- K-C3.5L: Started 26 November, 2010
- First draft: 2 December, 2010
- Release 3 December, 2010
- 8 December, 2010: Several slides modified for easier Chinese translation. No content changes.

Contents

Slide 2

No additional notes.

No additional notes.

Product Codes

- **There are two versions of Model K-C3.5L – K-C3.5Lb (simplex) and K-C3.5Lcd (duplex).**
- **K-C3.5Lb Product Codes**
  - B268-50 (Asia-Pacific)
  - B268-59 (Taiwan)
  - B276-67 (Europe)
- **K-C3.5Lcd Product Codes**
  - B269-49 (Asia-Pacific)
  - B269-59 (Taiwan)
  - B244-61 (China)
  - B277-67 (Europe)

Note: In this course we will refer to the two versions as K-C3.5Lb and K-C3.5Lcd.

Slide 4

No additional notes.

The Machine

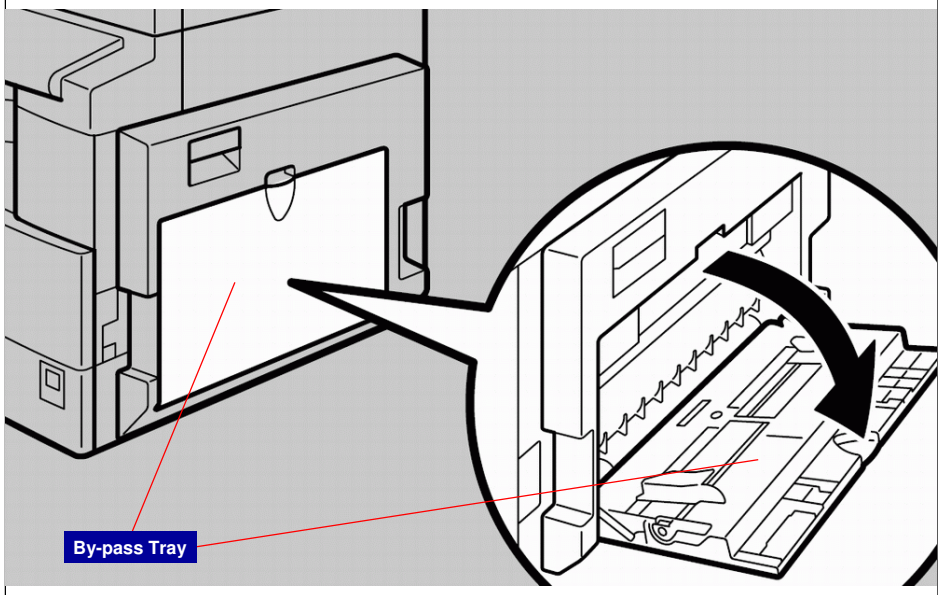
This is the machine you will study in this training course. Note the following:

- Paper trays
- Bypass tray
  - » On right side of machine
    - – See next slide
- Operation panel
- ADF/ARDF (optional)

Slide 5

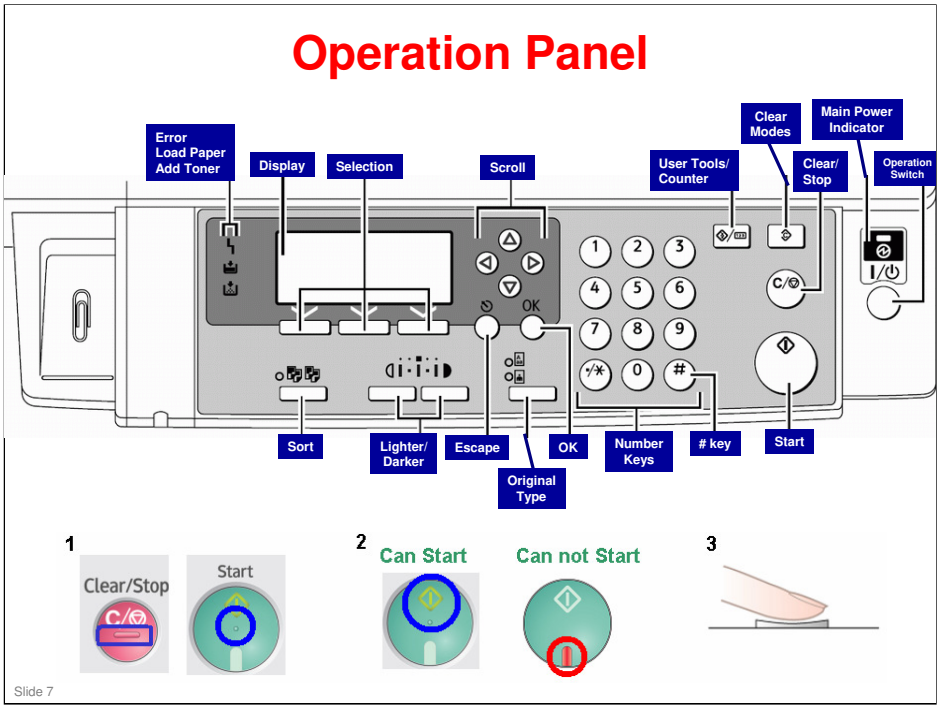
No additional notes.

Bypass Tray

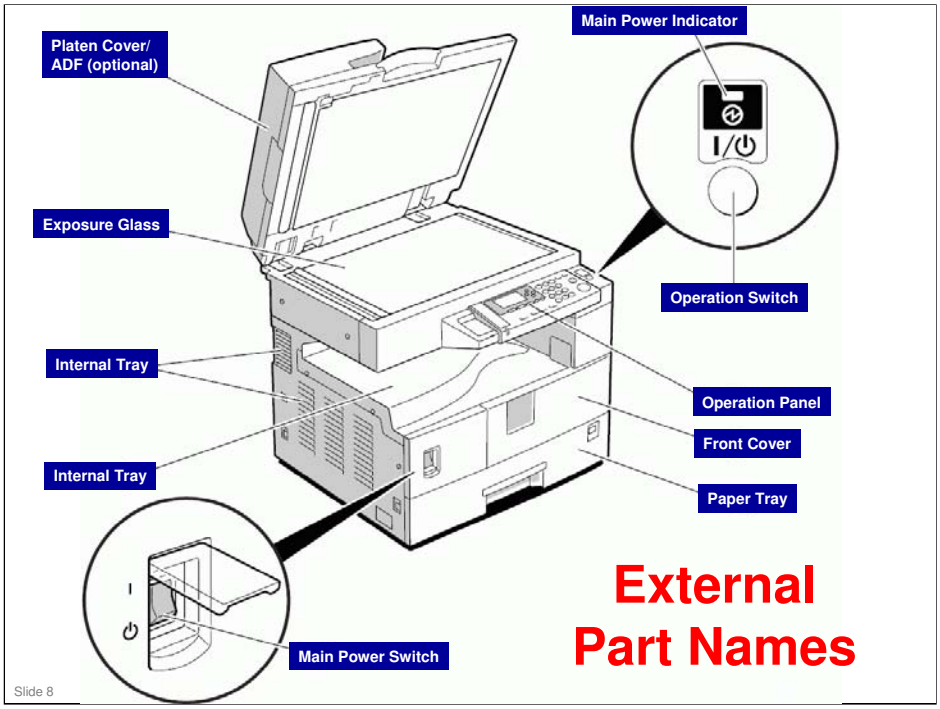


Slide 6

No additional notes.

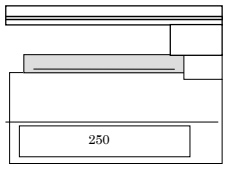


No additional notes.



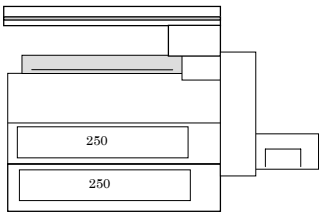
"Operation Switch" refers to the Operation Panel Power Switch.

Standard Components



K-C3.5Lb Mainframe

- Copy/Printer/Twain Scanner
- 16MB Memory
- 16MB+32MB memory (w/o NIC model)
- 250-sheet x1 tray
- 100-sheet bypass tray
- 250-sheet output tray
- USB 2.0



K-C3.5Lcd Mainframe

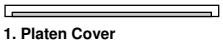
- Copy/Printer/Twain Scanner
- Duplex
- 16MB Memory
- 16MB+32MB memory (w/o NIC model)
- 250-sheet x2 tray
- 100-sheet bypass tray
- 250-sheet output tray
- USB 2.0

Slide 9

No additional notes.

Optional Units

- **The external optional units are shown to the right.**
- **Internal option:**
  - NIC (Network interface card)

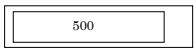


1. Platen Cover

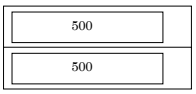
2. ADF

3. ARDF: Only for K-C3Lcd

4. 1 Bin Tray: Only for K-C3Lcd



5. 1-tray paper bank



6. 2-tray paper bank

7. Accessibility handles for standard and optional trays

Slide 10

No additional notes.

No additional notes.

General Specifications

- **Configuration**
  - Desktop
- **Scanning system**
  - Flatbed with CCD sensing elements
- **Printing process**
  - Laser beam exposure
  - Dry, dual-component development system
- **Zoom**
  - 50% to 200% in 1% steps
- **Power Consumption**
  - Full system
    - » Less than 1.28 kW
  - Reduced Electrical Consumption via Lower Power mode
    - » Less than 1 W.
  - See Energy Saver Modes for more details.
- **Print speed**
  - K-C3.5Lb: 16 cpm (18 cpm for B268-50)
  - K-C3.5Lcd: 20 cpm
- **First copy time**
  - Less than 6.5 seconds (A4/8½" x 11" LEF)
- **Warm-up**
  - Less than 15 seconds

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- Refer to the field service manual for detailed specifications.

No additional notes.

Install the Copier

- **Procedure: *Copier Installation* (see field service manual)**
- **Developer Initialization must be performed via SP-2214-1**
  - After installing machine & all options, and making all test copies, record value of total counter.
    - » This is very important, because this value will be used for billing with Meter Click contracts.
    - » Also, inform customer of value along with reason why counter does not start from zero.
      - – Do not set to zero.

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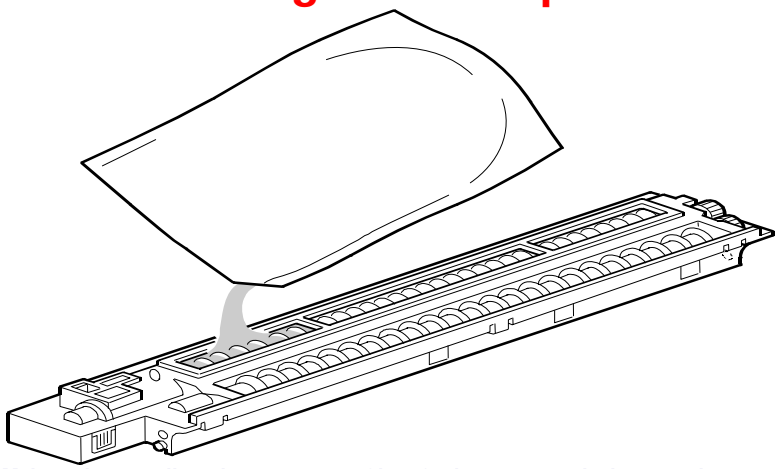
No additional notes.

Putting in Developer



- Make only a small cut in top corner of bag for better control when pouring.
- Make sure not to spill developer on the gears.
- If you have to turn the gears to distribute developer evenly, make sure to do so very slowly and as little as possible. Otherwise developer may spill.
- After pouring in developer, initialize it with SP-2214-1.

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No additional notes.

Installation of Options

- **Install the following options. See the FSM for all procedures.**
  - Platen Cover, ADF, or ARDF
    - » Only one of these can be installed.
  - Network Interface Board
    - » This NIB is new with this product.
  - Two-tray Paper Tray Unit
  - One-tray Paper Tray Unit
  - One-Bin Tray
- **Special Options (GW controller)**
  Install the following if required. These options have their own separate service manuals.
  - Printer/Scanner Unit Type 2000
  - Fax Option Type 2000

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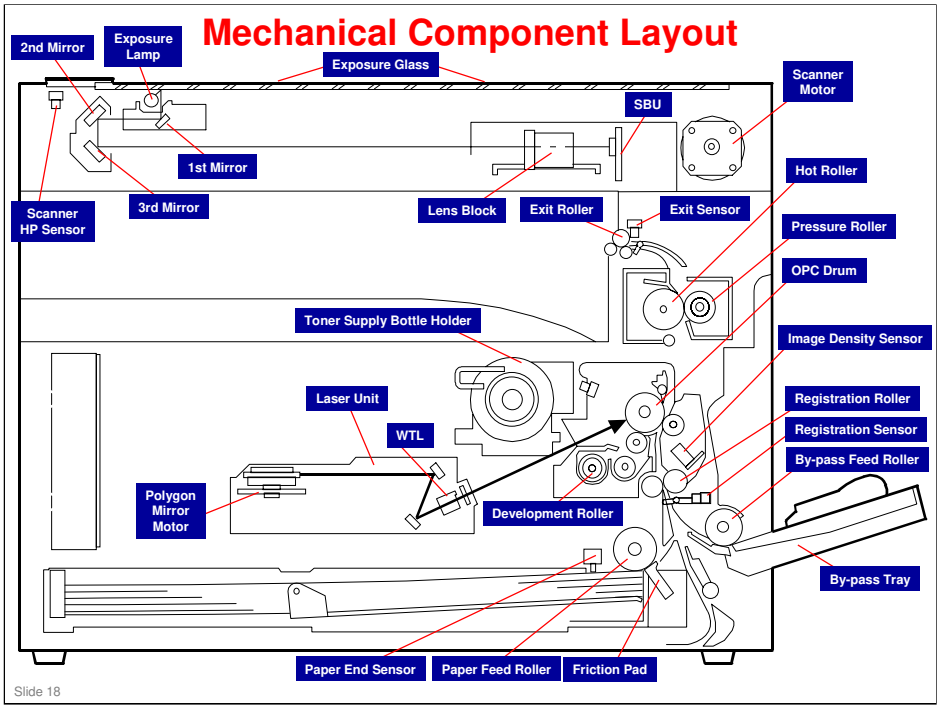
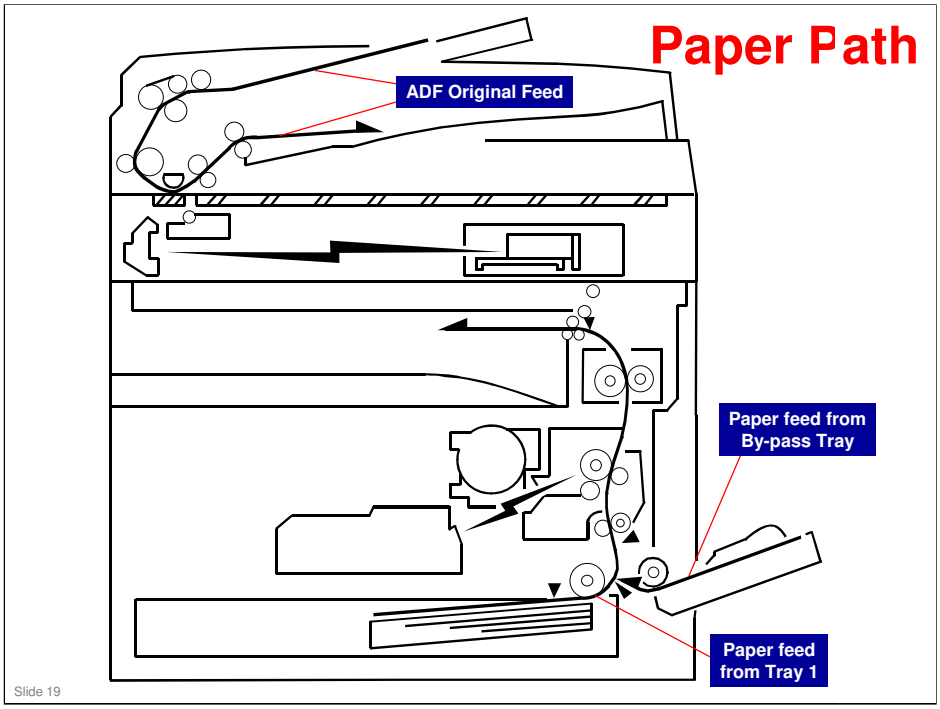
No additional notes.

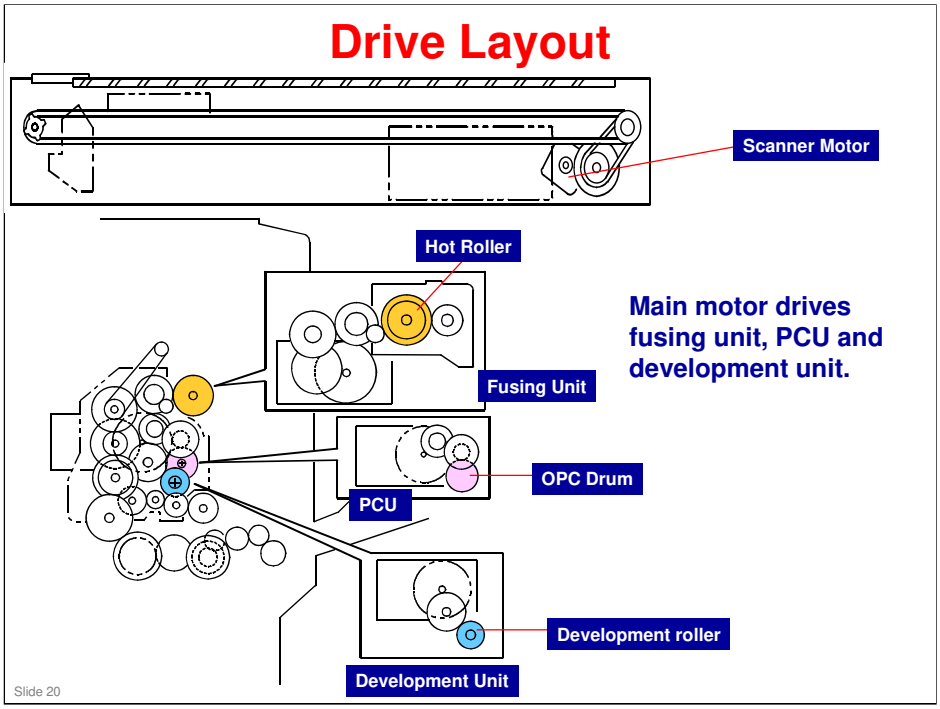
No additional notes.



No additional notes.

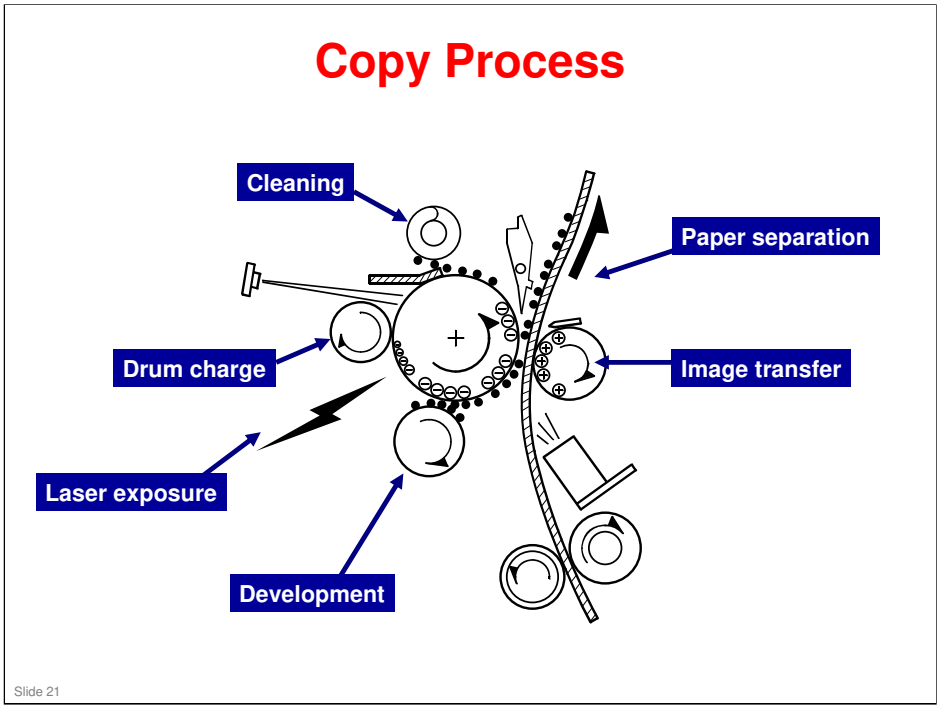


No additional notes.



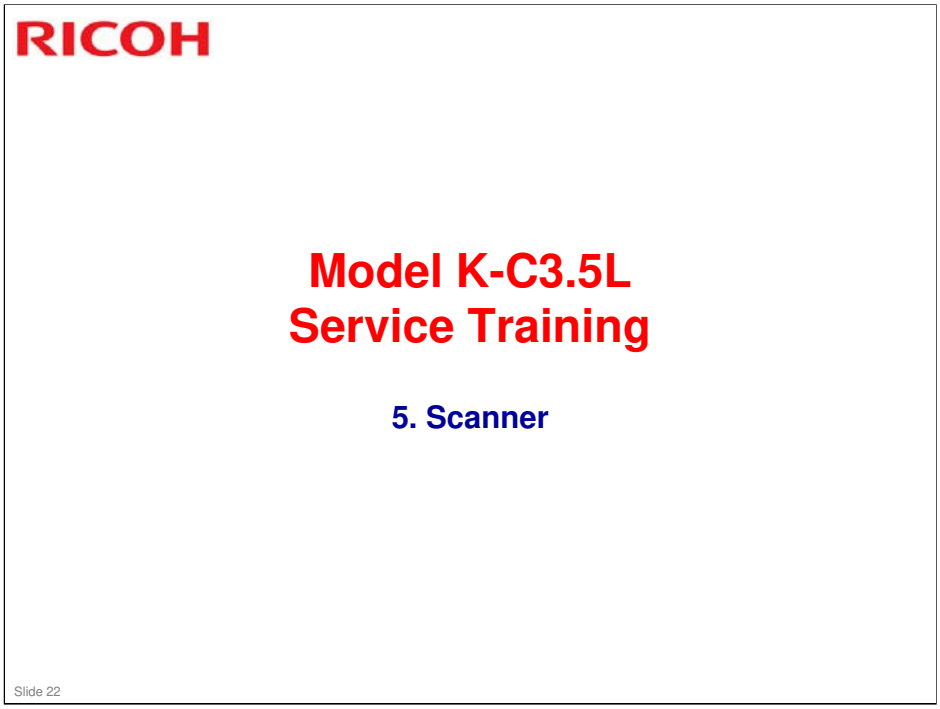
More on Drive Layout

- The top diagram shows the scanner. The scanner has one motor.
- The bottom diagram shows how the main motor drives the fusing unit, PCU, and development unit.
- The three insets on the right hand side show the main motor and the gear trains to these three units.
- The main motor also drives the paper feed mechanisms via the train of gears in the lower part of the bottom diagram.



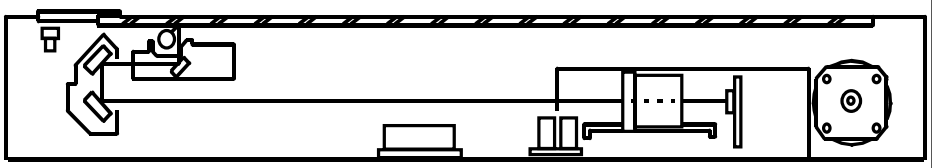
More on the Copy Process

- The photoconductor unit (PCU) contains the drum, development roller, and charge roller.
- A charge roller gives the drum a negative charge.
- The laser beam writes a latent image on the drum, switching on to discharge the drum when writing black parts of the image. Toner is attracted to these discharged parts of the drum.
- The transfer roller applies a positive current to the reverse side of the paper (the size of the current depends on the resolution and the paper size). This pulls the toner off the drum and onto the paper.
- The electrostatic pull from the transfer roller separates the paper from the drum. There is also a discharge plate, which is grounded.
- The quenching lamp removes residual charge from the drum.
- The ID sensor and TD sensor are used for toner supply control.



No additional notes.

Scanner Unit



- 600 dpi CCD
- Exposure lamp: One xenon lamp
- The reflector reduces shadows on paste-up originals

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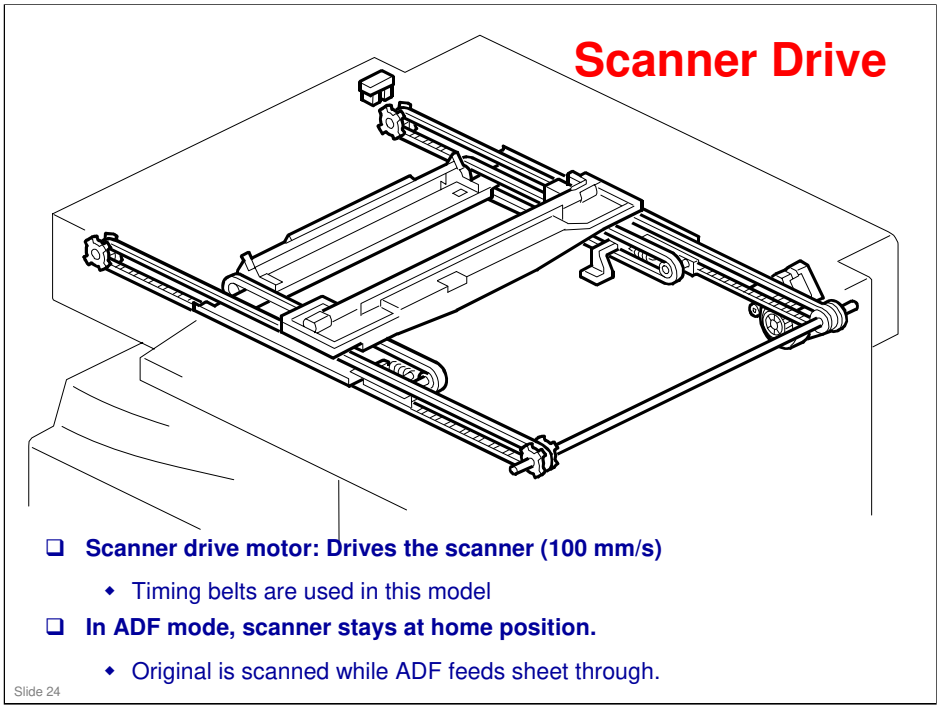
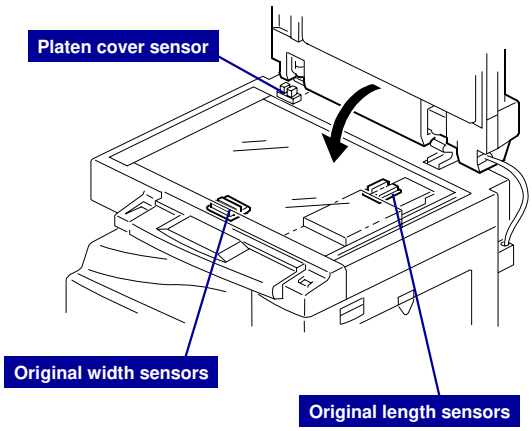
No additional notes.



