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MODEL SH-MF1 TRAINING
Machine Codes: M052/M053/M054

Version 1.0

Slide 1

- This course is for the SK-MF1 series of copiers.

Modifications

- Started 12 January 2011.
- Release version -- 8 March 2011.

Course Contents

- Product Outline
  - Introduction
  - New Features
  - Specifications
  - Options
- Installation
- Transporting the Machine
- Maintenance
- Machine Overview
- ARDF
- Scanner
- Paper Feed
- Laser Exposure
- All In One Cartridge (AIO)
- Fusing
- Paper Exit
- Duplex
- Optional Paper Tray Units (M375, M376)
- Internal Finisher (M054 only)
- One-bin Tray (M053 only)
- Environmental Conservation

Slide 2

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PRODUCT OUTLINE

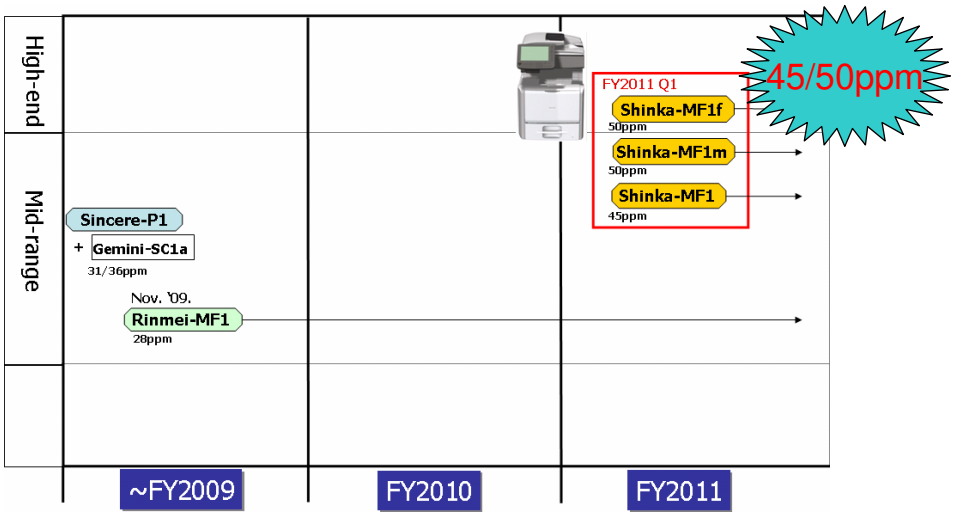
Introduction

Slide 3

No additional notes

Machine Concepts

❑ Product Placement



❑ Concepts

1. There is not a predecessor model. (New engine)
2. New AIO was developed to achieve B&W 45/50ppm.
3. User install & User maintenance.

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No additional notes.

How many Models?

- **Three models**
  - SH-MF1: basic model
    - » Copy
    - » Print
    - » Scan
  - SH-MF1m: fax model
    - » Copy
    - » Print
    - » Scan
    - » Fax
    - » 1-Bin tray
  - SH-MF1f: finisher model
    - » Copy
    - » Print
    - » Scan
    - » Internal finisher

Name Table

Model	Code	Product Names
SH-MF1	M052	SP5200S/ Aficio SP5200S
SH-MF1m	M053	SP5210SF/ Aficio SP5210SF
SH-MF1f	M054	SP5210SR/ Aficio SP5210SR

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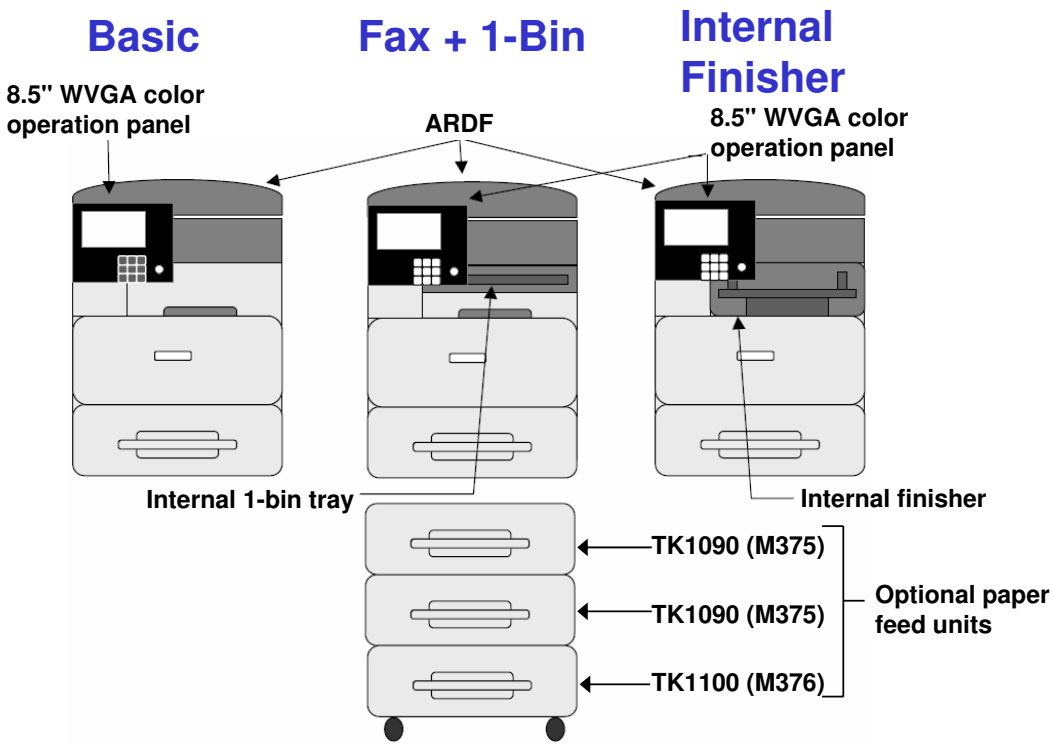
- SH-MF1m: **m** = modem
  SH-MF1f: **f** = finisher

Configuration

- Here are the three model configurations.



Slide 6

- The ARDF, internal finisher, and operation panel are the same as those used on the Model Z-C1 series.
- All three models come with one paper tray.
- If installed on the floor, up to three paper feed units can be added as options with a maximum of two TK1090 units. The lowermost paper feed unit must be TK1100 (has casters).
- If installed on a desk/table only one TK1090 unit can be installed.
- The standard paper tray and the paper feed units all hold 550 sheets of paper (80 g/m^2).

Equipment, Functions & Features (1)

Function/Feature	Code	Basic Model (M052)	1-Bin + Fax Model (M053)	Finisher Model (M054)
ARDF	-	Standard	Standard	Standard
Printer/Scanner	-	Standard	Standard	Standard
One-bin Tray	-	N/A	Standard	N/A
Internal Finisher	-	N/A	N/A	Standard
Security Card (1)	-	Standard	Standard	Standard
SD/USB card slots	-	Standard	Standard	Standard
Fax option type SP5200	M381	Option	Standard	Option
Memory unit type B (Fax SAF memory)	G578	Option	Option	Option
Paper feed unit TK1090	M375	Option	Option	Option
Paper feed unit TK1100	M376	Option	Option	Option
PS3/PDF direct print	-	Standard	Standard	Standard
NIC, USB 2.0, USB host	-	Standard	Standard	Standard
HDD (128 GB), 1 GB memory	-	Standard	Standard	Standard
Gigabit Ethernet board type A	G874	Option	Option	Option
IEEE 802.11a/b/g type J, K (2)	D377	Option	Option	Option

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- This slide shows some of the available equipment for each model.
  - (1) Combined data overwrite security unit and HDD encryption.
  - (2) Wireless LAN
- N/A = Not available (cannot be installed)

Equipment, Functions & Features (2)

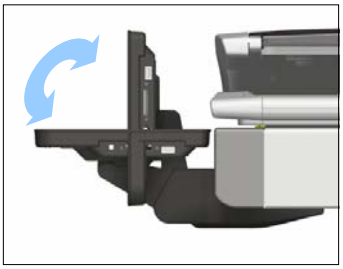
Function/Feature	Code	Basic Model (M052)	1-Bin + Fax Model (M053)	Finisher Model (M054)
Browser unit type E	D430	Option	Option	Option
IPDS unit type 5210	D571	Option	Option	Option
Copy data security unit type F	B829	Option	Option	Option
File format converter type E	D377	Option	Option	Option
Bluetooth interface unit type D (USB type)	D566	Option	Option	Option
Key card I/F	-	Option	Option	Option
VM card	-	Standard	Standard	Standard

Slide 8

- This slide shows more of the available equipment for each model.
- This machine is compatible with Remote communication gate type A (D459).

Operation Panel

[Tilt Operation Panel]



On M053 and M054 units, the panel can be tilted for better viewing.
(The panel cannot be adjusted on M052 units.)

- **8.5-inch color LCD**

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- This is the same operation panel as used by Model Z-C1 series (M022/M024/M026/M028).

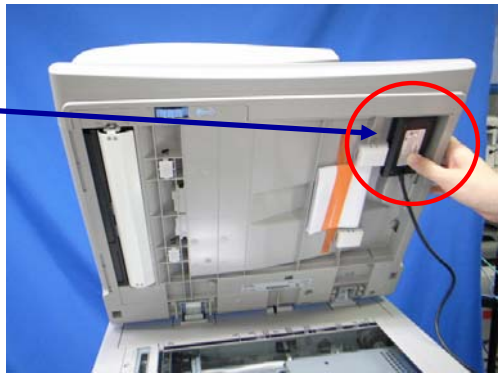
Internal Finisher

- Standard equipment for the finisher models, but not available as an option for the standard models.
- The staple cartridge can be changed easily.

Slide 10

No additional notes.

Installing the Card Reader



- **Space for installing a card reader is shown above.**

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- The IC card reader is not supplied by Ricoh and must be procured locally.
- Card Authentication Package (CAP) will be available as option after SH-MF1 is released.

Product Outline

New Features

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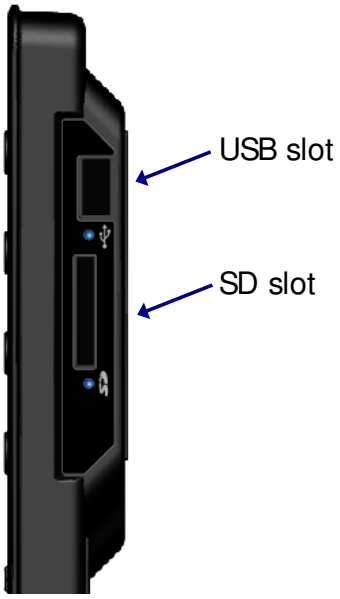
No additional notes

Print from Media (USB/SD)

- This function enables users to print data stored in USB memory devices or SD cards directly by plugging them into slots on the operation panel.
- There is no need to use a PC.
- This is especially useful for printing in public places such as airports or libraries.



Operation Panel: side view

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- In most previous models, the USB/SD card slots could only be used for scanning data to an SD card or USB device.
- However, in this product, it is also possible to print from data stored on an SD card or USB device.
- Though standard, this feature can be turned off by the administrator.

SPs Related to Media Print

- **SP1-110-001 Media Print Function Setting**
  - 0: Disable
  - 1: Enable (default)
  - Note: For other models such as AP/AT-C2.5 or DI-C1.5, the default of this SP is 0 because media print is an option for these machines.
  - The SD card must be formatted with FAT16 or FAT32 (media formatted with NTFS is not supported)
- **Supported Media**
  - USB formatted to FAT16 or FAT32
  - SD card formatted to FAT16 or FAT32
  - Note: Media formatted to NTFS (other than FAT16 or FAT32) is not supported.
- **Supported File Formats**
  - PDF (including High compression PDF and Encrypted PDF)
  - JPEG
  - TIFF

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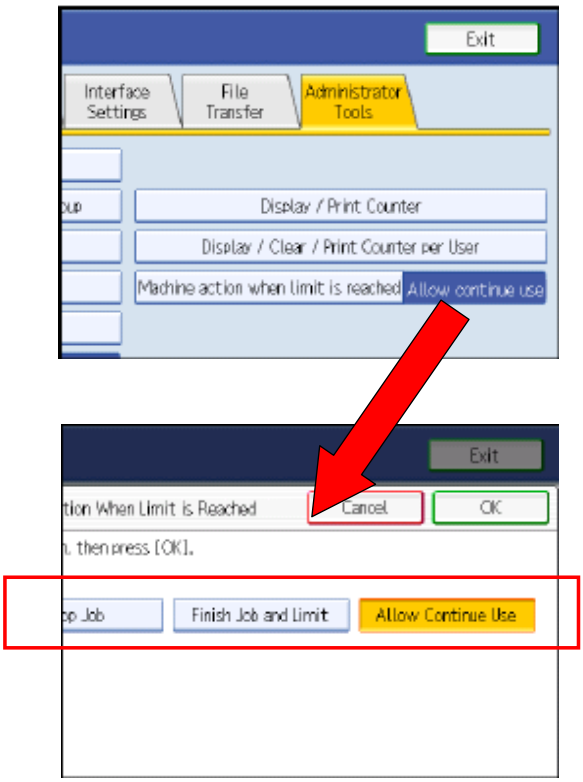
- SP1-110-001 is set to “1” by default because the media print function is standard. On some earlier machines (examples: AP/AtC2.5, DI-C1.5) it was an option.

User Account Limiting (Quota Setting)

- **This function allows the customer to set limits on the number of outputs for each individual user or group.**
- **The following applications can be managed with this function.**
  - Copy
  - Print (including "Print from USB/SD")
  - Document Server
  - SDK
  - Fax related jobs and "Mail to Print" jobs can't be limited.
- **User authentication must be enabled.**
- **Possible Settings**
  - Stop Job: When the maximum print volume is reached, both the current job and waiting jobs are canceled.
  - Finish Job and Limit: When the maximum print volume is reached, the current job is allowed to finish, but waiting jobs are canceled.
  - Allow Continue Use (Default setting): Print volume is not limited.

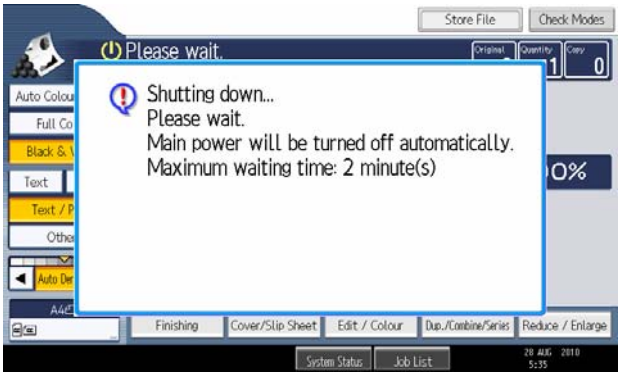


Slide 15

❒ By being able to manage and set limits on the number of outputs, the administrator will be able to understand the usage of each individual and/or group and to reduce the level of unnecessary output. This can reduce TCO and reduce environmental impact.

Safe Shutdown

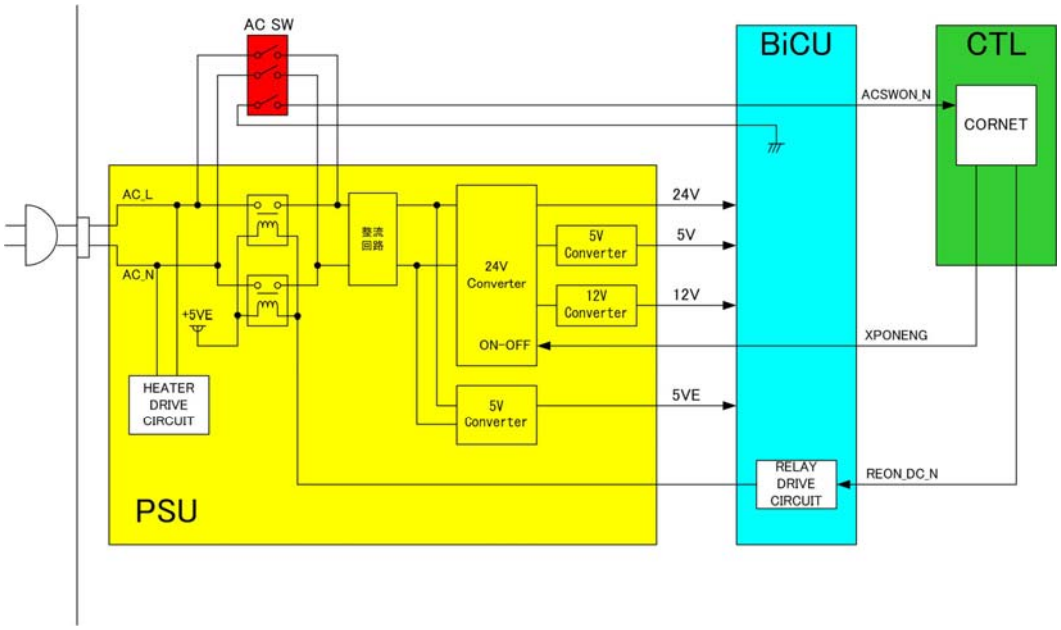
- In this machine, a power relay drive circuit protects the HDD unit.
- After the main power switch of the machine has been turned off, the relay drive circuit keeps the power supply to the controller until the HDD unit has been shutdown safely.
- When shutting down from normal stand-by mode, and the safe shutdown takes more than 2 minutes, there is a problem with the controller board. It may be necessary to replace this board.



Slide 16

No additional notes.

Safe Shutdown Circuit



❑ **This diagram shows the safe shutdown circuit.**

(More details in notes below.)

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- ❒ After the AC switch is turned on, the relay turns on at about the same time that the software starts up.
- ❒ When the AC switch is turned off, the controller detects the change in the state of the ACSWON_N signal.
- ❒ The controller shuts down the hard disk drive in a safe manner.
- ❒ Then the controller sends a signal (REON_DC_N) to turn off the relay.

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PRODUCT OUTLINE

Specifications

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This section explains the important specifications.

Specifications 1

- **Copy/Print Rate**
  - SH-MF1: 45 cpm (A4), 47 cpm (LT)
  - SH-MF1m/MF1f: 50 cpm (A4), 52 cpm (LT)
- **First Copy Time**
  - 10 seconds or less (A4/LT SEF)
- **First Print Time**
  - 7.5 seconds or less (A4/LT SEF)
- **Warm-up Time (from main switch on)**
  - 20 seconds or less
- **Max Power Consumption**
  - Less than 950W
- **Max Paper Size**
  - A4/LT

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- The speed difference (45 cpm vs 50 cpm) is due to marketing request. It is controlled by firmware. (different controller)

Specifications 2

- **Paper Feed Capacity (LT/A4, 80g/m²)**
  - Standard Tray: 550 sheets
  - Optional Trays: 550 sheets each (up to 3)
  - Bypass tray: 100 sheets
- **Paper Output Capacity (LT/A4 , 80g/m²)**
  - SH-MF1: Up to 500 sheets
  - SH-MF1m: Up to 600 sheets
  - SH-MF1f: Up to 250 sheets
- **Paper Weight**
  - Standard Tray, Optional Trays, By-pass Tray: 52-220 g/m², 14-59 lb
  - Duplex: 60-163 g/m², 16-44 lb
- **Resolution**
  - Scanning: Book – 600 x 600 dpi, ARDF – 600 x 300 dpi
  - Printing: 600 x 600 dpi

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❒ For additional and more detailed specifications, see the FSM.

Reliability Targets

- Average Print/Copy Volume per month: 5.5k
- Maximum Print/Copy Volume per month: 15K
- Installation Time Estimation: 15 minutes
- MPBF (Mean Prints/Copies Between Failure):
  - M052/M053: 98 K
  - M054: 70 K
- Machine Life: 900k or 5 years

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No additional notes

Product Outline

Options

Slide 22

No additional notes

Optional Units

- **Paper handling options**
  - One TK1100 550-sheet paper feed unit (with casters)
  - Up to two TK1090 550-sheet paper feed units (without casters)
- **Controller options**
  - Fax Option Type SP5200: New
  - Memory Unit Type B (32MB), for fax: Used in many other models
  - One of the following wireless LAN units:
    - » IEEE802.11a/g Type J: Same as Z-C1, AP-C2.5, etc.
    - » IEEE802.11g Type K: Same as Di-C1
  - Gigabit Ethernet Type A: Same as Di-C1
  - File Format Converter Type E: Same as Z-C1, AP-C2.5, etc.
  - Copy Data Security Unit Type F: Same as Z-C1, V-C3, etc.
  - Browser Unit Type E: Same as Di-C1, AP-C2, etc.
  - IPDS Unit Type 5210: New
  - Bluetooth Interface Unit Type D: New
  - Remote Communication Gate A: Same as Z-C1

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- Wireless LAN, Gigabit Ethernet, and File Format Converter cannot be installed together. (Only one installation slot)

User Installable vs Service Installable Options

	Location
● User installable options	
Wireless LAN IEEE802.11a/g Type J	I/F slot
Wireless LAN IEEE802.11g Type K	I/F slot
Gigabit Ethernet Type A	I/F slot
File Format Converter Type E	I/F slot
● Service installable options	
Fax Option Type SP5200	Controller Box
Memory Unit Type B (32MB)	Controller Box
Copy Data Security Unit Type F	Insert to Board
Browser Unit Type E	SD card
IPDS Unit Type 5210	SD card
Bluetooth Interface Unit Type D	USB

Slide 24

- Wireless LAN, Gigabit Ethernet, and File Format Converter cannot be installed together. (Only one installation slot)
- Refer to the previous slide for information on which options are new and which are common with other products.

Optional Paper Trays

- You can install up to three optional paper trays.
- The bottom tray must be TK1100 because it has casters. Stabilizers must also be attached, as shown.

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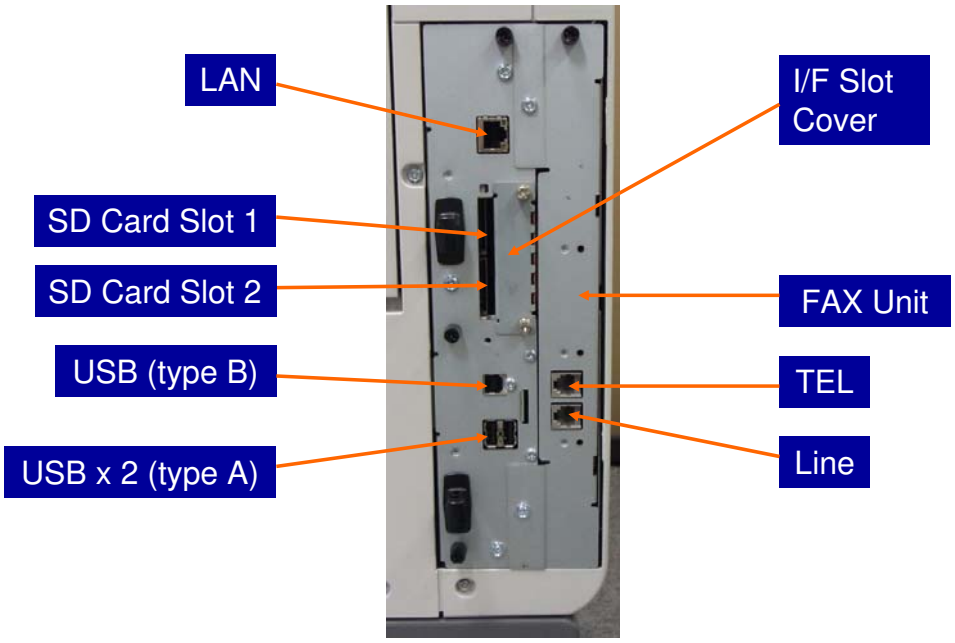
No additional notes

Slots/Plugs for Controller Options



- **One of three options can be installed in the I/F slot -- Wireless LAN, Gigabit Ethernet, or File Format Converter.**

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- The SD Card slots are discussed in more detail on the next few slides.
- Remove the plate to install the wireless LAN or a Gigabit Ethernet unit.

SD Card Slots

- **Slot 1 (upper slot)**
  - Contains the Security SD Card when shipped
    - » The Security SD Card contains the Data Overwrite Security unit and HDD Encryption Unit.
  - Used for running programs (including the IPDS application)
- **Slot 2 (lower slot)**
  - Empty when shipped; contains the VM card after the machine's installation procedure.
  - Use this slot for service procedures, such as firmware update and NVRAM backup.
  - Also use this slot to install programs to the HDD (Browser Unit for example).

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❒ The IPDS application must be copied to the Security SD card for use.

Removing the VM Card

- To remove the VM card with an active application such as App2Me, just turn off the machine in the normal safe way (first operation switch, then main power switch), then pull the card out.
- The procedure used for previous models with App2Me (V-C3, AL-C1.5, R-C5.5) is recommended.

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No additional notes.

Installation

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- The installation procedure is quite simple. Follow the instructions in the service manual.
- This presentation will only explain notable points or steps that need more explanation.

SMC Sheet

- The SMC sheet is under the platen cover in the ARDF.

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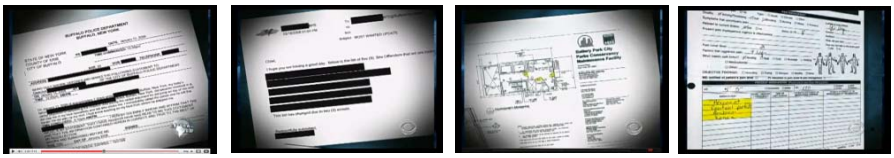
No additional notes

Security & Encryption Unit Background

- **Until now, HDD encryption and data overwrite security have been options for MFPs.**
- **However, in response to the following, it was decided to make these options standard on MFPs.**
  - On 19th May, I sent an e-mail to you regarding the news report by CBS in US about the risk of information leakage from hard drive on MFP. After that, RCL have been studying what actions should we take for the news report. Now I would like to give you the Ricoh's direction of the actions as below for you to follow.

http://www.cbsnews.com/video/watch/?id=6412572n&tag=contentBody;featuredPost-PE



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No additional notes

Security & Encryption Unit
Action

- **Objectives**
  - To let customers use Ricoh MFPs/Printers without security concerns caused by information leakage from the hard drives of their products. Through these actions, we hope to increase customer retention and product competitiveness, and avoid unnecessary legal challenges from customers.
- **Action Plan**
  - To standardize the Data Overwrite Security feature and the HDD Encryption feature on all future MFPs/Printers.

