RICOH

AP-C2.5 TRAINING
COPIER ENGINE

SUPPLEMENT: SINGLE-PASS DUPLEX ARDF

Slide 1

- The ADF is a standard component of the machine. It is based on the ADF of the MT-C4 and V-C3 series copiers.
- This section of the course will explain the ADF's mechanisms.

❒ This shows the AP-C2.5 with the single-pass duplex ARDF installed.

How Many Models?

- **Two models**
  - AP-C2.5c (D088): 45 cpm
  - AP-C2.5d (D089): 55 cpm
- **Differences between these two new models and the previously-released D088 and D089.**
  - Single-pass ARDF
  - BICU (in the new models, the CIS connects directly to the BICU, so the board is different from the old models)

Slide 3

No additional notes

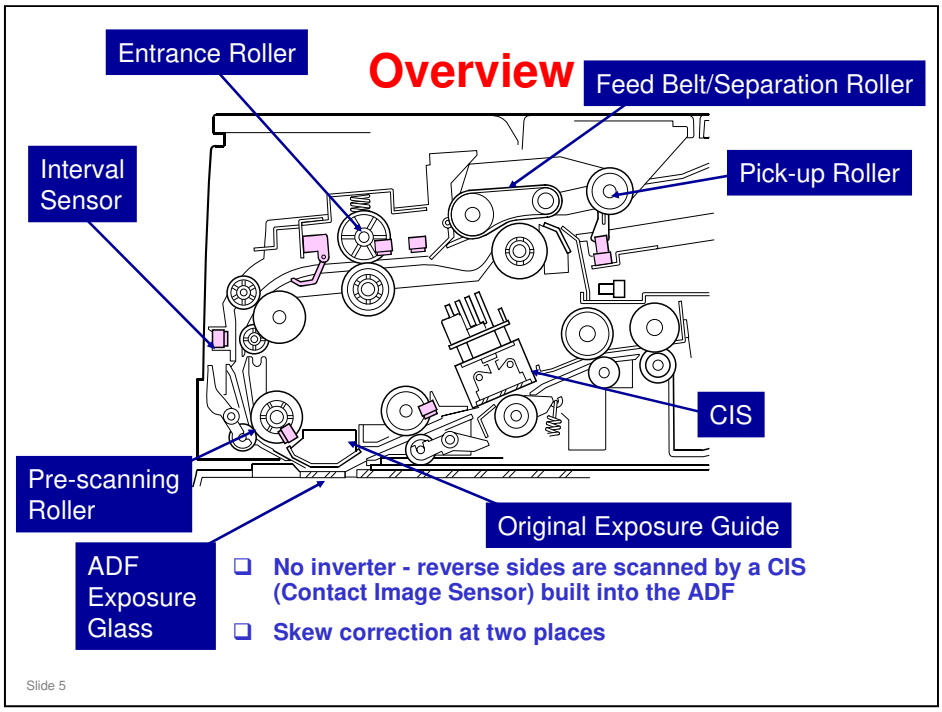
Basic Specifications

- **Scanning speed (A4/LT LEF, 200/300 dpi):**
  - Normal DF (black-and-white, color): 67 ppm
  - Single-pass duplex DF: 85 ppm (one-sided), 116 ppm (duplex)
- **Line speed: 265 mm/s**
- **Original size: A3, A4, A5, B4, B5, B6, DTL, LG, LT, HLT**
- **Original thickness:**
  - Simplex: 40 – 128 g/m^2
  - Duplex: 52 – 128 g/m^2

