RICOH

Modifications to this TTP

June 23rd

- Modified slides (old slide numbering)
  - 6: ELP-NX and CAP are options for Z-P1a; note added about SDK/duplex/1260 mm printing
  - 16: SP mode deleted - do not adjust
  - 21: First print speed: Measured with ELP disabled.
  - 22: Plain Paper 2 is the default; note about thick paper 3 and 4
  - 23: Note about RPCS firmware
  - 24: Notes about G-P3
  - 27: ELP-NX is option for Z-P1a
  - 28: VM Card Type O details; caster table added to the list
  - 32: Transfer Unit PM interval; color PCDUs provided as 3 separate service parts
  - 45: Purpose of the tray heater is mentioned
  - 47: Two notes added about the securing brackets
  - 55: New instruction for moving
  - 61: Transfer Unit PM interval
  - 63: Technicians can replace the individual parts of the ITB unit and the fusing unit.
  - 76: ID Sensor cleaning added; SC700 added
  - 136: Quenching: new OPC material
  - 159: ID Sensor cleaning added; SC700 added
  - 186: Modified ‘at end of job’
- New slide inserted between slides 101 and 102 (old numbering)
- New slide inserted between slides 223 and 224 (old numbering)

No additional notes

Course Overview - 1

- Product Outline
- Installation
- Updating the Firmware
- Maintenance
- Machine Overview
- Paper Feed
- Laser Unit

Slide 3

No additional notes

Course Overview - 2

- PCDU (Photoconductor and Development Unit)
- Development
- Process Control
- Image Transfer
- Fusing
- Paper Exit
- Optional Paper Feed Unit
- Environmental Conservation

Slide 4

No additional notes

Product Outline

Introduction

Slide 5

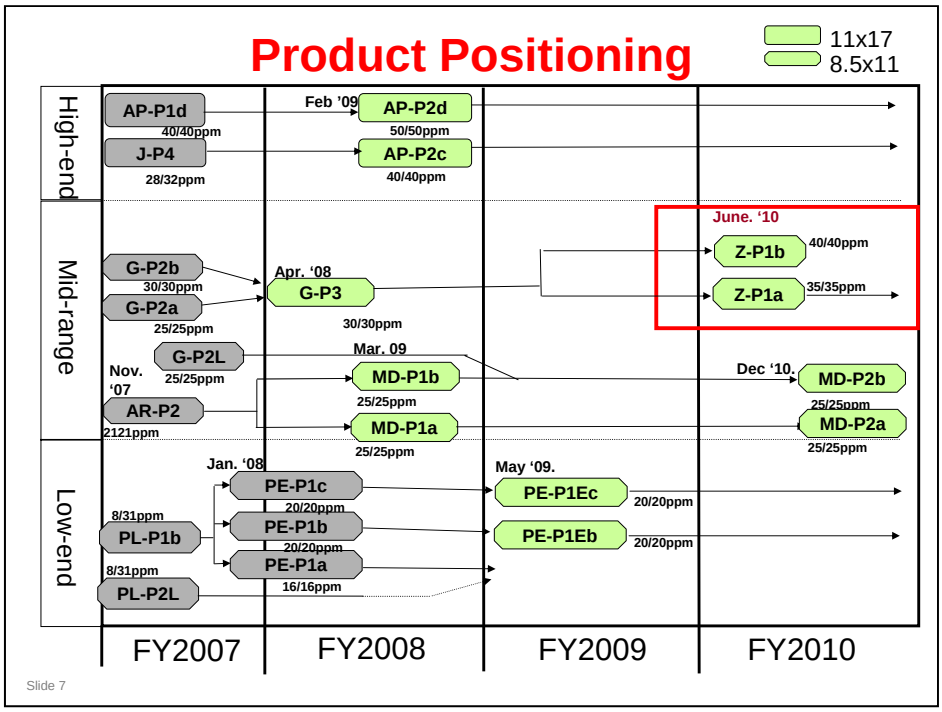
No additional notes

Two Models

- **Z-P1a (M065)**
  - 35 ppm (A4), 37 ppm (LT)
  - Memory: 384 MB (up to 768 MB with optional memory unit)
  - Optional: HDD, VM card, ELP-NX, CAP
    - » To install CAP (Card Authentication Package), 768 MB memory must be installed.
- **Z-P1b (M066)**
  - 40 ppm (A4), 42 ppm (LT)
  - Memory: 768 MB (no optional memory unit)
  - Also included: HDD, VM card, ELP-NX
  - CAP (Card Authentication Package) available as an option

Slide 6

- The Z-P1 replaces the G-P3 in the product line-up.
- However, the Z-P1 has stronger security features (Z-P1a – optional, Z-P1b – some are built-in)
- App2Me is not available with this product.
- P1a: If 768 MB of memory is installed, printing 1260 mm in duplex mode is possible even if an SDK application is installed.



❒ The Z-P1 series is the successor to the G-P3 series.

The Machine

- This shows the machine with no options installed.

Slide 8

No additional notes

The Machine (with Optional Paper Trays)

- **This shows the machine with three optional paper trays installed.**
  - Up to three of these 550-sheet trays can be installed.
- **If the machine will be installed on the floor (not on a desk or table), a caster table must be installed.**
- **Securing brackets must be installed between the trays if a caster table is installed.**
  - These securing brackets must also be added if tray heaters are installed in the optional trays, even if there is no caster table.

Slide 9

Paper capacity

- Standard: 650 sheets (Bypass: 100 sheets, Standard tray: 550 sheets)
- Maximum: 2300 sheets

- The securing brackets are needed for stability.

Operation Panel

- **Four-line LCD, with 10-key pad.**
- **The 10-key pad is needed for use with CAP (Card Authentication Package), so that encryption keys can be input.**

Slide 10

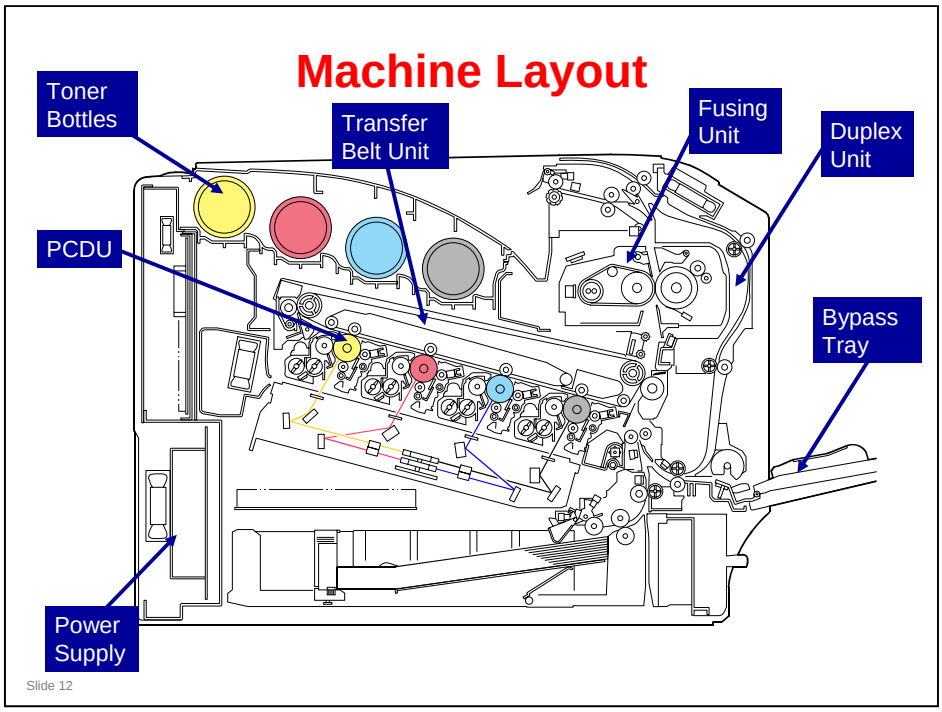
- For how to operate the machine, see the Operating Instructions (Hardware Guide) for details.
- G-P3 has a 4-line LCD, but does not have a ten-key pad.

Card Authentication Package (CAP)

- Space for installing a card reader for the Card Authentication Package (CAP).

Slide 11

No additional notes



- PCDU: Photoconductor and Development Unit
  - One for each colour.
- The amount of space required is about the same as for the G-P3 printer.
- In the 'Machine Overview' section, we will compare the Z-P1 with the G-P3.

Improvements over the G-P3

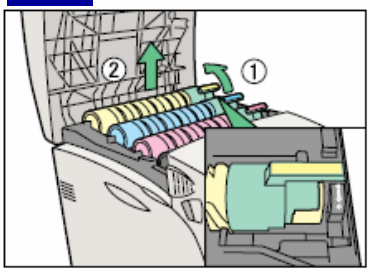
	Z-P1a	Z-P1b	G-P3
Continuous Speed (ppm)	35 / 35	40 / 40	30/30 ppm
First Print	15 / 10 sec.		15 / 10 sec.
Controller	GW (09A)		GW (08S)
Resolution	1200dpi, 600dpi		
Paper Capacity (Standard)	550-sheet tray + 100-sheet bypass		
Paper Capacity (Max)	2,300 sheets		
Paper weight (Standard Tray)	up to 220gsm		up to 216gsm
Paper weight (Bypass)	up to 256gsm		up to 216gsm
Paper weight (Duplex)	up to 163gsm		up to 157gsm
Operation Panel	4-line LCD, 10-key pad		4-line LCD
Dimensions (W x D x H)	444 x 658 x 490		446 x 589.5 x 487
Weight	57 kg		50 kg
Toner Yield	15,000		5,000 / 15,000

Slide 13

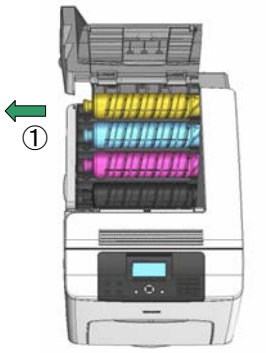
- The yellow areas show improvements over the G-P3.
- Gsm: grams per square meter (paper weight)

Easier to Replace Toner Cartridges

G-P3



Z-P1



- **G-P3: Two steps required**
- **Z-P1: Only one step needed**
  - Decals also make it easy to see where to install each toner cartridge.

Slide 14

No additional notes

Product Outline

Economy Color: New Feature

Slide 15

- The next few slides briefly explain this feature, which is selectable at the printer driver.

Economy Color (1)

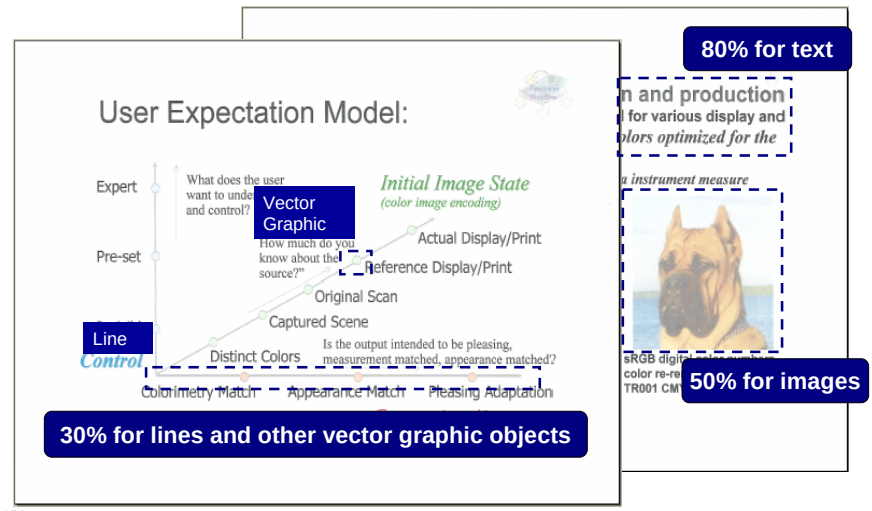
- **Economy Color is a new feature.**
  - The purpose is to use less toner so that full-color printing is almost the same cost as black-and-white printing.
  - This makes the Z-P1 attractive for people who may wish to move from black-and-white to full-color printing.
  - Toner saving reduces the amount of toner used on a page.

Slide 16

- 09A or later LPs only
  - MD-P2 will have this feature.

Economy Color (2)

- Default toner consumption

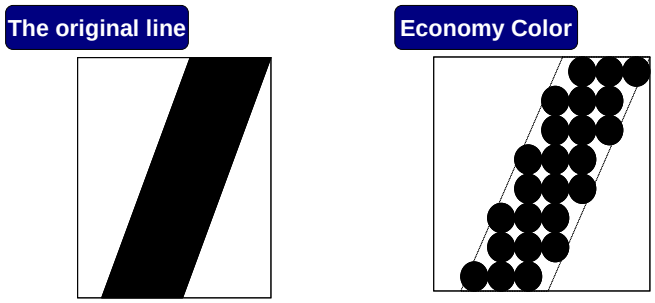


Slide 17

No additional notes

Economy Color (3)

- **Principle:**
  - Reduce the number of printed dots, to reduce the consumption of toner.

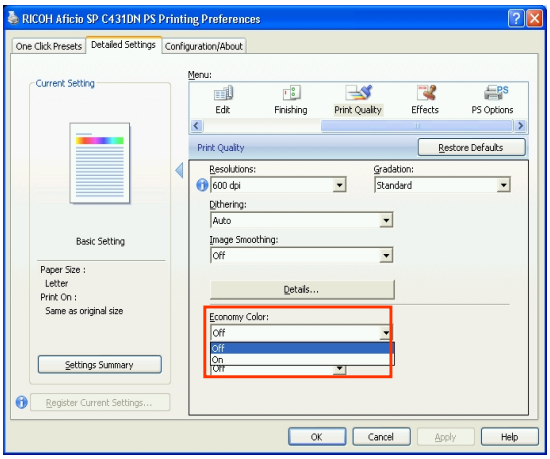


Slide 18

No additional notes

Economy Color (4)

- **Printer driver support for Economy Color:**
  - PCL6 mono driver
  - PS mono driver



Slide 19

- Mono driver: This is a driver which is distributed through other means than shipping with an OS (e.g. through the internet or on a driver CD)
- Mini drivers: These are shipped with Windows (on systems that have Windows pre-installed, or on Windows CDs/DVDs). They do not support Economy Color mode.

- If Economy Color is switched on, the toner consumption will be reduced in accordance with the SP settings discussed previously.
- If Economy Color is switched off, there will be no reduction in toner consumption.

Product Outline

Specifications

Slide 20

No additional notes

General Specifications 1

- **Printing Speeds (ppm) [Monochrome/Color]**
  - Z-P1a: 37 ppm LT, 35 ppm A4
  - Z-P1b: 42 ppm LT, 40 ppm A4
- **First Print Speed (A4/LT SEF from tray 1):**
  - Color: 15 seconds or less
  - Black & White: 10 seconds or less
- **Warm-up Time: Less than 50 seconds (at 23° C/50%)**
- **Print Paper Capacity (80 g/m², 20lb):**
  - Standard tray: 550 sheets
  - By-pass tray: 100 sheets
  - Optional paper feed tray: 550 sheets (up to 3 can be installed)
  - Maximum paper feed capacity: 2300 sheets
- **Output Paper Capacity: 500 sheets (face down)**

Slide 21

- This slide shows the important specifications.
- For a full list, see the field service manual.
- First print speed: Measured with ELP disabled.

General Specifications 2

- **Print Paper Size:**
  - Standard Tray, Optional Tray:
    - » Minimum 90 x 148 mm, Maximum 216 x 355.5 mm
  - Bypass Tray:
    - » Minimum 70 x 127 mm, Maximum 216 x 1260 mm
- **Printing Paper Weight: Standard tray, Optional paper tray, and bypass tray:**
  - Standard Tray, Optional Tray: 52-220 g/m^2 (14-59 lb)
  - Bypass Tray: 52-256 g/m^2 (14-68 lb)
  - Duplex: 60-163 g/m^2 (16-44 lb)
- **Paper weight settings at printer driver and operation panel:**
  - Thin: 52-60.2 g/m^2
  - Plain Paper 1: 60.2-80 g/m^2
  - Plain Paper 2 (Default): 80.1-90.2 g/m^2
  - Middle Thick: 90.3-105.3 g/m^2
  - Thick Paper 1: 105.4-130 g/m^2
  - Thick Paper 2: 130.1-163 g/m^2
  - Thick Paper 3: 163.1-220 g/m^2
  - Thick Paper 4: 220.1-256 g/m^2

Slide 22

- This slide shows the important specifications.
- For a full list, see the field service manual.
- Print Paper Size: See "Supported Paper Sizes“ in the field service manual for full details.
- Also see the separate file Z-P1 Print Possibility.xls to see the availability of printing on various paper sizes at different resolutions.
  - Duplex printing on custom paper sizes with a long-edge size from 356 to 1260 mm is not available
- Thick paper 3 and 4 are new settings (the Z-P1 is the first machine to use these settings).

General Specifications 3

- **Resolution (dpi):**
  - XPS: 1200 x 1200, 600 x 600
  - PCL5c: 600 x 600
  - PCL6: 1200 x 1200, 600 x 600
  - Adobe PS 3: 1200 x 1200, 600 x 600
  - For 600 x 600 dpi printing, 2-bit is the default, but can be changed to 1-bit with a driver setting.
  - For 1200 x 1200 dpi printing, only 1-bit is possible.
- **Gradations: 256 gradations**
- **Maximum power consumption: 1540 W (120 V models), 1600 W (220-240 V models)**

Slide 23

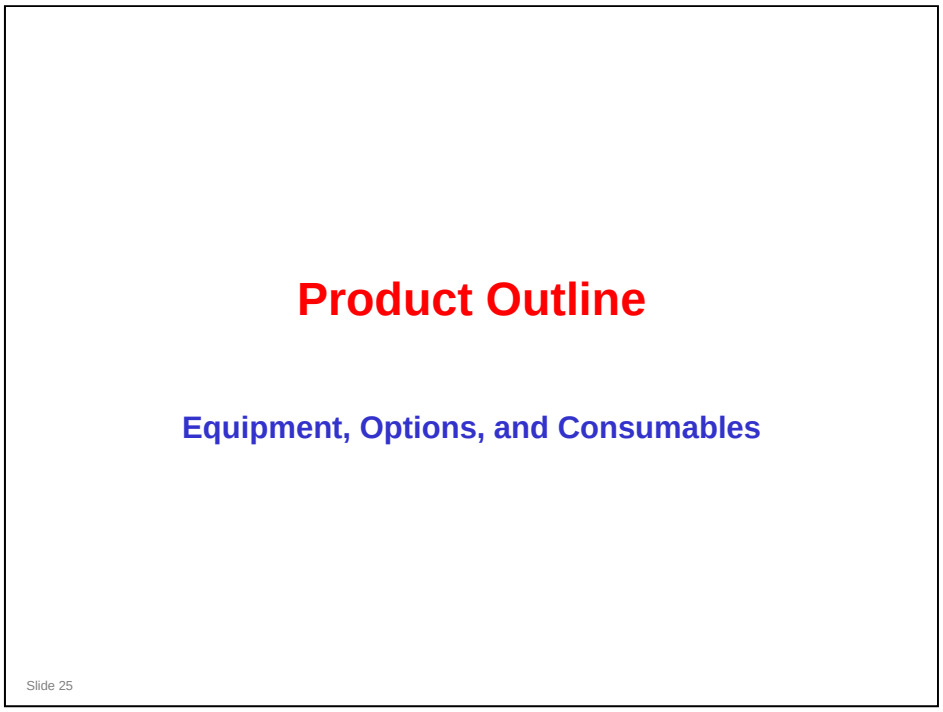
- This slide shows the important specifications.
- For a full list, see the field service manual.
- There is no RPCS driver for this model. However, the RPCS firmware is present.

Targets

- **Toner Yield: 15k (3k for the starter kit)**
- **Monthly Print Volume:**
  - Z-P1a: Average: 3.2k prints, Maximum: 20k prints
  - Z-P1b: Average: 5k prints, Maximum: 20k prints
- **Duty: 150k prints/Month (Color ratio 50%)**
- **Estimated Life: 5 years or 1200k prints whichever comes first**

Slide 24

- Toner yield for G-P3: 10k for starter and supply cartridge (color ratio 50%).
- Monthly print volume for G-P3: 5k



No additional notes

Standard Units

- **The machine has this equipment built in.**
  - 550-sheet tray
  - Bypass tray
  - Duplex mechanism
  - Ethernet 10/100base T
  - USB 2.0
  - USB host I/F (for the camera direct print card)
  - Memory:
    - » Z-P1a: 384 MB (up to 768 MB with optional 512 MB memory unit)
    - » Z-P1b: 768 MB (no optional memory unit)
  - HDD: built in only for Z-P1b
    - » Z-P1a: Optional, Z-P1b: Built-in
  - ELP-NX and VM cards: see the next slide

Slide 26

- Z-P1b is marketed as a higher-security model, with Z-P1a as a standard model.
- Z-P1a memory
  - There is 256 MB on-board, with 128 MB in a socket. To add the 512 MB optional memory, remove the 128 MB memory, then install the 512 MB memory.

ELP-NX and VM Cards

- **ELP-NX**
  - Z-P1a: Optional
  - Z-P1b: SD card included in the carton box; must be installed by the user in SD card slot 2
- **VM card**
  - Z-P1a: Optional SD card, requires optional 512 MB memory; must be installed by the user in SD card slot 2
  - Z-P1b: Included on the same SD card as ELP-NX; must be installed by the user in SD card slot 2
- **Notes**
  - Z-P1a: The ELP-NX and VM card options are on separate VM cards.
  - Z-P1b: ELP-NX and VM are standard, and included with the machine in the carton box on the same SD card. This SD card is also available as a service part in case of damage.

Slide 27

- The ELP-NX SD card for Z-P1b should not be used in the Z-P1a; this is not supported by Z-P1a.
- However, the ELP-NX SD card for Z-P1a can be used in the Z-P1b if necessary.

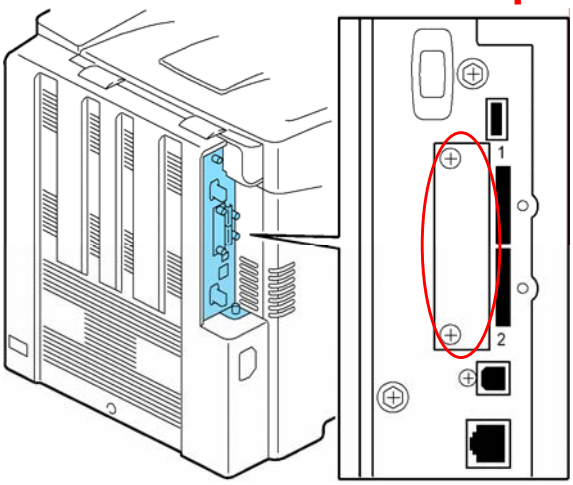
Optional Units

- **Paper handling options**
  - Up to 3 x 550-sheet paper feed units (PB1020): The mechanism is similar to Ap-C2
- **Controller options**
  - HDD Option Type 5000: Same as AI-C1/P1 (optional for Z-P1a only, standard for Z-P1b)
  - Memory Unit Type I (512 MB, optional for Z-P1a only, standard for Z-P1b): Same as Di-C1
  - One of the following:
    - » IEEE802.11a/g (g) Types L and M: Same as G-P3
    - » IEEE1284 Type A: Same as G-P3
    - » Gigabit Ethernet Type A: Same as G-P3
  - Data Overwrite Security Unit Type K: Same as G-P3
  - HDD Encryption Unit Type D: Same as Ap-P2
  - Camera Direct Print Card Type H (PictBridge): New item
  - VM Card Type O: New item (for Z-P1a only, for Z-P1b the VM card is included on the ELP-NX card which is packed with the machine)
  - SD Card for NetWare Printing Type D: New item
- **Others**
  - Caster table

Slide 28

- There is no Bluetooth option.
- The only new items are as follows:
  - PB1020 paper tray
  - Camera Direct Print Card Type H
  - VM Card Type O
  - SD Card for NetWare Printing Type D

Slots for Controller Options

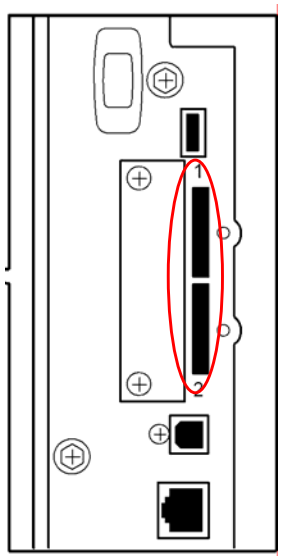


- **Interface slot: IEEE1284, IEEE802.11a/g, Gigabit Ethernet**
  - Only one of these can be installed

Slide 29

No additional notes

Slots for Controller Options

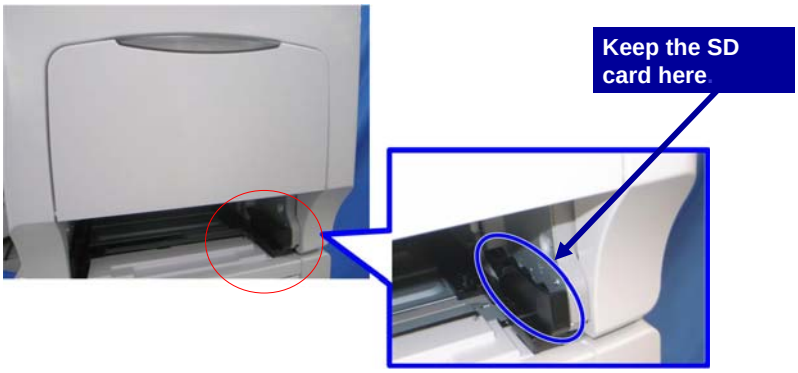


- **SD card slot 1 (upper): Camera direct print card, Data overwrite security unit, NetWare card**
- **SD card slot 2 (lower): HDD encryption unit, VM card (Z-P1a), VM/ELP-NX card (Z-P1b), firmware update**
- **SD card applications for slot 1 can be copied (merged) onto one card.**
  - A technician must visit the customer to do this. The user cannot do it.
  - A new SD card cannot be used as the target. Also, do not use a card that was previously used on another device. Always use one of the SD card options for slot 1 as the target card.
- **Do not try to copy or merge any of the SD cards that are installed in slot 2.**

Slide 30

- Z-P1a: The VM card must stay in slot 2 after installation.
- Z-P1b: The VM/ELP-NX card must stay in slot 2 after installation.
- However, the HDD encryption unit can be removed after installation, because the application is copied to the machine's hard disk.
- So it is not necessary to copy or merge any of the applications that go in slot 2.
- To update firmware, just ask the customer to remove the card in slot 2; no special operation is needed.

Keeping the SD Card



- **SD card applications can be copied (merged) onto one card.**
  - Do not try to copy the VM card to another SD card.
- **After moving or copying a program, the original SD card must be kept, as proof of purchase.**

Slide 31

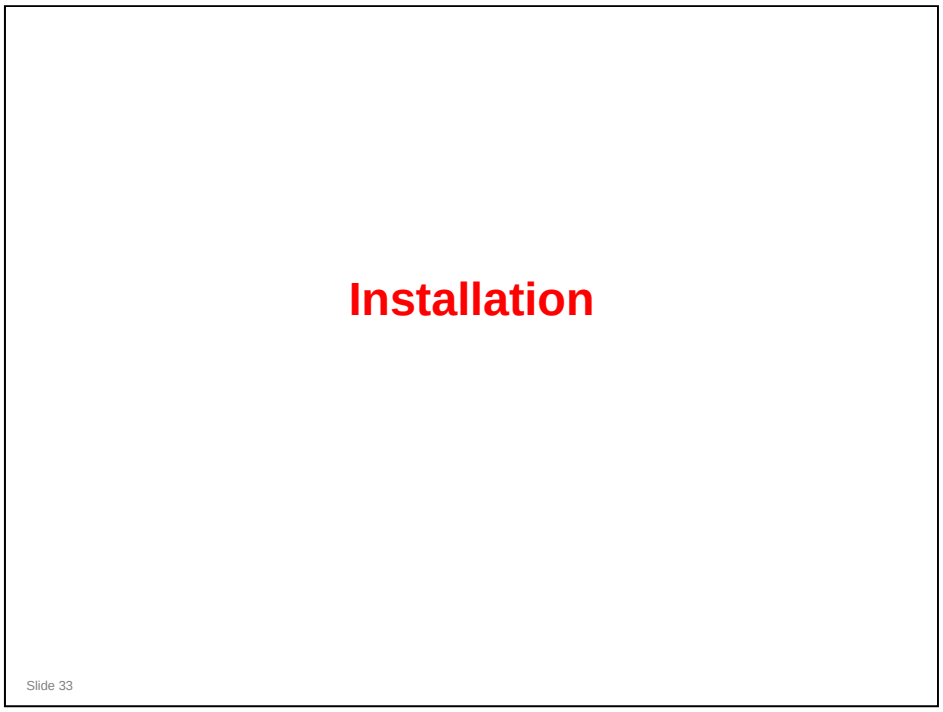
No additional notes

Consumables

- **Toner (based on a 5% chart)**
  - Black and color: About 15k prints/cartridge (3k for the starter cartridge)
- **Maintenance Kits**
  - Black PCDU: About 50k prints
  - Color PCDUs: About 50k prints
    - » This Maintenance Kit contains PCDUs for three colors.
    - » The Color PCDUs will be registered as three separate service parts (C, M, and Y).
  - Waste Toner Bottle: About 50k prints
  - Transfer Unit: About 100k prints
    - » This Maintenance Kit contains the transfer belt unit and the paper transfer roller.
  - Fusing Unit: About 120k prints
    - » This Maintenance Kit contains the fusing unit and three dust filters.
  - The maintenance kits are not registered as service parts.

Slide 32

- The consumables are all unique for the Z-P1. Do not use these in another model. Do not use another model's consumables in the Z-P1.
- PCDU: Photoconductor and Development Unit



No additional notes

Overview

- **The user installs this machine.**
- **However you should also know how to install the machine in the event you are asked to do so in the field.**
  - This will be necessary if the customer requests the printer to be installed on the floor, using the caster table.
- **You will refer to the following documents in this training manual.**
  - Z-P1 field service manual, installation section
  - Quick installation guide
  - Hardware guide

Slide 34

No additional notes

Before You Start

- **Read the notes for the following before you install the machine.**
  - Environment
  - Space requirements
  - Power requirements
- **The next few slides will explain the important points about installing the main unit. For full details, see the installation procedure in the field service manual.**

Slide 35

Z-P1 field service manual, Installation, Installation Requirements

Installation – Main Unit

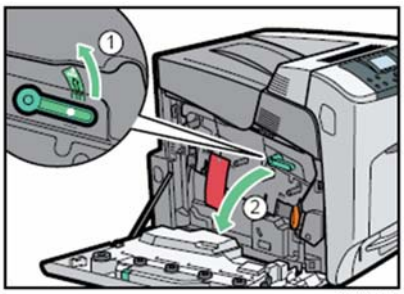
Unpacking

- **Use the inside grips on both sides of the machine.**
  - Note: Grips must be used only for moving the machine without caster table and/or paper feed unit. If either or both these items are installed when you move the machine, do not use the grips.
- **Four people must lift the machine.**
- **Do not hold the machine at the front and rear bottom corners when lifting.**
- **Do not remove the tapes until you put the printer in the required location for operation.**

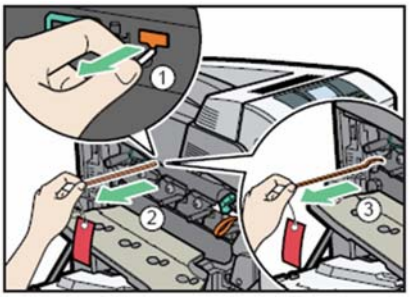
Slide 36

- The next few slides will explain the important points about installing the main unit. For full details, see the installation procedure in the field service manual.

Installation – Main Unit
Securing Pin (Transfer Unit)



m065i503



m065i504

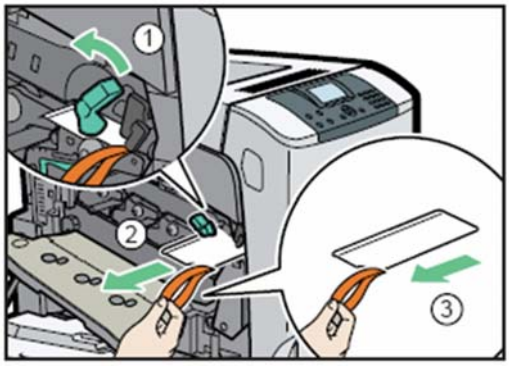
- Turn the green lever counter-clockwise.
- Remove the securing pin.

Slide 37

- The green lever is turned clockwise again later in the procedure (as described in the field service manual).

Installation – Main Unit

Protective Sheet (Transfer Unit)



m065i505

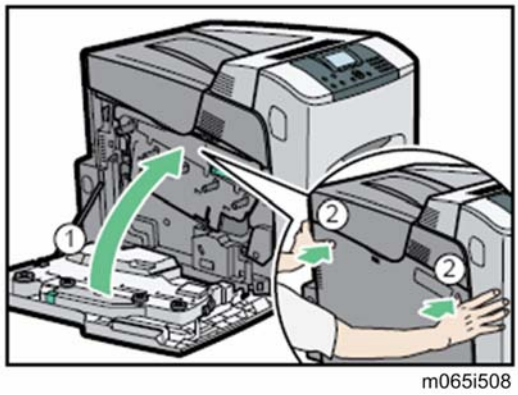
- Turn the lever counter-clockwise.
- Remove the protective sheet.
- Turn the lever clockwise again after removing the sheet.

