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B282-62/B283-62
Service Training

Release date – 19 February 2010

Course Contents

No additional notes.

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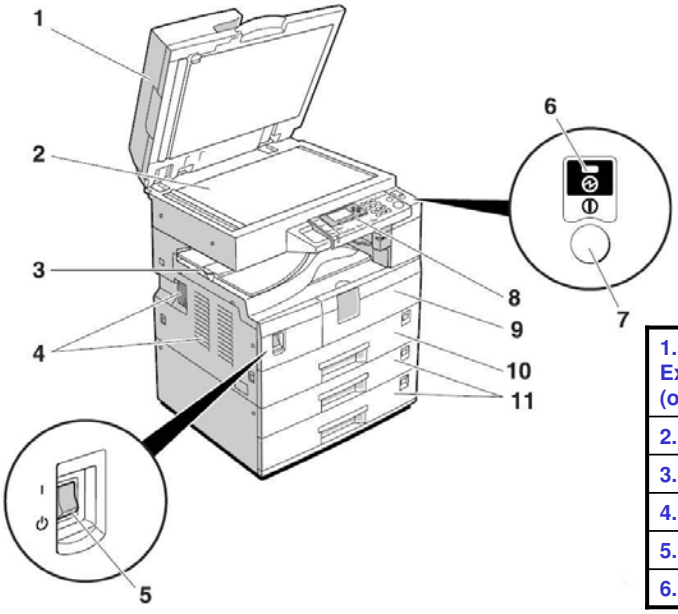
1. Product Overview

No additional notes.

The Machine – Overall

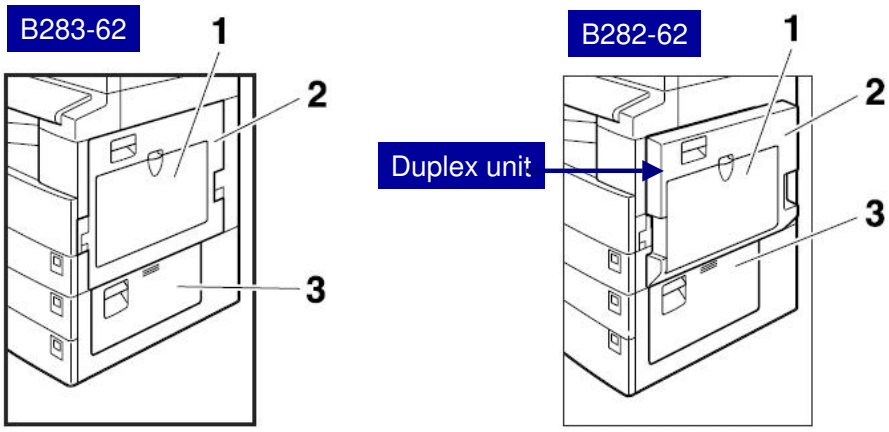


1. ARDF, ADF, or Exposure glass cover (options)	7. Operation switch
2. Exposure glass	8. Control panel
3. Internal tray	9. Front cover
4. Ventilation holes	10. Paper tray
5. Main power switch	11. Paper tray unit
6. Main power indicator	

- **This the machine you will study in this training course.**
- **The B384 Two-Paper Tray unit or the B385 One-Tray unit can attached below the machine. (Maximum of three paper trays.)**

- Refer to the operating instructions for more details.

The Machine – Right Side



1. By-pass tray
2. Right cover
3. Lower right cover

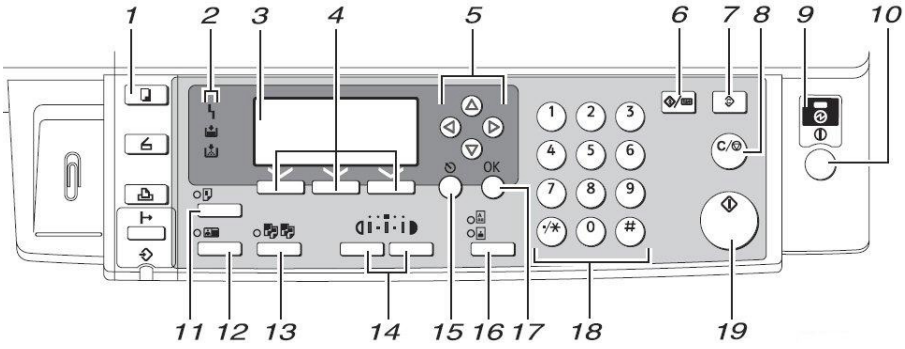
No additional notes.

Machine Details

- **Basic model: B283-62**
  - Copy/Printer/Twain Scanner
  - 250-sheet x1 tray
  - 100-sheet bypass tray
  - 250-sheet output tray
  - USB 2.0
- **Duplex model: B282-62**
  - Same as B283-62 plus Duplex

No additional notes.

Operation Panel

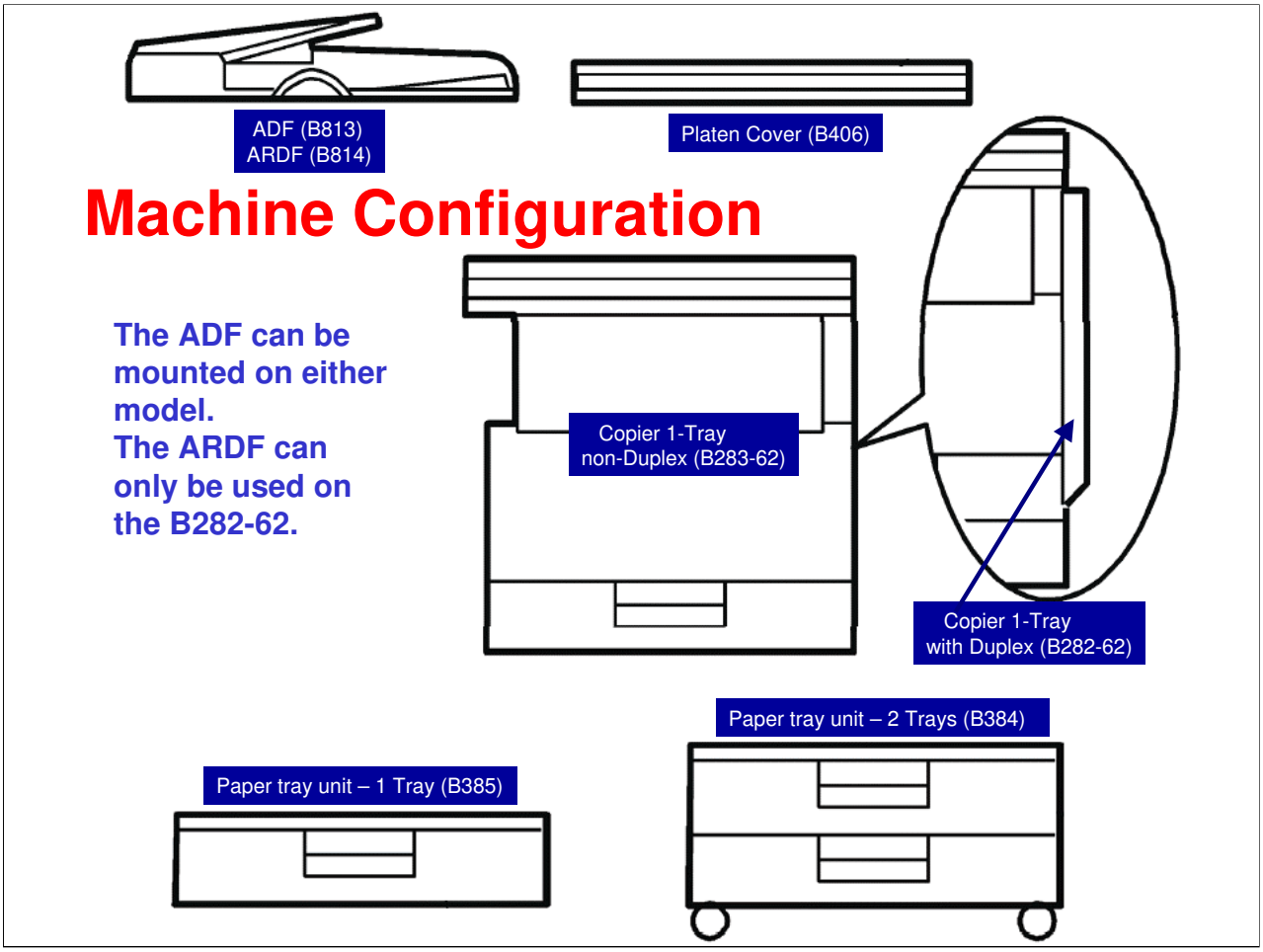


- Familiarize yourself with the operation panel.
- See the operating instructions for detailed descriptions of key and indicator function.

1. Function keys	11. Duplex key
2. Indicators	12. ID copy key
3. Display panel	13. Sort key
4. Selection keys	14. Image density keys
5. Scroll keys	15. Escape key
6. User tools/Counter key	16. Original key
7. Clear modes key	17. OK key
8. Clear/Stop key	18. Number keys
9. Main power indicator	19. Start key
10. Operation switch	

- Round Start Key and bar in Clear/Stop Key make them easy to find and easy to press.
- Color frequency adjusted 4-line LCD display ensures that users with color vision deficiency will be able to easily distinguish between LED colors.
- Panel Keys are easy to press and easy to find.

Machine Configuration



- All the options are common with GW-C2 (B282-61 & B283-61).
- There are optional accessibility handles available for the standard paper tray and the optional paper trays.
- There aren't any internal options.
- The GDI controller comes with a dedicated controller box and printer/scanner panel.

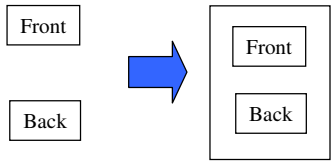
Interfaces

- USB 2.0

No additional notes.

Major Differences from B283-61/B282-61

- **ID Copy Function**
  - Allows copying of both sides of an ID card (or other small document) onto one sheet.
  - No alignment problems. Don't have to feed the paper back into the machine.



- **Increased Copy Speed**
  - Multicopy rate has been increased for the B282-62. (18 cpm ⇒ 20 cpm)
  - ADF 1 to 1 speed is still 18 cpm.
  - B283-62 multicopy rate is unchanged. (18 cpm)
- **Design Change**
  - Internal tray is blue.

- The ID Copy function is a requirement of the Chinese market. The Chinese ID was changed in 2007 and now has important information on the reverse side. Financial institutions and government offices especially need to easily copy both sides.
- ID Copy is different from Combine Copy function in that the output size is the same as the original.
- Users can identify output documents more easily with the blue internal tray.

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2. Specifications

No additional notes.

Specifications - 1

- **Copy Process**
  - Dry electrostatic transfer system
- **Maximum Original Size:**
  - A3/11” x 17”
- **Maximum Copy Paper Size:**
  - A3/11” x 17”
- **Reproduction Ratios:**
  - 3 enlargement and 4 reduction
- **Zoom**
  - 50% to 200%, in 1% steps

No additional notes.

Specifications - 2

- **Power Source**
  - 220-240V, 50/60 Hz, 7A
- **Noise Emission**
  - Standby (Mainframe/Full System)
    - » Not above 40 db
  - Operating (Mainframe only)
    - » Not above 62.7 db
  - Operating (Full System)
    - » Not above 66.7 db
- **Dimensions (W x D x H)**
  - B283-62: 550 x 568 x 420 mm
  - B282-62: 587 x 568 x 460 mm
    - » With ADF height is 510 mm. With ARDF height is 615 mm.

No additional notes.

Specifications - 3

- **Weight**
  - B283 - 35 kg
  - B282 - 40 kg
- **Warm-up Time**
  - Less than 25 seconds (at 20 C)
- **First Copy Time**
  - Less than 6.5 seconds
- **Toner Yield**
  - 6,000 copies (A4 LEF, 6% full black)
- **Copy-Tray Capacity**
  - 250 sheets

No additional notes.

Specifications - 4

- **Optional Equipment**
  - Platen Cover
  - Auto-document feeder
  - Auto-reverse document feeder (B282-62 only)
  - Paper tray unit (1 tray)
  - Paper tray unit (2 trays)
  - Tray heater
  - Optics anti-condensation heater
- **Copy Paper Weight**
  - 60 - 90 g/m^2 (16 - 24 lb)
- **For more details regarding the machine's specifications, see the Field Service Manual and also the User Guides.**

No additional notes.

Interfaces (Built-in)

- GDI-Controller (USB 2.0, with NIC)

No additional notes.

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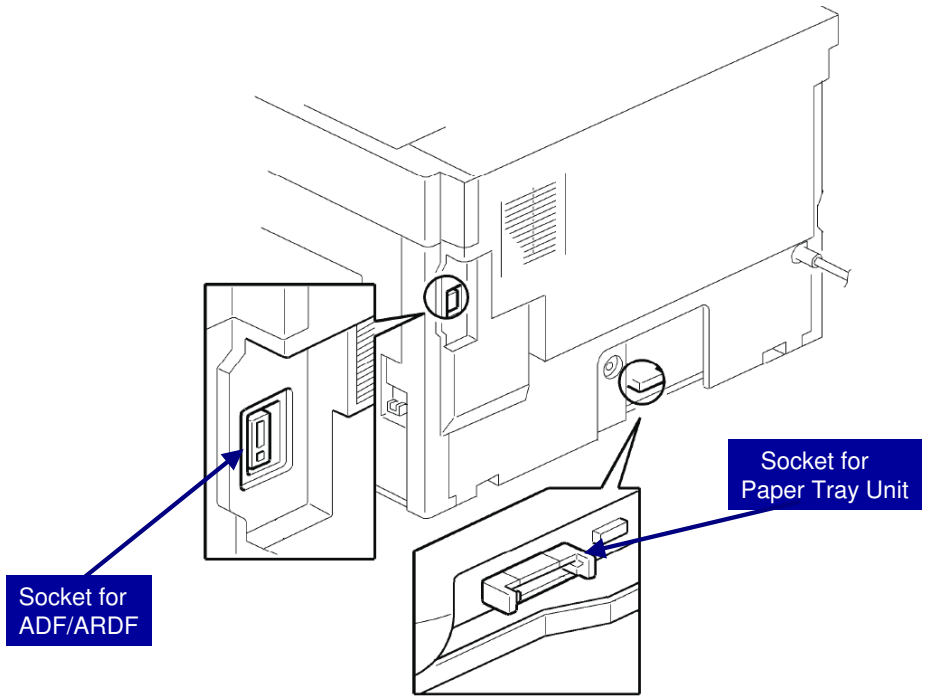
3. Installation

No additional notes.

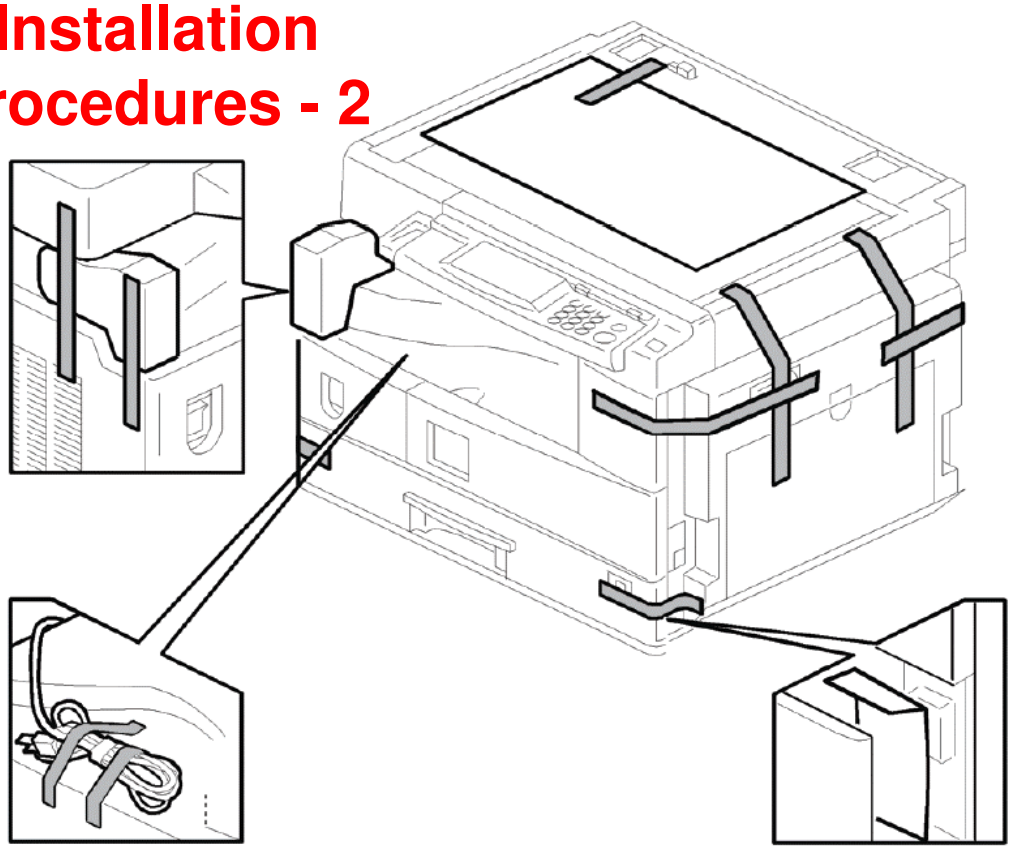
Installation Procedures - 1

❑ In the Field Service Manual, see *Copier Installation*.



No additional notes.

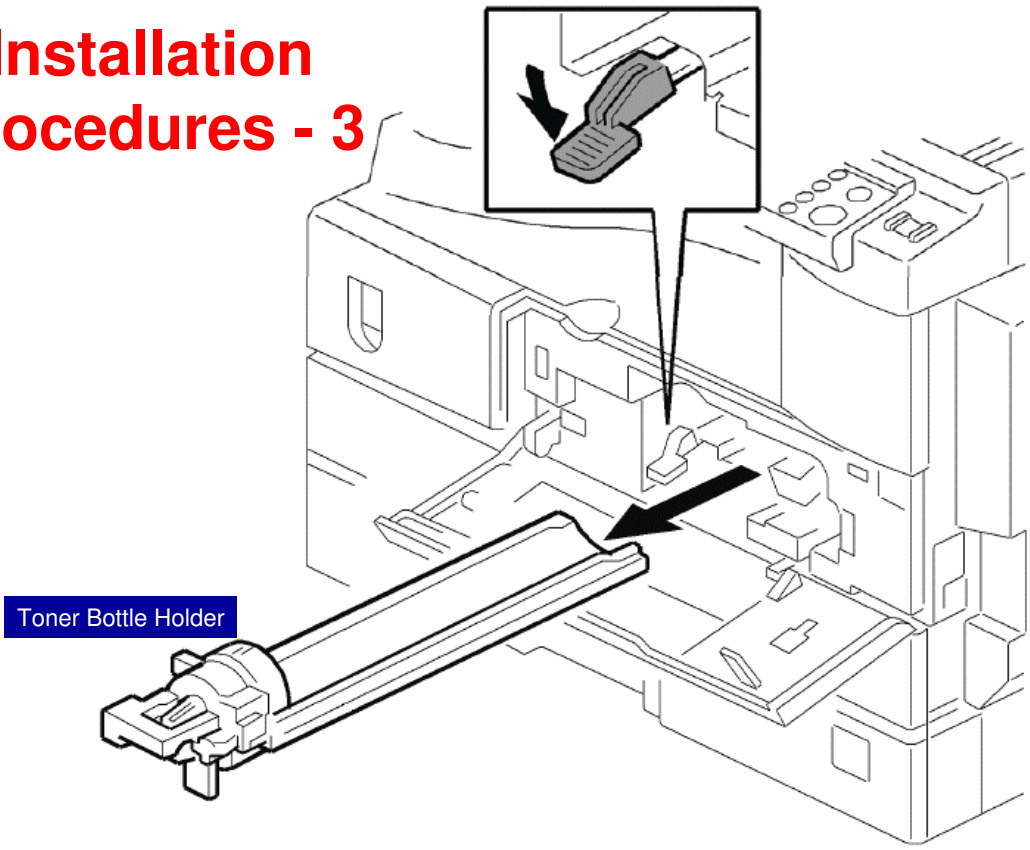
Installation Procedures - 2



❑ Remove all tape and padding from the machine.

No additional notes.

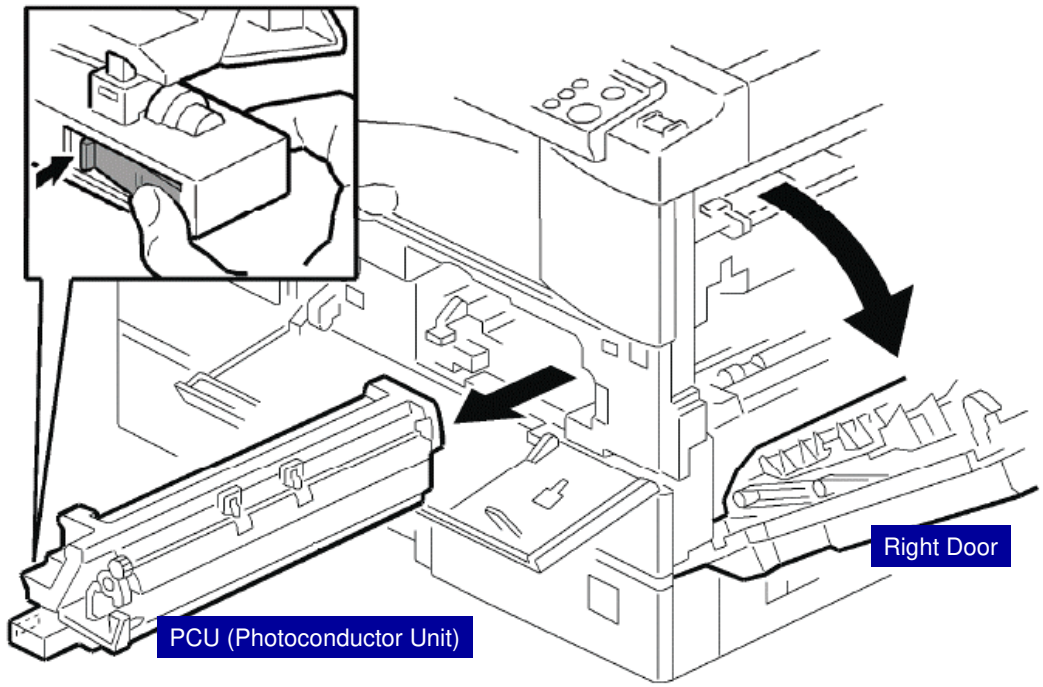
Installation Procedures - 3



❑ Open the front door and remove the toner bottle holder.

No additional notes.

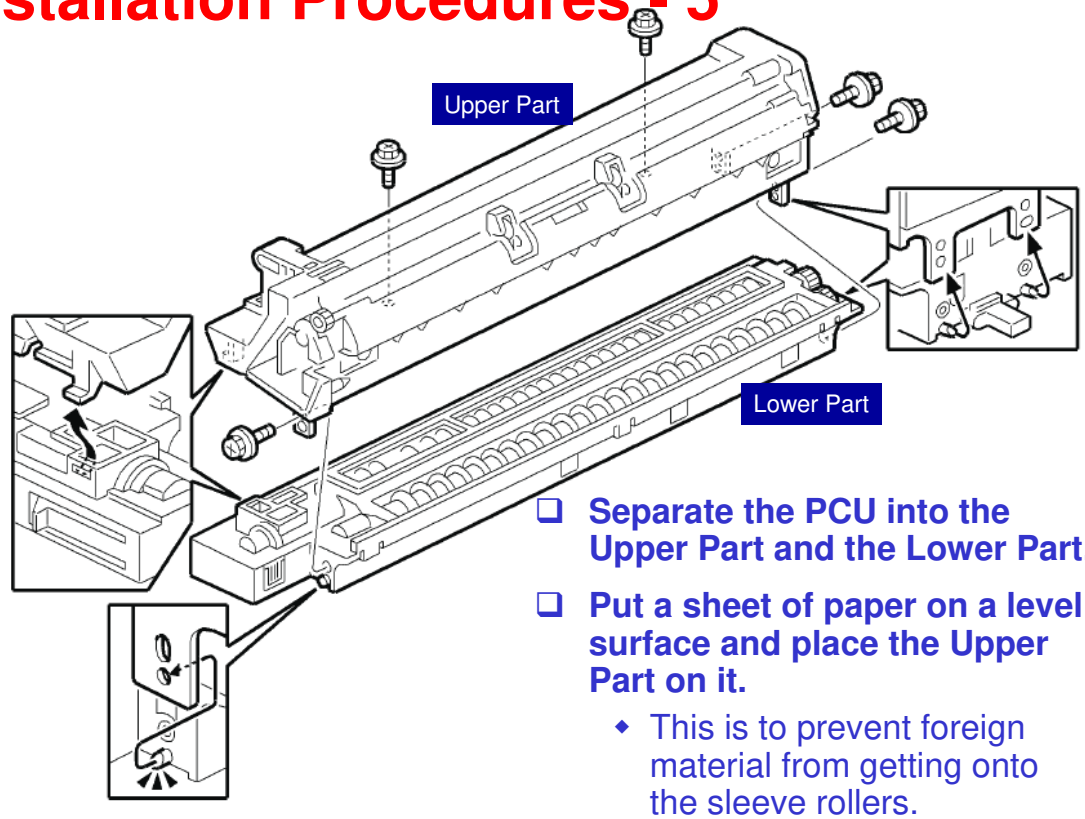
Installation Procedures - 4



Open the Right Door and remove the PCU (Photoconductor Unit)

No additional notes.

Installation Procedures - 5

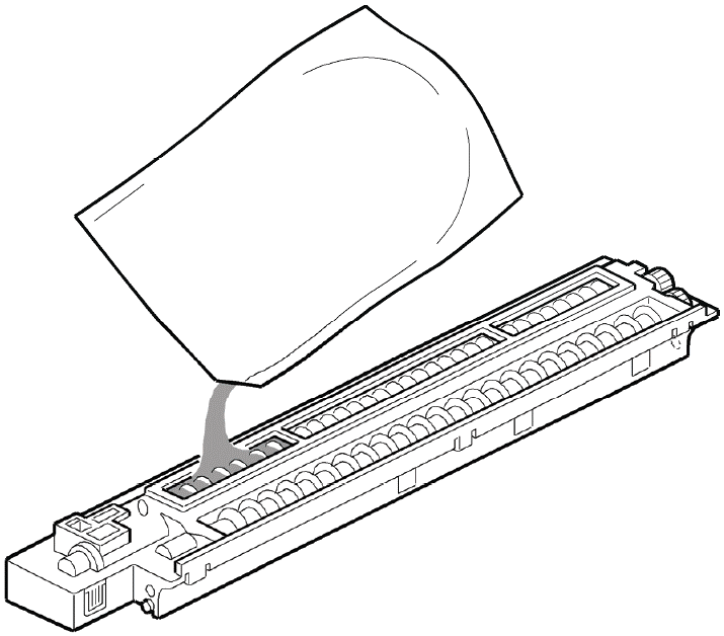


- **Separate the PCU into the Upper Part and the Lower Part.**
- **Put a sheet of paper on a level surface and place the Upper Part on it.**
  - This is to prevent foreign material from getting onto the sleeve rollers.

No additional notes.

Installation Procedures - 6

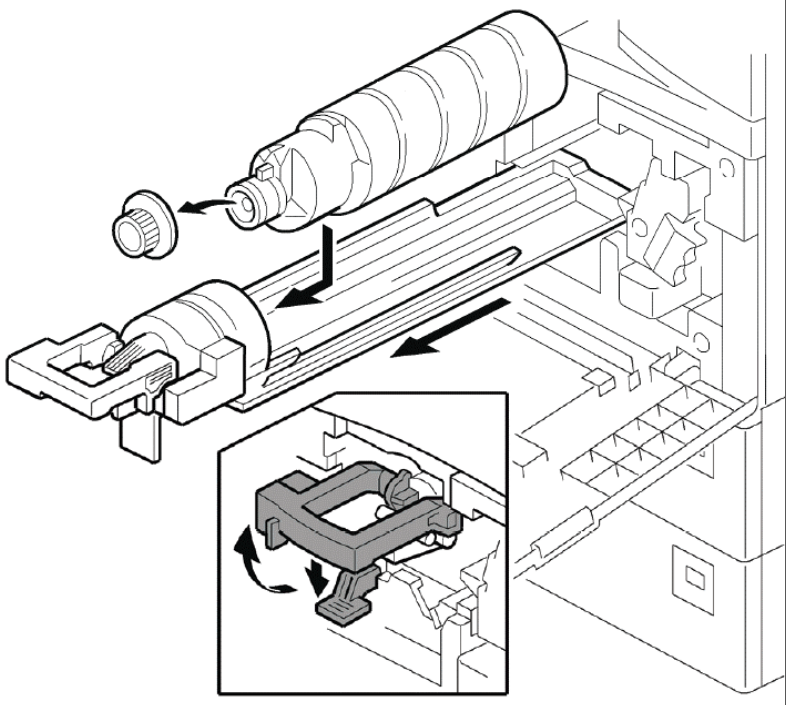
- Distribute a pack of developer to all openings equally.
- Make only a small cut in the top corner of the bag for better control when pouring.
- Make sure not to spill developer on the gears.
- If you have to turn the gear to distribute the developer evenly, make sure to do so very slowly and as little as possible. Otherwise the developer may spill.



No additional notes.

