printing on paper with a width less than 90 mm, "Bypass Print: 64-90 MM" must be set to [Active]. (At other times it should be set to [Inactive].)

Drive



- **The transport/fusing motor controls the paper feed roller and registration roller with the paper feed clutch, registration clutch and gears.**
  - The transport/fusing motor also controls the fusing unit and paper exit roller.

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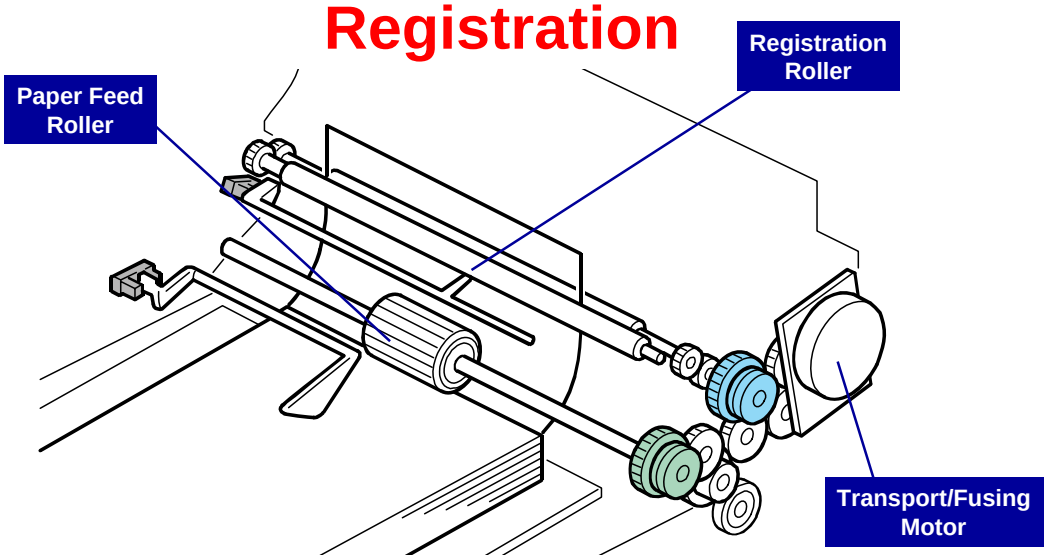
- The clutches are shown in blue (registration) and green (feed).

Registration

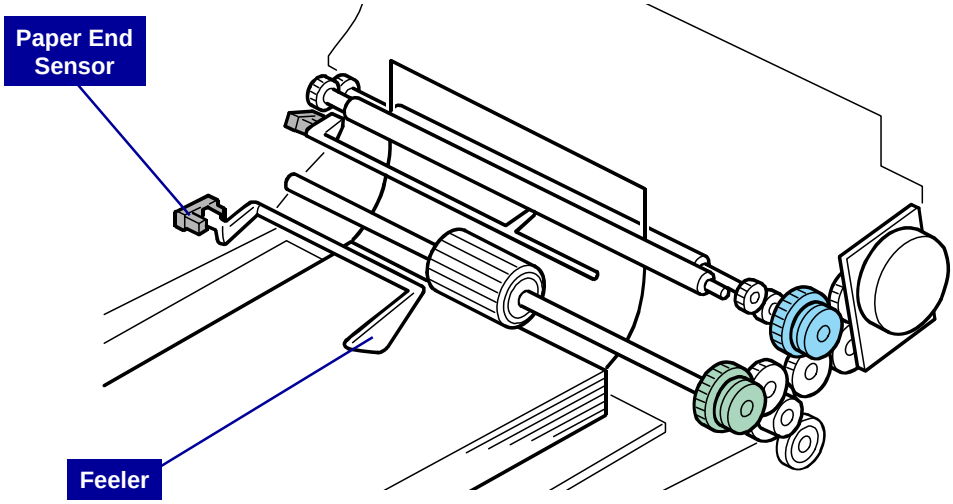


- When the registration sensor detects paper, the machine makes paper buckle at the registration roller to correct paper skew.
- Then, the registration clutch turns on, and then the registration roller transports a sheet of paper to the transfer roller unit.
- Paper buckle adjustment: SP1003

Slide 84

No additional notes.

Paper End Detection



- When the paper is finished, the feeler falls through a cutout in the bottom of the tray, and the sensor detects paper end.

Slide 85

No additional notes.

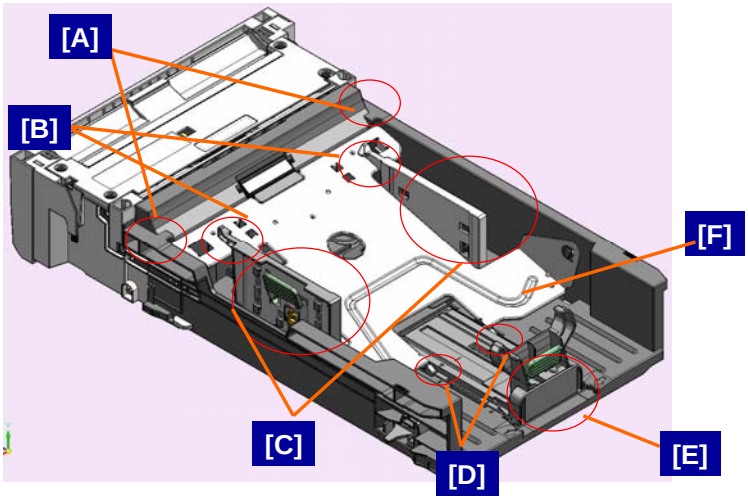
Tray Lift

- Springs lift the bottom plate when the tray is installed in the machine.
- There is no mechanism to lower the tray. You must push the bottom plate down until it locks in place.

Slide 86

No additional notes.

Recent Changes to the Tray



- **The paper tray has been modified from the previous product at the points shown above.**
- **Refer to the notes below for details.**

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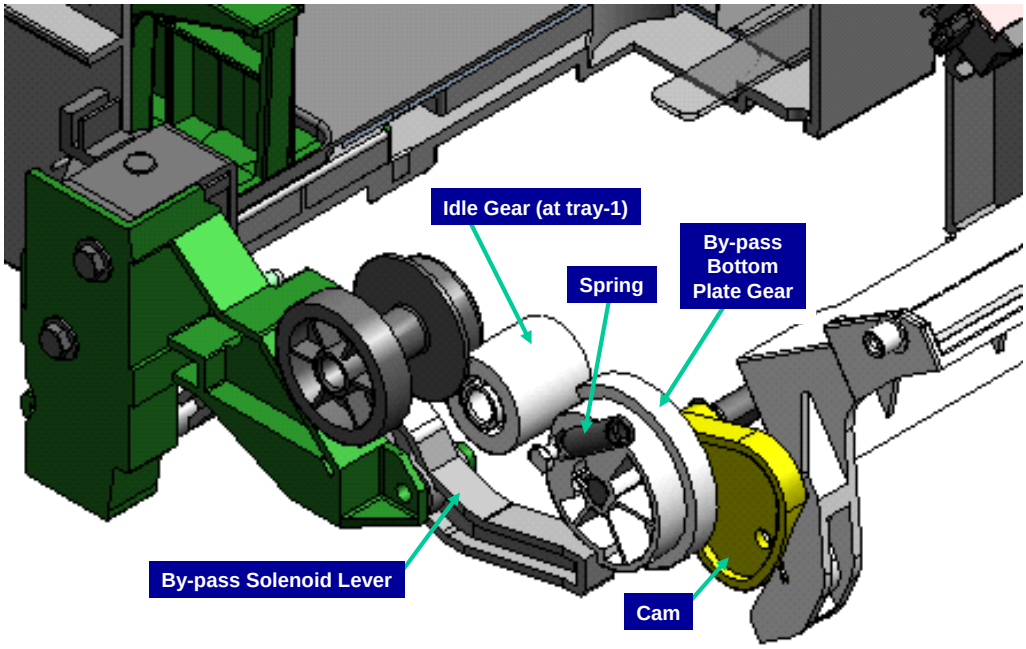
- To make it easier to load paper:
  [A] The space at the paper leading edge was expanded.
  [B] The shape of the tabs of the side fences was modified.
- For easier operation:
  [C] The lever for the side fence position movement was changed from a simple formed metal type to a composite type with lock lever and spring.
  [D] The pressure plate of the end fence was eliminated. Instead, the end fence applies pressure to the paper stack by moving forward when the bottom plate is lifted up.
  [E] The end fence was modified so that the end fence solidly clicks into position at the standard paper size locations.
  [F] The base plate was modified to accommodate the other changes.
- These modifications were also applied to the MD-P1 production. For more details refer to Technical Bulletin RM040011 for the MD-P1.

By-pass Tray - 1/3



- When not feeding paper from the by-pass tray, the By-pass Solenoid Lever holds the By-pass Bottom Plate Gear inactive, with the toothless flat section of the By-pass Bottom Plate Gear next to the (continually rotating) Idle Gear. When the By-pass Solenoid pulls the By-pass Solenoid Lever away from the By-pass Bottom Plate Gear, the By-pass Bottom Plate Gear Spring pulls the By-pass Bottom Plate Gear around to where the By-pass Bottom Plate Gear teeth mesh with the Idle Gear teeth.

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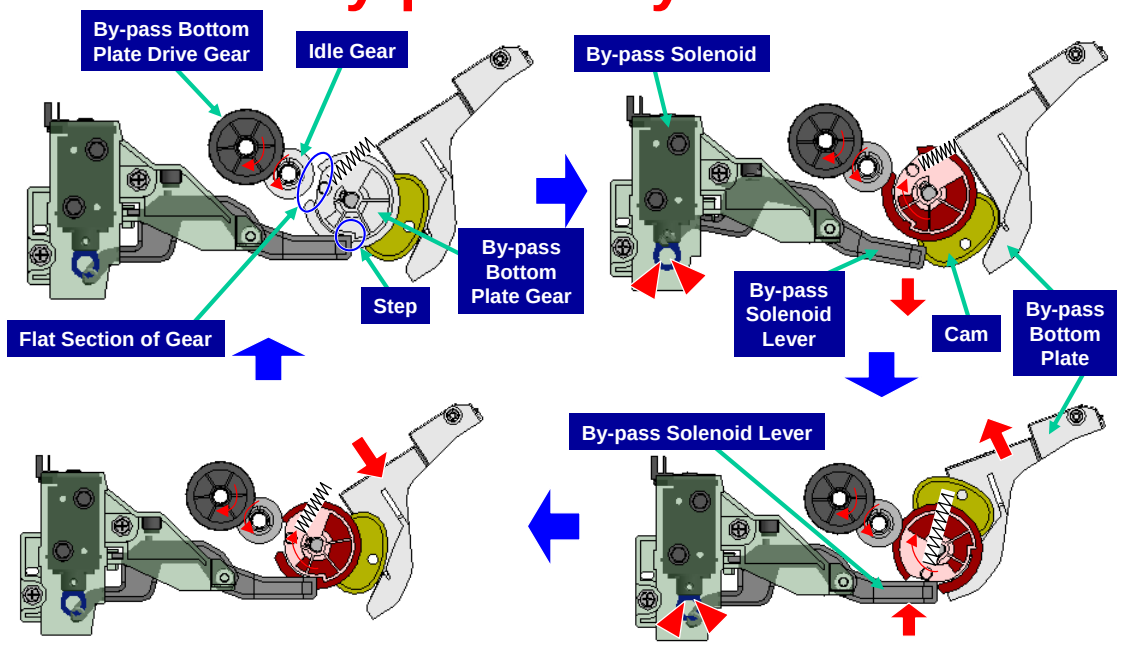
No additional notes.

By-pass Tray - 2/3



- The rotating By-pass Bottom Plate Gear turns two cams (one on each side) which raise (and lower) the By-pass Bottom Plate. As the Bottom Plate comes down and the flat section of the By-pass Bottom Plate Gear comes next to the Idle Gear, the By-pass Solenoid Lever stops the By-pass Bottom Plate Gear. When it's time to feed the next sheet of paper from the by-pass tray, a new cycle begins.

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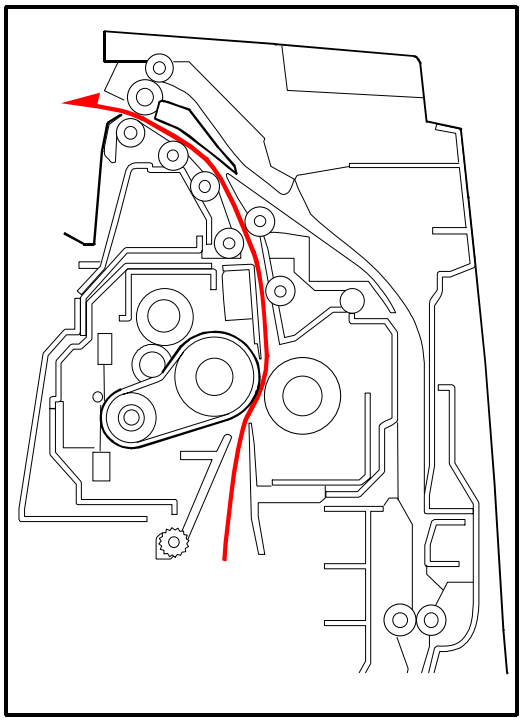
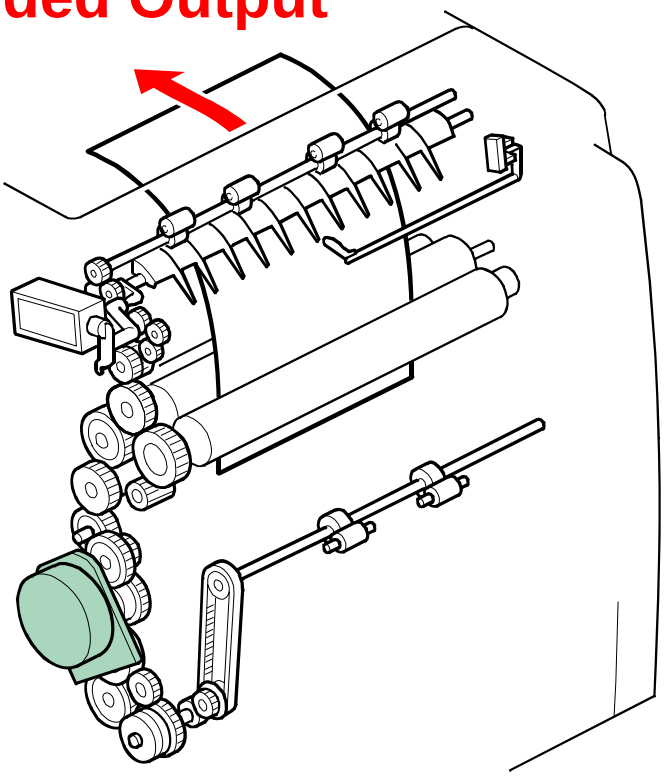
No additional notes.