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No additional notes

Security & Encryption Unit Installation

- **The machine contains the Security SD Card (Security and Encryption Unit) in Slot 1 (upper), when shipped.**
  - It is already installed. The technician does not need to do anything.
- **If the user wants to use HDD encryption, they must enable it with user tools.**
  - For details: See Operating Instructions > Security Reference > 5. Securing Information Sent over the Network or Stored on Hard Disk > Encrypting Data on the Hard Disk

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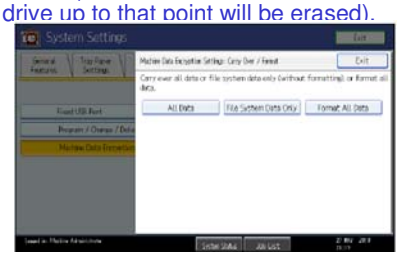
No additional notes

Security & Encryption Unit Installation

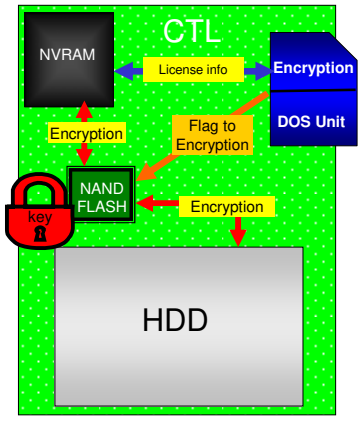
- **If you are installing a new machine, it is recommended to activate the Security Unit by selecting "Format All Data".**
- **Note:** This method is recommended because there is no user data on the hard drive yet (Address Book data, image data, etc.).
- **If the customer wishes to activate the Security Unit on a machine that is already running, it is recommended to activate the unit by selecting "All Data".**
- **IMPORTANT:** Selecting **"All Data"** will preserve the data that has already been saved to the hard drive. (If "Format All Data" is selected, all user data saved to the hard drive up to that point will be erased).



Slide 34

No additional notes

Security & Encryption Unit Mechanism



- SD card and NVRAM : License information linkage
- NAND FLASH on CTL: Encryption key is generated
- CTL and HDD: Encryption is created the dependence of both CTL and HDD
- CTL and NVRAM : Encryption is created the dependence of both CTL and NVRAM

- Encryption creates interdependence between CTL, HDD, NVRAM and SD card

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No additional notes

Security & Encryption Unit Troubleshooting

- **The following slides explain troubleshooting for the following symptoms:**
  - SC 861 to 865 (defective HDD)
  - Any SC that indicates a defective controller board
  - 'Please wait' remains on display
- **Replace the SD card and NVRAM if any of the following occurs:**
  - SC866 and SC868
  - 'This SD card is already installed' appears on the display

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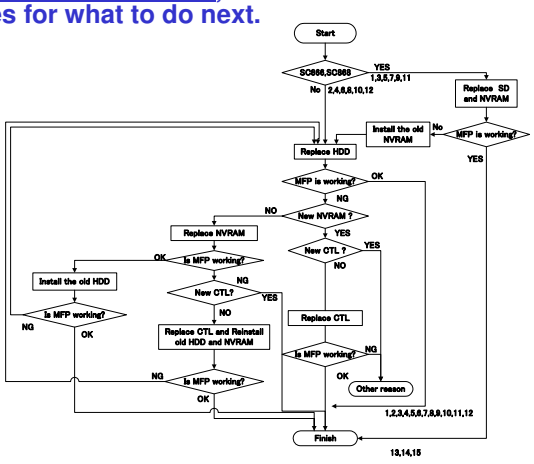
No additional notes

Security & Encryption Unit Troubleshooting

- To determine which parts are causing the problem, test the machine using this flow chart.
- After you have finished with this flow chart, put the original parts back in the machine, then see the tables on the next slides for what to do next.



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Note: The flow chart is for the Z-C1. An RTB will be issued, updating the chart for the SH-MF1. (The flow is basically the same.)

Security & Encryption Unit Troubleshooting

- **This table shows what to do in each case.**
  - For example, if only the controller and HDD were found to be defective, then it is case 4.

- **Table 1: Encryption Off**

CTL	HDD	NVRAM	SD Card	Action	No
X	X	X	X	Replace CTL・HDD・SDCARD/NVRAM	1
X	X	X	(X)	Replace CTL・HDD・SDCARD/NVRAM	2
X	X	(X)	X	Replace CTL・HDD・SDCARD/NVRAM	3
X	X	O	O	Replace CTL・HDD	4
X	O	X	X	Replace CTL・SDCARD/NVRAM	5
X	O	X	(X)	Replace CTL・SDCARD/NVRAM	6
X	O	(X)	X	Replace CTL・SDCARD/NVRAM	7
X	O	O	O	Replace CTL	8
O	X	X	X	Replace HDD・SDCARD/NVRAM	9
O	X	X	(X)	Replace HDD・SDCARD/NVRAM	10
O	X	(X)	X	Replace HDD・SDCARD/NVRAM	11
O	X	O	O	Replace HDD	12
O	O	X	X	Replace SDCARD/NVRAM	13
O	O	X	(X)	Replace SDCARD/NVRAM	14
O	O	(X)	X	Replace SDCARD/NVRAM	15

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Note: The table is for the Z-C1. An RTB will be issued, updating the table for the SH-MF1. (The information is basically the same.)

- O; Normal parts
- X: Defective parts, must replace
- (X): Not defective parts but must be replaced
  - If the SD card is replaced, the NVRAM must be replaced.
  - If the NVRAM is replaced, the SD card must be replaced.

Security & Encryption Unit Troubleshooting

❑ This table shows what to do in each case.

❑ Table 2: Encryption On

CTL	HDD	NVRAM	SD Card	Action	
X	X	X	X	Replace CTL・HDD・SDCARD/NVRAM	1
X	X	X	(X)	Replace CTL・HDD・SDCARD/NVRAM	2
X	X	(X)	X	Replace CTL・HDD・SDCARD/NVRAM	3
X	X	O	O	Replace CTL・HDD	4
X	O	X	X	Replace CTL・SDCARD/NVRAM, then the HDD is automatically formatted	5
X	O	X	(X)	Replace CTL・SDCARD/NVRAM, then the HDD is automatically formatted	6
X	O	(X)	X	Replace CTL, then restore the old encryption key, then replace SDCARD/NVRAM	7
X	O	O	O	Replace CTL, then restore the old encryption key	8
O	X	X	X	Replace the HDD, then restore the old encryption key, then replace SDCARD/NVRAM	9
O	X	X	(X)		10
O	X	(X)	X		11
O	X	O	O	Replace HDD, then restore the old encryption key	12
O	O	X	X	Restore the old encryption key, then replace SDCARD/NVRAM	13
O	O	X	(X)	Restore the old encryption key, then replace SDCARD/NVRAM	14
O	O	(X)	X	Restore the old encryption key, then replace SDCARD/NVRAM	15

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Note: The table is for the Z-C1. An RTB will be issued, updating the table for the SH-MF1. (The information is basically the same.)

O: Normal parts, X: Defective parts, must replace

(X): Not defective parts but must be replaced

- If the SD card is replaced, the NVRAM must be replaced.
- If the NVRAM is replaced, the SD card must be replaced.

Cases 1 to 4:

- The HDD is replaced so the old data is gone. The SD card is new, so a new encryption key is made. After you replace the parts, the user must enable encryption. The controller then makes a new encryption key. Then the machine prints the new encryption key.

Cases 5 and 6:

- The NVRAM is defective, so the encryption key cannot be restored, so the data on the HDD cannot be recovered. The HDD is formatted automatically.
- After you replace the parts, the user must enable encryption. The controller then makes a new encryption key. Then the machine prints the new encryption key.

Cases 7 and 8:

- The HDD is not defective but the data is encrypted, and there is no link between the HDD and the new controller, so the old encryption key must be restored to decrypt the data before the new encryption key is made. The NVRAM is normal, so the old encryption key can be restored (in cases 5 and 6, the NVRAM is defective so the old encryption key cannot be restored).
- After you restore the old encryption key (and replace the SD card and NVRAM in case 7), turn the machine power on. The user must then enable encryption. The controller then makes a new encryption key and encrypts the data on the HDD. Then the machine prints the new encryption key.

Cases 9 to 15

- The controller is not replaced, but there is no link between the old controller and the new parts, so the old encryption key must be restored, in the same way as for cases 7 and 8, before the user enables encryption and a new key is made.

Security & Encryption Unit Troubleshooting

❑ **Restoring the encryption key**

1. Prepare an SD card which is initialized.
2. Make the "restore_key"folder in the SD card.
3. Make an "nvram_key.txt"file in the "restore_key“ folder in the SD card.
4. Ask an administrator to input the encryption key (this has been printed out earlier by the user into the "nvram_key.txt"file.
5. Turn on the main power switch.
6. Confirm that the prompt on the LCD tells you to install the SD card (storing the encryption key) in the machine.
7. Turn off the main power switch.
8. Insert the SD card that contains the encryption key into slot 2.
9. Turn on the main power switch, and the machine automatically restores the encryption key in the flash memory on the controller board.
10. Turn off the main power switch after the machine has returned to normal status.
11. Remove the SD card from slot 2.

Slide 40

❒ The previous slide says that we have to restore the old encryption key sometimes. This slide shows the procedure.

❒ This procedure was in the AP-C2 service manual but was omitted from the AP/AT-C2.5 and Z-C1 manuals.

Security & Encryption Unit
Troubleshooting

- If the SD card and NVRAM are replaced, the HDD encryption unit and the Data Overwrite Security unit must both be re-installed after you complete the actions in the tables on the earlier slides (37, 38). See the procedures in the field service manual.

Slide 41

No additional notes.

Security & Encryption Unit Important

- **Immediately after encryption is enabled, the encryption setting process will take several minutes to complete before you can begin using the machine.**
  - If encryption is enabled after data has been stored on the disk, or of the encryption key is changed, this process can take up to three and a half hours.

Slide 42

No additional notes

Security & Encryption Unit Important

- The machine cannot be operated while data is being encrypted.
- Once the encryption process begins, it cannot be stopped.
- Make sure that the machine's main power is not turned off while the encryption process is in progress.
- If the machine's main power is turned off while the encryption process is in progress, the hard disk will be damaged and all data on it will be unusable.
  - The hard disk must be replaced. This is similar to case 5 in the troubleshooting tables.
- Keep the Encryption Key in a safe place.
- If the machine loses the Encryption Key due to damaged components, the controller board, hard disk, NVRAM and this SD Card must all be replaced at the same time.

Slide 43

No additional notes

Security & Encryption Unit Merging

- **Slot 1 (upper) contains the Security SD Card (Security and Encryption Unit) when shipped**
  - If you want to install one or more SDK applications, move them onto one SD card.
    - » Remove the security card from slot 1, and put the VM card in slot 1.
    - » Put the SD card with the SDK application into slot 2.
    - » Merge from slot 2 to slot 1. The VM card now has the SDK application on it.
    - » Then put the VM/SDK card in slot 2, and put the security card back in slot 1.

Slide 44

No additional notes

Transporting the Machine

Slide 45

No additional notes

Moving the Machine a Long Distance

- Do SP 4806-001 to move the scanner carriage from the home position.
- Make sure there is no paper left in the paper trays.
- Attach shipping tape to the covers and doors, or shrink-wrap the machine tightly.

Note: The machine may be moved either with or without an AIO installed.

Slide 46

No additional notes.

Maintenance

Slide 47

No additional notes

User/Service Maintenance

User Maintenance

- This product has been designed for user maintenance using Maintenance Kit SP5200.
- Maintenance Kit SP5200 components
  - Fusing unit (1)
  - Transfer roller (1)
  - Feed roller (5)
  - Friction pad (5)
- Expected yield of this kit is 120,000.
  Yield calculated based on:
  - A4 (LT) short-edge feed
  - 5% image coverage
  - 3 prints/job

Service Maintenance

- Maintenance Kit SP5200 components are available individually as service parts.

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- The use of Maintenance Kit SP5200 depends on local marketing and service policy.

Alert Display & Machine Condition

- **The table below shows the alert display for supply items.**

Maintenance Kit	Action	Alert timing	Near End Alert Timing	Machine condition at the end	Alert: (Meter click charge OFF, SP5930-1 set to 0, = default)		Alert: (Meter click charge ON, SP5930-1 set to 1)	
					Near end	End	Near end	End
Print cartridge (AIO)	Replace	25K prints	1250 prints before the end	Cannot print	Toner "Near End" message is shown	Toner "End" message is shown	Toner "Near End" message is shown (1)	Toner "End" message is shown (1)
Kit SP5200	Replace	120K prints	1250 prints before the end	Useable	Message is shown	Message is shown	Message is not shown (2)	Message is not shown (2)

- **The yield figures in the above table are based on the following conditions:**
  - A4 (LT) short-edge feed
  - 5% image coverage
  - The expected yield measurement for the Print Cartridge is based on ISO 19798.
- **(1) In addition to the toner Near End/End messages, you can also turn on drum yield Near End/End messages with SP5930-003. 0 = message shown, 1 = message not shown (Default: 1)**
- **(2) SP5930-002 sets the display for Kit SP5200 when meter click charge is ON. 0 = message shown, 1 = message not shown (Default: 1)**

Slide 49

No additional notes.

PM Parts

- Feed roller: 120k
- Fusing unit: 120k
- Transfer Roller: 120k
- Friction Pad: 120K

Slide 50

No additional notes.

PM Counter Reset

- **User Maintenance Mode (default)**
  - If the machine is set for user maintenance, all PM counters are automatically reset when maintenance kit parts are replaced.
- **Service Maintenance Mode (click charge set to ON with SP5930-001, and SP5067-001 set to 0)**
  - The fusing unit counter resets automatically.
  - The following counters must be reset manually using SP7804.
    - » All clear: SP7804-002
    - » Transfer roller: SP7804-004
    - » Feed roller: SP7804-005
  - You can do a forced reset of the fusing unit with SP7804-003. (Useful if using a rebuilt fusing unit.)

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- Refer to "New Fusing Unit Detection" in the fusing section of this course.
- SP5067-001 selects service maintenance or user maintenance. (1 = User maintenance, 0 = Service maintenance, default = 1)

Machine Overview

Components

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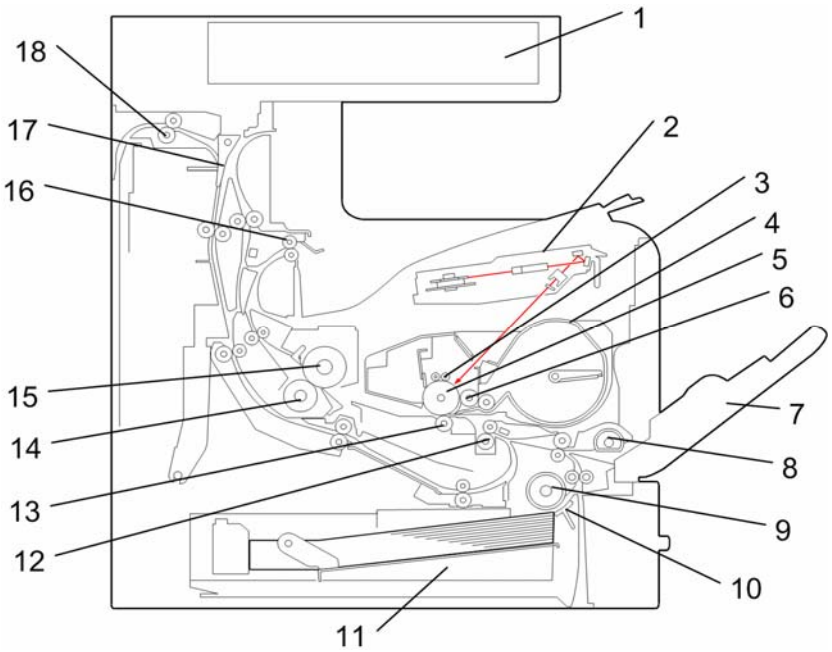
PURPOSE OF THE SECTION

In this section you will :

- ❒ Learn the locations of primary components
- ❒ Learn about the paper feed path

Component Layout

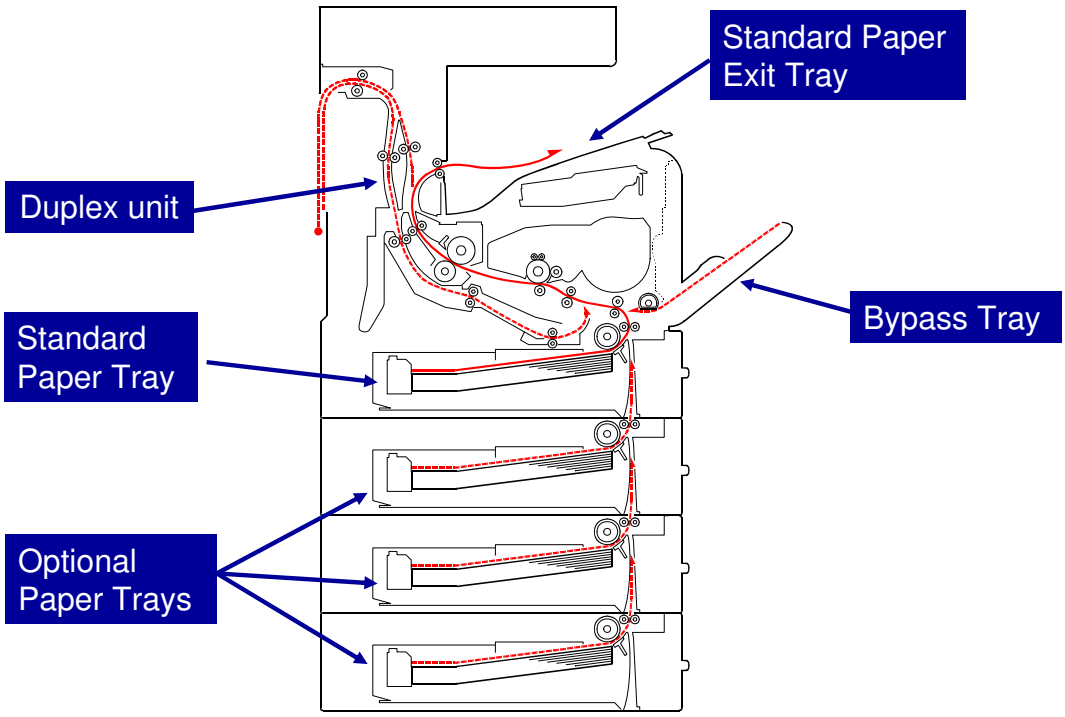
1. Scanner unit
2. Laser unit
3. Charge roller
4. Cartridge (AIO-type)
5. Drum
6. Development roller
7. By-pass feed tray
8. By-pass feed roller
9. Paper feed roller
10. Friction pad
11. Paper tray
12. Registration roller
13. Transfer roller
14. Pressure roller
15. Hot roller
16. Paper exit roller
17. Junction gate
18. Inverter roller



Slide 53

- This slide shows the major components. Details will be covered later.
- The AIO (all in one unit) contains the drum, charge rollers, toner, development mechanism, and drum cleaning mechanism.
- The 1-bin tray and internal finisher are not shown. Refer to the paper path illustrations on later slides.
- The scanner unit at 90 degrees to the paper path. See the scanner section later in this document for its components.

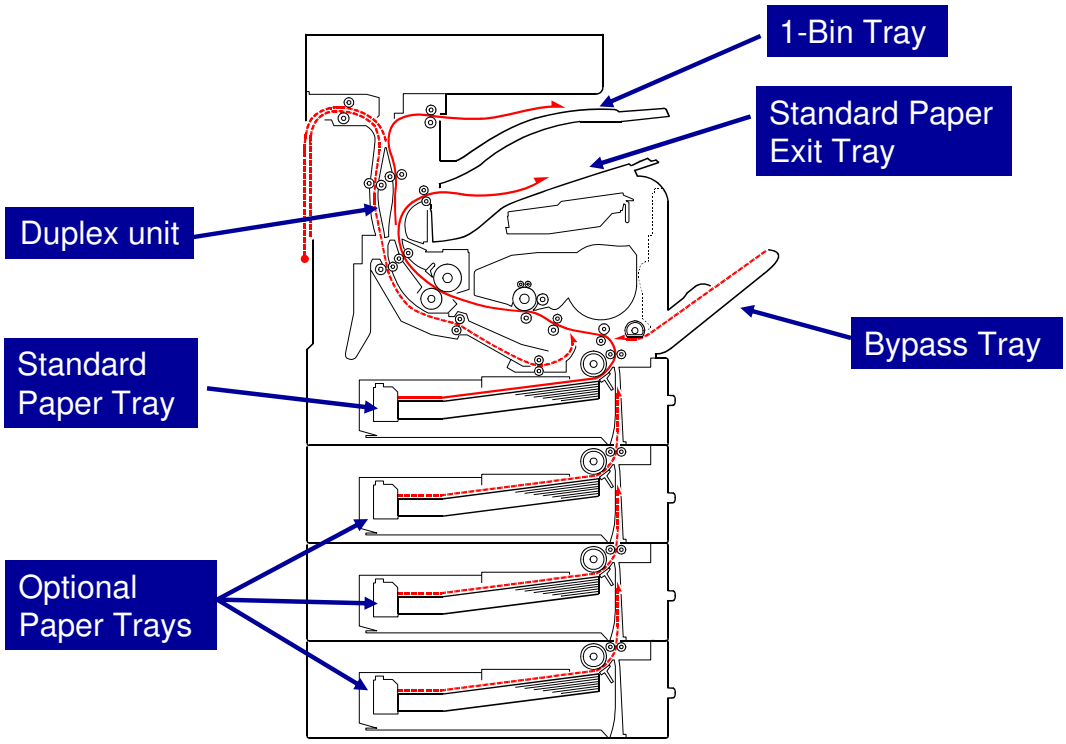
Paper Path – Basic Model



Slide 54

❒ This slide shows the paper path for the basic model (M052) with three optional paper trays installed.

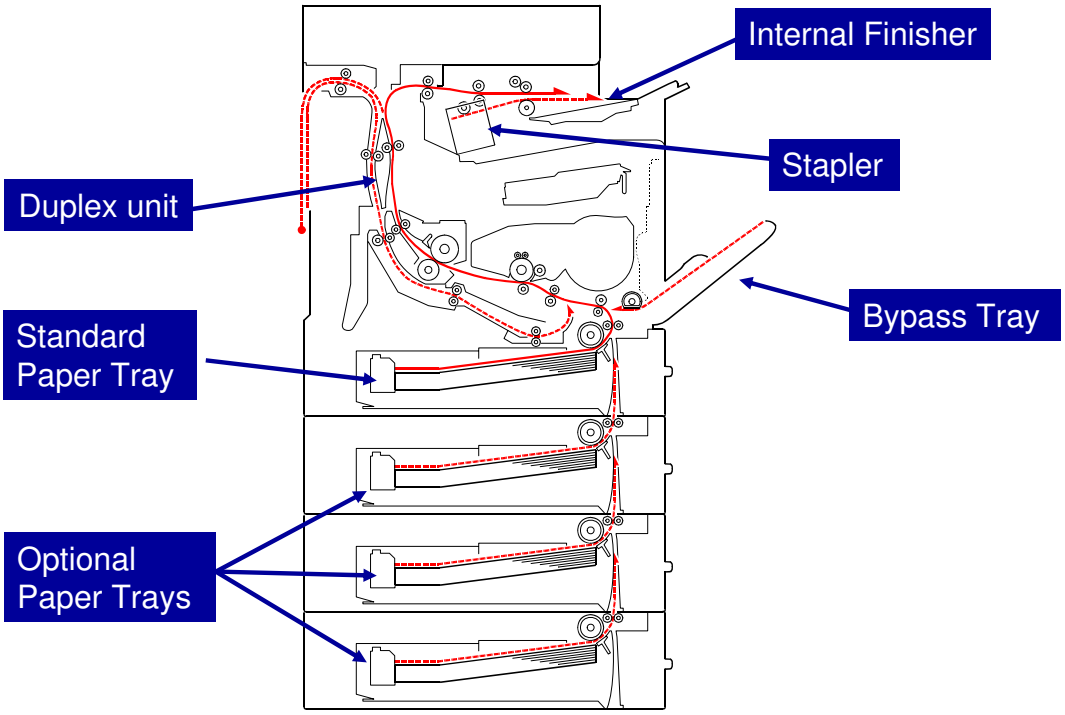
Paper Path – Fax + 1-Bin Model



Slide 55

- This slide shows the paper path for the Fax/1-Bin model (M053) with three optional paper trays installed.

Paper Path – Internal Finisher Model

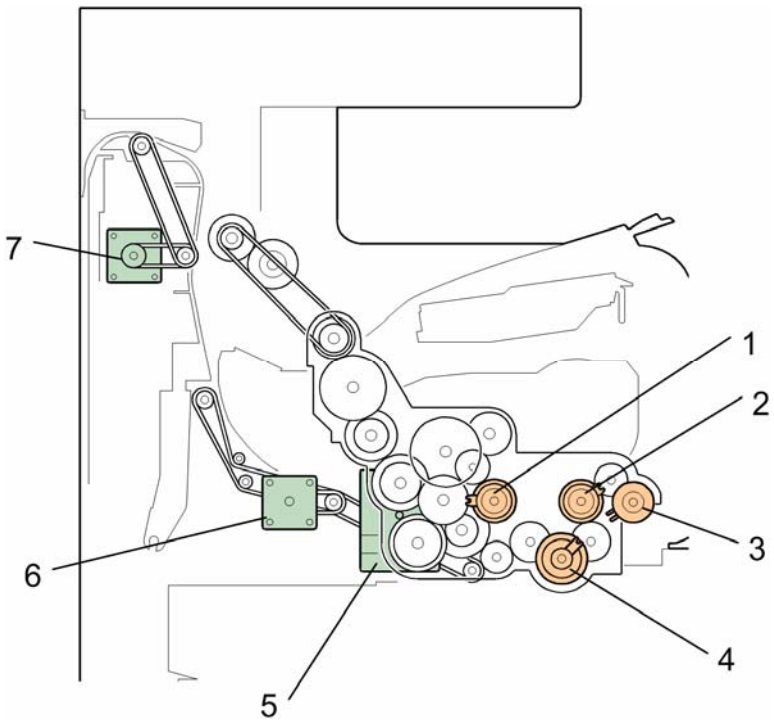


Slide 56

- This slide shows the paper path for the internal finisher model (M054) with three optional paper trays installed.
- The stapler is included with the finisher.

Drive Layout

1. Registration clutch
2. Relay clutch
3. By-pass clutch
4. Paper feed clutch
5. Main motor
6. Duplex motor
7. Inverter motor



Slide 57

No additional notes.

