RICOH

D109/D110
Service Training

Product Outline

Slide 1

No additional notes.

Machine Appearance

Slide 2

No additional notes.

Operation Panel

Slide 3

No additional notes.

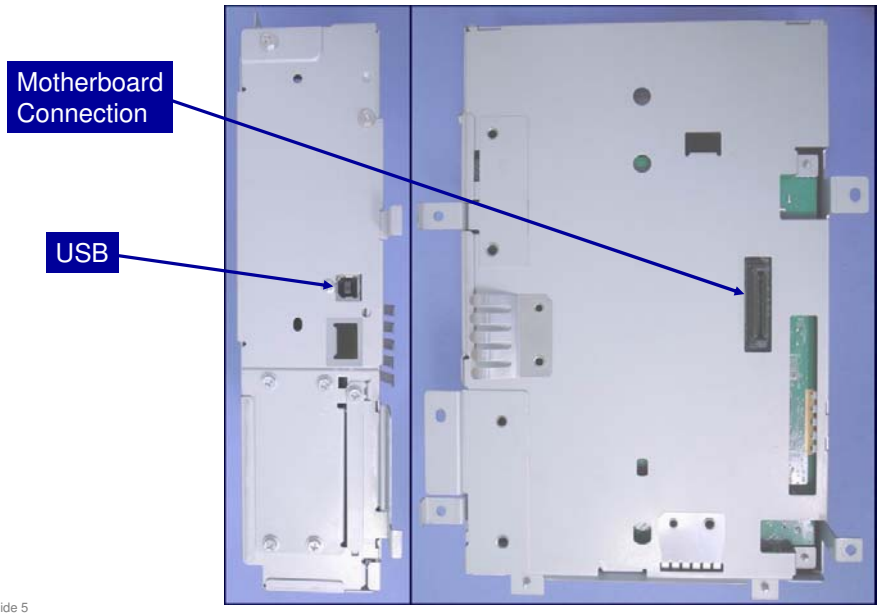
Improved Over Previous Model

- ARDF document feeder automatically scans double-sided pages (optional on this model).
- Color scanning ability added (for saving as data in computers via TWAIN).
- Overall performance improvement with faster operation over previous version.
- GDI Controller – (USB 2.0)
  - Ethernet (with NIC option for D109)

Slide 4

No additional notes.

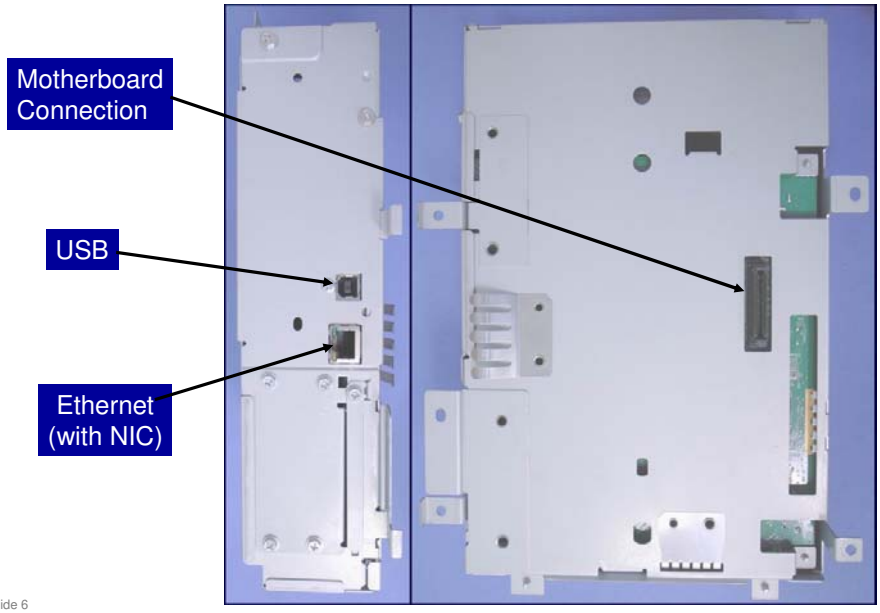
GDI Controller Box (D109)



Slide 5

- Note that the exact shape of the production controller box may slightly vary from the picture above – but the location of the motherboard connection and connectivity jacks should be the same.

GDI Controller Box (D110)



- Note that the exact shape of the production controller box may slightly vary from the picture above – but the location of the motherboard connection and connectivity jacks should be the same.

Who Will Use This Model

- Small office users (3-10 people) or individuals (as a personal business machine).
- Mid to large sized offices (10-50 people) as a work group division printer/scanner.
- Mid to large sized offices as a business personal machine.
- This machine has these benefits:
  - Compact size
  - Quick warm up time
  - Standard duplex printing (both scan and print)
  - Copier/printer

Slide 7

No additional notes.

Machine Operation

- Refer to the operating instructions, general settings section, and examine what you can do with this machine.
- As this is only a brief introduction, also refer to the operating instructions in the Machine Overview and Machine Operation training module.

Slide 8

No additional notes.

Specifications

- This module covers general specifications.

In this section you will do these things:

- Examine the general specifications for the machine.
- Examine the machine configuration.

When you finish this section, you should know the answers to these questions:

- What are the main specifications for this machine?
- Are the specifications the same for all models?

General Specifications

- Configuration: Desktop
- Copy Process: Laser scanning & electrophotographic printing
- Copy speed: 17 ppm (A4 / 8½" x 11"; 100%)
- Warm up: (basic) 10 seconds or less
- First copy time: 7.5 seconds or less
- Copy paper capacity:
  - Paper tray: 250 sheets
  - Optional paper tray: 500 sheets x 2
  - Bypass: 100 sheets
- Toner Yield: 7,000 copies per toner bottle

Slide 10

No additional notes.

More Specifications

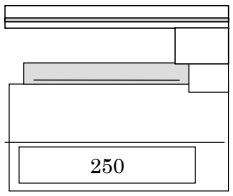
- **For a more detailed description of the machine's specifications, refer to the Specifications section of the Field Service Manual, noting in particular the following:**
  - Copy paper size
  - Copy paper weight
  - Power consumption and machine dimensions
  - Copy paper capacity
  - Original paper size
  - Paper feed

Slide 11

No additional notes.

Machine Configuration

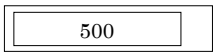
Standard



- Copy
- Duplex
- 250-sheet x1 tray
- 100-sheet bypass tray
- 250-sheet output tray
- GDI printer
- USB 2.0
- Color Scan

Options

- ARDF



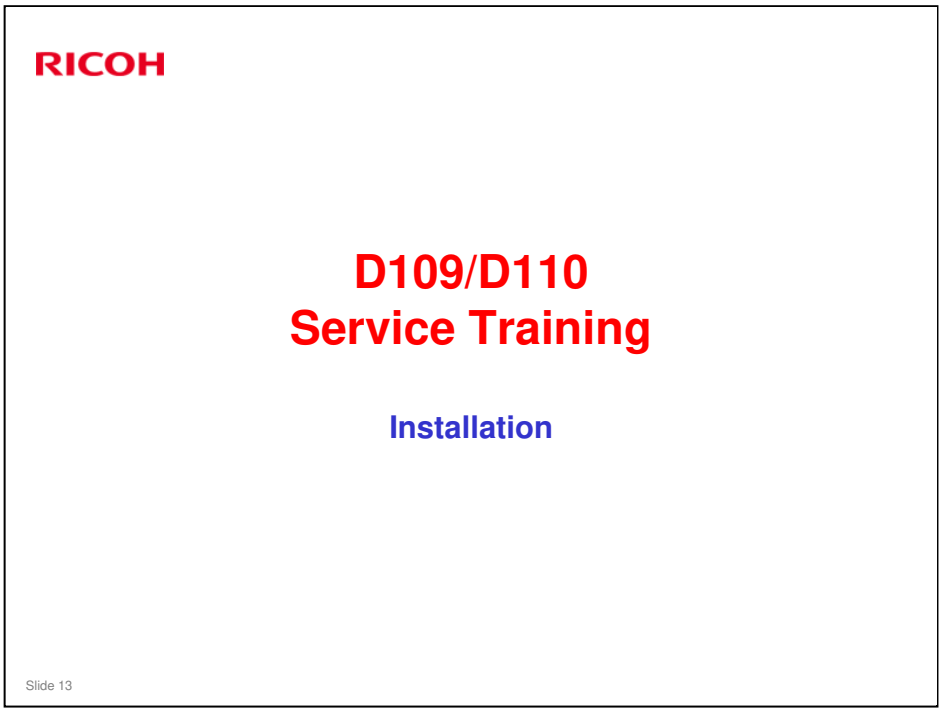
- 500 Sheet Tray

- Accessibility handle

- **The standard configuration is shown to the left. The options are on the right.**
- **There are two machines in this series.**
  - D109 – for Asia: GDI controller without NIC (NIC is an option)
  - D110 – for Europe: GDI controller with NIC

Slide 12

No additional notes.



In this section you will do these things:

- ❒ Install the main machine.

When you finish this section, you should know the answers to these questions:

- ❒ How do I install this machine?
- ❒ What do I have to do after I have installed the machine?
- ❒ Is there any firmware for this machine?

Before You Start

- **Read the Installation chapter of the Service Manual before installing the machine, noting:**
  - Environment (ventilation, temperature range, etc.)
  - Space and power requirements.
  - Accessory check (for the model you will install).
- **Before installing optional units, be sure to:**
  - **Switch the machine off and remove the power cord and network cable.**
- **Keep the system parameter report. You will need it for any future troubleshooting of the machine.**

Slide 14

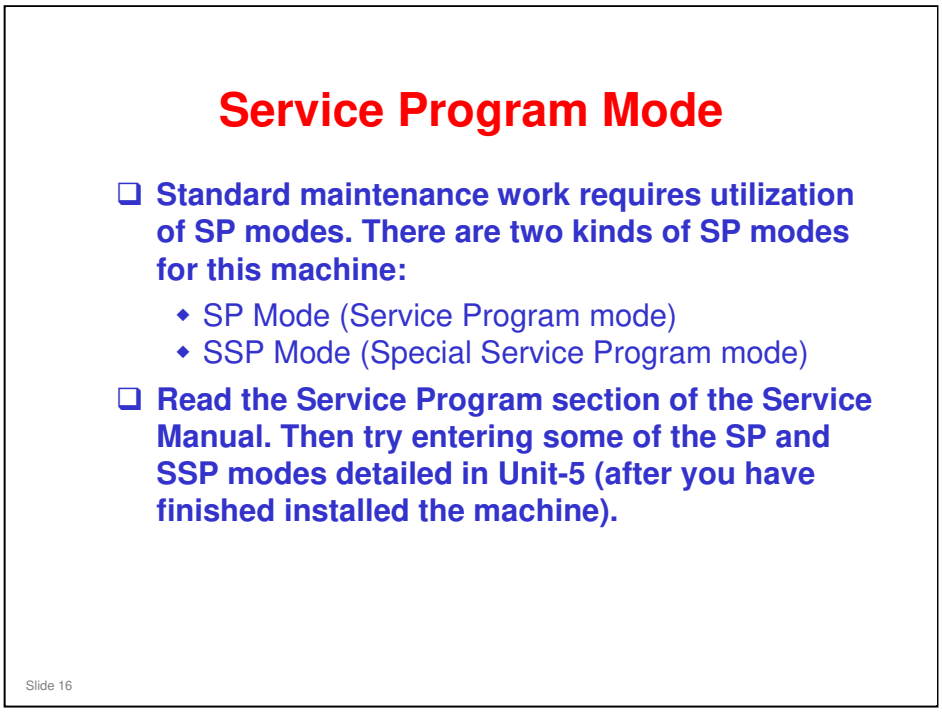
No additional notes.

Installation

- **Install the machine. See "Installation" in the Field Service Manual.**
- **Install the optional paper tray unit and ARDF.**
- **Be sure to keep in mind the following when you install the machine and paper tray unit:**
  - You do not need to pull the toner bottle holder all the way out of the machine.
  - Do not remove the inner cap of the toner bottle.
  - Do not use force to turn the toner bottle after you have set it in the toner bottle holder. The machine will turn the bottle.
  - Remove all tape from the machine.

Slide 15

No additional notes.



Service Program Mode

- SP & SSP modes are for the service technician only. Do not let users access SP & SSP modes.

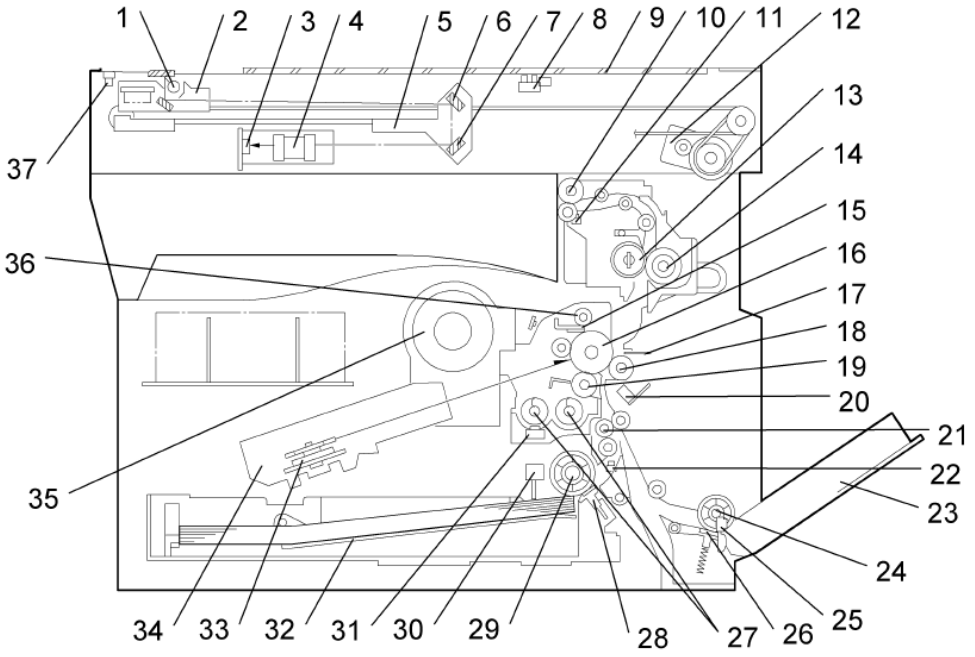
Machine Overview

- ❒ Introducing the machine.

In this section you will do these things:

- ❒ Examine mechanical and electrical components.
- ❒ Examine the paper path and drive layout.
- ❒ Learn the basic copy process.

Component Layout



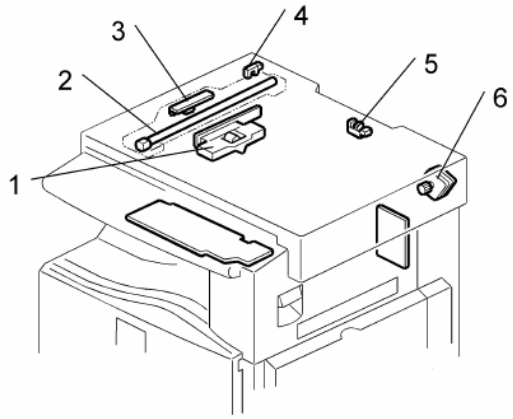
- The callout key is in the notes. (Notes view required)

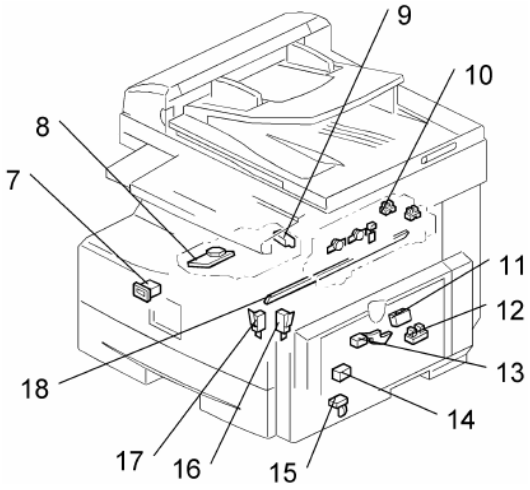
Slide 18

Component names:

1. Exposure Lamp	20. ID (Image Density) Sensor
2. 1st Scanner	21. Registration Roller
3. CCD (on SBU)	22. Registration Sensor
4. Lens Block	23. Bypass Tray
5. 2nd Scanner	24. Bypass Paper Feed Roller
6. 2nd Mirror	25. Bypass Paper End Sensor
7. 3rd Mirror	26. Bypass Friction Pad
8. Platen Cover Sensor	27. Mixing Augers
9. Exposure Glass	28. (Main) Friction Pad
10. Exit Roller	29. Paper Feed Roller
11. Exit Sensor	30. Paper End Sensor
12. Scanner Motor	31. TD (Toner Density) Sensor
13. Hot Roller	32. Bottom Plate
14. Pressure Roller	33. Polygon Mirror Motor
15. Cleaning Blade	34. Laser Unit
16. OPC Drum	35. Toner Supply Bottle (or THM)
17. Discharge Plate	36. Toner Collection Coil
18. Transfer Roller	37. Scanner HP Sensor
19. Development Roller	

Electrical Components – 1





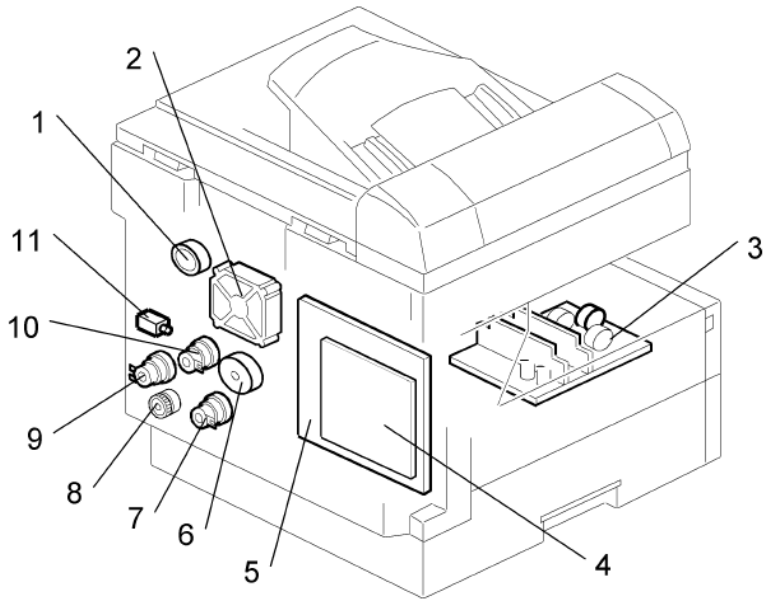
- The callout key is in the notes. (Notes view required)

Slide 19

Component names:

1. Lens Block 2. Exposure Lamp 3. Lamp Stabilizer Board 4. Scanner HP Sensor 5. Platen Cover Sensor 6. Scanner Motor 7. Mechanical Counter 8. Polygon Mirror Motor 9. LD Unit	10. Exit Sensor 11. ID (Image Density) Sensor 12. Registration Sensor 13. Paper End Sensor 14. Toner Density Sensor 15. Bypass Paper End Sensor 16. Right Door Safety Switch 17. Front Door Safety Switch 18. Quenching Lamp

Electrical Components – 2

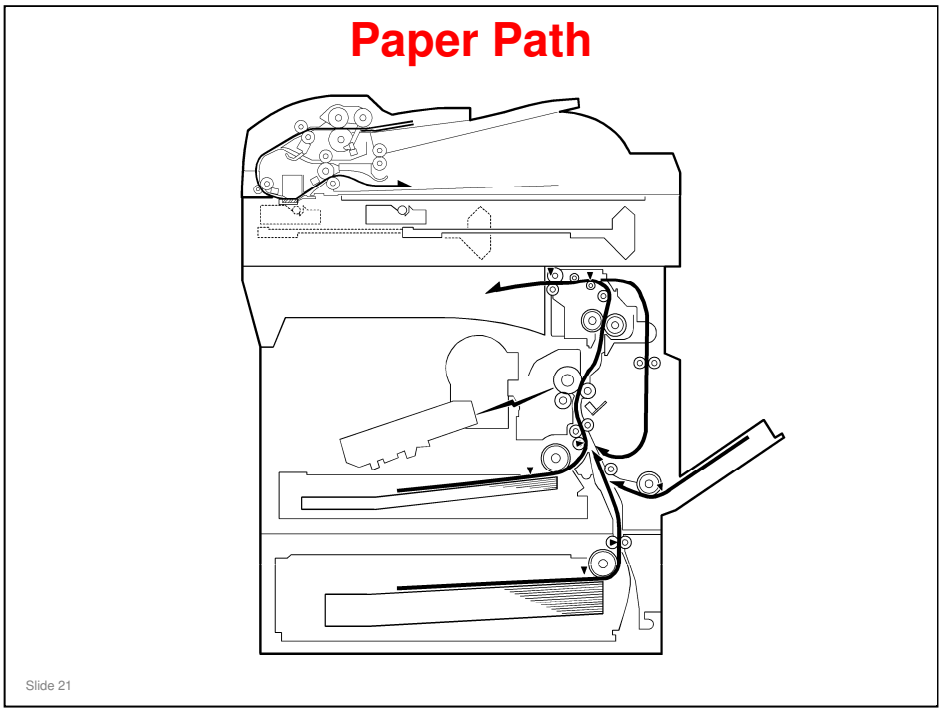


- The callout key is in the notes.