Slide 38

- The protective sheet is between the transfer unit and the K PCDU.
- For this model, it is not necessary to remove seals from the development units. This allows the PCDUs to be inspected at the factory.

Installation – Main Unit

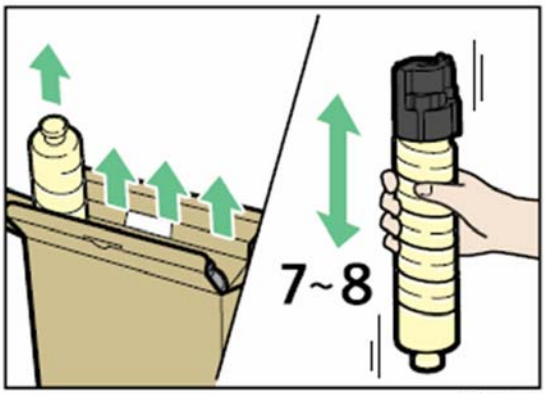
Close the Left Cover



Slide 39

No additional notes

Installation – Main Unit
Shake the Toner Bottles



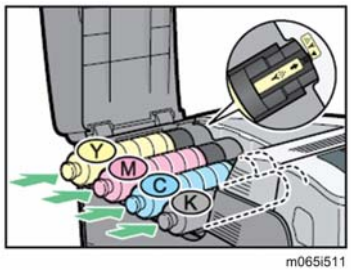
- Shake the toner bottles up and down seven or eight times.

Slide 40

No additional notes

Installation – Main Unit

Install the Toner Bottles



m065i511

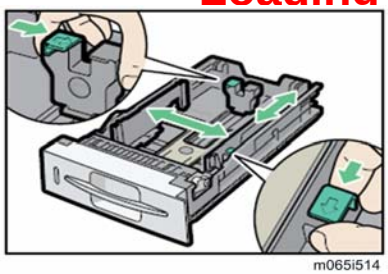

m065i512

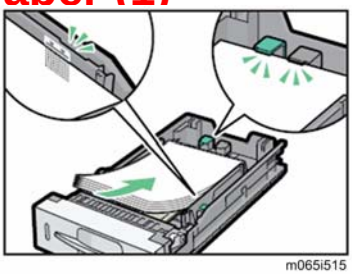
- **Install the yellow toner bottle first.**
  - Holding the toner bottle horizontally with the locking lever on the upper side, install the toner bottom first, and then move the locking lever to the triangle mark.
- **Be sure to align the label on the toner and the triangle shaped mark on the receiving side.**
- **Push in the toner bottle until you hear a clicking sound.**
- **Do not repeatedly insert and remove toner bottles. This causes toner leakage.**

Slide 41

No additional notes

Installation – Main Unit
Loading Paper (1)





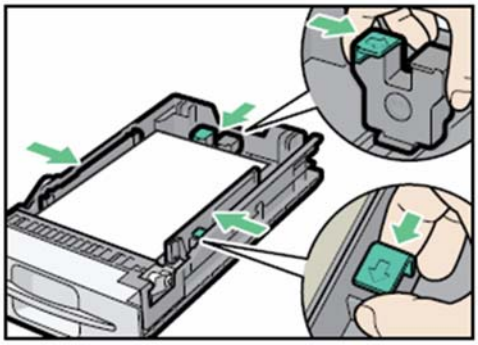
- **Adjust the green clips of the side guide and the end guide to the paper size you want.**
  - When adjusting the paper width, use the right side guide only, with the green clip. Do not hold the left side guide at this time, or skew will occur.
- **Load the new paper stack print side up, making sure the paper is flush against the paper guides.**

Slide 42

- When doing maintenance on the machine, please follow these instructions when loading paper.
- Do not move paper loaded in the tray more than a few millimeters. Excessive movement of loaded paper can cause edges of sheets to snag on the openings of the tray's lifting plate, resulting in sheets being folded or becoming jammed.

- The optional paper tray is the same.

Installation – Main Unit
Loading Paper (2)



m065i516

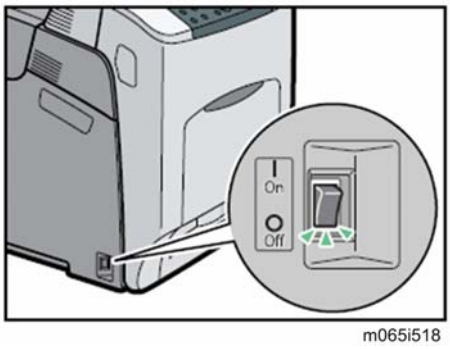
- **Adjust the paper guides to close any gaps.**
- **Do not move paper loaded in the tray more than a few millimeters.**
  - Excessive movement of loaded paper can cause edges of sheets to snag on the openings of the tray's lifting plate, resulting in sheets being folded or becoming jammed.

Slide 43

No additional notes

Installation – Main Unit

Turning on the Power



- **Do not turn off the power switch until initialization is completed.**
  - 'Ready' appears on the display when initialization is completed.
- **Otherwise, the machine may malfunction.**

Slide 44

No additional notes

Installation – Tray Heater

- **The purpose of this heater is to prevent the paper from getting damp, and preventing jams due to paper curl.**
- **Before installing, make sure that the power source rating of the tray heater is same as the machine.**
- **You can adjust the tray heater switch setting with SP5805-001 as shown below.**
  - 0: Default setting. The heater is on when the main switch is off or when the machine is in energy saver mode.
  - 1: The heater is always on.

Slide 45

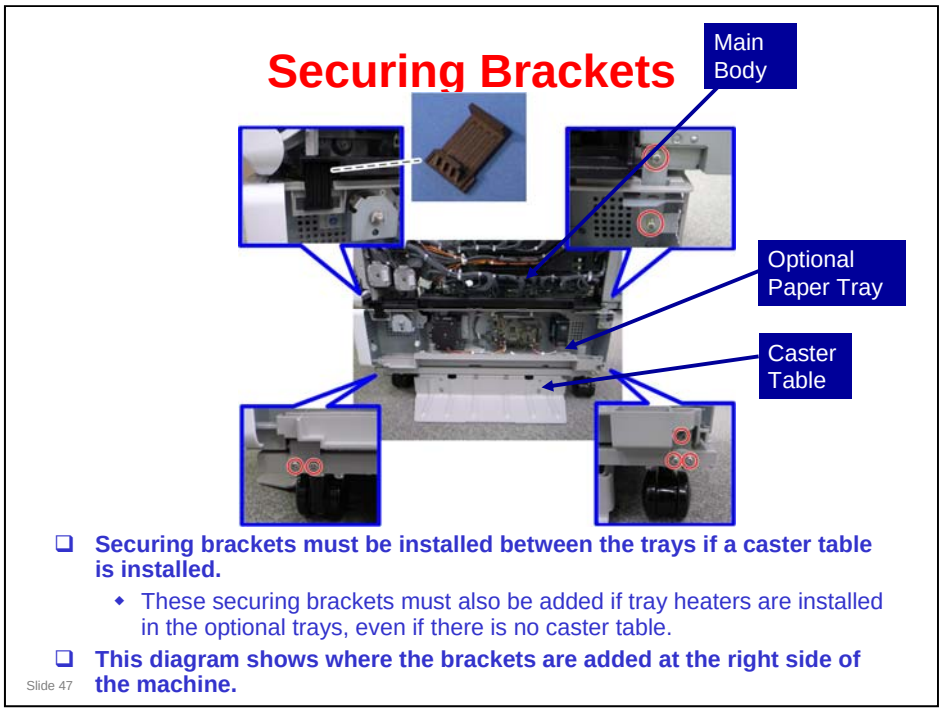
Field service manual, Installation, Tray Heater

Installation - Optional Paper Feed Units

- When installing two or three units, first connect the units to each other, and then connect them as a single unit to the machine.

Slide 46

Field service manual, Installation, Paper Feed Unit

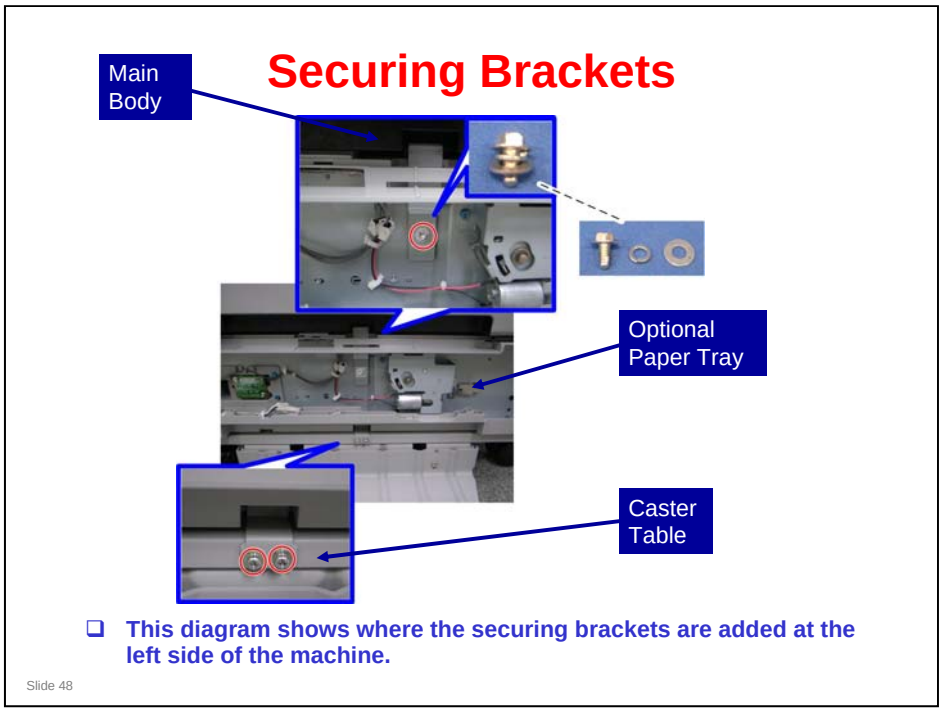


- ❒ Four securing brackets are shipped with the caster table.
- ❒ The technicians must attach these brackets.
- ❒ Details of how to attach the securing brackets are in the installation procedures in the field service manual.
- ❒ If more that one optional tray is installed, securing brackets must be installed in a similar location at the right side between each optional tray.

Installation, Tray Heater

Installation, Caster Table

- ❒ The next slide shows the securing brackets at the left side.



- Details of how to attach the securing brackets are in the installation procedures in the field service manual.
- If more that one optional tray is installed, securing brackets must be installed in a similar location at the left side between each optional tray.

Adjusting the Printer

- **The user can do the following adjustments:**
  - Color registration
  - Color calibration
  - Registration
- **The procedures are in the Hardware Guide (8. Adjusting the Printer)**

Slide 49

No additional notes

Meter Charge

- **Turn meter charge off or on with SP 5930-1.**
  - The default is 0 (off).
- **If you turn meter charge on, you can select two types with SP 5045**
  - Prints: The customer is charged according to the number of prints made by the machine. This is the default setting.
  - Developments: The customer is charged according to the number of developments made by the machine
- **Also, check the settings for turning PM alerts on or off.**
  - 5930-010: PCDU
  - 5930-014: ITB Unit
  - 5930-016: Fusing Unit
  - The default for these is 1 (off).
- **Follow the flow chart in the field service manual to set meter charge up correctly.**

Slide 50

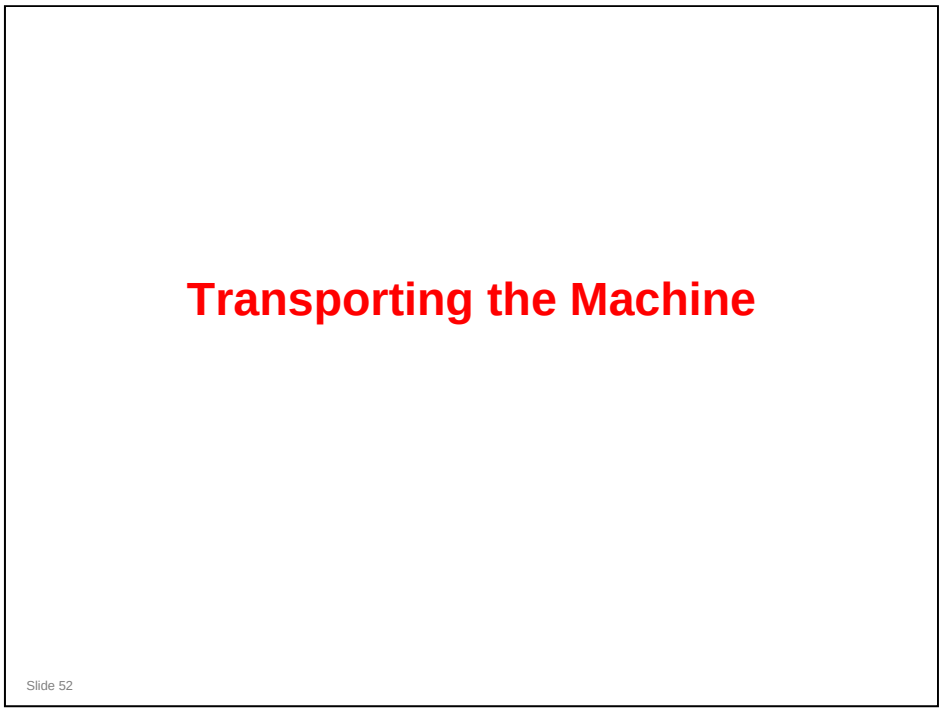
- If you change the setting of SP 5930-1, then the settings of SP 5930-10, -14, and –16 are **not** changed automatically.

Installing the Options

- See the Operating Instructions (Hardware Guide) for details on how to install options.

Slide 51

No additional notes



No additional notes

Moving the Machine a Short Distance

- Remove all trays from the optional feed unit.

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Z-P1 field service manual, Installation, Copier Installation, Moving the Machine

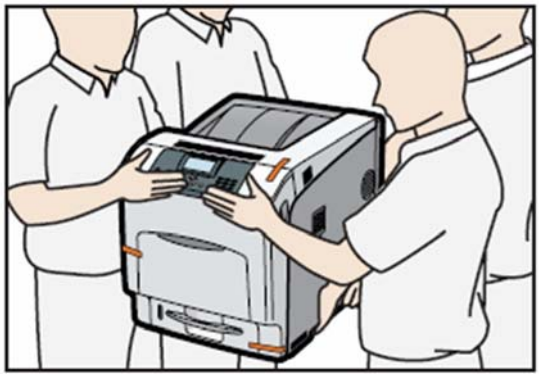
Moving the Machine a Long Distance

- Remove the toner bottles.
- Remove the paper from the paper trays, and secure the bottom plates with tape.
- Attach shipping tape to the covers, or tightly wrap the machine with shrink-wrap.

Slide 54

Z-P1 field service manual, Installation, Copier Installation, Transporting the Machine

Moving the Machine a Long Distance



- **If the machine is connected to optional paper tray(s) and/or caster table, don't use the inset grips when moving the machine.**
  - You can use them if no optional tray or caster table is connected.
- **Do not hold the duplex unit or controller box when moving the machine.**

Slide 55

No additional notes

After Moving the Machine a Long Distance

- **Do the "Auto Color Registration" as follows. This optimizes color registration.**
  - First, do "Forced Line Position Adj. Mode c" (SP2-111-3).
  - Then, do "Forced Line Position Adj. Mode a" (SP2-111-1).
- **To check if SP 2-111-1 was successful, watch the screen during the process. A message is displayed at the end.**
  - Also, you can check the result with SP 2-194-10 to -12.
- **Make sure that the side fences in the trays are correctly positioned, to prevent color registration errors.**

Slide 56

- SP 2111-1 and –3 are used at other occasions, after replacing certain parts. We will see this again.

Field service manual, Troubleshooting, Process Control Error Conditions

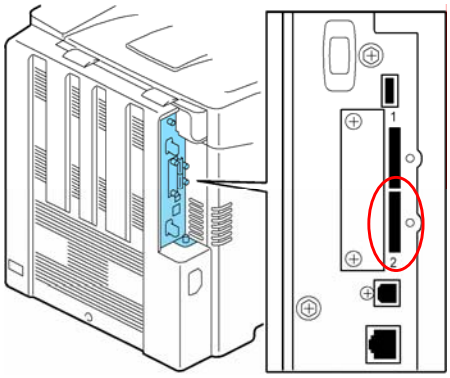
Field service manual, Troubleshooting, Troubleshooting Guide

- For SP 2194, see these sections of the field service manual.

PURPOSE OF THE SECTION

- ❒ Learn about how to update the firmware.
- ❒ The procedure is the same as for the G190 printer (G-P3).

Downloading New Firmware



- **The firmware SD card plugs into SD card slot 2.**
  - Do not use slot 1 to update the firmware. If slot 2 is occupied, ask the customer to temporarily remove the SD card in slot 2.
- **When you update the firmware:**
  - It is recommended to update only one module at a time.
  - Verify the update was successful (print the configuration page: Menu Key > List/Test Print > Config. Page
- **Update the operation panel firmware separately.**
  - Controller firmware and operation panel firmware cannot be updated at the same time.

Slide 58

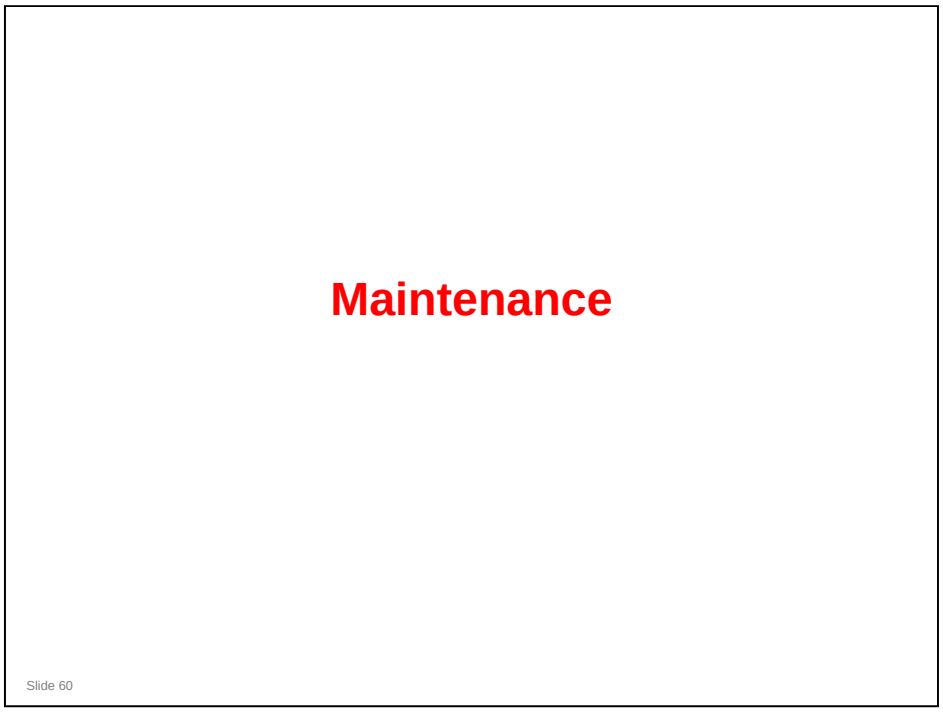
- Make sure that you read the ‘Before you Begin’ section, which explains how to handle SD cards.
- The Engine module contains firmware for the line position adjustment process.

Firmware Update Problems

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

Slide 59

No additional notes



No additional notes

User Maintenance

- **The user replaces the following parts at the following PM intervals.**
  - 50k prints
    - » PCDU
    - » Waste toner bottle
  - 100k prints
    - » Image transfer belt unit
    - » Paper transfer roller
  - 120k prints
    - » Fusing unit
    - » Dust filter (x3)
- **Paper feed rollers: The life of these rollers is long, so there is no need to change them during the life of the machine.**

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- After you turn meter charge on, if you want PM alerts to be displayed when it is time to replace the PCDU, ITB unit, or fusing unit, you must change the following SPs to 0 (see the 'Meter Charge' slide earlier in this course).
  - 5930-010: PCDU
  - 5930-014: ITB Unit
  - 5930-016: Fusing Unit
- It is not necessary to reset counters for each part if the technician does the PM. The machine detects new components and automatically resets the necessary counters.

Service Maintenance

- **If the technician visits the customer to repair the machine, there are some cleaning jobs to perform.**
  - See the Maintenance section of the field service manual for details on which parts to clean.
- **It is not necessary to reset counters with SP mode.**
- **Technicians can replace individual parts of some user-replaceable items, such as the fusing unit.**
  - Users can only replace entire units.

Slide 62

No additional notes

Fewer Spare Parts

- **PCDU: This is replaced as a unit only.**
  - There are no replacement procedures for the drum unit, developer, or development unit.
  - Always replace the PCDU as a complete unit.
- **Image transfer belt unit:**
  - For users, this is replaced as a unit only.
  - Technicians can replace individual parts of this unit.
- **Fusing unit:**
  - For users, this is replaced as a unit only.
  - Technicians can replace individual parts of this unit.

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No additional notes

New Unit Detection

- **For the following units, there is a new unit detection mechanism. It is not necessary to reset PM counters.**
  - PCDU
  - Image transfer belt unit
  - Fusing unit (when replaced as a complete unit)
  - Waste toner bottle (if full or near-full)
- **There is no new unit detection for the paper transfer roller.**
  - The machine resets the counter for the paper transfer roller when it detects a new image transfer belt unit. These 2 parts are normally changed at the same time.

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Image transfer belt unit, Fusing unit

- A new unit contains a fuse, which blows immediately after it is installed in the machine.

PCDU

- The machine detects a new PCDU by the signal from the TD sensor inside the new PCDU.

Waste Toner Bottle

- See the next slide.

Waste Toner Bottle

- If the bottle is full or near-full, the counter is reset when the bottle is replaced or emptied.
- But the counter is not reset if you replace a bottle that is not full or near-full. You must reset the counter manually (SP 3902-020).

Slide 65

No additional notes

Service Maintenance - Cleaning

- The field service manual shows which parts of the machine and optional equipment must be cleaned when you visit the machine.
- Paper dust container: This should not fill up within the machine's lifetime.

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Z-P1 field service manual, Maintenance, Service Maintenance Items

Machine Overview

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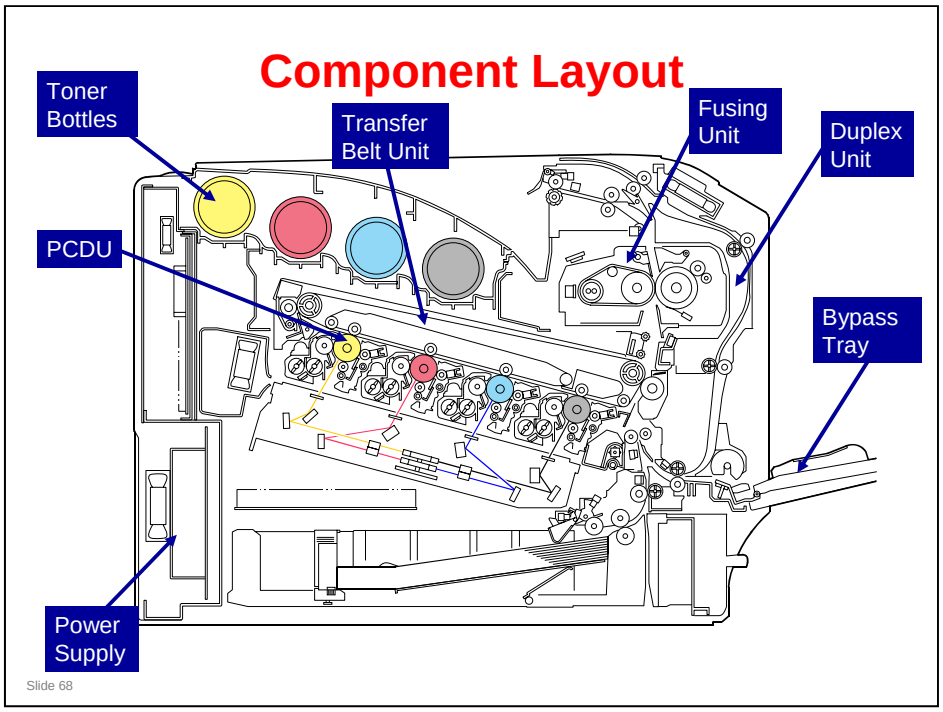
PURPOSE OF THE SECTION

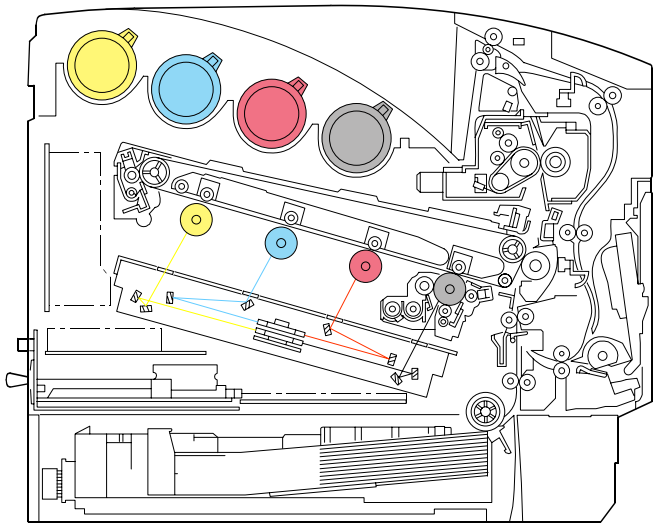
In this section you will :

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



- PCDU: Photoconductor and Development Unit
  - One for each colour.

Component Layout – G-P3



Slide 69

- The layout of the predecessor model, G-P3, is shown here for comparison.
- The order of PCDUs is different.
  - YCMK: Used by G-P3, Ap-series, At-series, V-series
  - YMCK: Used by Di-C1, Z-P1 – To improve grainy images

Dimensions of Major Components

- Abnormal image at 35-mm intervals: Charge roller
- Abnormal image at 795-mm intervals: Image transfer belt unit
- Colored spots at 41-mm intervals: Image transfer roller
- Colored spots at 82-mm intervals: Image transfer belt drive roller or Image transfer belt idling roller
- Colored spots at 33-mm intervals: Development roller
- Abnormal image at 83-mm intervals: Paper transfer roller
- Colored spots at 94-mm intervals: OPC drum
- Spots at 141-mm intervals: Pressure roller
- Spots at 126-mm intervals: Fusing roller
- Spots at 204-mm intervals: Fusing belt

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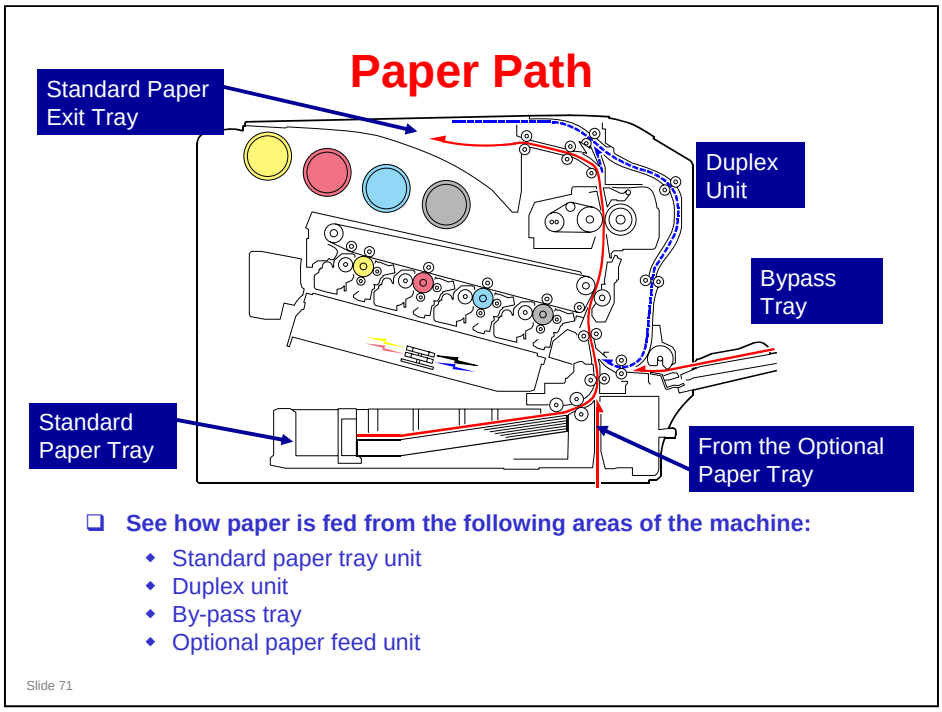
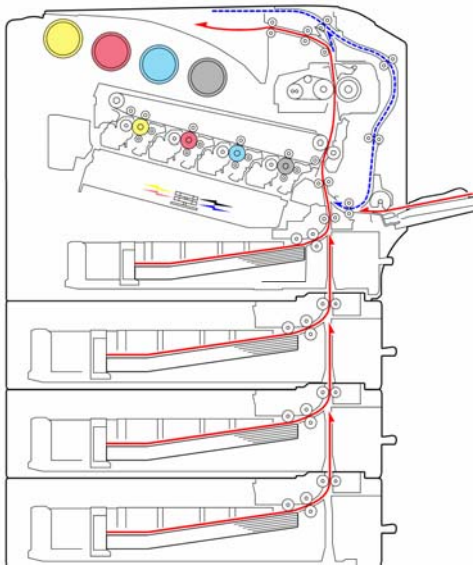
- This list may be useful during troubleshooting.

Field Service Manual, Appendix, Troubleshooting Guide, Repeated Spots or Lines on Prints



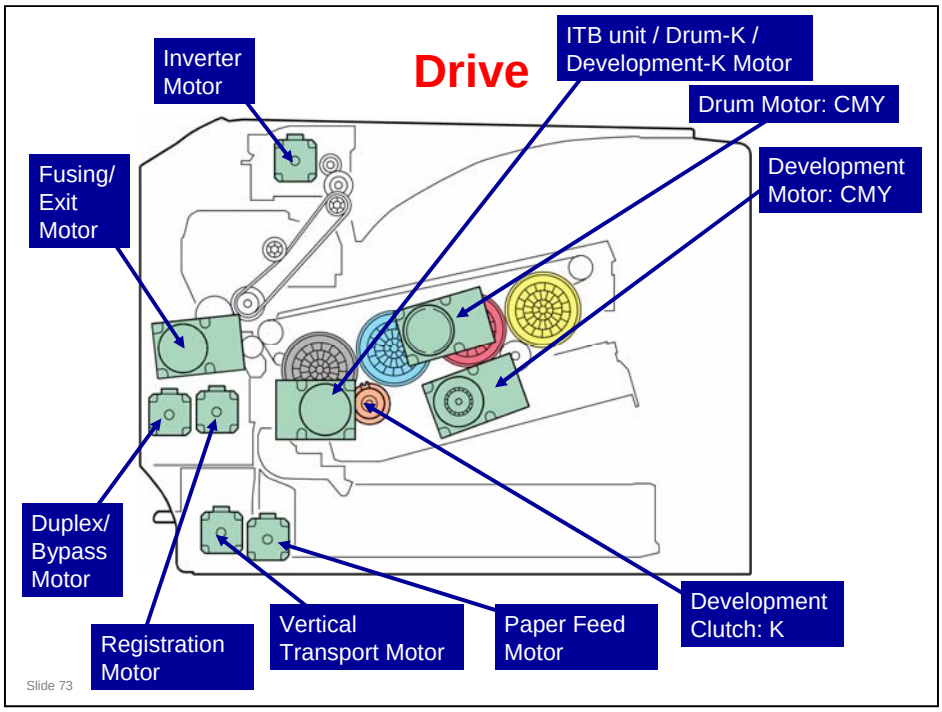
❒ The next slide shows the optional paper trays.

Paper Path – With Optional Trays



Slide 72

No additional notes



ITB unit / Drum-K / Development-K Motor

- ❒ This controls the black OPC, development unit for black, and ITB unit.

Drum Motor: CMY

- ❒ This controls the OPCs for cyan, magenta, and yellow.

Development Motor: CMY

- ❒ This controls the color development units (cyan/magenta/yellow).

Development Clutch: K

- ❒ This controls the drive power to the development unit-K.

Paper Feed Motor

- ❒ This controls the paper feed mechanisms (tray 1).

Vertical Transport Motor

- ❒ This controls the vertical transport roller.

Registration Motor

- ❒ This controls the registration rollers.

