Color Printer

d-Color MF550 d-Color MF450

THEORY OF OPERATION

Code Y107522-3

PUBLICATION ISSUED BY:

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Revision history

After publication of this service manual, the parts and mechanism may be subject to change for improvement of their performance.
Therefore, the descriptions given in this service manual may not coincide with the actual machine.

When any change has been made to the descriptions in the service manual, a revised version will be issued with a revision mark added as required.

Revision mark:

- To indicate clearly a section revised, △1 is shown at the left margin of the revised section.
  The number inside △1 represents the number of times the revision has been made.

- To indicate clearly a page that contains the revision, 1 is shown near the page number of the corresponding page.
  The number inside 1 represents the number of times the revision has been made.

NOTE

Revision marks shown in a page are restricted only to the latest ones with the old ones deleted.

- When a page revised in Ver. 2.0 has been changed in Ver. 3.0:
  The revision marks for Ver. 3.0 only are shown with those for Ver. 2.0 deleted.
- When a page revised in Ver. 2.0 has not been changed in Ver. 3.0:
  The revision marks for Ver. 2.0 are left as they are.

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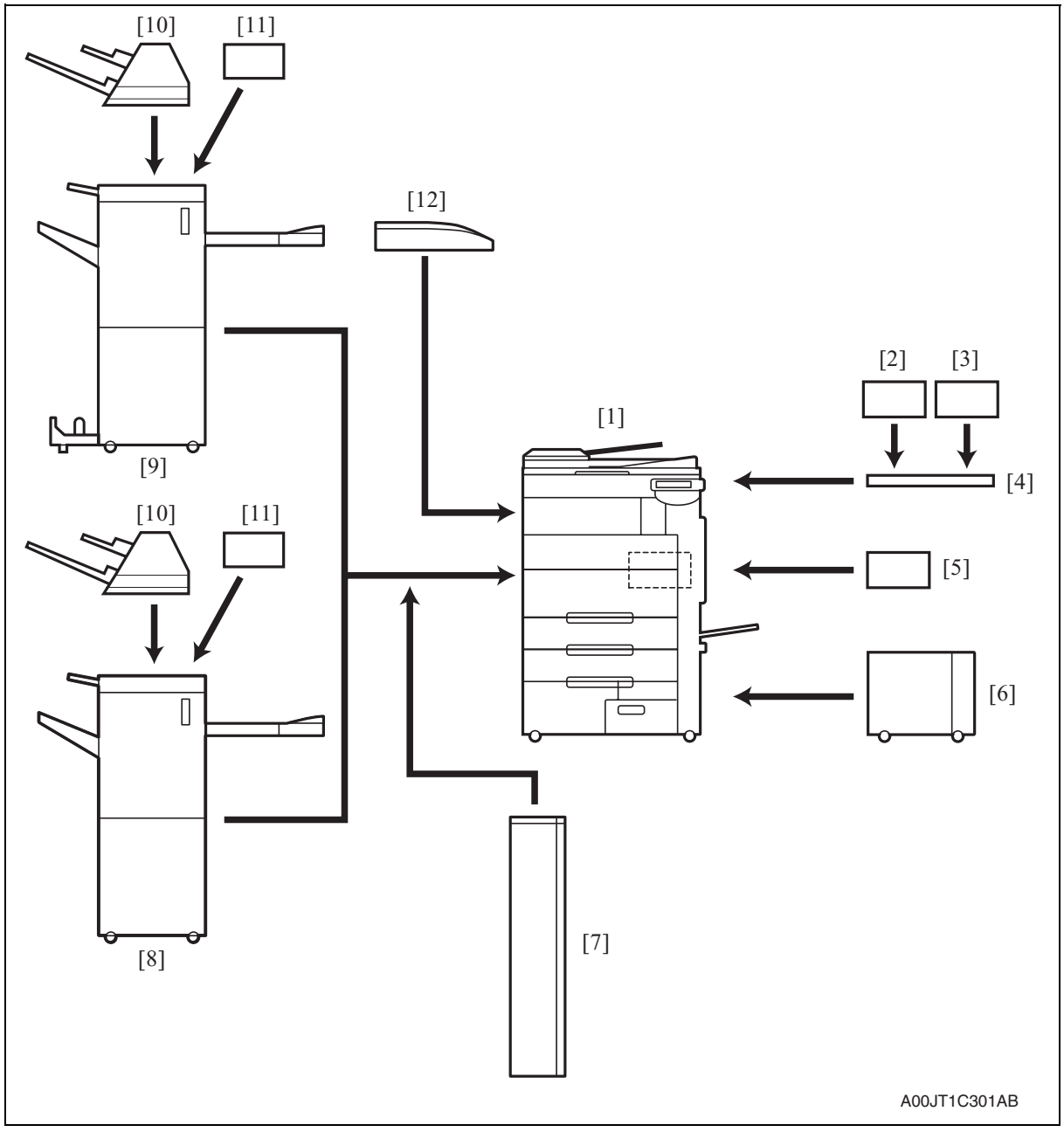
Outline

1. System configuration

1.1 MF550

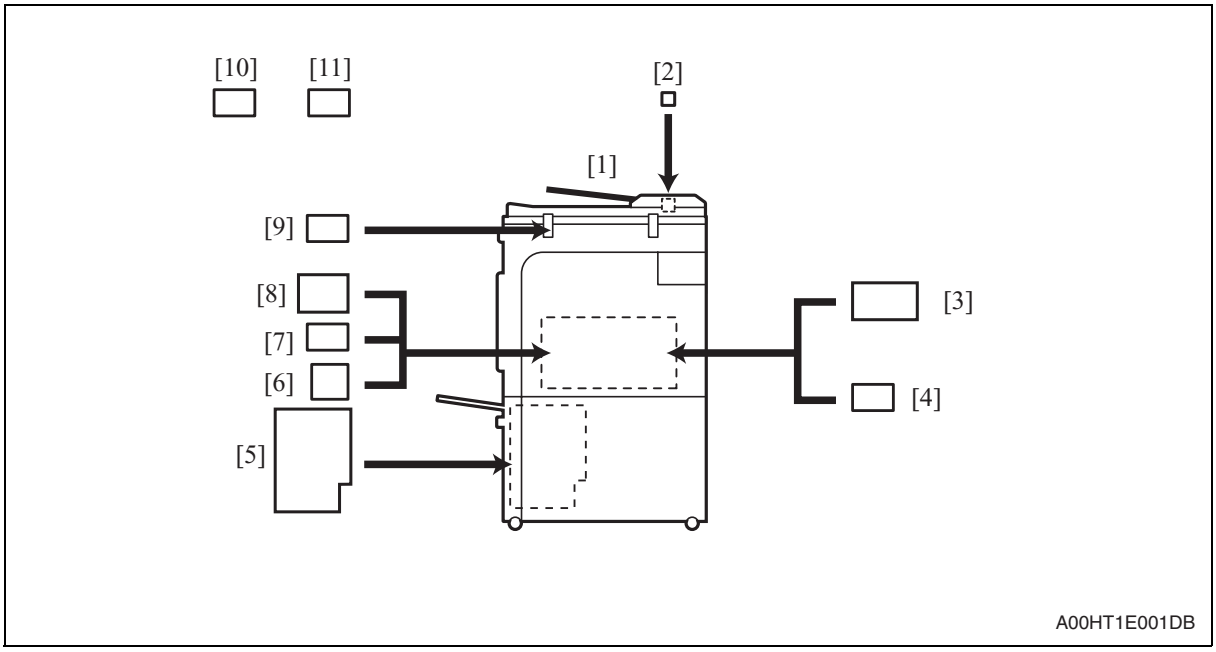
1/2 System front view



[1]	Main body		[6]	Large capacity unit	LU-301
[2]	Authentication unit: Biometric type		[7]	Z folding unit	ZU-603
△6		AU-101	[8]	Finisher	FS-517/518
[3]	Authentication unit: IC card type		[9]	Finisher	FS-608
		AU-201	[10]	Post inserter	PI-503
[4]	Working table	WT-502	[11]	Punch kit	PK-512/513
[5]	Local interface kit	EK-602/603	[12]	Output tray	OT-503

2/2 System rear view

△4



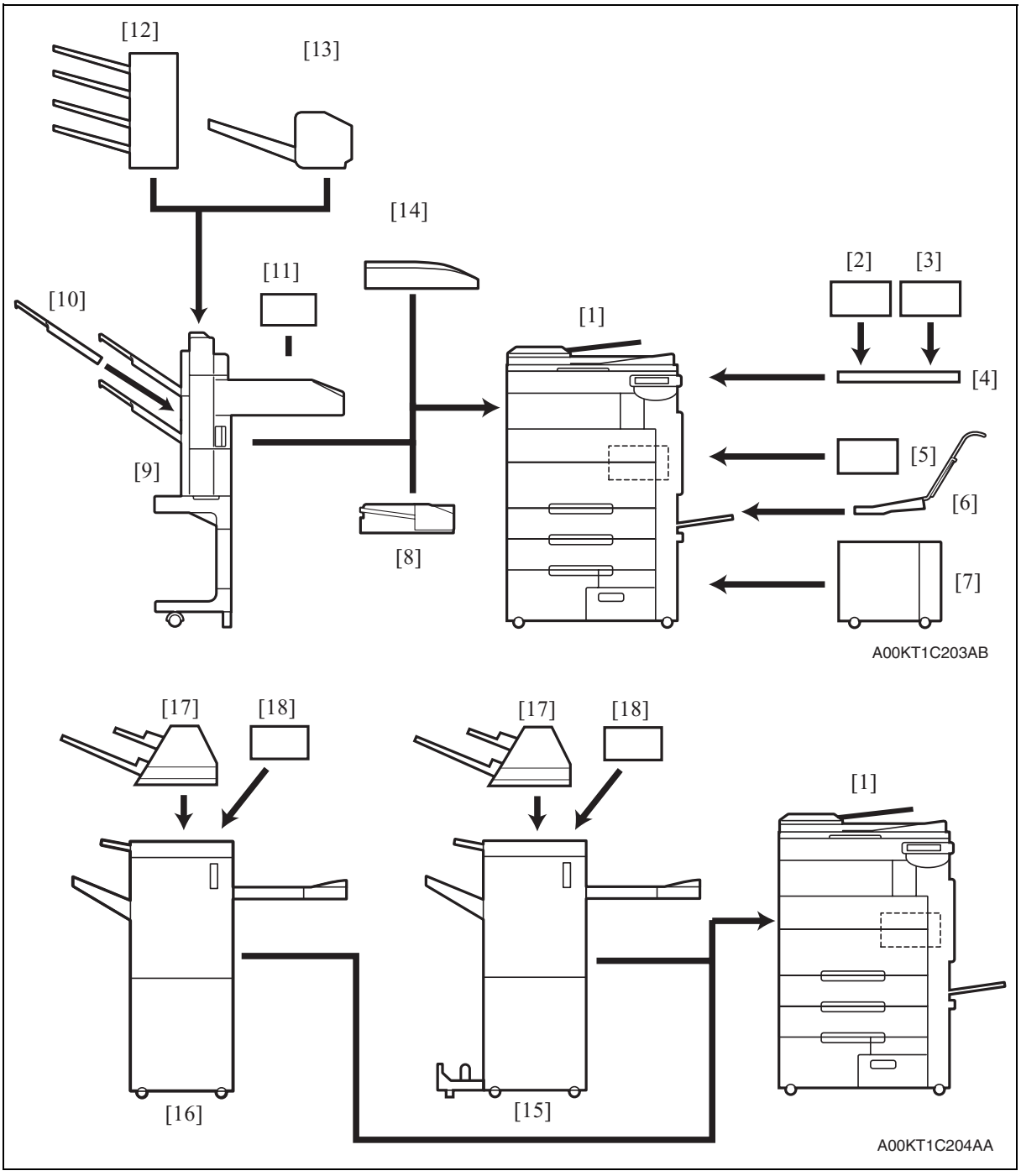
	[1]	Main body			
	[2]	Stamp unit	SP-501	[8] Fax multi line	ML-501
	[3]	Fax kit	FK-502	[9] Key counter kit	KIT-1
△4	[4]	Security kit	SC-503	[10] i-Option	LK-101*/102*/103
△4	[5]	Image controller	IC-409	[11] Upgrade kit	UK-201
	[6]	Video interface kit	VI-504		
	[7]	Scan accelerator kit	SA-501		

*: Except for the North America area.

1.2 MF450

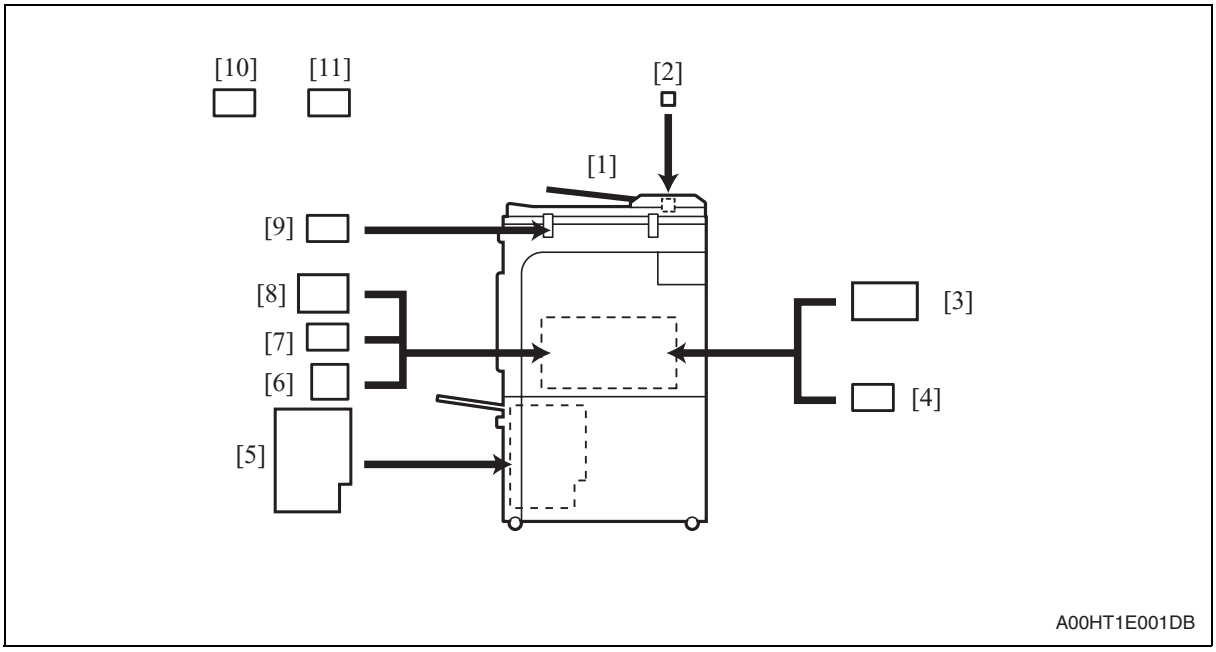
1/2 System front view

△6



[1]	Main body		[10]	Output tray (for FS-519)	OT-602
[2]	Authentication unit: Biometric type	AU-101	[11]	Punch kit	PK-510
[3]	Authentication unit: IC card type	AU-201	[12]	Mailbin kit	MT-502
[4]	Working table	WT-502	[13]	Saddle sticher	SD-505
[5]	Local interface kit	EK-602/603	[14]	Output tray (for main body)	OT-503
△6 [6]	Mount kit	MK-715	[15]	Finisher	FS-608
[7]	Large capacity unit	LU-301	[16]	Finisher	FS-517
[8]	Job separator	JS-504	[17]	Post inserter	PI-503
[9]	Finisher	FS-519	[18]	Punch kit	PK-512/513

2/2 System rear view



	[1]	Main body			
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4	[4]	Security kit	SC-503	[10] i-Option	LK-101*/102*/103
4	[5]	Image controller	IC-409	[11] Upgrade kit	UK-201
	[6]	Video interface kit	VI-504		
	[7]	Scan accelerator kit	SA-501		

*: Except for the North America area.

2. Product specifications

A. Type

Type	Combination scanner and printer console type
Copying system	Electrostatic dry-powdered image transfer to plain paper
Printing process	Laser electrostatic printing system
PC drum type	OPC drum: KM-12 (OPC with high mold releasability)
Scanning density	600 dpi
Exposure lamp	White rare-gas fluorescent lamp 30 W
Platen	Stationary (mirror scan)
△2 Original scanning	Mirror scanning CCD optical system * Sheet through system when DF-611 is used
Registration	Rear left edge
Paper feeding separation system	Manual bypass : Roller separation system with pick-up mechanism Tray 1 : Roller separation system with pick-up mechanism Tray 2 : Roller separation system with pick-up mechanism Tray 3 : Roller separation system with pick-up mechanism Tray 4 : Roller separation system with pick-up mechanism
Exposure system	1 polygon 2 beam x 4 LD exposure and polygon mirror scan system
Exposure density	Equivalent to 1800 dpi in main scanning direction × 600 dpi in sub scanning direction
Developing system	Dry 2 components developing method, HMT developing system
Charging system	DC comb electrode scorotron system with electrode cleaning function
Neutralizing system	Red LED system
Image transfer system	Belt image transfer system (1st)/roller image transfer system (2nd)
Paper separating system	Combination of curvature, separating claws, and bias system
Fusing system	Belt IH fusing system
Heating system	Heating: IH heating, Soaking: Halogen lamp

B. Functions

Types of original			Sheets, books, and three-dimensional objects
Max. original size			A3 or 11 x 17
Max. original weight			Max. 2 kg
Multiple copies			1 to 9999
2	Warm-up time (at ambient temperature of 23° C/73.4° F and rated source voltage)	When the sub power switch is turned ON at any timing while the main power switch remains ON for a predetermined period of time or more	
		MF550/MF450	30 sec. or less (Monochrome print, Color print)
		MF550: Taiwan only	60 sec. or less (Monochrome print, Color print)
		MF450: Taiwan only	30 sec. or less (Monochrome print)
			60 sec. or less (Color print)
		When the main power switch is turned ON during the sub power switch being ON	
		MF550/MF450	85 sec. or less (Monochrome print, Color print)
		MF550: Taiwan only	115 sec. or less (Monochrome print, Color print)
		MF450: Taiwan only	85 sec. or less (Monochrome print)
			115 sec. or less (Color print)
	Image loss		Leading edge: 4.2 mm (3/16 inch), Trailing edge: 3 mm (1/8 inch), Rear edge: 3 mm (1/8 inch), Front edge: 3 mm (1/8 inch)
2	First copy time	(Tray1/2 A4 or 8 1/2 x 11, full size)	
		MF550	4.3 sec. or less (Monochrome print) 6.5 sec. or less (Color print)
		MF450	4.8 sec. or less (Monochrome print) 6.5 sec. or less (Color print)
2	Processing speed	Plain paper monochrome	MF550: 264.00 mm/s
			MF450: 216.00 mm/s
		Plain paper/full color	MF550: 216.00 mm/s
			MF450: 216.00 mm/s
		Thick 1, Thick 1+	MF550: 132.00 mm/s
			MF450: 132.00 mm/s
		Thick 2, Thick 3, Thick 4, OHP, Post card, Envelope, Label sheet	MF550: 108.00 mm/s
			MF450: 108.00 mm/s
2	Copying speed for multi-copy cycle (A4 or 8 1/2 x 11, plain paper)	Monochrome	MF550: 1-sided: 55 copies/min, 2-sided: 55 copies/min
			MF450: 1-sided: 45 copies/min, 2-sided: 45 copies/min
		Full color	MF550/MF450: 1-sided: 45 copies/min, 2-sided: 45 copies/min

Fixed zoom ratios	Full size	x1.000	
	Reduction	Metric area	x0.500, x0.707, x0.816, x0.866
		Inch area	x0.500, x0.647, x0.733, x0.785
	Enlargement	Metric area	x1.154, x1.224, x1.414, x2.000
		Inch area	x1.214, x1.294, x1.545, x2.000
	Zoom ratios memory	Metric area	3 memories
Variable zoom ratios	x0.250 to x4.000	Inch area	in 0.001 increments
Paper size	Tray 1/Tray 2	Metric area	A3 Wide, A3 to A5S, A6S, post card
		Inch area	11 x 17 to 8 $^1/_2$ x 11, 8 x 13 *1, 16K, 8K, 12 $^1/_4$ x 18
	Tray 3/Tray 4	A4, B5, A5, 8 $^1/_2$ x 11, 5 $^1/_2$ x 8 $^1/_2$, 16K, postcard S	
	Manual bypass tray	Metric area	A3 wide, A3 to B6S, A6S, postcard
		Inch area	11 x 17 to 5 $^1/_2$ x 8 $^1/_2$, 8 x 13 *1, 16K, 8K, 12 $^1/_4$ x 18
Copy exit tray capacity (When OT-503 is mounted)	Plain paper	250 sheets	
	Thick paper	10 sheets	
	OHP transparencies	1 sheet	

△2 *1: 1-sided from tray 3 or tray 4.
1-sided from tray 1: 63 copies/min; 1-sided from tray 2: 64 copies/min

C. Paper

Type		Paper source (maximum tray capacity)				
		Tray 1	Tray 2	Tray 3	Tray 4	Multiple bypass
Paper type	Plain paper (64 to 90 g/m² / 17 to 24 lb)	❍ (500 sheets)	❍ (500 sheets)	❍ (1500 sheets)	❍ (1000 sheets)	❍ (150 sheets)
	Translucent paper	–	–	–	–	–
	OHP transparencies	–	–	–	–	❍ (20 sheets) *3
	Thick paper 1 *1 (91 to 120 g/m² / 24.25 to 32 lb)	❍ (400 sheets)	❍ (400 sheets)	❍ (1150 sheets)	❍ (750 sheets)	❍ (100 sheets)
	Thick paper 1+ *1 (121 to 157 g/m² / 32 to 41.75 lb)	❍ (280 sheets)	❍ (280 sheets)	❍ (800 sheets)	❍ (500 sheets)	❍ (80 sheets)
	Thick paper 2 *1 (158 to 209 g/m² / 42 to 55.5 lb)	❍ (250 sheets)	❍ (250 sheets)	❍ (700 sheets)	❍ (450 sheets)	❍ (70 sheets)
	Thick paper 3 *1,2 (210 to 256 g/m² / 55.75 to 68 lb)	❍ (200 sheets)	❍ (200 sheets)	❍ (600 sheets)	❍ (400 sheets)	❍ (60 sheets)
	Thick paper 4 *1,2 (257 to 300 g/m² / 68.25 to 80 lb)	–	–	–	–	❍ (50 sheets)
	Postcards	–	–	❍ (200 sheets)	❍ (200 sheets)	❍ (50 sheets)
	Envelopes	–	–	–	–	❍ (10 sheets)
	Labels	–	–	–	–	❍ (50 sheets)
	Long Size Paper *4	–	–	–	–	❍ (1 sheet)
Copy paper dimensions	Width	139.7 to 311.1 mm 5 1/2 to 12 1/2 inch		A4, B5, A5, 8 1/2 x 11, 5 1/2 x 8 1/2, 16K, postcard S		90 to 311.1 mm 3 1/2 to 12 1/4 inch
	Length	182.0 to 457.2 mm 7 1/4 to 18 inch				139.7 to 457.2 mm 5 1/2 to 18 inch
Long Size Paper *4	Width	–	–	–	–	210 to 297 mm 8 1/4 to 11 3/4 inch
	Length	–	–	–	–	457.2 to 1200 mm 18 to 47 1/4 inch

*1: Excluding damp paper, curled paper, and recycled paper.

*2: Image is not guaranteed when thick paper 3/4 is used.
*3: Monochrome print only.
*4: Paper to be reliably fed through only for MF450 (127 to 210 g/m^2 (33.75 to 55.75 lb))

Automatic duplex unit : Only the plain paper weighing 64 to 90 g/m^2 (17 to 24 lb) or thick paper weighing 91 to 256 g/m^2 (24.25 to 68 lb) are reliably fed.

D. Maintenance

- MF550

△7

No. of pages printed per month (average)	Color print	5,000 prints
	Monochrome print	20,000 prints
Standard copy mode	Color print	5 pages/job
	Monochrome print	6 pages/job
Standard original density	Color print	C, M, Y, K 5%
	Monochrome print	K 5%

- MF450

△7

No. of pages printed per month (average)	Color print	3,000 prints
	Monochrome print	11,400 prints
Standard copy mode	Color print	5 pages/job
	Monochrome print	5 pages/job
Standard original density	Color print	C, M, Y, K 5%
	Monochrome print	K 5%

E. Machine specifications

△2 • MF550/MF450

Power requirements	Voltage:	AC 100 V, 120 V, 127 V, 220-240 V	
	Current:	100 V	15 A
		110 V	15 A
		120 V	16 A
		127 V	16 A
		230 V	10 A
	Frequency:	50 to 60 Hz ± 3 Hz	
Max power consumption		100 V	1,500 W or less
		110 V	1,650 W or less
		120 V	1,920 W or less
		127 V	2,000 W or less
		230 V	2,000 W or less
Dimensions		650 *1 (W) x 777 (H) x 1,155 mm (H) 25.5 *1 (W) x 30.5 (D) x 45.5 inch (H)	
Space requirements		2,360 (W) x 1,483 mm (D) *2 93.0 (W) x 58.25 inch (D) *2	
Weight	Machine	Approx. 190.0 kg / 419.0 lb (without IU and TC)	
	IU and TC	Approx. 14.5 kg / 32.0 lb	

*1: Width when the manual bypass tray is closed

*2: Space requirements are the values when the finisher is slid to the maximum, the paper feed tray is slid to the maximum, and the upper right door is open.

F. Operating environment

Temperature	10 to 30° C / 50 to 86° F (with a fluctuation of 10° C / 18° F or less per hour)
Humidity	15 to 85% (Relative humidity with a fluctuation of 10%/h)
Levelness	Difference between front and back, right and left should be 1 degree or under.

G. Print functions

Type	Built-in printer controller	
RAM	1,024 MB (shared with the main body)	
HDD	60 GB (shared with the main body)	
Interface	Standard	Ethernet (1000Base-T/100Base-TX/10Base-T) USB2.0/1.1
	Option	USB 2.0
Frame type	Ethernet 802.2, Ethernet 802.3, Ethernet II, Ethernet SNAP	
Supported protocols	TCP/IP, IPX/SPX, NETBEUI, Apple Talk (EtherTalk)	
Print speed (A4 or 8 $^1/_2$ x 11, plain paper)	Monochrome print	MF550: 1-sided: 55 ppm, 2-sided: 55 ppm MF450: 1-sided: 45 ppm, 2-sided: 45 ppm
	Color print	MF550: 1-sided: 45 ppm, 2-sided: 45 ppm MF450: 1-sided: 45 ppm, 2-sided: 45 ppm
△3△3 Printer language	PCL5e/c Emulation, PCL6 (XL Ver. 3) Emulation PostScript 3 Emulation (3016) XPS	
Print resolution	Equivalent to 1800 dpi in main scanning direction × 600 dpi in sub scanning direction	
Printer fonts	PCL Latin 80 Fonts Postscript 3 Emulation Latin 137 Fonts	
Supported computer	IBM PC/AT compatible machine, Macintosh (PowerPC/Intel processor)	
△3 Supported operating systems	Server	Windows NT4.0 (SP6)/2000 (SP3)/2003 (incl. 64 bit)
	Client	Windows Vista (incl. 32/64 bit) Windows 2000 (SP3)/XP (incl. 64 bit) Windows NT4.0 (SP6) Mac OS 9.2 or later/Mac OS X 10.2, 10.3, 10.4 Linux

H. Scan functions

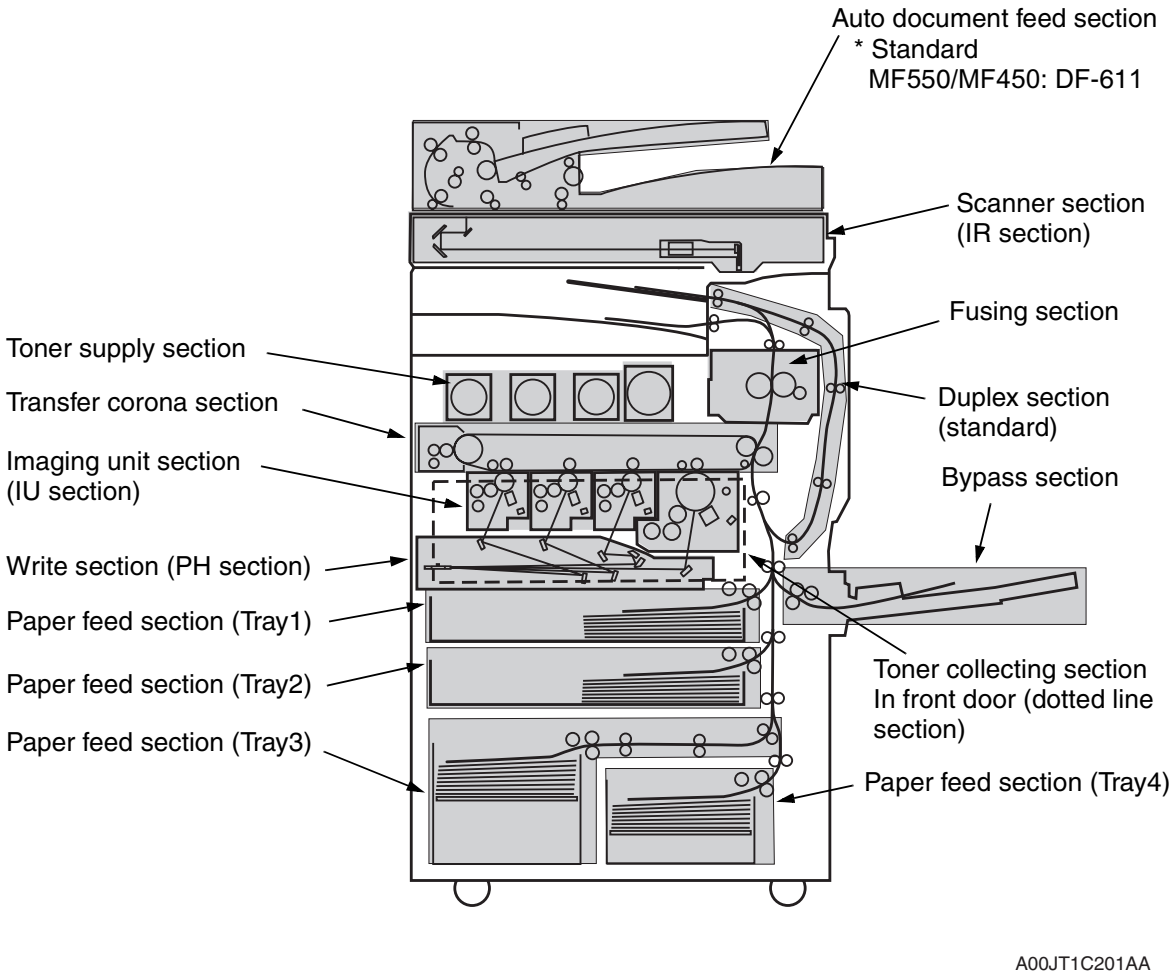
Driver	OLIVETTI scanner driver	
Compatible operating systems	Windows 2000, Windows XP/XP (incl. 64 bit)	
Scan speed (A4 or 8 1/2 x 11, Resolution 300 dpi)	MF550/MF450: DF-611	Monochrome: 70 pages/min Full color: 70 pages/min
Scannable range	Same as the copier (Max. A3)	
Functions	Scan to E-mail, Scan to FTP, Scan to SMB, Scan to BOX	
Resolution	200/300/400/600 dpi	

NOTE

- **These specifications are subject to change without notice.**

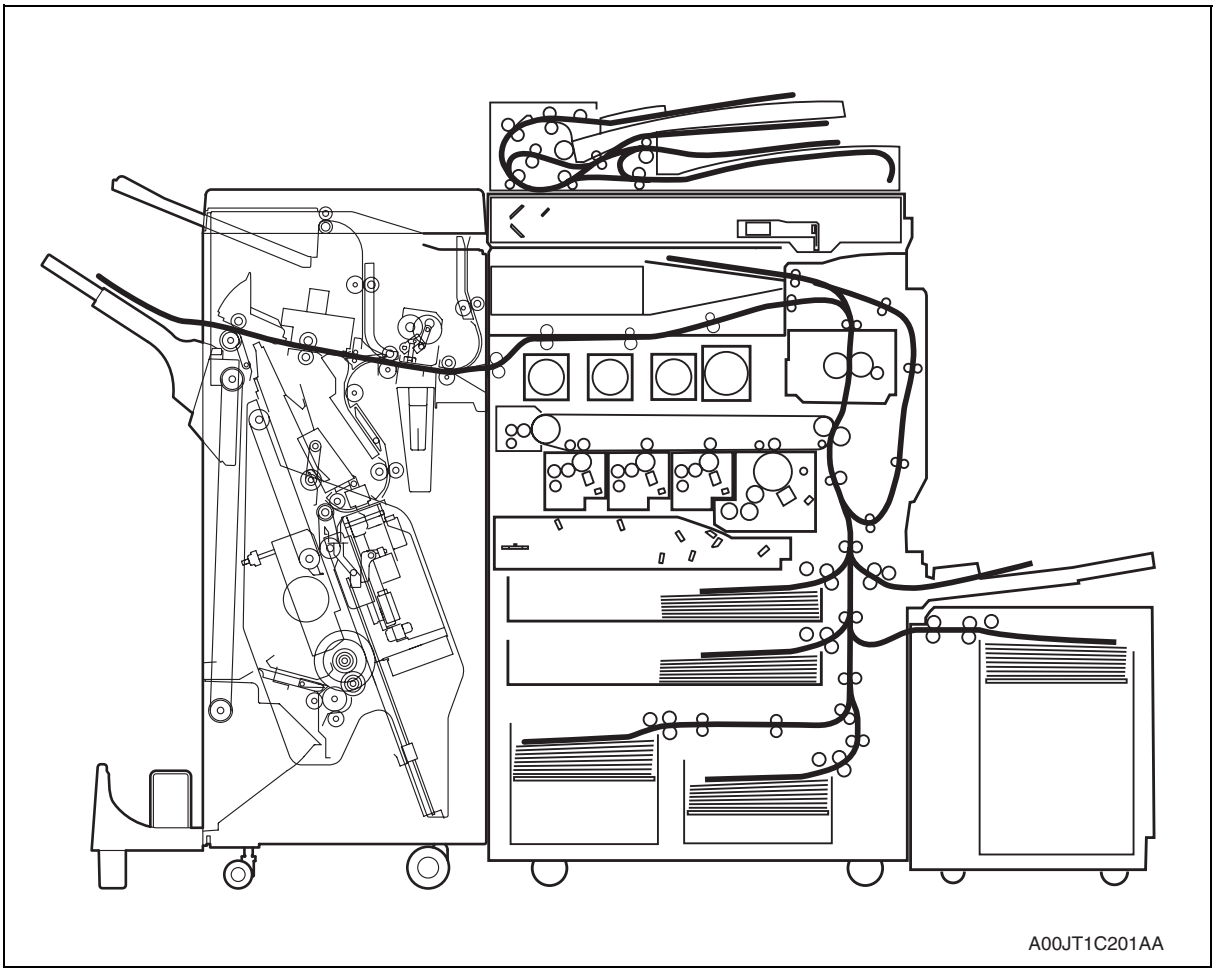
3. Section configuration

△2

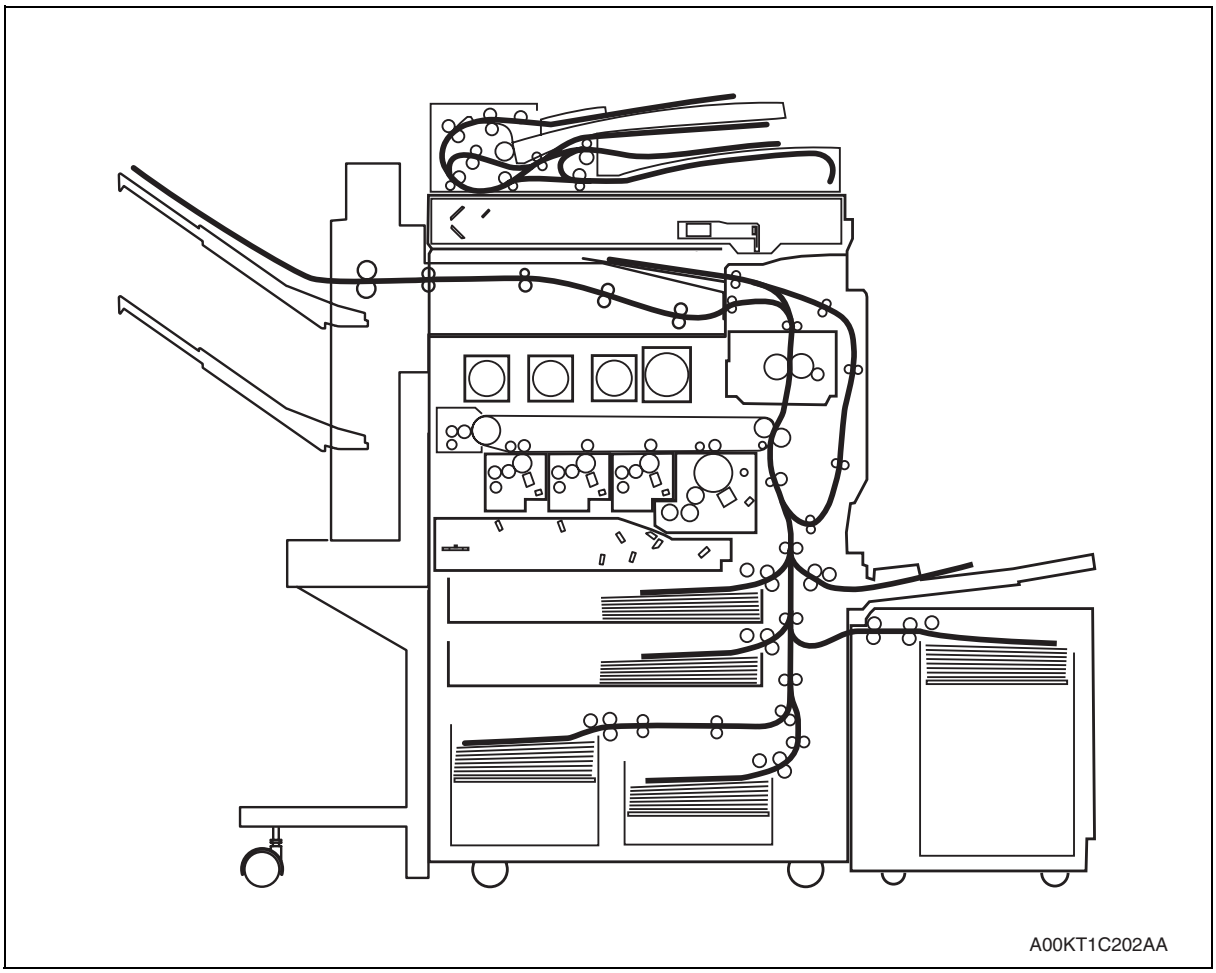


4. Paper path

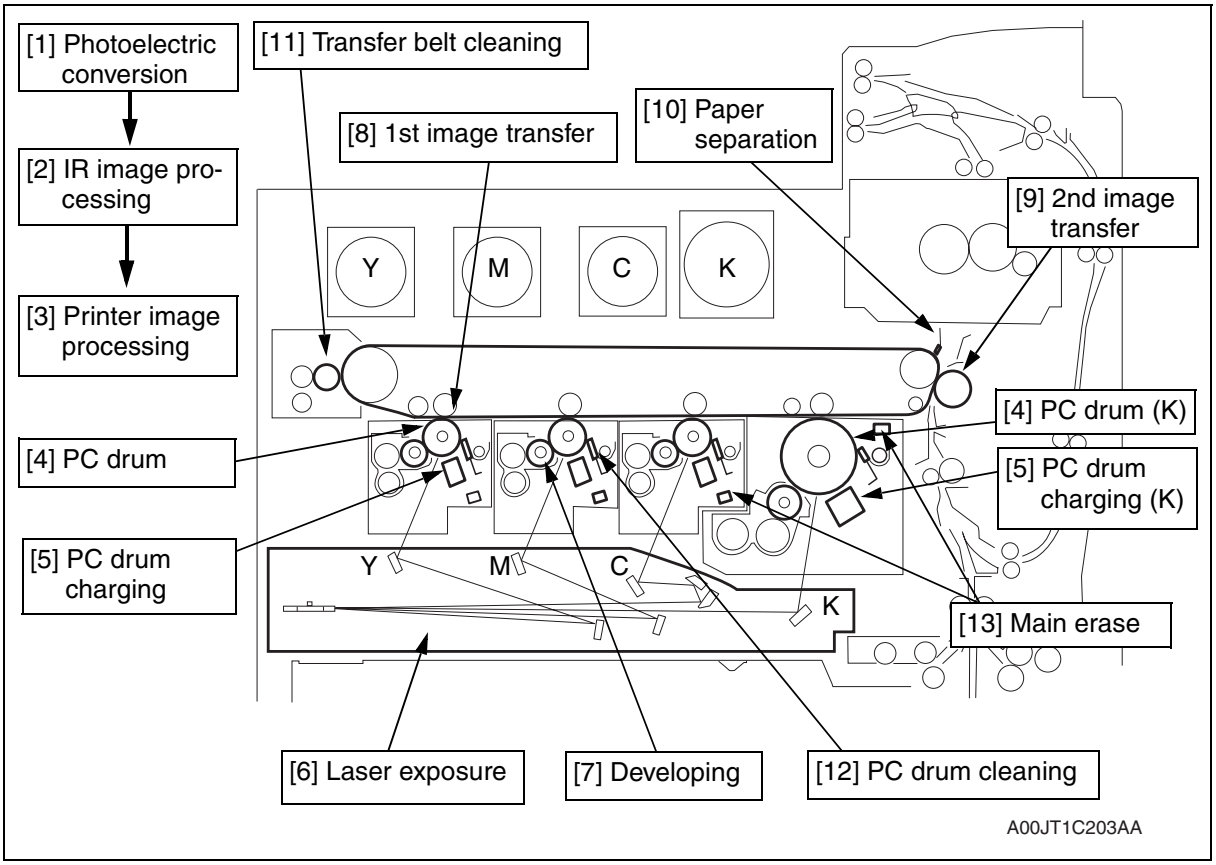
△2 4.1 MF550



4.2 MF450



5. Image creation process



[1]	Photoelectric conversion	• The light reflected off the surface of the original is separated into different colors using the color filters (R, G, and B); CCD then converts it into a corresponding electric signal and outputs the signal to the IR imaging processing section.
[2]	IR image processing	• The electric signal is converted to 8-bit digital image signals. After going through some corrections, video signals (C, M, Y, and K) are output to the printer image processing section.
[3]	Printer image processing	• D/A conversion will be performed after the VIDEO signals (Y, M, C, Bk) are corrected. This data will control the emission of the laser diode.
[4]	PC drum	• The image of the original projected onto the surface of the PC drum is changed to a corresponding electrostatic latent image.
[5]	PC drum charging	• Supply DC (-) charge on the PC drum.
[6]	Laser exposure	• Expose photo conductor to a laser beam to develop electrostatic latent image.
[7]	Developing	• The toner, agitated and negatively charged in the developer mixing chamber, is attracted onto the electrostatic latent image formed on the surface of the PC drum. It is thereby changed to a visible, developed image. • AC and DC negative bias voltages are applied to the developing roller, thereby preventing toner from sticking to the background image portion.
[8]	1st image transfer	• A DC positive voltage is applied to the backside of the transfer belt, thereby allowing the visible, developed image on the surface of each of the PC drums (Y, M, C, and K) to be transferred onto the transfer belt.

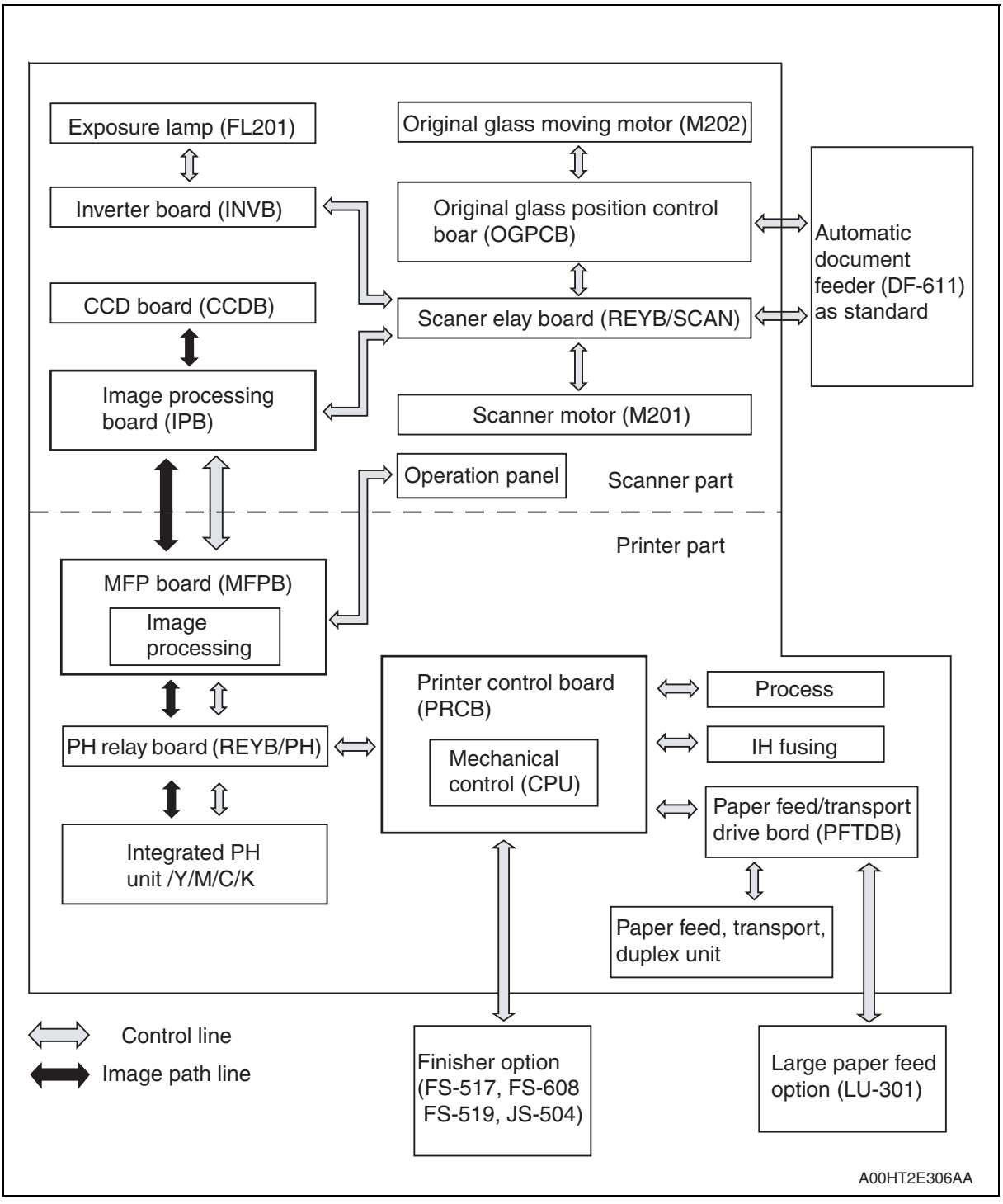
[9]	2nd image transfer	• A DC positive voltage is applied to the backside of the paper, thereby allowing the visible, developed image on the surface of the transfer belt to be transferred onto the paper.
[10]	Paper separation	• The paper, which has undergone the 2nd image transfer process, is neutralized so that it can be properly separated from the transfer belt by the paper separator claws.
[11]	Transfer belt cleaning	• Residual toner on the surface of the transfer belt is collected for cleaning by cleaning brush.
[12]	PC drum cleaning	• The residual toner left on the surface of the PC drum is scraped off.
[13]	Main erase	• The surface of the PC drum is irradiated with light, which neutralizes any surface potential remaining on the surface of the PC drum.

Composition/Operation

6. Overall composition

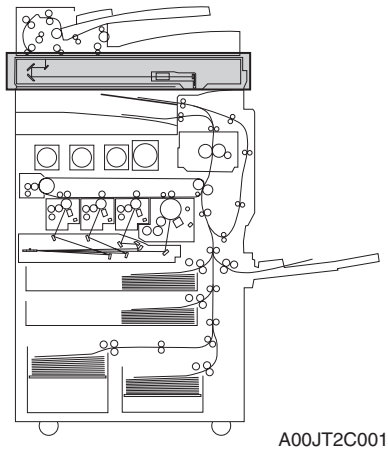
6.1 Control block diagram

△3



7. Scanner section (IR section)

7.1 Composition



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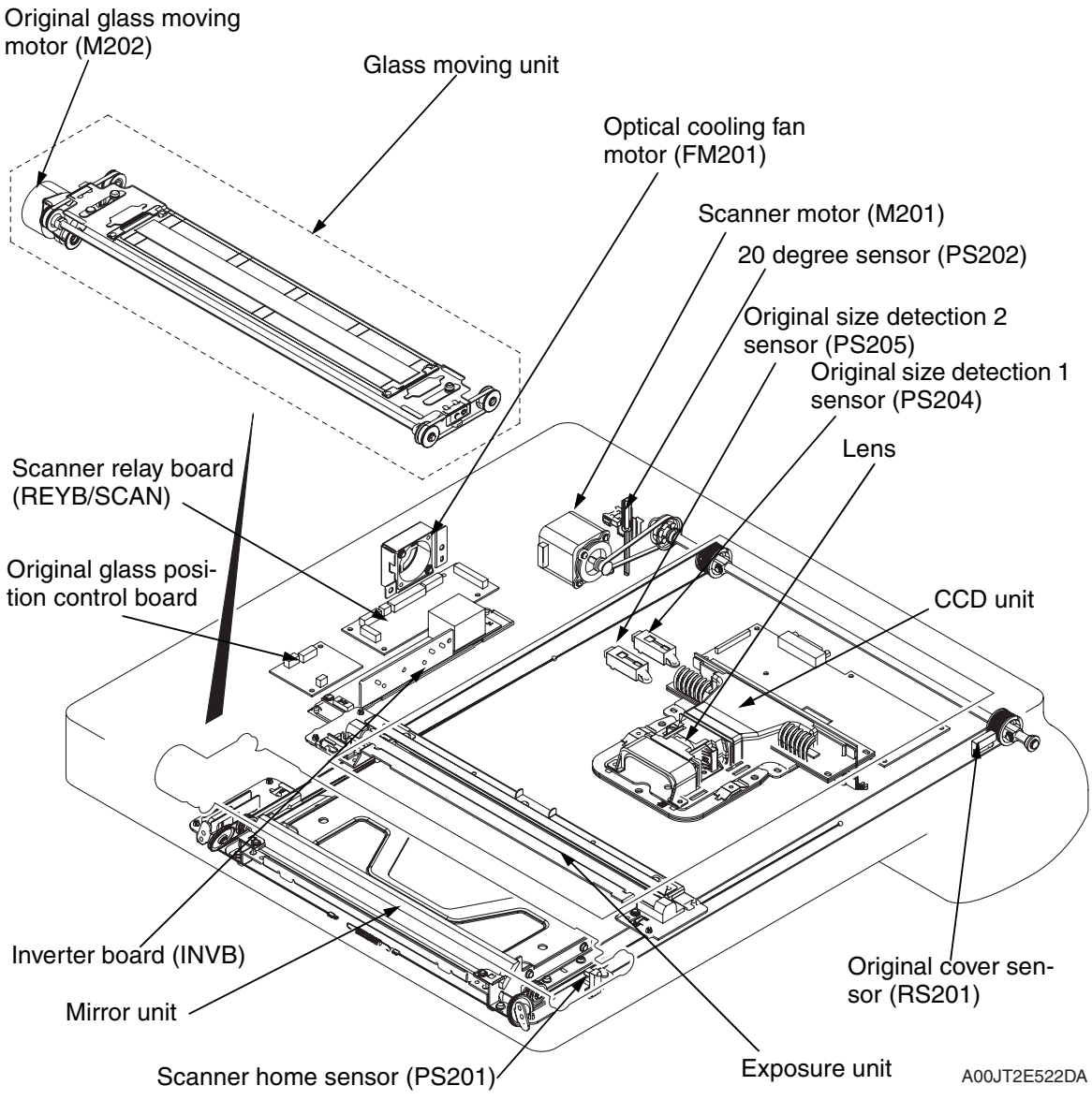

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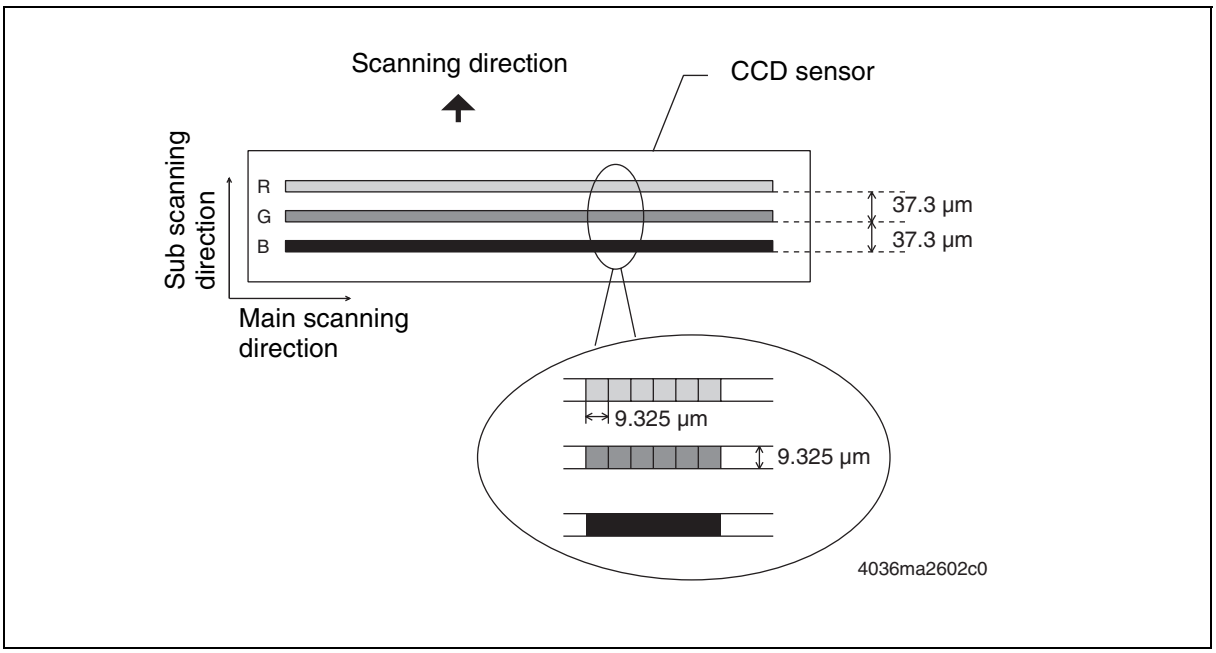
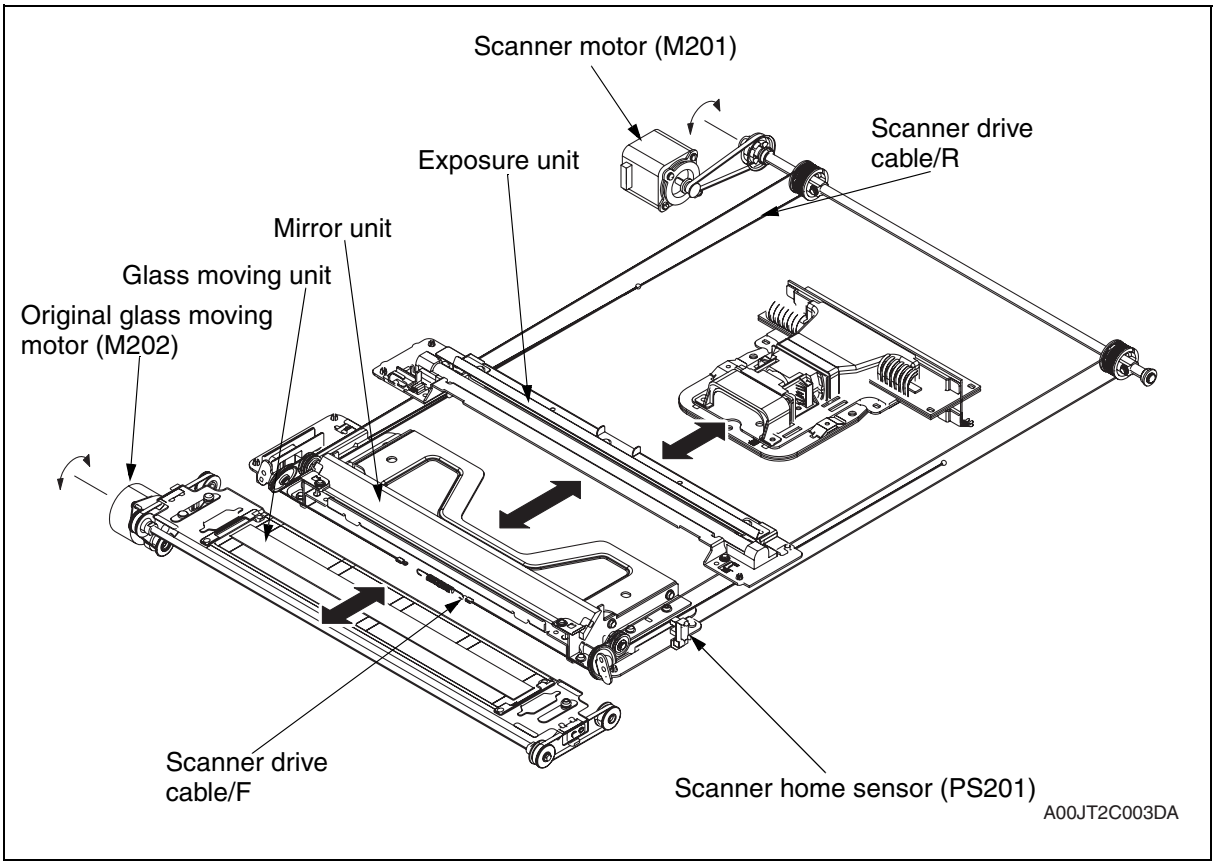
7.1.1 CCD unit



7.2 Drive



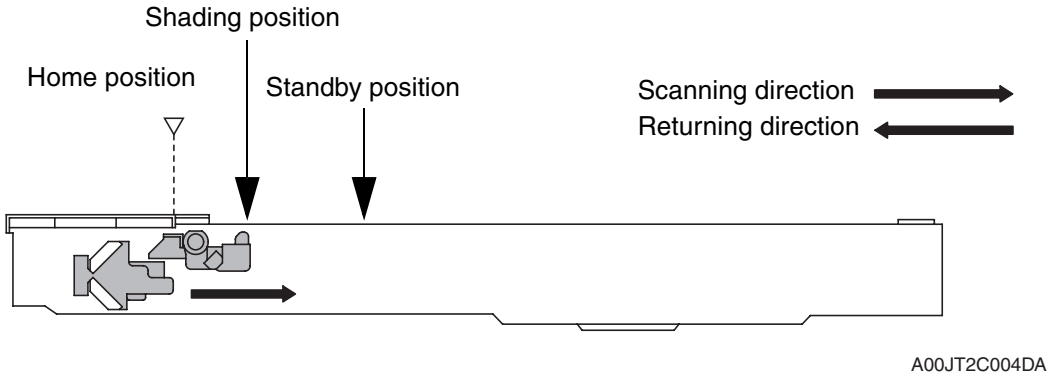
7.3 Operation

7.3.1 Scan and exposure lamp control

A. When the power is ON

1. The exposure unit moves from the scanner standby position to the home position.
2. Exposure unit moves from the home position to the shading position (under the shading correction sheet) and stops (in scanning direction).
3. The gain value of the CCD sensor output voltage is adjusted for R, G, and B.
4. A shading correction is made.
5. After the adjustment has been made, the exposure unit moves in the return direction and stops at the home position.
6. The exposure unit moves in the scan direction and stops at the standby position.