Slide 20

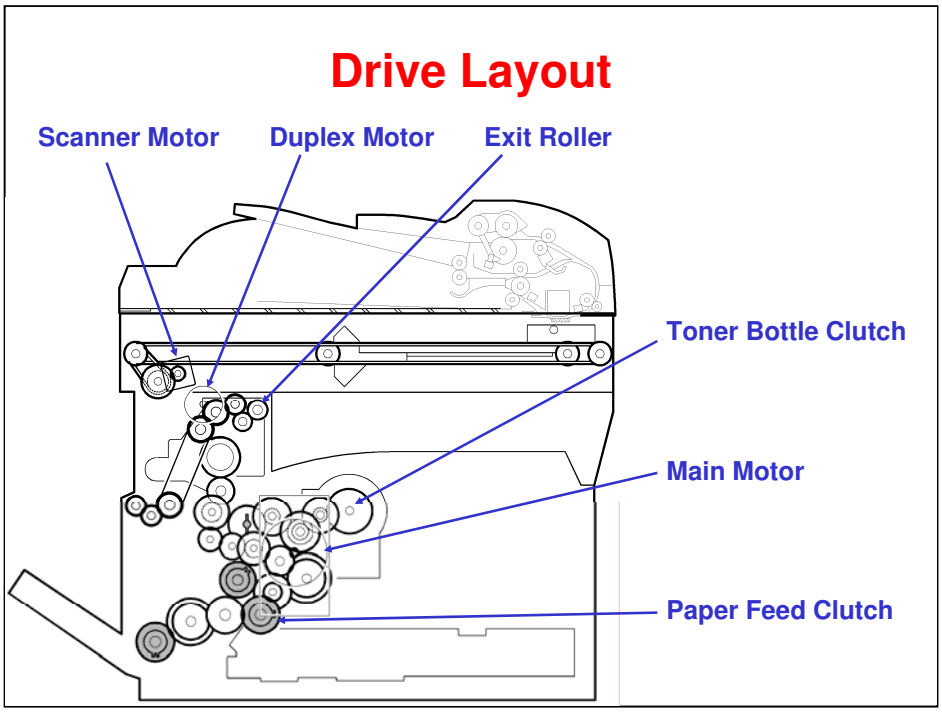
Component names:

1. Duplex Motor
2. Exhaust Fan
3. PSU
4. Controller Board (GDI)
5. BICU
6. Main Motor
7. Paper Feed Clutch
8. Toner Supply Clutch
9. Bypass Feed Clutch
10. Registration Clutch
11. Fusing Solenoid



Paper Path

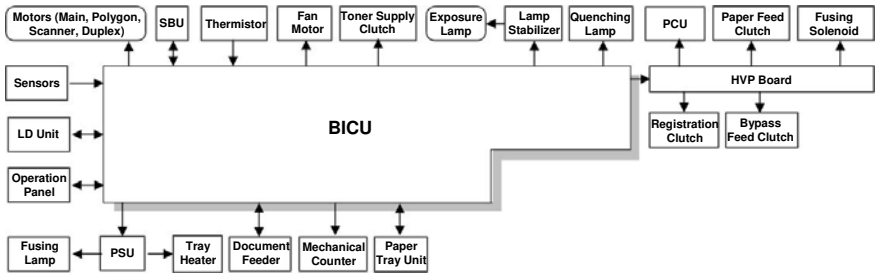
- The paper path is indicated on the slide with heavy black lines and arrows.
- The ARDF is optional.



Drive Layout

- The slide shows some of the drive components. For more details and information, refer to the Service Manual.

Block Diagram



Slide 23

No additional notes.

NVRAM Upload/Download

- **This section depends on which model you have. There are two different procedures.**
  - SP5-824-1 (NVRAM Upload) - From the BICU to a flash memory card
  - SP5-825-1 (NVRAM Download) - From a flash memory card to the BICU
- **Practice as outlined in the NVRAM Data Upload/Download (SP5-824/825) section of the Service Tables unit.**

Slide 24

No additional notes.

Adjusting Copy Image

- **Adjust the copy image area at these times:**
  - After clearing engine data (SP-5801-2).
  - If you replace any of these: First scanner or second scanner, lens block, scanner motor, polygon mirror motor, paper tray.
- **Do adjustments as outlined in "Adjusting Copy Image Area" section of Replacement and Adjustment chapter of Service Manual**

Slide 25

No additional notes.

Operating Instructions

- **While these are user operations, service technicians should also be generally familiar with them.**
- **Read these if you're not already familiar with them:**
  - User Tools: General settings
  - Placing originals and copying

Slide 26

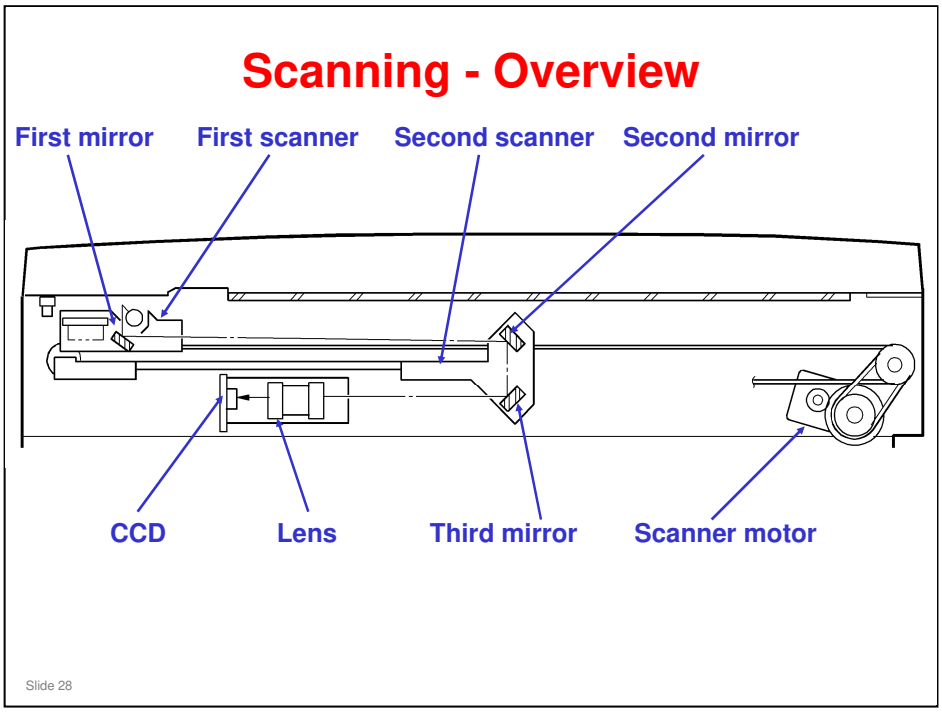
No additional notes.

Scanning and Image Processing

- ❒ Scanning and Image Processing will be covered.

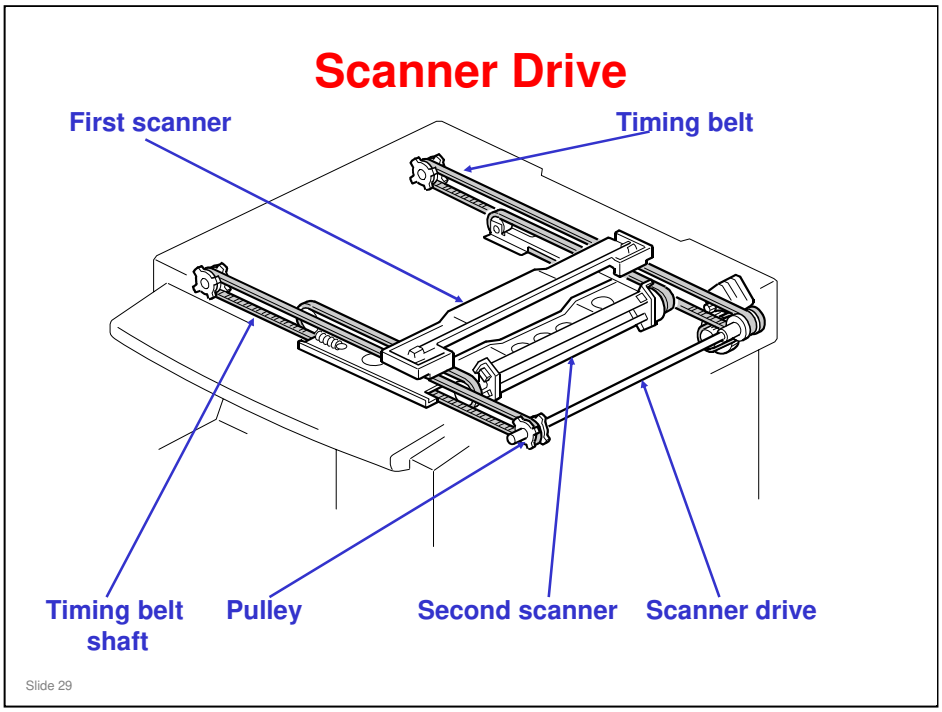
In this section you will do these things:

- ❒ Examine how the machine does image processing.
- ❒ Examine the steps involved in image processing.



Scanning Overview

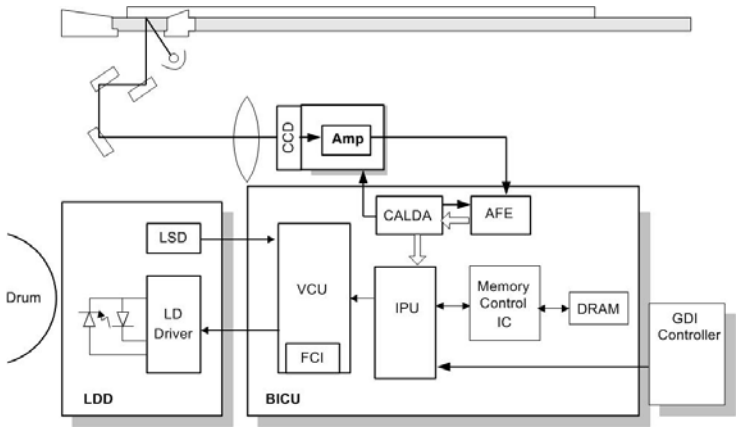
- The HP sensor makes sure the scanner is at home position.
- To copy, the original is illuminated by the xenon exposure lamp. Then the 1st, 2nd, and 3rd mirrors move reflected light to the lens block. Then the lens transmits it to the CCD.
- The 1st scanner has a reflector. This helps to not let shadows get on pasted originals.



Scanner Drive

- The scanner motor drives a gear that turns a small drive belt. This drives the scanner drive shaft.
- Pulleys on the ends of the shaft drive timing belts that drive the 1st scanner.The first scanner is attached to timing belts, which drive the 2nd scanner with the 2nd scanner's pulleys.
- When you scan in book mode, the 2nd scanner moves at half the speed of the 1st scanner. (Scanner speed is faster for reduction printing, and slower for enlargement printing.)
- You can adjust magnification in the sub-scan direction with SP 4008. This will adjust the motor speed.
- You can adjust the main scan direction with SP 4009

Image Processing - Overview



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The scanned image is processed by the following modules.

- In the SBU
  - CCD: Converts the reflected light from the image into an analog signal. Driven by the CALDA.
  - Amp: Amplifies the analog signal and sends it to the AFE on the BICU.
- In the BICU
  - IPU: Auto shading, filtering, magnification, scanner gamma correction, ID gamma correction
  - VCU: Printer gamma correction, LD print timing control and laser power PWM control
  - FCI (inside the VCU): Smoothing
  - The data then moves to the LD drive board in accordance with timing controlled by the BICU.
  - CALDA: CCD drive, AFE drive, Data conversion, Offset correction
  - AFE: Analog digital converter, Gain adjustment, Offset adjustment (Analog Front End)

Image Processing–Overview

- **Changing Modes:**
  - You cannot switch modes at these times:
    - » When accessing user tools.
    - » When scanning an original
- **Practice switching modes and getting multi-access. (Refer to Operating Instructions, General Settings Guide)**
- **To learn more about image processing, see the Core Technology Manual**

Slide 31

No additional notes.

Laser Exposure and PCU

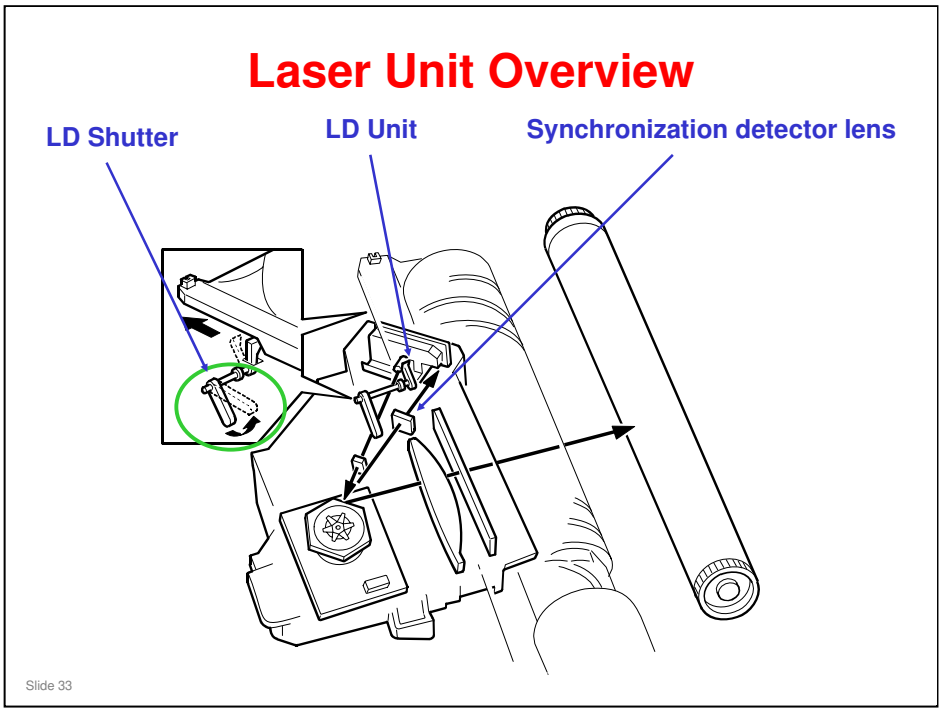
- ❒ The laser and PCU (Photoconductor Unit) units will be covered.

In this section you will do these things:

- ❒ Examine the laser and PCU units.
- ❒ Examine drum drive and drum charge.

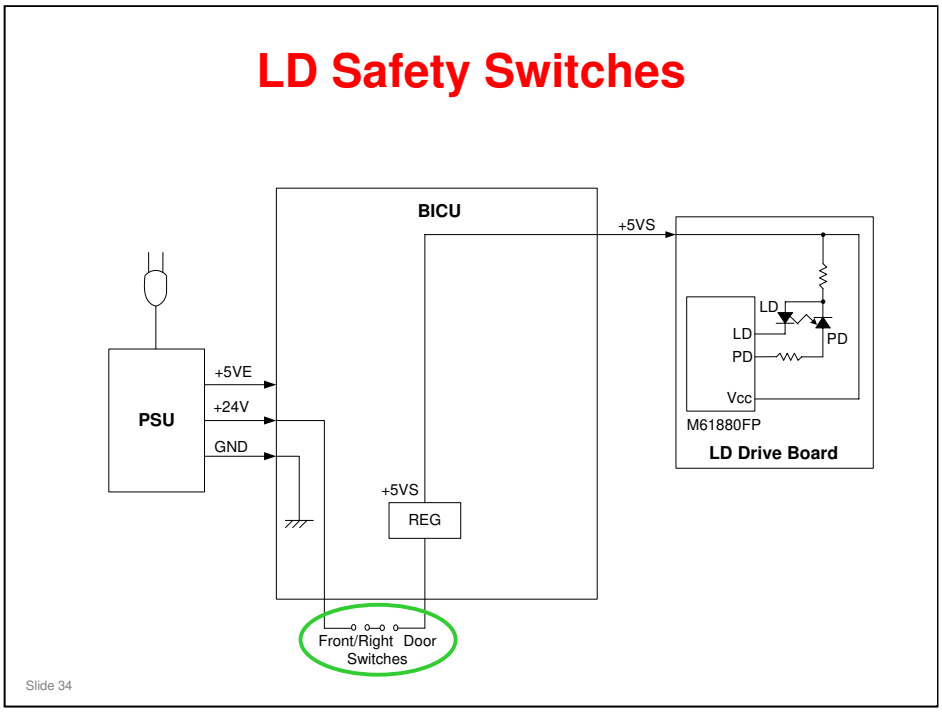
When you finish this section, you should know the answers to these questions:

- ❒ How do I replace the laser unit?
- ❒ What SP modes do I need to use after I replace the laser unit?
- ❒ How does the machine detect a new PCU?
- ❒ How does the machine clean the charge roller?



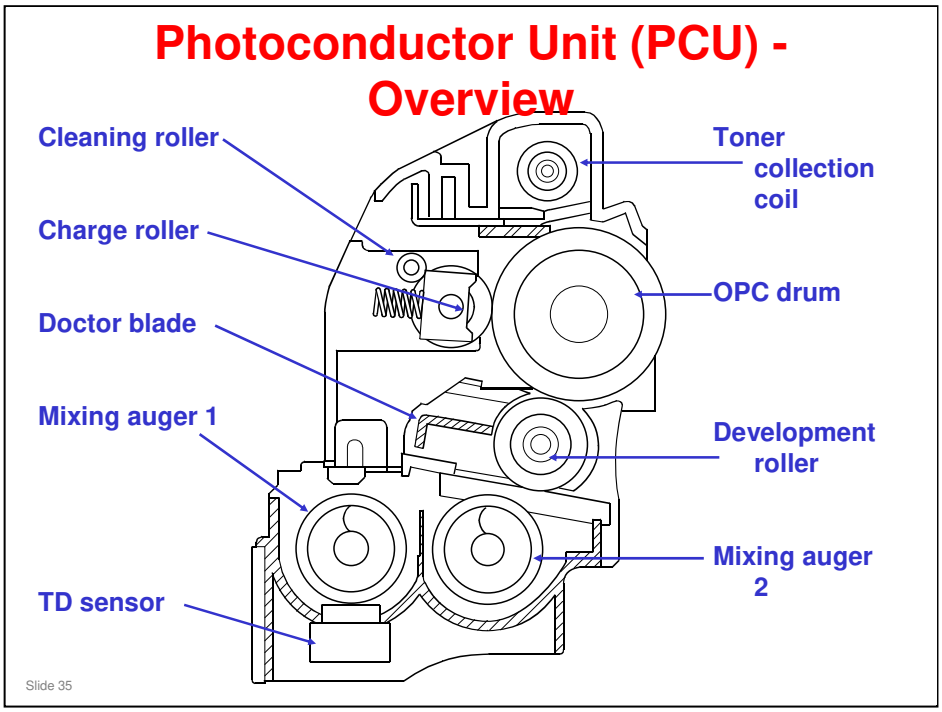
Laser Unit-Overview

- ❒ This machine uses a standard exposure unit. The LD unit controls laser output and synchronization.
- ❒ The machine cuts the power to the LD drive board when the front door or right door is opened.
- ❒ The LD shutter blocks the laser-beam path if the toner bottle holder is unlatched.



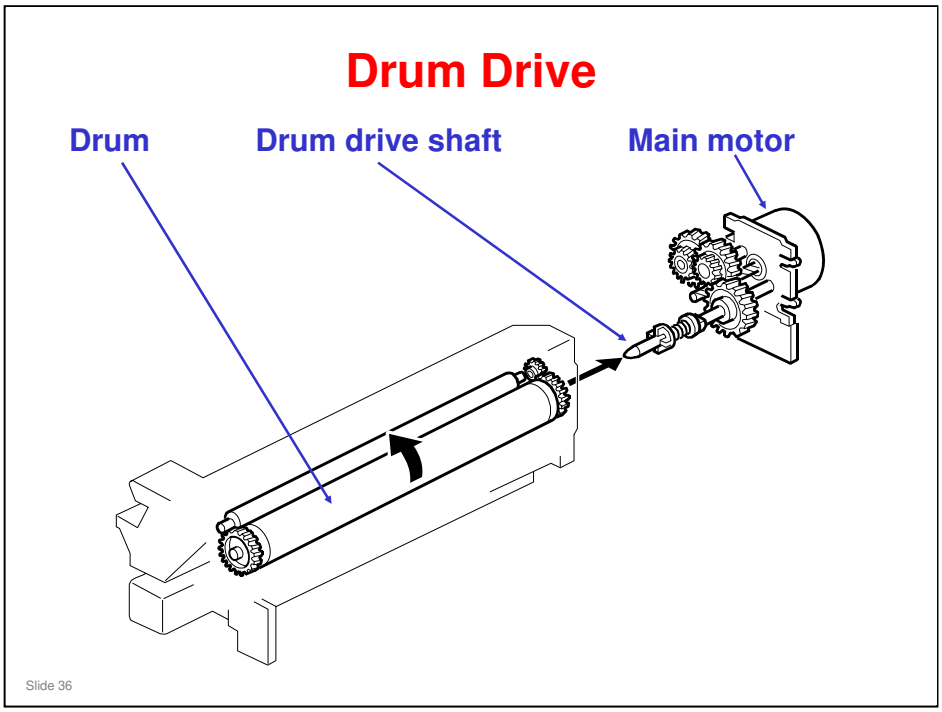
LD Safety Switches

- Safety switches are installed at the front and right doors. The machine will cut power to the LD drive board if either door is opened. The corresponding switch cuts the power supply (+5VS) to the laser diode.
- The safety switches are installed on the +24V line coming from the power supply unit (PSU). The +24V supply must pass through these switches before converting into the +5VS power that drives the laser.