One-sided Output





❑ One-sided (printing output) paper path is as illustrated above.

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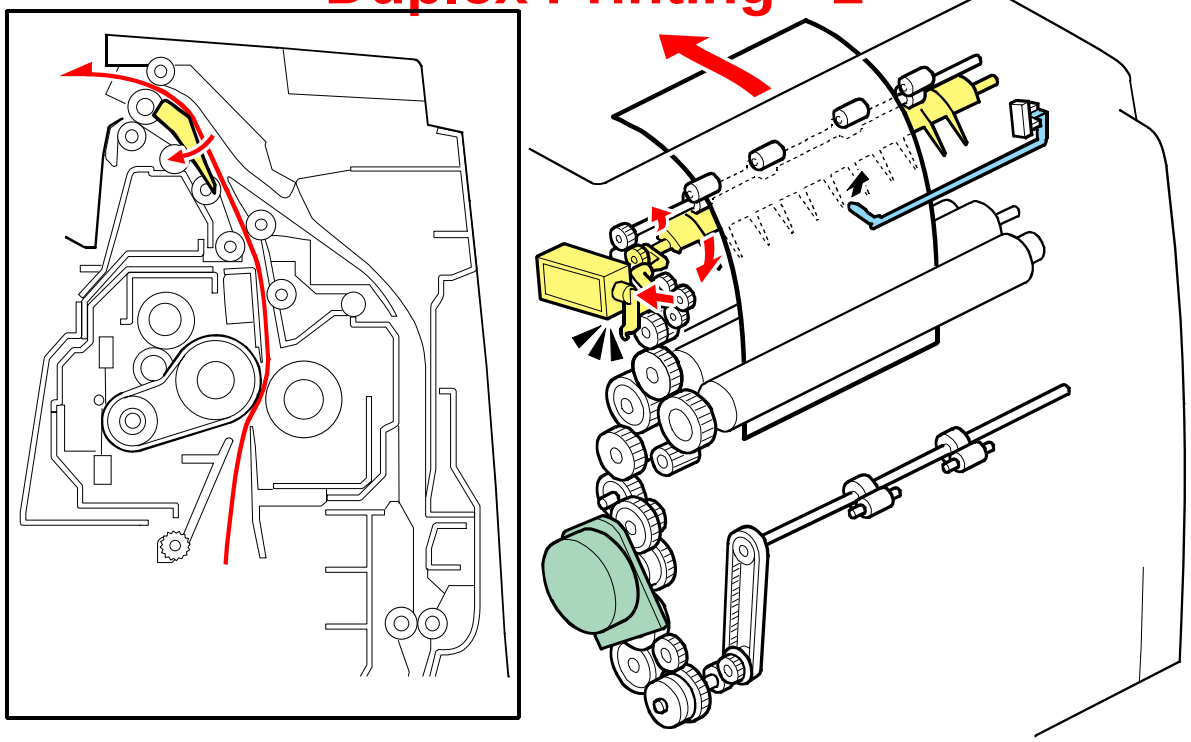
No additional notes.

Duplex Printing - 1

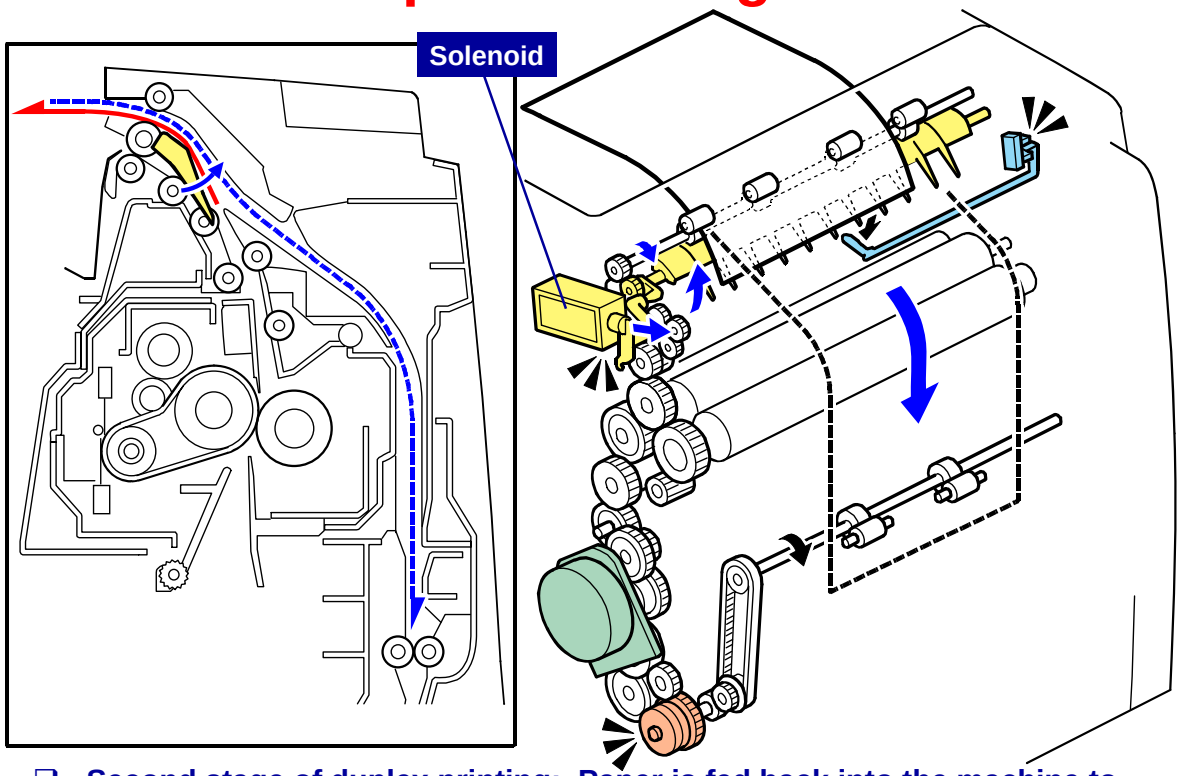


- First stage of duplex printing: As bottom edge of paper triggers sensor... (see next slide)

Slide 91

No additional notes.

Duplex Printing - 2



- Second stage of duplex printing: Paper is fed back into the machine to print second side (via solenoid-activated gear change).

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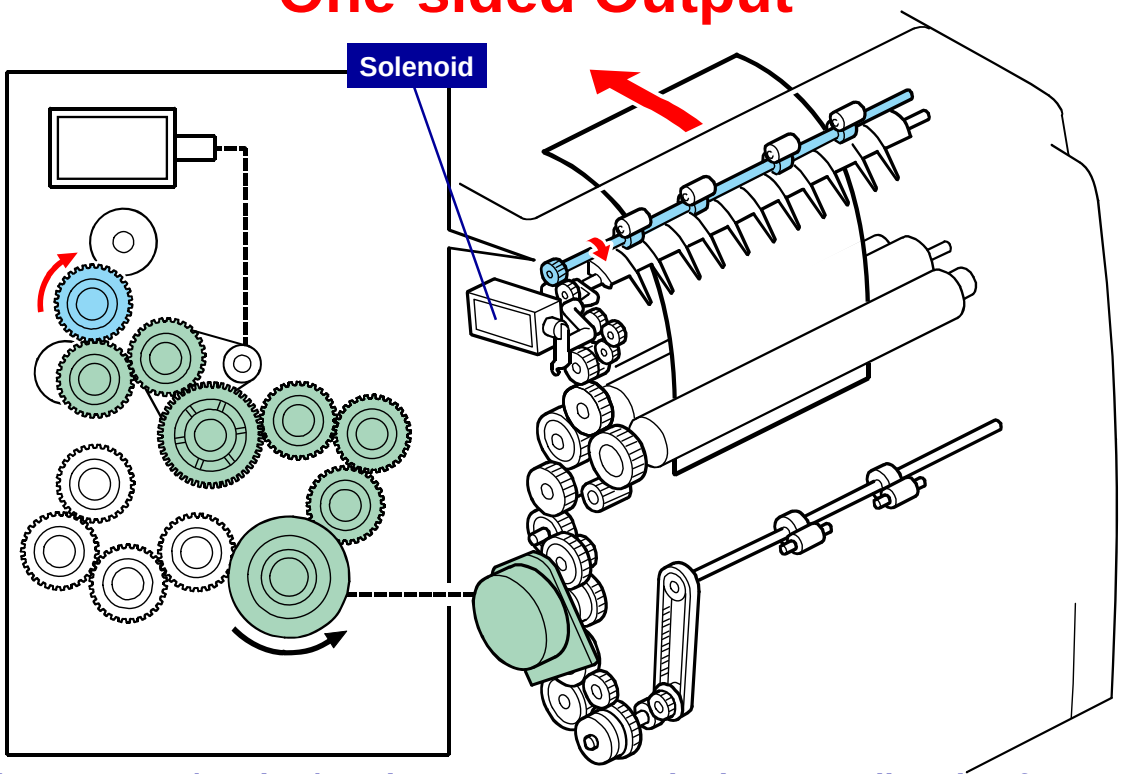
No additional notes.

One-sided Output



- Transport/Fusing/Duplex Motor rotates in the same direction for both one-sided and duplex output.

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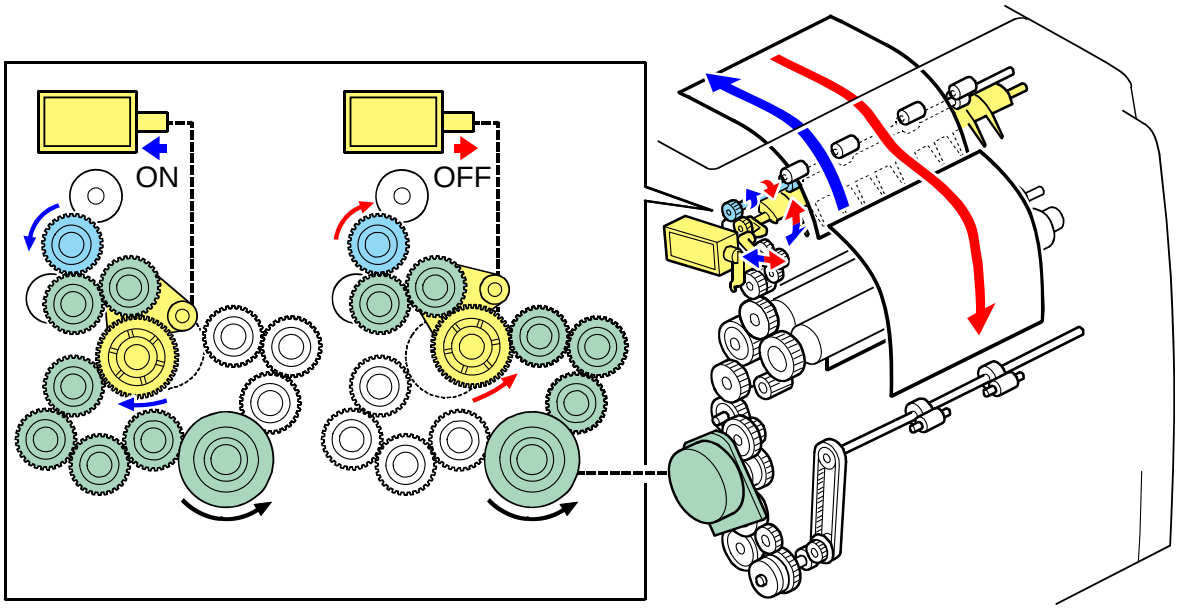
No additional notes.

Duplex Output



- Transport/Fusing/Duplex Motor always rotates in the same direction. Gear change (via solenoid) determines paper direction.

Slide 94

No additional notes.

Replacing the Separation Pad

Correct

Incorrect

- When reinstalling the separation pad, make sure that the mylar is not placed under the separation pad.

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No additional notes.