Power is ON



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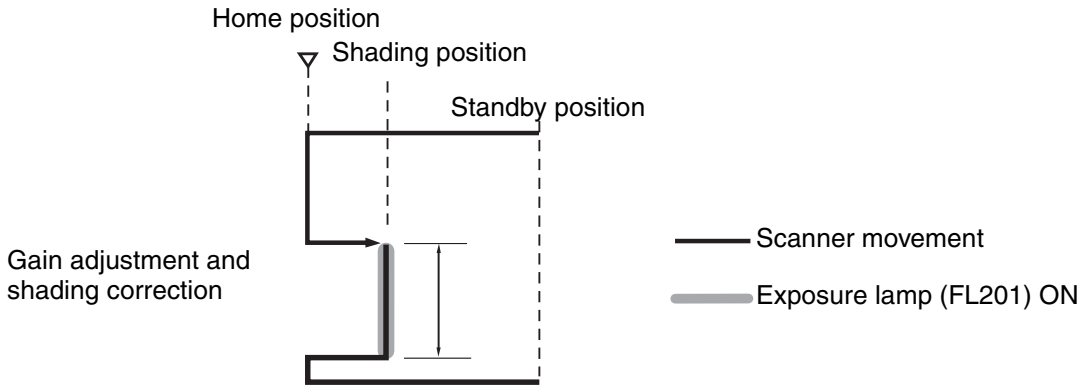

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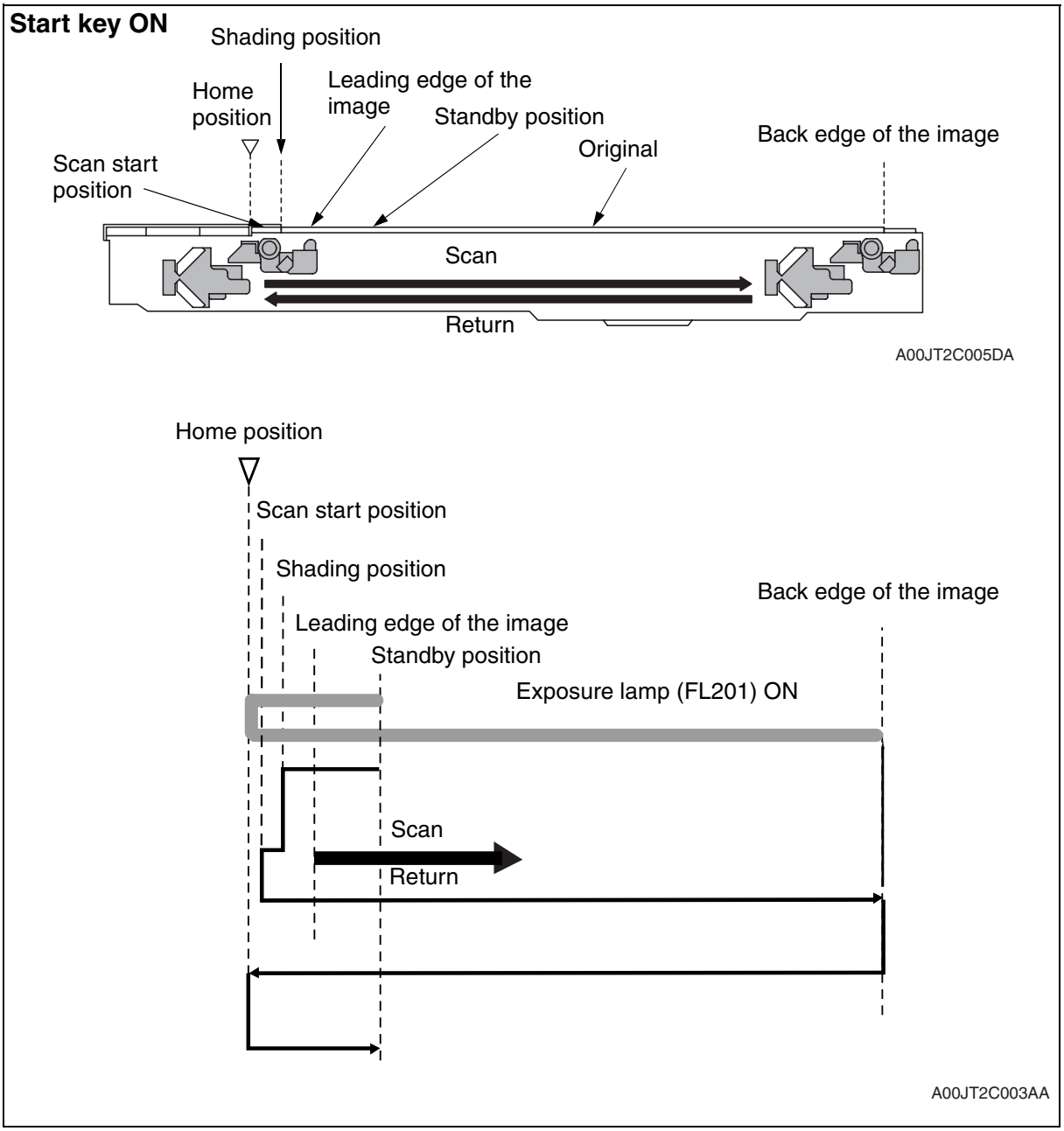
B. When the Start key is pressed

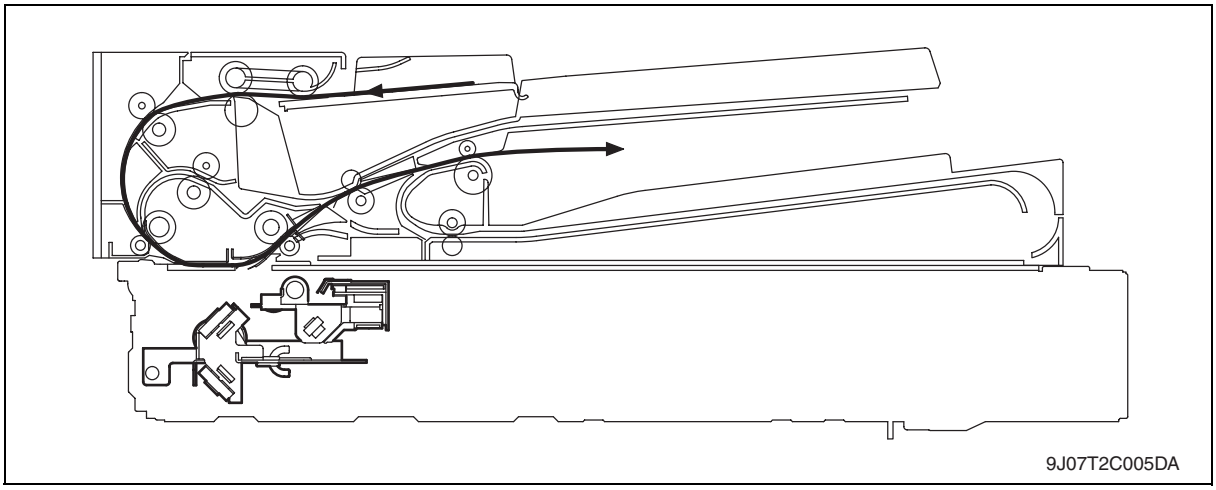
(1) Original cover mode

1. Turning the Start key ON will turn the exposure lamp ON (at the standby position)
2. The exposure unit moves in the return direction and stops at the shading position. At the shading position, the gain adjustment is made.
3. The exposure unit moves in the return direction and stops at the scan start position.
4. To start a scan, the exposure unit moves from the scan start position to the leading edge of an original while performing shading correction. The exposure unit will start reading the original image from the leading edge. The unit will finish reading the image at the back edge of the image.
5. The exposure lamp will be OFF when the reading is complete.
6. The exposure unit moves in the return direction and stops at the home position. Then the exposure unit moves in the scan direction and stops at the standby position. It scans only once even for the color-copies, since R, G, and B data will all be memorized in one scanning.



(2) DF mode

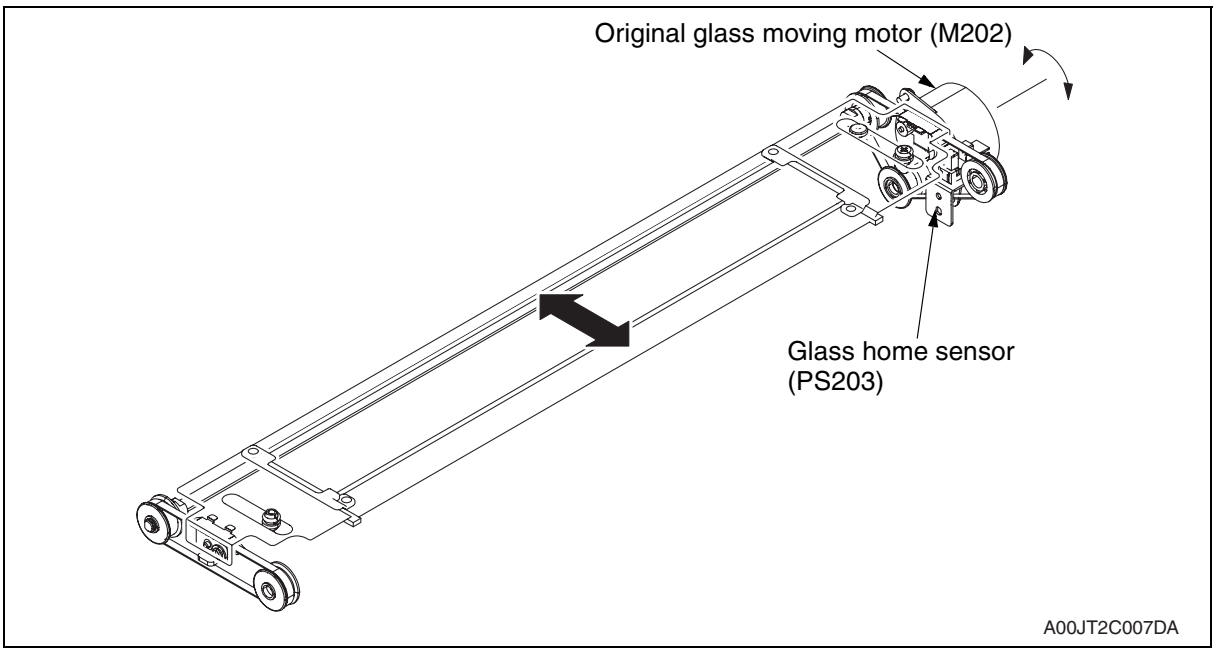
- The original fed by the document feeder will be read at the original DF glass for. The Exposure unit will move to the reading position and stops. The document will be read as the paper is transferred.



7.3.2 Preventing stain on the DF original glass

A. DF original glass movement

- The reading lines will occur when DF original glass has stain. Shift mechanism for the DF original glass is provided to avoid this trouble.
- The stand-by position for the DF original glass will be detected by the glass home sensor.
- DF original glass will move back and forth by the original glass moving motor.

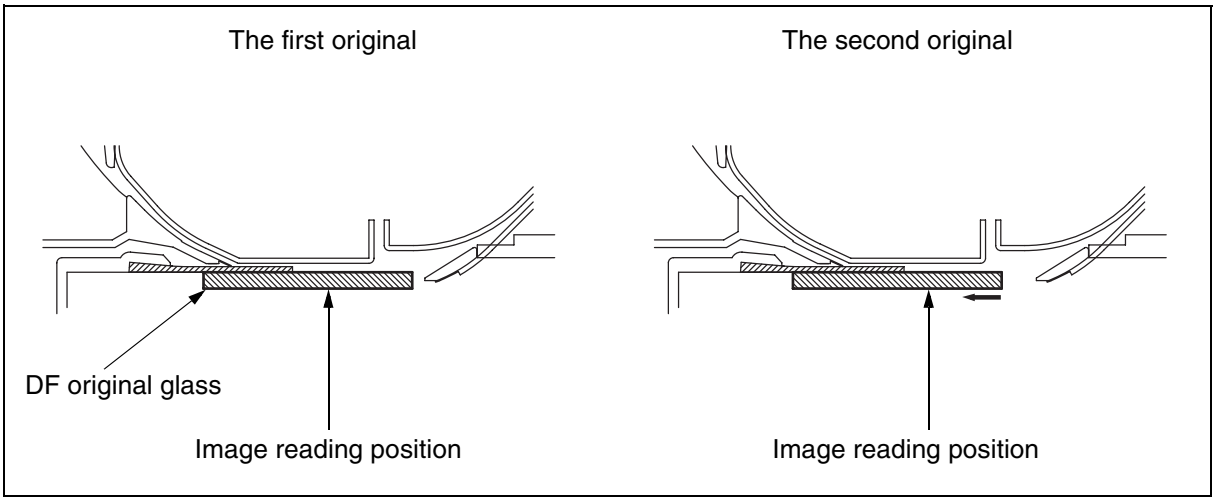


B. Details on DF original glass movement

- The DF original glass makes four different movements. Each of the four modes available uses different glass movements.
- The following explains the four different movements and the four different modes.

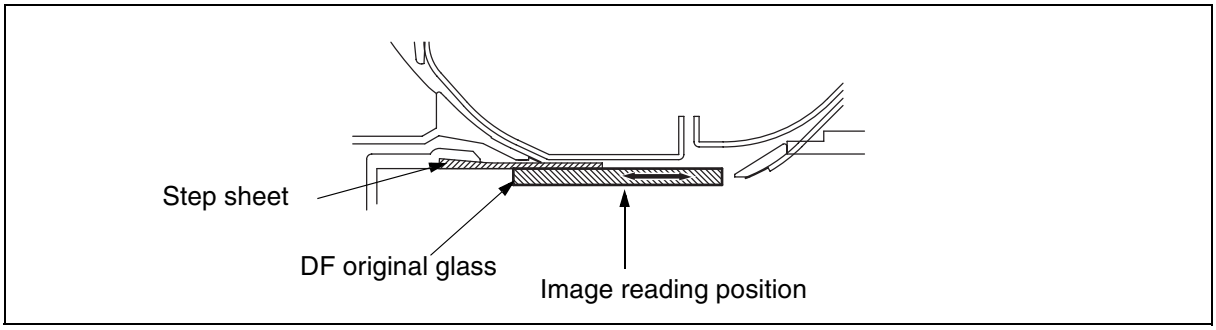
(1) Normal movement performed each time after reading a sheet of original

- The DF original glass moves slightly back or forth every time after reading a sheet of multiple originals. This changes the image reading position on the DF original glass and prevents the repeated occurrence of lines in the sub scan direction due to the same stain on the glass.
- 2 The movement of the DF original glass is varied according to the specific model of the reverse automatic document feeder installed, as each model has a specific rating of scanning speed.

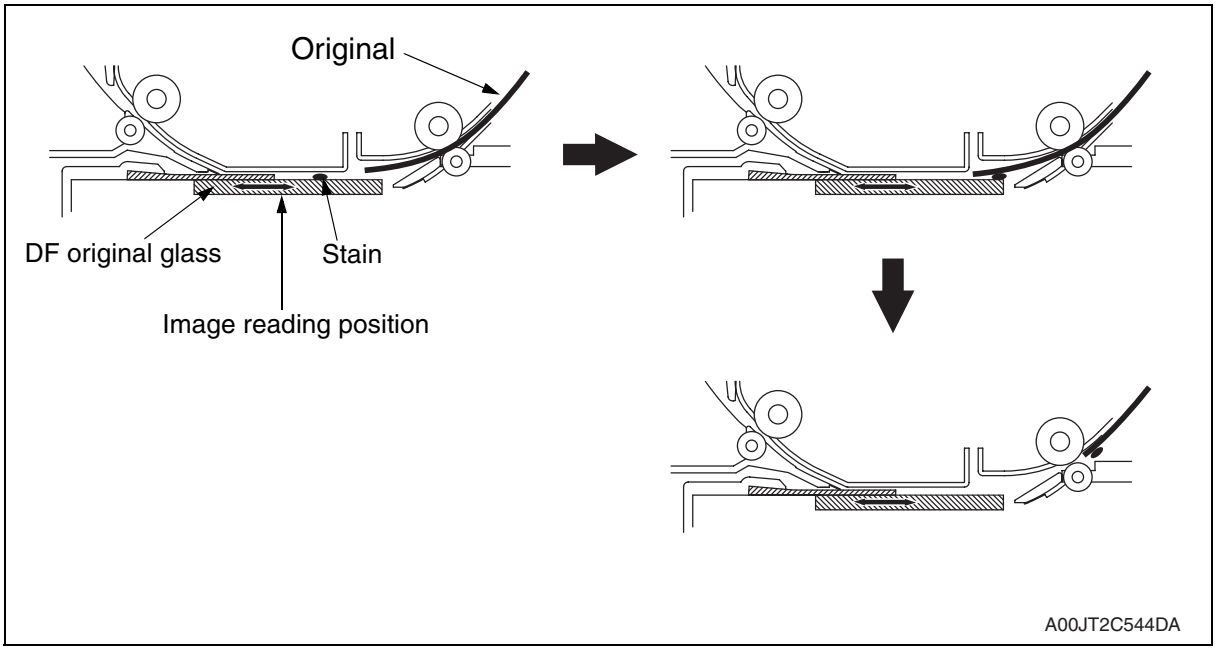


(2) DF original glass cleaning movement performed each time after reading a sheet of original

- While reading multiple originals consecutively, the DF original glass moves widely back and forth between each original reading.
- Due to the effect of the step sheet that makes contact with the DF original glass, stain on the DF original glass can be removed from the reading position and reduce image streaks in the sub scan direction.



- Stain collected on the DF original glass is removed from the reading section by the trailing edge of an original that is passing by.



(3) DF original glass cleaning movement performed after completing a job

- After the completion of a job, the DF original glass moves widely back and forth to remove stain remaining on the surface. This reduces the occurrence of lines in the sub scan direction.

(4) Split line erase movement

- While reading originals, the DF original glass moves widely. This is to remove stain on the glass and to enable the image processing board to detect lines produced by stain. The detected lines are corrected in the image-processing step to prevent the occurrence of lines. After the completion of image reading, the DF original glass returns to the original position.
- This movement can be done when level 2 or higher is selected from 0 to 6 levels in the Detection during paper passage setting. To make this setting, press keys as follows. Service Mode → [System 2] → [Split Line Detect. Setting]

C. DF original glass movement in each mode

(1) Normal mode

1	Repeats the normal movement each time after reading a sheet of original
2	Makes the DF original glass cleaning movement after completing a job **NOTE** **This cleaning operation is not performed when the setting is made in the service mode as follows. [System 2] - [Split Line Detect. Setting] - [Prior Detection] - [Not Set]**

(2) Stain reduction mode (available from the copy mode screen)

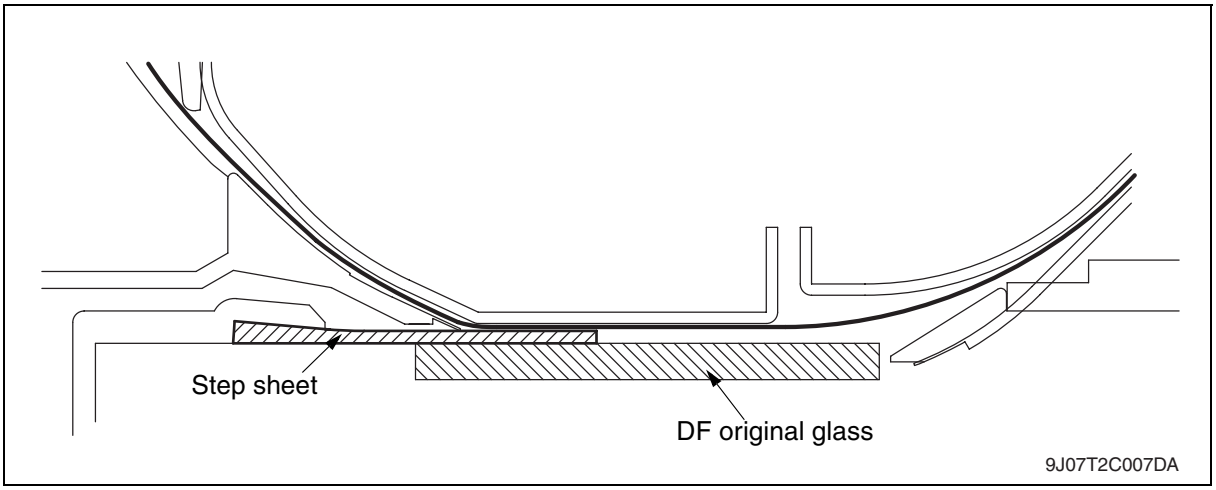
1	Repeats the DF original glass cleaning and the normal movements each time after reading a sheet of original
2	Makes the DF original glass cleaning movement after completing a job

(3) Split line erase mode (available from the service mode)

1	While reading originals, the DF original glass moves to remove stain and to correct lines produced by stain by processing images. This reduces the occurrence of lines.
2	Makes the DF original glass cleaning movement after completing a job

D. Step sheet

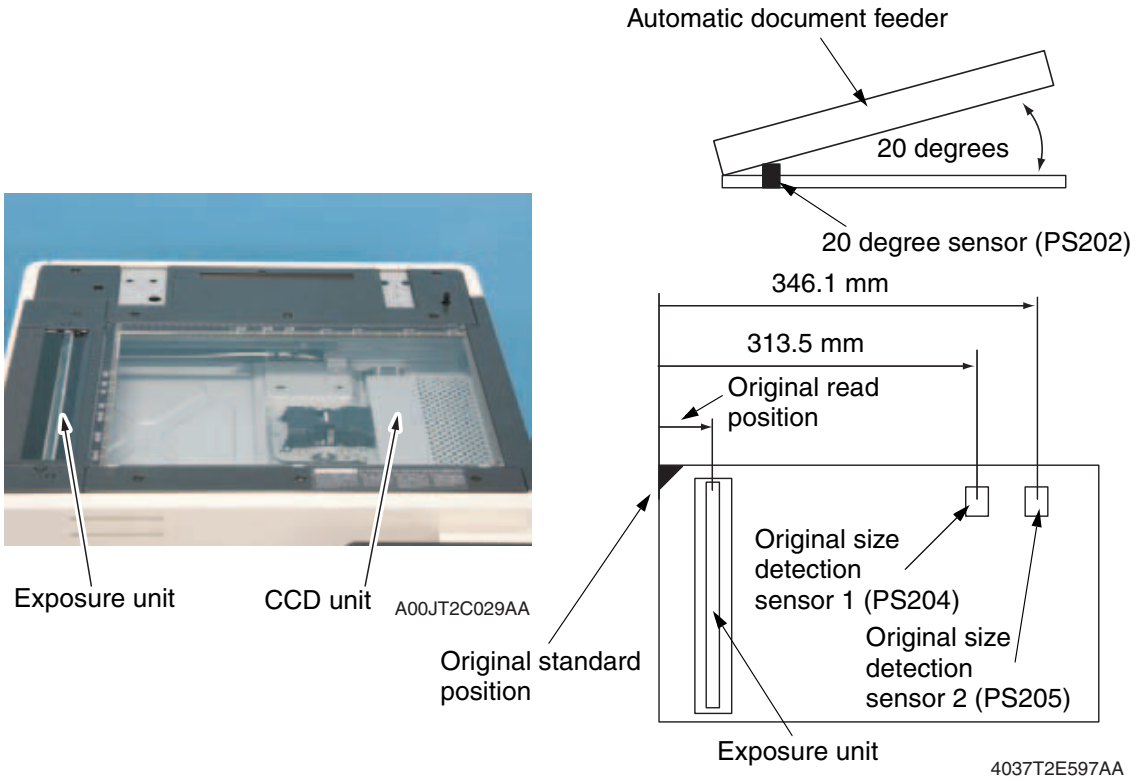
- The step sheet is provided in order to reduce the stain on the DF original glass.
- It is installed to the operator side of the DF original glass in order to reduce the area original touches the glass.



7.3.3 Original size detection control

A. Detection method

- For detection of the original size, the reflective size sensors detect the length of the original while the CCD detects the width of the original.
- Mounting the optional sensor on a machine intended for the metric areas permits detection of inch sizes. Mounting the optional sensor on a machine intended for the inch areas permits detection of metric sizes.



- With Image processing board, the original size will be judged by the original size sensor and CCD.
- An original of an irregular size is rounded to the nearest standard size.

NOTE

- Table 1 or 2 can be selected in the service mode.

Metric area & china areas

Table 1

Original size detection sensor 1	CCD width (mm)							
	~153.0	~187.0	~200.0	~215.0	~225.0	~261.5	~275.0	278.1~
OFF	A5S	B5S	16KS	A4S	B5	B5	16k	A4
ON	-	-	-	-	FLS	B4	8k	A3

Table 2

Original size detection sensor		CCD width (mm)										
1	2*	~143	~153	~187	~200	~213	~220.9	~225	~261.5	~274.7	~284.4	284.5~
OFF	OFF	$5^1/_2 \times 8^1/_2$ S	A5S	B5S	16KS	A4S	$8^1/_2 \times 11$ S	-	B5	16K	$8^1/_2 \times 11$	A4
ON	OFF	-	-	-	-	FLS	FLS	FLS	-	-	-	-
OFF	ON	-	-	-	-	-	-	-	-	-	-	-
ON	ON	-	-	-	-	-	-	-	B4	8K	11 × 17	A3

*: Option

Inch areas

Table 1

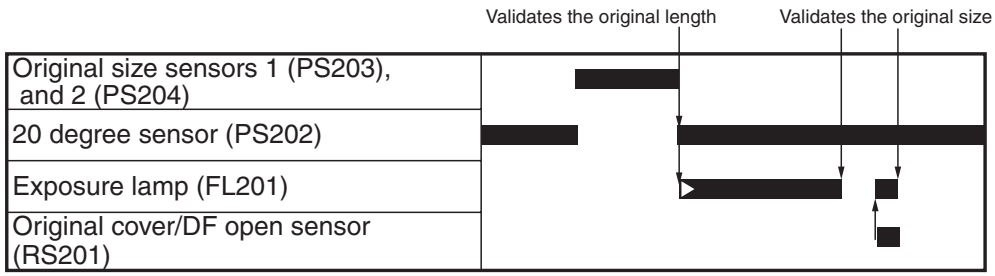
Original size detection sensor 1	CCD width (mm)		
	~144.7	~220.9	~221.0
OFF	$5^1/_2 \times 8^1/_2$ S	$8^1/_2 \times 11$ S	$8^1/_2 \times 11$
ON	-	$8^1/_2 \times 14$	11 × 17

Table 2

Original size detection sensor		CCD width (mm)								
1	2*	~143	~153	~187	~213	~220.9	~225	~262	~284.4	284.5~
OFF	OFF	$5^1/_2 \times 8^1/_2$ S	A5S	B5S	A4S	$8^1/_2 \times 11$ S	-	B5	$8^1/_2 \times 11$	A4
ON	OFF	-	-	-	FLS	FLS	FLS	-	-	-
OFF	ON	-	-	-	-	$8^1/_2 \times 14$	-	-	-	-
ON	ON	-	-	-	-	$8^1/_2 \times 14$	-	B4	11 × 17	A3

*: Option

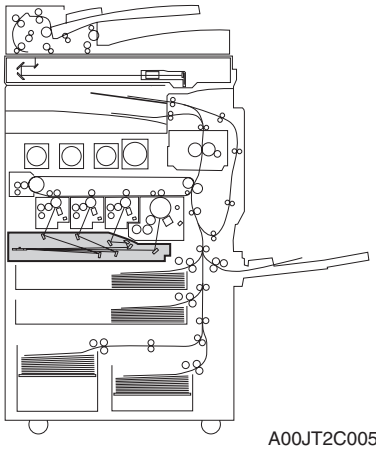
B. Detection timing



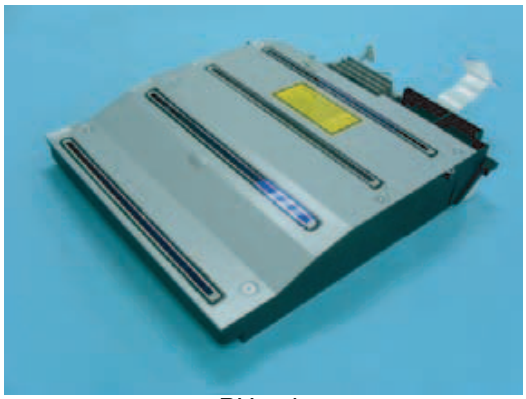
A00JT2E511DA

8. Write section (PH section)

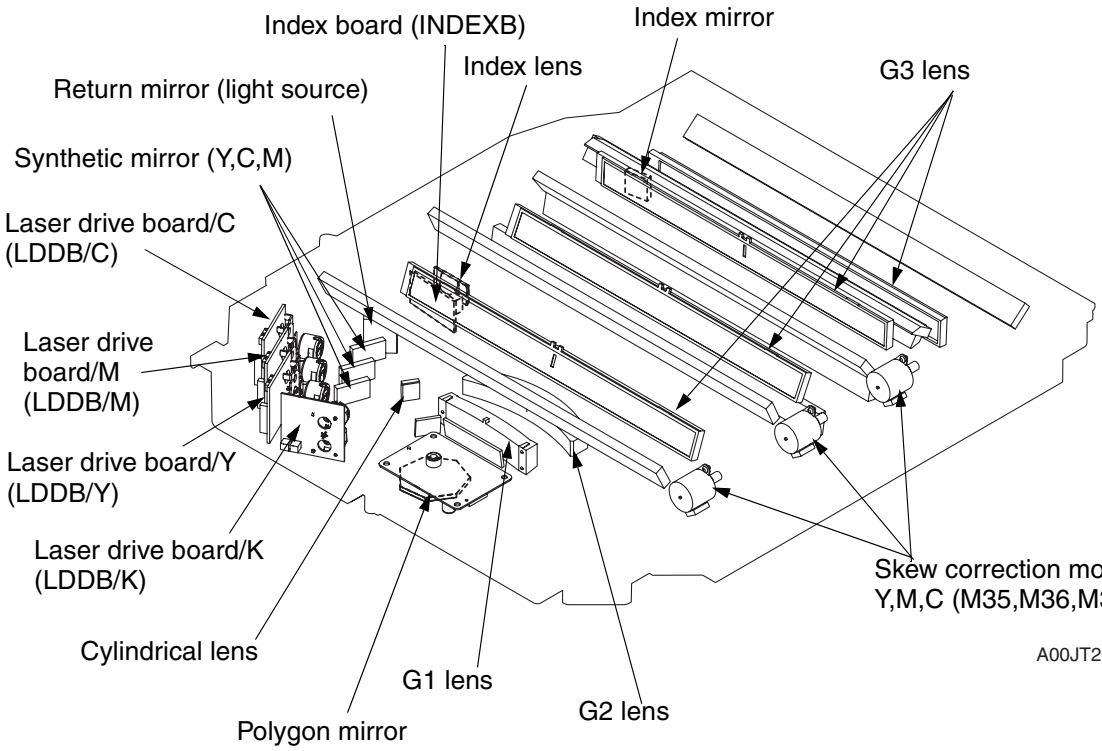
8.1 Composition



A00JT2C005AA



PH unit A00JT2C030AA

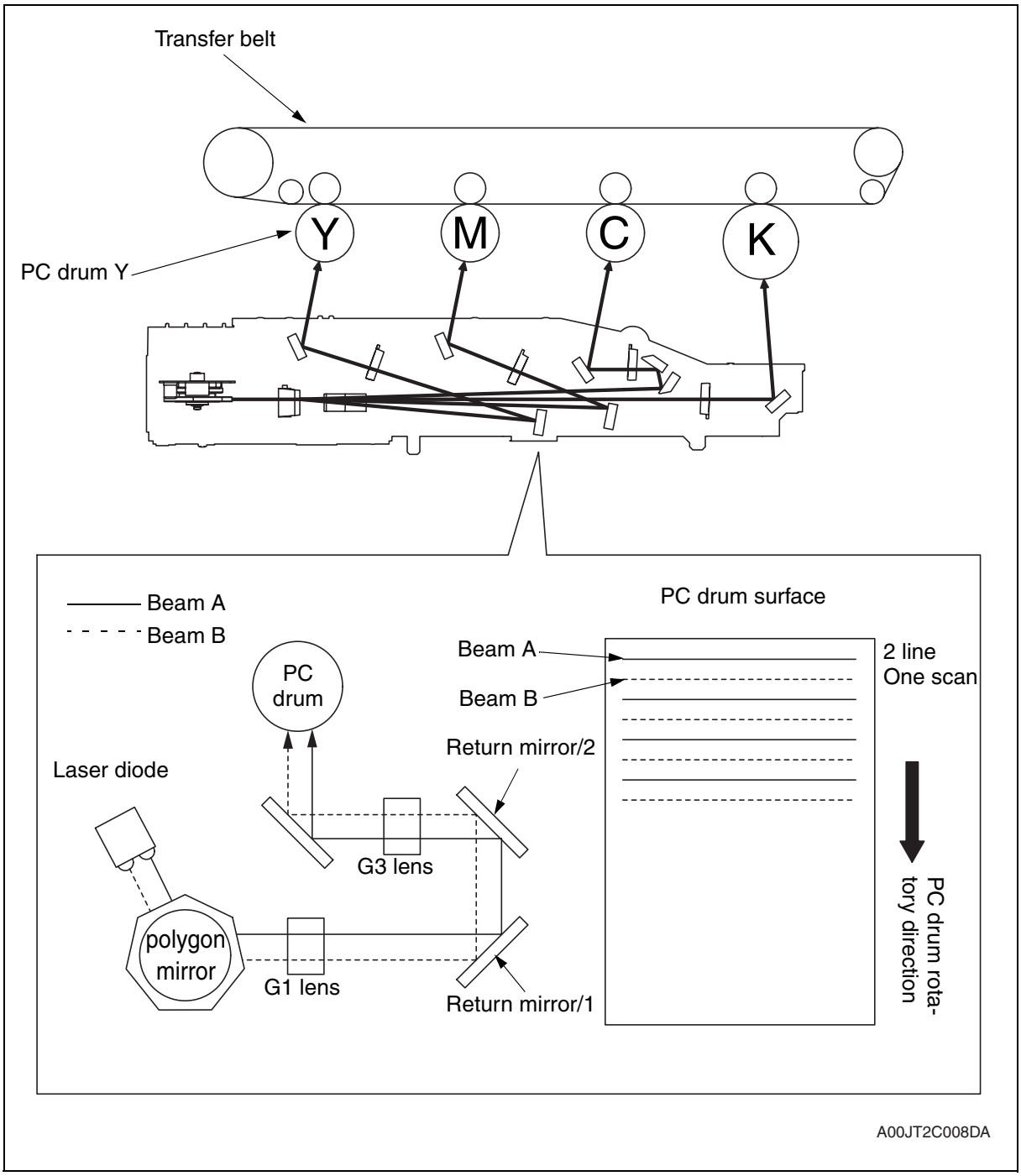


A00JT2C001DA

8.2 Operation

8.2.1 Outline

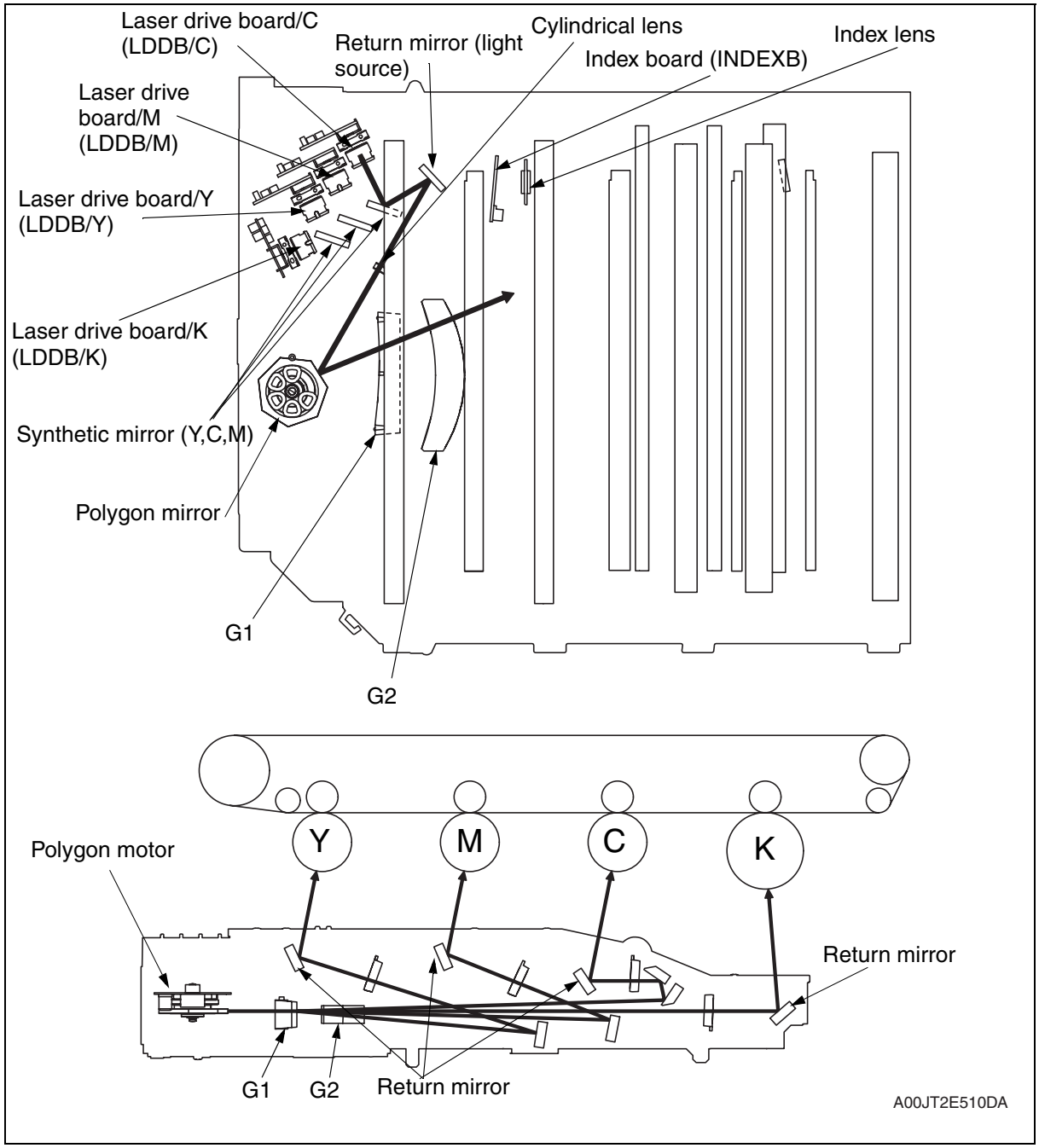
- The surface of the photo conductor is irradiated with a laser light and an electrostatic latent image is thereby formed.
- The PH unit has a single-piece construction. The PH unit has four semiconductor lasers with one laser for each four different color. A single polygon motor is used to make a scan.
- To be compatible with the high speed printing system, a seven sided polygon mirror is used. The two beam array LD is used to control the growth of the polygon motor rotation speed.
- The two-beam array LD consists of two LD elements arranged vertically. Two lines are scanned with two laser beams emitted from these two LD elements through a single face of the polygon mirror.



8.2.2 Laser exposure process

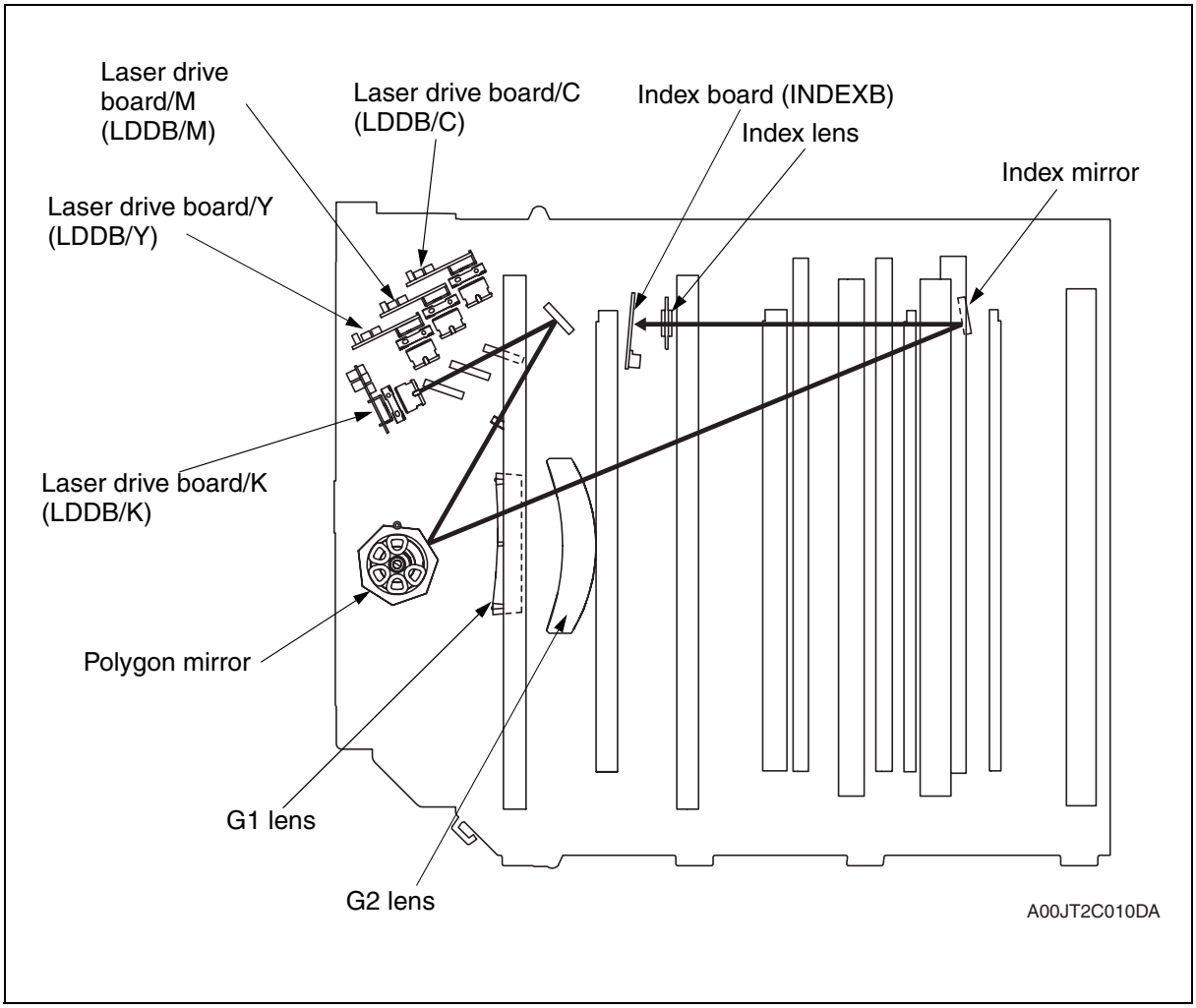
A. Operation

1. The K laser light enters the cylindrical lens via the return mirror (light source). The Y, M, and C laser light enter the cylindrical lens via the synthetic mirror and return mirror (light source).
2. At the cylindrical lens, each laser light is condensed in the vicinity of the polygon mirror.
3. Since the angle of incidence for each color of laser light varies, the laser light reflected by the polygon mirror is reflected in a different angle for each color.
4. The condensing angle of each color of laser light is corrected by the G1 and G2 lenses and then reaches each return mirror.
5. The K laser light is condensed on the PC drum surface via the G3 lens and return mirror /1. The Y and M laser light is condensed on the PC drum surface via the return mirror /1, G3 lens, and return mirror /2. The C laser light is condensed on the PC drum surface via the return mirror /1, return mirror /2, G3 lens, and return mirror /3.



8.2.3 Laser emission timing

- After a print cycle has been started, when the stable rotation signals of PC drum and polygon motor are detected, a laser ON signal is output from the printer control board.
- The laser ON signal triggers each laser light emission.
- After passing through the return mirror (light source), cylindrical lens, polygon mirror, G1 lens, G2 lens, index mirror, and index lens, the K laser light is applied to the index board. This generates an index signal.
- This index signal has a function of keeping the same laser light emission timing per every two lines in the main scanning direction.
- The index signal is only generated from the K laser beam but for the other colors, the emission timing is determined with K as a basis.



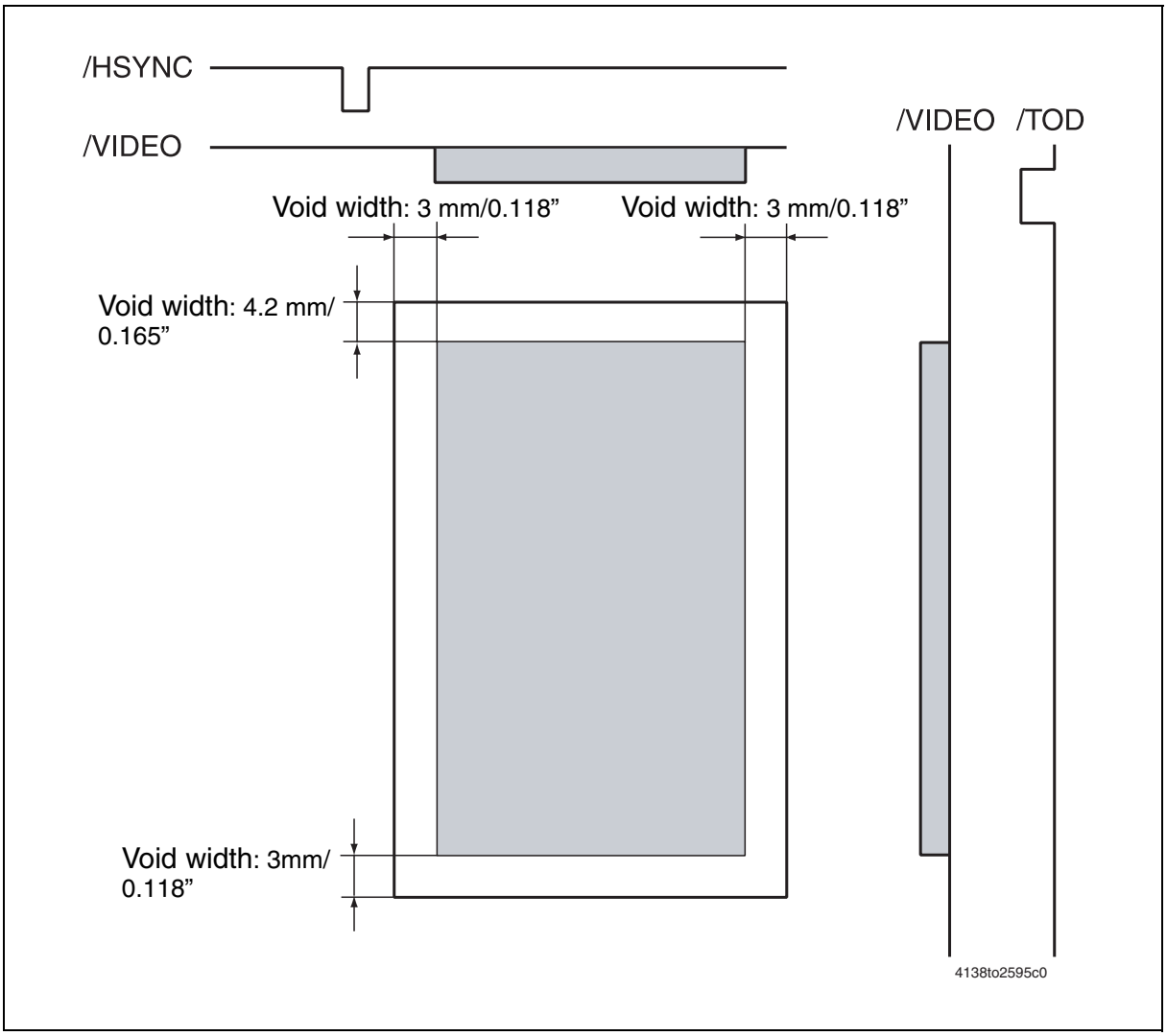
8.2.4 Laser emission area

A. Main scanning direction

- The print start position in the CD direction is determined by the CD print start signal (/HSYNC) that is output from the printer control board and the width of the paper.
- The laser emission area is determined by the paper size. The area of 3 mm/0.118 inch on both edges of the paper is, however, the void image area.

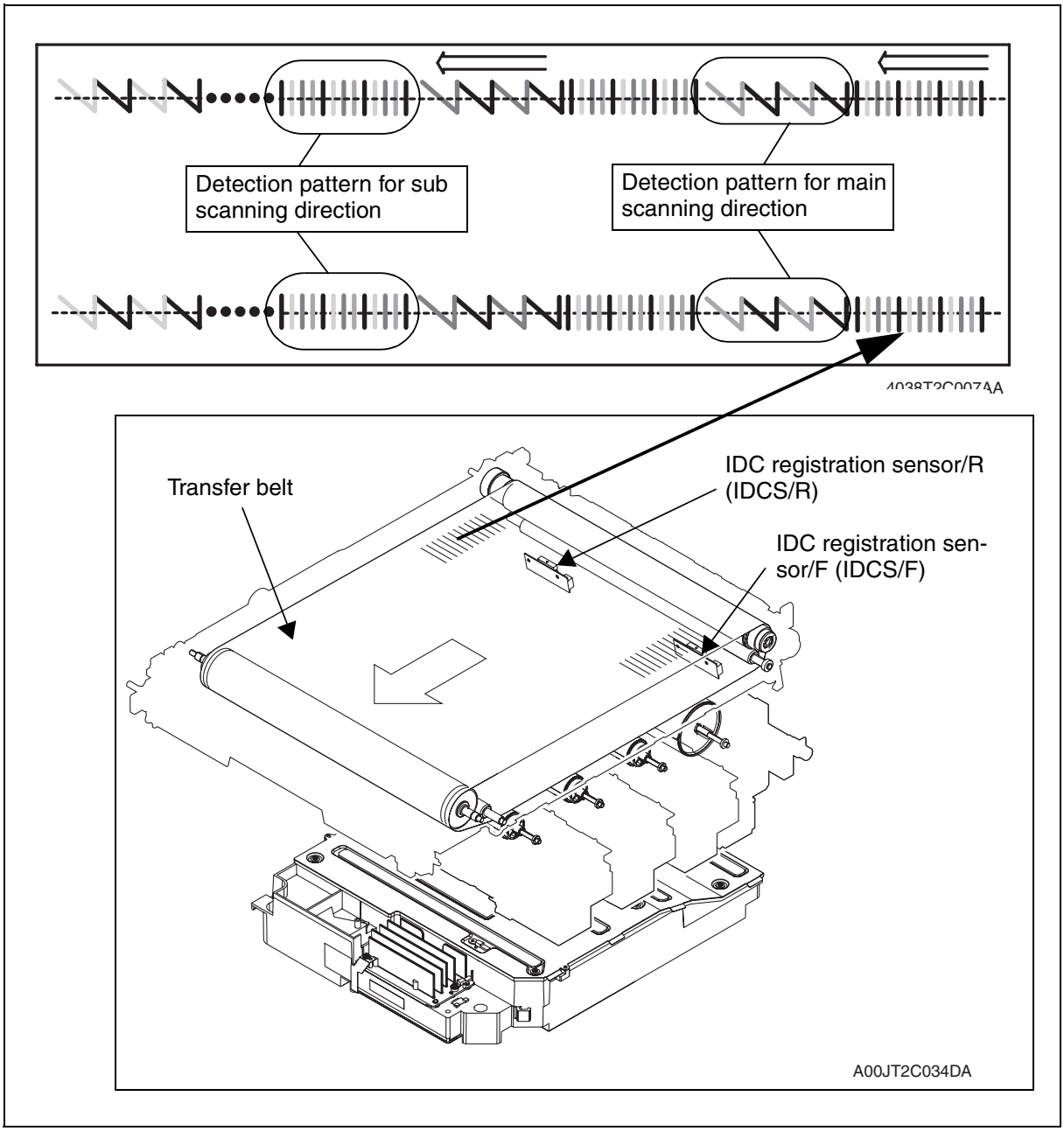
B. Sub scanning direction

- The print start position in the sub scanning direction is determined by the image write start signal (/TOD) that is output from the printer control board and the length of the paper.
- The laser emission area is determined by paper size. However, there are void areas that are 4.2 mm/0.165" from the leading edge and 3 mm/0.118" from the trailing edge of paper.