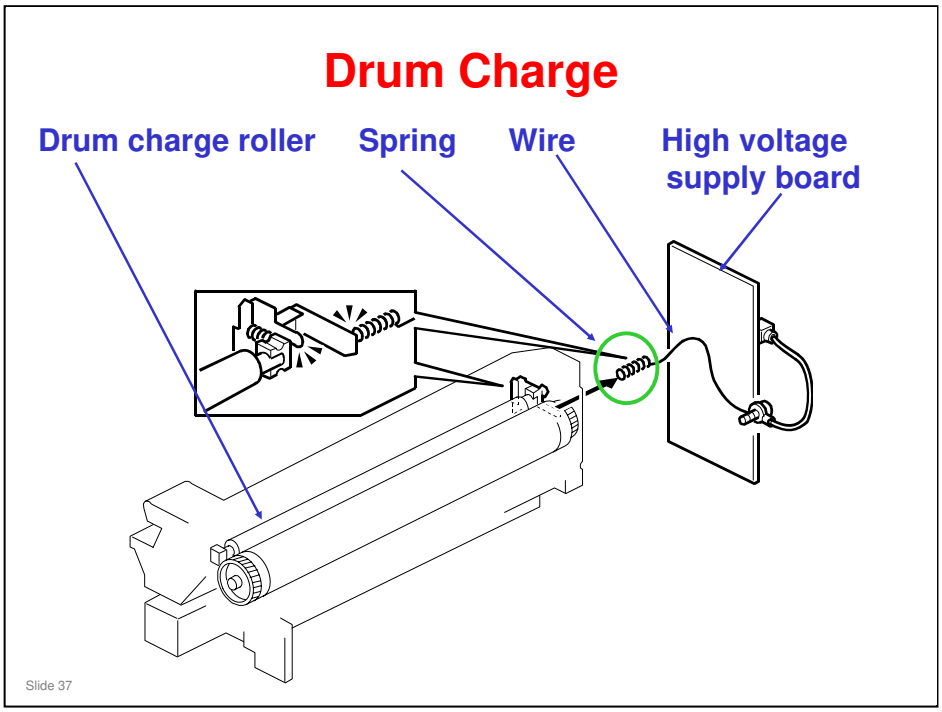
PCU-Overview

- ❒ Go to the machine and find the above components if you're not already familiar with them.



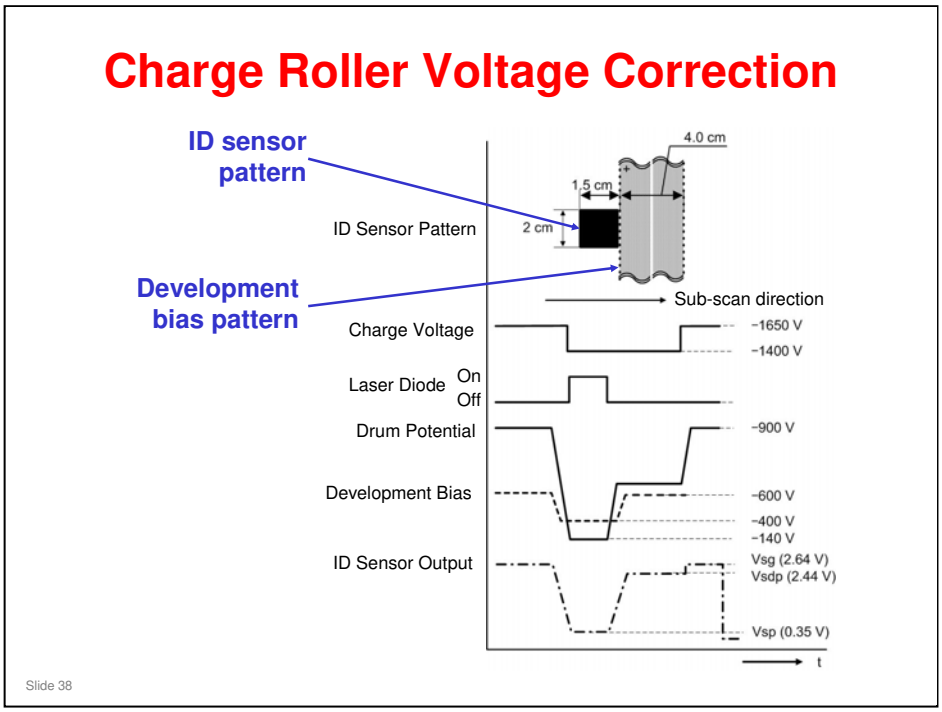
Drum Drive

- ❒ The main motor drives the drum through a series of gears and the drum drive shaft.



Drum Charge

- The OPC drum is charged via a contact charge roller. The drum charge roller stays in contact with the drum. This gives a charge of –900 V on the drum surface.
- The high voltage supply board gives a negative charge to the charge roller with a wire and spring.
- The default base charge is –1650V. You can adjust this with SP 2001 1.

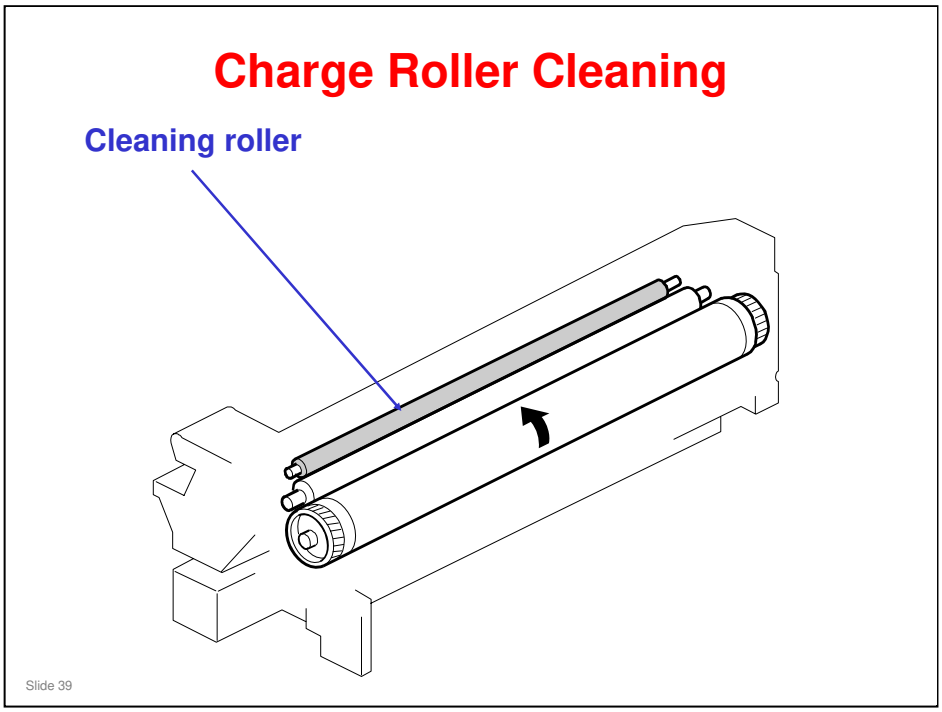


Charge Roller Voltage Correction

- Voltage transfer from the charge roller to the drum decreases as the ambient temperature and humidity increase. The machine checks the charge transfer, and adjusts the charge roller voltage when required.
- Checks are done on initial warm-up. If the machine is set to low-power or auto-off mode for more than 4 hours, a check will be done when the machine wakes up.

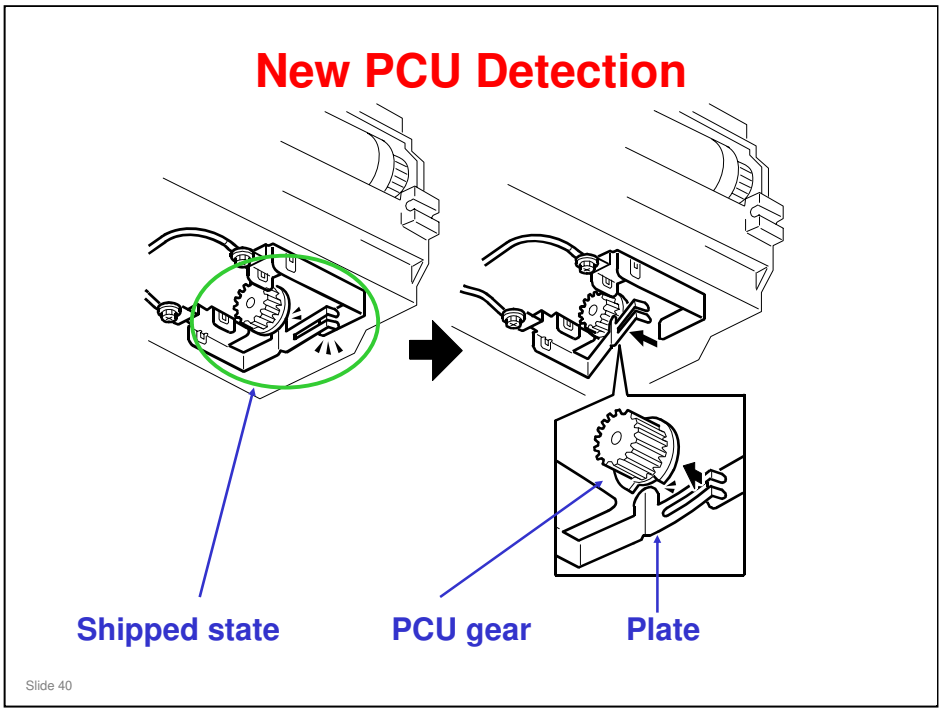
Procedure:

- Right after the machine creates the ID sensor pattern for toner density control, the development bias pattern is created.The development bias is decreased to –400 V.
- The ID sensor measures the development bias pattern's density (Vsdp) and the bare drum's voltage (Vsg).
- The FCU compares the results and adjusts the roller voltage accordingly.
  - Vdsp/Vsg > 0.95: Decreases the negative charge on the charge roller by +50 V.
  - Vdsp/Vsg < 0.90: Increases the negative charge on the charge roller by –50 V.
- Use SP 2221 to see the current ID sensor values.



Charge Roller Cleaning

- ❒ A cleaning roller cleans the charge roller. You do not need to replace or clean this roller.



New PCU Detection

- ❒ The machine automatically detects a new PCU at these times:
  - ➢ At time of copier installation
  - ➢ When a replacement PCU is installed
- ❒ A new PCU must be initialized before it can be used. These also must be done:
  - ➢ Agitate toner/developer mix.
  - ➢ Initialize the TD sensor.
  - ➢ Initialize the PCU counter.

❑The machine automatically detects a new PCU and performs initialization. In the shipped state, the connection plates are pressed together and make a complete circuit. This tells the CPU that the PCU is new and must be initialized. When the PCU gear rotates, the top connection plate gets free and breaks the circuit.

❑Pre-installed PCUs do not use this mechanism. A factory-set flag tells a new machine to initialize the PCU when the machine is switched on for the first time.

Development

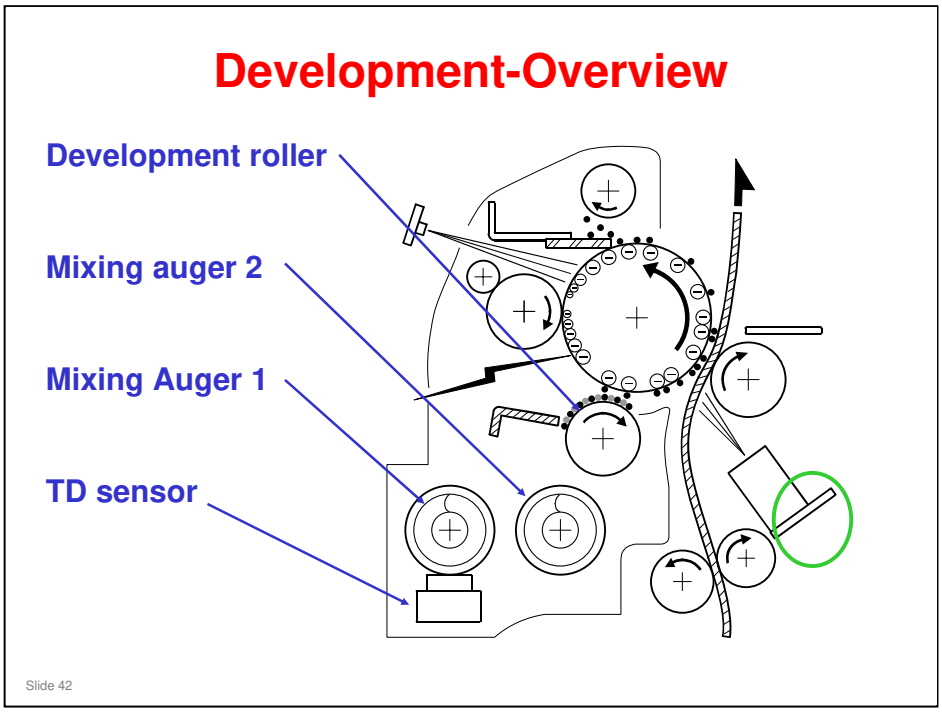
- ❒ The development unit will be covered.

In this section you will do these things:

- ❒ Examine toner supply and toner path.
- ❒ Examine the toner bottle.
- ❒ Examine toner density control.
- ❒ Examine SP modes used for the development unit.

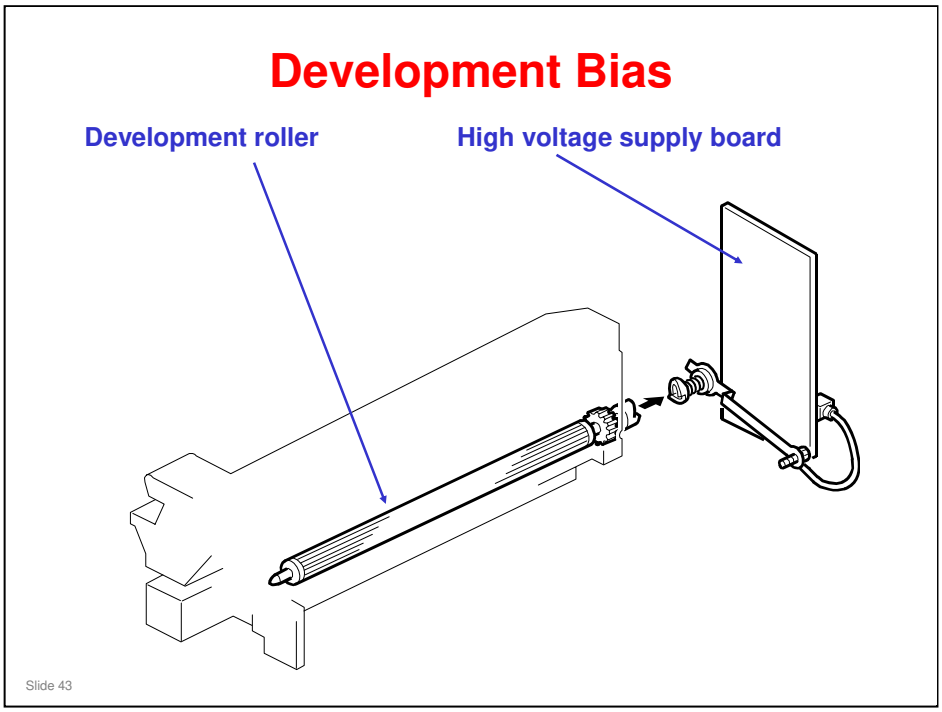
When you finish this section, you should know the answers to these questions:

- ❒ How is toner supplied to the machine?
- ❒ How can I adjust toner density?
- ❒ What toner errors does the machine show?



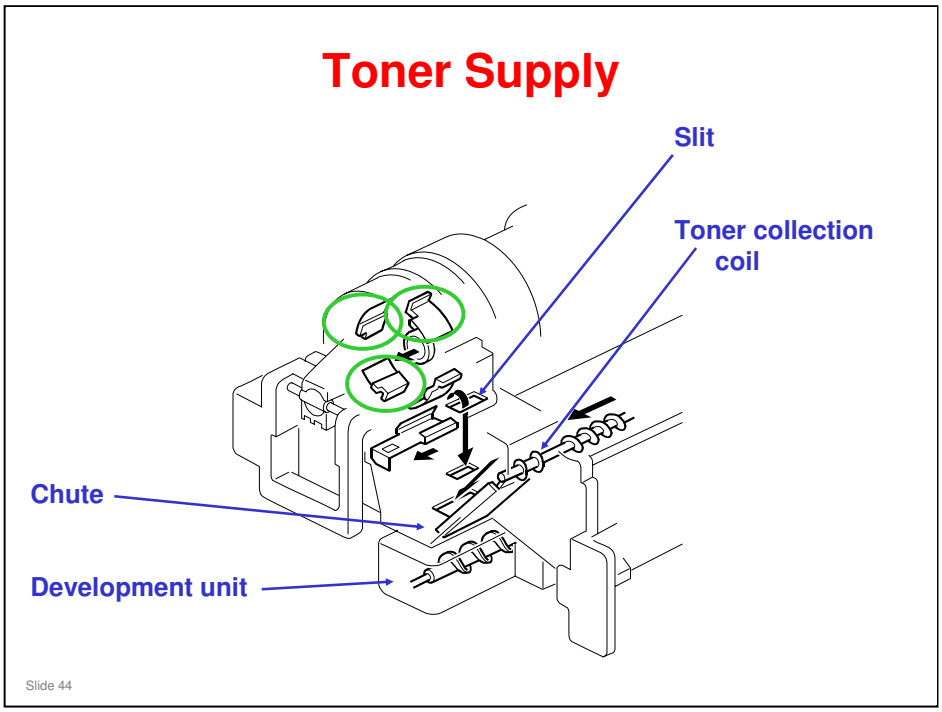
Development-Overview

- ❒ Two mixing augers mix the developer (carrier/toner mix). The TD (toner density) sensor and the ID (image density) sensor (shown in a red circle) are used to control the copy image density.



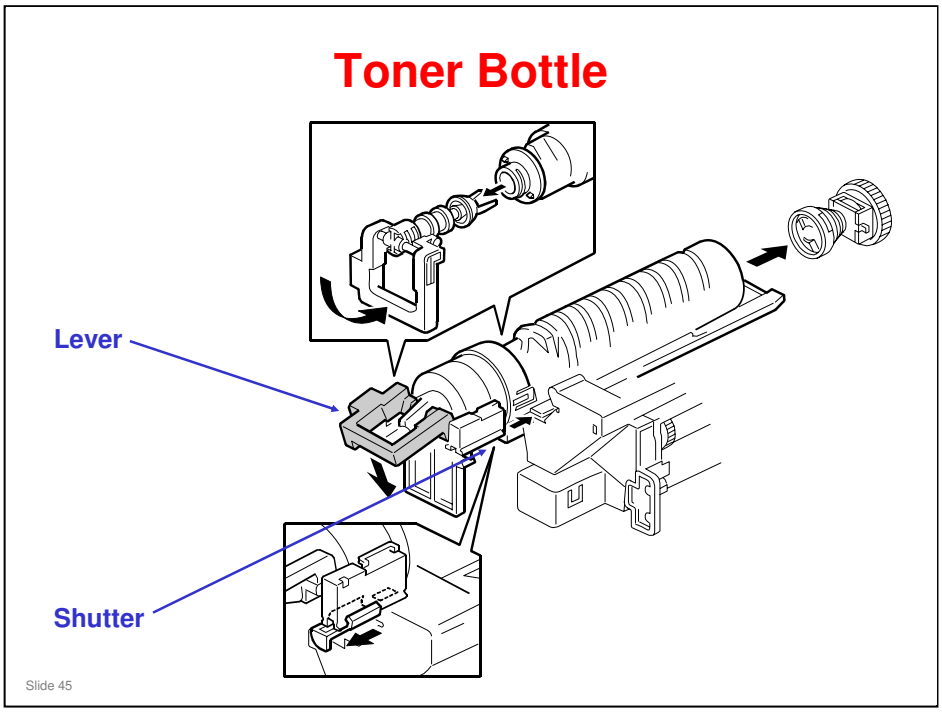
Development Bias

- Toner gets to the areas with the smallest negative charge.The drum has a large negative charge (-900V). The latent image on the drum has a small negative charge (-140 ± 50V).
- The high voltage supply board gives a –600 V bias to the development roller.This sends toner from the development roller to the latent image.
- You can adjust the development bias with SP 2201 1



Toner Supply

- The toner path is the same for all models. There are two sources of toner: new toner and recycled toner.
- A shutter is pushed open by the PCU body when a toner bottle is set in the machine. The toner bottle cap is held with a chuck. The cap comes off when you push in the lever.
- Spiral grooves move toner out of the bottle. Mylar blades (circled in red) move toner through a slit into the development unit. This happens when the clutch turns the toner bottle.
- The toner collection coil recycles toner it gets from the OPC drum. Recycled toner moves down the chute and goes into the development unit through a slit.



Toner Bottle

- ❒ The toner bottle is the same for all models.
- ❒ The toner shutter opens when you set the toner bottle into the machine.
- ❒ The bottle cap will open when you press the lever.
- ❒ Spiral grooves move toner out when the bottle spins.