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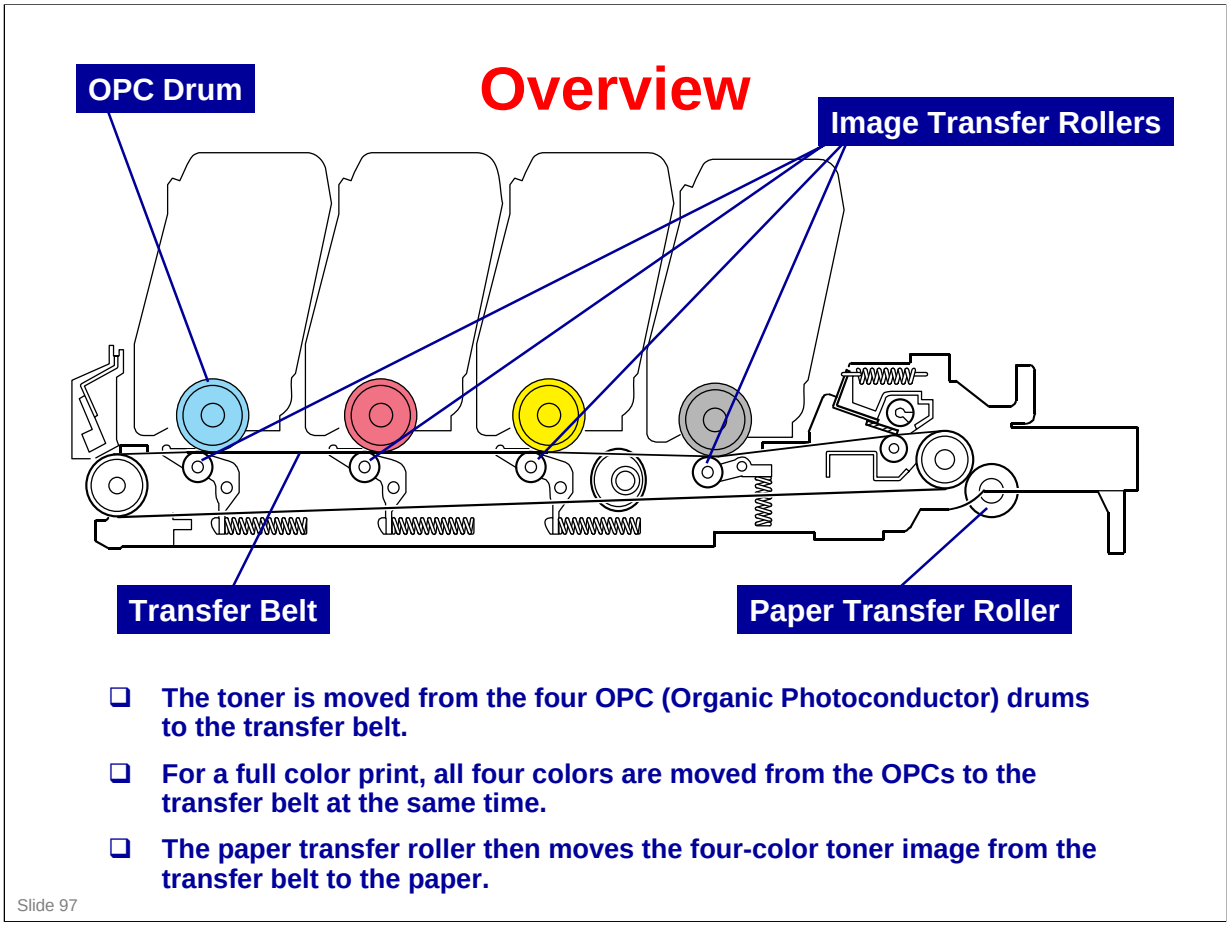
Service Training

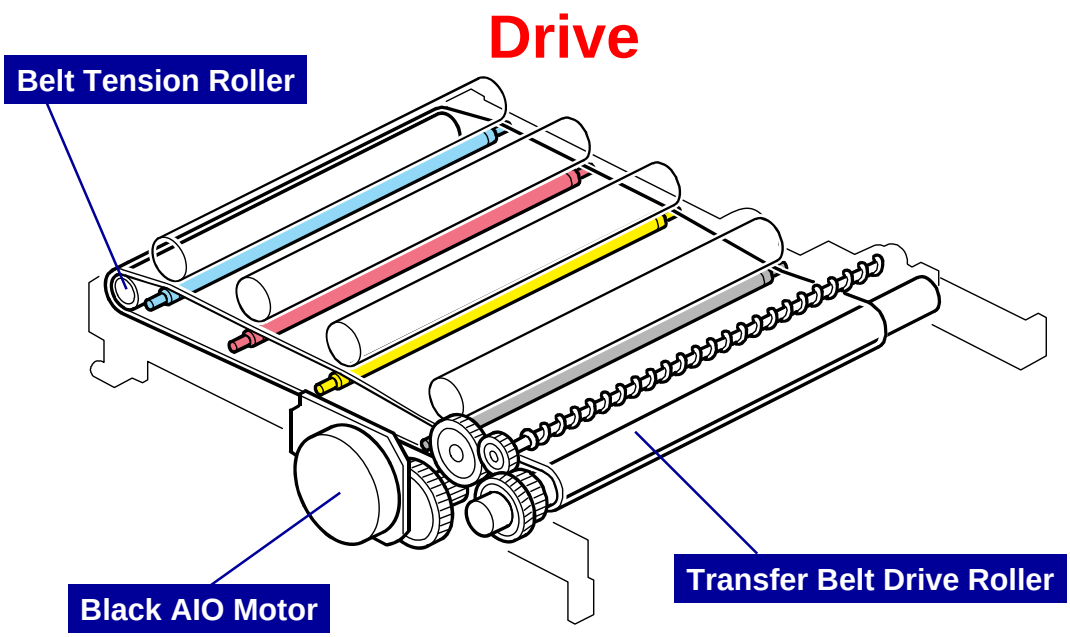
Image Transfer

Slide 96

No additional notes.



No additional notes.

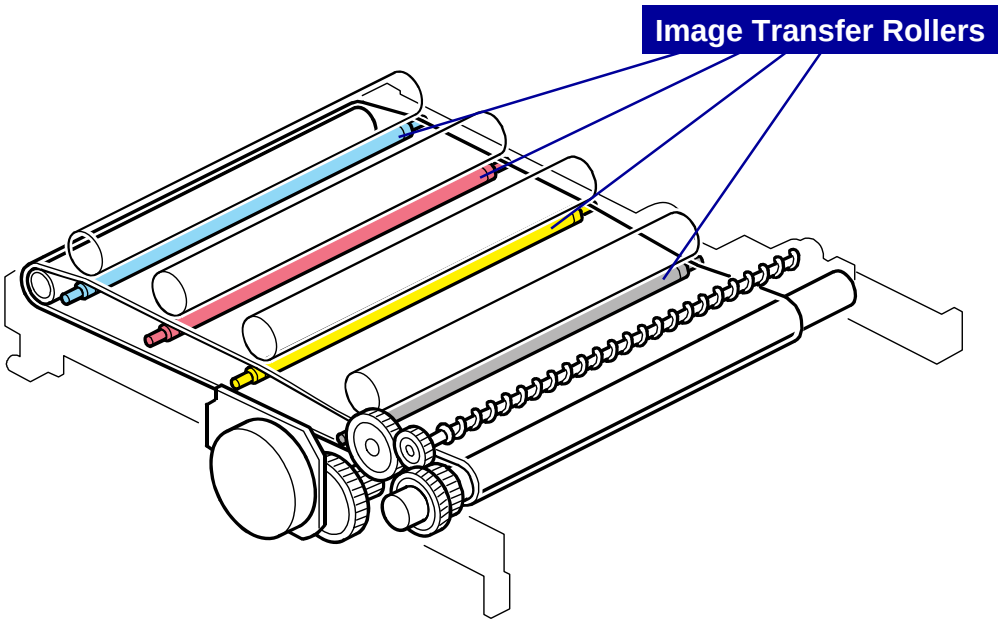


- The black AIO motor controls the transfer belt drive roller.
- The belt tension roller adds tension to the transfer belt to help to turn this belt.

Slide 98

No additional notes.

Transfer Voltage

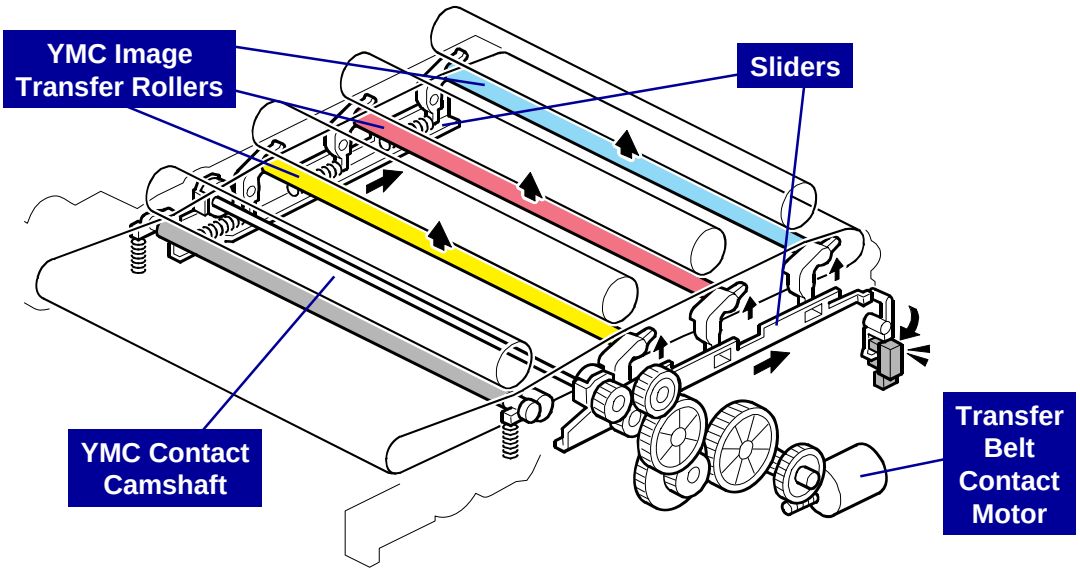


- The image transfer rollers move the toner from the OPCs to the image transfer belt.

Slide 99

No additional notes.

Transfer Belt Contact - 1

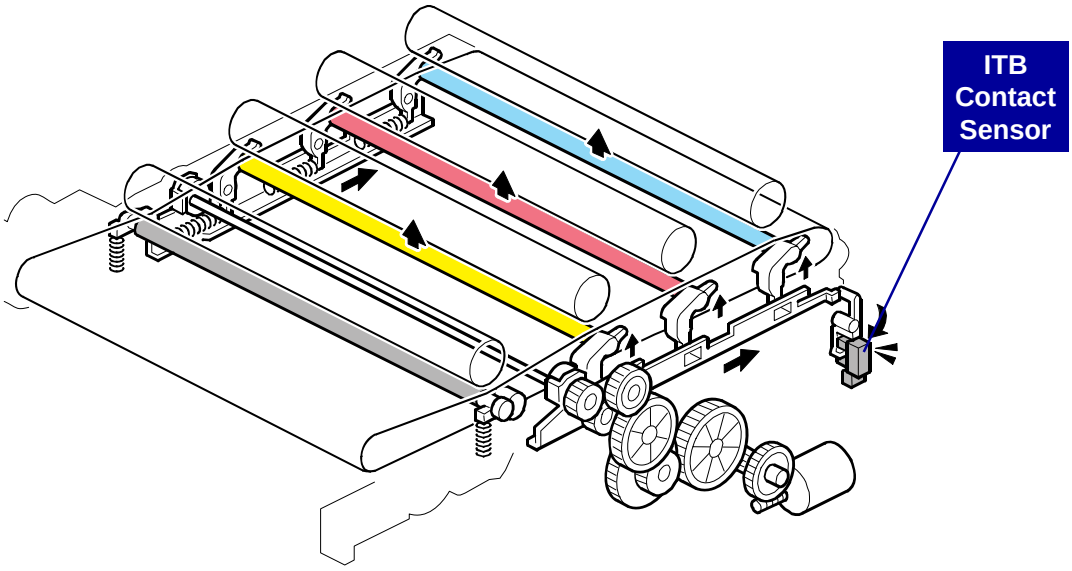


- **The transfer belt does not touch the color OPCs (yellow, magenta and cyan) when the machine makes a black and white print.**
- **When the machine starts to make a color print, the transfer belt contact motor turns the YMC contact cam shaft.**
- **The YMC contact cams slide the right and left sliders. The sliders lift the belt transfer rollers for the YMC OPCs to the transfer belt.**

Slide 100

- Because of this mechanism, the life of the transfer belt is longer (it is not necessary for the transfer belt to touch the color OPCs when the machine makes a black and white print).
  - However, if the customer selects "Off" with the "ACS" (Auto Color Sensing) setting (Menu → System → B&W Page Detect → Per Job), the four OPC drums always touch the image transfer belt even if the B & W page is printed..

Transfer Belt Contact - 2

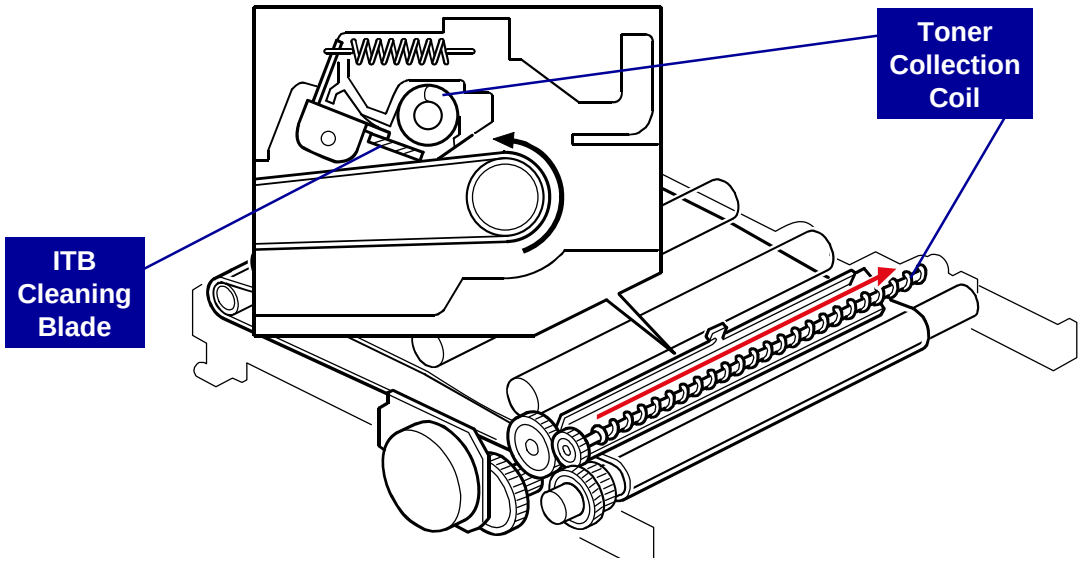


- The ITB contact sensor detects if the transfer roller unit for each OPC (YMC) touches the transfer belt.
- If it does not touch the transfer belt during color printing, the machine stops and shows SC 445.

Slide 101

No additional notes.