Installation Procedures - 7

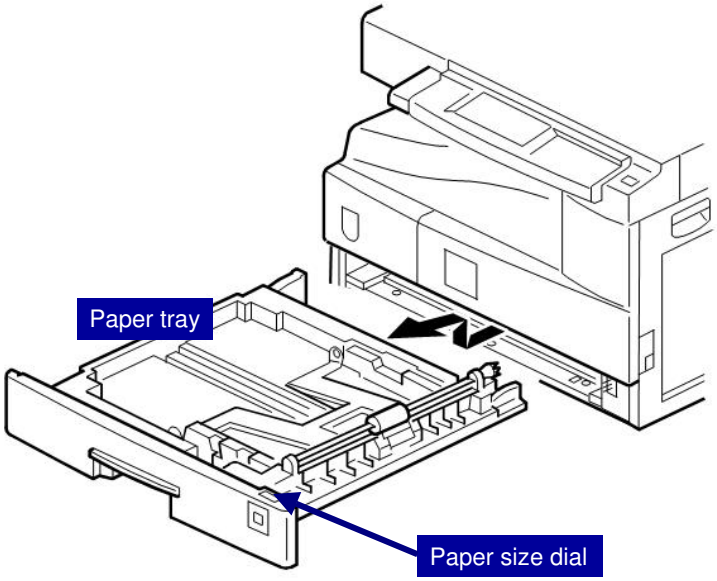
- Reassemble the PCU and reinstall it.
- Shake the toner bottle (with the cap still on).
- Remove the bottle cap and install the bottle on the holder (do not touch the inner cap).
- Set the holder (with the toner bottle) in the machine.



No additional notes.

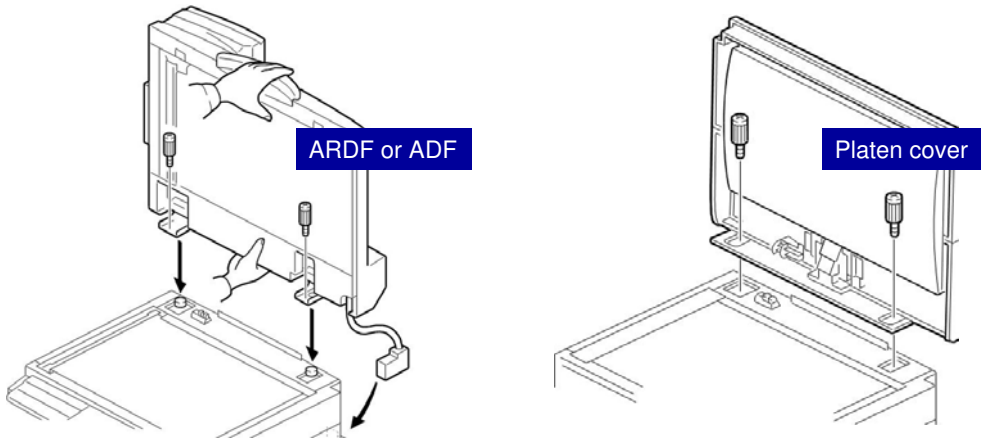
Installation Procedures - 8

- Pull out the paper tray.
- Turn the paper size dial to the appropriate size.
- Adjust the positions of the end and side guides.



No additional notes.

Installation Procedures - 9



- **Install the optional ARDF, ADF, or platen cover.**
  - Follow the appropriate procedure in the field service manual.
- **Plug in the main power cord and turn on the main switch.**
- **Activate the SP mode and execute "Developer Initialize" (SP 2214 -1).**
  - It takes about 45 seconds. "Completed" will be displayed when finished.
- **Load paper and make some copies to check side-to-side and leading edge registrations.**

- After completing installation, you may need to change the display language. Do this with the User Tools. (Refer to "Changing the Language" in the operator's manual.

Inverter Tray - 1

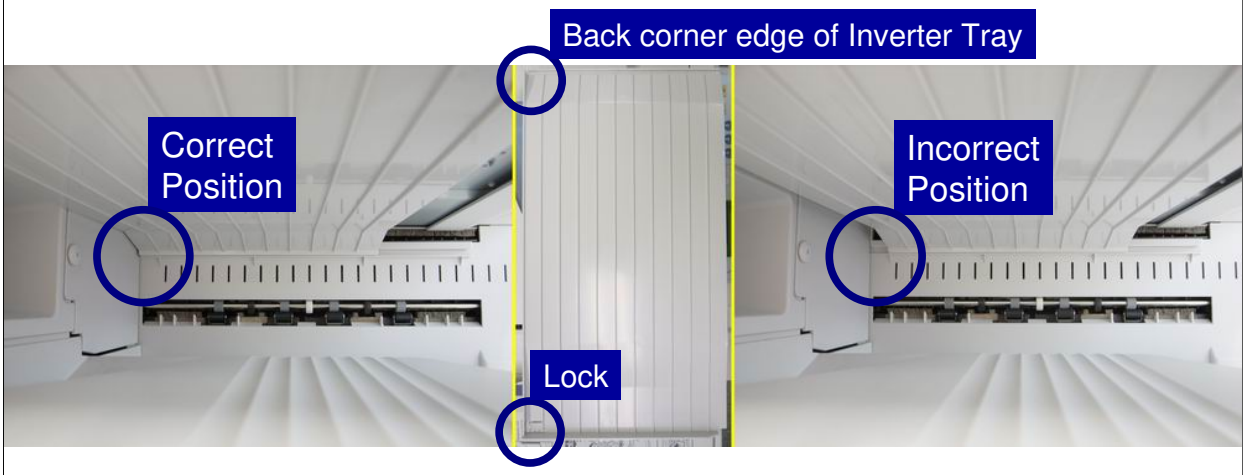
(Duplex Model B282-62 only)

Check that the back corner edge of the Inverter tray is fully against the back of the slot (see following slides for details).

- Note: This is only applicable to when making duplex copies/prints. For single-sided output, the paper doesn't come out of the slot just above the Inverter Tray. For this reason, if the Inverter Tray is out-of-position, single sided printing/copying will proceed smoothly, with no jamming or errors, while duplex printing/copying can produce a jam.

Inverter Tray - 2

(Duplex Model B282-62 only)



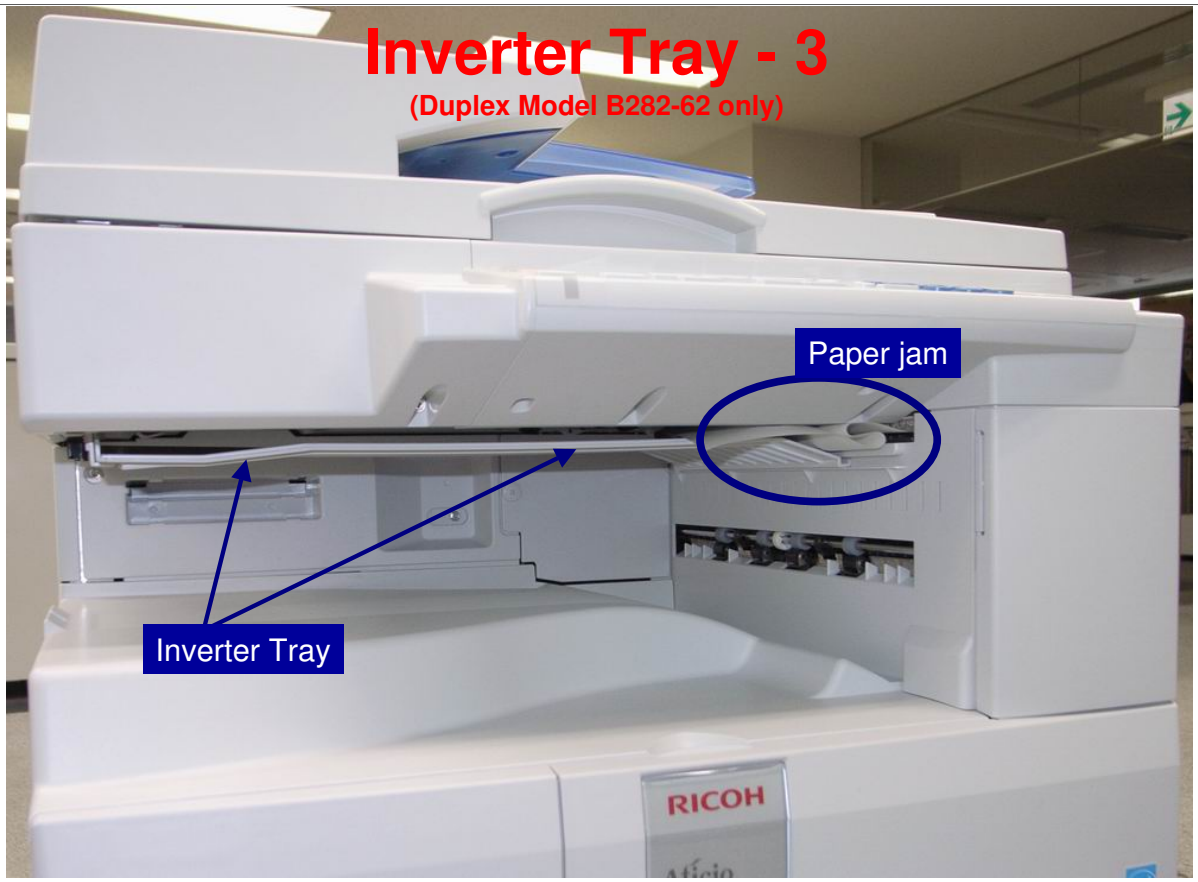
Insure that the back corner edge of the Inverter Tray is fully against the back of the slot. If the back corner edge is away from the back (see right photo above), then duplex printing will jam (see next slide), due to paper hitting the corner edge (see previous slide).

Note: The Lock is easily released by pulling on the tray to remove it from its slots.

- Note: This is only applicable to when making duplex copies/prints. For single-sided output, the paper doesn't come out of the slot just above the Inverter Tray. For this reason, if the Inverter Tray is out-of-position, single sided printing/copying will proceed smoothly, with no jamming or errors, while duplex printing/copying can produce a jam.

Inverter Tray - 3

(Duplex Model B282-62 only)



Paper jam caused by protruding back corner edge of Inverter Tray

- Note: This is only applicable to when making duplex copies/prints. For single-sided output, the paper doesn't come out of the slot just above the Inverter Tray. For this reason, if the Inverter Tray is out-of-position, single sided printing/copying will proceed smoothly, with no jamming or errors, while duplex printing/copying can produce a jam.

Options

- **See the Field Service Manual for installation procedures for the following optional items:**
  - Two-tray paper tray (B384)
  - One-tray paper tray (B385)
  - Anti-Condensation Heaters
  - Tray heaters
  - Paper tray grip handles

- There are tray heaters for the main frame and the optional paper tray units
- The paper tray grip handles are accessibility options. Install them if needed.

Set SP Modes

- **Input the product serial number and service contact numbers.**
  - SP 5811: Serial number
  - SP 5812: Service telephone and fax numbers

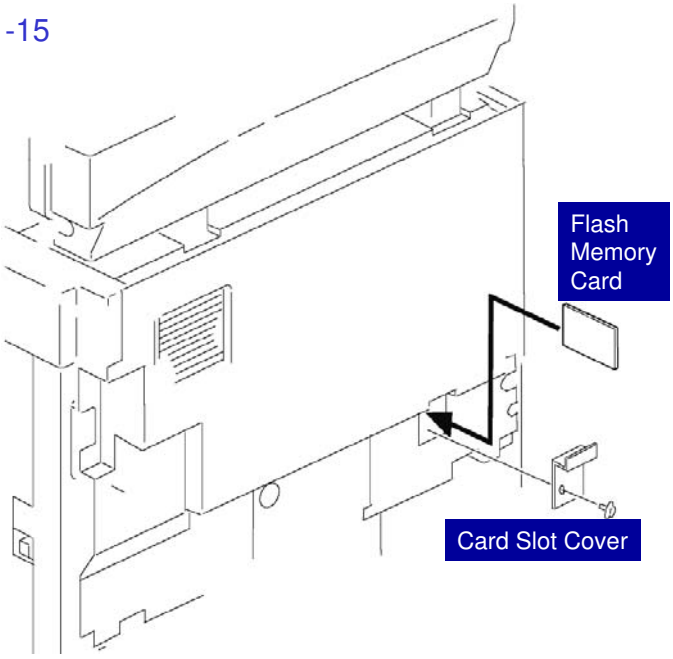
No additional notes.

Firmware Update Procedure - 1

Engine (BICU)

- **There are two types of firmware for this machine:**
  - Engine (BICU) – SP-7801-2
  - GDI (Printer/Scanner) – 7801-15

- **Turn off the main power switch.**
- **Remove the card cover.**
- **Insert the flash memory card.**
- **While holding the Operation Panel Power Switch on, turn on the main power switch.**
- **Do not touch any of the keys while the message "Load Status..." is indicated (indicating that the program is running).**



No additional notes.

Firmware Update Procedure - 2

Engine (BICU)

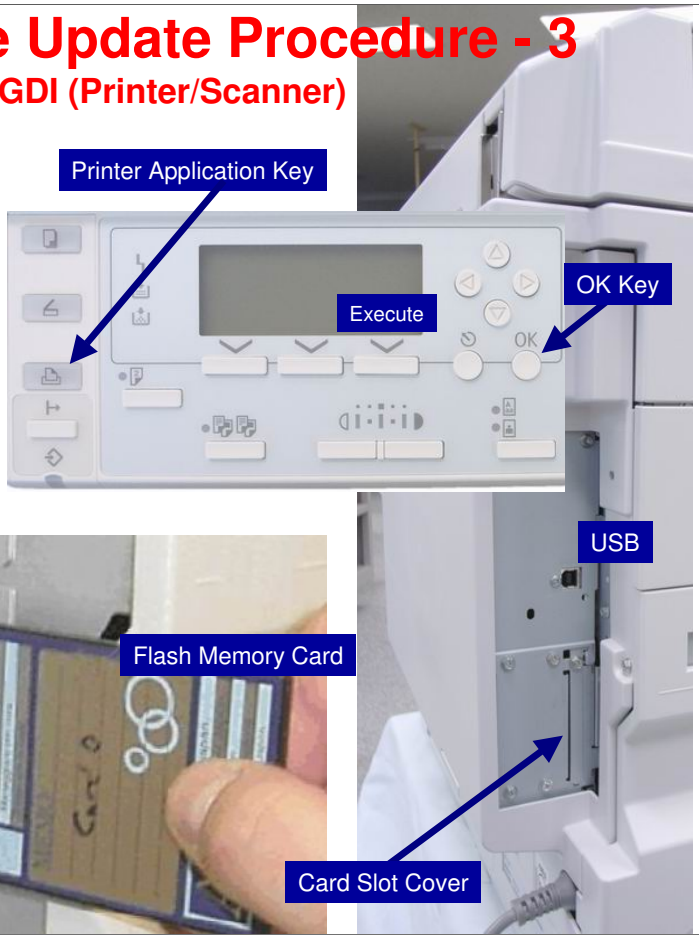
- Be sure the firmware has completely updated before going to the next step (which is turning off the power).
- Turn off the main power switch.
- Remove the flash memory card.
- Replace the card cover.
- Turn the main switch on.
- Verify machine operation.

No additional notes.

Firmware Update Procedure - 3

GDI (Printer/Scanner)

- Turn off the main power switch.
- Remove the card slot cover.
- Insert the flash memory card.
- Turn on the main power switch.
- Push the Printer Application key.
- Push the OK key and then push Execute.
- Turn off the main power switch.
- Remove the Flash Memory Card
- Replace the slot cover.



- Note: Do not turn the machine off while "Now Writing" is displayed. Be sure the message "Completed" is displayed, which indicates the program has successfully been completed.

No additional notes.

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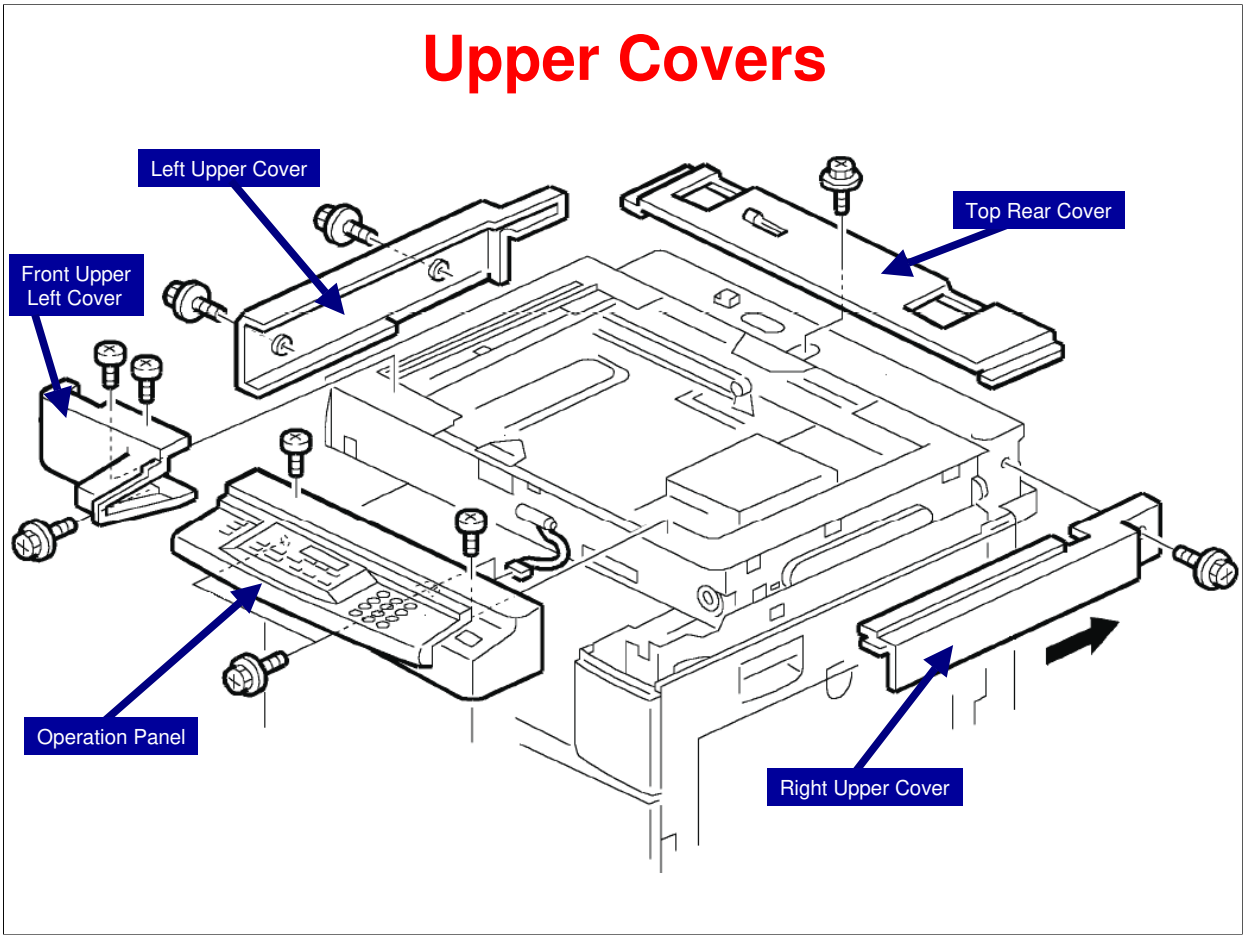
4. Machine Overview

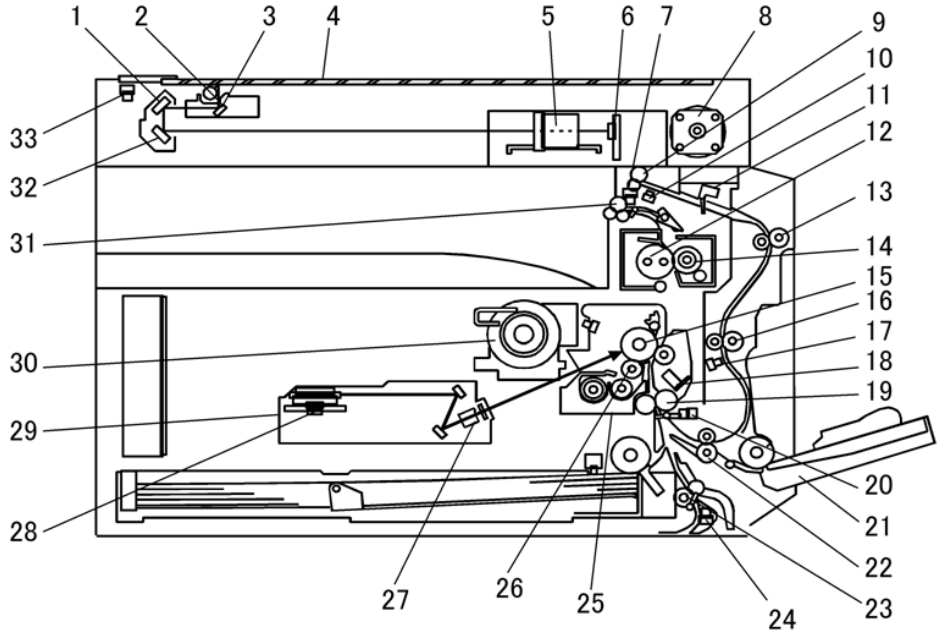
No additional notes.

Upper Covers



The illustration shows how to remove all upper covers.

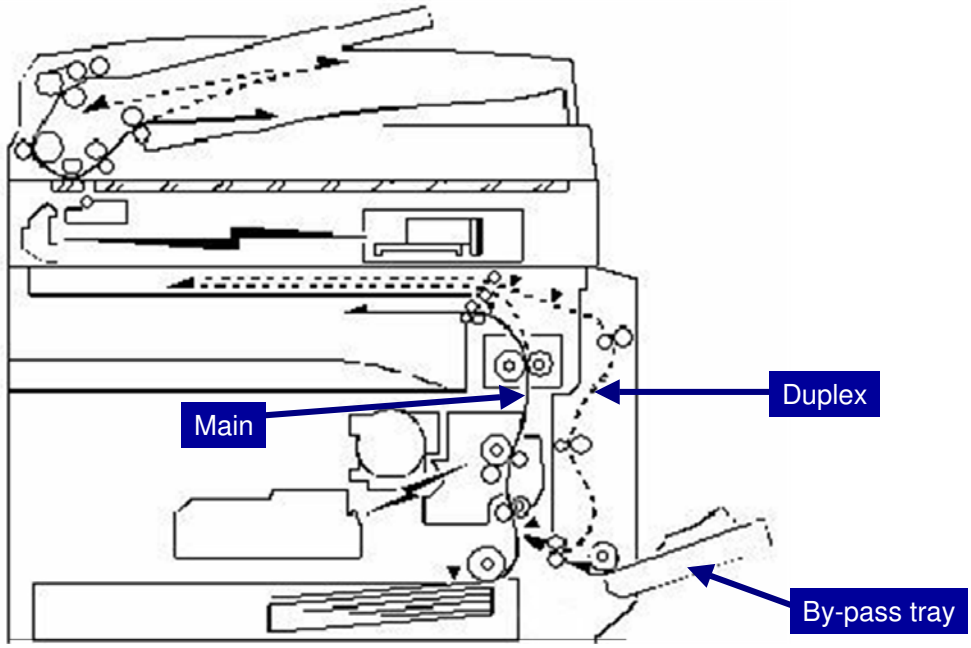
Mechanical Component Layout



- The above illustration is the B282 model.
- The B283 model does not have the duplex unit.
- Refer to the notes for the component names.

1. 2nd Mirror
2. Exposure Lamp
3. 1st Mirror
4. Exposure Glass
5. Lens Block
6. SBU
7. Exit Sensor
8. Scanner Motor
9. Inverter Roller (B282)
10. Duplex Inverter Sensor (B282)
11. Duplex Entrance Sensor (B282)
12. Hot Roller
13. Upper Transport Roller (B282)
14. Pressure Roller
15. OPC Drum
16. Middle Transport Roller (B282)
17. Duplex Exit Sensor (B282)
18. Image Density Sensor
19. Registration Roller
20. Registration Sensor
21. By-pass Tray
22. Lower Transport Roller (B282)
23. Upper Relay Roller
24. Relay Sensor
25. PCU
26. Development Roller
27. WTL
28. Polygon Mirror Motor
29. Laser Unit
30. Toner Supply Bottle Holder
31. Exit Roller
32. 3rd Mirror
33. Scanner HP Sensor

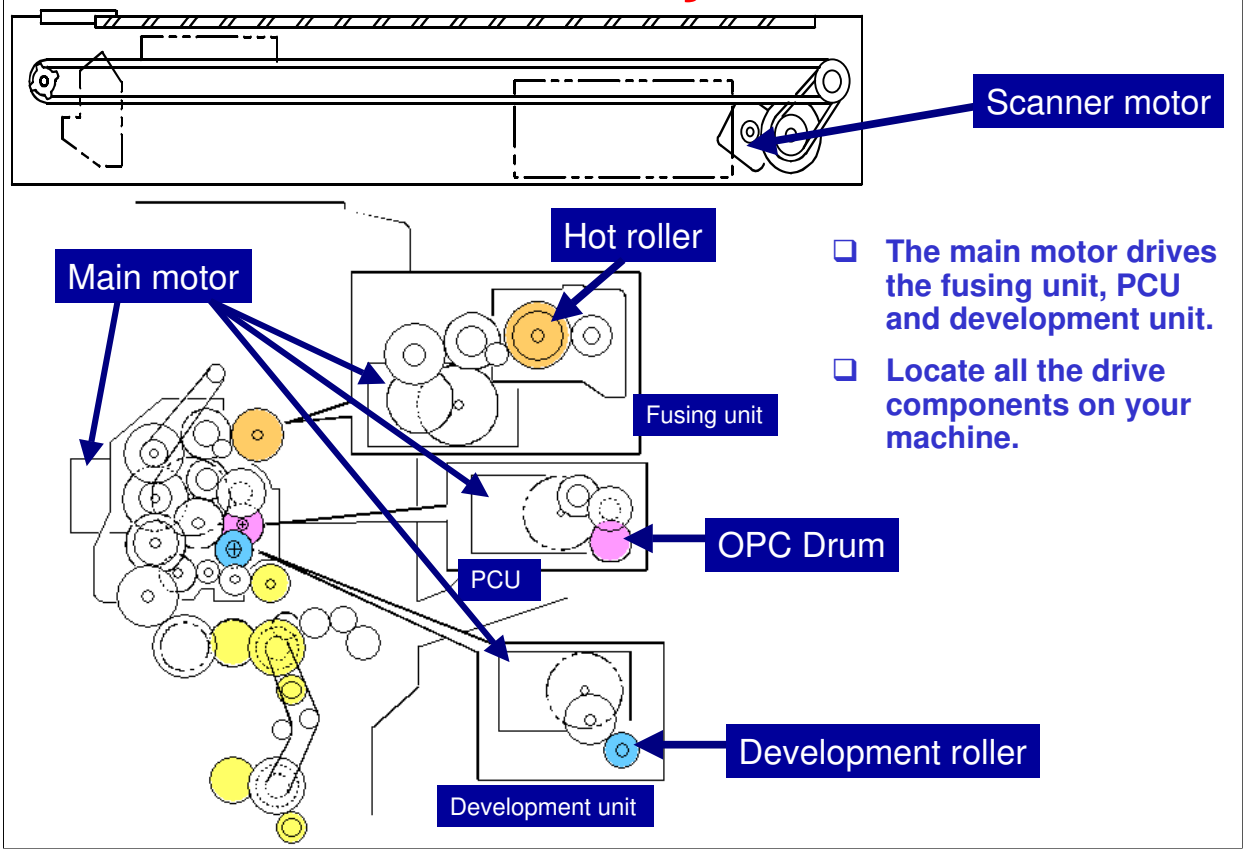
Paper Path



- The above illustration shows how paper is transported in the machine.
- The B282 model has a duplex unit mounted on the right side of the machine.
- All models have a by-pass tray.

No additional notes.

Drive Layout

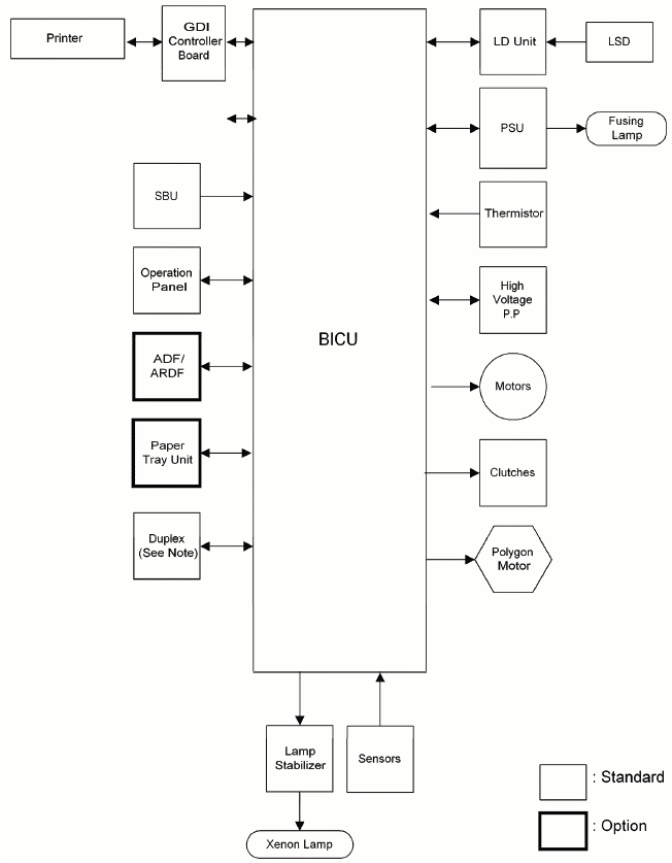


- The main motor drives the fusing unit, PCU and development unit.
- Locate all the drive components on your machine.

For a full list of drive components, see *Overview* under *Product Information* in the FSM.