Toner Density Control

- **Toner concentration in the developer is controlled with these values:**
  - Vts: TD sensor initial set of 1.25V. (Used as reference voltage when Vref is not available).
  - Vref: Toner supply reference voltage (calculated value; periodically updated).
  - Vt: Actual output from TD sensor.
  - Vsg/Vsp: Values from ID sensor, where Vsp is the voltage of a test pattern (the "ID sensor pattern"), and Vsg is the voltage of the bare drum.
- **Toner is given to the development unit if Vt is more than the reference voltage**

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Toner Density Control

Reference Voltage

- Vts is used as the reference if the PCU has just been installed, or if ID sensor correction is set “off” with SP 2927. Vref is used as the reference at all other times.

Toner Density Sensor Initial Setting

- The Vts for this machine is 1.25 V. The machine adjusts the sensor so that it reads out 1.25V for TD sensor initialization when a new PCU is installed.

Toner Concentration Measurement

- The machine checks concentration every copy cycle, comparing Vt against the reference voltage to do this.

Vsp/Vsg Detection

- An ID sensor pattern is made on the drum by the charge roller and laser diode. The ID sensor detects the pattern density (Vsp) and the density of the bare drum (Vsg). Detection is done at the same time as (and immediately before) charge-roller voltage detection.
- You can set ID sensor control “off” with SP 2927.

Calculation of Vref

- Vref is calculated based on the ID sensor output (Vsp/Vsg) and the present reference voltage (Vref or Vts) – Vt.

Toner Supply Determination

- The machine gives toner if Vt gets to more than the reference voltage. You can see current Vt and reference voltage values with SP 2220.
- You can see other ID sensor values with SP 2221.

Toner Errors

- **Sensor errors occur at these times:**
- **ID Sensor:**
  - Vsg ≤ 2.5 (when Vsg is read)
  - Vsg < 3.5 (at maximum power)
  - Vsp ≥ 2.5
  - Vt ≥ 2.64 or Vt < 0.20
- **You can see the current readings with SP 2221**
- **TD Sensor**
  - TD < 0.20 V
  - TD > 2.64 V
- **If the machine gets error readings 10 times in succession, SC 390 will be shown. You can see the current value with SP 2220**

Slide 47

No additional notes.

Toner Near End/End Detection

- **The machine will show toner near end at these times:**
  - Vt is at Level-6 five times in succession.
  - Vt > 1.85 five times in succession.
- **The machine will show toner end at these times:**
  - VT is >= Level-6 or VT> 1.85 n times in a row.
  - VT is at Level-7 or VT> 2.00 three times in a row

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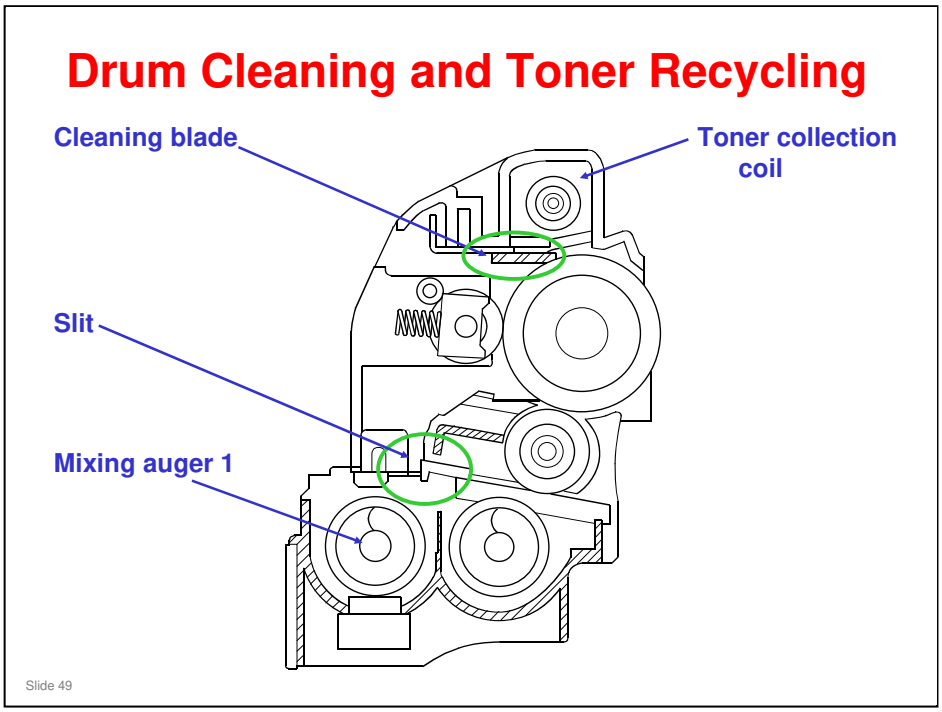
Toner Near End/End Detection

•n is the number of sheets that can be printed before toner near end gets to toner end. n is set to 50 by default.

•You can change the value of n to 20 with SP 2213.



Drum Cleaning and Toner Recycling

- The cleaning blade gets leftover toner from the drum after an image transfer. Then toner piles on the blade.
- The toner collect coil moves toner from the pile and puts it onto the chute. Then the toner moves to the development unit through a slit.
- The drum turns about 3 mm in reverse at the end of each copy job. This moves toner away from the cleaning blade.

SP Modes

- SP 2214: Developer initialization.
- SP 2802: Forced developer churning.
- SP 2908: Forced toner supply.
- SP 2921: Toner supply mode.
- SP 2922: Toner supply time.
- SP 2926: Standard Vt.
- SP 2928: Toner end clear

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No additional notes.

Replacement and Adjustment

- **Remove the Toner Supply Clutch**
  - See the procedure in the FSM.
- **Preventive Maintenance.**
  - You must clean the toner bottle holder after you replace the PCU.
- **To learn more see the following in the Core Technology Manual.**
  - Development process
  - Development bias
  - Toner supply

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No additional notes.

Paper Feed

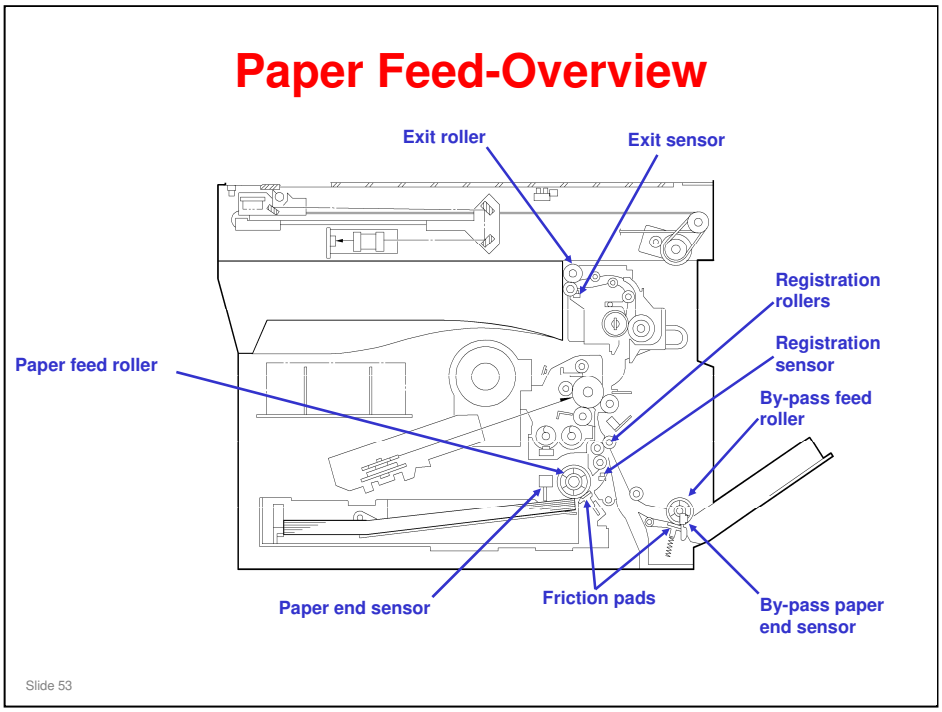
- ❒ Paper feed will be covered.

In this section you will do these things:

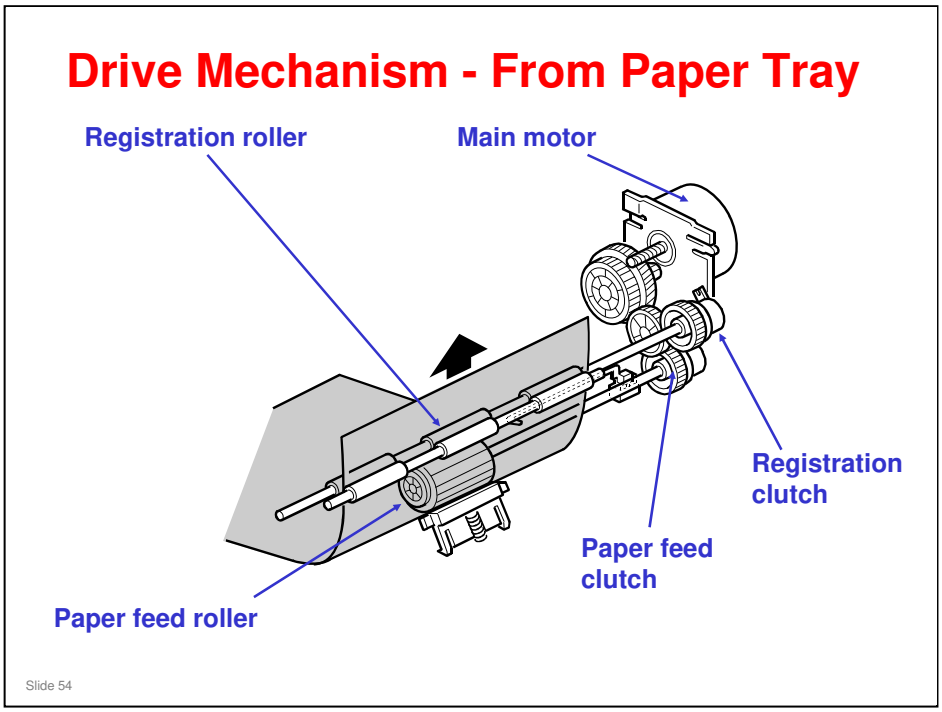
- ❒ Examine the paper feed mechanism.
- ❒ Examine the paper feed path and drive.

When you finish this section, you should know the answers to these questions:

- ❒ How is paper fed through the machine?
- ❒ What parts do I need to replace?
- ❒ What adjustments do I need to make?

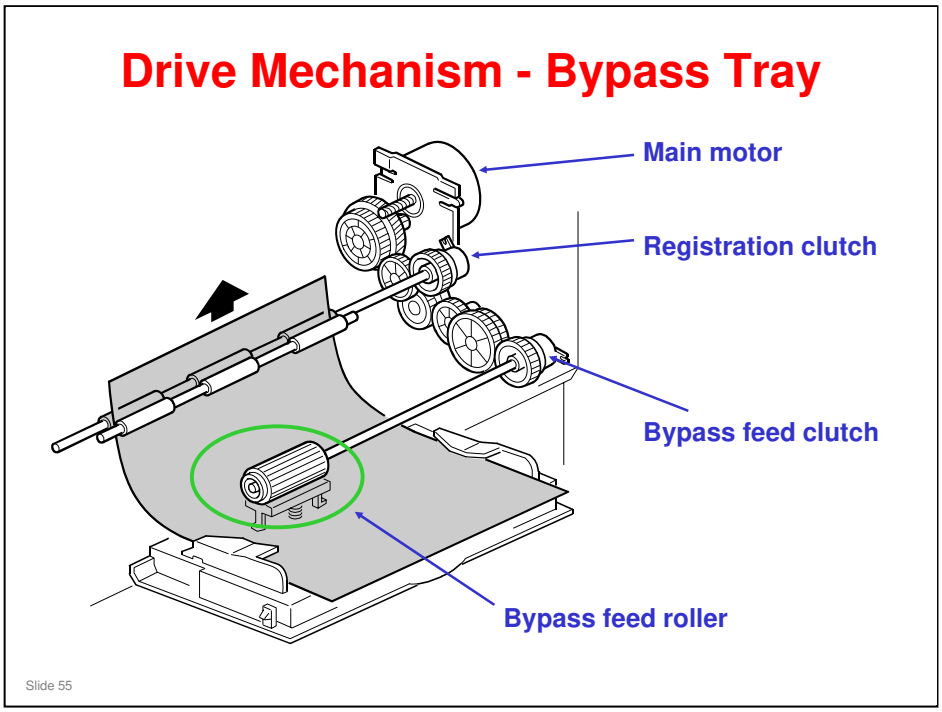


No additional notes.



Drive Mechanism - From Paper Tray

- The main motor drives gears on the registration clutch and the paper feed clutch. These clutches transmit motion to the registration roller and paper feed roller.



Drive Mechanism - Bypass Tray

- The main motor drives the gears of the registration clutch and bypass feed clutch. The bypass feed clutch moves the bypass feed roller.

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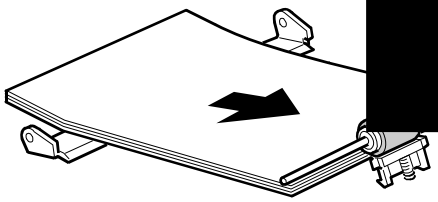
Paper Feed And Se



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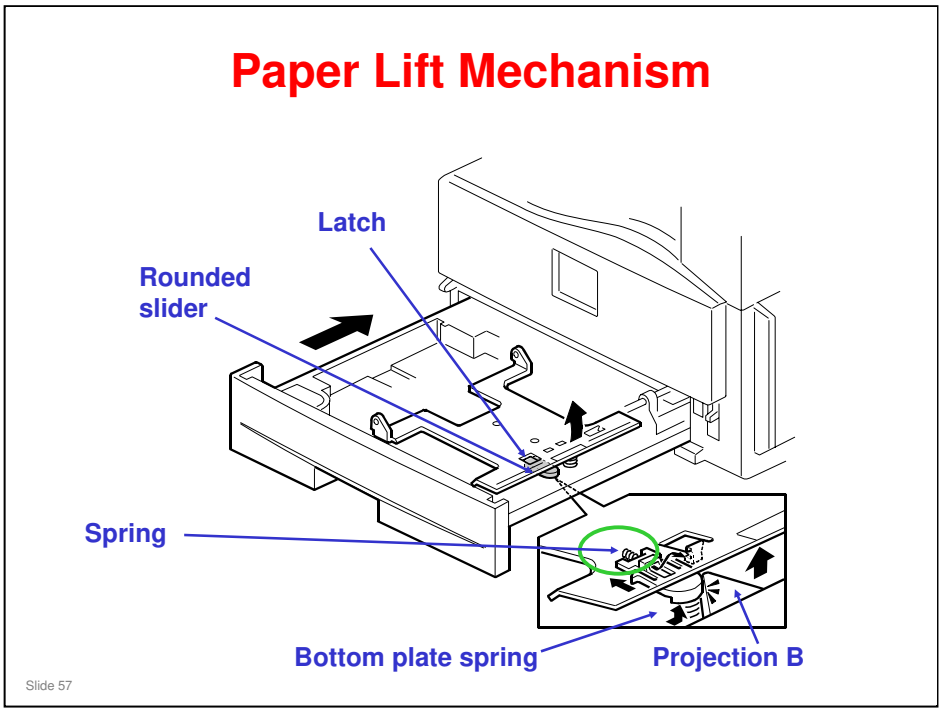
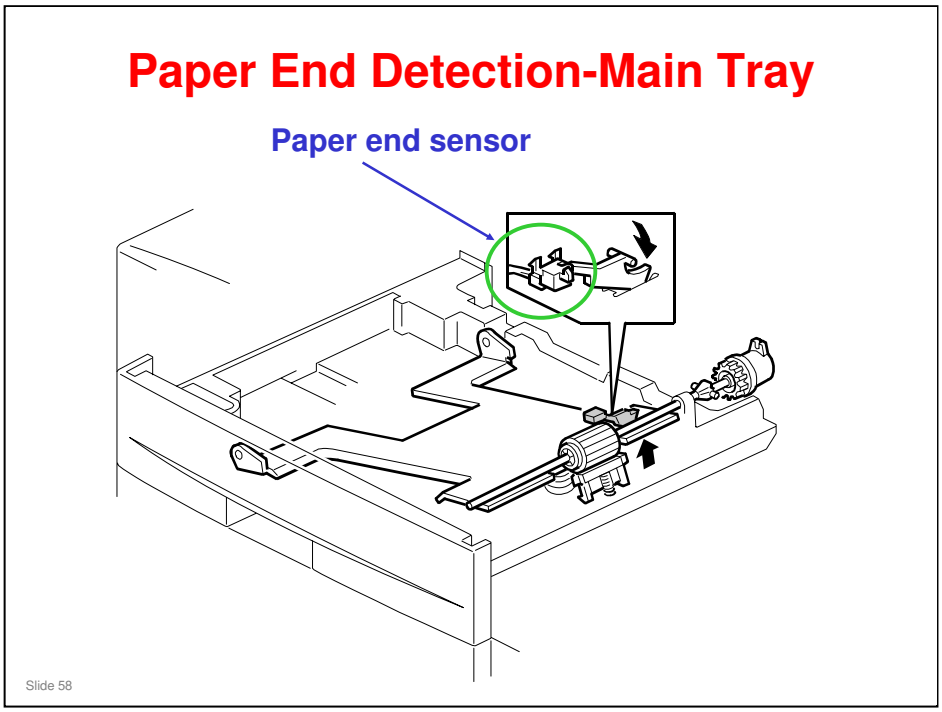


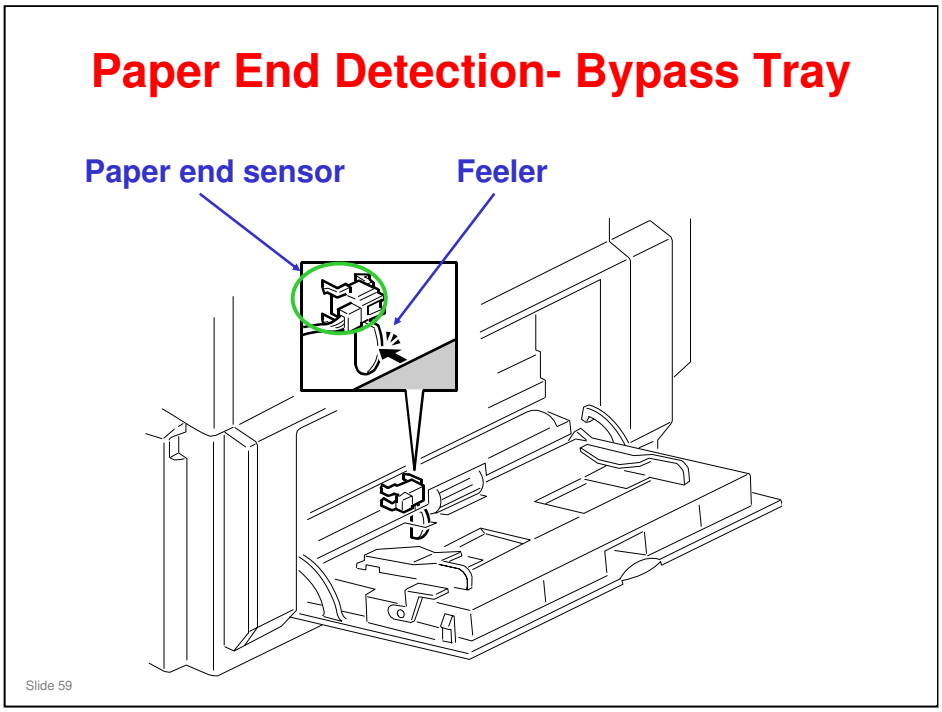
Paper Lift Mechanism

- The projection [B] on the frame pushes the rounded slider in against the spring when the tray is closed (by sliding it into the machine). This retracts the latch, allowing the bottom plate spring to push the plate up.



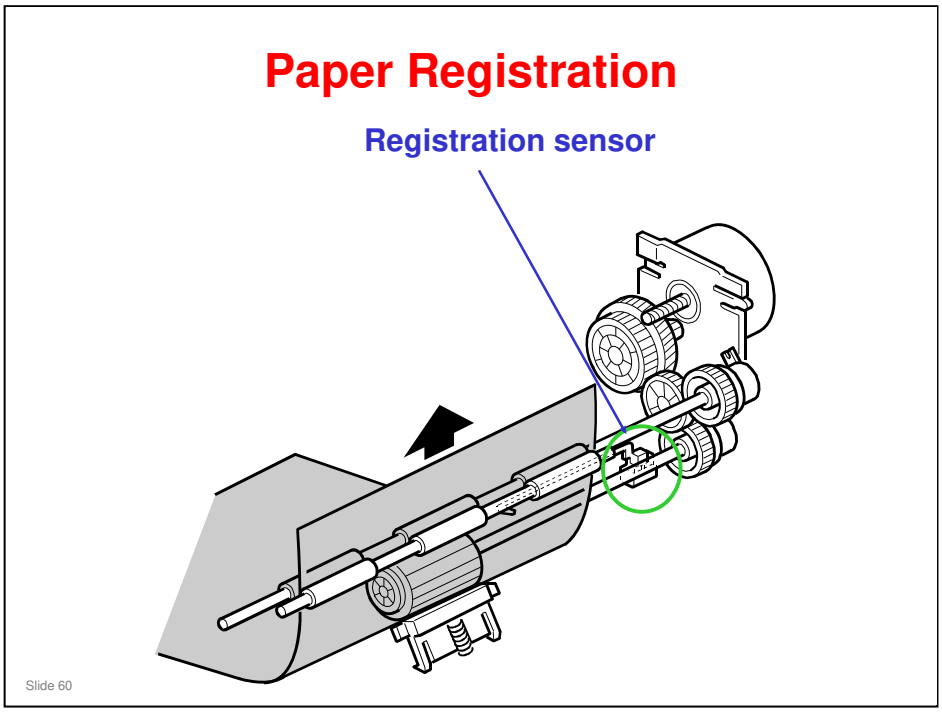
Paper End Detection-Main Tray

- The feeler goes into the cutout when paper runs out. Then the paper end sensor is activated.