8.2.5 Color registration control (color shift correction) system

- In a tandem engine, each four different color has an independent image reproduction process. Color shift may occur because of variations in part accuracy. The color registration control system automatically detects color shift and correct color shift in the main and sub scanning directions.
- The color shift detection sequence proceeds as follows. A detection pattern each in the main scanning direction is produced at the front and rear on the transfer belt. Each of IDC registration sensor F and R at the front and rear reads the corresponding pattern. The amount of color shift in the sub scanning direction is then calculated and stored in memory. A detection pattern each in the sub scanning direction is next produced at the front and rear on the transfer belt. Each of IDC registration sensor F and R at the front and rear reads the corresponding pattern. The amount of color shift in the main scanning direction is then calculated and stored in memory. Based on the data representing the amounts of color shift, the machine calculates how much each of the different colors should be corrected. The correction data is further stored in memory. Based on the data stored in memory, the machine controls each dot during production of image outputs, thereby correcting the color shift.

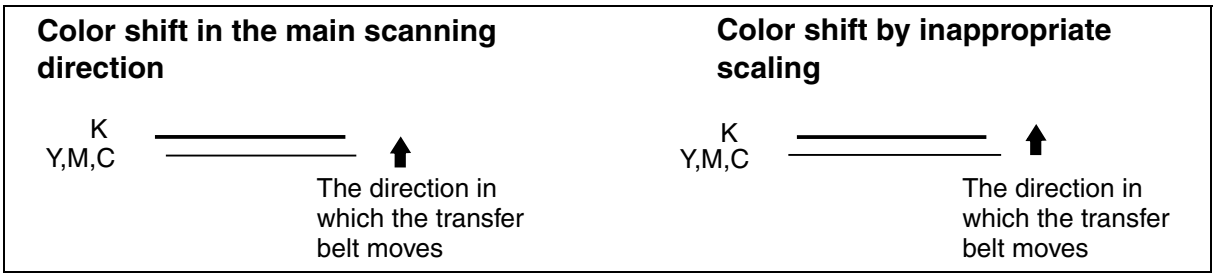


A. Color shift correction method

- Black (K) is used as a standard of reference when other colors, yellow (Y), magenta (M), and cyan (C), are individually corrected.

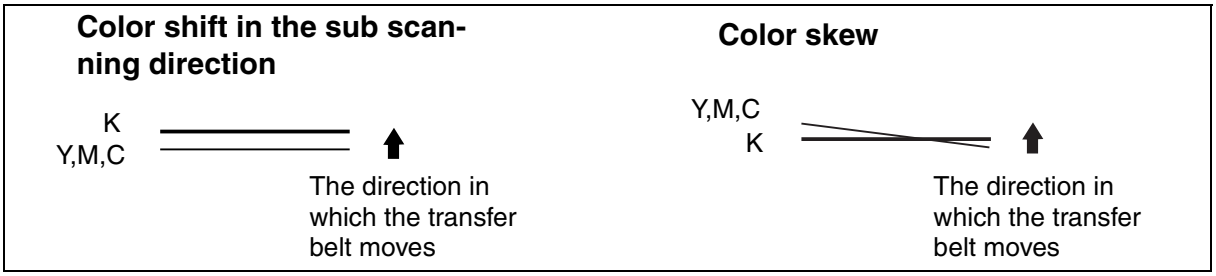
(1) Color shift in the main scanning direction

- The following two methods are available to correct color shift in the main scanning direction.
  1. Adjustment in the main scanning direction: Change of image write start timing in the main scanning direction.
  2. Overall scaling: Change of writing clock frequency.



(2) Color shift in the sub scanning direction

1. Adjustment in the sub scanning direction: Change of image write start timing in the sub scanning direction.
2. Color skew correction:
   Adjustment of the PH unit G3 lens skew.
   The G3 lens is driven by the skew correction motor.



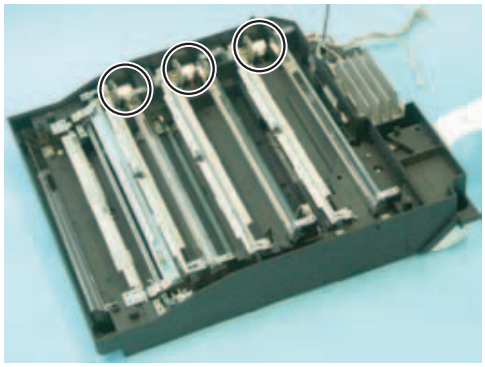
- For an easier explanation, the above illustration uses the relation between black toner (K) and color toners (Y, M, C) that are transferred onto the transfer belt.

B. Color registration control operation timing

The color registration control and the image stabilization control operate at one time. For detail, refer to the image stabilization control section.

8.2.6 Color skew correction control

- Temperature may change inside the PH unit and the components can change over time. This may cause color skew problems. To prevent the problems, individual G3 lenses that correspond to Y, M, and C respectively have a color skew auto adjustment mechanism.
- When the skew correction motor runs, the G3 lenses moves up and down to perform an automatic color skew correction.



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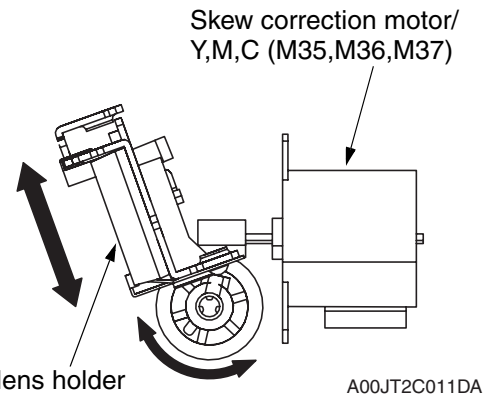
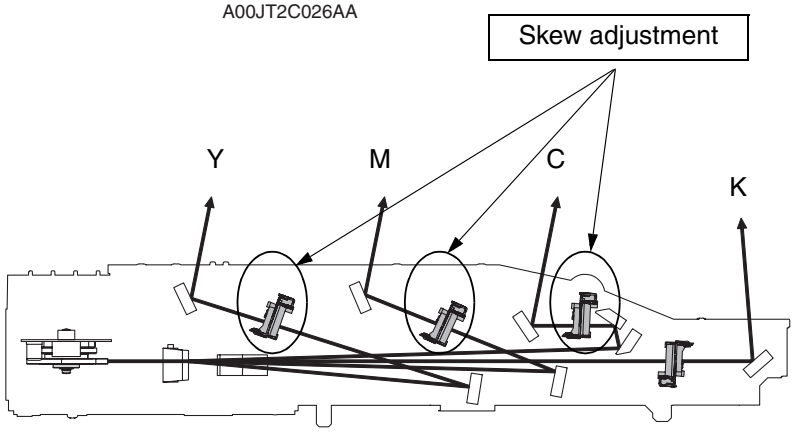


A00JT2C011DA



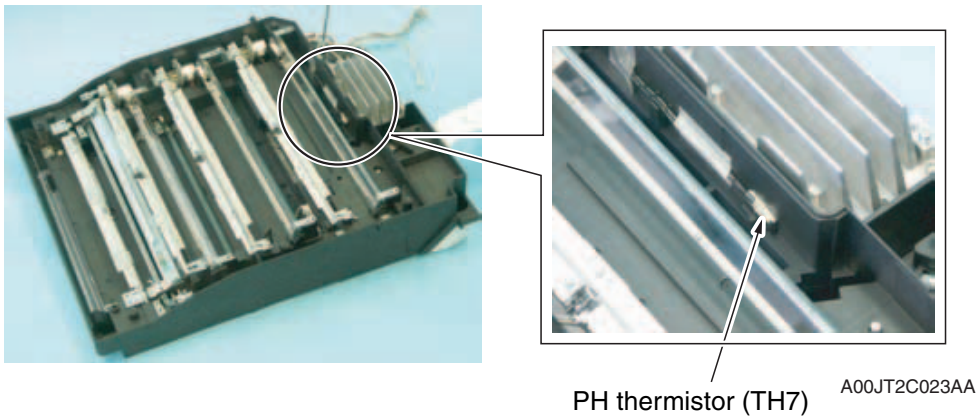
A00JT2C012DA

A. Operation timing

- The color registration control and the color skew control operate at one time.
- By using the CD registration pattern detected, the color skew amount is calculated for each color. Each color skew is corrected using the previous correction data as a standard of reference.

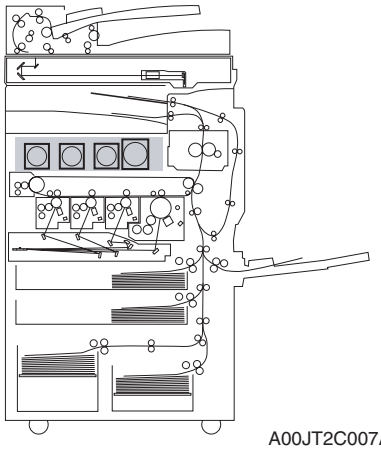
8.2.7 PH unit temperature detection control

- Temperature change inside the PH unit may cause color shift. To prevent the problem, temperature inside the PH unit is measured by the PH thermistor. The color registration control and the color skew control start to operate when the machine detects a certain amount of temperature change between the current temperature and the one measured when the color registration was performed last time.
- This temperature detection control is carried out when the main power switch is turned ON.



9. Imaging unit

9.1 Composition



A00JT2C007AA

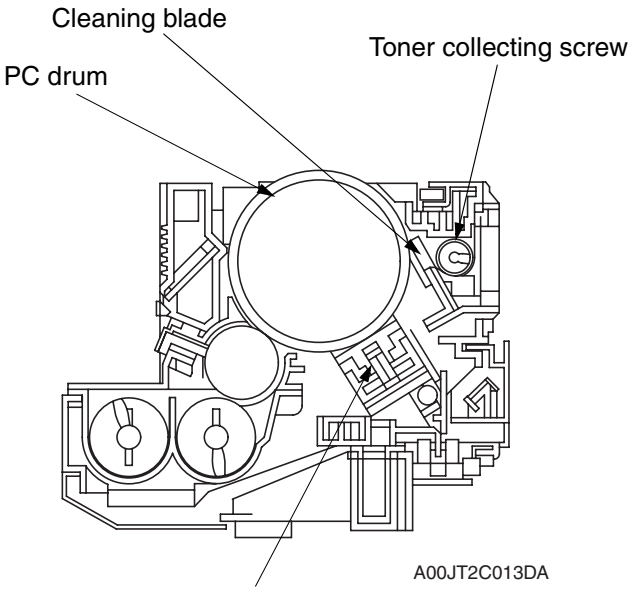
Imaging unit/K

A00JT2C032AA

Imaging unit/Y, M, C

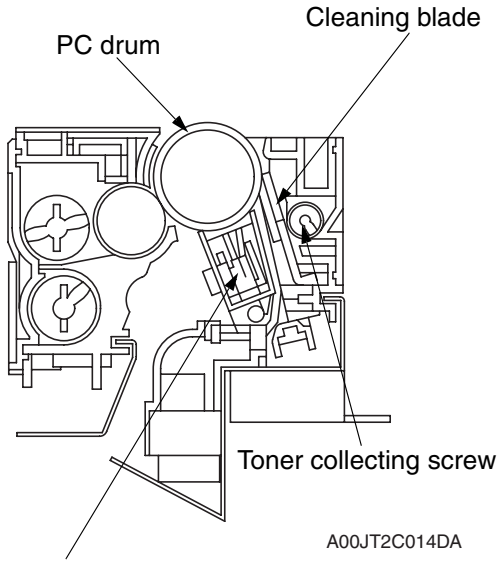
A00JT2C031AA

Developing unit/K



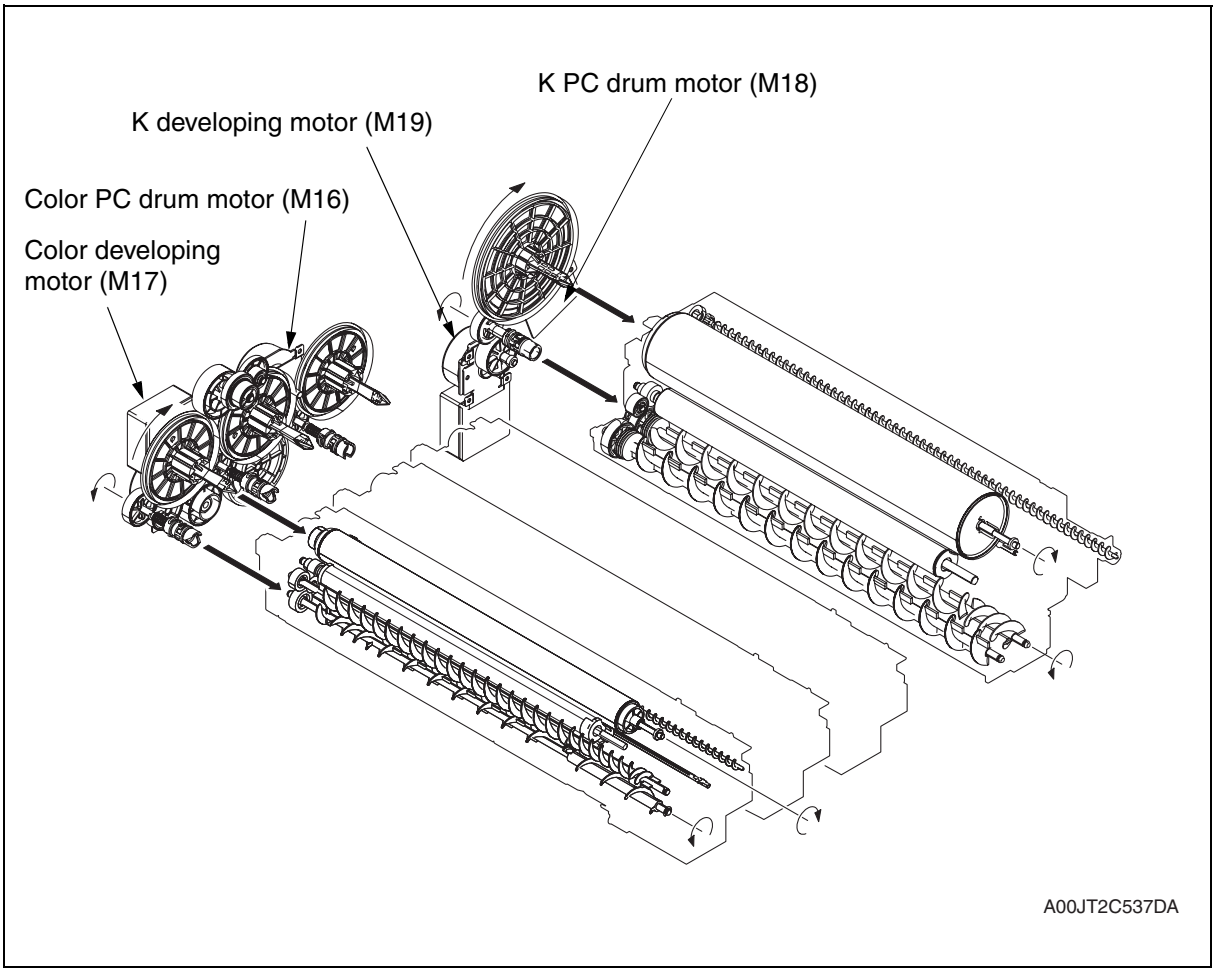
A00JT2C013DA

Developing unit/Y, M, C



A00JT2C014DA

9.2 Drive


K PC drum motor (M18)
K developing motor (M19)
Color PC drum motor (M16)
Color developing motor (M17)
A00JT2C537DA

9.3 Operation

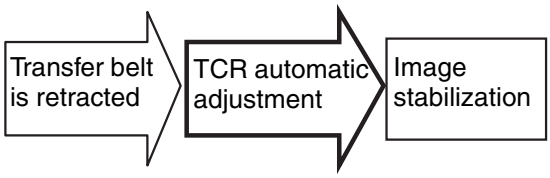
9.3.1 IU life control

- Each IU has EEPROM board that detects a new IU and keeps track of the service life of the IU.

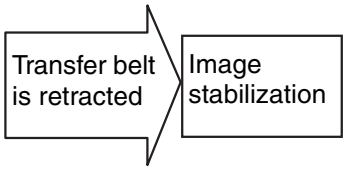
A. New IU detection

- New IU is detected when 24 V is turned ON as the main power switch is turned OFF and ON or the front door is opened and closed.
- When a new IU is detected, an TCR adjustment sequence is carried out.

Operation when a new IU is detected



Operation when a new IU is not detected



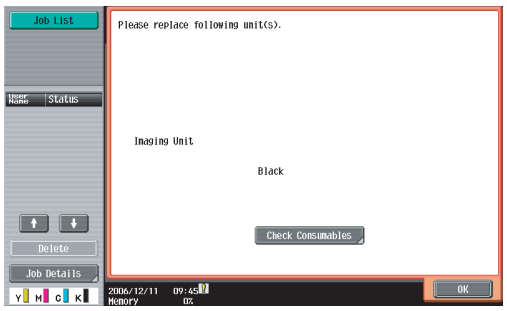
4036ma2133c0

B. When life is reached

- The IU life counter is used to keep track of IU life.
- When the life value is reached, a warning message is given on the screen. When a predetermined number of printed pages are produced after the life value has been reached, the machine inhibits the initiation of a new print cycle with a message prompting the user to replace the IU given on the screen.
- Warning screen and IU replacement screen is displayed differently by making adjustments to promoting expendable supplies in the service mode, choice of unit replacement and IU life stop setting in the security mode.

1

When a life value is reached



A00JT2E501DA

When the machine stops printing due to the end of IU (K) life

A00KT2E005DA

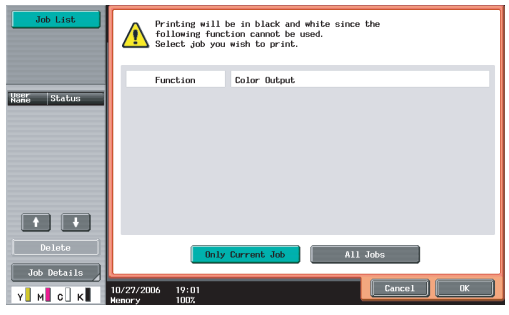
- If one of the color IUs reaches its life and a certain number of sheets are printed, the machine stops printing. In this case, by pressing the Continue operation key on the screen, monochrome copies instead of color copies can be made.

1

When the machine stops printing due to the end of color IU life

Continue operation key

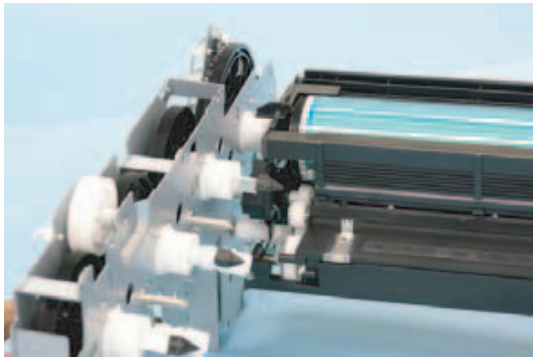
A00KT2E006DA



A00JT2E504DA

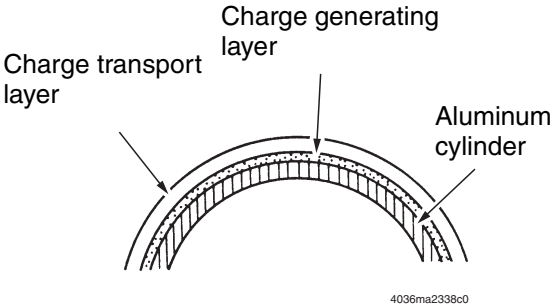
10. Photo conductor section

10.1 Composition

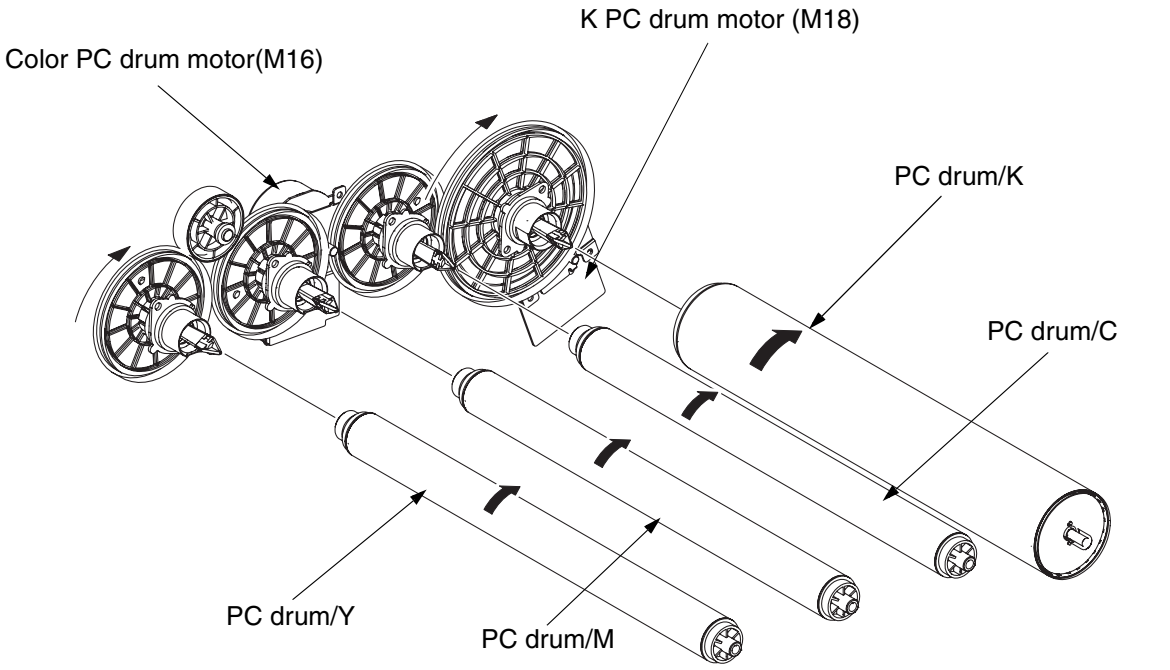


PC drum

A00JT2C033AA



10.2 Drive

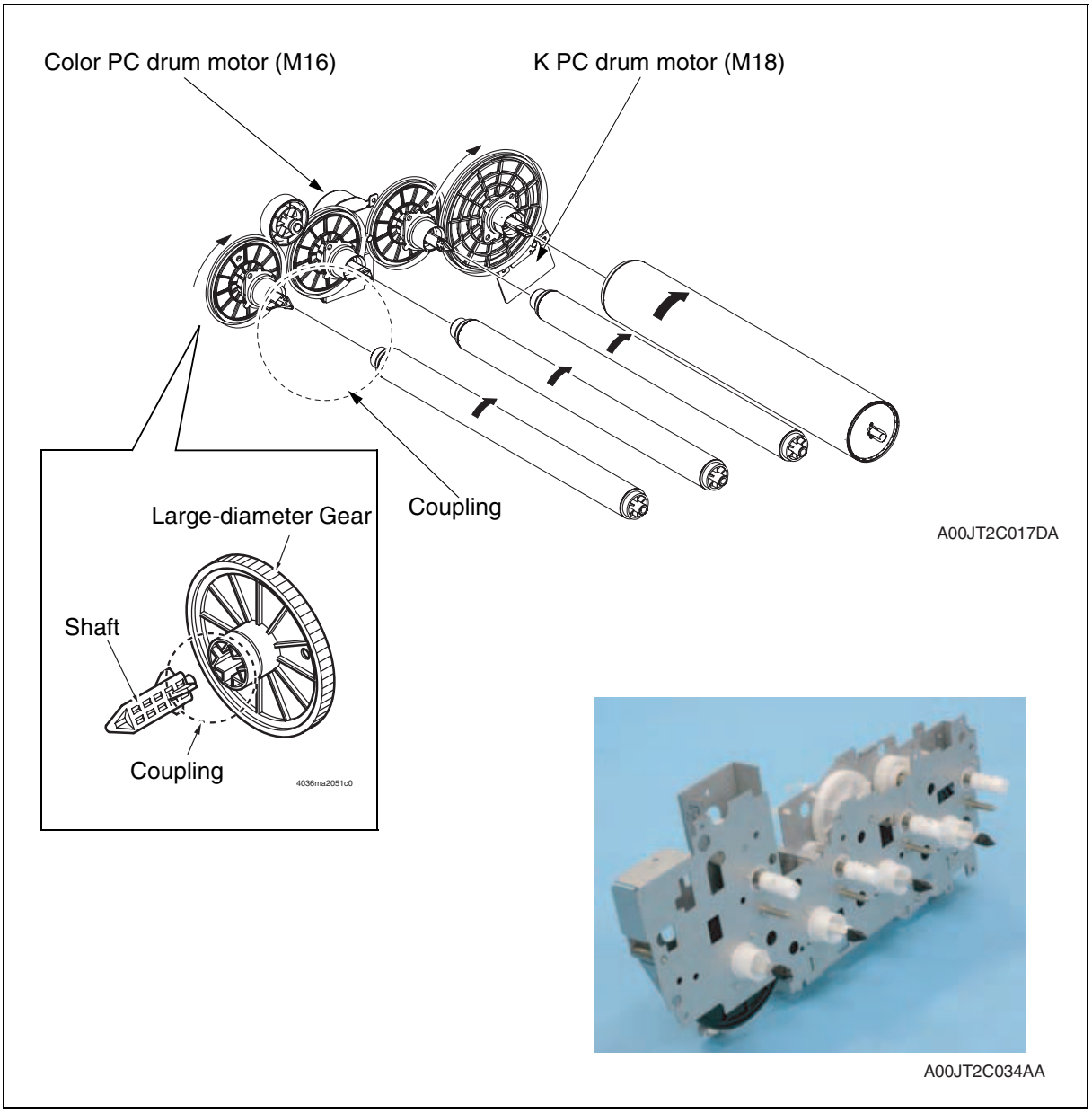


A00JT2C016DA

10.3 Operation

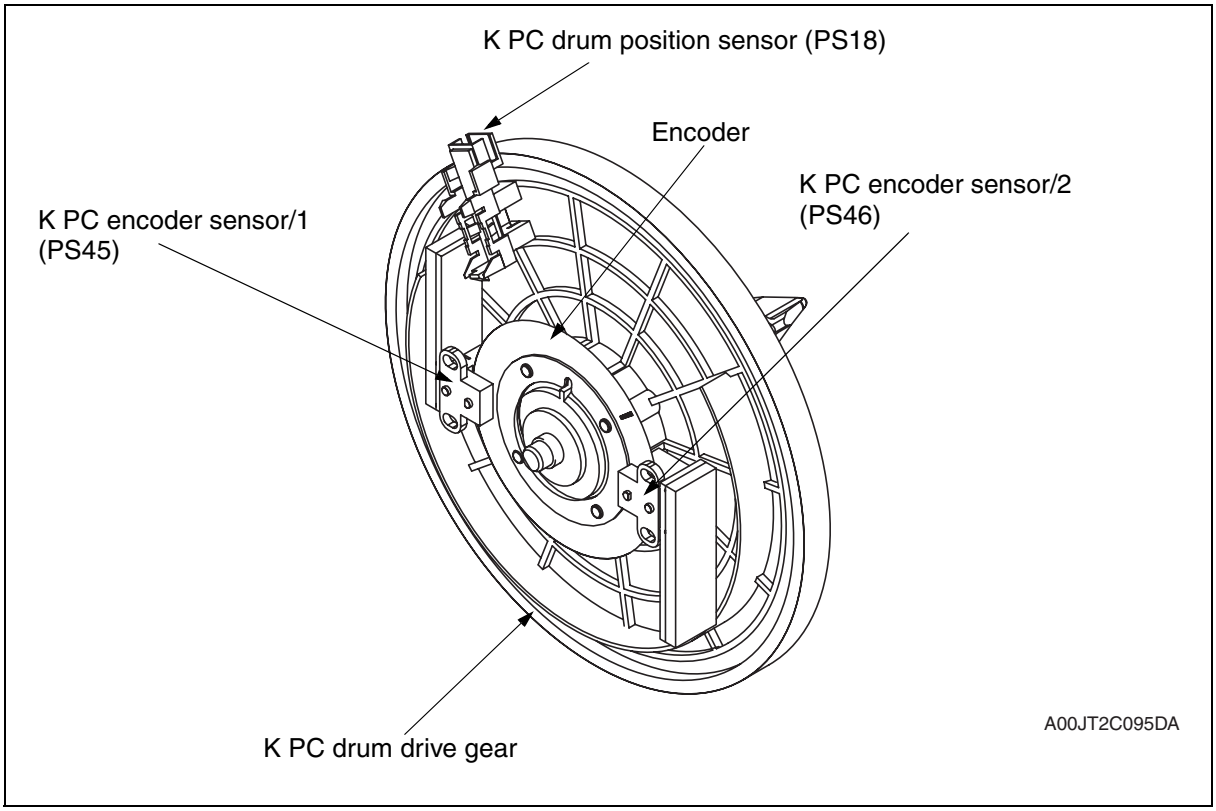
10.3.1 PC drum drive mechanism

- Two independent PC drum motors (for color and monochrome) are used for the drive mechanism to suppress incorrect color registration and uneven pitch.
- The color PC drum motor drives the PC drums/Y, M, and C, while the K PC drum motor drives the PC drum/K.
- Drive is transmitted to each of the PC Drums when the triangular coupling is engaged with the mating part that also has a triangular shape.
- CPM is different between color and monochrome printing. The K PC drum drive gear is larger than the color PC drum drive gear.



10.3.2 K PC drum phase control

- The K PC drum drive gear has a diameter larger than that of the color PC drum drive gears to enable the high-speed monochrome printing.
- The K PC drum diameter is also larger than that of the color drums. (Kϕ60 / YMCϕ30)
- It is impossible to perform the conventional phase control due to the difference in the PC drum diameters. By controlling the K PC drum motor speed, the machine reduces irregular rotation (color shift) caused by eccentricity of the K PC drum drive gear.
- The two K PC drum encoder sensors detect the rotation speed of the K PC drum drive gear. Based on the data, the K PC drum motor speed is controlled.
- The K PC drum position sensor detects the PC drum drive gear speed detection start position.

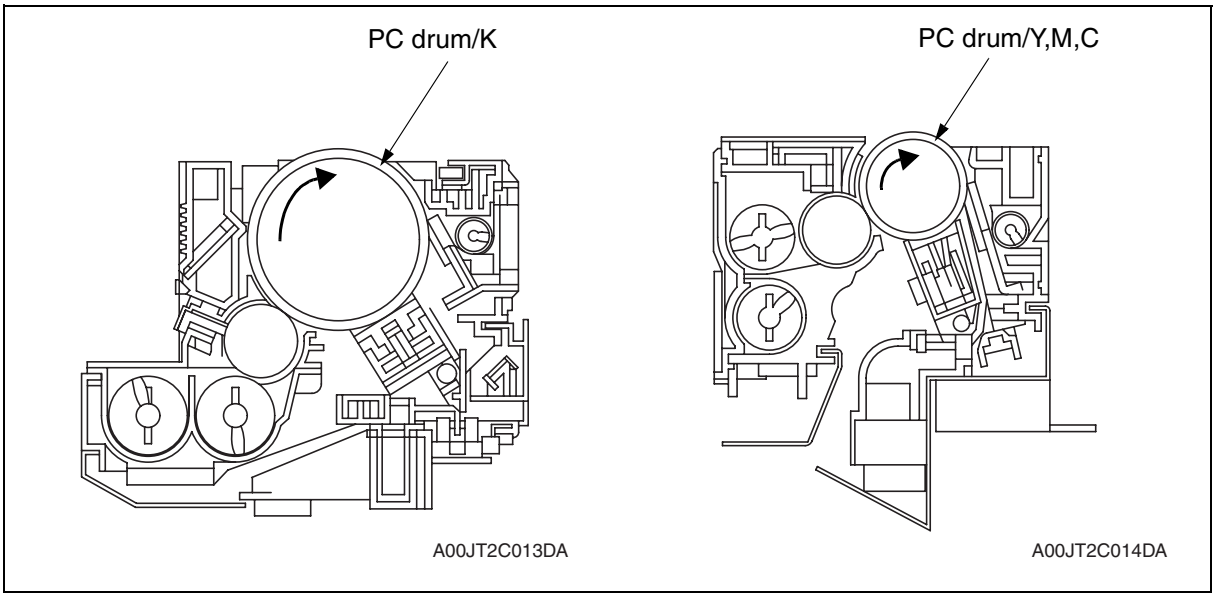


10.3.3 PC drum small amount rotation control

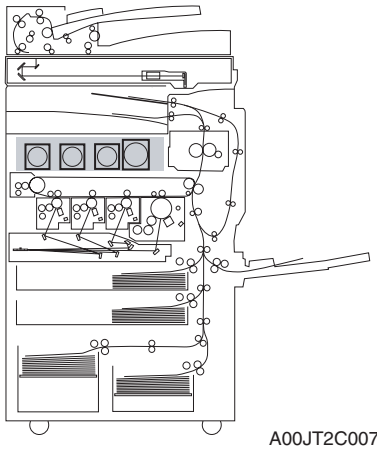
- Humidity around the IU can produce a difference in sensitivity among different PC drums. This could lead to drum memory, allowing black bands to occur in the image. In addition, ozone stagnant in areas near the PC drum charge corona reduces sensitivity of the PC drums, causing white bands to occur in the image.
- To prevent these image problems, that the PC drum is turned at regular intervals to keep the surface sensitivity uniform as temperature and humidity change.

A. PC drum small amount rotation operation timing

- During the standby state after the end of a print cycle, the PC drum small amount rotation is made under the following timings.
- The machine continues to print for more than a predetermined period of time. (The PC drum continues to run for more than a predetermined period of time.)
- The machine prints intermittently for a given period of time with an intermission of less than 10 minutes between print jobs. (The machine detects that the cumulative rotation time of the PC drum exceeds a given period of time.)
- PC drum cumulative rotation time is calculated based on cumulative drive distance of the PC drum.
- The time interval between small amount rotations is set different depending on how long the PC drum has been used and what the humidity and the temperature are inside the machine.



11. Charge Corona section



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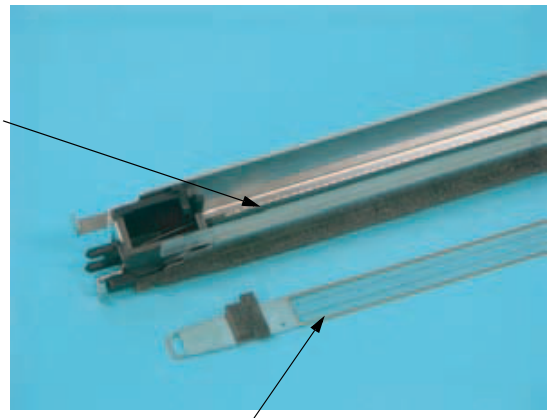
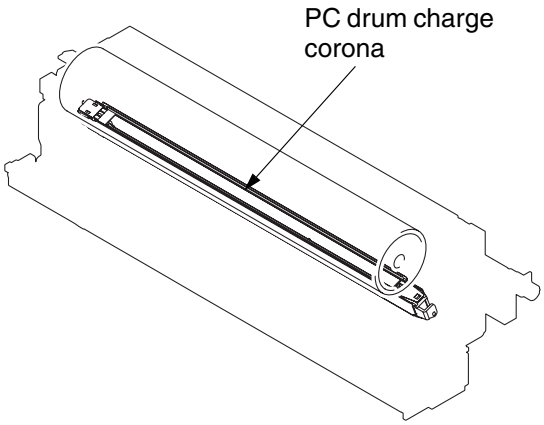


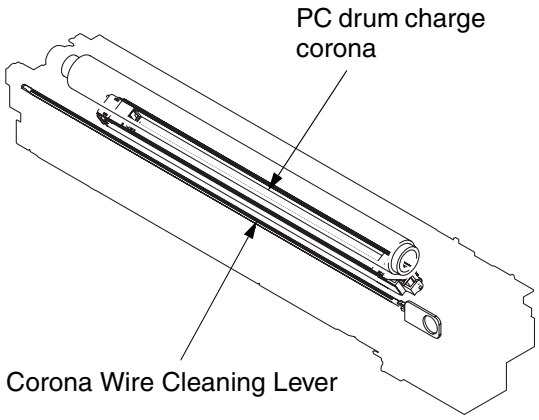
4038T2C027AA

IU/K

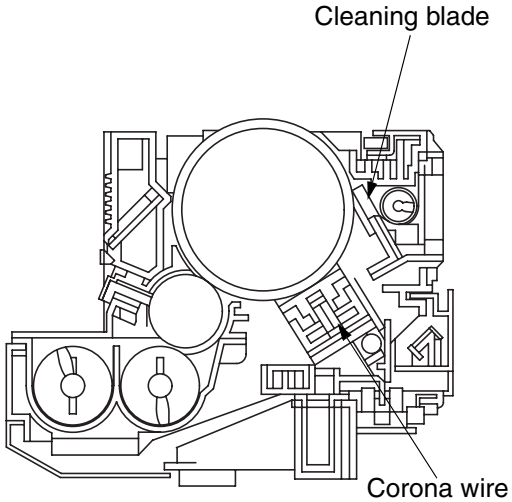


A00JT2C019DA

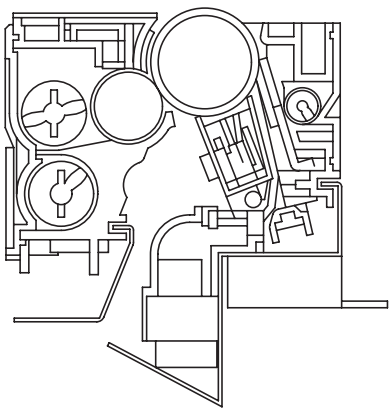
IU/Y,M,C



A00JT2C018DA



A00JT2C013DA

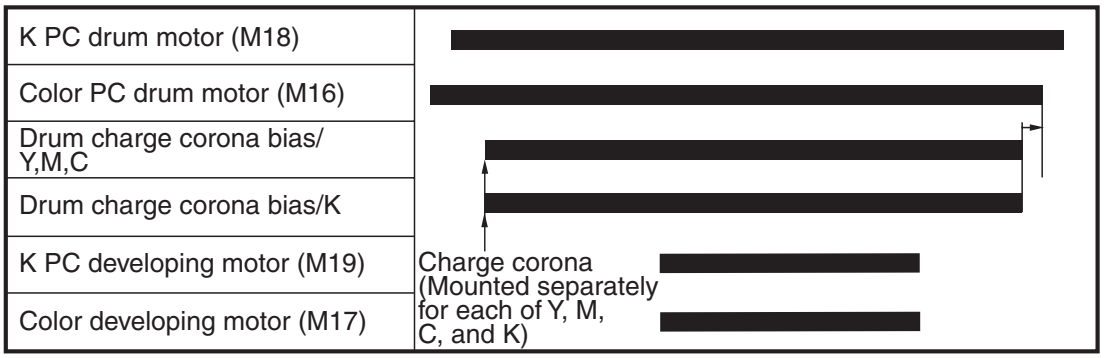


A00JT2C014DA

11.1 Operation

11.1.1 PC drum charge corona ON/OFF control

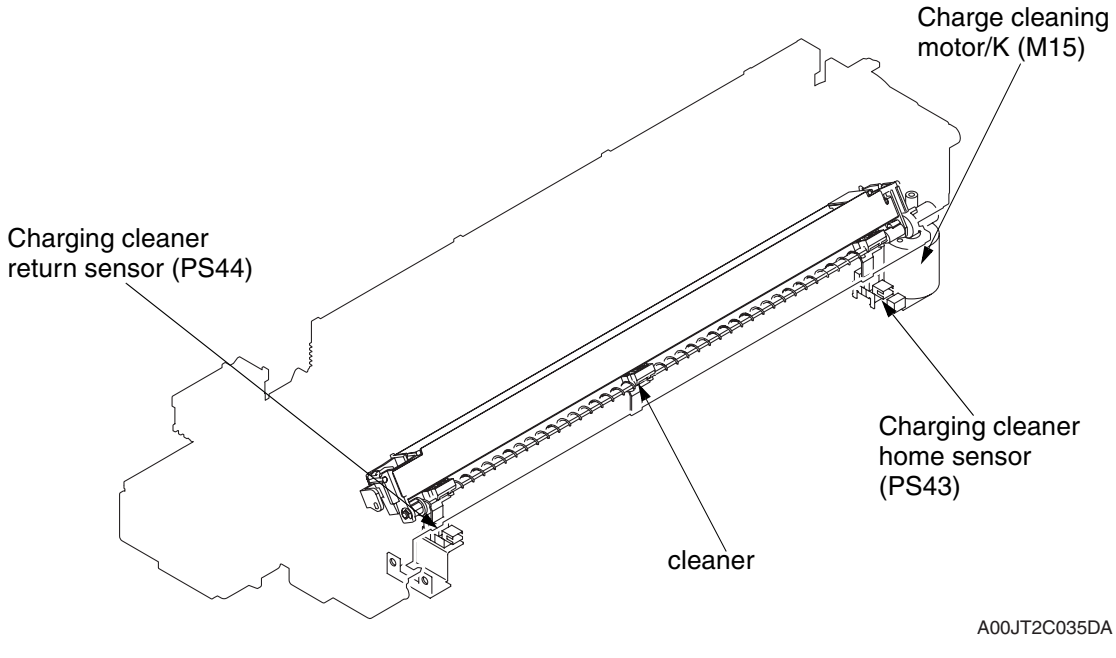
- The grid voltage (Vg) applied to the grid mesh is controlled through the image stabilization control.



A00JT2E512DA

11.1.2 Charge corona cleaning control

- A dirtied PC drum charge corona may cause bands or uneven image problems and the increase of the electric potential on the surface of the PC drum. To prevent those problems, the charge corona has a cleaning mechanism that periodically cleans the needle electrode and the grid mesh.
- The cleaner is driven by the charge cleaning motor/K.
- When the power switch is turned ON or the front door is opened/closed, the charge corona cleaner home position is detected.
- The charging cleaner home sensor detects the position (rear) of the charge corona cleaner. The charging cleaner return sensor (this side) detects the return position.
- Only IU/K has this cleaning control system as the IU/K operates longer hours than the other IUs.
- IU/Y, M, C needs to be cleaned by hand with the cleaning jig attached to each IU.



A00JT2C035DA

A. Operation timing

- When the count goes over 2700 during a print job, the cleaning operation starts after the completion of the print job. However, when the remaining number of pages of the job is 50 or more, the job is stopped and the cleaning operation is performed.
- The count method is shown below.

△2 • MF550

Paper length in the sub scanning direction	Count
216 mm or less	1
Over 216 mm and up to 432 mm	2
Over 432 mm	3

• MF450

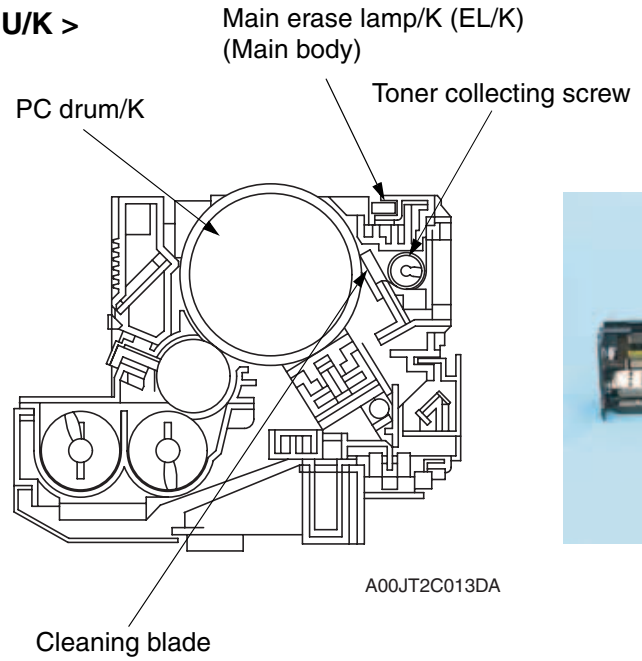
Paper length in the sub scanning direction	Count
216 mm or less	1
Over 216 mm and up to 432 mm	2
Over 432 mm and up to 648 mm	3
Over 648 mm and up to 864 mm	4
Over 864 mm and up to 1080 mm	5
Over 1080 mm	6

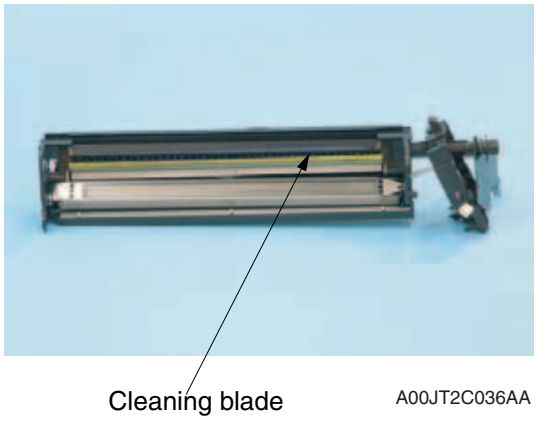
11.1.3 Cleaning/main erase mechanism

A. Main erase lamp/K control

- IU/K has a main erase lamp/K located on the upstream side of the cleaning blade to improve cleaning performance.
- Main erase lamp/K radiation onto the surface of the PC drum removes electric charge remaining on the surface and makes the cleaning operation by the cleaning blade easier.

< IU/K >

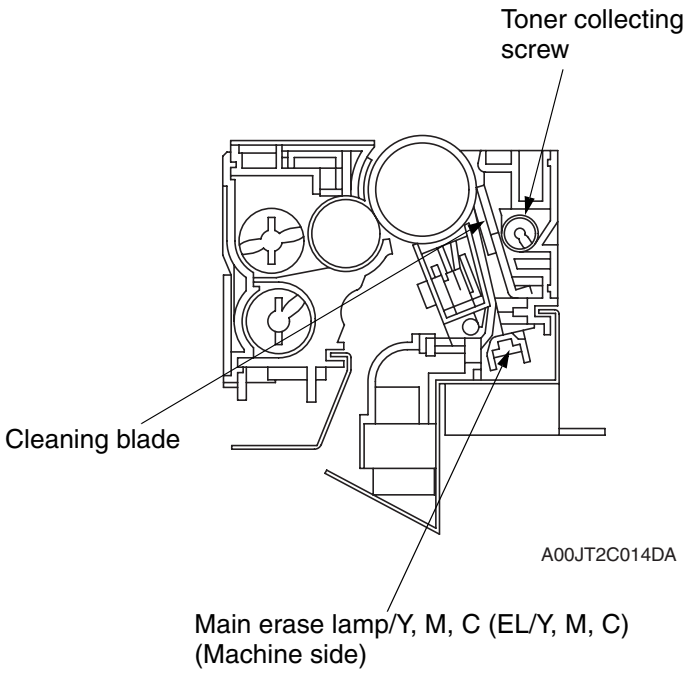




B. Main erase lamp/Y,M,C control

- The main erase lamp/Y, M, C radiation onto the PC drum surface neutralizes potential left on the surface of the PC drum.

< IU/Y,M,C >

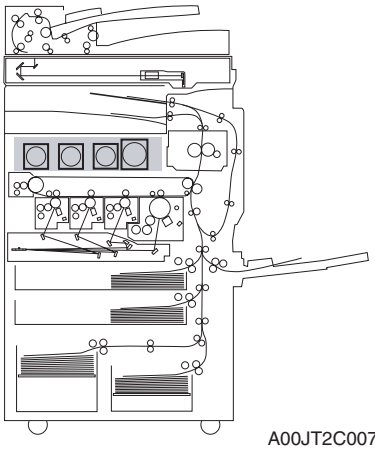


C. Cleaning/main erase operation

1. After the image transfer process, the PC drum surface is irradiated by the main erase lamp/K to remove potential left on the surface. (Only for IU/K)
2. The cleaning blade is pressed up against the surface of the PC drum, scraping residual toner off the surface (Blade abutting PC drum in a counter direction).
3. Toner, which has been scraped off the surface of the PC drum, is conveyed to the front side of the machine by the toner collecting screw. It is collected into the waste toner collecting box.
4. The PC drum surface is irradiated by the main eraser lamp/Y,M,C to remove (neutralize) potentials left on the surface.