ITB Cleaning Unit



- The toner collection coil moves waste toner from the ITB to the waste toner tank.
- A shutter in the ITB cleaning unit closes when the ITB unit is removed. This prevents toner from falling out.

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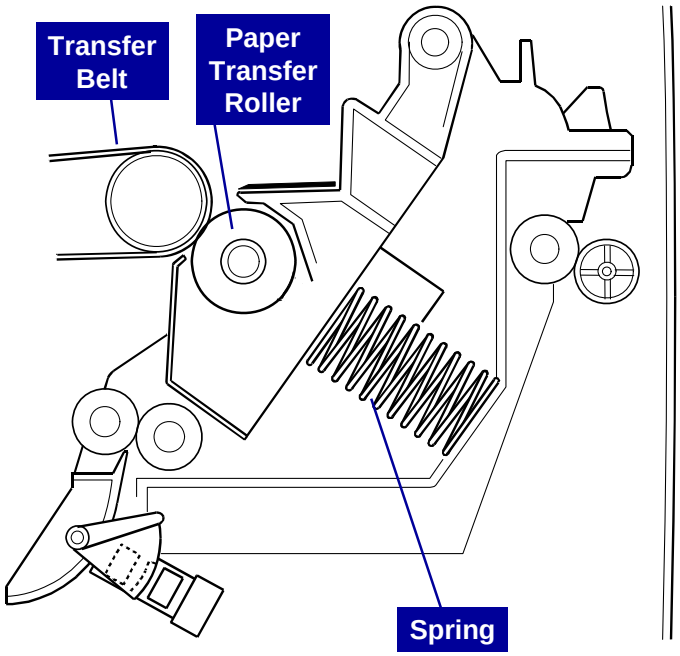
- There will be more about the waste toner collection mechanism for the ITB later in this section.

Paper Transfer Roller



- The transfer roller is always pressed against the image transfer belt by pressure from a spring.
- The transfer roller moves the toner image from the transfer belt to the paper.
- When a sheet of paper goes between the transfer roller and the transfer belt, the transfer roller turns with the paper.

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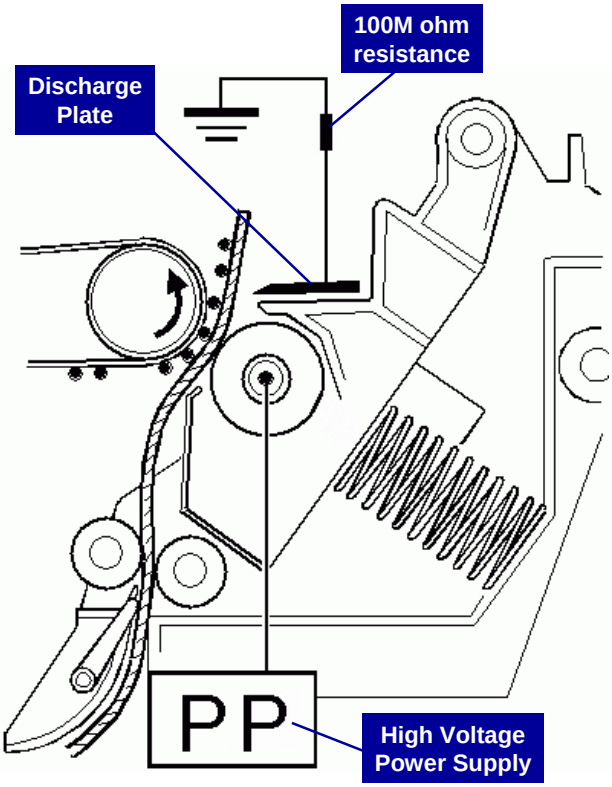
- In some places, you will see the term '2nd Transfer'. This refers to what the transfer roller does (transfer from belt to paper).

Paper Transfer and Discharge

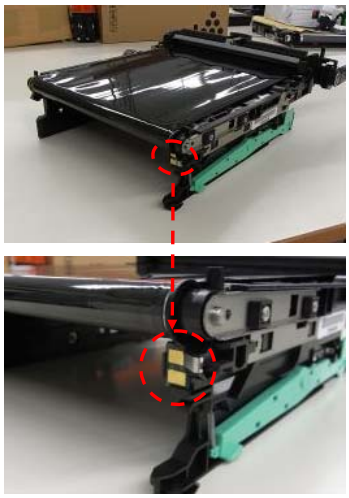


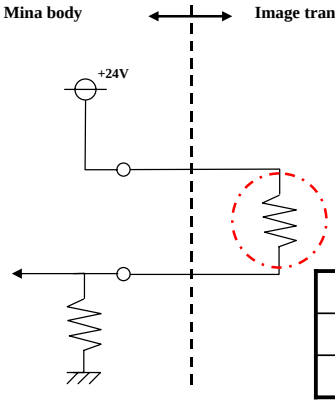
- The transfer roller receives a positive charge from high voltage power supply.
- The discharge plate removes charge that was applied to paper during paper transfer. This helps paper move away from transfer roller.
- 100M ohm resistance between discharge plate and ground prevents humidified paper from returning charge from discharge plate to paper under high temperature and humidity conditions.

Slide 104

No additional notes.

Detection Mechanism for Image Transfer Belt Unit





- The ITB unit has a fuse. The machine detects low resistance initially and determines that a new unit is installed.
- Once used, the fuse opens, and if reinstalled, the machine recognizes that there is an older unit being reinstalled.

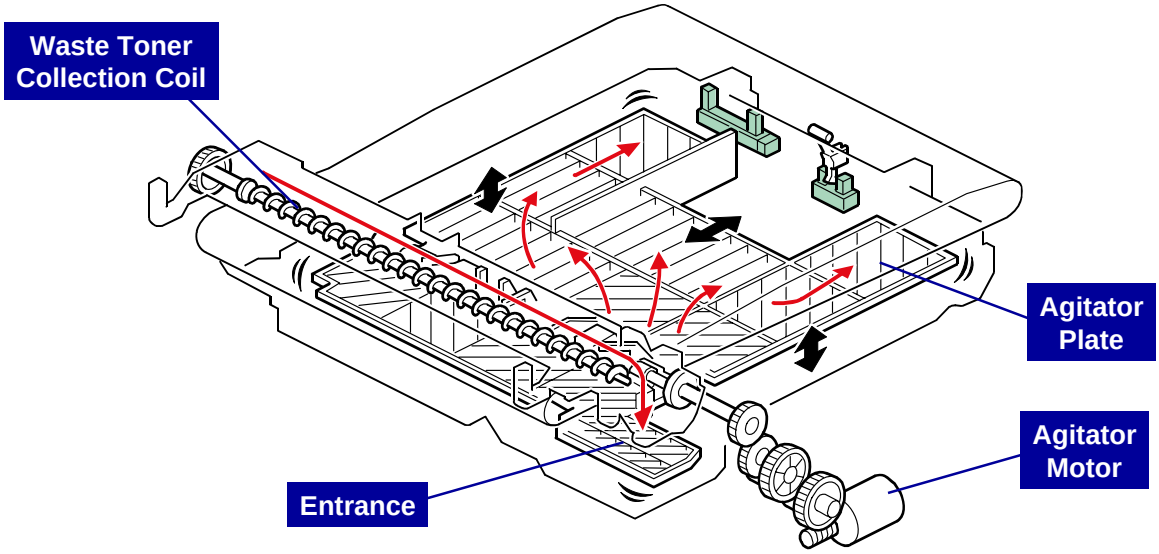
Condition	Old	New
New unit signal	L	H
Fuse resistance	High	Low

- New unit detection is performed when machine is powered on. After replacing the ITB unit (after H signal is detected), image transfer belt counter is cleared.
- Fuse type register is open due to current in the circuit. L signal is detected as new unit signal, and counter for ITB begins. Thus SP-code "Reset Transfer Unit Life Counter" is not necessary.
- "Near end" is indicated when transfer unit counter reaches 89.2 K.

Slide 105

No additional notes.

Waste Toner Collection - 1

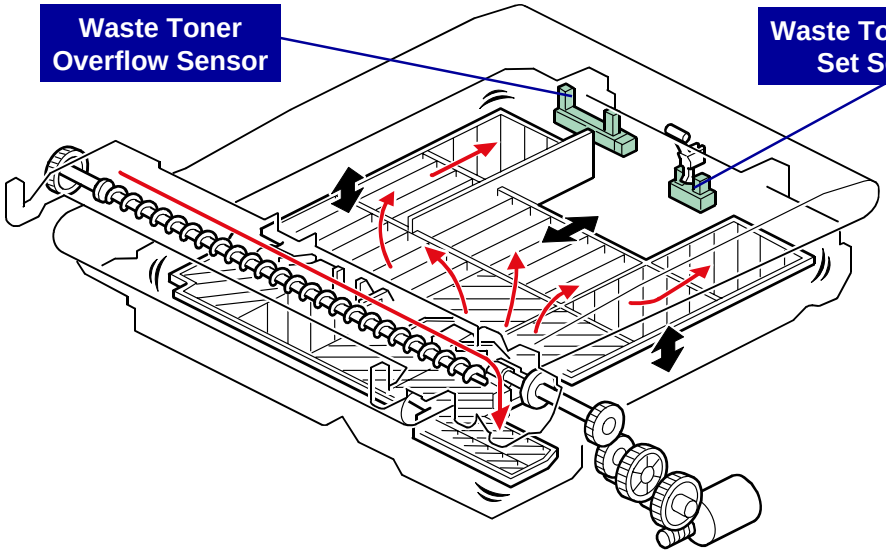


- The waste toner collection coil moves waste toner from the transfer belt to the entrance of the waste toner tank.
- The agitator plate makes sure that the waste toner is evenly distributed. The agitator motor controls this plate.

Slide 106

No additional notes.

Waste Toner Collection - 2



- The waste toner tank set sensor detects whether the waste toner tank is set.
- The waste toner overflow sensor detects whether the waste toner tank is full.
- When the machine detects that the tank is full, 800 more pages can be printed. Then the machine stops.

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- If the tank is not set or if it is full, an error message appears on the LCD for the MF model.

Other Notes

- **The ITB (Image Transfer Belt) cleaning unit contains waste toner. When you remove the ITB cleaning unit, put it on a sheet of paper.**
  - A shutter mechanism inside the unit should prevent toner from falling out. But a small amount may already be on the exterior.
- **Waste toner tank set sensor, waste toner overflow sensor: make sure to connect these up to the correct connectors, as explained in the manual.**

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No additional notes.

RICOH

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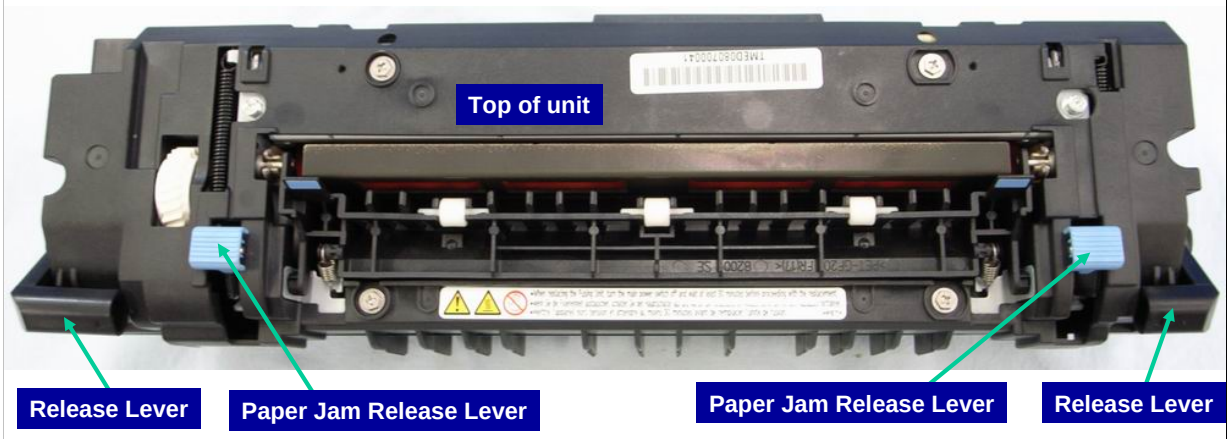
M075
Service Training

Fusing

Slide 109

No additional notes.

Fusing Unit



- View of Fusing Unit as it appears when pulled out from the rear of the machine.