Duplex/By-pass Motor

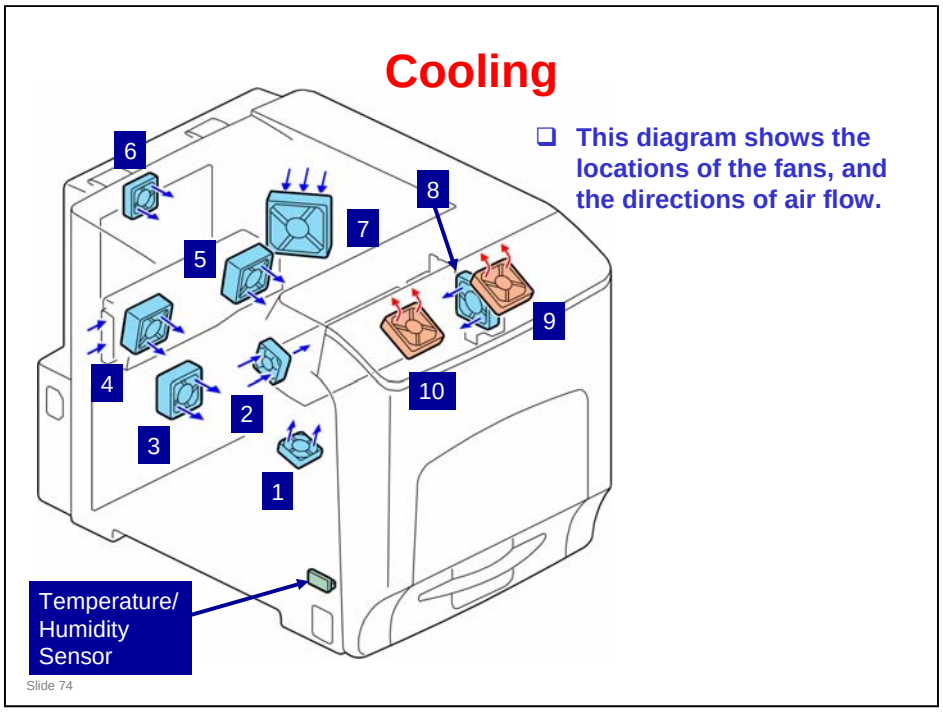
- ❒ This controls the duplex entrance, relay, exit, and by-pass feed rollers.

Fusing/Paper Exit Motor

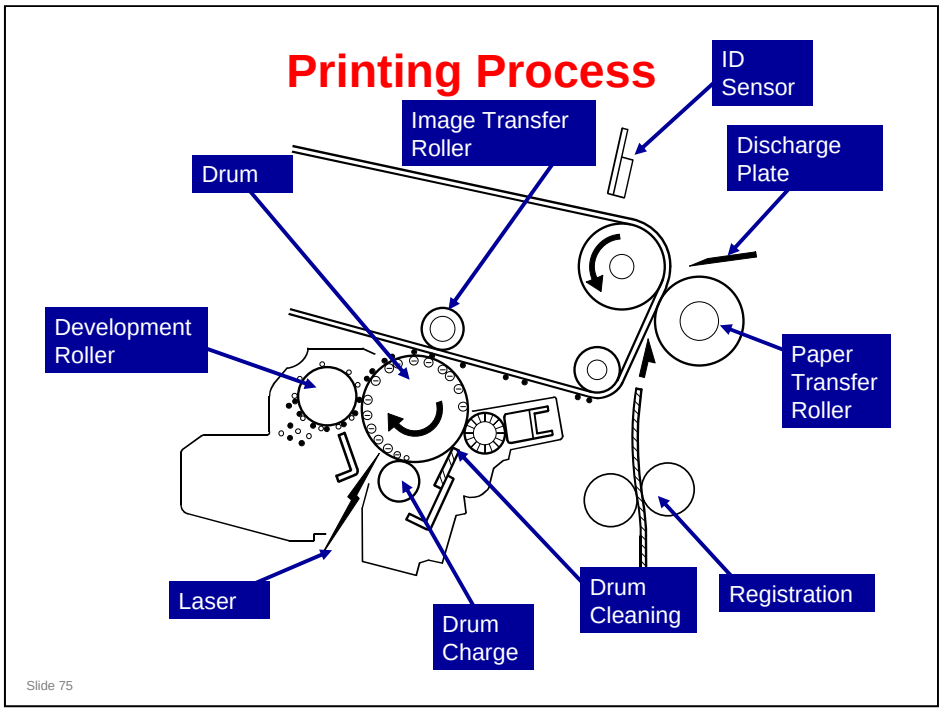
- ❒ This controls the fusing unit and paper exit rollers.

Inverter Motor

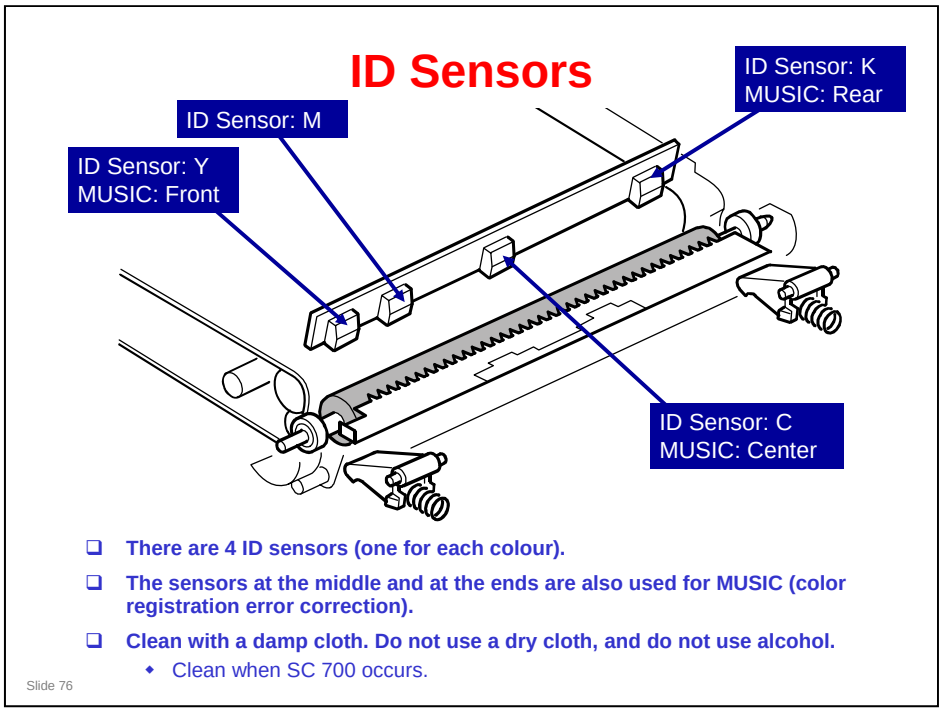
- ❒ This controls the inverter roller that feeds the output into the duplex feed path.



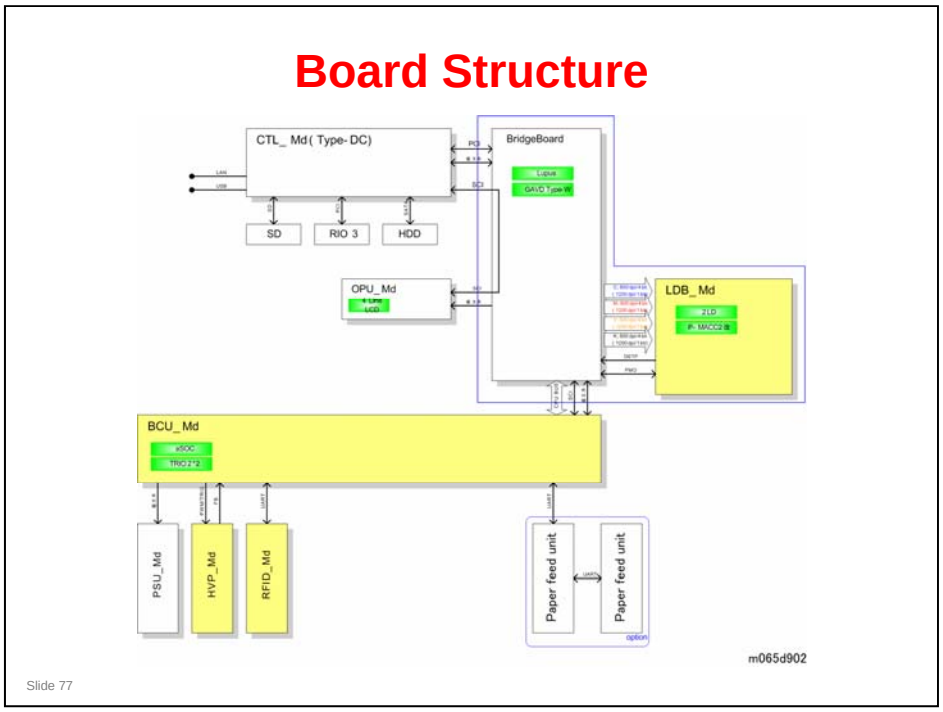
- 1. Laser Unit Fan
- 2. Fusing Cooling Fan
- 3. PSU Fan
- 4. Development Fan 1
- 5. Development Fan 2
- 6. Controller Fan
- 7. Drive Unit Fan
- 8. Toner Supply Fan
- 9. Fusing Fan 2
- 10. Fusing Fan 1



- This machine uses four PCDUs, and four laser beams. Each PCDU contains a drum, charge roller, cleaning brush, and blade.
- The toner image on each drum is moved to the transfer belt. The four colors are put on the belt. All four toners are put on the belt at the same time. Then the completed four-color image is moved to the paper.
- Drum charge: The charge roller gives 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 negatively-charged toner to the latent image on the drum surface. There are four development units (one for each color).
- Image transfer: The charge that is applied to the image transfer roller pulls the toner from the drums to the transfer belt.
- Paper Transfer and Separation: Toner transfers from the transfer belt to the paper when the paper is fed between the transfer belt and image transfer roller. At this time, the paper also separates from the transfer belt, because of a discharge plate immediately after the transfer roller.
- Cleaning for OPC drum: The cleaning brush and blade remove remaining toner on the drum surface after image transfer to the paper.
- 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.
- ID sensors: The ID sensor board contains four ID sensors (one for each color; see the next slide). The ID sensor detects the density of the ID sensor pattern on the transfer belt. The ID sensor output is used for process control and for automatic line-position adjustment, skew, and color registration adjustments for the latent image.



❒ During MUSIC, only three of the sensors are used.



BCU (Base Engine Control Unit):

- The BCU controls all the mechanical components and the following functions:
  - Engine sequence
  - Engine operation

Controller:

- The controller handles the following functions:
  - Operation panel interface
  - Network interface

Bridge Board:

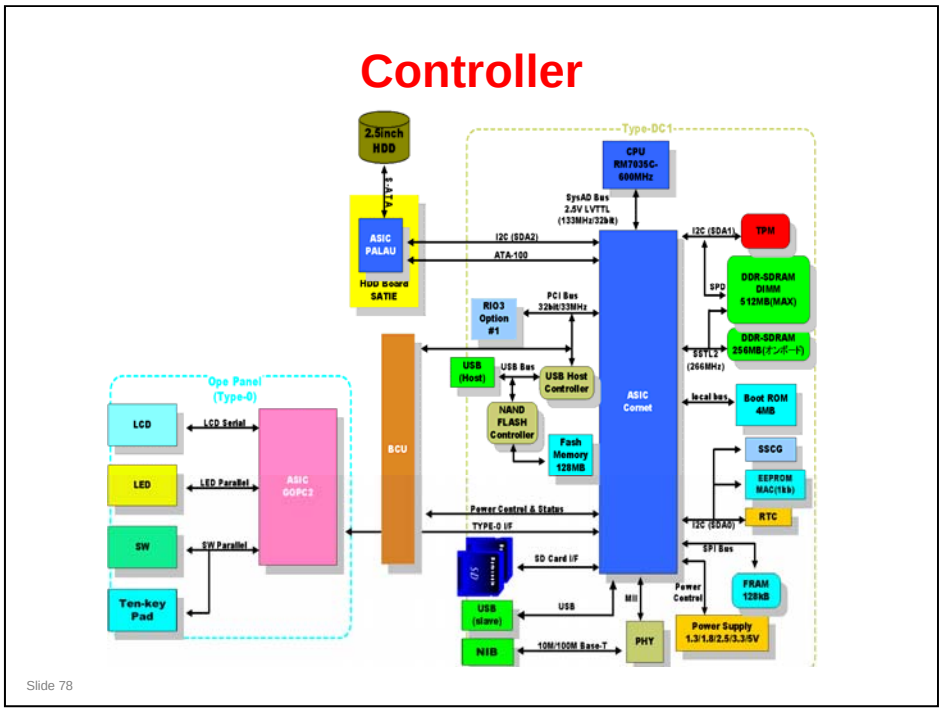
- The bridge board is a large-scale integrated circuit. This unit processes digital signals.

LDB:

- This is the laser diode drive circuit board.

OPU:

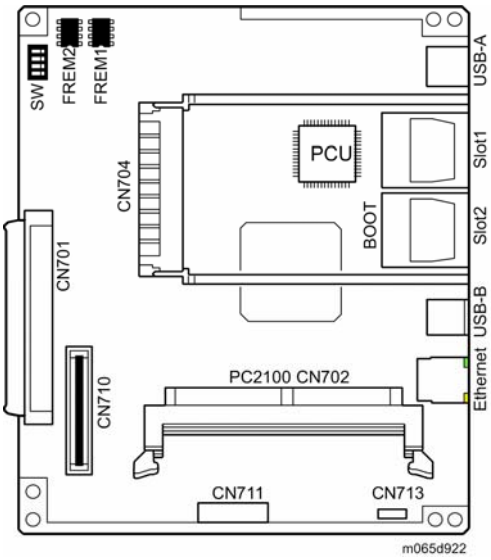
- This controls the display panel, the LED and the keypad.



Slide 78

- The controller uses GW architecture (09A version).
- ASIC: GW architecture ASIC
- CPU: RM7035C (600MHz).
- DDR-SDRAM: The image memory for image compression, image rotation and other operations.
- Flash Memory: Firmware area, work area for PDF direct print, VM card. Maximum capacity: 128 MB.
- USB Interface: USB 2.0
- NIB: 10M/ 100M Base-T
- Boot ROM: Stores the boot program.
- FRAM: The memory that stores the system configuration and user codes.

Controller Board Layout



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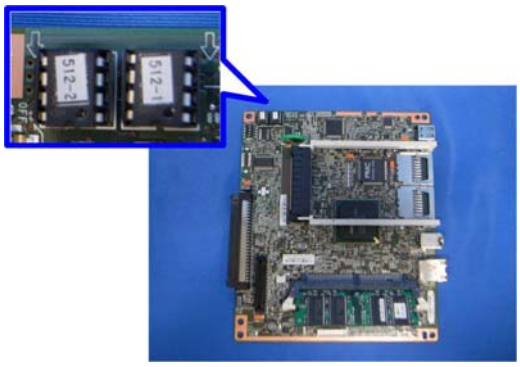
No additional notes

Controller Board NVRAMs

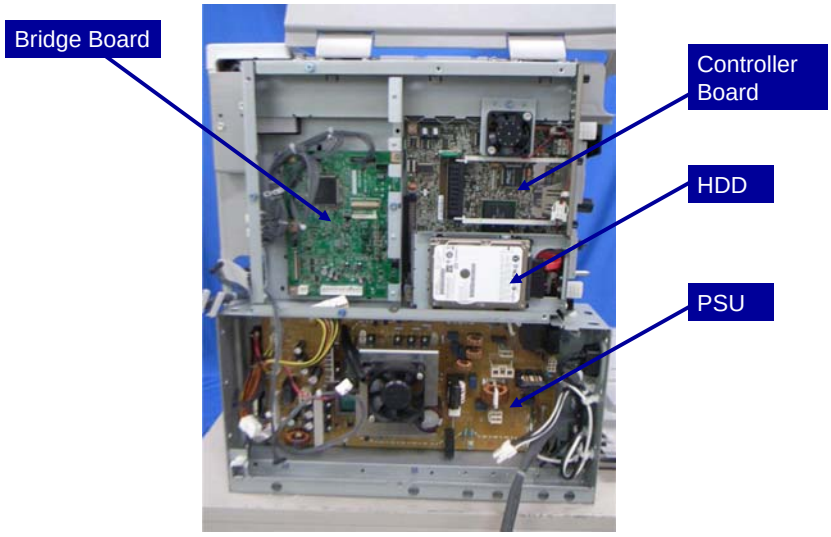


- **There are 2 NVRAMs. They are labeled and there are marks on the board to show how to put them back.**
- **But if the NVRAMs were replaced, the new NVRAMs may not have labels. So, when installing NVRAMs on a new controller board, make sure you get them in the correct sockets.**
  - Spare parts from Ricoh will have labels.
  - It is not possible to change only one NVRAM; both must be changed at the same time.

Slide 80

No additional notes

Board Layout
Rear Cover Open



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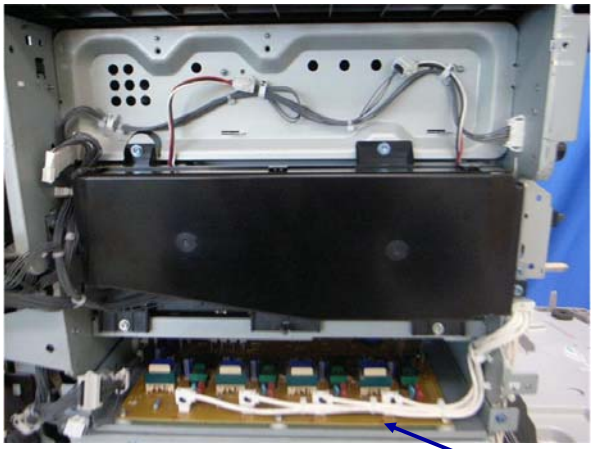
No additional notes

Board Layout
With Controller Box Removed

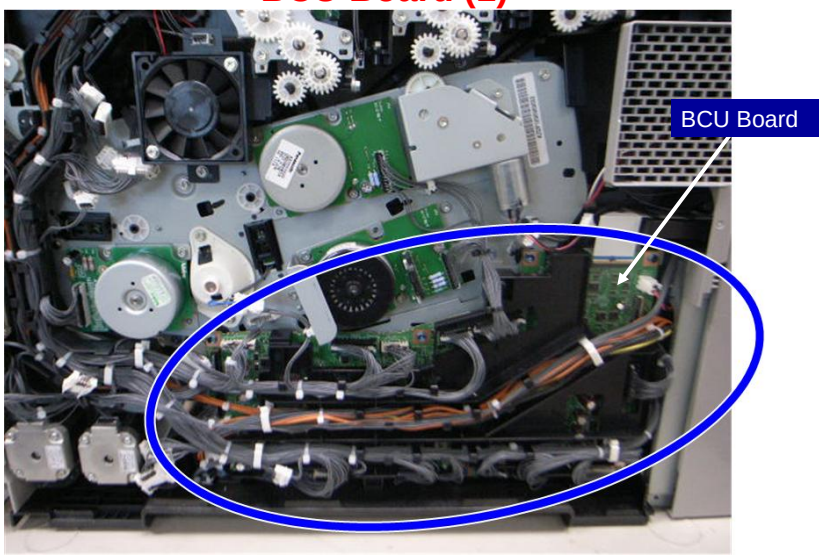


Slide 82

- This board supplies charge roller and development bias voltages.

Board Layout

BCU Board (1)

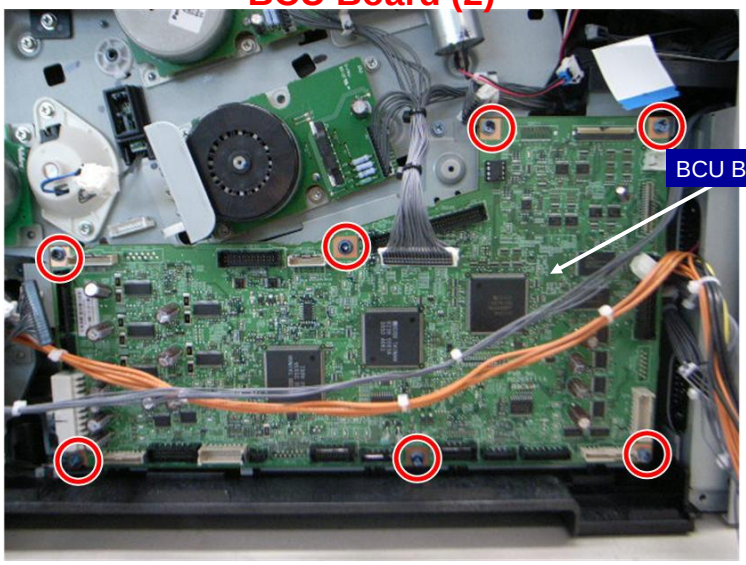


Slide 83

- The black plastic component is a harness guide. You can just see the BCU. The next slide shows the BCU with the harness guide removed.

Board Layout

BCU Board (2)



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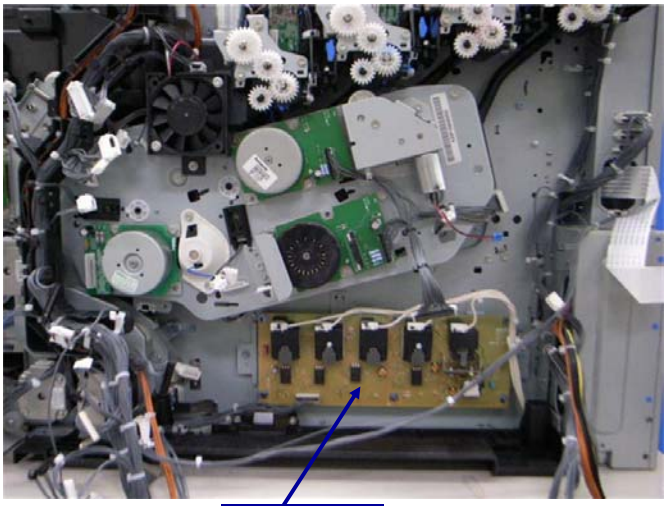
No additional notes

Board Layout

BCU Assembly Removed



Slide 85

❒ This board supplies image and paper transfer voltages.

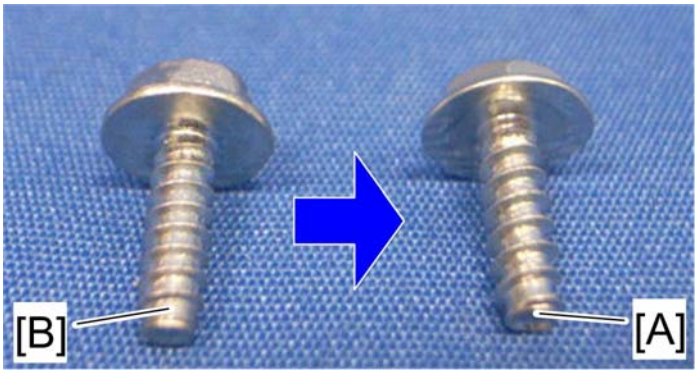
Before You Start Work on the Machine

- Turn off the main power switch and unplug the machine before you start to remove components from the machine.

Slide 86

No additional notes

New Screw Type

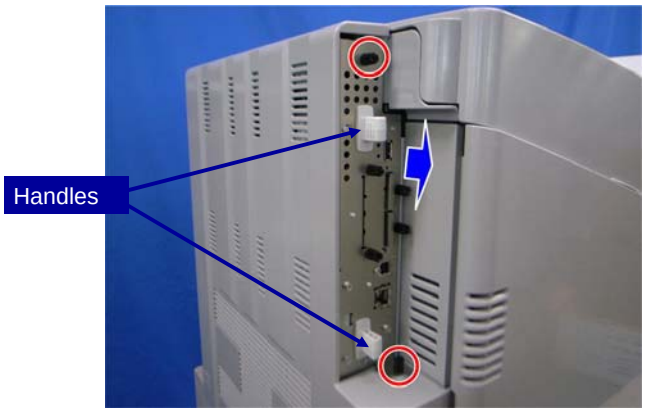


- About 30% of the tapping screws [B] have been changed to a new type [A] (Eagle Screw [A]).
- The threads have a different pitch, so do not use an Eagle screw in a hole where a tapping screw was removed, and vice versa.

Slide 87

- 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.

Removing the Controller Box



- Remove the screws shown in red circles, then pull out the controller box using the two handles.

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No additional notes

Replacing the Controller

- **Remove the two NVRAMs from the old board and install them on the new one.**
  - Make sure that you install the NVRAMs in the correct sockets on the new board.
- **Make sure that you install the correct board.**
  - There are 2 models. The controller board is different for each one.
  - If you install the wrong board, the machine will not work.

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- NVRAMs: See the slide titled ‘Controller Board NVRAMs’ earlier in the course.
- If you need to change the NVRAMs, remember that it is not possible to change only one NVRAM; both must be changed at the same time.

Replacing the BCU

- Remove the NVRAM from the old BCU and install it on the new one.
- Turn the machine on.
  - SC995-01 appears. This means that the serial number is not stored.
- Store the serial number with SP 5811-004.
- Cycle the main power off/on.
- There is only one type of BCU. You install the same board in each of the models.

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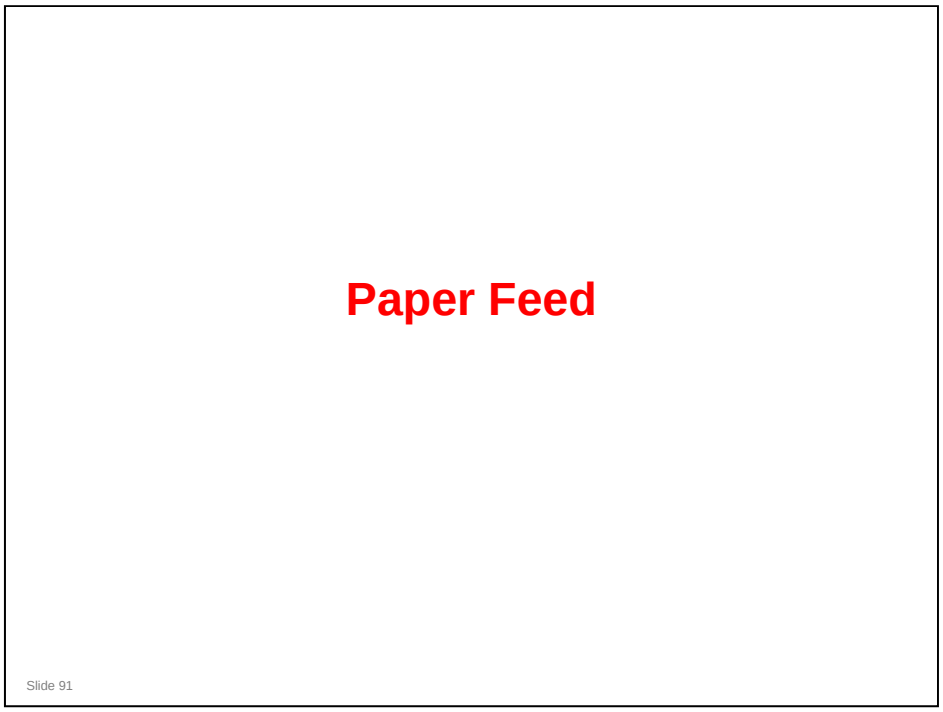
No additional notes



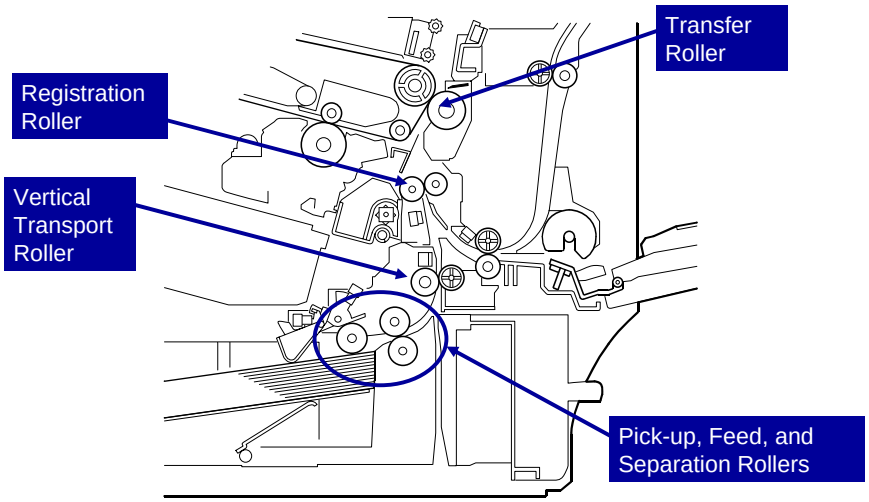
PURPOSE OF THIS SECTION

- ❒ 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.

Paper Feed Components

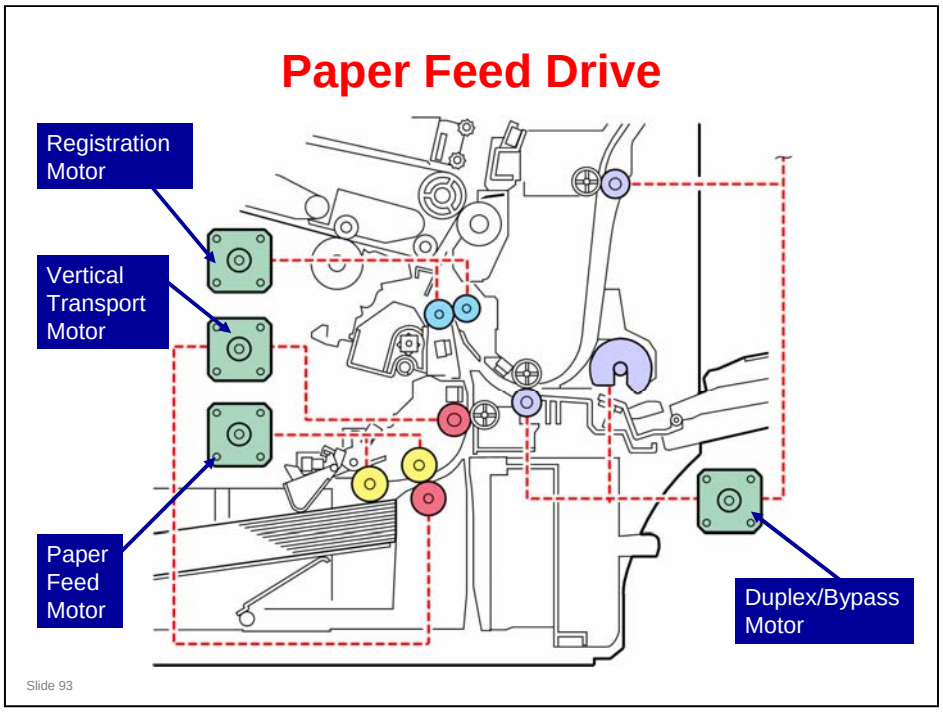


- The machine uses a feed and reverse roller mechanism for the standard and optional trays.
- The bypass tray has a feed roller and friction pad system..

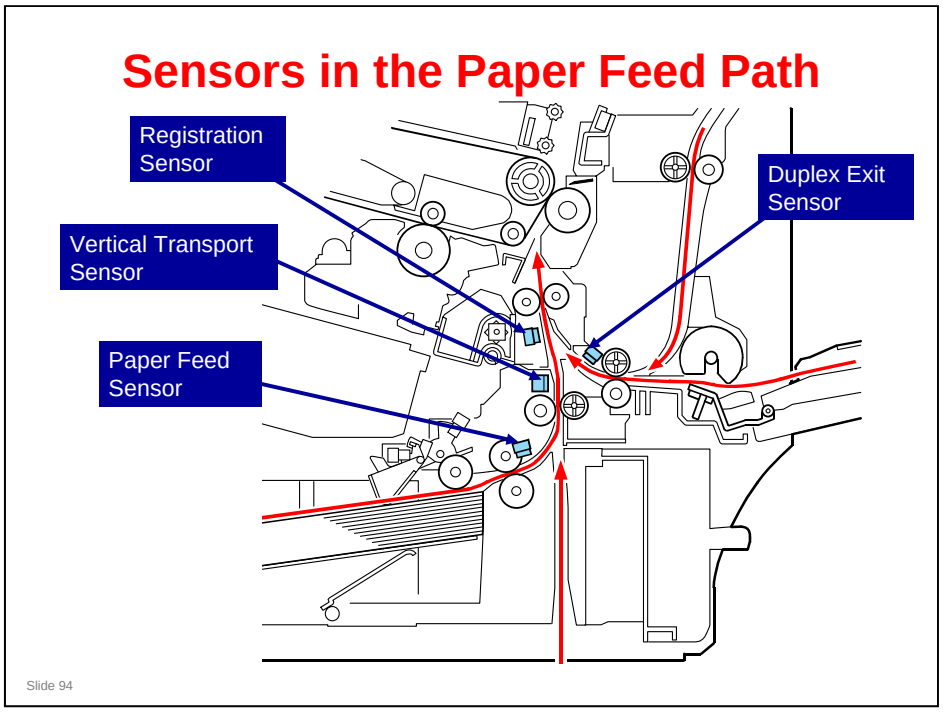
Slide 92

- The machine has a paper tray (550 sheets) and a by-pass paper feed table (100 sheets).

- G-P3: The standard tray uses a feed roller and friction pad mechanism.