Circumference of Rollers

- **Abnormal image repeating at intervals may be related to a roller with a matching circumference.**
  - 113 mm: Feed roller
  - 94 mm: By-pass feed roller
  - 51.8 mm: Transport rollers
  - 50.7 mm: Registration rollers
  - 96 mm: Drum
  - 50 mm: Transfer roller
  - 117.8 mm: Hot roller
  - 100.5 mm: Pressure roller
  - 43.4 mm: Fusing exit rollers
  - 44 mm: Exit rollers, 1-bin relay rollers
  - 56.8 mm: Duplex inverter rollers, duplex entrance rollers
  - 45.5 mm: Duplex relay rollers, duplex exit rollers
  - 53 mm: 1-bin exit rollers
  - 52 mm: Development roller

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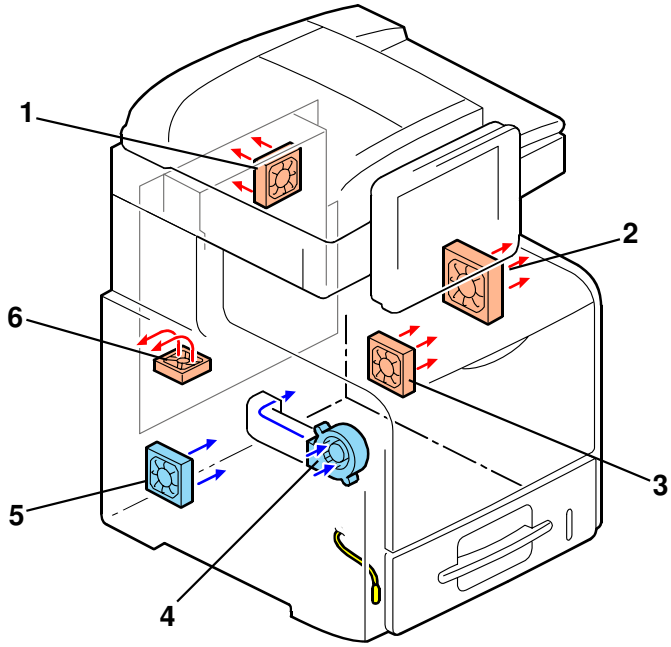
- This list may be useful during troubleshooting.
- The duplex reverse rollers and duplex entrance rollers are driven by the inverter motor.
- The duplex relay rollers and duplex exit rollers are driven by the duplex motor.
- All other rollers and the drum are driven by the main motor.

Machine Ventilation

1. Duplex fan
2. Main unit fan
3. PSU fan 2
4. AIO fan
5. PSU fan 1
6. Controller fan

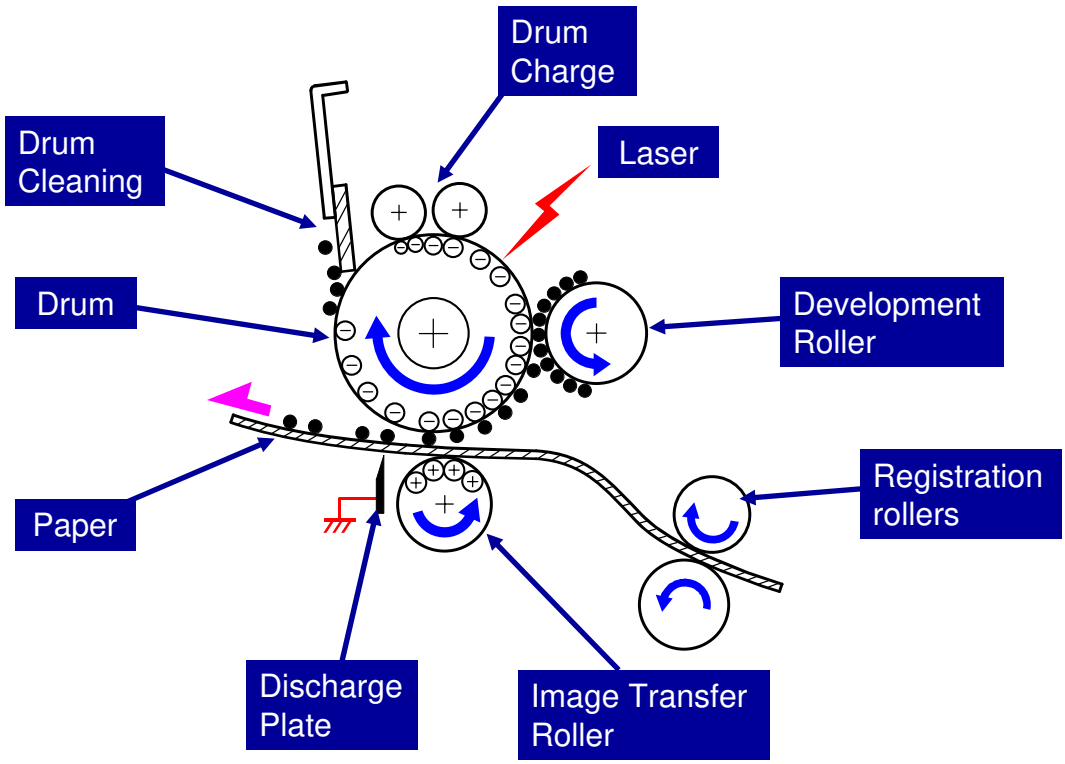


- This machine uses two cooling fans and four exhaust fans.

Slide 59

No additional notes.

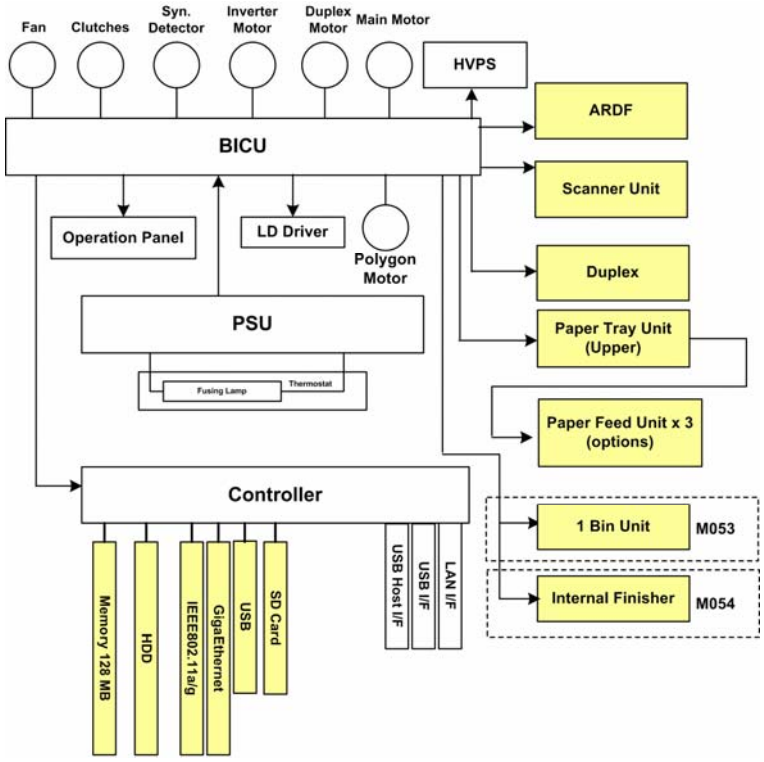
Printing Process



Slide 60

- The illustration shows the basic printing/copying processes.
  - Paper registration: The registration roller controls the paper feed timing to make sure that the image transfers to the correct location on the paper. It also removes skew.
  - Drum charge: The charge rollers give the drum a negative charge
  - Laser exposure: To make a latent image on the drum, the machine turns the laser beam on and off.
  - Development: The development roller moves toner to the drum where the toner is attracted to the latent image on the drum surface.
  - Image transfer: The charge that is applied to the image transfer roller pulls the toner from the drum to the paper.
  - Separation: The paper separates from the drum. The discharge plate immediately after the transfer roller helps to remove the paper from the drum.
  - Cleaning: The cleaning blade removes any toner remaining on the drum surface after the image transfers to the paper.
- Refer to the Core Technology manual for more information about basic processes.

Board Structure



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BICU (Base Internal Control Unit):

- The BICU controls all the mechanical components and the following functions:
  - Engine sequence
  - Engine operation
  - Operation panel

Controller:

- The controller handles the following functions:
  - HDD
  - Network interface
  - USB and SD cards

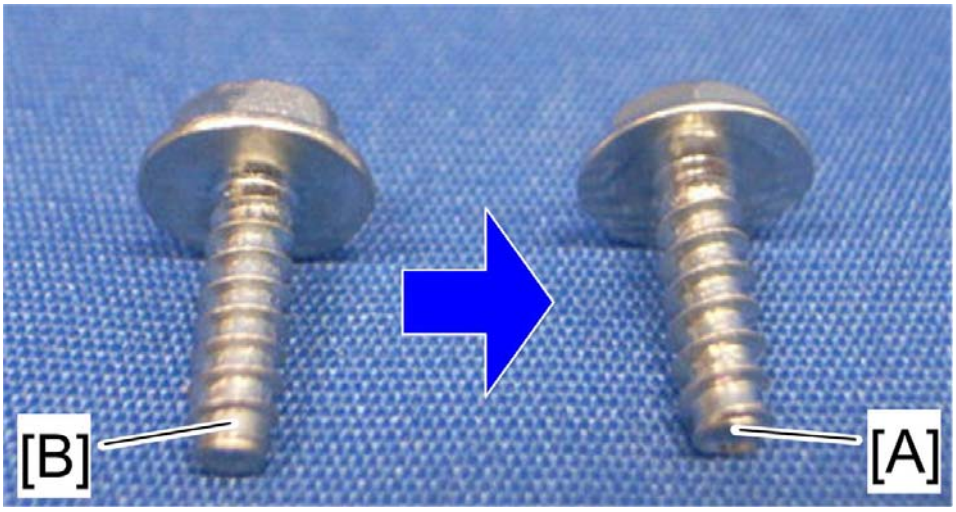
Before You Start Work on the Machine

- Turn off the main power switch, check that the shutdown process has finished, then unplug the machine before you start to remove components from the machine.

Slide 62

No additional notes

New Screw Type



- **Some of the tapping screws [B] have been changed to a new type [A] (Eagle Screw [A]).**
- **The threads have a different pitch, so do not use an Eagle screw in a hole where a tapping screw was removed, and vice versa.**
- **The Eagle screws are used only in the internal finisher.**

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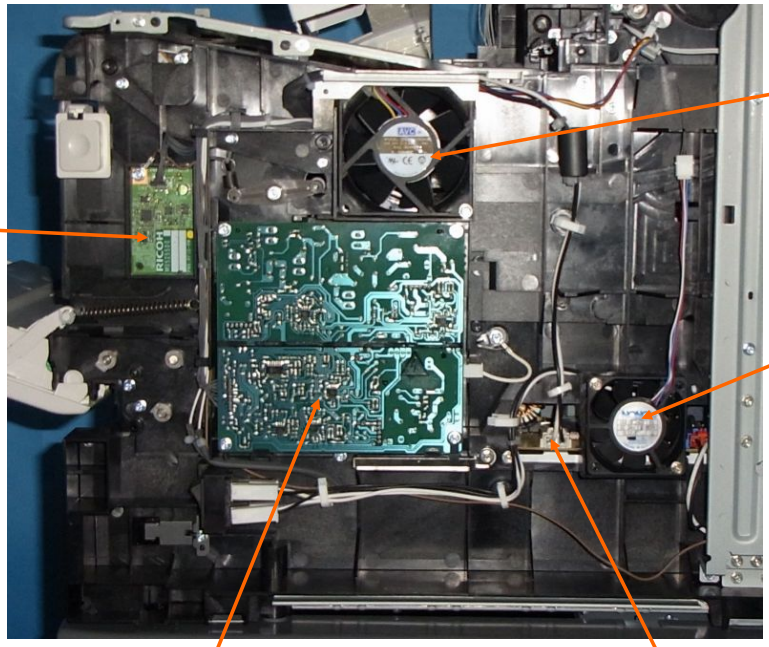
- Try to remember which holes the screws came out from. If not, use your experience and common sense when putting screws back. If it doesn't feel right, try the other type of screw. Don't force the screw into the hole; it may be the wrong type, and threads could be damaged.

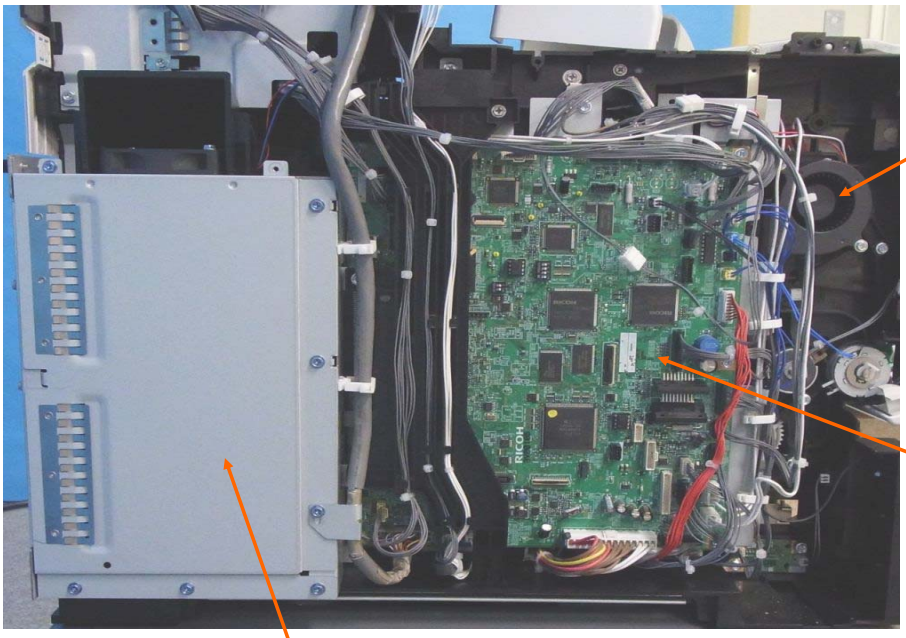
Component Location: Right Cover Off



Slide 64

- PSU = Power supply unit
  HVPP = High voltage power pack
  RFID = Radio frequency identification

Component Location: Left Cover Off



Slide 65

- BICU = **B**ase Engine and **I**mage **C**ontrol **U**nit.

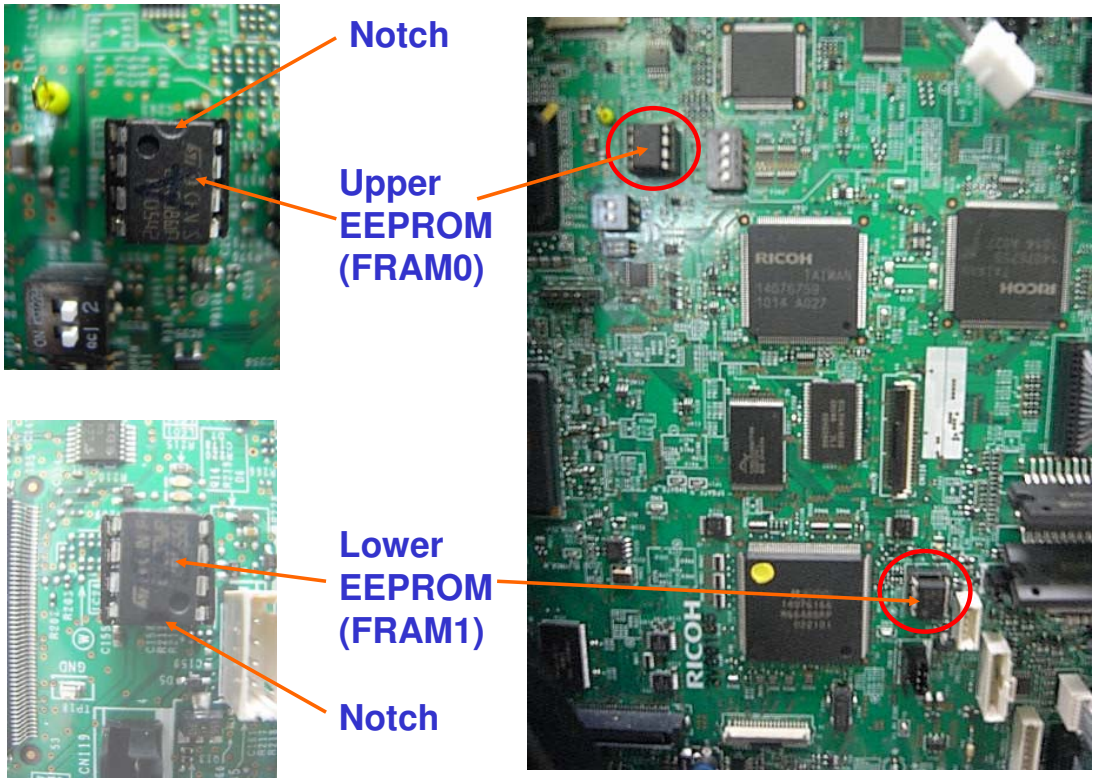
Replacing the BICU – 1

- Print out the SMC first.
- When you replace the BICU, remove the two EEPROMs from the old BICU and install them on the new one.
- Make sure the EEPROM units are oriented correctly.
  - The notches must be oriented as shown in the illustrations on the next slide.
- Enter the S/N with SP5811-4.
- Do not change the DIP switches.
- Refer to the FSM for the detailed BICU replacement procedure.

Slide 66

No additional notes

Replacing the BICU – 2



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- Insert the EEPROMs in the proper positions and make sure they are oriented correctly.
- If replacing the EEPROMs, but not the BICU, follow the procedure in the FSM.
- On production machines, the EEPROMs will be labeled FRAM0 and FRAM1. Don't mix them up.

Replacing the BICU EEPROMs (Data is Alive)

- ❑ Make sure you have the SMC report (factory setting) that comes with machine.
- ❑ Print out the SMC first if possible.
- ❑ Copy EEPROM data to SD card with SP5-824-001 if possible.
- ❑ Replace new EEPROM on the BICU board.
- ❑ Make sure the EEPROMs are oriented correctly.
  - ◆ The notches must be oriented as shown in the illustration on the previous slide.
- ❑ Copy the data from SD card to EEPROM with SP5-825-001.
- ❑ Refer to the FSM for the detailed BICU replacement procedure.
- ✓ Ask supervisor for details.

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No additional notes.

Replacing the BICU EEPROMs (Data is Dead)

- Make sure you have the SMC report (factory setting) that comes with machine.
- Input the factory settings manually.

Slide 69

No additional notes.

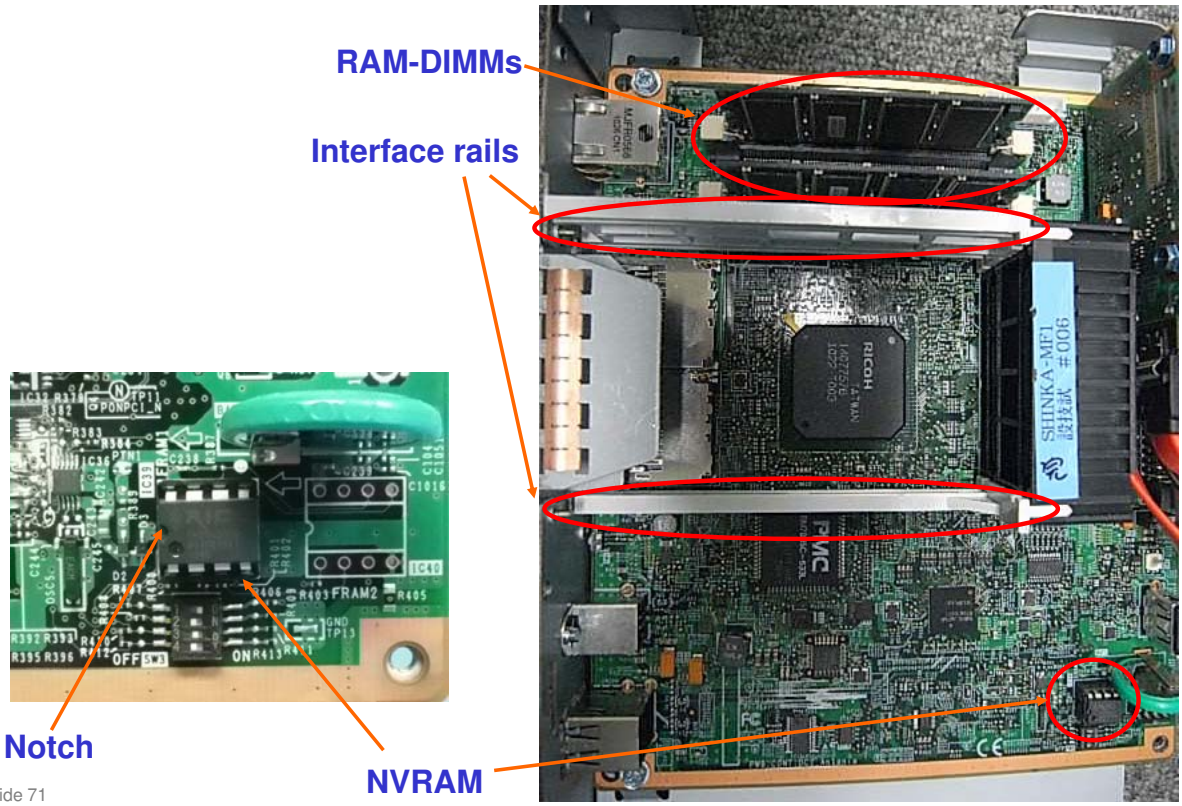
Replacing the Controller – 1

- Print out the SMC first.
- When you replace the controller, remove the NVRAM, 2 Interface rails, and 2 RAM-DIMMs from the old controller and install them on the new one.
- Make sure the NVRAM is oriented correctly.
  - The notch should be oriented as shown in the illustrations on the next slide.
- Do not change the DIP switches.
- The 45 cpm and 50 cpm machines have different controller boards. Don't mix them up!
- Refer to the FSM for the detailed controller replacement procedure.

Slide 70

No additional notes.

Replacing the Controller – 2



- Orient the NVRAM as shown.
- Do not use the empty NVRAM socket. (Empty socket will be removed from production machines.)

Replacing the NVRAM (Data is Alive)

- ❑ **Make sure you have the SMC report (factory setting) that comes with machine.**
- ❑ **Print out the SMC first if possible.**
- ❑ **Copy NVRAM data to SD card with SP5-824-001 if possible.**
- ❑ **Replace new NVRAM on the Controller board.**
- ❑ **Make sure the NVRAM units are oriented correctly.**
  - ◆ The notches must be oriented as shown in the illustrations on the previous slide.
- ❑ **Copy the data from SD card to NVRAM with SP5-825-001.**
- ❑ **Refer to the FSM for the detailed Controller board replacement procedure.**
- ✓ **The value of Total counter is reset to “0” when NVRAM is replaced.**
- ✓ **When Encryption is ON please refer to the information RTB issued separately. (See notes below.)**

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❒ At the time of writing, the latest information was in general RTB "RGene039". However, this RTB was scheduled for update; so, consult your RTB database or the service supervisor.

Replacing the Controller NVRAM (Data is Dead)

- Make sure you have the SMC report (factory setting) that comes with machine.
- Input the factory settings manually.

Slide 73

No additional notes.

ARDF

Slide 74

- In this section, you will study the mechanisms of the optional ARDF. This is built into all models of the Z-C1 series.

Overview

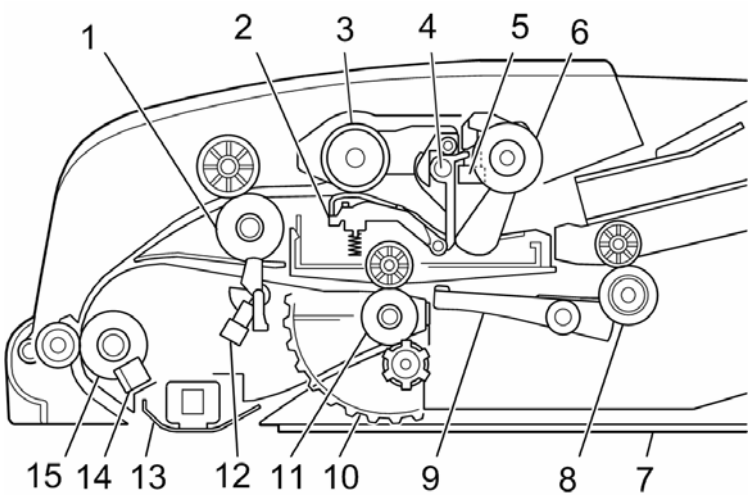
- Same as the ARDF for Z-C1.
- Feed roller and friction pad system
- Mixed original length mode is not possible
- No original size sensors
- No fax stamp
- Contains a space for mounting the card reader (as described earlier)

Slide 75

No additional notes

ARDF Mechanical Component Layout

1. Transport Roller
2. Friction Pad
3. Feed Roller
4. Registration Gate
5. Original Set Sensor
6. Pick-up Roller
7. Platen Cover
8. Inverter Roller
9. Junction Gate
10. Jam Removal Knob
11. Exit Roller
12. Inverter Sensor
13. Original Exposure Guide
14. Registration Sensor
15. Registration Roller

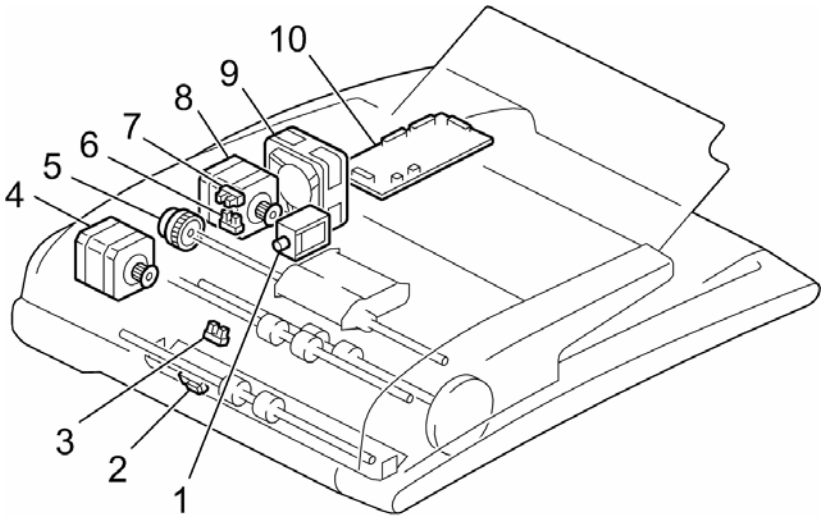


Slide 76

No additional notes.