No additional notes.

Original Size Detection – Platen Mode (1)

- Reflective photosensors (APS sensors) detect the paper size.



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More on Original Size Detection in Platen Mode

Overview

- Study the APS sensors. There are two length sensors and two width sensors.
- When the platen cover is being closed, the CPU checks the sensors when the platen cover is about 15 cm above the exposure glass (detected by the platen cover sensor).
- If the platen cover stays open during copying, the CPU checks the sensors when the Start key is pressed.

Multi-copy mode

- Note that the machine scans each page once, and stores it to memory.

Original Size Detection – Platen Mode (2)

- This table shows the outputs of the sensors for each original size.

Original Size		Length Sensors		Width Sensors		SP4301 Display
A3/A4 Version	LT/DLT Version	L2	L1	W2	W1	
A3	11"x17"	1	1	1	1	11110000
B4	8.5"x11"	1	1	0	1	11010000
8.5"x13"	–	1	1	0	0	11000000
A4 SEF	8.5"x13"	0	1	0	0	01000000
A4 LEF	11"x8.5"	0	0	1	1	00110000
B5 LEF	8.5"x11"	0	0	0	1	00010000
B5 SEF	8.5"x5.5"	0	0	0	0	00000000
–	8.5"x13"	0	1	0	1	01010000

0: High (no paper), 1: Low (paper present)

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The above table shows the outputs of the sensors for each original size. This original size detection method eliminates the necessity for a pre-scan and increases the machine's productivity.

For other combinations, “Cannot Detect Original Size” will be indicated on the operation panel display (if SP 4303 is kept at the default setting). However, if the by-pass feeder is used, note that the machine assumes that the copy paper is short-edge first. For example, if A4 paper is placed long-edge first on the by-pass tray, the machine assumes it is A3 paper and scans the full A3 area for the first copy of each page of the original, disregarding the original size sensors. However, for each page, the data signal to the laser diode is stopped to match the copy paper length detected by the registration sensor. This means that copy time for the first page may be slower (because of the longer time required for scanning), but it will be normal for the rest of the job.

SP Modes

- SP 4008: Sub scan magnification
- SP 4009: Main scan magnification
- SP 4010: Leading edge registration
- SP 4011: Side-to-side registration
- SP 4013: Scanner free run (exposure lamp off)
- SP 4305: Determines how machine interprets original size sensors for A4/LT widths.

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No additional notes.

Lab Work

- **Practice the following replacement and adjustment procedures, referencing the FSM.**
  - Scanner Unit
  - Copy adjustments
- **Do any of the procedures that you think are in need of practicing.**
- **Pay attention to all notes, cautions, and warnings in the manual.**

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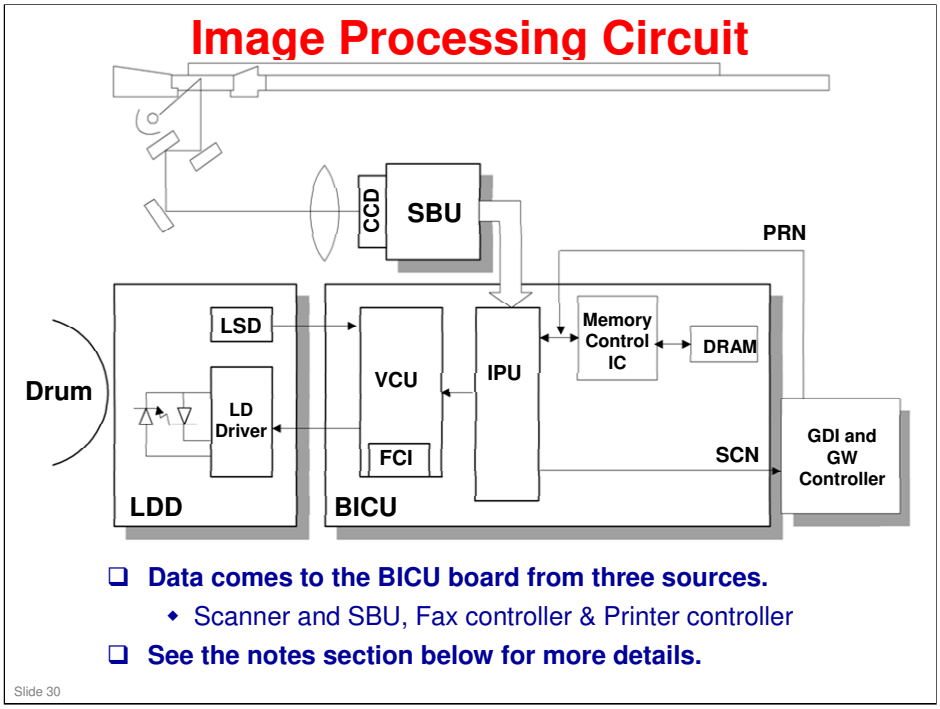
No additional notes.

No additional notes.



The CCD generates an analog video signal. The SBU (Sensor Board Unit) converts the analog signal to an 8-bit digital signal, then it sends the digital signal to the BICU board.

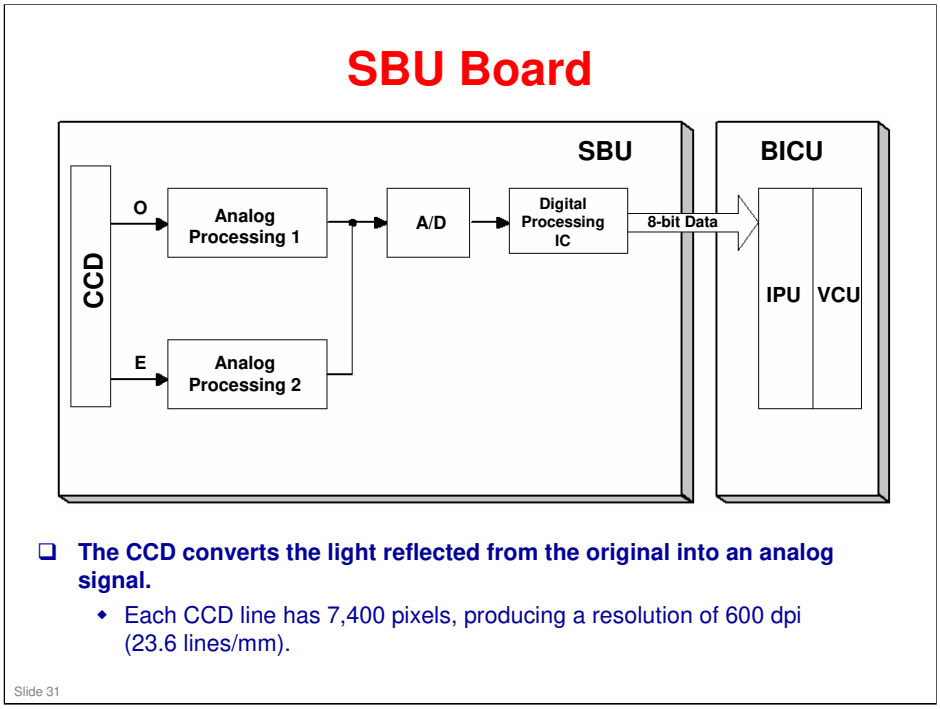
The BICU board can be divided into three image-processing blocks: the IPU (Image Processing Unit), FCI (Fine Character Image), and VCU (Video Control Unit).

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

Note: The IPU and VCU are contained in the same IC called SCRATCH on the BICU.



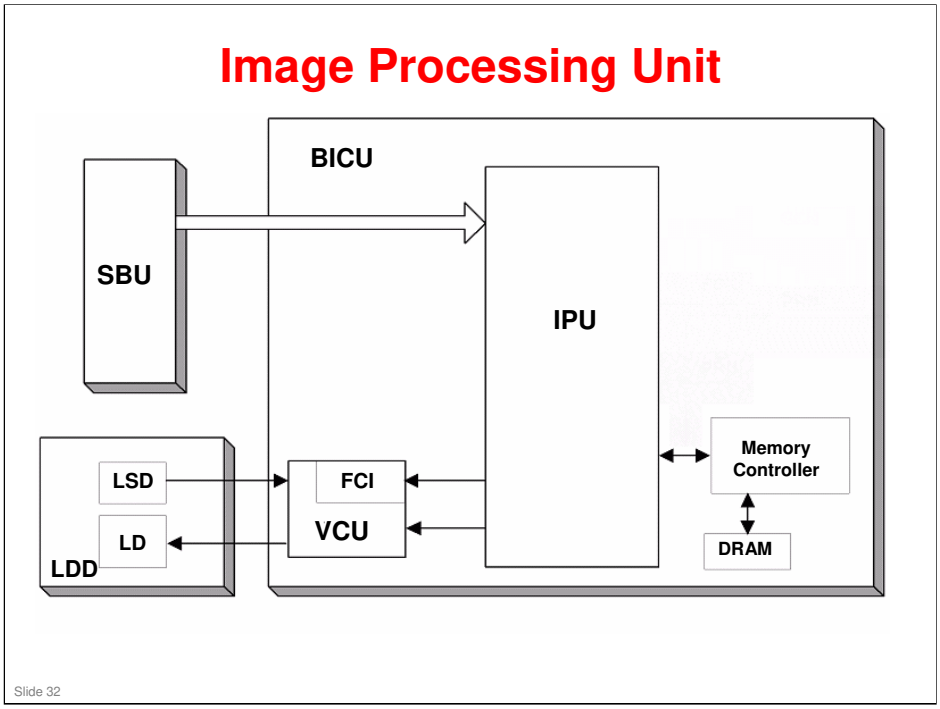
The CCD converts the light reflected from the original into an analog signal. The CCD line has 7,400 pixels and the resolution is 600 dpi (23.6 lines/mm).

The CCD has two output lines, for odd and even pixels, to the analog processing circuit. The analog processing circuit performs the following operations on the signals from the CCD:

1. Z/C (Zero Clamp): Adjusts the black level reference for even pixels to match the odd pixels.

2. Signal Amplification: The analog signal is amplified by operational amplifiers.

After the above processing, the analog signals are converted to 8-bit signals by the A/D converter. Each pixel will be assigned a value on a scale of 256 grades. Then, the digitized image data goes to the BICU board.



The image data from the SBU goes to the IPU (Image Processing Unit) on the BICU board, which carries out the following processes on the image data:

1. Auto shading
2. White/black line correction
3. ADS
4. Scanner gamma correction
5. Magnification (main scan)
6. Filtering (MTF and smoothing)
7. ID gamma correction
8. Binary picture processing
9. Error diffusion
10. Dithering
11. Video path control
12. Test pattern generation

The image data then goes to the GDI controller.

Image Quality Adjustments - 1/3

- **Three basic original types**
  - Text
  - Photo
  - Special (can only be accessed through a user tool)
- **Ten original types in total, selectable with a user tool**
  - Text modes: 2
  - Photo modes: 3
- **Special modes: 5**

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More on Image Quality Adjustments 1

- There are three basic original types: text, photo, special.
- Each of these types has sub-categories, as shown on the slide, to make a total of 10 types that the user can select.
  - Only two are immediately accessible at the operation panel. However, the user can set up the operation panel with a user tool. This will be explained on the next slide.
- The table in the service manual gives details of the uses for each type.
- In the SP tables and other parts of the manual, these modes are also referred to as Text 1, Text 2, Photo 1, etc.
- Text 2 (Sharp) does not use any greyscales for scanning.
- Special 1 (Unneeded background) is similar to Text 2 (Sharp), but stronger. Special 1 only works well in certain cases and was designed for a specific case in the Japanese market (for copying vehicle inspection certificates).

Image Quality Adjustments - 2/3

- **The original mode key on the operation panel has two settings:**
  - Text
  - Photo
- **The default settings are:**
  - Text indicator lit: Normal Text (Text 1)
  - Photo indicator lit: Photo Priority (Photo 1)
- **To allocate an original type:**
  - Light either the Text or Photo indicator
  - Select the required original mode with User Tools - Copier Features - Adjust Original Mode

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More on Image Quality Adjustments 2

- Only two of the 10 settings can be accessed directly from the operation panel.
- In a new machine, these are Text 1 and Photo 1.
- To change to a different two settings, use the user tool indicated on the slide.
- Note that the Text indicator does not have to be allocated to a Text mode and the Photo key does not have to be allocated to a Photo mode.
  - For example, the Text indicator can be allocated to Photo 3, and the Photo indicator can be allocated to Special 4.

Image Quality Adjustments - 3/3

- **SP 4922 to 4932: Image processing adjustments**
- **SP 4921: Selects one of the original modes; only one can be adjusted at any one time.**
  - First select a mode with SP 4921. Then adjust it with SP 4922 to 4932.

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No additional notes.

SP Modes

- **SP 4015: Adjusts the area of the white plate used for auto shading**
- **SP 4903: ADS level**
- **SP 4904: Lower limit for ADS**
- **SP 4905: Determines how much of the image is used for ADS (the whole width or just a narrow strip)**
  - Use SP 4015 to adjust the area of the white plate that is used for auto-shading. Adjust this if there is damage to the white plate causing defective auto shading.

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No additional notes.

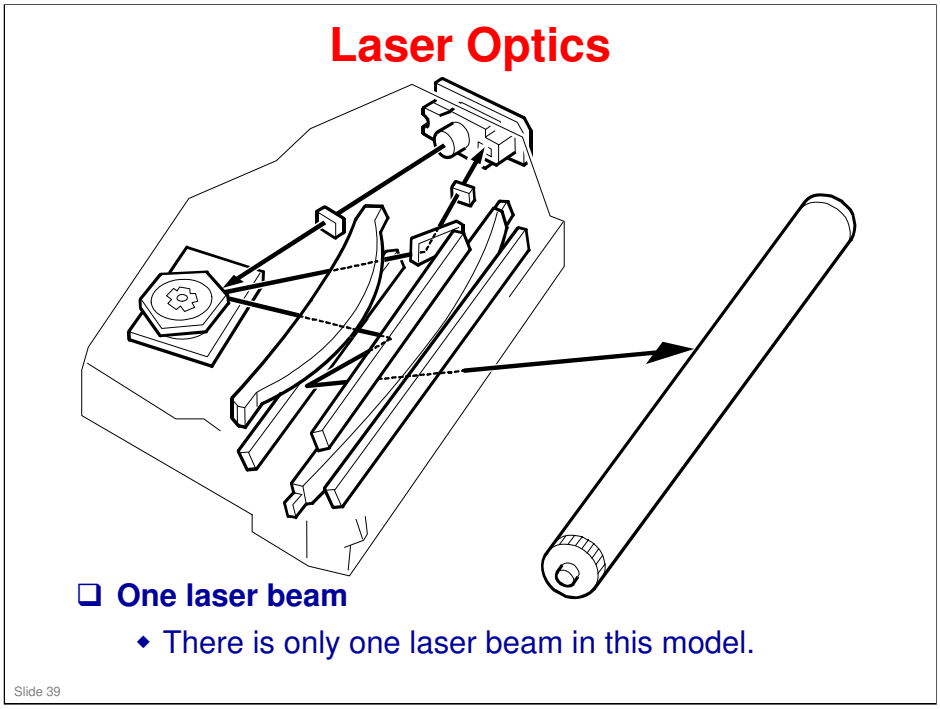
Lab Work

- **Study the scanning adjustments in the FSM.**
  - FSM → Replacement and Adjustment → Copy Adjustments Printing/Scanning → Scanning
- **Do any of the procedures that you think that you need to practice.**
- **Pay attention to all notes, cautions, and warnings in the manual.**
- **If you have time, test the effects of the various original modes and the SP modes used for adjusting the image processing features.**

Slide 37

No additional notes.

No additional notes.



More on Laser Optics

- The LSD (laser synchronisation detector) is part of the laser diode unit, and cannot be replaced separately.

Laser beam

- There is only one in this model.

Automatic Power Control

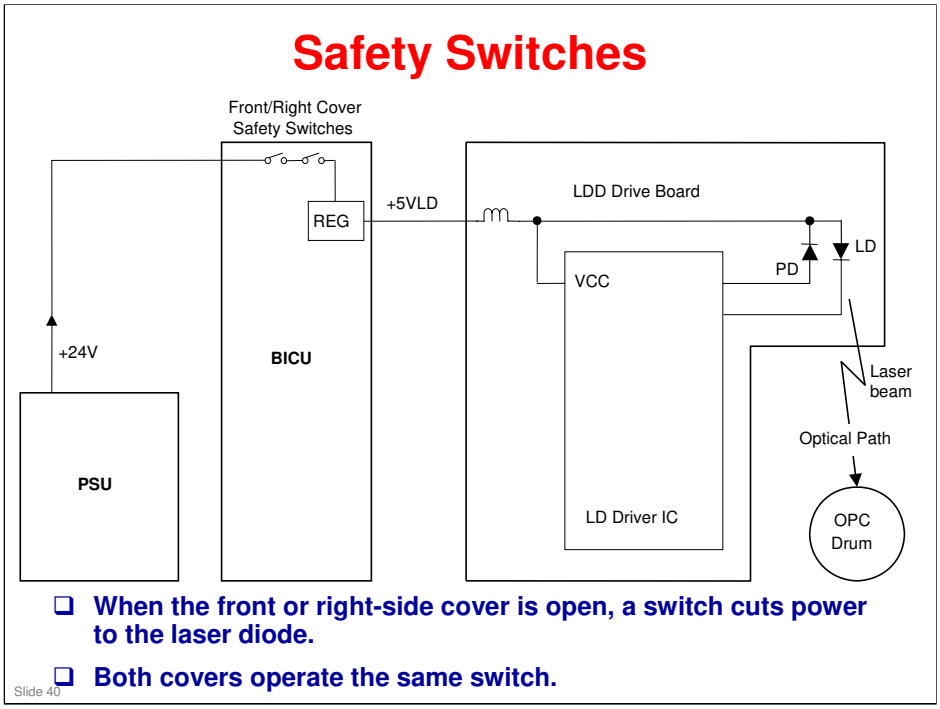
- Laser power is controlled automatically.

Shutter

- There is no mechanical shutter to stop the laser beam.

Safety Switches

- A safety switch stops power to the laser beam if the front or right cover is open.



No additional notes.

SP Modes

- **SP 2915: Polygon mirror idling time**
- **SP 2998: Main scan magnification (printer)**
  - There is also a main scan adjustment for the scanner, which affects image processing algorithms.
    - » SP 2998 affects laser on/off frequency in main scan direction.

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No additional notes.

Lab Work

- **Before you start**
  - Go to the machine. Look for the front and right cover switches. See how the covers operate the switches.
  - On the point-to-point diagram, look at the circuit from the power supply through to the laser diode.
- **Practice the following**
  - Laser unit component replacement procedures.
    - » FSM → Replacement and Adjustment → Laser Unit
  - Copy adjustments:
    - » FSM → Replacement and Adjustment → Copy Adjustments Printing/Scanning → Printing
- **Do any procedures you think should be practiced.**
- **IMPORTANT: Read the safety notice in the service manual, and examine the warning labels. Pay attention to all notes, cautions, and warnings in the manual.**

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No additional notes.

No additional notes.

Overview

- **There is no new PCU detection in this machine. This is due to the PCU not being a user-replaceable part.**
  - Some of the PCU components are replaced individually at PM.
  - When a new PCU is installed, new developer must also be installed and SP 2214 must be done to reinitialize the TD sensor.

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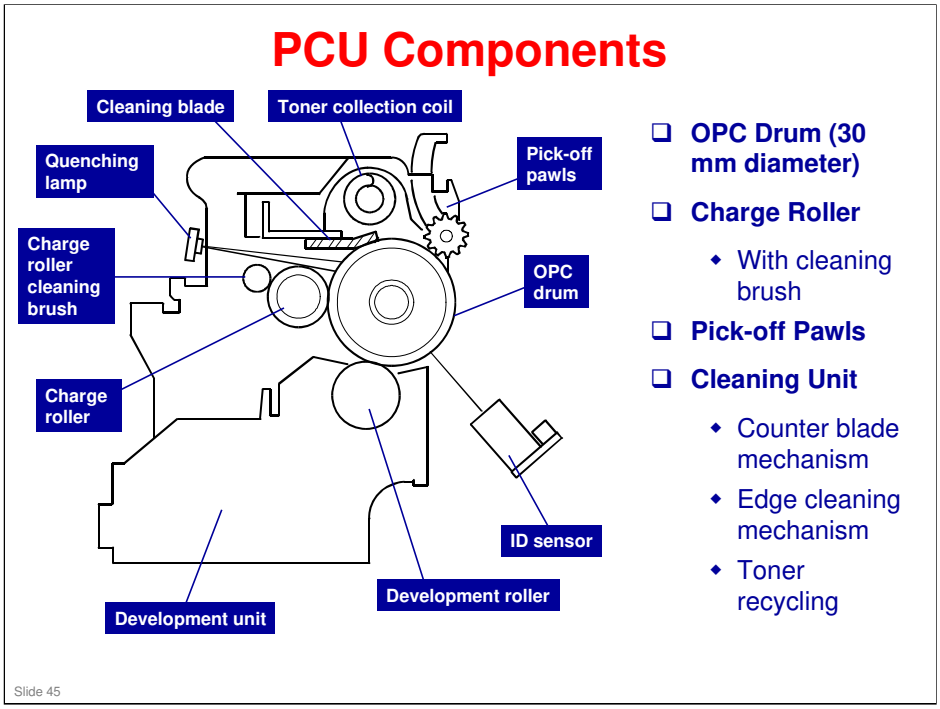
No additional notes.



- OPC = Organic Photo-Conductor
- The ID sensor and quenching lamp are not included in the PCU.

PCU Details

- **The PCU contains the following.**
  - OPC drum
  - Development unit (including development roller and TD sensor)
  - Charge roller and charge roller cleaning brush
  - Drum cleaning unit (blade, toner collection coil)
  - Pick-off pawls
- **The PCU does not contain the following.**
  - Transfer roller
  - ID sensor
  - Quenching lamp
  - Toner bottle

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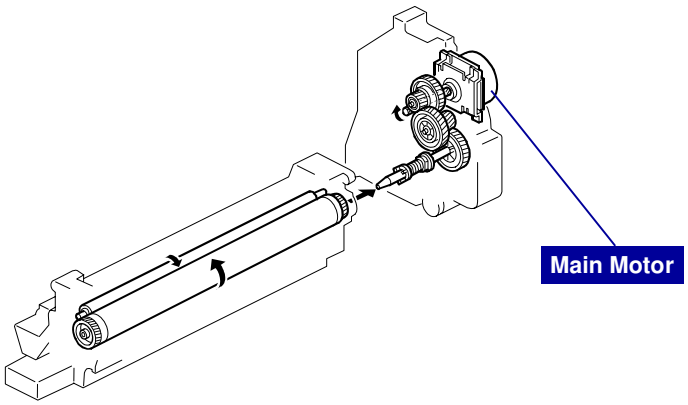
No additional notes.

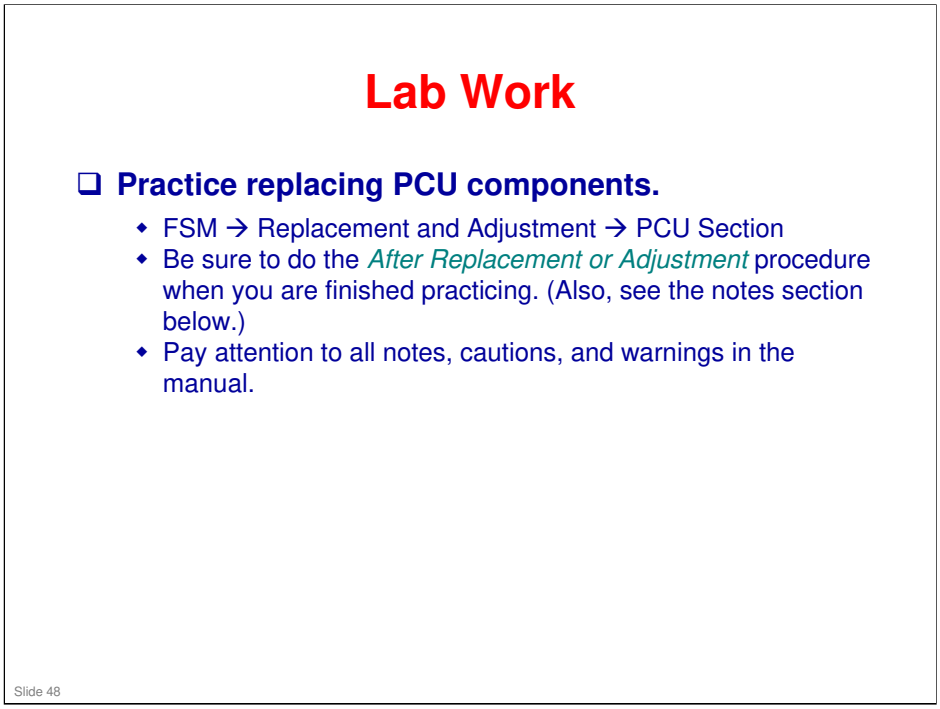
Drive



- The main motor drives the drum through a series of gears as shown above.

Slide 47

No additional notes.



More on Lab Work

PCU

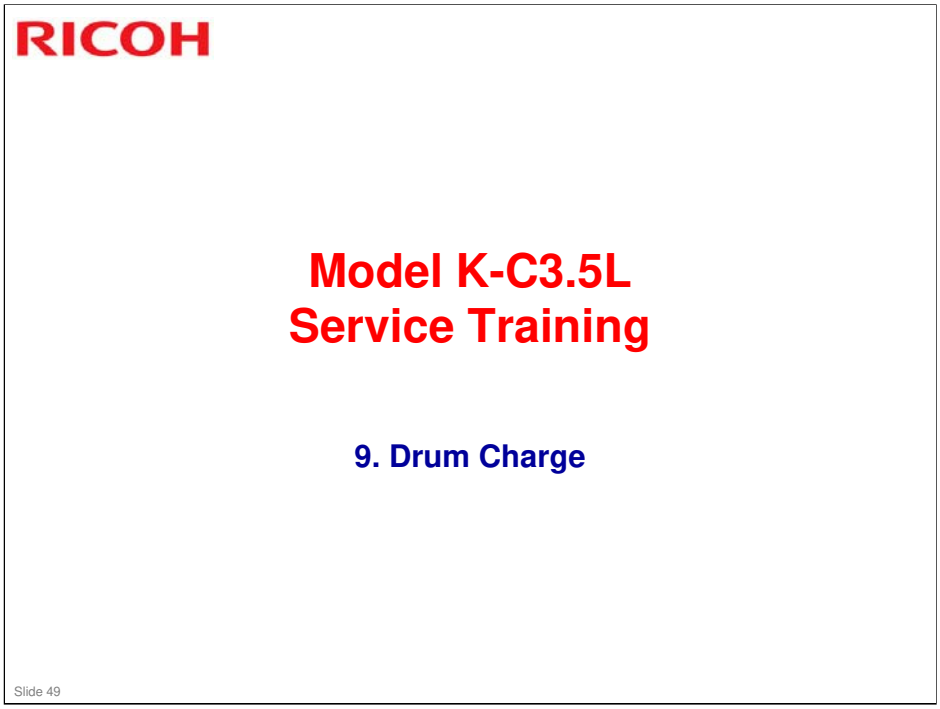
- When a new PCU is installed, new developer must also be installed and SP 2214 must be done to reinitialize the TD sensor.
- There is no new PCU detection in this machine. This is because the user does not replace the PCU.