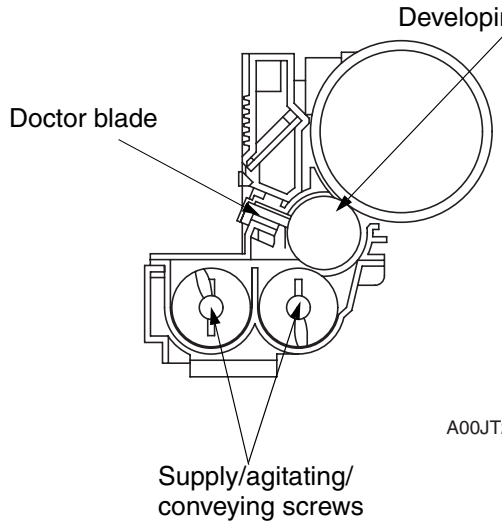
12. Developing section

12.1 Composition



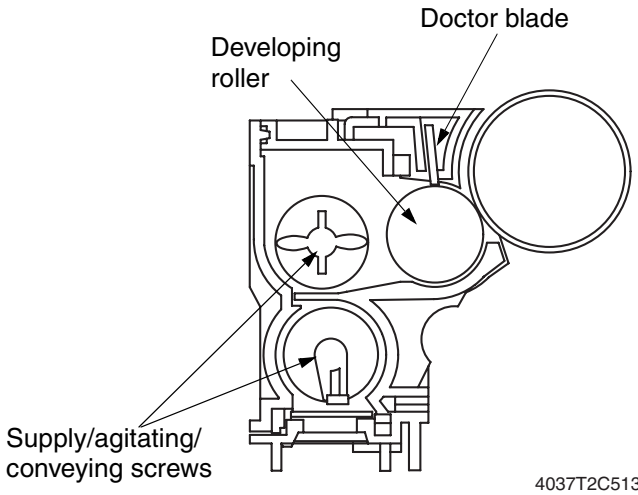
A00JT2C007AA

< K developing unit>

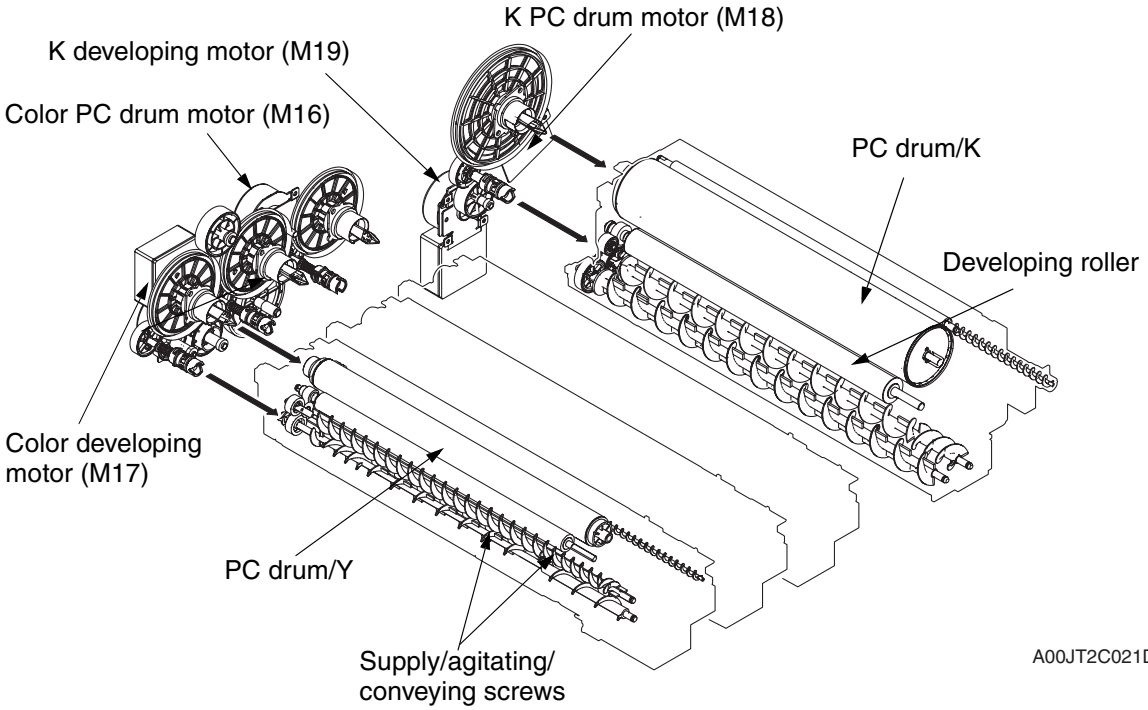


A00JT2C020DA

< Color developing unit >

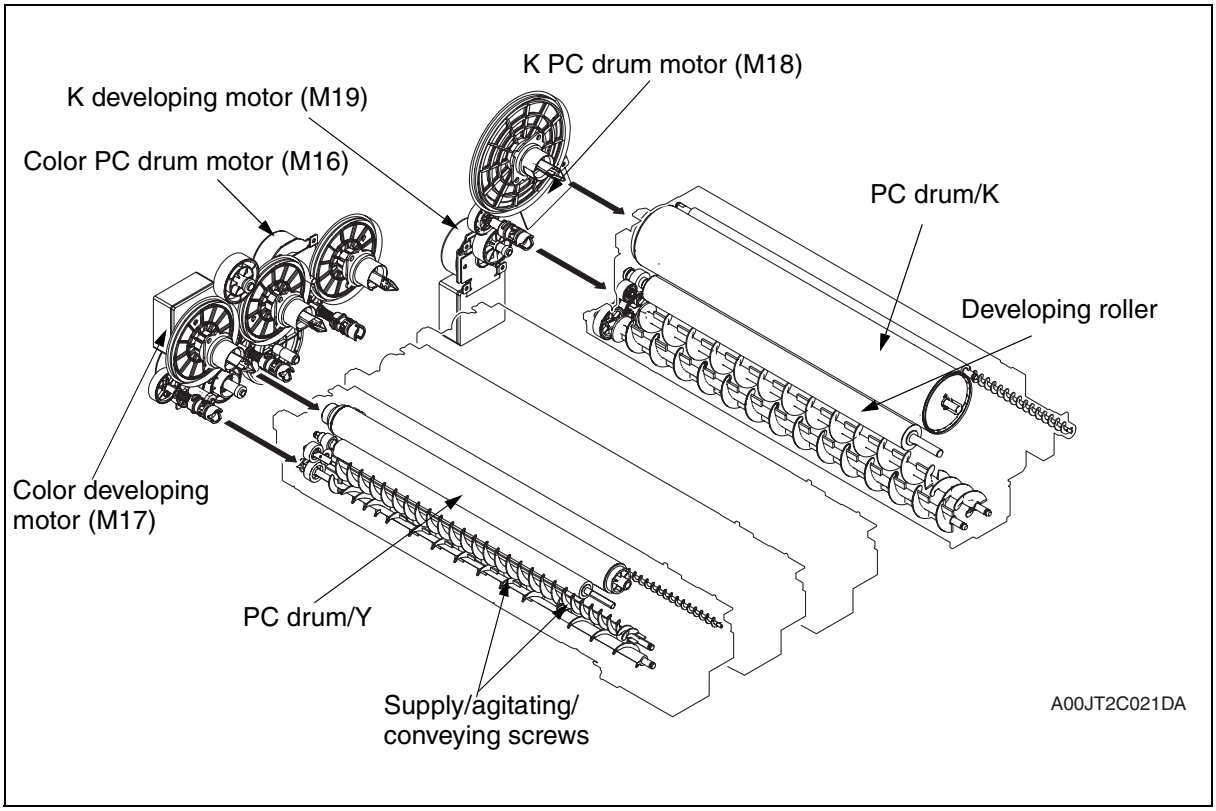


4037T2C513AA



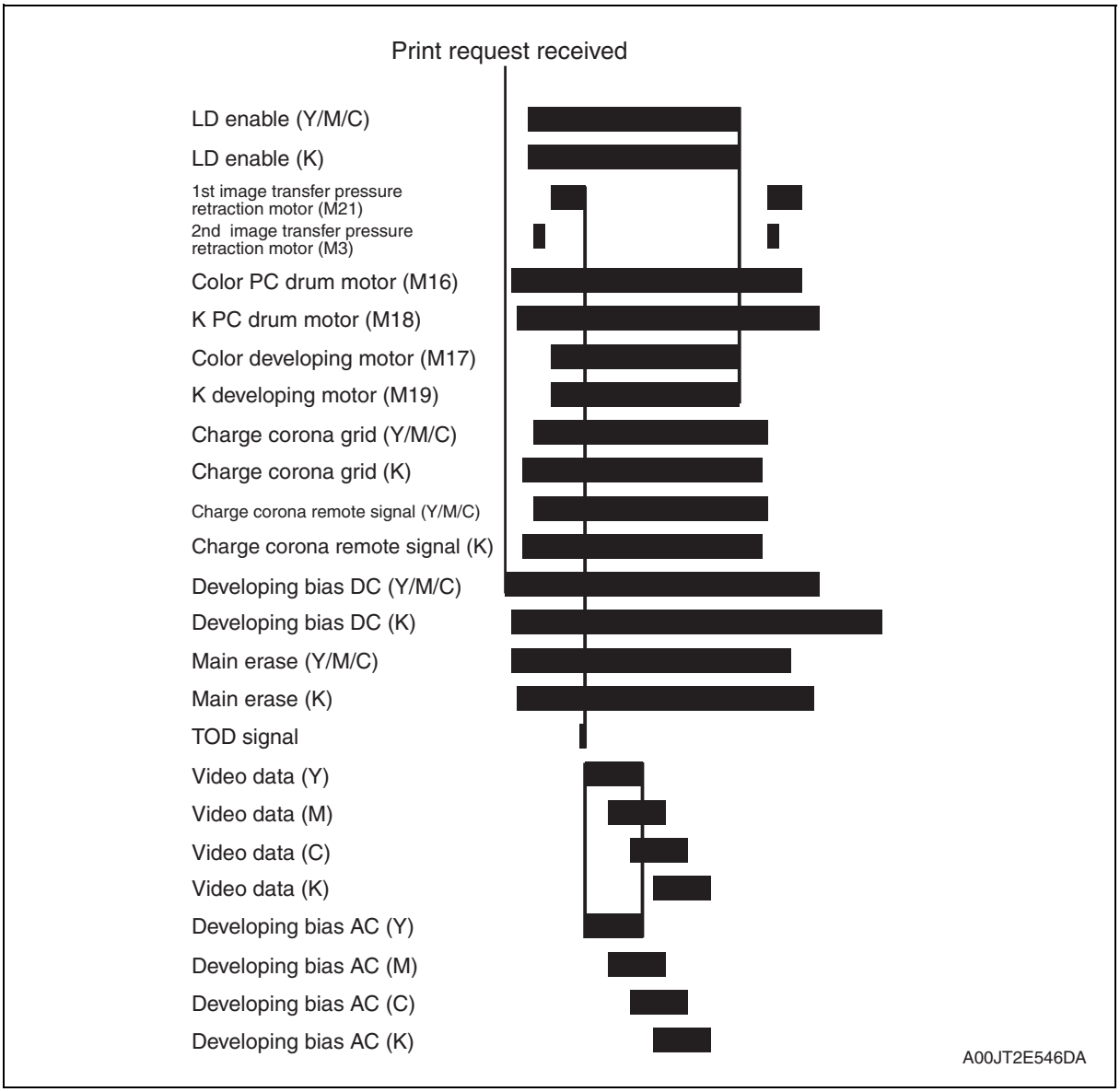
A00JT2C021DA

12.2 Drive


K PC drum motor (M18)
K developing motor (M19)
Color PC drum motor (M16)
PC drum/K
Developing roller
Color developing motor (M17)
PC drum/Y
Supply/agitating/ conveying screws
A00JT2C021DA

12.3 Operation

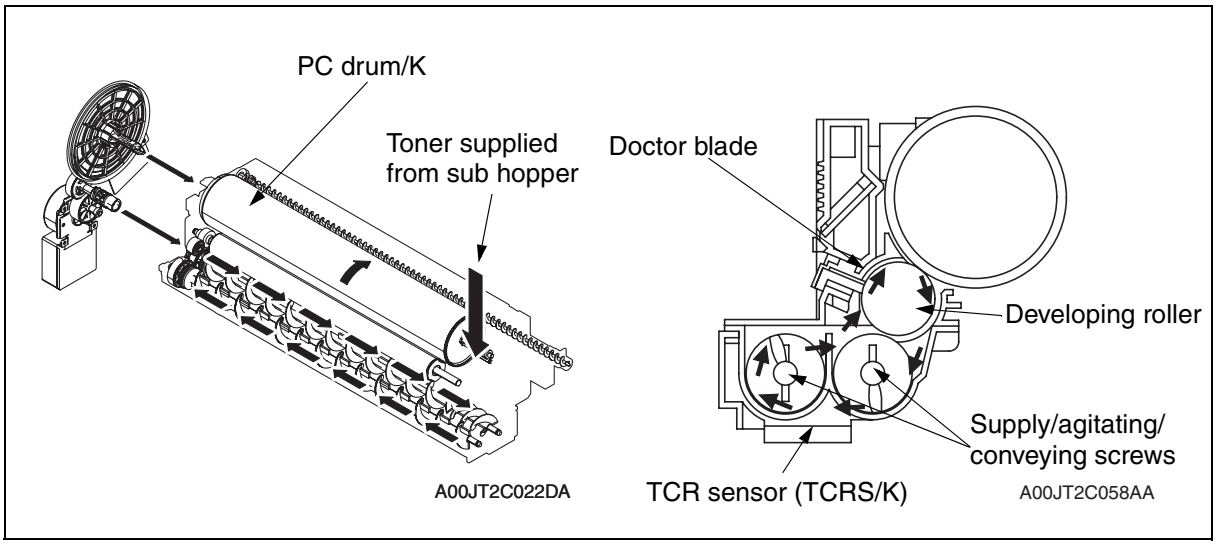
12.3.1 Developing drive control



12.3.2 Developer flow

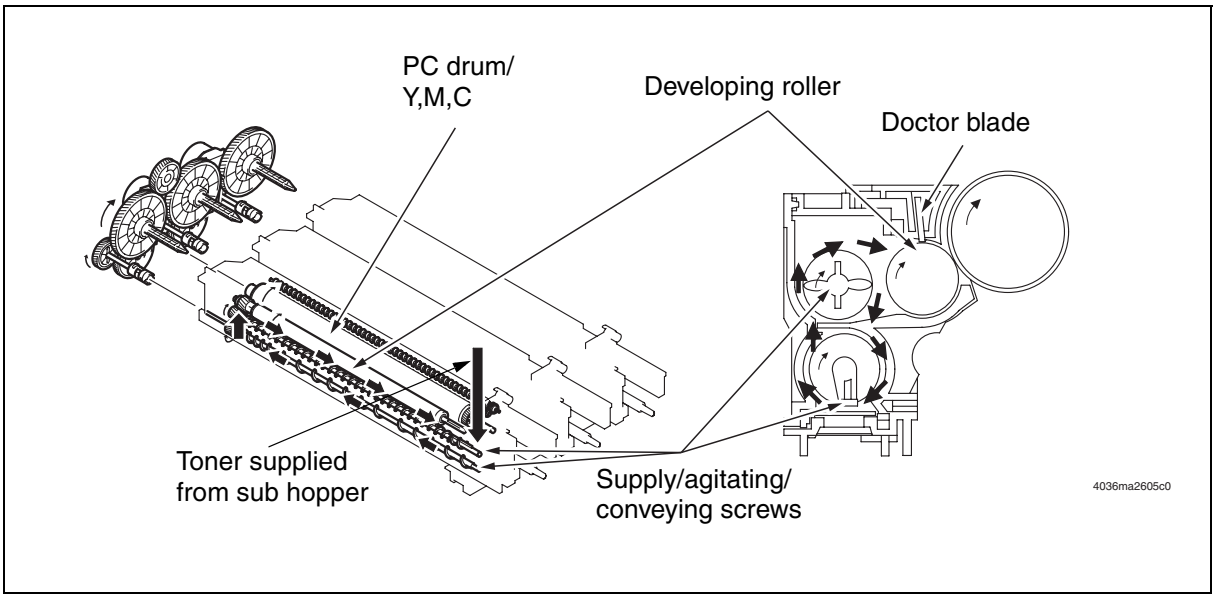
A. IU/K

1. Toner supplied from the front end of the Developing Unit is fed to the lower screw. It is then fed to the rear of the unit, while being mixed with developer and electrically charged by the Supply/Agitating/Conveying Screws.
2. The TCR sensor installed on the underside of the developing unit detects toner-to-carrier ratio during this time.
3. The developer conveyed to the rear of the unit is carried to the screw on the right.
4. The developer is conveyed onto the developing roller. The doctor blade then controls the height of the developer brush to ensure that the developer on the developing roller levels out.
5. Toner sticks to the electrostatic latent image on the surface of the PC drum. Developer that is left on the sleeve is returned to the screw on the right by the magnetic pole positioning of the developing roller. It is then conveyed to the front of the unit.



B. IU/Y,M,C

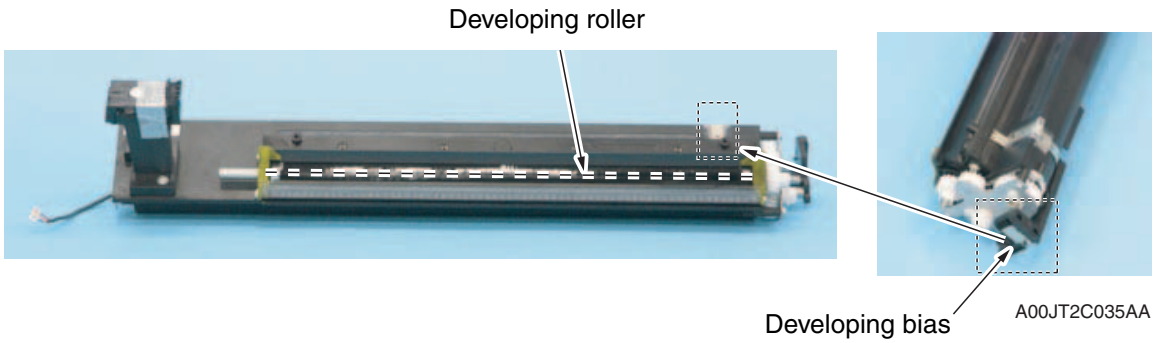
1. Toner supplied from the front end of the Developing Unit is fed to the lower screw. It is then fed to the rear of the unit, while being mixed with developer and electrically charged by the Supply/Agitating/Conveying Screws.
2. The TCR Sensor installed on the underside of the Developing Unit detects toner-to-carrier ratio during this time.
3. The developer, fed to the rear of the Developing Unit, is conveyed further to the upper screw.
4. The developer is conveyed onto the developing roller. The doctor blade then controls the height of the developer brush to ensure that the developer on the developing roller levels out.
5. The Toner sticks to the electrostatic latent image on the surface of the PC Drum. The developer that is left on the Sleeve is returned to the upper screw by the magnetic pole positioning of the Developing Roller. It is then conveyed to the front side of the Developing Unit.



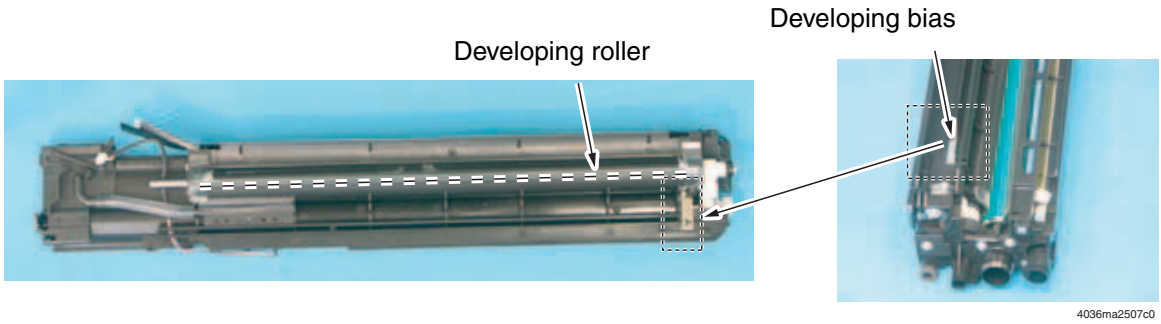
12.3.3 Developing bias

- The developing bias voltage (Vdc) is applied to the developing roller so that an adequate amount of toner is attracted onto the surface of the PC drum.
- To help toner to be attracted more easily to the surface of the PC drum, the developing bias (Vb) of Vdc+Vac is applied during development. AC component is applied only while development is taking place. At any other timing, only Vdc is applied.
- The developing bias (Vb) is supplied from high voltage unit /1.

Imaging unit/K

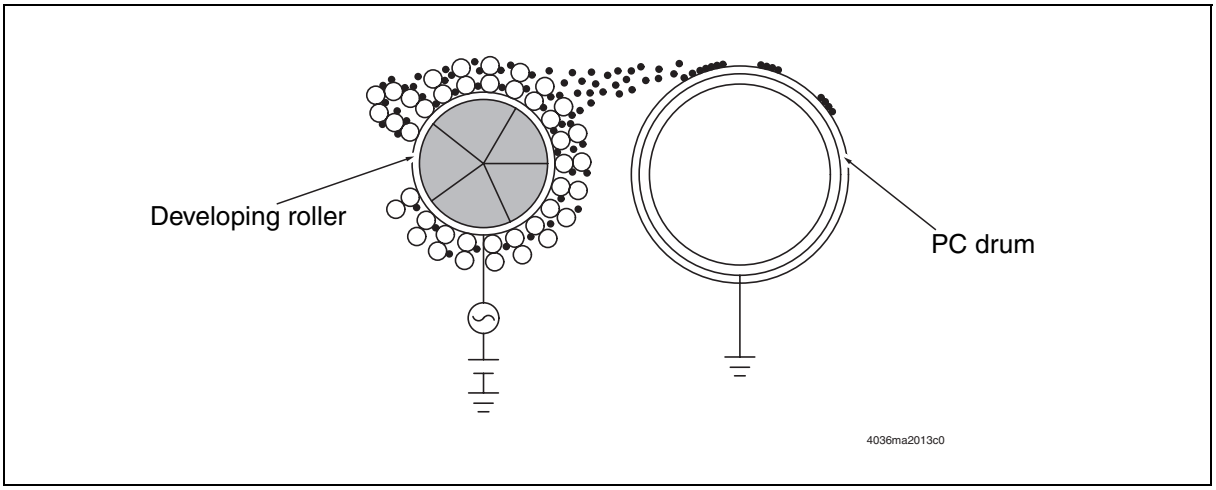


Imaging unit/Y,M,C



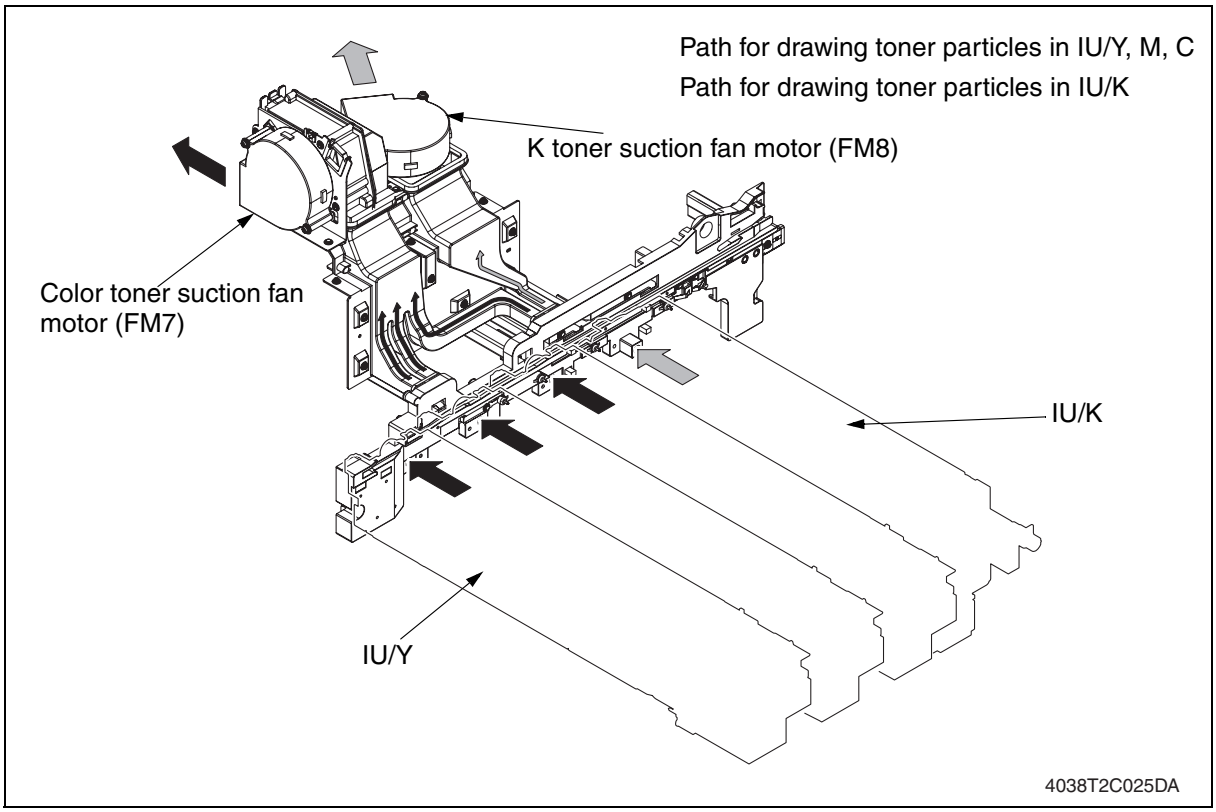
12.3.4 HMT (high grade micro toning) development

- The machine employs the two-component non-contact development system.
- With the HMT method, the magnetic developer brush does not rub against the surface of the PC drum (the images). Accordingly, sharper line images can be reproduced, involving no uneven image density at the trailing edge or thin lines and achieving even finer reproduction of the solid image areas.



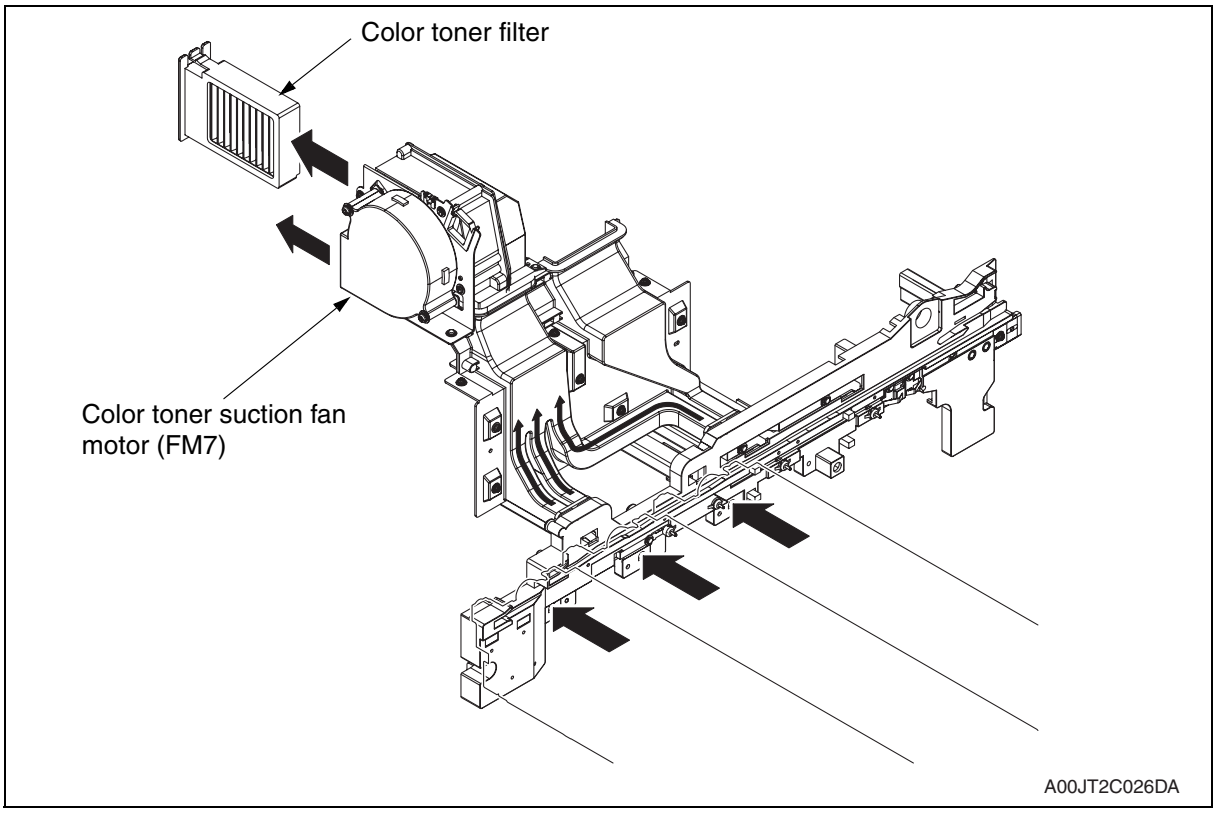
12.3.5 Developer Scattering Preventive Mechanism

- To prevent the image and the machine interior from being dirtied, the color toner suction fan motor and K toner suction fan motor are incorporated to trap toner particles rising up inside the machine.



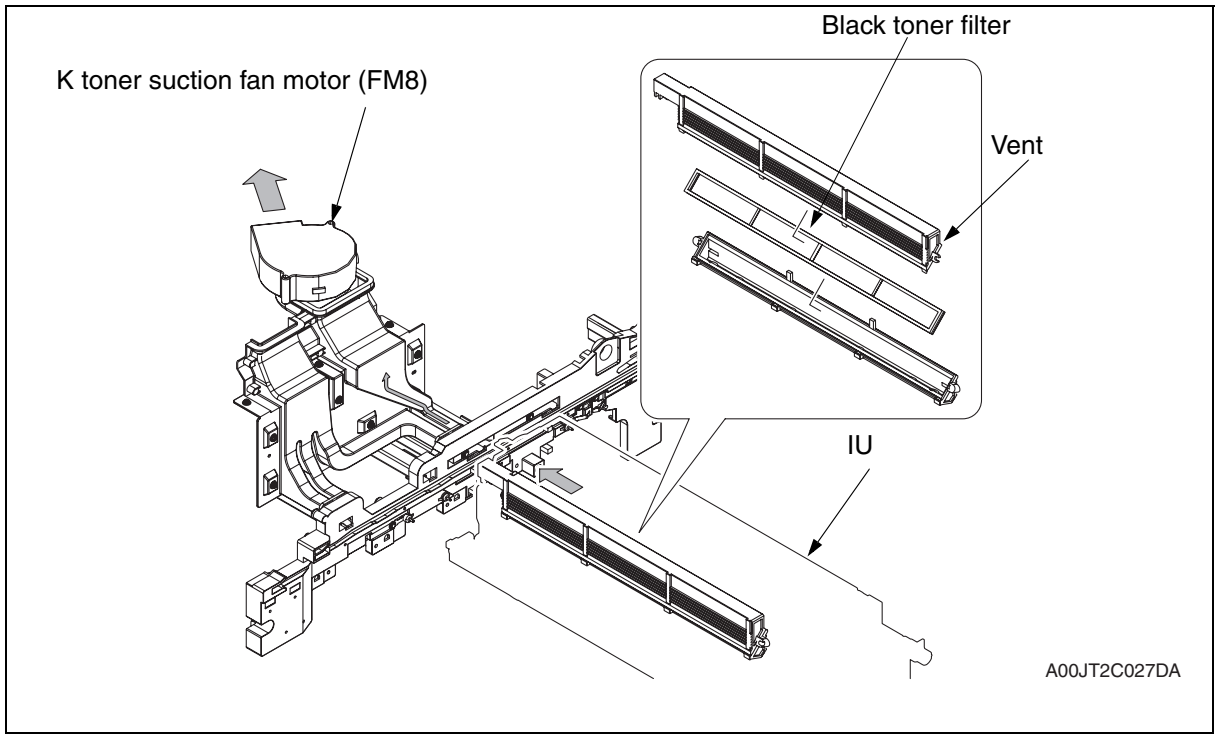
A. IU/Y, M, C

- For IU/Y, M, C, a color toner filter is installed at the rear of the machine and toner particles are trapped by the color toner suction fan motor during development.



B. IU/K

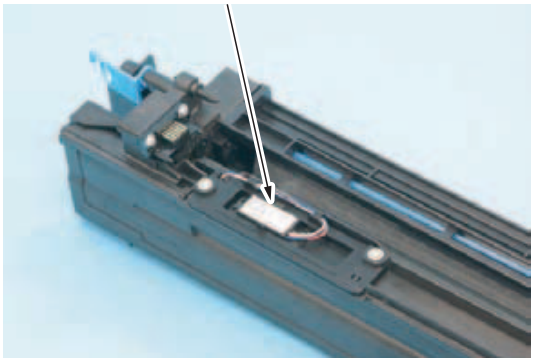
- For IU/K, a black toner filter is installed under the IU and toner particles are trapped by the K toner suction fan motor during development.
- As the K suction black toner filter and the IU unit come together as one piece, they are replaced together.



12.3.6 TCR sensor control

- The TCR sensor is mounted on the underside of each of the developing sections. The sensor for C, M, Y and K is a magnetic type. Each of these sensors detects toner-to-carrier ratio (T/C) of the developer. The reading is used for determining the amount of toner supplied.
- Individual TCR sensors are automatically adjusted when a new imaging unit is installed in the machine and they cannot be adjusted manually.
- The target T/C ratio is 7% for both color and K.
- The target T/C ratio can be changed in the TCR level setting available from the service mode.
- The magnetic permeability (powder density) of the carrier in the developer is measured to determine the T/C.
- A mylar is provided for the conveying screw portion to scrape toner off the surface of the TCR sensor. (Only IU/Y, M, C)
- The TCR sensor is integrated with the imaging unit. When the TCR sensor is to be replaced with a new one, the entire imaging unit must be replaced.

TCR sensor/Y,M.C



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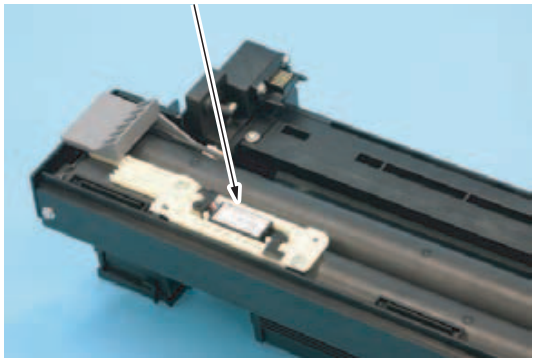
TCR sensor/K



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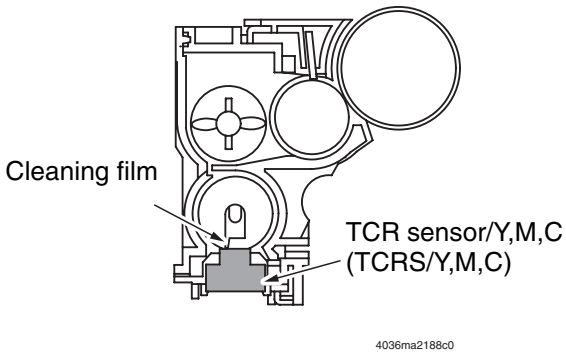
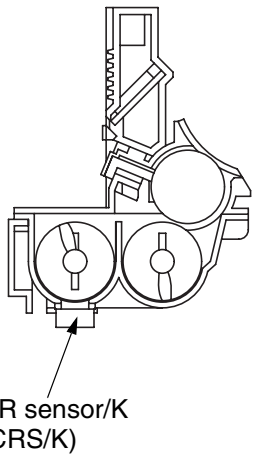


4036ma2188c0



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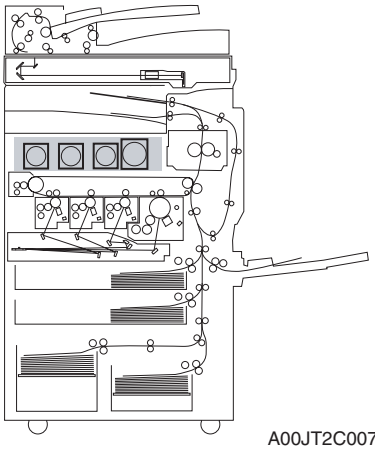
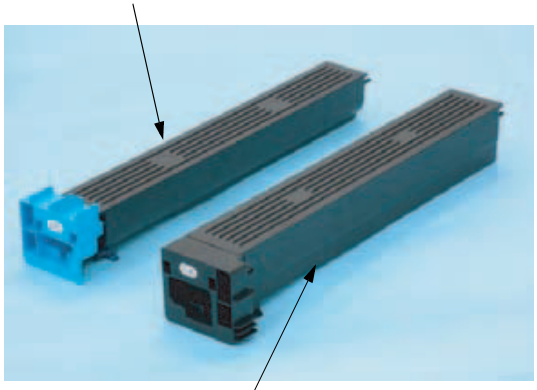
13. Toner supply section

13.1 Composition



A00JT2C007AA



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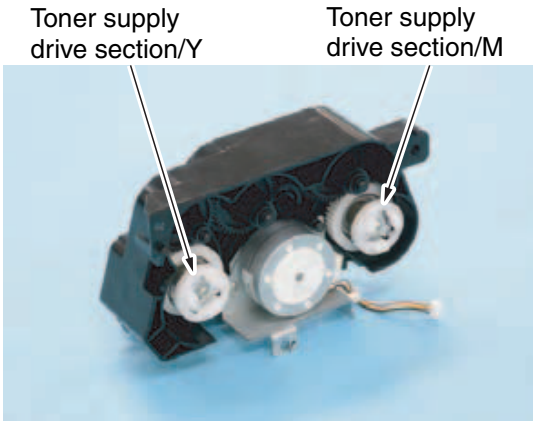
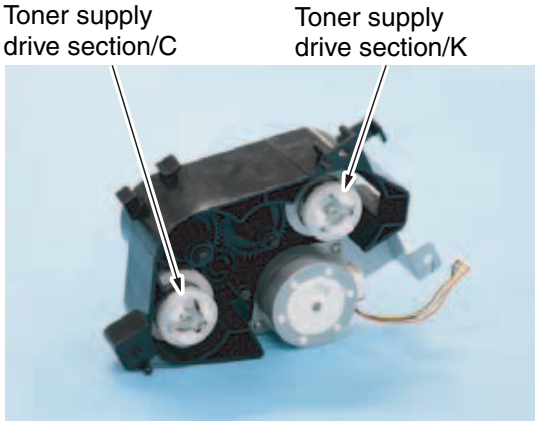


A00JT2C041AA



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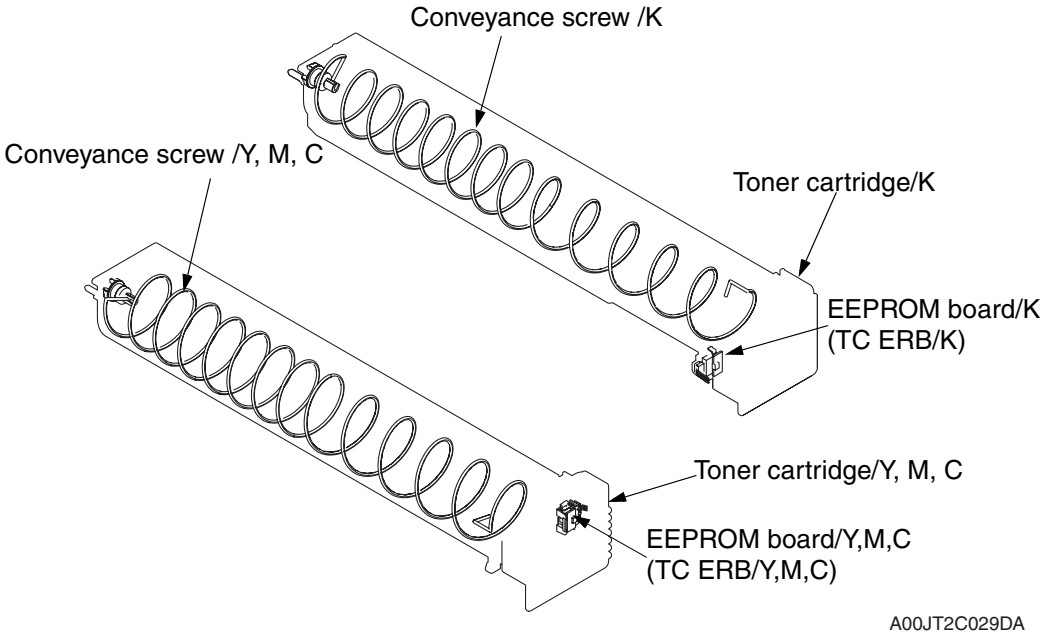

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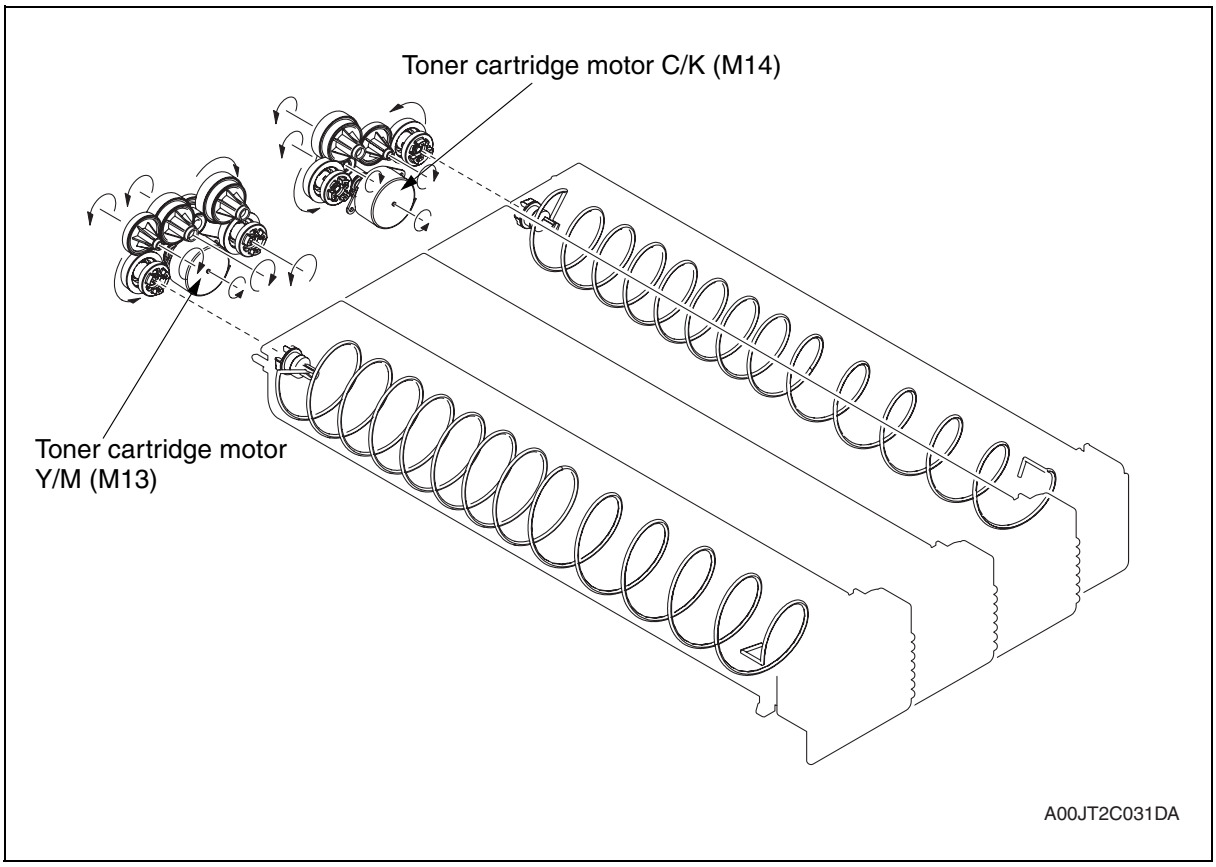
13.2 Drive


Toner cartridge motor C/K (M14)
Toner cartridge motor
Y/M (M13)
A00JT2C031DA

13.3 Operation

13.3.1 Toner replenishing mechanism/control

A. Overview

- Toner replenishing mechanism consists of two toner supply steps. One replenishment step is from the toner cartridge to the sub hopper and the other is from the sub hopper to the developing unit.

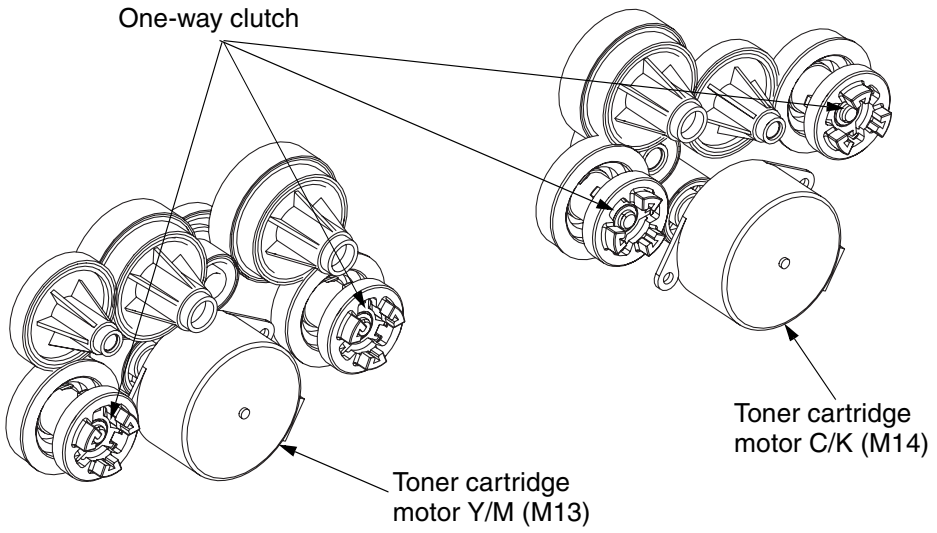
B. Mechanism of toner replenishing to the sub hopper

- In the toner replenishing step from the toner cartridge to the sub hopper, a single toner supply motor is turned either forward or backward to supply toner of two different colors. (A toner cartridge motor for K/C and a toner cartridge motor for Y/M)
- The toner empty sensor located in the sub hopper detects the remaining toner amount and controls toner replenishment from the toner cartridge to the sub hopper.

Toner cartridge motor C/K	K toner	C toner
Turned forward	Energized	Deener-gized
Turned backward	Deenergized	Energized

Toner cartridge motor Y/M	Y toner	M toner
Turned forward	Energized	Deener-gized
Turned backward	Deener-gized	Energized

1

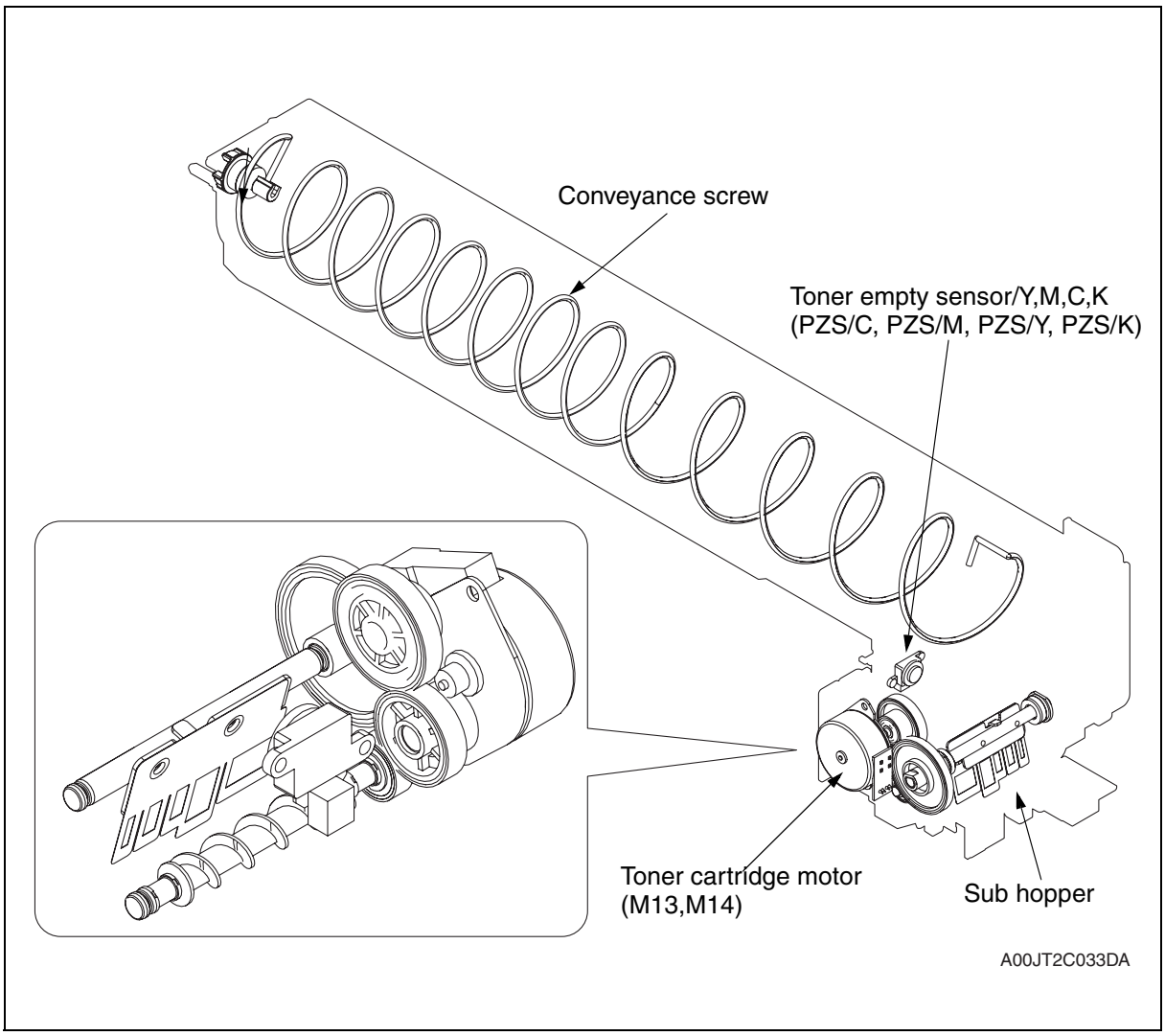


C. Operation of toner replenishment to the sub hopper

1. Drive of the toner cartridge motor is transmitted through a gear train to the drive gears of the toner cartridges of two colors. A one-way clutch is used for each of these drive gears, meaning that the drive gears turn in one direction only. Either one of these two drive gears is turned according to whether the toner cartridge motor turns forward or backward.
2. As the drive gear turns, the conveyance screw installed inside the toner cartridge rotates to transfer the toner to the toner cartridge replenishing port. Then the toner goes through the carrier pipe of the main body and drops into the sub hopper port to replenish toner to the sub hopper.

D. Control of toner replenishment to the sub hopper

- Toner is supplied from the toner cartridge to the sub hopper based on the detection of the toner empty sensor.

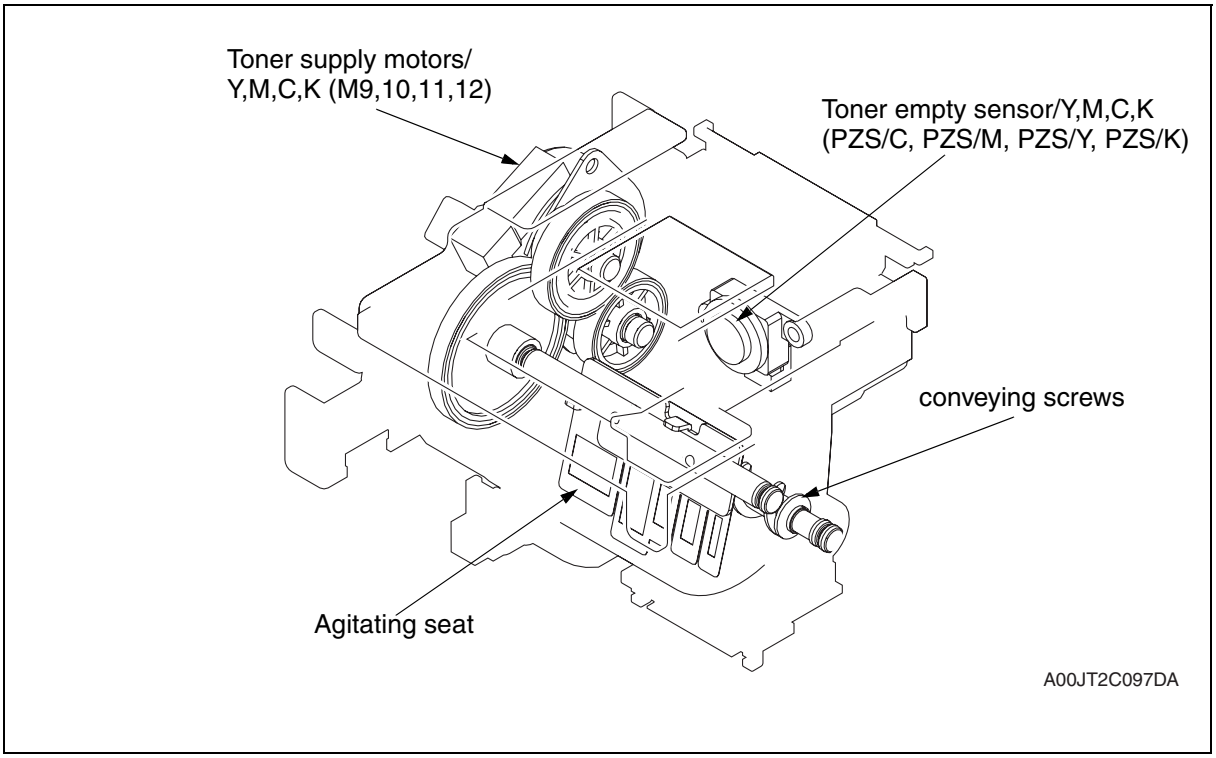


E. Replenishing speed selection control

- Depending on the toner amount to be replenished, the toner cartridge motor selects a rotation speed of either low or high.
- When much toner remains in the cartridge, the toner cartridge motor rotates at the low speed.
- When the toner cartridge near empty is detected, toner amount that can be replenished within a certain time decreases. Therefore, toner cartridge motor starts to operate at high speed.

F. Control of toner replenishment to the developing unit

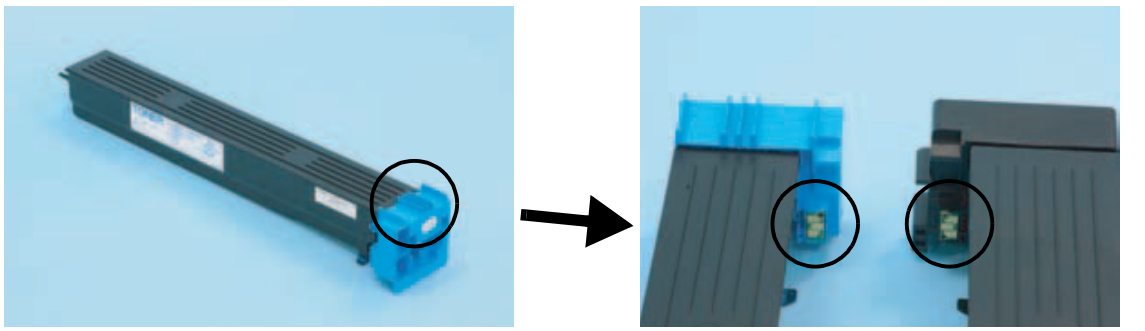
- Toner, which has been supplied from the toner cartridge to the sub hopper, is replenished to the developing unit by the toner supply motors that independently operate for Y, M, C, and K
- T/C is detected when the developing clutch/K is energized for K or when the color developing motor is energized for C, M, and Y.
- Based on T/C ratio detected by the TRC sensor and amount of consumption calculated by the dot counter, toner replenishing time (amount) is determined.
- When the machine determines the toner replenishing, sometime it detects the toner amount that surpasses the maximum volume for one replenishing control. If it is not possible to replenish the supply of the required amount of toner within this maximum replenishing time, the reminder time is stored in memory and added to the replenishing time for the next replenishing sequence.



13.3.2 Toner cartridge life control

A. Toner cartridge detection/new unit detection timing

- Individual cartridge detection is controlled by means of accessing the data of EEPROM board when the front upper door is closed or the power switch is turned ON.
- Based on the data, the machine confirms if the cartridge is mounted or not.
- After detecting the presence of the cartridge, with the data machine checks if the cartridge is new or not.



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13.3.3 Toner cartridge life control

- The amount of toner remaining in the cartridge is displayed as the four states, normal, toner cartridge near empty, toner cartridge empty, and sub hopper empty.

Remaining toner amount	Description
Normal	Enough toner remains in the toner cartridge and the sub hopper. (Low speed replenishment)
Toner cartridge near empty	Low speed replenishment cannot supply the required amount of toner to the sub hopper within a certain time. (Switch to the high speed replenishment)
Toner cartridge empty	Even high speed replenishment cannot supply the required amount of toner to the sub hopper within a certain time.
Sub hopper empty	Toner inside the sub hopper is running out and the T/C ratio in the developing unit is becoming lower than the threshold.

- Normal: The number of pages that can be printed is 7,000 or more.
- Toner cartridge near empty: The number of pages that can be printed is less than 5,000-7,000.
- Toner cartridge empty: No toner remains in the toner cartridge.
  The number of pages that can be printed is less than 1,400.
- Sub hopper empty: The machine stops printing.

A. Toner cartridge near empty detection control

- When new toner is set, toner remaining level is set to TC EEPROM board. Based on the remaining level, the machine calculates the toner near empty detection timing. When the hours for which the toner cartridge motor has turned at the low speed exceeds a predetermined period of time and the sub hopper toner empty sensor continuously detects toner empty 10 times or more, the toner near empty warning is displayed.

B. Toner cartridge empty control

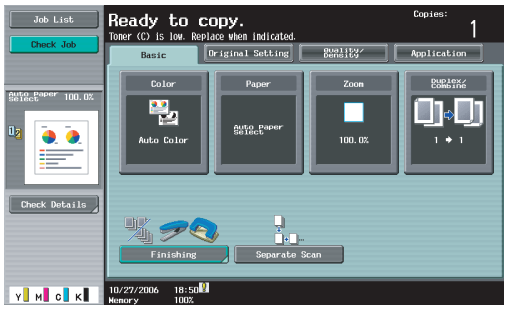
- After the toner cartridge empty condition is detected, if the sub hopper toner empty sensor continuously detects toner empty 10 times or more, the toner empty warning is displayed.

C. Sub hopper toner empty detection

- After a near-empty condition is detected, the toner density detected by the TCR sensor, at every T/C ratio detection timing, is compared with the target toner density to calculate the density difference. The count number defined according to each density difference is added, and when the value reaches the given level, toner empty warning is displayed.

△3

Toner cartridge near-empty



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Toner cartridge empty

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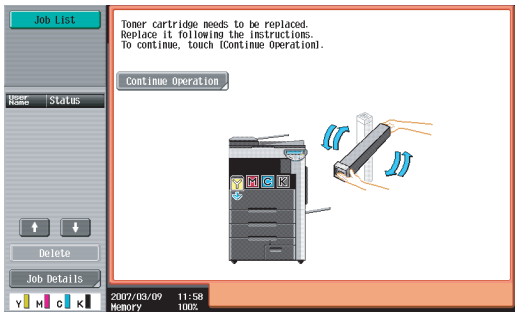
Sub hopper empty



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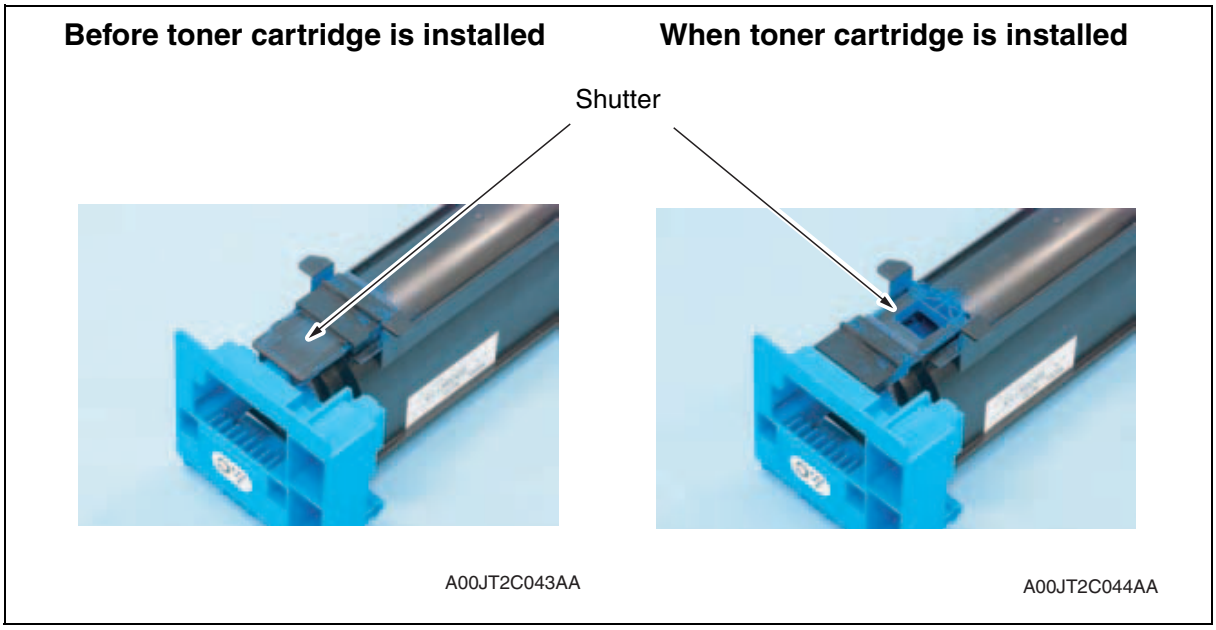
- A different toner empty screen is displayed if “User” is selected for “Unit change” available from the Service Mode.

13.3.4 Shutter mechanism

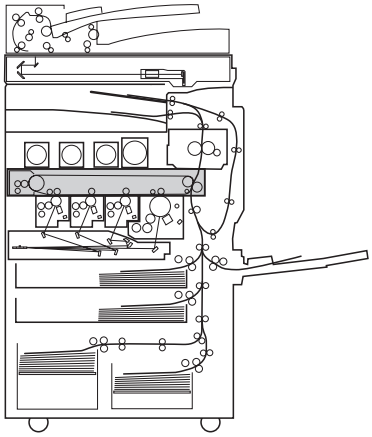
- To prevent toner from being spilled when the toner cartridge is removed from the machine, there is a shutter mechanism provided. When the toner cartridge is installed in the machine, the shutter opens.
- Put the replacement port face down to keep the cover close.