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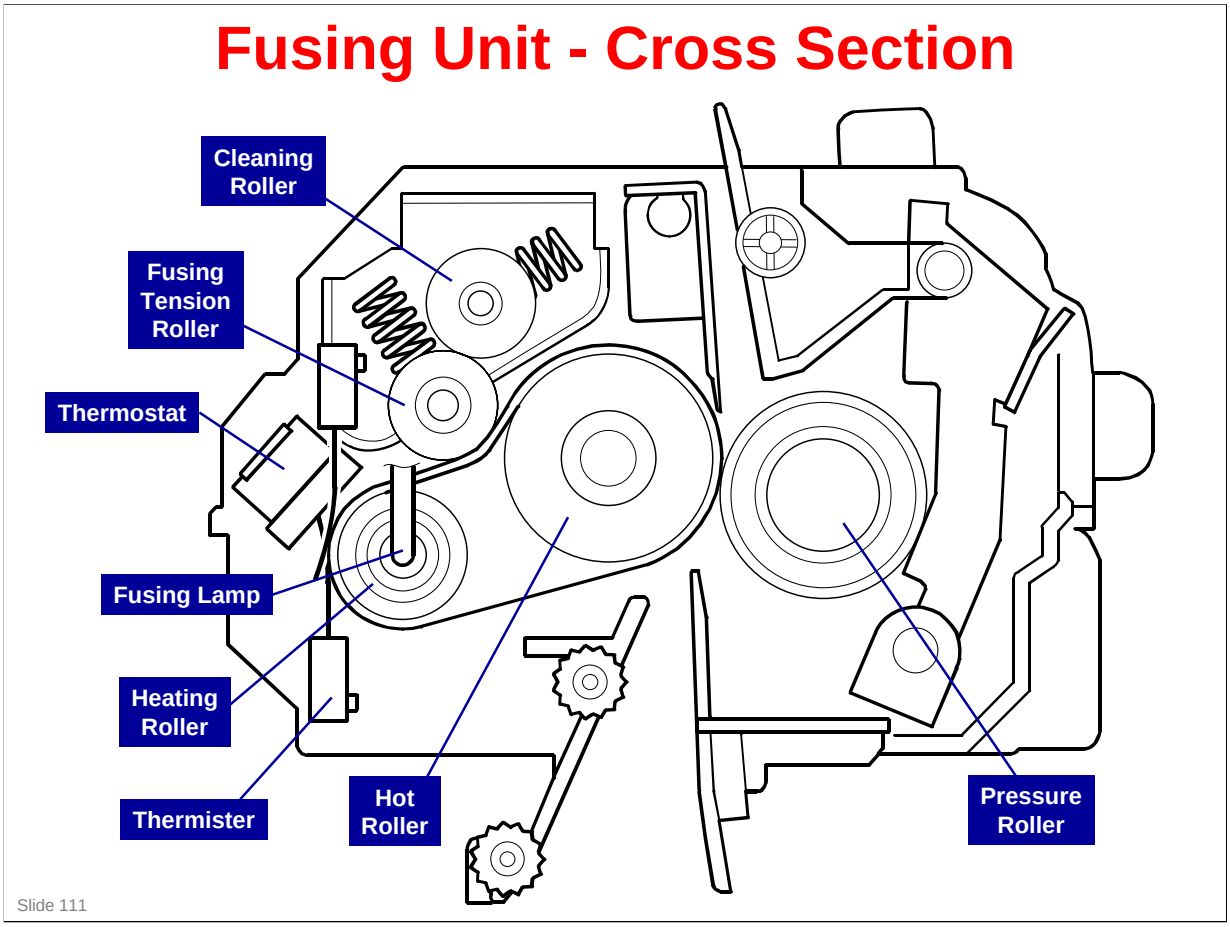
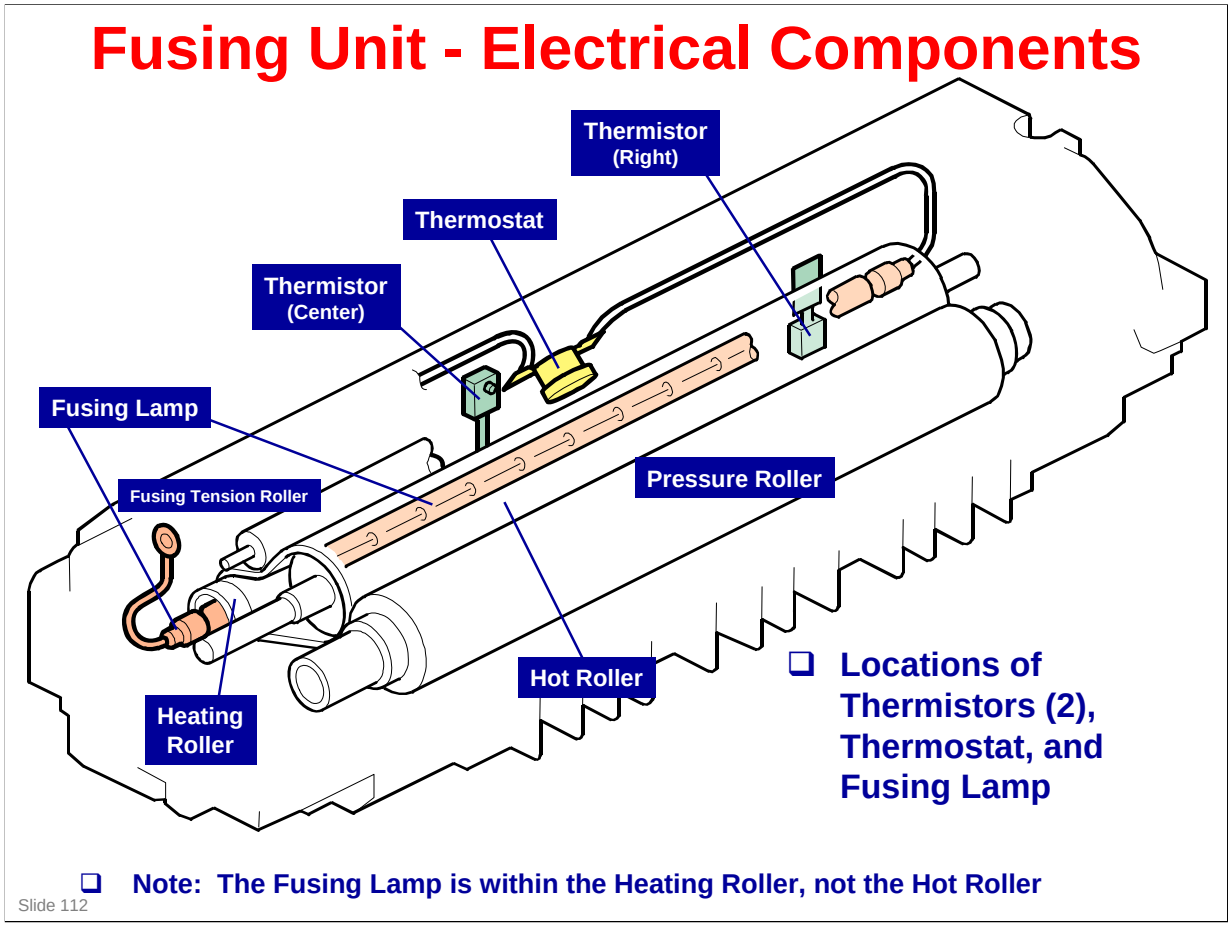
No additional notes.

Fusing Unit - Cross Section

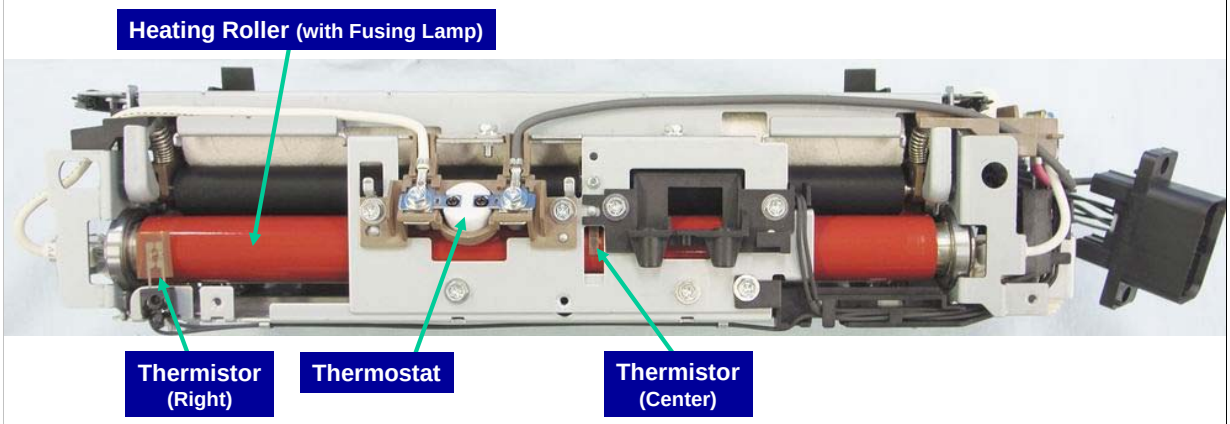


- This design, utilizing a belt between the Heating Roller and the Hot Roller, enables quick heating with the Fusing Lamp in the aluminum Heating roller, and a wider nip with the sponge Hot Roller.



No additional notes.

Fusing Unit - 1/7



- View of Fusing Unit with covers removed.

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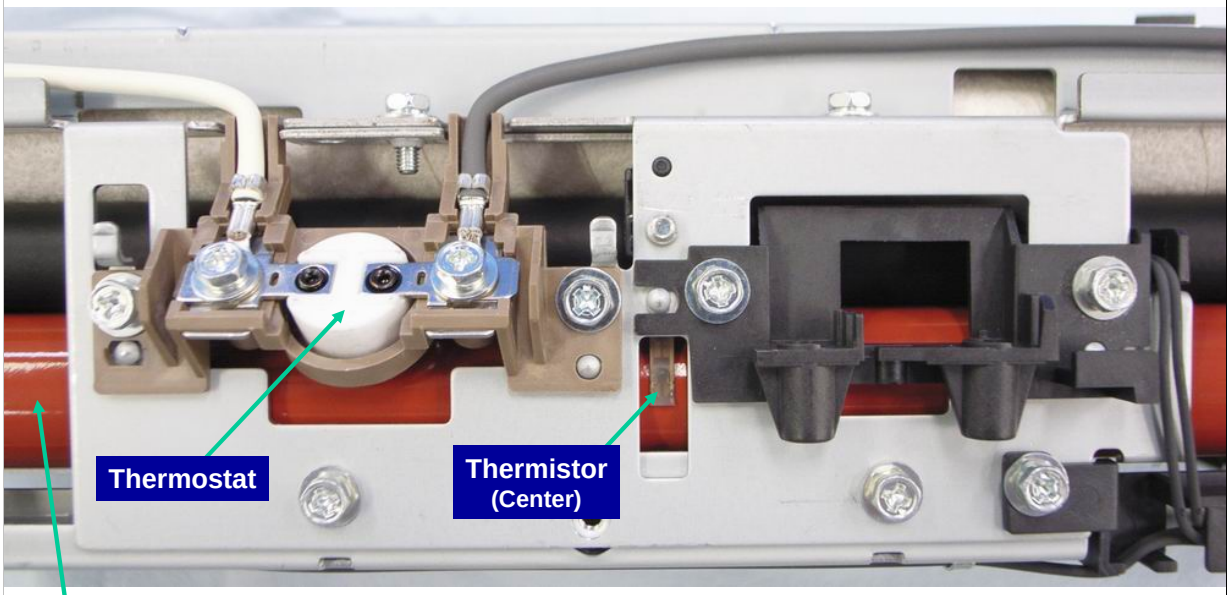
No additional notes.

Fusing Unit - 2/7



- Close-up view of thermostat and central thermistor, mounted near the Heating Roller.

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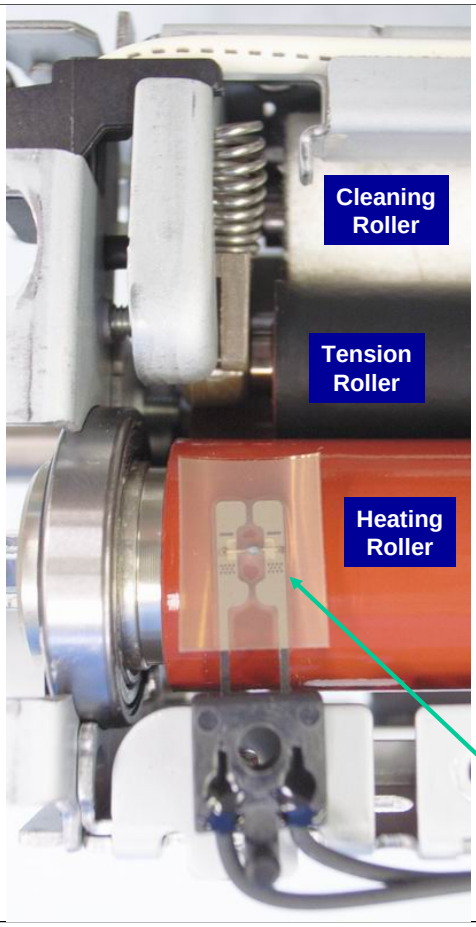
No additional notes.

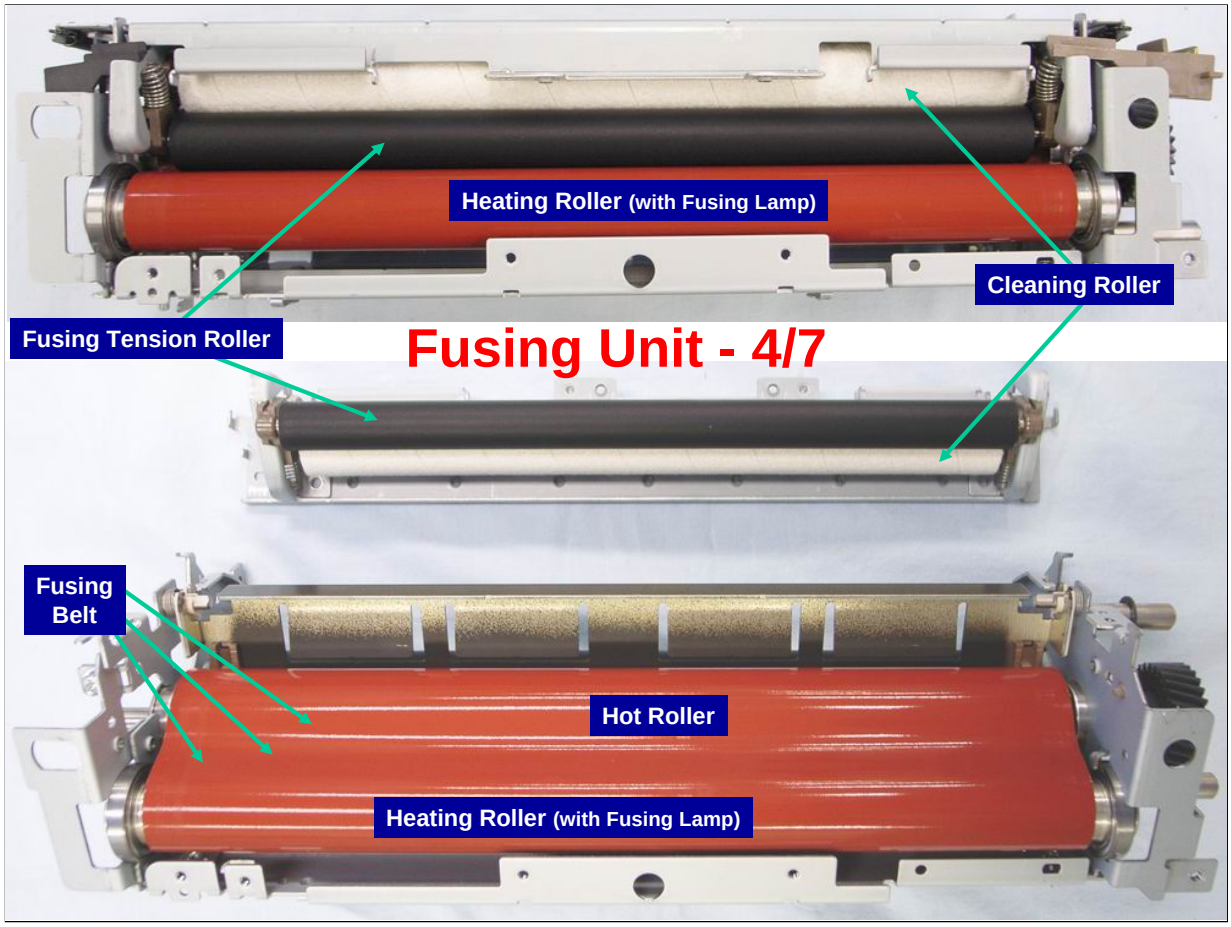


Fusing Unit - 3/7

- Halogen heating element is inside Heating Roller.
- Heat is transferred from the Heating Roller to the Hot Roller via the Fusing Belt.
- The combination of the aluminum Heating Roller and the Fusing Belt produces a faster warm-up time.
- Note that new belt type fusing system results in lower temperatures than the previous type.