Developer

- Before adding new developer, note that you must tap the top of the PCU at several locations, as described in step 2 of the procedure.
  - This is to remove recycled toner from the toner collection coil. If this toner is not removed, it may fall into the new developer while the technician is reassembling the machine. Then there will be too much toner in the developer, and this will cause toner spots on copies.
  - This toner may drop into the developer when replacing other parts of the mechanism, but there is no point in tapping the coil because we are not going to remove the old developer. So, to remove the excess toner, the technician has to make skyshot copies after replacing any PCU components, as explained in step 7 of the 'After Replacement or Adjustment' section.

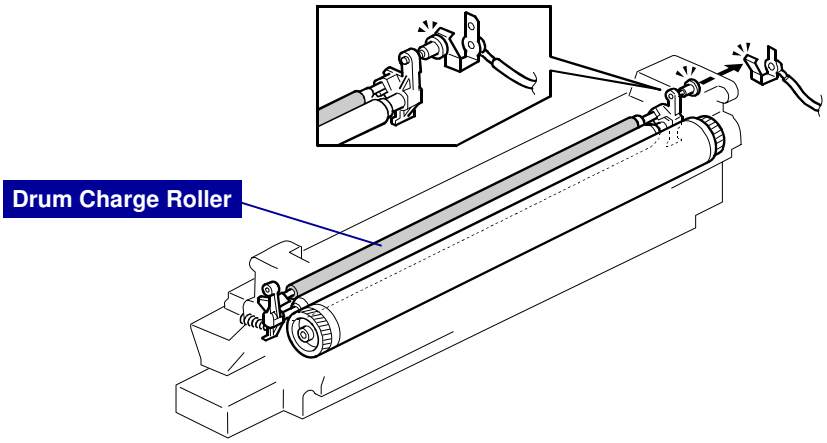
    These skyshot copies are not necessary after replacing developer, because the coil was tapped to remove the toner before adding new developer.

    Step 1 of the procedure says make 5 copies. These are test copies to check whether we have a problem with excess toner causing spots on copies.
- Note that in step 6, we open and close the cover. This is to activate the cover sensor and trigger the toner supply coil rotation to dislodge toner blockages in the coil.
- If new developer is added without changing the PCU, SP 2214 must also be done.
  - Also, after adding a new PCU, new developer must be added, so developer



No additional notes.

Drum Charge Roller



- Roller is always in contact with drum.
- Drum charge roller is at -1700 V for printing.
- Drum surface voltage is - 950 V

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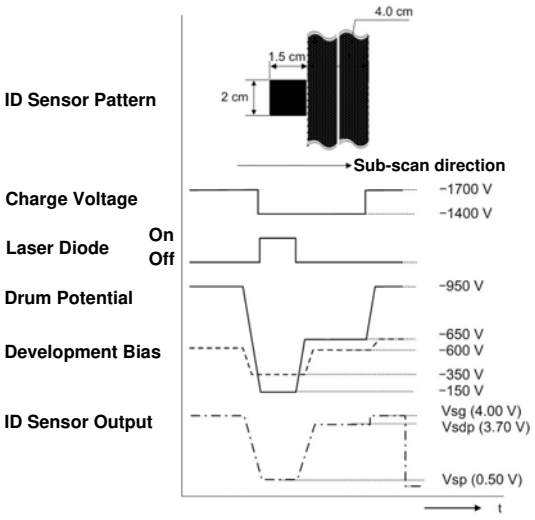
More on Drum Charge Roller

- The charge roller is part of the PCU unit.
- The charge roller turns by friction with the drum.
- A charge roller does not generate much ozone, so there is no ozone filter

Charge Roller Voltage Correction



Details are in the notes section below.

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With a drum charge roller system, the voltage transferred from roller to drum varies with the temperature and humidity around the drum charge roller. The higher the temperature or humidity is the higher the applied voltage required.

To compensate, the machine uses the ID sensor to measure the effects of current environmental conditions. For this measurement, the process control parameters are balanced so that any small change in drum potential caused by environmental effects is reflected in a change in the amount of toner transferred to the drum.

This measurement is made immediately after the ID sensor pattern for toner density control. Immediately after making ID sensor pattern [A], the charge roller voltage stays the same, but the development bias goes up to –600 V; as a result the drum potential is reduced to –650 V. The laser diode is not switched on, and the drum potential is now slightly higher than the development bias, so a very small amount of toner transfers to the drum. The ID sensor measures the density of this pattern [B], and the output voltage is known as Vsdp. This voltage is compared with Vsg (read from the bare drum at the same time).

If the humidity drops, the drum potential goes up (to a higher negative voltage) even if the charge roller voltage supply stays the same (efficiency of voltage transfer is higher with lower humidity). As a result, less toner is transferred to ID sensor pattern [B]. If the sensor output reaches a certain point, the drum charge voltage will be reduced.

To determine whether to change the drum charge roller voltage, the machine compares Vsdp with Vsg.

- Vsdp/Vsg > 0.95 = Make the drum charge voltage less negative (smaller) by 50 V
- Vsdp/Vsg < 0.90 = Make the drum charge voltage more negative (larger) by 50 V

ID Sensor Pattern Production Timing

- **The ID sensor pattern is made at the following times:**
  - During warm-up at power on
  - When the machine starts warming up from energy saver mode and the temperature is less than the target temperature as set with SP Mode.
  - When the machine starts warming up from energy saver mode and the machine prints more than 100 prints.
- **While machine is recovering from energy saver mode, or while machine starts, BICU ignores ID-sensor signals if fusing temperature is at specified value or higher.**
  - » Adjustable from 30 degrees to 90 via SP 2994)

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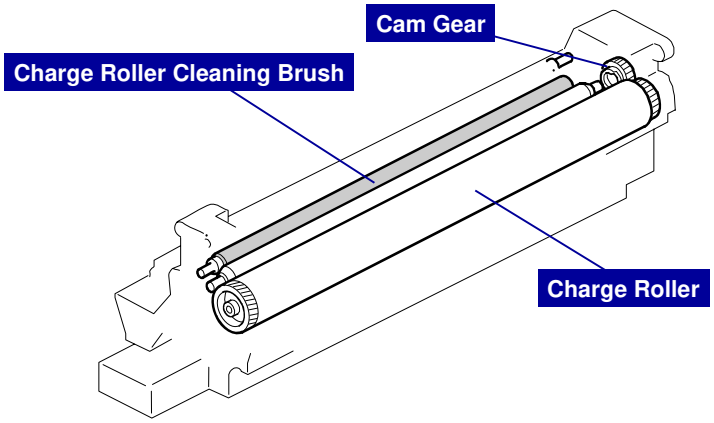
No additional notes.

Charge Roller Cleaning



- Cleaning Brush is always in contact with drum charge roller
- A cam gear moves the charge roller from side to side to improve cleaning.
  - This waste toner is not recycled.

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No additional notes.

SP Modes

- SP 2001: Charge roller voltage adjustment (for printing and for making an ID sensor pattern).

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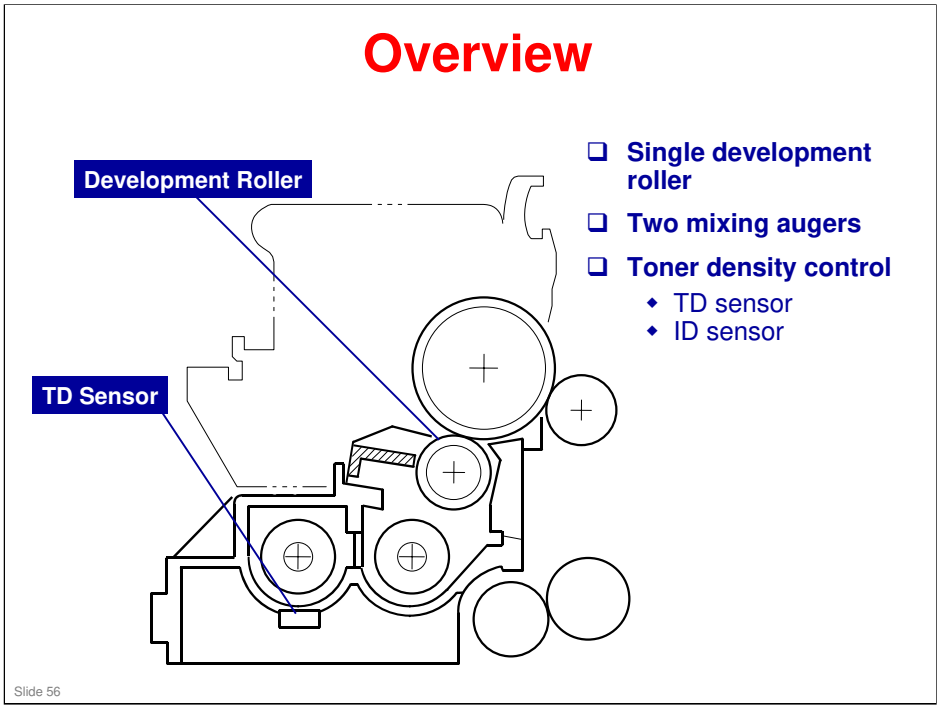
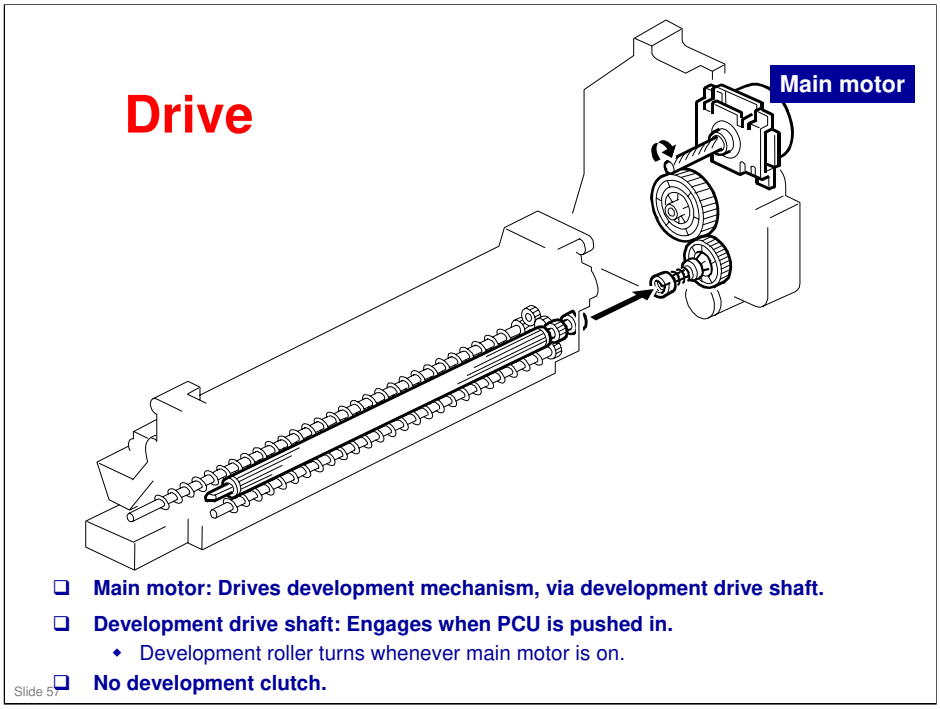
No additional notes.

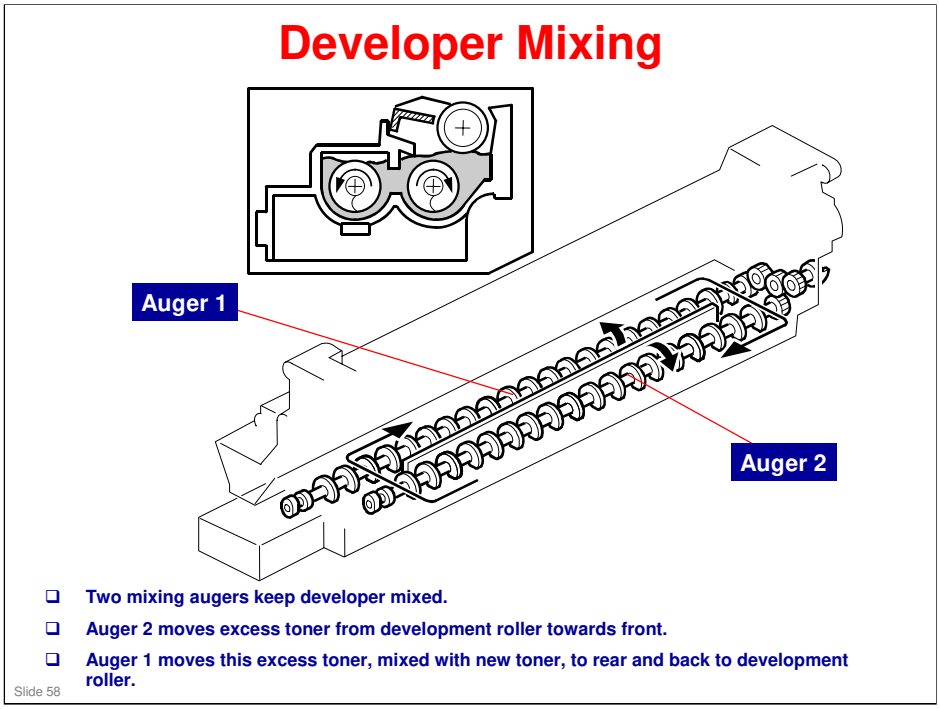
No additional notes.



This machine uses a single-roller development system. Two mixing augers mix the developer. The toner density (TD) sensor and image density (ID) sensor (see the illustration in the PCU section) are used to control the image density.

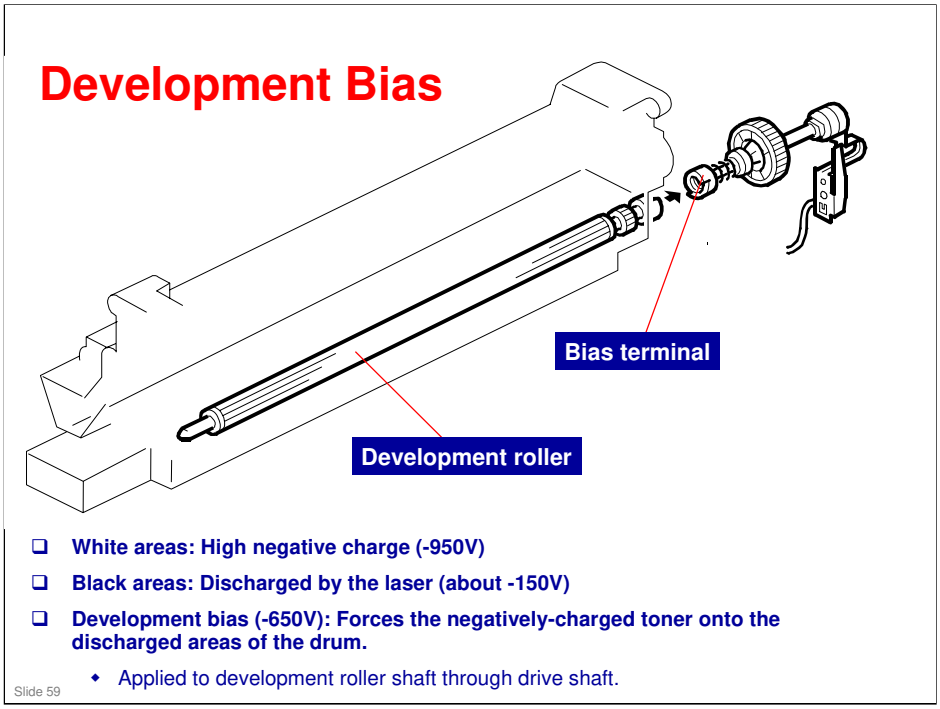


No additional notes.



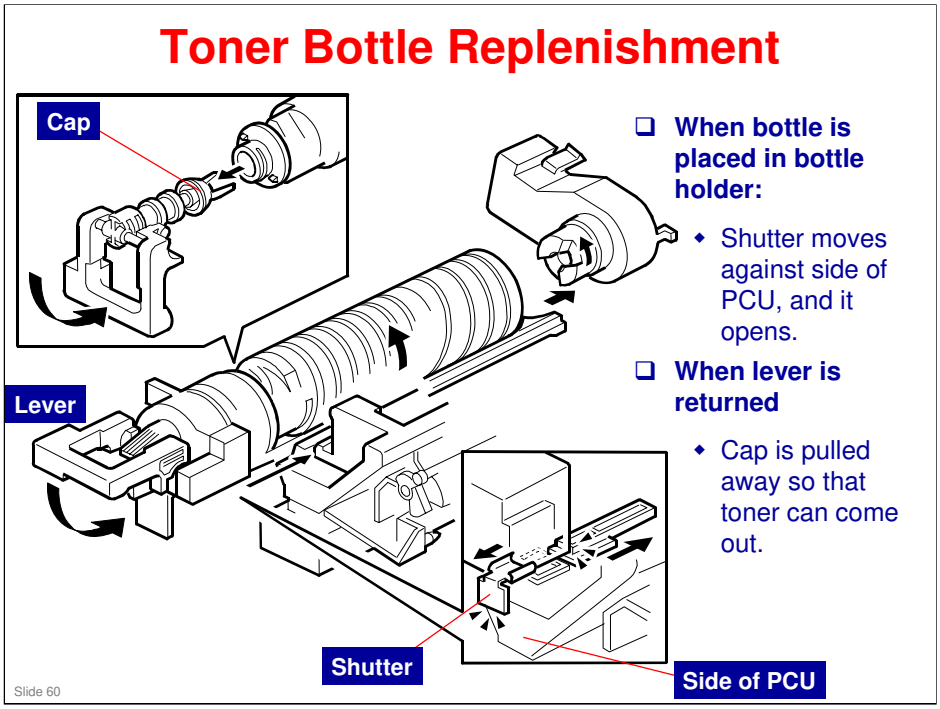
More on Developer Mixing

- Mixing does the following:
  - Keeps the toner and developer evenly mixed
  - Prevents lumps from forming
  - Helps create a triboelectric charge on the toner.
- The doctor blade splits the developer into the following two parts.
  - One part goes to the development roller to form the magnetic brush and the latent image on the drum.
  - The other part is returned to the development unit, where it is mixed with new developer (and recycled toner) and moved back to the development roller.



More on Development Bias

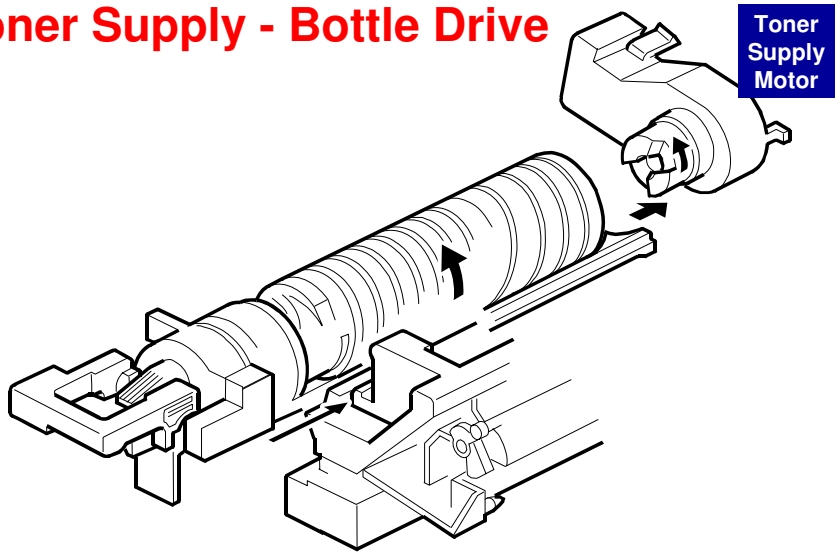
- This machine uses a negative-positive development system, in which black areas of the latent image are at a low negative charge (about –154 ± 50 V) and white areas are at a high negative charge (about –950 V).
- To attract negatively charged toner to the black areas of the latent image on the drum, the high voltage supply board applies a bias of –650 volts to the development rollers throughout the image development process. The bias is applied to the development roller shaft [A] through the drive shaft [B].
- The development bias voltage (–650 V) can be adjusted with SP 2201 1.



More on Toner Bottle Replenishment

- When the bottle is placed in the machine, the shutter opens to allow toner to go into the development unit.
  - The shutter mechanism is shown in the bottom right part of the diagram.
- Then, when the holder is released, the top of the bottle is pulled out.
  - The holder mechanism is shown in the top left part of the diagram.

Toner Supply - Bottle Drive



- **Toner supply motor turns the bottle**
  - To supply fresh toner to development unit, toner supply motor turns on.
  - Spiral grooves help toner to move towards bottle exit.

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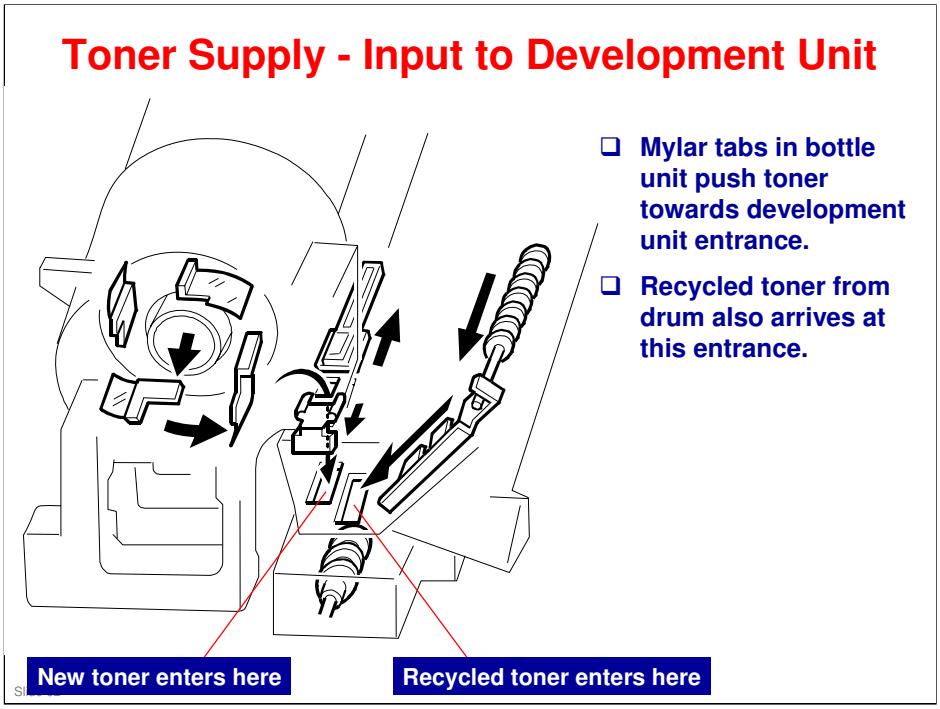
No additional notes.

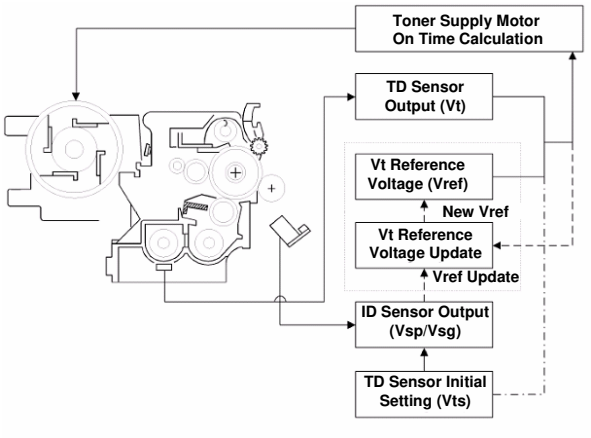


More on Toner Supply Input to the Development Unit

- Toner enters the development unit through the shutter.
  - This shutter is opened when a bottle is put in the machine, as explained earlier.
- Note where the new toner enters the development unit.
  - Recycled toner also enters through the same opening. The toner collection coil for recycled toner can be seen at the top right side of the drawing on the right hand side of the slide.
- Toner recycling is covered in the next section of the course.

Toner Density Control – 1
Overview

- Controlled by TD and ID sensors.
- There are four modes but only two can be used. (See notes below for details.)



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There are four modes for controlling toner supply which can be changed with by SP 2921. The factory setting is SP2921 = 0.

Basically, the toner concentration in the developer is controlled using the standard TD sensor voltage (Vts), toner supply reference voltage (Vref), actual TD sensor output voltage (Vt), and ID sensor output data (Vsp/Vsg).

The Four Modes

- Sensor Mode 1: SP2921 = 0, Normal sensor control mode
- Sensor Mode 2: SP2921 = 1, Design use only (don't use)
- Fixed Mode 1: SP2921 = 2, Design use only (don't use)
- Fixed Mode 2: SP2921 = 3: Use temporarily if the TD sensor needs to be replaced.

Toner Density Control – 2

Toner Density Sensor Initial Setting

- The TD sensor initial setting (SP 2214: Developer Initialize) procedure must be done after replacing the developer. During TD sensor initial setting, the TD sensor is set so that the TD sensor output is the value of SP 2926 (default: 2.4 V). This value will be used as the standard reference voltage (Vts) of the TD sensor.

Toner Concentration Measurement

- The toner concentration in the developer is detected once every copy cycle. The sensor output voltage (Vt) during the detection cycle is compared with the standard reference voltage (Vts) or the toner supply reference voltage (Vref).

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No additional notes.

Toner Density Control – 3

Vsp/Vsg Detection

- The ID sensor detects the following voltages.
  - Vsg: The ID sensor output when checking the drum surface
  - Vsp: The ID sensor output when checking the ID sensor pattern
- In this way, the reflectivity of both the drum surface and the pattern on the drum are checked, compensating for any variations in the reflectivity of the ID sensor pattern or the reflectivity of the drum surface.
- The ID sensor pattern is made on the drum by the charge roller and laser diode.
- Vsp/Vsg is not detected every page or job; it is detected during warm-up at power on to decide Vref. This is done if the machine starts warming up when the fusing temperature is 30C or less (default) after entering night mode or low power mode (SP 2994 specifies the temperature setting).