14. Transfer Corona section

14.1 Composition

14.1.1 1st Image Transfer section



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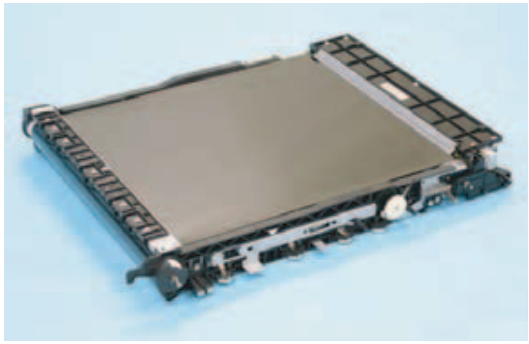

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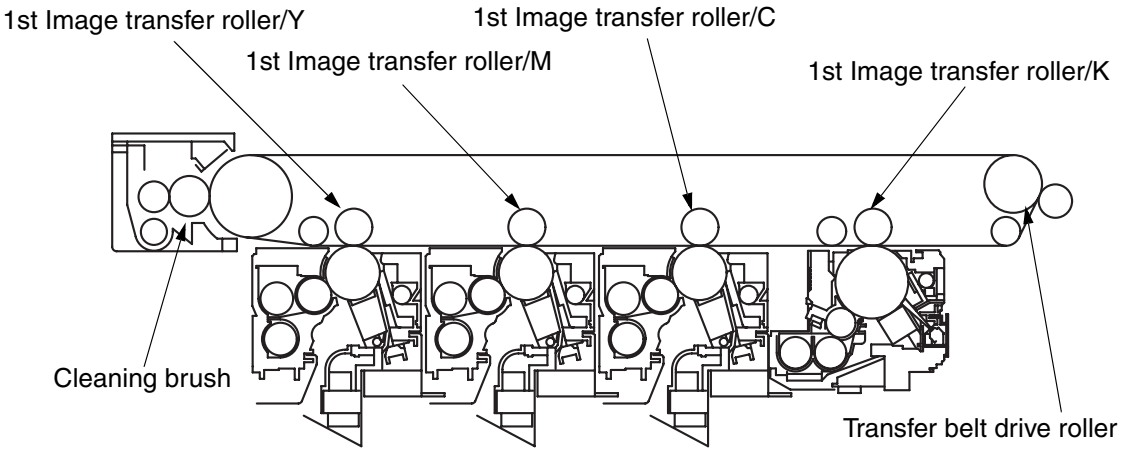

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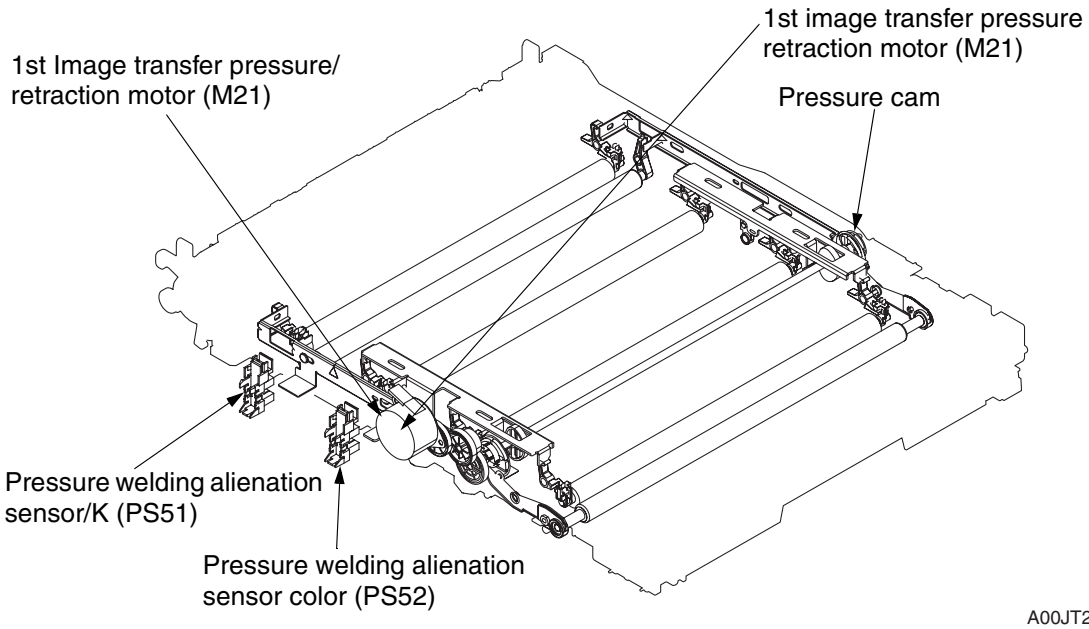

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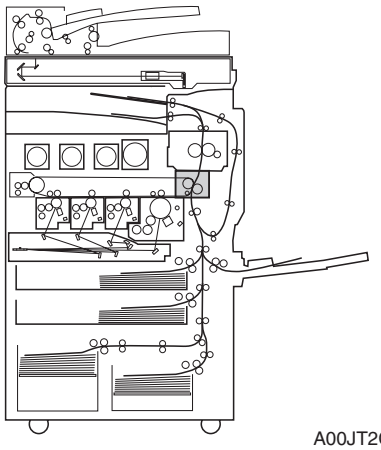
14.1.2 2nd Image Transfer section



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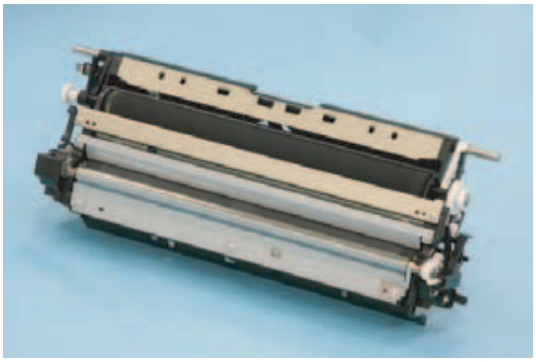

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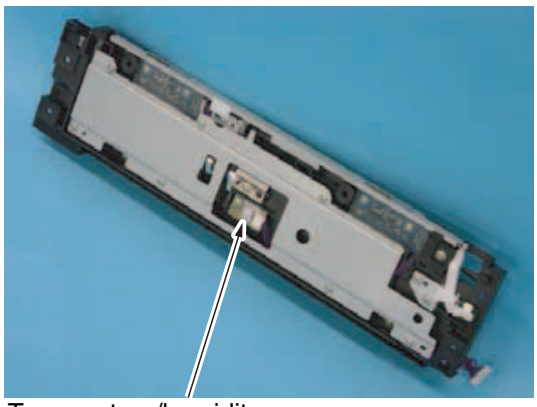

Temperature/humidity sensor (TEM/HUMS)

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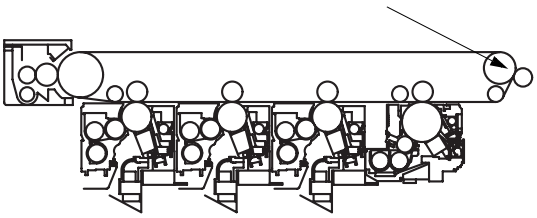

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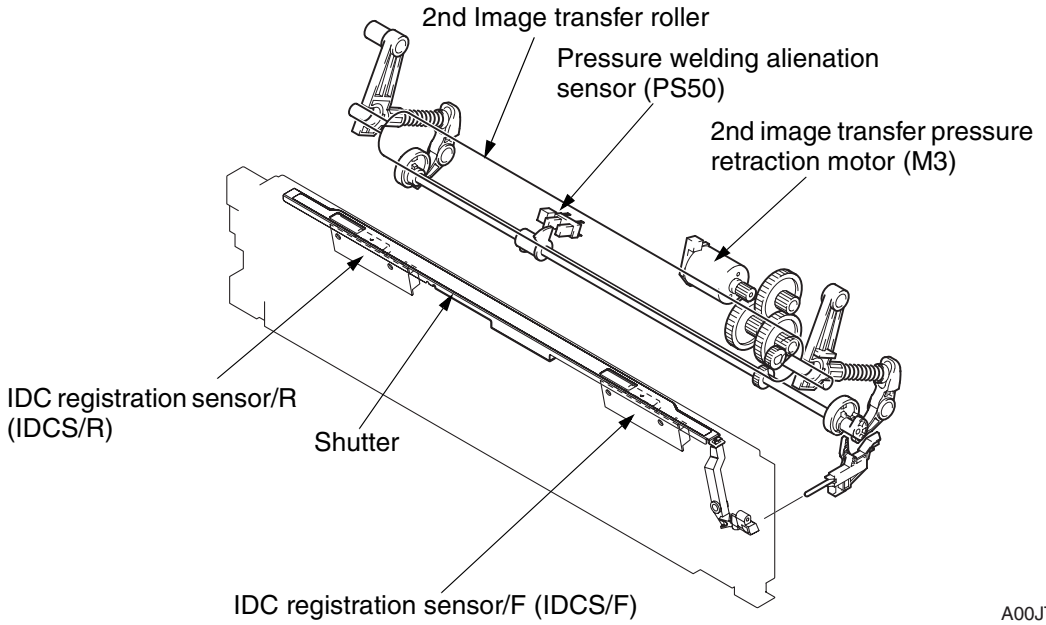

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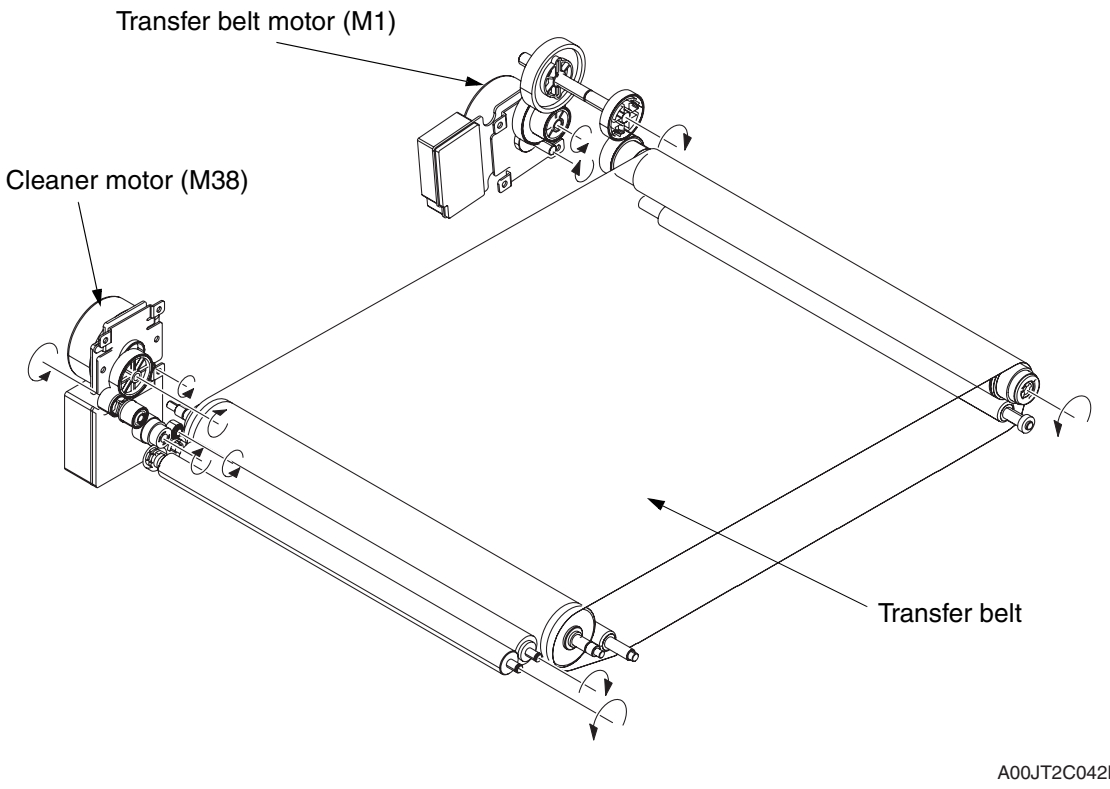
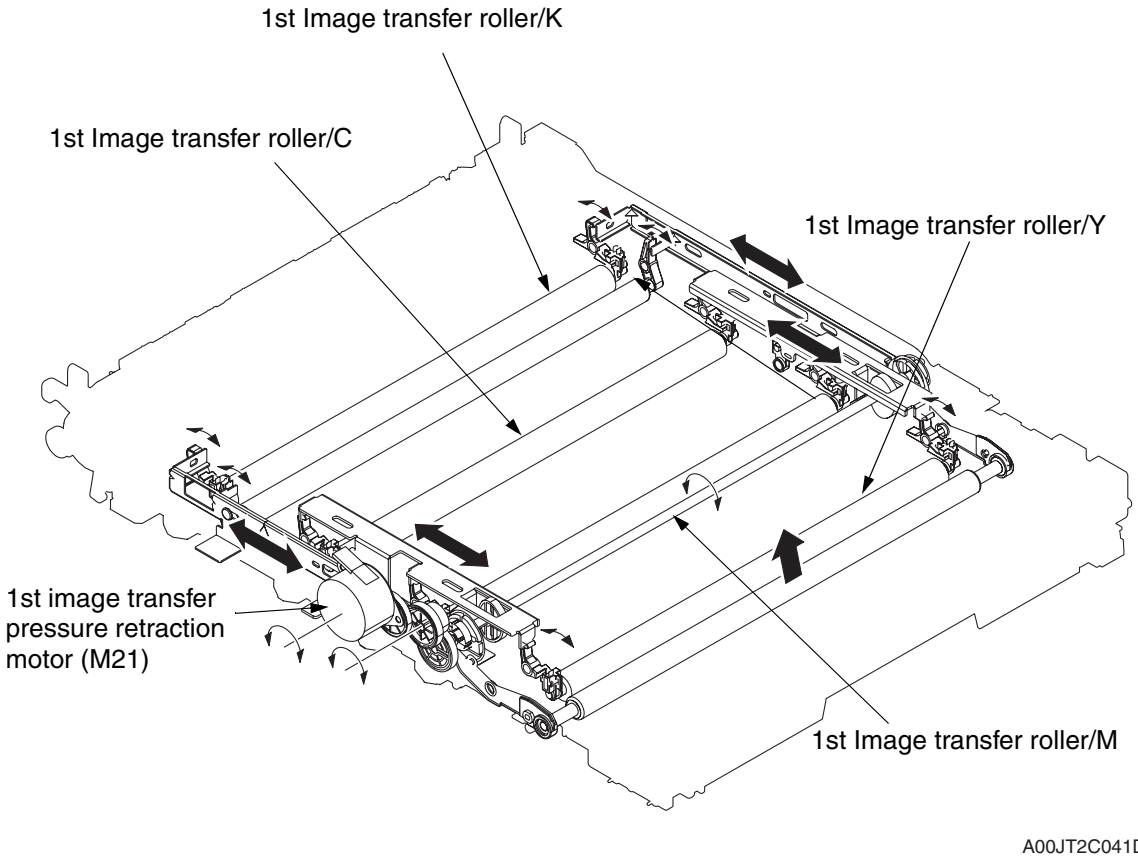
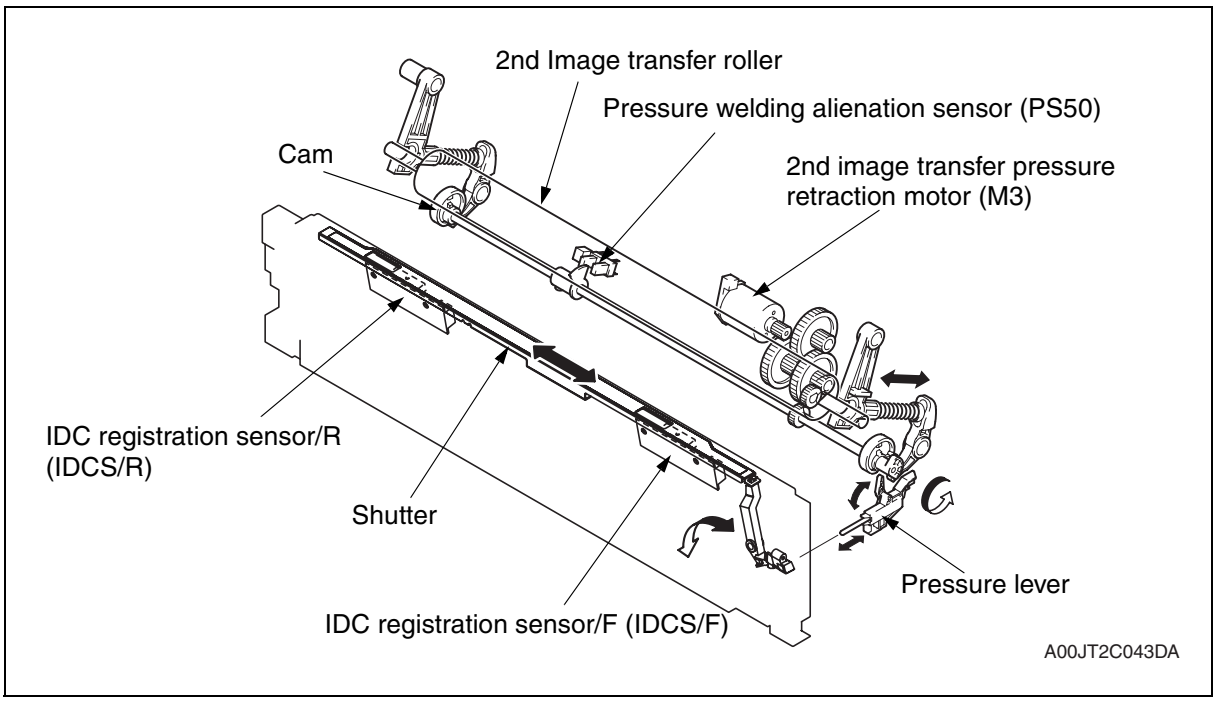
14.2 Drive

14.2.1 1st Image Transfer Section





14.2.2 2st Image Transfer Section



14.3 Operation

14.3.1 Transfer belt speed control

- The Transfer Belt is driven by the Transfer belt motor.
- The appropriate belt speed is selected according to the print mode and paper type as detailed below.

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Paper Source	Print Mode	Transfer belt speed (mm/ s)	
		MF550	MF450
Plain paper (64 to 90g m²)	Monochrome	264	216
	Color	216	216
	ACS	216	216
Thick paper 1 (91 to 120g/ m²) Thick paper 1+ (121 to 157g/ m²)	-	132	132
Thick paper 2 (158 to 209g/ m²) Thick paper 3 (210 to 256g/ m²) Thick paper 4 (257 to 300g/ m²) OHP transparencies, postcards, envelopes, label sheet	-	108	108

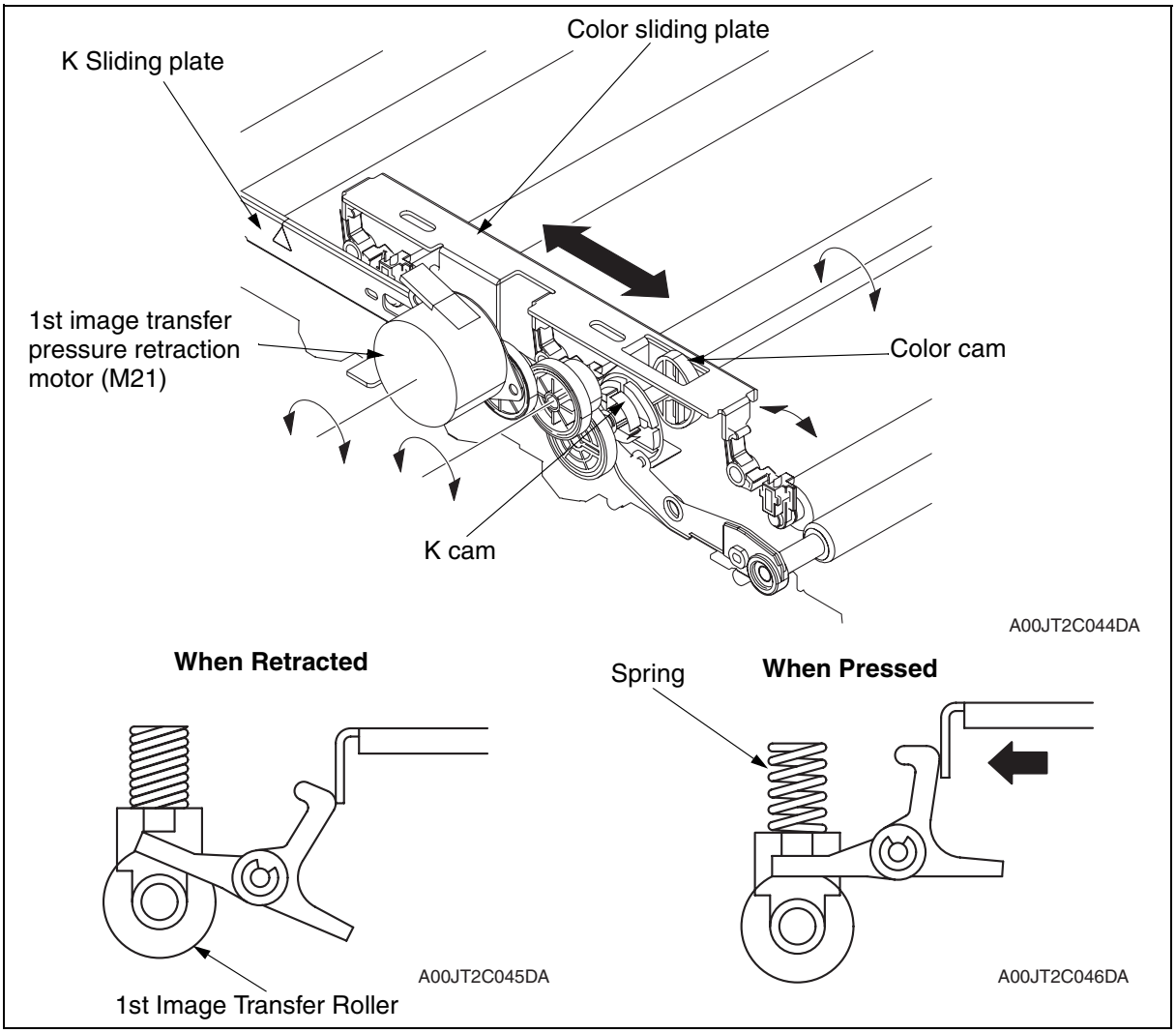
14.3.2 1st Image Transfer Roller mechanism

- The machine is provided with a mechanism that presses the 1st Image Transfer Rollers up against the inside of the Transfer Belt during the 1st image transfer stage. The 1st Image Transfer pressure retraction motor provides the drive for this operation.
- The retraction position sensor /K detects the retraction position of the 1st image transfer roller /K, and then detects the retraction position of the 1st image transfer rollers /Y, M, C.
- To detect pressure and retraction positions, the K and color sliding plate positions are detected respectively.
- In the pressure operation, a predetermined pulse controls the stop position.

A. Pressure/retraction operation

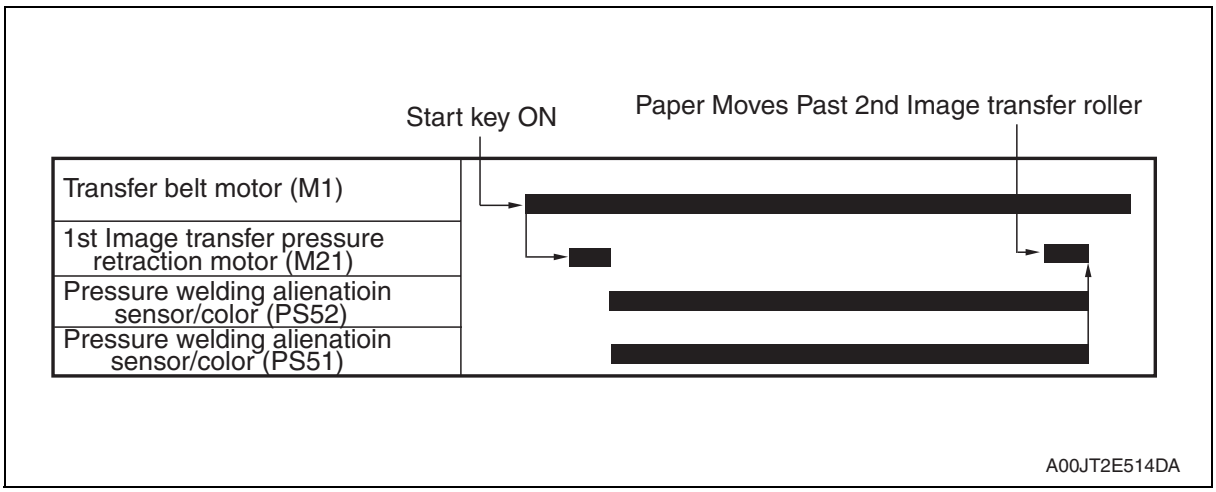
- Pressure operation
  1. Drive from the 1st Image transfer pressure retraction motor is transmitted through a gear train to the drive gear.
  2. Rotation of the drive gear turns the pressure cam, which allows the Sliding Plate to move.
  3. As the Sliding Plate moves, the spring is released. This lowers the 1st Image Transfer Roller and the roller presses against the Transfer Belt.

- Pressure operation
  1. Under the pressure operation, if the drive gear turns either forward or backward, the pressure cam rotates. This pushes and moves the sliding plate.
  2. As the Sliding Plate moves, the Pressure Lever is then pressed to raise the 1st Image Transfer Roller, allowing the roller to leave the Transfer Belt.



B. Operation timing

- The pressure operation starts when a print cycle starts and ends when the print cycle completes.

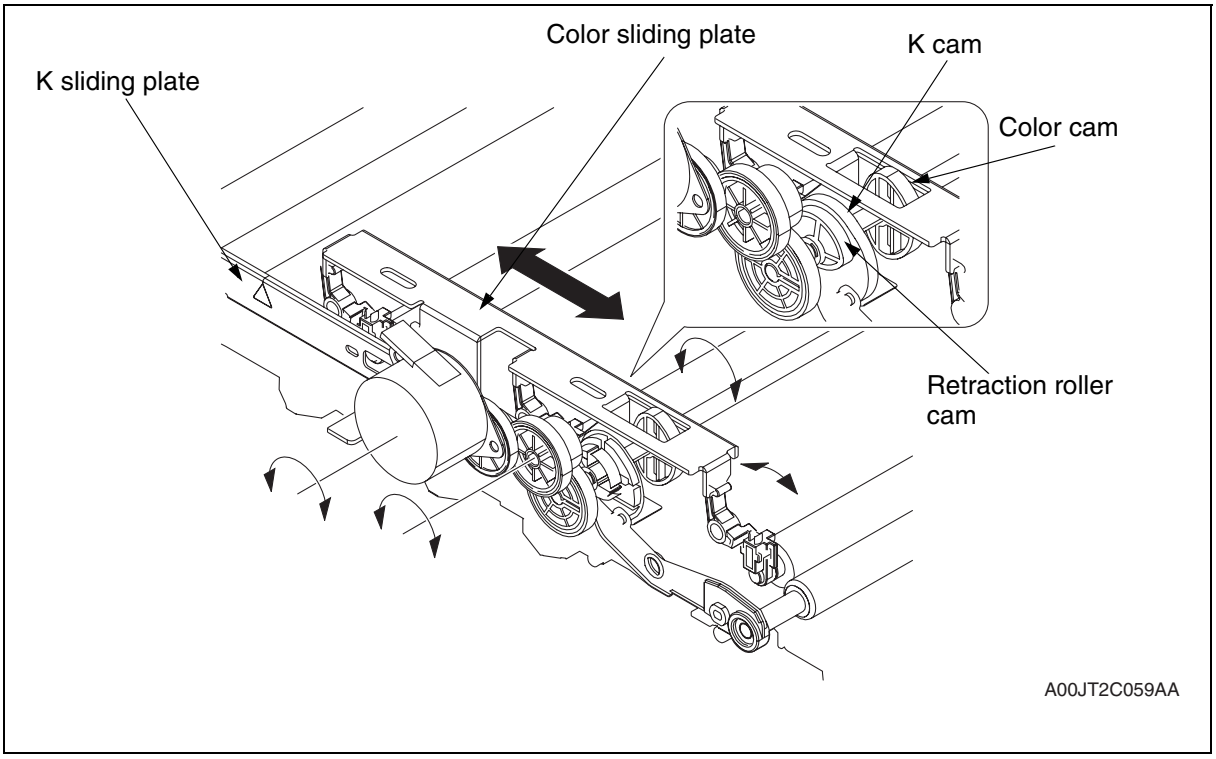


C. Pressure position changing mechanism

- To extend the service life of the PC Drum/Y, M, C, the pressure position of the 1st Image Transfer Roller is changed between the monochrome mode and the color mode. In the monochrome mode, the 1st Image Transfer Roller/Y, M, C is left in the retracted position and the PC Drum/Y, M, C is stopped.
- The pressure position is changed by varying the pulse count of the 1st Image Transfer Pressure Retraction Motor, which results in the pressure cam stop position being varied. The pressure position of the Image Transfer Roller is also changed by changing the stop position of the Sliding Plate.
- In order to reduce the first print time, the machine uses the cam that can turn both forward and backward. With the least rotation of the cam, the 1st transfer roller position can be changed.

(1) Types of cams

- Three types of cams are arranged on a shaft.
- K cam: for the pressure and retraction operation of the 1st image transfer roller /K and the K retraction roller.
- Color cam: for the pressure and retraction operation of the 1st image transfer roller /Y, M, C and the color retraction roller.
- Retraction roller cam: for the pressure and retraction operation of the color retraction roller.

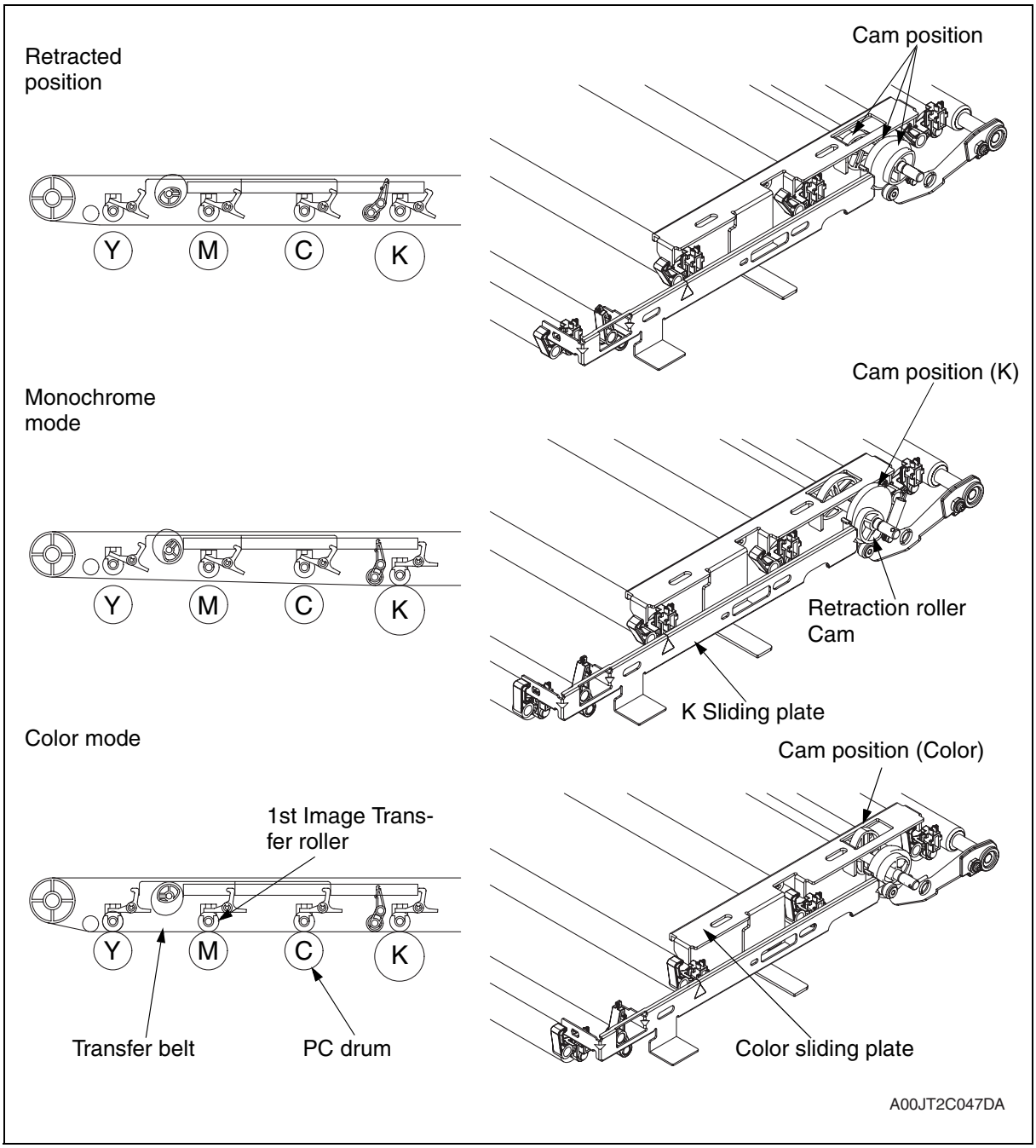


(2) Color mode

- The pressure position of the Image Transfer Roller is where the PC Drum is in contact with the Transfer Belt for all four colors of toner.

(3) Monochrome mode

- The pressure position of the Image Transfer Roller/Y, M, C is where the PC Drum/Y, M, C leaves the Transfer Belt. While that of the Image Transfer Roller/K is where the PC Drum/K is in contact with the Transfer Belt. This allows the PC Drum/Y, M, C to remain stationary in this mode.

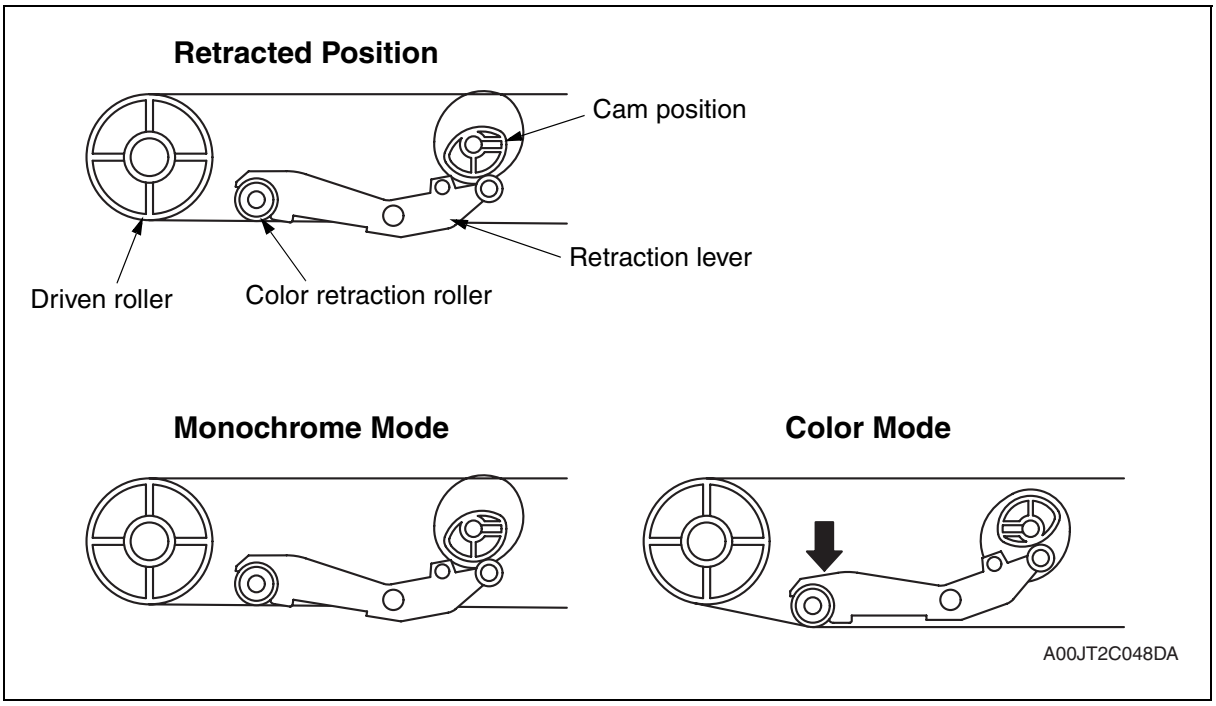


D. Retraction mechanism

- In addition to the change of the pressure position of the 1st image transfer roller, the machine moves the color retraction roller or the K retraction roller up and down to change the position of the image transfer on the surface of the transfer belt depending on the print mode of each job.
- Similar to the pressure position change mechanism, the retraction mechanism changes the position at which the pressure cam stops in order to move the retraction lever so that the retraction roller moves up and down.

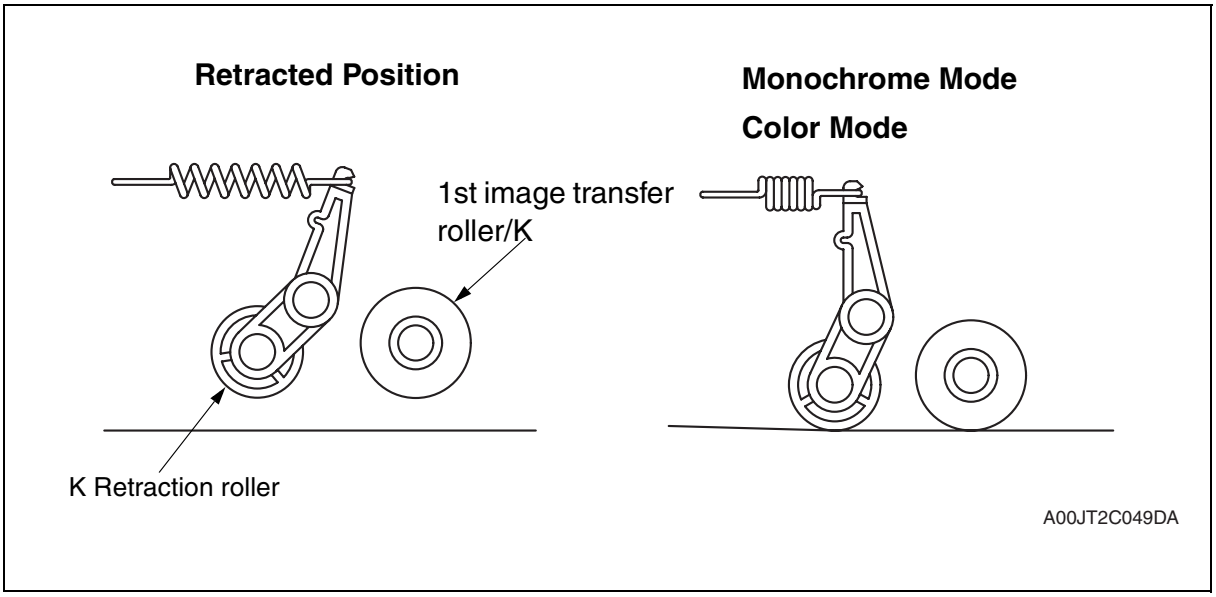
(1) Color retraction roller

- The color retraction roller is driven by the color cam.



(2) K retraction roller

- The K retraction roller is driven by the K cam.

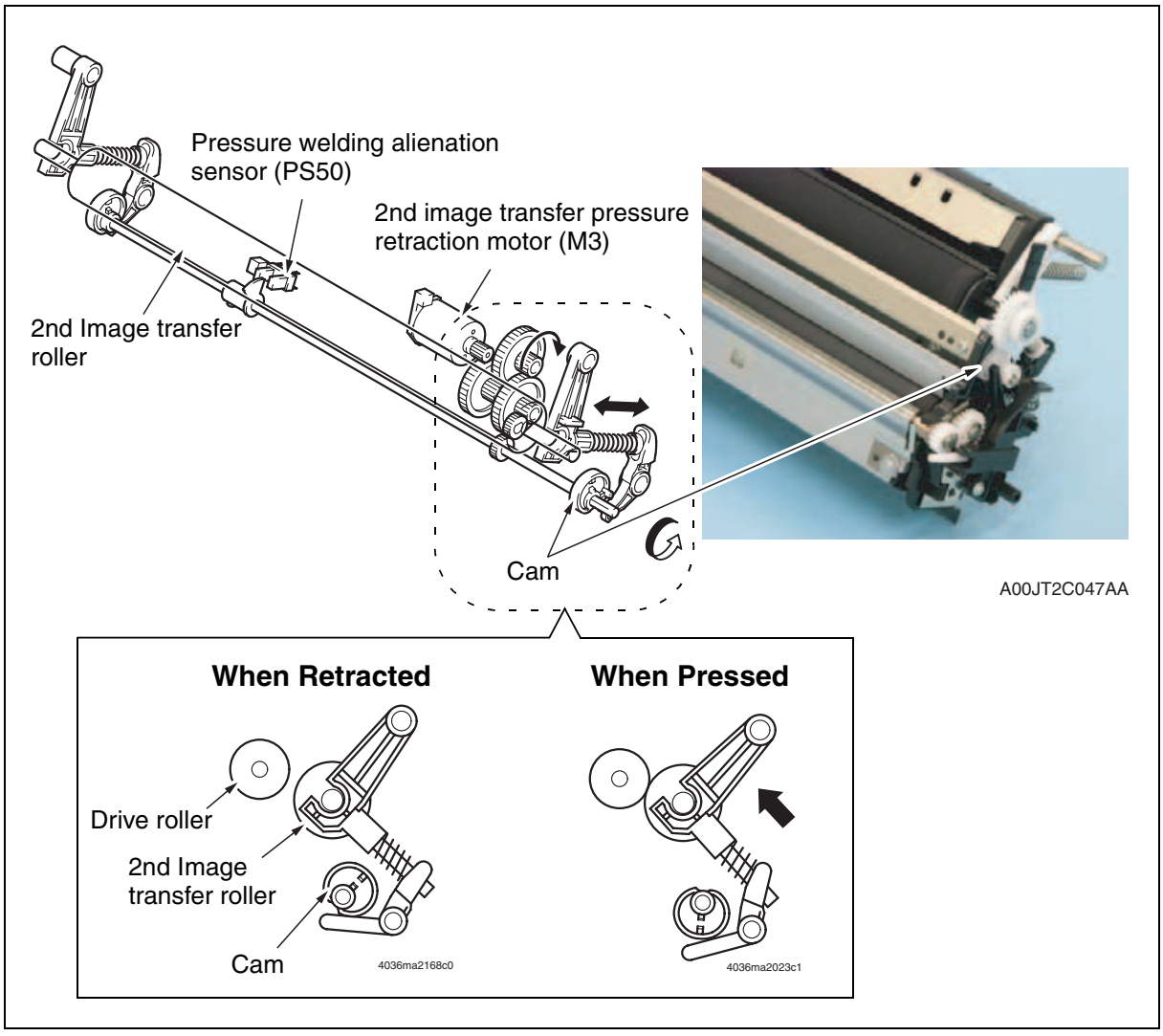


14.3.3 2nd image transfer roller pressure mechanism

- The 2nd image transfer roller has the pressure/retraction mechanism which presses to and retracts from the transfer belt so the patterns made on the transfer belt except by printing (such as detection pattern during image stabilization) will not affect the 2nd image transfer roller.

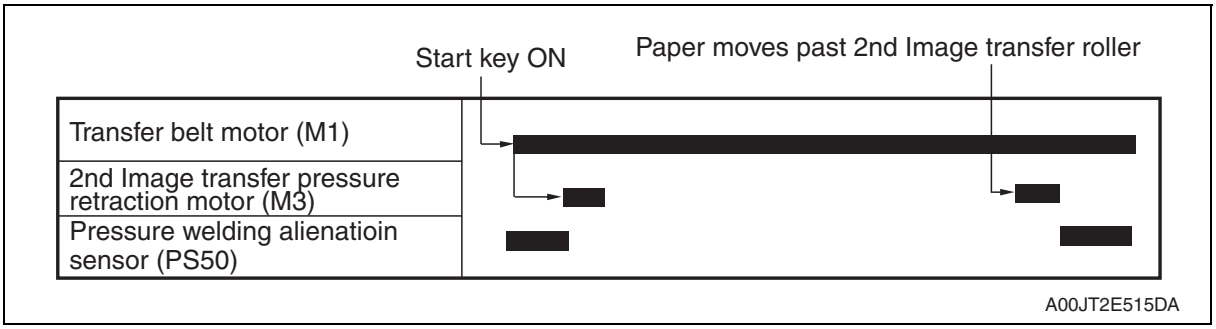
A. Pressure/retraction operation

1. Drive from the 2nd image transfer pressure/retraction motor is transmitted through a gear train to the drive gear.
2. The drive gear rotates to rotate the cam. Pressing down the pressure lever will pushes the 2nd image transfer roller against the transfer belt.
3. At this timing, the 2nd image transfer pressure position sensor detects that the 2nd image transfer roller gets to the pressure position. The 2nd image transfer pressure retraction motor is stopped.
4. The cam rotates further when the motor turns ON again. Releasing the pressure lever will move the 2nd image transfer roller to the retraction position. At this timing, the 2nd image transfer pressure position sensor detects that the roller gets to the retraction position. The 2nd image transfer pressure retraction motor is stopped.



B. Operation timing

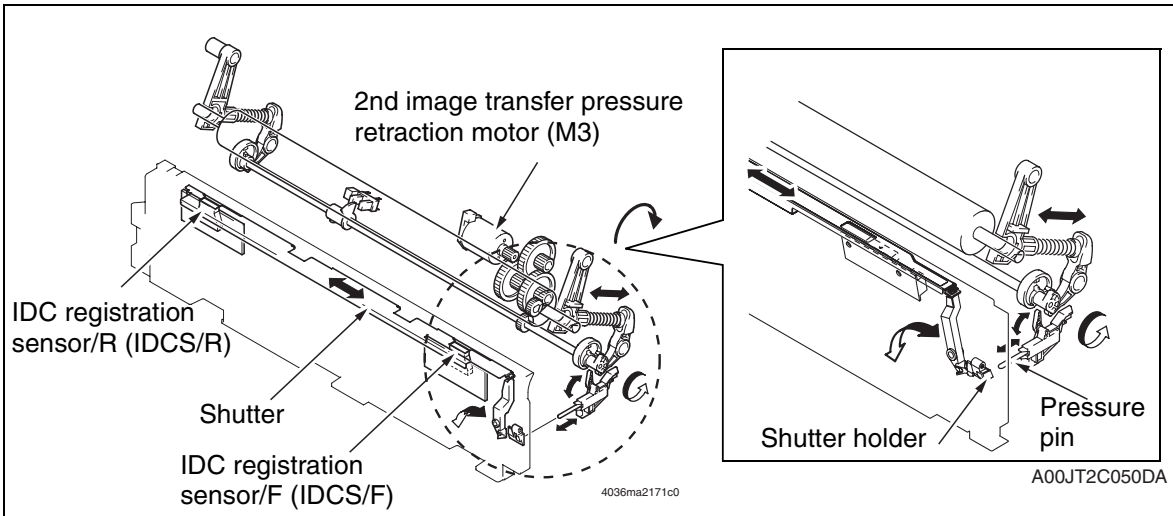
- The pressure operation starts when a print cycle starts and ends when the print cycle completes.



14.3.4 IDC sensor shutter mechanism

- The IDC sensor can be contaminated with toner since it is located under the transfer belt. There is a shutter mechanism provided for the sensor to prevent it from being contaminated.
- The shutter opens and closes in synchronism with the pressure and retraction motion of the 2nd image transfer roller. When the 2nd image transfer roller is retracted from the transfer belt, the pressure pin pushes the shutter holder. This moves the shutter at the IDC sensor to the front side.
- When the 2nd image transfer roller is pressed against the transfer belt, on the other hand, the shutter of the IDC sensor is moved by a spring force to the rear side and closed.

2nd image transfer roller	Shutter
Retracted	Open
Pressed	Closed



When Sensor Shutter is Closed

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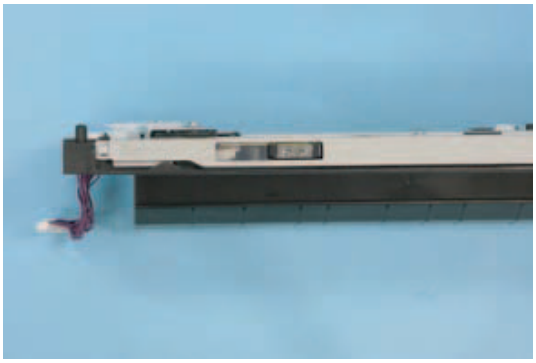
When Sensor Shutter is Open



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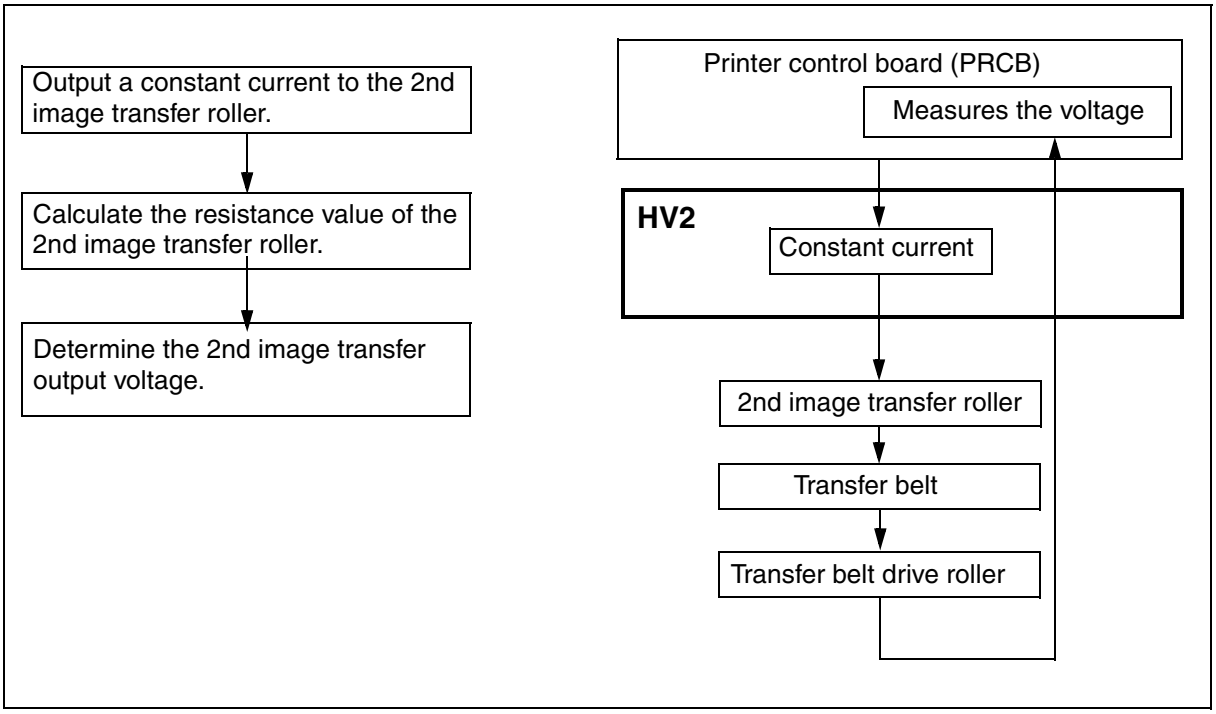
14.3.5 ATVC (Auto transfer voltage control)

- To adjust the 2nd image transfer output to the correct voltage, ATVC system is installed. A constant current is output to the 2nd image transfer roller to measure voltage. The measured voltage is corrected to be used for automatic adjustment of the 2nd image transfer output voltage.

A. Overview of ATVC operation



B. 2nd image transfer ATVC operation

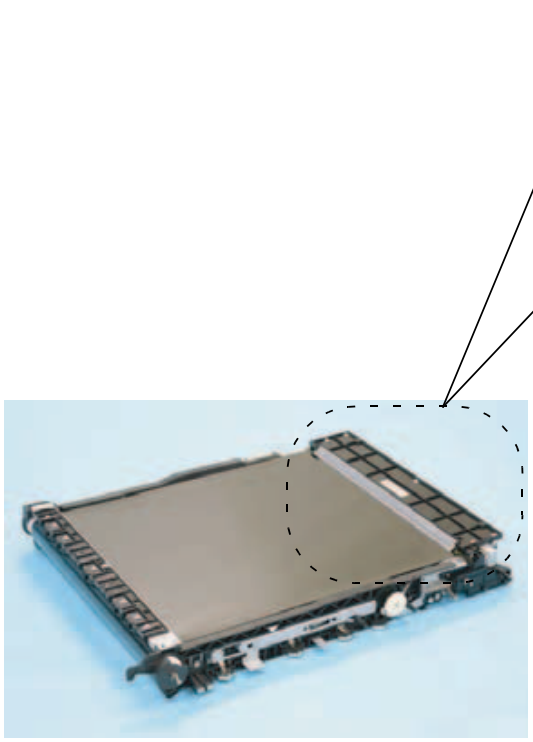
1. Constant current of the 2nd image transfer which is output from the high pressure unit will be fed back to the printer control board through 2nd image transfer roller, transfer belt, and the transfer belt drive roller.
2. The measured resistance, together with the type of paper, temperature and humidity, and the color or monochrome mode 1st side/2nd side, is used as the basis for determining the optimum 2nd image transfer voltage.

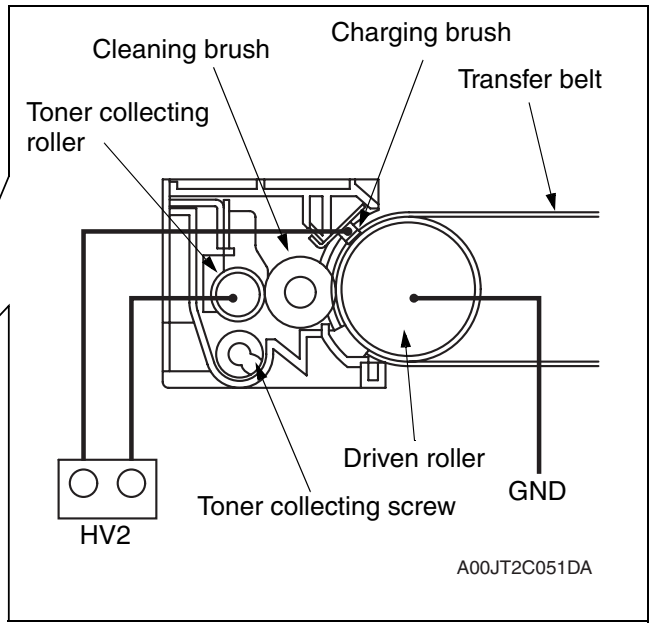
C. 1st and 2nd image transfer ATVC operation timing

- After the power switch is turned ON. (Mainly just before the image stabilization operation).
- Before the machine starts a print cycle for the first time after the temperature change inside the machine went over the threshold, ATVC operation is performed.

14.3.6 Transfer belt cleaning

- To scrape residual toner off the surface of the transfer belt, the transfer belt is provided with a cleaning brush and a charging brush.
- The cleaning brush is a rotary brush. To enhance its ability to scrape residual toner off the surface of the transfer belt, the brush is turned in a direction opposite to that of the transfer belt. The cleaner motor provides the drive for this system.
- To make toner on the surface of the transfer belt easier to be removed, two types of bias (+DC and –DC) are applied to the belt through a different route.
- Residual toner on the surface of the transfer belt is in a state of mixture of positive and negative charges. The charging brush supplies negative charge to the toner to make the toner negatively charged. The toner collecting roller supplies positive charge to collect toner with the cleaning brush.
  1. +DC bias: Toner collecting roller → Cleaning brush → Transfer belt → Driven roller → GND
  2. -DC bias: Charging brush → Transfer belt → Driven roller → GND





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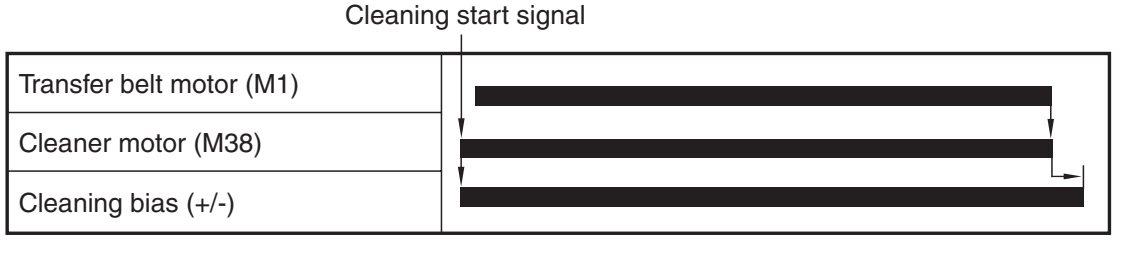
A. Operation timing

- During a print cycle, an image stabilization operation, the 2nd transfer roller cleaning, and other states whenever the transfer belt operates.