Paper End Detection-Bypass Tray

- ❒ The feeler goes into the cutout when paper runs out, activating the paper end sensor.



No additional notes.

Learn More

- **Refer to the Core Technology Manual.**
  - Paper path
  - Paper feed process
  - Paper registration
  - Paper transport

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No additional notes.

Image Transfer and Paper Separation

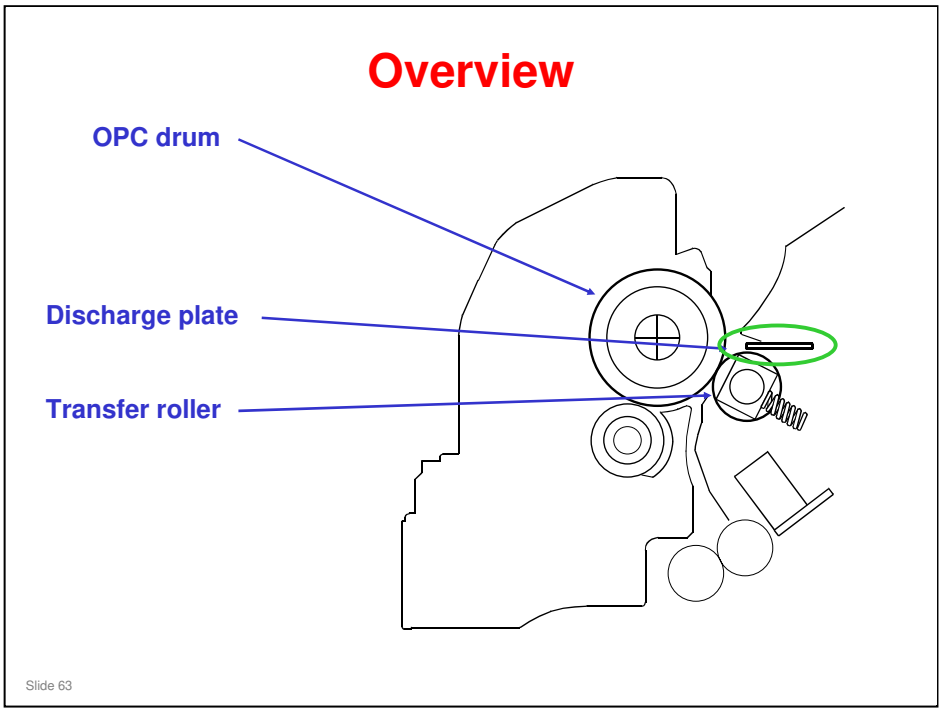
- ❒ Image transfer and paper separation will be covered.

In this section you will do these things:

- ❒ Examine how paper is fed through the machine.
- ❒ Examine transfer current.

When you finish this section, you should know the answers to these questions:

- ❒ How is paper fed through the machine?
- ❒ How is the transfer roller cleaned?



Overview

- The transfer roller is pressed against the OPC drum. The high-power supply board gives a positive charge to the transfer roller, which causes toner to be transferred from the drum to the paper.
- This machine uses the following two paper separation techniques:
  - The drum's curvature helps separate the paper.
  - The discharge plate removes the paper's charge.

Transfer Current Timing

- **The machine has two transfer current levels: Low and High.**
  - Low level: The high voltage supply board supplies 10µA to the transfer roller before image transfer starts. This prevents the transfer roller from getting positively charged toner on the drum surface.
  - High level: The high voltage supply board supplies high level of current to the transfer roller at the time of image transfer. This allows the transfer roller to move toner to the paper.
  - The high voltage supply board does not supply current when the trailing edge of the paper has passed the transfer roller. The high voltage supply board supplies low level current if the machine prints more pages.

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Transfer Current Timing

- You can adjust the transfer current level with SP 2301.
- Examine the default current settings. If you do not adjust the transfer current level correctly, the following may happen:
  - Parts of the page being printed may have ghost images.
  - You may damage the OPC drum.

Transfer Roller Cleaning

- **Toner can get onto the transfer roller at these times:**
  - If you print on paper that is smaller than the image size
  - During paper jams.
- **You must clean the roller so toner will not get onto the back of other prints.**
- **The high voltage supply unit gives a negative charge to the transfer roller. Toner with negative charge moves back to the drum. Then the high voltage unit provides a positive current. Toner with a positive charge moves back to the drum.**
- **The roller is cleaned at these times:**
  - When power is switched on.
  - After you clear a paper jam.
  - At the end of a job, if at least 10 print jobs have been made since the last clean cycle.
- **You can change the current for the cleaning procedure with SP 2301-4.**

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No additional notes.

Learn More

- **Core Technology Manual**
  - Image transfer and paper separation
- **Transfer roller cleaning**
  - You may want to know where the positively charged toner came from as the toner gets a negative charge in the development unit. Almost all of the toner on the transfer roller is negative (>98%). However, stress and pressure applied to toner particles (for example at the cleaning blade or at times of recycle) can cause a very small percent to take on a slight positive charge.

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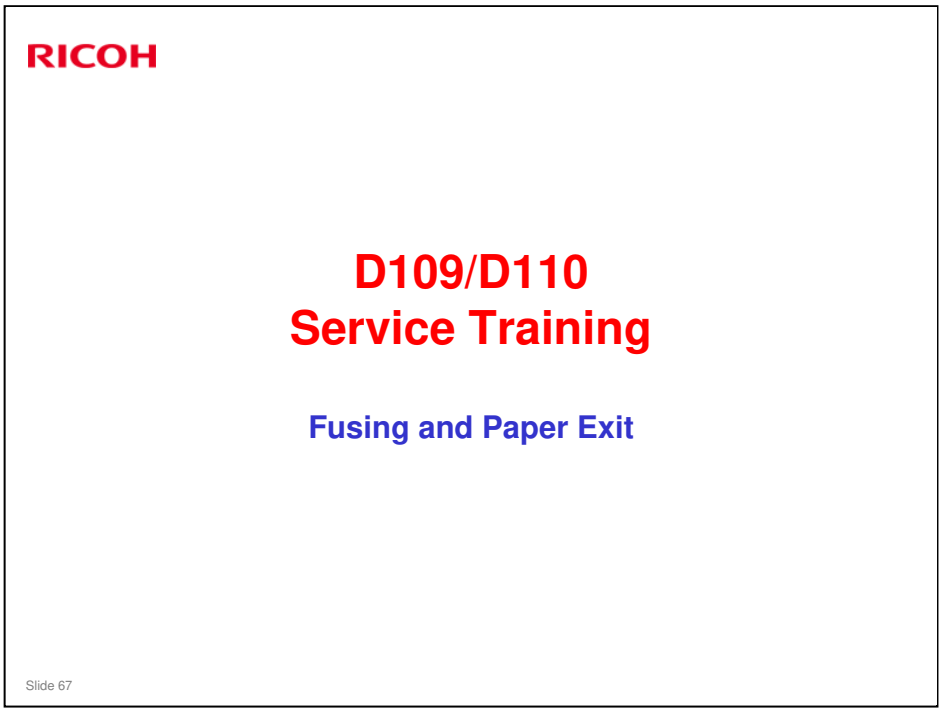
No additional notes.



Fusing and Paper Exit

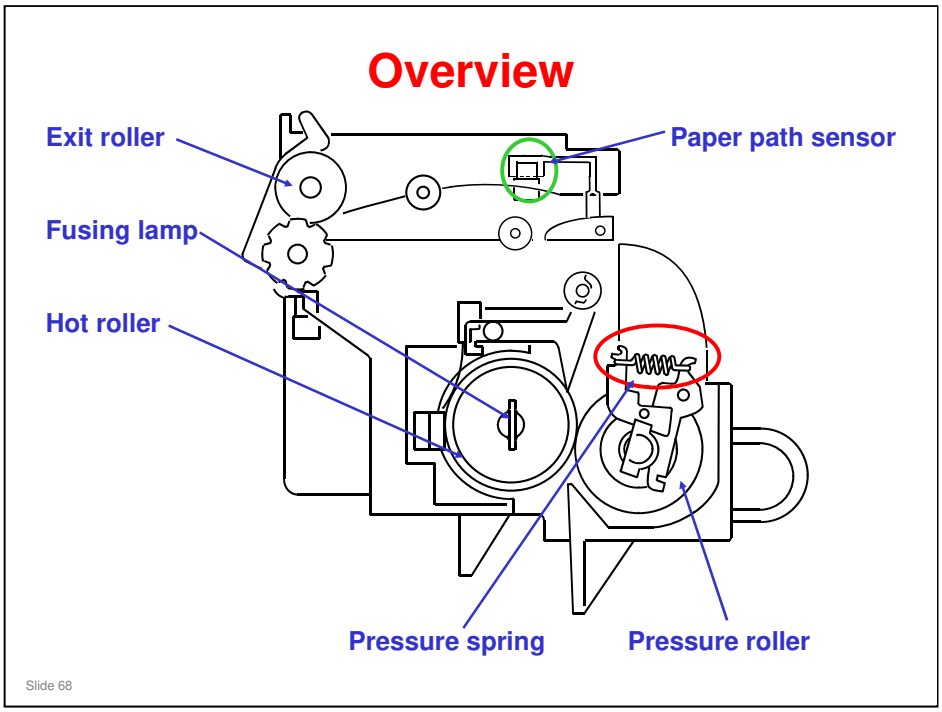
- ❒ The fusing unit will be covered.

In this section you will do these things:

- ❒ Examine the machine's fusing unit.
- ❒ Examine the energy saver mode.
- ❒ Examine replacement and adjustments.
- ❒ Learn the SP modes used.

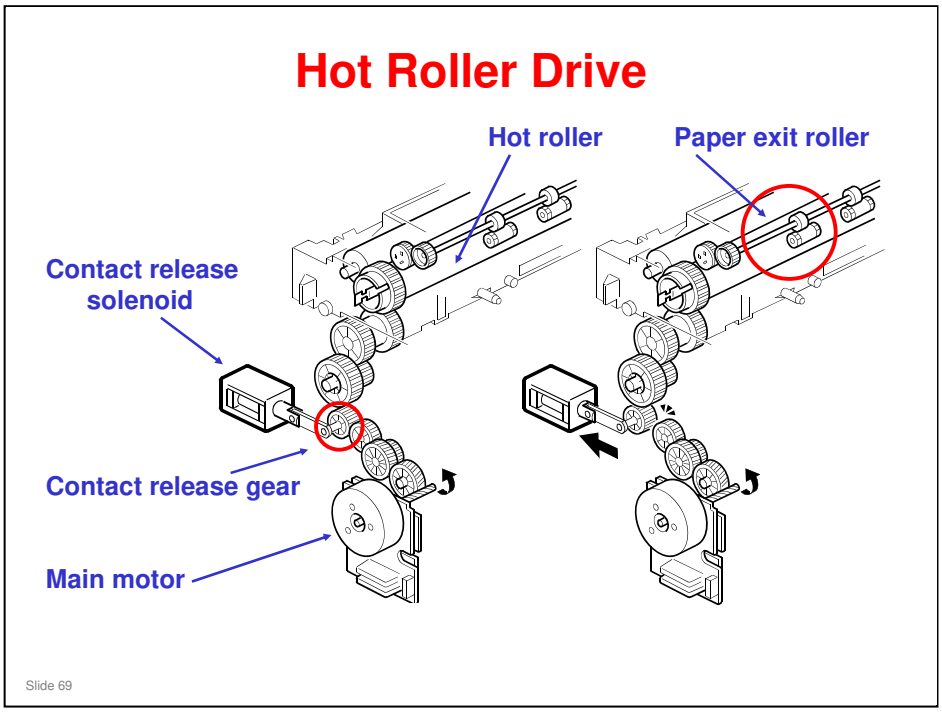
When you finish this section, you should know the answers to these questions:

- ❒ How many energy saver levels does the machine have?
- ❒ What is the target fusing temperature for this machine?
- ❒ Which parts in the fusing unit are replaceable?



Overview

- This slide shows some of the components for the fusing unit. For more details, see the Service Manual.



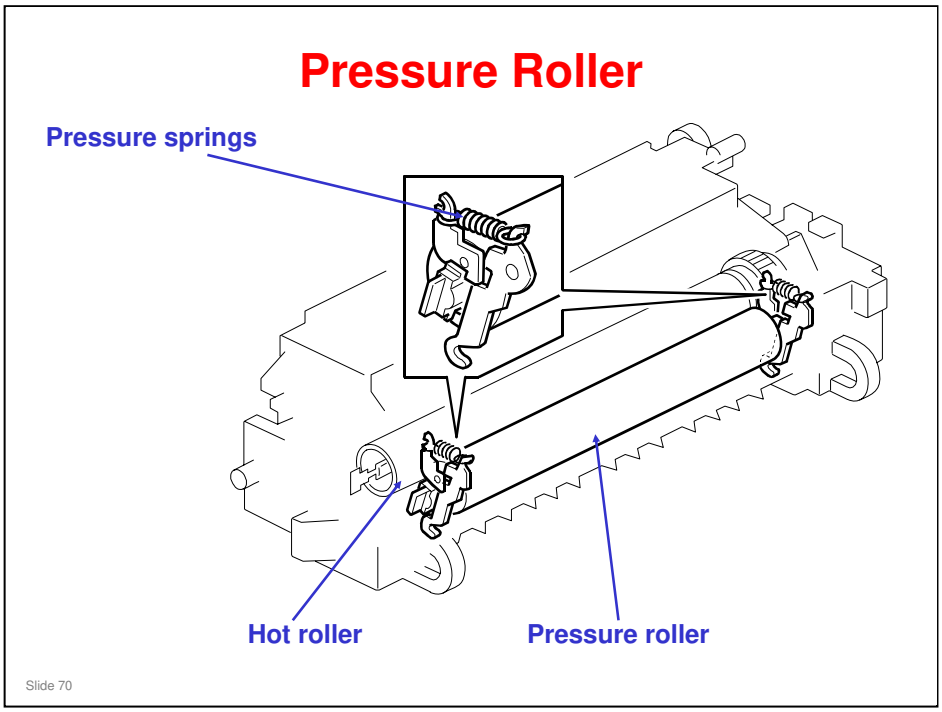
Hot Roller Drive

Mechanism

- The main motor drives the hot roller through a gear train. One of the gears in the gear train is the contact-release gear. This gear is linked to the contact-release solenoid. When the contact-release solenoid is activated, it separates the contact-release gear from another gear in the gear train.
- Drive power of the main motor is not transmitted to the hot roller.
- Drive power of the main motor is not transmitted to the paper exit roller. This roller is driven by the exit motor.

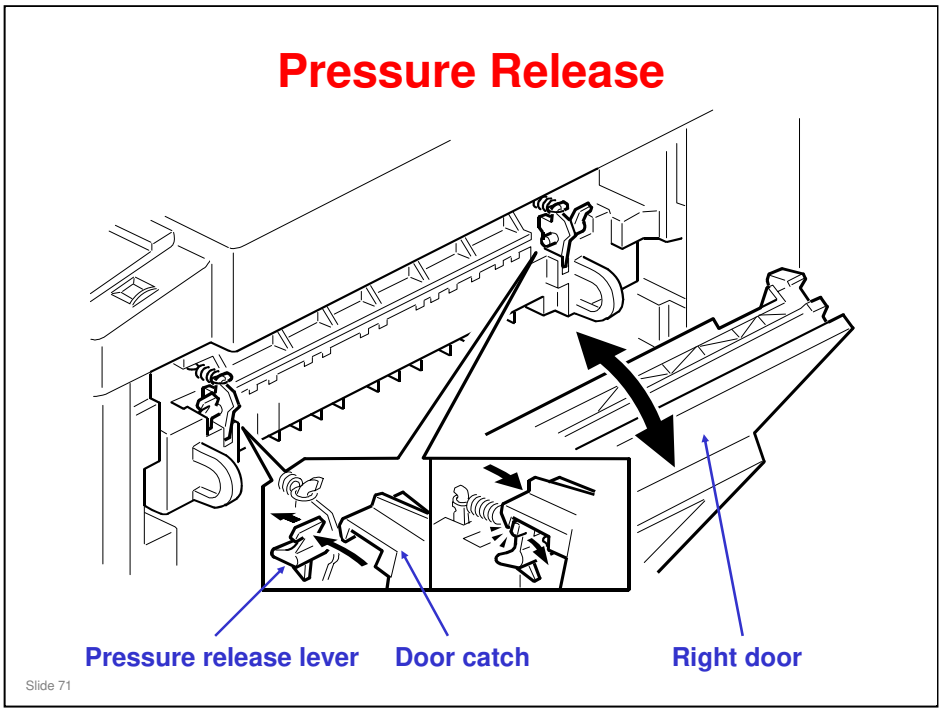
Contact/Release Control

- The contact-release solenoid comes on at these times:
  - When the copier warms the hot roller.
  - When the hot roller temperature is 18°C or higher.
  - Fusing idling (SP 1103 1) is set to "No."
- Control is based on these:
  - The copier takes a shorter time to heat the hot roller when the roller isn't turning.
  - The temperature of the hot roller surface may get uneven when the hot roller temperature is low and the roller does not turn.



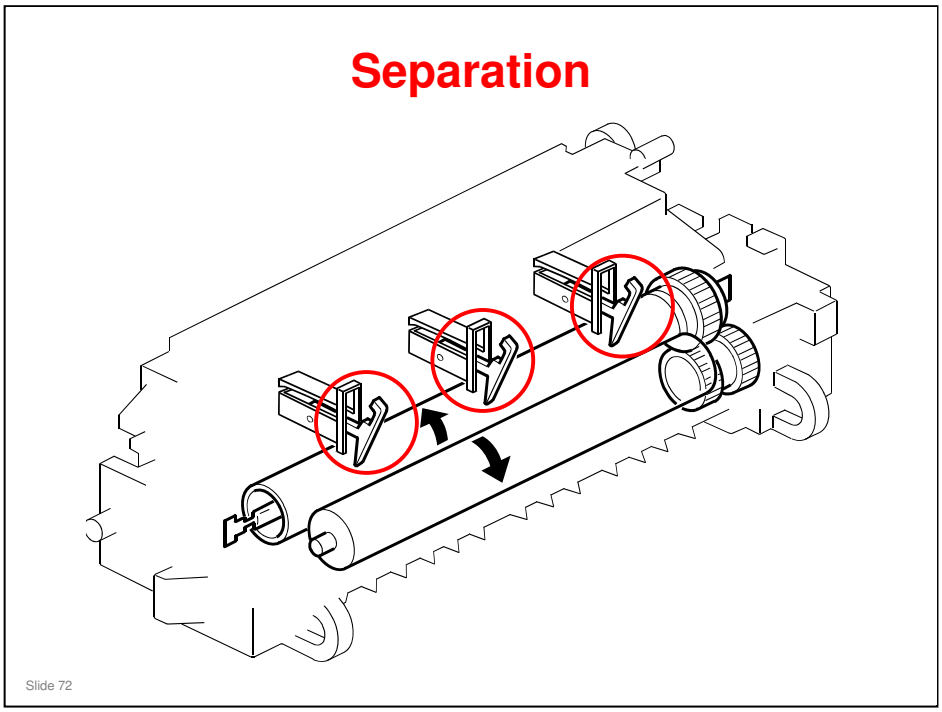
Pressure Roller

- The pressure springs constantly press the pressure roller against the hot roller. The springs can be set in two different positions. The default is set in the high-pressure (lower position) position.
- You can move the springs to the low-pressure (upper position) position if you want to lower the pressure.



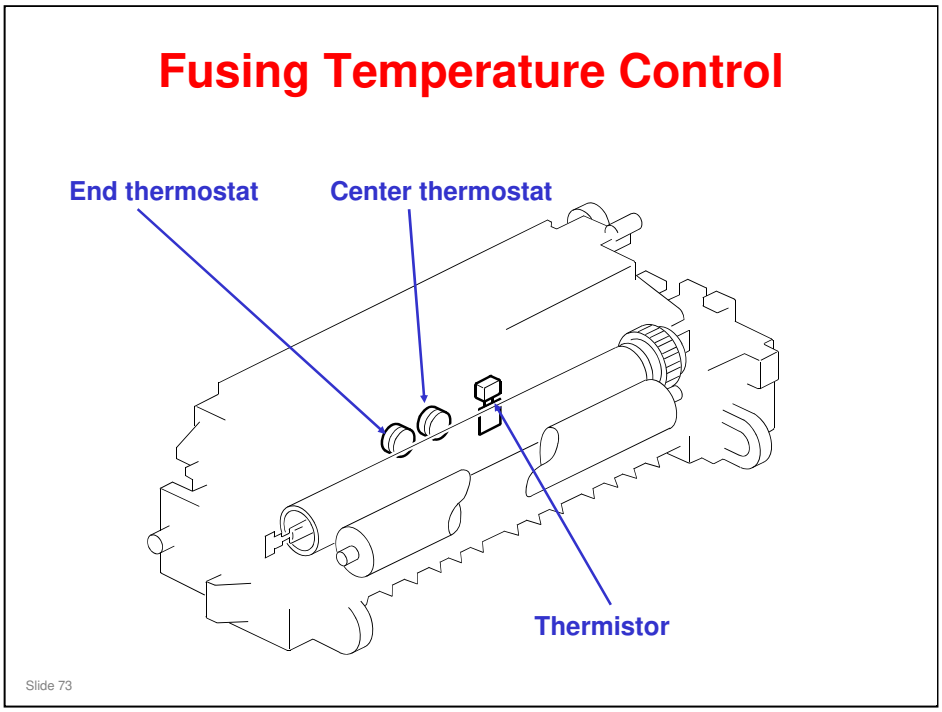
Pressure Release

- When the right door opens (on each side) it pulls open the door catch (on each side). This releases pressure on the pressure roller, allowing the pressure roller to turn freely, assisting in removal of jams.
- When the right door closes, the pressure release lever pushes the door catch closed. This lets normal pressure return.