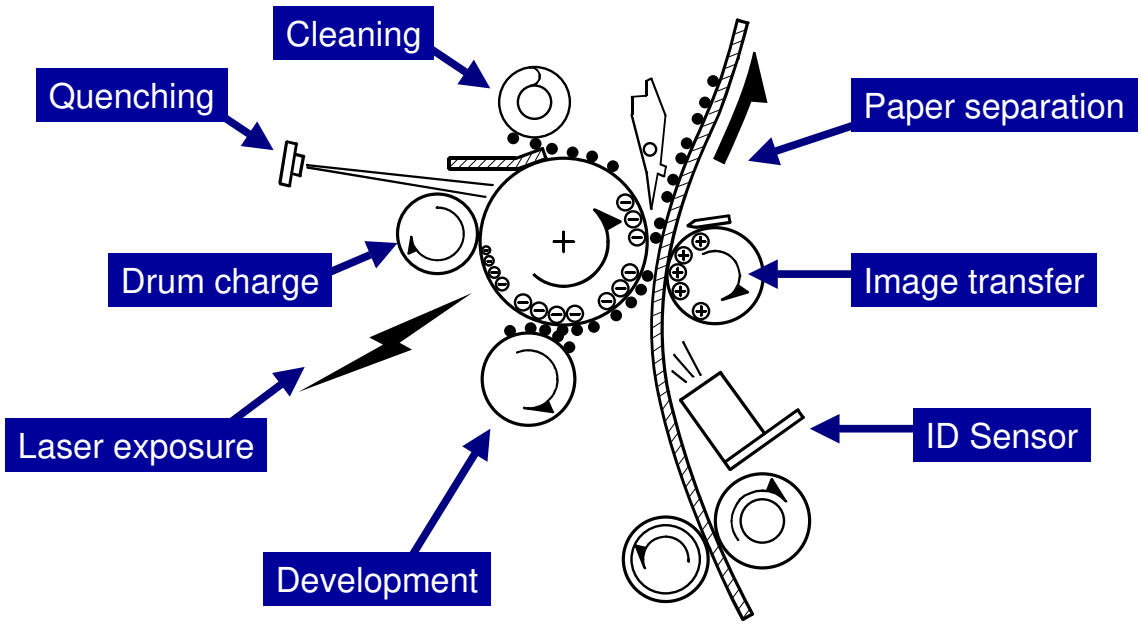
Block Diagram

- This block diagram shows overall machine control.
- See the notes for details.



- This machine uses a (built-in) GDI controller.
- Only B282 model has a duplex unit.
- BICU (Base Engine and Image Control Unit)
- The main board controls the following functions:
  - Engine sequence
  - Timing control for peripherals
  - Image processing, video control
  - Operation control, system control
  - Machine control
  - Drive control for the sensors, motors, and clutches of the printer and scanner
  - High voltage supply board control
  - Serial interfaces with peripherals
  - Fusing control
- SBU (Sensor Board Unit)
  - The SBU deals with the analog signals from the CCD and converts them into digital signals.

Copy Process



❑ **See the notes for copy process details.**

- ❑ Exposure
  - ➢ A xenon lamp exposes the original. Light reflected from the original passes to the CCD, where it is converted into an analog data signal. This data is converted to a digital signal, processed and stored in the memory. At the time of printing, the data is retrieved and sent to the laser diode which writes the image on the drum.
- ❑ Drum Charge
  - ➢ In the dark, the charge roller gives a negative charge to the organic photo-conductive (OPC) drum. The charge remains on the surface of the drum because the OPC layer has a high electrical resistance in the dark.
- ❑ Laser Exposure
  - ➢ The processed data scanned from the original is retrieved from the memory and transferred to the drum by a laser beam, which forms an electrical latent image on the drum surface. The amount of charge remaining as a latent image on the drum depends on the laser beam intensity, which is controlled by the BICU board.
- ❑ Development
  - ➢ The magnetic developer brush on the development roller comes in contact with the latent image on the drum surface. Toner particles are electrostatically attached to the areas of the drum surface where the laser reduced the negative charge on the drum.
- ❑ ID Sensor
  - ➢ The laser forms a sensor pattern on the drum surface. The ID sensor measures the reflectivity of the pattern. The output signal is one of the factors used for toner supply control. Also, the ID sensor measures the reflectivity of the drum surface. The output signal is used for charge roller voltage control.
- ❑ Image Transfer
  - ➢ Paper is fed to the area between the drum surface and the transfer roller at the proper time for aligning the copy paper and the developed image on the drum surface. Then, the transfer roller applies a high positive charge to the reverse side of the paper. This positive charge pulls the toner particles from the drum surface onto the paper. At the same time, the paper is electrostatically attracted to the transfer roller.
- ❑ Paper Separation
  - ➢ Paper separates from the drum as a result of the electrostatic attraction between the paper and the transfer roller. The discharge plate (grounded) helps separate the paper from the drum.
- ❑ Cleaning
  - ➢ The cleaning blade removes any toner remaining on the drum surface after the image transfers to the paper.
- ❑ Quenching
  - ➢ The light from the quenching lamp electrically neutralizes the charge on the drum surface.

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5. PM (Preventive Maintenance)

No additional notes.

PM Intervals

- **PM intervals of 60 K, 80 K, and 120 K.**
  - Main machine: 60 K and 120 K PM intervals
  - ADF and ARDF: 80 K PM intervals
    (See *PM Tables* in the Field Service Manual.)
- **Reset the PM counter after finishing a PM (SP 7804 1).**
  - See ***How to Reset the PM Counter*** in the Field Service Manual.
- **Other related SP modes**
  - SP 5501 1: PM alarm (0: No alarm)
  - SP 7803: Current PM counter status

No additional notes.

Preventive Maintenance Tables

- **Familiarize yourself with the PM Tables.**
  (Refer to *PM Tables* in the Field Service Manual for details.)
- **Locate the PM parts on the machine**
  - It is not necessary to disassemble units such as the PCU and fusing unit at this time. You will do that later when practicing replacement and adjustment.
  - Caution: The fusing unit may be hot.

No additional notes.

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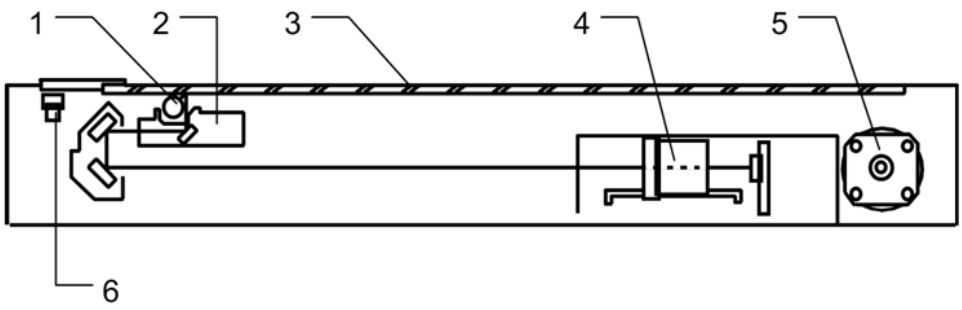
6. Scanner

No additional notes.

Scanner Unit



- 600 dpi CCD
- Exposure lamp: One xenon lamp
- The reflector reduces shadows on paste-up originals
- Anti-condensation heater available as an option
- See the notes for more details.

1. Exposure Lamp
2. 1st Scanner
3. Exposure Glass
4. Lens Block
5. Scanner Motor
6. Scanner HP Sensor

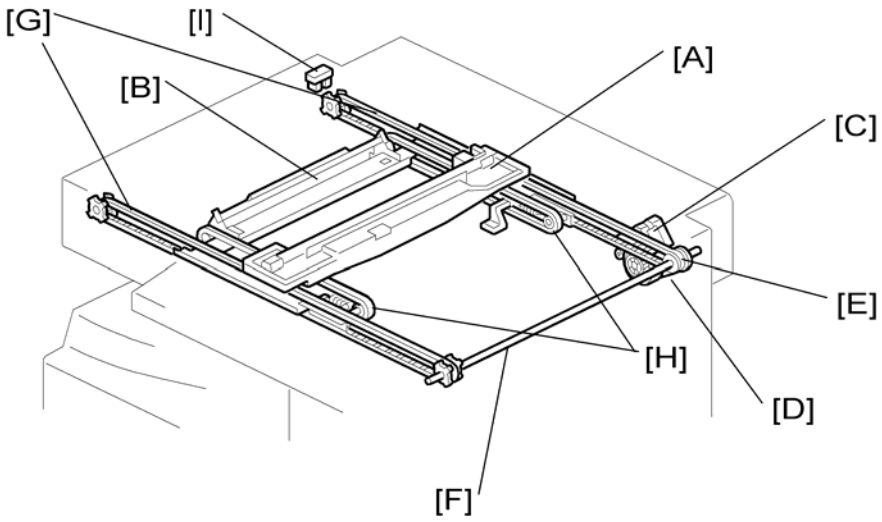
The original is illuminated by the exposure lamp (a xenon lamp). The image is reflected onto a CCD (charge coupled device) on the lens block via the 1st, 2nd, and 3rd mirrors, and through the lens on the lens block.

The 1st scanner consists of the exposure lamp, a reflector, and the 1st mirror. The 2nd scanner holds the 2nd and 3rd mirrors.

A lamp stabilizer energizes the exposure lamp. The light reflected by the reflector is of almost equal intensity, to reduce shadows on pasted originals.

An optics anti-condensation heater is available as an option. It can be installed on the left side of the scanner. It turns on whenever the power cord is plugged in.

Scanner Drive



- **Book mode: Scanner drive motor drives the scanner.**
  - Timing belts are used in this model.
- **ADF/ARDF mode: The scanner stays at home position.**
  - The original is scanned while the ADF/ARDF feeds the sheet through.
- **See the notes for details.**

A stepper motor drives the 1st and 2nd scanners [A, B]. The 1st scanner is driven by the scanner drive motor [C], drive gear through the timing belt [D], scanner drive pulley [E], scanner drive shaft [F], and two timing belts [G]. The 2nd scanner is driven through the 1st scanner and two timing belts [H].

- Book mode -

The BICU controls and operates the scanner drive motor. In full size mode, the 1st scanner speed is 100 mm/s during scanning. The 2nd scanner speed is half that of the 1st scanner (50 mm/s).

In reduction or enlargement mode, the scanning speed depends on the magnification ratio. The returning speed is always the same, whether in full size or magnification mode. The image length change in the sub scan direction is done by changing the scanner drive motor speed, and in the main scan direction it is done by image processing on the BICU board.

Magnification in the sub-scan direction can be adjusted by changing the scanner drive motor speed using SP 4008. Magnification in the main scan direction can be adjusted using SP 4009.

- ADF mode -

The scanners are always kept at their home position (the scanner HP. sensor [I] detects the 1st scanner) to scan the original. The ADF motor feeds the original through the ADF. In reduction/enlargement mode, the image length change in the sub-scan direction is done by changing the ADF motor speed. Magnification in the main scan direction is done in the BICU board, like for book mode.

Magnification in the sub-scan direction can be adjusted by changing the ADF motor speed using SP 6006 5. In the main scan direction, it can be adjusted with SP 4009 (same as book mode).

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)

- These are the SP Modes related to scanning that are frequently used in servicing.
- Refer to the SP Mode tables in the field service manual for the other scanner SP modes.

Lab Work

- **Practice the replacement and adjustment procedures in the Field Service Manual.**
  - Replacement and Adjustment ⇒ Scanner Unit
  - Do any of the procedures that you think you need to practice.
  - Pay attention to all notes, cautions, and warnings in the manual.

Note the caution about moving the scanner.
"Grasp the front and rear ends (not the middle) of the first scanner when you manually move it. The first scanner may be damaged if you press, push, or pull its middle part."

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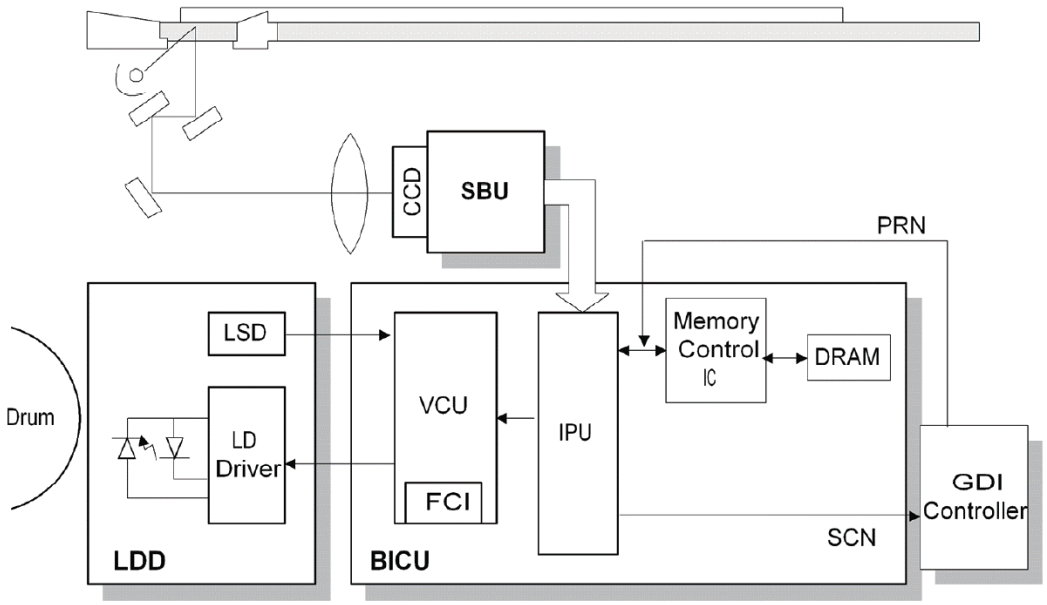
Service Training

7. Image Processing

No additional notes.

Image Processing Overview



- **Data comes to the BICU board from three sources -- scanner, SBU, and printer controller.**
- **See the notes for more details.**

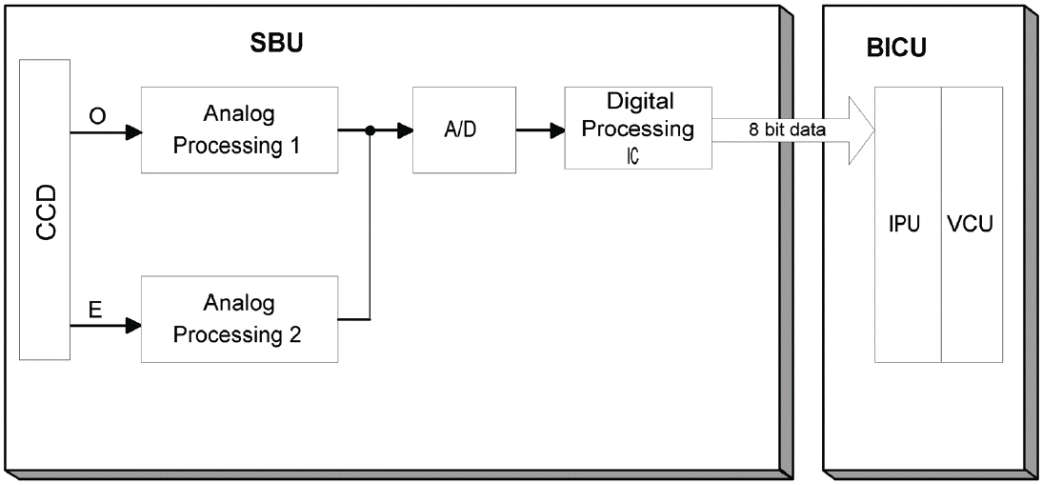
The CCD generates an analog video signal. The SBU (Sensor Board Unit) converts the analog signal to an 8-bit digital signal, then it sends the digital signal to the BICU board.

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.

SBU (Sensor Board Unit)



- **The CCD converts the light reflected from the original into an analog signal.**
  - Each CCD line has 7,400 pixels, producing a resolution of 600 dpi (23.6 lines/mm).
- **SBU does analog processing and analog to digital conversion.**
- **See the notes for more details.**

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).

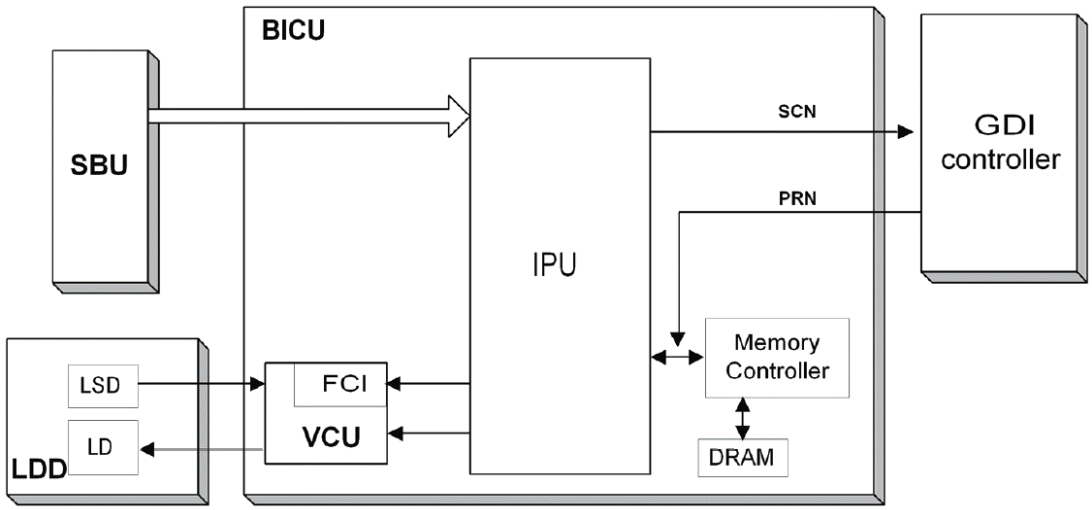
The CCD has two output lines, for odd and even pixels, to the analog processing circuit. The analog processing circuit performs the following operations on the signals from the CCD:

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.

For more details about analog signal processing and A/D conversion, refer to the core technology manual.

Image Processing – Overview



- The illustration shows image processing data flow.
- See the notes for a list of the processes done.

Note: The next 13 slides will cover some details of image processing.

The BICU is where the main image processing is done.

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:

- Auto shading
- White/black line correction
- ADS
- Scanner gamma correction
- Magnification (main scan)
- Filtering (MTF and smoothing)
- ID gamma correction
- Binary picture processing
- Error diffusion
- Dithering
- Video path control
- Test pattern generation

The image data then goes to the GDI controller.

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

For more information about image processing, refer to the core technology manual.

Image Processing Modes

- The table shows the image processing modes.
- Three original types: Text, Photo and Special, each with several modes.
- Refer to the notes for details.

Original Type	Mode	Targeted Original Type
Text	Normal	Normal text originals
	Sharp	Newspapers, originals through which the rear side is moderately visible as faint text.
Photo	Photo priority	Text/photo images which contain mainly photo areas
	Text priority	Text/photo images which contain mainly text areas
	Photographs	Actual photographs
Special	Unneeded background	Originals through which the rear side is extremely visible (or have a colored background) with faint text. Also for originals with very grainy backgrounds (some newspapers) and faint text.
	Colored text	Originals with colored text and lines.
	Normal Pixel Photo	Photo images created by dither patterns (dots visible), such as newspaper photos – normal resolution.
	Coarse Pixel Photo	Photo images created by dither patterns (dots visible), such as newspaper photos – coarse resolution.
	Preserved Background (Normal Text)	Use instead of Normal Text if, e.g. an embedded white area causes Auto Image Density to initially remove the surrounding (darker) background but leave the rest. Use if the customer wishes to keep this background.

The user can select Text, Photo and Special original types. However, each of these original types has a range of different choices (such as “sharp”, “photographs”, etc), which are listed in the table in the slide above.

- All modes can be customized with a range of SP modes that can be adjusted to meet user requirements.

The user can select the mode that best suits their original with the following user tool:
Original Type: User Tools – Copier Features – Image Adjustment

Original Modes

The machine has 10 original modes. There are two text modes, three photo modes, and five “special” modes.

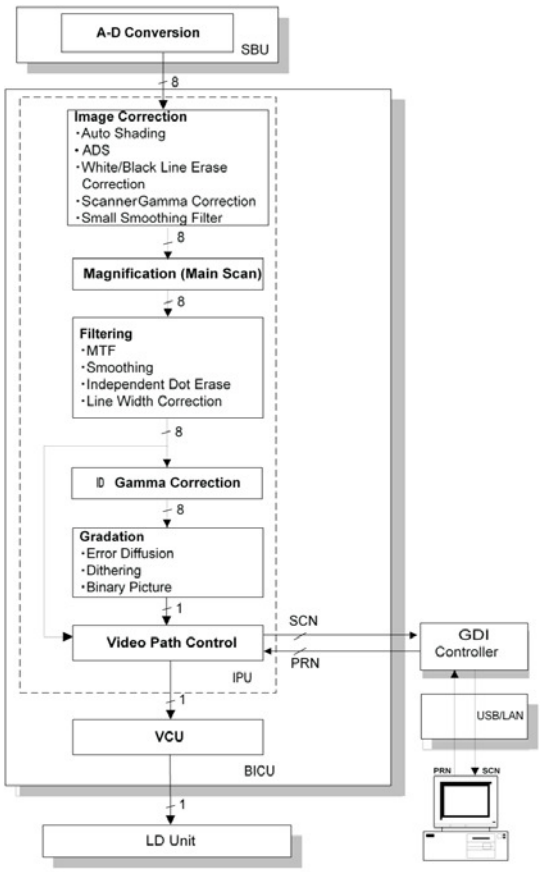
The original mode key on the operation panel has two settings, text and photo. With the default settings, the machine uses “Normal Text (Text 1)” when the Text indicator is lit, and uses “Photo Priority (Photo 1)” when the Photo indicator is lit.

The customer can allocate different modes to the Text and Photo indicators with User Tools – Copier Features – Image Adjustment. 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.

If the user wishes to customize one of the original modes, the technician can change the settings using SP 4922 to SP 4942. (Refer to the next slide “SP Modes for Each Image Processing Step”.) However, only one of the original modes can be customized at any one time.

Image Processing Path

- The diagram shows the various stages of image processing and where they are performed.



No additional notes.

SP Modes for Each Image Processing Step

- **These are the SP Modes for each processing step.**
  - 4921: Selects which original mode the settings from SP 4922 to SP 4932 will be applied to.
  - 4922: Selects the scanner γ curve. You can select either a curve for text-based originals (brings out text) or a curve for photo originals (better distinctions between shades of dark colors).
  - 4923: Selects the central notch position value for the ID adjustment LEDs.
  - 4926: Adjusts the texture removal level (used with error diffusion).
  - 4927: Adjusts the line width.
  - 4928: Selects the dot erase level.
  - 4929: Converts white to black, and black to white
  - 4930: Adjusts the clarity of line images and the edges of solid images.
  - 4931: Adjusts the clarity of solid image areas.
  - 4932: Adjusts the clarity of low ID lines.
  - 4941: Selects the white line erase level.
  - 4942: Selects the black line erase level.
- **See the SP Mode table in the field service manual for more information.**
- **If a fax and/or scanner/printer option is installed, you can make separate settings for copier, fax, and scanner/printer mode with these SPs.**

No additional notes.

Auto Shading

- **Overview**
  - There are two auto shading methods: black level correction and white level correction. Auto shading corrects errors in the signal level for each pixel.
  - Black and white level correction are always done.
- **Black Level Correction**
  - The IPU detects the black dummy data from one end of the CCD signal (32 pixels at the end are blacked off) and takes the average of the black dummy data. Then, the black level value from each image pixel is detected.
- **White Level Correction**
  - This machine uses 6-bit data (64 gradations). When white level correction is applied to 8-bit data, white lines are more easily generated. This is because the normal variations in CCD pixel response (which are very slight), when rounded off by white level correction, will show up much easier on the copy when the data is divided into 256 gradations.
  - Before scanning the original, the machine reads a reference waveform from the white plate. The average of the white video level for each pixel is stored as the white shading data in the FIFO memory in the IPU (SCRATCH) chip.
  - The video signal information for each pixel obtained during image scanning is corrected by the IPU (SCRATCH) chip. If the maximum value of the video level is 64 or less, SC101 (exposure lamp error) is generated.
  - Auto shading is done before scanning for the first original as well as after scanning each page to prepare for the next page.
  - If the image density or the original mode is changed during a copy run, auto shading is done before scanning the next original.

No additional notes.

White Line Erase

- **Setting SP4941-1 to a value other than "0" turns on white line erase. This feature works as follows:**
  1. The copier scans the original.
  2. The density level of each pixel is compared with its adjacent pixels.
  3. If the density level of a pixel is extremely lower then adjacent pixels, the level is corrected. The density levels of the adjacent pixels are considered.
- **When you activate the white line erase feature, the feature works for all originals. This feature erases the white lines of 1- through 6-pixel width (approximately, up to 0.25 mm). The white lines that exceed this width are not erased.**
- **When you specify "2," instead of "1," in SP 4941 1, the feature becomes stronger and erases darker white lines (less white lines). Note that this SP does not affect the width of white lines to be erased.**

- The default value of SP4941-1 is 1.
- Refer to SP4941 in the SP mode table for more information.

Black Line Erase

- **The black line erase feature is the function that erases black lines made by dust or dirt on the exposure glass. The feature is validated (default) when you specify a value other than "0" in SP 4942 1.**
- **When you specify a larger value in this SP, the feature erases weaker black lines (less black lines). This SP also affects the width of black lines to be erased. If you specify "1" or "2," the feature erases the black lines of 1- through 4-pixel width (approximately, up to 0.17 mm); if you specify "3," the feature erases the black lines of 1- through 6-pixel width (approximately, up to 0.25 mm). Note that some black lines on the original may be erased when you specify a larger value in the SP.**

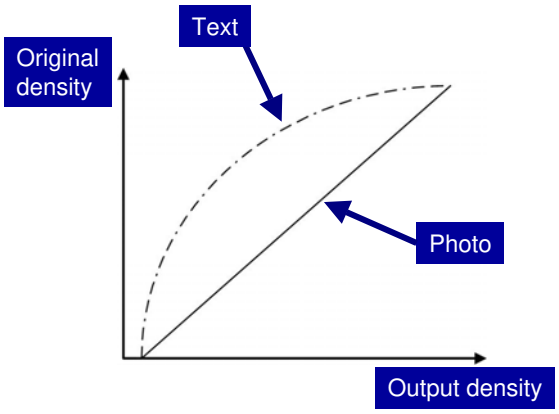
- The default value of SP4942-1 is 2.
- Refer to SP4942 in the SP mode table for more information.

Auto Image Density (ADS)

- **In the SBU**
  - ADS prevents the background of an original from appearing on copies. As the scanner scans down the page, the IPU on the BICU detects the peak white level for each scan line. The IPU determines the reference value for the A/D conversion for a particular scan line using the peak white level for that scan line. Then, the IPU sends the reference value data to the reference controller on the SBU.
  - When an original with a gray background is scanned, the density of the gray area is the peak white level density. Therefore, the original background will not appear on copies. Because peak level data is taken for each scan line, ADS corrects for any changes in background density down the page.
  - As with previous digital copiers, the user can select manual image density when selecting ADS, and the machine will use both settings when processing the original.
- **By Original Type**
  - ADS mode is only enabled when the user has selected Text mode 1 or 2 (Normal or Sharp), Photo mode 2 (Text/Priority), or Special mode 1 or 2 (Unneeded background or Colored Text).
  - This can be done using Adjust Original Mode (3) in User Tools (Copier Features).

No additional notes.

Scanner Gamma Correction



- **Scanner gamma correction brings out gradations in darker areas.**
- **Scanner gamma correction is used in photo mode only.**

The CCD output is not proportional to the quantity of light received. Scanner gamma correction corrects the CCD output so that grayscale data is proportional to the quantity of light received.

The machine has two possible scanner gamma curves: Text and Photo. When selecting Text, the machine does not use scanner gamma correction. As a result, the output is darker than the image density on the original. The advantage of this is that the machine can bring out gradations in paler areas. The disadvantage is that the machine cannot bring out gradations in darker areas, i.e. differences in shades of dark colors are hard to distinguish.

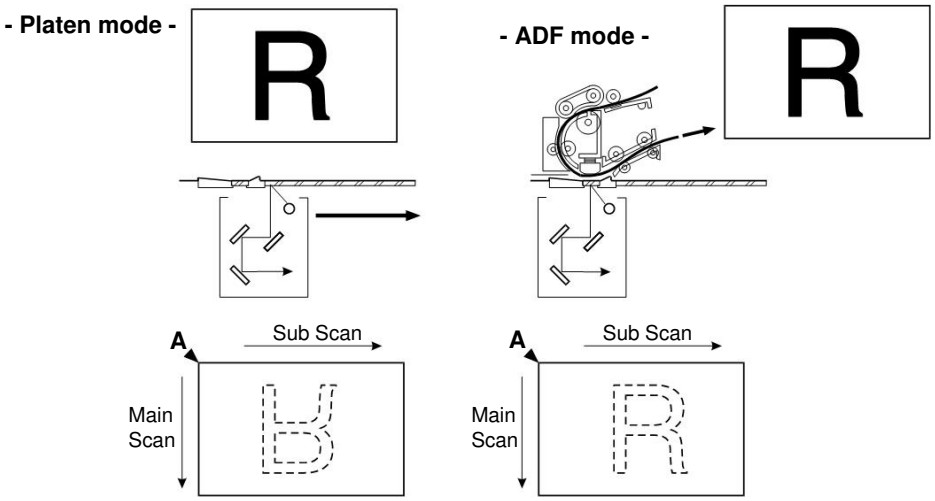
When selecting Photo, the machine uses scanner gamma correction. One advantage of this is that the machine can bring out gradations in dark areas of photo image originals. The disadvantage is that it in some cases images come out lighter than the customer desires.

Magnification

- Changing the scanner speed enables enlargement and reduction along the sub scan direction.
- Enlargement and reduction along the main scan direction is handled by the IPU (SCRATCH) chip.
- The processing for main scan enlargement/reduction is the same as in previous digital machines.

No additional notes.

Mirroring in ADF Mode



❑ **In ADF mode, a mirror image is created.**

When making copies using the ADF, the magnification circuit creates a mirror image. This is because the scanning start position along the main scan direction in ADF mode is at the opposite corner of platen mode.

In platen mode, the original is placed face down on the exposure glass. The main scan start position is at corner [A], and the scanner moves down the page. In ADF mode, the ADF feeds the leading edge of the original to the DF exposure glass. Therefore as mentioned above, the main scan start position will be at the opposite corner.

To create the mirror image, the IPU stores each line in LIFO (Last In First Out) memory.