ARDF Electrical Component Layout

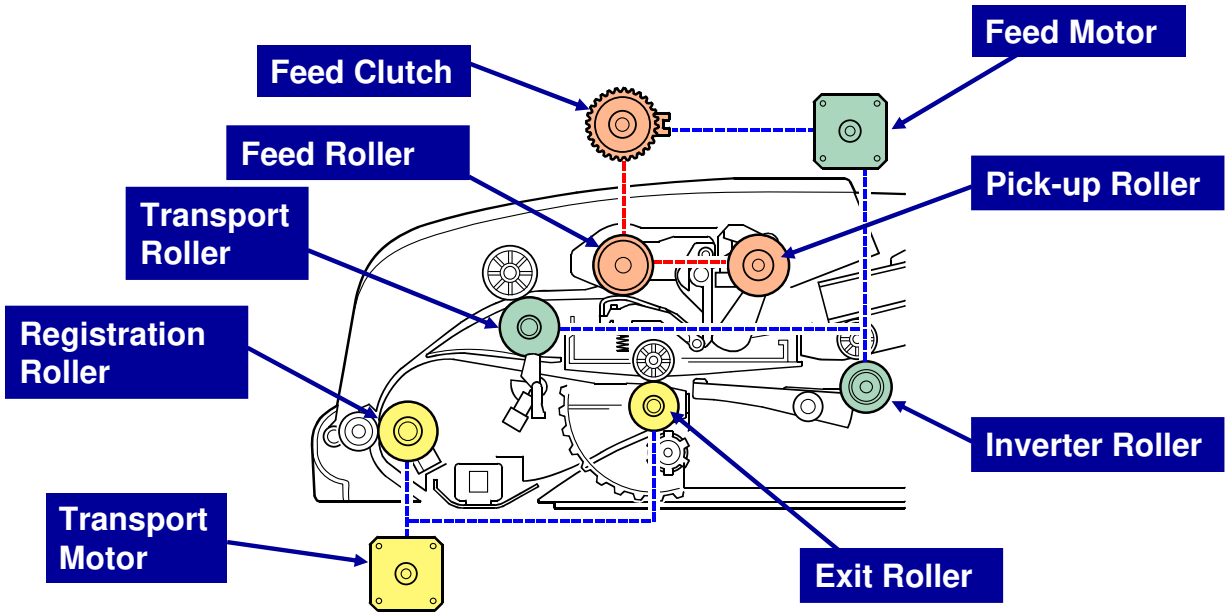
1. Inverter Solenoid
2. Registration Sensor
3. Inverter Sensor
4. Transport Motor
5. Feed Clutch
6. Original Set Sensor
7. Cover Sensor
8. Feed Motor
9. Cooling Fan
10. Drive Board



Slide 77

No additional notes.

Drive (1)

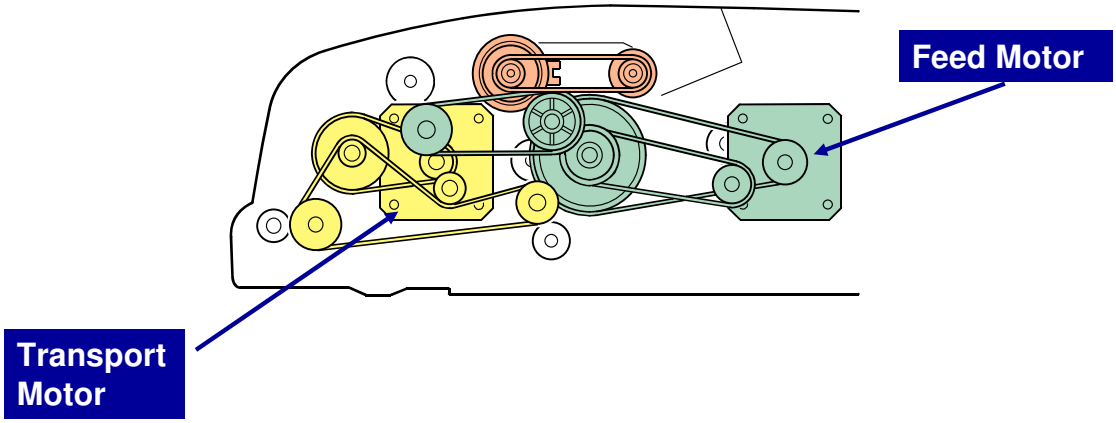


- The feed motor drives the pick-up and feed rollers through the feed clutch.

Slide 78

No additional notes

Drive (2)

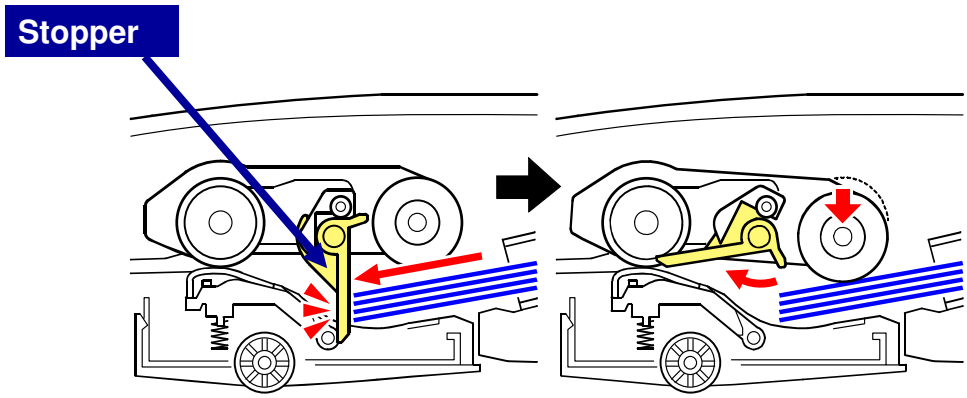


- This diagram shows the layout of the pulleys and timing belts.

Slide 79

No additional notes

Pick-up Roller

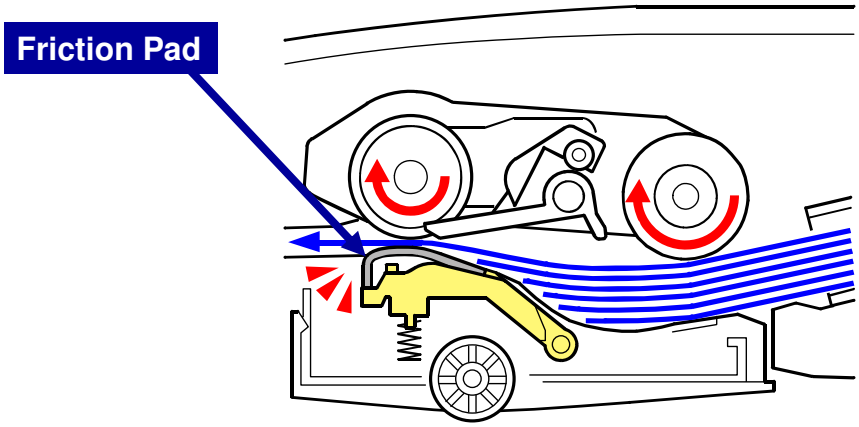


- When the document is set in the feeder, the stopper prevents the pages from entering the scanner.
- When the pick-up roller drops onto the top of the stack, the stopper moves out of the way, and the pick-up roller feeds the top sheet of paper to the feed roller.

Slide 80

No additional notes

Separation

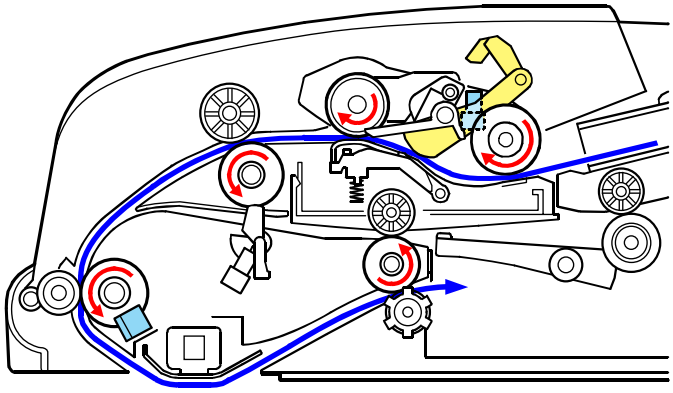


- The feed roller and friction pad make sure that only one sheet of paper goes into the scanner.

Slide 81

No additional notes

Original Transport and Exit
Single-sided Originals



- The feed motor and transport motor feed the original through the scanner.
- Motor speed depends on the reproduction ratio.

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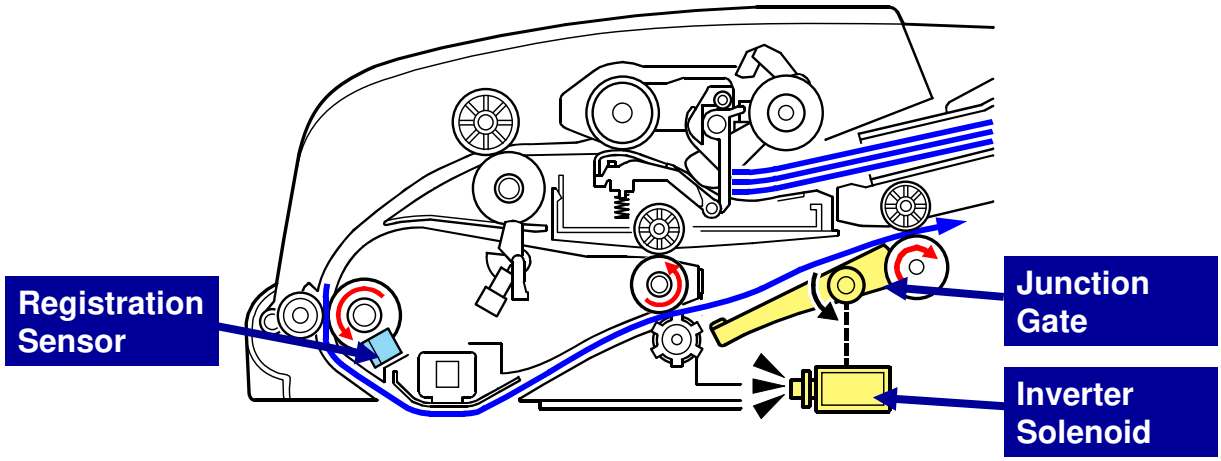
No additional notes.

Original Transport and Exit
Two-sided Originals (1)

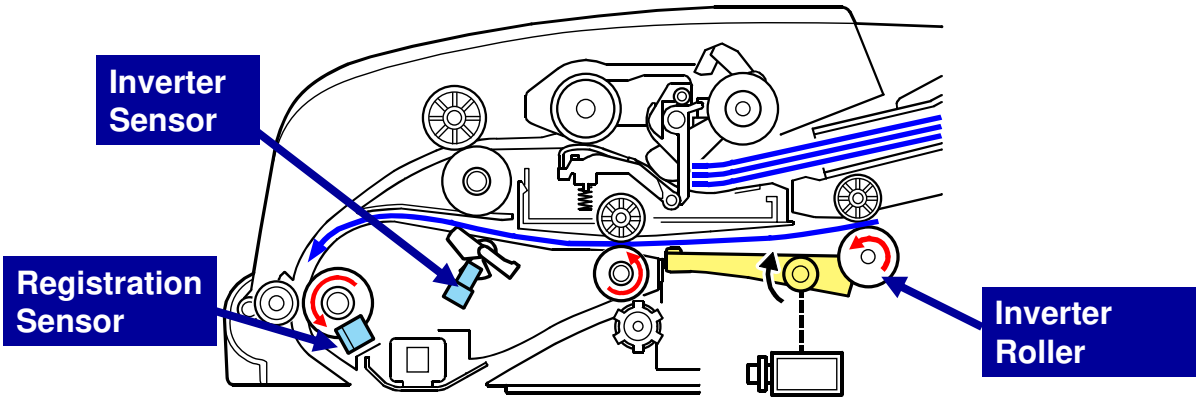


- First, the front side of the original is scanned.
- When the registration sensor detects the leading edge of the original, the inverter solenoid opens the junction gate. The original is then fed to the inverter table.

Slide 83

No additional notes

Original Transport and Exit
Two-sided Originals (2)

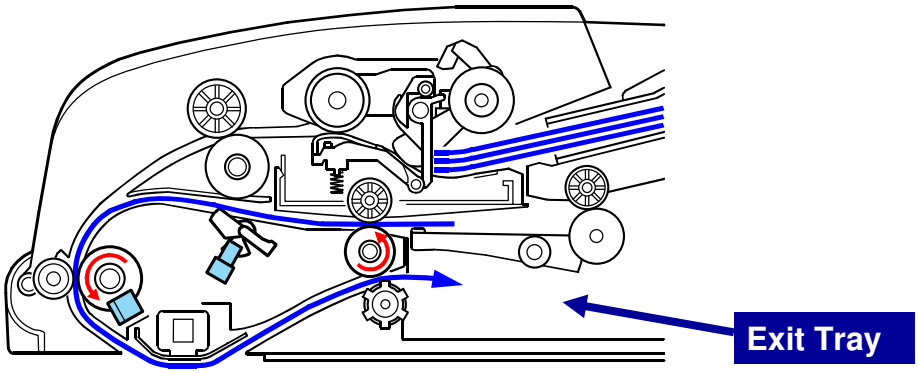


- After the trailing edge of the original passes the inverter sensor, the junction gate solenoid switches off and the junction gate is closed.
- When the original has been fed onto the inverter table, the feed motor switches on in reverse. The inverter roller and registration roller feed the original to the ADF exposure glass, and the reverse side will be scanned.

Slide 84

No additional notes

Original Transport and Exit
Two-sided Originals (3)

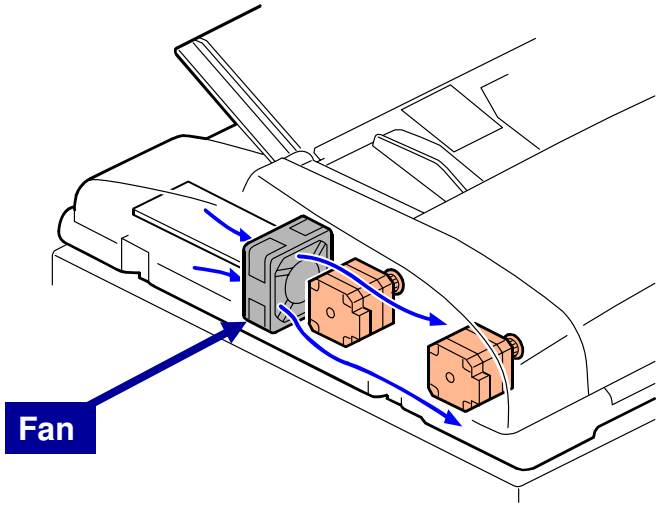


- The original is then sent to the inverter table again to be turned over.
- This is done so that the duplex copies will be properly stacked front side down in the exit tray in the correct order.

Slide 85

No additional notes

ADF Motor Cooling



- The fan pulls in air to cool the motors.

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No additional notes

Scanner

Slide 87

No additional notes.

Overview

- Same as the Z-C1.
- No original size sensors
  - Because of this, the copy display has changed, and the user must be careful to select the correct paper size.
- No coating on the exposure glass
- Additional measures to prevent dust from entering the optics
- No anti-condensation heater (even as an option)

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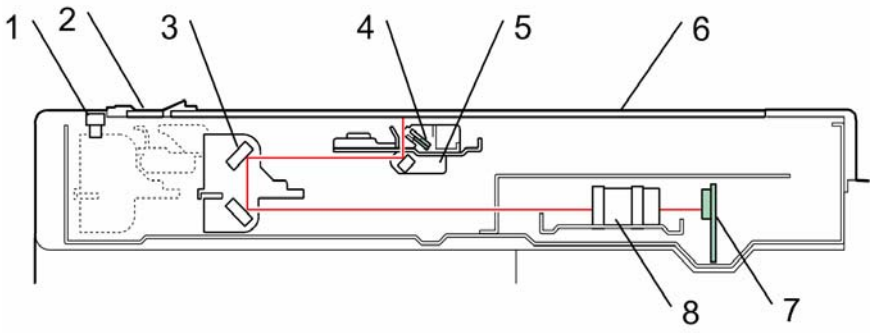
No additional notes

Components

1. Scanner HP sensor
2. ADF exposure glass
3. 2nd scanner (2nd carriage)
4. LED array
5. 1st scanner (1st carriage)
6. Exposure glass
7. Sensor board unit (SBU)
8. Lens Block



- When the original is manually placed on the exposure glass (6), the scanner motor pulls the 1st and 2nd scanners (5, 3) via mechanical linkage. The original is scanned from left to right.
- When the original is fed from the ARDF, it is fed past the ARDF exposure glass (2), and to the original exit. The original does not stay on the main exposure glass. The 1st and 2nd scanners stay at their home positions.

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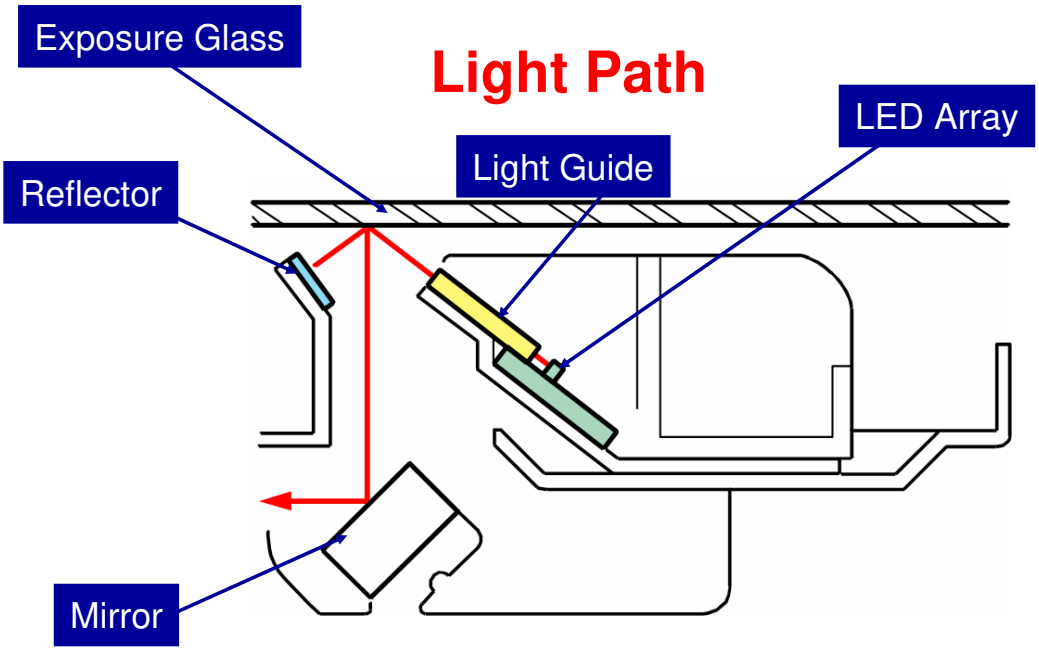
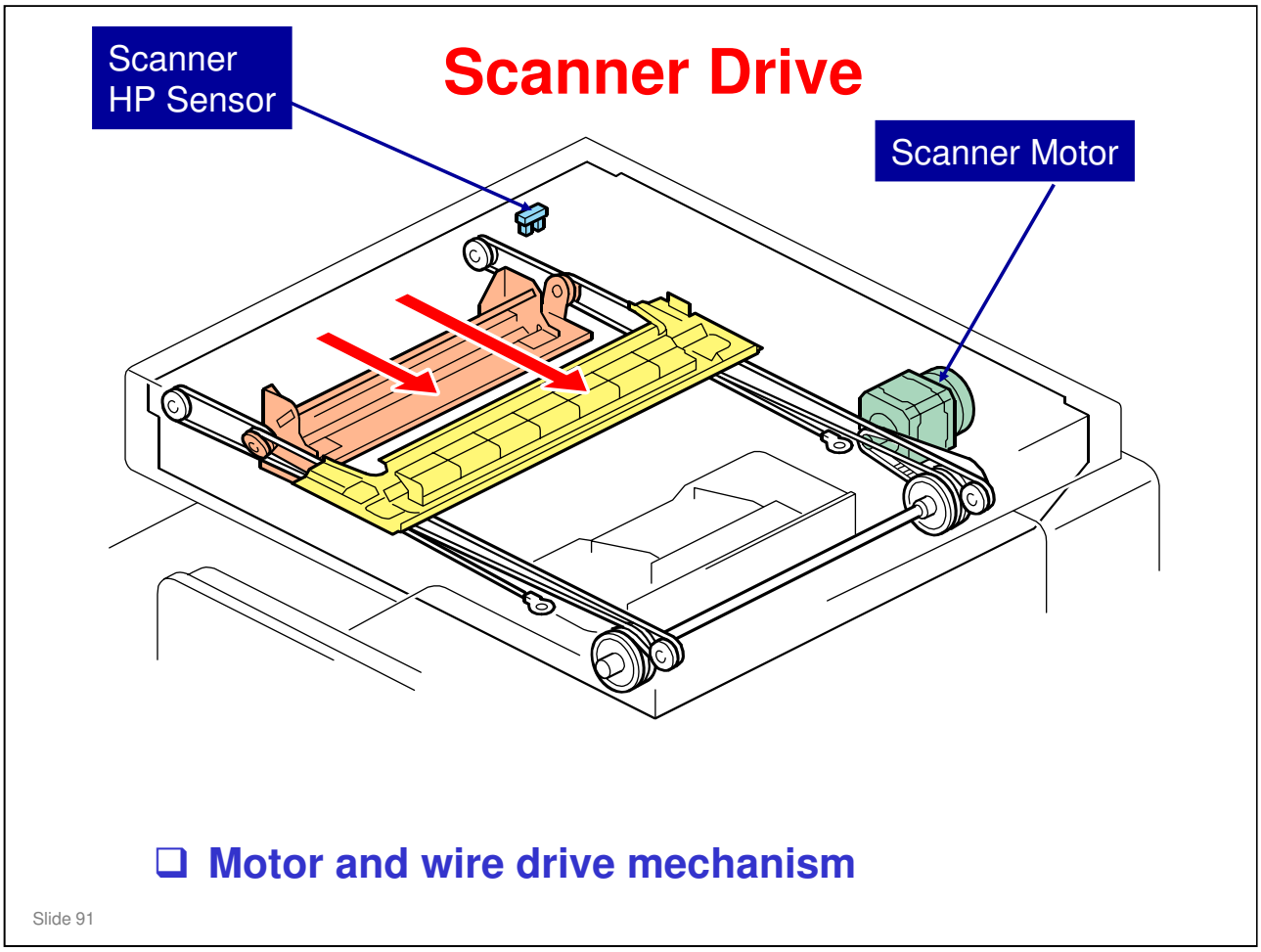
- There isn't an anti-condensation heater.



- **This shows the path of light from the LED array to the original on the exposure glass.**
  - LED array – Light Guide – Exposure Glass – Reflector – Exposure Glass – Mirror - CCD

Slide 90

- Light emitting device: White LED
- LED number: 35 pcs
- Light emitting mechanism: Light guide + reflector
- Unit supplied as service parts: LED unit
- Merits of LED compared with Xenon Lamp: Life is long, energy-saving, high-speed warm-up
- Demerits of LED: Low amount of light



- The same motor drives the first and second scanners.
  - The first scanner contains the exposure lamp, reflectors, the 1st mirror, and the lamp regulator. The second scanner contains the 2nd and 3rd mirrors.
  - The regulator is mounted on the scanner to reduce the wiring between the lamp and the regulator.
  - The second scanner moves at half the speed of the first scanner. This is to maintain the focal distance between lens and original.
  - In reduction or enlargement mode, the scanning speed depends on the magnification ratio. The returning speed is always the same, whether in full size or magnification mode. The image length change in the sub scan direction is done by changing the scanner motor speed. In the main scan direction it is done by image processing on the BCU board.
  - You can adjust the magnification in the sub-scan direction by changing the scanner motor speed with SP4-008.
- In this machine, wires are used instead of timing belts. These are more difficult to replace, but copy quality is better (less jitter).
- Note that the operation in ADF mode is different from platen mode.
  - In ADF mode, the scanner goes to home position (detected by the home position sensor), and stays there during scanning.
  - The ARDF motor feeds the original through the ARDF. In reduction/enlargement mode, the image length change in the sub-scan direction is done by changing the ARDF motor speed. Magnification in the main scan direction is done in the BCU board. This is the same as for book mode.
  - You can adjust magnification in the sub-scan direction by changing the

Original Size Detection

- There are no width or length sensors in the scanner.
- If the original size is different from the paper in the selected paper tray, the customer must input the correct original size at the operation panel.
  - By default the original size is assumed to be the same as the selected paper tray.
- There is no Auto Paper Size Detect mode.

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No additional notes

Copy Display is Changed

- Because there is no original length or width detection, the SH-MF1 cannot detect the original size.
- This means that SH-MF1 does not have the Auto Paper Select function.
- Because of the above, the user must input the original size at the start of every job. Therefore, the copy display is different from other models.

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No additional notes.

Dust Detection – SP Modes

- **This function is for the ARDF exposure glass only, and not for the main exposure glass.**
- **4020-001: Dust check**
  - Turns the dust check on/off.
    - » 0: OFF (Default), 1: ON
  - The platen cover is white, so black dust is detected, but white dust such as paper dust cannot be detected
  - When dust is detected, the scanning position is shifted in the sub scan direction. An alert is displayed on the operation panel, when dust reoccurs after that.
- **4020-002: Dust Detection**
  - Level 0: lowest detection
  - Level 8: highest detection level
  - Level 4 is the default
  - If the level is higher, the detection level is higher (dust is more likely to be detected)
- **4020-003: Dust reject level**
  - 0: Off (default)
  - Level 1 is weakest, Level 4 is strongest

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No additional notes

Replacement and Adjustment

- **Exposure Lamps**
  - Do not touch the new lamp directly by hand. Grease spots will cause poor scanning quality.

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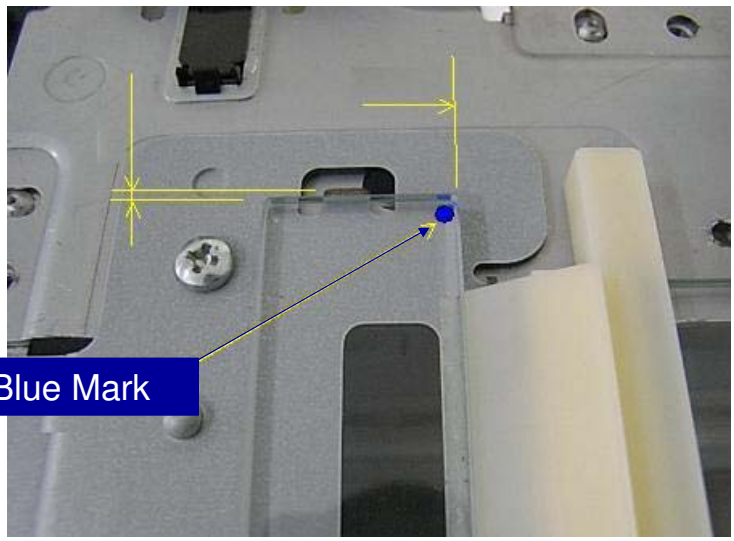
- Note that the copy adjustments must be done after replacing the lens block, scanner motor or scanner wires.