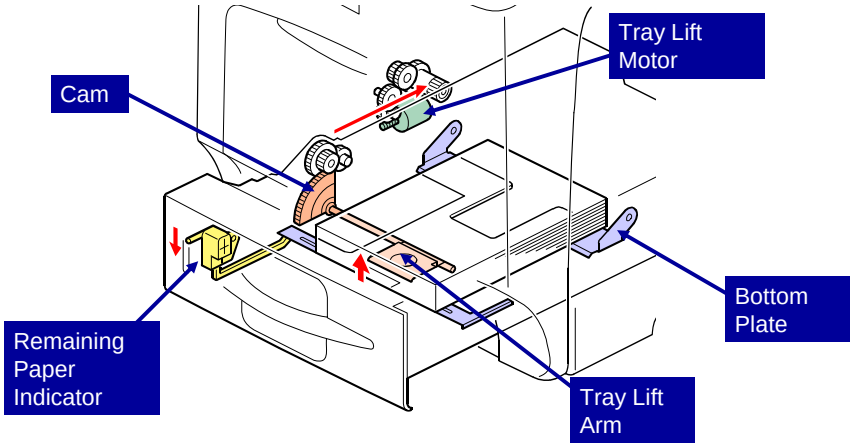


- This diagram shows which motors drive the rollers.
- Note that the separation roller is driven by the vertical transport motor.



- These sensors are used for jam detection and for paper registration.
- The duplex exit also works as a bypass entrance sensor. When the sensor is on, the bypass feed motor stops.

Paper Lift - 1



- **The tray lift motor lifts the bottom plate until the paper lift sensor detects that the top of the stack is at the paper feed position.**

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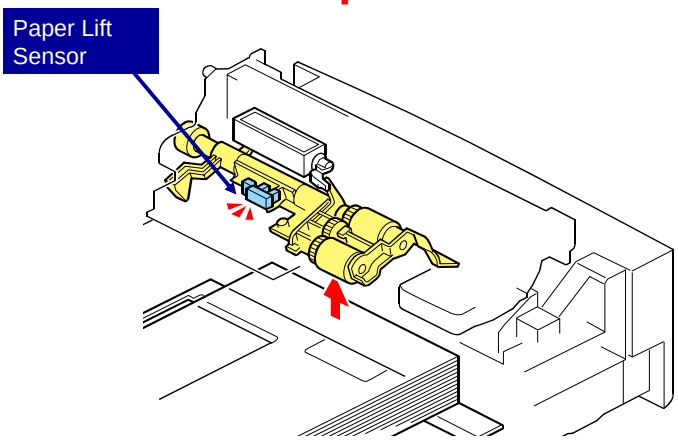
- This is similar to the mechanism in the AP-C1.
- The rear end of the paper tray pushes the tray set switch (not shown here). As a result, the machine detects that the paper tray is installed.
  - Tray set switch: You can see this later on the 'Paper Size Detection' slide.
- When the machine detects that a tray has been placed in the machine, the tray lift motor drives the cam on the lift arm shaft.
- Then the tray lift arm lifts the tray bottom plate (purple in the diagram).

- The mechanism at the front of the tray (shown in yellow) shows how much paper remains in the tray.

Paper Lift - 2



- **The tray lift motor lifts the bottom plate until the paper lift sensor detects that the top of the stack is at the paper feed position.**

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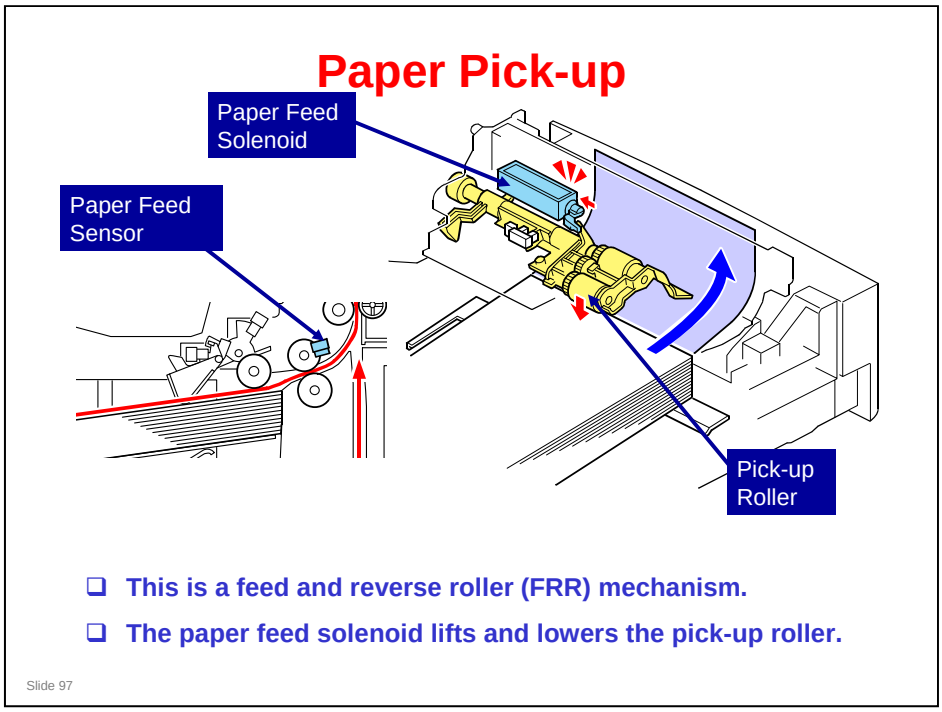
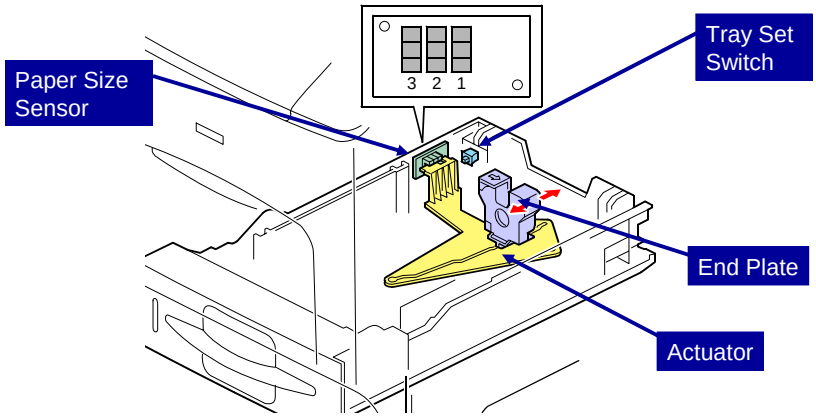
- The tray lift arm lifts the tray bottom plate until the paper lift sensor detects that the top of the stack is at the paper feed position.



- This is similar to the AP-C1.
- When the paper feed sensor detects the trailing edge of the previous sheet of paper, the paper feed solenoid turns on and off. This lifts the pick-up roller from the top of the stack paper briefly and then releases the pick-up roller. This makes paper pick-up more effective.

Paper Size Detection



- The paper size sensor is at the rear of the tray. This sensor has three switches.
- The outputs from the switches detect the paper size. The actuators move when the end plate moves.

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- The sensor can detect sizes down to A6.

Paper Size	Sensor 1	Sensor 2	Sensor 3
LG SEF	ON	ON	OFF
A4 SEF	ON	ON	ON
	OFF	ON	ON
LT SEF	ON	OFF	ON
EXE SEF	OFF	ON	OFF
HLT SEF/A5 SEF	OFF	OFF	ON
A6 SEF	OFF	OFF	OFF

Paper Type Settings

- **This slide shows the correct paper type settings for various paper types.**
  - Glossy paper: Use ‘Thick Paper 1’.
  - Glossy paper (thick): Use ‘Thick Paper 3’.
  - Envelopes: Use ‘Middle Thick’.
  - Matte paper: Use ‘Thick Paper 1’.
  - Matte paper (thick): Use ‘Thick Paper 3’.
  - Letterhead paper: Use ‘Plain Paper 2’.
  - Waterproof paper: Use ‘Thick Paper 3’.
  - Label paper: Use ‘Thick Paper 3’.

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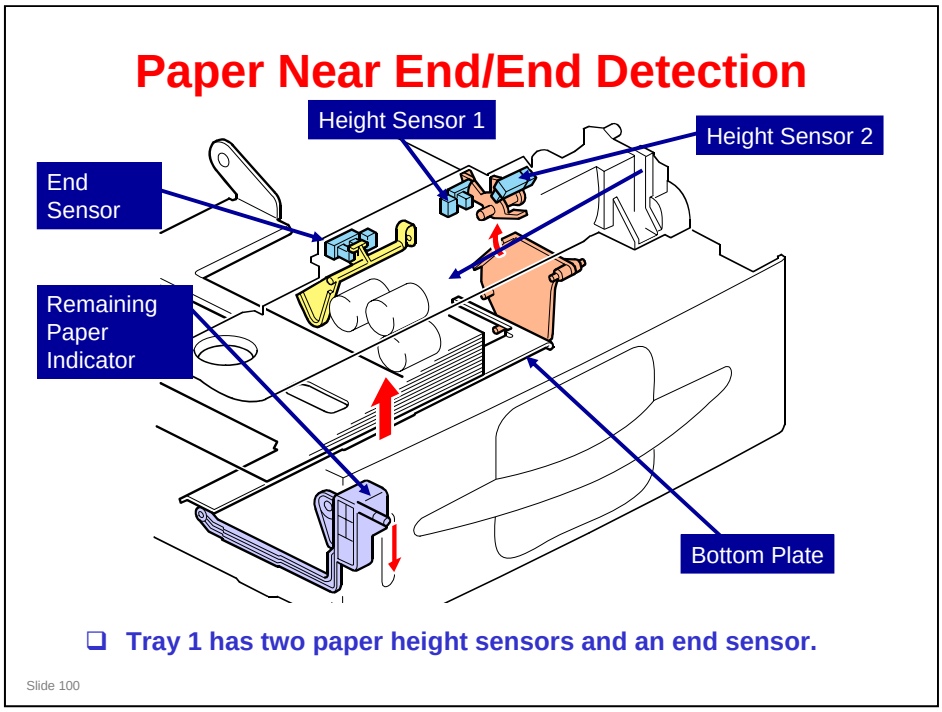
No additional notes



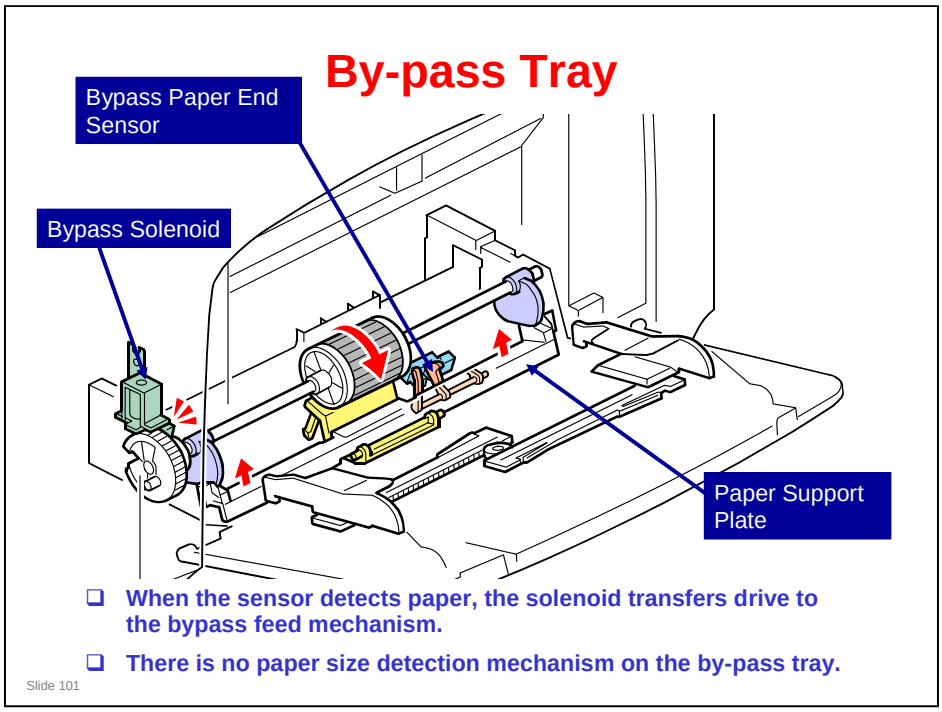
Near end detection

- ❒ Two height sensors detect the amount of paper in the tray. When the quantity of paper decreases, the bottom plate moves up and the actuators (pink in the diagram) turn.

Remaining paper	Paper height sensor 1	Paper height sensor 2
Full – 350	OFF	OFF
350 – 150	ON	OFF
150 – 50	ON	ON
50 – 0	OFF	ON

End detection

- ❒ When the paper tray is empty, the actuator (yellow in the diagram) goes into the end sensor. The sensor detects paper end.



- This mechanism is the same as the At-C1.

Paper Feed Mechanism

- When the bypass paper end sensor detects a sheet of paper, the by-pass solenoid unlocks the feed shaft stopper at the left end of the by-pass feed shaft. The by-pass feed shaft has a feed roller and two cams. These cams move the paper support plate up and down, and push the sheets of paper against the feed roller.

Paper Size Detection Mechanism

- There is no paper size detection mechanism on the by-pass tray in this printer. Paper size on the by-pass tray can be adjusted with the operation panel or printer driver, but there is no sensor, so the customer must take care to insert the correct paper size. If the paper size is different, a jam may occur.

Jam if Wrong Paper Size or Type is Selected

- **When printing from the bypass tray, if the paper size or type selected at the driver is different from the actual paper size or type in the bypass tray, the machine's behavior depends on a user tool setting:**
  - Menu > Print Setting > Machine Mode > Tray Setting Priority > Bypass Tray
    - » 1 (Driver Command) – default setting: If the paper size in the tray is different from the paper size set with the driver, printing cannot be done.
    - » 2 (Machine): If the paper size and type that are set with the machine's operation panel are different from the settings made with the driver, printing cannot be done.
    - » 3 (Any Size/Type): Printing is possible from the bypass tray with any paper size or type, if the driver setting is for a standard or custom paper size.
    - » 4 (Any Custom Size/Type): Printing is possible from the bypass tray with any paper size or type, if the driver setting is for a custom paper size. Also, printing is not possible from the bypass tray with any paper size or type, if the driver setting is for a standard paper size.
  - If the setting is changed to 3 or 4, the line speed will be reduced to prevent jams.

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- This is a new function. In previous models, printing always stops if the size and type are different.

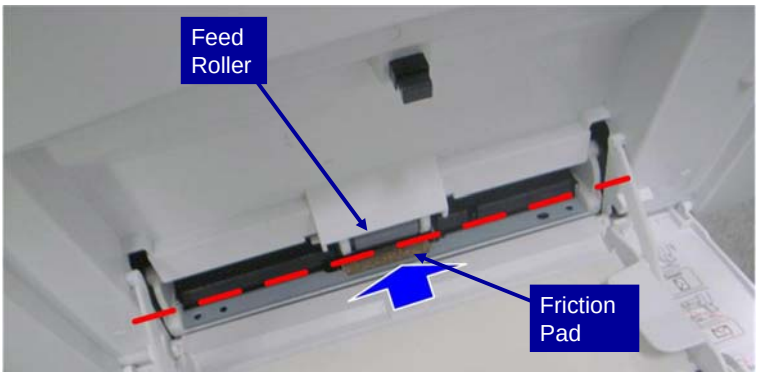
Paper Size

- There is no size sensor in the bypass tray.
- To check paper size, the machine measures the paper length using the duplex exit sensor. This prevents jams when feeding paper from the bypass tray that has a different length from the driver setting.

Paper Thickness (Paper Type)

- If the setting is 2, printing will be stopped if the paper type set with the driver is different from the paper type set with the operation panel.
- If the setting is 1, 3, or 4, printing will not be stopped if the paper type settings are different.

Adding Paper to the Bypass Tray



- Don't push the paper between the feed roller and the friction pad, or a jam will occur.
- The leading edge must be pushed against the paper support plate (black plastic cover below friction pad).

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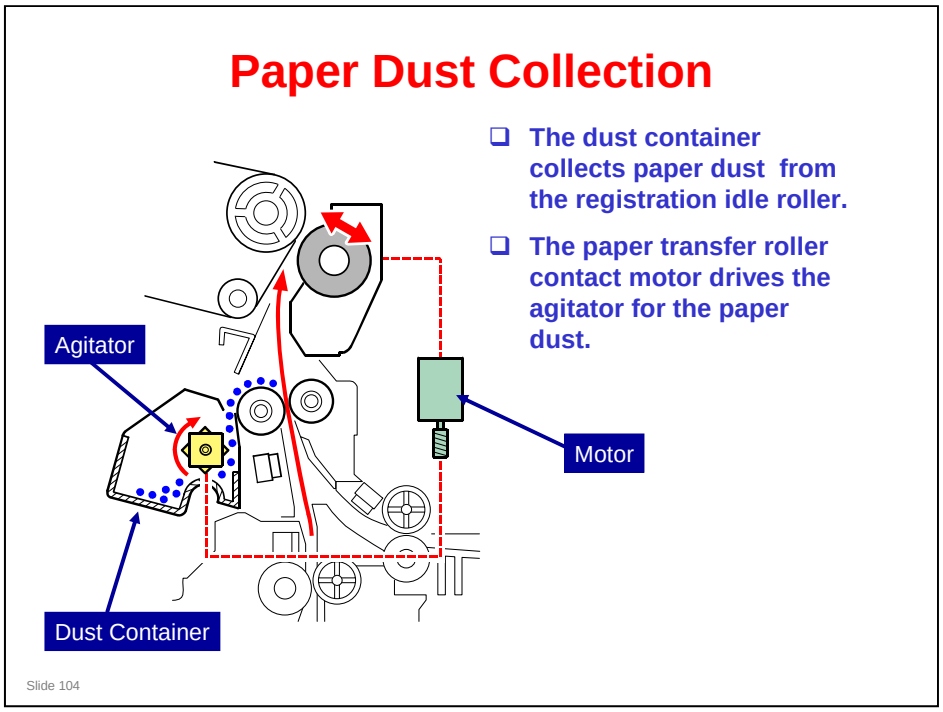
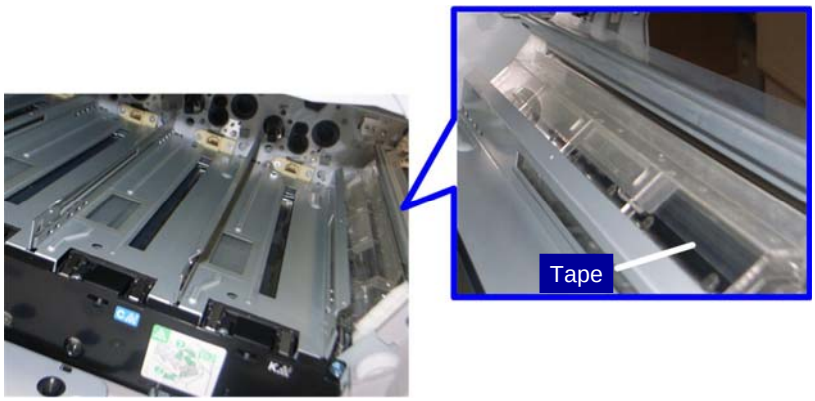
- The top edge of the paper must be below the dotted red line in the diagram.



- The dust container should not need to be emptied during the life of the machine.
- To see the dust container, open the duplex unit. The user cannot remove the container. It is difficult to remove the container; the drive unit and other parts must be removed. However, if you remove the ITB and K PCDU, you can remove a tape and vacuum out the dust (see the next slide).

Removing the Paper Dust



- Remove the ITB and K PCDU.
- Peel off the tape and remove the paper dust from the container with a vacuum cleaner.

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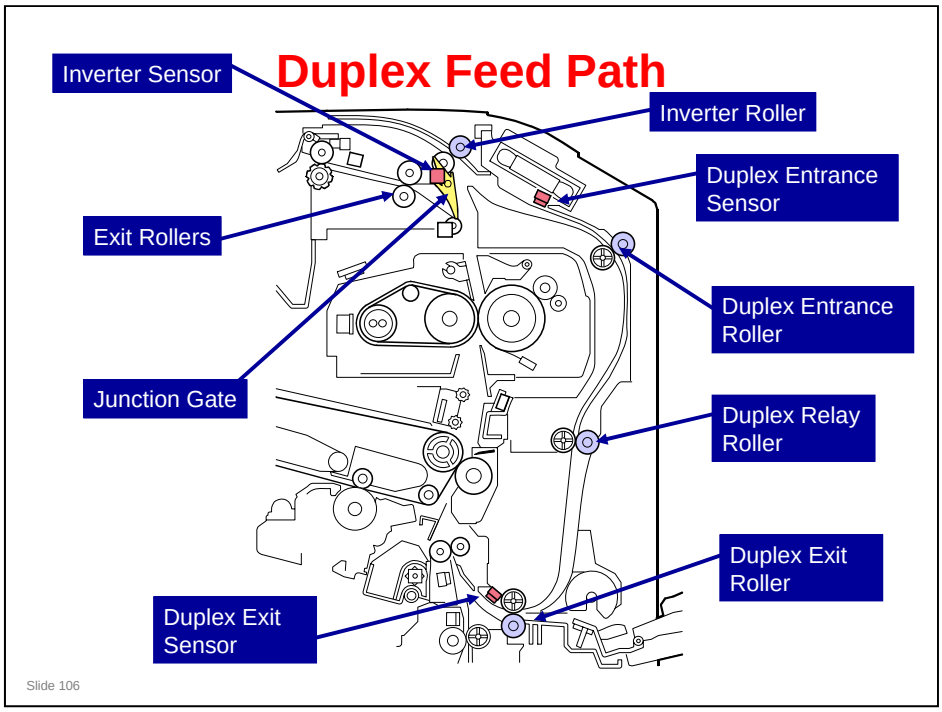
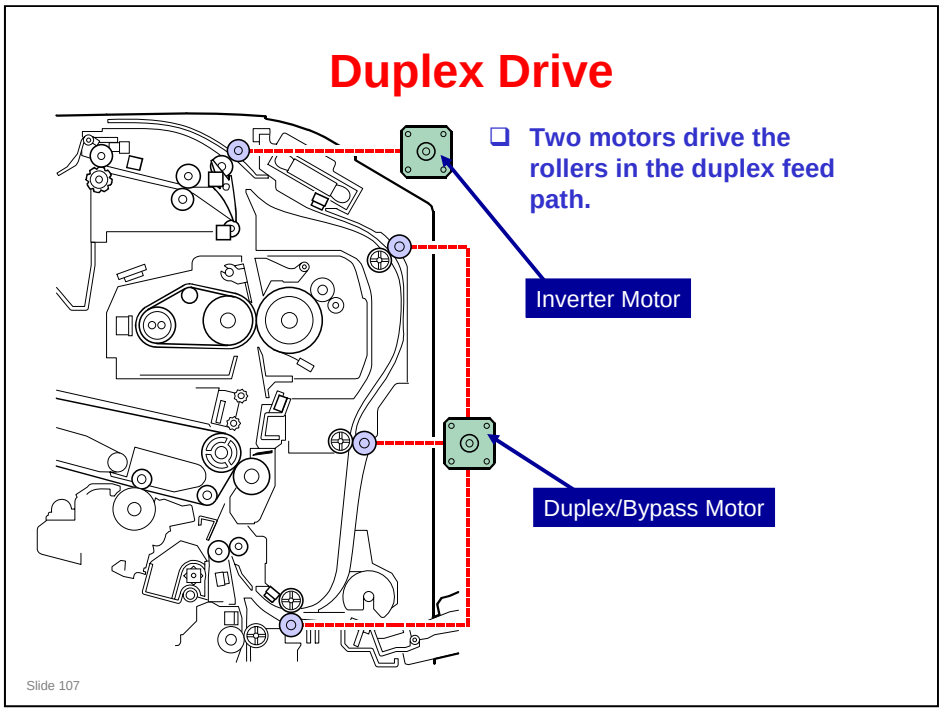
No additional notes

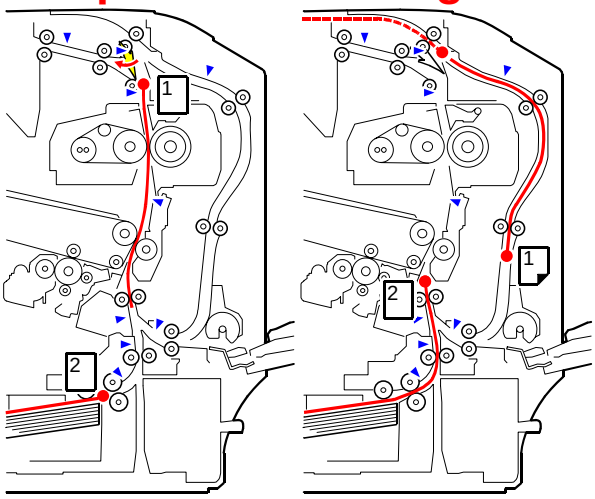


- When a sheet of paper is fed out of the fusing unit, it is fed upwards. The junction gate blocks the path to the exit rollers, so the paper goes to the inverter roller.
- To print on the other side of the paper, the junction gate moves up (to stop the paper from going back into the fusing unit), and the inverter roller feeds the paper back into the machine towards the duplex feed path.
- The duplex exit sensor detects when the paper is ready to feed in to the registration roller to print on the other side of the paper.



- The inverter motor drives the inverter roller, which feeds the sheet of paper to the duplex unit.
- The duplex/bypass motor controls the following:
  - Duplex entrance roller (at the top of the duplex feed path)
  - Duplex relay roller (in the middle)
  - Duplex exit roller (at the bottom)
- These rollers transport the sheet of paper from the duplex entrance through to the registration roller.

Duplex Interleaving - 1



- Two sheets of paper can pass through the machine at the same time.
- Interleaving is not done when the bypass tray is used.

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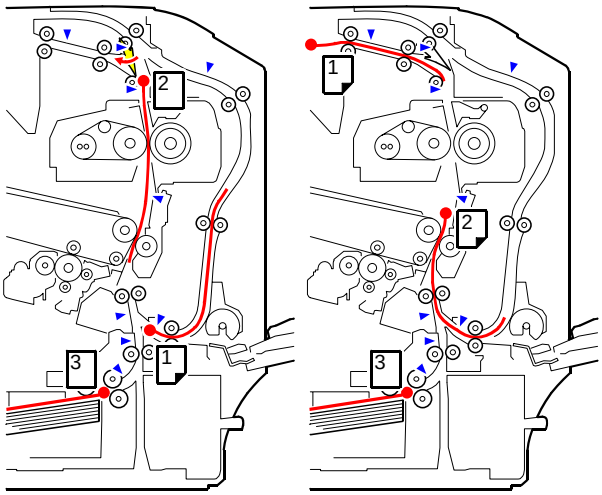
- The machine prints on the reverse side of the first sheet of paper [1].
- Then, the first sheet of paper is fed out of the exit, but not fully.
- Then the inverter roller changes direction and the paper goes to the duplex feed path.
- At the same time, the second sheet of paper [2] is fed from the paper tray between the transfer belt and the transfer roller, and one side is printed.

Duplex Interleaving - 2



- Two sheets of paper can pass through the machine at the same time.

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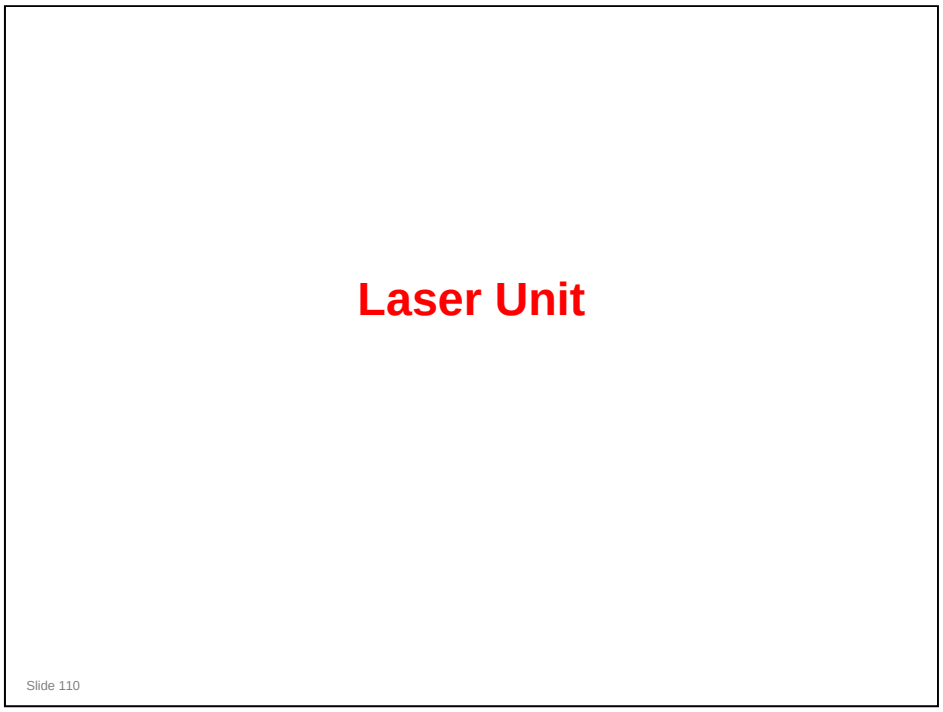
- The machine prints on the second sheet of paper [2].
- The second sheet of paper is fed to the paper exit, and into the duplex feed path.
- At the same time, the first sheet of paper [1] is fed between the transfer belt and the transfer roller, and the other side is printed.
- The second sheet of paper [2] immediately follows the first sheet of paper in the duplex feed path.
- Then the third sheet [3] is fed in from the paper tray.

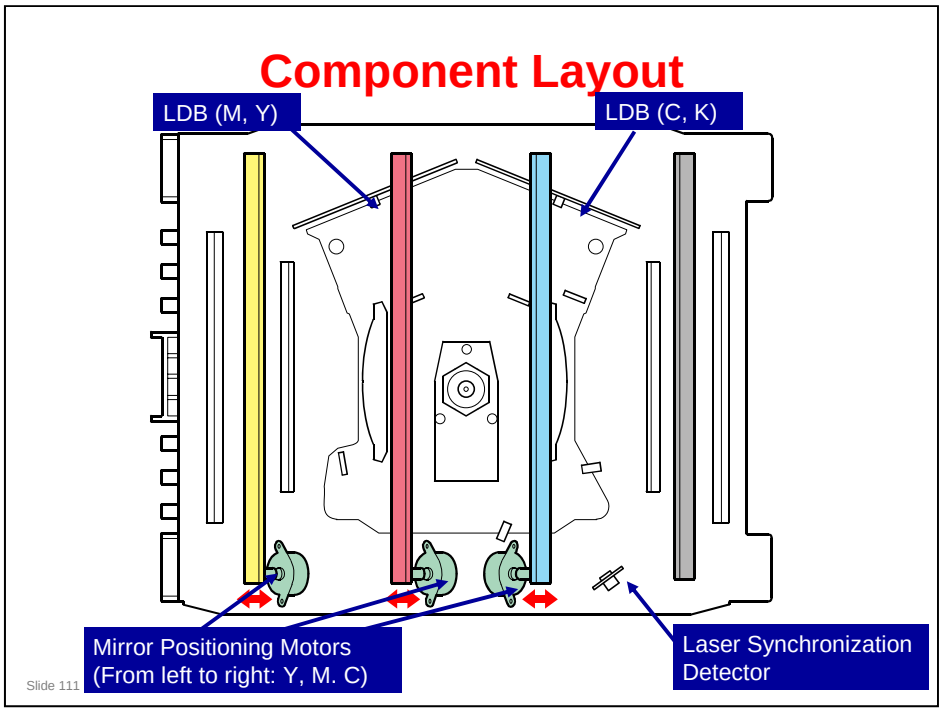


PURPOSE OF THIS SECTION

- ❒ This section describes the laser circuit and safety devices.

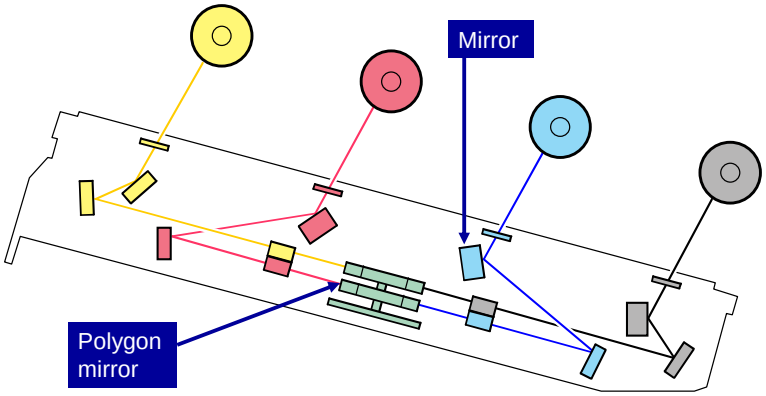
In this section you will:

- ❒ Study the optic and electronic components in the laser unit
- ❒ Learn how to do work on the laser unit safely
- ❒ Repair the laser unit



- This machine uses two LDB units and one polygon mirror motor to produce latent images on four OPC drums (one drum for each color toner).
  - Each LDB has two laser diodes.
  - On the LDB (C, K), the laser diode for black is located above the laser diode for cyan.
  - On the LDB (M, Y), the laser diode for yellow is located above the laser diode for magenta.
- There are two hexagonal mirrors. Each mirror reflects beams from two LD units.
- Laser exposure for magenta and yellow starts from the rear side of the drum. But it starts at the front side of the drum for cyan and black. This is because the laser diodes for magenta and yellow are on opposite sides of the polygon mirror from the cyan and black laser diodes.