Filtering

Overview

- There are several software filtering processes for enhancing the desired image qualities of the selected original mode. There are three MTF filters, a smoothing filter, independent dot erase, and line width correction. Each can be used only when certain modes are selected (details below) and are automatically applied.
- The strength levels for the MTF are controlled by SP 4932. The levels for line width correction and independent dot erase are controlled by SP 4927 and 4928, respectively.
- The MTF filters bring out sharpness. The three MTF filters are Edge, Solid Image and Low ID Line. Line width correction adjusts the line width. Independent dot erase removes unwanted dots from the image.

(Continued in notes.)

MTF Filter Adjustment - Edge

In order to determine whether a given dot is part of an edge or not, the IPU checks all surrounding dots (vertical, horizontal, and diagonal). If the IPU determines that the dot is part of an edge, the machine applies the MTF filter for edges, using the value set in SP 4930. The higher the setting, the sharper the image. However, this is only used when the customer uses Text 1, Text 2, Photo 1-3, Special 1, Special 2, or Special 5.

The default value is “0” for each mode. However the actual strength of “0” differs from mode to mode.

MTF Filter Adjustment - Solid

If the IPU detects that the dot is not part of an edge, the machine applies the MTF filter for solid areas using the value set in SP 4931. The higher the setting, the sharper the image. However, this is only used when the customer uses Text 2.

The default value is “0” for each mode. However the actual strength of “0” differs from mode to mode.

MTF Filter Adjustment - Low ID Line

The IPU also checks the image density of all dots. If a succession of low-density dots is detected, the machine interprets this as a low ID line and applies the MTF filter for low ID lines, using the value set in SP 4932. The higher the setting, the sharper the image. However, this is only used when the customer uses Text 1, Text 2, Photo 2, Special 1, Special 2, or Special 5.

The default value is “0” for each mode. However, the actual strength of “0” differs from mode to mode.

Independent Dot Erase

When the user selects Text 1 and 2, Photo 2, and Special 1, 2, and 5 modes, independent dots are detected using a matrix and erased from the image. The detection level can be adjusted with SP 4928.

The higher setting, the greater number of dots the machine will erase. The machine erases the dots regardless of their image density. However, note that dots in mesh-like images may be mistakenly detected as independent dots.

Line Width Correction

When the user selects Text 1 and 2, Photo 2, Special 1, 2, and 5, the thickness of lines is adjusted using the setting of SP4-927. Note that the default for all modes except Special 2 is OFF.

Line width correction is done by the IPU (SCRATCH) chip.

ID Gamma Correction

Overview

- The machine automatically selects the most appropriate ID gamma correction based on the selected original type and the operation panel ID setting.
- In all modes, ID gamma correction can be adjusted with SP 4923.
- Gradation Processing
- There are three types of gradation processing.
  - » Binary picture processing
  - » Error diffusion
  - » Dithering

(Continued in notes.)

Binary Picture Processing

The 8-bit image data is converted into 1-bit data (black and white image data). This is done when the user selects Text 2 or Special 1. The threshold for deciding whether a pixel is black or white cannot be adjusted.

Error Diffusion

Error diffusion reduces the difference in contrast between light and dark areas of a halftone image. Each pixel is corrected using the difference between it and the surrounding pixels. The corrected pixels are compared with an error diffusion matrix.

Error diffusion is applied when the user selects Text 1, Photo 1-3 and Special 2 and 5.

As the final step in error diffusion, a process called Texture Removal is applied to Text 1, Photo 2, Special 2, and Special 5 by default, but can also be applied to Photo 1 and 3 by changing the value of SP 4926.

Texture removal uses 256 threshold values in an 8 x 8 matrix. The value of SP 4926 controls the application of Texture Removal for each of the 6 modes listed above. The settings are as follows:

0: The default value for each mode is used. Text 1, Photo 2, Special 2, and Special 5 have a default of 3 (see below) and Photo 1 and 3 have a default of 1.

1: No removal applied.

2 – 6: Removal applied at the level specified here. The higher the setting (level), the less clear the image will become (more texture removal).

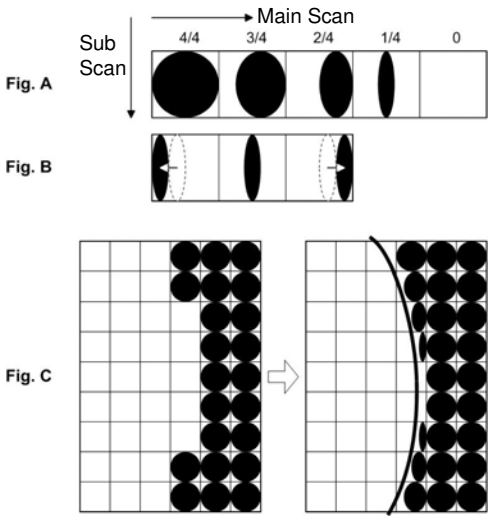
Dithering

Each pixel is compared with the threshold in a dither matrix. Several matrices are available to bring out half-tone areas in images such as newspaper-type photographs. Dithering is only used for Special 3 and Special 4.

Video Control Unit (VCU)

- **Fine Character and Image (FCI)**
  - The FCI performs image smoothing. This functions only affects binary picture processed images for certain original modes.
  - Usually, binary picture processing generates jagged edges on characters, as shown in the illustration. These are reduced using edge smoothing. The FCI changes the laser pulse duration and position for certain pixels.
  - Fig. A shows the four possible pulse durations, and Fig. B shows how the laser pulse can be in one of three positions within the pixel. Fig. C shows an example of how edge smoothing is used.

  (Continued in notes.)



FCI smoothing is only effective when Text 2 or Special 1 is selected. There is no SP adjustment for this.

Printer Gamma Correction

Printer correction corrects the data output from the IPU to the laser diode to account for the characteristics of the engine components (e.g. drum, laser diode, lenses).

The machine chooses the most suitable gamma curve for the original type selected by the user. There is no SP adjustment for this.

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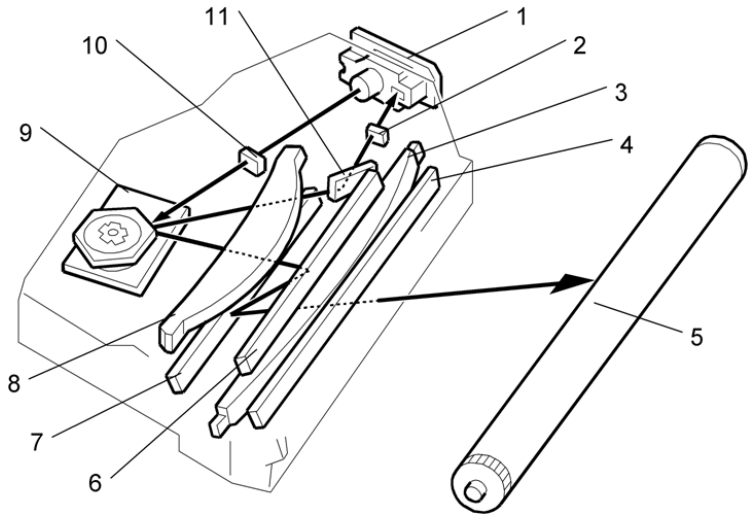
Service Training

8. Laser Exposure

No additional notes.

Laser Optics

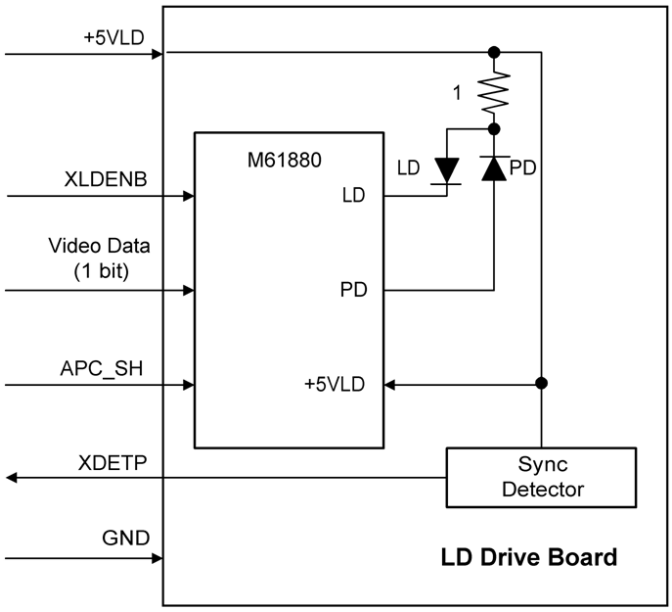


- This model uses a single laser beam.
- The LD drive board controls both the laser output and laser synchronization mechanism.
- The machine cuts off the power supply to the LD drive board if the front or right cover is opened.
- See the notes for the component names.

1. LD unit
2. Synchronization detector lens
3. Double toroidal lens
4. Shield glass
5. OPC drum
6. 1st mirror
7. 2nd mirror
8. F-theta lens
9. Polygon mirror Motor
10. Cylindrical lens
11. Synchronization detector mirror

Auto Power Control (APC)

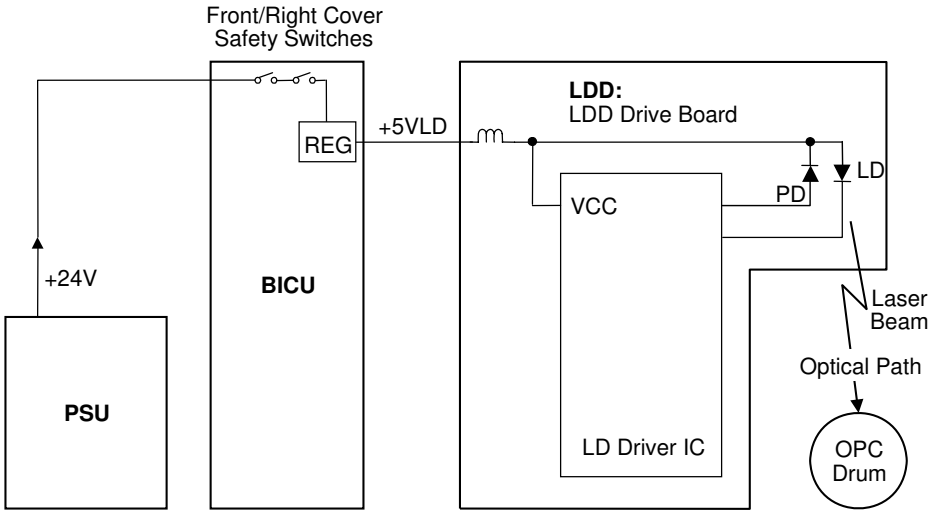
- The LD board controls the laser diode.
- The APC circuit adjusts laser power for temperature changes.
- The laser diode power is adjusted on the production line.
- Do not adjust the variable resistors on the LD unit in the field.
- See the notes for details.



The LD driver IC drives the laser diode. To prevent the intensity of the laser beam from changing because of the temperature, the machine monitors the current passing through the laser diode (LD). The machine adjusts the current to the laser diode by comparing it with the reference level from the reference circuit.
This auto power control is done just after the machine is turned on and during printing.

The laser diode power is adjusted on the production line.

LD - Safety Switch



- **When the front or right-side cover is open, a switch cuts power to the laser diode.**
- **Both covers operate the same switches.**

To ensure technician and user safety and to prevent the laser beam from inadvertently switching on during servicing, there are safety switches at the front and right covers.

When the front cover or the right cover is opened, the power supply to the laser diode is interrupted.

The switches are installed on the +24V line coming from the power supply unit, then the +5VLD is generated from the +24V supply after it goes through the interlock switches.

SP Modes

- **SP 2915: Polygon mirror idling time**
- **SP 2998: Main scan magnification (printer)**
  - There is also a main scan adjustment for the scanner (SP 4009). That one affects the image processing algorithms. SP 2998 affects the laser on/off frequency in the main scan direction.

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: See the Field Service Manual for details.
    Replacement and Adjustment ⇒ Laser Unit
  - Laser Unit Alignment Adjustment: This is the only laser related adjustment.
- **Do any procedures you think should be practiced.**
- **IMPORTANT: Read the safety notice in the field service manual, and examine the warning labels. Pay attention to all notes, cautions, and warnings in the manual.**

No additional notes.

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Service Training

9. Photoconductor Unit

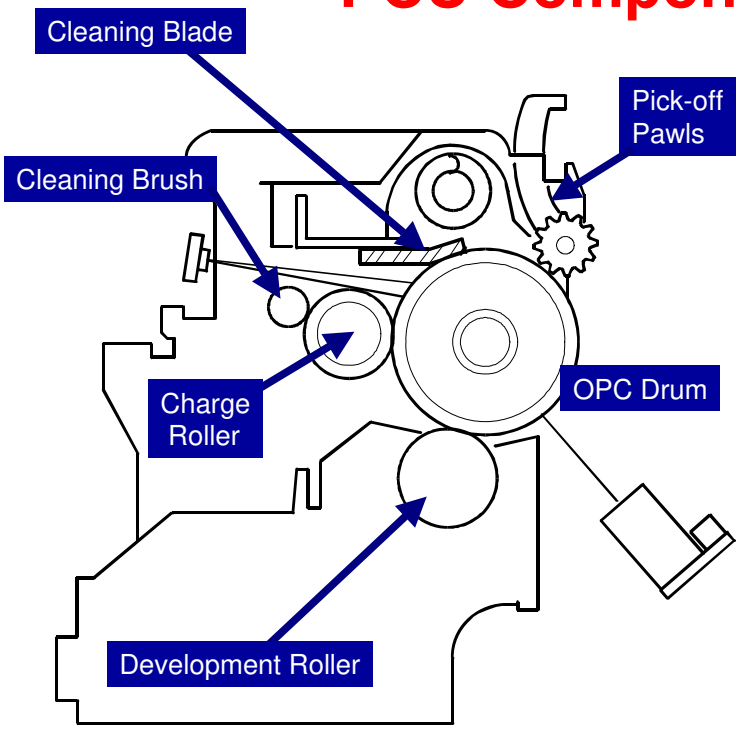
No additional notes.

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 components of the PCU are replaced individually at PM.
  - When a new PCU is installed, new developer must also be installed and SP 2214 must be done to initialize the TD sensor.

- SP 2214 initializes both the TD sensor toner supply target voltage and the TD sensor gain value.

PCU Components



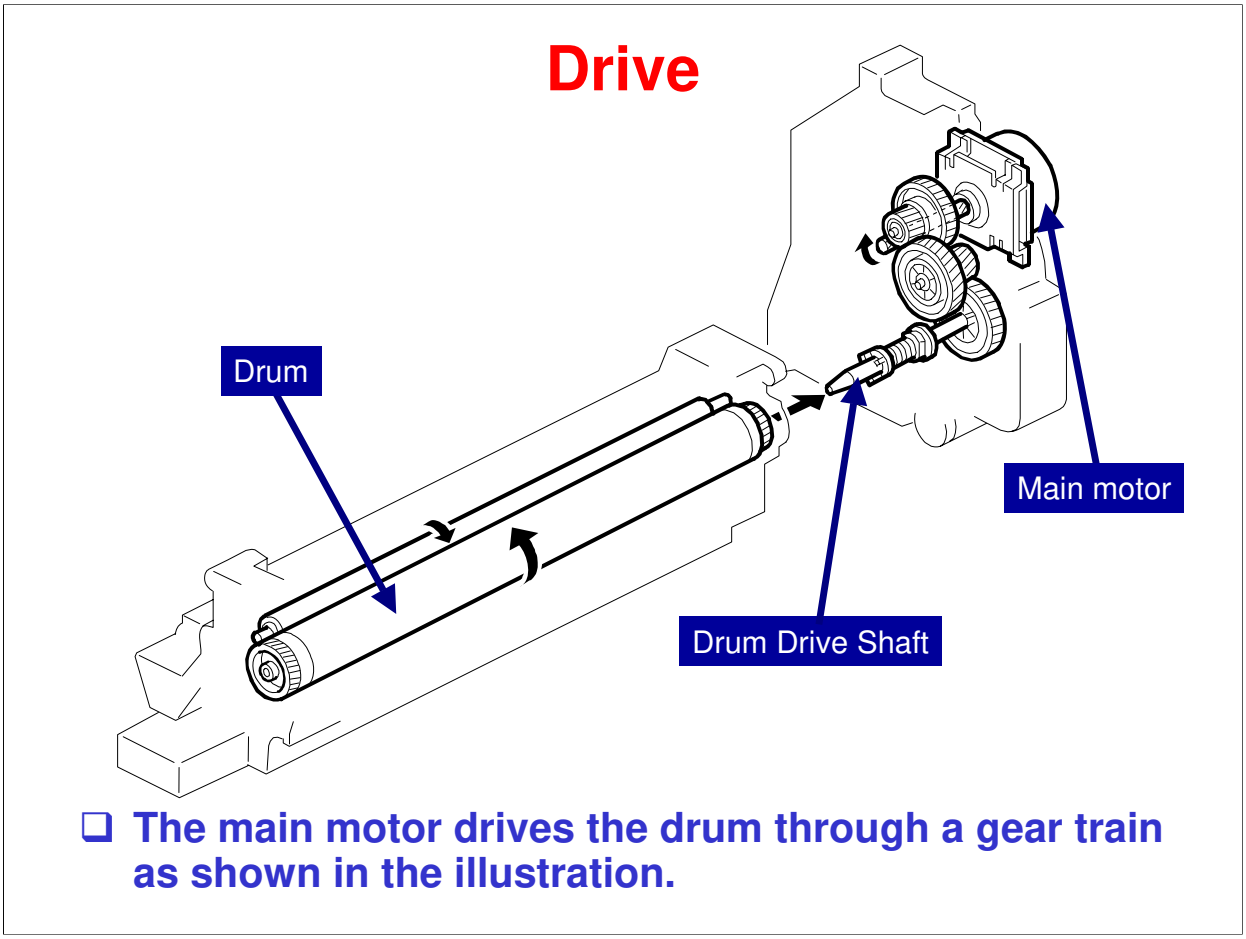
- **OPC Drum (30 mm diameter)**
- **Charge Roller**
  - With cleaning brush
- **Pick-off Pawls**
- **Cleaning Unit**
  - Counter blade mechanism
  - Edge cleaning mechanism
  - Toner recycling
- **Development Unit**

- OPC – Organic Photo-Conductor
- The quenching lamp and ID sensor are not part of 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

No additional notes.



The main motor drives the drum through a series of gears and the drum drive shaft. The main motor assembly includes a drive controller, which outputs a motor lock signal when the rotation speed is out of the specified range.

Lab Work

- **Replace the PCU.**
  - See the field service manual:
    Replacement and Adjustment ⇒ PCU Section ⇒ PCU

- Individual PCU components will be replaced in later sections.

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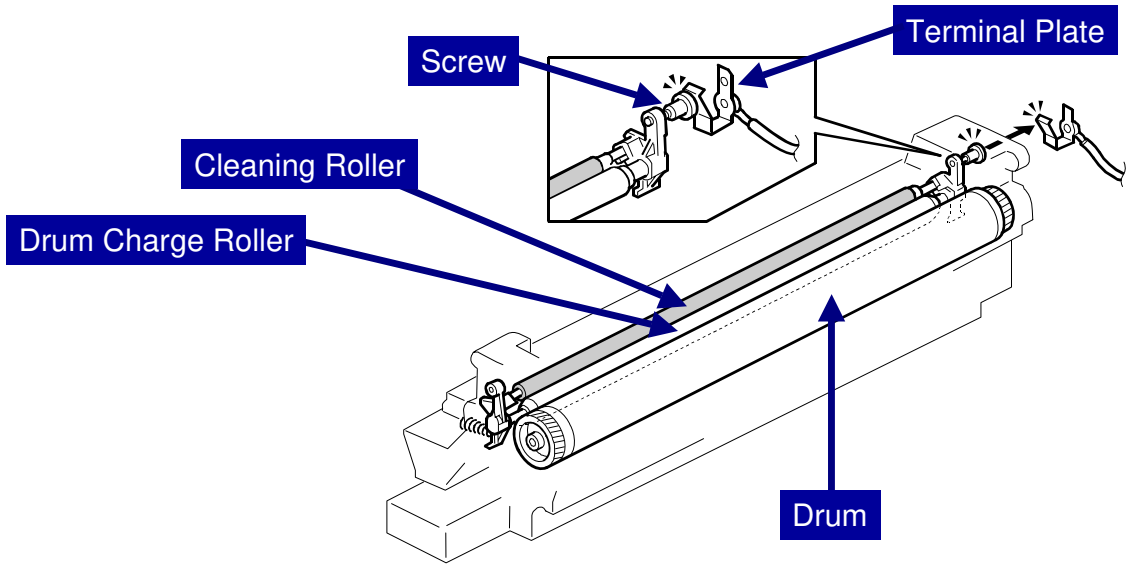
10. Drum Charge

No additional notes.

Drum Charge Roller

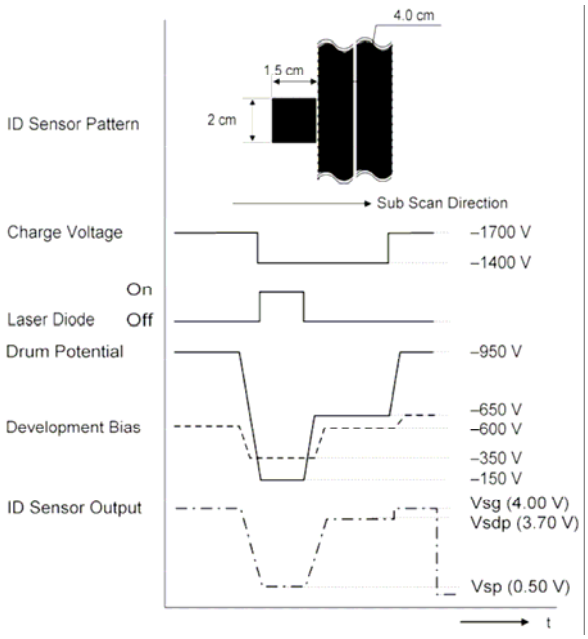


- **The roller is always in contact with the drum**
- **The drum charge roller is at -1700 V for printing**
  - This voltage can be changed using SP-2001-1
- **The drum surface voltage is -950 V**

This copier uses a drum charge roller to charge the drum. The drum charge roller always contacts the surface of the drum to give it a negative charge of –950 V. The high voltage supply board gives a negative charge of –1700 V to the drum charge roller through the screw and terminal plate. This voltage can be changed using SP 2001 1.

Charge Roller Voltage Correction

- **Temperature and humidity affect the efficiency of voltage transfer from the drum charge roller to the drum.**
- **Lower humidity causes a higher drum charge voltage. As a result, less toner is transferred.**
- **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



•Vsdp = Check for environmental correction (charge applied with bias at –600 V).

•Vsg = Check reflectivity of bare drum (charge not applied and bias at –650 V).

•Vsdp and Vsg are checked immediately after checking reflectivity of the ID sensor pattern (Vsp).

- More Details -

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

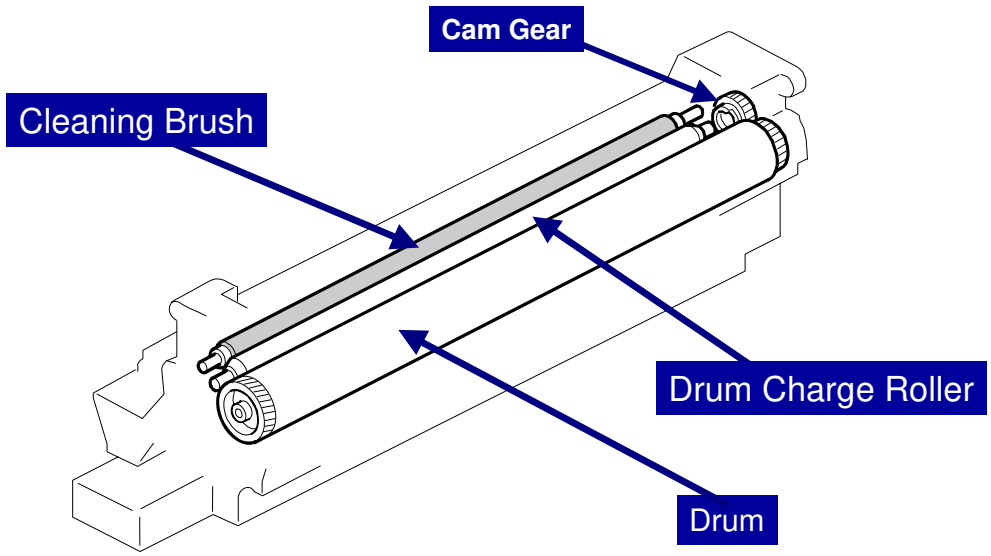
§ Vsdp/Vsg < 0.90 = Make the drum charge voltage more negative (larger) by 50 V

ID Sensor Pattern Production Timing

- **Not for every page or every print or copy job, but at the following times:**
  - During warm-up at power on
  - When the machine starts warming up from energy saver mode and the fusing temperature is less than the target temperature set with SP 2994.

No additional notes.

Charge Roller Cleaning



- The Cleaning Brush is always in contact with the Drum Charge Roller to clean off material which the Drum Charge Roller picks up from the Drum.
- A cam gear moves charge roller from side to side to improve cleaning.
- This waste is not recycled.

- Do not practice disassembly at this time. All PCU related disassembly will be done later after studying drum cleaning.

SP Modes

- **SP 2001: Charge Roller Bias Adjustment**
  - SP 2001-1 : Adjusts the voltage applied to the charge roller when printing.
  - SP 2001-2 : Adjusts the voltage applied to the charge roller when generating the ID sensor pattern.

- SP2001-1: Increasing the (absolute) value will make the output image lighter. Decreasing it will make the image darker.

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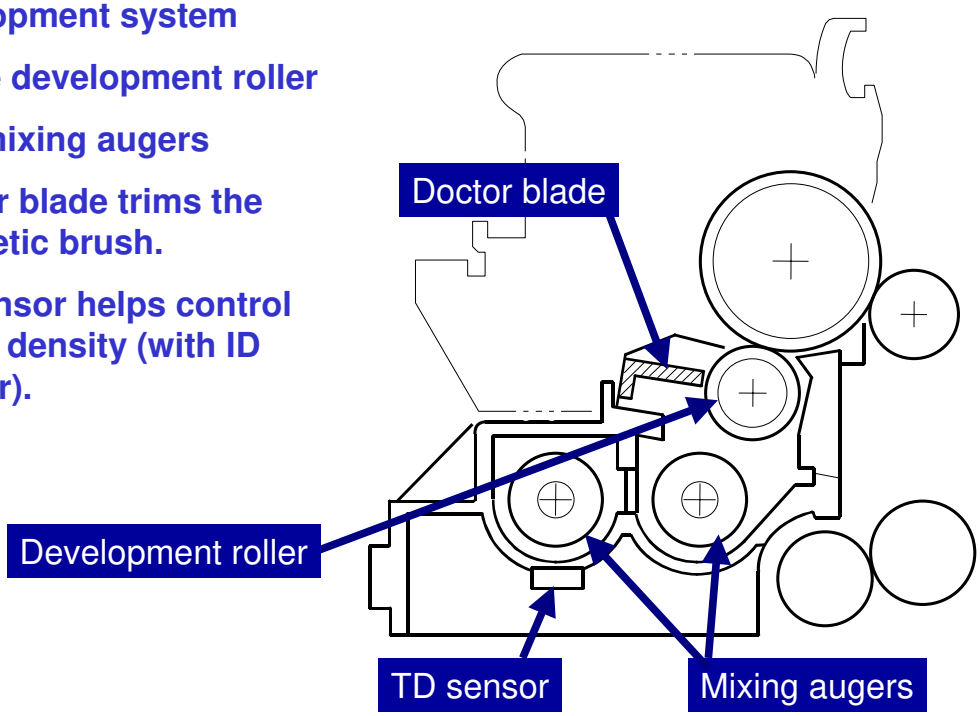
11. Development and Toner Supply

No additional notes.

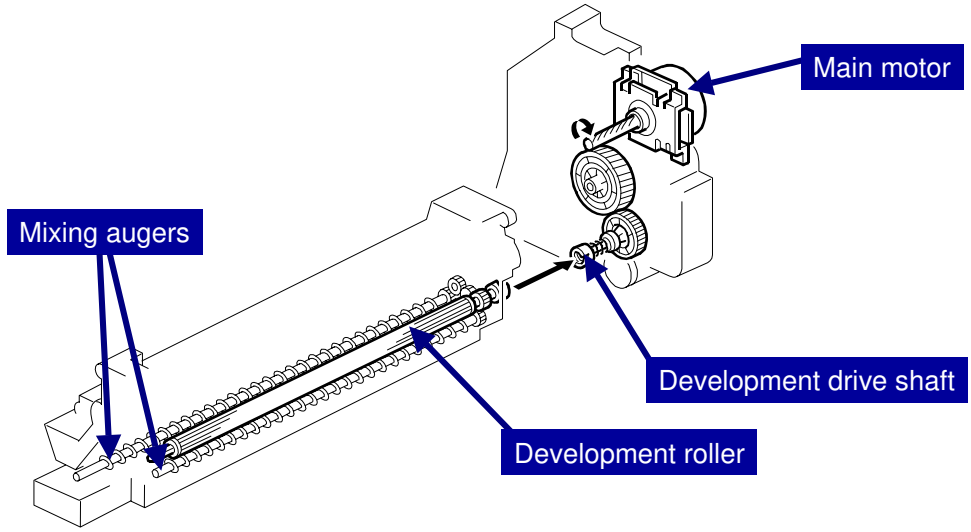
Overview

- Dual component development system
- Single development roller
- Two mixing augers
- Doctor blade trims the magnetic brush.
- TD sensor helps control image density (with ID sensor).



- Refer to the Core Technology Manual for details about dual component development.