Slide 115

No additional notes.



No additional notes.

Fusing Unit - 5/7

- The five rollers within the Fusing Unit.

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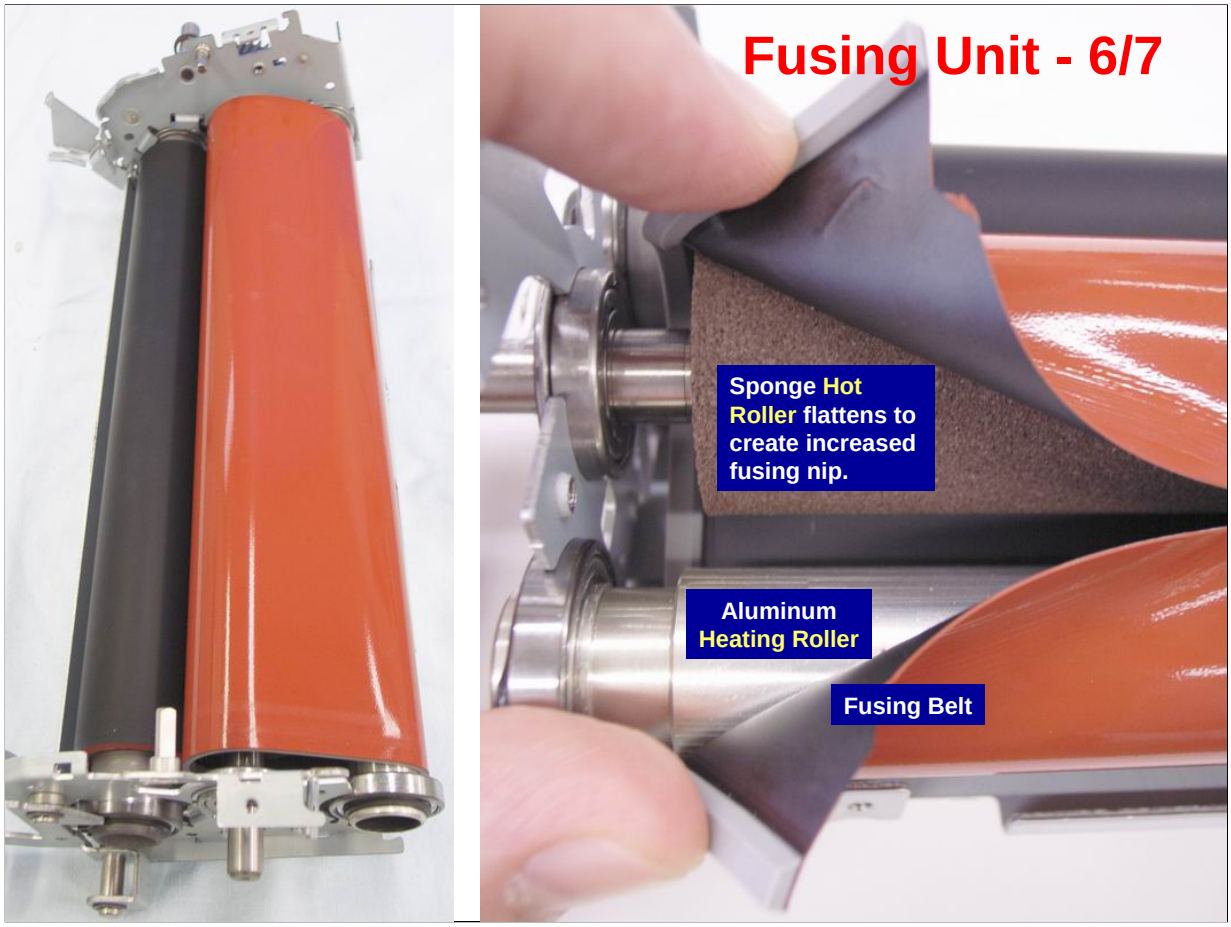
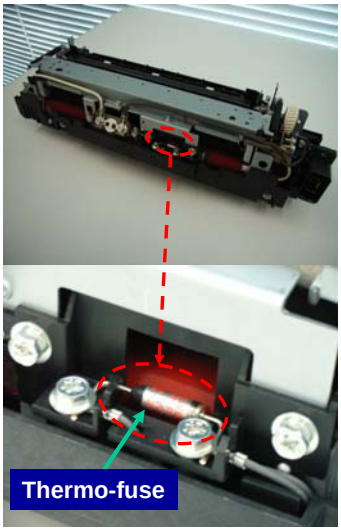
No additional notes.

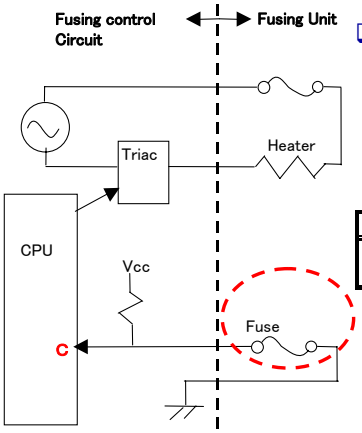


No additional notes.

Fusing Unit - 7/7

Detection Mechanism (Maintenance Kit)





- Thermofuse in the new fusing unit opens when its temperature reaches 72 degrees centigrade.

Conditon	Old	New
New unit signal C	H	L

- When the machine reaches operating temperature, new unit detection is performed.
- After an "L' signal is detected, the fusing unit counter is cleared when the fusing unit is replaced.
- The thermofuse opens after the fusing temperature reaches the target temperature.
- The machine indicates "near end" when the fusing unit counter reaches 90 k, but continues to operate.

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When the new fusing unit (Maintenance Kit or spare part of the fusing unit) is detected, counters SP7803-018 (2 Transfer Roller Counter A), SP7803-019 (2 Transfer Roller Count B) are reset to 0 as well as SP7803-011 (Fusing Unit Count) and SP7803-012 (Fusing Rotate Distance). Do the following action.

Maintenance Kit replacement: No action

Fusing unit replacement only: SP7805-022 (2nd Transfer unit restore)

When the new transfer unit or paper transfer is replaced with new one, counters SP7803-018 (2nd Transfer Roller Counter A), SP7803-019 (2nd Transfer Roller Counter B) ARE NOT reset to 0. Carry out SP7804-022 (2nd Transfer Roller Counters A & B reset to 0.)

2 Transfer Roller Counter

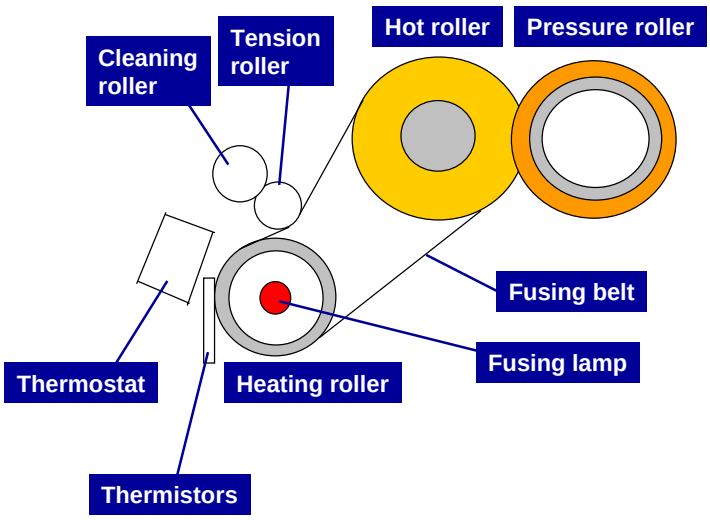
A: Bias control

B: Indication on the operation panel

As the transfer roller bias should be change as the transfer roller counter is counted up. The resistance of the roller surface is changed as the transfer roller is used.

Fusing Temperature Control - 1/3

- **The illustration shows the basic fusing unit design.**
- **To reduce warm-up time and energy consumption (compared to MD-P1):**
  - Fusing belt composition has been changed. (Slightly thinner silicone rubber layer)
  - Fusing lamp changed from 850W to 1000W type.



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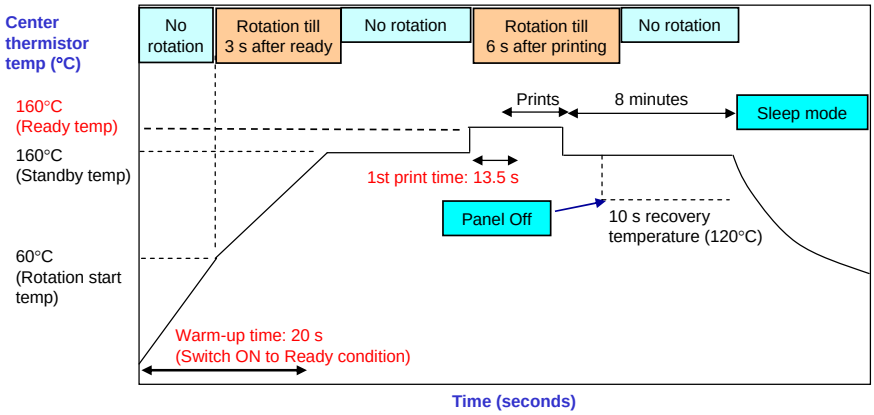
- Fusing belt silicone rubber thickness: MD-P1 = 0.2 mm, MD-P2 = 0.15 mm
- Two thermistors – one near the end and one at the center of the heating roller.

Fusing Temperature Control - 2/3



- Center thermistor controls fusing temperature.
- The above chart shows the relationship between temperature and fusing belt rotation.

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No additional notes.

Fusing Temperature Control - 3/3

- **This chart shows the fusing temperature and print speed at each mode setting. (Environment temperature greater than 16**°C.)

Paper	Speed	Temp
Thinner	1	157°C
Thin	1	160°C
Plain	1	167°C
Recycled	1	167°C
Plain & recycled	1	167°C
Color paper	1	167°C
Preprinted	1	167°C
Prepunched	1	167°C
Thick 1	1/2	158°C
Thick 2	1/2	164°C
Cardstock	1/2	164°C
Bond	1/2	164°C
Envelope	1/2	164°C
Glossy paper	1/2	150°C
Thick 3	1/2.5	158°C

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No additional notes.

Fusing Unit SC Codes

- SC541, 542, 543, 544, 545, and 548
- To prevent damage to the machine, the machine cannot be operated until the fusing related SC has been reset by a technician.
- To reset the machine, do the following in SP mode:
  - Execute SP5810-001, and then turn the main power switch off and on.

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No additional notes.

Humid Environments

- **To reduce paper curl in high temperature and humidity environments, the fusing unit does idle rotation before a job, if the customer enables this function in the user mode.**
  - Mode 1: No fusing idling, transfer roller voltage is increased
  - Mode 2: Fusing unit rotates for 30 seconds before a job, transfer roller voltage is increased.
  - Mode 3: Fusing unit rotates for 60 seconds before a job, transfer roller voltage is increased.

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- Lab tests: Fusing idling mode 2 should be enough in most cases

Replacement

- **Do the procedures in these sections of the service manual.**
  - Replacement and Adjustment → Image Fusing
- **Follow all notes and cautions in the manual.**
- **Make sure that the fusing unit is cool before you touch it.**
- **Make sure to restore the insulators, shields, etc after you service the fusing unit.**

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No additional notes.

Fusing Unit Jams

- Normally, the user will remove fusing unit jams.
- But, if the service program 'Fusing JAM SC Setting' (SP1159-001) is changed to 'On', the machine stops if a jam occurs in the fusing unit for three consecutive paper feeds. Then, SC559 appears. The technician must remove the jam.

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No additional notes.

RICOH

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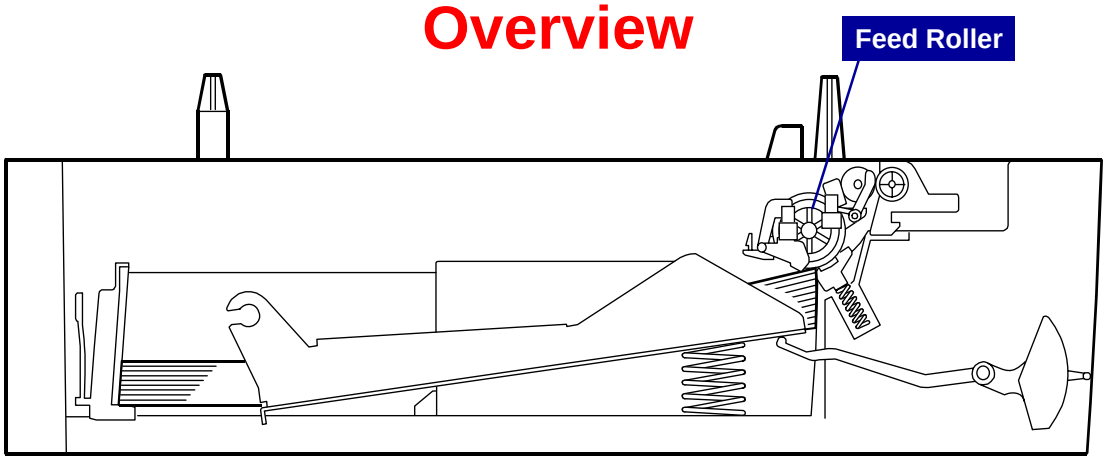
M075
Service Training

Optional Paper Tray Unit (G849)

Slide 127

No additional notes.