Optical Path



- The laser beams for cyan and magenta go to the lower part of the polygon mirror. Yellow and black beams go to the upper part of the polygon mirror.
- The speed of the polygon mirror depends on the selected mode.

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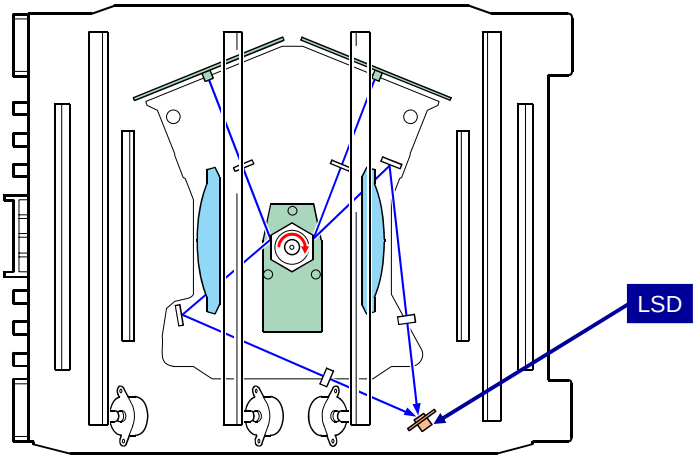
No additional notes

Mode	Resolution (dpi)	Polygon motor speed (rpm)	Process line speed (mm/s)	Print speed (ppm)
B/W (except OHP/thick paper)	600 x 600	30708.7	260	40
	1200 x 1200	40157.5	85	15
Color (except OHP/thick paper)	600 x 600	30708.7	260	40
	1200 x 1200	40157.5	85	15
OHP/Thick	600 x 600	30708.7	260	40
	1200 x 1200	40157.5	85	15

Laser Synchronizing Detector (LSD)



- The machine has one laser synchronizing detector board. It detects each of the 4 laser beams at the start of the main scan.

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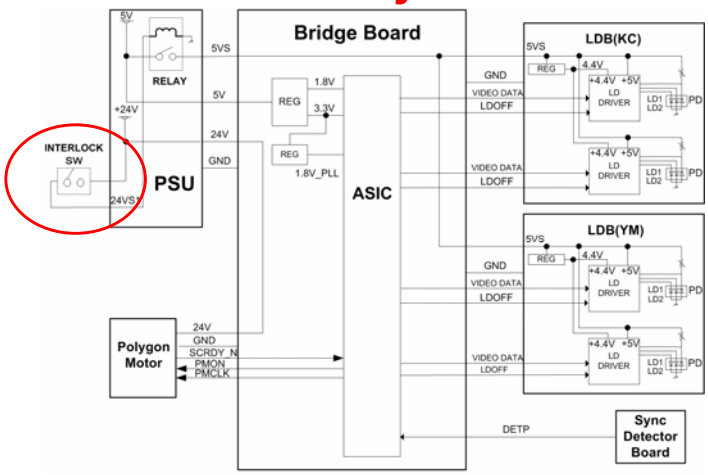
No additional notes

LD Safety Switch



- A safety switch turns off when the front cover or the left cover is opened.
- As a result, the relay on the PSU cuts off the power supply (+5V) to the two LD boards.

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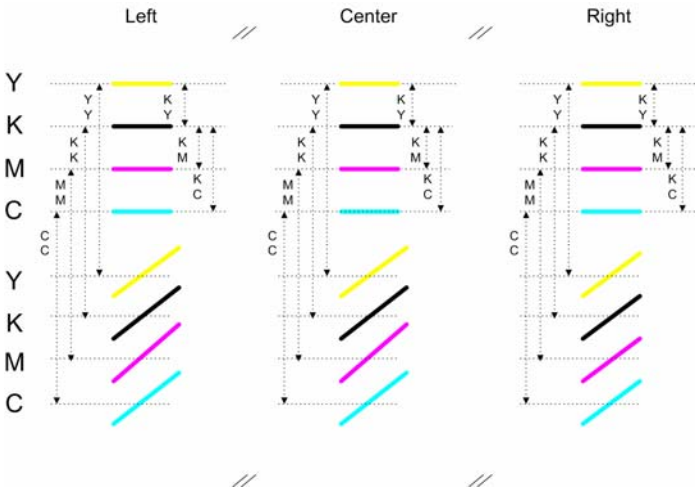
No additional notes

Automatic Line Position (MUSIC)



- YY, KK, CC, MM: Spaces between two lines of the same color
- KY, KC, KM: Spaces between a black line and a colored line

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More on Automatic Line Position

- During automatic line position adjustment, the line patterns above are made eight times on the transfer belt. The spaces between the lines (YY, KK, CC, MM, KY, KC, KM) are measured by the left, center, and right ID sensors. The engine reads the average of the spaces, and adjusts the following items:
  - Sub scan line position for YCM
  - Main scan line position for KYCM
  - Magnification ratio for KYCM
  - Skew for YCM

Tolerance specifications for skew and color registration

- Color registration: Within 180 μ m
- Skew
  - Paper width below B5 SEF: 0.6 mm
  - Paper width B5 SEF and higher: 1.1 mm

Adjustment Conditions

- **If SP 2193 1 is set to 'on', then automatic line position adjustment is done at the following times.**
  - Initialization
    - » Immediately after power is turned on
    - » Immediately after recovery from energy saver mode
  - During a job
  - At the end of a job
  - When a door or cover is opened
  - During standby mode
  - When a new PCDU is detected
  - Forced adjustment (can be done with SP mode at any time)

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- There is no adjustment after process control.

Initialization

- **The adjustment is done immediately after the main power is turned on or the machine comes back from energy saver mode, if one of the following conditions occurs.**
  - The time after the drum motor stops or the main power was last turned on exceeds a certain value (SP3522-002)
  - The temperature change since the previous line position adjustment exceeds a certain value (SP2193-008/011)
  - The number of prints since the previous line position adjustment exceeds a certain value (SP2193-016)
- **The adjustment is done either once or twice (or not at all), depending on the temperature change since the previous line position adjustment.**

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No additional notes

During a Job

- **The job is interrupted and the adjustment is done once, if one of the following conditions occurs:**
  - Number of prints since the previous line position adjustment exceeds 200.
    - » SP 2193-004/005
  - Time since the previous line position adjustment exceeds a certain value
  - Temperature change since the previous line position adjustment exceeds a certain value
- **The machine checks the above conditions every 10 pages (SP 3512 001).**

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No additional notes

At the End of a Job

- **At the end of a job, the adjustment is done once, if one of the following conditions occurs:**
  - Number of prints since the previous line position adjustment exceeds 200 (full color) or 500 (if there are black-and-white pages in the job).
    - » SP 2193-002/003
  - Time since the previous line position adjustment exceeds a certain value
  - Temperature change since the previous line position adjustment exceeds a certain value

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No additional notes

After a Cover is Opened and Closed

- **After a cover is opened or closed, the adjustment is done once (or twice), if one of the following conditions occurs :**
  - Time since the previous line position adjustment exceeds a certain value
  - Temperature change since the previous line position adjustment exceeds a certain value

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No additional notes

In Standby Mode

- **In standby mode (but not Energy Saver mode), the adjustment is done once, if one of the following conditions occurs:**
  - Time since the previous line position adjustment exceeds a certain value
  - Temperature change since the previous line position adjustment exceeds a certain value
  - Number of prints since the previous line position adjustment exceeds a certain value.
- **The machine checks the above conditions in standby mode every 10 minutes (SP 3512 002). Then, line position adjustment is done if one of the following conditions occurs:**
  - Time and number of prints have both exceeded a certain value since the previous adjustment.
  - Temperature and number of prints have both exceeded a certain value since the previous adjustment.

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No additional notes

New PCDU Detected

- When the machine detects a new PCDU, line position adjustment is automatically done twice.

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No additional notes

Forced Line Position Adjustment

- **You can do this at any time with SP 2111.**
- **It must be done after installing a new laser optics unit, or after moving the machine.**
- **There are three adjustments.**
  - 2111 001: Fine adjustment, twice
  - 2111 002: Fine adjustment, once
  - 2111 003: Rough adjustment, once
  - 2111 004: Rough adjustment and Fine adjustment, once each.
- **Normally, do SP 2111 003 first. Then do SP 2111 001.**
  - The screen displays the results of SP 2111 001. Also, you can see SP 2194 007 (0: Successful, 1: Failed).
  - If you do the rough adjustment, then you must follow immediately with the fine adjustment.
- **If the error is more than 1.4 mm, the fine adjustment cannot correct it.**
  - If this happens 4 times, SC285 occurs.

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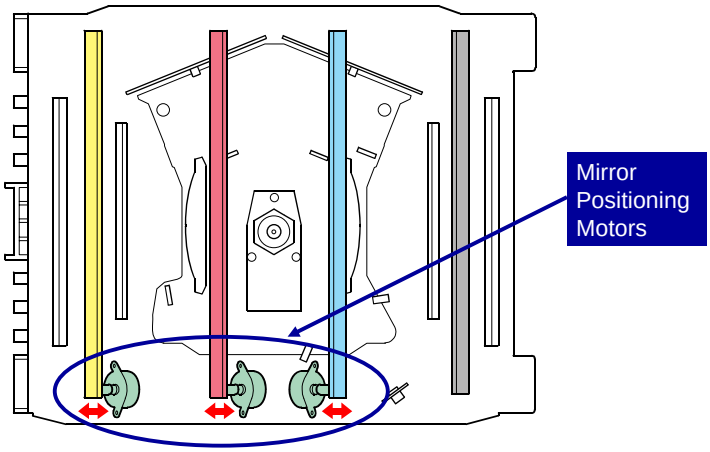
No additional notes

Main Scan Skew Adjustment



- **The motors automatically adjust the angle of the mirror below the laser exit for each colour, based on the mirror position for black.**
  - The mirror position for black is adjusted in the factory.
- **This mechanism corrects main scan skew.**

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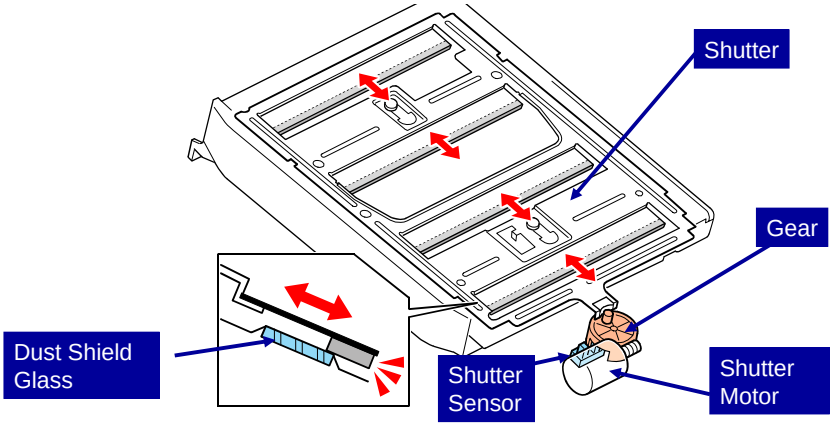
- This is similar to Di-C1 and Pe-MF1.
- In the G-P3, there is no automatic adjustment. An adjustment cam for C, M, and Y can be adjusted with a screw driver.

Shutter Mechanism



- **The LD unit has a shutter. As a result, toner and other dust does not fall on the dust shield glass. The shutter motor moves the shutter in the direction of the arrow with the gear.**

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- SC293 occurs if the output of the LDU shutter sensor does not change 1 second after the LDU shutter motor turned on.
- SC290 occurs if the sensor cannot find the home position.
- SC291 occurs if the sensor cannot find the open position. SC292 occurs if the sensor cannot find the close position.

Practical Work

- Turn off the main power switch and unplug the printer before you do the procedures in this section of the machine. Laser beams can cause serious eye injury.

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No additional notes

Laser Unit Replacement (1)

- **First, prepare the new laser unit.**
- **Then, before you switch the machine off, you must make some SP adjustments.**
  - These SP adjustments do the following:
    - » Move the mirror positioning motors back to home position.
    - » Reset the main scan start position and laser power settings.
  - Note: If you forget to do these SP adjustments, there is a recovery procedure in the manual. Do this before you do the 'After installing the laser unit' procedure.
- **After you install the new unit, do the SP adjustments, and the line position adjustment, as explained in the manual (also see the next slide).**

Slide 127

Field Service Manual, Replacement and Adjustment, Laser Optics

- Make sure that you understand the points on this slide before you start the procedures.
- If the mirror positioning motors are not reset, the motors in the new unit will be at the home position, but the SP setting could be different. This could cause errors in skew correction.
- If the main scan start position is not reset, the main scan will start in the wrong place, and this will cause colour registration errors across the page.
- If the laser power settings are not reset, the output for the affected colours will be too bright or too dark.

Laser Unit Replacement (2)

- **The sheet that is packed with the new laser unit clearly shows which numbers to store in the SP modes.**
  - Input the numbers from the lower part of the chart, as shown by the red square in the diagram.
- **If that is not enough, look at the replacement procedure in the field service manual for a full explanation of the SP modes that must be input.**
- **If the SP settings are not input correctly, it may cause color registration errors.**

Slide 128

No additional notes

PCDU (Photoconductor and Development Unit)

OPC Drum

Slide 129

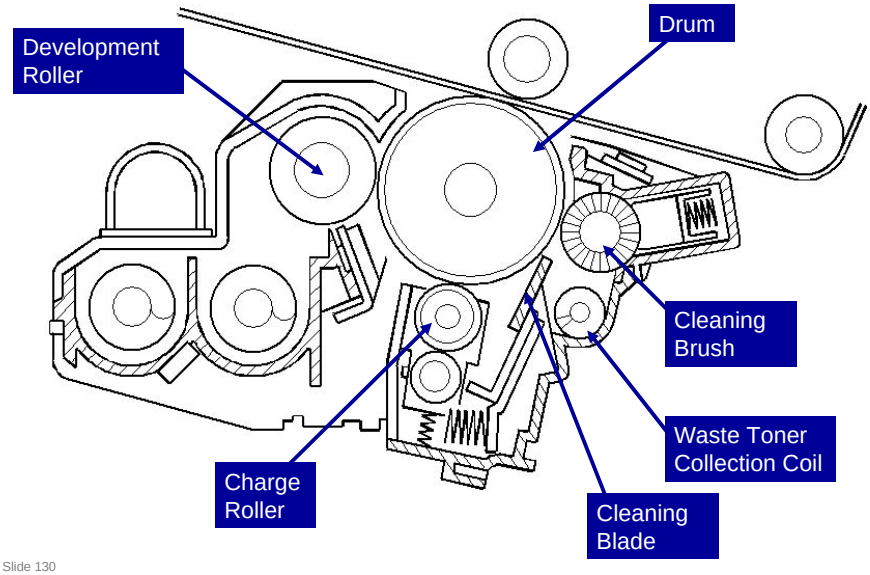
PURPOSE OF THIS SECTION

- In this section, you will study the components around the drum. This includes the drum, drum charge, drum cleaning, and toner recycling.

In this section you will:

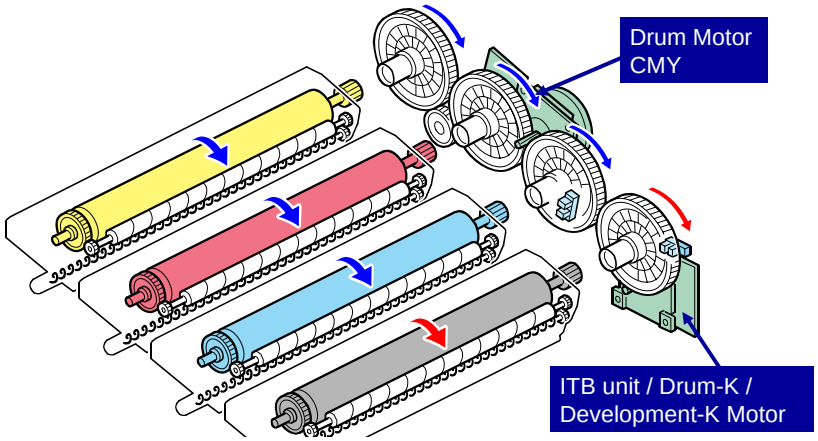
- Study the components of the PCDU
- Study the components around the drum

Component Layout



- The PCDU for this machine is similar to the one for the G104/G160/G190 series printers.
- The machine has four PCDUs, one for each color, and each PCDU has the following.
  - OPC drum
  - Charge roller
  - Cleaning brush
  - Cleaning blade
  - Development unit
- The photoconductor gap between the drum and the corresponding development roller is set by the drum positioning plate. You cannot adjust this in the field.

Drum Drive

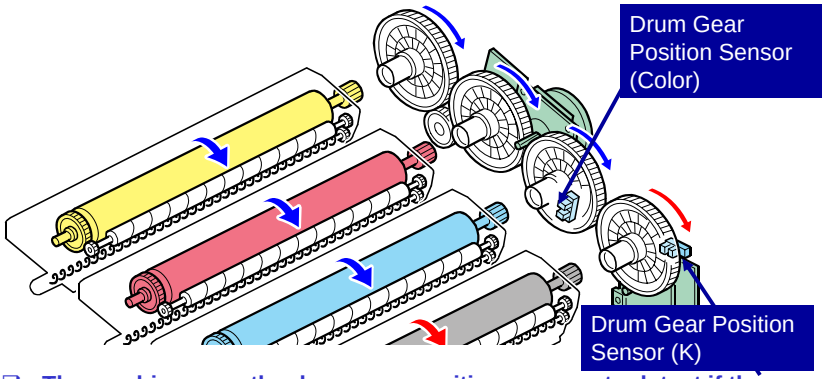


- The ITB unit / Drum-K / Development-K motor controls the PCDU for black.
- The drum motor: CMY controls the PCDUs for magenta, cyan, and yellow. One motor controls these three drums to help reduce the CMY color registration errors.

Slide 131

No additional notes

Drive Gear Position Sensors



- **The machine uses the drum gear position sensors to detect if the drum motors turn.**
  - SC 380 (K) or 381 (CMY) occurs when the drum motor does not move.
- **These sensors also help the machine to initialize the positions of the gears when the main switch is turned on and at initialization.**
  - This prevents changes between printouts in how the gears engage. This can cause changes in copy quality.

Slide 132

- There is an actuator on each of the black and cyan drum gears. The drum gear position sensors detect the positions of these actuators. This mechanism makes sure that output quality does not change. The magenta and yellow drum gears operate with the cyan drum gear because these three drum gears are connected through other gears.
- In the ready condition, if the two actuators are not in the home position, the machine adjusts the position of the black drum gear.
- When a drum gear position sensor has found an error, an SC code is shown. The following shows the steps of the initialization procedure, possible errors, and corresponding SC codes.
  - Step 1: The four drums turn at the same time for seven seconds. The drum position sensors detect the drum gear interrupters several times.

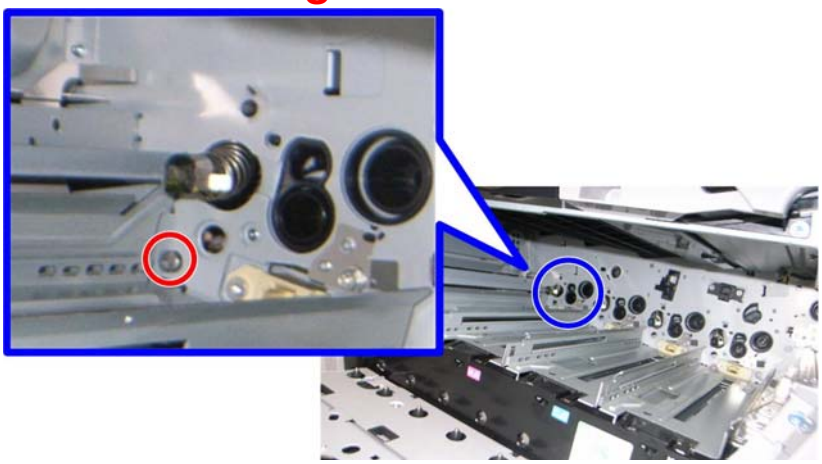
    If the black drum gear actuator is not detected: SC 380

    If the color drum gear actuator is not detected: SC 381

    If both black and color drum gear actuators are not detected: SC 380
  - Step 2: The time lags between detection of the black drum gear interrupter and detection of the color drum gear interrupter are checked. The average time lag is calculated.
  - Step 3: The black drum turns. The position of the gear is adjusted for the average time difference.

    If the black drum gear actuator is not detected: SC 380
- If the connector of the black drum position sensor is connected to the color drum position sensor (and the connector of the color drum position sensor is connected to the black drum position sensor), no errors are detected.

Installing a New Gear Unit

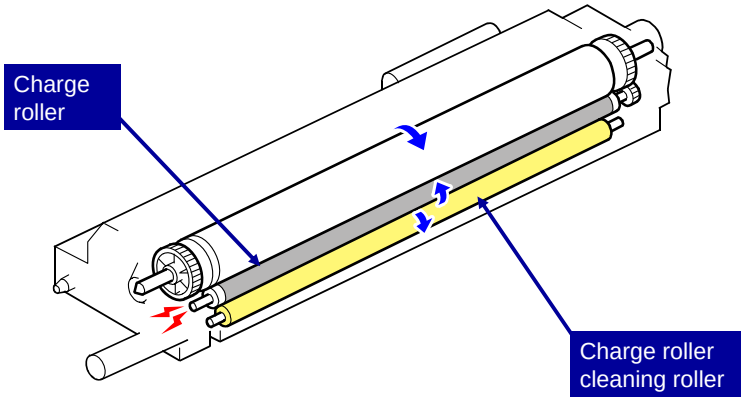


- Make sure that the positioning pin (red circle) is set correctly (blue circle) when installing the gear unit.

Slide 133

- There is no need to do a drive gear position adjustment.
- Also note that when the PCDU or image transfer belt unit is replaced, the drive gear position is adjusted automatically.

Drum Charge



- **The machine uses a charge roller to give the drum surface a negative charge.**
  - The high voltage supply board gives a dc and ac voltage (at a constant current) to the roller. The ac voltage helps to make sure that the charge given to the drum is as constant as possible.

Slide 134

- The high voltage supply board is at the rear of the machine.
- The charge roller has been improved over previous models, to prevent black streaks on prints.
- The machine automatically controls the charge roller voltage if automatic process control is enabled (SP 3041 1 is set to 1). However, if process control is turned off, (SP 3041 1 is set to 0), the dc voltage is the value stored in SP 2005 1 to 4 (Do not adjust this in the field unless instructed to do so).
- The cleaning roller, which always touches the charge roller, cleans the charge roller.
- There is no quenching lamp.

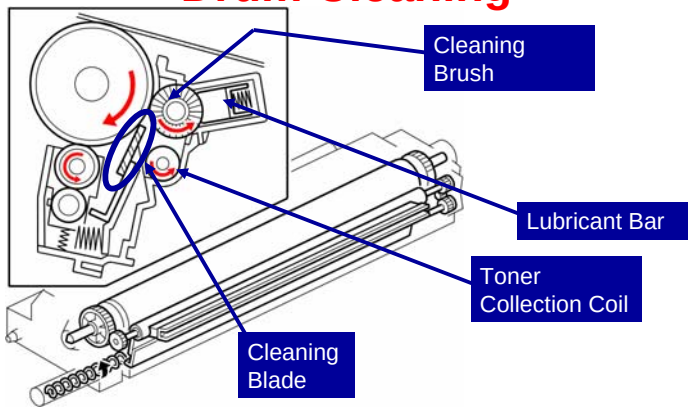
Charge Roller Voltage

- **The charge roller gives the drum surface a negative charge.**
- **An ac voltage is also applied to the charge roller, at a constant current.**
  - The ac voltage helps to ensure that the charge given to the drum is as uniform as possible.
- **The high voltage supply board - CB, at the rear of the machine, supplies the ac and dc to the charge roller.**
- **The machine automatically controls the charge roller voltage if automatic process control is enabled.**

Slide 135

No additional notes

Drum Cleaning



- The cleaning brush spreads out the waste toner on the drum. The lubricant bar lubricates the brush. Then the cleaning blade removes the waste toner.
- The toner collection coil moves the toner to the waste toner collection duct.

Slide 136

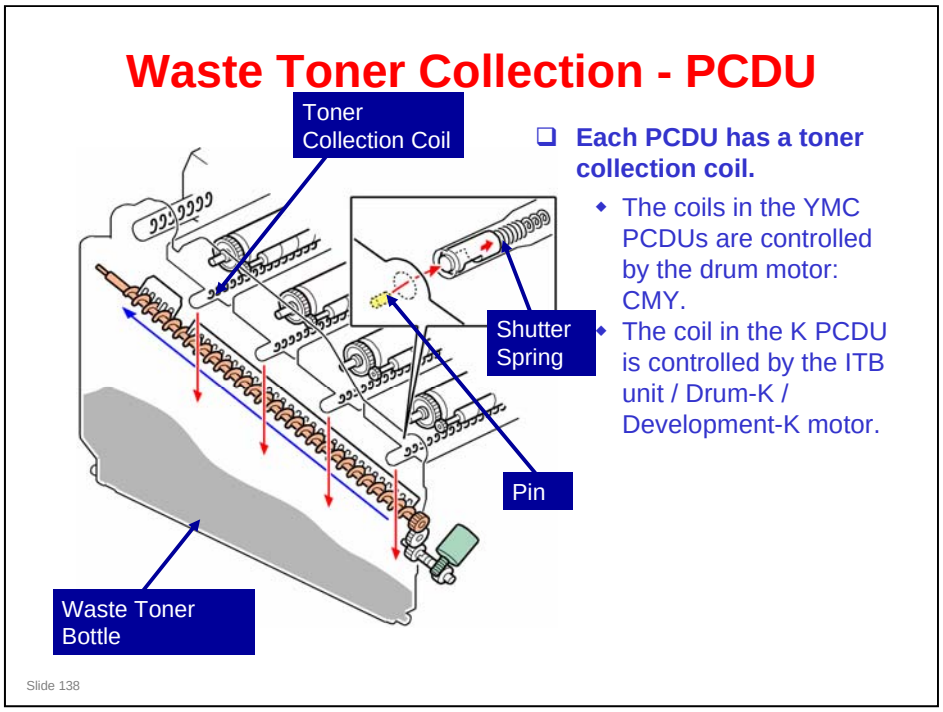
- The lubricant reduces friction between the drum and the cleaning blade, and this makes it easier to remove the waste toner.

Quenching

- **In the G-P3, the laser exposes all areas of the drum at the end of each job.**
  - This removes any charge remaining on the drum.
- **The Z-P1 does not do this, because the OPC drum has been improved to prevent residual charge.**
  - The new OPC material used for this drum makes it difficult for charge to remain on the drum surface after transfer.

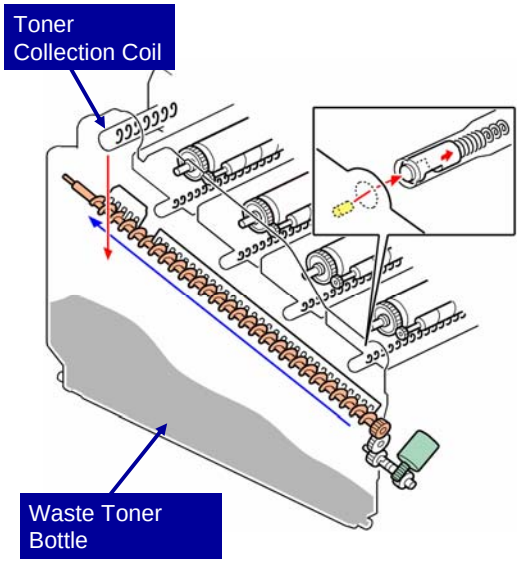
Slide 137

No additional notes



- The waste toner from the collection coils in the four PCDUs falls into the waste toner bottle from the four openings at the front of the PCDUs. The toner collection coils move this waste toner towards the waste toner bottle.
  - There is another opening for the waste toner from the transfer belt unit: see the next slide for more on this.
- The waste toner bottle has five seals (one at each entrance). These do not let the waste toner scatter at the entrances.
- The pin at each waste toner entrance pushes the shutter spring at the front of the PCDU. Because of this, waste toner can fall into the waste toner bottle. If the left cover is open, the waste toner does not come out from the front of the PCDUs.

Waste Toner Collection – Transfer Unit



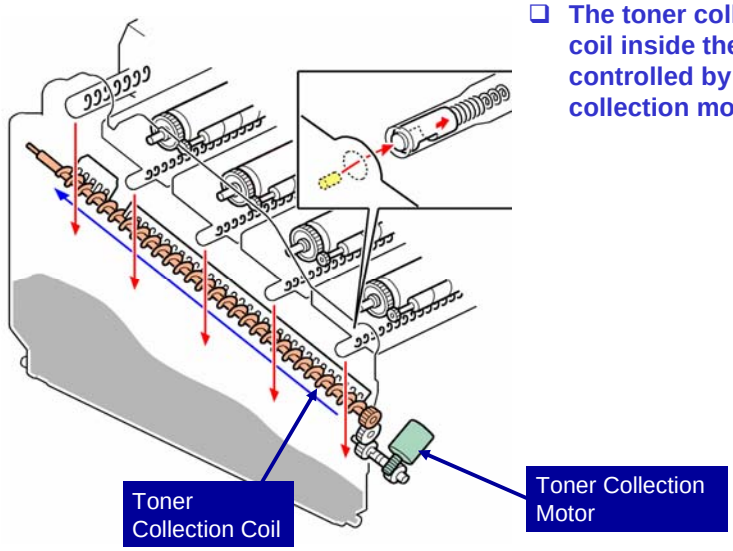
- **This waste toner collection coil is driven by paper transfer roller contact motor.**

Slide 139

- The waste toner from the transfer belt cleaning unit falls into the waste toner bottle from a different opening.

Waste Toner Collection – Bottle

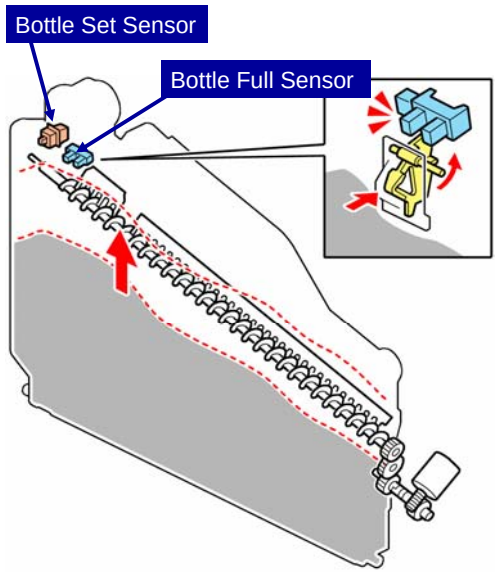
- The toner collection coil inside the bottle is controlled by the toner collection motor.



Slide 140

No additional notes

Waste Toner Bottle Full/Set Detection

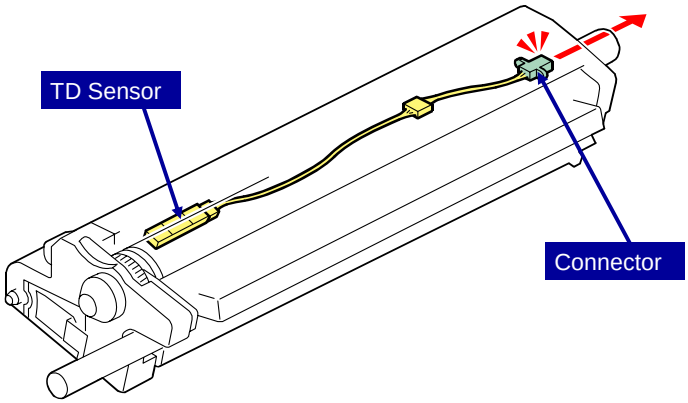


- **Waste toner bottle set sensor: Detects when the left cover is open. It also detects if the waste toner bottle is put in the machine.**
- **Waste toner bottle full sensor: Detects when the bottle is almost full (2000 more pages can be printed).**

Slide 141

- The waste toner bottle set sensor in the main frame detects when the left cover is open. It also detects if the waste toner bottle is put in the machine. If 'Close Front/Left Cover' appears on the LCD when the cover is closed, check if the waste toner bottle is in the machine.
- The waste toner bottle full sensor detects when the bottle is almost full. When the bottle contains a set quantity of waste toner, the sensor turns off. The machine detects that the waste toner bottle is almost full. After that, the machine can print approximately 2000 more sheets. After printing 2000 sheets, “Replace Waste Toner bottle” appears immediately, even if it is not the end of job. At this time, the printer cannot be used until the bottle is replaced or emptied.
- The number of sheets is calculated for a paper size of A4 and an image coverage ratio for each color of 5%.