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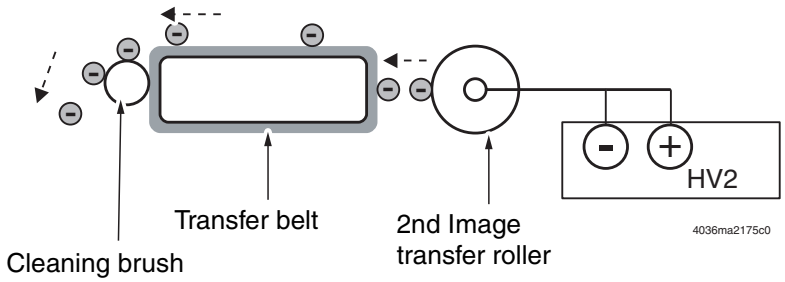
14.3.7 2nd image transfer roller cleaning

- To remove residual toner off the surface of the 2nd Image transfer roller, a +/- DC bias is applied alternately to the roller, thereby moving the residual toner to the surface of the transfer belt.
- The cleaning brush then scrapes off the toner on the surface of the transfer belt.

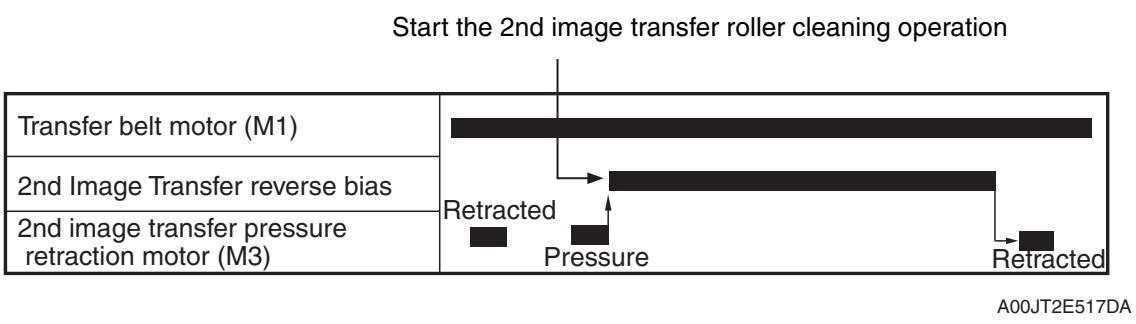


A. Operation timing

- The sequence is carried when the power switch are turned ON or the cover is opened and closed when a print cycle has been abnormally terminated due to a misfeed or malfunction.
- The sequence is also carried out at the end of a print cycle that is run after the cumulative number of printed pages produced has exceeded 300, or during a print cycle that is run after the cumulative number of printed pages produced has exceeded 3000, since the previous cleaning operation.

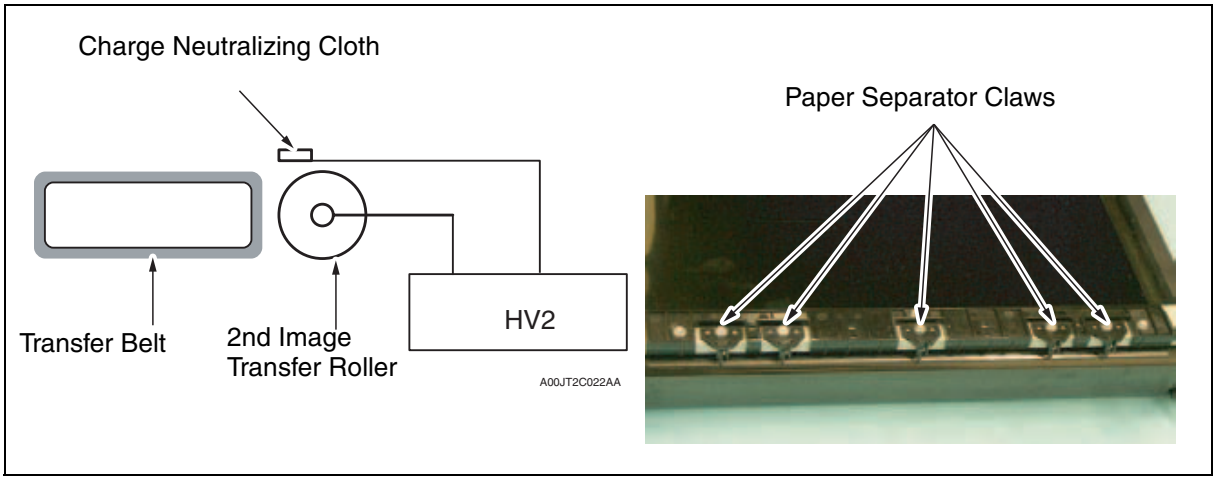
Paper length in the sub scanning direction	Print mode	Count
216 mm or less	Color	3
	Monochrome	1
Over 216 mm	Color	6
	Monochrome	2

2nd image transfer roller cleaning after the completion of a print cycle



14.3.8 Charge neutralization and separation of paper

- To neutralize any charge potential left in the paper which has undergone the 2nd image transfer stage, a Charge Neutralizing Cloth is installed to the guide plate after the 2nd Image Transfer Roller.
- The output of the Charge Neutralizing Cloth is switched automatically using the high voltage unit according to the paper type and the environmental conditions, and whether the print cycle is for printing the 1st side or 2nd.
- In order to separate thin paper or curled paper caused by 2-sided printing from the transfer belt without fail after the 2nd image transfer, transfer belt separator claws are mounted at 5 places.

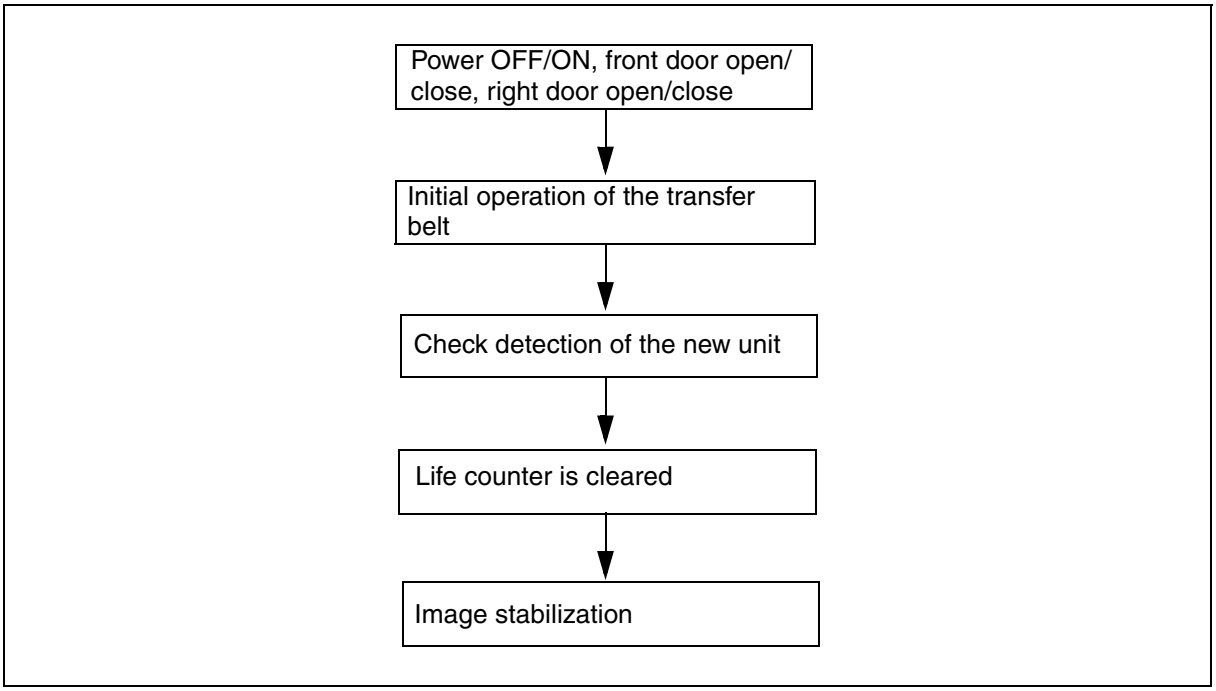


- Switching of output of the charge neutralizing cloth

Paper Type	Ambience	Control	Detailed description
1-sided printing on the plain paper	Low humidity	Bias applied	• A negative charge, which is the reverse polarity to the positive output from the 2nd Transfer Roller, is applied to prevent the paper from being wound around the Transfer Belt.
	Normal	Bias applied	
	High humidity	GND through resistors	• To prevent separation noise, grounded through resistors regardless of the ambient conditions.
2nd side of 2-sided printing on the plain paper	–	Bias applied	• Bias is applied regardless of the ambient conditions, since the paper to go to the 2nd side print cycle, which has undergone the fusing process, has the condition equivalent to paper under low humidity ambience.
Special paper other than plain paper	–	GND through resistors	• Paper is stiff enough to present no separation problems. • To prevent separation noise, grounded through resistors regardless of the ambient conditions.

14.3.9 Detection of new transfer belt unit

- When a new transfer belt unit is installed in the machine, the life counter is automatically cleared through new unit detection.
- The new unit detection is made when the power switch is turned OFF and ON, the front door is opened and closed or the right door is opened and closed.
- New unit detection timing/operation.



14.3.10 Pressure/retraction control during ACS mode

- For monochrome printing in the ACS mode, the pressure/retraction operation of the 1st image transfer roller is controlled according to the number of monochrome originals that continue during multiple copies. It promotes high productivity and extends consumables life.

* ACS: Auto color selection

A. Operation

- ACS control starts counting the number of multi-copies of the monochrome original when switched from the color original to the monochrome original.
- When the number of multi-copies is as specified or under.
  : The monochrome printing will start with color mode. (with the 1st image transfer roller / Y/M/C being pressed)
  The transfer belt being pressed saves time since the 1st image transfer roller does not need to be retracted.
- When the number of multi-copies is as specified or over.
  : The monochrome printing will start when the color mode is complete and the 1st image transfer roller /Y/M/C is retracted to be switched to the monochrome mode.
  The transfer belt being retracted prevents IU to be wasted by useless rotation.

- Number of multiple copies of monochrome originals when the paper feed speed is 216 mm/s (Plain paper).

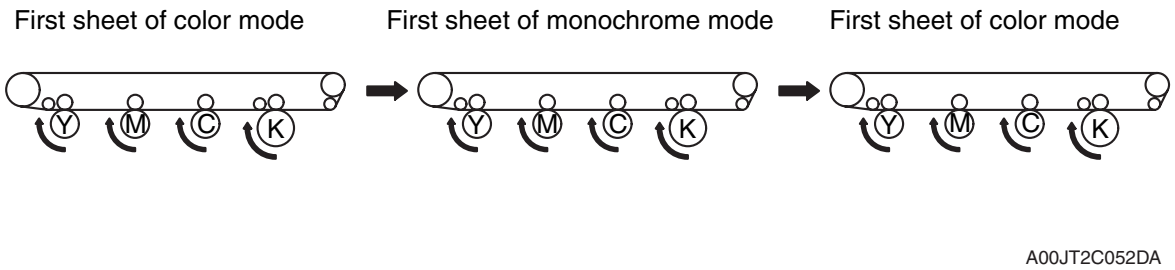
Paper length in the sub scanning direction	monochrome printing in color mode	Monochrome printing after switched to monochrome mode
216 mm or less	4 sheets or less	5 sheets or more
Over 216 mm and up to 297 mm	3 sheets or less	4 sheets or more
Over 297 mm and up to 381 mm	2 sheets or less	3 sheets or more
Over 381 mm and up to 432 mm	1 sheet or less	2 sheets or more
Over 432 mm	1 sheet or less	2 sheets or more

- Number of multiple copies of monochrome originals when the paper feed speed is 132 mm/s, or 108 mm/s (Thick stock 1, Thick stock 1+, Thick stock 2, Thick stock 3, Thick stock 4, Special paper).

Paper length in the sub scanning direction	monochrome printing in color mode	Monochrome printing after switched to monochrome mode
216 mm or less	3 sheets or less	4 sheets or more
Over 216 mm and up to 297 mm	2 sheets or less	3 sheets or more
Over 297 mm and up to 381 mm	1 sheet or less	2 sheets or more
Over 381 mm and up to 432 mm	1 sheet or less	2 sheets or more
Over 432 mm	1 sheet or less	2 sheets or more

- ACS control operates only after the number of multi-copies for monochrome original is counted.
  "The pressure/retraction control for ACS mode" will not be properly executed with only one sheet of print job, since on the first copy, the control can be performed only for where the original is read and counted.
  The ACS control performs effectively for the print jobs as listed below.
  For the 2nd set of prints onward in electronic sorting
  printing using job programs

When printing in monochrome with color mode
(effecting monochrome printing with the four PC drums rotating)



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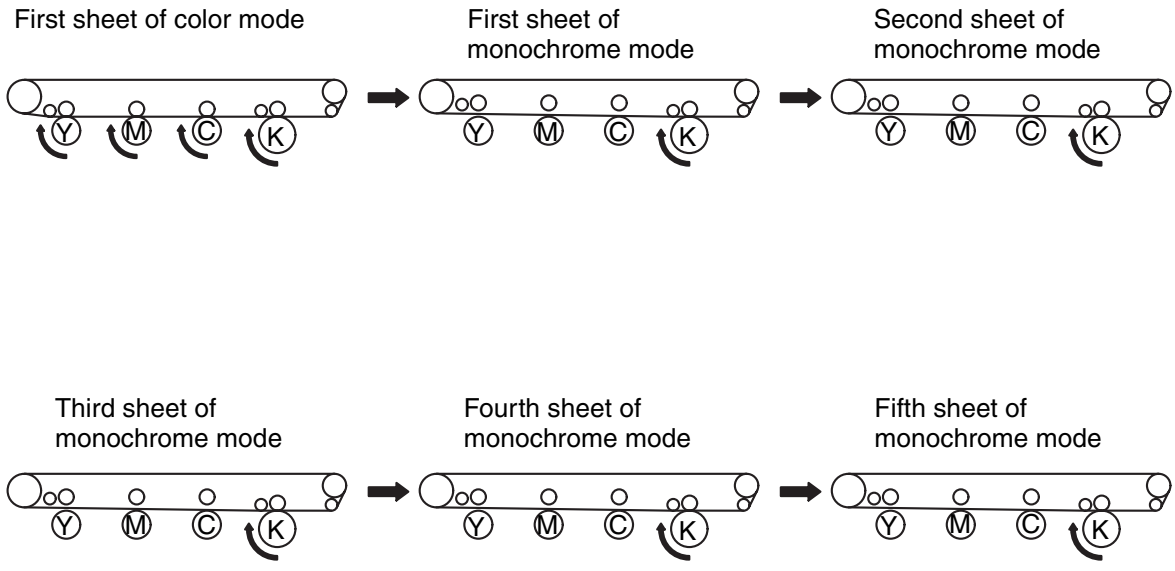
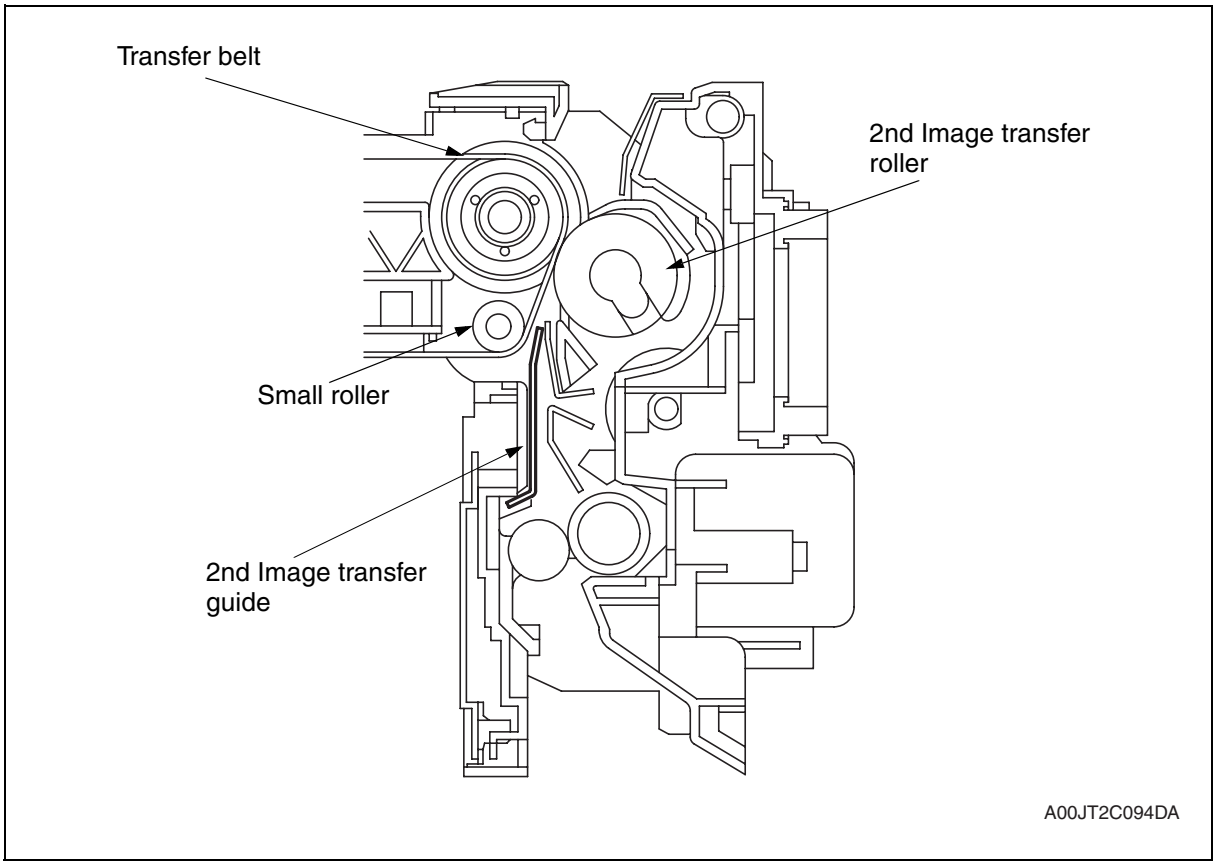
Switching to monochrome mode



A00JT2C053DA

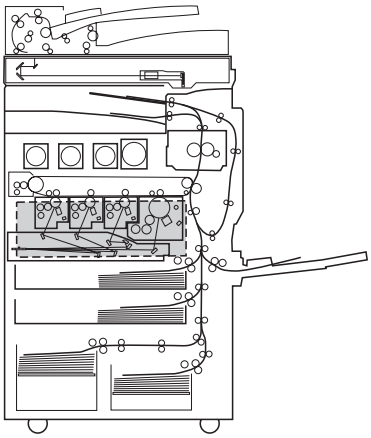
14.3.11 Electric discharge control before the 2nd image transfer

- The small roller and the 2nd image transfer guide are installed under the drive roller to carry paper parallel to the transfer belt. This reduces electric discharge before the 2nd image transfer process and toner scattering when solid images are being printed.



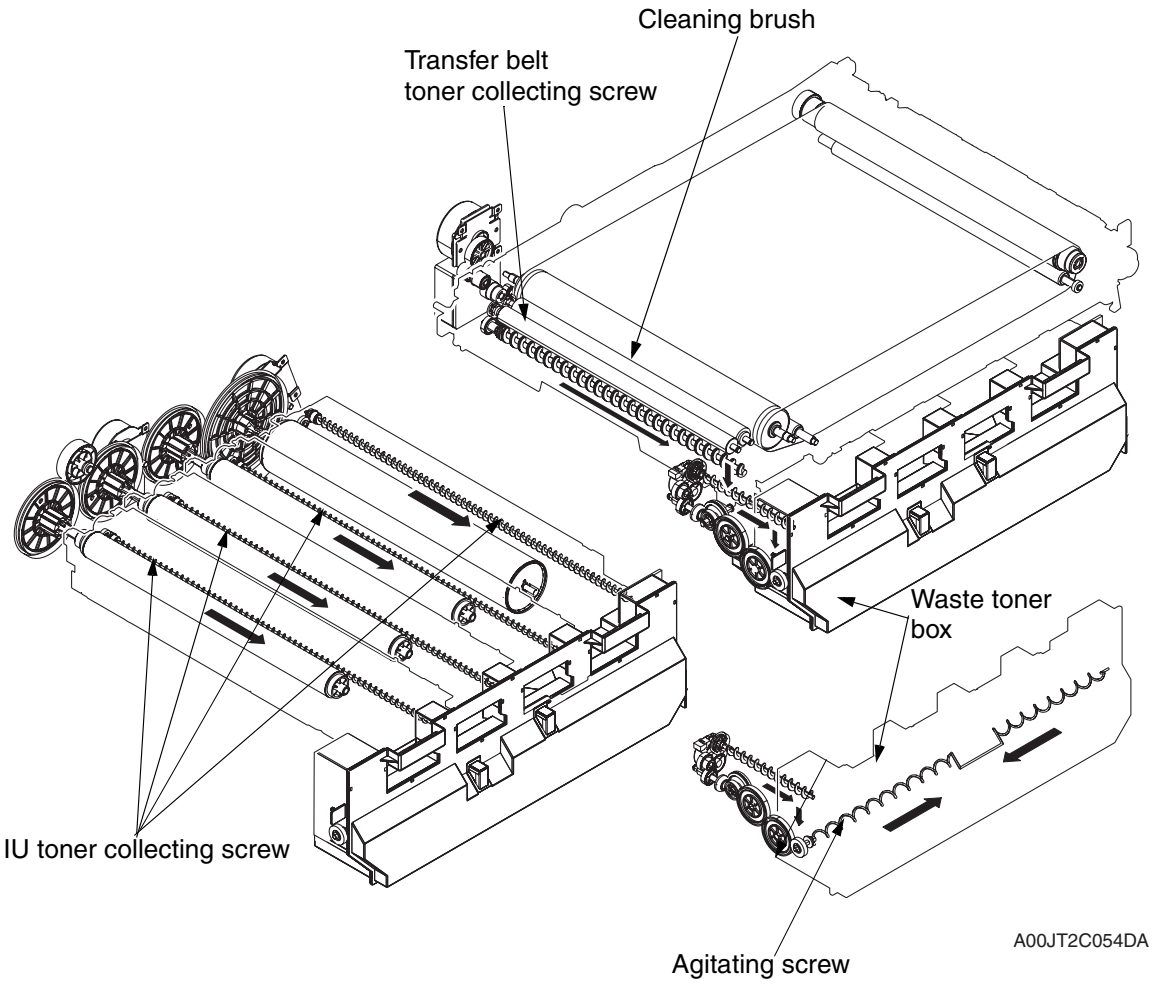
15. Toner collecting section

15.1 Composition



A00JT2C016AA

A00JT2C048AA



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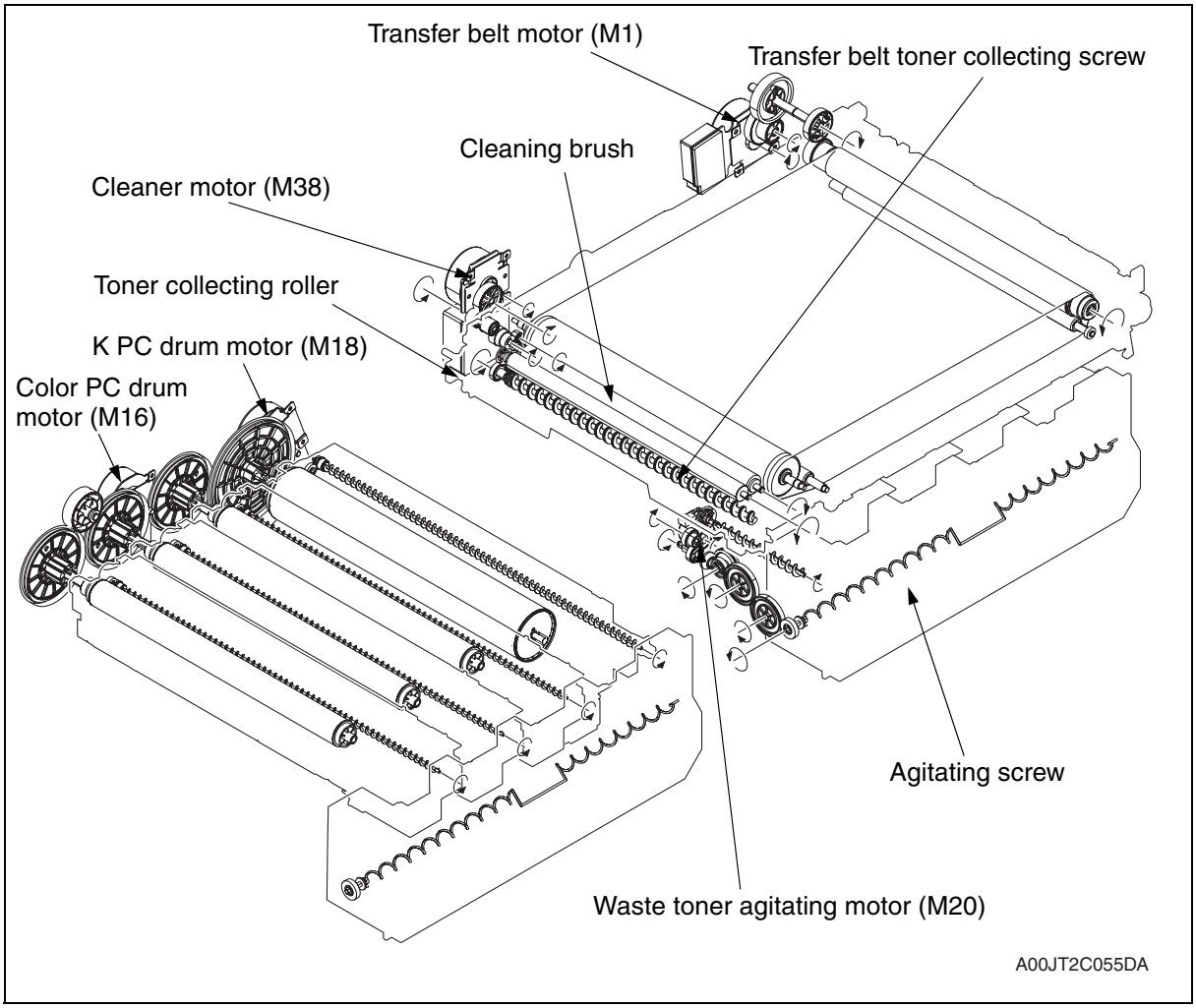
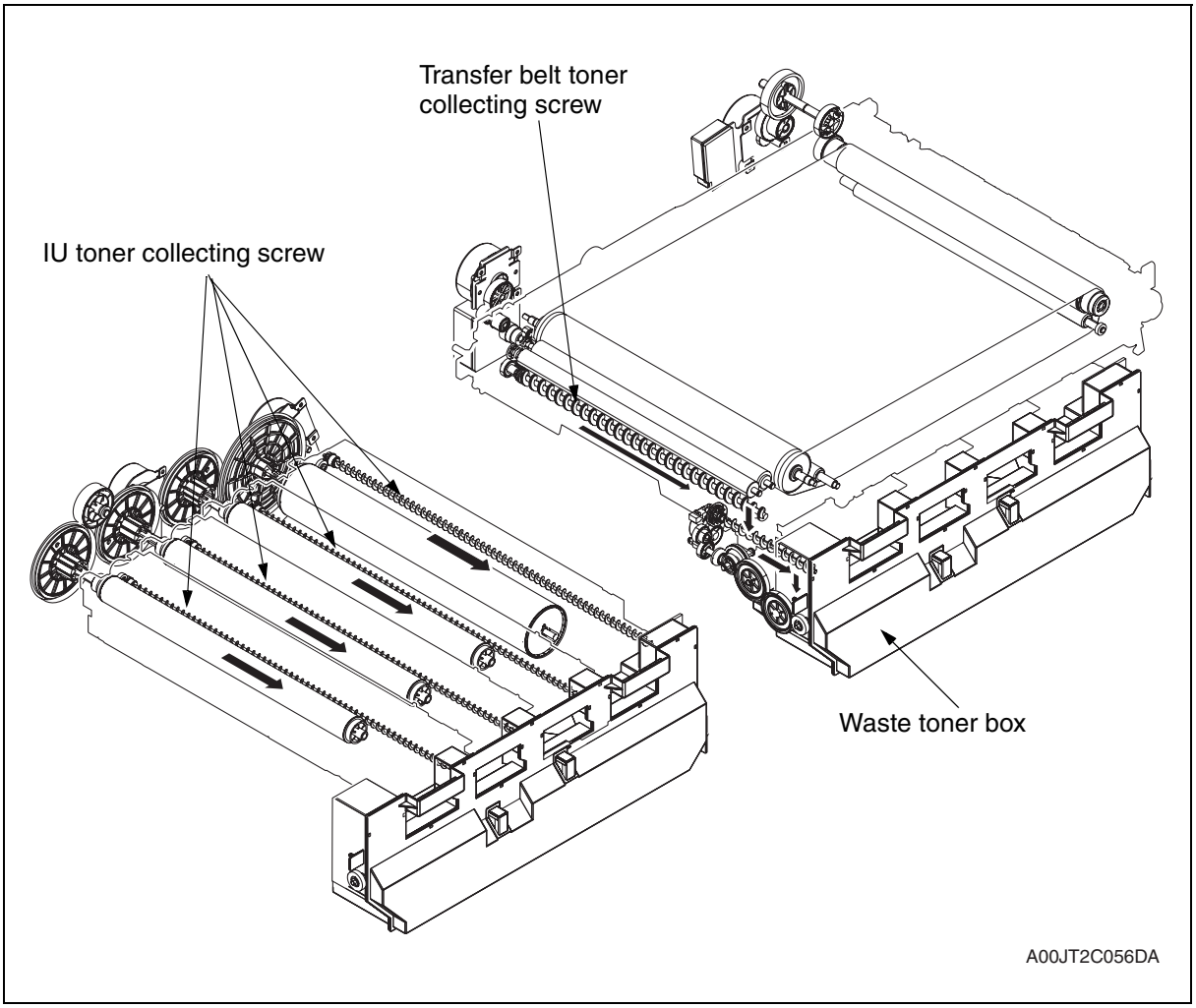
15.2 Drive


Transfer belt motor (M1)
Transfer belt toner collecting screw
Cleaning brush
Cleaner motor (M38)
Toner collecting roller
K PC drum motor (M18)
Color PC drum motor (M16)
Agitating screw
Waste toner agitating motor (M20)
A00JT2C055DA

15.3 Operation

15.3.1 Toner collecting mechanism

- Toner collected by the cleaning brush of the transfer belt and waste toner in each of the imaging units are conveyed by the corresponding toner collecting screws to the waste toner box.

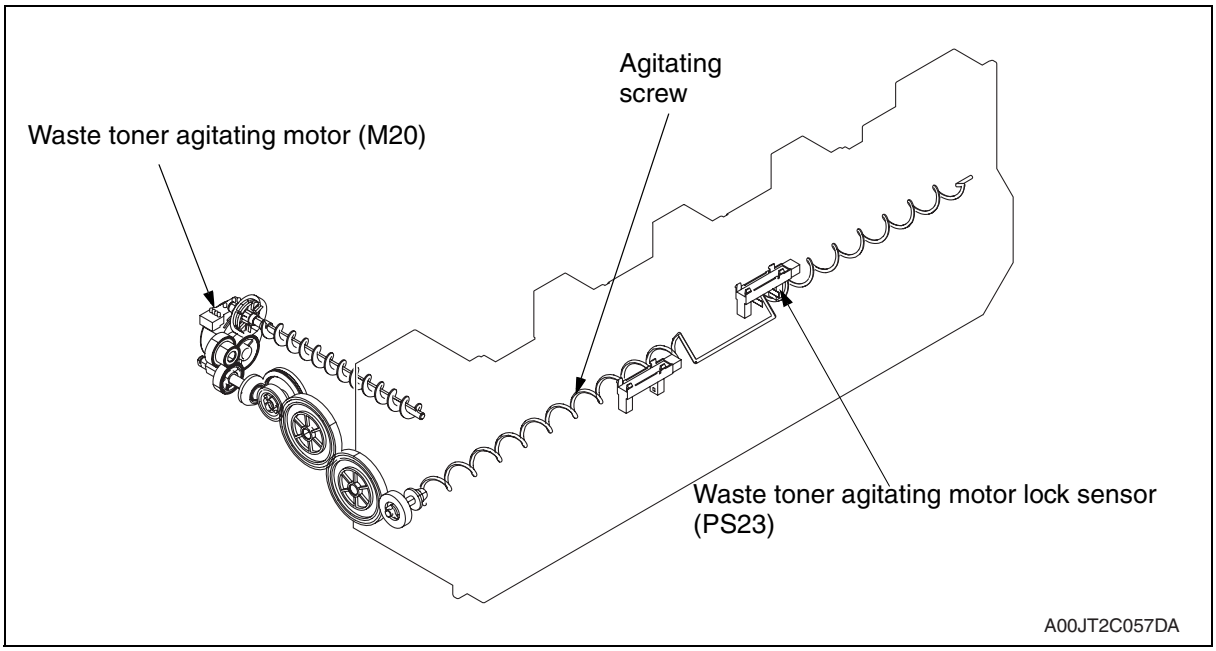


15.3.2 Waste toner agitation control

- In order to avoid detecting an incorrect waste toner amount, the agitating coil is set in the waste toner box so that waste toner can build up evenly in the box.
- The agitating coil is driven and rotated by the waste toner agitating motor.
- The waste toner agitating motor lock sensor detects the waste toner agitating motor lock.

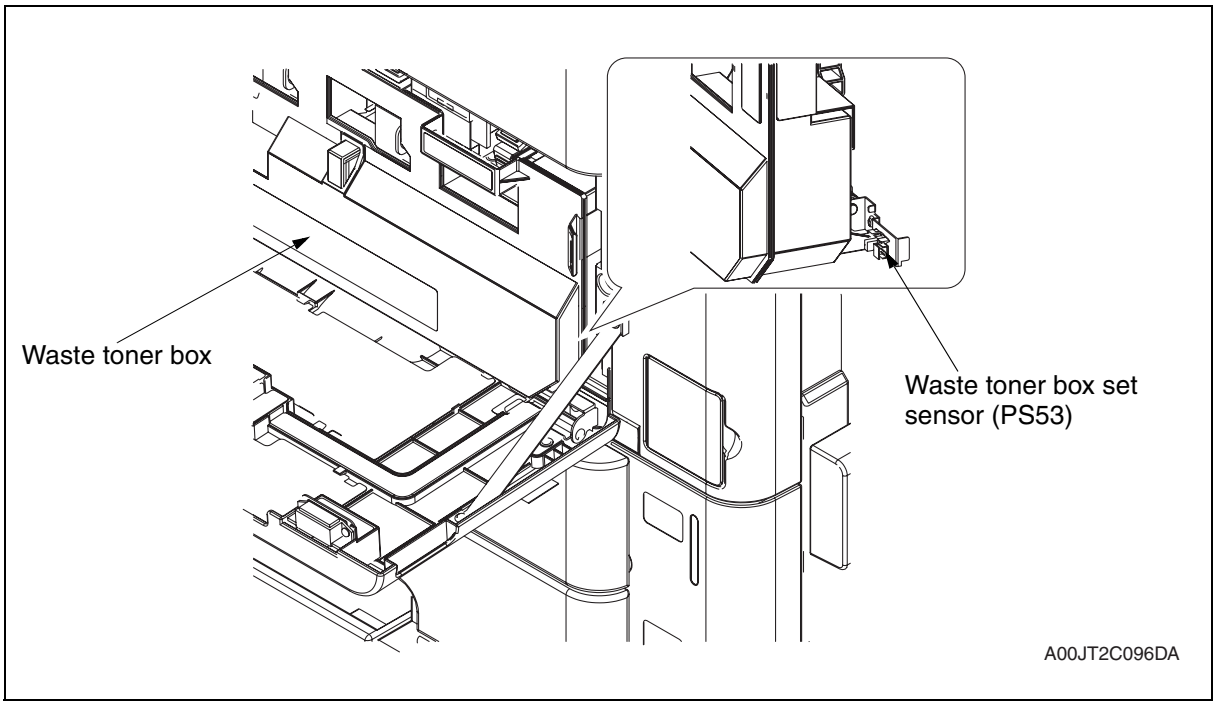
A. Operation timing

- The waste toner agitating motor operates when the TCR sensor performs an automatic adjustment, toner is forcefully replenished, and the transfer belt is driven.



15.3.3 Waste Toner Box-in-position detection

- The waste toner box set sensor is provided to detect a waste toner box loaded in position. Timing for this detection is when the power switch is turned OFF and ON, or the front door is opened and closed. If the waste toner box is found to be out of position, the machine inhibits the initiation of a new print cycle.



15.3.4 Waste Toner Near-Full/Full detection control

A. Waste toner near-full detection control

- An optical sensor is used to detect waste toner. When the sensor is blocked for a given period of time, the machine determines that the Waste Toner box is nearly full of waste toner.
- At this time, a corresponding warning (near-full warning) is given on the control panel.

B. Waste toner full detection control

- Upon the waste toner near full detection, the counter exclusive for waste toner inside the machine starts counting. When the number of color pages reaches around 3,000 sheets (A4) or the number of monochrome pages reaches around 12,000 sheets (A4), the machine detects a waste toner full condition and stops printing.
- Counting method of the counter exclusive for the waste toner is corrected to count the value appropriately according to the color or monochrome mode or paper length.
- When the waste toner full counter reads 12,000, the machine regards that the waste toner box is full.

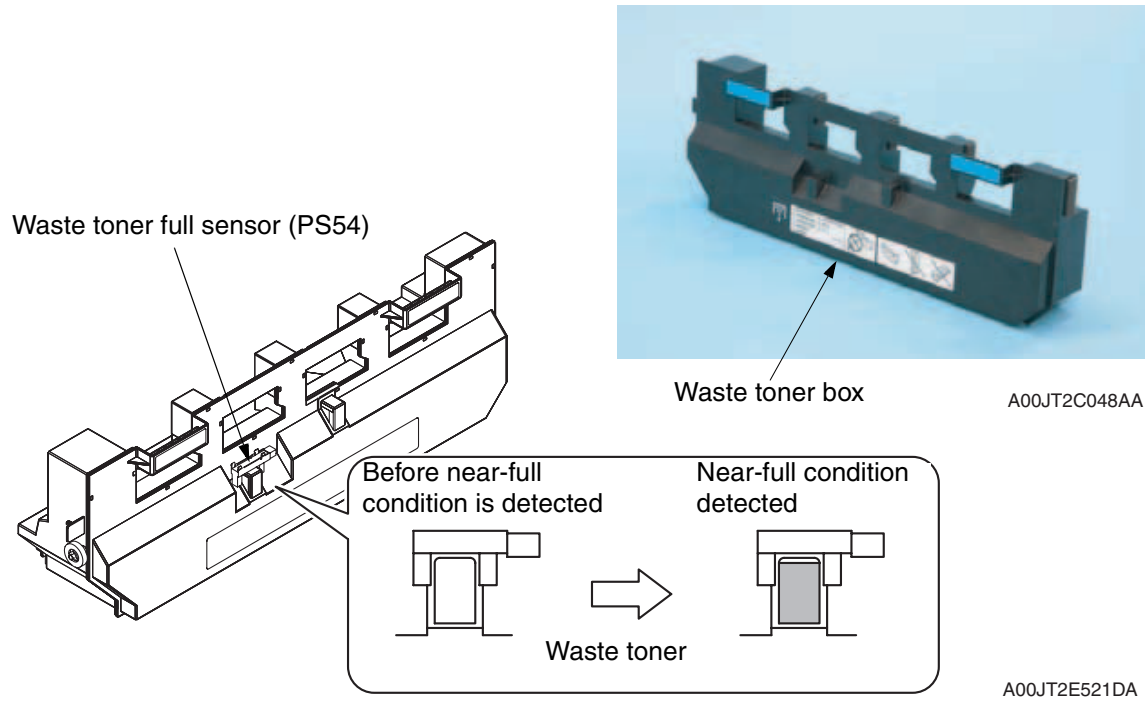
△2 • MF550

Paper length in the sub scanning direction	Print mode	Count
216 mm or less	Color	4
	Monochrome	1
Over 216 mm and up to 432 mm	Color	8
	Monochrome	2
Over 432 mm	Color	12
	Monochrome	3

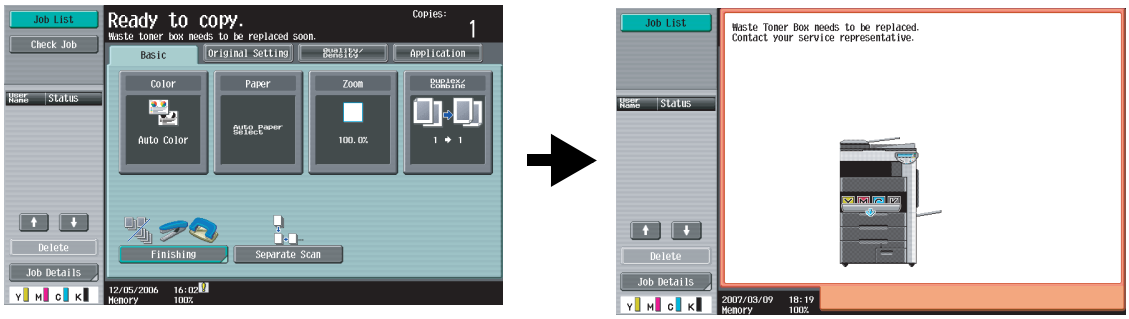
- MF450

Paper length in the sub scanning direction	Print mode	Count
216 mm or less	Color	4
	Monochrome	1
Over 216 mm and up to 432 mm	Color	8
	Monochrome	2
Over 432 mm and up to 648 mm	Color	12
	Monochrome	3
Over 648 mm and up to 864 mm	Color	16
	Monochrome	4
Over 864 mm and up to 1080 mm	Color	20
	Monochrome	5
Over 1080 mm	Color	24
	Monochrome	6

- After the waste toner box has been replaced and the waste toner full sensor has been unblocked for a given period of time, the machine cancels the copying-disabled condition, while at the same time automatically clearing the counter exclusive for the waste toner.



Near-Full Condition Warning Display **Full Condition Warning Display**



A00JT2E508DA A00KT2E008DA

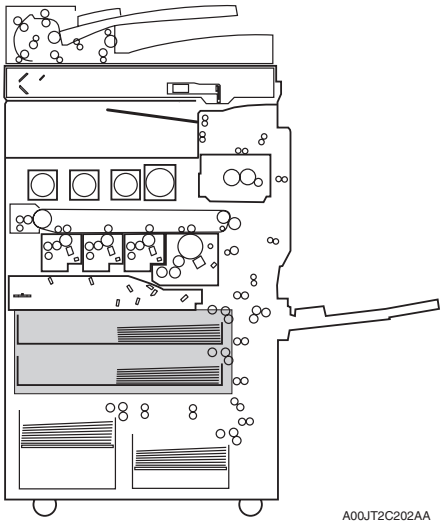
A different toner full warning screen is displayed if “User” is selected for “Unit Change” available from the Service Mode.

16. Paper feed section

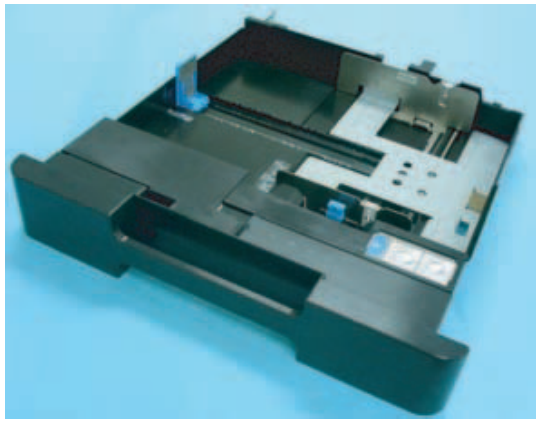
16.1 Composition

16.1.1 Tray1, 2

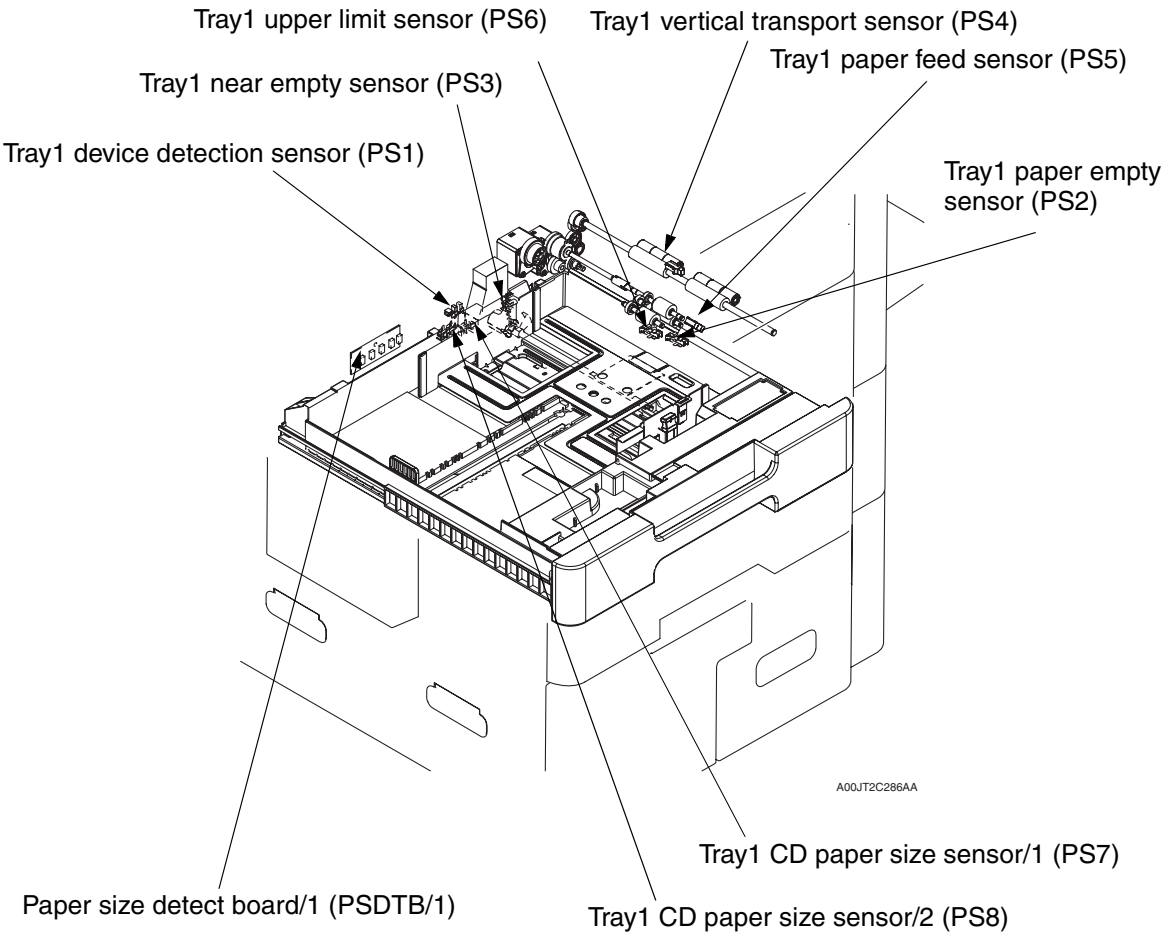
- Tray1 and 2 are same sensor position.