Separation

- The hot roller stripper pawls (3 stripper pawls) prevent paper from staying on the hot roller.



Temperature Control

- The BICU checks the signal from the thermistor every 1.5 seconds.
- The BICU controls the fusing lamp depending on the following conditions:
  - Current temperature
  - Previous temperature (1.5 seconds before)
  - Target fusing temperature
- The target fusing temperature starts at 180ºC and then goes to 170ºC after one minute.
- Examine the target temperature table in the Service Manual.

Overheat Protection

- The BICU checks the fusing temperature through the thermistor. The copier has five features to safeguard the machine from overheating.
- Feature 1 prevents the machine from overheating.
- Features 2 & 3 are fail-safe features.
- Features 4 & 5: See notes below.

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Overheat Protection

Feature 1

- The BICU switches the fusing lamp off when the fusing temperature gets too high.

Feature 2

- The BICU (Base engine & Image Control Unit) stops the machine when the thermistor detects an abnormal condition. Then the machine will show one of these SC codes: SC 543, SC 544, SC 545, SC 546

Feature 3

- The BICU stops the machine if the thermistor does not work correctly. Then the copier shows SC 541

Feature 4

- The thermostat near the center cuts power to the fusing lamp at 160ºC. The thermoswitch near the end cuts power to the fusing lamp at 170ºC. These thermoswitches are on the same circuit as the fusing lamp.

Feature 5

- The BICU stops the machine if the exhaust fan does not work correctly. Then the machine shows SC 590.
- A defective exhaust fan could cause the machine to overheat.

Energy Saver Modes

- **This model has these energy saver modes:**
  - Low power mode
  - Night/off mode
- **The machine exits energy saver modes at these times:**
  - When the power switch is switched on.
  - When originals are set on the document feeder.
  - When the platen cover is opened.

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Timers

- The engine controller activates the energy saver when in low power mode. (Timers are user-settable.)
- The energy saver timer and the auto off timer start at the same time when the machine ends all jobs or when the user ends all manual operations. The auto off timer does not wait for the energy saver timer.
- If the user sets a smaller value in the energy saver timer, the auto off timer will finish before the energy saver timer. Low power mode will not be activated. At this time, the engine controller starts the night/off mode after the auto-off timer finishes.

Replacement and Adjustments

- **Do these removal procedures: (Reference the Fusing Unit in the Service Manual)**
  - Fusing unit.
  - Exit sensor.
  - Hot roller stripper pawls.
  - Hot roller and fusing lamp.
  - Thermoswitch and thermistor.
  - Pressure roller.
  - Nip band adjustment.
  - Contact release solenoid.

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Replacement and Adjustments

- All parts for the fusing unit have the same PM intervals. You must replace or clean these components at PM 90 K.

Learn More

Core Technology Manual

- Fusing overview
- Stripper Pawls

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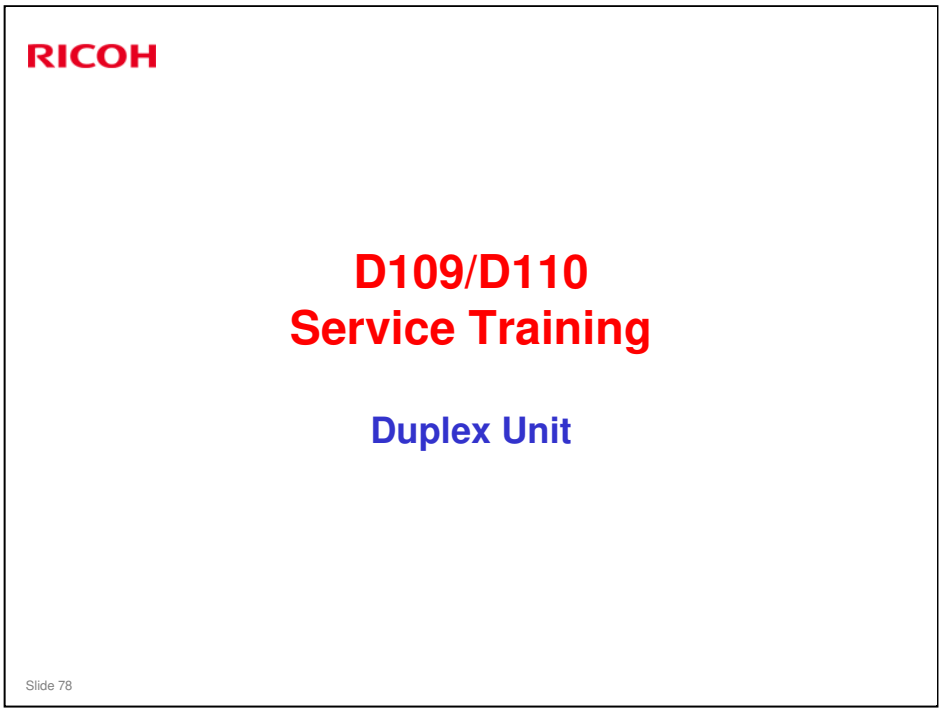
No additional notes.



Duplex Unit

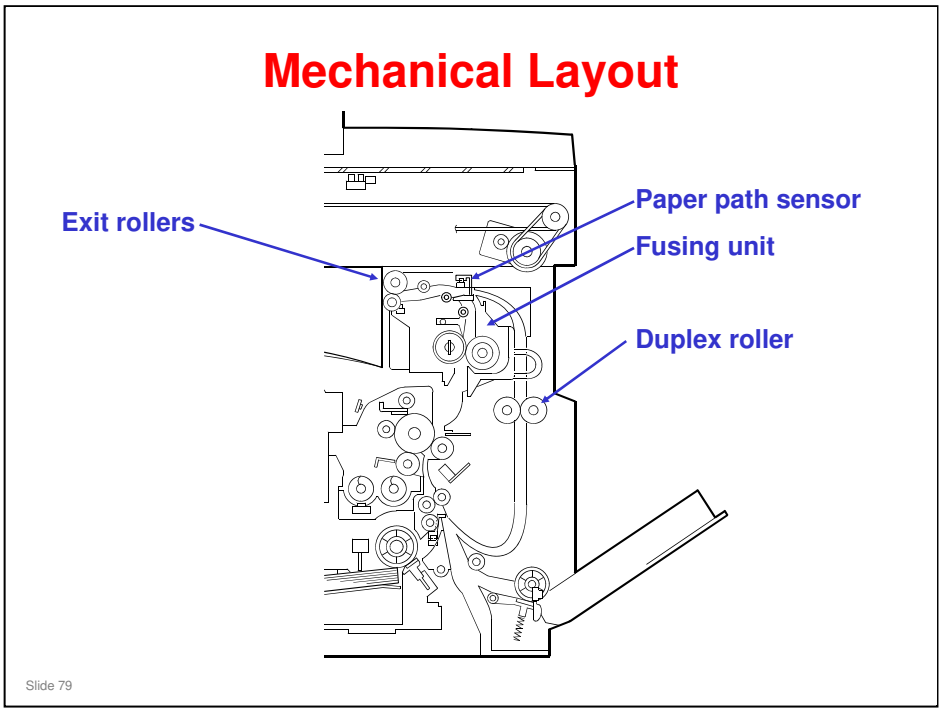
- ❒ The duplex unit will be covered.

In this section you will do these things:

- ❒ Examine the duplex print procedure.
- ❒ Examine the adjustments for the duplex unit.
- ❒ Learn the SP modes used in the duplex unit.

When you finish this section, you should know the answers to these questions:

- ❒ How is duplex printing done with this machine?
- ❒ What do I need to replace or adjust in the duplex unit?



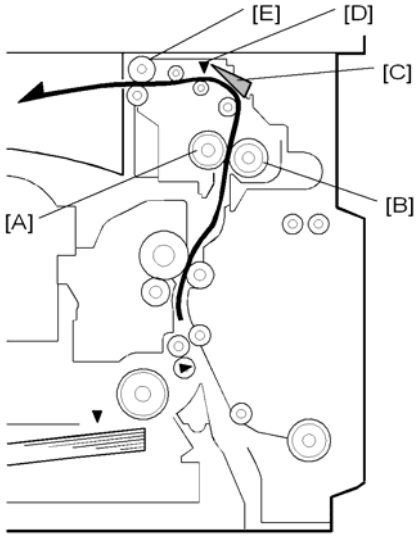
Mechanical Layout

- The exit motor drives the exit roller and duplex roller. One of the paper guides on the fusing unit is linked to the duplex timing sensor.
- The bypass tray cannot be used for duplex printing.

Duplex Printing Process – 1

- **The main steps of the duplex printing process are as follows:**
  1. The controller starts to operate the main motor and duplex motor.
  2. The hot roller [A] and pressure roller [B] transport the paper to the paper guide [C].
  3. The leading edge of the paper pushes the paper guide; the paper guide turns the paper path sensor [D] on.
  4. When the leading edge of the paper reaches the exit roller [E], the exit roller transports the paper.

  (Continued on next slide.)



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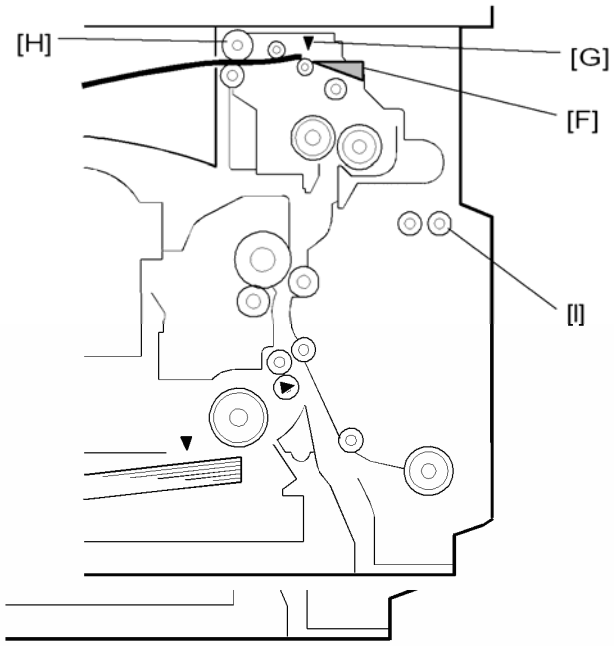
No additional notes.

Duplex Printing Process – 2

- **Continued from previous slide**
  5. When the trailing edge of the paper exits from the paper guide, the paper guide drops to the original position [F] and turns the paper path sensor [G] off.
  6. The controller starts to operate the duplex motor in reverse; the exit roller [H] turns in reverse, transporting the paper to the duplex roller.
  7. The paper goes over the paper guide and reaches the duplex roller [I].
  8. The duplex roller transports the paper into the duplex unit. The paper goes through the unit.

  (Continued on next slide.)



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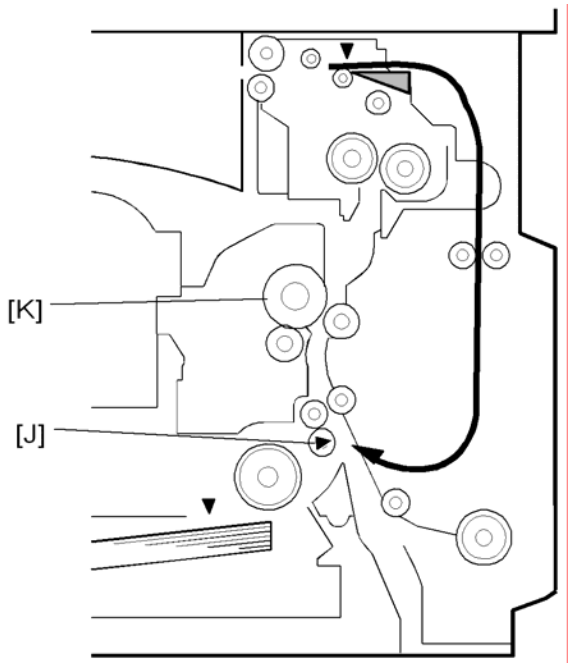
No additional notes.

Duplex Printing Process – 3

- **Continued from previous slide**

9. When the leading edge of the paper reaches the registration sensor [J], the controller stops the duplex motor. The duplex roller holds the paper in the duplex unit.
10. When the OPC drum [K] gets ready for printing, the controller restarts the duplex motor. The duplex roller transports the paper.
11. The duplex roller keeps transporting the paper until the paper reaches the fusing unit.
12. The hot and pressure rollers transport the paper to the paper guide.

(Continued on next slide.)



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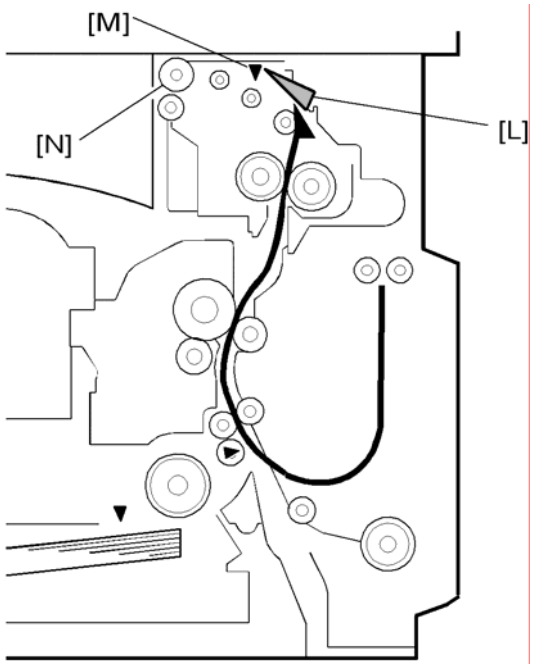
No additional notes.

Duplex Printing Process – 4

- **Continued from previous slide**
  13. The leading edge of the paper pushes the paper guide [L]; the paper guide turns the paper path sensor [M] on.
  14. The controller changes the direction of the duplex motor. The exit roller [N] changes the direction of its rotation, transporting the paper to the copy tray.



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No additional notes.

Adjustment/SP Modes

- **SP Modes: Examine these SP modes in the Service Manual:**
  - SP 1001 3: Leading edge registration
  - SP 1002 6: Side to side registration
  - SP 1003 5: Paper feed timing
  - SP 2301 3: Transfer current timing
  - SP 7504 60: Off registration duplex
  - SP 7504 123: Off duplex inverter
  - SP 7504 125: On duplex inverter

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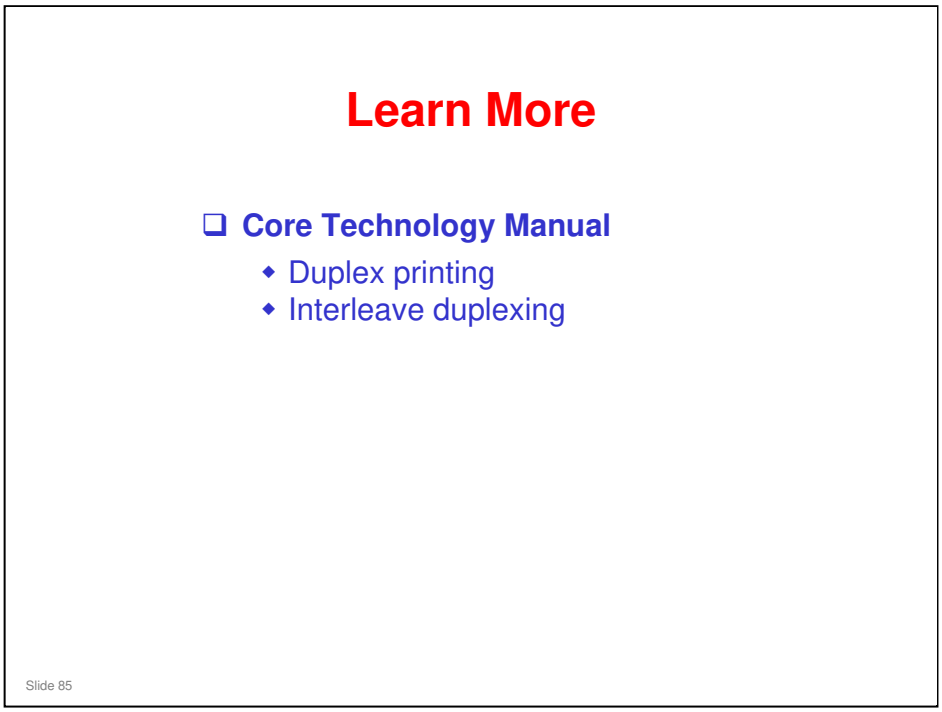
No additional notes.



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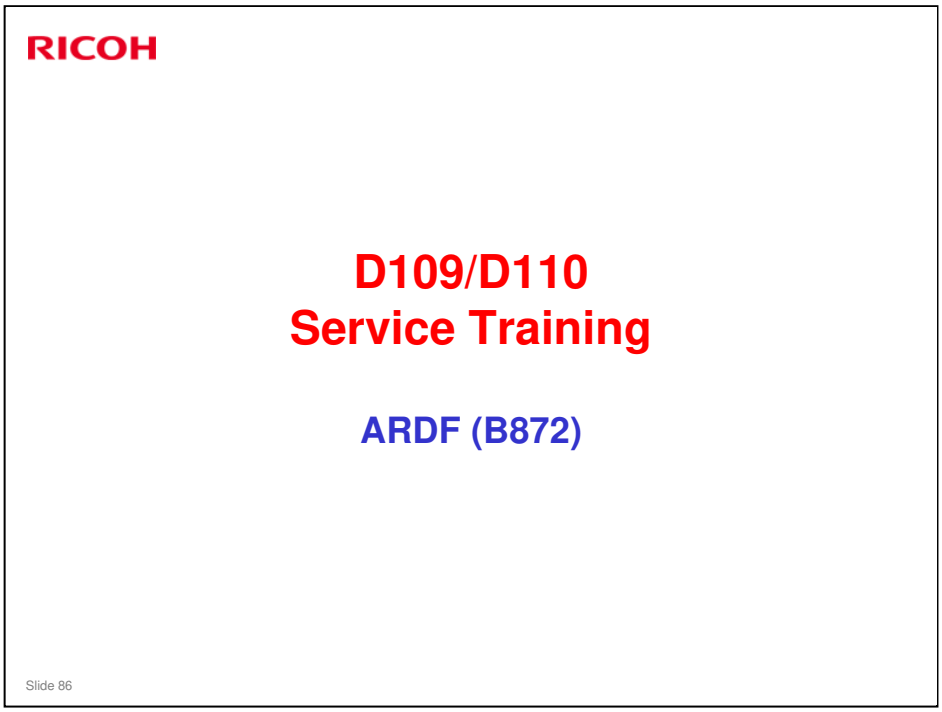

Automatic Recycling Document Feeder (ARDF) (B872)

- ❒ The ARDF will be discussed.

In this section you will do these things:

- ❒ Examine the mechanical layout for the ARDF.
- ❒ Examine the feed process.
- ❒ Review the replacement and adjustment procedures.

When you finish this section, you should know the answers to these questions:

- ❒ Are the optics fixed or do they move for original scanning?
- ❒ What paper sizes can the ARDF handle?