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No additional notes.

Toner Density Control – 4

Toner Supply Reference Voltage (Vref) Determination

- The toner supply reference voltage (Vref) is used for toner supply determination (see below). Vref is determined using the following data:
  - » ID sensor output (Vsp/Vsg)
  - » (Vts or the current Vref) – Vt

Toner Supply Determination

- The reference voltage (Vts or Vref) is the threshold voltage for determining whether or not to supply toner. If Vt becomes greater than the reference voltage, the machine supplies additional toner.
- This can be checked using SP 2220.

Toner Supply ON Time

- Sensor supply mode on time can be adjusted with SP2922 and 2923.
- Fixed supply mode on time can be adjusted with SP2922 and 2923.

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No additional notes.

Abnormal Sensor Conditions

- **ID sensor**
  - If ID sensor output is out of spec, machine disregards output from sensor, and uses a Vref of 2.5 V.
  - After replacing ID sensor, reset error counter with SP 7-992.
- **TD sensor**
  - If TD sensor output is out of spec, machine changes to fixed supply mode 2.
    - » Toner supply motor on always for 200 ms per page
  - Copying continues until a TD sensor error is detected 10 consecutive times.
  - Then SC 390 is generated and machine cannot be used.

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More on abnormal sensor conditions

ID Sensor

Readings are abnormal if any of the following conditions occur:

• Vsg 2.5V

• Vsg < 3.5V when maximum power (979) is applied

• Vsp 2.5V

• (Vsg – Vsp) < 1.0V

• Vt 4.5V or Vt 0.2V

The above ID sensor values can be checked using SP 2221.

When this is detected, the machine changes the value of Vref to 2.5 V then does the toner density control process (in a similar way to sensor control mode 2).

No SC code is generated if the ID sensor is defective.

TD Sensor

The TD sensor output is checked every copy. If the readings from the TD sensor become abnormal, the machine changes the toner density control mode to fixed supply mode 2, and the toner supply amount per page is always 200 ms, regardless of the value of SP 2925. If the machine detects the TD sensor error condition 10 times consecutively, an SC code is generated (SC390) and the machine must be repaired.

Toner Near-end/End Detection

- No near-end or end sensors
- Toner near-end/end are determined by TD sensor output (current and reference voltages).
- If near-end is detected, toner is added for a short period (adjustable with SP 2 923).
- If the toner level does not recover, toner end is after 50 more copies (the number of copies is adjustable with SP 2 213).
- There is no toner end or near-end detection if the machine is in fixed control 2 mode.

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No additional notes.

Toner Near-end/End Detection - Details

- **If Vt level 6 is detected 5 consecutive times, near-end is detected.**
- **Toner is added after the copy job:**
  - If supply recovers to Vt level 5, near-end is cancelled.
  - Otherwise, toner end occurs after 50 copies
  - If Vt level 7 is detected 3 consecutive times, toner end is detected immediately.
- **Recovery after adding new toner**
  - The machine must recover to Vt level 5 after a new bottle has been added

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No additional notes.

SP Modes - Development

- SP 2201: Development bias (printing, ID sensor pattern creation)
- SP 2802: Forced developer agitation

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No additional notes.

SP Modes - Toner Supply

- SP 2221: ID sensor error display (Vsg, Vsp, Vt, etc if an ID sensor error occurred)
- SP 2908: Forced toner supply
- SP 2921: Toner supply mode (sensor control, fixed control)
- SP 2922: Toner supply motor on time (sensor control mode)
- SP 2925: Toner supply motor on time
- SP 2926: Adjusts Vts (target for TD sensor initialization
- Sp 2927: Use of the ID sensor, enable/disable

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No additional notes.

SP Modes - Toner Near-end/End

- **SP 2213: Number of copies between near-end and end (20 or 50 - default: 50)**
- **SP 2923: Toner supply motor on time during recovery from end/near-end**
- **SP 2928: Clears the toner end condition**
  - Normally, do not use this, for the reasons explained in the SP table.

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No additional notes.

Lab Work

- **Remove the ID sensor.**
  - FSM → Replacement and Adjustment → Image Transfer → Image Density Sensor

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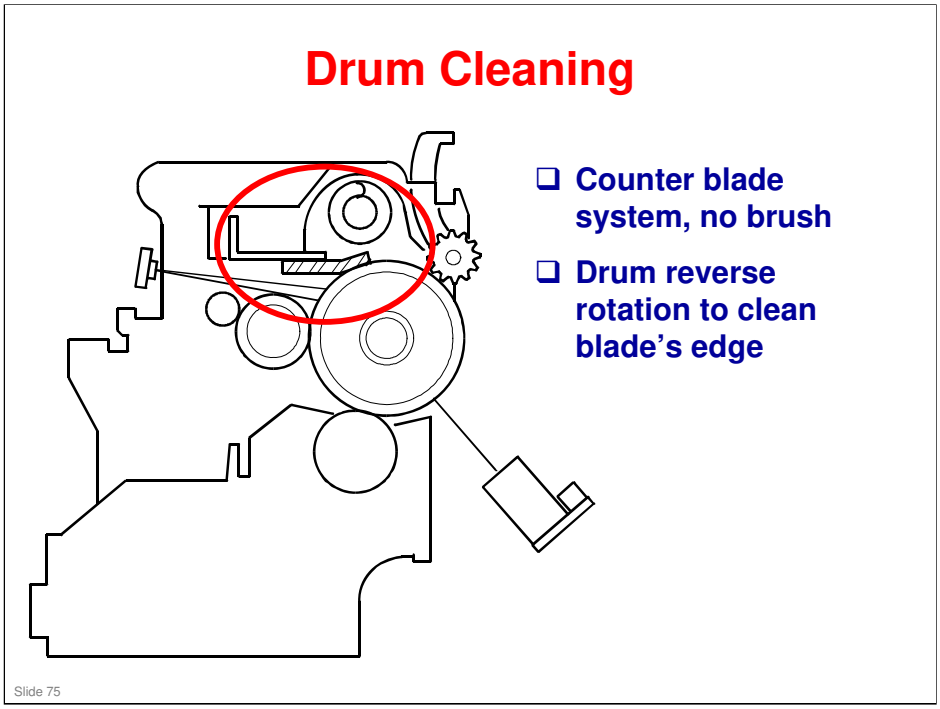
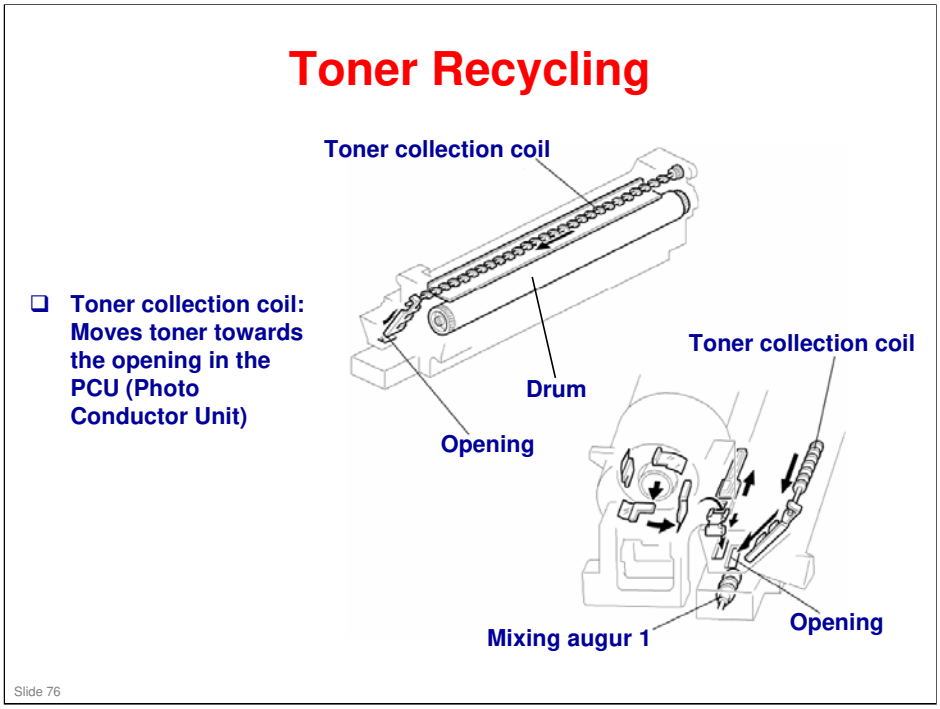
No additional notes.

No additional notes.



More on Drum Cleaning

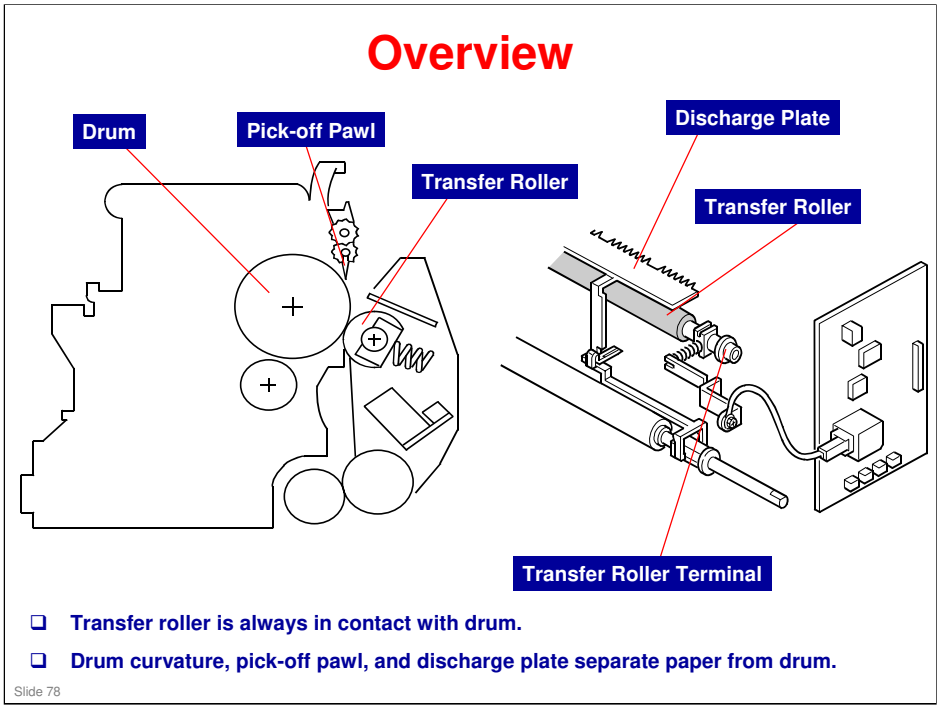
- This machine uses a counter blade, but no brush.
  - The blade scrapes toner off the drum, and a toner collection coil picks up toner from the top of the pile and carries it back to the development unit.
  - At the end of every copy job, the drum reverses for 5 mm to scrape toner off the edge of the cleaning blade.



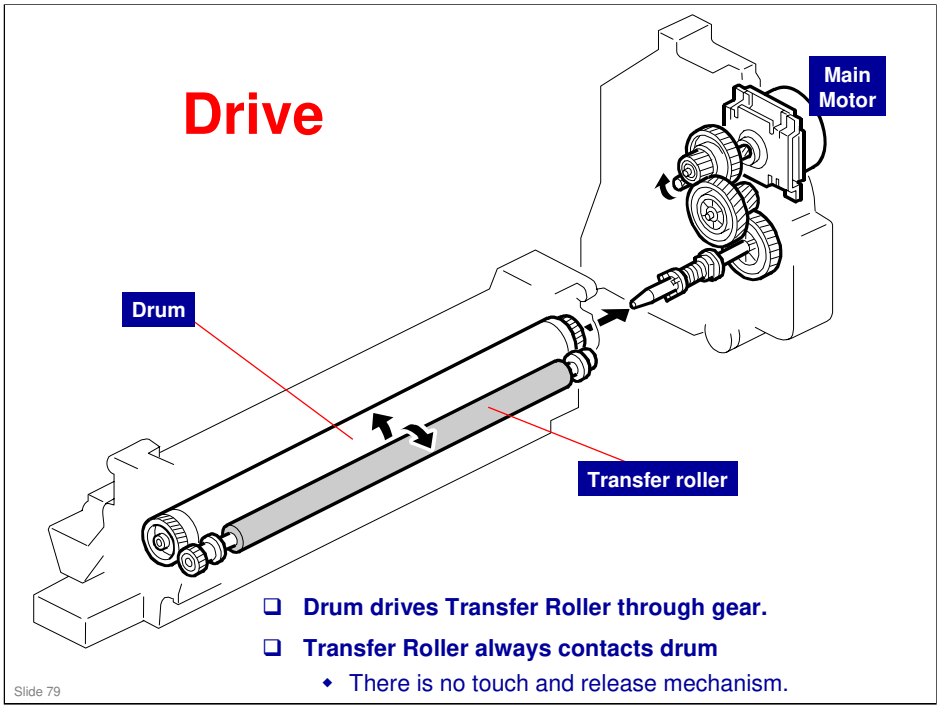
More on Toner Recycling

- The slider with the two comb-like appendages on it is always vibrating.
  - The comb-like appendages break up any blockages of toner.
- Note the two slots in the development unit.
  - The one on the left receives fresh toner from the cartridge.
  - The one on the right receives the recycled toner.
  - New and recycled toner are mixed together in the development unit.
- Mixing auger 1 in the development unit mixes the recycled toner with fresh toner from the bottle.
- Toner adhering to the transfer roller is sent back to the drum, as we shall see in the Transfer section of the course. This toner is in turn recycled to the development unit. It may contain some small amounts of paper dust.

No additional notes.



- The discharge plate is grounded.



No additional notes.

Transfer Current

- **First, a low current (10 μA) is supplied at leading edge (before print area).**
  - Prevents positively charged toner remaining on drum from transferring to roller.
- **Then high current is supplied (amount depends on paper size and type).**
  - This transfers toner to paper.
- **Finally, at trailing edge, either:**
  - Multi-copy mode, between pages
    - » Low current is applied again.
  - Final page
    - » Transfer current is switched off.

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No additional notes.

Transfer Roller Cleaning

- **Negative cleaning current is applied, followed by positive current.**
  - Negatively and positively charged toner particles are both transferred back to drum.
  - Current for negative-charge phase can be adjusted with SP 2301-4.
- **Three conditions for entering cleaning mode:**
  - Before starting a job
    - » Default: Cleaning is not done before each job.
      - – Change with SP 2996 if required
  - Just after turning on power.
  - After a copy paper jam has been removed.

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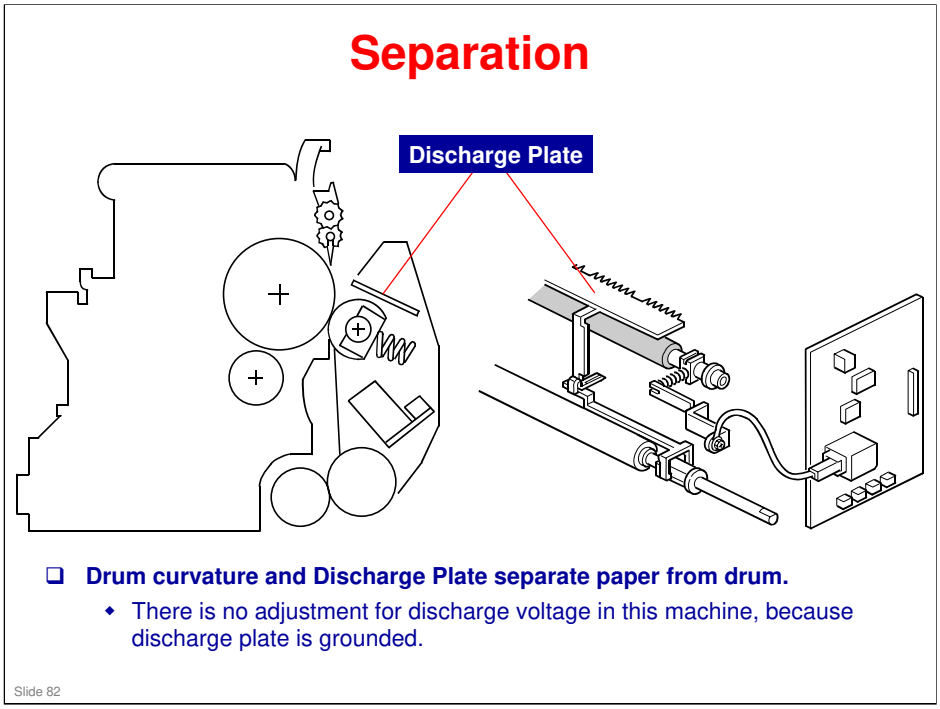
More on Transfer Roller Cleaning

- Toner may transfer from drum to transfer roller if:
  - A paper jam occurred
  - The paper size is smaller than the printed image
- The transfer roller must be cleaned to prevent toner from being transferred from the roller to the back side of copies.
  - There is no mechanism, just the application of positive and negative current to transfer any adhering toner back to the drum.

    The negative current pushes negatively-charged particles back to the drum.

    The positive current pushes positively-charged particles back to the drum.
  - Note that the roller is not cleaned before each job unless the setting of SP2-996 is changed from the default. This is to keep the copy speed as high as possible.
- The toner that transfers back to the drum is recycled with the other unused toner. Paper dust may also find its way into the toner because of this.



No additional notes.

SP Modes

- **SP 2301: Transfer current**
  - SP 2301 1: Paper tray
    - » 'Normal' paper
  - SP 2301-2: By-pass tray
    - » For special/thick paper
  - SP 2301-4: During transfer roller cleaning
- **SP 2906: Image writing position shift**
- **SP 2996: Transfer roller cleaning before each job, on/off**

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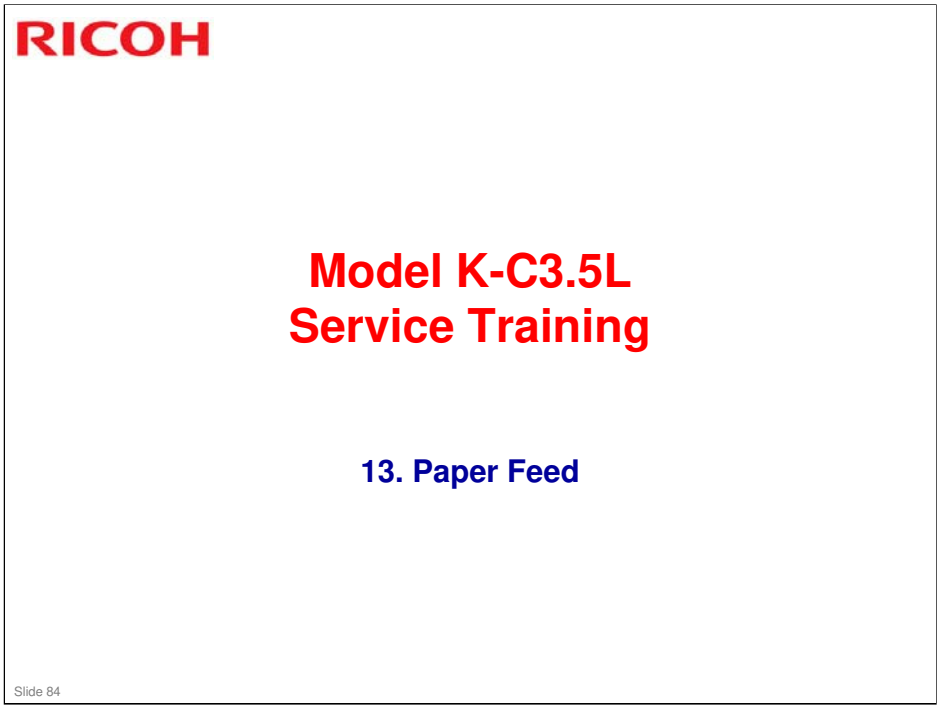
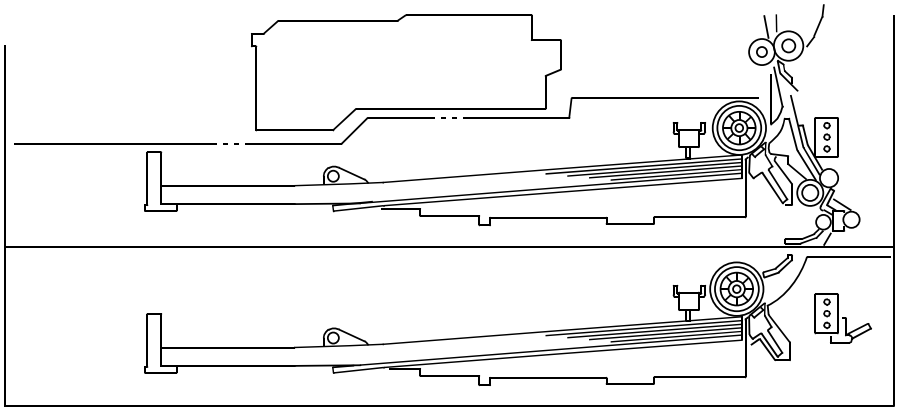
No additional notes.



No additional notes.

Overview



- **Built-in paper trays: 250 sheets each**
  - Friction pad and feed roller system
- **By-pass tray: Up to 100 sheets**

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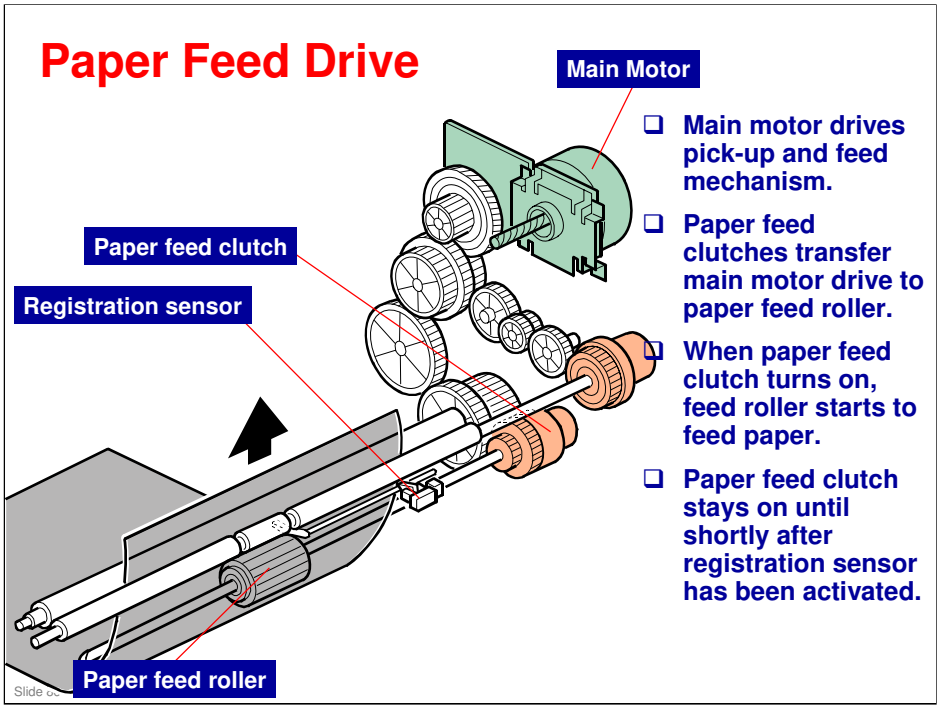
More on Overview

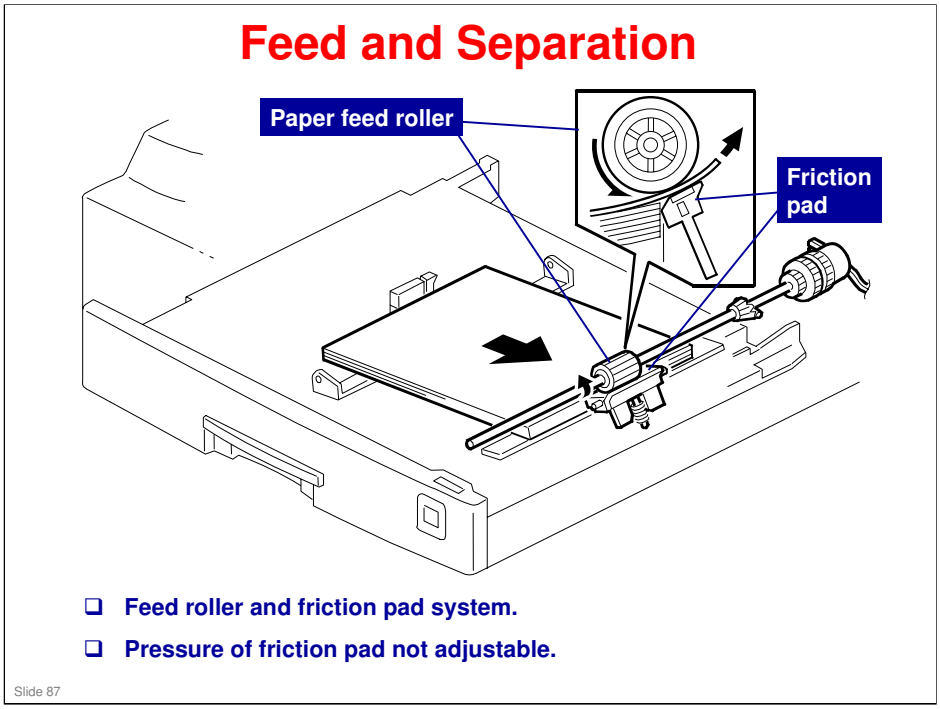
- Note that the paper feed roller and shaft come out with the tray when the user pulls the tray out. This prevents paper from getting caught inside the machine when the tray is pulled out.
- Note the functions of the two relay sensors.
- The by-pass tray is not shown on the diagram.
- The by-pass tray can handle thick paper (this mode is also for OHPs) and 'special' paper (meaning envelopes, traditional Japanese paper, etc.).
  - The machine does not change the fusing, transfer, or other parameters if the user selects 'special paper'.

    Choose "Special Paper" from the driver when printing from a tray that is set up for 'special paper'. Otherwise, the job will not print.