PCDU Detection

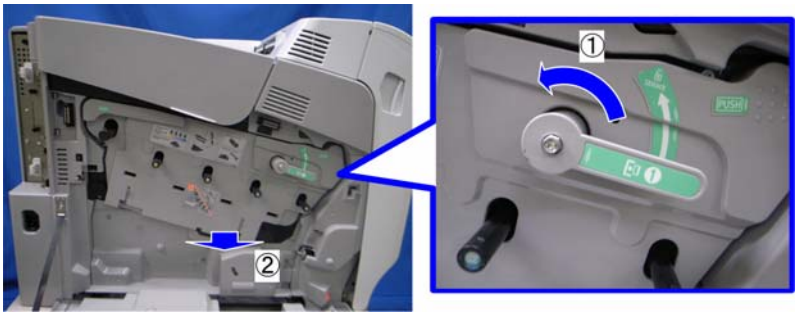


- The machine uses this connector to detect if the PCDUs are in the machine.
- Each PCDU is detected through this connector when the drum positioning plate is attached.

Slide 142

- This mechanism is different from the G-P3.
- The machine uses a circuit in the TD sensor to detect if a new PCDU is installed.

Drum Positioning Plate



Slide 143

❒ This slide shows the drum positioning plate being removed.

PCDU (Photoconductor and Development Unit)

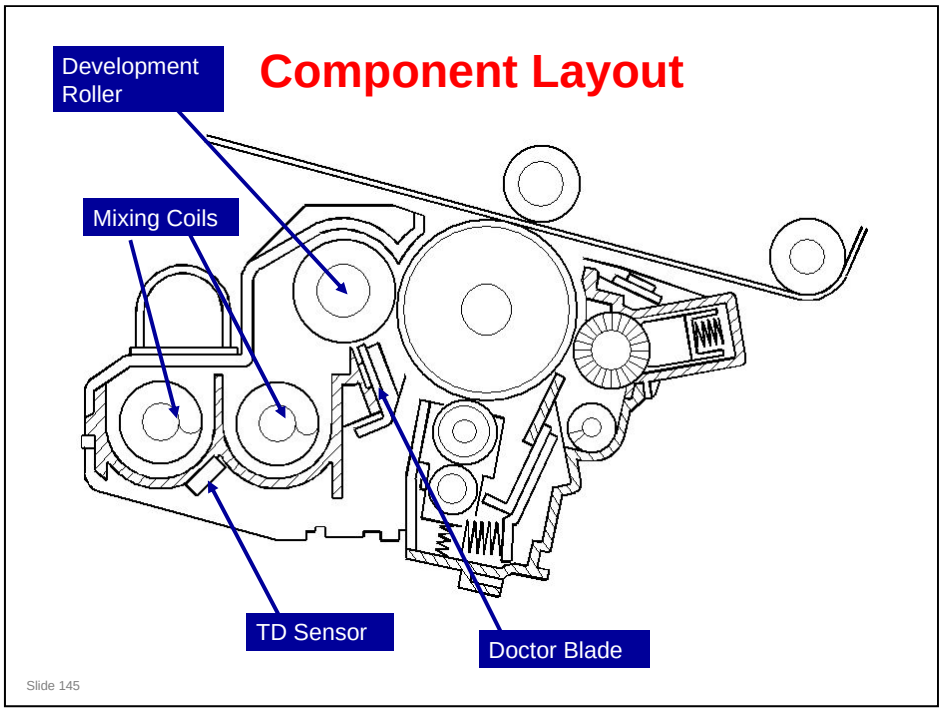
Development

Slide 144

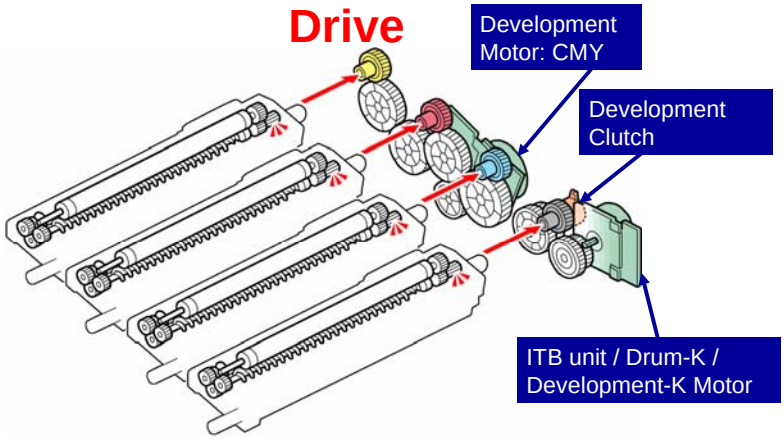
PURPOSE OF THE SECTION

In this section, you will:

- ❒ Learn about the development process.



- This machine has four development units, one for each color.
  - The development unit is part of the PCDU.
- The two mixing coils send developer from unit to the development roller. Electrostatic attraction moves the developer to the surface of the roller.
- The drum positioning plate sets the photoconductor gap between the drum and the development roller. You cannot adjust this the field.
- The TD sensor detects toner density. Each development unit has a TD sensor.

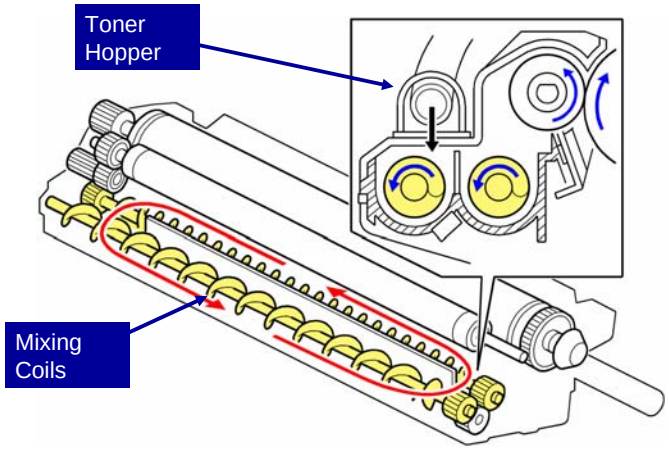


- **The ITB unit / Drum-K / Development-K motor drives the development roller and the photoconductor for black through gears and the development clutch.**
- **The development motor: CMY drives the development unit for magenta, cyan, and yellow through gears.**
- **The machine only contains one development clutch (for black).**
  - The clutch is needed because the same motor also drives the K drum.

Slide 146

No additional notes

Developer Mixing



- Toner is supplied at the rear of the development unit by the toner hopper.

Slide 147

More on Developer Mixer

- Two mixing augers coils move the developer forward and rearward to mix the developer at the following times:
  - Immediately after a new PCDU is installed.
  - During the process control self check
  - During toner supply
  - During development.
  - If absolute humidity changes more than ± 6 g/m3 (e.g. from 23° C/ 50% to 27° C/ 70%). You can change the humidity threshold with SP 3522 5.

Development Bias

- The HVPS: CB board supplies development bias to the development roller at the rear of each development unit.
- There are ac and dc bias voltages. The ac bias improves toner transfer to the drum.
- The machine automatically controls the dc bias, if automatic process control is enabled. However, if process control is turned off, (SP 3041 1 is set to 1), the dc bias is the value stored in SP 2229 1 to 4.
  - Do not adjust this in the field.

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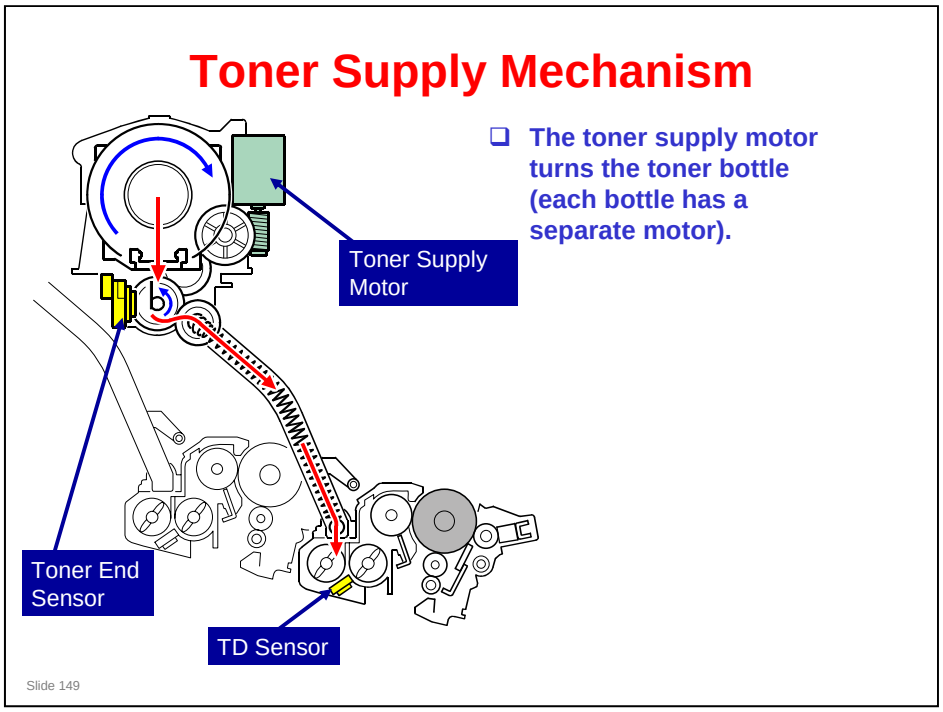
No additional notes



- When the toner supply drive mechanism starts, the toner bottles turn and the groove moves toner to the mouth of the bottle. Here, toner spills into a hopper. Mylar blades turn and move the toner to an opening in the side of the hopper. Then the toner falls into the development unit. The quantity of toner that is added is controlled by the length of time that the toner supply mechanism turns.

Toner Near End

- To detect toner near-end, the machine uses:
  - Pixel count (memory chip on the toner bottle)
  - Toner supply motor rotation count

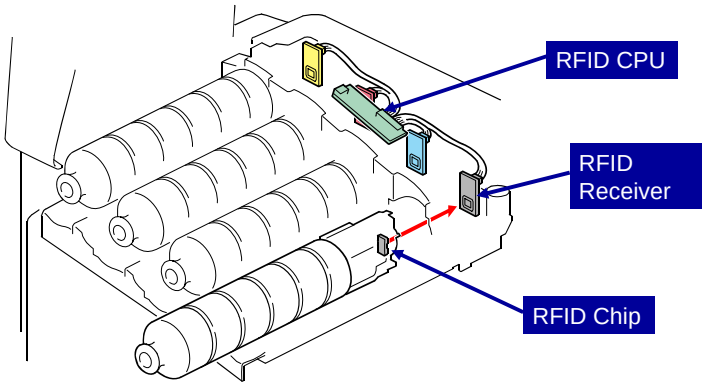
Toner End

- To detect toner end, the machine uses:
  - Output from the toner end sensor

Removing the Toner Supply Mechanism

- In the G-P3, the toner supply tube is full of toner. In the Z-P1, it is not.

Toner Near-end and End Detection



- **To detect toner near-end, the machine uses:**
  - Pixel count (RFID chip on the toner bottle)
  - Toner supply motor rotation count
- **To detect toner end, the machine uses:**
  - Output from the toner end sensor

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❒ Each bottle has a RFID chip.

Toner Near-end Detection

- **To detect toner near-end, the machine uses the following data:**
  - Toner supply motor rotation counter
  - Pixel counter
  - Toner end sensor
- **If one (or both) of the counters detect that the remaining toner amount is less than a set value (see below), the machine enters the near-end condition.**
  - 45 g (1500-3000 sheets at 5% coverage)
- **Also, the toner end sensor checks for the near-end condition when there are only 100 sheets left.**
  - This occurs when the bottle is empty, but a small amount of toner remains in the sub hopper.

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No additional notes

Toner End Detection

- **The toner end sensor checks for toner in the hopper, and if it detects toner, the toner end condition is cancelled.**
  - If toner end is detected for black, the toner bottle must be replaced or the machine cannot print.
  - If toner end is detected for C, M, or Y, the machine can print in black and white only. Colour print jobs cannot be started.
    - » If C, M, or Y toner ends during a colour-printing job, the job is suspended until toner is supplied.
    - » If new colour toner is not installed, the user can print black-and-white jobs only.

Slide 152

No additional notes

Toner End Recovery

- **The machine assumes that the toner cartridge was replaced if either of the following occurs when the near-end or end status exists:**
  - The left cover is opened and closed.
  - The main switch is turned off and on.
- **Then the machine starts to supply toner to the development unit.**
- **Then, the machine clears the toner near-end or end status if the toner end sensor detects that toner was supplied.**
- **The machine tries to supply toner for a maximum of 50 times. If the sensor still does not detect toner, there is no recovery from toner end.**

Slide 153

No additional notes

PCDU (Photoconductor and Development Unit)

Replacement Procedures

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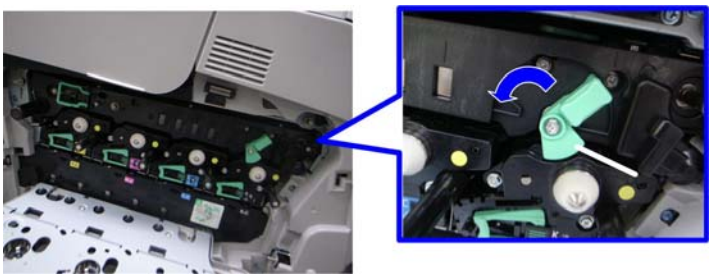
- This section covers the main points about replacement procedures for the PCDU section.

Before you Remove the K PCDU

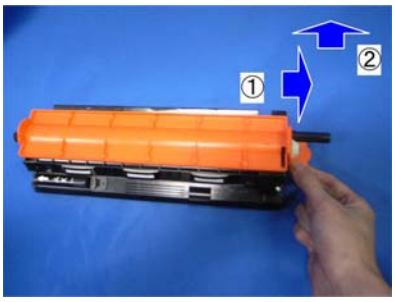


- **Turn the ITB lock lever counterclockwise before you remove the K PCDU. This will separate the ITB unit from the K PCDU.**
  - This step is not needed when you remove only the C, M, or Y PCDUs.

Slide 155

No additional notes

Replacement and Adjustment



- **When installing a new PCDU**
  - Remove the cover and the tape from the new development unit before installing a new PCDU in the machine.
  - There is no tape to remove in the starter PCDU, but the service part and maintenance kit part has tape.

Slide 156

No additional notes

Error Messages

- When the machine cannot detect a PCDU, it displays, 'Turn power off, then set the PCDU correctly', and the color(s) that cannot be detected.

Slide 157

No additional notes

Process Control

Overview

Slide 158

PURPOSE OF THE SECTION

In this section, you will:

- ❒ Learn the basic points about process control

Overview

- **This machine has the following two forms of process control:**
  - Potential control
  - Toner supply control
- **Process control uses the following components:**
  - Four ID (image density) sensors. These ID sensors are used for process control, line positioning.
  - TD (toner density) sensor in each development unit.

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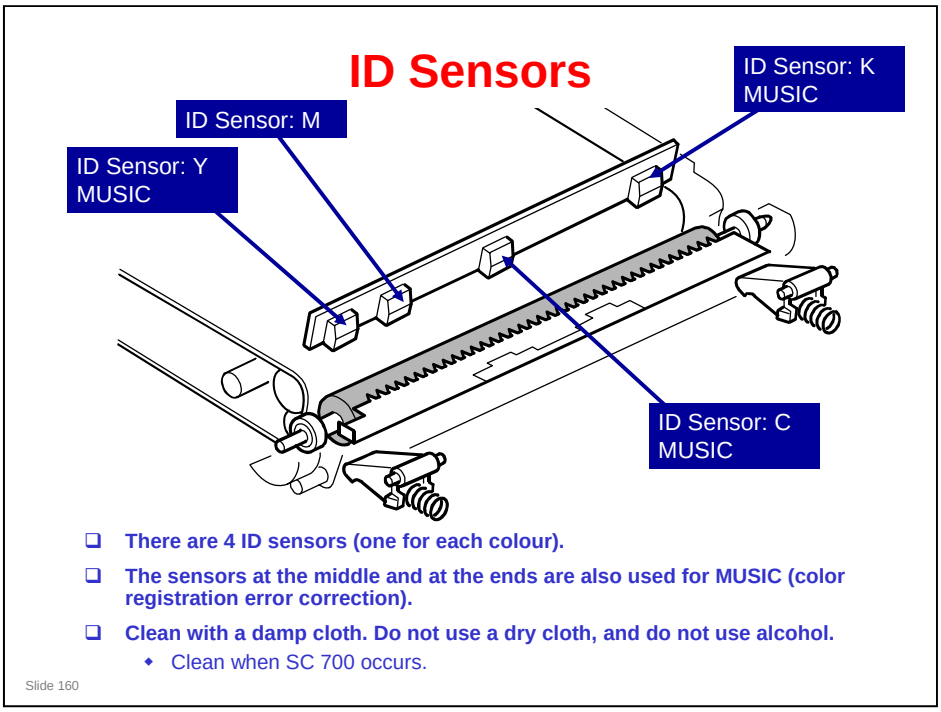
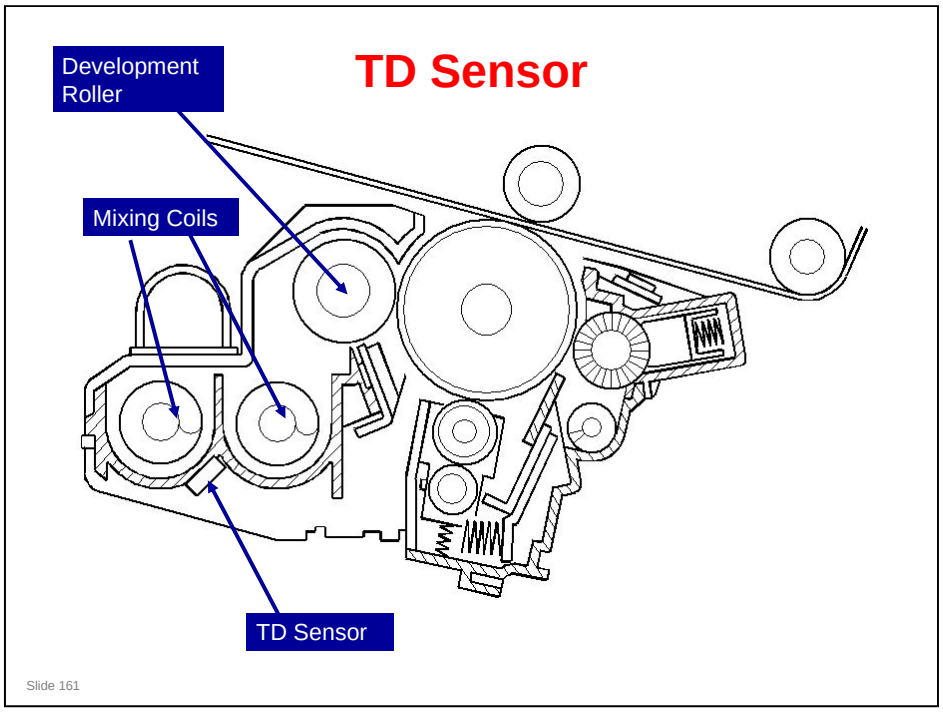
No additional notes



❒ The ID sensors are the direct reflection type.



❒ The TD sensor detects toner density. Each development unit has a TD sensor.

Time Required for Process Control and MUSIC

- **Initial start-up**
  - Process control: approx. 30 seconds
- **During a job**
  - Process control: approx 15 seconds
  - At low process speeds (85 or 182 mm/s): approx 20 seconds
- **At the end of a job**
  - Full-colour job-end process control: approx. 15 seconds
  - B&W job end process control: approx. 15 seconds
  - After a full-color job with low coverage ratio: 15-60 seconds

Slide 162

- Process Speeds – see the slide on Transfer Belt Unit Detection

- Process control and MUSIC are done together. These times show how long the machine stops for these processes.

Process Control

Potential Control

Slide 163

No additional notes

Overview

- **The machine determines the best possible V_D, V_B, and V_L, based on current machine conditions.**
  - V_D: Drum potential without exposure – to adjust this, the machine adjusts the charge roller voltage.
  - V_B: Development bias
  - V_L: Drum potential at the strongest exposure – to adjust this, the machine adjusts the laser power.
- **At the same time, the machine also determines V_{TREF}: Reference TD sensor output, used for toner supply control.**

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No additional notes

Process Control Self Check

- **Potential control is done with the process control self check. It is done at the following 5 times.**
  - Initial process control
  - At the end of a job
  - During a job
  - After installing a new ITB unit, PCDU, fusing unit, or waste toner bottle
  - Forced (manual execution)

Slide 165

No additional notes

Initial Process Control

- **Immediately after the power is turned on, or when the machine recovers from the energy saver mode.**
- **Done if one of these conditions occurs:**
  - Temperature has changed by more than a certain amount after the drum motor stopped.
    - » Power-on: SP 3522 003, Recovery from energy saver: SP 3531 002
  - Humidity has changed by more than a certain amount after the drum motor stopped.
    - » Power-on: SP 3522 004/005, Recovery from energy saver: SP 3531 003/004
  - 250 b/w or 85 full colour prints were made since the previous adjustment (SP 3511 005/006).
- **And**
  - The machine was not used for more than 6 hours (SP 3522 002).

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No additional notes

At the End of a Job

- Done if 250 b/w or 85 full colour prints were made since the previous adjustment (SP 3511 001/002).

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No additional notes

During a Job

- **Done if 500 b/w or 200 full colour prints were made since the previous adjustment (SP 3511 003/004).**
  - The machine checks the above condition every 10 pages (SP 3512 001). Then, potential control is done if the condition occurs.
- **Done every 20 pages (approximately) if the following the condition occurs:**
  - Pixel coverage is more than 30% (SP 3-224-010) for any one colour.

Slide 168

No additional notes

After Replacement of Parts

- **After replacing any of these parts, process control occurs automatically.**
  - ITB unit
  - PCDU
  - Fusing unit
  - Waste toner bottle

Slide 169

No additional notes

Forced (Manual Execution)

- Use SP 3011 001
- Process control counters (SP 3510-001/002) are not reset after a forced execution

Slide 170

No additional notes

Five Steps in the Self-Check

- **The process control self check has five steps:**
  - Step 1: V_{SG} Adjustment
  - Step 2: ID Sensor Solid Pattern Generation
  - Step 3: Sensor Pattern Detection
  - Step 4: Toner Amount Calculation
  - Step 5: V_D, V_B, V_L Selection and V_{TREF} Adjustment

Slide 171

No additional notes

VSG Adjustment

- The ID sensor checks the bare transfer belt's reflectivity and the machine calibrates the ID sensor until its output (known as VSG) is as follows.
  - V_{SG} = 4.0 ± 0.5 Volts
- This calibration adjusts for the transfer belt's condition and the ID sensor condition, for example, dirt on the belt or ID sensor.

Slide 172

No additional notes

ID Sensor Solid Pattern Generation

- **The machine mixes the developer and then makes a gradation pattern on the transfer belt for each toner color.**
  - The solid pattern has one square (the sequence is as follows: one black square, one cyan square, one magenta square, and one yellow square).
  - To make the squares for the gradation pattern, the machine keeps the laser power constant, and changes the development bias and charge roller voltage. The difference between development bias and charge roller voltage is always the same.
  - Each of the squares is 15.03 mm x 12.23 mm.

Slide 173

No additional notes

Sensor Pattern Detection

- The ID sensor detects the densities of the one solid-color square for each color. This data goes to memory.

Slide 174

No additional notes

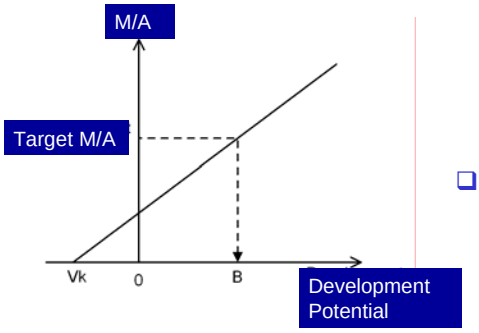
Toner Amount Calculation

- The quantity of toner on the transfer belt (M/A, mass per unit area, mg/cm^2) is calculated for each of the 10 gradations of the sensor pattern.
- To do this, the machine uses the ID sensor output value from each gradation of the pattern.

Slide 175

No additional notes

V_D, V_B, V_L Selection and V_{REF} Adjustment (1)



- The machine makes a plot of the 10 values of M/A against the development potential that was used to make each of the gradations. Then it makes a line through the 10 points.
- Then, it finds the development potential that is necessary to put the 'target M/A' of toner on the OPC.

Slide 176

No additional notes

V_D, V_B, V_L Selection and V_{REF} Adjustment (2)

- **This development potential is then used to find the best values of development bias, charge roller voltage and laser power for the machine in its current condition.**
  - To do this, it refers to a table in memory.
- **The machine also adjusts V_{REF} (toner density target) at the same time.**
  - As a result, the development gamma detected by process control will be the value stored in SP 3561 1 to 4 (do not adjust in the field unless told to do this).
- **After that, the transfer belt cleaning unit cleans the transfer belt.**

Slide 177

No additional notes

Process Control

Toner Supply Control

Slide 178

No additional notes

Overview

- **Uses these components:**
  - TD sensor: Detects how much toner there is in the developer
  - ID sensor: Measures the density of standard sensor patterns during process control.
  - Pixel counter: Counts pixels to determine how much toner for each colour is used on the page
- **The result of toner supply control determines how long the toner supply motor turns on for.**
- **This determines the amount of toner supplied.**
- **This is done before every development for each colour.**

Slide 179

No additional notes

Five Toner Supply Modes (1)

- **There are 5 toner supply modes. The mode used depends on SP3-044-001 to –004.**
- **1. PID control mode**
  - Uses the TD sensor, ID sensor, and pixel count.
  - V_{TREF} is adjusted by process control.
- **2. PID control mode with fixed V_{TREF}**
  - Change to this mode if the ID sensor breaks.
  - This mode uses only the TD sensor.
  - V_{TREF} is fixed at the value stored in SP3-222-001 to –004.
- **3. Fixed supply mode**
  - Change to this mode if the TD sensor breaks.
  - The amount of toner supplied depends on SP3-401-001 to –004.
  - The default is 70% of normal supply, to prevent excessive supply of toner.

Slide 180

No additional notes

Five Toner Supply Modes (2)

- **4. MBD control mode: This is the default mode.**
  - Uses the TD sensor, ID sensor, and pixel count.
  - V_{TREF} is adjusted by process control.
- **5. MBD control mode with fixed V_{TREF}**
  - Change to this mode if the ID sensor breaks.
  - This mode uses only the TD sensor.
  - V_{TREF} is fixed at the value stored in SP3-222-001 to –004.
- **You can select a different mode for each colour, if necessary.**
  - Use SP 3-044 if the TD sensor and/or ID sensor breaks and no spare part is available.
  - After replacing the part, return the SP setting to the default.

Slide 181

No additional notes

Process Control

Toner Density Adjustment Mode

Slide 182

No additional notes

Overview

- Process control adjusts the toner density so that the density of each colour in the image is correct.
- But, sometimes, process control adjusts the toner density too slowly, and the first few copies after process control have incorrect toner densities.
- Toner density adjustment mode brings toner concentrations to the correct values much more quickly.

Slide 183

No additional notes

What is Done? - 1

- **The machine makes sensor patterns and checks the current development gamma in the following 4 cases (A, B, C, D).**
  - A) Development gamma low during process control: If the following condition occurs, the machine increases the toner density. To do this, it supplies toner to the development unit.
    - » Current gamma < Target gamma - 0.50 (SP3-239-012)
  - B) Development gamma very high during process control: If the following condition occurs, the machine decreases the toner density. To do this, some of the toner in the development unit is sent to the waste toner bottle during process control.
    - » Current gamma ≥ Target gamma + 0.50 (SP3-239-009)

Slide 184

❒ See the next slide for cases C and D.

What is Done? - 2

- **Continued from the previous slide**
  - C) Development gamma too low immediately after power is switched on: If the following condition occurs, the machine increases the toner density. To do this, it supplies toner to the development unit.
    - » Current gamma < Target gamma - 0.75 (fixed value; no SP adjustment)
  - D) Low image area coverage (less than 18 cm^2 per meter of development roller rotation): Some of the toner in the development unit is sent to the waste toner bottle at the end of the job.
    - » To do this, toner is transferred to the drum, and removed by the OPC cleaning unit. The toner is not transferred to the transfer belt.

Slide 185

- Case D: Note that case D will not come into effect unless the coverage is very low. Even in economy color mode, this should not be very often.
  - Toner that stays in the development unit during printing with low image area coverage becomes damaged and is not easily attracted to carrier. So it is necessary to refresh the toner if there is low image coverage. This is the reason for the toner density adjustment mode for case D.

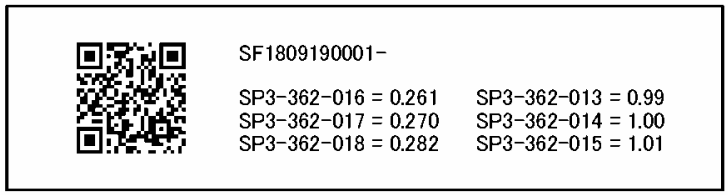
When is it Done?

- **Automatic**
  - After power-on (toner supply only, no consumption)
    - » Done if case C or D occurs
  - After new unit detection/after toner end recovery
    - » Done if case A, B, or C occurs
  - At end of job (toner supply only, no consumption)
    - » Done if case C occurs
- **The machine also has a forced toner density adjustment mode (SP 3011 002).**

Slide 186

No additional notes

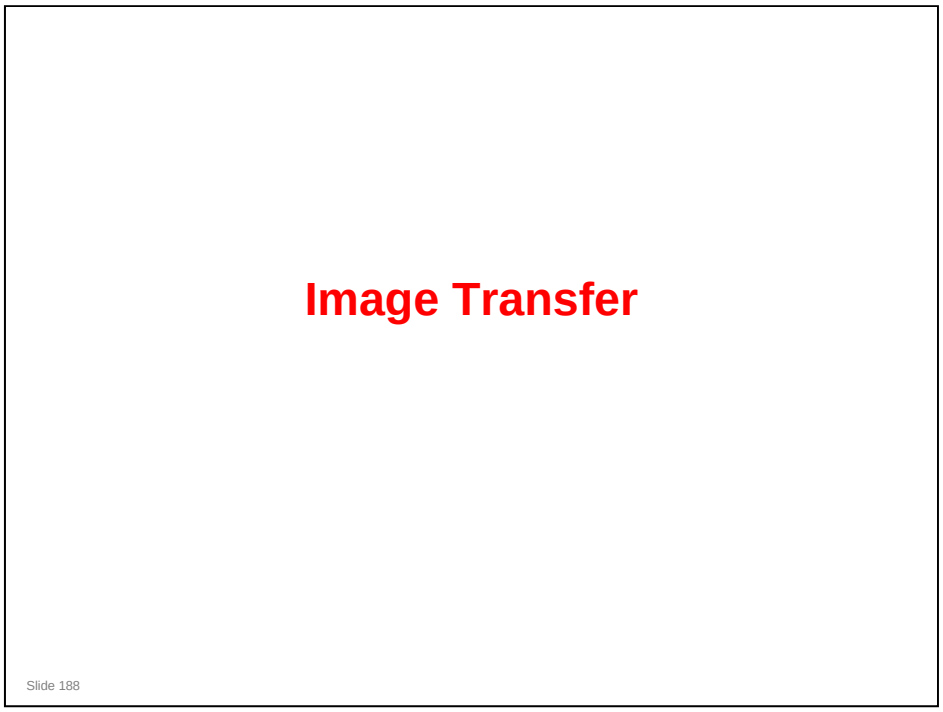
Replacing the ID Sensor



- **The ID sensor unit contains all 4 ID sensors.**
- **If you install a new ID sensor unit, input the values from the decal into SP mode as shown in the field service manual.**
- **Clean the ID sensor every EM. Use a cloth moistened with alcohol.**
  - Do not use a dry cloth. Otherwise, the ID sensors may get more dirty due to static electricity.

Slide 187

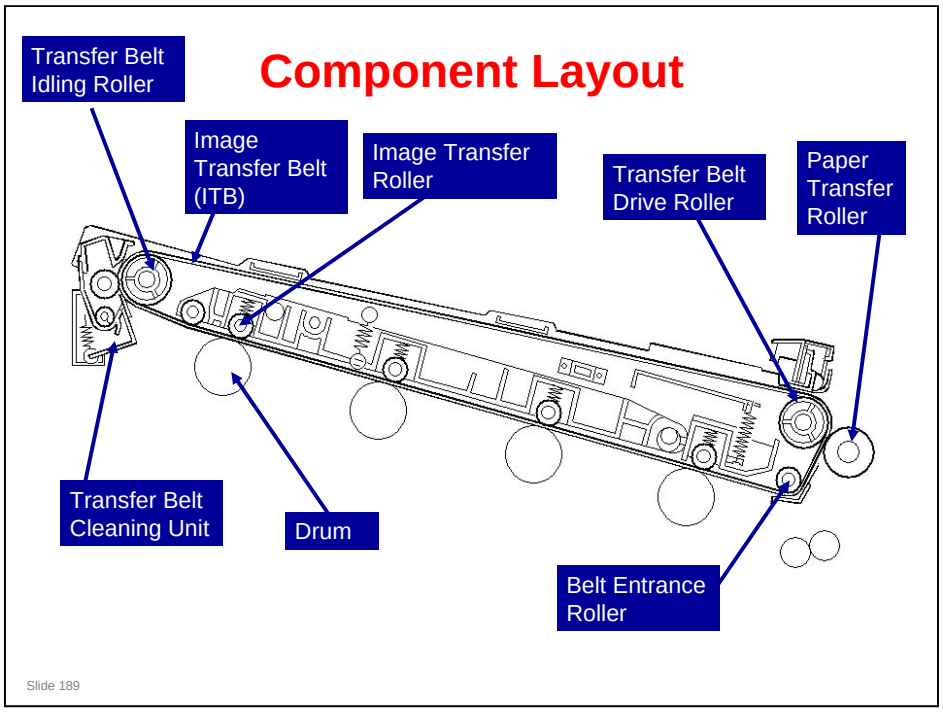
❒ The decal is similar to the Di-C1 copiers.