DF Exposure Glass



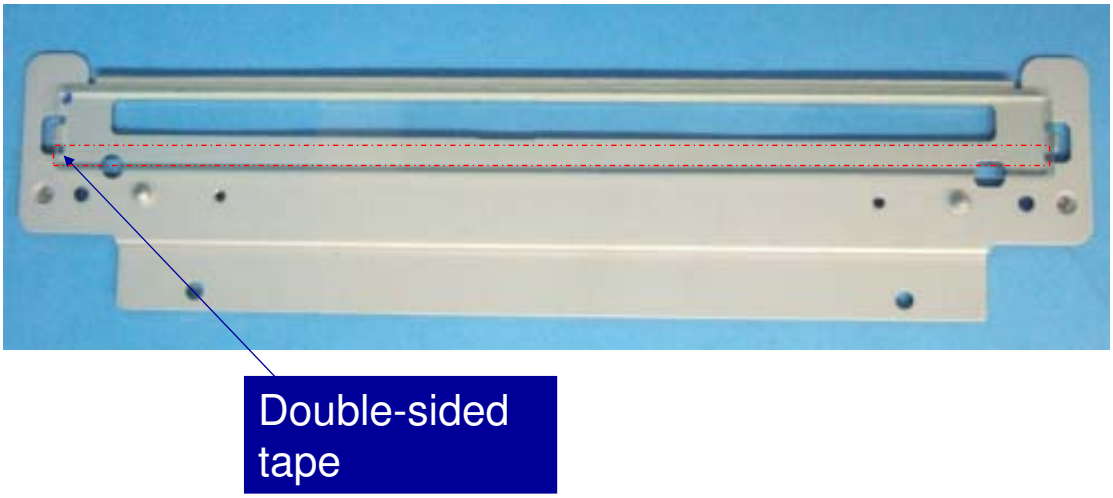
- **The blue mark must be at the rear right corner.**

Slide 96

No additional notes

DF Exposure Glass: Service Part

- The ARDF exposure glass/bracket assembly is available as a service part.
- The ARDF exposure glass is attached to its bracket with double-sided tape. This tape prevents dust from getting into the scanner.



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No additional notes

Replacement and Adjustment

❑ SBU

- Adjust the following SP modes after you replace the sensor board unit:
  - » SP4–008 (Sub Scan Mag): See "Image Adjustment: Scanning".
  - » SP4–010 (Sub Mag Reg.): See "Image Adjustment: Scanning".
  - » SP4–011 (Main Scan Reg): See "Image Adjustment: Scanning".
  - » SP4–688 (DF: Density Adjustment): Use this to adjust the density level if the ID of outputs made in the DF and Platen mode is different.

Note: The SBU is not a separate service part. It is included in the Lens Block Assembly, and the entire assembly should be replaced.

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No additional notes

Replacement and Adjustment

- When setting the platen cover, it is necessary to have a 1 to 2 mm gap on the upper side and on the left side.

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No additional notes

Paper Feed

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PURPOSE OF THIS SECTION

- ❒ The paper feed mechanisms for the main body (tray 1, bypass tray) will be described in this section. The optional feed units will be dealt with in a later section.

In this section you will do the following:

- ❒ Learn how the paper feed mechanisms are driven.
- ❒ Learn how paper size is detected.

Overview

Paper Tray

- Paper Feed System: Feed roller and friction pad
- Paper Lift Mechanism: Tray arm and spring
- Paper Detection: Remaining paper sensors & paper end sensor
- Paper Size Detection: Paper size switch
- Tray Capacity: 550 sheets
- Tray Extension: Available

By-pass Tray

- Paper Feed System: Feed roller and friction pad
- Paper Lift Mechanism: Cams and springs
- Paper Detection: By-pass tray paper sensor
- Paper Size Detection: None
- Tray Capacity:100 sheets

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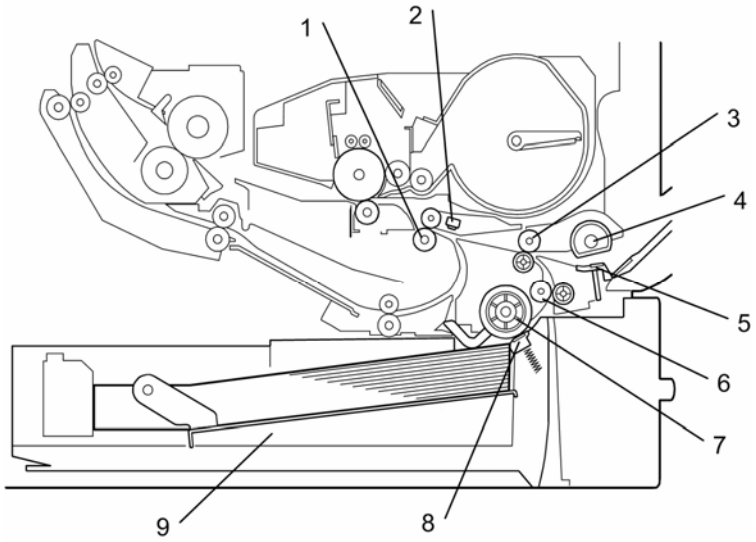
No additional notes

Paper Feed Components

1. Registration Rollers
2. Registration sensor
3. Upper relay rollers
4. By-pass feed roller
5. By-pass friction pad
6. Lower relay rollers
7. Tray feed roller
8. Friction pad
9. Paper tray



- The trays and by-pass all use a friction pad feed mechanism.

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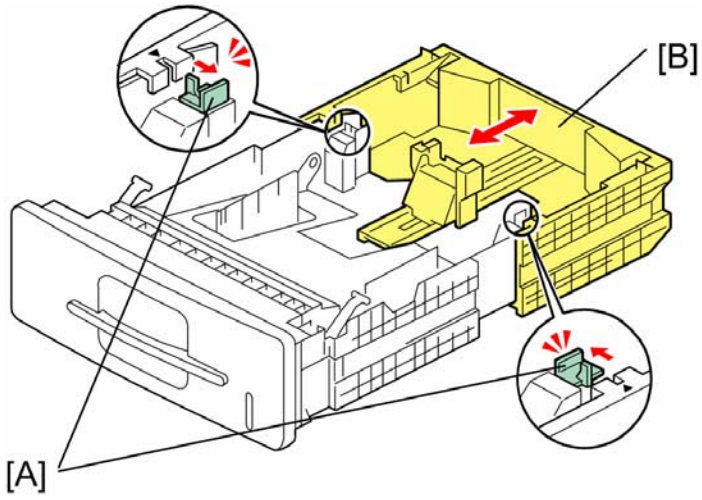
Additional notes:

- The friction pad cannot be adjusted.
- The machine makes the paper buckle at the registration rollers to correct paper skew.
- The paper buckle can be adjusted for each paper type with SP 1003.

Tray Extension

- **The user can extend the tray manually to hold paper longer than A4/Letter size.**
- **To use longer paper:**
  - Release the two locks [A]
  - Extend the tray [B] and close the locks.



Paper Sizes

Tray Mode	Possible Paper Sizes
Short (default)	A5 (LEF/SEF), B5 (SEF), A4 (SEF), LT (SEF)
Long	LG (SEF), 8.5" x 13" (SEF), 8" x 13" (SEF), 8.25" x 13" (SEF)

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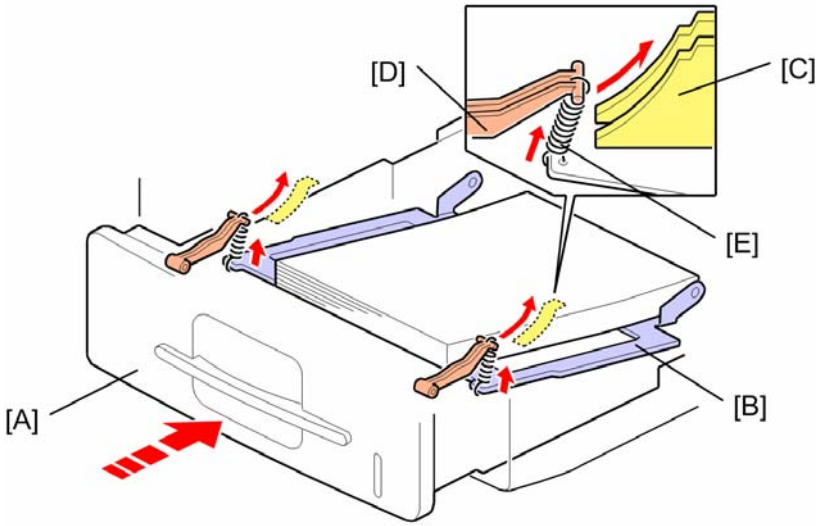
No additional notes.

Paper Lift



- **When the tray [A] is pushed into the machine, the bottom plate [B] lifts as follows.**
  - The slopes on the guide blocks [C] on the machine lift up the tray arms [D].
  - The springs [E] between the tray arms and bottom plate lift the plate.

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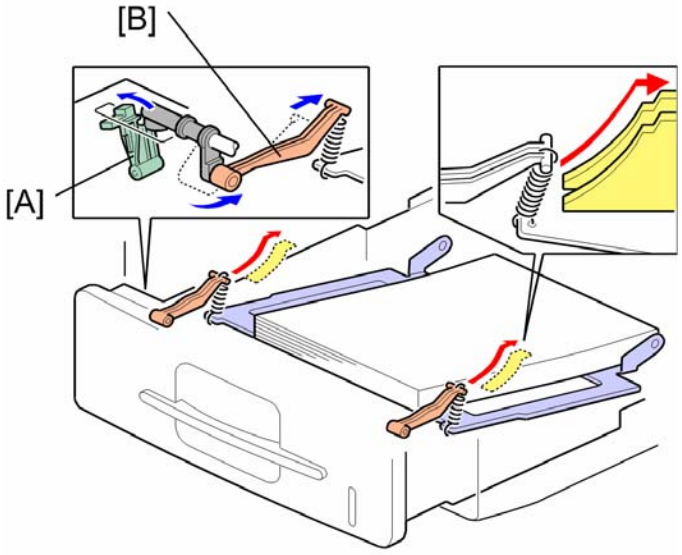
No additional notes.

Tray Lift Pressure Adjustment

- Normal position (right) for paper 105 g/m2 or less (28 lb or less)
- Thicker paper position (left) for paper more than 105 g/m2 (28 lb)



- The paper thickness selector [A] can change the lift pressure of the bottom plate. When changing the position of the paper thickness selector from the normal position (right) to thicker paper position (left), the tray arms move to the rear side a little bit. As a result, the spring tension of the tray arms is stronger than before changing the selector's position.

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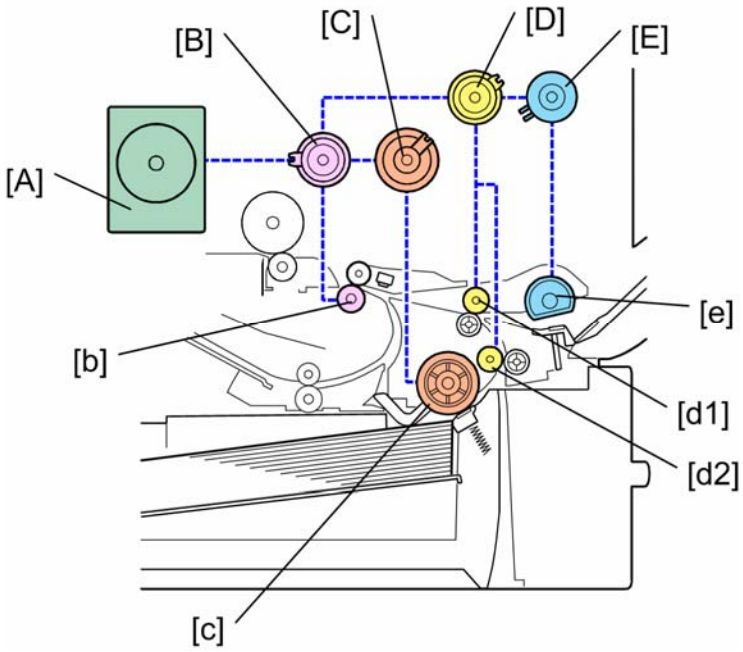
No additional notes.

Paper Feed Drive

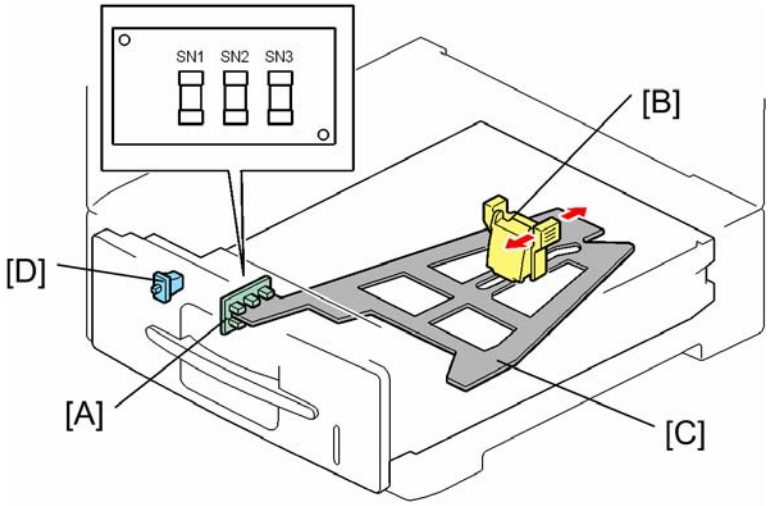
- **The main motor [A] drives all rollers related with the paper feeding via gears and clutches. Each clutch corresponds with a roller as follows:**
  - Registration clutch [B]: Registration roller [b]
  - Paper feed clutch [C]: Feed roller [c]
  - Relay clutch [D]: Upper relay roller [d1] and lower relay roller [d2]
  - By-pass feed clutch [E]: By-pass feed roller [e]



Slide 106

No additional notes.

Paper Size Detection



- The paper size detection sensor board [A] detects the size of the paper in the paper tray.
- Sliding the end fence [B] changes the position of the paper size actuator [C].
- Paper size detection occurs after the tray set switch [D] detects the paper tray.
- See the paper size detection table on the next slide.

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No additional notes.

Paper Size Detection Table

Size	SN1	SN2	SN3
A4 SEF	ON	ON	OFF
A5 SEF	ON	OFF	ON
B5 SEF	OFF	ON	OFF
Custom size	ON	OFF	OFF
LG SEF	OFF	OFF	OFF
LT SEF	OFF	OFF	ON
HLT SEF	OFF	ON	ON

- The paper size detection sensor board determines the paper size based on the switch combination as shown in the paper size detection table above.

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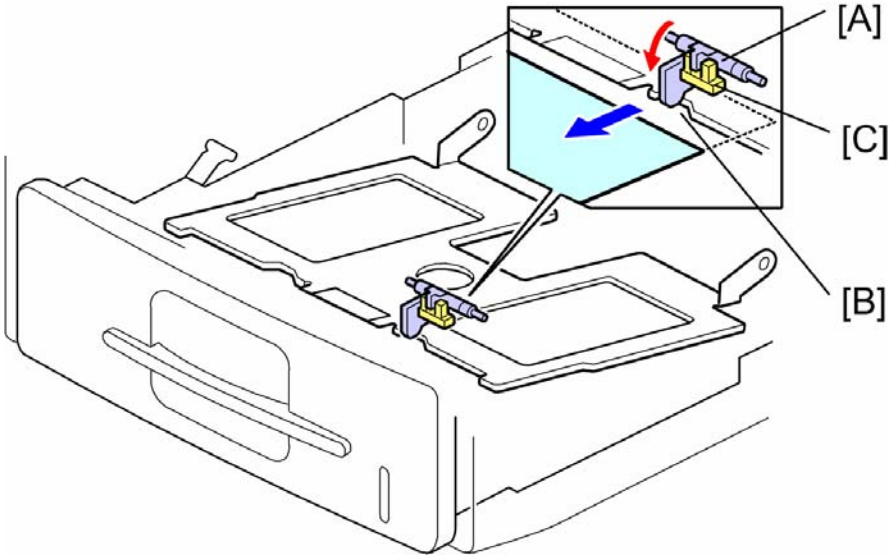
No additional notes.

Paper End Detection



- When there is no paper in the tray, the feeler [A] falls into the cutout [B] in the bottom plate, and the paper end sensor [C] comes on.

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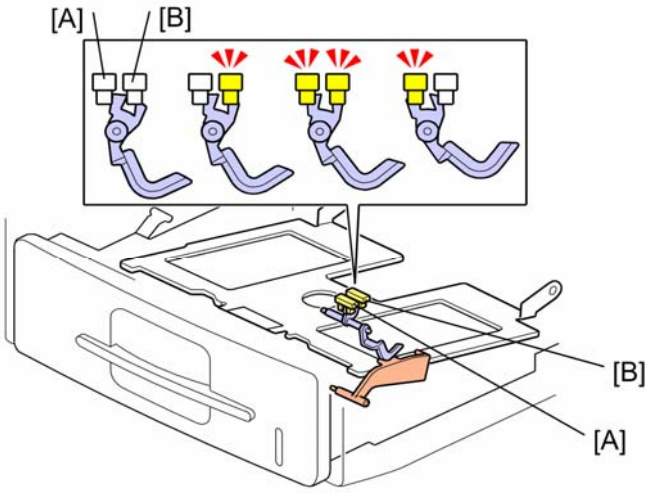
No additional notes.

Remaining Paper Detection

- Remaining paper is detected by the combination of the remaining paper sensor signals.
- The signals from the sensors indicate whether there are 500, 450, 250, or 50 sheets remaining.
  - [A] Remaining paper sensor 1
  - [B] Remaining paper sensor 2



Amount of paper	Sensor 1	Sensor 2
1-50 sheets (10%)	OFF	OFF
51-250 sheets (50%)	OFF	ON
251-450 sheets (90%)	ON	ON
451-550 sheets (100%)	ON	OFF

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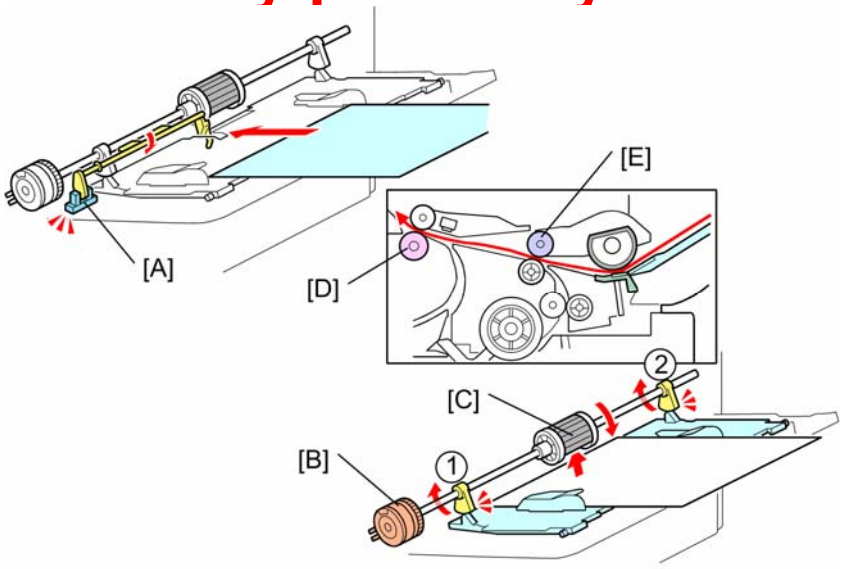
No additional notes.

By-pass Tray



- The by-pass paper sensor [A] detects when paper is placed on the tray.
- The CPU energizes the by-pass clutch [B]. Then the by-pass feed roller [C] starts to feed paper to the registration roller [D] through the relay roller [E].
- The by-pass feed roller shaft has two cams (1), (2). These cams release the bottom plate to press the stack of paper against the by-pass feed roller. There is no width sensor.

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- To prevent bad effects from too much friction between the feed roller and friction pad, the by-pass feed roller contains a metal plate.

Laser Exposure

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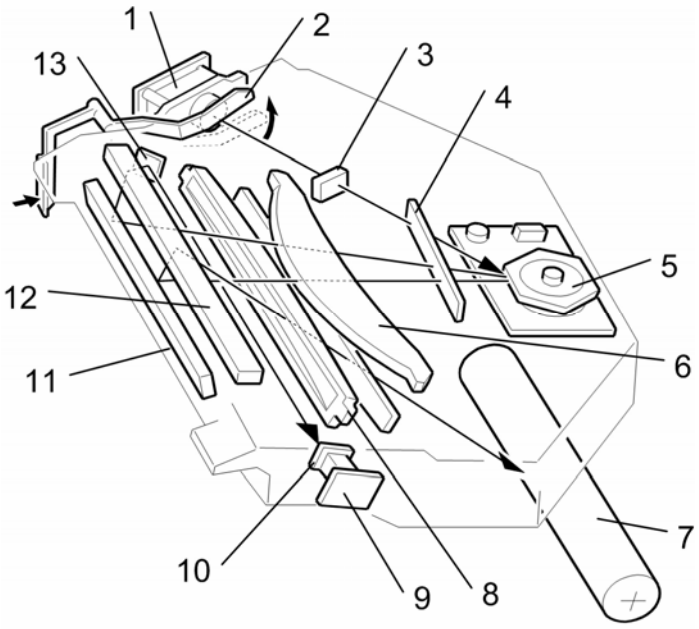
No additional notes.

Laser Unit Components

1. LD unit
2. Laser shutter
3. Cylindrical lens
4. Shield glass
5. Polygon mirror
6. L1 lens
7. Drum
8. L2 Lens
9. Synchronization detector
10. Toroidal lens
11. 1st mirror
12. 2nd mirror
13. Detector mirror



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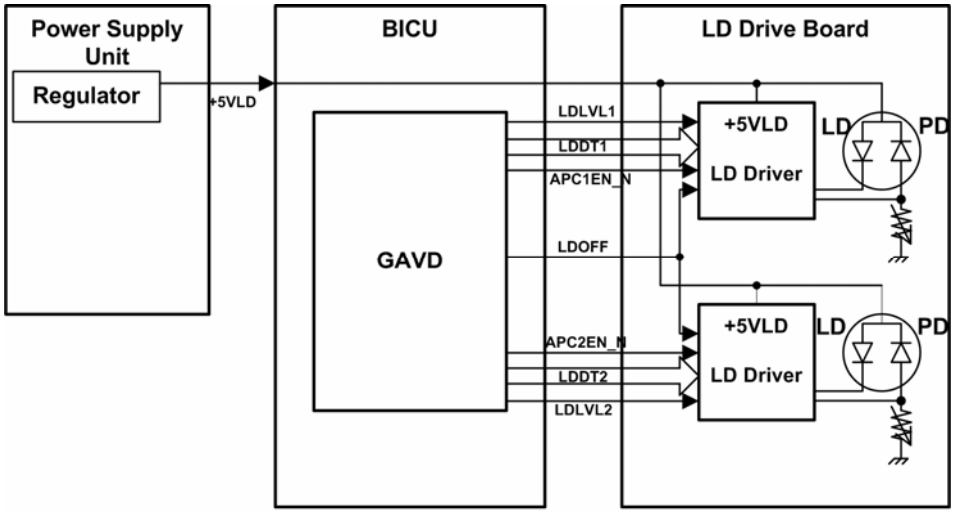
- Synchronization detector: The 1st mirror, 2nd mirror, and the detector mirror reflect the beam from the LD unit to the synchronization detector.
- Two laser beams: The LD unit writes two lines at the same time.
- LD safety shutter: When the user opens the front cover, the shutter closes and blocks the laser beam path.
- After you replace the LD unit, adjust its position (see Replacement and Adjustment).
- There is a thermistor next to the laser unit (not shown) that checks the temperature inside the machine. The machine automatically corrects the charge roller and transfer voltages based on this temperature.

Automatic Power Control (APC)



- **The LD driver on the LD drive board automatically controls power for the laser diodes.**
- **The laser diode power is adjusted in the factory.**
  - Never adjust the variable resistors on the LD unit in the field.

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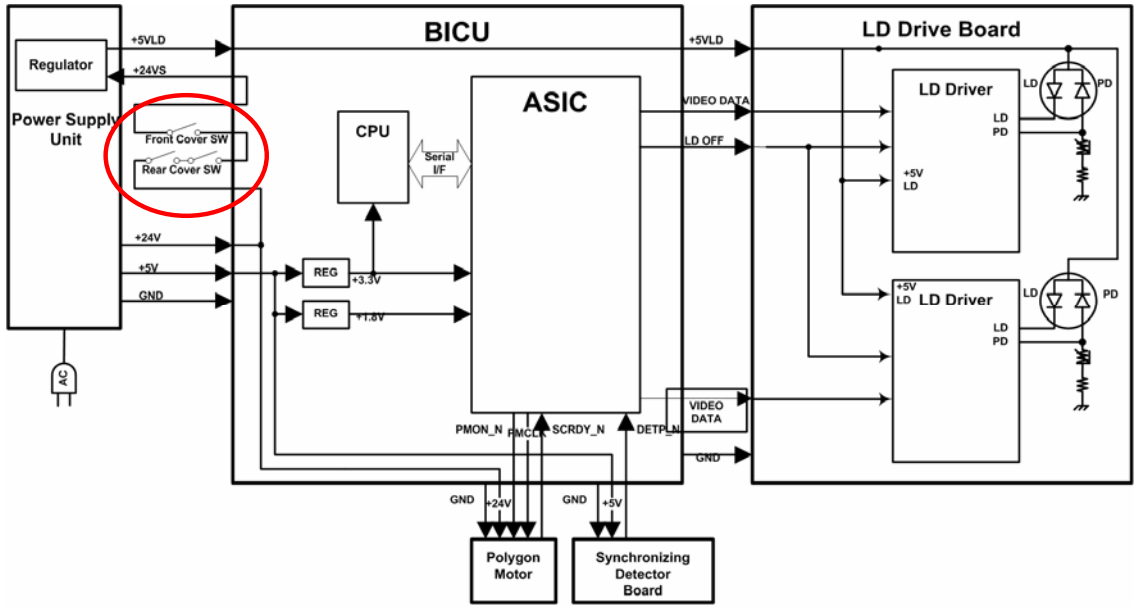
No additional notes.

Laser Safety Switch



- **Safety switches cut power to the LD drive board when a cover is opened.**

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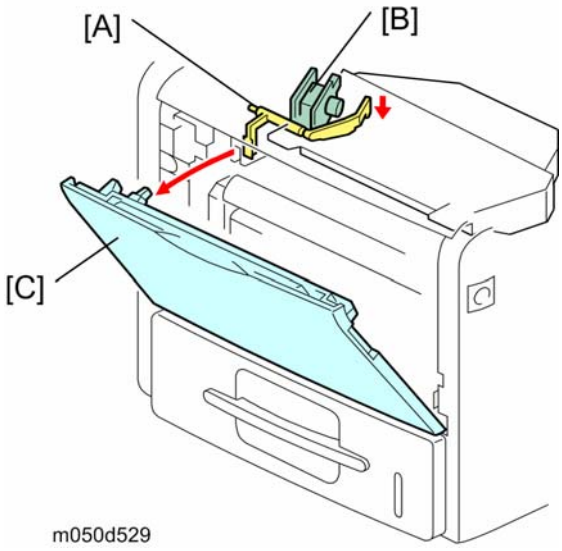
Additional details:

- A safety switch turns off when the front cover or the rear door is opened. As a result, the relay on the PSU cuts off the power supply (+5V) to the LD board. (The electric circuits go through the engine board)
- This system prevents unexpected laser emission, and ensures user safety and technician safety.