    Trays set up for 'special paper' will be skipped for Auto Continue

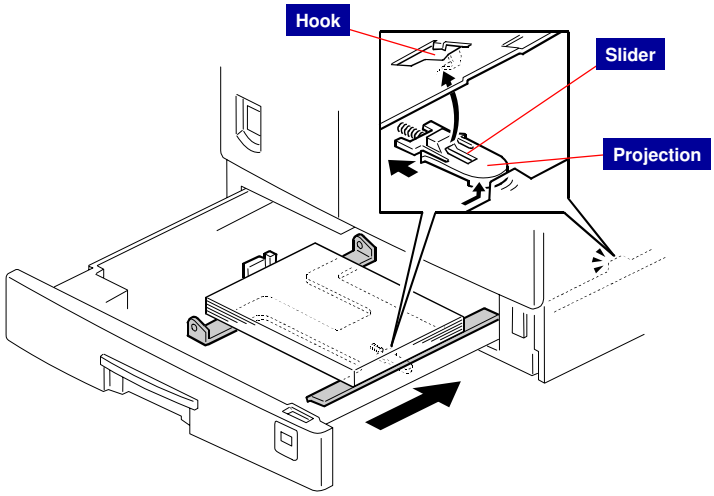


No additional notes.



No additional notes.

Tray Lift



- When the tray is closed, projection on copier frame pushes slider off bottom plate hook.
  - Slider is on bottom part of tray.
- After slider comes off, compressed springs lift bottom plate.

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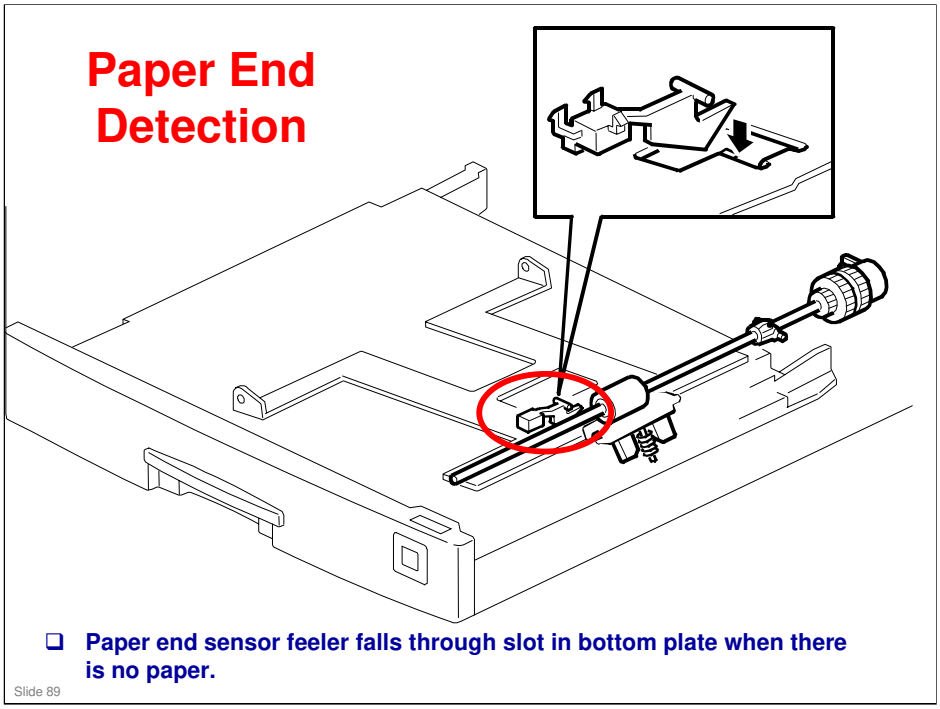
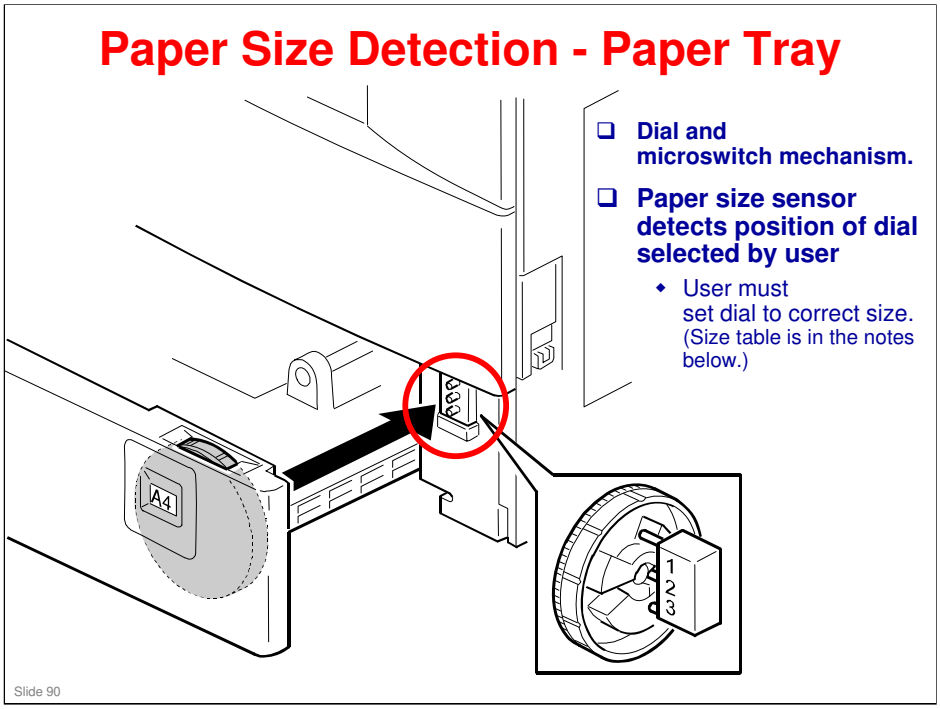
No additional notes.



No additional notes.



More on Paper Size Detection

Using a non-standard paper size

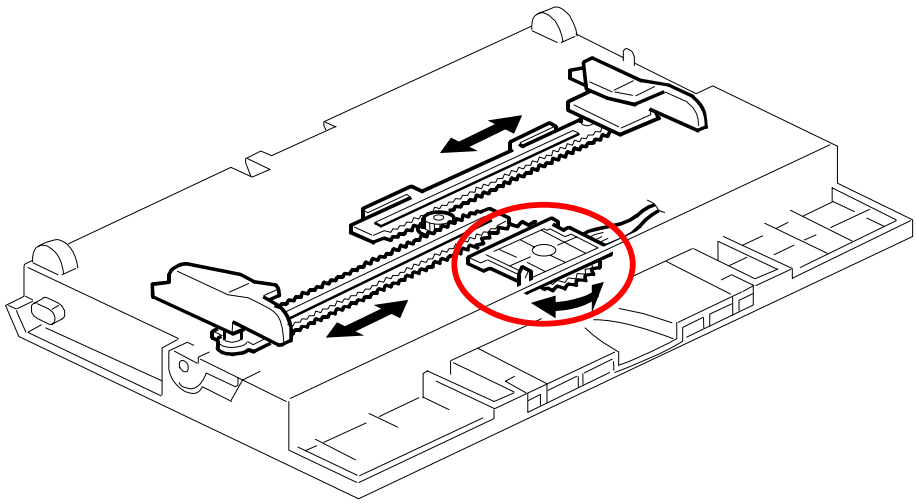
- To use a non-standard paper size, set the dial to the * mark
- Then, set the size with a User Tool (System Settings – Tray Paper Settings – Tray Paper Size).
- The machine disables paper feed from the tray if the paper size cannot be detected (the paper size cannot be detected if the paper size actuator is broken or if no tray is installed).

Paper size table

- On = Not pushed, Off = Pushed

Paper Size	SW 1	SW 2	SW 3
A3, 11" x 17"	Off	Off	Off
A4 LEF	On	On	Off
A4 SEF, 8½" x 11"	On	Off	Off
A5 LEF, 8½" x 14"	Off	On	On
8½" x 13"	On	Off	On
11" x 8½"	Off	On	Off
* (asterisk)	Off	Off	On

Paper Size Detection - By-pass Tray



- Bypass paper size switch monitors paper width.
- Side fences turn a gear wheel that contains sensor terminals.

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More on Paper Size Detection

- The side guides contain ratchets that turn a gear wheel at the center of the sensor. The gear wheel contains terminals. The output of the sensor changes when the gear wheel rotates over the wiring patterns on the rectangular part of the width sensor.
- The bypass tray hardware only determines the paper width. The base copier hardware determines the length.

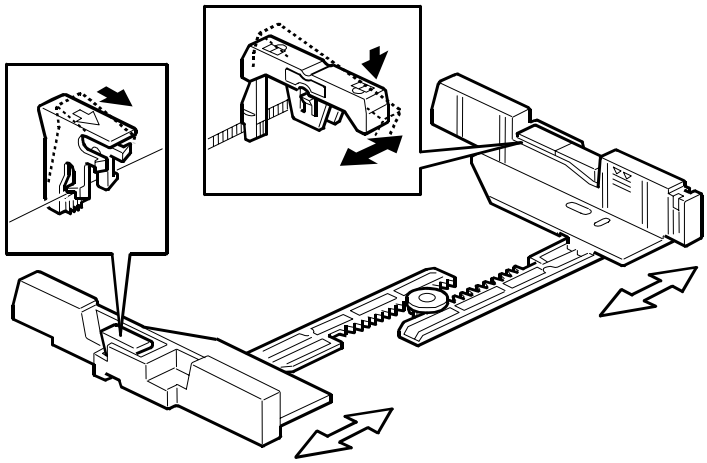
North America

CN No. (BICU)	11" x 17"	$8^1/_2$" x 14"	$5^1/_2$" x $8^1/_2$"		
CN136-1	ON/OFF	OFF	OFF	OFF	OFF
CN136-2	OFF	OFF	OFF	ON	OFF
CN136-3 (GND)	OFF	OFF	OFF	OFF	OFF
CN136-4	OFF	ON	OFF	OFF	ON
CN136-5	ON	ON	OFF	OFF	OFF

Europe/Asia

CN No. (BICU)	A3	A4 SEF	8" x 13"	A5 SEF
CN136-1	ON/OFF	OFF	OFF	OFF
CN136-2	OFF	OFF	OFF	ON/OFF
CN136-3 (GND)	OFF	OFF	OFF	OFF
CN136-4	OFF	ON	ON	OFF
CN136-5	ON	ON	OFF	OFF

Side Fences

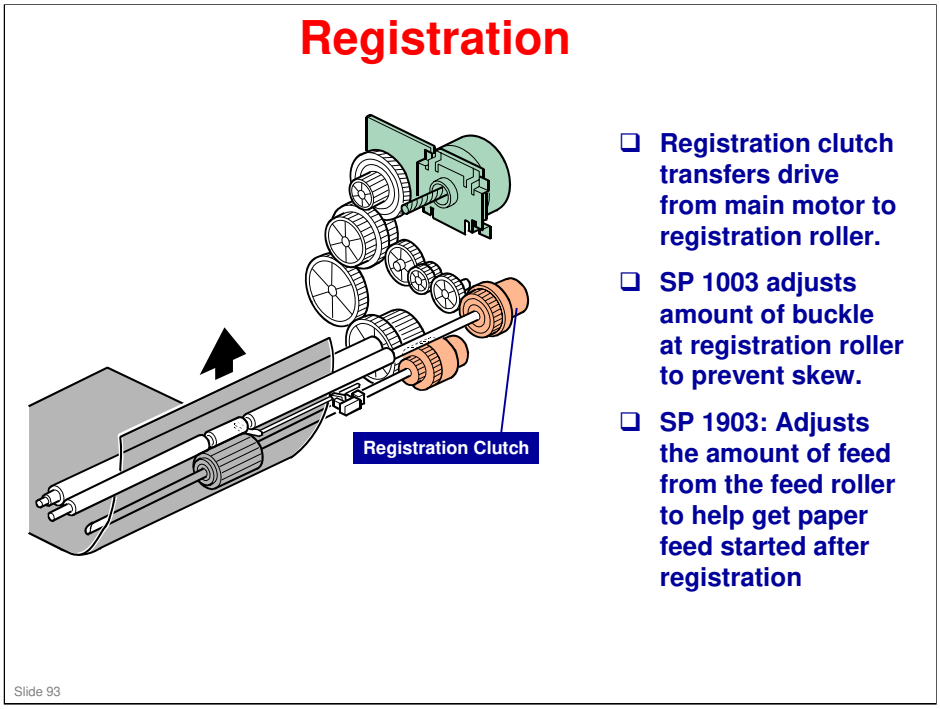


- Side fences have stoppers to prevent them from bending when a full tray is pushed in too strongly

Slide 92

More on Side Fences

- If the tray is full of paper and it is pushed in strongly, the fences may deform or bend. This may cause the paper to skew or the side-to-side registration to be incorrect.
- Each side fence can be secured with a screw for customers who do not want to change the paper size.



More on Registration

- The paper feed clutch stays on slightly after the registration clutch turns off, so that the paper buckles against the registration roller.
  - SP 1003 can be used to adjust the amount of buckling.
- The paper feed clutch can come on again to help paper feed get started after registration. This is a good idea if there are frequent jams at the registration roller just after registration.
  - These jams occur when the paper jumps over the registration instead of going between them. The clutch comes on again for certain paper types, such as thick paper, to try to push the paper between the rollers.
  - SP 1903 adjusts this feature.
  - In lab tests, this problem was not found when feeding from tray 1. So there is no adjustment for tray 1.

SP Modes

- **SP 1001: Leading edge registration for various paper feed stations**
- **SP 1002: Side-to-side registration for various paper feed stations**
  - SP 4010 - 11: Scanner registration
  - SP 6006: ADF registration
- **SP 1003: Paper feed timing. (Adjusts buckle at the registration roller to prevent skew.)**
- **SP 1903: Feed clutch boost after registration**

Slide 94

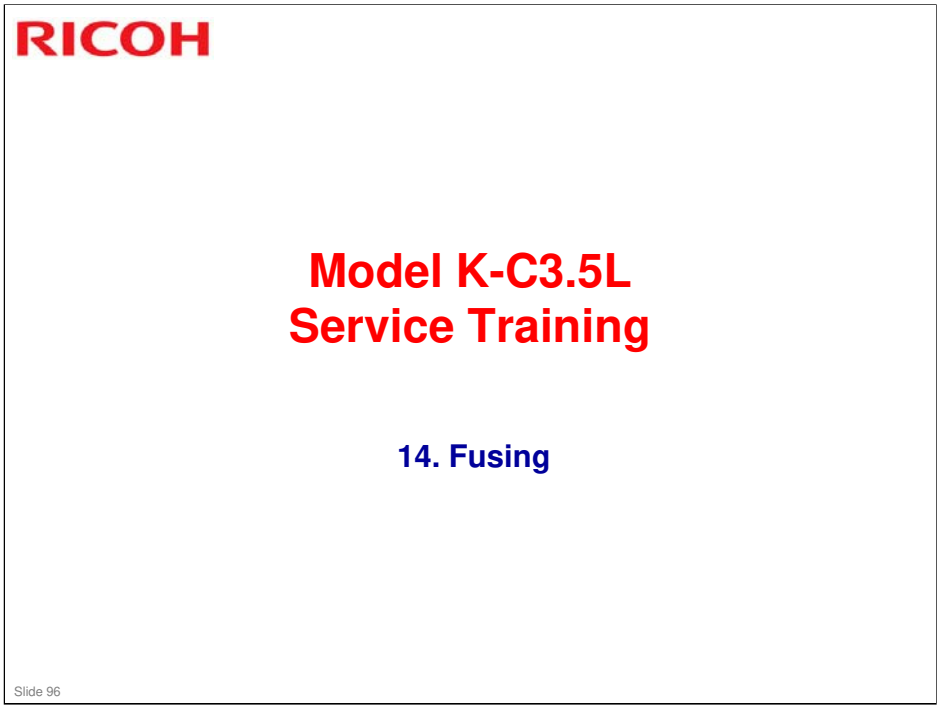
No additional notes.

Lab Work

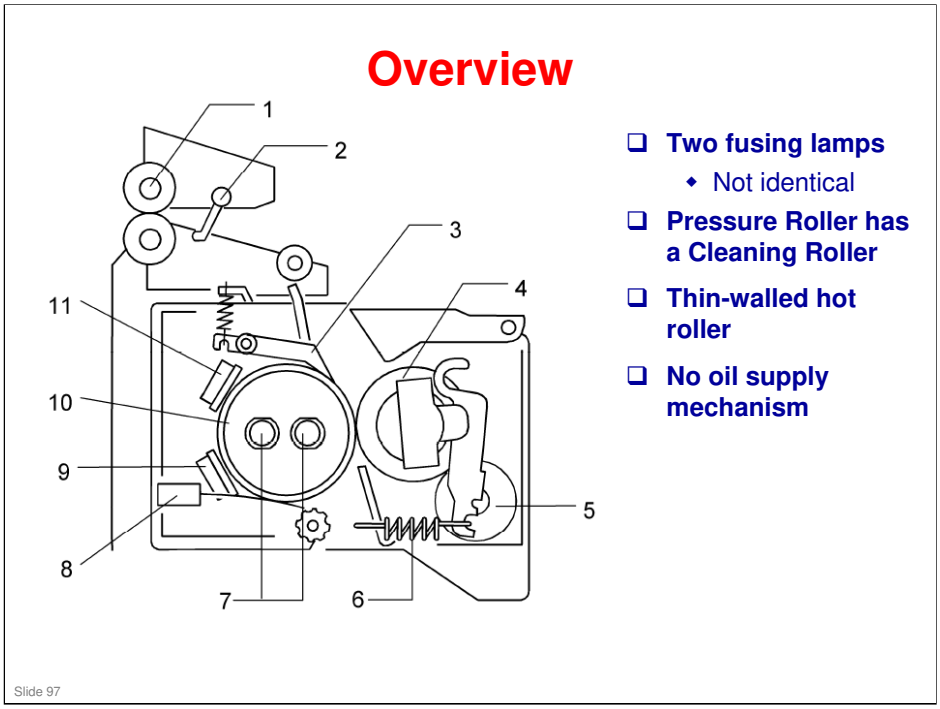
- **Practice the removal procedures for the paper feed section.**
  - FSM → Replacement and Adjustment → Paper Feed Section

Slide 95

No additional notes.



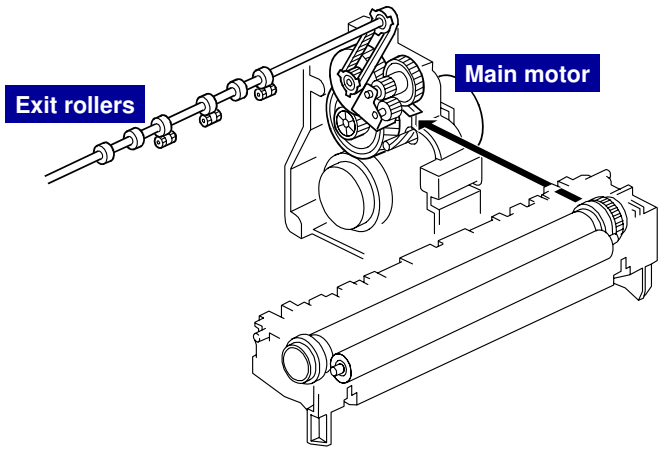
No additional notes.



Components

1. Paper exit roller
2. Exit sensor
3. Hot roller strippers
4. Pressure roller
5. Cleaning roller
6. Pressure spring
7. Fusing lamps
8. Thermistor
9. Thermostat
10. Hot roller
11. Thermostat

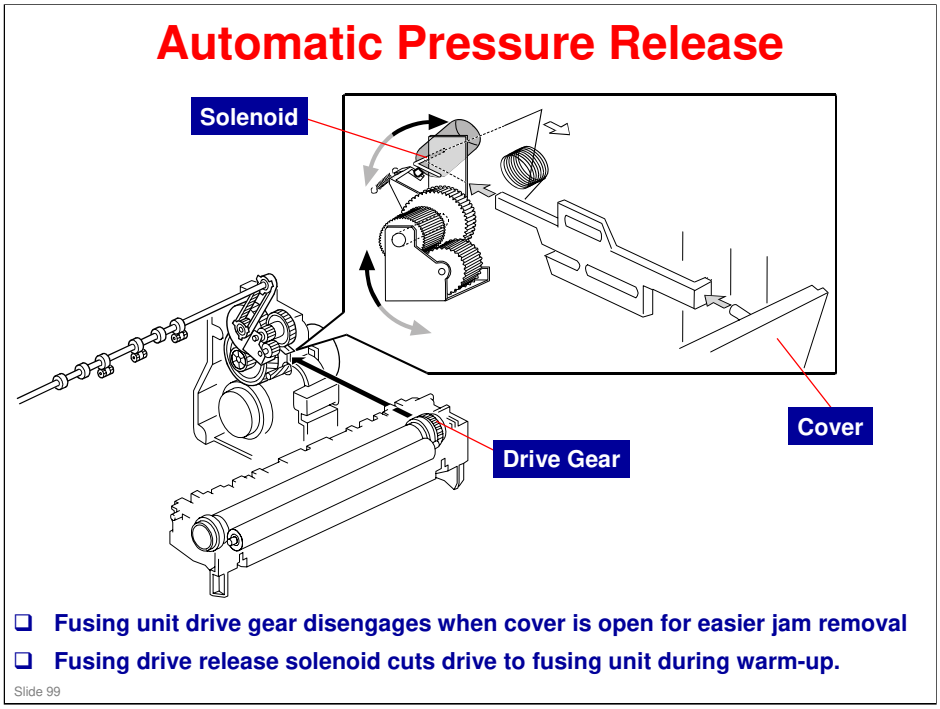
Drive



- Fusing unit is driven by main motor through gears.
- Paper exit rollers are driven by main motor through a timing belt.

Slide 98

No additional notes.



More on Automatic Release

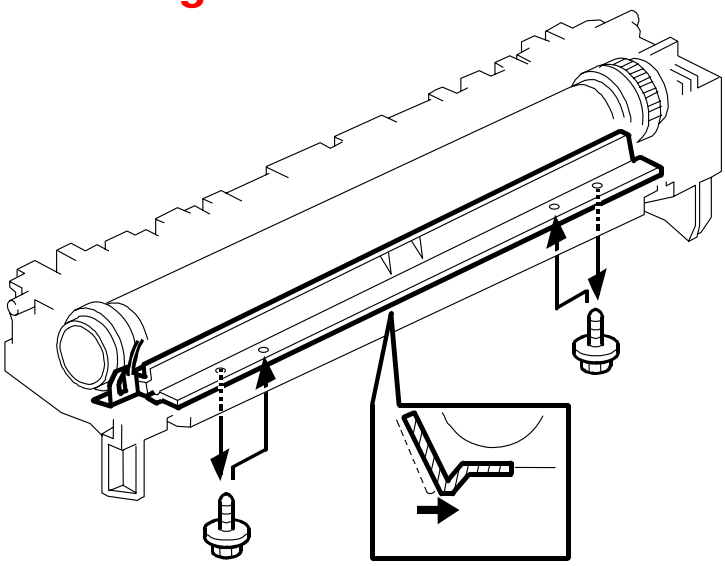
Pressure release when the cover is open

- The drive gear releases when the cover is open, so that jams can be removed.

Pressure release during warm-up

- During warm up (just after the main power is switched on, or from standby/energy saver mode), if the temperature is above 18°C, the solenoid turns on and disengages the drive gear, which cuts the drive to the fusing unit.
- If the solenoid is off, the drive gear is engaged, and the hot roller turns whenever the main motor is on. When the hot roller turns, it will be cooled down by the pressure roller. So, the machine will take longer to detect the standby temperature.
- However, when the machine is cold (below 18°C), the hot roller turns so that it will warm up evenly. Then, at 18°C, the roller will stop turning.
- Note that if fusing idling is switched on (SP 1103), the solenoid will always engage the drive gear and the rollers will turn, regardless of the temperature.

Fusing Entrance Guide Shaft



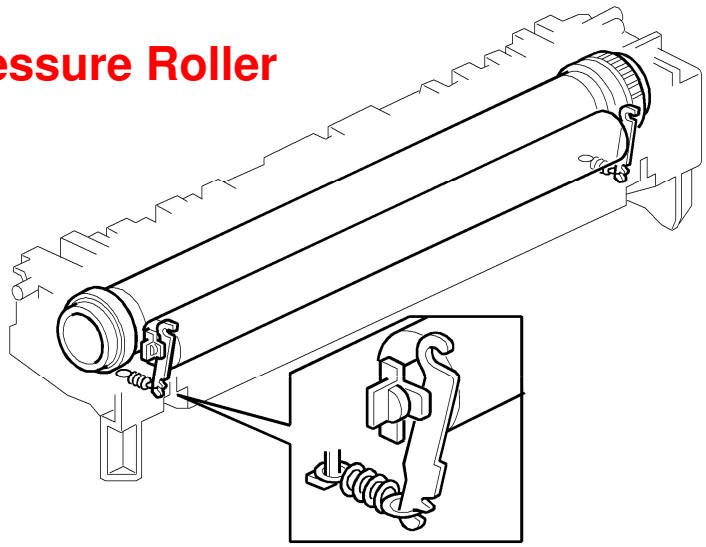
❑ If paper creases in fusing unit, move guide to right.

Slide 100

More on Entrance Guide Shaft

- ❑ The entrance guide can be moved to prevent creasing.
- ❑ Moving the guide to the right feeds the paper more directly to the gap between the two rollers.

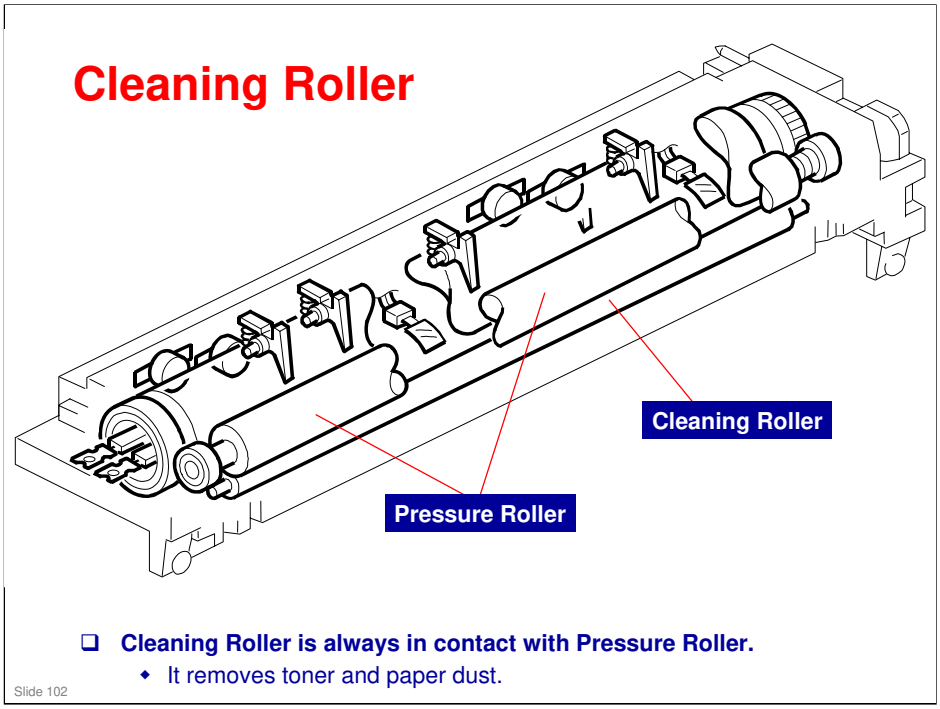
Pressure Roller



- The springs apply pressure between hot roller and pressure roller.
- The springs can be moved.
  - Default position is at end.