Slide 4

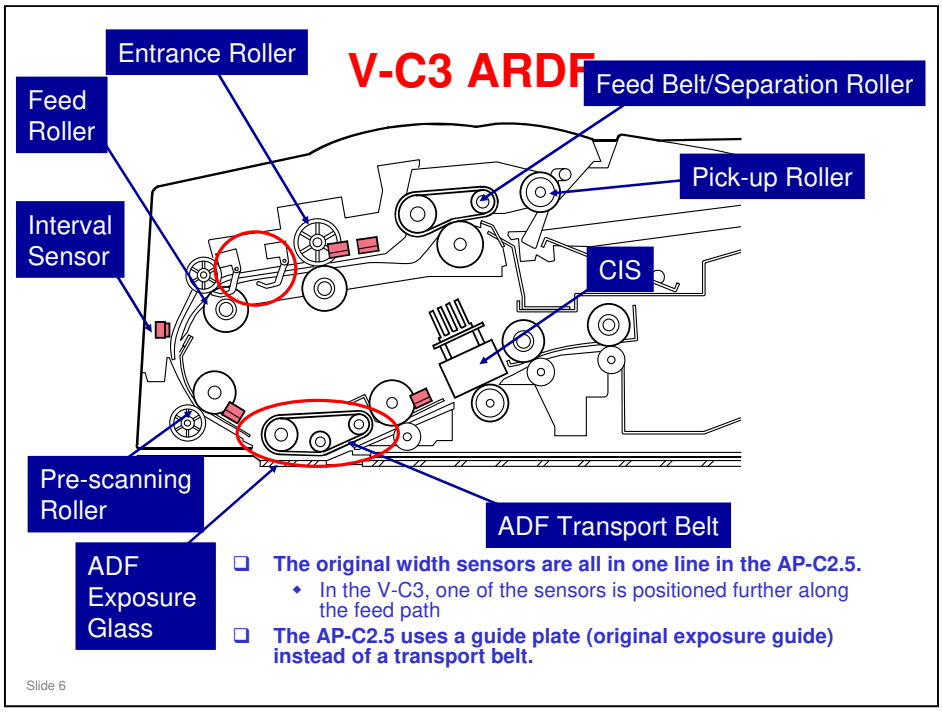
V-C3 scanning speed

- Single-sided: Color 70 ppm, B/W 82 ppm
- Duplex: Color 90 ppm, B/W 130 ppm

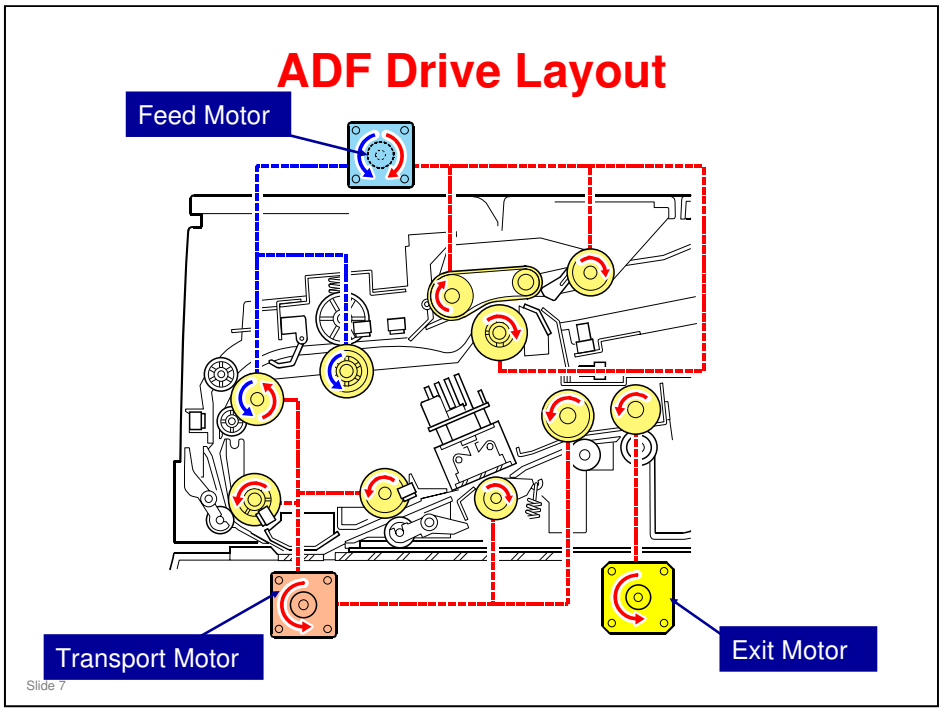


- The most important points are on the slide.
  - The entrance roller is also known as the grip roller.
- Here is a brief overview of how the ADF works.
  - The pick-up roller feeds the original to the feed belt and separation roller. Skew is corrected at the entrance roller, but only for small original sizes (B6, A5, HLT), or for duplex scanning (any size).

    For sizes larger than A5, the pre-scanning roller slows, which buckles the paper and corrects skew (the entrance roller is still turning at the original speed, which is now faster than the pre-scanning roller, so the paper buckles and skew is corrected).
  - When the skew correction sensor detects the leading edge of the original, the pre-scanning roller starts. Skew is also corrected at the pre-scanning roller.
  - The CCD is below the ADF exposure glass, where the original is scanned.
  - For two-sided original scanning, the CIS scans the reverse side while the original leaves the ADF.



- This shows the V-C3 ARDF for comparison.
- The different points are shown by red circles.



Pick-up roller lift motor (not shown here): Drives the pick-up roller lift mechanism.

Feed motor: Drives the following:

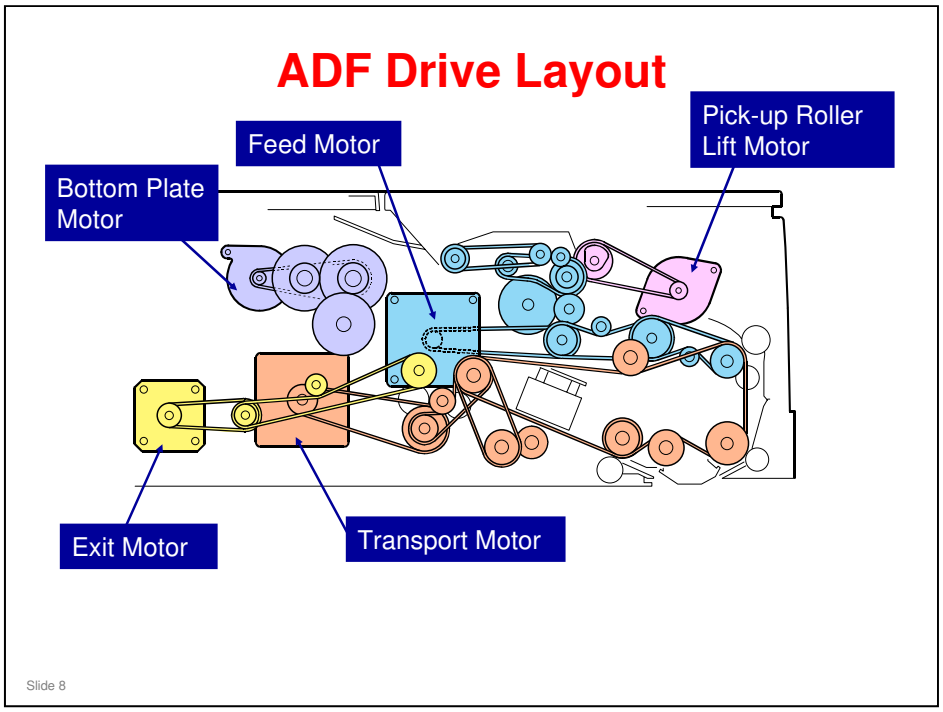
- ❒ Pick-up roller and feed belt drive gear
- ❒ Entrance roller and 1st transport roller

Bottom plate motor (not shown here): Drives the bottom plate lift mechanism.

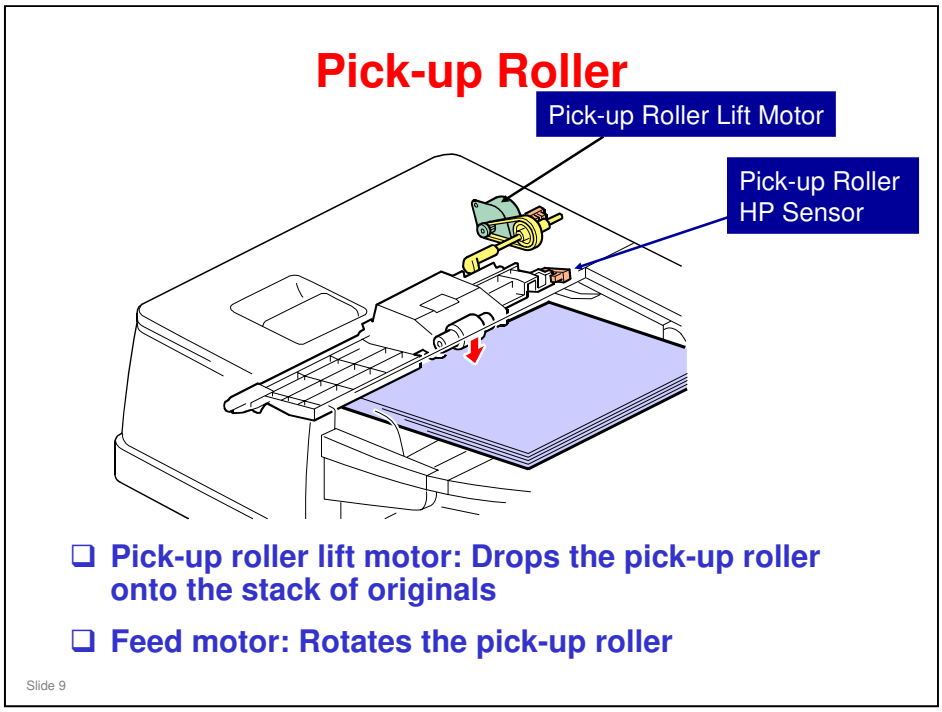
Transport motor: Drives the following:

- ❒ Pre-scanning roller
- ❒ Scanning roller
- ❒ 2nd transport roller
- ❒ White platen roller
- ❒ 3rd transport roller

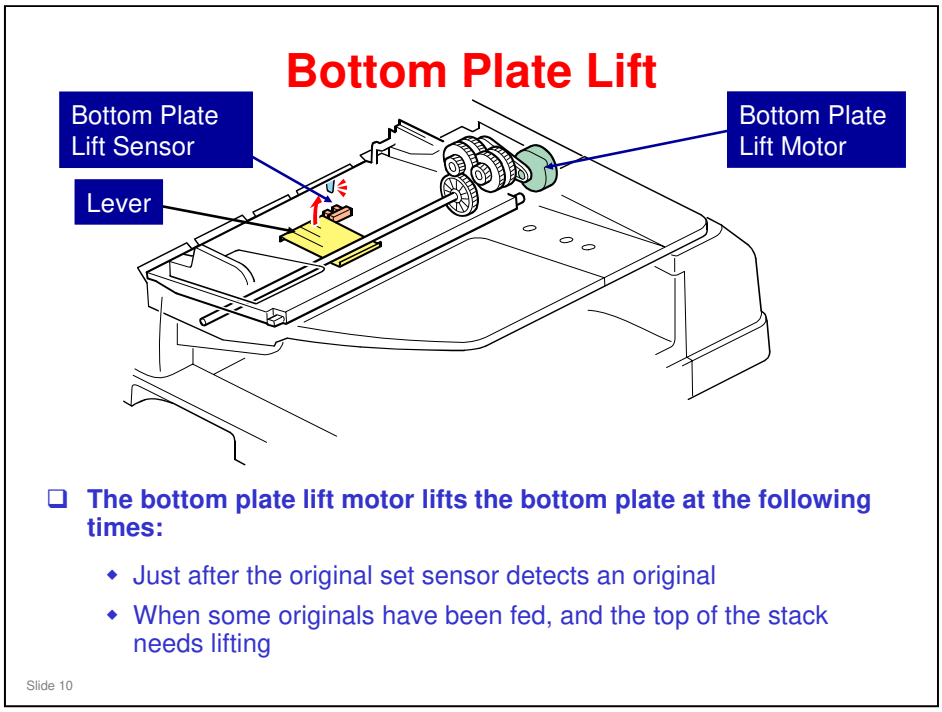
Exit motor: Drives the exit roller.