Drive

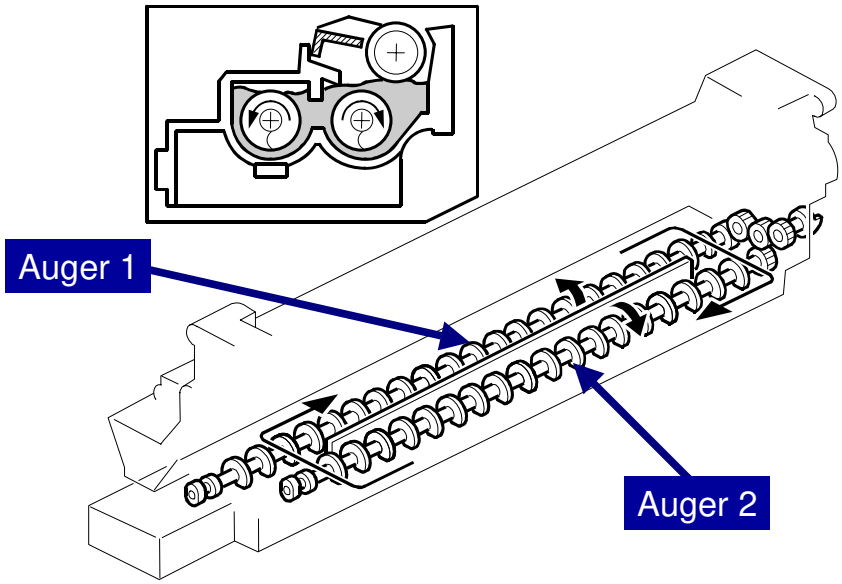


- **Main motor: Drives the development mechanism, via the development drive shaft**
- **Development drive shaft: Engages when the PCU is pushed in**
  - The development roller turns whenever the main motor is on.
- **No development clutch**

The main motor drives the development roller and mixing augers through a train of gears and the development drive shaft. When the PCU is pushed in, the development drive shaft engages the development roller gear.

The development drive gears (except for the gears in the development unit) are helical gears. These gears are quieter than normal gears.

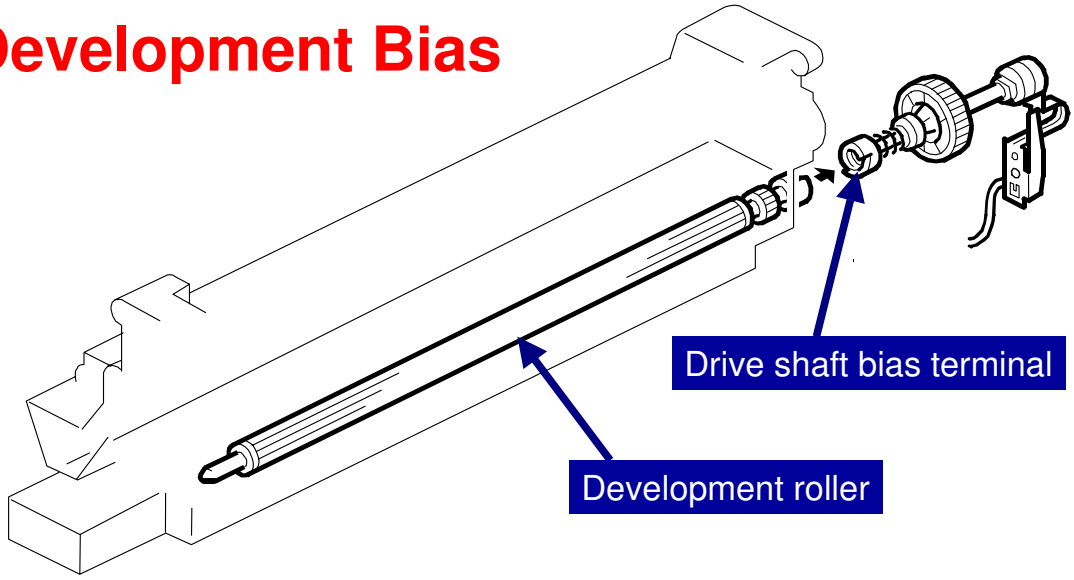
Developer Mixing



- Two mixing augers keep the developer mixed.
- Auger 2: Moves excess toner from the development roller towards the front
- Auger 1: Moves this excess toner, mixed with new toner, to the rear and back to the development roller

The two mixing augers, keep the developer evenly mixed. Mixing auger 2 transports excess developer, scraped off the development roller by the doctor blade, towards the front of the machine. Mixing auger 1 returns the excess developer, along with new toner, to the rear of the mixing assembly. Here the developer is reapplied to the development roller.

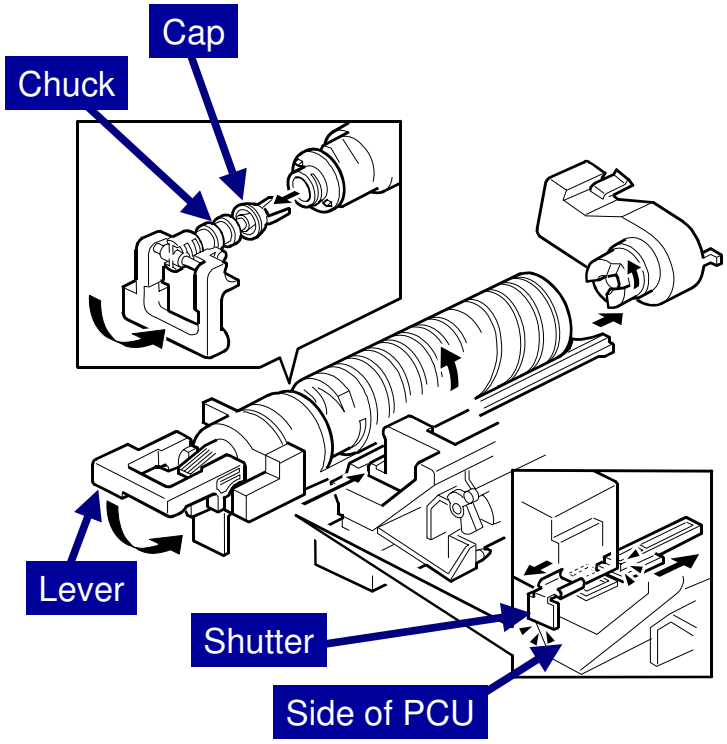
Development Bias



- **White areas: High negative charge (-950V)**
- **Black areas: Discharged by the laser (about -150V)**
- **Development bias (-650V): Forces the negatively-charged toner onto the discharged areas of the drum.**
  - Applied to the development roller shaft through the drive shaft

- This machine uses a negative-negative 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 through the drive shaft.
- The development bias voltage (–650 V) can be adjusted with SP 2201 1.

Toner Bottle Replenishment



- **When the bottle is placed in the bottle holder**
  - The shutter moves against the side of the PCU, and it opens.
- **When the lever is returned**
  - The cap is pulled away so that toner can come out.

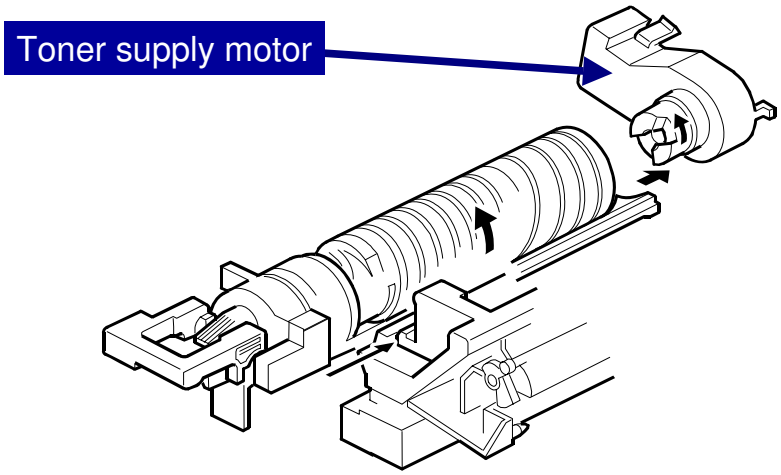
When a toner bottle is placed in the bottle holder unit and the unit is pushed in completely, toner shutter moves against the side of the PCU. When the toner bottle holder lever is put back in the original position, the cap on the toner bottle is pulled away and kept in place by a chuck.

The toner supply mechanism transports toner from the bottle to the development unit. The toner bottle has a spiral groove that helps move toner to the development unit.

To add a new toner bottle, first lift the toner bottle holder. When this is done, the chuck releases the toner bottle cap into its proper position to prevent toner from scattering.

Then, when the bottle holder unit is pulled out to add a new toner bottle, the toner shutter shuts to block the opening as a result of pressure from a spring.

Toner Supply - Bottle Drive

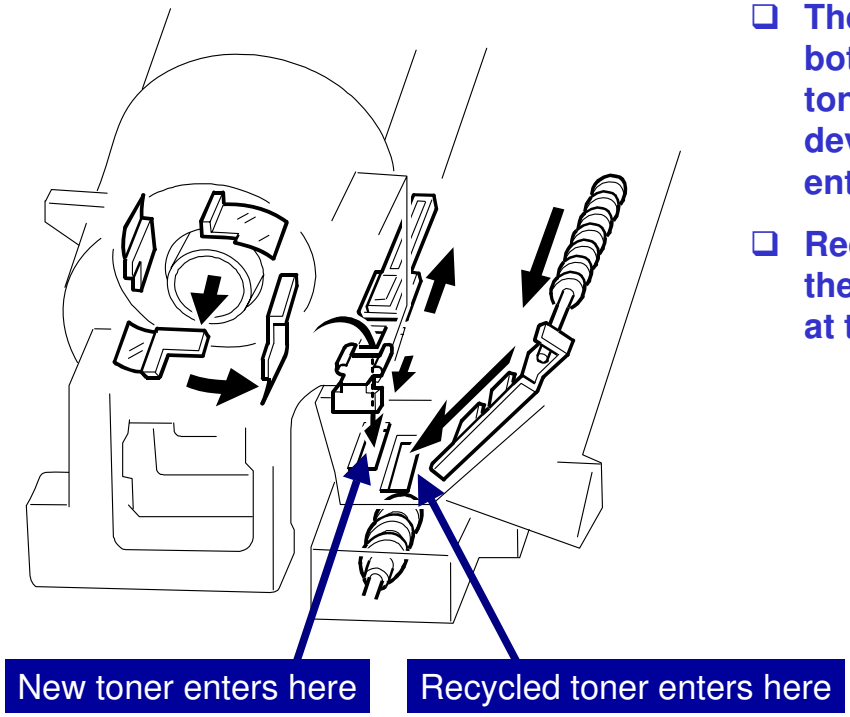


❑ Toner supply motor turns the bottle

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

No additional notes.

Toner Supply - Input to Development Unit

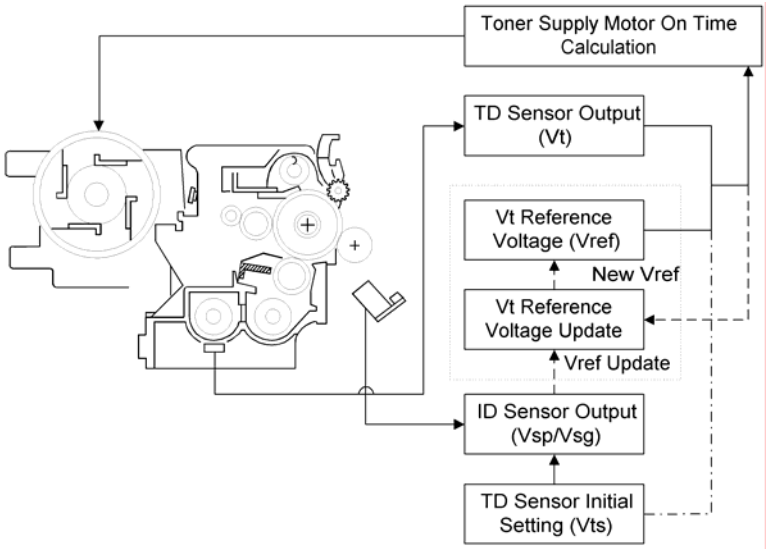


- The Mylar tabs in the bottle unit push the toner towards the development unit entrance.
- Recycled toner from the drum also arrives at this entrance.

No additional notes.

Toner Density Control 1 -- Overview

- **Toner density is controlled by both TD sensor and ID sensor.**
- **Toner is supplied when Vt is higher than Vref.**



- There are four toner-density control modes set by SP 2921. However, SP 2921 should almost always be set to 0.
- If the TD sensor needs to be replaced SP 2921 can be temporarily set to 3 (fixed control 2).
- SP 2921 should not be set to 1 or 2 in the field. (Design and production use only)

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).

No additional notes.

Toner Density Control 3

❑ Vsp/Vsg Detection and Vref Determination

- 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 pattern on the drum or the reflectivity of the drum surface.
- The ID sensor pattern is made on the drum by the charge roller and laser diode.
- Vref (toner supply reference voltage) is Vsp/Vsg.
- Vsp/Vsg is not detected every page or job. It is detected during warm-up at power on.

❑ While the machine is recovering from an energy saver mode, or while the machine starts, the controller ignores the ID-sensor signals if the fusing temperature is at or higher than the value specified by SP 2994. The default is 30°C.

Toner Density Control 4

❑ Toner Supply Determination

- The reference voltage (either 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.
  - » SP2220 displays both Vt and Vref
  - » Vt > Vref = toner is supplied.

(See the next slide for toner supply motor on times.)

No additional notes.

Toner Density Control 5

- **Toner supply motor on time in fixed control mode**
  - The toner supply motor on time is specified by the setting of SP 2925, and does not vary.
  - The default setting is 200 ms for each copy. The toner supply motor on time for each value of SP 2925 is shown in the table to the right.
  - Effective only if SP 2921 is set to 3.

Value of SP2925	Motor On Time (t = 200 ms)
0	t
1	2t
2	4t
3	8t
4	12t
5	16t
6	Continuously
7	Not supplied

No additional notes.

Toner Density Control 6

- **Toner supply motor on time in sensor control mode**
  - For sensor control modes 1 and 2, the toner supply motor on time is decided by the following factors.
    - » Vt
    - » Vref or Vts
    - » TD sensor sensitivity (coefficient: S, value is 0.4)
  - There are seven levels for toner supply motor on time as shown in the table below.

Level	Decision	Motor On Time (seconds)
1	(Vts or Vref) < Vt ≤ (Vts or Vref) + S/16	t (0.4)
2	(Vts or Vref) < Vt ≤ (Vts or Vref) + S/8	t x 2 (0.8)
3	(Vts or Vref) < Vt ≤ (Vts or Vref) + S/4	t x 4 (1.6)
4	(Vts or Vref) < Vt ≤ (Vts or Vref) + S/2	t x 8 (3.2)
5	(Vts or Vref) < Vt ≤ (Vts or Vref) + 4S/5	t x 16 (6.4)
6	Vt ≥ (Vts or Vref) + 4S/16 (near-end)	T (30); see note 3
7	Vt ≥ (Vts or Vref) + S (toner end)	T (30); see note 3

- The value of “t” can be changed using SP 2922. (default: 0.4 second)
- The value of “T” can be changed using SP 2923. (default: 30 seconds)
- T (30) means that toner is supplied intermittently in a 1/3 duty cycle (1 s on, 2 s off) for 30 seconds.

Abnormal ID 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.**

No additional notes.

Abnormal TD Sensor Condition

- 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.

No additional notes.

Toner Near-end/End Detection

- **If Vt level 6 is detected 5 consecutive times, near-end is detected.**
- **Toner is supplied 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 the toner bottle has been replaced.

- Do not practice disassembly at this time. All PCU related disassembly will be done later after studying drum cleaning.

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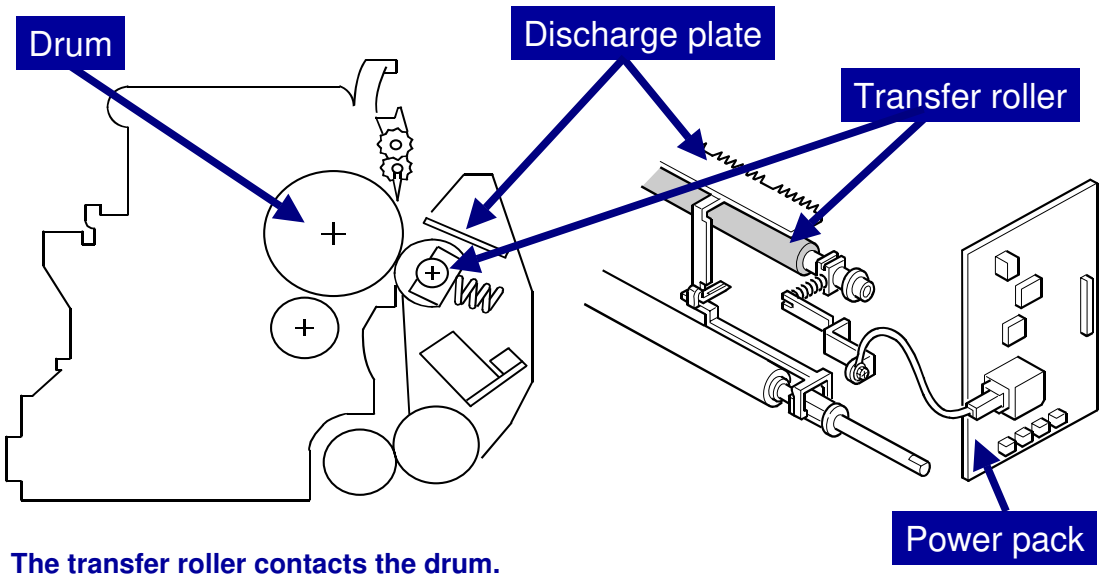
12. Image Transfer and Paper Separation

No additional notes.

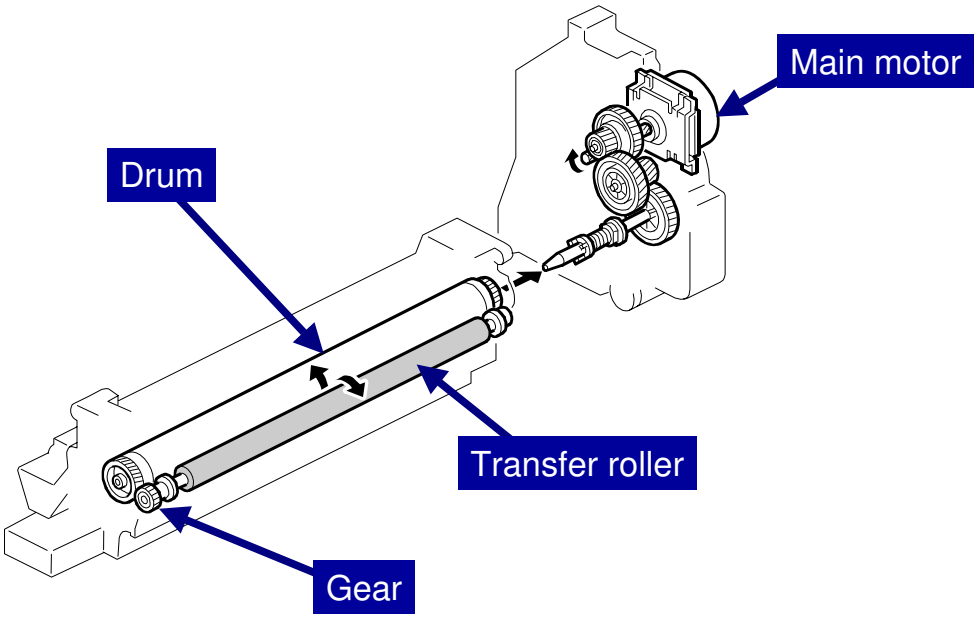
Image Transfer and Paper Separation



- **The transfer roller contacts the drum.**
- **A positive charge is applied to the transfer roller as paper passes between it and the drum, attracting the image from the drum to the paper.**
- **Drum curvature and the discharge plate separate the paper from the drum. Pick-off pawls prevent paper from wrapping around the drum.**

- The transfer current depends on the paper width, paper type, and paper feed tray.

Drive



- The drum drives the transfer roller through a gear
- The transfer roller always contacts the drum (there is no touch and release mechanism).

No additional notes.

Transfer Current

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

No additional notes.

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Transfer Current Table

- The high transfer current levels (default) are as shown in the table below in the notes.
  - (Go to "Notes Page" view to see the table.)
- With SP 2301, the high transfer current level used for the paper feed trays, duplex tray, by-pass tray, and transfer roller cleaning can be adjusted.
- Be careful when increasing the transfer current. This may cause a ghosting effect, in which part of the image at the top of the page is repeated lower down the page at a lower density. In the worst case, it may also damage the OPC drum.

High transfer current level table

	By-pass Tray (Thick/OHP)	Paper Tray/ By-pass Tray (Normal)
A3/A	11 u	

Transfer Roller Cleaning

- **A negative cleaning current is applied, followed by a positive current.**
  - Negatively and positively charged toner particles are both transferred back to the drum.
  - The current for the 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 the power
  - After a copy paper jam has been removed

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 SP2996 is changed from the default (0). 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.

Lab Work

- **Practice replacing the following components**
  - Transfer roller
  - ID sensor
    (Not related to transfer, but this is a convenient time to practice ID sensor removal as the transfer roller must be removed first.)

No additional notes.

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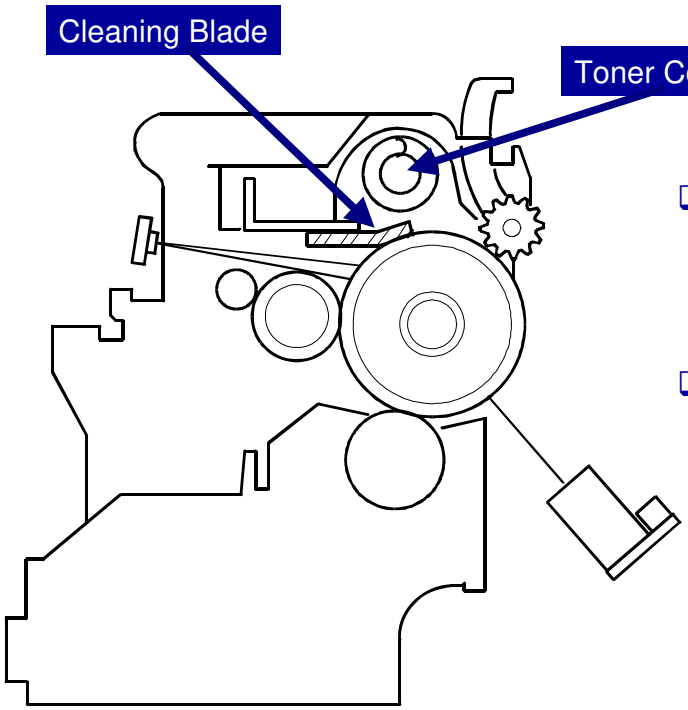
13. Drum Cleaning and Toner Recycling

No additional notes.

Drum Cleaning



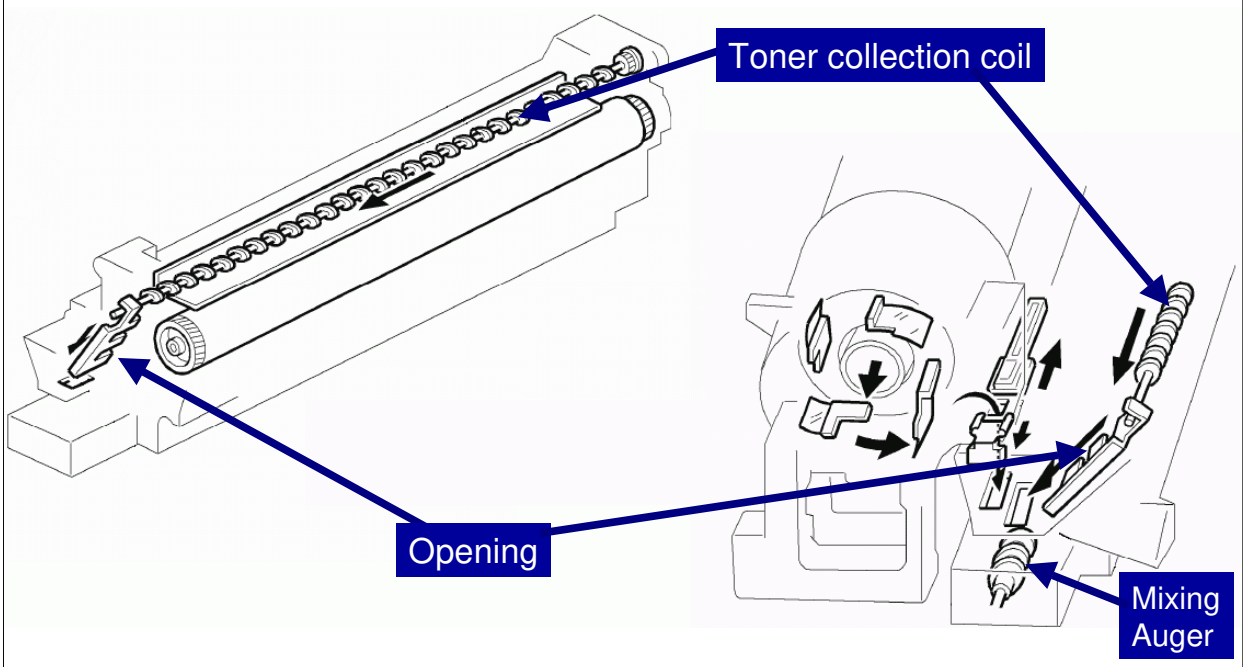
- **Cleaning blade removes remaining toner from drum after the image is transferred to the paper.**
- **To remove toner from edge of the cleaning blade, the drum turns in reverse for about 5 mm at end of each copy job.**

The cleaning blade removes any toner remaining on the drum after the image is transferred to the paper. This model uses a counter blade system. (See the Core Technology Manual for more information on cleaning systems.)

The cleaning blade scrapes off toner remaining on the drum. When toner builds up in the cleaning unit, toner at the top of the pile is removed by the toner collection coil.

To remove the toner and other particles that are accumulated at the edge of the cleaning blade, the drum turns in reverse for about 5 mm at the end of every copy job.

Toner Recycling



- **Toner collection coil: Moves toner towards the opening in the PCU (Photo Conductor Unit), where it is mixed with new toner and used again.**

Toner picked up by the toner collection coil, is transported to the opening in the side of the PCU. This toner falls into the development unit with new toner coming from the toner bottle and it is all mixed together in the developer by the mixing auger.

Lab Work

- **Take out the PCU and practice removing and installing the following parts.**
  (Refer to the Field Manual for all procedures.)
  - Pick-off pawls and toner density sensor
  - OPC drum
  - Charge roller and cleaning brush
  - Cleaning blade
  - Developer (This is optional as you added developer during installation.)

  Note: When you are finished, be sure to do the actions specified by the "After Replacement or Adjustment" procedure.

No additional notes.

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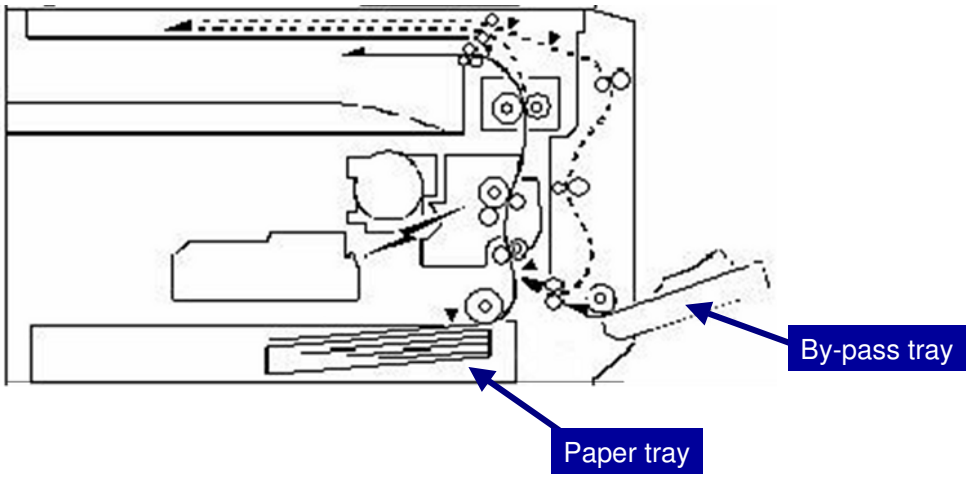
14. Paper Feed

No additional notes.

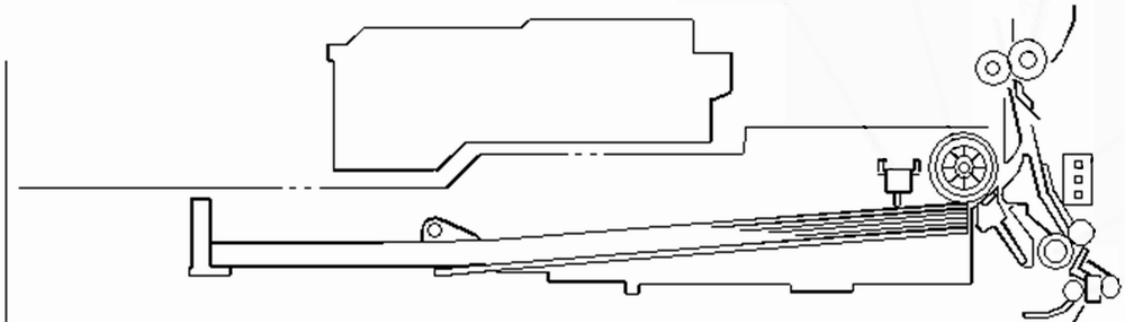
Overview - 1



- **Built-in paper tray: 250 sheets**
  - Friction pad and feed roller system
- **Bypass tray: Up to 100 sheets**

- Refer to the Core Technology Manual for details about paper feed systems.