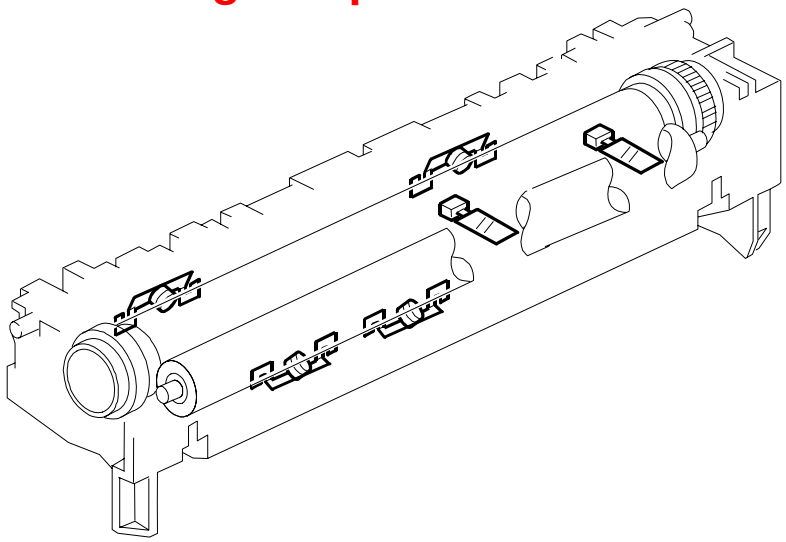
Slide 101

No additional notes.



No additional notes.

Fusing Temperature Control



- Machine checks thermistors once every 1.5 seconds.
- Machine compares current and previous readings, and the target, and then decides how long to keep lamp on during next second.

Slide 103

More on Fusing Temperature Control

- The cpu switches the fusing lamp on/off depending on the thermistor output.
- The cpu determines how long to keep the lamp on during the next second by comparing the current and previously detected temperatures with the target temperature.
- Starting and stopping the fusing lamp power every 1.5 seconds may cause fluorescent lighting in the room to flicker. To reduce this flickering, increase the value stored in SP 1108.

Fusing Lamp Power Supply

- **Soft Start: Full power is applied to the fusing lamp gradually, not all at once**
  - Machine gradually allows more power to fusing lamp over a number of zero-cross cycles of ac supply.

Slide 104

No additional notes.

Room Lighting Affects

- **Caused by starting and stopping fusing lamp power every second**
  - SP 1108: Reduce flicker by inputting a larger value
  - BICU may be unable to detect fusing lamp errors if the cycle is more than 2 seconds.

Slide 105

More on Room Lighting Affects

- The CPU checks the output from the fusing thermistor once every 1.5 seconds (default setting). The CPU compares the current and previous temperatures. Based on the result, it then decides how long the fusing lamp power should be on during the next one-second interval
- Even with the 'soft start' feature, starting and stopping the fusing lamp power every second can cause fluorescent lighting in the room to flicker.
- To reduce this flickering, use SP 1108 to change the cycle to a longer setting.

Poor Fusing on the First Few Copies

- **If the room is cold, the hot roller may not stay hot for very long after reaching the print ready temperature.**
- **To solve this problem, set SP 1103 to 'on'.**

Slide 106

More on Poor Fusing on the First Few Copies

- If the room is cold, the fusing on the first few copies may be poor because the hot roller may not be holding enough heat, even if it has reached the correct fusing temperature.
- If this happens, enable fusing idling with SP 1103. This will turn the hot roller and heat it for longer than is needed to heat the roller to the ready temperature (it turns for 30 seconds instead of just 6 seconds, if the fusing unit temperature is lower than 100°C). The customer must wait this extra time whenever the machine is switched on or recovers from energy saver mode.
- With fusing idling set to ‘off’, the machine just waits for the roller to reach the ready temperature, then prints. This may not be enough to warm the roller up.

What is the purpose of fusing idling?

- Fusing idling allows the hot roller to heat the pressure roller to a constant temperature. This prevents insufficient fusing opposite cooler parts of the pressure roller. It also repairs small dents on the pressure roller that could cause jitter on the first few copies. However, the machine takes longer to warm up, so it is normally only used in high-speed copiers.
- Fusing idling is normally disabled in this machine, because the copy speed is only in the middle range. However, if fusing is incomplete on the 1st and 2nd copies, switch it on. This may occur if the room is cold, especially with thick paper.

Offset when Making Many Copies on Narrow Paper

- **Target fusing temperature lowered by 10°C**
  - If the smallest copy paper width detected during a 40-second interval is less than 220 mm.
- **Target fusing temperature lowered by another 5°C**
  - If, during the next 80 seconds, the smallest width detected is again less than 220 mm.

Slide 107

More on Offset when Making Copies

- If narrow paper is fed through the fusing unit continuously, the temperature at the ends of the rollers becomes higher than at the center.
  - This is because paper is not drawing heat away from the ends.
- Then, if a wider paper is used soon after, the higher temperature could cause offset to appear at the sides of the copy.
  - This is very likely when making several copies of an original with many pages using the rotation sort feature (sets of copies are made with SEF and LEF paper alternately – the ends of the rollers heat up when making a copy on SEF paper, then offset will appear when making the next set on LEF paper).
- The machine deals with this as explained on the slide.
  - However, note that if A6 is detected, the temperature increases 10°C as explained earlier (Thick paper from the By-pass Tray).

Reduced Copy Speed - Narrow Paper

- **To ensure that images are properly fused onto paper 220 mm or less in width, machine automatically reduces copy speed under following conditions:**
  - After 180 seconds of continuous copying.
  - When Thick or Special paper mode is used.
  - When paper is fed from the by-pass tray.

Slide 108

More on Reduced Copy Speed – Narrow Paper

- The feature described on the previous slide shows how the machine prevents the ends of the hot roller from getting too hot when copying using narrow-width paper.
- The feature on this slide prevents the centre of the roller from cooling down too much when using narrow-width paper.
- Paper removes heat from the roller
- The temperature has been lowered, because of the feature explained on the previous slide.
- So, the temperature in the middle may drop too low, and fusing may not be sufficient.
- Because of all this, the copy speed is reduced so that paper does not cool down the middle part of the roller too quickly.

Overheat Protection

- **Three levels of overheat protection**
  Normally, the primary level can fully protect the hardware. The second works as the fail-safe feature for the first one. The third works as the fail-safe feature for the second one.
- **Primary Level:**
  - If the fusing temperature reaches 230°C (or higher) and stays so for one second, the controller turns the fusing lamp off. In a case like this, SC543 or SC553 shows.
- **Second Level:**
  - If the fusing feature reaches 250°C, the controller cuts off the 24V line. (The fusing lamps are on the 24V line.)
- **Third Level:**
  - Two thermostats are attached on each line of the two fusing lamps. (four thermostats in total). One of the two thermostats cuts the power supply to the fusing lamp at 179°C, and the other cuts the power supply at 180°C. (Note that the thermostat temperature is somewhat lower than the fusing temperature.)

Slide 109

More on Overheat Protection

- There are three error codes associated with thermostat failure.
  - SC544 is related to low temperature detection
  - SC546 is related to unstable fusing unit temperature.
  - SC541 occurs after resetting the above codes, if the thermostat is still open.

SP Modes

- SP 1103: Fusing idling on/off
- SP 1105: Fusing unit temperatures
- SP 1106: Displays the current fusing unit temperature
- SP 1107: Soft start adjustment
- SP 1108: Fusing temperature control cycle (1, 1.5, or 2 seconds)
- SP 1109: Nip band width adjustment
- SP 1902: Displays the mains ac frequency to the fusing lamp

Slide 110

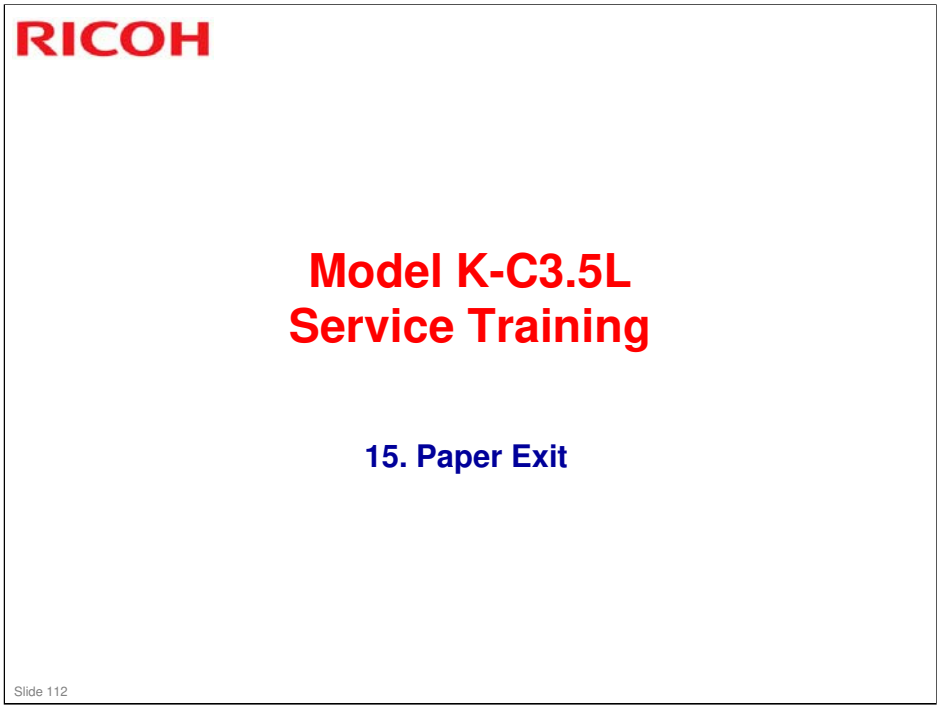
No additional notes.

Lab Work

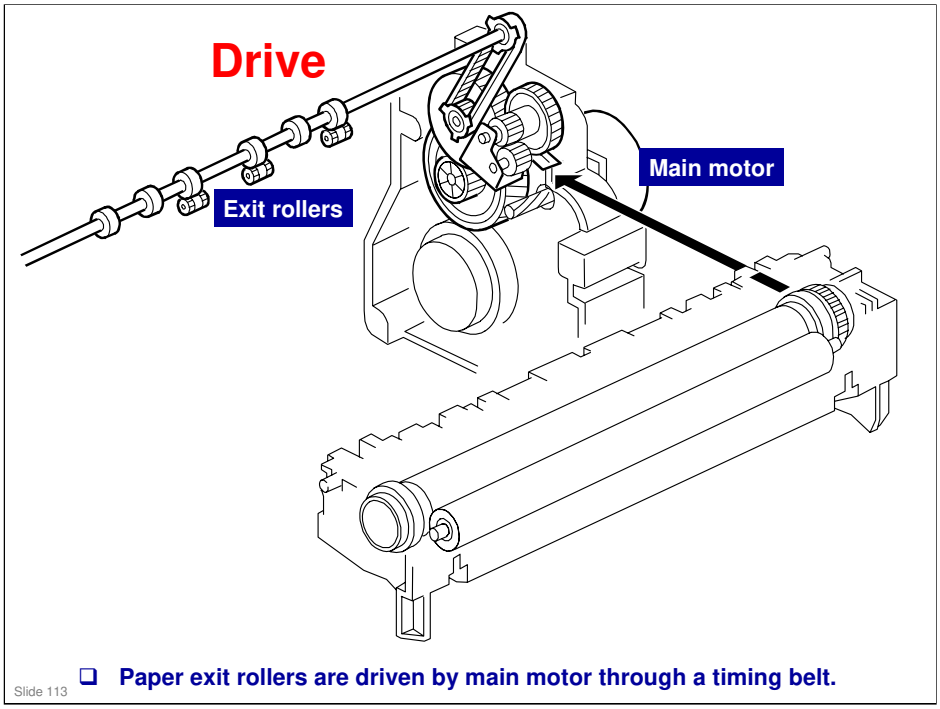
- **Practice the removal procedures for the fusing section.**
  - FSM → Replacement and Adjustment → Fusing

Slide 111

No additional notes.

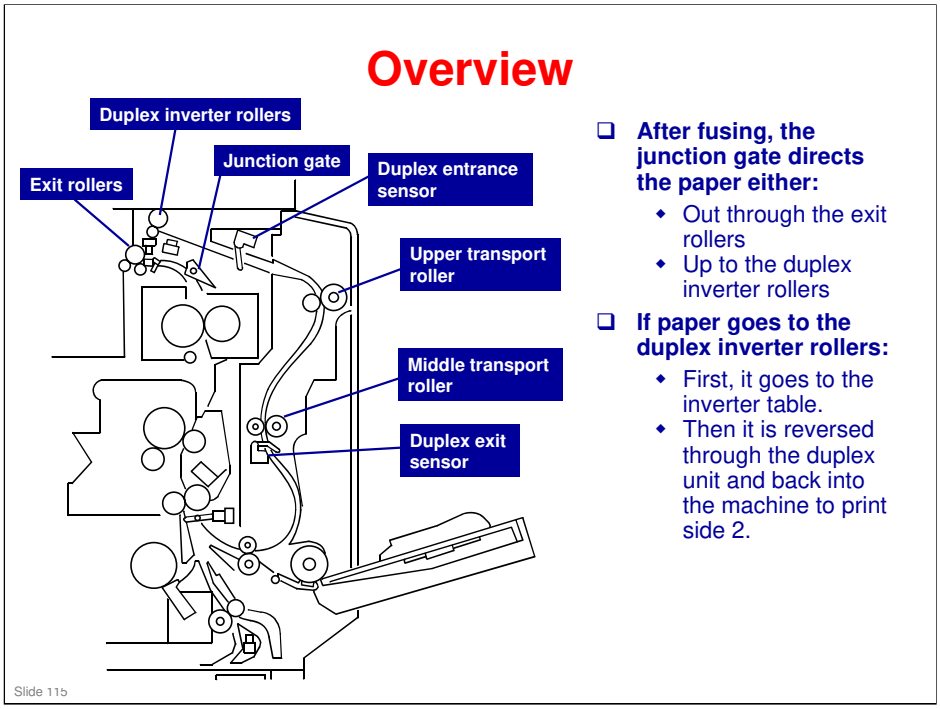


No additional notes.



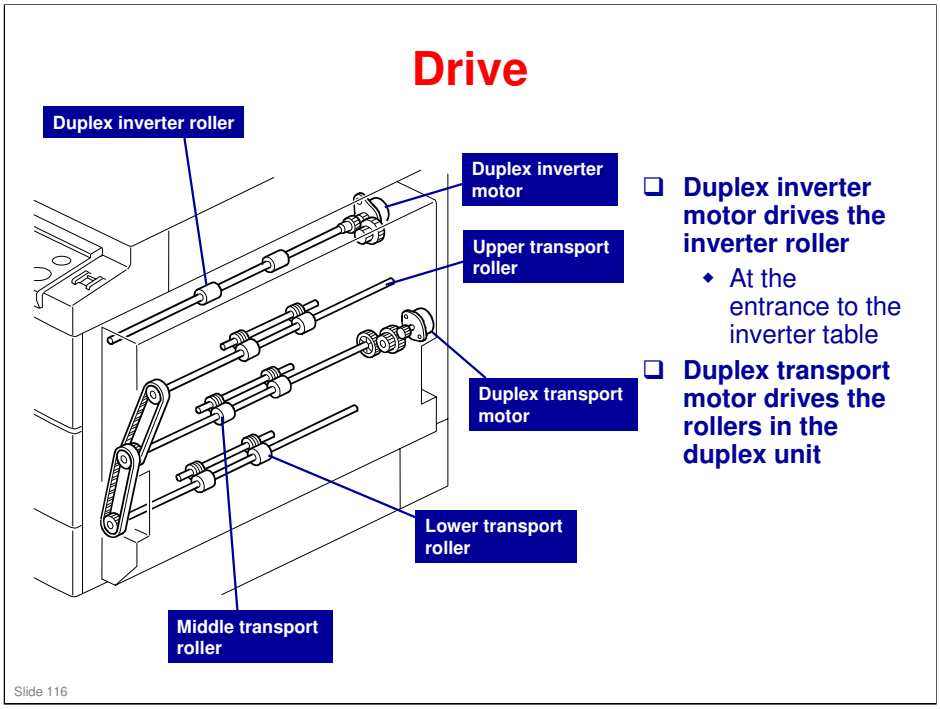
No additional notes.

- This section is for the K-C3.5Lcd only. The K-C3.5Lb is a simplex machine.



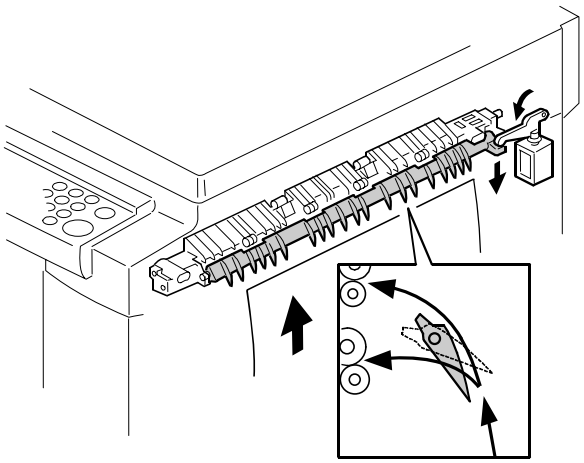
More on Overview

- The duplex unit consists of an inverter table above the copy exit, and a duplex unit attached to the right side of the machine.
- The duplex unit is in the B269/B244 models only



No additional notes.

Duplex Entrance



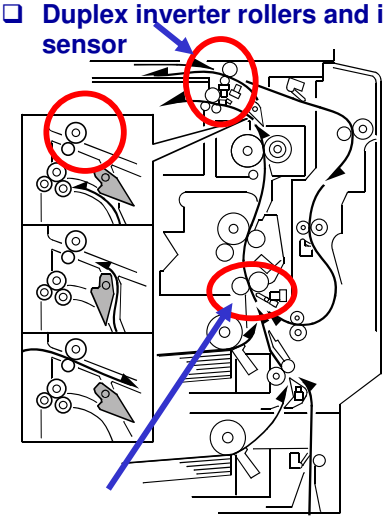
- **Inverter gate solenoid**
  - Switches on to send paper to the inverter table
  - Stays off to feed paper out of the machine

Slide 117

No additional notes.

Duplex Feed Path

- Duplex inverter rollers and inverter sensor



- Registration rollers

- The junction gate directs the paper up to the duplex inverter rollers, instead of out to the exit rollers.
- When the paper trailing edge reaches the duplex inverter sensor:
  - The inverter roller reverses and the paper goes to the duplex unit.
- The paper goes down through the duplex unit to the registration rollers.
- Then, the second side is printed and the page is fed out.

Slide 118

More on Duplex Feed Path

- While the paper is being fed towards the duplex unit, the junction gate goes back to the normal position, to make sure that the paper goes to the duplex unit and not directly down to the fusing unit.
- If there are two or more copies being made with A4/8½" x 11" or smaller, the next sheet waits at the registration sensor for the current sheet to exit the inverter.

Paper Feed Time – Interleaving

- Longer than A4/LT SEF: Only one page can pass through at a time (that is, no interleaving is done).
- A4/LT SEF or shorter: Two pages can go through the duplex unit at once (this is known as 'interleaving'). The copier interleaves the pages; this gives maximum throughput.

Slide 119

No additional notes.

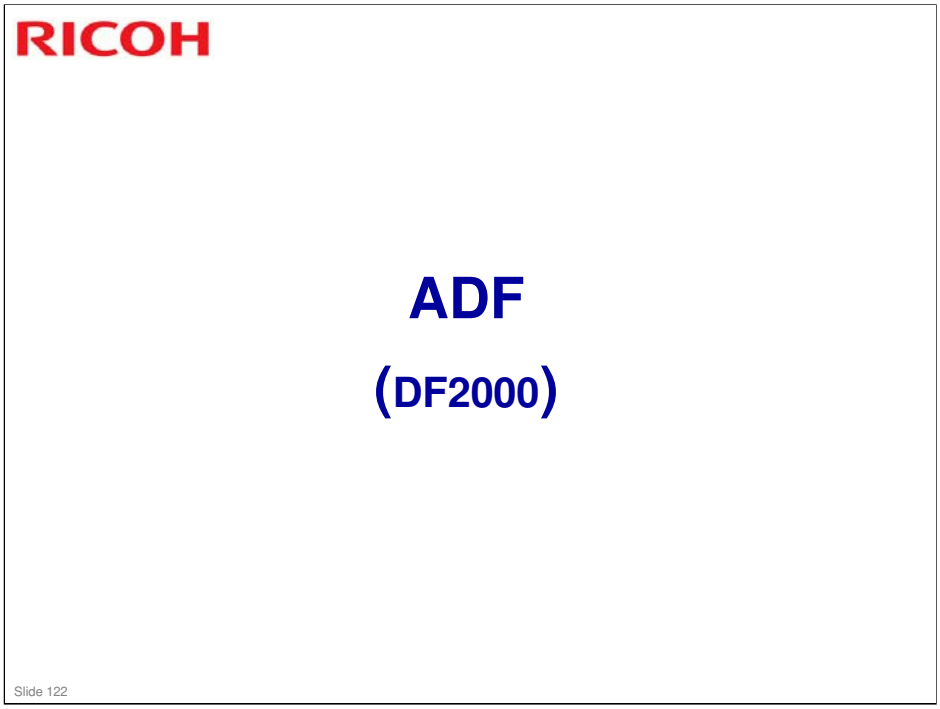
Lab Work

- **Practice the removal procedures for the duplex unit.**
  - FSM → Replacement and Adjustment → Duplex Unit

Slide 120

No additional notes.

No additional notes.



No additional notes.

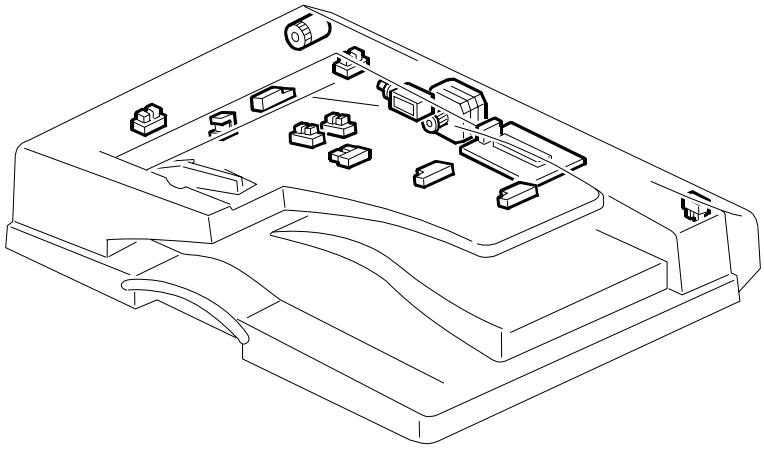
Overview

- Feeds originals past the DF exposure glass while scanning
- No inverter unit
- The DF exposure glass is a narrow glass to the left of the exposure glass.
- The ADF does not use the main exposure glass, unless the user selects book mode and places the originals on the glass (in which case, the ADF mechanism isn't used - just the cover).
- Study the component layout diagrams (mechanical, electrical, and drive) in the DF2000 service manual.

Slide 123

No additional notes.

Original Size Detection

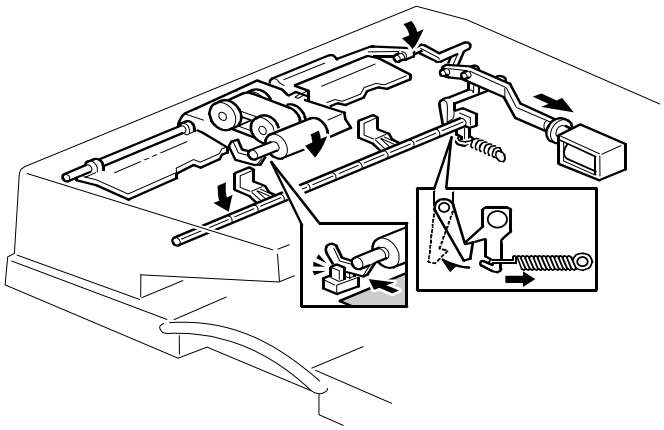


- **Two width sensors, and two length sensors.**
  - All sensors are reflective photosensors.
  - See *Supported Paper Sizes* under *Specifications* in the FSM.
  - See *Original Size Detection* in the DF2000 service manual.

Slide 124

No additional notes.

Pick-up Mechanism

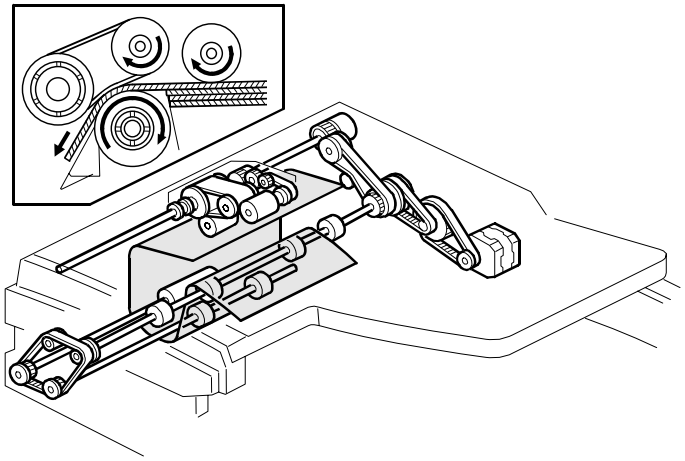


- Original set sensor detects when original has been placed in feeder.
- Pick-up solenoid drops pick-up roller onto top sheet of originals.
- For details see *Pick-up and Separation* in the DF2000 service manual.

Slide 125

No additional notes.

Separation Mechanism

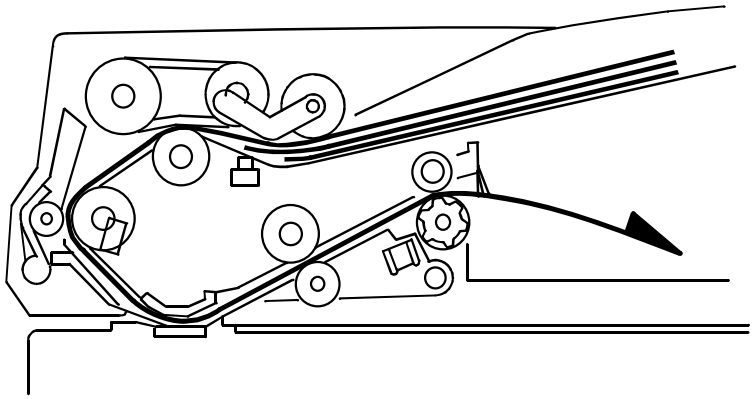


- Transport motor drives all rollers.
- Feed clutch drives pick-up roller and feed belt.
- For details see *Pick-up and Separation* in the DF2000 service manual.