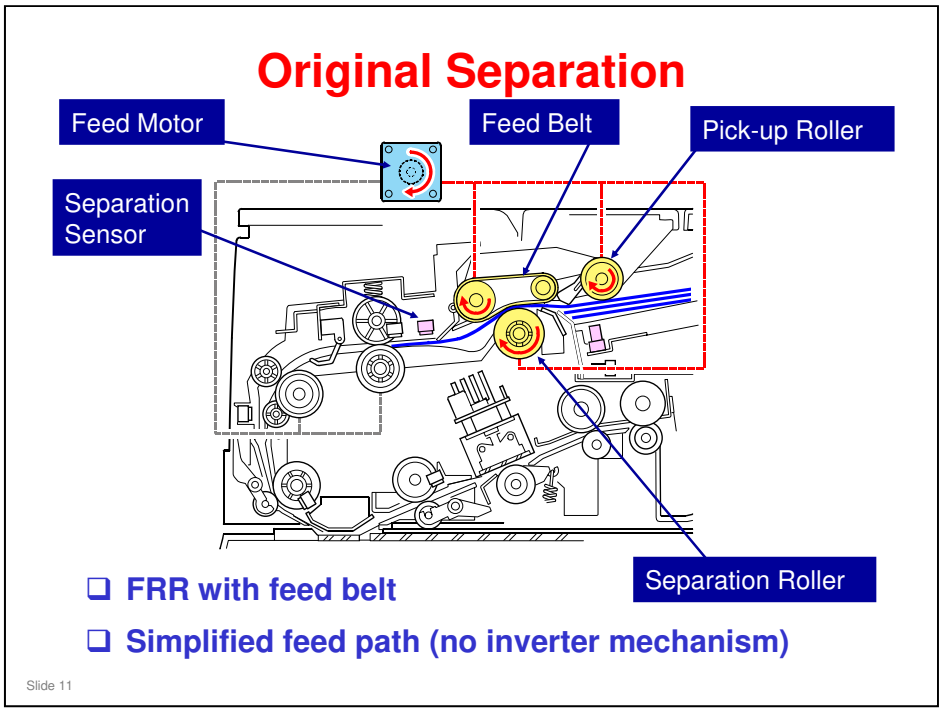
❒ Here is a cross-section view of the ARDF drive layout.



- Just after the original set sensor detects an original, the pick-up roller lift motor switches on, to drop the pick-up roller onto the original stack.
- When the leading edge of the original reaches the skew correction sensor, the pick-up roller lift motor switches on again, to lift the pick-up roller away from the original stack.
  - Home position is detected by the pick-up roller HP sensor.
- When the trailing edge of the original passes the skew correction sensor, and there are still some originals on the tray, the pick-up roller is again dropped onto the stack of originals.
- Details of the mechanism are as follows:
  - When there are no originals: The pick-up roller remains up (this is the home position).
  - When an original is placed on the tray: The original set sensor switches on, and this switches the motor on. The cam releases a lever. The lever rises and the pick-up roller drops onto the stack of paper. Then the pick-up roller feeds the paper to the feed belt and separation roller.
  - When the leading edge of the original reaches the skew correction sensor: The motor switches on again. The cam pushes the lever down until the actuator enters the sensor and switches off the motor. This stops the pick-up roller at the home position.
  - When the trailing edge of the paper passes the skew correction sensor with originals still waiting for scanning: The motor switches on to feed in the next sheet.