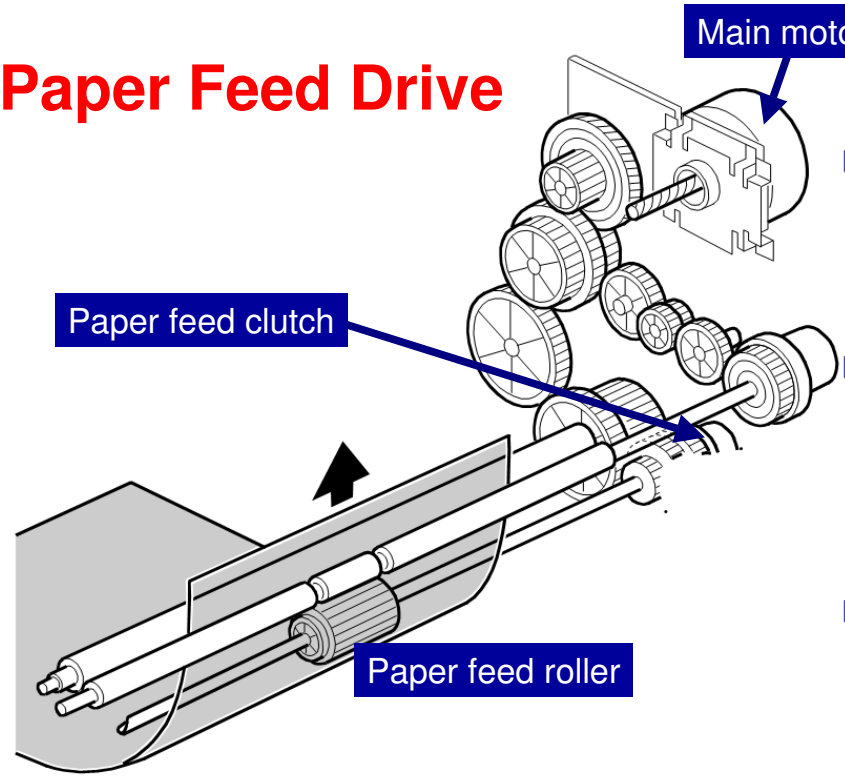
Overview - 2



- **The paper tray holds 250 sheets. The paper tray feed stations use a friction pad system. To prevent paper from getting caught inside the machine when the tray is pulled out, the paper feed roller and shaft do not separate from the tray when the tray is pulled out. Two relay sensors are used for paper jam detection. The lower one detects jams when paper is fed up from the optional paper feed unit.**

- This model has one paper tray.

Paper Feed Drive

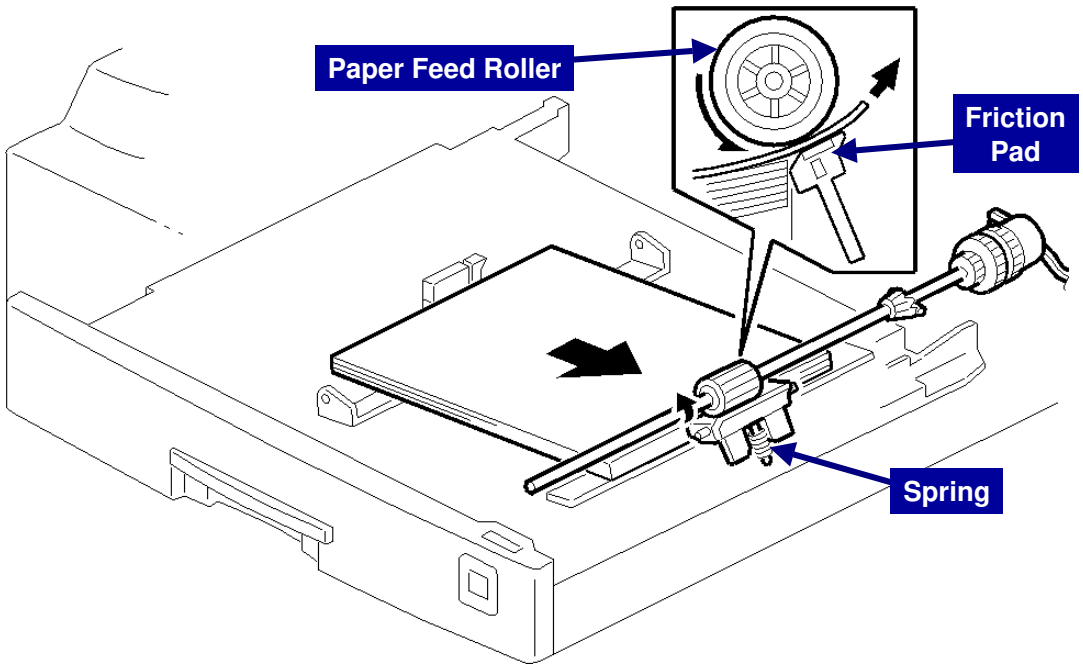


- Main motor: Drives pick-up and feed mechanism of paper tray.
- Paper feed clutch transfers main motor drive to the paper feed roller.
- When the paper feed clutch turns on, feed roller starts to feed paper.
- Paper feed clutch stays on until shortly after registration sensor has been activated.

No additional notes.

Feed and Separation

- Feed roller and friction pad feed system.
- The friction pad pressure is not adjustable.

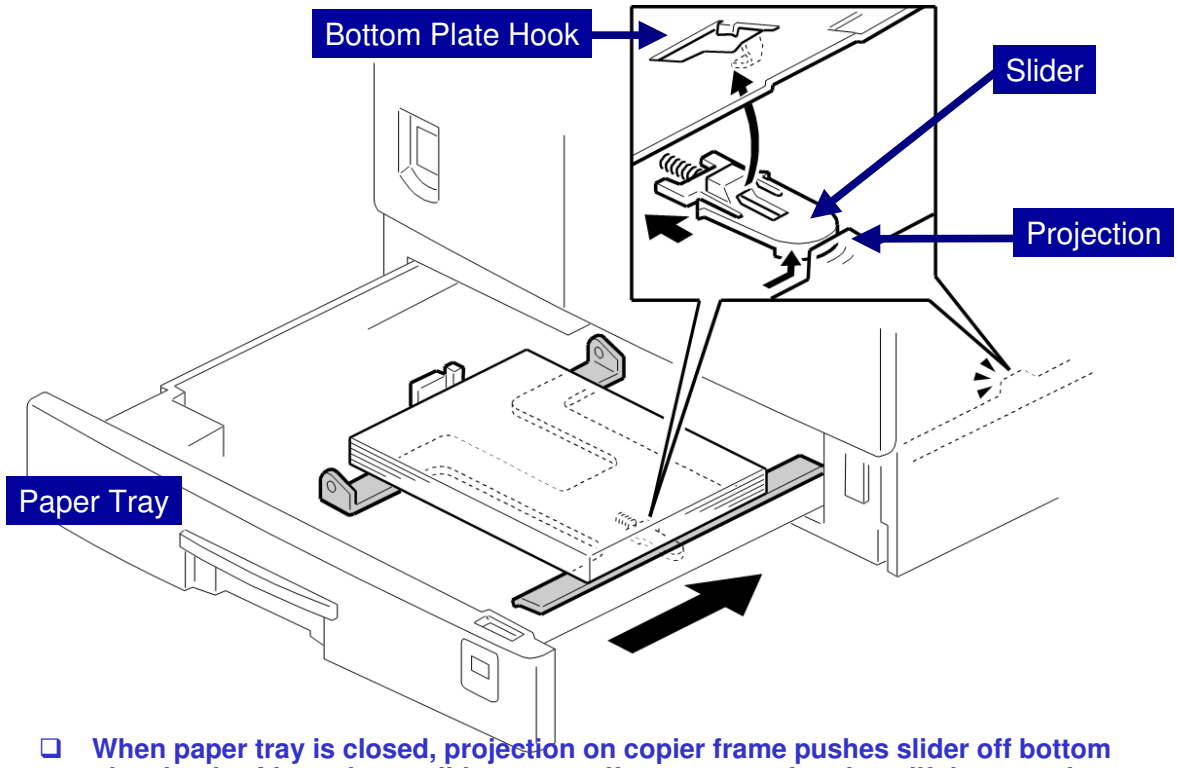


The paper feed roller drives the top sheet of paper from the paper tray to the copier. The friction pad allows only one sheet to feed at a time. The friction pad is pressed against the feed roller by a spring.

The friction pad pressure cannot be adjusted.

See the Core Technology Manual for more information on paper feed systems.

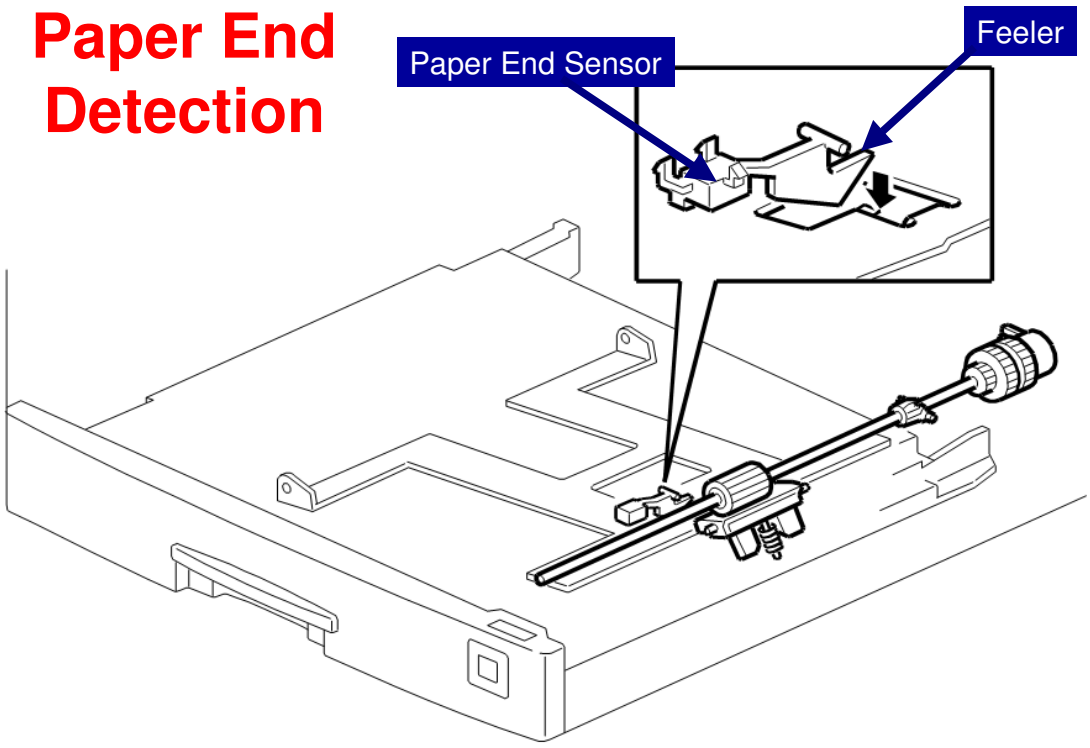
Paper Lift Mechanism



- When paper tray is closed, projection on copier frame pushes slider off bottom plate hook. After release slide comes off, compressed springs lift bottom plate.

No additional notes.

Paper End Detection



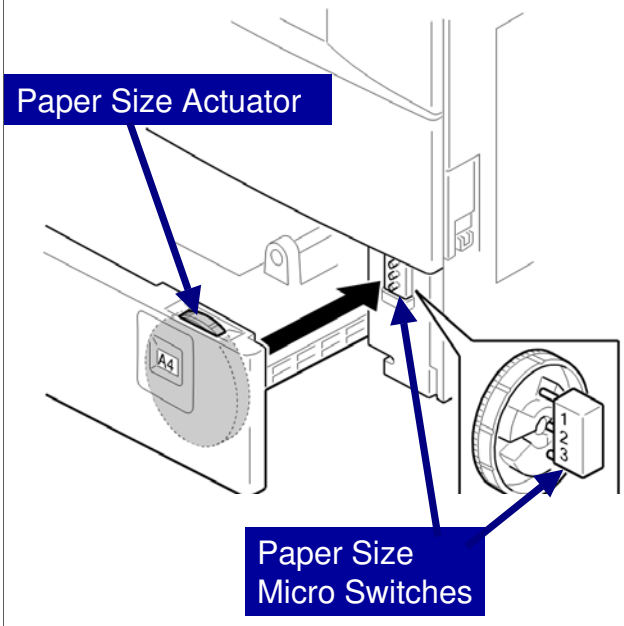
- **Paper end sensor: Feeler falls through a slot in the bottom plate when there is no paper.**

The paper end sensor is mounted on the frame above the paper tray. If there is any paper in the paper tray, the paper stack lifts the feeler and the paper end sensor is deactivated.

When the paper tray runs out of paper, the paper end feeler drops into the cutout in the tray bottom plate and the paper end sensor is activated.

When the paper tray is pulled out with no paper in the tray, the shape of the paper end feeler causes it to lift up and so it does not interfere with tray movement.

Paper Size Detection – Paper Tray



- **Switches actuated by paper size actuator behind paper size indicator plate.**

Paper Size	Switch		
	1	2	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

ON=Not pushed, OFF=Pushed

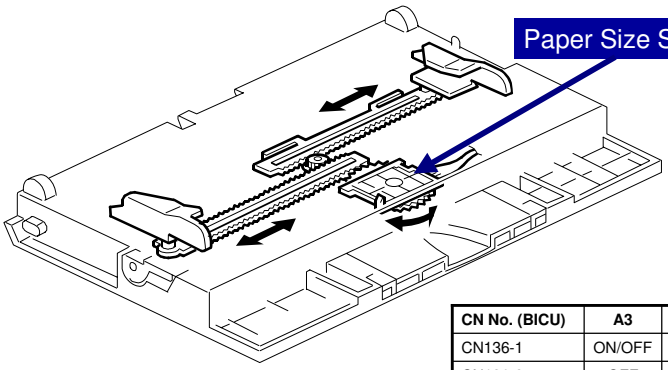
There are three paper size micro-switches on the lower front right plate. The switches are actuated by a paper size actuator, which is on the front right of the tray.

Each paper size has its own unique combination of notches. To determine which size has been installed, the CPU reads which micro-switches the actuator has switched off.

The CPU disables paper feed from the tray if the paper size cannot be detected. If the paper size actuator is broken, or if there is no tray installed, the Add Paper indicator will light.

When the paper size actuator is at the asterisk "*" mark, the paper tray can be set up to accommodate one of a wider range of paper sizes by using User Tools. If the paper size for this position is changed without changing the User Tool setting, a paper jam will result.

Paper Size Detection – By-pass Tray



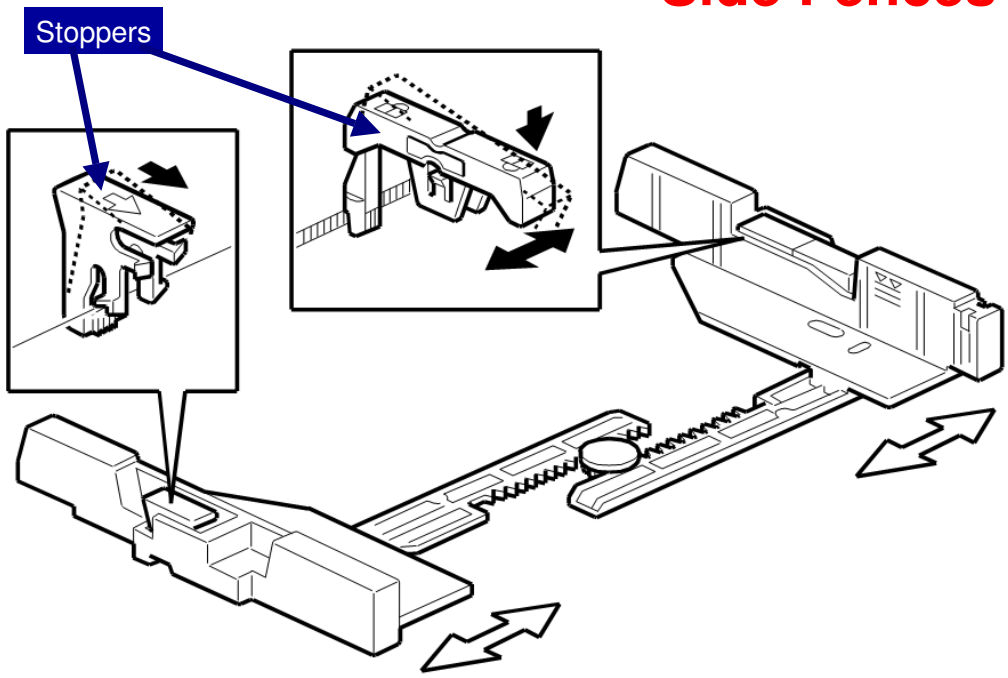
CN No. (BICU)	A3	A4 SEF	8"x13"	A5 SEF
CN136-1	ON/OFF	OFF	OFF	OFF
CN136-2	OFF	OFF	OFF	ON/OFF
CN136-3 (GND)	OFF	OFF	OFF	OFF
CN136-4	OFF	ON	ON	OFF
CN136-5	ON	ON	OFF	OFF

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

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.

Side Fences

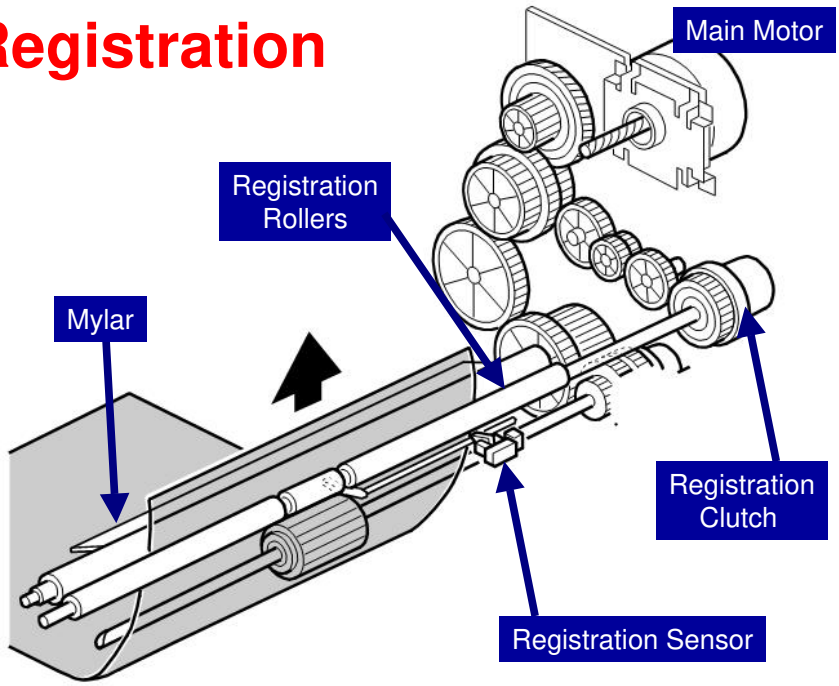


- **The side fences have stoppers to prevent them from moving when a full tray is pushed in too strongly.**

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. To correct this, each side fence has a stopper attached to it. Each side fence can be secured with a screw, for customers who do not want to change the paper size.

Paper Registration

- **Registration sensor: Detects paper arrival at the registration rollers and detects paper misfeeds.**
- **SP 1003: Adjusts amount of buckle at the registration rollers to prevent skew.**
- **SP 1903: Adjusts the amount of push after skew correction to help feed certain types of paper.**



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 rollers instead of going between them. The clutch comes on again for certain paper types, such as thick paper, 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 1003: Adjusts amount of buckle at the registration roller to prevent skew.**
- **SP 1903: Feed Clutch Boost**
  - Adjusts the amount of extra push that the feed clutch gives to the paper after the skew has been corrected at registration. This feature helps the registration rollers feed certain types of paper (such as thick paper). Increase the value if thick paper is jamming after feeding from the registration roller.
  - Can be used only with the by-pass tray and optional paper tray units.

Related SP Modes

- SP 4010: Scanner leading edge registration
- SP 4011: Scanner side-to-side registration
- SP 6006: ADF/ARDF registration

Lab Work

- **Practice replacing the following parts**
  - Feed roller
  - Friction pad
- **Optional replacement practice**
  - Exit sensor
  - By-pass feed roller and paper end sensor
  - Registration roller
  - By-pass paper end switch
  - Registration clutch
  - Registration sensor
  - Paper feed clutch and by-pass feed clutch
  - Relay clutch
  - Relay sensor
  - Paper size switch

No additional notes.

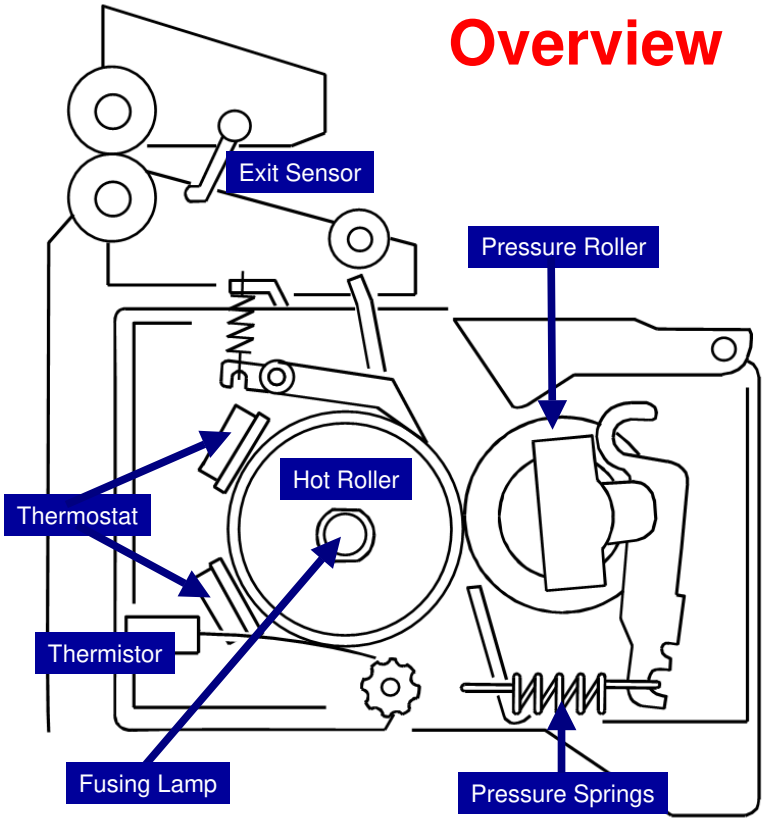
RICOH

B282-62/B283-62
Service Training

15. Fusing

No additional notes.

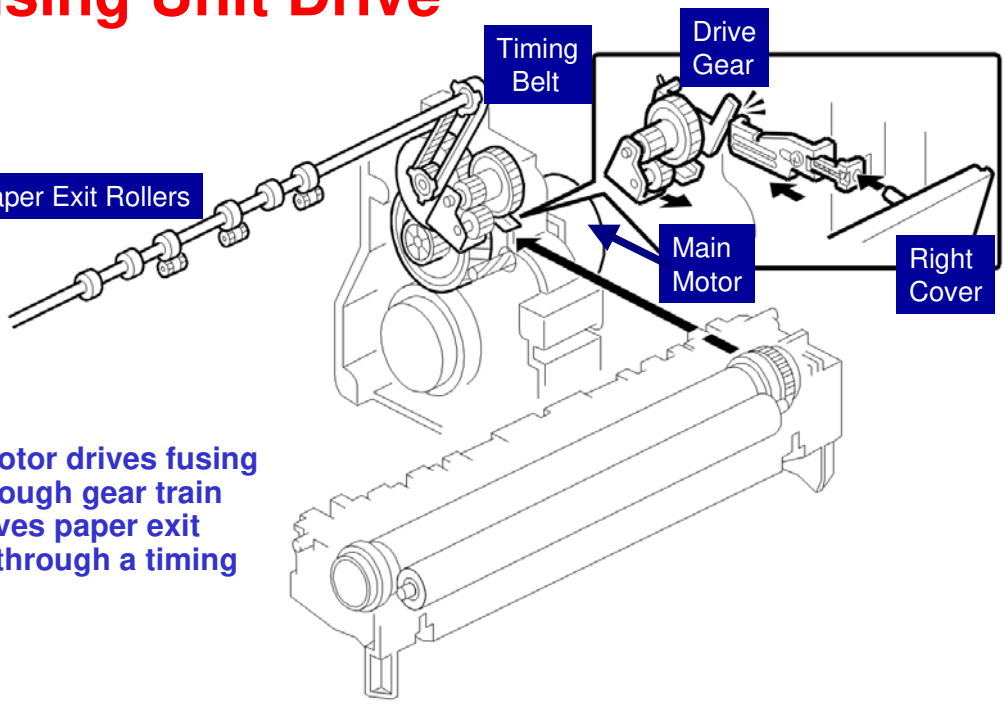
Overview



- This is a standard heat and pressure fusing system.
- Thin-walled hot roller with lamp heat source.
- Pressure roller constantly pressed against hot roller by springs.

No additional notes.

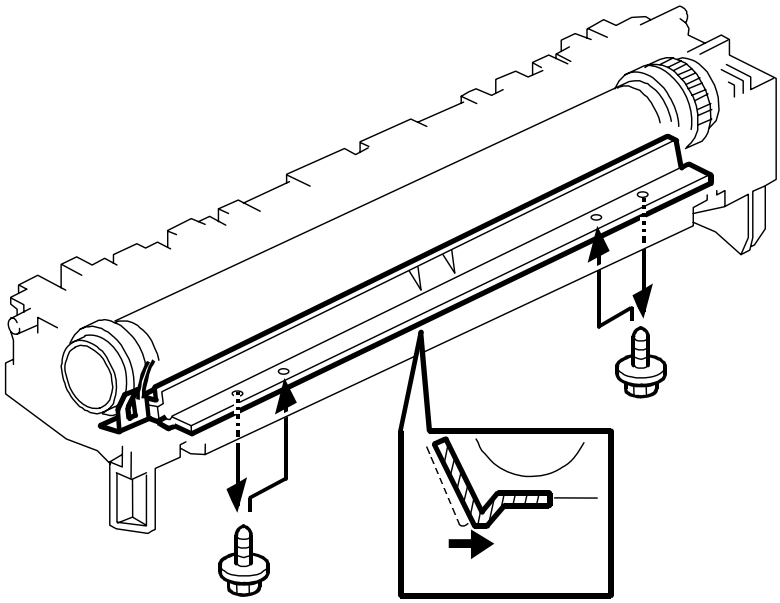
Fusing Unit Drive



- Main motor drives fusing unit through gear train and drives paper exit rollers through a timing belt.
- Fusing unit drive gear disengages when the cover is open for easier jam removal.

No additional notes.

Fusing Entrance Guide Shift

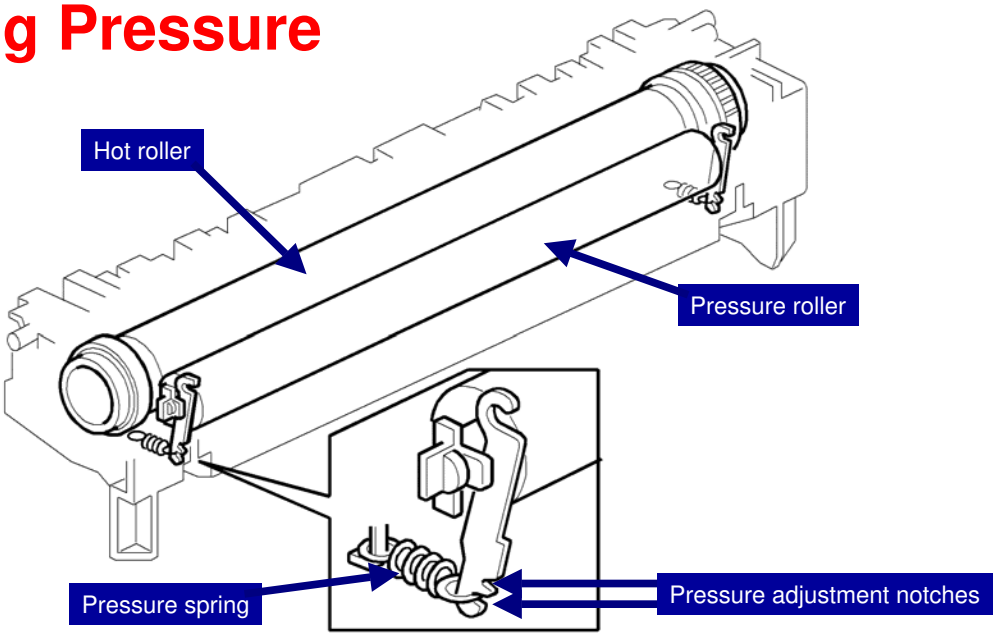


- **If the paper creases in the fusing unit, shift the guide by moving the screws to the inner holes.**

The entrance guide is adjustable for paper thickness to prevent creasing. The outer screw holes on each side are used as the default setting.

If creasing occurs frequently in the fusing unit, adjust the entrance guide to the right, by securing it with the inner holes. This allows more direct access to the gap between the hot roller and the pressure roller.

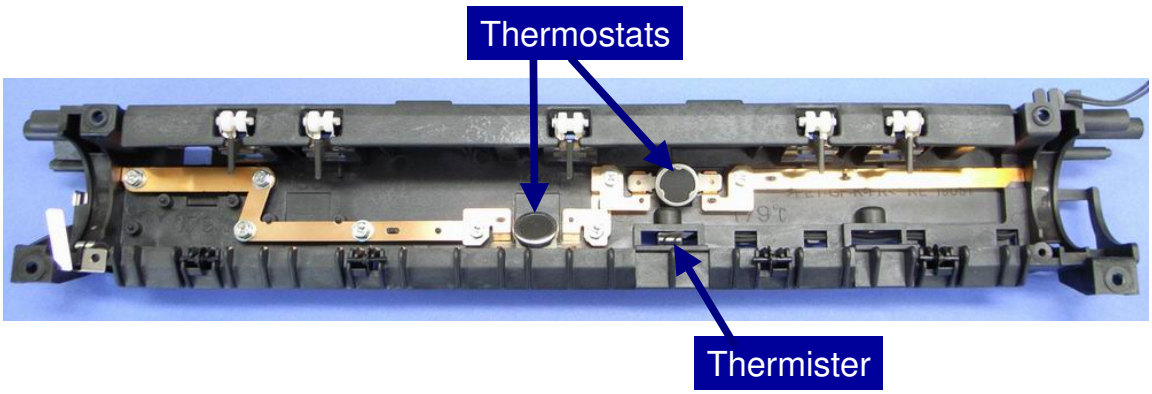
Fusing Pressure



- The springs apply pressure between the hot roller and the pressure roller.
- The springs can be moved to adjust pressure. The default position is the end notch.