Slide 126

No additional notes.

Transport and Feed-out

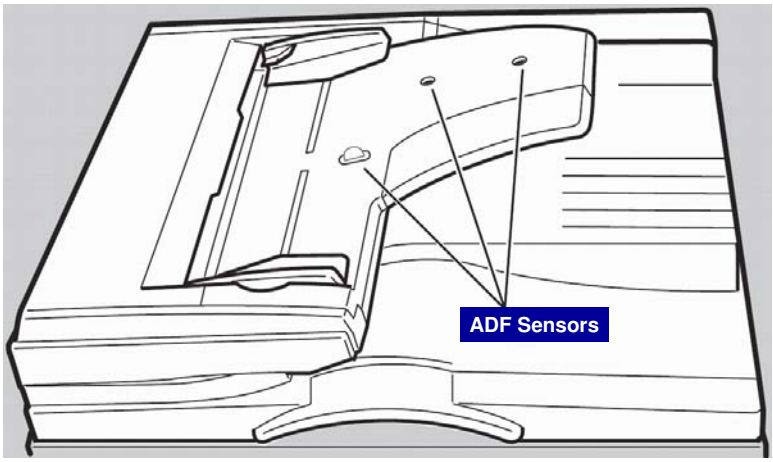


- Transport motor feeds original through scanner.
- Motor speed depends on reproduction ratio.
- For details see *Original Transport and Exit Mechanism* in the DF2000 service manual.

Slide 127

No additional notes.

ADF Sensors



- **Note: Do not cover above sensors with your hands, or place objects on them. Doing so could cause:**
  - Paper size to be detected incorrectly
  - Paper misfeed error message to appear.

Slide 128

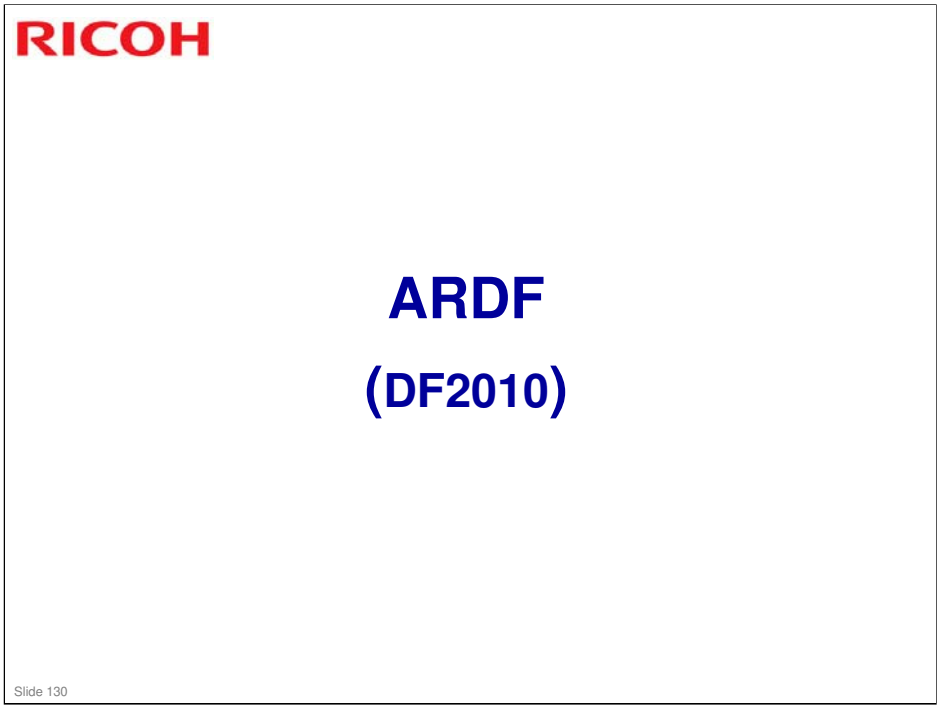
No additional notes.

SP Modes

- SP 6006: Registration
- SP 6009: ADF free run
- SP 6901: APS sensor display for the ADF

Slide 129

No additional notes.



No additional notes.

Overview

- Feeds originals past the DF exposure glass while scanning
- Inverter unit allows duplex copying and stacking in the correct order after scanning
- The DF exposure glass is a narrow glass to the left of the exposure glass.
- The ARDF does not use the main exposure glass, unless the user selects book mode and places the originals on the glass (in which case, the ARDF mechanism isn't used - just the cover).

Slide 131

No additional notes.

Mechanical Components

- **Look at the component layout diagrams.**
  - Mechanical component layout
  - Drive layout
- **Go to your machine and find the components on the diagrams.**
  - Note the two motors (DF Feed, DF Transport) and the clutch (DF Feed). Their functions will be explained during this section of the course.

Slide 132

No additional notes.

Electrical Components

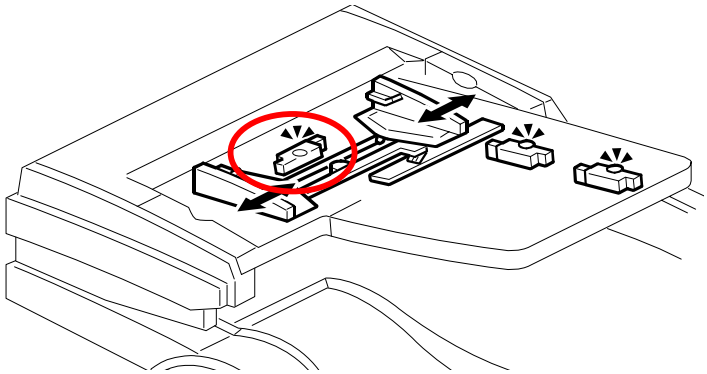
- **For details regarding component layout, the functions of the components, and overall operation of the document feeder, refer to the ARDF DF2010 Service Manual.**
- **Go to your machine and find the components in the diagrams.**

Slide 133

More on Electrical Components

- Note the functions of the following components:
  - Trailing edge sensor: During one-to-one copying, copy paper is fed to the registration roller in advance, to increase the copy speed. This sensor monitors the stack of originals in the feeder, and detects when the trailing edge of the last page has been fed in. This stops the copier from feeding an unwanted extra sheet of copy paper.
  - Original reverse sensor: Detects paper coming back from the reverse tray in double-sided original mode
  - The original width sensor uses an electrode plate, with terminals attached to the document guides. The sensor output changes when the user slides the guides to match the document width. Of course, this means that the wrong width will be detected if the user doesn't position the guides correctly.
  - The DF position sensor only detects when the DF is opened. The platen cover sensor triggers the APS sensors.

Original Size Detection



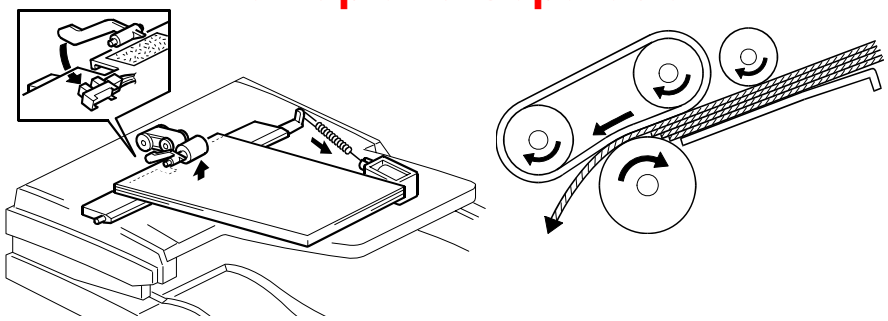
- **One width sensor, and two length sensors**
  - Width sensor: Output depends on the guide position

Slide 134

More on Original Size Detection

- The width sensor has four possible outputs, as shown in the diagram in the manual.
- As pointed out earlier, the user must position the guides correctly.
- The link at the bottom of the slide goes to a table that shows how the machine interprets the outputs from the sensors. There is also some more information about how the sensors work.

Pick-up and Separation

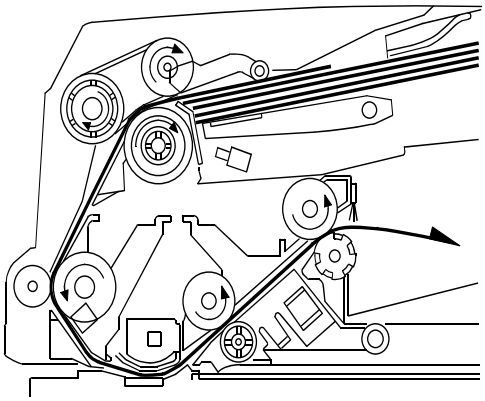


- Pick-up solenoid: Lifts the entrance guide, to lift the originals to the pick-up roller
- Transport motor: Drives all the rollers
- Feed clutch: Drives the pick-up roller and feed belt

Slide 135

No additional notes.

Original Transport and Exit Single-sided Originals



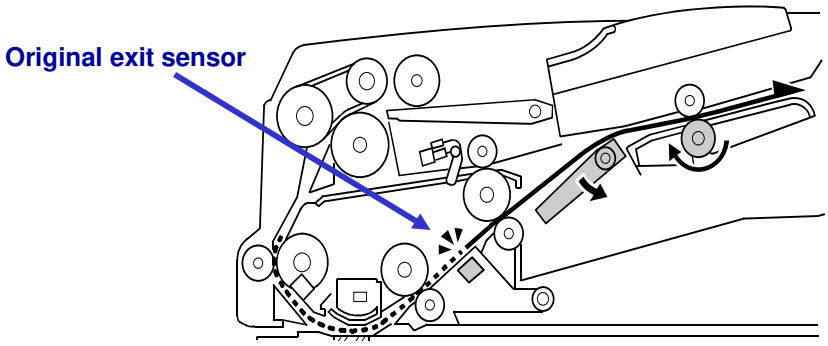
- **Transport motor: Feeds the original through the scanner**
- **Motor speed depends on the reproduction ratio**

Slide 136

More on Original Transport and Exit Single-sided Originals

- Study the path of paper through the DF.
- The machine scans the original through the DF exposure glass.
- The original stops at the registration sensor. However, there is no registration like in the paper feed path (the feed motor in the ADF has stopped, so there is no skew correction). The purpose of stopping here is for timing, so that the original can be fed in at the correct time to synchronize with the rest of the copy process.

Original Transport and Exit Double-sided Originals 1

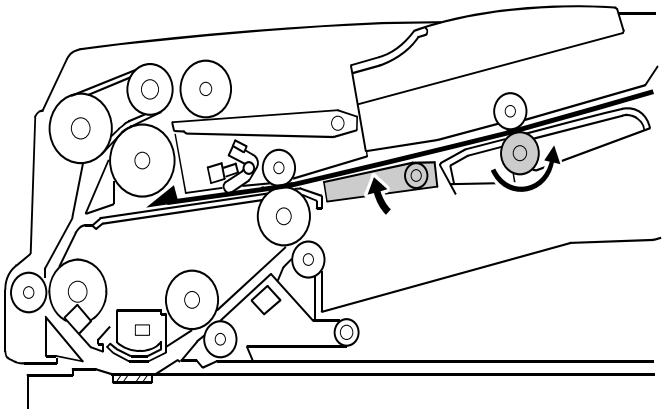


- When the original exit sensor detects the leading edge, the junction gate opens and the original goes to the reverse tray.

Slide 137

No additional notes.

Original Transport and Exit Double-sided Originals 2

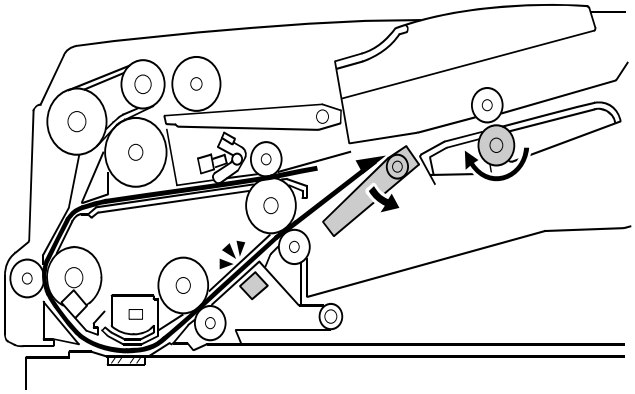


- When the paper is in the reverse tray, the DF feed motor reverses and the reverse roller feeds the original back into the ARDF.

Slide 138

No additional notes.

Original Transport and Exit Double-sided Originals 3

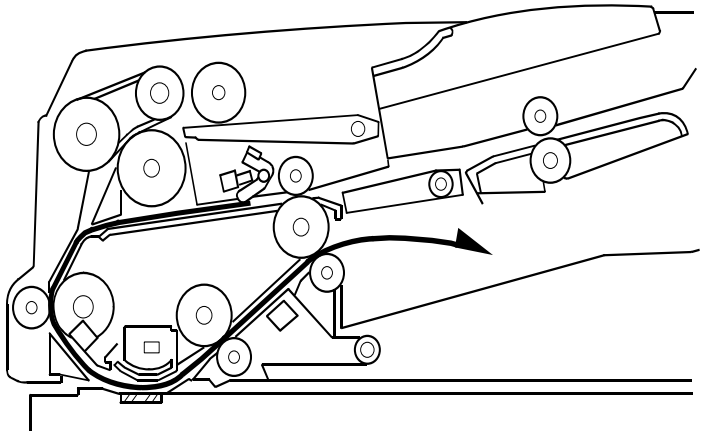


- **The reverse side is scanned**
- **The original is fed to the reverse tray again**
  - The ARDF will reverse the page once more so that the pages of the original are stacked in the correct order.

Slide 139

No additional notes.

Original Transport and Exit Double-sided Originals 4



- The page is fed in from the reverse tray and out to the exit tray.

Slide 140

No additional notes.

SP Modes

- SP 6006: Registration
- SP 6009: ARDF free run
- SP 6010: Stamp position adjustment (in the sub-scan direction only)
- Sp 6901: APS sensor display for the ARDF

Slide 141

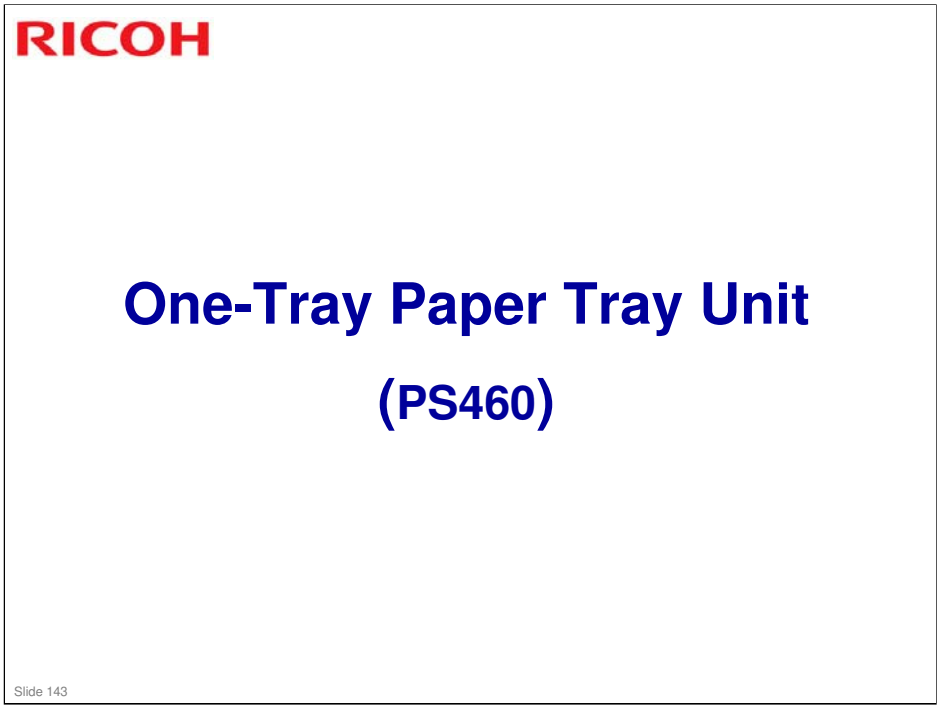
No additional notes.

Lab Work

- **Practice removal and replacement procedures (see *Replacement and Adjustment* in the DF2010 Service Manual):**
  - Do any of the procedures that you think that you need to practice.
  - Pay attention to all notes, cautions, and warnings in the manual.

Slide 142

No additional notes.



No additional notes.

Mechanical Components

- **Study the mechanical and drive component layout diagrams in the Paper Tray 1 (PS460) service manual.**
  - Overall layout
  - Drive layout
- **Go to your machine and find the components on the diagrams.**

Slide 144

More on Mechanical Components

- The feed roller is part of the tray.
  - When the user pulls out the tray, paper caught between the feed roller and friction pad does not remain jammed inside the machine.
- The drive layout diagram shows the motor and gears for driving the paper feed roller.

Electrical Components

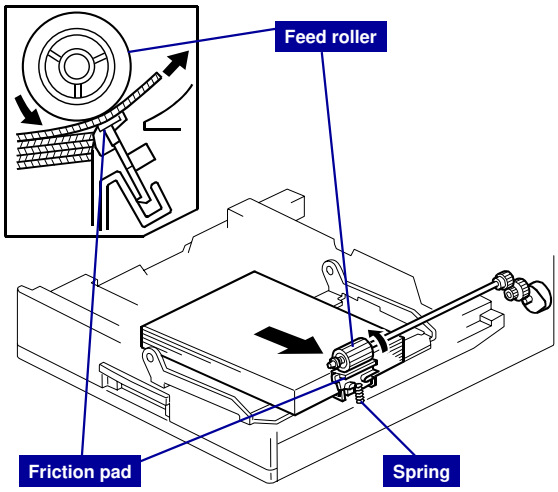
- Study the electrical component layout diagram in the Paper Tray 1 (PS460) Service Manual.
- Go to your machine and find the components in the diagram.

Slide 145

More on Electrical Components

- There are two motors, one to lift the tray and one to drive the rollers.
- There are no clutches.
  - The two-tray unit has clutches, to direct motor drive to the rollers in the correct tray.

Paper Feed and Separation

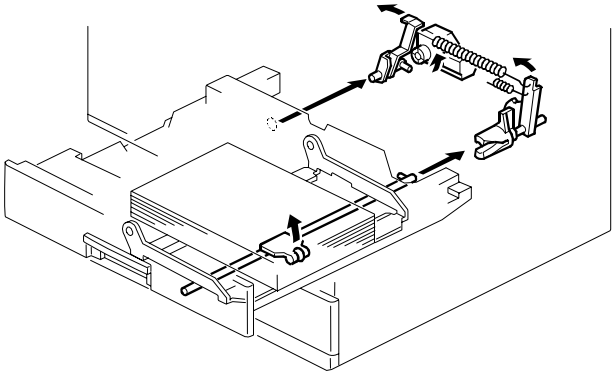


- **Feed roller and friction pad feed system**
- **Paper feed motor drives the feed roller. There is no clutch.**

Slide 146

- The paper tray holds 500 sheets.
- The paper feed roller drives the top sheet of paper from the paper tray to the copier/printer.
- The friction pad allows only one sheet to feed at a time. A spring presses the friction pad against the feed roller.

Paper Lift - Engaging the Shafts



- **Paper size switch: Detects when the tray is pushed in**
- **The two shafts engage when the tray is pushed into the machine.**
  - One shaft lifts the stack
  - The other shaft controls the paper feed pressure

Study the mechanism on your machine

Slide 147

More on Paper Lift

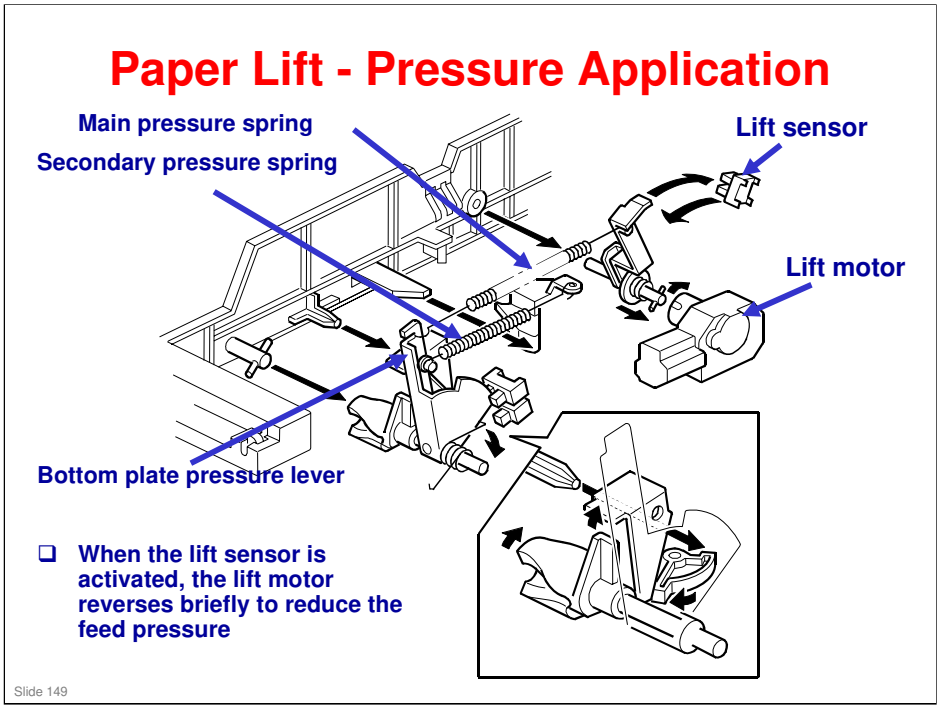
- This mechanism has two purposes:
  - To lift the stack to the paper feed height.
  - To apply a suitable paper feed pressure.
- This slide shows how the shafts engage when the tray is pushed into the machine.

Paper Lift - Pressure Application

- **Study the mechanism on your machine.**
  - Refer to the Paper Tray 1 (PS460) Service Manual.
  - Study the description while referring to the diagram.

Slide 148

No additional notes.

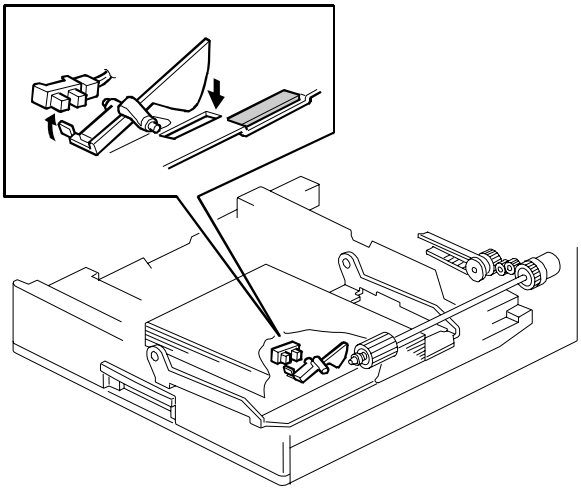


More on Paper Lift – Pressure Application

- This slide shows how the tray is lifted.
- The lift motor turns on, and turns clockwise as viewed on the diagram.
  - The main pressure spring pulls the bottom plate pressure lever, and this lifts the tray bottom plate.
- When the top of the stack touches the feed roller, the motor cannot pull up the plate any more, so it pulls the actuator into the lift sensor.
  - The pressure of the feed roller on the paper is now too high, so the lift motor now reverses to reduce this pressure. It reverses for 200 ms or 600 ms, depending on the paper size. For smaller paper, it reverses the larger amount (600 ms) to reduce the pressure more.
  - The lift motor reverse timing can be adjusted with SP1-908-1, to change the pressure from the main pressure spring.

    If the pressure is too strong, the sheet of paper may not be fed smoothly, and if it is too weak, more than one sheet of paper may be fed at a time.
  - For A4-LEF, A3-SEF, and B4-SEF paper, a projection on the side fence engages the secondary pressure spring, to ensure that extra pressure is applied to wider paper.
- Finally, when the tray is pulled out, the lift motor reverses for 1.7 ms. This makes it easier to put the tray back.

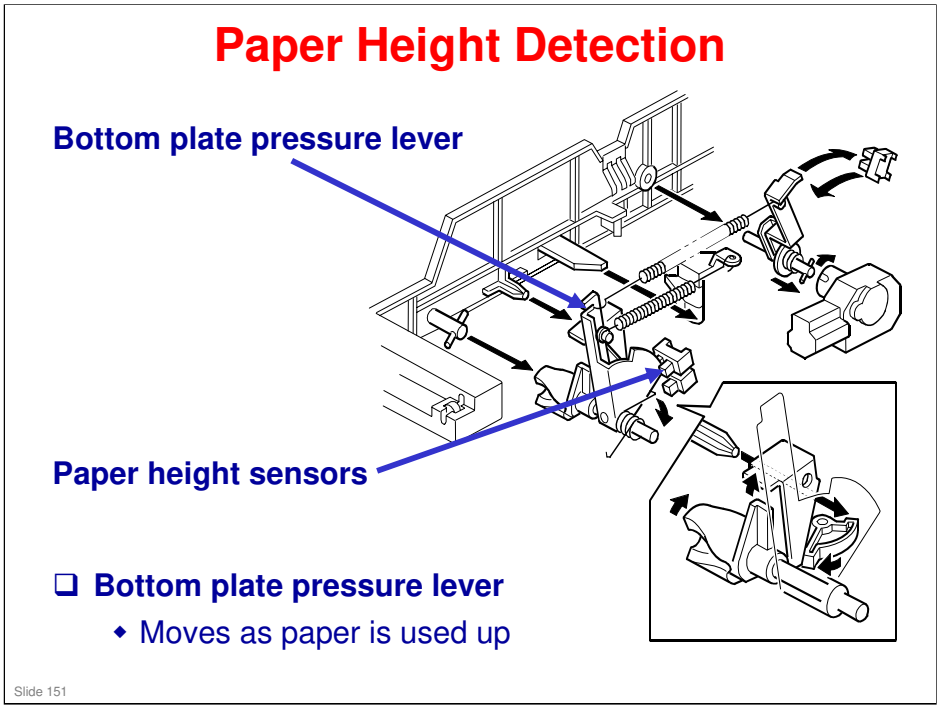
Paper End Detection



- Paper end sensor feeler: Falls through a slot in the bottom plate when there is no paper.