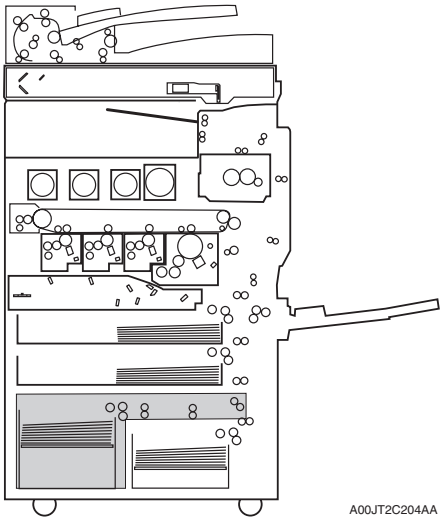
A00JT2C202AA



A00JT2C277AA



16.1.2 Tray3



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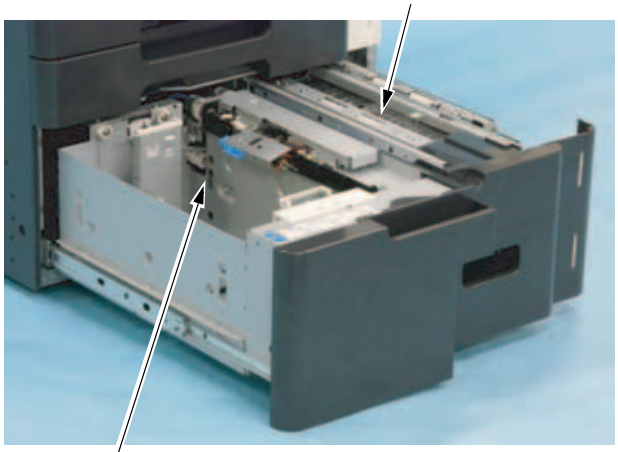

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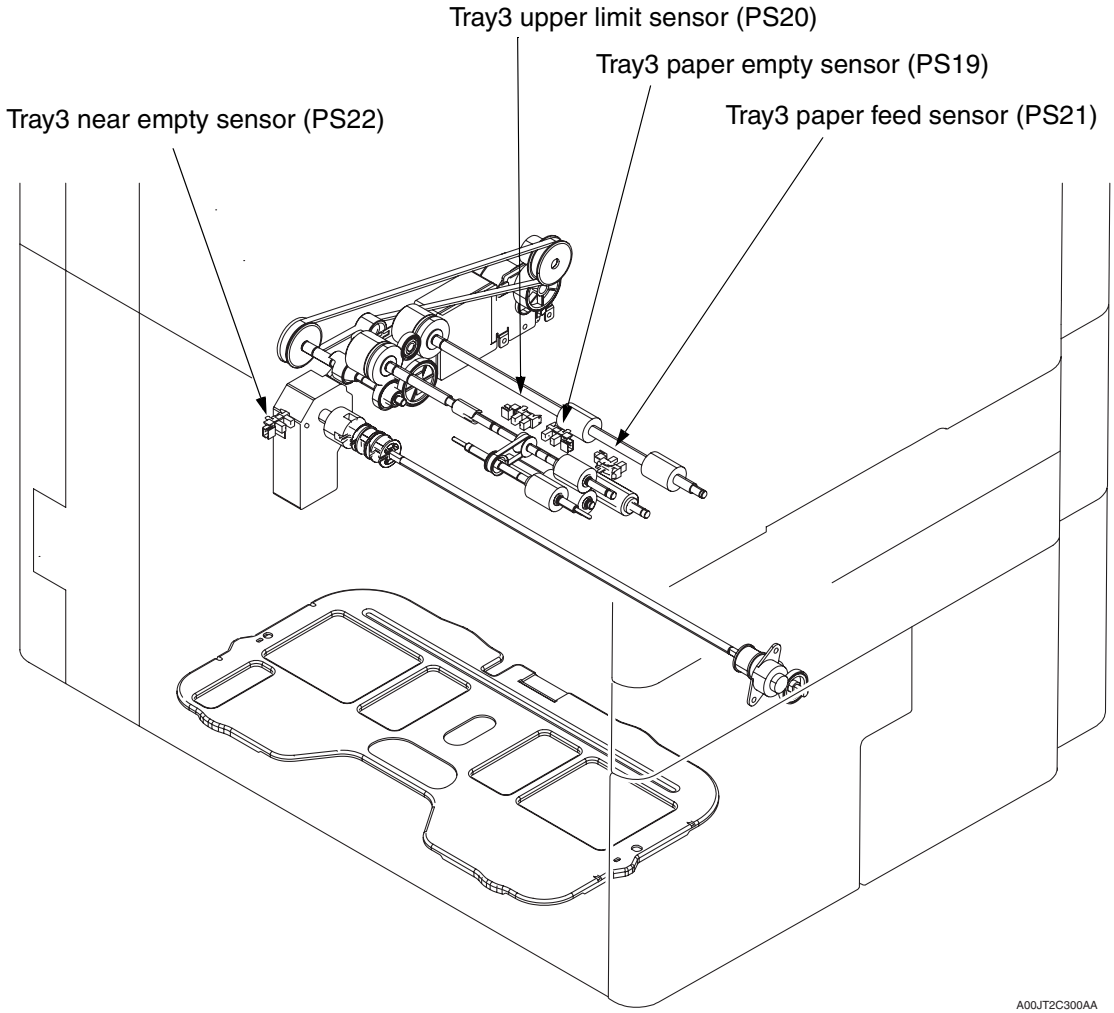

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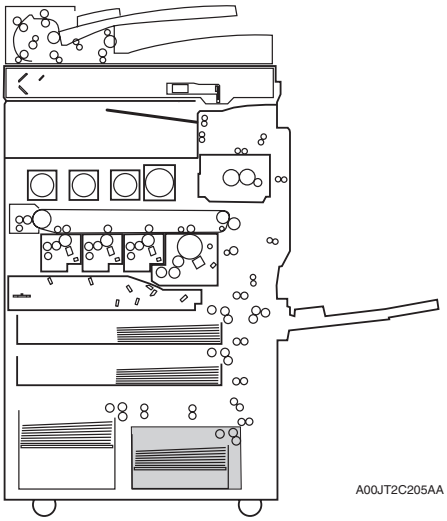
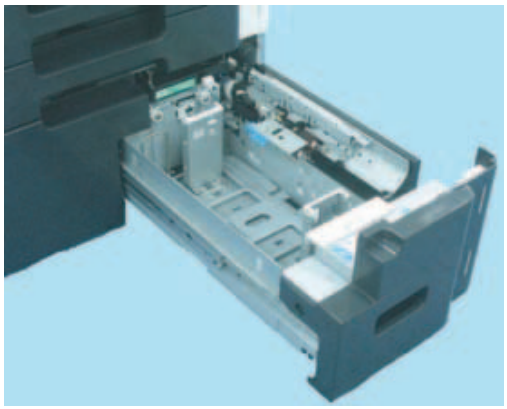
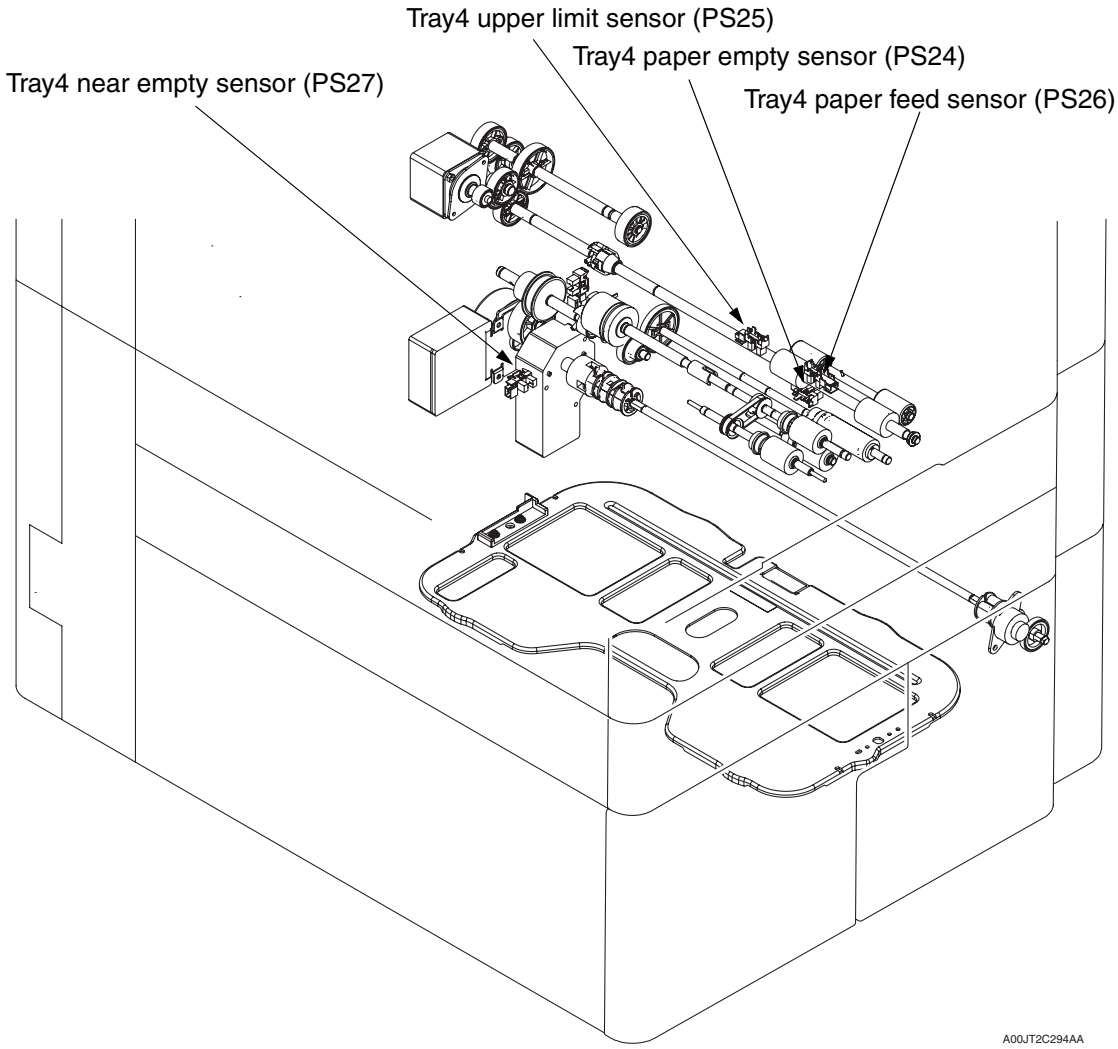
16.1.3 Tray4



A00JT2C205AA



A00JT2C276AA



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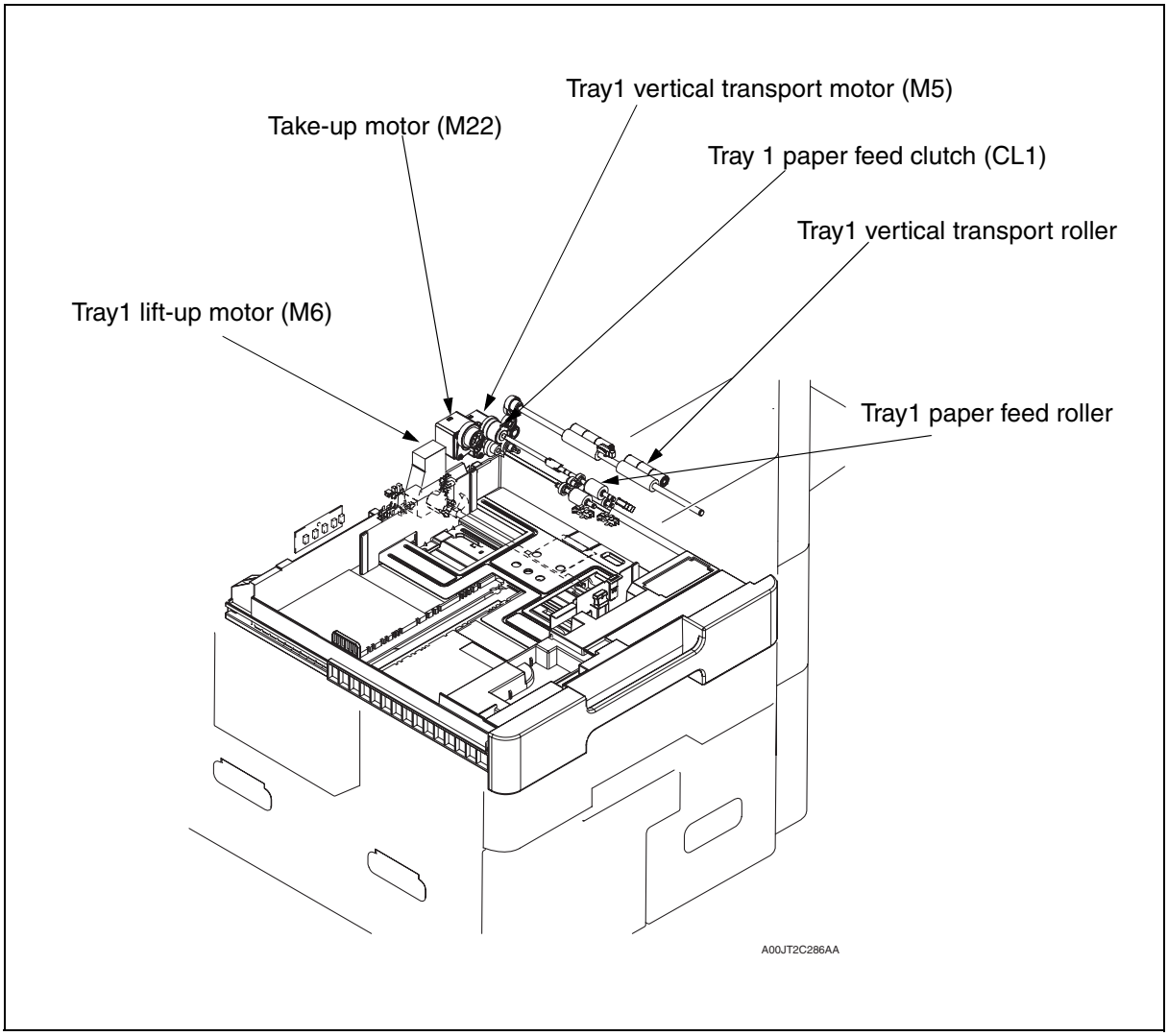
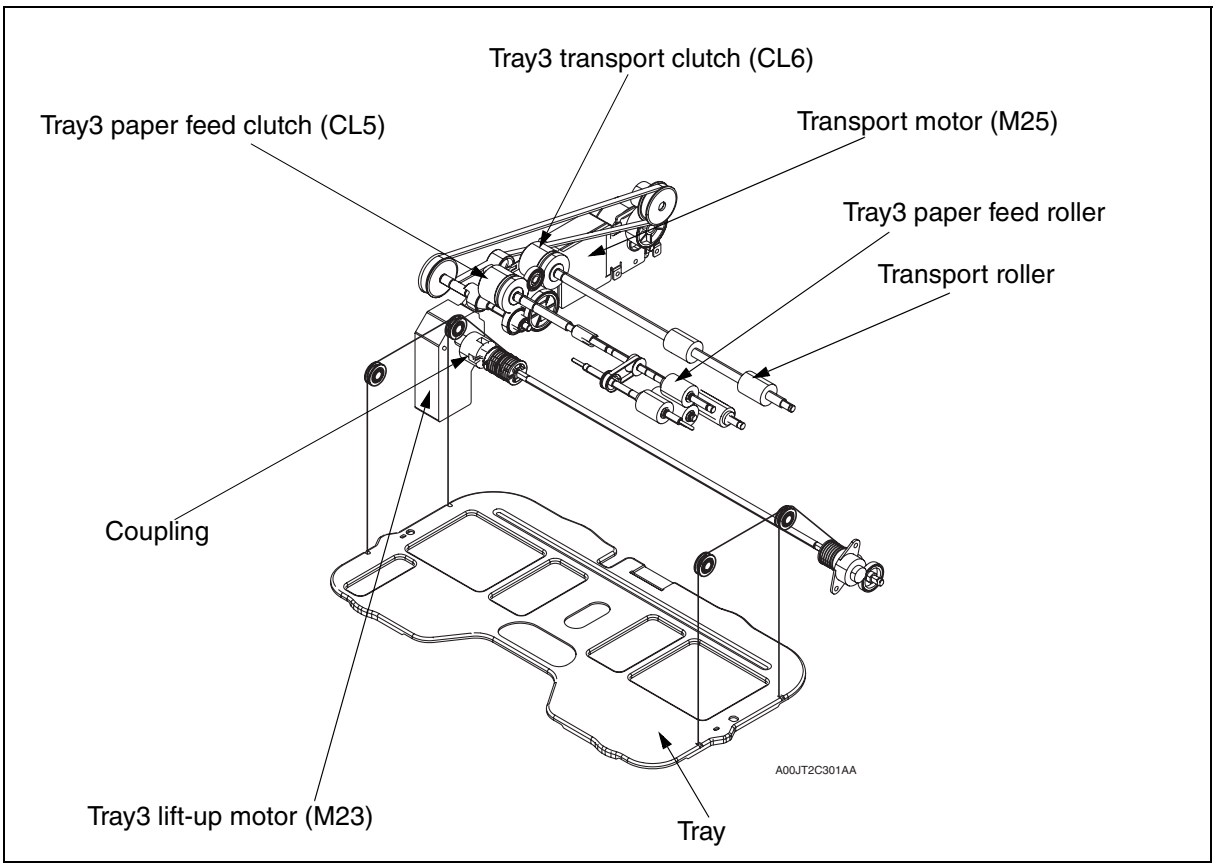
16.2 Drive

16.2.1 Tray1, 2

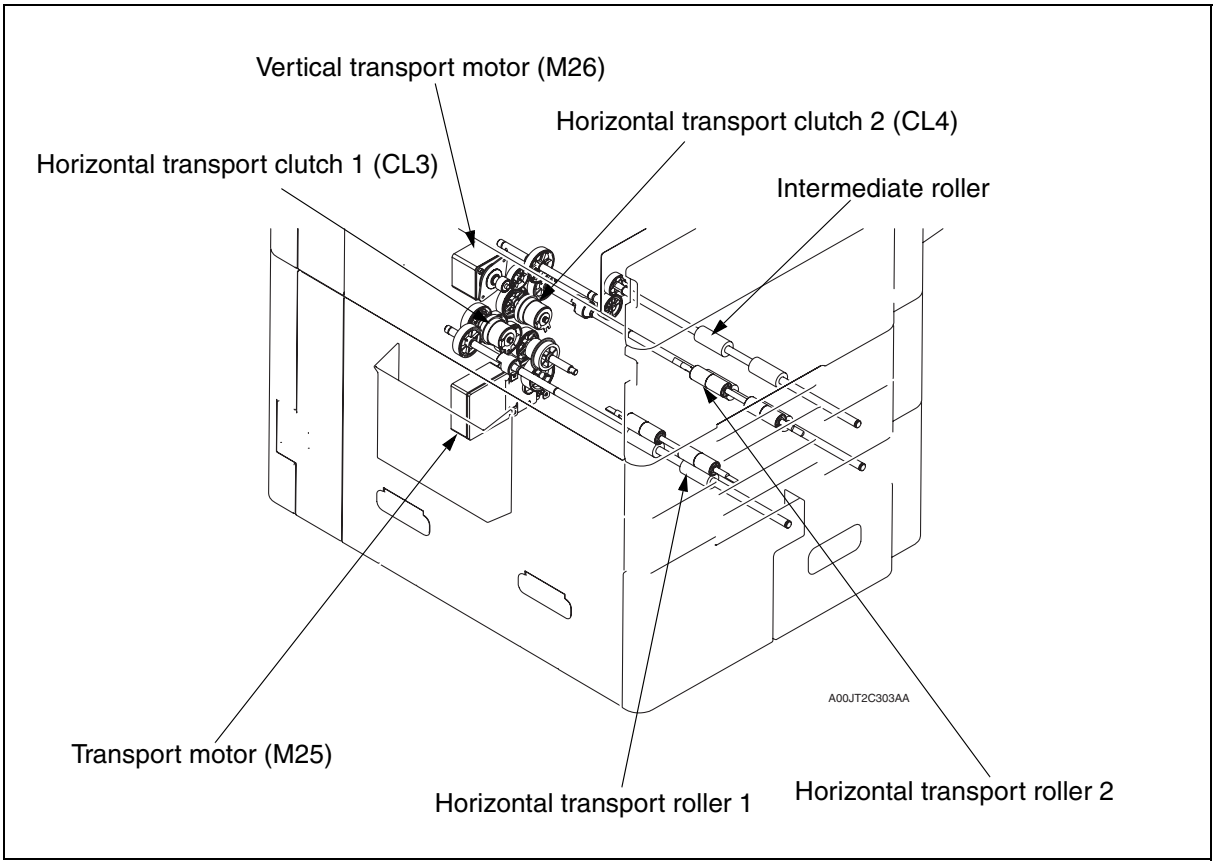
- Take-up motor drives the tray1 and 2 paper feed rollers.
- Each paper feed roller has a clutch that is turned ON when it needs to be driven.



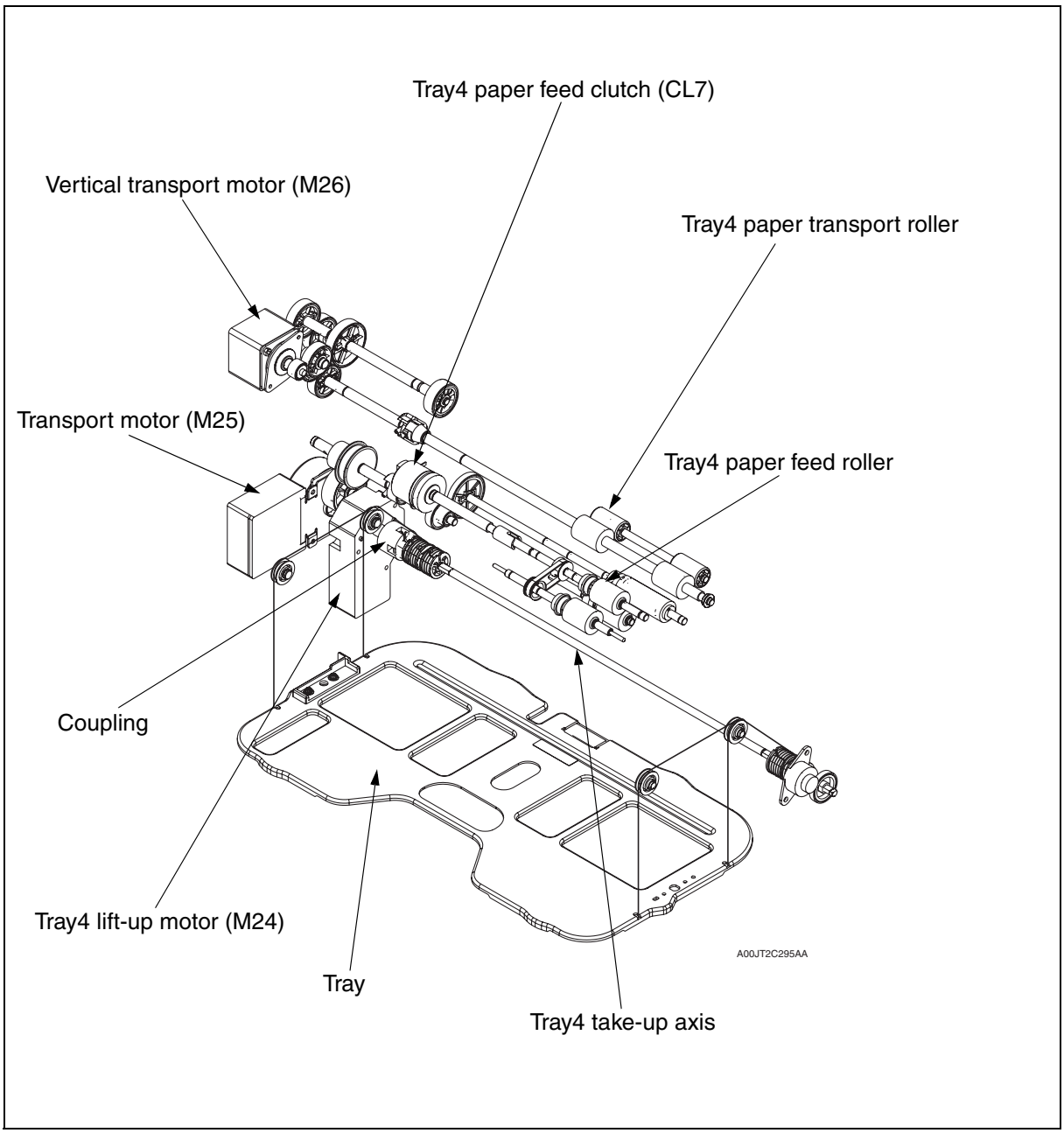
16.2.2 Tray3



16.2.3 Tray3 horizontal transport



16.2.4 Tray4


Tray4 paper feed clutch (CL7)
Vertical transport motor (M26)
Tray4 paper transport roller
Transport motor (M25)
Tray4 paper feed roller
Coupling
Tray4 lift-up motor (M24)
Tray
Tray4 take-up axis
A00JT2C295AA

16.3 Operation

16.3.1 Tray1, 2

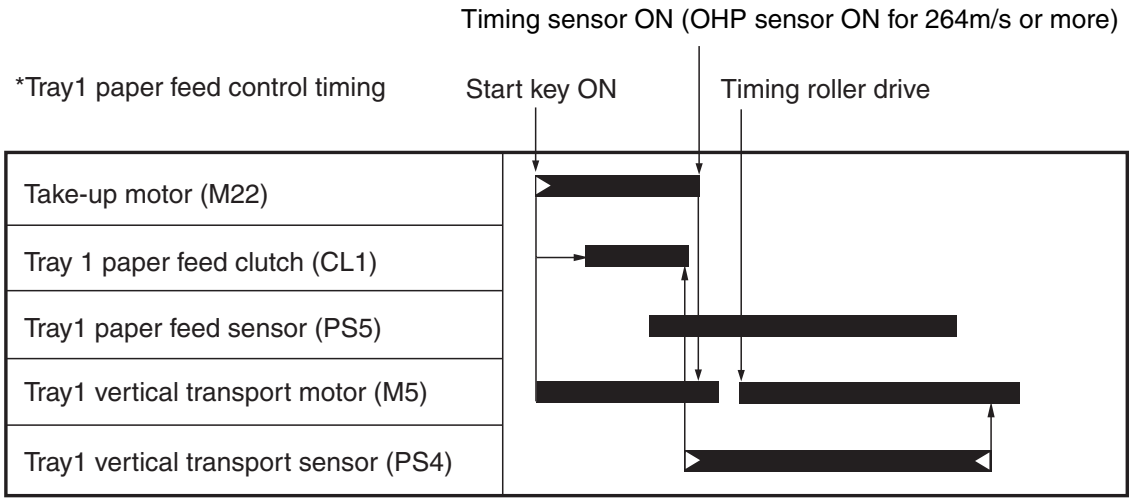
- Tray1 and Tray2 are controlled in the same control procedure.
- Paper transport speed from Tray1 and Tray2 is the same as the system speed.

A. Paper feed control

Paper type		Plain paper	Plain paper	Thick paper 1, 1+	Thick paper 1, 2, 3, 4 Special paper
Print mode		Monochrome	Color	Monochrome/Color	Monochrome/Color
Paper transport speed	MF550	264 mm/s	216 mm/s	132 mm/s	108 mm/s
	MF450	216 mm/s	216 mm/s	132 mm/s	108 mm/s

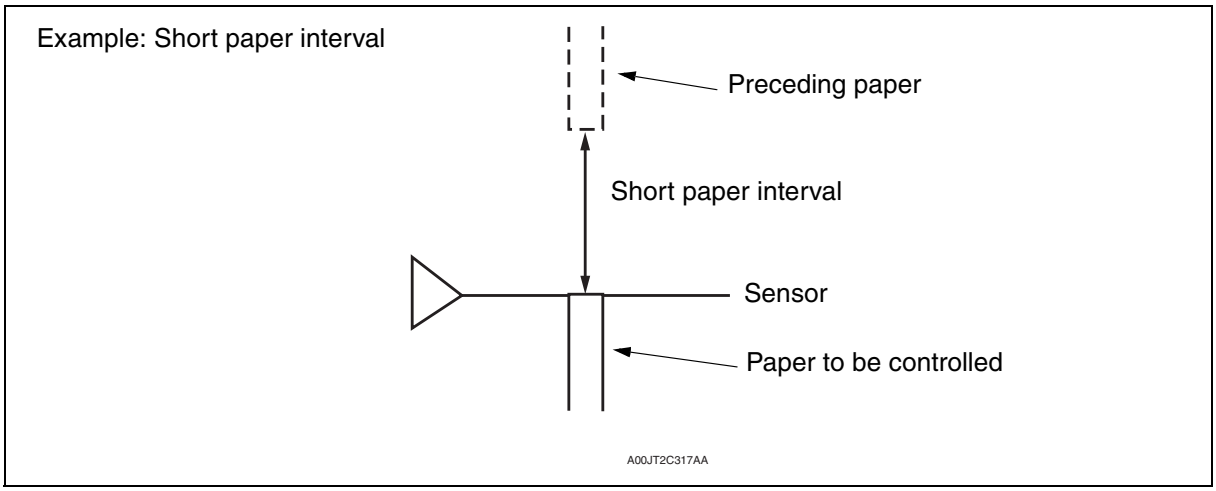
2

2



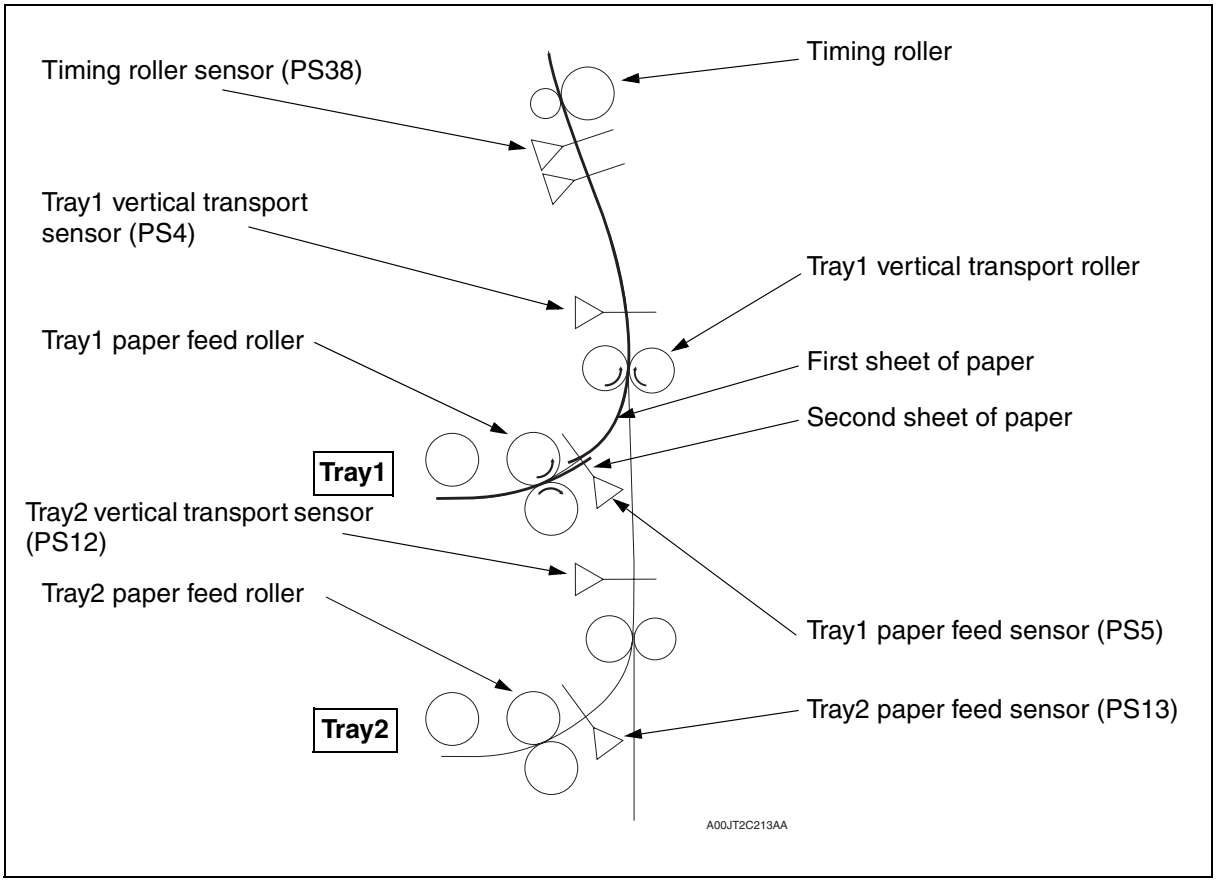
B. Paper feed speed reduction control

- When paper reaches the tray1 (tray2) paper feed sensor, if the interval between the paper and the preceding paper is short, the take-up motor speed is reduced temporarily to adjust the paper interval to the proper one.
- When paper reaches the tray1 (tray2) vertical transport sensor, if the interval between the paper and the preceding paper is short, the tray1 (tray2) vertical transport motor reduces its speed (in the case of transport speed 216 mm/s or more) or stops (in the case of transport speed 132 mm/s or less) in order to adjust the paper interval to the proper one.
- Paper from the Tray1 and Tray2 is transported at the same speed with the system speed.



C. Double feed control

- After the take-up motor is turned ON, if it is not turned OFF (no paper) by the time when the paper is supposed to be at the paper feed sensor, the machine judges that a double feed is occurring and reduces the rotation speed of the paper feed roller (take-up motor).

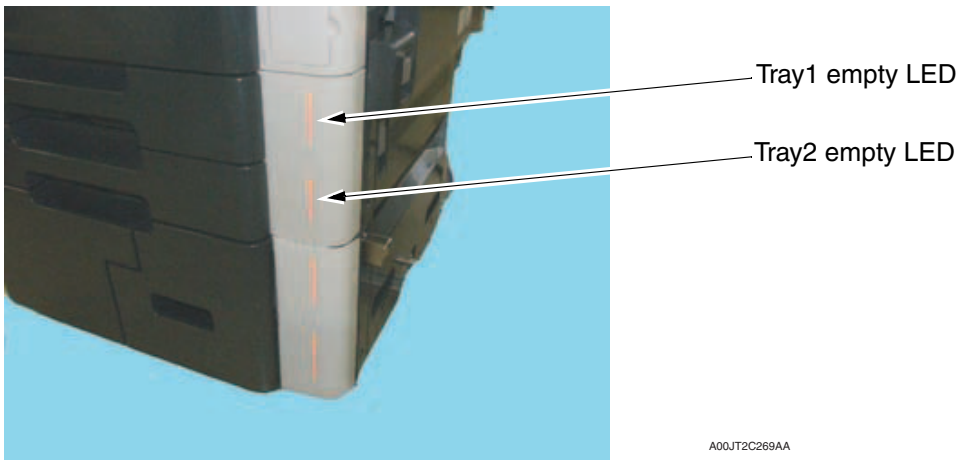


D. Paper supply level

- The amount of remaining paper is indicated by the LED on the right side of each tray and by the screen of the control panel.
- The following shows how the level is displayed.

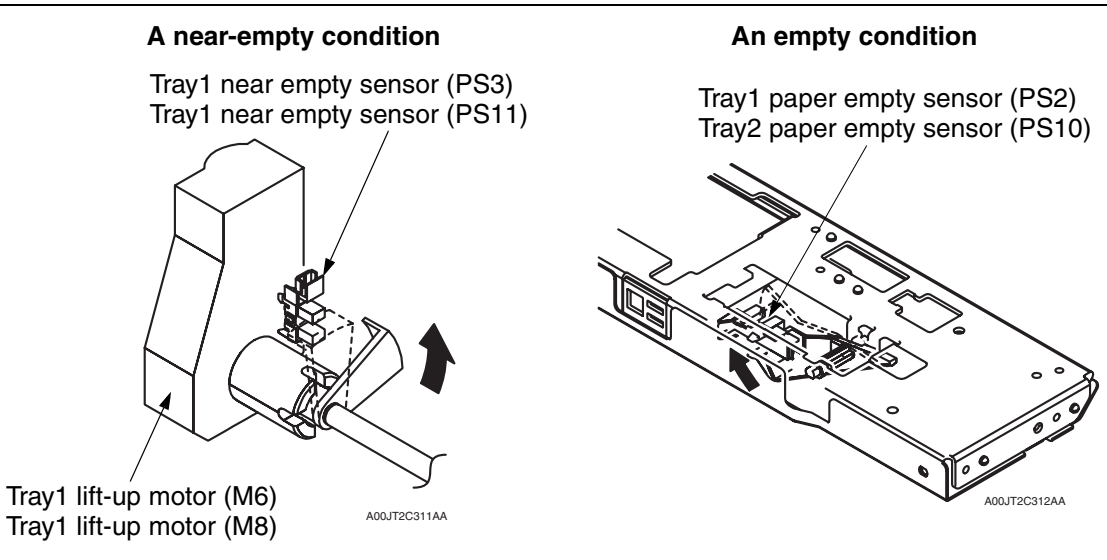
Tray condition	Empty	Near empty	Other statuses (Including during lift-up and no tray conditions)
LED	ON	Blinking *1	OFF

△3 *1: LED turns OFF when Paper Remainder is set to Type 2: Service Mode → System 1 → Machine State LED Setting → Paper Remainder.



E. Paper near-empty/Paper empty detection

- Paper near empty is detected by the tray1 (tray2) near empty sensor.
- Paper empty is detected by the tray1 (tray2) paper empty sensor.
- The paper supply level when a paper near-empty condition is detected is about 50 ± 30 sheets.



F. Paper size detection control

- Paper width/length are detected to determine the paper size from their combination.

Metric area

Paper size	Paper size detect board/1 (PSDTB/1) Paper size detect board/2 (PSDTB/2)				Tray1 CD paper size sensor/1 (PS7) Tray2 CD paper size sensor/1 (PS15)	Tray1 CD paper size sensor/2 (PS9) Tray2 CD paper size sensor/2 (PS16)
	Switch 1	Switch 2	Switch 3	Switch 4		
A3	OFF	ON/OFF	OFF	OFF	H	L
B4	OFF	OFF	OFF	ON	H	L
A4S	ON	ON/OFF	OFF	OFF	L	H
A4	ON/OFF	ON	ON	ON	H	L
B5S	ON	ON	OFF	ON	L	L
B5	OFF	OFF	ON	ON	H	L
A5S	ON/OFF	ON	ON	ON	L	L

Inch area

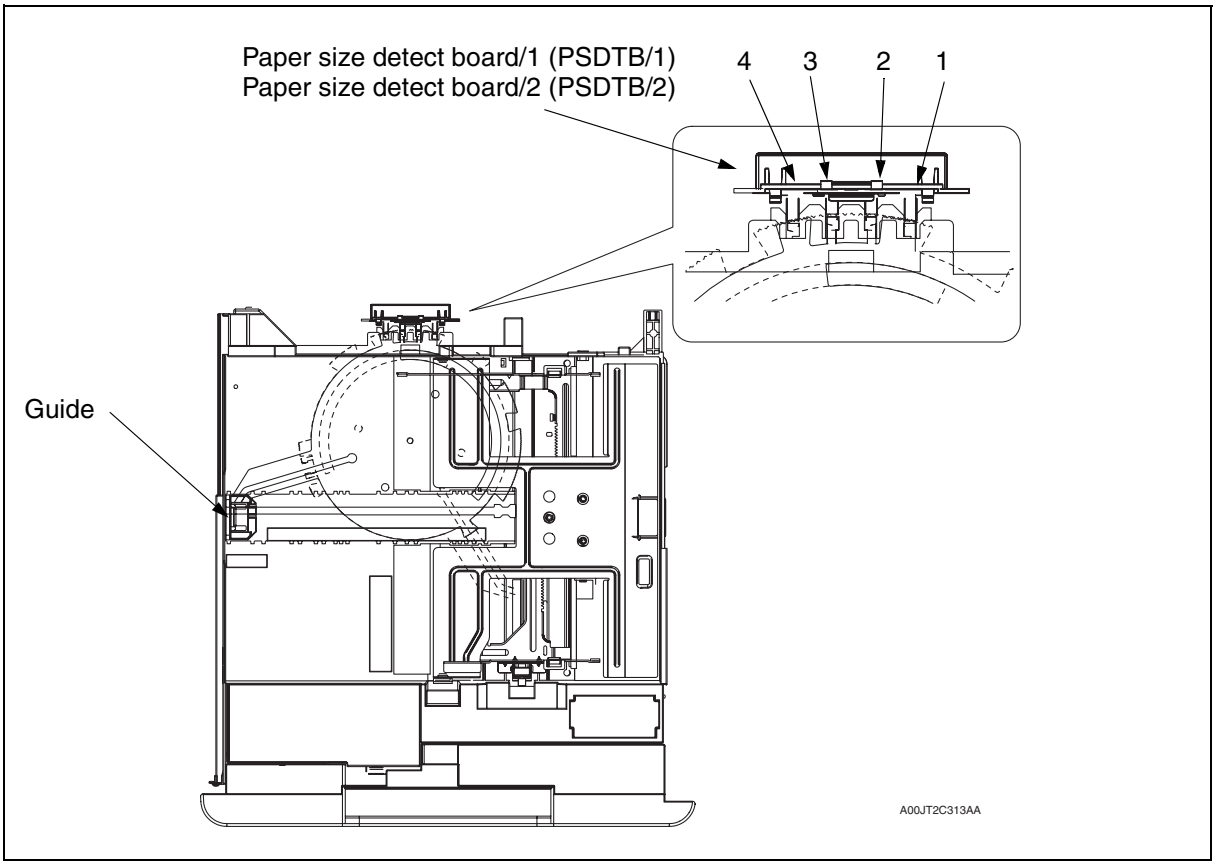
Paper size	Paper size detect board/1 (PSDTB/1) Paper size detect board/2 (PSDTB/2)				Tray1 CD paper size sensor/1 (PS7) Tray2 CD paper size sensor/1 (PS15)	Tray1 CD paper size sensor/2 (PS9) Tray2 CD paper size sensor/2 (PS16)
	Switch 1	Switch 2	Switch 3	Switch 4		
12 × 18S	ON	OFF	OFF	ON	H	L
11 × 17	OFF	ON	OFF	OFF	H	H
$8^1/_2$ × 14	OFF	OFF	OFF	ON	L	H
$8^1/_2$ × 11S	OFF	ON	ON	OFF	L	H
$8^1/_2$ × 11	ON	ON	ON	ON	H	H
FLS *1	OFF	OFF	OFF	OFF	L	H
8K (8 Open) S (270 mm × 390 mm)	OFF	OFF	ON	OFF	H	H
16K (16 Open) (270 mm × 195 mm)	OFF	ON	ON	ON	H	H

- This combination will also be used due to the sensor's ability.

H: Blocking

L: Unblocking

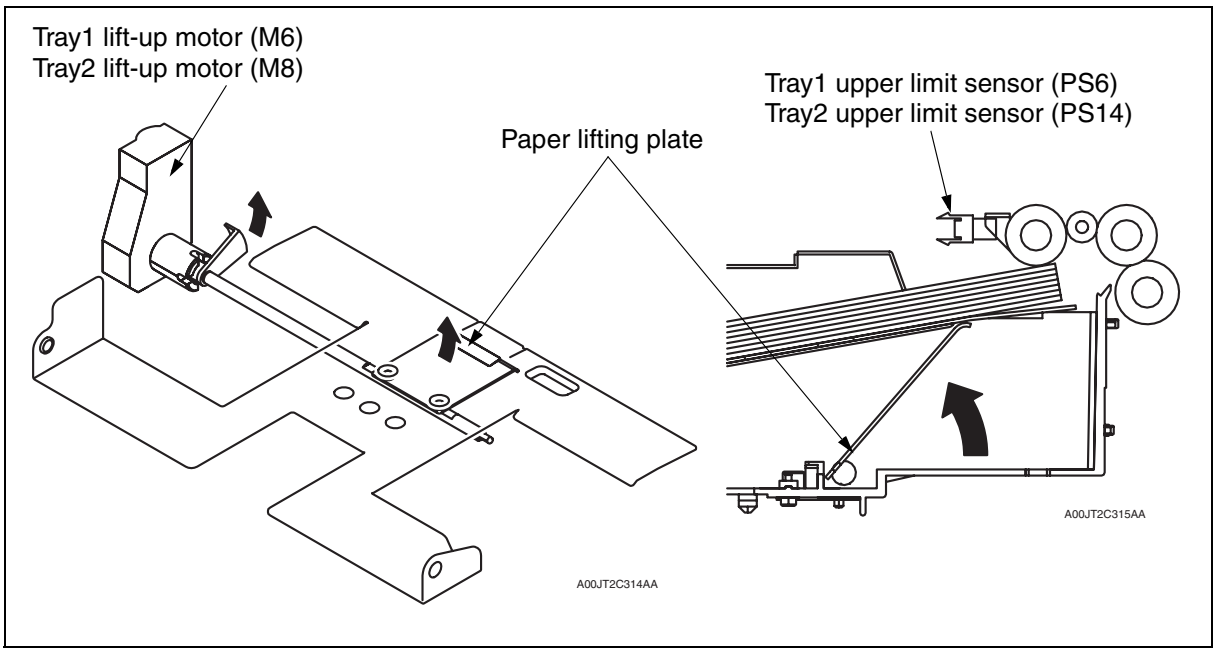
*: One of the following paper sizes can be selected to be set for FLS.
220 x 330 mm, 8 × 13, 8.125 × 13.25, 8.25 × 13, 8.5 × 13

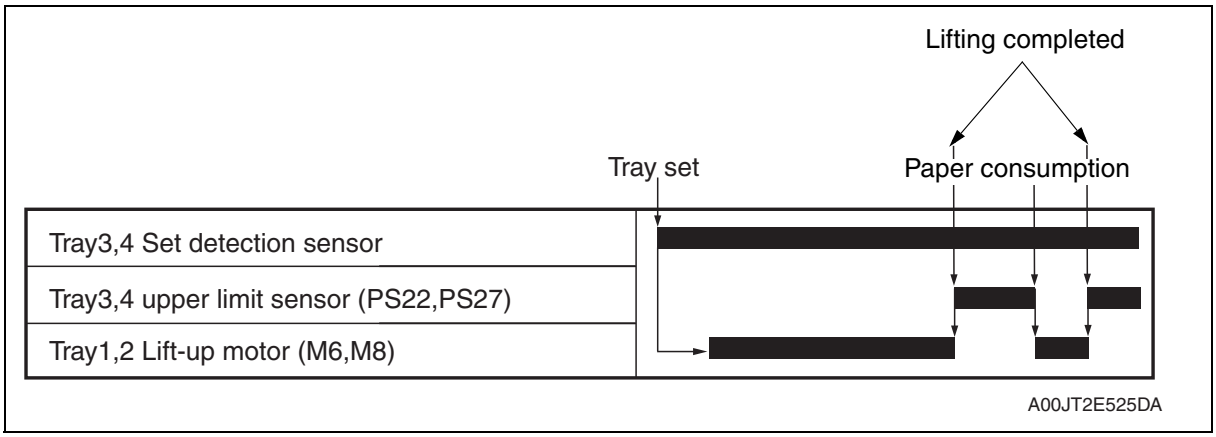

Paper size detect board/1 (PSDTB/1)
Paper size detect board/2 (PSDTB/2)
4
3
2
1
Guide
A00JT2C313AA

G. Tray lifting motion control

(1) When tray is slid in

- When the upper limit sensor is unblocked (OFF) with the tray being closed, lift-up motor will rotate to start lifting up the paper lifting plate.
- When the upper limit sensor is blocked (ON) after the paper lifting plate starts moving up, the trays 2 lift-up motor will stop to stop lifting the paper lifting plate.
- The lifting motion is controlled not to make more than two trays are lifted at the same time.





(2) During a print cycle

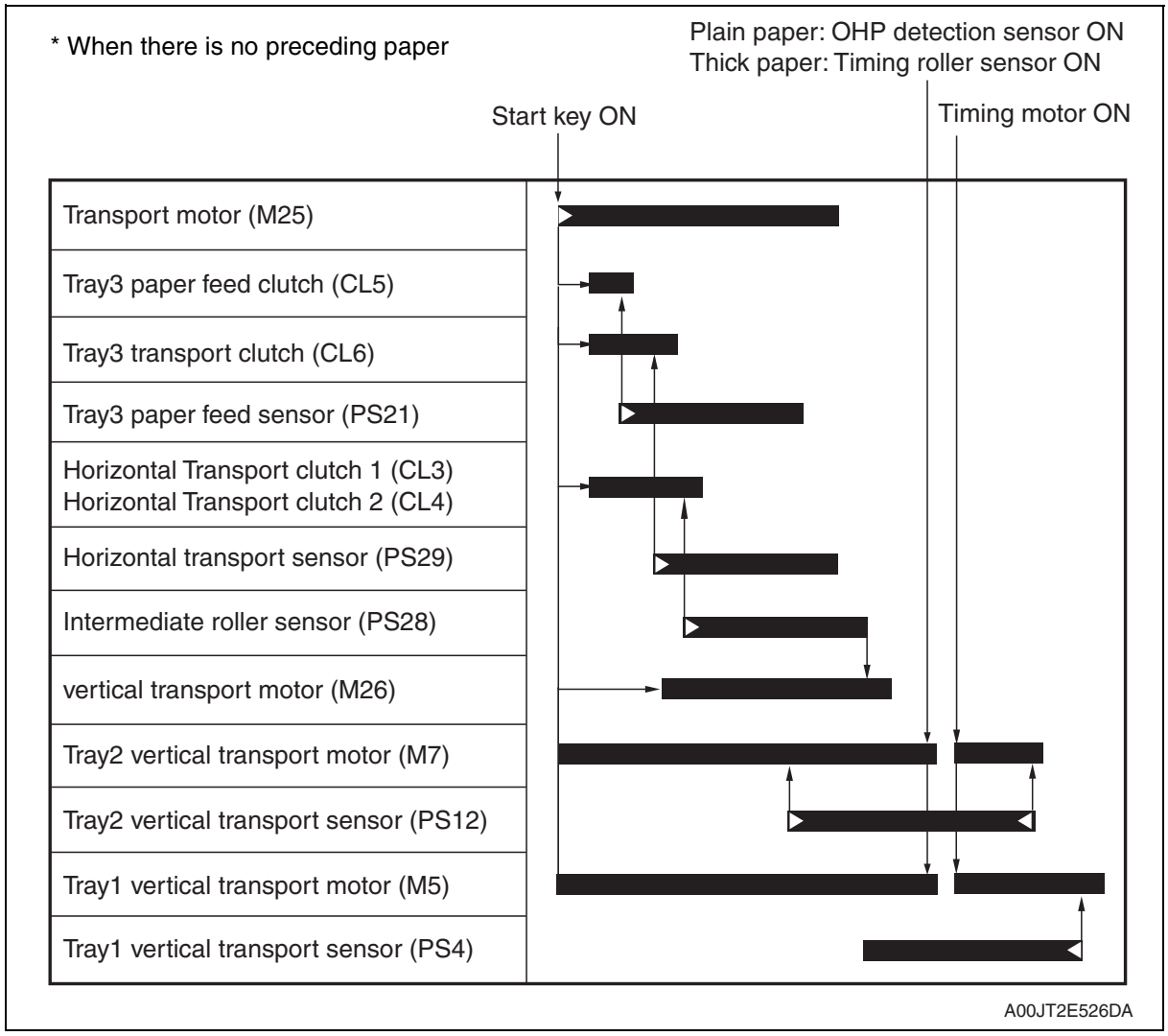
- When the amount of paper decreases as the unit keeps printing, the pick-up roller will gradually come down to unblock the upper limit sensor. The lift-up motor will rotate again to lift up the paper lifting plate.
- When the upper limit sensor is blocked (ON), the lift-up motor will stop to stop lifting the paper lifting plate.
- The sequence of these operations is repeated to keep constant the pressure between the pick-up roller and paper stack (paper take-up pressure) regardless of the amount of paper still available for use.

16.3.2 Tray3, 4

A. Paper Feed control

(1) Tray3

- When the interval between the paper and the preceding paper both fed from the tray3 is short, the tray3 transport clutch is stopped to adjust the paper interval to the proper one.
- When paper reaches the intermediate roller, if the interval between the paper and the preceding paper is short, the vertical transport motor is stopped to adjust the paper interval to the proper one.
- The horizontal transport clutch 1 and 2 make the control in the same timing.



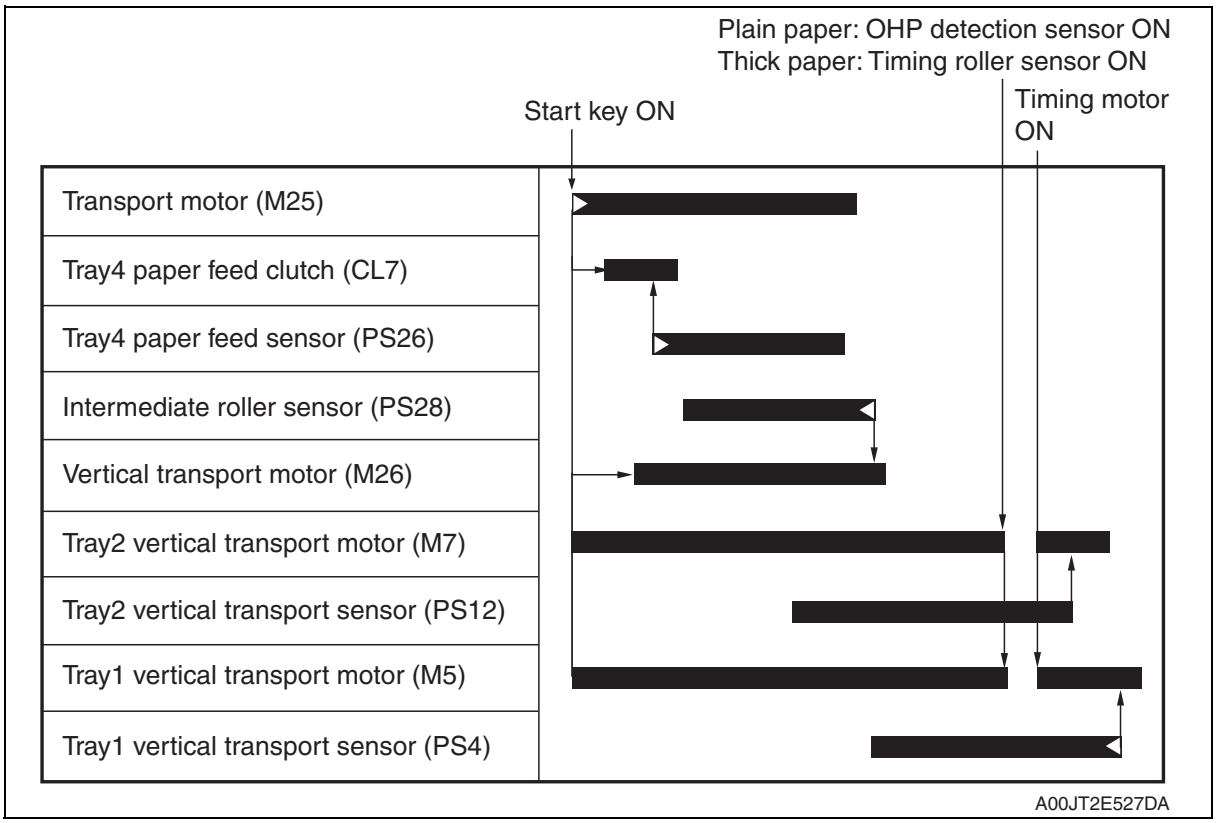
- Paper is fed from Tray3 and Tray4 at a speed faster than the system speed.
- Paper feed speed varies in order to feed paper at a faster speed to ensure a proper paper interval when the interval gets longer.

△2

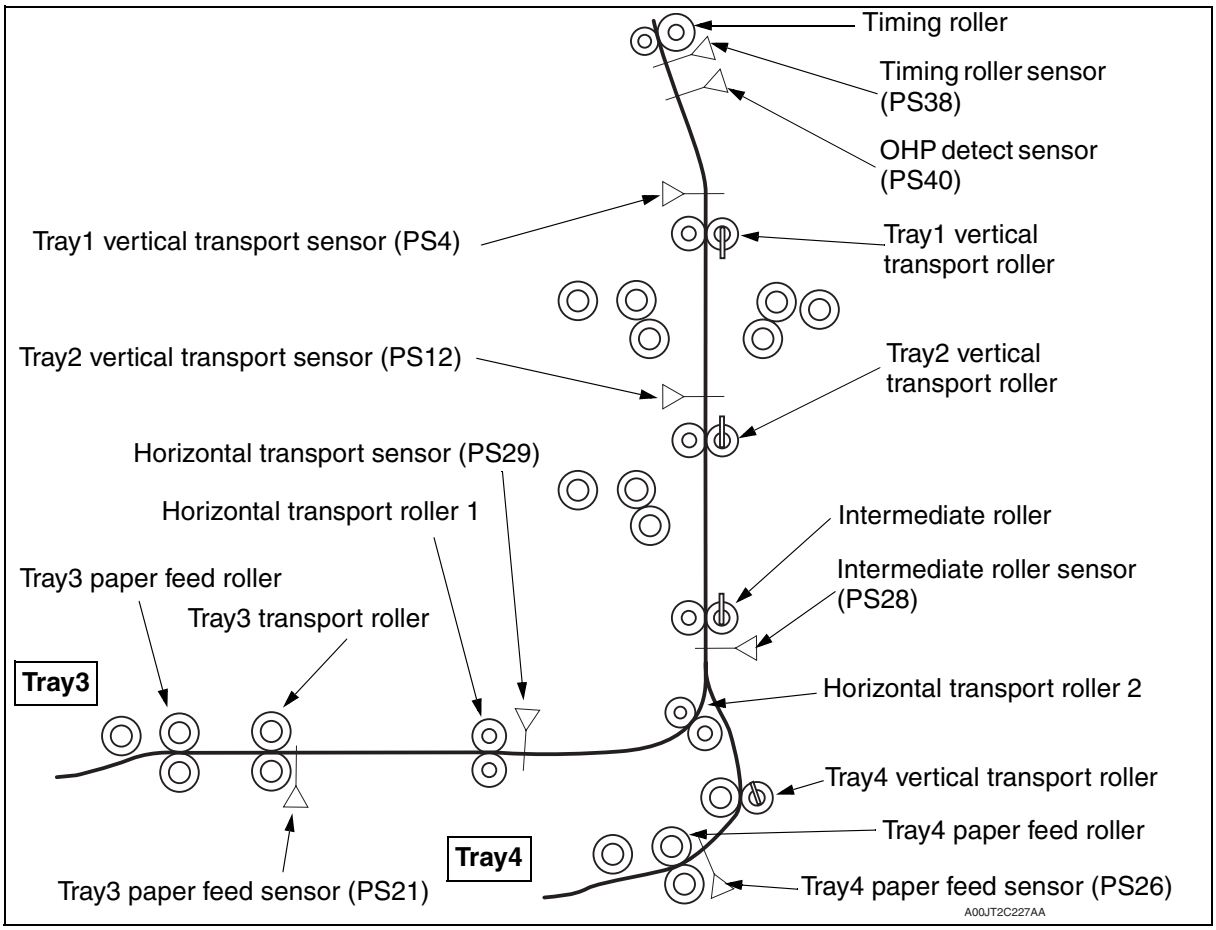
System speed (mm/s)	Transport speed (mm/s)
310 to 216	420
155 to 108	219

(2) Tray4

- When paper reaches the intermediate roller, if the interval between the paper and the preceding paper is short, the vertical transport motor is stopped to adjust the paper interval to the proper one.



(3) Sensor and roller arrangement

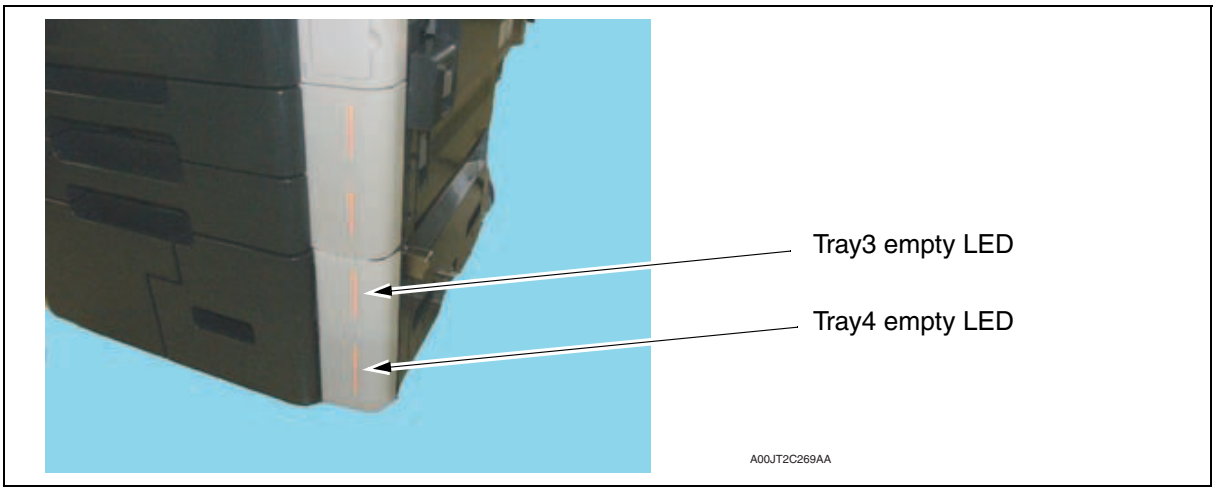


B. Display of paper supply level

- The amount of remaining paper is indicated by the LED on the right side of each tray and by the screen of the control panel.
- The following shows how the level is displayed.

Tray condition	Empty	Near empty *1	Other statuses (Including during lift-up and no tray conditions)
LED	ON	Blinking	OFF

△3 *1: LED turns OFF when Paper Remainder is set to Type 2: Service Mode → System 1 → Machine State LED Setting → Paper Remainder.



C. Paper supply level detection control

- Paper supply level is detected by calculation of the paper remaining level based on the time when the tray is lifted.
- Plain paper is used as the reference of the calculation for the paper supply level.
- When the thick paper is set, off set value is used to calculate the paper supply level.
  Ex: When thick paper 2 is set, paper supply level is calculated as a half of the plain paper level.
- Lifting time is measured when the power is turned ON, save mode is released and a tray is inserted.

Tray condition	Paper full	Paper near full	Paper remained
Paper supply level	100 to 66%	65 to 33%	33% to 51 sheets
Tray3 paper supply level	1500 to 1000 sheets	999 to 501 sheets	500 to 51 sheets
Tray4 paper supply level	1000 to 666 sheets	665 to 334 sheets	333 to 51 sheets

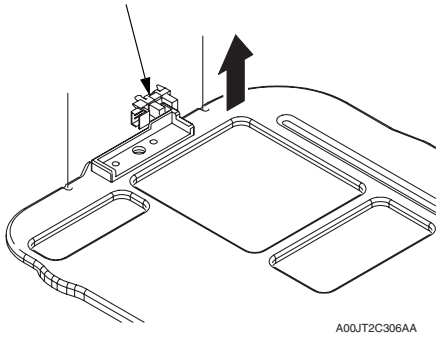
D. Paper near-empty/paper empty detection

- Paper near empty is detected by the tray3 (tray4) near empty sensor (blocking).
- Paper empty is detected by the tray3 (tray4) paper empty sensor (tray3: unblocking, tray4: blocking).
- The paper supply level when a paper near-empty condition is detected is about 50 ± 30 sheets.