The pressure springs constantly apply pressure between the hot roller and the pressure roller. Applied pressure can be changed by adjusting the position of the pressure springs. The spring is positioned at the end as the default setting.

Fusing Temperature Control 1



- **The machine checks the thermistor once per second.**
- **The machine compares the current and previous readings, and the target, and decides how long to keep the lamp on during the next second.**
- **The thermostats provide overheat protection.**

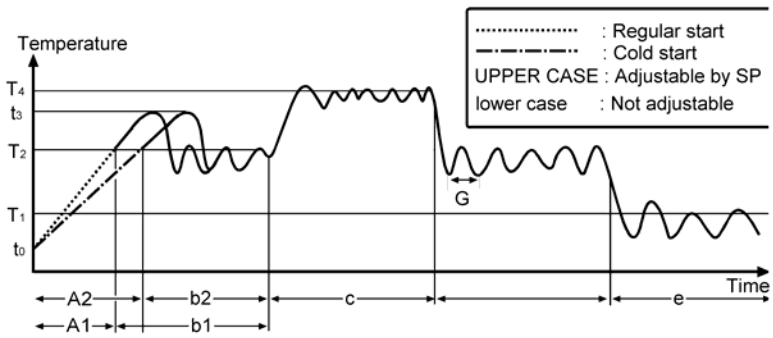
The fusing temperature is controlled using a thermistor.

The CPU checks the output from the fusing thermistor once every second. The CPU decides how long the lamps must be switched on during the next second by comparing the following temperatures.

- The thermistor temperature and the target temperature.
- The difference of the previous thermistor temperature and the current thermistor temperature.

The fusing lamp is turned on/off to maintain a target fusing temperature of 175° C during copying. (Default is 175° C. Can adjust with SP1105-5.)

Fusing Temperature Control 2



- **A1: Normal warm-up (SP1103-1 = 0, default)**
- **A2: Idling during warm-up (SP1103-1 = 1, good for cold temp starts)**
- **T1: Low power temp (SP1105-7, default is 60° C)**
- **T2: Stand-by temp (SP1105-3, default is 175° C)**
- **T4: Print/copy temp (SP1105-5, default is 175° C)**
- **G: Fusing temp check timing (SP1108, default is 1 s)**

- Normally leave SP1103-1 at 0. Set SP1103-1 to 1 if fusing quality is low just after warm-up. Warm-up will take longer but fusing quality will be better.
- T4 for thick paper is set by SP1105-9.
- T2 default for this machine is the same as T4 (175° C).
- Generally leave SP1108 alone. If room lights flicker when the fusing lamp comes on, you can set a larger value.
  - However, if you set SP1108 to 2 (3 seconds), the BICU may not be able to detect fusing lamp errors.

Overheat Protection

- **Fusing Overheat Error 1**
  - If the fusing temperature reaches more than 230°C and continues 10 times consecutively (100 ms x 10 = 1 second), SC543 shows on the LCD and the controller turns the fusing lamp off.
- **Fusing Overheat Error 2**
  - If the fusing temperature reaches more than 250°C and continues 10 times consecutively (100 ms x 10 = 1 second), SC544 shows on the LCD and the controller turns the fusing lamp off.
- **Overheat Fail-safe**
  - The two thermostats provide overheat fail-safe protection. They are on the line of the fusing lamp. They cut the power supply to the fusing lamp if the temperature of the thermostats reaches 180°C.

- Fusing overheat error 1 is detected by the thermistor.
- Fusing overheat error 2 is detected by the fusing temperature control circuit.
- The thermostats are near the hot roller but not in contact.

SP Modes

- **SP 1103: Fusing idling on/off**
- **SP 1105: Fusing unit temperatures**
  - SP1105-9 sets the fusing temperature for thick paper. (default: 185°C) This is only used for paper fed from the bypass tray. The user must go to User Settings and set the bypass paper type to "Thick Paper".
- **SP 1106: Displays the current fusing unit temperature**
- **SP 1107: Fusing soft start adjustment**
  - This SP sets the number of zero-cross cycles of the fusing lamp AC supply needed to bring the fusing lamp power to 100% while bringing the lamp up to the standby temperature or while copying. Normally leave this alone.
- **SP 1108: Specifies the interval for fusing-temperature control (1, 2, or 3 seconds)**
- **SP 1109: Nip band width adjustment**
- **SP 1902: Display-AC Freq.**
  - Displays the fusing lamp power control frequency (as detected by the zero cross signal generator). The displayed value is 1/5 the actual frequency: 10 = 50 Hz, 12 = 60 Hz.

This slide summarizes the fusing related SP modes. Refer to the Field Service Manual for other details about these SP modes.

Lab Work

- **Practice replacing the following parts.**
  - Hot roller
  - Pressure roller
  - Stripper pawls
  - Optional – replace the thermistor and thermostats. (Easy)
- **Practice nip width adjustment.**
- **Refer to the FSM for the details. Be sure to heed all cautions and notes.**

No additional notes.

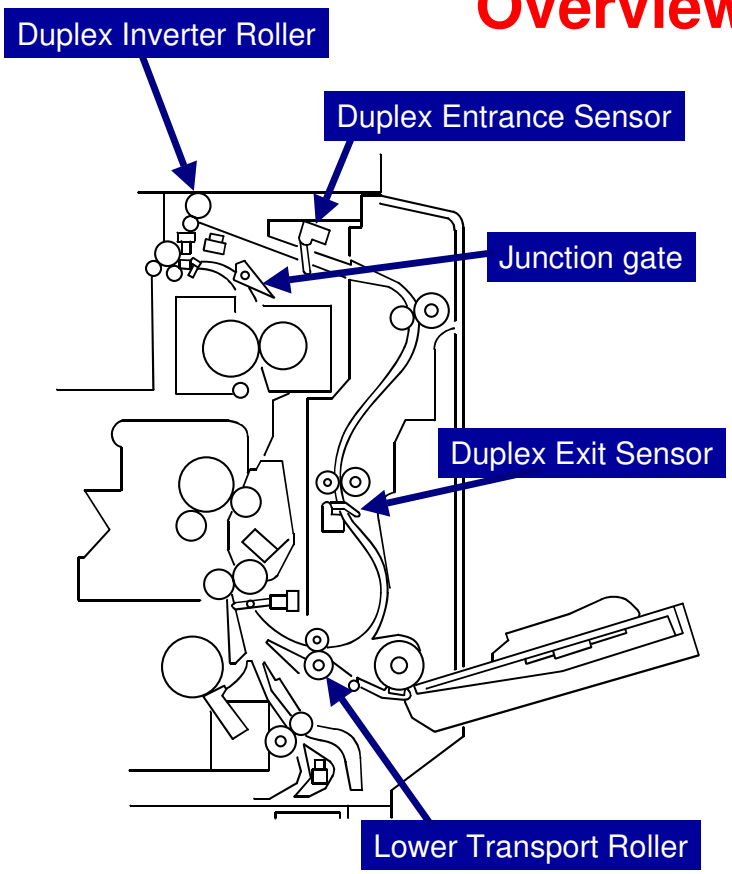
RICOH

B282-62/B283-62
Service Training

16. Duplex

No additional notes.

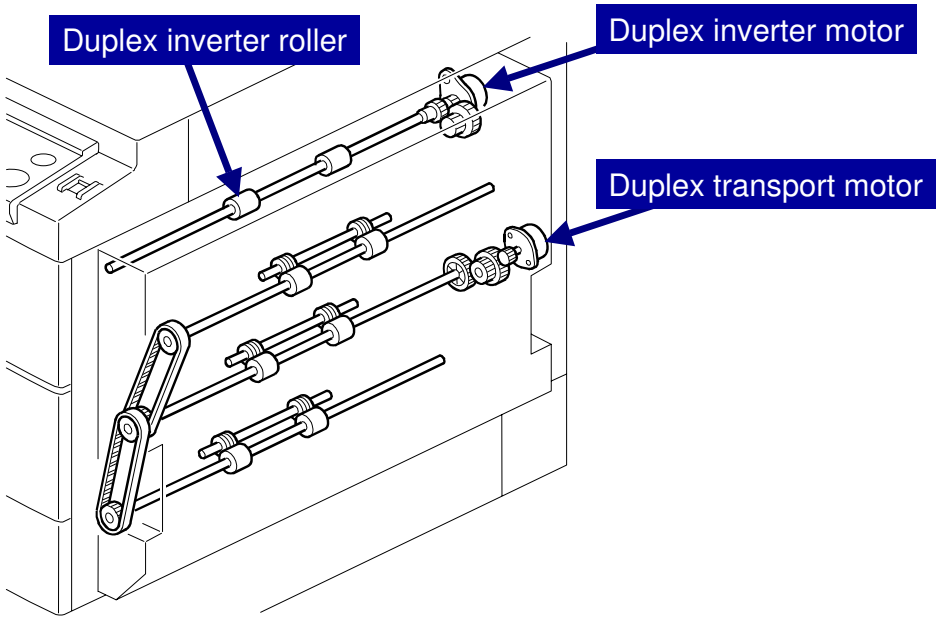
Overview



- **After fusing, the junction gate directs the paper either:**
  - Out through the exit rollers
  - Up to the duplex inverter rollers
- **If paper goes to the duplex inverter rollers:**
  - First, it goes to the inverter table.
  - Then it is reversed through the duplex unit and back into the machine to print side 2.

No additional notes.

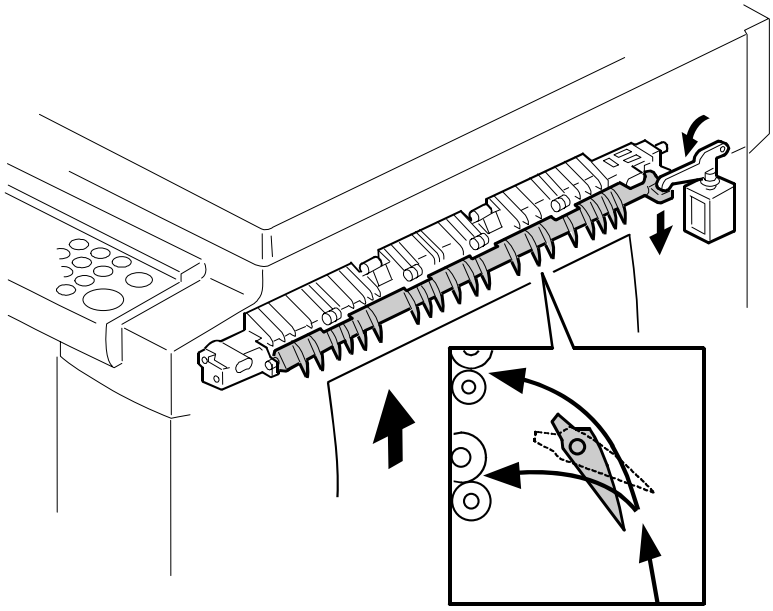
Drive



- **Duplex inverter motor: Drives the inverter roller**
- **Duplex transport motor: Drives the rollers in the duplex unit**

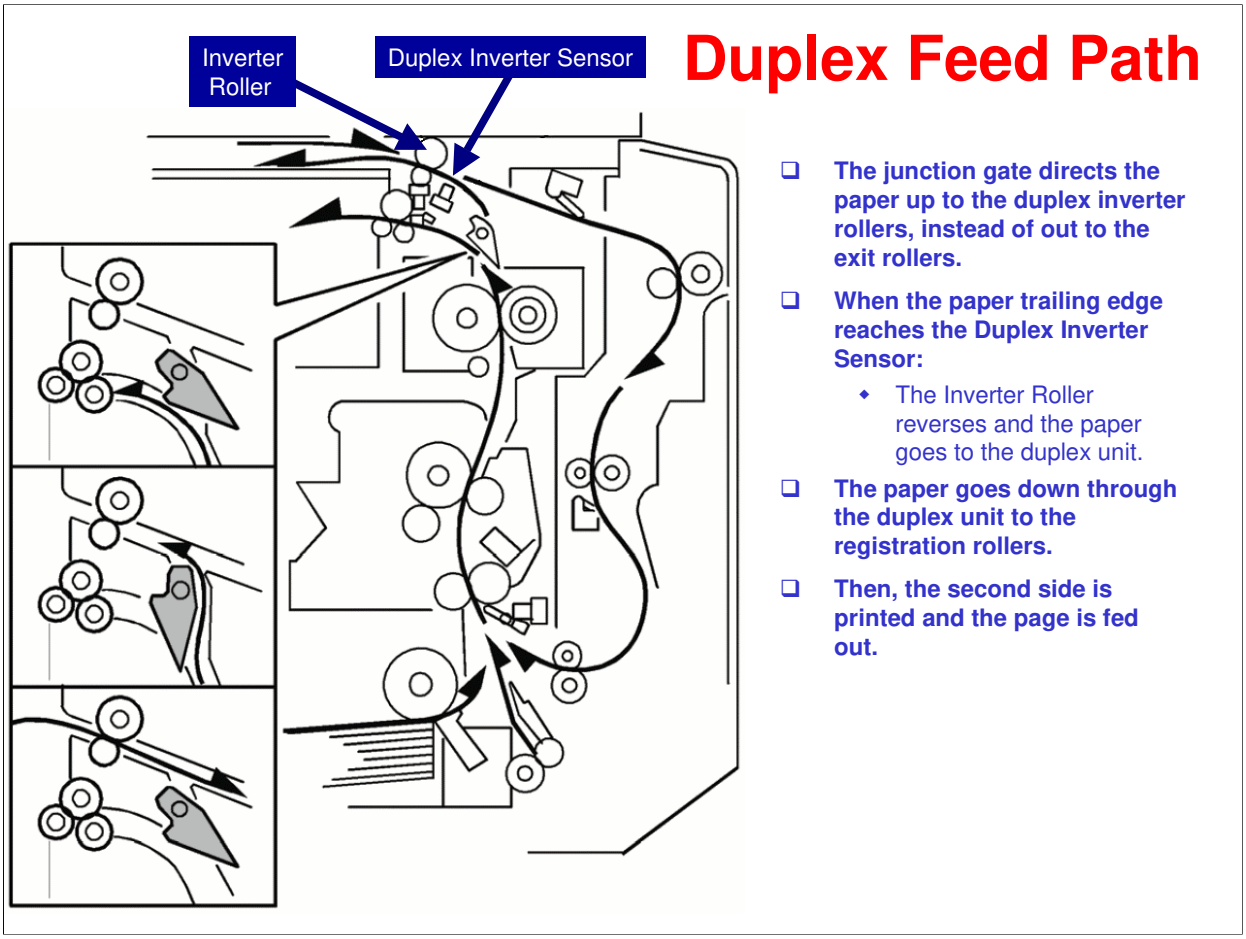
- Two motors drive the duplex mechanism.
- The duplex inverter motor is a reversible motor.

Duplex Entrance



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

No additional notes.

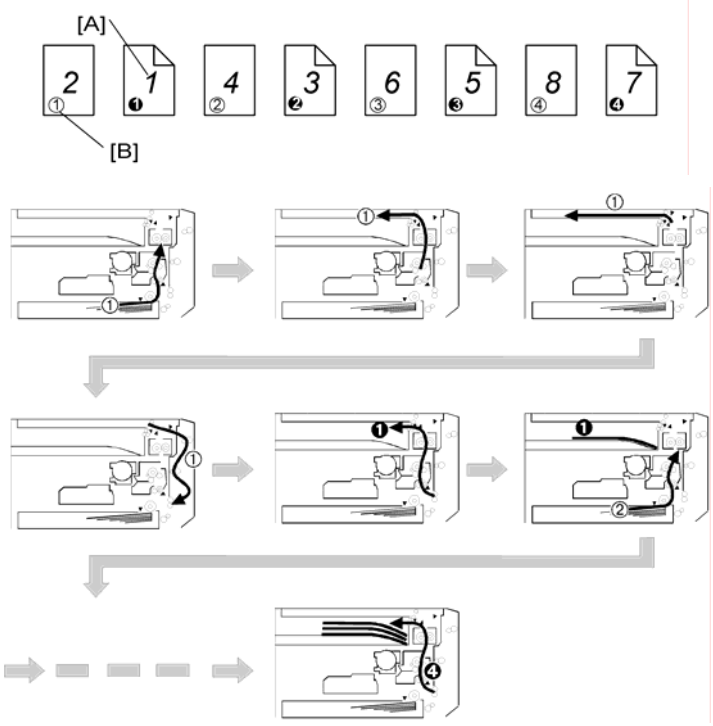


No additional notes.

Basic Operation 1

Larger than A4 Short-edge/LT Short-edge

- The paper feed path can hold only one sheet of copy paper at a time.
- Example: 8 pages. The number [A] in the illustration shows the order of pages. The number [B] in the illustration shows the order of sheets of copy paper (if black, this indicates the second side).

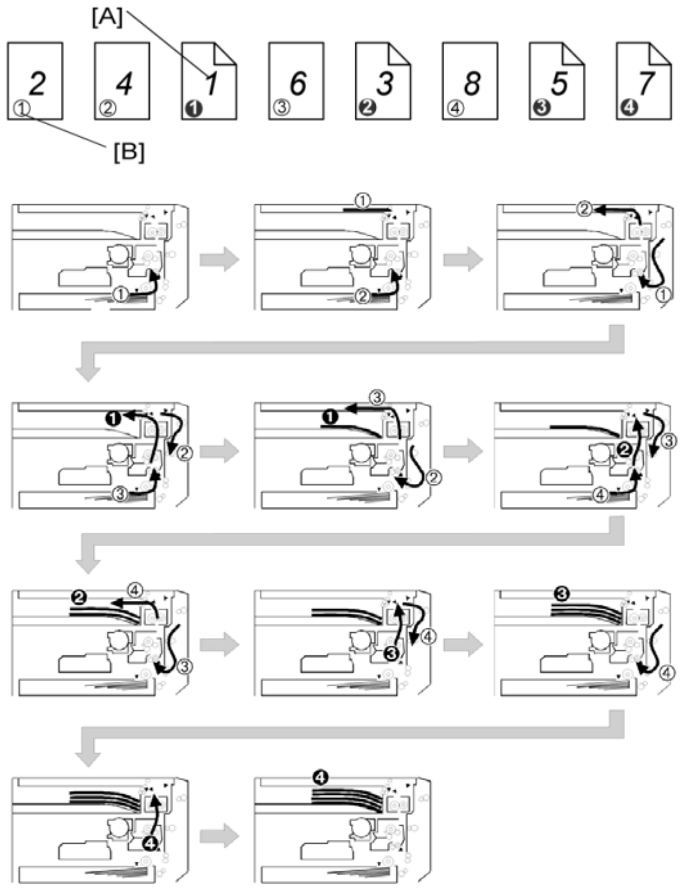


- Only one page can pass through at a time (that is, no interleaving is done).

Basic Operation 2

Up to A4 Short-edge/LT Short-edge

- The paper feed path can hold two sheets of copy paper.
- Example: 8 pages. The number [A] in the illustration shows the order of pages. The number [B] in the illustration shows the order of sheets of copy paper (if black, this indicates the second side).



- This is known as ‘interleaving’.
- Two pages can go through the paper path at once. The copier interleaves the pages; this gives maximum throughput.

SP Mode

- **SP2301-3 : Transfer current adjustment – Duplex**
  - Adjusts the current applied to the transfer roller when carrying out a duplex job.
  - Use this SP if there is poor image transfer on the rear side of duplex copies.

No additional notes.

Lab Work

- Practice the removal procedures for the Duplex Unit.
- See the Field Service Manual for the detailed procedures.

- Skip this if you are trained on the B282-61.

RICOH

B282-62/B283-62
Service Training

17. ADF

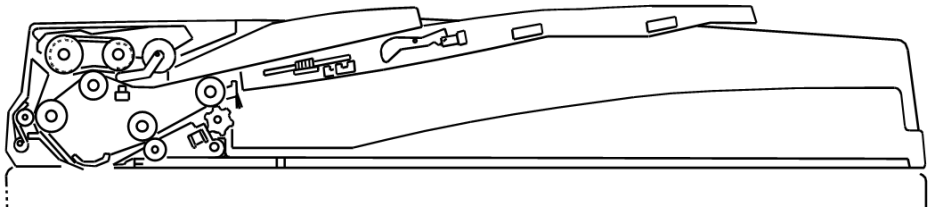
No additional notes.

Overview

- Feeds originals past the DF exposure glass while scanning. (Fixed optics, moving original)
- 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.

No additional notes.

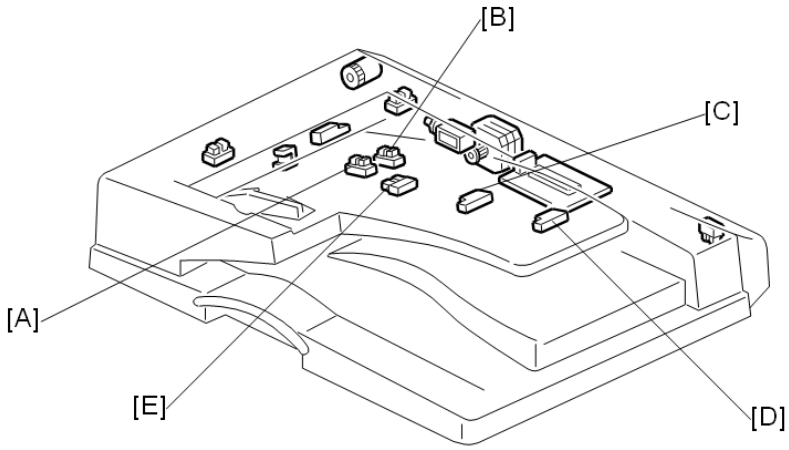
Component Layout



- **Study the component layout diagrams in the service manual.**
  - Mechanical layout
  - Drive layout
  - Electrical component layout
- **Go to your machine and find the components on the diagrams.**

No additional notes.

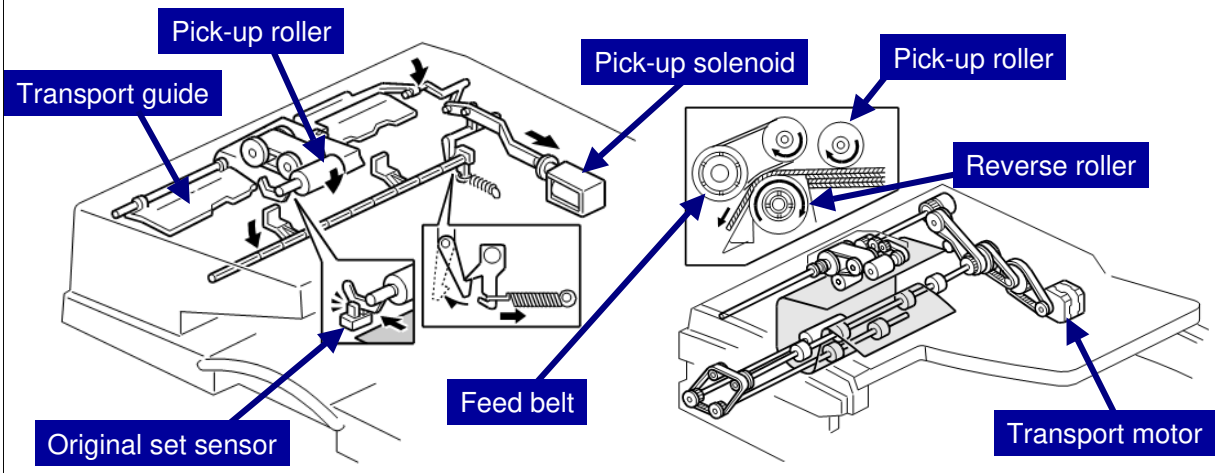
Original Size Detection



- **Two width sensors [A, B]) and two length sensors [C, D])**
  - Refer to the original size detection matrix on page B813-5 of the service manual.
- **The original exit trailing edge sensor [E] detects when the trailing edge of the last page has been fed in.**

No additional notes.

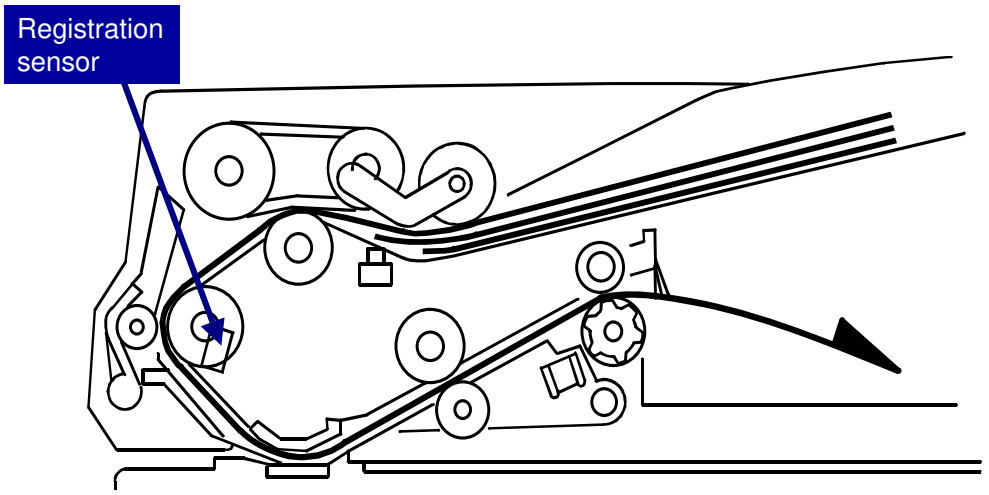
Pick-up and Separation



- **Pick-up solenoid: Lowers the transport guide and pick-up roller.**
- **Transport motor: Drives all the rollers.**
- **FRR feed system**

- Refer to the Core Technology Manual for details about FRR (and other) feed systems.

Transport and Feed-out (ADF)



- **Transport motor (see previous slide) separates the top original and feeds it through the scanning area.**
- **Motor speed depends on the reproduction ratio.**

More on Transport and Feed-out

- Study the path of paper through the ADF.
- The machine scans the original through the DF exposure glass.
- The original stops at the registration sensor. However, 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.

SP Modes

- SP 6006: ADF image adjustments
- SP 6009: ADF free run
- SP 6901: Displays the status of original size sensors.
- SP 6910: ADF shading time

No additional notes.

Lab Work

- **Practice replacing the following PM parts.**
  - Feed belt
  - Reverse roller (Called the "separation roller" in the replacement procedure.)
  - Pick-up roller
- **Optionally disassemble the machine and replace any other parts you wish**
- **See the service manual for details of the replacement procedures.**

No additional notes.

RICOH

B282-62/B283-62
Service Training

18. ARDF

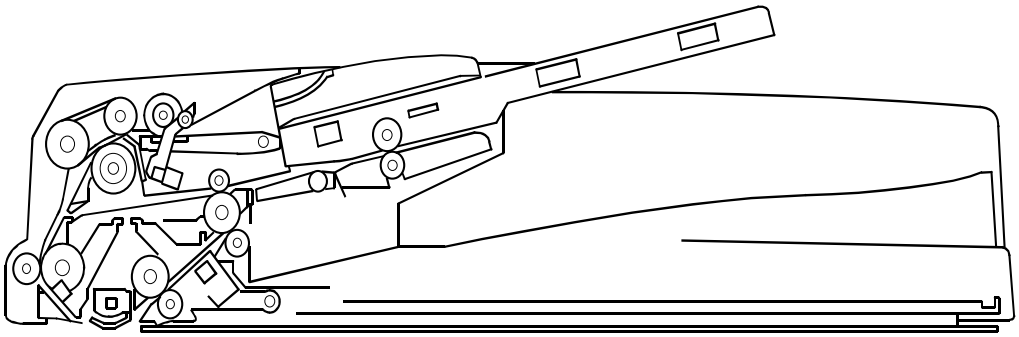
No additional notes.

Overview

- Feeds originals past the DF exposure glass while scanning. (Fixed optics, moving original)
- 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.

No additional notes.

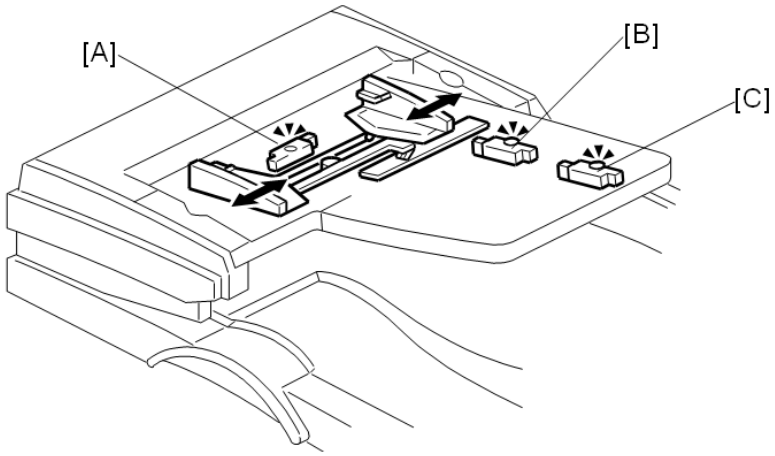
Component Layout



- **Study the component layout diagrams in the service manual.**
  - Mechanical layout
  - Drive layout
  - Electrical component layout
- **Go to your machine and find the components on the diagrams.**

No additional notes.