Slide 150

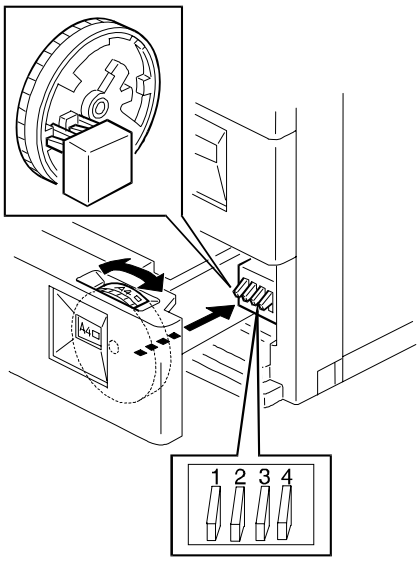
No additional notes.



More on Paper Height Detection

- ❑ Note that these sensors are not used unless the optional printer controller has been installed. Then the current status can be viewed from the driver. Note that this feature is only available for the optional paper tray units.
- ❑ The two paper height sensors detect the amount of paper in the tray.
- ❑ The actuator is attached to the bottom plate pressure lever.
- ❑ The lift motor rotates to increase the feed pressure when the remaining paper falls below a certain amount.
  - ➢ When the tray contains paper of a small width, the paper feed pressure may become too low when the thickness of the remaining stack of paper has decreased. To counteract this, the lift motor rotates forward for a short while after the remaining paper falls below a certain level. This increases paper feed pressure, simulating the pressure generated by a full tray.

Paper Size Detection

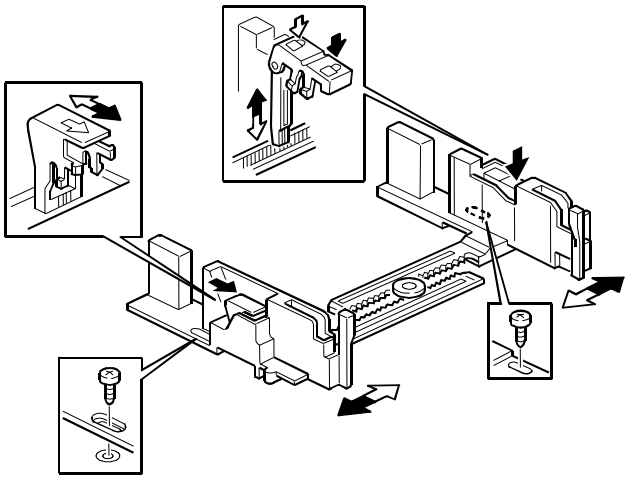


- **Paper size switch detects the position of the dial selected by the user**
  - '*' position: Use to select a non-standard paper size
  - Input the size with User Tools - System Settings – Tray Paper Settings – Tray Paper Size

Slide 152

No additional notes.

Side Fences



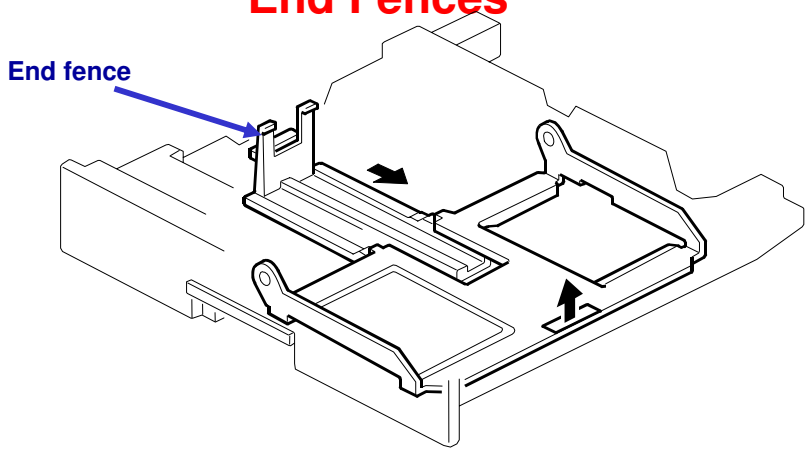
- **The side fences have stoppers to prevent them bending when a full tray is pushed in too strongly**

Slide 153

More on Side Fences

- If the tray is full of paper and it is pushed in strongly, the fences may deform or bend. This may cause the paper to skew or the side-to-side registration to be incorrect.
- Each side fence can be secured with a screw, for customers who do not want to change the paper size.

End Fences



- The bottom plate lifts as the paper is used up
- The fence is connected to the bottom plate, and it moves forward when the bottom plate lifts.
- This keeps the edges of the paper in the stack tidy.

Slide 154

No additional notes.

SP Modes

- SP 1908: Paper lift adjustment

Slide 155

No additional notes.

Lab Work

- **Practice replacement procedures.**
  - Refer to the Paper Tray 1 (PS460) Service Manual.
  - Do any of the procedures that you think that you need to practice.
  - Pay attention to all notes, cautions, and warnings in the manual.

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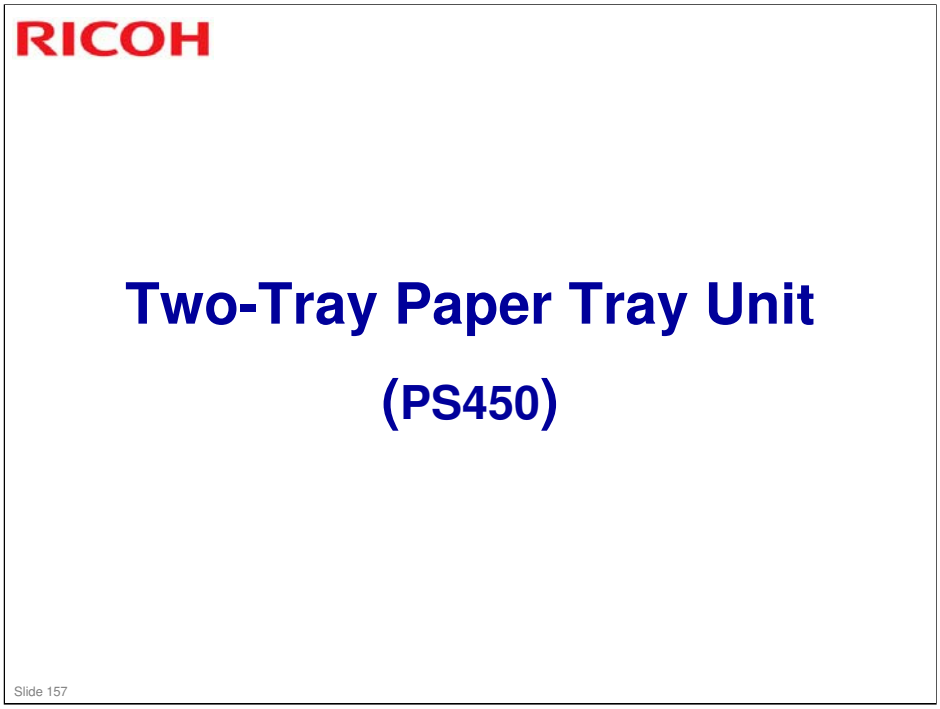
No additional notes.



No additional notes.

Mechanical Components

- **Study the component layout diagrams in the *Two-Tray Paper Tray Unit* (PS450) Service Manual.**
  - Mechanical component layout
  - Drive layout
- **Go to your machine and find the components in the diagrams.**

Slide 158

More on Mechanical Components

- The feed roller is part of the tray.
  - When the user pulls out the tray, paper caught between the feed roller and friction pad does not remain jammed inside the machine.
- The drive layout diagram shows the motor and gears for driving the paper feed roller.
- A relay roller feeds paper up from the lower tray. This is operated by the relay clutch.

Electrical Components

- **See the component layout diagram and details regarding component functionality in the *Two-Tray Paper Tray Unit* (PS460) Service Manual.**
- **Go to your machine and find the components on the diagram.**

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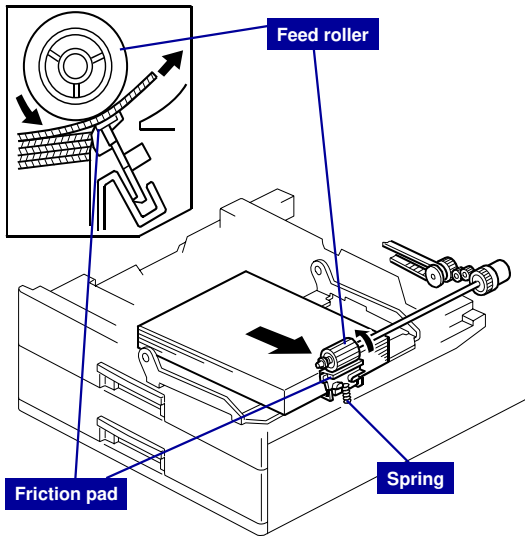
More on Electrical Components

- There are three motors, one lift motor for each tray and one to drive the rollers in both the trays.
- The upper and lower paper feed clutches transfer drive from the paper feed motor to the correct set of rollers.
- The vertical transport sensor detects paper coming up from the bottom tray.

Paper Feed and Separation



- **Feed roller and friction pad system**
- **Paper feed motor drives the feed roller**
  - The appropriate paper feed clutch turns on to transfer drive from the motor to the rollers in the required tray.
  - The relay clutch drives the relay roller, which feeds paper up from the lower tray.

Slide 160

More on Paper Feed and Separation

- This tray unit has clutches. The one-tray unit does not.
- For the relay clutch, see the drive layout.

Mechanisms

- **The following are the same as for the one-tray unit.**
  - Paper Lift
    - » The only difference is that there are adjustment SPs for both trays.
  - Paper End Detection
  - Paper Height Detection
  - Paper Size Detection
  - End and Side Fences

Slide 161

No additional notes.

SP Modes

- SP 1908: Paper lift adjustment

Slide 162

No additional notes.

Lab Work

Practice the replacement procedures in the *Two-Tray Paper Tray Unit* (PS460) Service Manual.

- Do any of the procedures that you think that you need to practice.
- Pay attention to all notes, cautions, and warnings in the manual.

Slide 163

No additional notes.

No additional notes.

Overview

- This tray can only be used on the B269 and B244 models.
- This is an optional extra output tray. It isn't a sorter. The tray does not move from side to side.
- Tray capacity: 100 sheets
- With more than one output tray, the user can (for example) direct copy mode output to the standard output tray, and fax mode output to the 1-bin tray.
  - User Tools - System Settings - General Features - Output: Copier
  - The one-bin tray is called Internal Tray 2.

Slide 165

No additional notes.

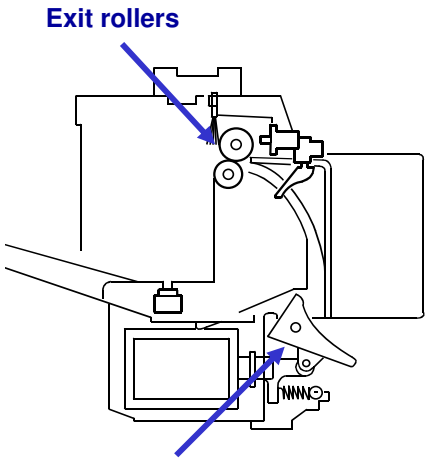
Components

- **See the component layout diagrams in the One Bin Tray (PT340) Service Manual.**
- **Go to your machine and find the components on the diagrams.**
- **Note**
  - The tray motor drives the components of the one-bin tray.
  - The paper sensor checks if there is any paper in the tray.

Slide 166

No additional notes.

Feed Mechanism

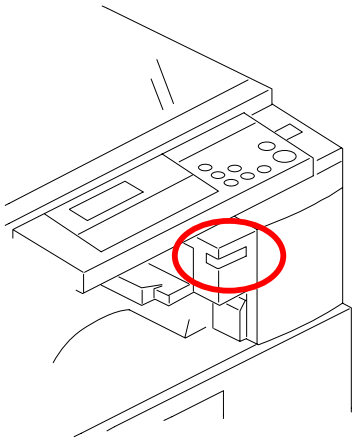


- **At a fixed time after the first sheet of paper passes the copier's registration sensor:**
  - The tray motor turns on to drive the exit rollers
  - The junction gate solenoid turns on to open the junction gate.
- **After the last sheet has been fed out past the exit sensor:**
  - The tray motor stops

Slide 167

No additional notes.

Paper Detection



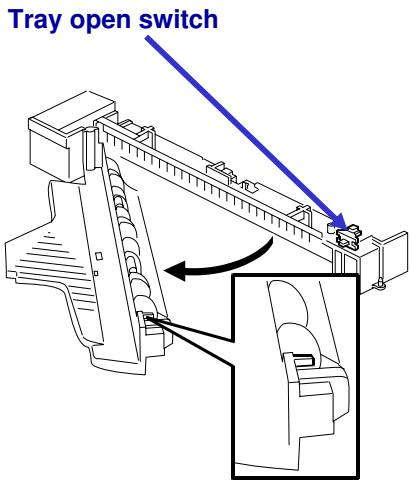
- **The LED lights whenever the paper sensor detects that there is paper in the tray.**
- **Tray capacity: 100 sheets**
- **Paper cannot be fed from the bypass tray to the one-bin tray.**

Slide 168

More on Paper Detection

- If the paper source is the bypass tray, the output will not go to the one-bin tray, even if the user specified that this type output should go to that tray.
- This is because the one-bin tray cannot handle thick paper, which the bypass tray can feed.

Tray Open Switch



- **This switch detects when the tray has been moved away from the main body to remove a paper jam.**
  - A 'cover open' message appears.
  - This message also appears if the one-bin tray becomes disconnected from the copier.
- **After removing a paper jam from the one-bin tray, you must open and close the copier's right cover.**

Slide 169

No additional notes.

Lab Work

- Practice removal procedures (see One Bin Tray (PT340) service manual).
- Do any of the procedures that you think that you need to practice.
- Pay attention to all notes, cautions, and warnings in the manual.

Slide 170

No additional notes.

No additional notes.

Service PM

- **The machine has PM intervals of 60 K, and 120 K.**
- **Reset the PM counter after finishing PM SP 7804 1.**

  See ***How to Reset the PM Counter*** in the FSM.
- **SP Modes**
  - SP 5501 1: PM alarm (0: No alarm)
  - SP 7803: Current PM counter status

See *PM Tables* in the *Preventive Maintenance* section of the FSM.

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No additional notes.

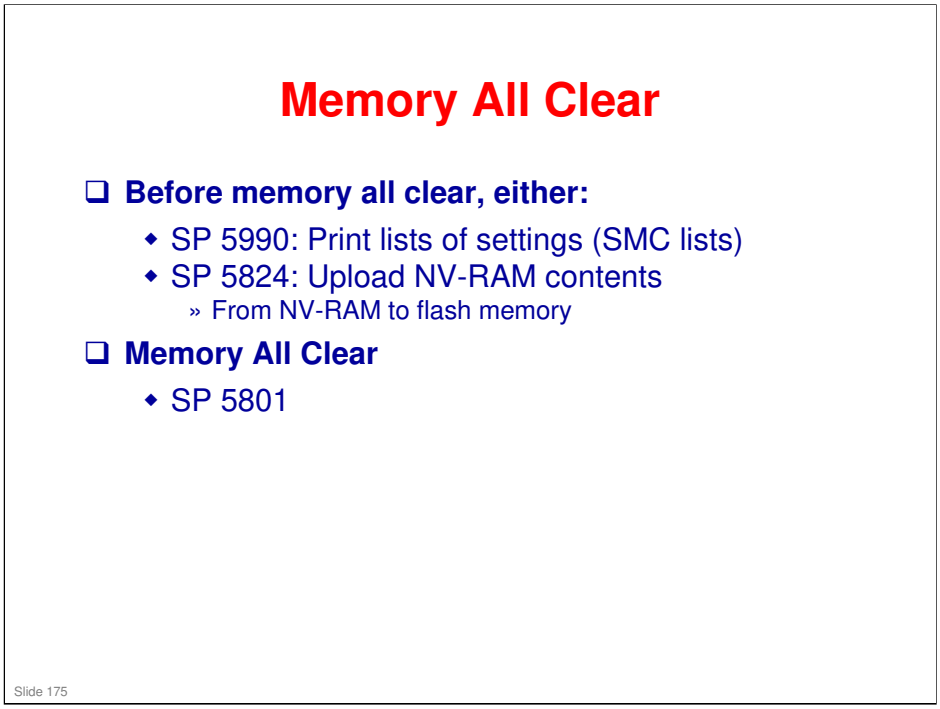
Firmware Update

- **In previous models of this series all firmware updates were done by flash memory card.**
- **Model K-C3.5L memory updating is done by:**
  - Flash memory card for BICU firmware update.
  - SD card for GDI controller update.
- **Refer to the FSM for update procedure details.**
  - FSM → Service Tables → Firmware Update Procedure → Engine (BICU) Firmware Update Procedure
  - FSM → Service Tables → Firmware Update Procedure → GDI (Printer Scanner) Update Procedure

Slide 173

No additional notes.

No additional notes.



More on Memory Clear

- This is only done after replacing the NVRAM or recovering from NVRAM problems.
  - The NVRAM will have to be replaced if you want to install a new total counter in the machine.
  - Note that after installing a new NVRAM, you can copy the contents of the old NVRAM from a flash memory card using SP 5825.
- The procedures are in the field FSM.

Self Diagnostics

- The self-diagnostics procedure is automatically done just after power has been switched on.
- SP 7832: Result of diagnostics

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No additional notes.

Printing SMC Reports

- SP 5990 - Engine

Slide 177

No additional notes.

Defective Electrical Component Troubleshooting

- Electrical component defect table: See *Electrical Component Defects* in the Field Service Manual.
- Blown fuse table: See *Blown Fuse Conditions* in the Field Service Manual.
- If a problem concerns electrical circuit boards, first disconnect then reconnect the connectors before replacing the PCBs.
- If a problem concerns a motor lock, first check the mechanical load before replacing motors or sensors.

Slide 178

No additional notes.

SC Codes

- **Study the *Service Call Conditions* section of the Field Service Manual.**
  (FSM → Appendices → Service Call Conditions)
- **There are four levels of SC codes.**
  - Reset 'Level A' codes by first entering SP mode and then switching the machine off and on.
    - » Level A codes cannot be reset by only switching the machine off/on.

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No additional notes.

SP Modes - Symptom Troubleshooting - 1/3

- **SP 1103: Fusing idling enable/disable**
  - Enable if fusing on the first two copies is incomplete
- **SP 1108: Fusing temperature control cycle**
  - Increase if the user complains about flickering room lights. However, fusing lamp errors may not be detected.
- **SP 1903: Re-energizes the feed clutch**
  - Increase the value if jams occur when feed restarts after registration]
- **SP 2213: Number of copies after near-end**
  - If the user makes a lot of copies with a high proportion of black, reduce this setting.
  - Also you can try increasing the value of SP 2922 and/or SP 2925

Slide 180

No additional notes.

SP Modes - Symptom Troubleshooting - 2/3

- **SP 2301: Transfer current**
  - SP 2301 1-2: Increase if thicker paper than normal is used in the paper trays
  - SP 2301 4: Increase if there is dirty background on the rear side
    - » SP 2996: Enable this if there is dirty background on the reverse side of the first copy of a job. The transfer roller will be cleaned before each job. The job will take slightly longer.
- **SP 2802: Developer mixing**
  - Use this to prevent dirty background when the machine has not been used for a long time.

Slide 181

No additional notes.

SP Modes - Symptom Troubleshooting - 3/3

- **SP 2906: 'Tailing' correction**
  - Adjust this if there are ghosts of thin vertical lines further down page from where vertical lines on image stop.
- **SP 6910: ADF shading interval**
  - Reduce setting if white level is drifting during copy jobs using ADF.

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No additional notes.

SP Modes - Tests

- SP 1007: By-pass paper size sensor output display
- SP 4902: Exposure lamp on
- SP 5001: Operation panel indicators on
- SP 5803: Input tests
- SP 5804: Output tests
- SP 5902: Test pattern printout
- SP 6901: APS sensor output test (ADF)

Slide 183

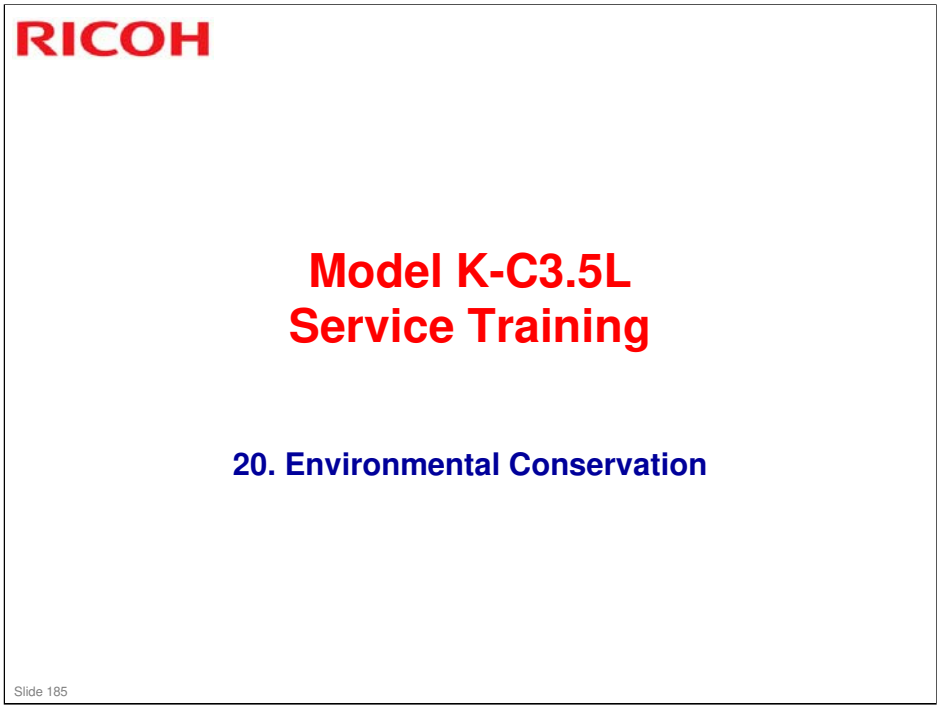
No additional notes.

SP Modes - Free Runs

- SP 4013: Scanner (with lamp on)
- SP 5802: Scanner and printer
- SP 5901: Printer
- SP 6009: ADF/ARDF

Slide 184

No additional notes.



No additional notes.

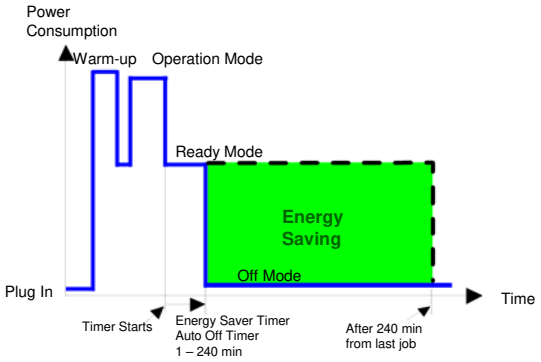
Promote Use of Energy Saving Features

- **Energy Saver Mode**
  - Proper use of energy saver modes saves energy and is environmentally friendly.

Slide 186

No additional notes.

Energy Saver Modes - 1/3



- Energy saver mode should be utilized to save energy & protect environment.
- Area shaded green in diagram above represents amount of energy saved.

Slide 187

No additional notes.

Energy Saver Modes - 2/3

- **User can set these timers with User Tools**
  - System settings > Timer setting
- **Energy saver timer (1–240 min)**
  - Energy Saver Mode
    - » Default setting: 1minute
- **Auto off timer (1–240 min)**
  - Off Mode
    - » Default setting: 1 minute
- **Example**
  - Energy saver timer: 1 min.
  - Auto Off: 1 min.
  - The machine goes to Off mode after 1 minute.
    - » Energy Saver mode is not used.

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No additional notes.

Energy Saver Modes - 3/3

- **Recommendation**
  - We recommend that default settings be used.
  - If customer requests settings change, please explain:
    - » Energy costs could increase
    - » The environment could be impacted.

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No additional notes.

Energy Save Effectiveness - 1/3

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

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No additional notes

Energy Save Effectiveness - 2/3

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

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

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

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

Mode/condition	Power consumption:
Operating mode	1081.8W
Ready mode / Energy Save	214W
Off/Sleep mode	7W

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No additional notes

Energy Save Effectiveness - 3/3

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

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

Example calculations:

Mode/condition	SP8941: Machine Status	Time at Start (min.) (1)	Time at End (min) (2)	Running time (hour) (2) – (1)/60 = (3)	Power Consumption Spec. (W) (4)	Power consumption (KWH) (3) x (4)/1000 = (5)
Operating	001: Operating Time	21089	21386	5.0	1081.8	5.35
Stand by (Ready)	002: Standby Time	306163	308046	31.4	214.0	6.72
Energy save	003: Energy Save Time	71386	75111	62.1	214.0	13.29
Off/Sleep	005: Off mode Time	508776	520377	193.4	7.0	1.35
Total (6)						26.71

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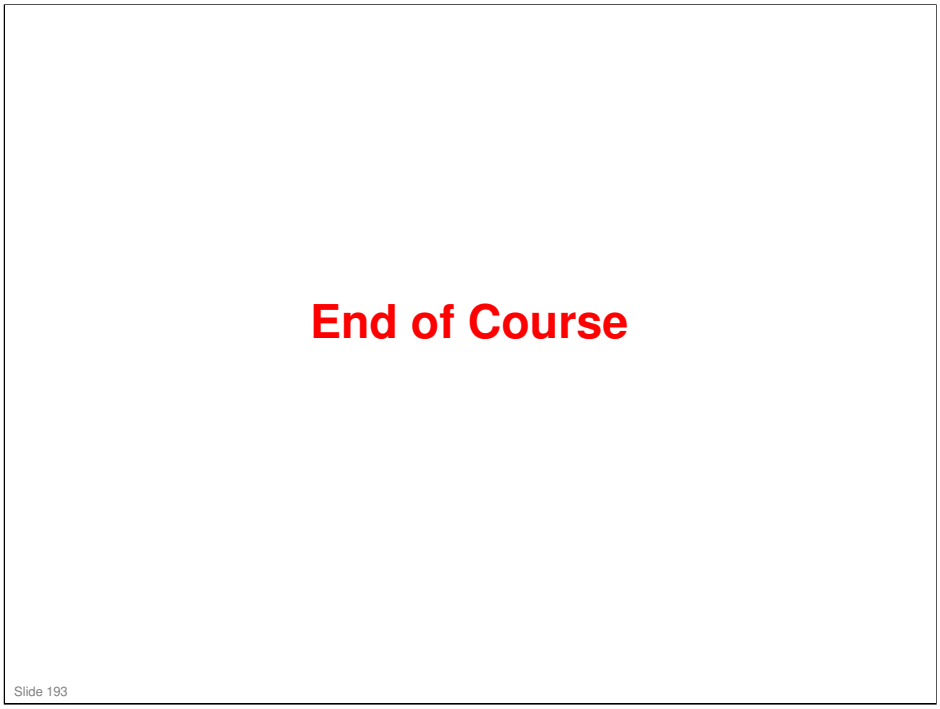
No additional notes


End of Course
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