Laser Shutter

- The laser shutter [A] provides back-up to the safety switches (previous slide).
- Even if the switches do not work and power gets to the laser diodes [B], the laser shutter physically stops the laser beam when the front cover [C] is open.



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No additional notes.

All In One Cartridge (AIO)

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Achieving 50 CPM with Mono-component Toner

- **New toner**
  - New toner was developed to improve fusibility and development at higher speed. (Toner is modified based on Midas/Per' toner.)
  - The silica component of the toner is decreased compared to the Midas/Per' toner.
    - » Merits:
      - – reduces metering blade wear
      - – extends the life of the development roller
    - » Demerit:
      - – The margin for smudged image is decreased. (However, there is no problem on actual usage.)
- **Development roller**
  - Uses a larger circumference development roller
- **Dual charge rollers**
  - To ensure the sufficient charging for the life of AIO, the SH-MF1/P1 machines use two charge rollers. (In high speed machines, there is a possibility that charge rollers become dirty.)

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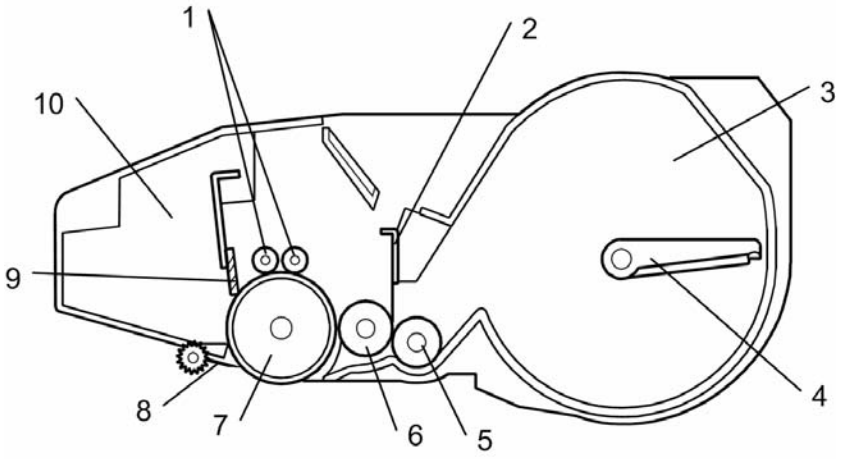
No additional notes.

AIO Components

1. Charge rollers
2. Metering blade
3. Toner tank
4. Agitator
5. Toner supply roller
6. Development roller
7. Drum
8. Separation pawls
9. Cleaning blade
10. Waste toner tank



- The AIO (All In One) cartridge combines toner, toner supply mechanism, development mechanism, photoconductive drum, charge mechanism, development mechanism, and drum cleaning mechanism in a single unit.

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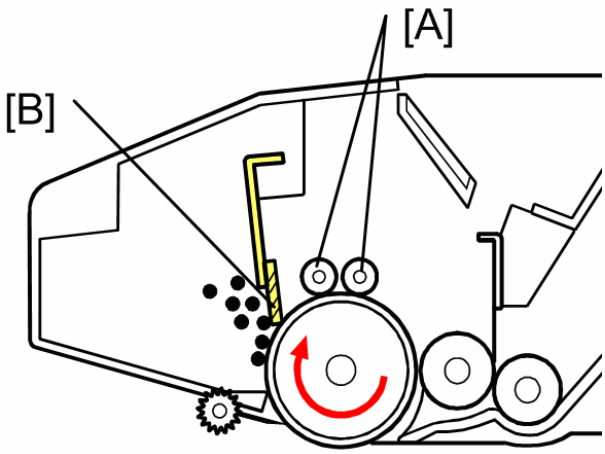
- The limiting factor for AIOs is toner.
  - The initial AIO that comes with the machine makes about 6k copies/prints.
  - The supply AIO makes about 25k copies/prints.

Drum Charge and Cleaning



- **The dual charge rollers [A] give the drum surface a negative charge of approximately –900 V.**
- **The cleaning blade [B] removes any toner remaining on the drum's surface after image development and transfer.**

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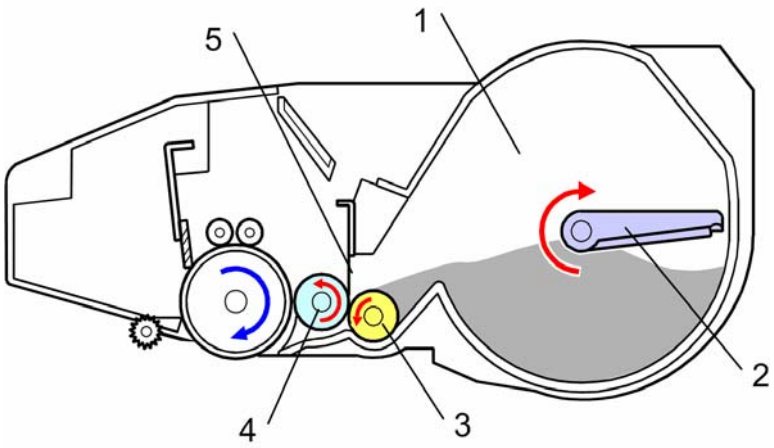
- The charge rollers are charged to -1550 V and they transfer -900 V to the drum.
- Cleaning blade is composed of polyurethane.
- Q: Why two charge rollers?
  A: Even with the cleaning blade the charge rollers will slowly get dirty. Design testing showed that two rollers are necessary to ensure sufficient charging for the life of the AIO under all environmental conditions.

Toner Supply and Development



- **The toner tank (1) holds sufficient toner for the entire life of the AIO.**
- **The agitator (2) moves toner to the toner supply roller (3).**
- **The supply roller provides toner to the development roller (4).**
- **The metering blade (5) controls the amount of toner on the development roller.**
- **The toner on the development roller develops the latent image on the drum as it rotates past.**

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- The high voltage supply applies the following:
  - -600V to the development roller
  - -1550V to the charge rollers
  - -110V to the supply roller
  - -490V to the metering blade
- The development components – drum, development roller, metering blade, and supply roller – are in contact. (= no photoconductor gap nor doctor gap.)
- Relative peripheral velocities: OPC 1, Development roller 1.2, Charge roller more than 1.2
- This AIO uses mono-component toner. Therefore, no toner density sensor or image density sensor is required.
- The toner is negatively charged.

Toner Near-end and Toner End Detection

- **This machine detects toner near-end and toner end as follows:**
- **Toner Near-end**
  - A toner-end sensor, mounted on the left frame of the machine, checks for a low-toner condition.
  - If the toner end sensor is activated ten times in a row, the toner near-end condition exists.
- **Toner End**
  - When the toner near-end condition occurs, the machine starts the toner-end count.
  - Toner End is based on dot count. After toner consumption equivalent to 1,250 A4 prints/copies at 5% coverage, the toner end condition is achieved.

(See the detection mechanism on the next two slides.)

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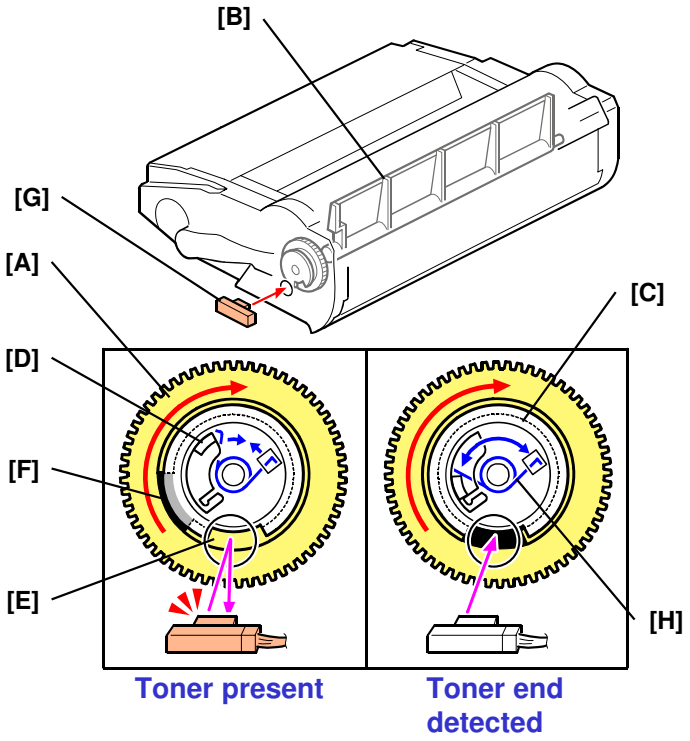
No additional notes.

Toner End Detection Mechanism – 1

- The agitator gear [A] drives the agitator [B] through the shutter plate [C].
- Toner present:
  Toner resists the agitator, preventing it from turning until the tab [D] of the gear contacts the shutter plate. The gap [E] in the shutter plate does not align with the hole [F] in the gear; so, light is reflected back to the toner end sensor [G].
- Toner near-end:
  There is low resistance to the rotation of the agitator. The torsion spring [H] causes the gap of the shutter plate to align with the hole in the agitator gear. Light is not reflected back to the sensor.



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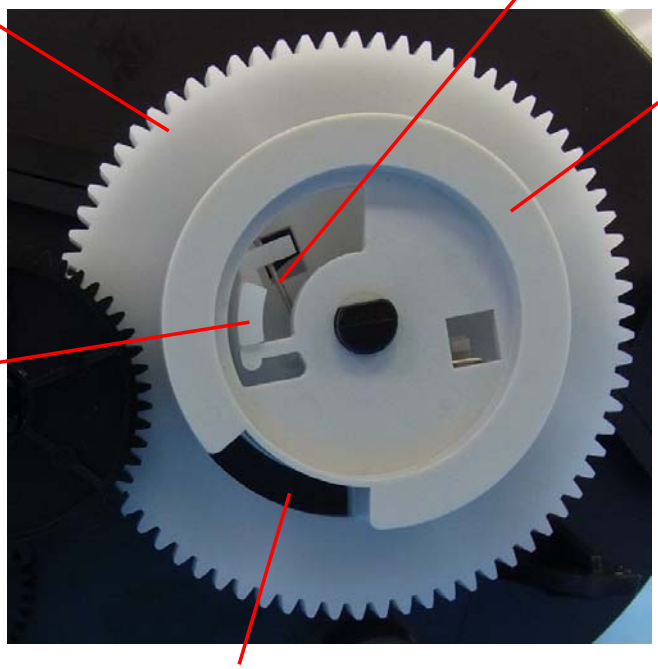
See next slide.

- Toner near-end + about 1,250 prints = Toner end

Toner End Detection Mechanism – 2



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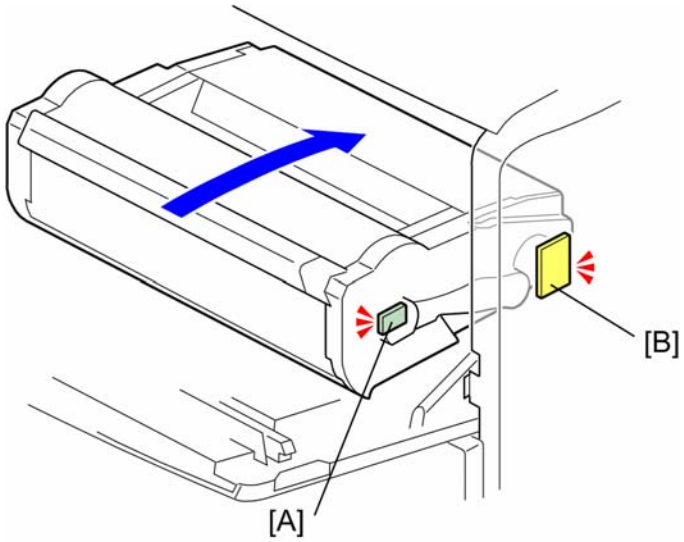
No additional notes.

RFID

- The AIO has a RFID IC [A]. The RFID stores some data which can be checked by SP mode. (SP 7-931 – see next slide.)
- This data is used to calculate the amount of toner remaining in the toner tank.
- The RFID chip is also used to detect whether the cartridge is installed.
- The RFID chip transmits & receives data to/from the RFID board [B].



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- RFID = Radio Frequency Identification
- This small RFID is not just a tag. It stores information that allows the AIO to be transferred to another machine. (Access the RFID data via SP7-931-1 to SP7-931-23.)

SP7-931 Data

Stored Data	SP Number
Machine ID	SP 7-931-001
Version	SP 7-931-002
Brand ID	SP 7-931-003
Area ID	SP 7-931-004
Class ID	SP 7-931-005
Color ID	SP 7-931-006
Maintenance ID	SP 7-931-007
New AIO	SP 7-931-008
Recycle Count	SP 7-931-009
EDP Code	SP 7-931-010
Serial Number	SP 7-931-011
Remaining Toner	SP 7-931-012
Toner End	SP 7-931-013
Refill Flag	SP 7-931-014
R: Total Counter	SP 7-931-015
E: Total Counter	SP 7-931-016
Unit Output Counter	SP 7-931-017
Install Date	SP 7-931-018
Toner End Date	SP 7-931-019
Conductor Time 1 to 4	SP 7-931-020 to -023

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No additional notes.

Fusing

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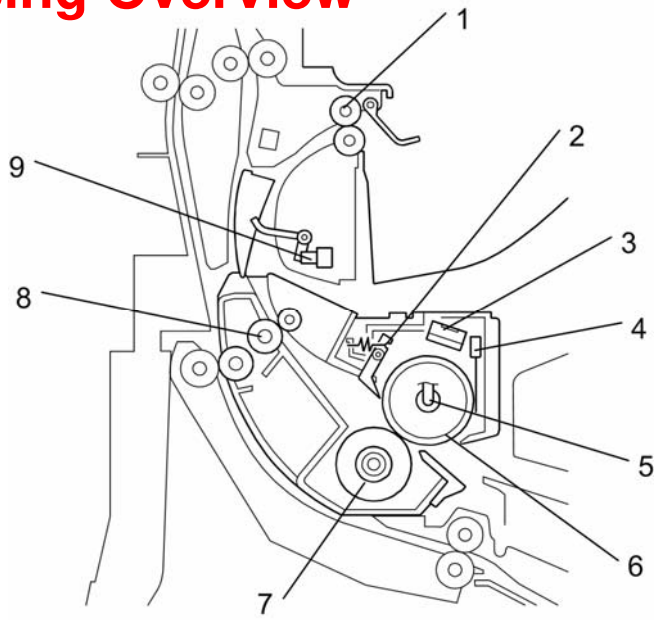
No additional notes.

Fusing Overview

1. Paper exit roller
2. Hot roller strippers
3. Thermostat
4. Thermistor
5. Fusing lamp
6. Hot roller
7. Pressure roller
8. Fusing exit roller
9. Paper exit sensor



- The hot roller and pressure roller fuse the toner image to the paper.
- After fusing, the paper passes through the fusing exit rollers and the paper exit rollers to the output tray. (See the Paper Exit section.)

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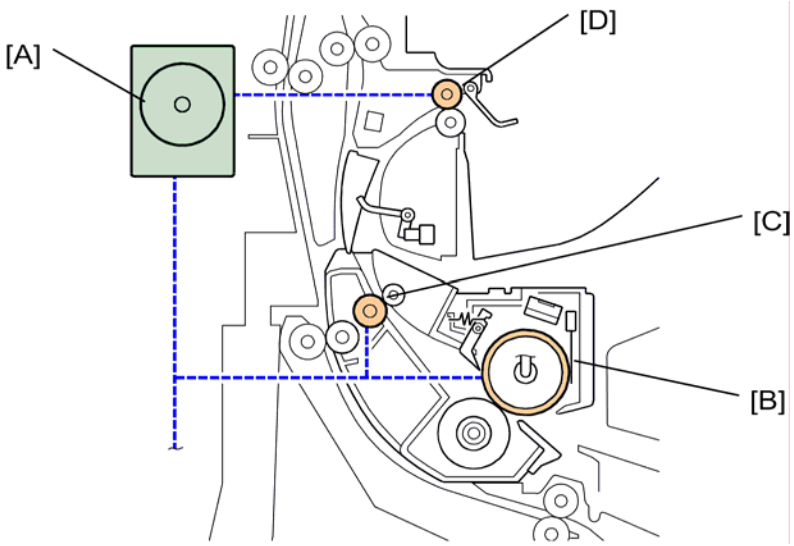
- The thermistor detects the temperature of the hot roller. (See the "Fusing Temperature control" slide.)
- The thermostat provides backup overheat protection.
- If making duplex copies, the junction gate directs to paper to the inverter mechanism rather than the exit rollers after the first side is copied. (See the duplex section.)

Fusing Drive



- The main motor [A] drives the hot roller [B], the fusing exit rollers [C], and the paper exit rollers [D] through a gear train.

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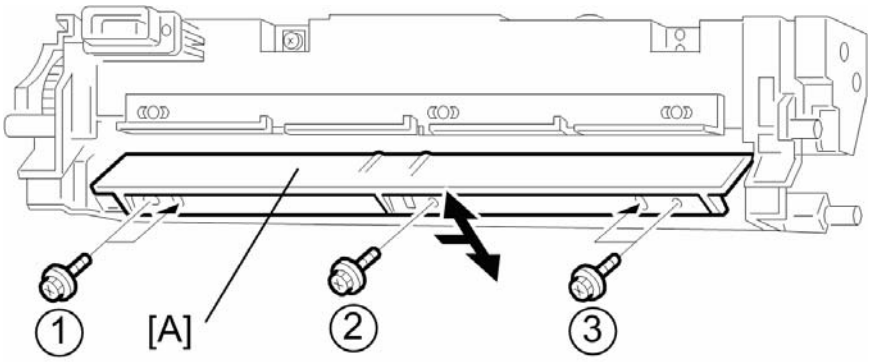
No additional notes.

Fusing Entrance Guide Adjustment



- The entrance guide [A] is adjustable for paper thickness to prevent creasing.
- If creasing occurs frequently in the fusing unit, remove all three screws and slide the entrance guide to the right. Replace the two end screws only. Do not replace the middle screw.
- This procedure allows paper to have more direct access to the point where the hot roller and the pressure roller meet.

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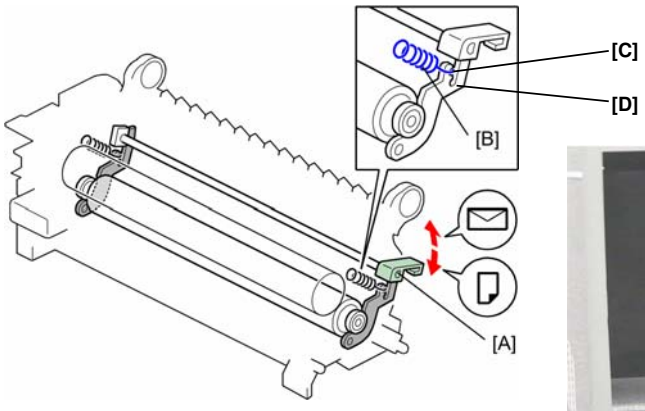
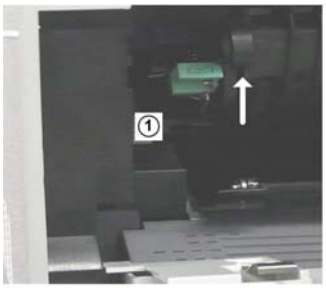
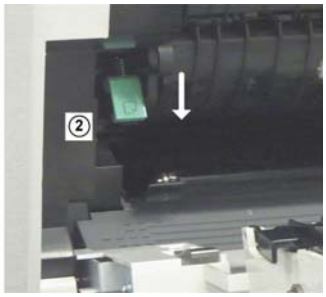
No additional notes.

Fusing Pressure Adjustments







- **Service Adjustment**
  - To increase fusing pressure move the pressure springs [B] from the upper notch [C] to the lower notch [D].
- **User Adjustment for Envelopes**
  - The user can change the fusing pressure with the envelope lever [A]. Less pressure is needed for envelopes, which are thicker than normal paper.
  - Raise the lever (①) to reduce the pressure. This prevents jams and wrinkling when printing on envelopes.
  - Lower the lever to (②) return pressure to normal for all other print jobs. Normally this lever should be down.

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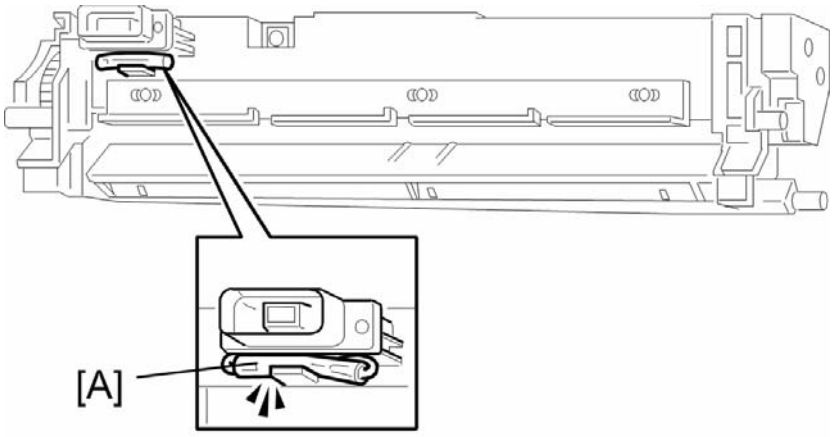
- You may need to increase pressure if the customer complains of insufficient fusing. The factory setting is the upper notch.

New Fusing Unit Detection



- In a new fusing unit, the looped wire on the fusing unit connector contains a fuse [A].
- When power is switched on after installing a new fusing unit, the engine board detects the fusing unit through the looped wire. However, the fuse opens very shortly afterwards.

(Also, see slide 51.)

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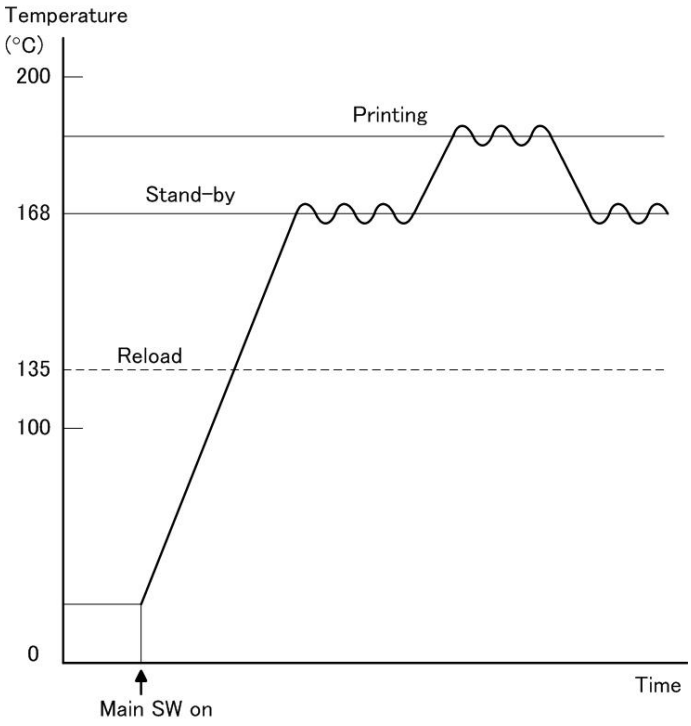
No additional notes.

Fusing Temperature Control

- When the main switch turns on, the CPU turns on the fusing lamp using the soft start process. (The soft start process prevents the room lights from flickering.)
- The lamp stays on until the thermistor detects the standby temperature.
- Then the CPU maintains this temperature using on-off control.
- At the start of printing, the CPU raises the fusing temperature to the printing temperature.



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- At the "Reload" temperature, the user can start job input.

Overheat Protection

- If the hot roller temperature becomes greater than 235°C, the CPU cuts off the power to the fusing lamp. At this time, SC543 will be generated.
- If the thermistor overheat protection fails, there are thermostats in series with the common ground line of the fusing lamp. If the temperature of a thermostat becomes greater than approximately 175°C, the thermostat opens, removing power from the fusing lamp. At this time, the machine stops operation.

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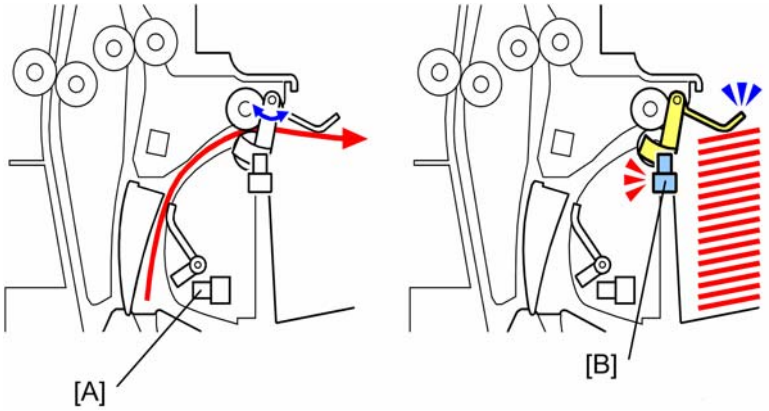
No additional notes.

Paper Exit

Slide 135

No additional notes.

Standard Model Paper Exit (M052)



- The paper exit sensor [A] detects paper misfeeds.
- When the paper overflow sensor [B] is activated, the machine detects that the paper stack height limit has been reached and stops printing.

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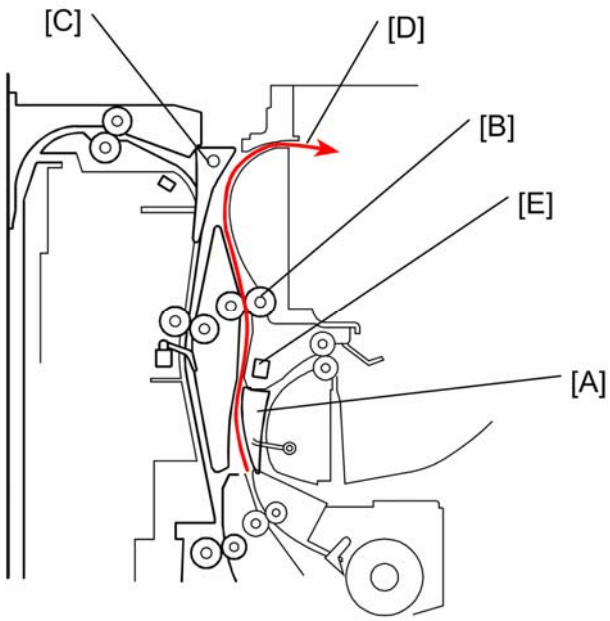
No additional notes.

Fax Model (M053) and Finisher Model (M054) Paper Exit

- When the finishing mode is selected or a received fax document is printed, junction gate 1 [A] and junction gate 2 [C] open the paper path to the upper unit (internal finisher or 1 bin unit).
- The paper is transported to the internal finisher or 1 bin unit [D] via the relay roller [B].
- The relay sensor [E] detects paper misfeeds.