Specifications

- **Paper sizes:**
  - A4 SEF, A5 SEF
  - 8½" x 5½" SEF, 8½" x 14" SEF
- **Paper weight: 52-105 g/m² (14-28 lb)**
- **Tray Capacity: 50 sheets (80 g/m², 21 lb)**
- **Transport: Roller transport**
- **Feed order: Top first**
- **Separation: FRR (Feed and Reverse Roller)**
- **Original transport: Roller transport**
- **Reproduction range: 50-200%**
- **Power source: 24 and 5 Vdc from the copier**

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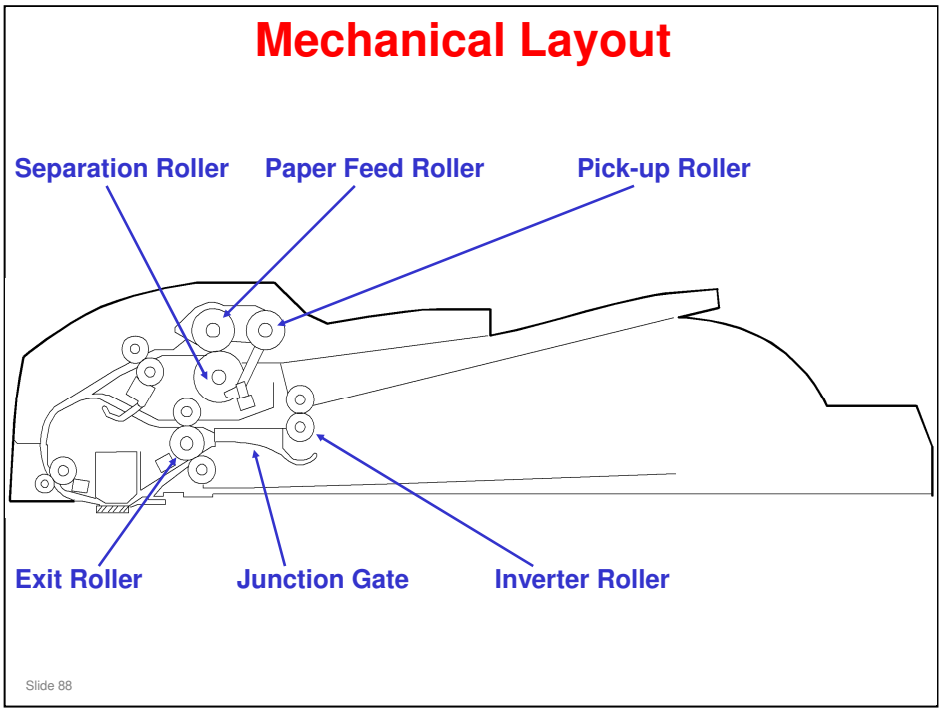
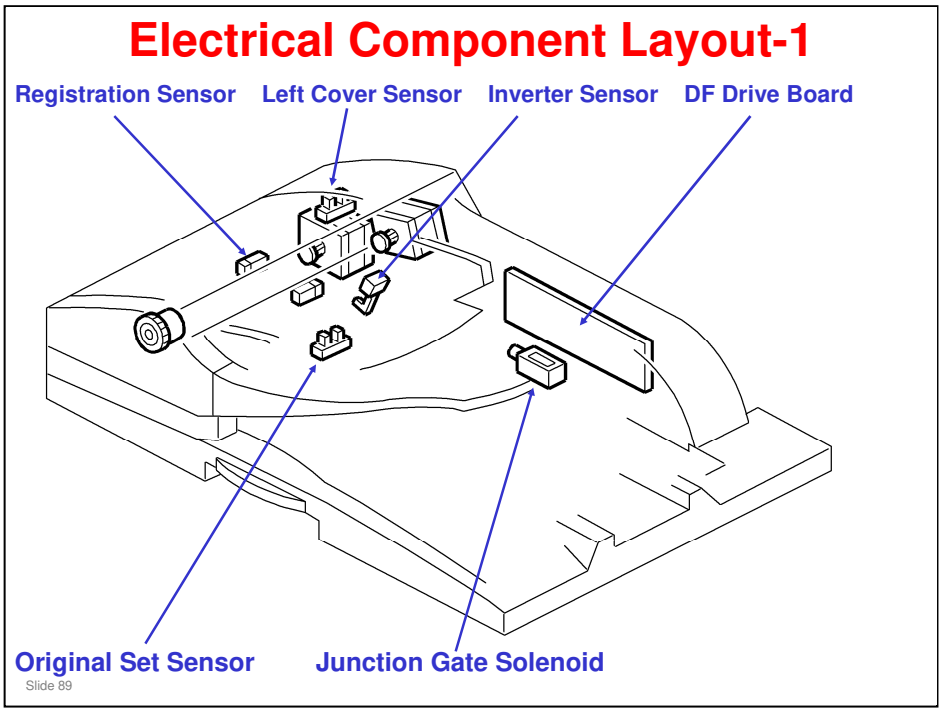
Specifications

- The ARDF is optional.



Mechanical Layout

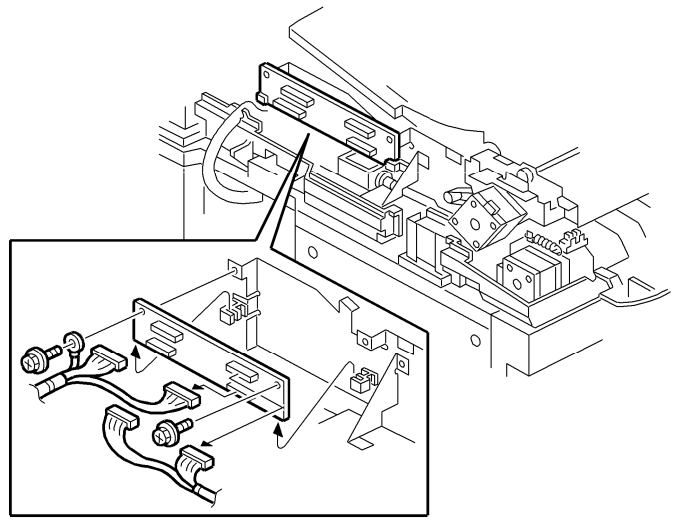
- This slide shows some of the components for the ARDF. See the ARDF DF1000 (B872) Service Manual for full details and technical drawings.



No additional notes.

Electrical Component Layout-2

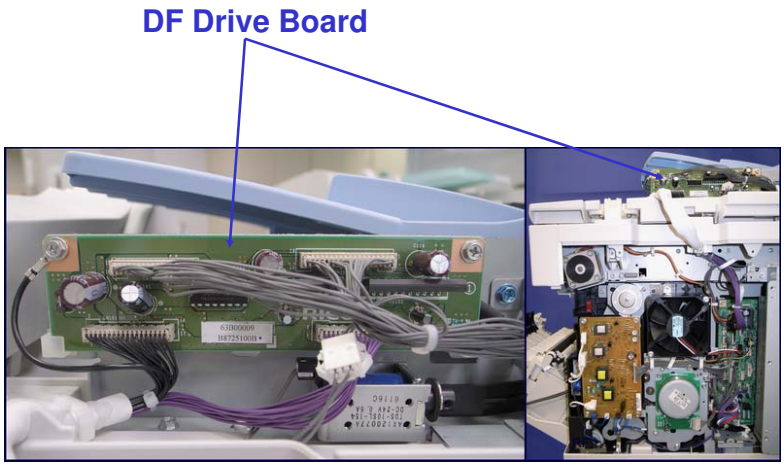
DF Drive Board



Slide 90

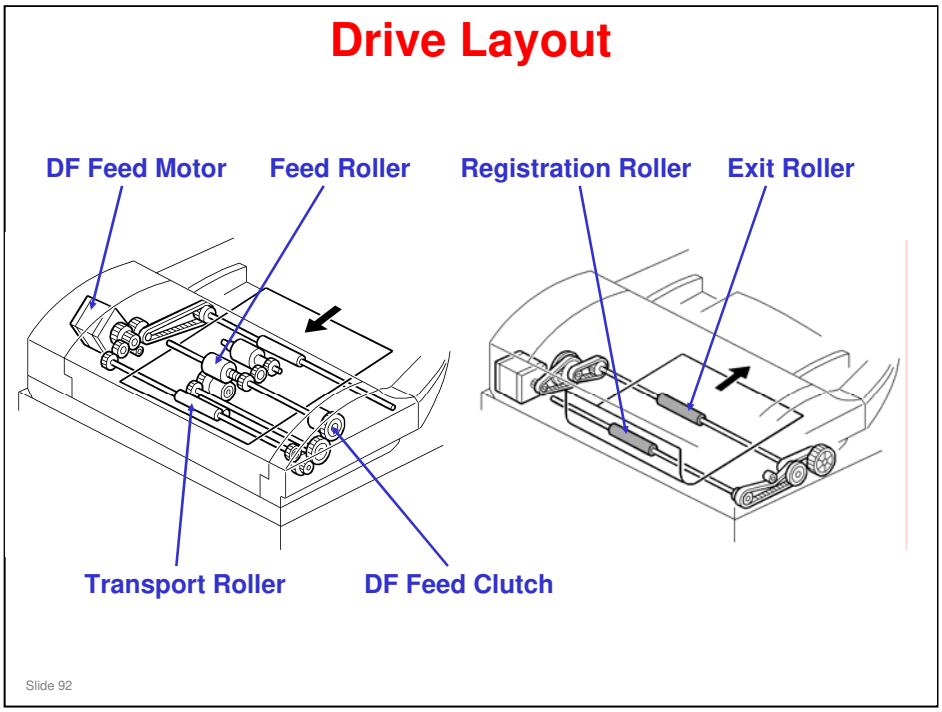
No additional notes.

Electrical Component Layout-3



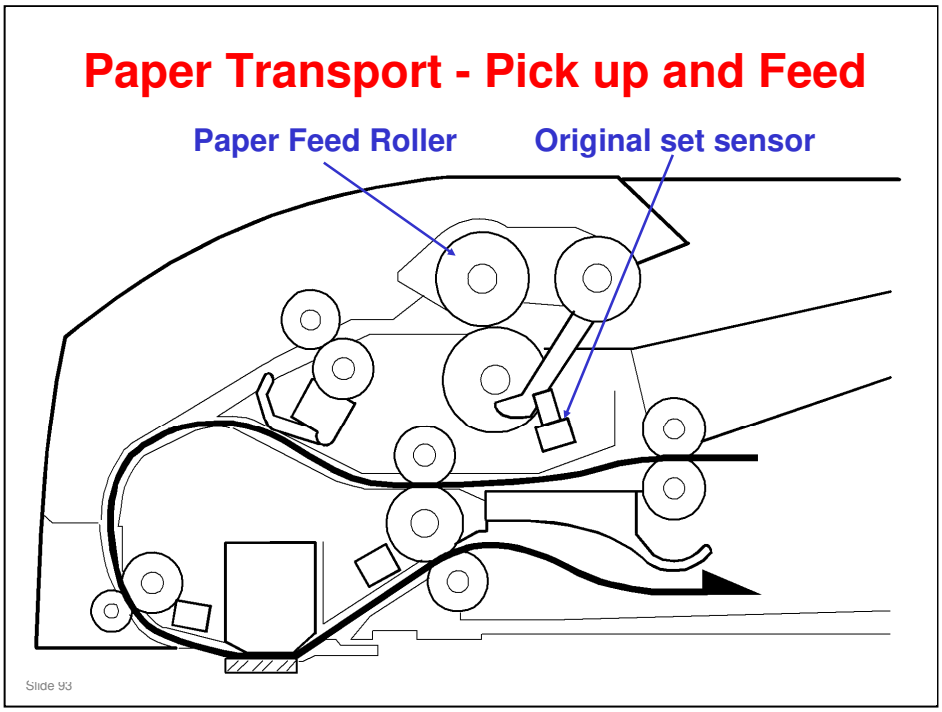
Slide 91

No additional notes.



Drive Layout

- This slide shows the major components. Refer to the ARDF DF1000 (B872) Service Manual for full details and technical drawings.



Original Size Detection

- ❒ The original pushes down the feeler of the original set sensor when you put an original on the feeder table.
- ❒ The copier exits energy saver mode (if energy saver mode is enabled).
- ❒ The ARDF does not detect paper sizes.

Paper Transport Pickup and Separation

- **Separation:**
  - The ARDF uses an FRR (feed & reverse roller) system.
  - The DF-Feed Motor drives the DF pickup roller, DF feed roller, DF separation roller, and transport roller.
  - The pickup roller drives the top sheet(s) between the feed and separation roller, where the top sheet is separated and fed to the transport rollers.
- **Clutch Operation:**
  - The DF feed clutch stops feeding when the original is fed to the inverter tray in double-sided mode. If the DF feed clutch didn't stop pick-up, feed, and separation rollers in double-sided mode, the next original would be fed while the first original was at the inverter tray and an original jam would occur.

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No additional notes.

Paper Transport – Two-sided Originals

- **Two-sided Transport Details**
  - After an original has been fed to the registration sensor by the transport roller, the DF feed motor stops briefly.
  - After the scanner moves to DF scan position, the front side of the original is scanned.
  - When the exit sensor detects the leading edge of the original, the junction gate solenoid is activated, opening the junction gate.
  - The original is then transported towards the inverter table.
  - After trailing edge of original passes the exit sensor, the junction gate solenoid switches off and the junction gate is closed.
  - Following feeding of the original onto the inverter table, feed and transport motors stop.
  - The feed motor rotates in reverse and the original is fed to the exit roller by the inverter roller.
  - Feed motor stops briefly to adjust original skew. After adjusting, original is fed again by exit roller and registration roller to the scanning area (where the reverse side will be scanned)
  - Original is then sent to inverter table again to be turned over, enabling duplex output to be properly stacked front side down in the exit tray.

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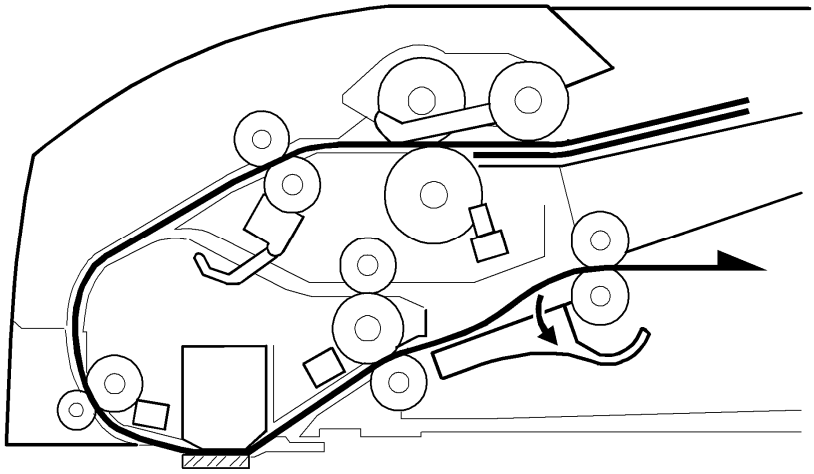
See technical drawings on following pages for illustrations of ARDF operation.

Paper Transport - Two-sided Originals 1



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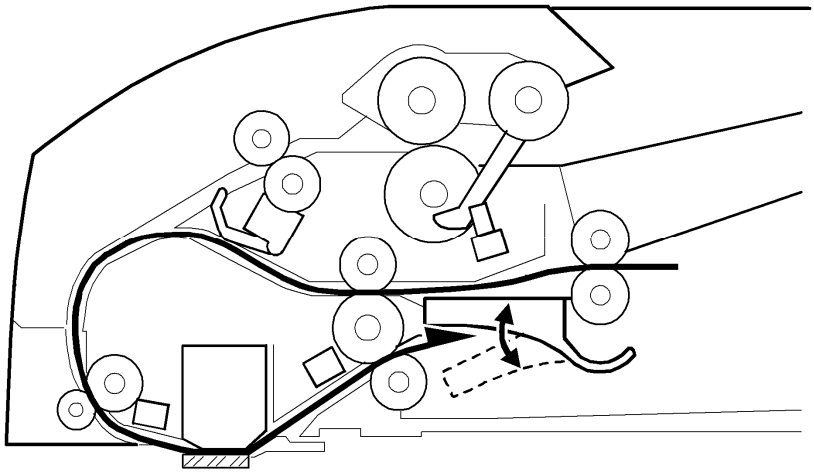
No additional notes.

Paper Transport - Two-sided Originals 2



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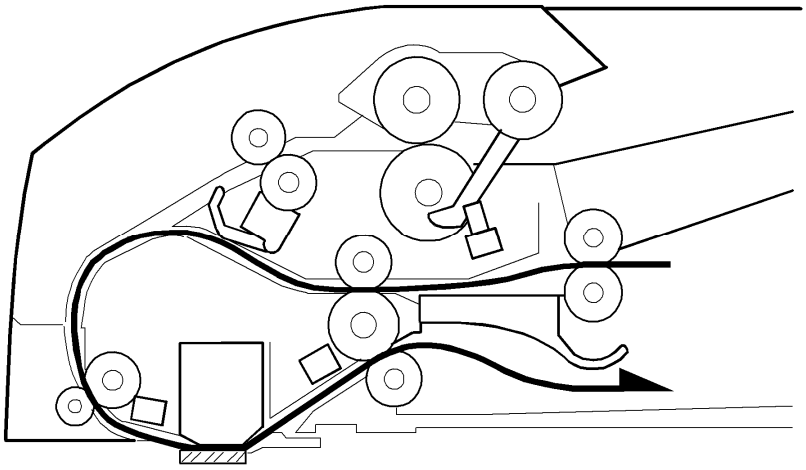
No additional notes.

Paper Transport - Two-sided Originals 3



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No additional notes.

Replacement and Adjustment

- **Before you start:**
  - Remove the exterior cover and original table. (See Replacement and Adjustment section of ARDF DF1000 (B872) Service Manual)
- **Practice the removal procedures for the following as outlined in the Service Manual**
  - Pick-up roller
  - Paper feed roller
  - Separation roller
  - DF feed motor
  - DF feed clutch
  - Sensors
  - DF drive board

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No additional notes.

SP Modes and SC Codes

- **These SP modes are used for the ARDF:**
  - SP 6006 1: Side to side/front registration
  - SP 6006 2: Leading registration
  - SP 6006 3: Trailing erase
  - SP 6006 5: Sub-scan magnification
  - SP 6009 1: ARDF free run in duplex mode
  - SP 6009 3: ARDF free run in simplex mode
  - SP 6910 1: ARDF shading time
- **These SC codes are for the ARDF. They are all level "B" error codes:**
  - SC 760: DF gate error 1
  - SC 761: DF gate abnormal 2
  - SC 762: DF gate abnormal 3
- **Practice using the above SP modes if you are unfamiliar with them.**

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No additional notes.

Preventive Maintenance

- **These need to be replaced at PM interval 90K:**
  - Separation roller
  - Pick-up roller
  - Feed roller
- **Clean the remaining parts when necessary.**

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No additional notes.

Paper Tray Unit (B421)

- ❒ The optional paper tray unit will be discussed.

In this section you will do these things:

- ❒ Examine the mechanical layout for the paper tray unit.
- ❒ Examine drive and paper lift.
- ❒ Learn how the paper tray unit detects the paper end.
- ❒ Replace the friction pad and feed roller.

When you finish this section, you should know the answers to these questions:

- ❒ What feed mechanism does the paper tray unit use?
- ❒ How is the paper end detected?
- ❒ Which components will I need to replace?

Overview

- **The paper tray unit is an option for this machine.**
- **The paper tray unit uses standard mechanisms for these:**
  - Paper feed (friction pad method)
  - Paper lift (springs)
  - Paper end detection (feeler method)
- **The paper tray unit does not have any mechanism to detect paper size. If you want to change the paper size, you must set the new paper size in the machine memory with a user tool. This will prevent timing jams.**

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No additional notes.

Specifications

- **Paper sizes:**
  - A4 SEF
  - 8½" x 11" SEF
  - 8½" x 13" SEF
  - 8½" x 14" SEF
- **Paper weight: 60-90 g/m² (16-24 lb)**
- **Tray Capacity: 500 sheets**
- **Paper feed system: Feed roller and friction pad**

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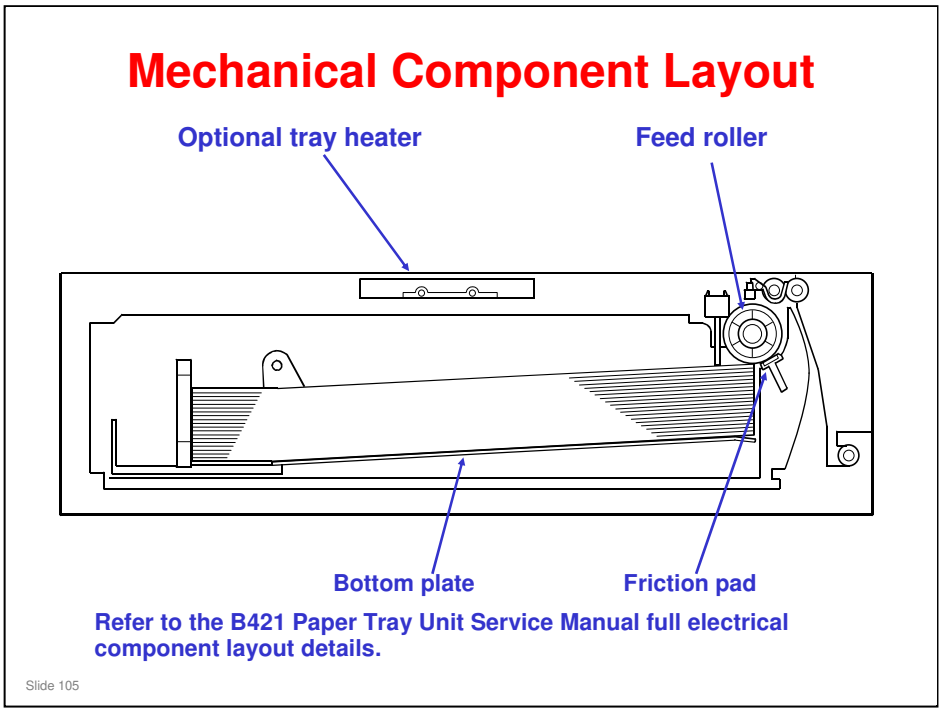
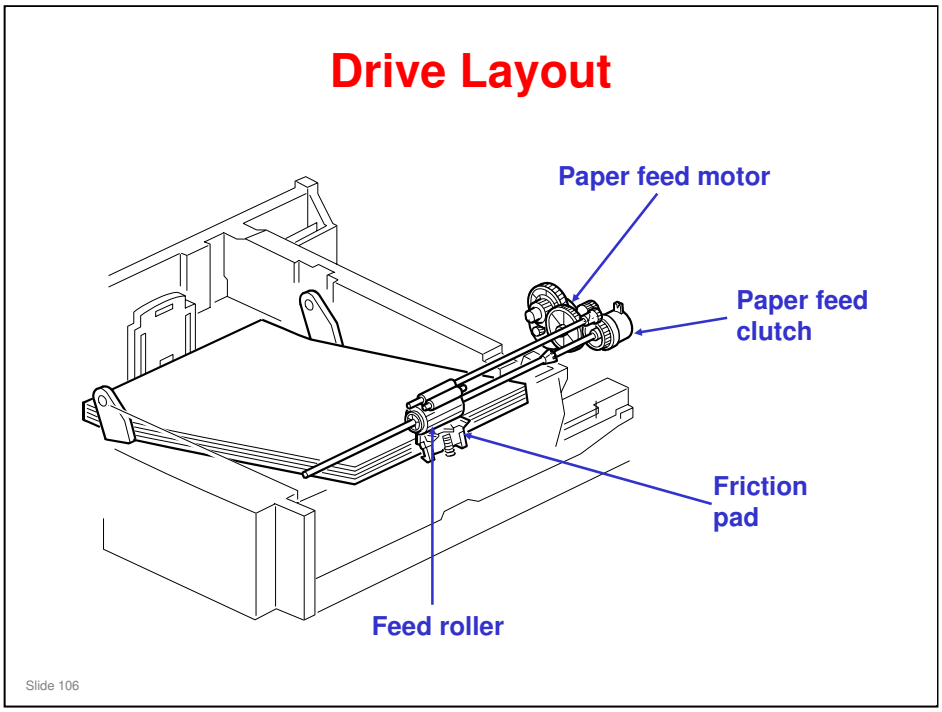
No additional notes.