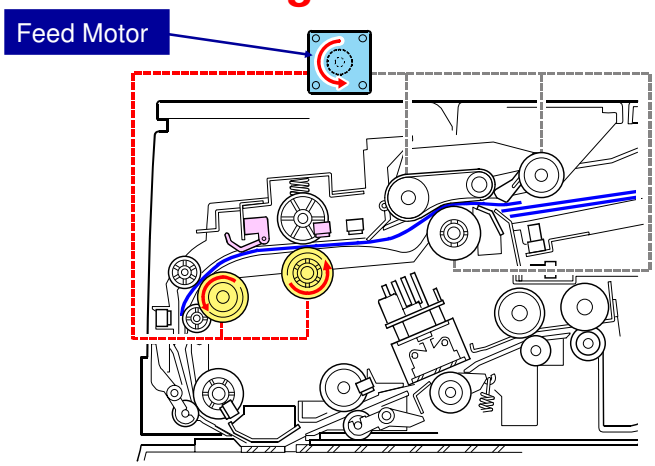


- The timing for the bottom plate motor to lift the bottom plate can be changed with SP 6900. The default is when an original is detected (as shown on the slide). However, this can be changed to after the Start key is pressed.
- The bottom plate sensor determines whether the plate needs lifting.
  - When an original is placed on the original tray: The original set sensor switches on, the pick-up roller drops, and the sensor (on the pick-up roller assembly) switches off. Then, the motor lifts the lever, raising the bottom plate.
  - When the bottom plate reaches the correct feed position: The sensor switches off and the motor stops.
  - During the job, when the top of the stack becomes too low: When the pick-up roller drops low enough to switch the sensor on again, the motor switches on again to raise the stack to the correct feed position.



❒ This mechanism prevents feeding more than one sheet at a time.

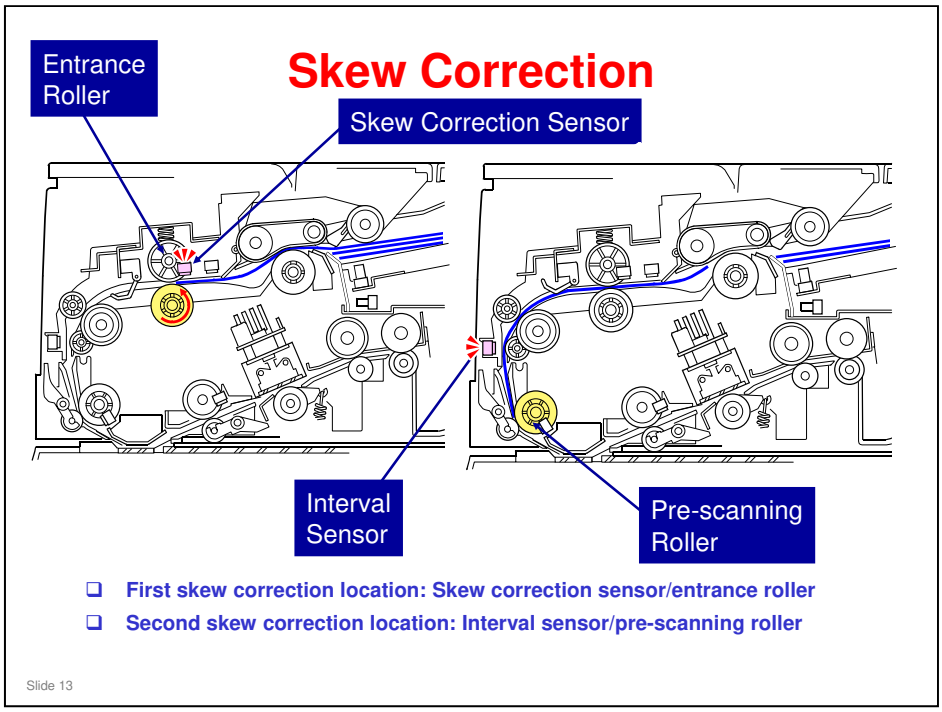
Original Feed-in



- The feed motor turns in the other direction to drive these rollers.

Slide 12

- Remember that there is no inverter. The second side is scanned by the CIS, which is near the exit roller.

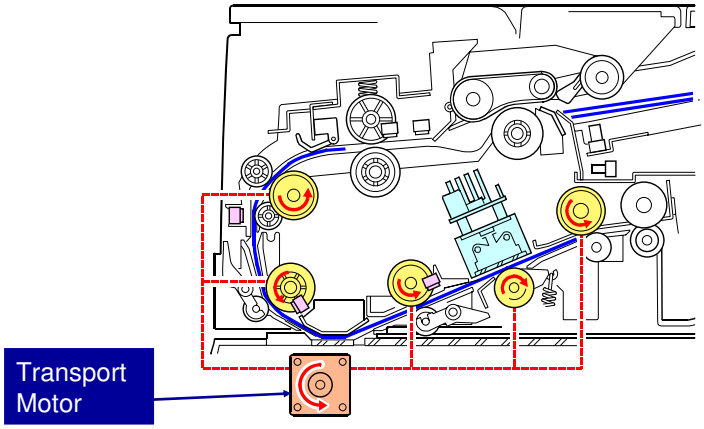


- Skew correction is done at the two circled locations.
  - Skew correction sensor/entrance roller: When the sensor detects the leading edge of the original, the roller stops for a certain period. This buckles the original and corrects the skew.
  - Interval sensor/pre-scanning roller: The actual method depends on the paper size, and whether both sides will be scanned.

    For single-sided scans larger than A5, after the entrance roller starts rotating, the feed motor increases the speed of the feed roller to reduce the interval between the original just fed and the original ahead being scanned. When the interval sensor detects the leading edge of the original approaching the pre-scanning roller, the pre-scanning roller slows down slightly. The feed roller is still feeding the paper faster than the pre-scanning roller, and this slows the original at the leading edge and corrects skew. If SP6020 is changed from the default, the roller will stop (like for other job types), for more precise skew correction.