Overview

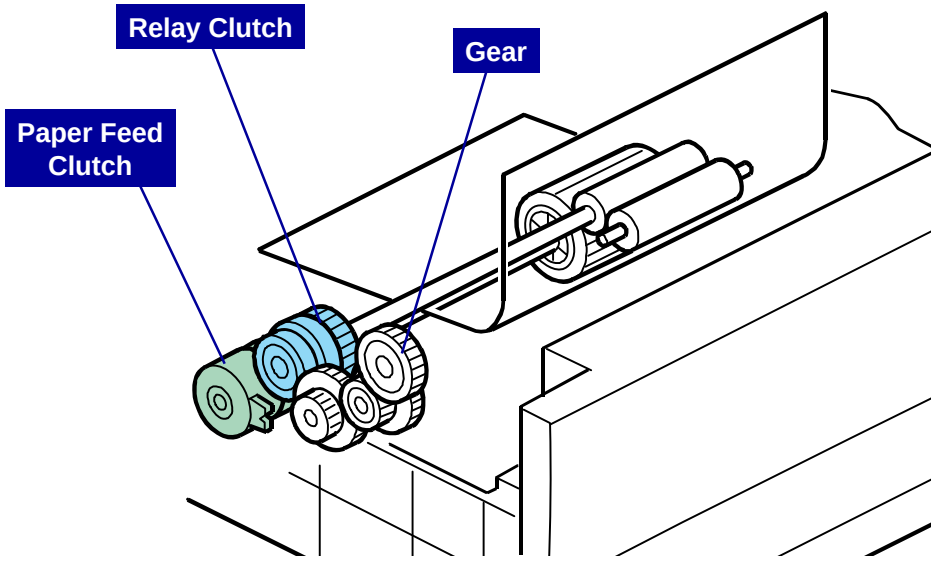


- Capacity: 500 sheets
- Feed roller and friction pad system

Slide 128

No additional notes.

Feed

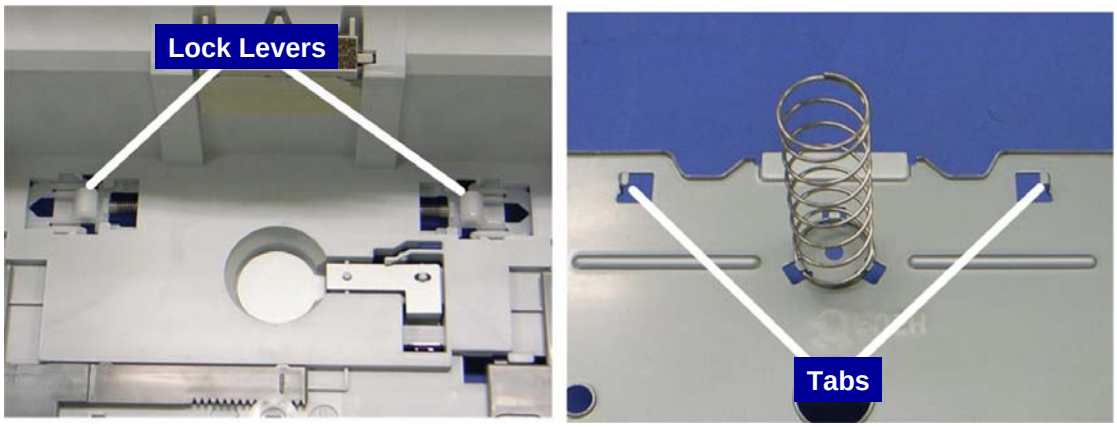


- The transport/fusing motor in the main machine drives the gear.
- The clutches transfer drive to the rollers at the correct times.

Slide 129

No additional notes.

Paper Lift - 1



- **The spring pushes the bottom plate up. So, you must press the bottom plate down before you put the tray in the machine.**
- **After the bottom plate is pressed down, the tabs hold the lock levers.**

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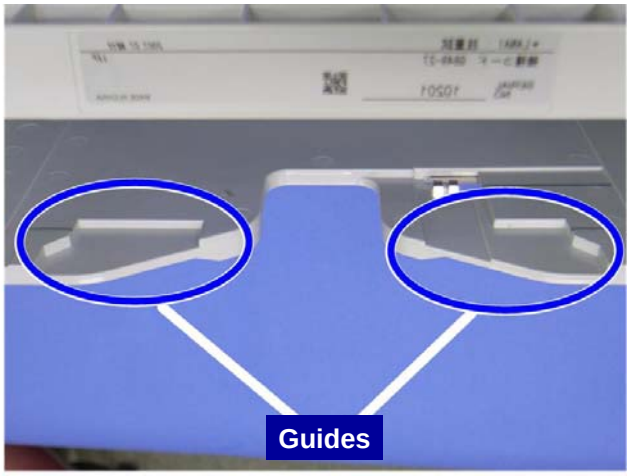
- The next slide shows what happens after you put the tray in the machine.

Paper Lift - 2

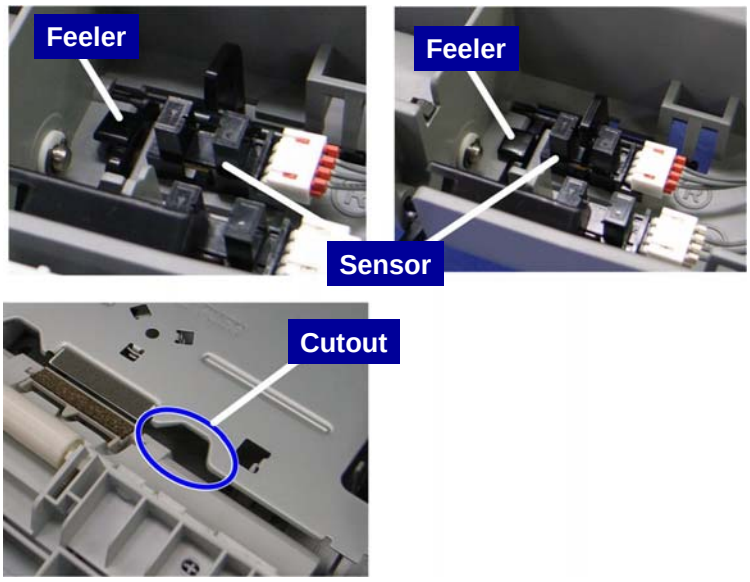


- When you put the tray in the machine, the guides in the main body of the paper tray unit push the lock levers, and the lock levers release the tabs.
- Then, the spring lifts the bottom plate.

Slide 131

No additional notes.

Paper End Detection

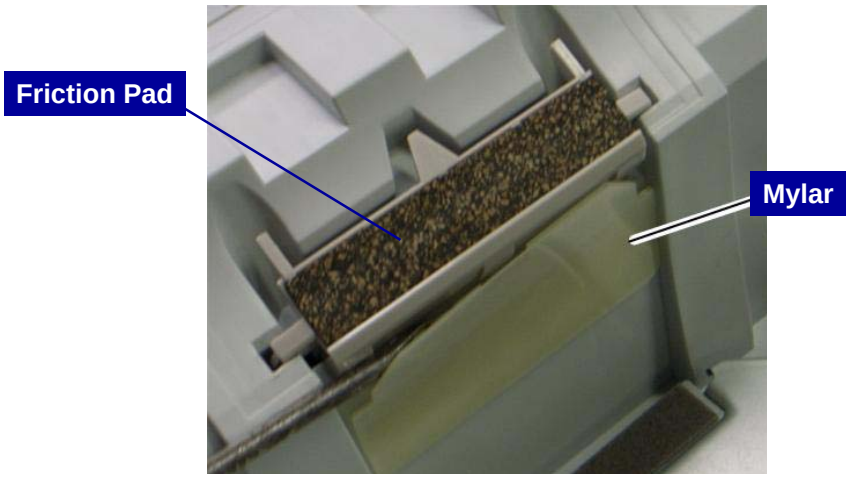


- When there is no paper in the tray, a feeler drops through a cutout in the bottom plate, and the actuator attached to the feeler enters the paper end sensor.

Slide 132

No additional notes.

Reinstalling the Friction Pad



- When re-installing the friction pad, make sure that the Mylar does not go under the friction pad.

Slide 133

No additional notes.

Replacement

- Do the procedures in the Replacement and Adjustment section of the G849 service manual.
- Follow all notes and cautions in the manual.

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No additional notes.

RICOH

RICOH

M075
Service Training
Troubleshooting

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No additional notes.

General Troubleshooting

- **Study the image troubleshooting section of the FSM.**
  - FSM → Troubleshooting → Image Problems
- **Familiarize yourself with the Service Call Code tables in the appendix of the FSM.**
  - FSM → Troubleshooting → SC Conditions

Slide 136

No additional notes.

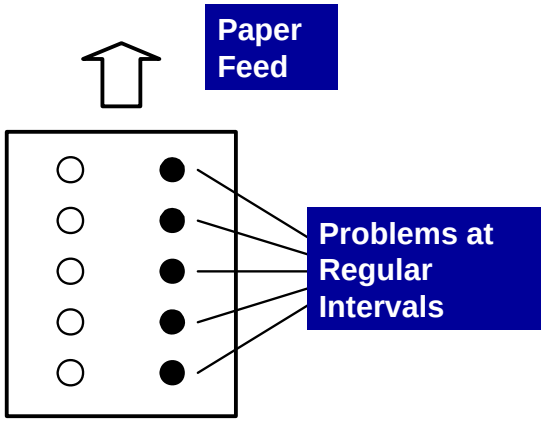
Error Codes

- Error codes can be seen on the operation panel.
- Fusing related SCs: To prevent damage, the machine cannot be operated until the SC has been reset by a technician.
  - Execute SP5810-001, and then turn the main power switch off and on.

Slide 137

No additional notes.

Image Problems



- 24-mm intervals: Image transfer belt unit
- 38-mm intervals: AIO cartridge (Development roller)
- 60-mm intervals: Transfer roller
- 75-mm intervals: AIO cartridge (OPC drum)
- 110-mm intervals: Fusing unit (Pressure roller)
- 141-mm intervals: Fusing unit (fusing belt)

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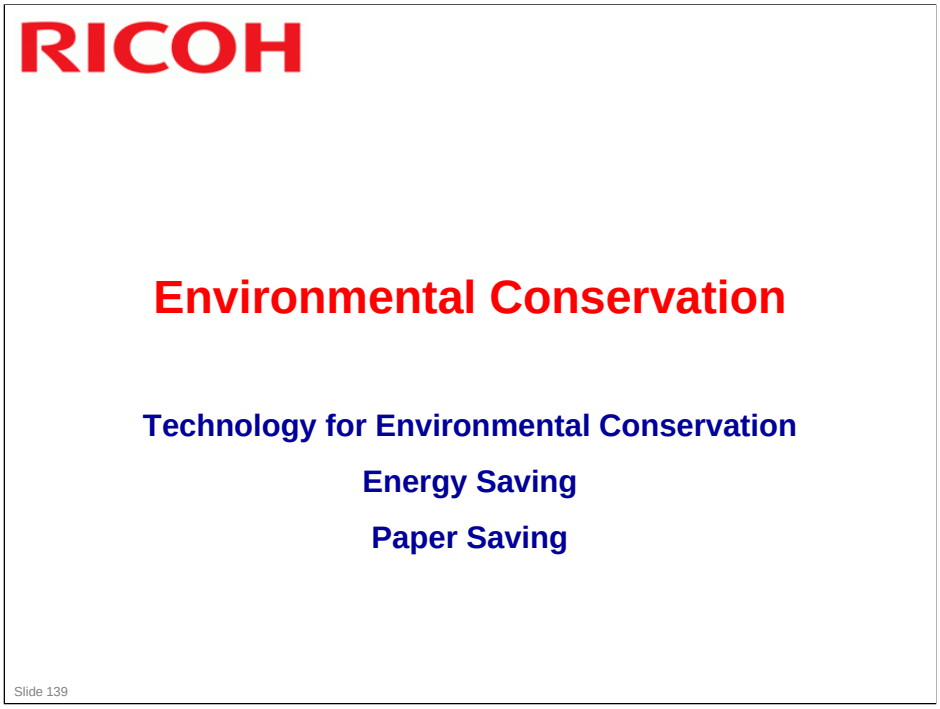
- Why 24 mm for the image transfer belt?
  - This is the circumference of the image transfer rollers. See the Transfer section of the course for information on these rollers.



- This section explains the technology used in this machine for environmental conservation, and the default settings of related functions.

Technology for Environmental Conservation

○: Has this function
Blank: Does not have this function

Environmental Technology/Feature	Description	New model MD-P2	Previous model MD-P1
1. QSU	- Reduction of warm-up time (Energy saving) - Reduction of CO2 emissions	○	○
2. Hybrid QSU	- Reduction of warm-up time (Energy saving) - Reduction of CO2 emissions		
3. IH QSU	- Reduction of warm-up time (Energy saving) - Reduction of CO2 emissions		
4. Paper-saving features	Allows documentation to be managed digitally, cutting down on paper consumption. Improves machine productivity when printing out duplex (double-sided) images.	○	○
5. High-speed duplex copying	Improves machine productivity when printing out duplex (double-sided) images.	○	○
6. Ozone reduction design	- Low ozone emissions	○	○
7. PxP (polymerized) toner	- Energy saving - Conservation of materials/resources (reduced toner consumption)		
8. Noise reduction design	- Low noise	○	○
9. Minimization of harmful substances	- Minimization of harmful substances	○	○
10. Environmentally-friendly toner bottle	- Conservation of materials/resources	–	–
11. Toner recycling	- Conservation of materials/resources		
12. Recycle-friendly design	- Conservation of materials/resources	○	○

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- This slide explains what technologies are used for conserving the environment in this product.