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No additional notes.

Duplex

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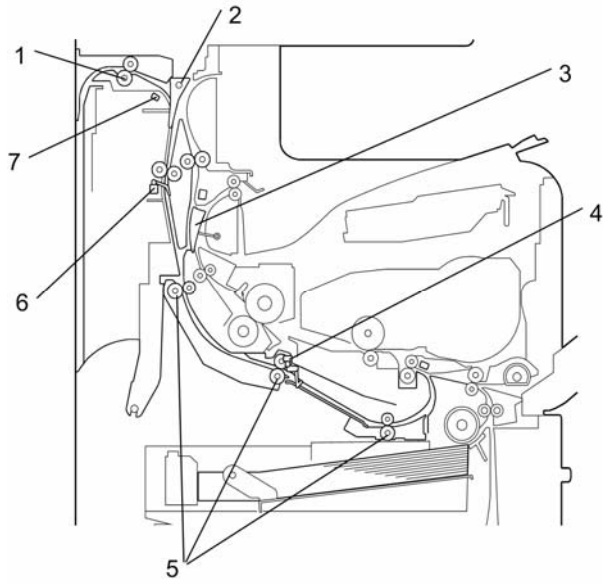
PURPOSE OF THE SECTION

In this section you will:

- ❒ Learn how paper is fed in duplex mode.

Components and Basic Operation

1. Duplex inverter roller
2. Junction gate 2
3. Junction gate 1
4. Duplex relay sensor
5. Duplex transport rollers
6. Duplex entrance sensor
7. Inverter sensor



- To print on the second side, the two junction gates direct the paper to the inverter roller.
- When the trailing edge reaches the inverter sensor the duplex inverter rollers reverse. At the same time junction gate 2 switches back to direct the paper through the duplex route.
- The duplex transport rollers feeds the inverted paper back to the registration roller.
- When both sides have been printed, junction gate 1 directs the paper to the output tray.

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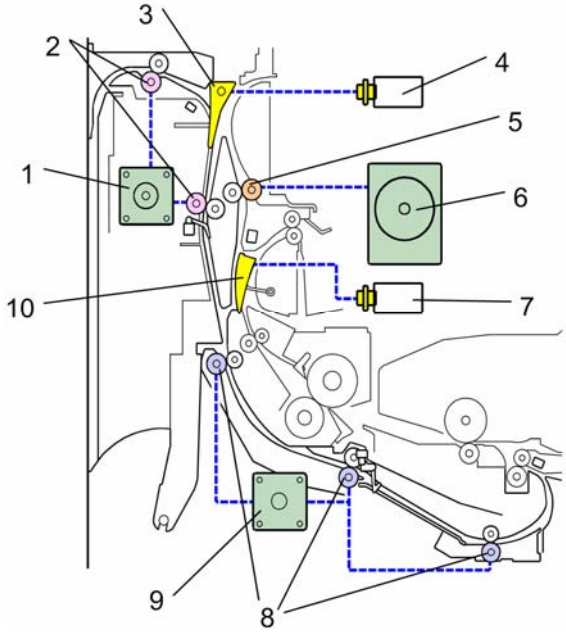
- The duplex entrance sensor and duplex transport sensor monitor for paper jams.

Duplex Drive

1. Duplex inverter motor
2. Duplex inverter rollers
3. Junction gate 2
4. Junction gate 2 solenoid
5. Relay roller
6. Main motor
7. Junction gate 1 solenoid
8. duplex transport rollers
9. Duplex motor
10. Junction gate 1



- The duplex inverter motor [1] drives the duplex inverter rollers [2].
- The main motor [6] drives the relay rollers [5].
- The duplex motor [9] drives the duplex transport rollers [8].
- The junction gate solenoids [4, 7] control the junction gates.

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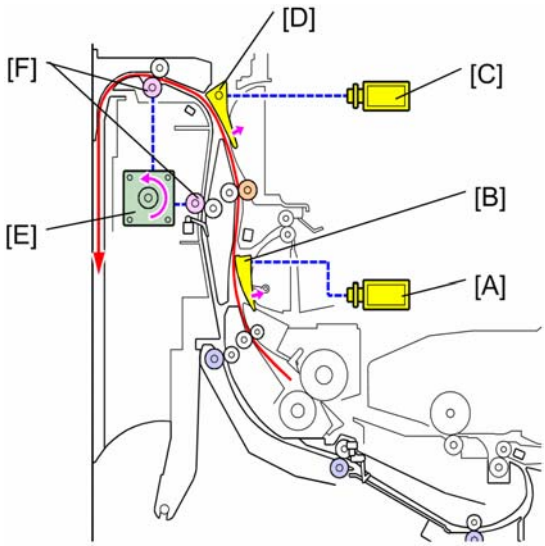
No additional notes.

Inverter Mechanism – 1

- When a duplex job is sent to the machine, junction gate 1 solenoid [A] moves the junction gate 1 [B] and opens the paper path to the upper unit and duplex section.
- Junction gate 2 solenoid [C] also moves junction gate 2 [D] and opens the duplex inverter path.
- A sheet of paper is fed to the duplex inverter rollers [F] by the relay roller.
- The duplex inverter rollers are driven counterclockwise by the duplex inverter motor [E] at this time.



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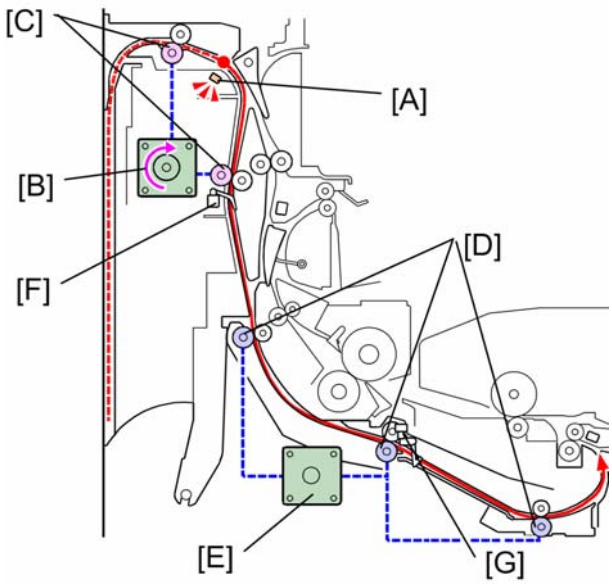
No additional notes.

Inverter Mechanism – 2

- When the duplex inverter sensor [A] detects the trailing edge of paper, the duplex inverter motor [B] reverses.
- The paper is switched back, and fed to the duplex path.
- In the duplex path, paper is transported by the duplex transport rollers [D] which are driven by the duplex motor [E].
- The paper arrives at the registration rollers with the reverse side up.
- After an image is printed and fused on the reverse side, the paper goes to the paper exit section or upper unit (internal finisher or 1 bin unit).



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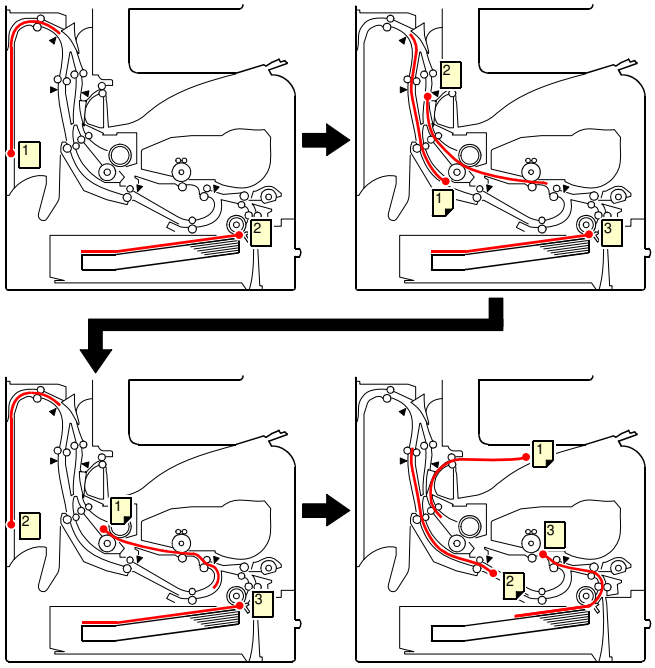
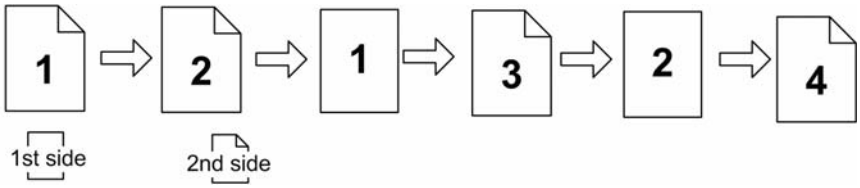
No additional notes.

Interleave Operation

- Up to three sheets of paper in the paper feed path at the same time. The interleave method is used.
- The illustration to the right shows how the paper travels through the machine during duplex copying.
- The illustration below shows image printing sequence.





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❒ For each sheet, the second side image is printed first so that the sheets will be stacked in the proper order on the output tray.

Optional Paper Feed Units (M375, M376)

Slide 144

- This section will cover only the items that are unique to the paper tray units.
- The components and feed mechanism are basically the same as for the standard paper tray.

Overview

- Each paper tray unit (PFU) has its own feed mechanism.
- Like the standard tray, each PFU holds 550 sheets of paper.
- If installed on the floor, the bottom PFU must be a TK1100 (M376) unit. (Has casters)
- The paper trays are almost exactly the same as the standard paper tray. The only difference is that the front plate is slightly higher on the PFU trays.

PFU Tray Standard Tray

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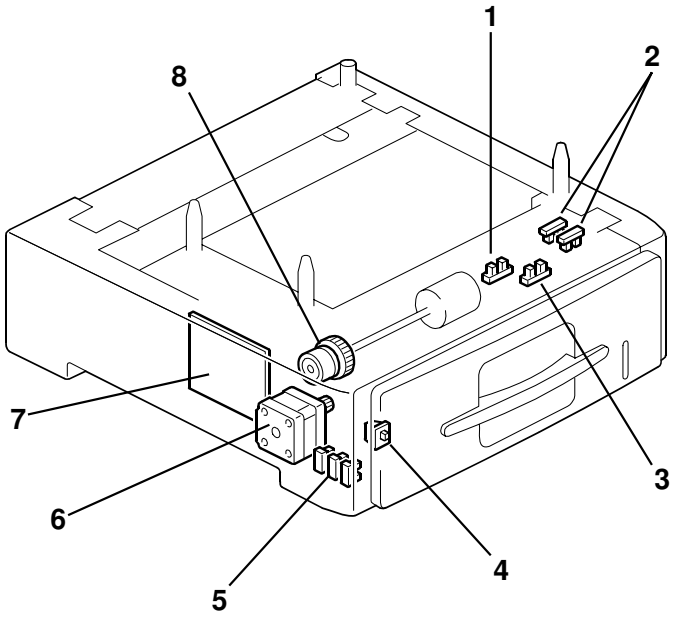
No additional notes.

Electrical Component Layout

1. Paper end sensor
2. Remaining paper sensors
3. Transport sensor
4. Tray set switch
5. Paper size detection sensor
6. PFU motor
7. PFU board
8. Feed clutch



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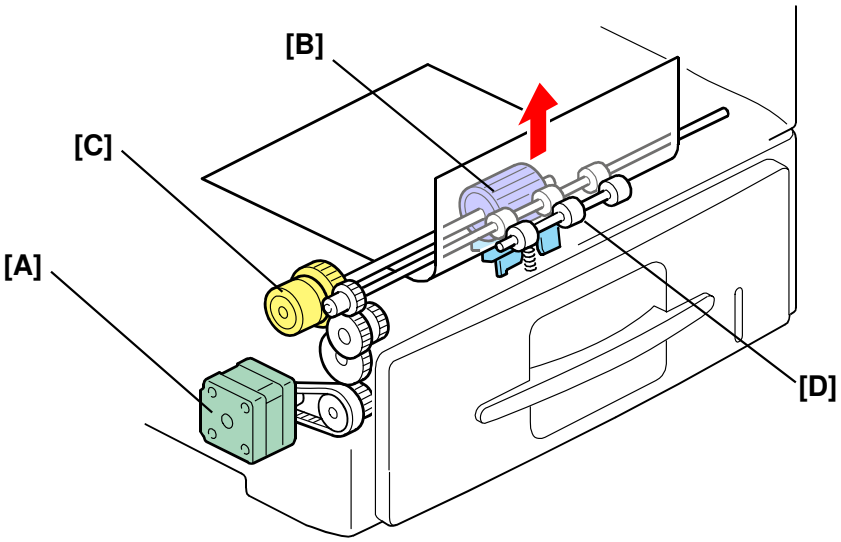
❒ Components 3, 6, 7, and 8 are unique to the paper tray units.

Paper Feed Drive



- The paper feed motor [A] drives the feed roller [B] via a timing belt, gears, and the feed clutch [C].
- The transport rollers [D] direct the paper to the main unit.

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No additional notes.

Internal Finisher (M054 only)

Slide 148

- In this section, you will study the mechanisms of the internal finisher. The finisher is built into the M054 model. It is not available as an option for the other models.

Specifications

- **Number of sheets in stapled set**
  - Paper length less than 300 mm: 50 sheets
  - Paper length 300 mm or more: 30 sheets
- **Size of paper that can be stapled**
  - Width: 182.0 mm to 216.0 mm
  - Length: 254.0 mm to 356.0 mm
- **Weights of paper that can be stapled**
  - 52 to 90 g/m^2
- **Number of stapling positions**
  - 1 position
- **Tray Capacity: 250 sheets (80 g/m^2)**

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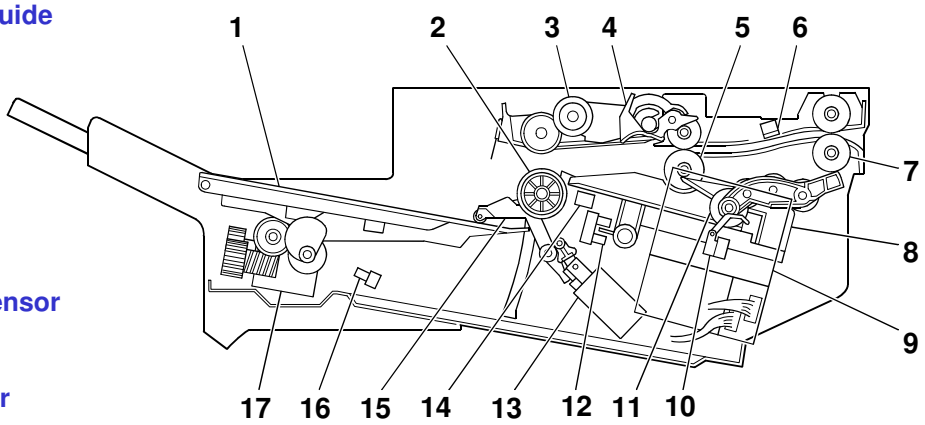
No additional notes

Component Layout - 1

1. Output tray
2. Paper exit roller
3. Gathering Roller
4. Paper trailing edge guide
5. Shift roller
6. Entrance sensor
7. Entrance roller
8. Stapler tray
9. Stapler
10. Staple tray paper sensor
11. Reverse roller
12. Jogger fence sensor
13. Pick-up solenoid
14. Paper exit sensor
15. Paper sensor arm
16. Lower limit sensor
17. Tray lift motor



- The first few slides show the locations of the components.

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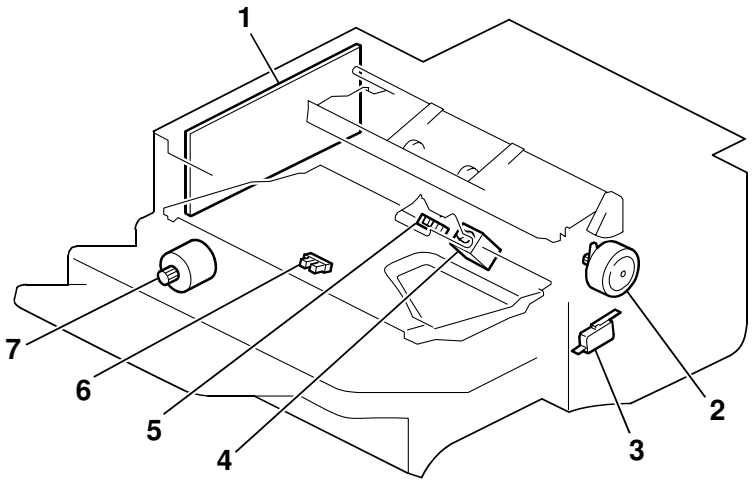
No additional notes.

Component Layout - 2

1. Main board
2. Exit guide plate motor
3. Interlock switch
4. Pick-up solenoid
5. Paper sensor
6. Tray lower limit sensor
7. Tray lift motor



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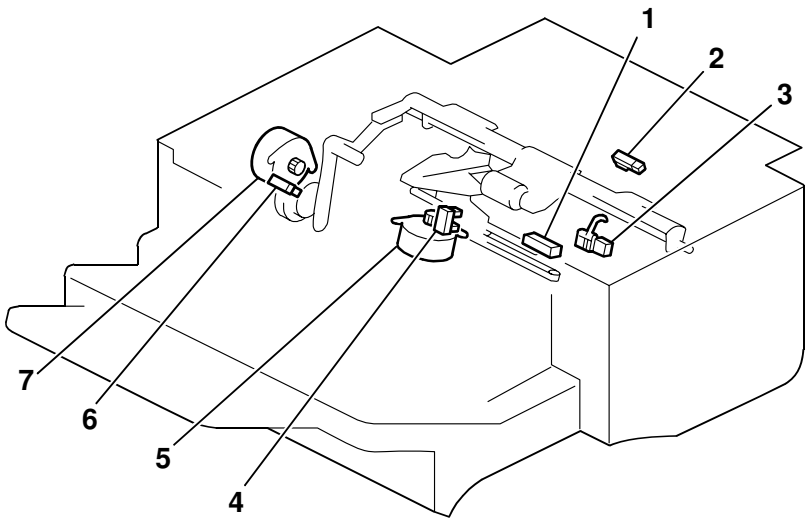
❒ The interlock switch turns off when the internal finisher front cover is opened. As a result, the relay on the PSU cuts off the power supply to the internal finisher.

Component Layout - 3

1. Paper exit sensor
2. Entrance sensor
3. Staple tray paper sensor
4. Jogger fence HP sensor
5. Jogger motor
6. Gathering roller HP sensor
7. Gathering roller motor



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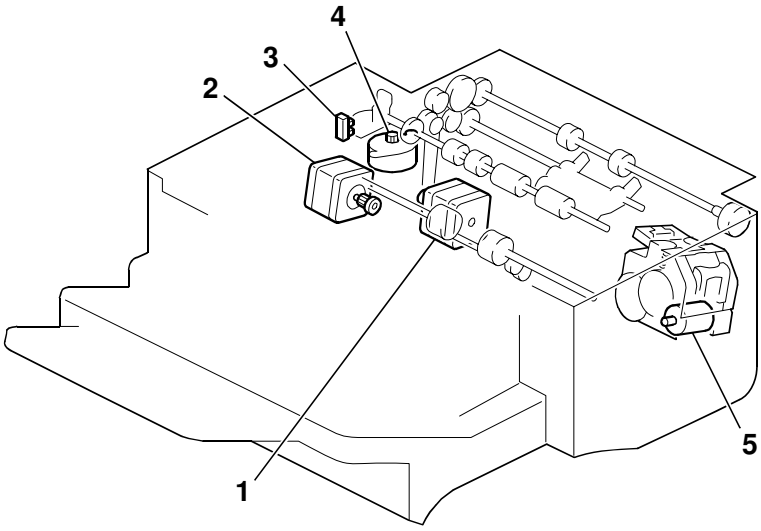
No additional notes.

Component Layout - 4

1. Transport motor
2. Paper exit motor
3. Shift roller HP sensor
4. Shift roller motor
5. Stapler motor



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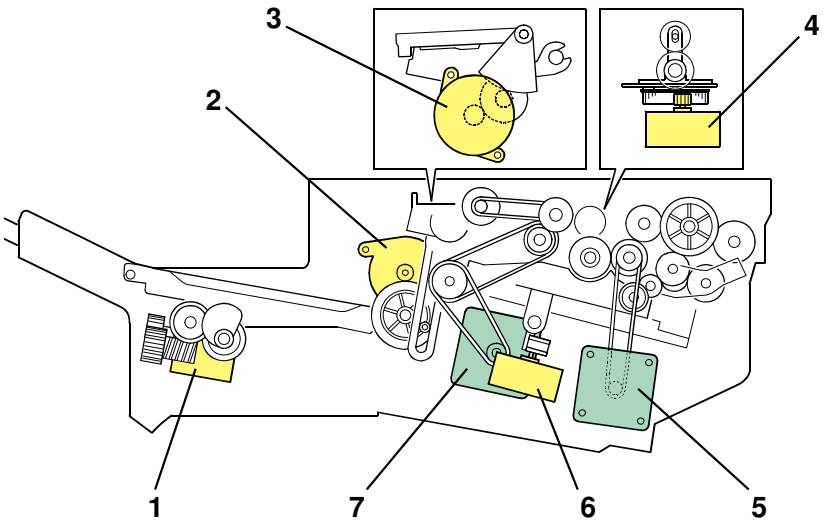
No additional notes.

Drive Layout

1. Tray lift motor
2. Gathering roller motor
3. Exit guide plate motor
4. Shift roller motor
5. Transport motor
6. Jogger motor
7. Paper exit motor



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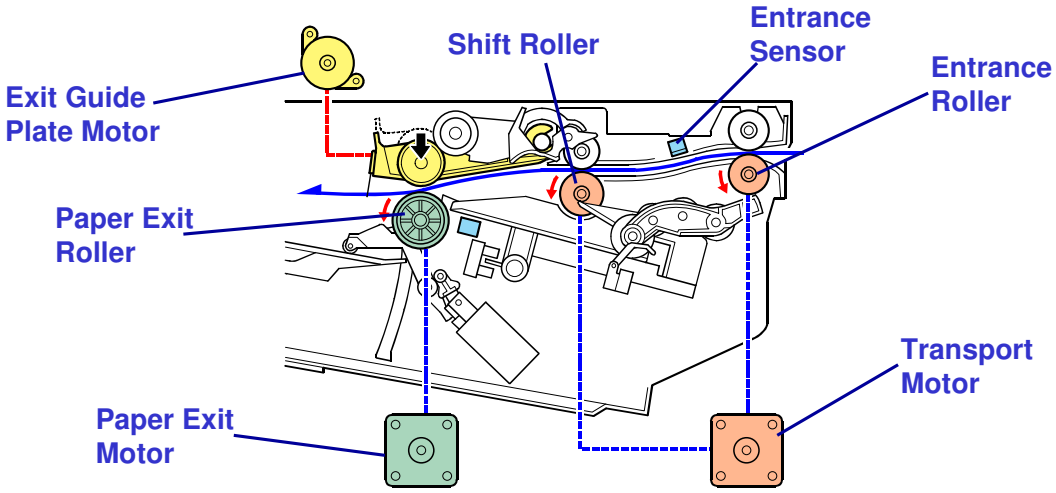
No additional notes.

Paper Feed Through the Finisher



- Transport motor: Drives the entrance roller and the shift roller.
- Paper exit motor: Drives the paper exit roller.
- When the entrance sensor detects the leading edge of the paper, the exit guide plate lowers the exit guide plate unit from its home position.
- The paper exit roller feeds the paper through to the output tray.

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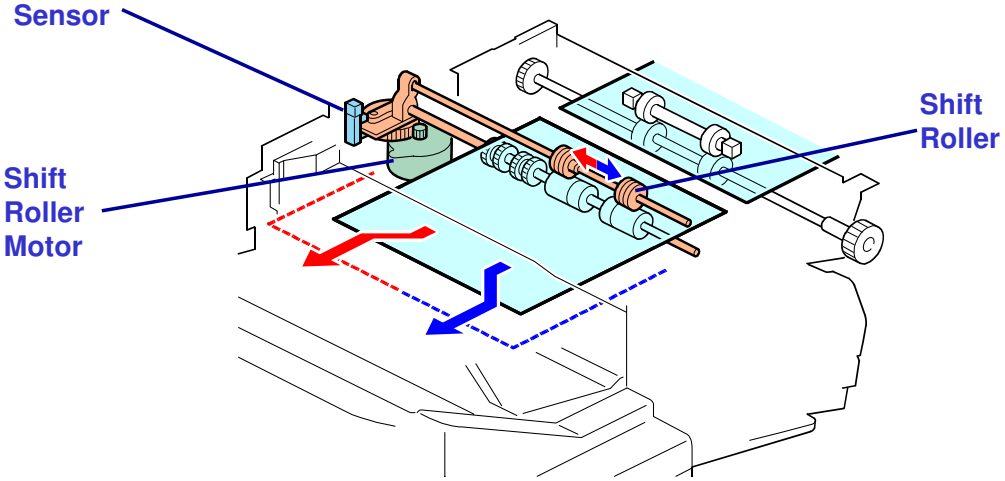
❒ This shows paper feed without stapling.

Shift



- The finisher separates each stack by shifting alternately to the left and right.
- The shift roller motor moves the shift roller from side to side.
- The shift roller HP sensor detects when the shift roller is at the home position again.

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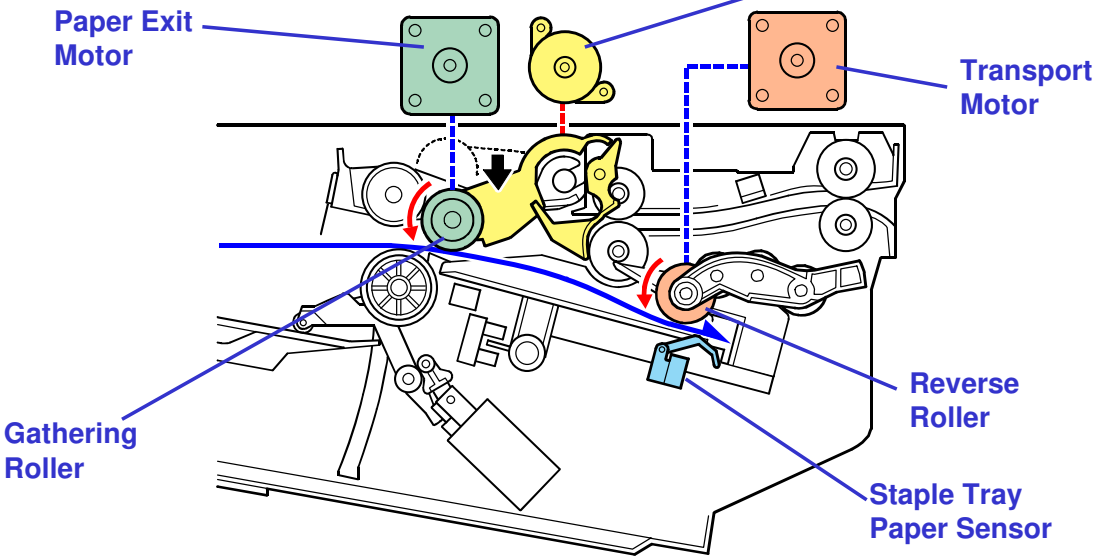
No additional notes

Stapling (1)



- The gathering roller motor drops the gathering roller onto the paper.
- The paper exit motor turns the gathering roller to reverse the paper into the staple tray.
- The reverse roller aligns the paper in the staple tray.
- The staple tray paper sensor detects the presence or absence of paper.