    For other types of job, the pre-scanning roller stops. All duplex scans are stopped at this roller, for the best possible skew correction. This is because both sides are scanned at the same time, by sensors on opposite sides of the paper. Any skew in the ADF would therefore be noticeable on the copy.
- The rollers are driven by different motors, which makes it possible for one roller to stop or be slower while the other one is still going.
  - Entrance roller, Feed roller (1st transport roller): : Driven by the feed motor
  - Pre-scanning roller: Driven by the transport motor
- The amount of buckle at each location can be adjusted with SP 6006.
  - 6006 005: Corrects the amount of buckle at the entrance roller
  - 6006 006: Corrects the amount of buckle at the pre-scanning roller

Original Transport

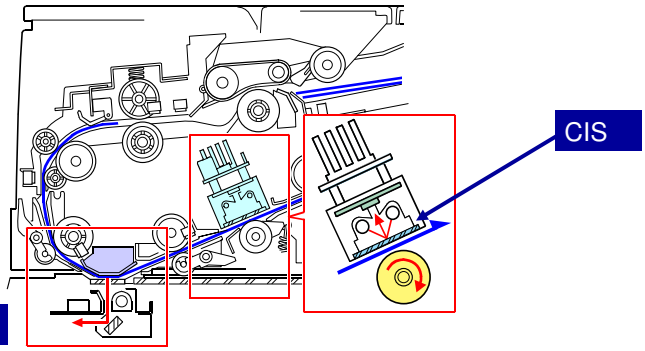


- The transport motor controls paper feed through this part of the ADF.

Slide 14

No additional notes

High-speed Duplex Scanning

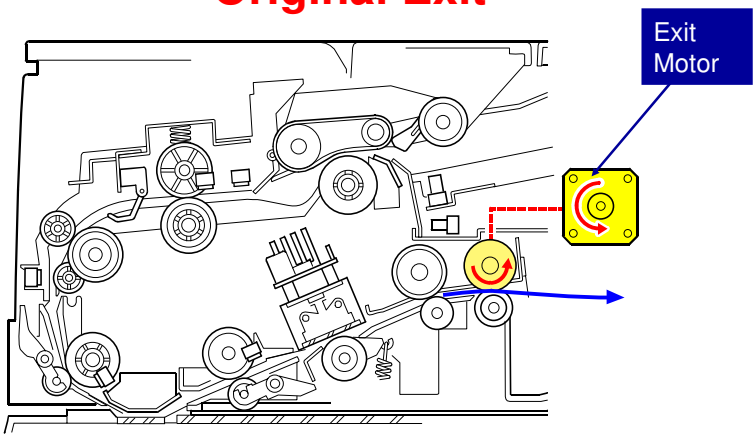


- **A CCD (inside the scanner unit, below the ADF) scans the front side, and a CIS (inside the ADF) scans the rear side.**
  - This means that for two-sided scanning, the original feeds though the scanner one time only.
- **The resolution of the CIS is 600 dpi, the same as the CCD.**
- **The white roller below CIS is used as a white reference point**

Slide 15

- This is the same idea as the V-C3 color copiers.
- The CIS can scan a line 306 mm (12") wide at 600 dpi. To increase the scanning speed, the sensors are divided into 13 parallel blocks.

Original Exit

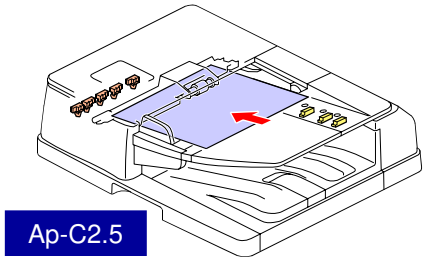


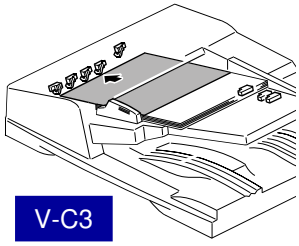
- The exit motor controls paper feed through this part of the ADF.

Slide 16

No additional notes

Original Size Detection





- **Original length and width are read when the original passes the separation sensor.**
- **In the AP-C2.5, these sensors are all in one line.**

Slide 17

- The original width sensors cannot detect the width until the original has passed the entrance roller.
- Some small sizes cannot be detected by the sensors (A5SEF, B6SEF, B6LEF), because the sensor outputs for these sizes are identical (all sensors are off). In this case, the length is detected using the separation sensor and clock pulse counts from leading edge to trailing edge.
- The machine cannot tell the difference between certain original sizes, such as DLT (11 x 17") and 11 x 15". The machine assumes such originals are 11 x 17. To change this, use SP 6016 and SP 5126.
  - North America: There are two sets of four sizes. To switch from the default set to the other, input 120. The other set of four sizes will then be detected. To change back again, input 0.
  - Europe: There are two sets of three sizes. To switch from the default set to the other, input 7. The other set of three sizes will then be detected. To change back again, input 0.
  - It is not possible to change just one of the settings. All three (or all four in the case of N. America) must be changed at the same time.