Brief Descriptions of the Technologies

- **1. QSU (Quick Start-up)**
  - This technology reduces both the amount of energy consumed while in Standby mode (the Ready condition) is reduced, as well as the time it takes for the machine to warm up to the Read condition.
  - This is made possible through the utilization of dual fusing lamp heating, low fusing point toner, a pressure roller with a "sponge" surface layer, and a thin surface layer hot roller.
- **2. Hybrid QSU**
  - This technology adds a capacitor to conventional QSU Technology, which allows the benefits of reduced energy consumption and reduced warm-up time described above to be extended to high-speed machines.

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No additional notes

Brief Descriptions of the Technologies

- **3. IH QSU**
  - This technology incorporates IH (Inductance Heating) technology into conventional QSU technology, which allows the benefits of reduced energy consumption and reduced warm-up time to be extended to color machines.
- **4. Paper-saving features**
  - 1) The duplex (double-sided) and Combine features reduce paper consumption.
    2) The Document Server and other electronic document management features reduce paper consumption by offering an electronic method for storing and managing important documents.

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No additional notes

Brief Descriptions of the Technologies

- **5. High-speed duplex copying**
  - 1) Enables high-speed duplex printing through the utilization of the Duplex Interleaf and high-speed Inverter Transport features.
  - 2) Enables quick printing of duplex jobs through the use of Duplex Scanning.
- **6. Ozone reduction design**
  - Greatly reduces the machine's ozone emissions to near-zero levels by utilizing:
    1) A charge roller/belt instead of a corona wire
    2) An image transfer roller/belt instead of a corona wire-based transfer system

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No additional notes

Brief Descriptions of the Technologies

- **7. PxP (polymerized) toner**
  - "PxP toner" is a fine-particle, polyester resin based toner, manufactured using a Ricoh-original polymerization method instead of the conventional pulverization method.
  - This allows the toner to fuse at a lower temperature, which reduces the impact on the environment and contributes to achieving even higher image quality than before.
  - PxP toner also has other benefits, including a reduction in the amount of toner needed to develop the image, as well as an approximate 35% reduction in CO_2 emissions during the toner manufacturing process.

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No additional notes

Brief Descriptions of the Technologies

- **8. Noise reduction design**
  - 1) The machine and its components are designed to minimize the overall noise generated by the machine. As a result, all noise levels conform to the local laws and regulations as well as user requirements in each market in which the products are sold.
  - 2) Reduces the noise generated by the polygon mirror motor.
- **9. Minimization of harmful substances**
  - 1) Products sold in the EU conform to the RoHS Directive.
  - 2) Products sold in China conform to China's version of the RoHS Directive.
  - 3) In addition, Ricoh imposes strict internal standards for limiting the presence of harmful substances.

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No additional notes

Brief Descriptions of the Technologies

- **10. Environmentally-friendly toner bottle**
  - A changeover from PS/PP/HDP to PET plastics allows approximately 40 percent by weight of the toner bottle to be recycled, and also reduces CO_2 emissions that occur during the toner bottle manufacturing process.
- **11. Toner recycling**
  - Enables effective use of resources by recycling (reusing) the toner left over on the drum surface after image transfer.
- **12. Recycle-friendly design**
  - To maximize the recycling ratio of machine and component materials, as well as the ease of performing the recycling in the field, machine sections and components are designed so that the recyclable parts can be separated out easily.
  - In addition, components are designed so that they can be reused for as long as possible after the machine has reached its operational lifetime.

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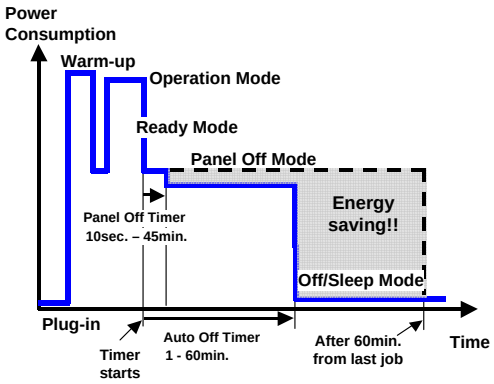
No additional notes

2. Energy Saving

2.1 Overview – 1



Energy Saver Modes	Description
Energy Saver Mode (Panel Off)	Panel off and lower the fusing temperature.
Sleep Mode	No power is supplied to the printing engine, and almost none to the controller.

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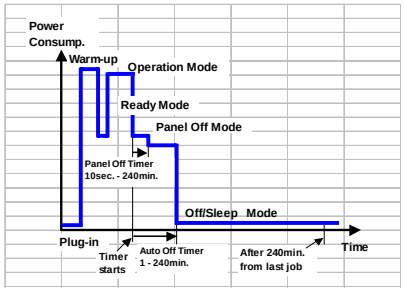
- When the machine is not being used, the machine enters energy saver mode to reduce the power consumption by turning off the LCD of the operation panel and lowering the fusing temperature.
- The area shaded green in this diagram represents the amount of energy that is saved when the timers are at the default settings. If the timers are changed, then the energy saved will be different. For example, if the timers are all set to 60 minutes, the green area will disappear, and no energy is saved before 60 minutes expires.

- In this model, there is no Off Mode, because a printer unit is built in. Sleep mode is used instead. Also, there is no Low Power Mode.

2. Energy Saving
2.2 Overview – 2 (System Settings)



1) Timer settings and recovery time (System settings => Timer setting)

Mode	Timer	Defult	Setting range	Recovery time
Panel off Mode	Panel Off Timer	10 sec.	10 sec to 45 min.	10 sec.
Off/Sleep Mode	Auto Off Timer	1 min.	1 to 60 min.	15 sec.

Specified values for timers	Panel Off	Auto Off
Panel Off > Auto Off	Can start	Can start
Panel Off = Auto Off	Cannot start	Can start
Panel Off < Auto Off	Cannot start	Can start

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- The user can set these timers with Menu key
  : Menu key > System settings > Energy Saver Timer
- Normally, Panel Off timer < Auto Off timer.
- But, for example, if Auto Off timer < or = Panel Off timer, the machine goes immediately to Off mode when the Auto Off timer expires. It skips the Panel Off modes.
- Example
  - Panel off: 5 minute
  - Auto Off: 5 minute
  - The machine goes to Off mode after 5 minute. Panel Off and Low Power modes are not used.
- We recommend that the default settings should be kept.
  - If the customer requests that these settings should be changed, please explain that their energy costs could increase, and that they should consider the effects on the environment of extra energy use.
  - If it is necessary to change the settings, please try to make sure that the Auto Off timer is not too long. Try with a shorter setting first, such as 30 minutes, then go to a longer one (such as 60 minutes) if the customer is not satisfied.
  - If the timers are all set to the maximum value, the machine will not begin saving energy until 60 minutes has expired after the last job. This means that after the customer has finished using the machine for the day, energy will be consumed that could otherwise be saved.
  - If you change the settings, the energy consumed can be measured using SP8941, as explained later in this presentation.

2. Energy Saving
2.2 Energy Saver Mode: Condition of LEDs

❑ Condition of LEDs on the operation panel

Mode	Operation Switch LED	Energy Saver LED	Main Power LED
Panel off Mode	-	-	On
Off/Sleep Mode	-	-	OFF

Panel off mode: LCD display is shaded.
Sleep mode: “Energy Saver mode” is displayed in the operation panel LCD.

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No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Panel Off Mode – 1

- **The machine enters panel off mode when one of the following is done.**
  - The panel off timer runs out after the last job.
    - » The panel off timer is controlled by User Tools: Menu key > System > Panel Off
- **The machine is still in the stand-by (ready) condition, but turns off the LCD of the operation panel.**
- **The machine recovers to the ready condition if one of the following occurs:**
  - The user touches the operation panel
  - The front cover is opened or closed

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2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 1

- **Sleep mode is used instead of auto off mode.**
- **The machine enters sleep mode when one of the following is done.**
  - The auto off timer runs out after the last job.
- **When the machine enters sleep mode, no power is supplied to the printing engine, and almost none to the controller.**
- **Recovery time**
  - Less than 15 seconds

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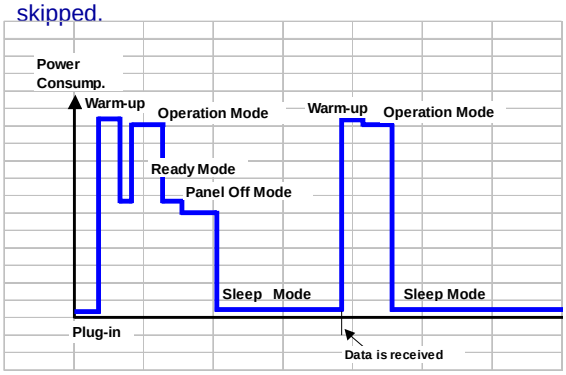
No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 2

- **The machine recovers to the ready condition:**
  - **If data is received**
    - » After warm-up, the job starts, but the operation panel stays dark.
    - » Then, after the job is completed, the machine returns to sleep mode immediately. Panel Off and Low Power modes are skipped.



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No additional notes

2. Energy Saving

2.3 Energy Save Effectiveness – 1

- **With the data from SP 8941:Machine Status, and the power consumption values from the specifications, we can estimate the amount of energy that is used by the machine.**
  - 8941-001: Operating mode
  - 8941-002: Standby mode
  - 8941-003: Panel off mode
  - 8941-005: Off/sleep mode
- **This should only be used as a reference value, because the power consumption specifications are measured in a controlled environment with a constant power supply.**
- **To get an exact measurement at the customers site, a watt meter must be used to measure the actual energy consumed.**

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No additional notes

2. Energy Saving

2.3 Energy Save Effectiveness – 2

(1) At the start of the measurement period, read the values of SP 8941:001-005 (Machine Status).

(2) At the end of the measurement period,read the values of SP 8941:001-005 (Machine Status).

(3) Find the amount of time spent in each mode.
(Subtract the earlier measurement from the later measurement and convert the result to hour.)

(4) Power consumption figures for each model are acquired from "Publication System of MSDS_&_PEI (PRODUCT ENVIRONMENT INFORMATION)" database.
Example:

Mode/condition	Power consumption:
Operating mode	525 W
Ready mode (Stand-by)	62 W
Panel off mode	5.5 W
Off/Sleep mode	4.5 W

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No additional notes

2. Energy Saving

2.3 Energy Save Effectiveness – 3

(5) Multiply this by the power consumption spec for each mode and convert the result to kWh (kilowatt hours)

(6) This is a simulated value for power consumed.

Example calculations:

Mode /condition	SP8941: Machine Status	Time at Start (min.) ①	Time at End (min) ②	Running time (hour) (②－①)/60＝③	Power Consumption Spec.(W) ④	Power consumption .(KWH) (③×④)/1000＝⑤
Operating	001: Operating Time	21089	21386	5.0	525.0	2.60
Stand by (Ready)	002: Standby Time	306163	308046	31.4	62.0	1.95
Energy save	003 Energy Save Time	71386	75111	62.1	42.0	2.61
Off/Sleep (Panel Off)	005: Off mode Time	508776	520377	193.4	4.5	0.87
Total⑥						8.02

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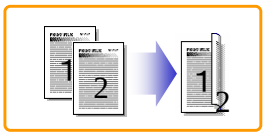
No additional notes

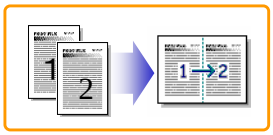
3. Paper Saving

3.1 Measuring the Paper Consumed – 1

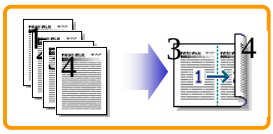
1. Duplex: Reduce paper volume in half!



2. Combine: Reduce paper volume in half!



3. Duplex + Combine: Using both features together can further reduce paper volume by 3/4!



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No additional notes

3. Paper Saving
3.1 Measuring the Paper Consumed – 2

- **To check the paper consumption, look at the total counter and the duplex counter.**
  - Total counter : SP 8581 001
  - Single-sided with combine mode : SP 8421 004
  - Duplex with combine mode : SP 8421 005
- **The total counter counts all pages printed.**
- **The duplex and combine counter counts all pages printed with duplex and combine mode.**

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No additional notes

3. Paper Saving

3.1 Measuring the Paper Consumed – 3

- **How to calculate the paper reduction ratio, when compared with Single-sided copying, with no 2-in-1 combine mode**
- **Paper reduction ratio (%) = Number of sheets reduced: A/Number of printed original images: B x 100**
  - Number of sheets reduced: A
    = Output pages in duplex mode/2＋ Number of pages in Single-sided with combine mode + Number of pages in Duplex with combine mode x 3/2
    A = (②)/2 + ⑤+⑥ x 3/2
  - Number of printed original images: B
    = Total counter＋ Number of pages in Single-sided with combine mode ＋ Number of pages in Duplex with combine mode
    B = ①+⑤+⑥

① **Total counter**	**: SP 8581 001 (pages)**
② **Single-sided with duplex mode**	**: SP 8421 001 (pages)**
⑤ **Single-sided with combine mode**	**: SP 8421 004 (pages)**
⑥ **Duplex with combine mode**	**: SP 8421 005 (pages)**

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In the above formula:

- Sheet: A sheet of paper
- Page: A side of a sheet of paper. In duplex mode, one sheet is two pages
  - Output page: One side of a sheet of output paper
- Original Image: An image of one original page (or, an image of one side of a two-sided original)
  - For one sheet of output paper in two-in-one copying, four original pages are copied onto two output pages.

End of Course

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