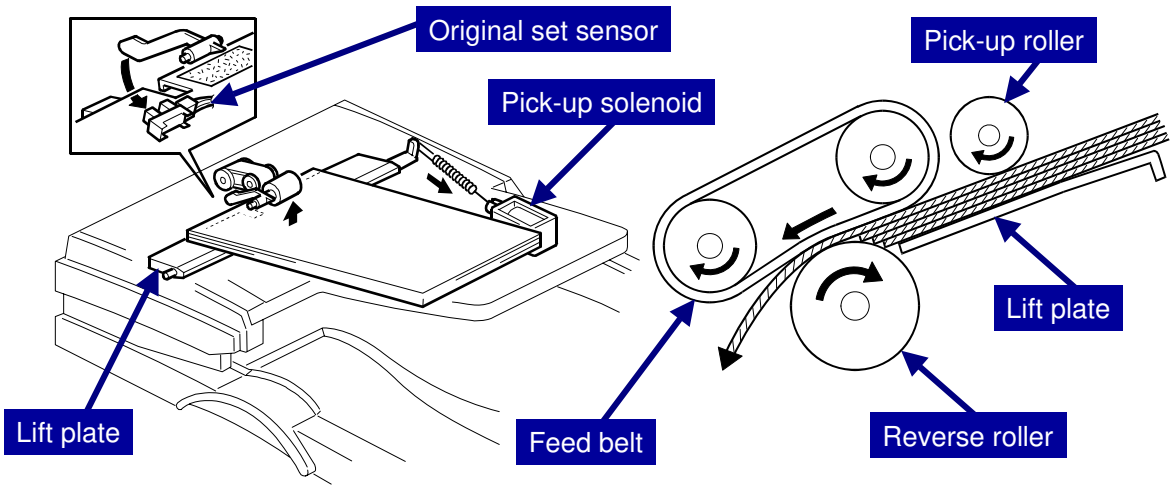
Original Size Detection



- **One width sensor [A], and two length sensors [B,C]**
  - Width sensor: Output depends on the guide position.
  - Refer to the original size detection matrix on page B814-5 of the service manual.

No additional notes.

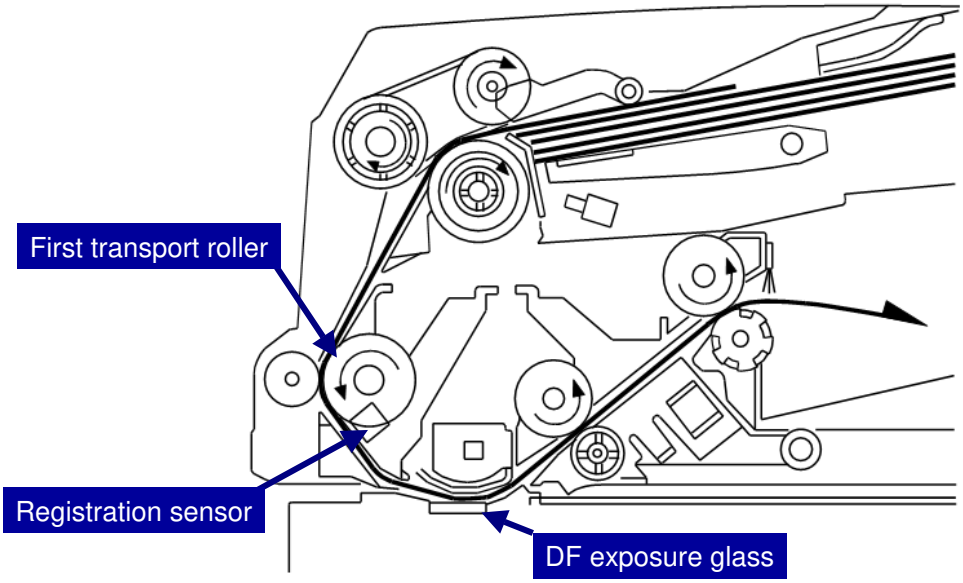
Pick-up and Separation



- **Pick-up solenoid: Raises the lift plate, to lift the originals to the pick-up roller.**
- **FRR feed system**

- Refer to the Core Technology Manual for details about the FRR feed system.

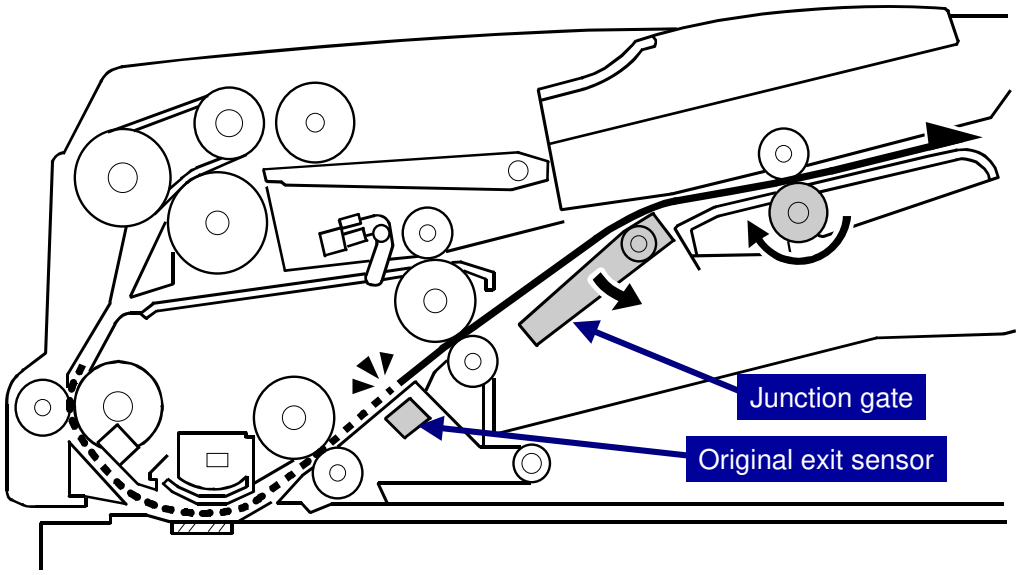
Original Transport and Exit Single-sided Originals



- Original is fed to the first transport roller at maximum speed and stops at the registration sensor.
- At registration time the original is fed at the scanning speed past the DF exposure glass.
- The scanning speed depends on the reproduction ratio

- The DF feed motor feeds the original to the registration sensor. Both the DF feed motor and the DF transport motor feed the original past the exposure glass.
- Refer to the service manual for more details.

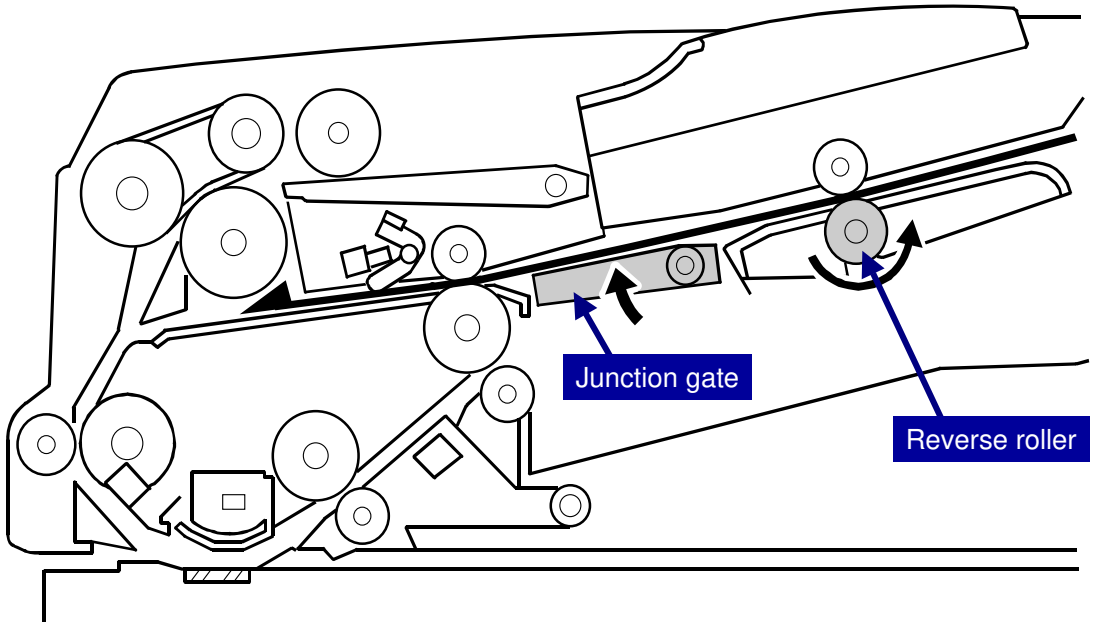
Original Transport and Exit Double-sided Originals 1



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

No additional notes.

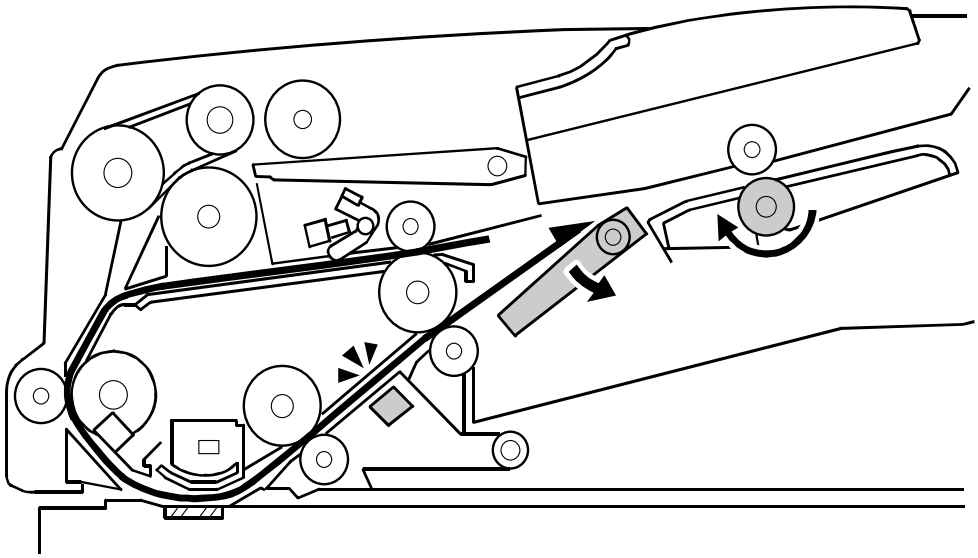
Original Transport and Exit Double-sided Originals 2



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

No additional notes.

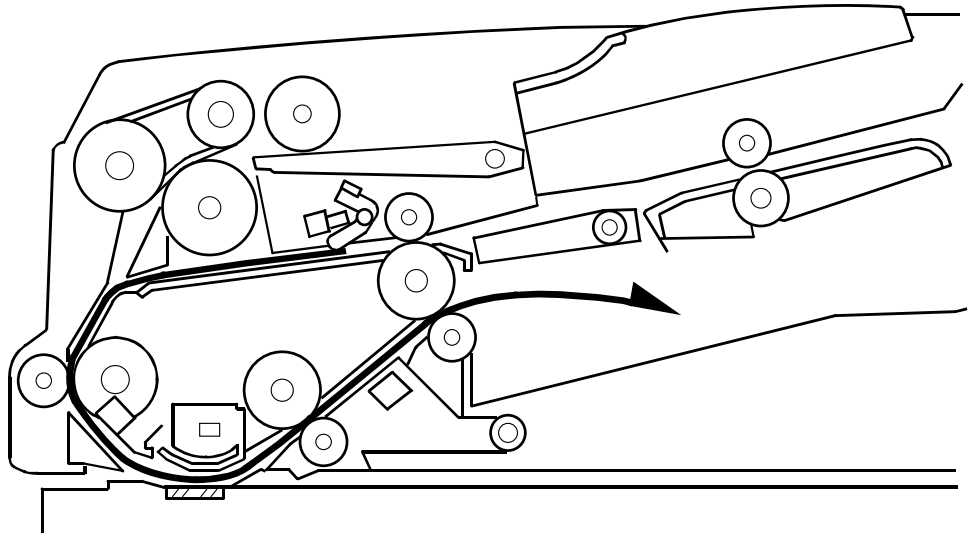
Original Transport and Exit Double-sided Originals 3



- **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.

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.

- Refer to the service manual for more details on scanning two-sided originals.

SP Modes

- SP 6006: ARDF image adjustments
- SP 6009: ARDF free run
- SP 6901: Displays the status of original size sensors.
- SP 6910: ARDF shading time

No additional notes.

Lab Work

- **Practice replacing the following PM parts.**
  - Feed belt
  - Reverse roller
  - Pick-up roller
- **Optionally disassemble the machine and replace any other parts you wish**
- **See the service manual for details of the replacement procedures.**

No additional notes.

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19. Paper Tray Unit

No additional notes.

Mechanical Components

- **Study the component layout diagrams (in both the *One* and *Two-Tray Paper Tray Unit* Service Manuals).**
  - Mechanical component layout
  - Electrical component layout
  - Drive layout
- **Go to your machine and locate the components shown in the diagrams.**

No additional notes.

Specifications

- **Paper Size:**
  - A5 to A3
  - 5½ " x 8½ " SEF to 11" x 17"
- **Paper Weight: 60 – 105 g/m^2, 16 – 28 lb**
- **Tray Capacity: 500 sheets (80 g/m^2, 20 lb) per tray**
- **Paper Feed System: Feed roller and friction pad**
- **Paper Height Detection: 4 steps (100%, 70%, 30%, Near end)**

No additional notes.

Mechanisms

- **The following are the same for both the one and two-tray units.**
  - Paper Lift
    - » The only difference being that there are adjustment SPs for both trays. (SP 1002 and 1003)
  - Paper End Detection
  - Paper Height Detection
  - Paper Size Detection
  - End and Side Fences

No additional notes.

Lab Work

- **Practice the replacement procedures in the 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.

No additional notes.

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20. Troubleshooting

No additional notes.

Special Tools & Lubricants

- **Scanner Positioning Pins (4 pins/set)**
  - A0069104 (1 set)
- **Test Chart S5S (10 pcs/set)**
  - A2929500 (1 set)
- **4MB Flash Memory Card**
  - N8036701
- **Grease Barrierta S552R**
  - A2579300

- Grease Barrierta S552R is temperature resistant. Use it on fusing unit drive components as needed

Memory All Clear

- **Before memory all clear, either:**
  - SP 5990: Print the lists of settings (SMC lists)
  - SP 5824: Upload the NV-RAM contents
- **Memory All Clear**
  - SP 5801

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 FSM.

Troubleshooting Done by the User

- **General Settings Guide – Troubleshooting**
  - See ***Troubleshooting*** in the OI Manual and try to imagine some of the mistakes users might make.

No additional notes.

SC Codes

- **Four levels: A – D (See notes)**
  - Reset 'Level A' codes with SP 7807
    - » Level A codes cannot be reset by only switching the machine off/on.

There are four levels of service call conditions.

- Level A: To prevent damage to the machine, the main machine cannot be operated until the SC has been reset by a service representative (see the note below).
  - Reset: Enter SP mode, and then turn the main power switch off and on.
- Level B: If the SC was caused by incorrect sensor detection, the SC can be reset by turning the main power switch off and on.
  - Reset: Turn the main power off/on.
- Level C: The main machine can be operated as usual, excluding the unit related to the service call.
  - Reset: Turn the main power off/on.
- Level D: The SC history is updated. The machine can be operated as usual.
  - No reset needed. The SC will not be displayed. Only the SC history is updated.

Self Diagnostics

- **The self-diagnostics procedure is automatically done just after the power is switched on.**
- **SP 7832: Displays Self-diagnostics**
  - Displays the SC codes and the number of their occurrences. Each number is in the range of 0 to 9999.

No additional notes.

SMC Print

- **SP 5990: Outputs machine status lists**
  - 001 All (Data List)
  - 002 SP (Mode Data List)
  - 003 User Program
  - 004 Logging Data
  - 005 Big Font
    - » The output given by the menu "Big Font" is suitable for faxing.
  - See the FSM for details
    [Using SP Modes ⇒ SMC Print (SP 5990)]

No additional notes.

SP Modes – Symptom Troubleshooting 1

- **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: Feed clutch boost**
  - Increase the value if jams occur when feed restarts after registration. (Not available for tray 1.)

No additional notes.

SP Modes – Symptom Troubleshooting 2

- **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
- **SP 2301: Transfer current**
  - SP 2301 1-2: Increase if thicker paper than normal is used in the paper trays
  - SP 2301 3: Increase if there is poor image transfer on side 2 of duplex copies
  - SP 2301 4: Increase if there is dirty background on the rear side
    - » Also see SP 2996 on the next slide.
- **SP 2802: Developer mixing**
  - Use this to prevent dirty background when the machine has not been used for a long time.

- Be careful when increasing the transfer current. This may cause a ghosting effect, in which part of the image at the top of the page is repeated lower down the page at a lower density. In the worst case, it may also damage the OPC drum.

SP Modes – Symptom Troubleshooting 3

- **SP 2906: 'Tailing' correction**
  - When making many copies of an original that contains vertical lines (such as in tables), the paper may not separate correctly. This can cause tailing images (ghosts of the vertical lines continuing past the bottom of the table).
  - Use this SP to shift the image writing position to prevent this problem.
- **SP 2996: Transfer Roller Cleaning**
  - 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.
    - » Also, see SP 2301 4 on the previous slide.
- **SP 6910: ARDF shading interval**
  - Reduce the setting if the white level is drifting during copy jobs using the ARDF

No additional notes.

Free Runs

- **Main Machine**
  - SP 4013: Scanner (with lamp on)
  - SP 5802: Scanner and printer
  - SP 5901: Printer
- **ADF/ARDF**
  - SP 6009
  - DIP switch 100
    - » You can use DIP switch 100 (on the DF control board) to carry out several document feeder free runs. (See the B813/B814 service manuals for details.)

The ADF and ARDF also have free run modes.

Other Troubleshooting Tools

- **The Field Service Manual contains the following troubleshooting tools (in addition to those already mentioned on previous slides).**
  - In the Troubleshooting section
    - » Electrical component defect table
  - In the System Maintenance Reference section
    - » ID Sensor Error Analysis (SP2221)
      There aren't any SC codes for ID sensor malfunction but SP2221 gives information on ID sensor condition.
    - » Input Check (SP5803)
      Use to check switch and sensor condition.
    - » Output Check (SP5804)
      Use to test electromechanical components.
    - » Test Pattern Print (SP5902)
      Use to test output.
  - In SP Section SP-7XXX
    - » Paper Jam Counters (SP7504)
    - » Several other jam counters and jam history displays

- There are other SP modes that may be useful for troubleshooting. For example:
  - SP 1007: By-pass paper size sensor output display
  - SP 4902: Exposure lamp on
  - SP 5001: Operation panel indicators on
- Please familiarize yourself with the contents of the SP table.

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21. Environmental Conservation

Technology for Environmental Conservation

Energy Saving

Paper Saving

No additional notes.

Technology for Environmental Conservation

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

Environmental Technology/Feature	Description	New model GW-C3	Old model GW-C2
1. QSU	- Reduction of warm-up time (Energy saving) - Reduction of CO_2 emissions	*	*
2. Hybrid QSU			
3. IH QSU			
4. Paper-saving features	- Allows documentation to be managed digitally, cutting down on paper consumption. - Improves machine productivity when printing out duplex (double-sided) images.	*	*
5. High-speed duplex copying	- Improves machine productivity when printing out duplex (double-sided) images	*	*
6. Ozone reduction design	- Low ozone emissions	*	*
7. PxP (polymerized) toner	-Energy saving - Conservation of materials/resources (reduced toner consumption)		
8. Noise reduction design	- Low noise	*	*
9. Minimization of harmful substances	- Minimization of harmful substances	*	*
10. Environmentally-friendly toner bottle	- Conservation of materials/resources	*	*
11. Toner recycling		*	*
12. Recycle-friendly design		*	*

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

Brief Descriptions of the Technologies

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

No additional notes

Brief Descriptions of the Technologies

❑ 3. IH QSU

- This technology incorporates IH (Inductance Heating) technology into conventional QSU technology, which allows the benefits of reduced energy consumption and reduced warm-up time to be extended to color machines.

❑ 4. Paper-saving features

- 1) The duplex (double-sided) and Combine features reduce paper consumption.
  2) The Document Server and other electronic document management features reduce paper consumption by offering an electronic method for storing and managing important documents.

No additional notes

Brief Descriptions of the Technologies

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

No additional notes

Brief Descriptions of the Technologies

❑ 7. PxP (polymerized) toner

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

No additional notes

Brief Descriptions of the Technologies

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

No additional notes

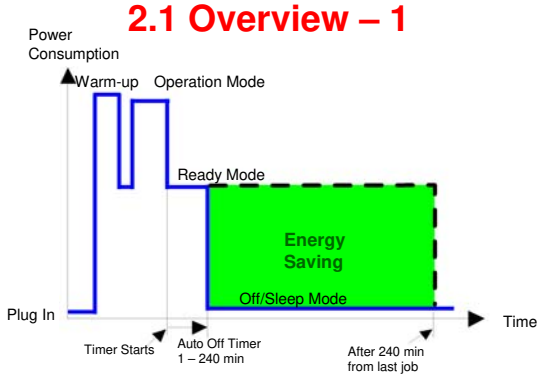
Brief Descriptions of the Technologies

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

No additional notes

2. Energy Saving

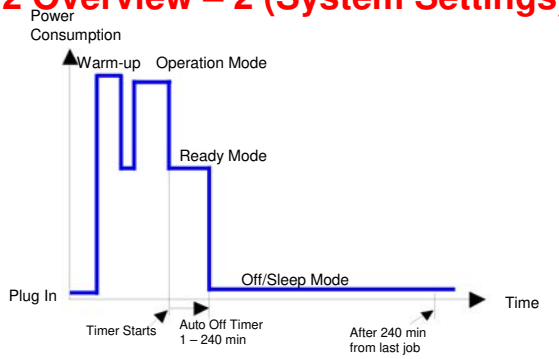
2.1 Overview – 1



Energy Saver Modes	Description
Auto Off Mode	If no printer/scanner or fax unit is installed: No power is supplied to the printing engine and the controller.
Sleep Mode	When a printer/scanner or fax unit is installed: No power is supplied to the printing engine, and almost none to the controller.

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

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



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

Mode	Timer	Default	Setting range	Recovery time
Off/Sleep Mode	Auto Off Timer	xx min.	1 to 240 min.	xx sec.

·Energy Saver Level

- ❑ The user can set the Auto Off timer with User Tools
  - ➢ User Tools > System settings > Timer Setting
- ❑ The machine goes to Off/Sleep mode when the Auto Off timer expires.
  - ➢ Auto Off: 1 minute
- ❑ We recommend that the default settings should be kept.
  - ➢ If the customer requests that the setting be changed, please explain that their energy costs could increase, and that they should consider the effects on the environment of extra energy use.
  - ➢ If it is necessary to change the settings, please try to make sure that the Auto Off timer is not too long. Try with a shorter setting first, such as 30 minutes, then go to a longer one (such as 60 minutes) if the customer is not satisfied.
  - ➢ If the timer is set to the maximum value, the machine will not begin saving energy until 240 minutes has expired after the last job. This means that after the customer has finished using the machine for the day, energy will be consumed that could otherwise be saved.
  - ➢ If you change the settings, the energy consumed can be measured using SP8941, as explained later in this presentation.

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

❑ Condition of LEDs on the operation panel

Mode	Operation Switch LED	Energy Saver LED	Main Power LED
Low Power Mode	On	On	On
Off/Sleep Mode	Off	Off	On

No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Low Power Mode

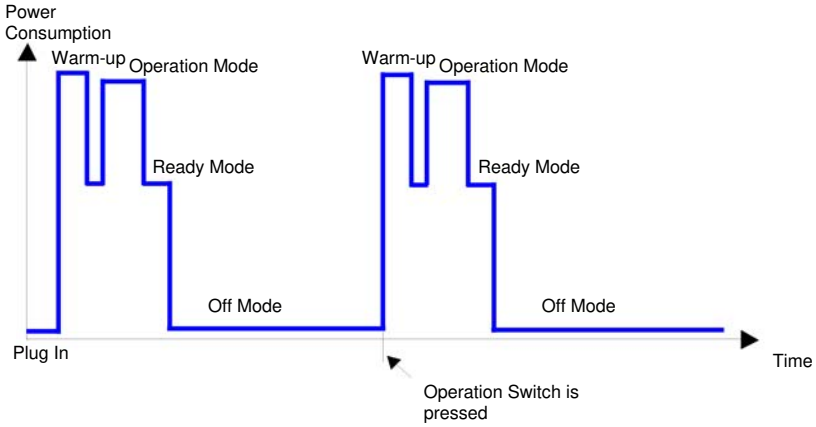
- **The machine enters low power mode when the energy saver timer runs out after the last job.**
- **When the machine enters low power mode, the fusing temperature is lowered to 60°C.**
- **The machine recovers to the ready condition if one of the following occurs:**
  - The Energy Saver key is pressed
  - An original is placed in the ADF/ARDF
  - The ADF/ARDF is lifted
  - The user touches the operation panel
  - The front door is opened or closed
- **The recovery time is less than 10 seconds.**

No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Off Mode – 2

- **The machine recovers to the ready condition if the operation switch is pressed.**



- This timing chart shows what happens if the operation switch is pressed while the machine in off mode.

2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 1

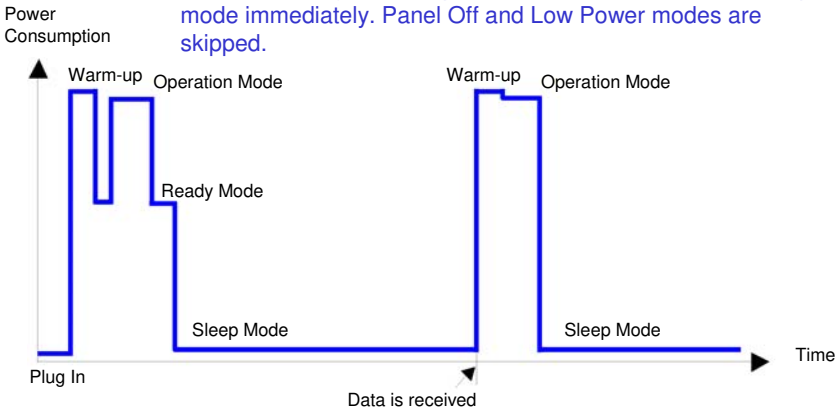
- **Sleep mode is used instead of auto off mode when a printer/scanner unit is installed.**
- **The machine enters sleep mode when one of the following is done.**
  - The auto off timer runs out after the last job.
  - The operation switch is pressed to turn the power off.
- **When the machine enters sleep mode, no power is supplied to the printing engine, and almost none to the controller.**
- **The recovery time is less than 10 seconds.**

No additional notes

2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 2

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

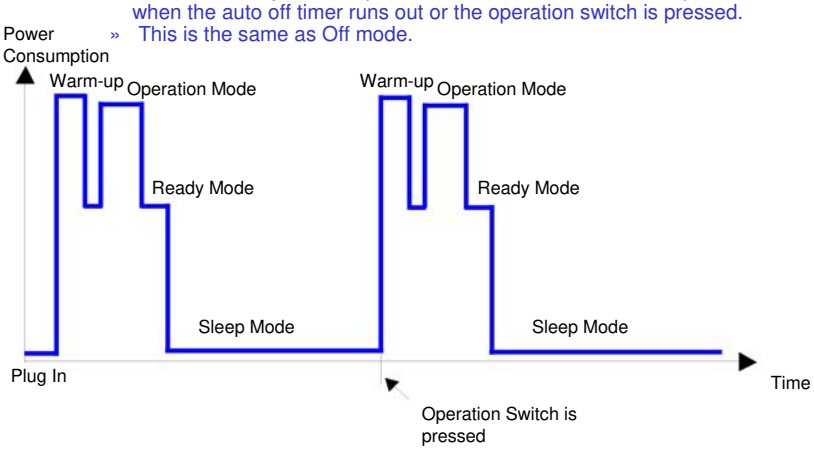


No additional notes

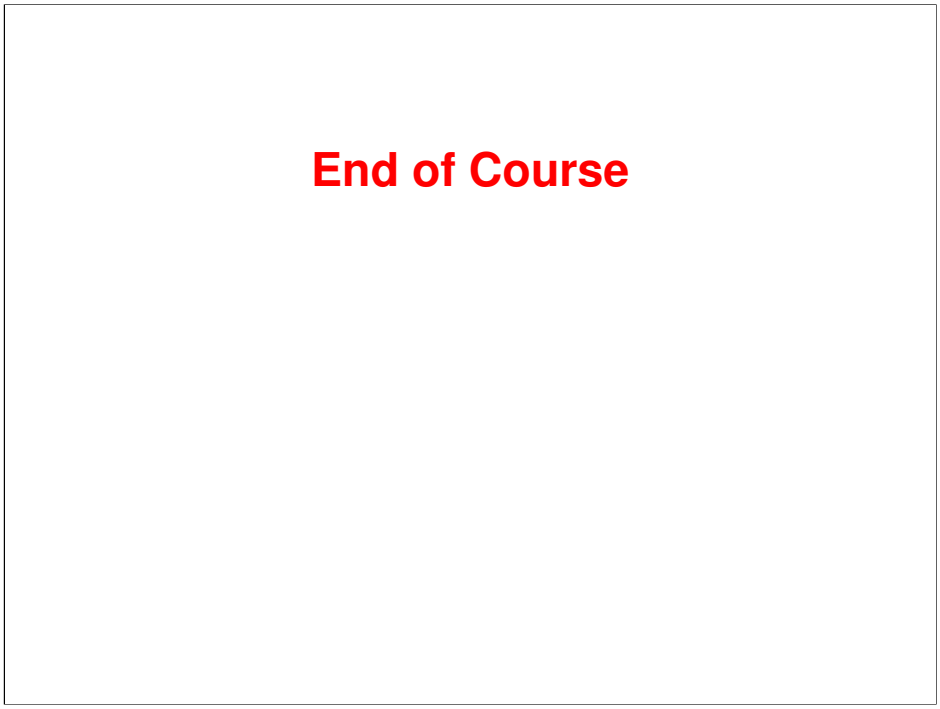
2. Energy Saving

2.2 Energy Saver Mode: Sleep Mode – 3

- **The machine recovers to the ready condition:**
  - **If the operation switch is pressed**
    - » The operation panel lights. When warm-up is finished, the machine goes to the ready condition.
    - » Then, after the job is completed, the machine returns to sleep mode when the auto off timer runs out or the operation switch is pressed.
    - » This is the same as Off mode.



- This timing chart shows what happens if the operation switch is pressed while the machine in off mode.



No additional notes.