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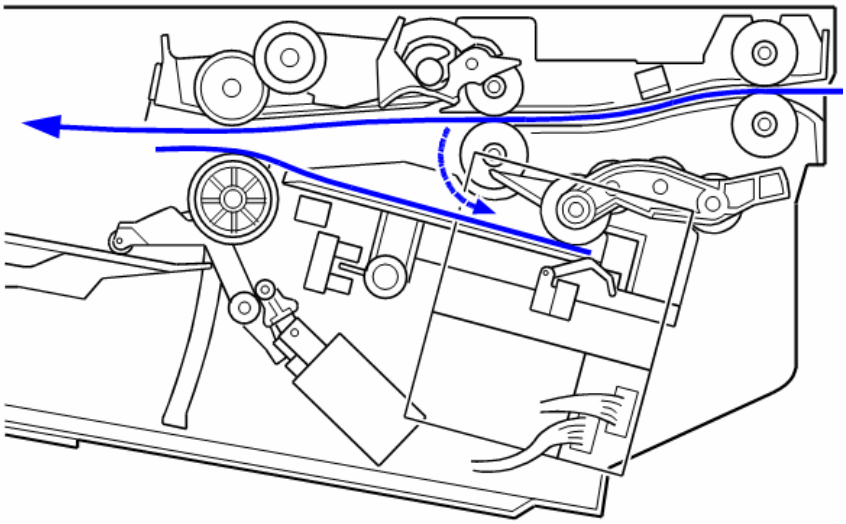
❒ This shows how the machine reverse-feeds the sheet of paper into the stapler.

Stapling (2)



- The gathering roller motor raises the gathering roller.
- Then the next sheet is fed into the finisher and reversed into the stapler tray.

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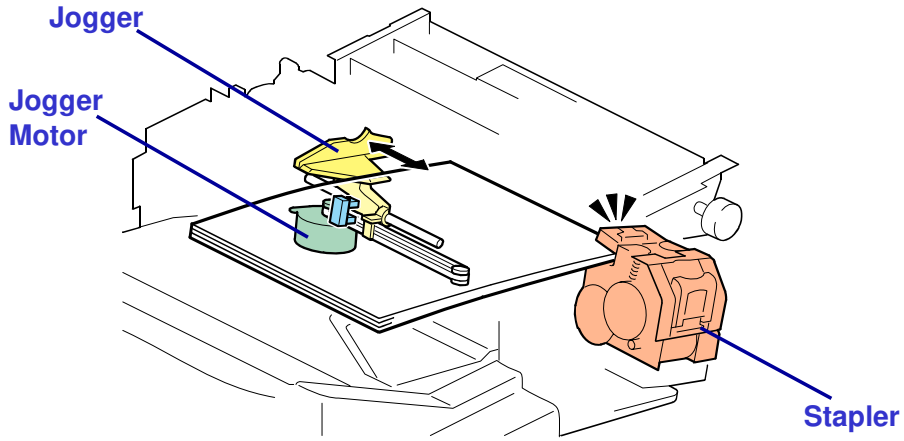
No additional notes

Stapling (3)



- The jogger motor drives the jogger.
- There is only one stapling position, and no stapler rotation.

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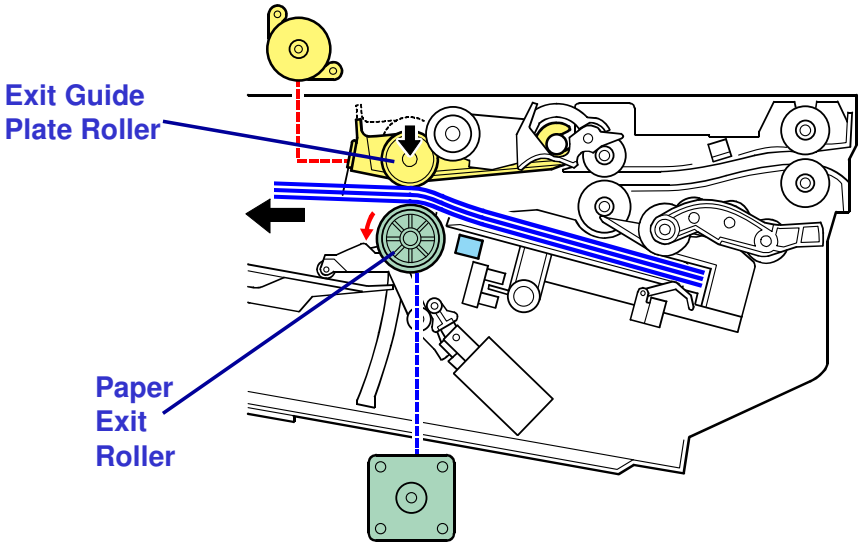
No additional notes

Stapling (4)



- After stapling, the exit guide plate roller drops onto the top of the stack.
- The paper exit roller feeds out the stack.

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No additional notes

Jogger Fence Fine Adjustment

- **You can adjust the jogging position of the jogger fence with the following SPs (from -1.0 mm to 1.0 mm).**
  - A4: 6132-003
  - B5: 6132-005
  - Legal: 6132-008
  - Letter: 6132-009
  - Other: 6132-012

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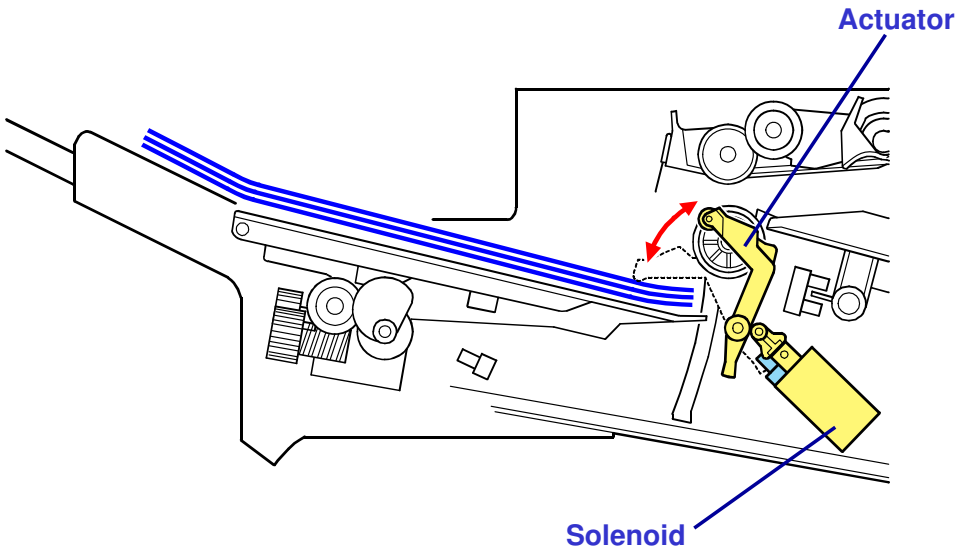
No additional notes

Tray Full Detection (1)



- The paper sensor solenoid moves the actuator until it touches the top of the stack.

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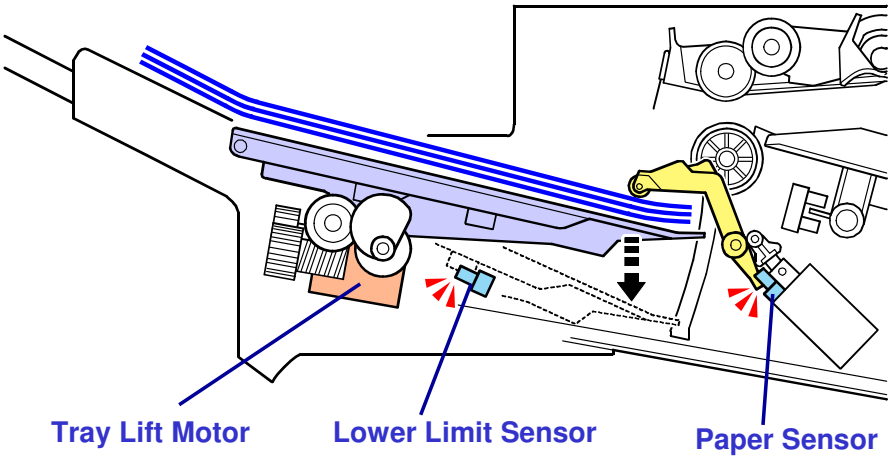
No additional notes

Tray Full Detection (2)



- When the sensor detects the actuator, the tray lift motor lowers the end of the tray nearest the exit. This makes room for more paper on the tray.
- If the tray lower limit sensor is activated, the tray cannot be lowered any more.

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No additional notes

Finisher Free Run

- **You can make a finisher free run with the following SPs. No paper is required when executing these SPs.**
  - 6137-001: Free Run 1 (Shift mode)
  - 6137-002: Free Run 2 (Staple mode)
  - 6137-003: Free Run 3 (Packing mode: Output tray descends to the lowest position.)
  - 6137-004: Free Run 4 (Not assigned)
- **You can also make a free run with dip switches (SW101)**

1	2	3	4	mode
OFF	OFF	OFF	OFF	Normal mode
ON	OFF	OFF	OFF	Shift mode
OFF	ON	OFF	OFF	Staple mode
OFF	OFF	ON	OFF	Packing mode: Output tray descends to the lowest position

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No additional notes

LED on Main Board

- **You can check the finisher status with the LEDs on the finisher main board.**

LED	Status
OFF	Machine power OFF
Blink (per 1.0 s)	Normal operation, Free run mode
Blink (per 0.4 s)	Error occurring (Jam, SC, etc.)
Blink (irregular)	Firmware update
ON	Finisher software malfunction

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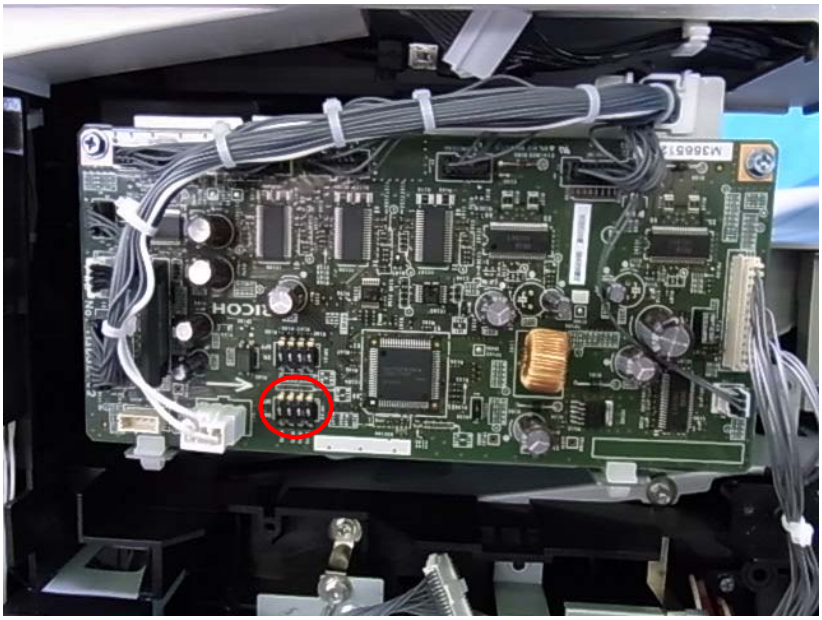
No additional notes

Replacing the Main Board



- Check the DIP switch (SW100) on the old main board. If the settings on the new main board are different from the old main board, change the settings on the new board (they must be the same as the settings on the old board).

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No additional notes

One-bin Tray (M053 only)

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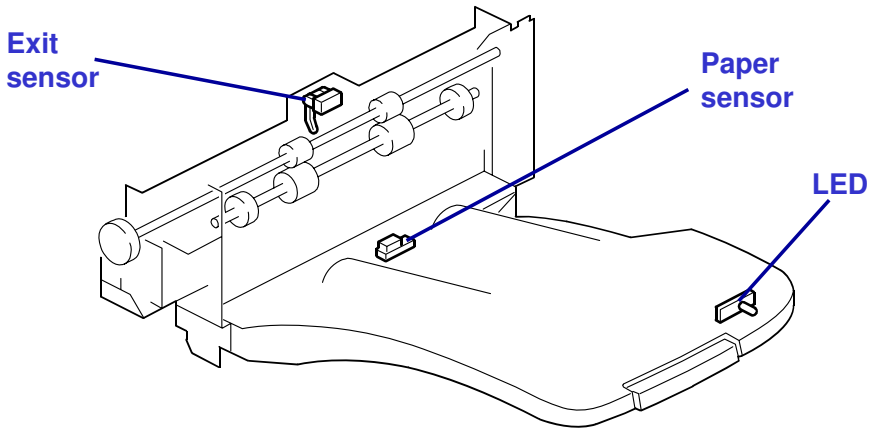
No additional notes.

1-Bin Tray Components



- The exit sensor monitors for paper jams.
- The paper sensor checks for paper on the 1-Bin tray.
- The LED lights when there is paper on the 1-Bin tray.

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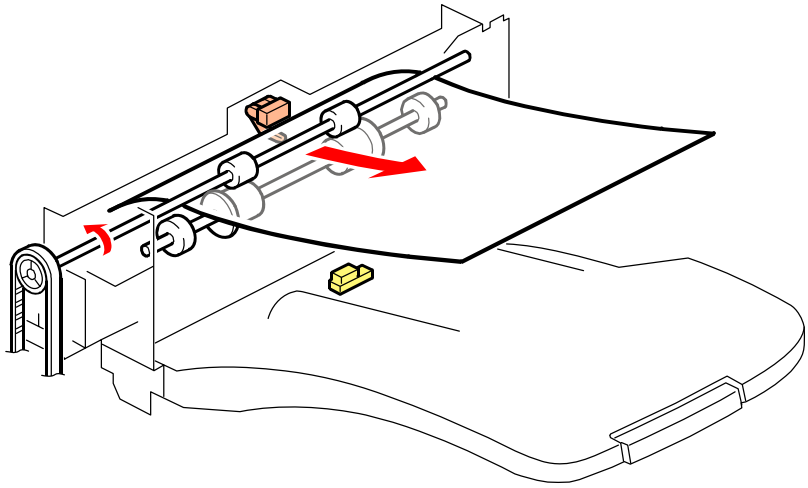
No additional notes.

1-Bin Tray Drive



- The 1-Bin tray is driven by a timing belt from the main unit.

Slide 169

No additional notes.

RICOH

Environmental Conservation

Technology for Environmental Conservation

Energy Saving

Paper Saving

Slide 170

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

Technology for Environmental Conservation

**: New or modified function
*: Has this function
Blank: Does not have this function

Environmental Technology/Feature	Description	SH-MF1/ SH-P1
1. QSU	- Reduction of warm-up time (Energy saving) - Reduction of CO_2 emissions	*
2. Hybrid QSU		
3. IH QSU		
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 output	- 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		
12. Recycle-friendly design		

The shaded parts of the chart are not applicable as this machine uses an AIO.

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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 Ready 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 an additional circuit 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 output**
  - Enables high-speed duplex printing through the utilization of the Duplex Interleaf and high-speed Inverter Transport features.
- **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

Quick Start-up

- **The warm-up time and recovery time from energy saver modes are as follows.**
  - Warm-up time (20 seconds)
  - Recovery time
    - » Energy Saver Mode:
      - – 1 second
    - » Sleep Mode:
      - – 20 seconds

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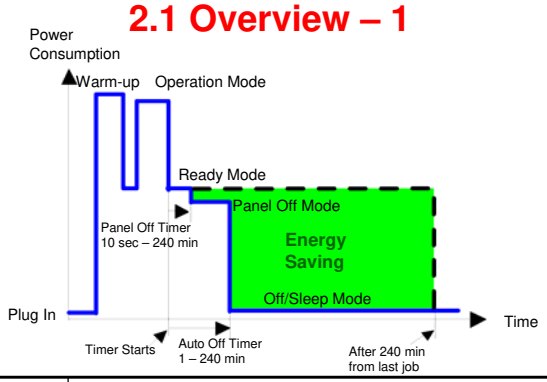
❒ Through major reductions in warm-up time and recovery time from energy saver modes (Low power, Sleep), QSU (Quick Start Up) Technology has eliminated the traditional trade-off between energy saving and convenience of speed.

2. Energy Saving

2.1 Overview – 1



Energy Saver Modes	Description
Energy Saver Mode (Panel Off)	The machine is still in the Copy Ready condition. Panel off only
Auto Off Mode	If no printer/scanner or fax unit is installed: No power is supplied to the printing engine and the controller.
Sleep Mode	When a printer/scanner or fax unit is installed: No power is supplied to the printing engine, and almost none to the controller.

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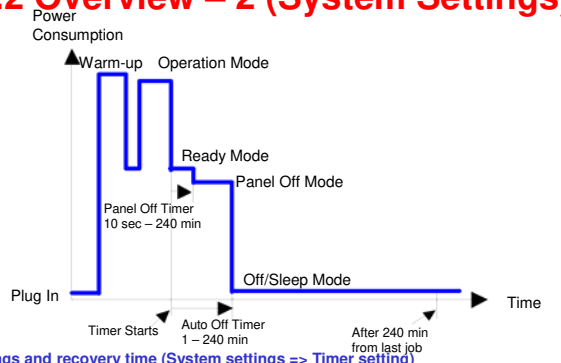
- When the machine is not being used, the machine enters energy saver mode to reduce the power consumption by turning off the LCD of the operation panel and lowering the fusing temperature.
- The area shaded green in this diagram represents the amount of energy that is saved when the timers are at the default settings. If the timers are changed, then the energy saved will be different. For example, if the timers are all set to 240 minutes, the green area will disappear, and no energy is saved before 240 minutes expires.
- Power consumption during warm-up may be much higher than shown in this diagram.

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



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

Mode	Timer	Default	Setting range	Recovery time
Panel off Mode	Panel Off Timer	1min	10 sec to 240 min.	1sec.
Off/Sleep Mode	Auto Off Timer	1min	1 to 240 min.	20 sec.

Specified values for timers	Panel Off Mode	Auto Off Mode
If Panel Off > Auto Off	This mode can start	This mode can start
If Panel Off = Auto Off	This mode cannot start	This mode can start
If Panel Off < Auto Off	This mode cannot start	This mode can start

2) Energy saver level setting (System setting => Administrator Tools => Energy saver level)

Level 1	Panel off only

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- The user can set these timers with User Tools
  MFP/ Priport: User Tools > System settings > Timer Setting
  Printer : User Tools > System settings > Energy Saver Timer
- Normally, Panel Off timer < Energy Saver timer < Auto Off timer.
- But, for example, if Auto Off timer < or = Panel Off timer and Energy Saver timer, the machine goes immediately to Off mode when the Auto Off timer expires. It skips the Panel Off and Energy Saver modes.
- Example
  - Panel off: 1 minute, Low power: 15 minutes, Auto Off: 1 minute
  - The machine goes to Off mode after 1 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 240 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.
- Power consumption during warm-up may be much higher than shown in this diagram.

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	On	On
Off/Sleep Mode	Off	Off	On

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No additional notes

2. Energy Saving
2.2 Energy Saver Mode: Panel Off Mode

- **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: Timer settings.
  - The Energy Saver key is held down for a second.
- **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 Energy Saver key is pressed
  - An original is placed in the ARDF
  - The ARDF is lifted
  - The user touches the operation panel
  - The front door is opened or closed
  - The user sends a job to the MFP

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- In some MFP models, when it takes 1 minute to return from Sleep mode, there may be no Panel Off Mode

2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 1

- **The machine enters sleep mode when one of the following is done.**
  - The auto off timer runs out after the last job.
  - The operation switch is pressed to turn the power off.
- **When the machine enters sleep mode, no power is supplied to the printing engine, and almost none to the controller.**
- **Recovery time**
  - Less than 20 seconds

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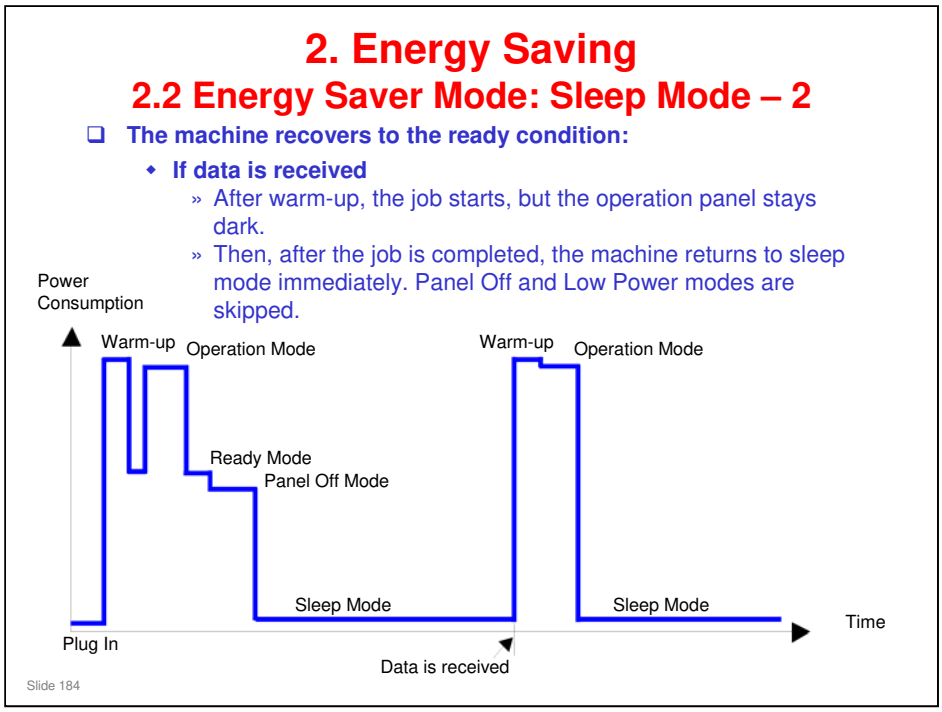
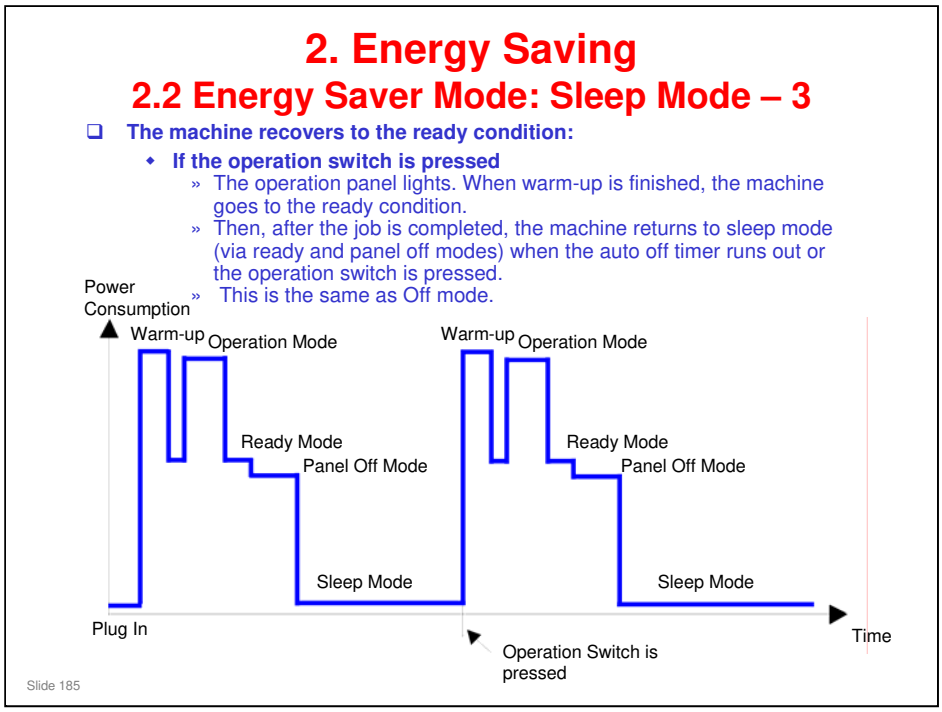
No additional notes



❒ This timing chart shows what happens if data is received while the machine is in sleep mode.

❒ Power consumption during warm-up may be much higher than shown in this diagram.



- This timing chart shows what happens if the operation switch is pressed while the machine in sleep mode.
- Power consumption during warm-up may be much higher than shown in this diagram.

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 time
  - 8941-002: Standby time
  - 8941-003: Energy Save time
  - 8941-004: Low power time
  - 8941-005: Sleep mode time
- **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), measured in minutes.

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

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

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

Mode/condition	Power consumption:
Operating mode	SH-MF1: 862 W SH-MF1m: 891 W SH-MF1f: 858 W
Standby mode	SH-MF1: 194 W SH-MF1m: 197 W SH-MF1f: 159 W
Energy Saver mode (Panel Off)	Same as standby mode
Sleep mode	SH-MF1: 2. 86 W SH-MF1m: 5.30 W SH-MF1f: 2.71 W

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❒ Power consumption values are based on the main unit only without optional paper tray units.

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 (SH-MF1m):

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) x (4)/1000 = (5)
Operating	001: Operating Time	21089	21386	4.95	891.00	4.41
Stand by (Ready)	002: Standby Time	306163	308046	31.38	199.00	6.24
Energy save (panel off)	003: Energy Save Time	74000	75111	18.52	199.00	3.69
Sleep	005: Sleep mode Time	508776	520377	193.35	5.30	1.02
Total (6)						15.36

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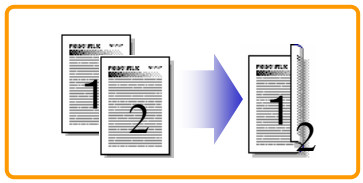
- Power consumption values are based on the main unit only without optional paper tray units.

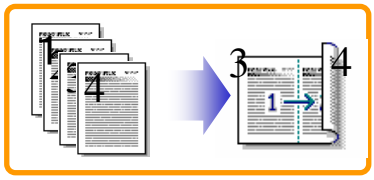
3. Paper Saving
3.1 Measuring the Paper Consumed – 1

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 duplex mode : SP 8421 001
  - Double-sided with duplex mode : SP 8421 002
  - Book with with duplex mode : SP 8421 003
  - 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+③+④)/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)**
    - **③ Double-sided with duplex mode : SP 8421 002 (pages)**
    - **④ Book with with duplex mode : SP 8421 003 (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.