    Test this, using the paper sizes that you will encounter in your market. The description in the manual could be incorrect. Perhaps you have to enter a decimal number equivalent to the 0/1 settings of an 8-bit register. Look at the accompanying file 'SP6016-alternativemethod.doc' for what may actually happen.
- The maximum length of an original in the ADF is 440 mm (17"). This can be changed to 1260 mm (49.5") with the Special Original function at the operation panel.
- In the scanner below the exposure glass, there are also some sensors, as in previous models.
- There are some differences between the Europe and North America versions
  - EU: Length sensor x 1, NA: Length sensor x 2

Original Size Detection

- The machine cannot tell the difference between certain original sizes, such as DLT (11" x 17") and 11" x 15". The machine assumes such originals are 11" x 17.
- To change this, use SP 6016 and SP 5126.

Slide 18

No additional notes

Changing the Default Selection with SP6016 and SP5126

Here is a list of paper sizes that can be set for the default to enable detection. The bold sizes are the default settings, and the italic sizes are the alternate settings.

North America			Europe/Asia		
Bit 6	DLT SEF	11" x 15"	Bit 2	8 K	DLT SEF
Bit 5	LT LEF	Exec LEF	Bit 1	16 K SEF	LT SEF
Bit 4	LT SEF	8" x 10" SEF	Bit 0	16 K LEF	LT LEF
Bit 3	LG SEF	Set by SP 5126			

To change the default settings:

1. Enter the SP mode.
2. Select SP6016.

On the screen you will see an 8-digit binary setting bar: 00000000
The default settings are all "0".
In North America, the size recognition is changed with Bits 6 to 3 (other bits are ignored):

	Bit6	Bit5	Bit4	Bit3
0	DLT SEF	LT LEF	LT SEF	LG SEF
1	11" x 15" SEF	EXE LEF	8" x 10" SEF	SP 5126 (default = F4 SEF)

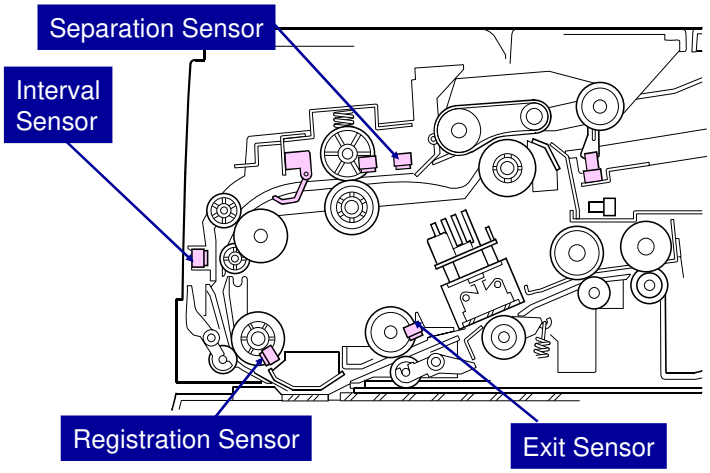
In Europe, the size recognition is changed with Bits 2 to 0 (other bits are ignored):

	Bit2	Bit1	Bit0
0	DLT SEF	LT SEF	LT LEF
1	8 Kai SEF	16 Kai SEF	16 Kai LEF

SP 5126

This SP controls the alternative paper sizes that are detected for LG SEF (USA) or 8.5 x 13" (Europe/Asia).

Feed Timing and Jam Detection



- Feed timing controlled by the separation and registration sensors
- Jam detection at the skew correction, separation, interval, registration, and exit sensors