PURPOSE OF THIS SECTION

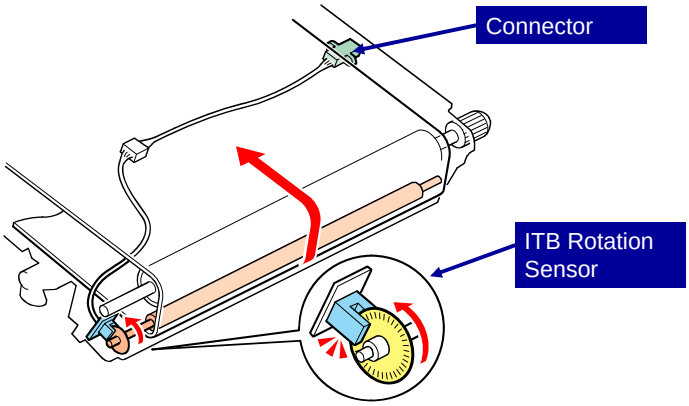
In this section you will do the following:

- ❒ Learn about the transfer belt.



- The toner is moved from the four OPC drums to the transfer belt. For a full color print, all four colors are moved from the PCDUs to the transfer belt at the same time.
- The paper transfer roller then moves the four-color toner image from the transfer belt to the paper.

Transfer Belt Unit Detection



- The transfer belt unit is detected when the connector is connected.
- The ITB rotation sensor detects the belt speed. If the speed is out of specification, SC 443 is generated.
- The encoder unit is supplied as a spare part. The individual components (photointerrupter, encoder wheel) are not available separately.

Slide 190

- The transfer belt rotation sensor detects when the transfer belt entrance roller turns. It also detects the belt speed. To do this, it monitors an encoder wheel attached to the shaft.
  - In the G-P3, there is no encoder wheel. The sensor monitors black and white markings on the shaft.
- Changes in temperature have an effect on the transfer belt drive roller. This can cause changes in belt speed. Color registration errors occur if belt speed is not constant. The rotation sensor detects the speed change and the machine keeps the transfer belt speed constant.
- You can enable or disable this belt speed correction with SP 2153 8.

The speed of the belt depends on the process speed.

- Process speed: See the next slide

Process Speed

Mode	Paper Weight (g/m^2)	Process Speed (mm/s)		Print speed (ppm)	
		600 dpi	1200 dpi	600 dpi	1200 dpi
Plain paper	61 to 80	260	85	40	15
	81 to 90	260	85	40	15
Middle thick	91 to 105	260	85	40	15
Thick 1	106 to 130	182	85	28	15
Thick 2	131 to 163	85	85	15	15
Thick 3	164 to 220	85	85	15	15
Thick 4	221 to 256	85	85	15	15
Thin	52 to 60	260	85	40	15
OHP	-	85	-	15	-

Slide 191

❒ Process speed depends on the print resolution, and/or type of paper selected.

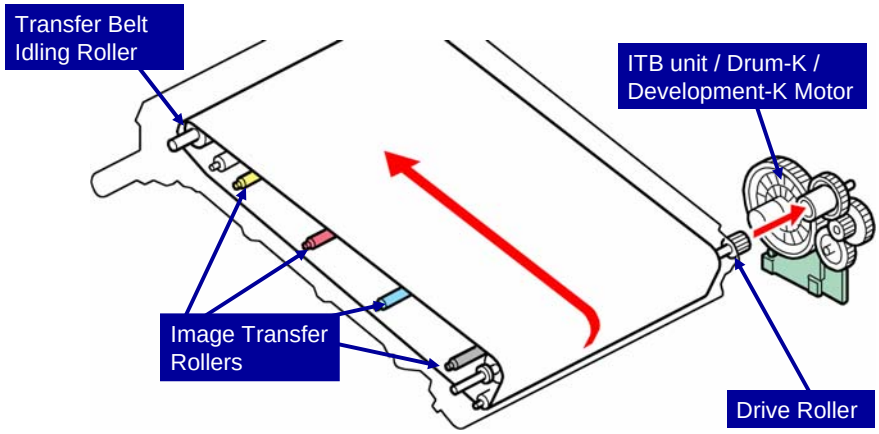
New Transfer Belt Unit Detection

- The transfer belt has a fuse when the transfer belt unit is new.
- The fuse is blown when the machine is turned on. At this time, it is detected as a new transfer belt unit.

Slide 192

No additional notes

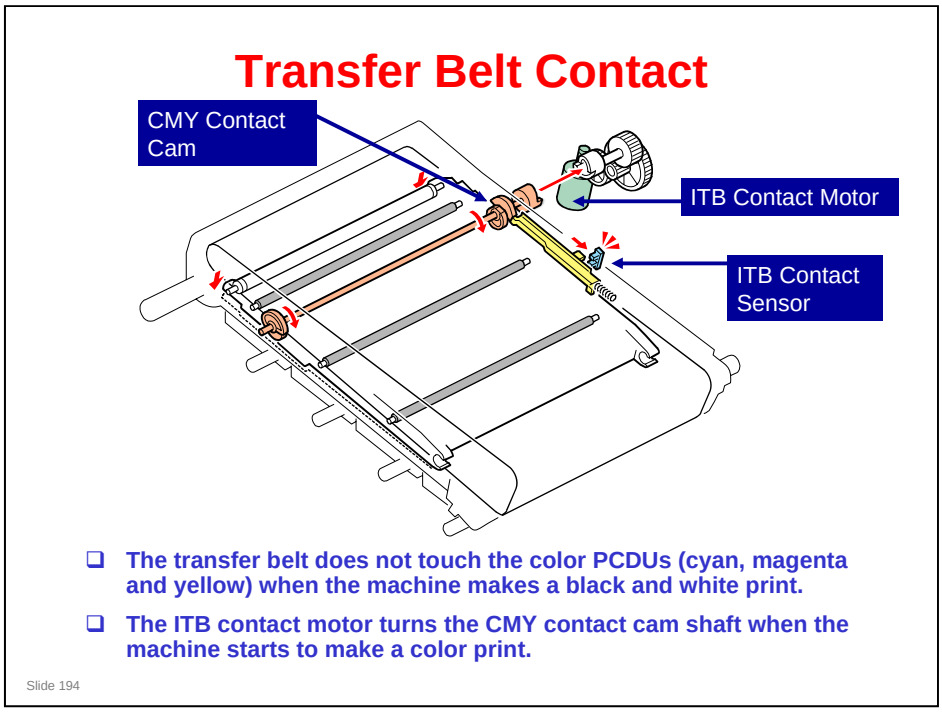
Drive and Transfer Belt Roller Voltage



- The ITB unit / Drum-K / Development-K motor controls the transfer belt drive roller.
- The transfer belt idling roller adds tension to the transfer belt to help to turn this belt. The speed of transfer belt drive is set by the process line speed.

Slide 193

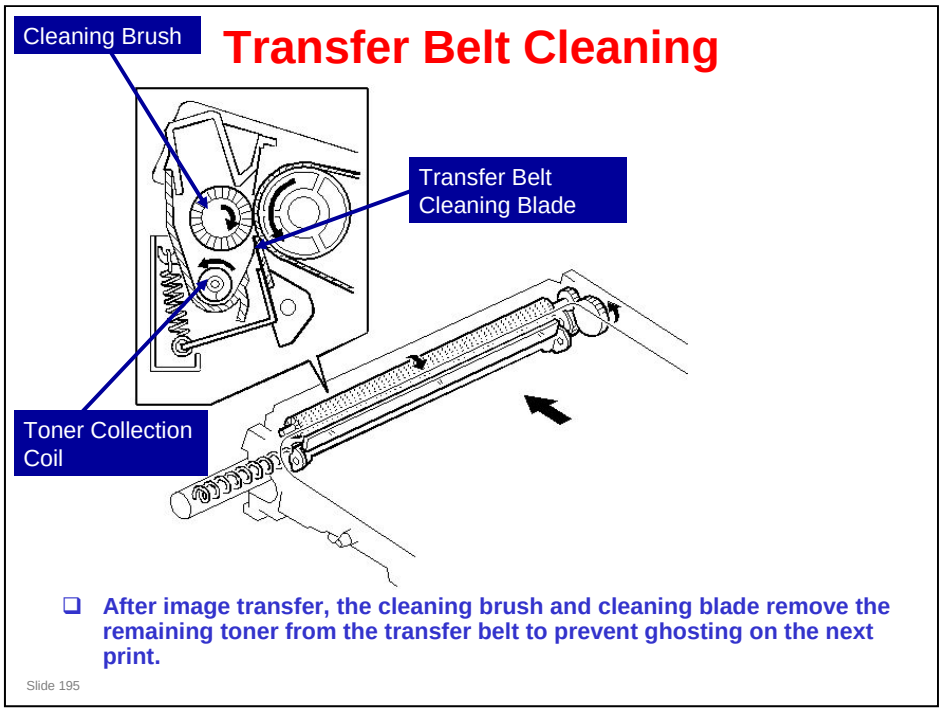
- The image transfer rollers are charged from terminal plates. Then they move the toner from the PCDUs to the transfer belt.



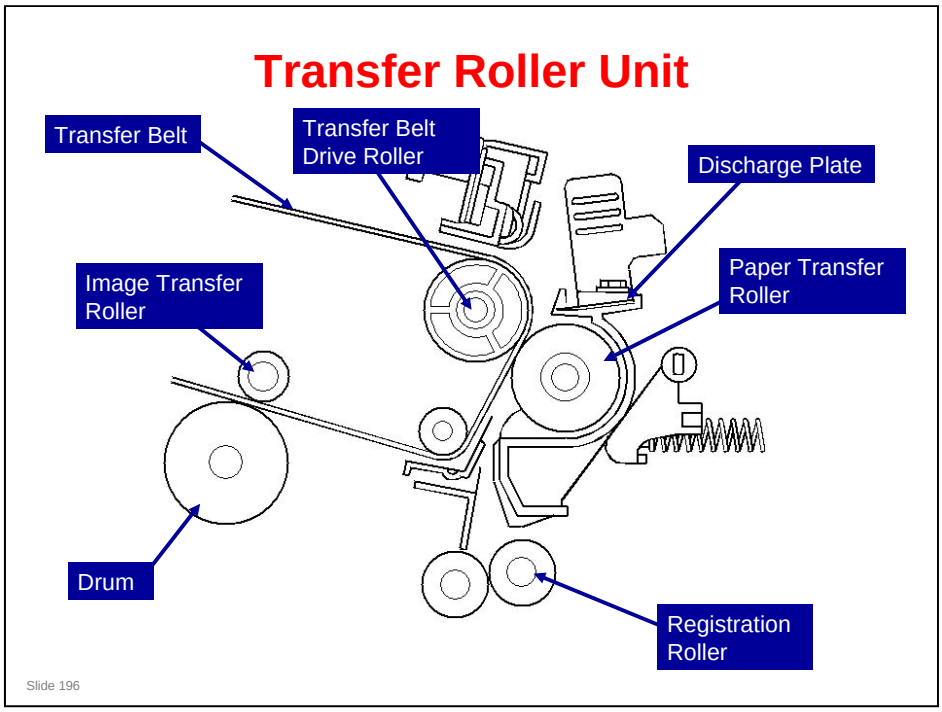
- The transfer belt does not touch the color PCDUs (cyan, magenta and yellow) when the machine makes a black and white print.
- The ITB contact motor turns the CMY contact cam shaft when the machine starts to make a color print. The CMY contact cam lifts the image transfer roller unit for CMY into contact with the transfer belt. Because of this mechanism, the life of the transfer belt is longer. It is not necessary for the transfer belt to touch the color PCDUs when the machine makes a black and white print.
- The ITB contact sensor detects if the image transfer roller unit for CMY touches the transfer belt. If it does not touch the transfer belt during color printing, the machine stops and shows SC 442.

How long does it take to change the transfer belt position?

- It is much faster than for the older models such as J-P1.
- Examples:
  - 12 sheets, one black-only, 11 full-colour: If the transfer belt does not change position for the black-only page, the print speed is 40 ppm. If the transfer belt does change position, the print speed for the job changes to 34 ppm.
  - 12 sheets, 6 black-only, 6 full-colour (alternate black-only and full-colour pages): If the transfer belt changes position between each page, the print speed for the job changes to 25 ppm.



- The pressure spring pushes the center of the blade holder.
- The toner collection coil moves the waste toner to the waste toner bottle.



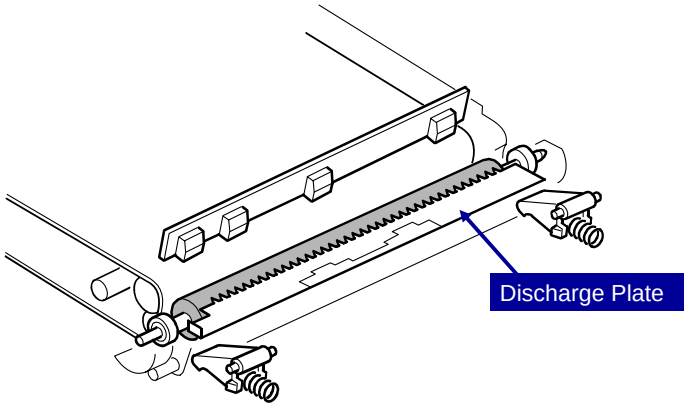
Transfer to the Belt

- The image transfer roller is given a positive voltage. This pulls the toner from OPC drum to the transfer belt.
- After all four layers of toner are transferred to the transfer belt, the registration roller turns on and feeds the paper to the paper transfer roller. Paper feed is timed to align the leading edge of the toner image on the belt at 4.2 mm from the leading edge of the paper. The paper moves at the same speed as the transfer belt.

Transfer to the Paper

- Charged with a negative voltage, the transfer belt drive roller pushes the toner from the transfer belt to the paper. This voltage is automatically corrected for the ambient temperature and humidity, print speed, and paper type.
- To clean the paper transfer roller, positive and negative voltages are applied to this roller to pull toner particles from the transfer roller to the belt. The belt-cleaning mechanism then removes this toner from the belt.

Discharge

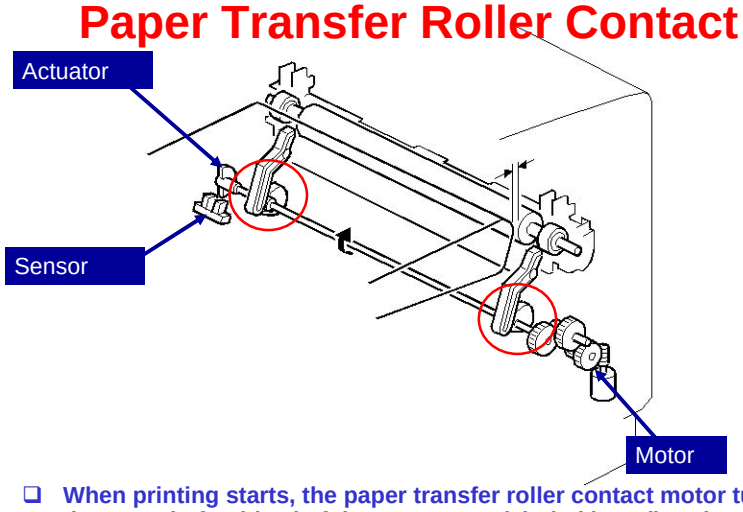


- The positive charge on the discharge plate removes remaining charge from the printed paper.
- As a result, the paper separates from the transfer belt.

Slide 197

No additional notes

Paper Transfer Roller Contact

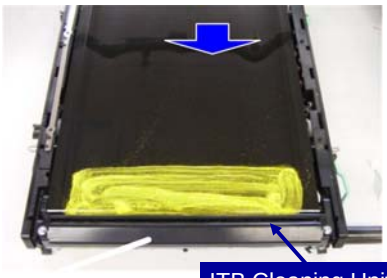


- When printing starts, the paper transfer roller contact motor turns the cam shaft. This shaft has two cams (circled in red) and an actuator. The two cams push the paper transfer roller contact levers and these push the paper transfer roller against the transfer belt.

Slide 198

- The paper transfer roller is kept away from the transfer belt during the machine ready condition.
- When printing starts, the paper transfer roller contact motor turns the cam shaft. This shaft has two cams (circled in red) and an actuator. The two cams push the paper transfer roller contact levers and these push the paper transfer roller against the transfer belt.
- The actuator turns on the paper transfer roller contact sensor when the cam shaft turns. Then, the machine detects that the paper transfer roller touches the transfer belt.

Installing a New Transfer Belt

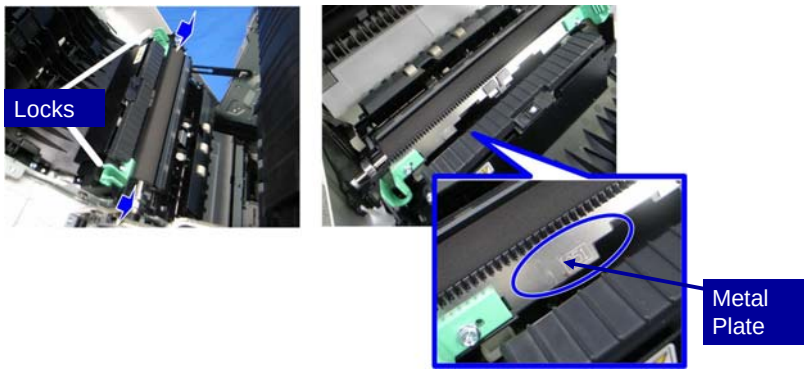


- **Lubricate a part of the surface of the image transfer belt with yellow toner as shown above left.**
  - Use fresh Z-P1 yellow toner, or the provided service part: D0159500 (G104 Yellow Toner)
  - Do not use lubricant powder, developer, or waste toner.
- **Then turn the image transfer belt to the position shown above left.**
- **Install the ITB cleaning unit, and then collect the yellow toner by turning the image transfer belt.**

Slide 199

- The toner must not contain developer. So, use fresh yellow toner from a Z-P1 toner bottle. This does not contain developer.
  - You can also use the provided service part: D0159500 (G104 Yellow Toner). This is yellow toner from the G-P1 series.
- Note that toner from the toner bottles in some other models may contain developer (for example, V-C2, V-C3).

Installing a New Paper Transfer Roller Unit



- When you install a new unit, pinch the two green locks while you push the unit back into position.
- Do not insert objects between the metal plate and its black plastic base.

Slide 200

- In this model, it is easy for objects to get between the metal plate and the plastic below it. This will distort the plate and may prevent it from being grounded properly.
- The grounding is done through the main body of the printer, and objects inserted here can break continuity between this unit and the main body.

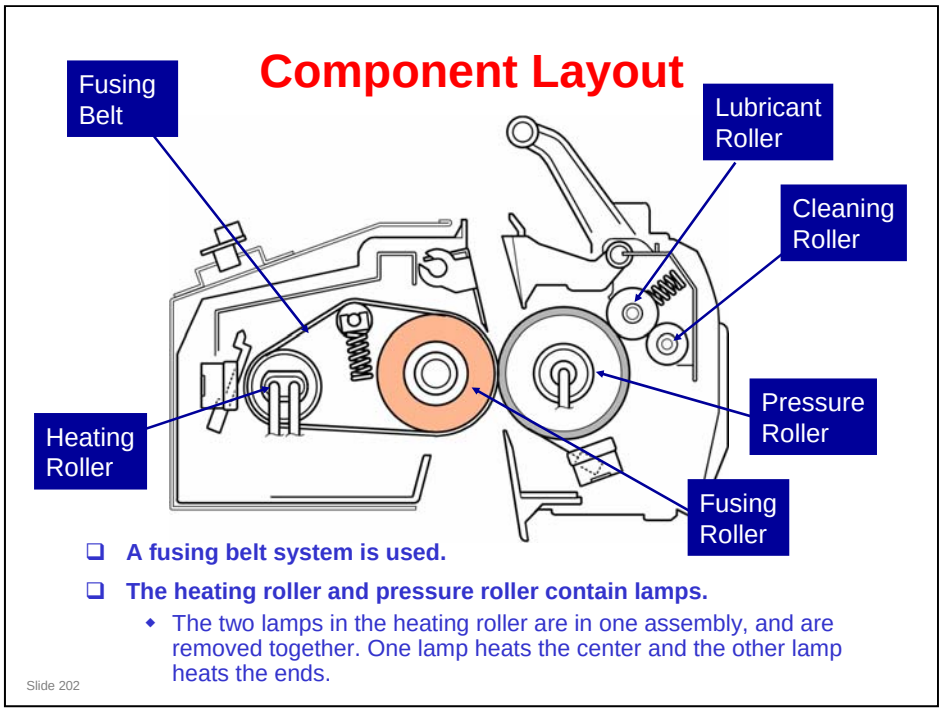
Fusing

Slide 201

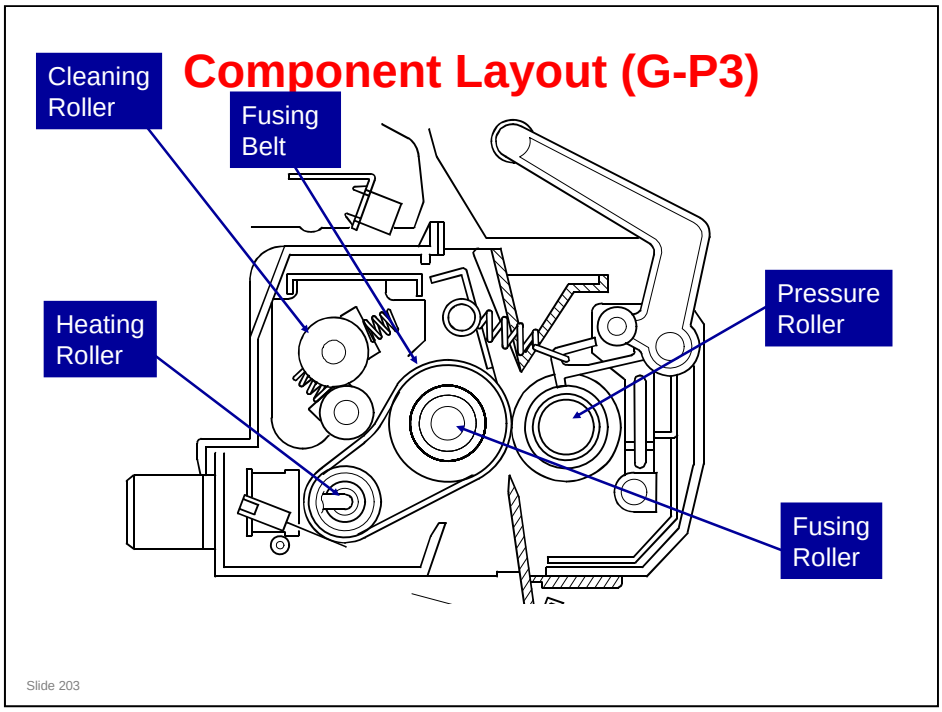
PURPOSE OF THE SECTION

In this section you will:

- ❒ Learn how the fusing unit works

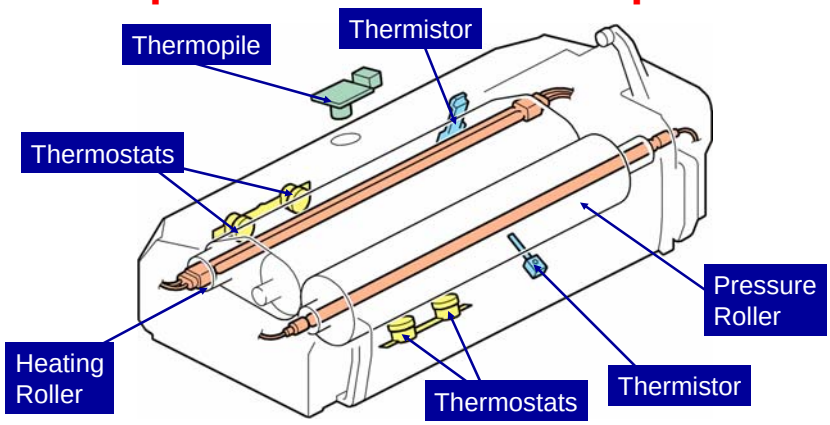


- After the toner image is transferred to the paper it goes through the fusing unit. The heating lamp applies heat to the heating roller, which applies heat to the fusing belt to melt the toner on the paper. The paper receives pressure between the fusing belt and the pressure roller, and melted toner bonds to the paper.
- The two lamps in the heating roller are in one assembly, and are removed together.
  - This system is similar to the Di-C1 and At-C2.
- A belt fusing system is used. This has a faster warm-up time than a standard hot and pressure roller system.
- The heating roller is made of aluminum to increase the temperature of the fusing belt quickly.
- The fusing roller is made of sponge, which becomes a little flat, and this increases the fusing nip. This roller does not contain a heating lamp.
- The heating roller thermistor controls the temperature of the lamp.
- Each new fusing unit contains a fuse. Immediately after a new fusing unit is installed, this fuse blows. When this occurs, the machine detects that a new fusing unit is installed.



❒ This slide shows the G-P3 fusing unit for comparison.

Temperature Control Components



- **The following components control the temperature:**
  - Heating roller: One thermistor and two thermostats
  - Pressure roller: One thermistor and two thermostats
  - At the front of the fusing unit: Thermopile

Slide 204

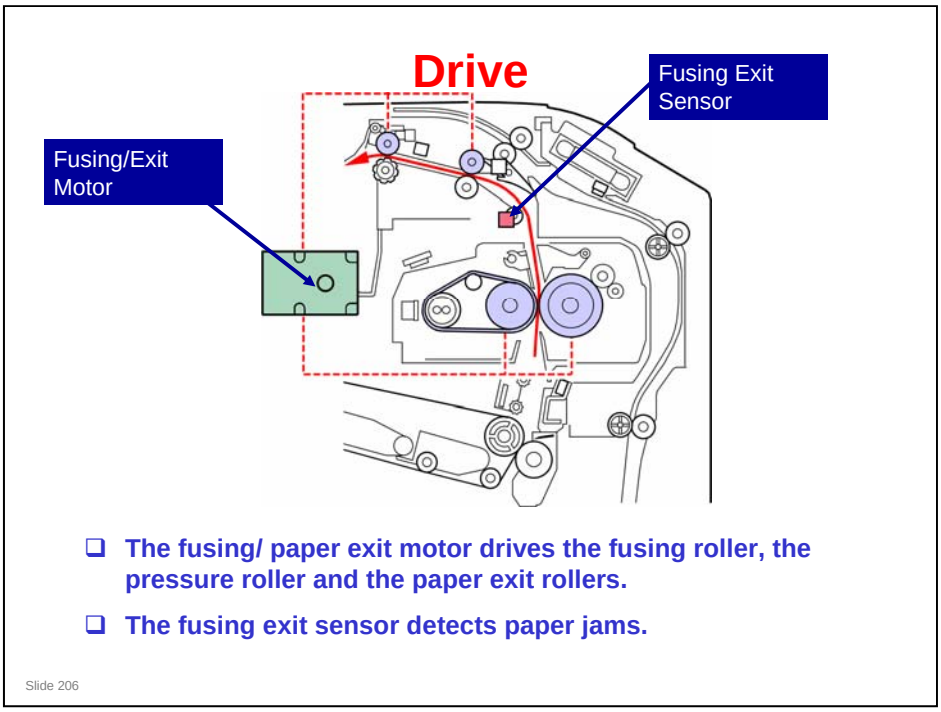
- Here is a three-dimensional drawing of the fusing unit.
- The thermopile detects the temperature at the center of the fusing unit, and the thermistor detects the temperature at the end.

Overheat Protection

- If the heating roller thermistor detects less than 0 ° C for six seconds, SC541 occurs.
- If the heating roller temperature is higher than 245 ° C for 1 second, the power to the fusing lamp is cut off and SC543 occurs.
  - If 250 ° C is detected, SC 544 occurs.
- If the heating lamp gets full power for 30 seconds after the heating roller gets to the print ready temperature, SC545 occurs.

Slide 205

No additional notes



No additional notes

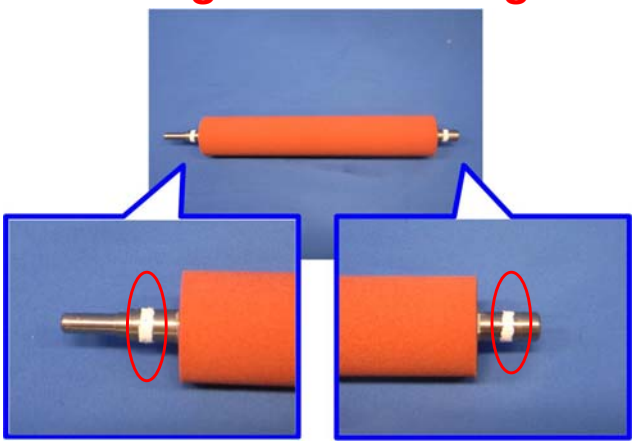
Practical Work

- **Make sure that the fusing unit is cool before you touch it. The fusing unit can be very hot.**
- **Make sure to restore the insulators, shields, etc after you service the fusing unit.**
- **Do not re-use a thermostat that is already open. Safety is not guaranteed if you do this.**
  - SC codes related to defective thermostats
    - » Defective thermostat for heating roller
      - – SC542
      - – SC552
      - – SC545
      - – SC555
    - » Defective thermostat for pressure roller
      - – SC565

Slide 207

No additional notes

Installing a New Fusing Roller



- Apply "Barrierta S552R" to the left and right ends of the roller as shown above.

Slide 208

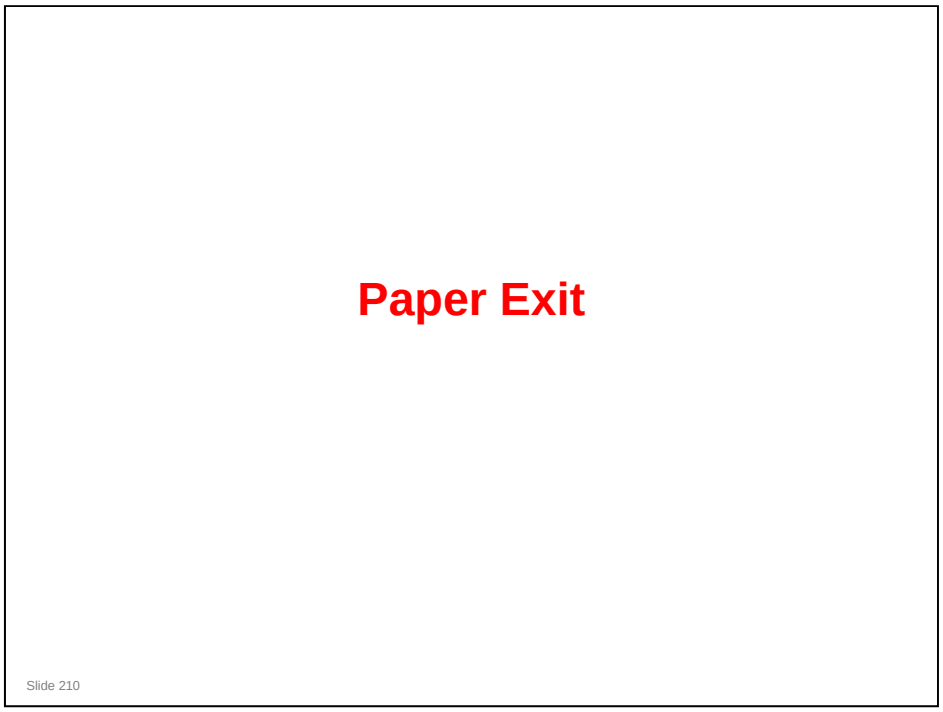
- Apply 0.1 to 0.2 g of grease at each end.

Installing a New Pressure Roller

- Apply "Barrierta S552R" to the left and right ends of the roller as shown above.