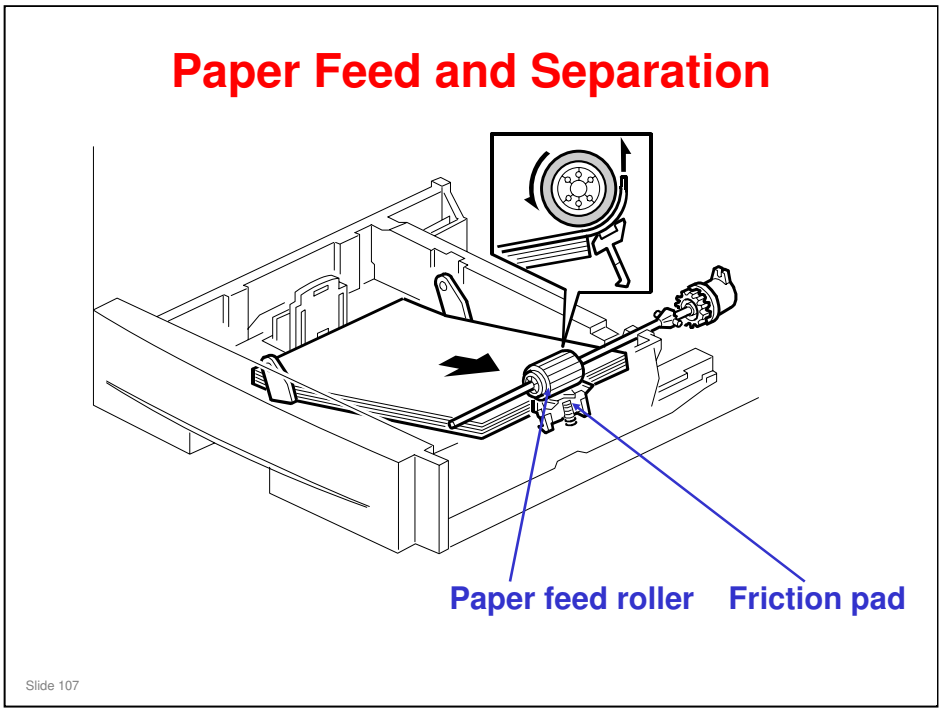


No additional notes.



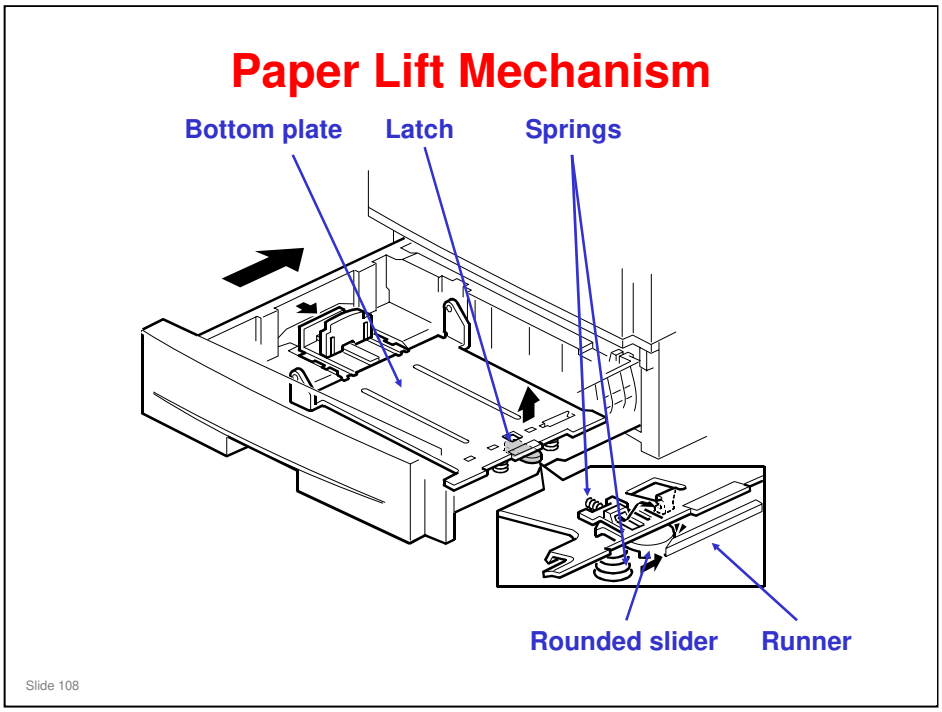
Drive Layout

- ❒ Find these components if you're not already familiar with them.



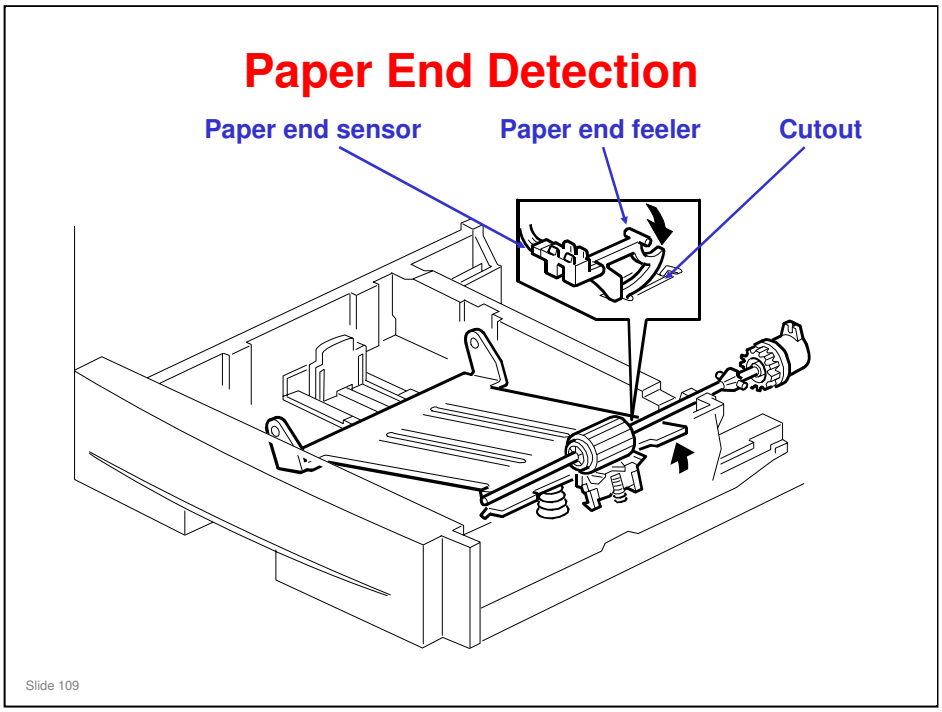
Paper Feed and Separation

- ❒ Find these components if you're not already familiar with them.



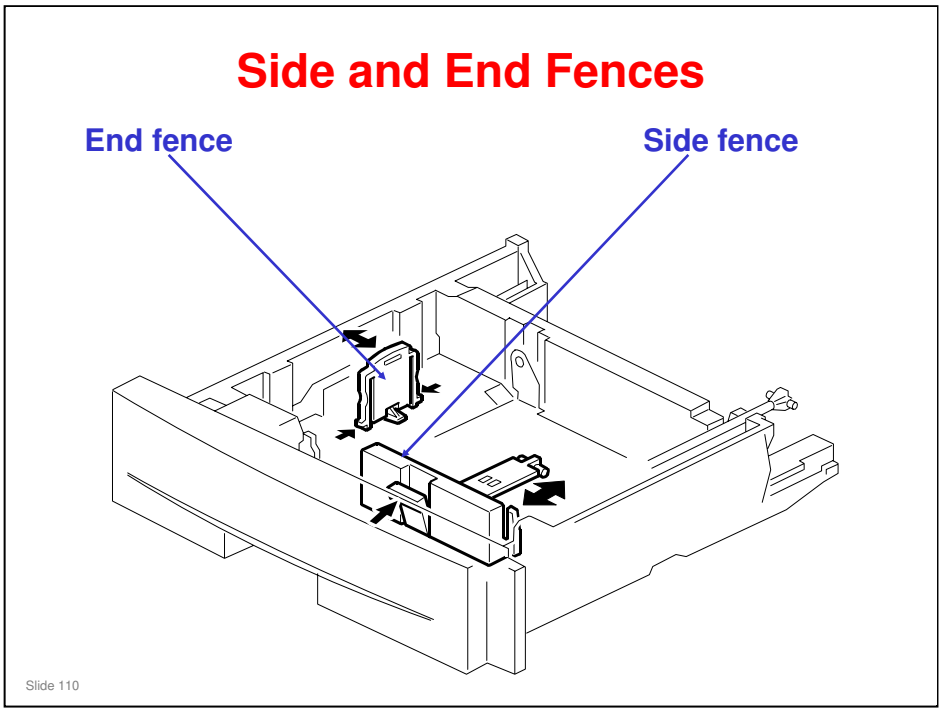
Paper Lift Mechanism

- When you push down the bottom plate, the latch will set, locking the plate down, compressing the spring below.
- After loading in paper, when you push the paper tray back into the machine, the runner pushes the rounded slider, releasing the latch. Then the compressed springs push the plate up and keep the latch retracted (preventing the plate from becoming locked down under a full load of paper.)



Paper End Detection

- If there is some paper in the tray, the feeler will push up and sense this.
- If there is no paper in the tray, the feeler drops in the cutout and activates the sensor.
- The feeler is rounded and moves when the tray is pushed in or out, preventing the feeler from getting caught in the tray.



Side and End Fences

- Side Fence: Set width to A4, 81/4", or 81/2".
- End fence: Set from 11" to 13", with standard settings at 11", A4, and 13". To feed 14" paper, the end fence must be removed (and stored in an internal storage compartment).
- You can secure both fences with screws at standard positions.

Replacement and Adjustment

- **Examine how to remove the paper tray unit from the machine before you do the replacement procedures. (Read Paper Tray Unit section of Service Manual.)**
- **You will usually have to replace these (PM interval every 120K) in the field due to normal wear and tear. Practice these removal procedures:**
  - Feed roller and friction pad
  - Sensors
  - Drive block
  - Paper feed motor
  - Paper feed clutch
  - Tray main board
  - Clean the bottom plate when necessary

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No additional notes.

Preventive Maintenance

- ❒ PM intervals for the machine will be covered.

In this section you will do these things:

- ❒ Examine the PM table.
- ❒ Learn how to clear the PM counter.

Before You Start

- Make sure you understand all warnings and precautions before you service the machine.
- Most parts have a PM interval of 90 K (the PCU has a PM interval of 45 K).
- Some parts require cleaning only. You do not need to replace these parts.
- You must clear the PM counter with SP 7804 after you do a PM schedule.
- Read these:
  - Preventative Maintenance chapter of the Service Manual
  - How to clear the PM counter (SP 7804-1)

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No additional notes.

Copy Image Adjustments–Overview

- **You need to do copy image adjustments if you do these:**
  - Do a memory all clear
  - Replace the first or second scanner
  - Replace the lens block
  - Replace the polygon mirror
  - Replace the paper tray

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No additional notes.

Printing Adjustments

- Leading edge registration: Check this for each paper tray. Use SP 1001 and make sure the registration is set to the correct tolerance levels.
- Side to side registration: Use SP 1002 and make sure the registration is set to the correct tolerance levels.
- Blank margin: Adjust the leading edge and left edge margins only if you could not correctly adjust the registration.

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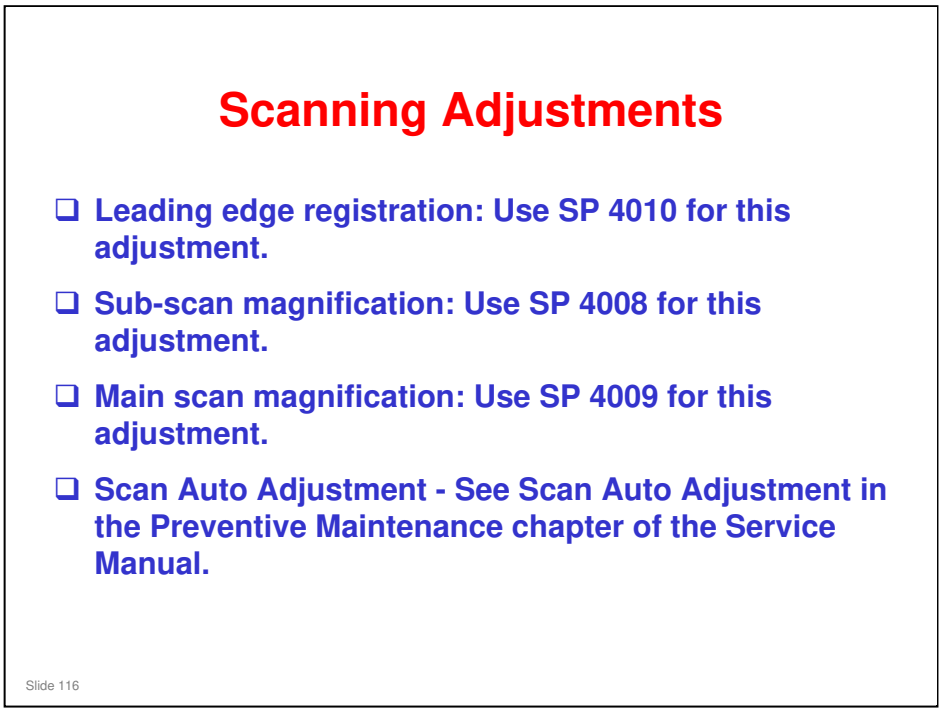
Printing Adjustments

- Make sure the paper is set correctly in the paper tray before starting.
- Use SP 5902 to print the test pattern to check the adjustments.

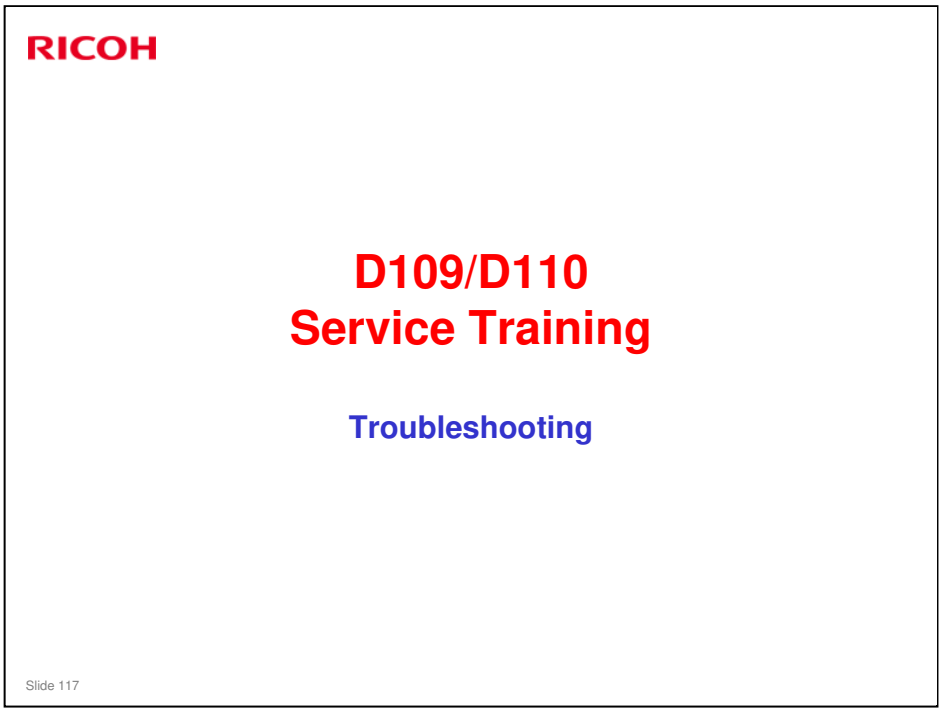
Blank margin:

- Adjust the margins in this order:
  - Trailing edge
  - Right edge
  - Leading edge
  - Left edge



Scanning Adjustments

- Do the registration and blank margin adjustments for printing before you adjust the scanner. Use the A4 test chart to perform all adjustments.

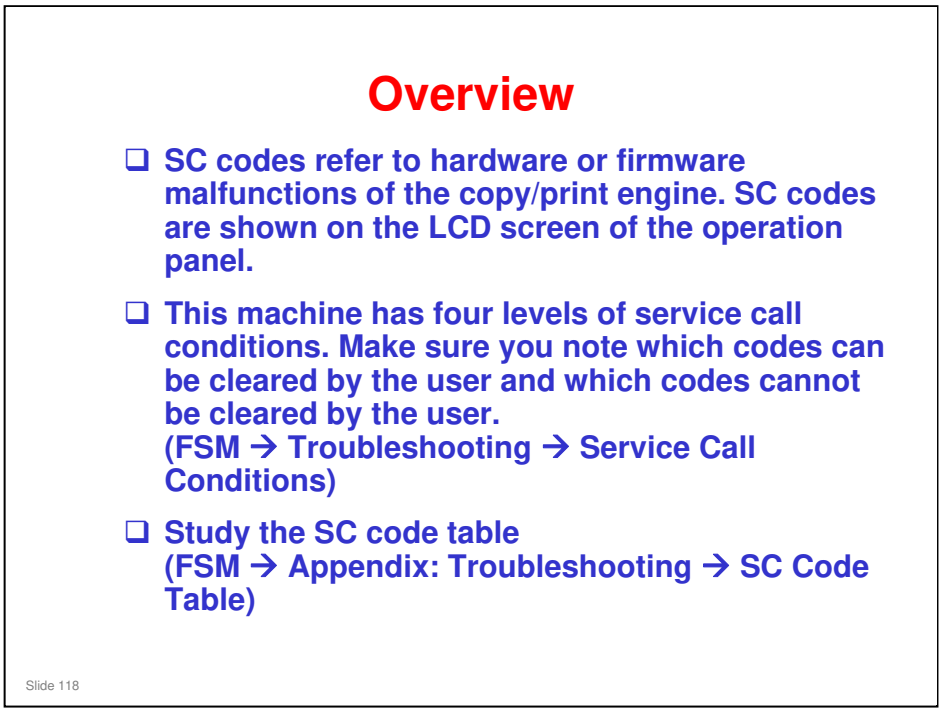


In this section you will do these things:

- ❒ Examine the error codes and SC code tables.
- ❒ Examine sensor and switch errors.
- ❒ Check machine functions.

When you finish this section, you should know the answers to these questions:

- ❒ How do I troubleshoot this machine?
- ❒ What machine checks can I do in the field?



Overview

Examine these before you replace any component in the machine:

- If the problem is with circuit boards: Disconnect and then reconnect all connectors before you replace a circuit board.
- If the problem is with a motor lock: Examine the mechanical load before you replace a motor or sensor.

Sensor/Switch Open Errors

- Study the Sensor/Switch Open Errors table. This table explains symptoms the machine will exhibit when a sensor or switched circuit is in an open condition.
- Open the front or right door. Make sure the “Close Front/Right Cover” message is indicated on the screen.
- Do some of the open sensor examples. Make sure you do not damage the connectors.

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No additional notes.

Blown Fuse Conditions

- Read the Blow Fuse Conditions section of the Troubleshooting unit of the Service Manual. It shows what happens if one of the fuses blows on the power supply board.
- Pull the copy tray out to simulate a blown fuse condition.

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No additional notes.

Machine Functions

- **Do these practical assignments to learn more about how to troubleshoot the machine:**
  - Test patterns: Print several of the test patterns indicated in the “Test Pattern Print (SP 5902-1)” section of the Service Tables unit in the Service Manual
  - Output check: Use the output check mode to test the operation of the polygon motor, main motor, and fan motor.
  - Free run
    - » Scanner, SP 4013
    - » Machine, SP 5802
    - » Printer, SP 5901
    - » ARDF, SP 6009

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No additional notes.

Sensors and Switches

- **Practice these to learn how to troubleshoot the sensors and switches:**
  - Input check: This lets you check the condition of most sensors and switches in the machine.
  - ID sensor analysis (SP 2221) lets you check these:
    - » Vsg (displayed as Vg)
    - » Vsp (displayed as Vp)
    - » Power (displayed as PW. This is the power for the light source.)
    - » Vsdp (displayed as Vg-Vp. This value does not have any error conditions.)
    - » Vt

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No additional notes.