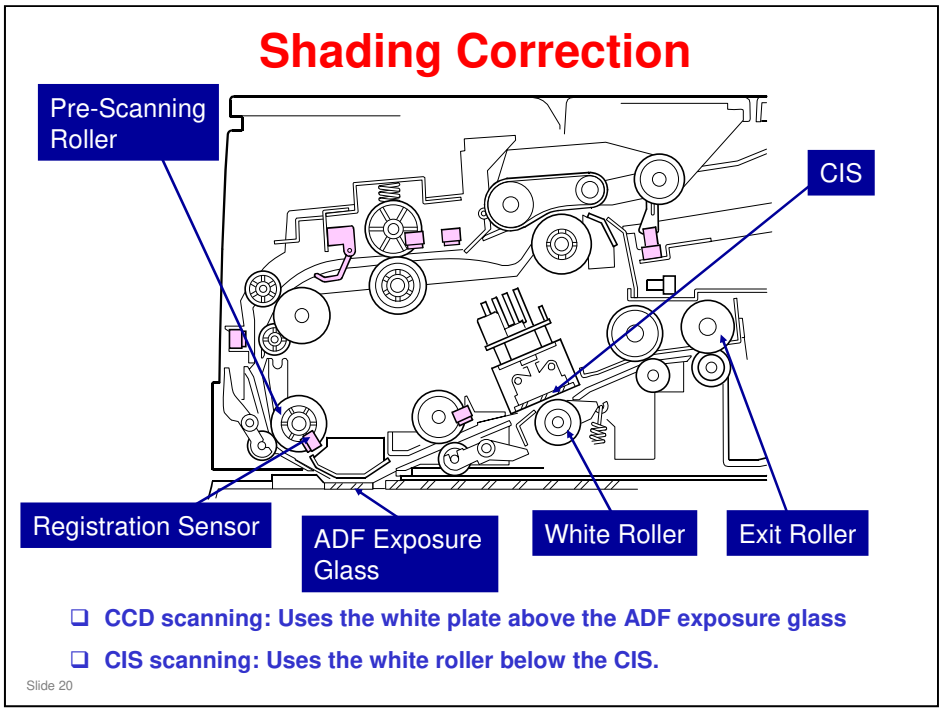
Slide 19

No additional notes

Jam Type		Cause
Separation sensor	Check in failure	Remains off after enough time for the original to feed twice the distance from the original setting position to the separation sensor.
Skew correction sensor	Check in failure	Remains off after enough time for the original to feed twice the distance from the separation sensor to the skew correction sensor.
Interval sensor	Check in failure	Remains off after enough time for the original to feed twice the distance from roller [F] to the interval sensor.
Registration sensor	Check in failure	Remains off after enough time for the original to feed twice the distance from the skew correction sensor to the registration sensor.
Exit sensor	Check in failure	Remains off after enough time for the original to feed twice the distance from the registration sensor to the exit sensor.
Separation sensor	Check out failure	Remains on after enough time for a 610 mm (24") original to feed (except when the user is feeding custom-sized originals, which can be up to 1260 mm).
Skew correction sensor	Check out failure	Remains on after enough time for the original to feed twice the distance from the separation sensor to the skew correction sensor.
Interval sensor	Check out failure	Remains on after enough time for the original to feed twice the distance from the interval sensor to the skew correction sensor.
Registration sensor	Check out failure	Remains on after enough time for the original to feed twice the distance from the skew correction sensor to the registration sensor.
Exit sensor	Check out failure	Remains on after enough time for the original to feed twice the distance from the registration sensor to the exit sensor.

Note

If a problem occurs in the ADF, either SC700 or SC701 will be issued.



- Shading correction, which attempts to compensate for slight distortions caused by the differences in brightness of the light elements due to wear, temperature variation, or distortion by the lenses, is done for the first sheet:
  - The original is fed for a few clock pulses after the registration sensor detects the leading edge of the original.
  - The original is then delayed slightly at the ADF exposure glass while the CPU uses the white plate (above the ADF exposure glass when the ADF is closed) to determine the white peak level for the job.
  - The pre-scanning roller and transport rollers feed the original over the ADF exposure glass and under the CIS, until it reaches the exit roller.
  - If the reverse side of the original is to be scanned, the CPU uses the surface of the white platen roller to determine the white peak level for the job.

Dust Detection – Overview

- **This function checks the ADF exposure glass for dust that can cause black lines in copies.**
- **The dust check is done before the first original is scanned.**
  - This is done only once at the beginning of a job. The check is not done for originals added during a long scanning job.
- **If dust is detected, a message is displayed on the operation panel, but the machine does not stop.**

Slide 21

No additional notes

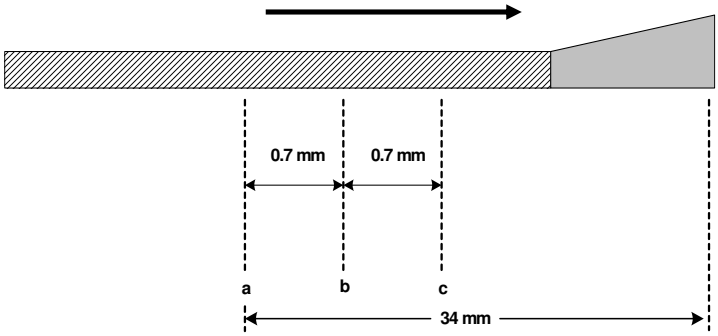
Dust Detection (SP 4020)

- **SP 4020 001: Enable/disable (default – disabled)**
- **SP 4020 002: Sensitivity adjustment**
- **SP 4020 003: Adjusts image processing parameters to remove thin vertical lines caused by dust**
  - A speck of dust on the ADF exposure glass causes a thin vertical line on the scanned image. This is because the ADF feeds the paper over the exposure glass during scanning. Dust on the glass appears on each line of the scanned image.
- **SP 7852: Counts how many times the machine detected dust on the ADF.**

Slide 22

No additional notes

Dust Detection – Action Taken



- If dust is detected, the scanner carriage position for ADF scanning is moved by 0.7 mm, in the direction of the left scale.
- The next time that dust is detected, the scanning position is moved again by 0.7 mm, in the direction of the left scale.
- The third time that dust is detected, the scanning position is not moved. An alert message is displayed but the job does not stop.

Slide 23

- If dust is detected after the scanner has been moved two times, an alert is displayed, but the job does not stop.
- Then, at the start of the next job, the scanner stays at the same position as the end of the previous job. But if dust is detected there, the scanner goes back to home position and the dust detection process starts again.

Replacement

- The ADF is heavy. Remove it carefully.

Slide 24

No additional notes