Slide 209

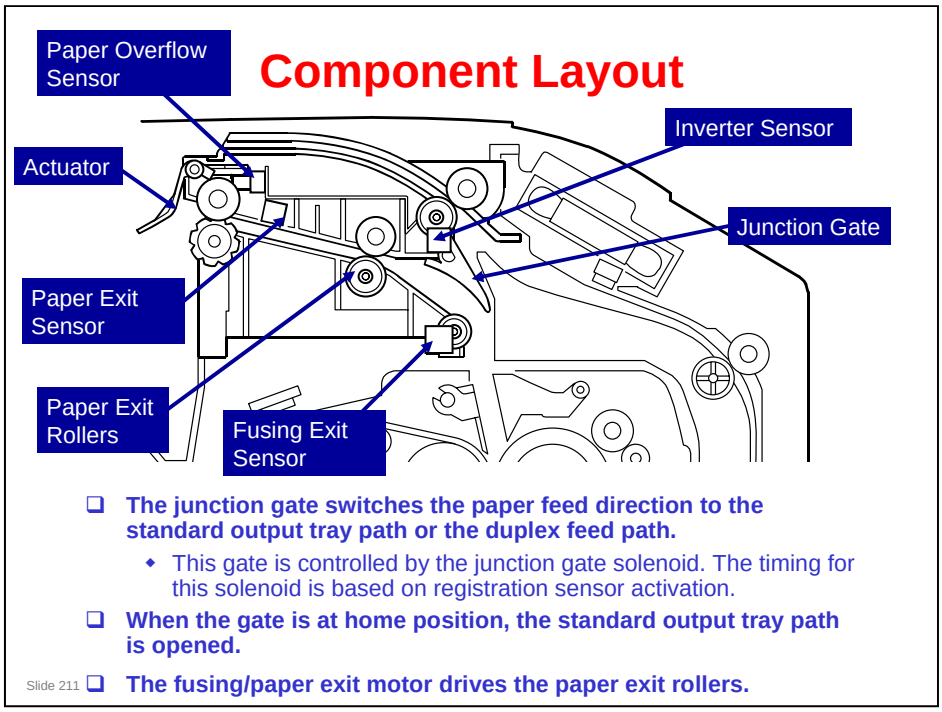
- Apply 0.15 to 0.25 g of grease at each end.



PURPOSE OF THE SECTION

In this section you will:

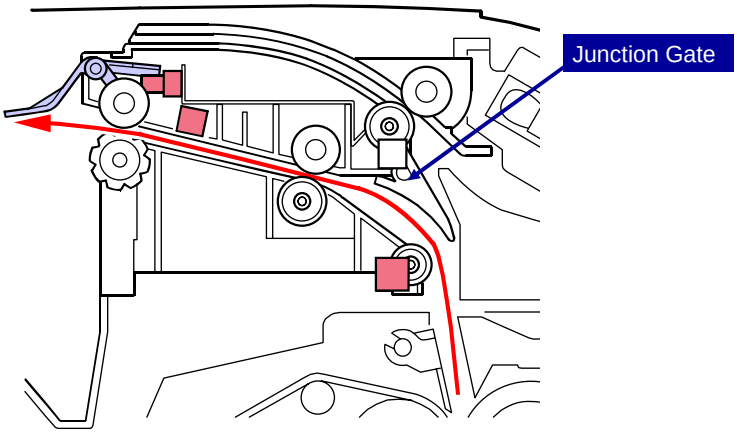
- ❒ Learn how paper is fed out of the machine



- This is similar to AP-C1.

- The paper exit rollers feed paper to the standard output tray.
  - These rollers are driven by the fusing/paper exit motor.
- When a sheet of paper stays in the paper exit unit, the paper exit sensor detects a paper jam and a jam alert is displayed.
- When outputs push up the tray full actuator, the paper overflow sensor detects that standard output tray is full and a message is displayed after job end.
- When duplex mode is selected, the junction gate closes the paper path to the standard tray.

Junction Gate – Feed-out

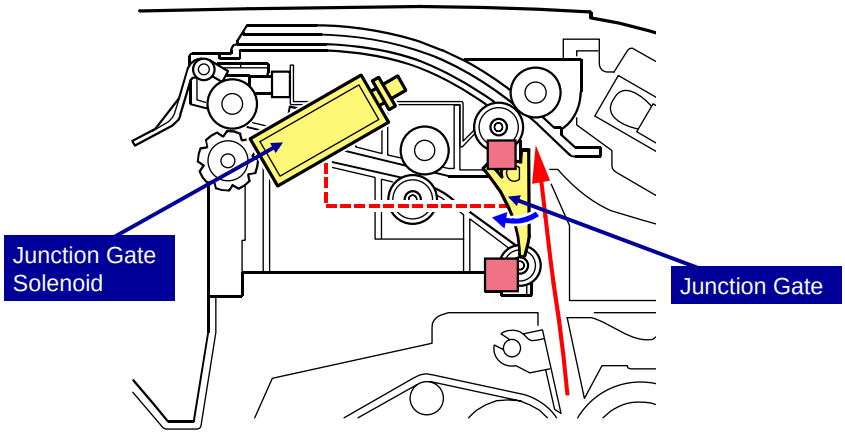


- This shows paper feeding out to the standard output tray.

Slide 212

No additional notes

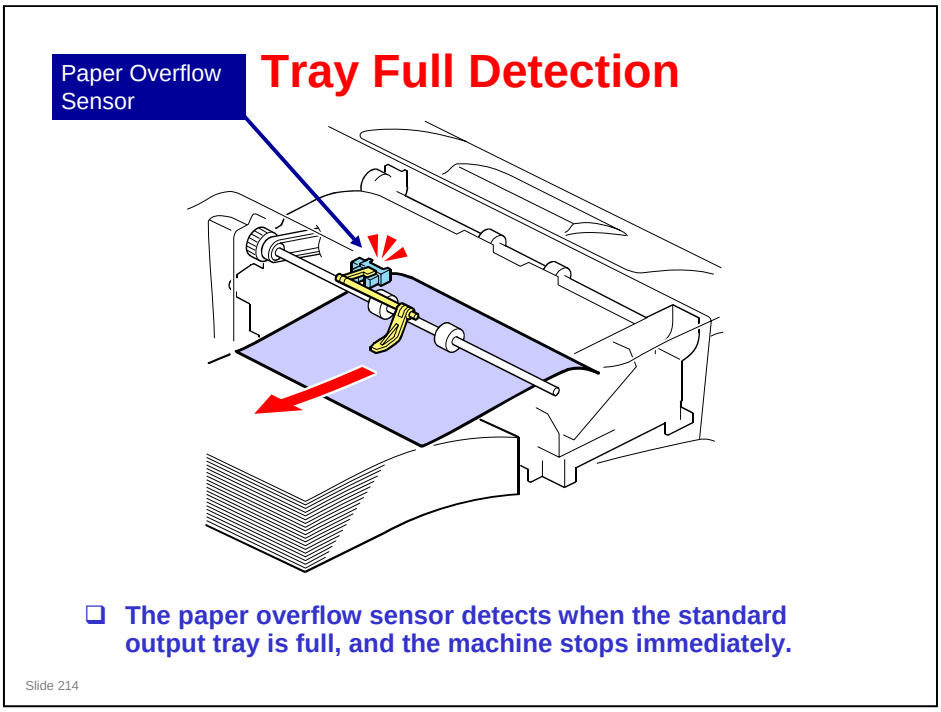
Junction Gate – Duplex



- This shows paper feeding up to the inverter, when duplex was selected.

Slide 213

No additional notes



No additional notes

Optional Paper Tray Unit (M384)

Slide 215

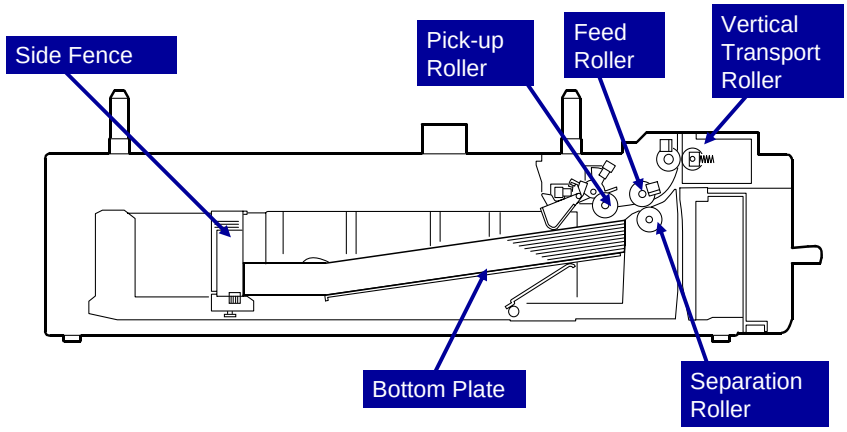
PURPOSE OF THIS SECTION

- ❒ In this section, you will study the mechanisms of the optional paper feed unit.

In this section you will:

- ❒ Study the paper tray mechanisms

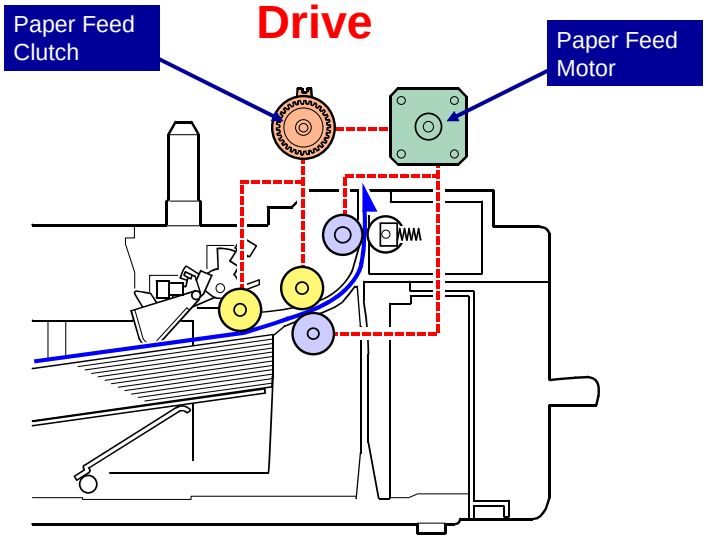
Mechanical Component Layout



- This tray uses a feed and reverse roller mechanism.

Slide 216

No additional notes

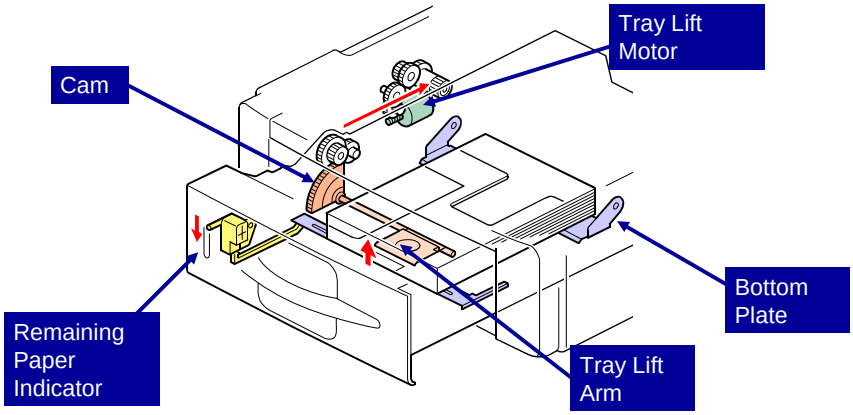


- The paper feed motor controls all the rollers.
- When the paper feed clutch is off, the feed and pick-up rollers do not turn.

Slide 217

No additional notes

Paper Lift - 1



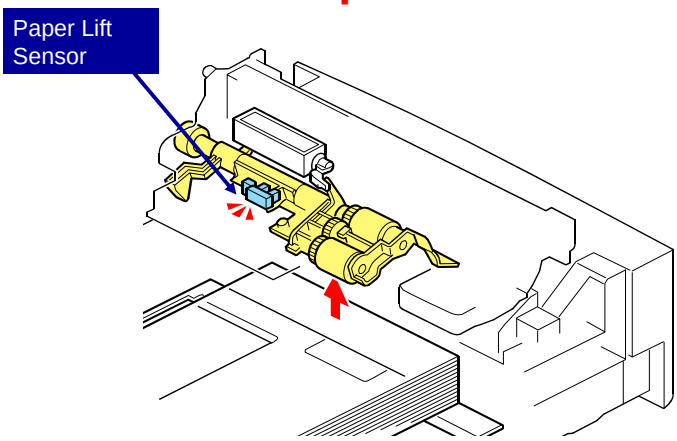
- **The tray lift motor lifts the bottom plate until the paper lift sensor detects that the top of the stack is at the paper feed position.**

Slide 218

- This is similar to the mechanism in the AP-C1.
- The rear end of the paper tray pushes the tray set switch (not shown here). As a result, the machine detects that the paper tray is installed.
  - Tray set switch: You can see this later on the 'Paper Size Detection' slide.
- When the machine detects that a tray has been placed in the machine, the tray lift motor drives the cam on the lift arm shaft.
- Then the tray lift arm lifts the tray bottom plate (purple in the diagram).

- The mechanism at the front of the tray (shown in yellow) shows how much paper remains in the tray.

Paper Lift - 2



- **The tray lift motor lifts the bottom plate until the paper lift sensor detects that the top of the stack is at the paper feed position.**

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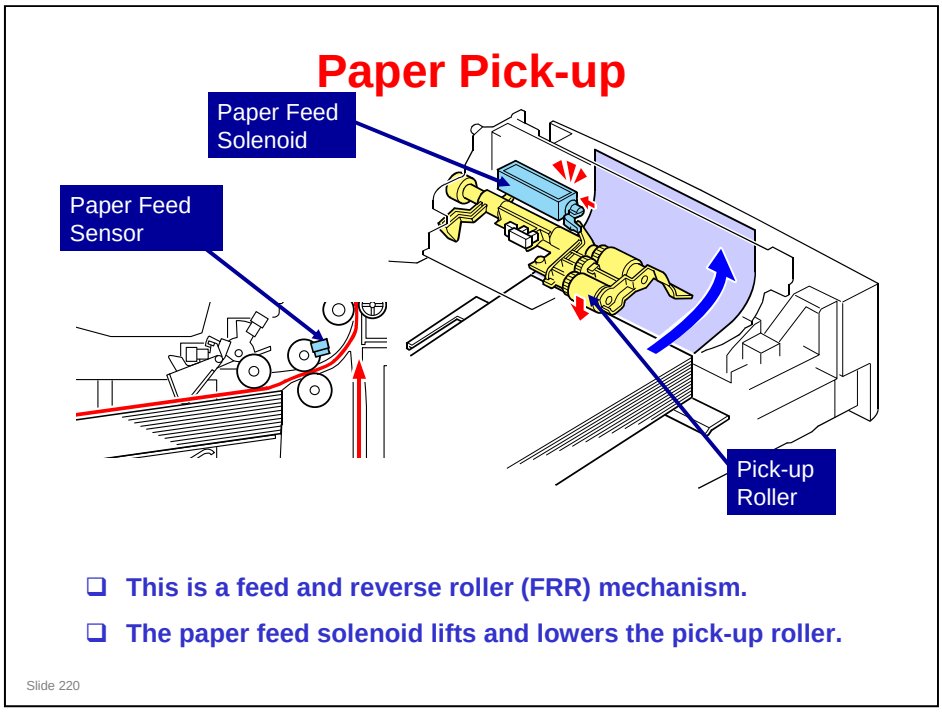
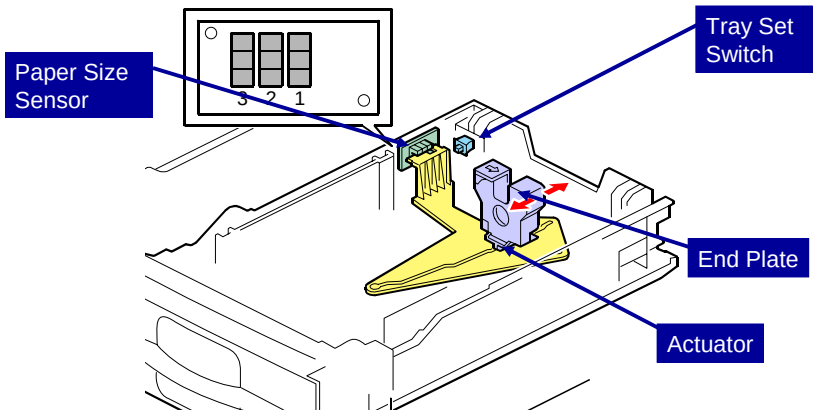
- The tray lift arm lifts the tray bottom plate until the paper lift sensor detects that the top of the stack is at the paper feed position.



- This is similar to the AP-C1.
- When the paper feed sensor detects the trailing edge of the previous sheet of paper, the paper feed solenoid turns on and off. This lifts the pick-up roller from the top of the stack paper briefly and then releases the pick-up roller. This makes paper pick-up more effective.

Paper Size Detection



- The paper size sensor is at the rear of the tray. This sensor has three switches.
- The outputs from the switches detect the paper size. The actuators move when the end plate moves.

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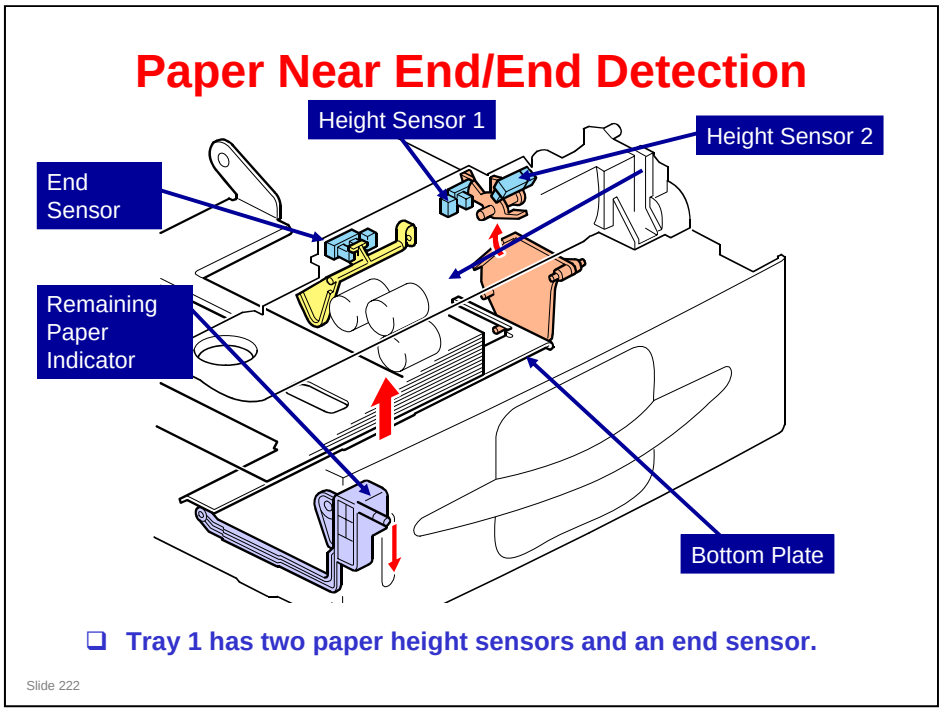
- The sensor can detect sizes down to A6.

Paper Size	Sensor 1	Sensor 2	Sensor 3
LG SEF	ON	ON	OFF
A4 SEF	ON	ON	ON
	OFF	ON	ON
LT SEF	ON	OFF	ON
EXE SEF	OFF	ON	OFF
HLT SEF/A5 SEF	OFF	OFF	ON
A6 SEF	OFF	OFF	OFF



Near end detection

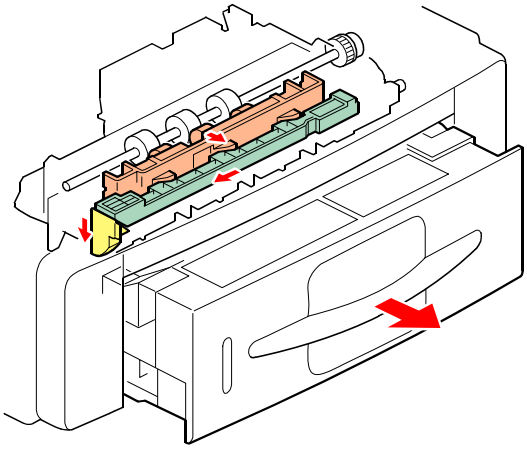
- Two height sensors detect the amount of paper in the tray. When the quantity of paper decreases, the bottom plate moves up and the actuators (pink in the diagram) turn.

Remaining paper	Paper height sensor 1	Paper height sensor 2
Full – 350	OFF	OFF
350 – 150	ON	OFF
150 – 50	ON	ON
50 – 0	OFF	ON

End detection

- When the paper tray is empty, the actuator (yellow in the diagram) goes into the end sensor. The sensor detects paper end.

Pressure Release



- When the paper tray is opened, paper jams can be removed easily because the pressure on the paper is released.

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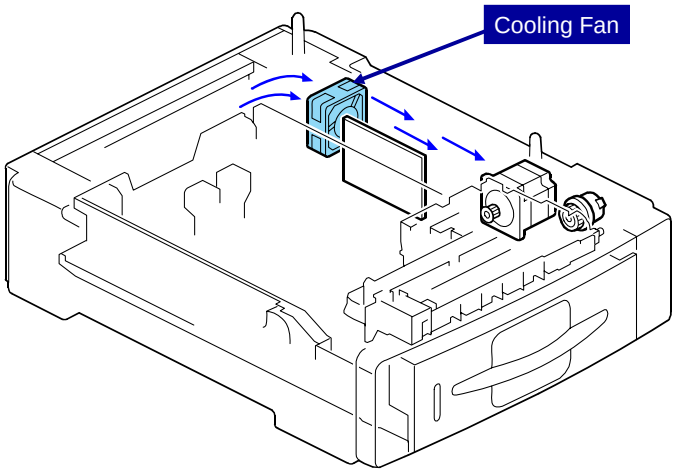
- This mechanism is only included in the optional paper tray unit. It is not included in the paper feed section of the Z-P1 main body.

Cooling



- The cooling fan blows cool air into the paper feed unit.

Slide 224

No additional notes

Caution When Moving the Machine

- **When moving the machine to a new location, the trays may move slightly away from perfect alignment. This will cause skew or side-to-side registration errors on printouts.**
- **If skew occurs after moving:**
  - Uninstall the paper tray units and re-install them.
  - Check the registration adjustment (Operating Instructions > Hardware Guide > 8. Adjusting the Printer > Adjusting Printing Position).

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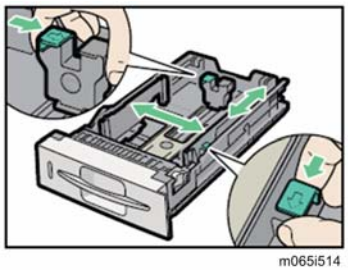
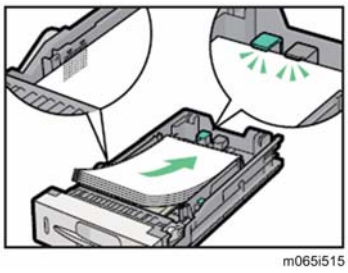
No additional notes

Loading Paper





- **Adjust the green clips of the side guide and the end guide to the paper size you want.**
  - When adjusting the paper width, use the right side guide only, with the green clip. Do not hold the left side guide at this time, or skew will occur.
- **Load the new paper stack print side up, making sure the paper is flush against the paper guides.**

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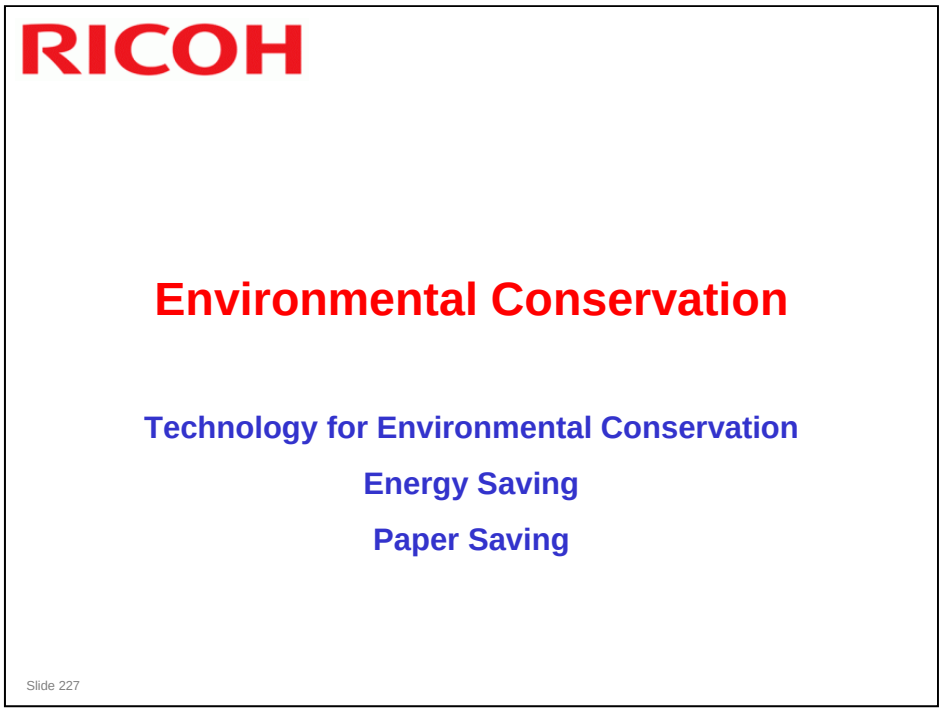
- Do not move paper loaded in the tray more than a few millimeters. Excessive movement of loaded paper can cause edges of sheets to snag on the openings of the tray's lifting plate, resulting in sheets being folded or becoming jammed.

- This is the same as the standard paper tray.



❒ 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	New model Z-P1	Old model G-P3
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		*	*

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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 (G-P3: 30 sec, Z-P1: 50 sec)
  - Recovery time
    - » Panel off:
      - – G-P3: 15 sec (full color), 10 sec (b/w)
      - – Z-P1: 9 sec (full color, b/w)
    - » Energy Saver: 18 sec (G-P3 not used)
    - » On/Off: 45 sec (G-P3 not used)

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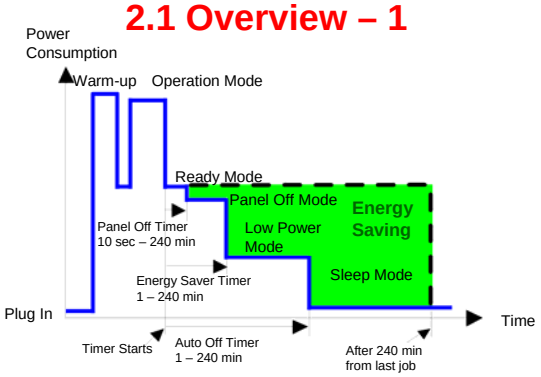
- This slide shows changes since the previous model (G-P3).
- Through major reductions in warm-up time and recovery time from energy saver modes (Low power, Sleep), QSU (Quick Start Up) Technology has eliminated the traditional trade-off between energy saving and convenience of speed.
- The IH (induction heating) method used in the Apollon series is also a part of this technology.

2. Energy Saving

2.1 Overview – 1



Energy Saver Modes	Description
Energy Saver Mode (Panel Off)	The machine is still in the Print Ready condition.
Low Power Mode	The fusing temperature is lowered to the prescribed temperature (below ready temperature).
Sleep Mode	No power is supplied to the printing engine, and almost none to the controller.

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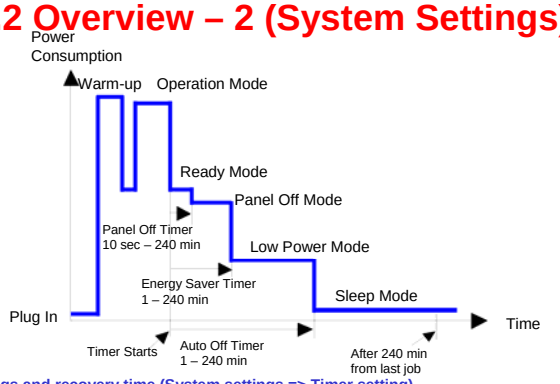
- When the machine is not being used, the machine enters energy saver mode to reduce the power consumption by turning off the LCD of the operation panel and lowering the fusing temperature.
- The area shaded green in this diagram represents the amount of energy that is saved when the timers are at the default settings. If the timers are changed, then the energy saved will be different. For example, if the timers are all set to 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	10 sec.	10 sec to 45 min.	9 sec.
Low Power Mode	Energy Saver Timer	1 min.	30 sec to 60 min.	18 sec.
Sleep Mode	Auto Off Timer	11 min.	1 min to 60 min.	45 sec.

Specified values for timers	Panel Off Mode	Low Power Mode	Sleep Mode
If Panel Off > Energy Saver > Auto Off	This mode cannot start	This mode cannot start	This mode cannot start
If Panel Off = Energy Saver = Auto Off	This mode cannot start	This mode cannot start	This mode can start
If Panel Off < Energy Saver < Auto Off	This mode can start	This mode can start	This mode can start

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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 Sleep 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 Sleep 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	Main Power LED
Panel off Mode	On
Low Power Mode	On
Sleep Mode	Off

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No additional notes

2. Energy Saving
2.2 Energy Saver Mode: Panel Off Mode – 1

- **The machine enters panel off mode when the panel off timer runs out after the last job.**
  - The panel off timer is controlled by User Tools: Timer settings.
- **The machine recovers to the ready condition if one of the following occurs:**
  - The user touches the operation panel
  - The user sends a job to the printer

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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
- Also, there is no Panel Off Mode in printers.

2. Energy Saving

2.2 Energy Saver Mode: Low Power Mode

- **The machine enters low power mode when the energy saver timer runs out after the last job.**
- **When the machine enters low power mode, the fusing temperature is lowered to the prescribed temperature (below the machine ready temperature).**
- **The machine recovers to the ready condition if one of the following occurs:**
  - The user touches the operation panel
  - The user sends a job to the printer
- **The recovery time is the same for each model and each region.**
  - Model P1a: 18 seconds
  - Model P1b: 18 seconds

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No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 1

- The machine enters sleep mode when the auto off timer runs out after the last job.
- When the machine enters sleep mode, no power is supplied to the printing engine, and almost none to the controller.
- Recovery time
  - Model P1a: Less than 45 seconds
  - Model P1b: Less than 45 seconds

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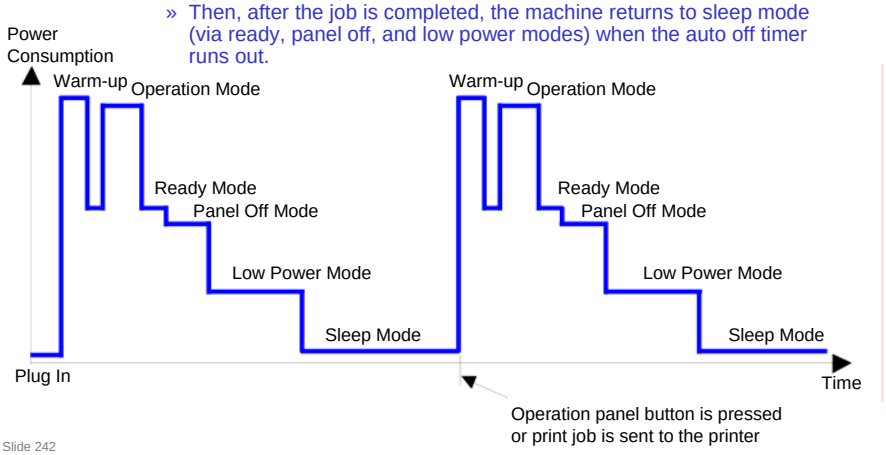
No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 2

- **The machine recovers to the ready condition:**
  - **If any button on the operation panel is pressed or a print job is sent to the printer**
    - » The operation panel lights. When warm-up is finished, the machine goes to the ready condition.
    - » Then, after the job is completed, the machine returns to sleep mode (via ready, panel off, and low power modes) when the auto off timer runs out.



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- 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	Z-P1a: 825 W Z-P1b: 894 W
Standby mode	177.3W
Energy Saver mode (Panel Off)	113.47W
Low power mode	72.31W
Sleep mode	5.2W

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No additional notes

2. Energy Saving

2.3 Energy Save Effectiveness – 3

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

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

Example calculations (Z-P1b):

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	5.0	894	4.43
Stand by (Ready)	002: Standby Time	306163	308046	31.4	177.3	5.56
Energy save	003: Energy Save Time	74000	75111	18.5	113.5	2.10
Low power	004: Low power Time	148000	150333	38.9	72.3	2.81
Sleep	005: Sleep mode Time	508776	520377	193.4	5.2	1.01
Total (6)						15.91

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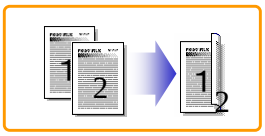
No additional notes

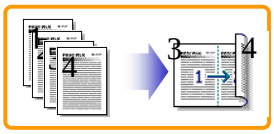
3. Paper Saving
3.1 Measuring the Paper Consumed – 1

1. Duplex: Reduce paper volume in half!



2. Combine: Reduce paper volume in half!

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



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No additional notes

3. Paper Saving

3.1 Measuring the Paper Consumed – 2

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

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No additional notes

3. Paper Saving

3.1 Measuring the Paper Consumed – 3

- **How to calculate the paper reduction ratio, when compared with Single-sided copying, with no 2-in-1 combine mode**
- **Paper reduction ratio (%) = Number of sheets reduced: A/Number of printed original images: B x 100**
  - Number of sheets reduced: A
    = Output pages in duplex mode/2＋ Number of pages in Single-sided with combine mode + Number of pages in Duplex with combine mode x 3/2
    A = ②/2 + ③+④ 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+③+④

① **Total counter**	**: SP 8581 001 (pages)**
② **Single-sided with duplex mode**	**: SP 8421 001 (pages)**
③ **Single-sided with combine mode**	**: SP 8421 004 (pages)**
④ **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.