A near-empty condition **An empty condition**

Tray3

Tray3 near empty sensor (PS22)



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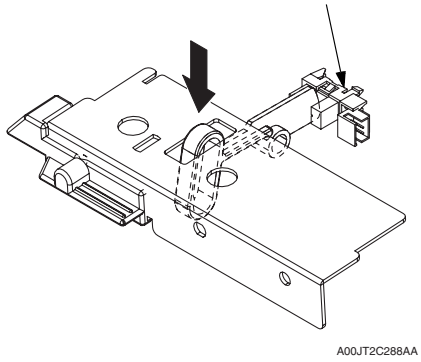
Tray3 paper empty sensor (PS19)



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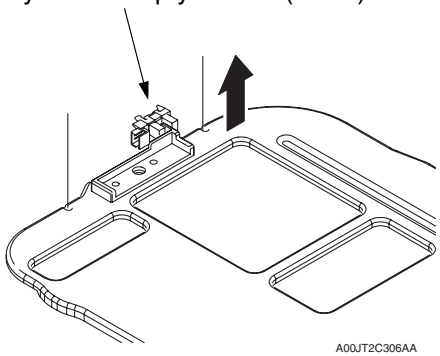
Tray4

Tray4 near empty sensor (PS27)



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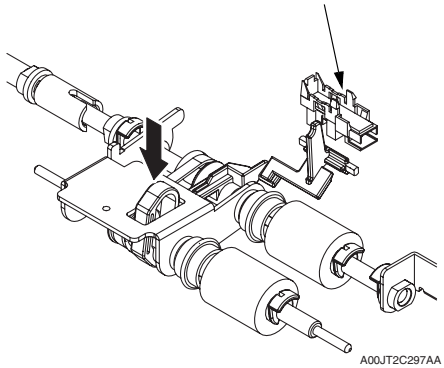
Tray4 paper empty sensor (PS24)



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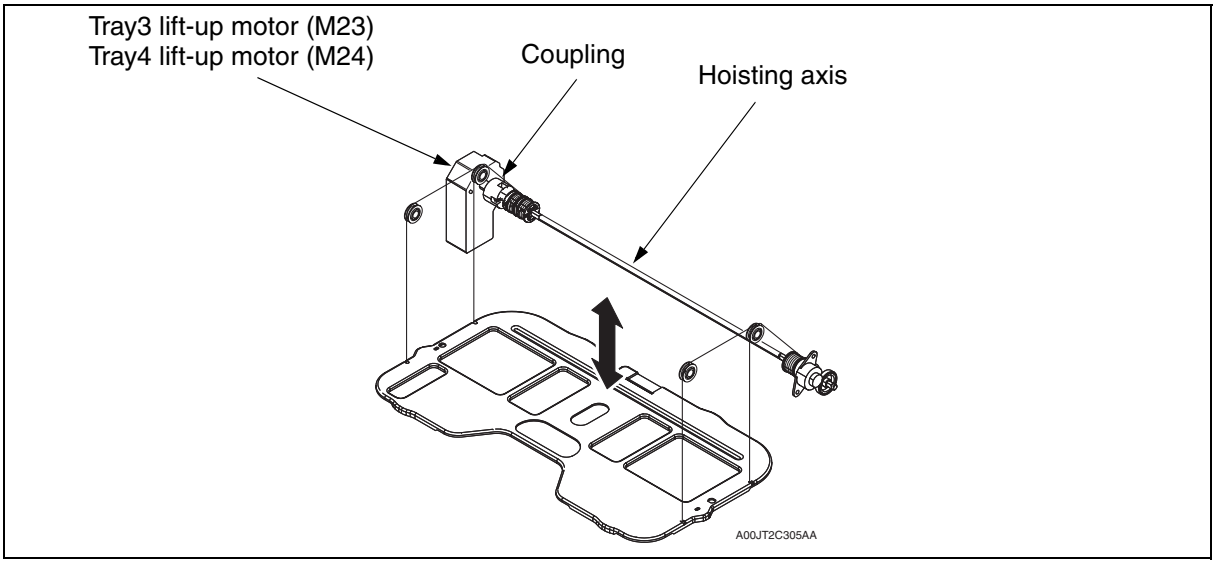
E. Tray lifting motion control

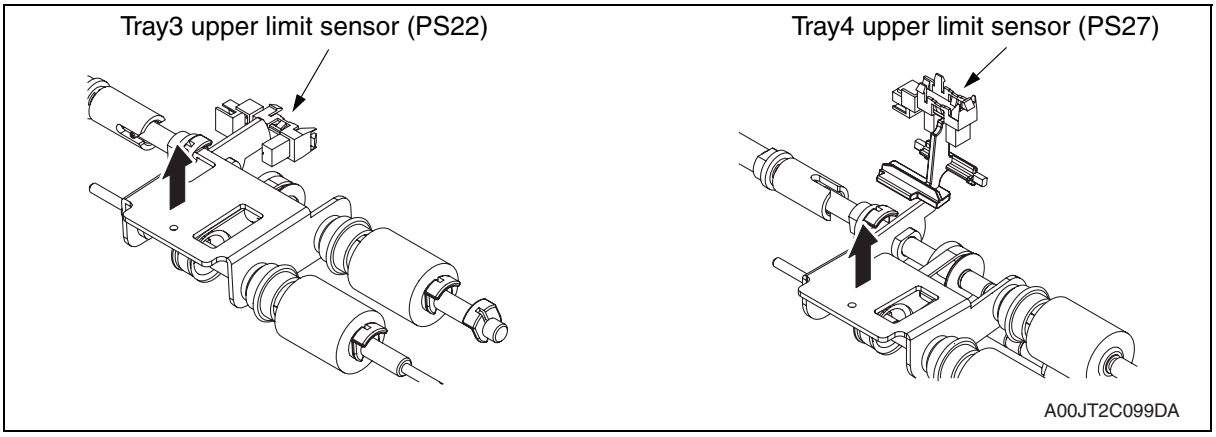
(1) Tray lifting motion

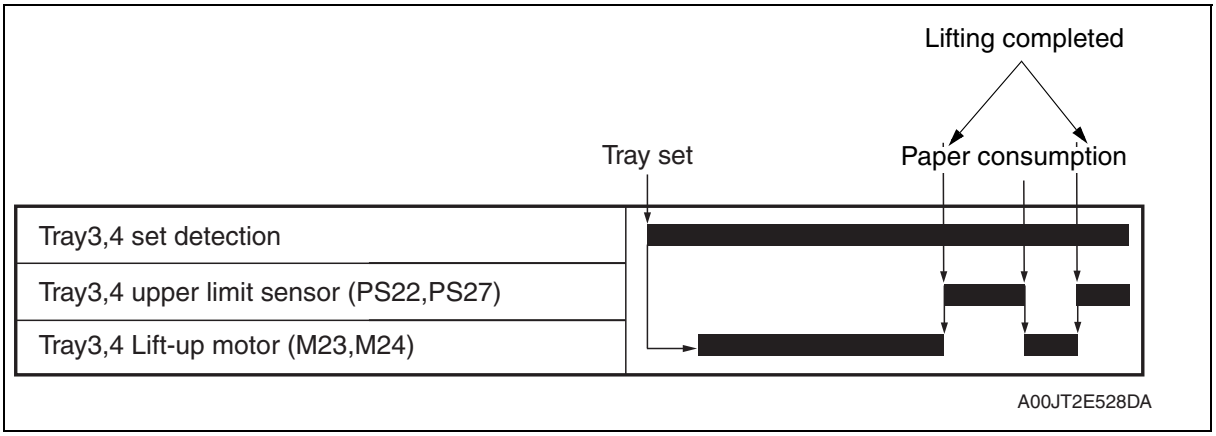
- The tray is hung with the wire connected to the front and the back.
- The wire is winded by the rotation of the lift-up motor, which lifts up the tray.
- When the tray is pulled out, the lift-up motor is disconnected from the hoisting axis, which lifts down the tray due to its own weight.



(2) When tray is slid in

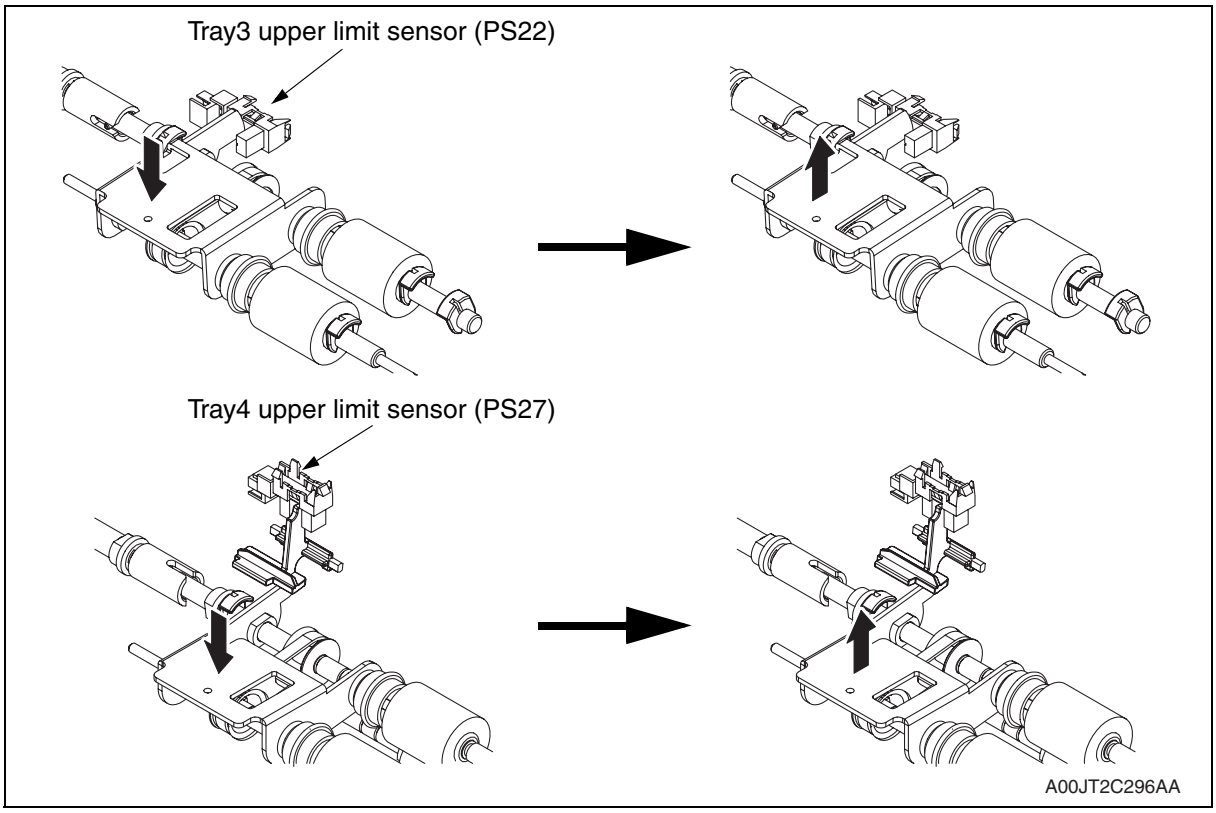
- While a tray is being closed, when the upper limit sensor of tray3 is unblocked or that of tray4 is blocked, the lift up motor rotates and starts lifting up the tray.
- After the machine starts to lift up the tray, when the upper limit sensor of tray3 is blocked or that of tray4 is unblocked, the lift up motor stops and finishes lifting up the tray.
- The lifting motion is controlled not to make more than two trays are lifted at the same time.





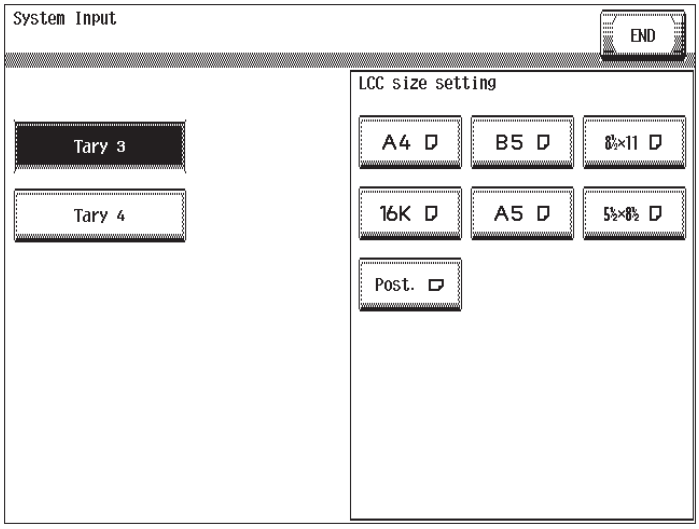
(3) During a print cycle

- When the amount of paper decreases as the machine continues printing, a tray will gradually go down making the upper limit sensor of tray3 unblocked or that of the tray4 blocked. The lift-up motor starts rotating again and lifting up the tray.
- When the upper limit sensor of tray3 is unblocked or that of tray4 is blocked, the lift- up motor stops and finishes lifting up the tray.
- The sequence of these operations is repeated to keep constant the pressure between the pick-up roller and paper stack (paper take-up pressure) regardless of the amount of paper still available for use.



F. Paper size detection

- Tray3 and 4 don't have paper size detection function.
- To set a different paper size, press keys as follows.
  Service mode → System setting 2 → LCC size setting
- Slide the paper guide plates to the positions that match the selected paper size and secure them with paper guide plate (screw cramp).



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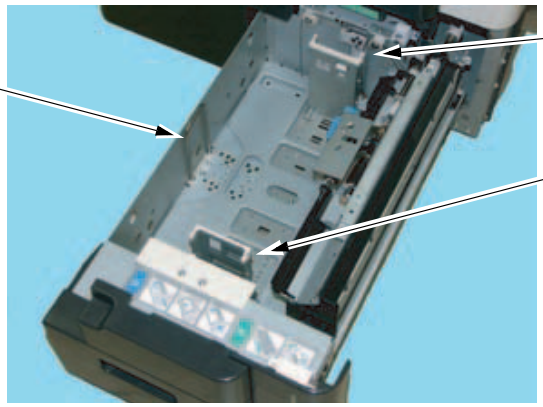

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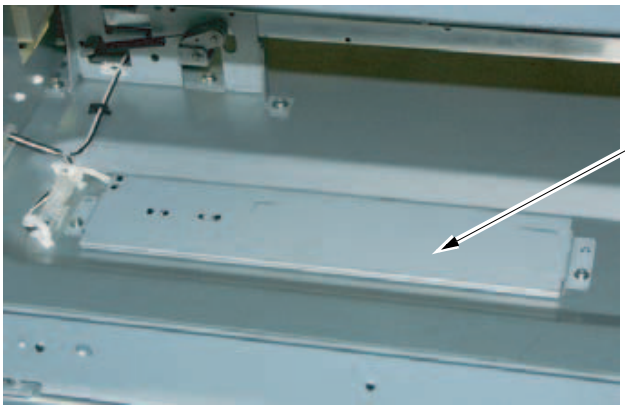
G. Dehumidification heater control

- Tray3 and 4 come equipped with the dehumidification heater.
- Power switch of the dehumidification heater locates the bottom of the back of the main body.
- When the PC motor is running, the dehumidification heater is turned OFF to reduce power consumption.

Dehumidification heater	Color PC motor	Black PC motor	During fine rotation
ON	Halt	Halt	OFF
ON	-	-	ON
OFF	Running	Halt	OFF
OFF	Halt	Running	OFF
OFF	Running	Running	OFF



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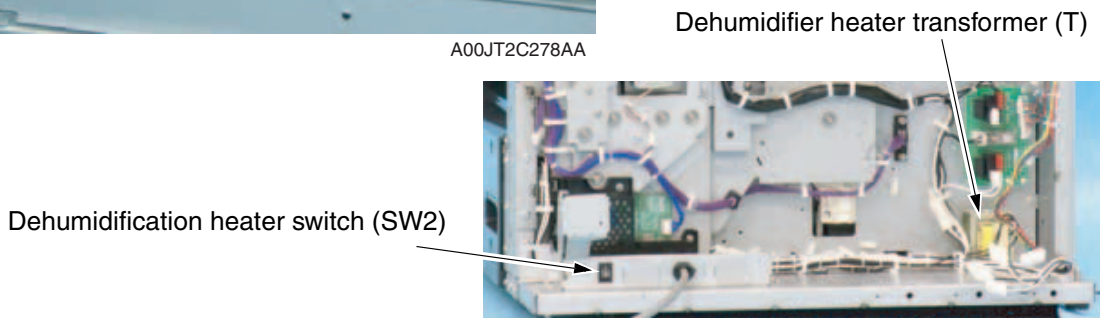

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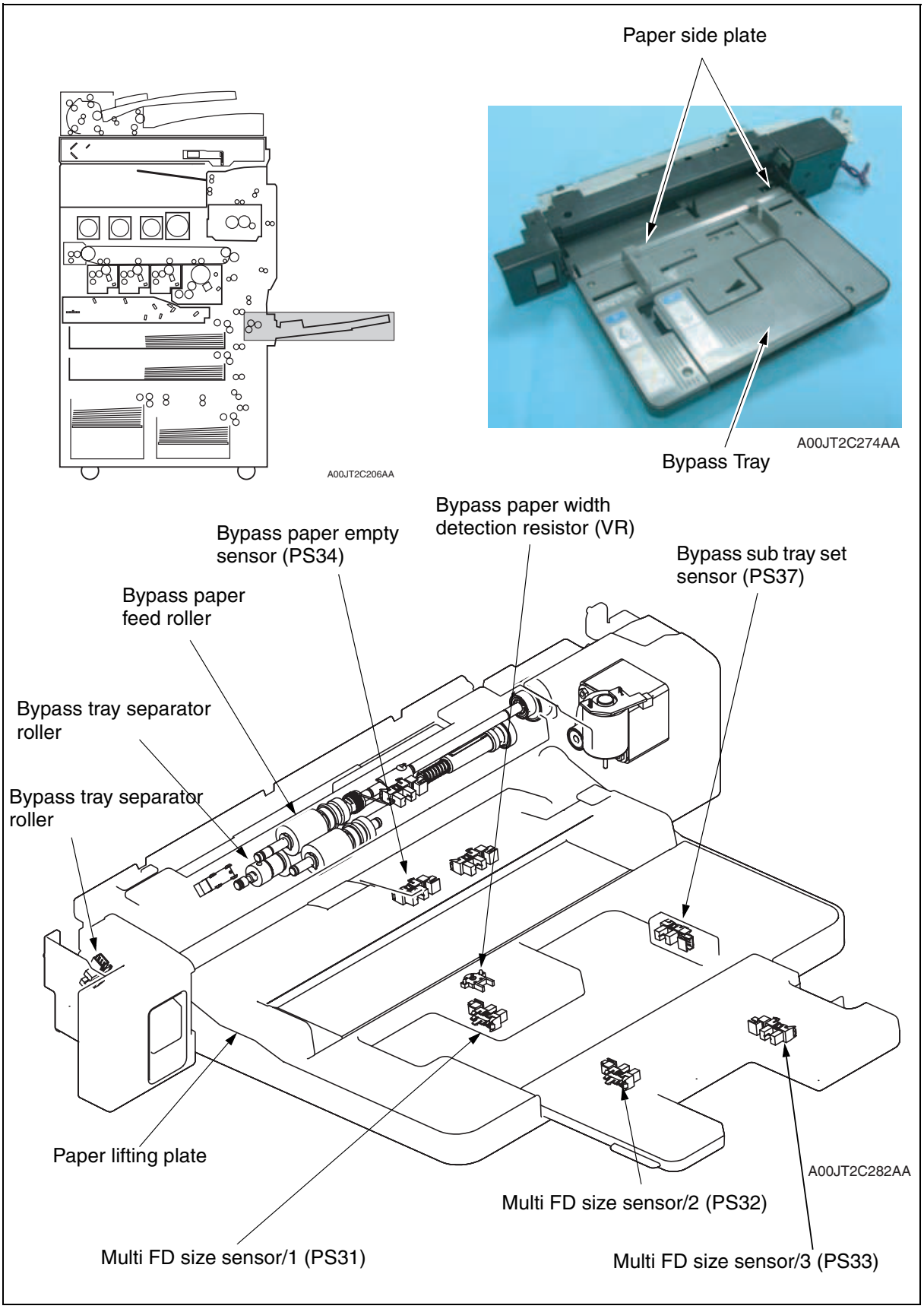
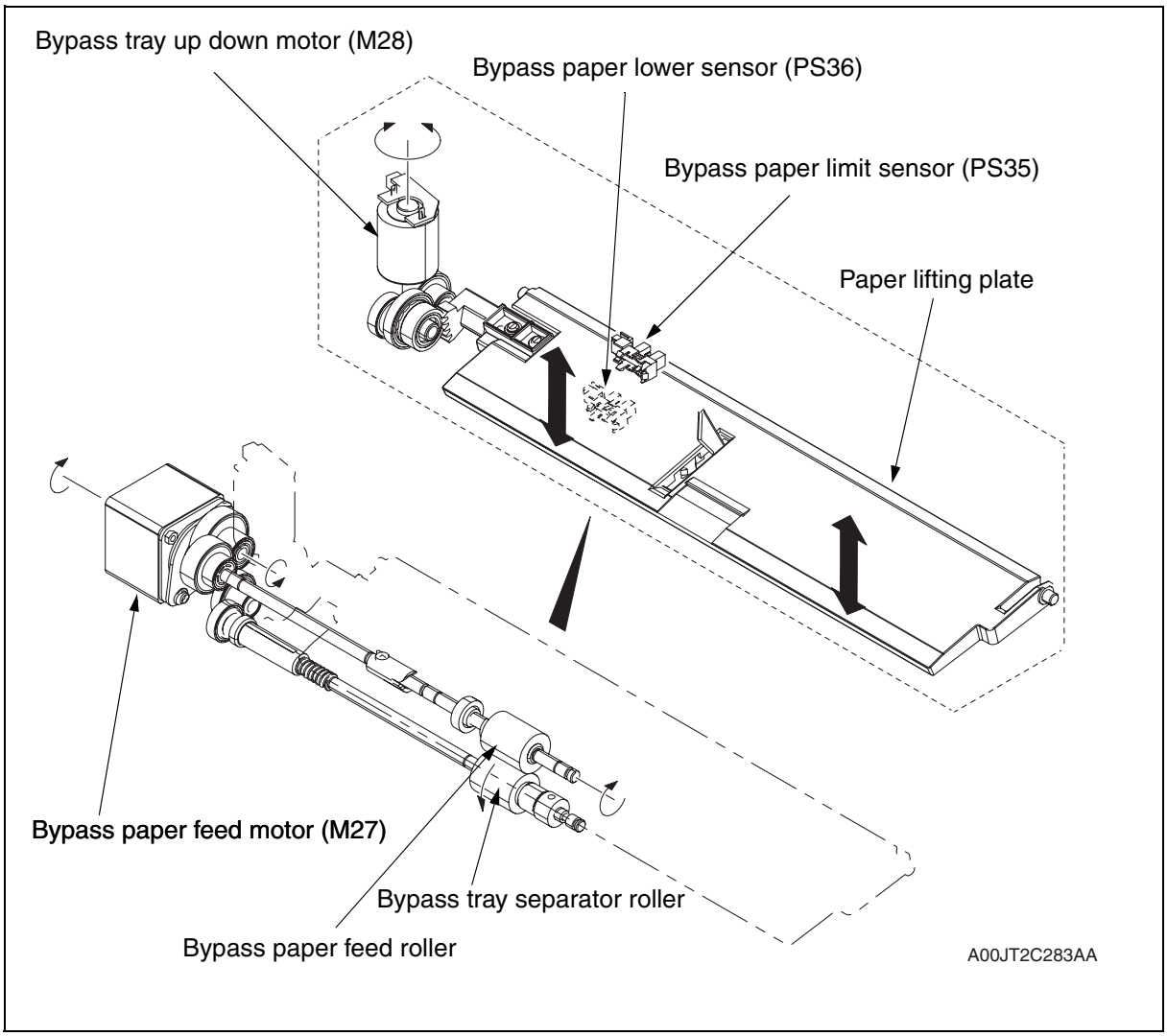
17. Bypass section

17.1 Composition



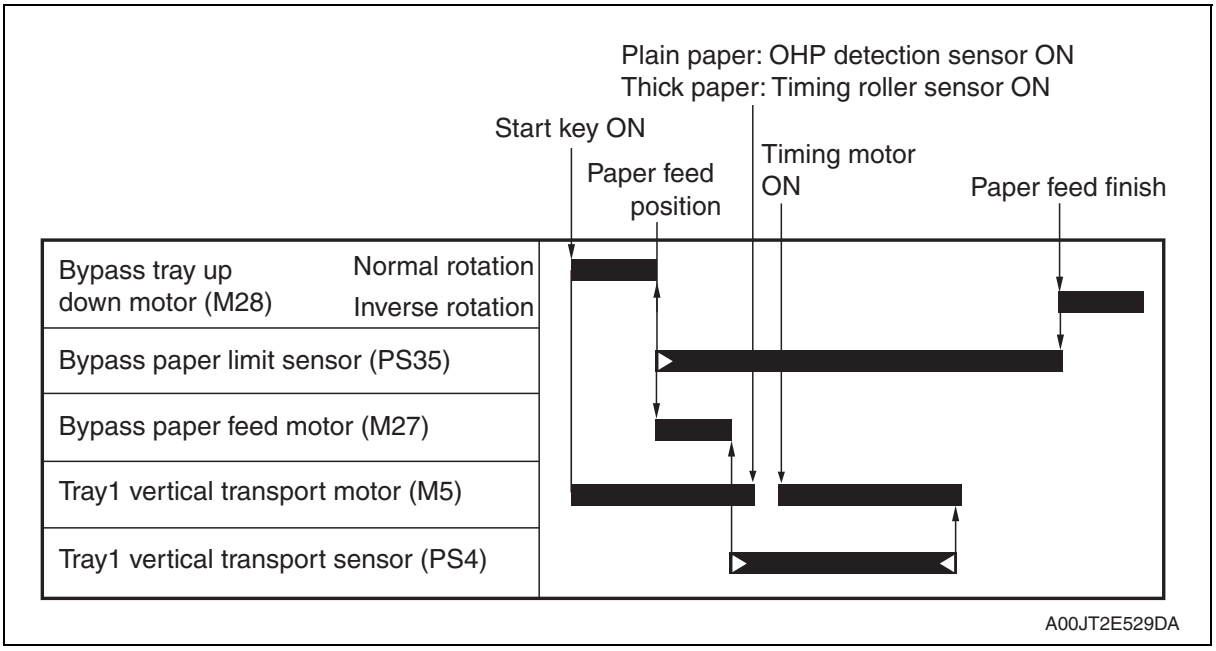
17.2 Drive


Bypass tray up down motor (M28)
Bypass paper lower sensor (PS36)
Bypass paper limit sensor (PS35)
Paper lifting plate
Bypass paper feed motor (M27)
Bypass tray separator roller
Bypass paper feed roller
A00JT2C283AA

17.3 Operation

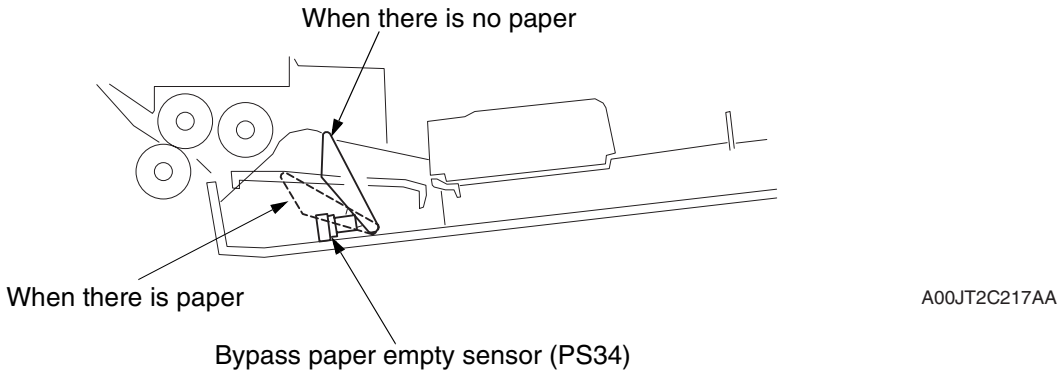
17.3.1 Bypass paper take-up control

- Bypass paper feed starts after the bypass tray up down motor lifts up paper to the take-up position.
- Paper is fed with the bypass paper feed motor.
- When paper reaches the tray1 vertical transport sensor, if the interval between the paper and the preceding paper is short, the tray1 vertical transport motor reduces its speed (in the case of transport speed 216 mm/s or more) or stops (in the case of transport speed 132 mm/s or more) to adjust the paper interval to the proper one.



17.3.2 Paper empty detection

- Paper empty is detected by the bypass paper empty sensor.
- Paper empty is detected both at the standby and the paper feed positions.



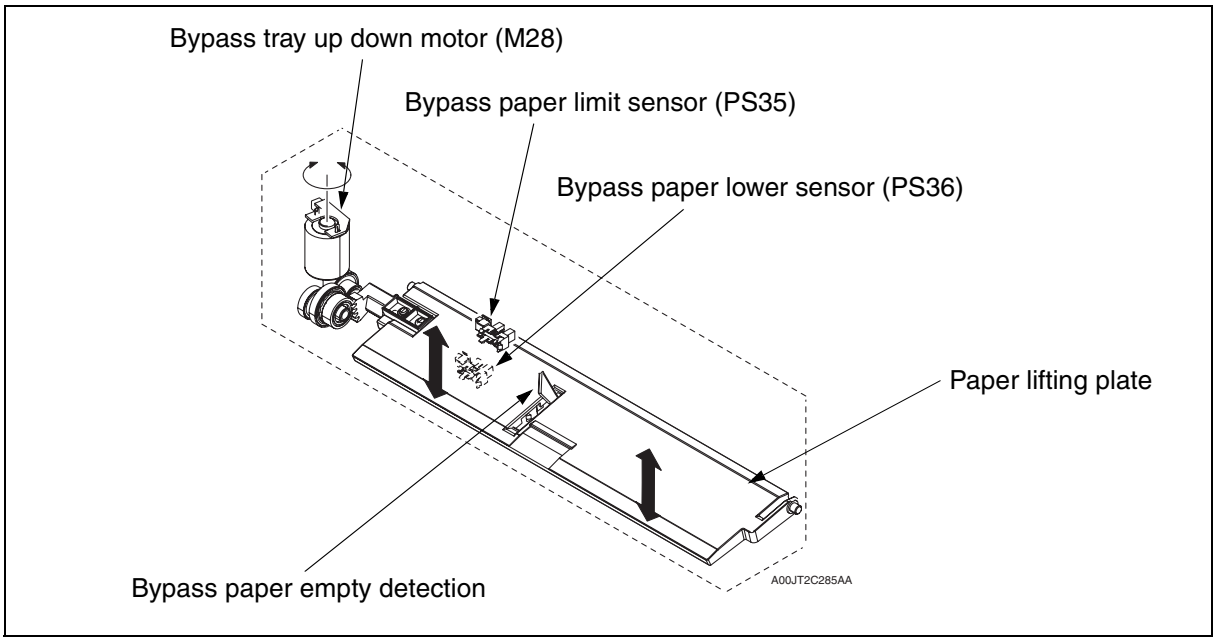
17.3.3 Bypass paper lifting motion control

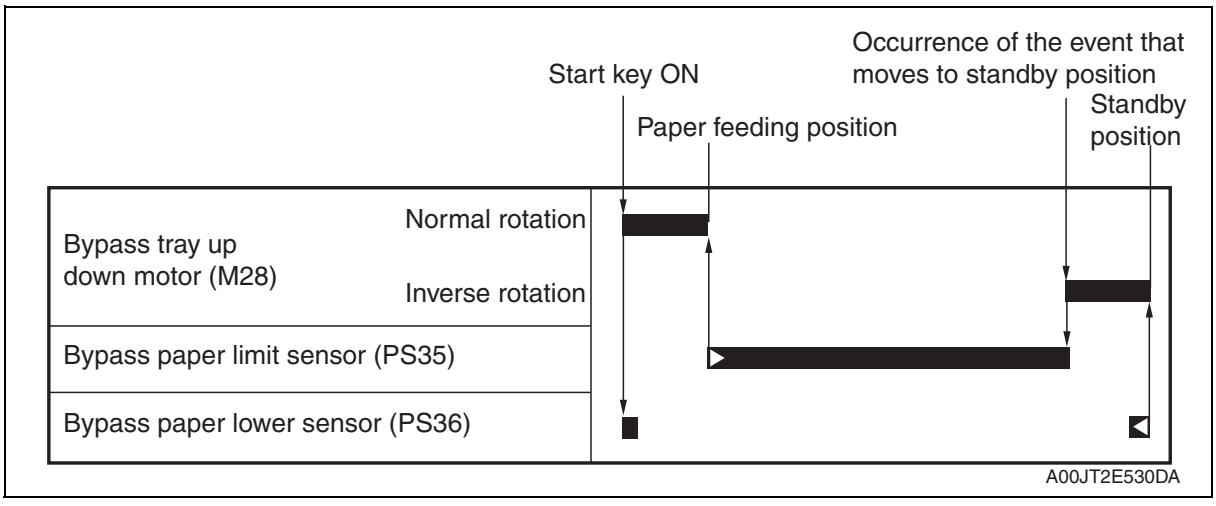
A. Move to paper feeding position

- When the bypass paper feeding starts, the bypass tray up down motor makes a normal rotation to move the paper lifting plate up to the paper feeding position. When the paper lifting plate is moved up, the bypass paper limit sensor turns ON to stops the bypass tray motor at the feeding position.
- When the paper supply level goes down during paper feeding and the bypass paper limit sensor turns OFF, the bypass tray motor rotates positively to move it up to the paper feeding position.

B. Move to standby position

- When there is no print request from the bypass tray and the paper fed from the bypass tray turns off the exit sensor, the paper lifting plate is lowered.
- Though other jobs are being processed, if the above conditions are met, the paper lifting plate is lowered.
- When the sensor detects the bypass paper empty at the feeding position, the paper lifting plate is moved to the standby position.
- When paper jam occurs, the paper lifting plate stops at the paper feeding position. After paper jam is resolved, the paper lifting plate moves to the standby position.





17.3.4 Paper size detection

- The size of the paper is detected by the combination of ON or OFF positions of three multi FD size sensors and the bypass paper width detection resistor.
- Moving the paper guide varies the resistance value of the bypass paper width detection resistor.

Metric area

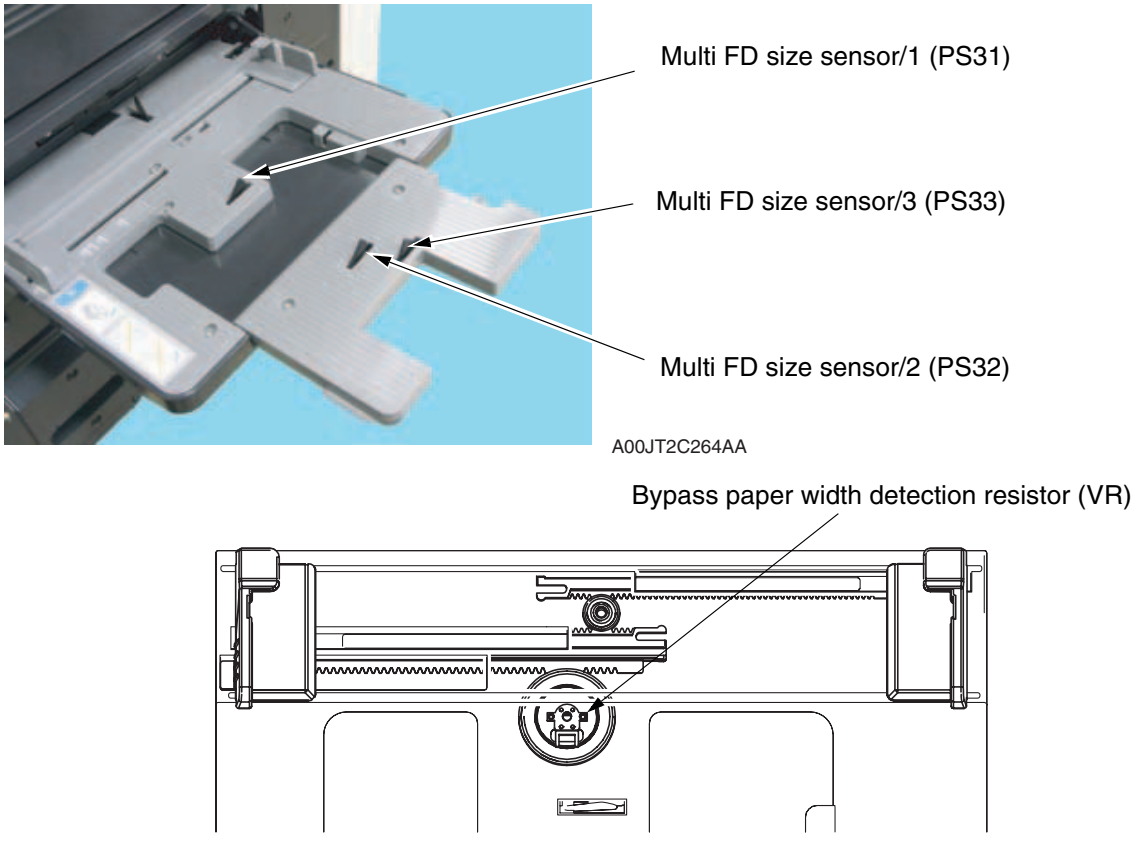
Multi FD size sensor/1	Multi FD size sensor/2	Multi FD size sensor/3	Bypass paper width detection resistor	Paper detection size
			Width (mm)	
OFF	OFF	OFF	80 to less than 115	A6S
			115 to 144 inclusive	B6S
			196 to 225 inclusive	A5
			242 to 268 inclusive	B5
ON	OFF	OFF	133 to 164 inclusive	A5S
			169 to less than 196	B5S
			196 to 225 inclusive	A4S
			255 to less than 288	$8^1/_2 \times 11$
			288 to 330 inclusive	A4
ON	ON	OFF	188 to 235 inclusive	FLS*
ON	ON	ON	201 to 231 inclusive	$8^1/_2 \times 14$
			242 to less than 268	B4
			268 to less than 288	11 × 17
			288 to less than 301	A3
			301 to 330 inclusive	12 × 18

*: One of the following paper sizes can be selected to be set for FLS.
220 x 330 mm, 8 × 13, 8.125 × 13.25, 8.25 × 13, 8.5 × 13

Inch area

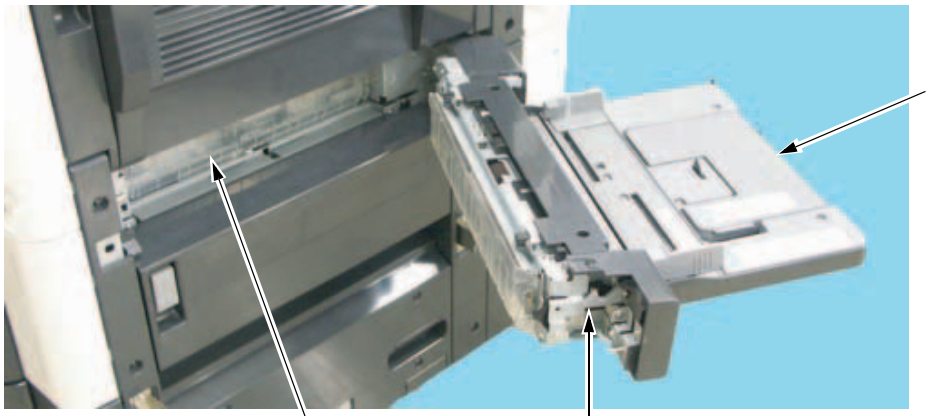
Multi FD size sensor/1	Multi FD size sensor/2	Multi FD size sensor/3	Bypass paper width detection resistor Width (mm)	Paper detection size
OFF	OFF	OFF	80 to less than 115	A6S
			115 to 144 inclusive	B6S
			201 to 231 inclusive	$5^1/_2 \times 8^1/_2$
			242 to 282 inclusive	$7^1/_4 \times 10^1/_2$
ON	OFF	OFF	125 to 155 inclusive	$5^1/_2 \times 8^1/_2$ S
			169 to less than 201	$7^1/_4 \times 10^1/_2$ S
			201 to 231 inclusive	$8^1/_2 \times 11$ S
			225 to less than 288	$8^1/_2 \times 11$
			288 to 330 inclusive	A4
ON	ON	OFF	188 to 235 inclusive	Foolscap*
ON	ON	ON	201 to 231 inclusive	$8^1/_2 \times 14$
			242 to less than 268	B4
			268 to less than 288	11 × 17
			288 to less than 301	A3
			301 to 330 inclusive	12 × 18

*: One of the following paper sizes can be selected to be set for Foolscap.
8 × 13, 8.125 × 13.25, 8.25 × 13, 8.5 × 13, 8.65 × 13



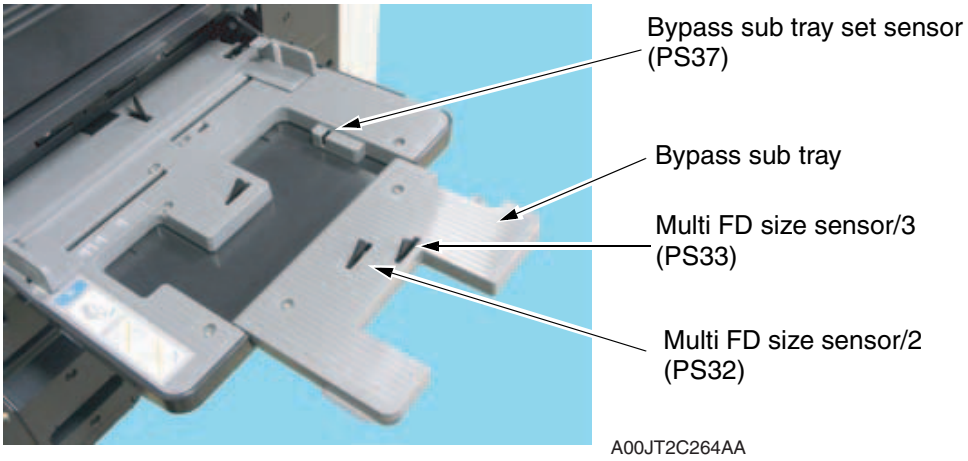
17.3.5 Bypass unit open/close mechanism

- The bypass unit open/close function has been installed to enable easier access to the jam controller and the tray1 paper feed part.



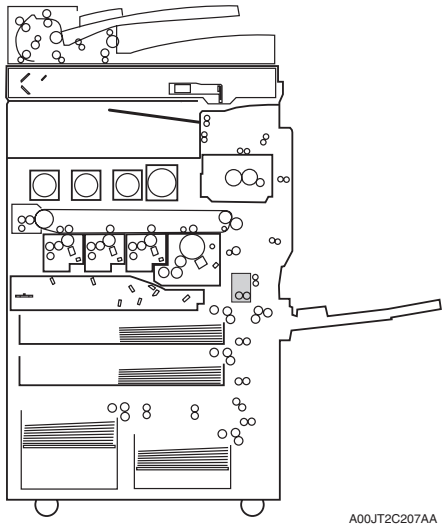
17.3.6 Bypass sub tray open/close detection

- The bypass sub tray set sensor has been installed to detect if the sub tray is open or close in order to prevent the false detection made by the multi FD size sensor/2, /3 when the bypass sub tray is closed.
- In this system both sensors don't function when the bypass sub tray is closed.



18. Timing roller section

18.1 Composition



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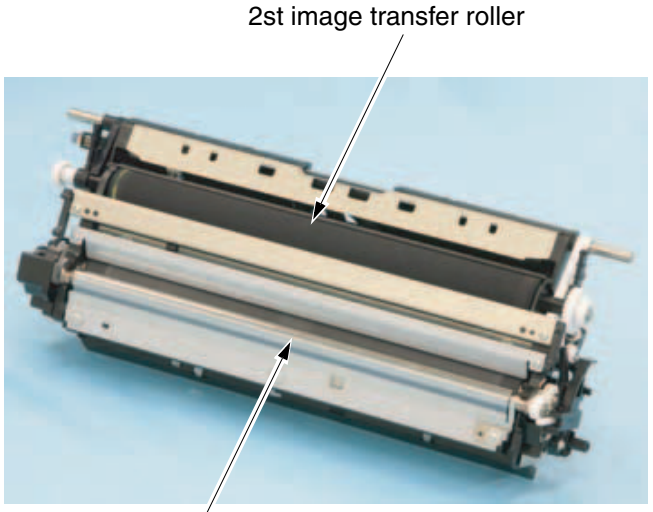

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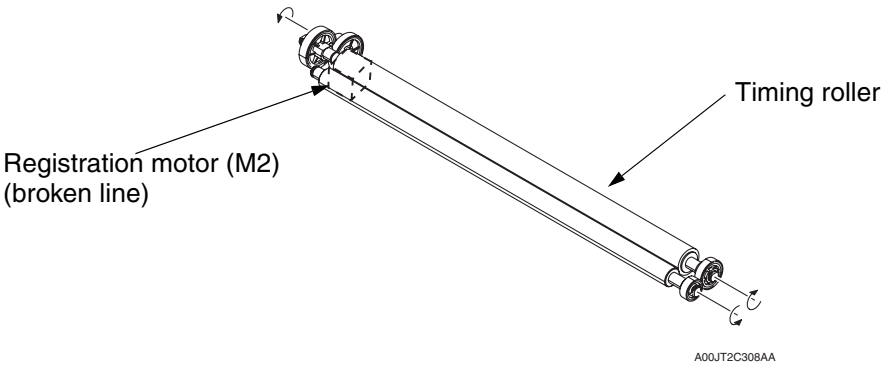
- **Drive**



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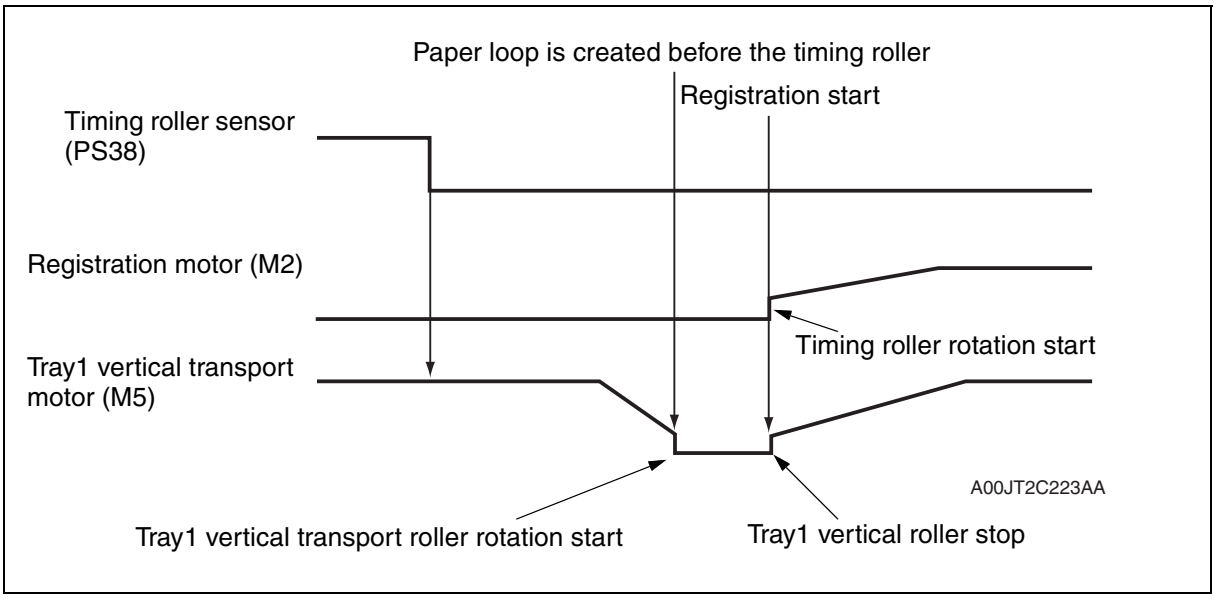
18.2 Operation

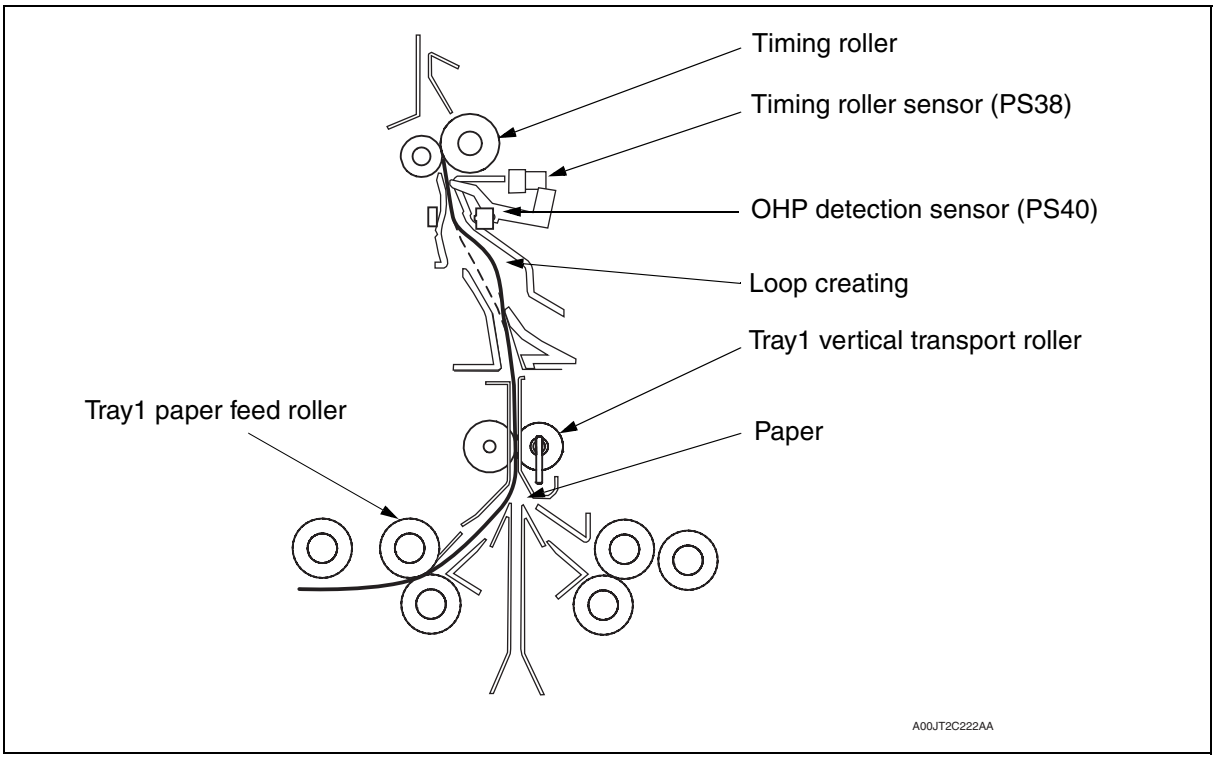
18.2.1 Timing roller control

- The paper will create a loop between the tray 1 vertical transport roller (or ADU transport roller 4) and the regist motor when the paper is being conveyed in order to correct the skew.
- Timing roller is controlled in order to synchronize the timing the unit starts writing the image and conveying paper.

A. Adjustment

- The amount of the loop of the paper can be adjusted in the “Service Mode - [Machine] - [Printer Regist Loop]”. Changing the adjustment value will change the OFF timing of the tray 1 vertical transport motor (or ADU transport motor 2).

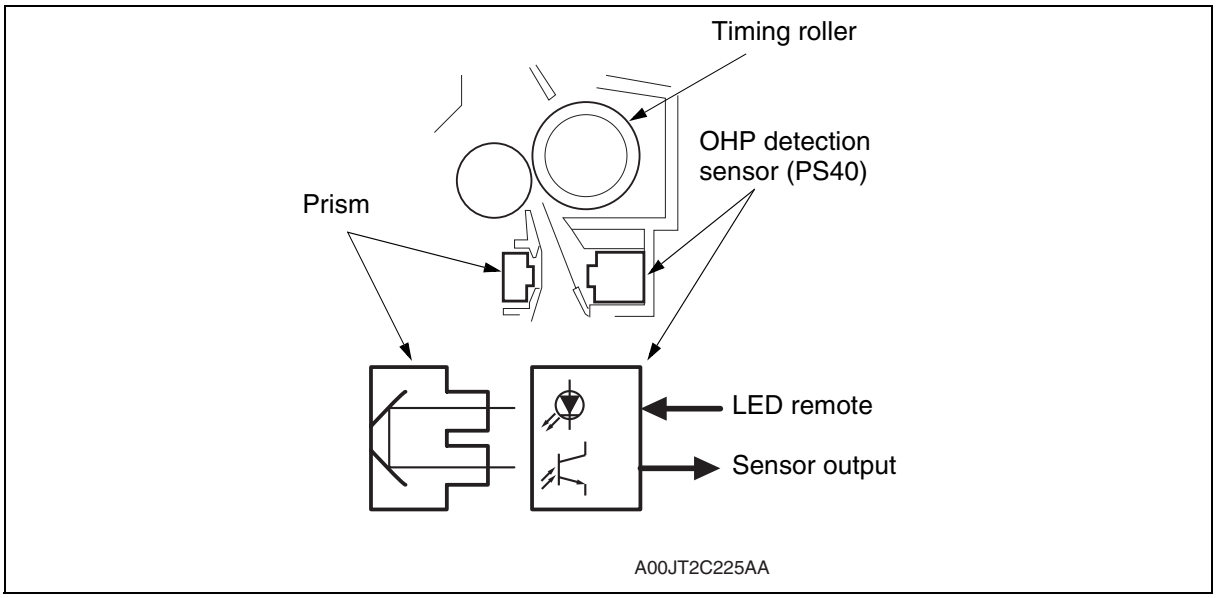




18.2.2 OHP detection

- OHP detection sensor checks to prevent printing on the paper other than OHP.
- OHP detection will be performed after paper made the loop at the timing roller. When the OHP detection shows the different result from the setting on the operation panel, printing will stop to display “Error.”

Paper type set from control panel	Results of OHP detection sensor (PC4) detection	Operation
OHP	Other than OHP	Stops printing promptly based on the detection of paper type inconsistency
Other than OHP	OHP	

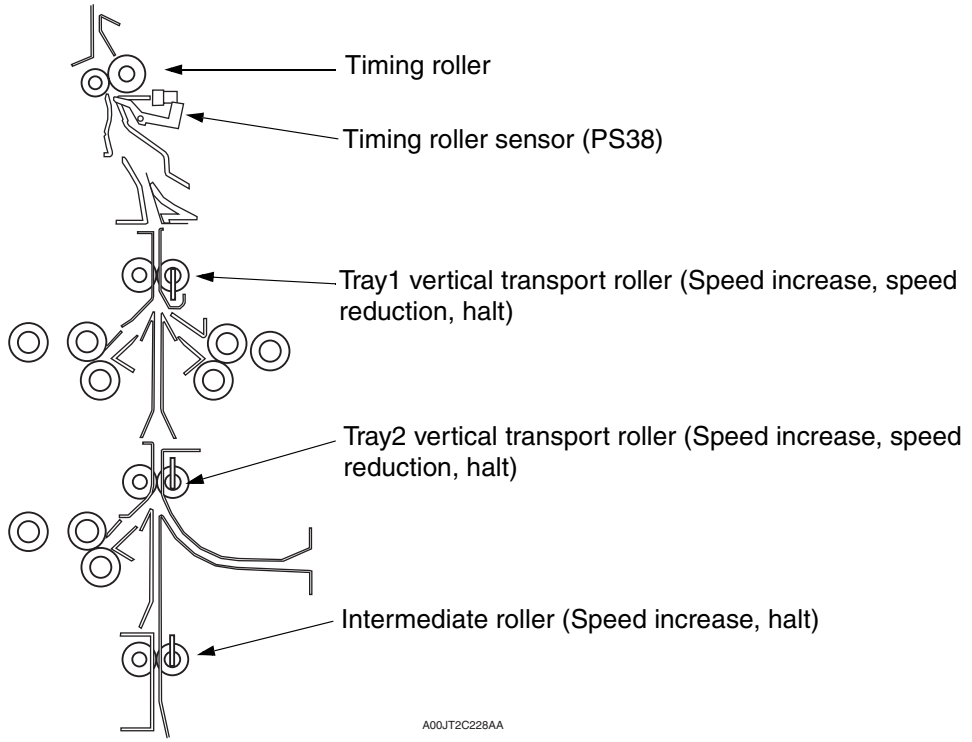


18.2.3 Speed control

- It controls the timing the paper reaches to the timing roller sensor.

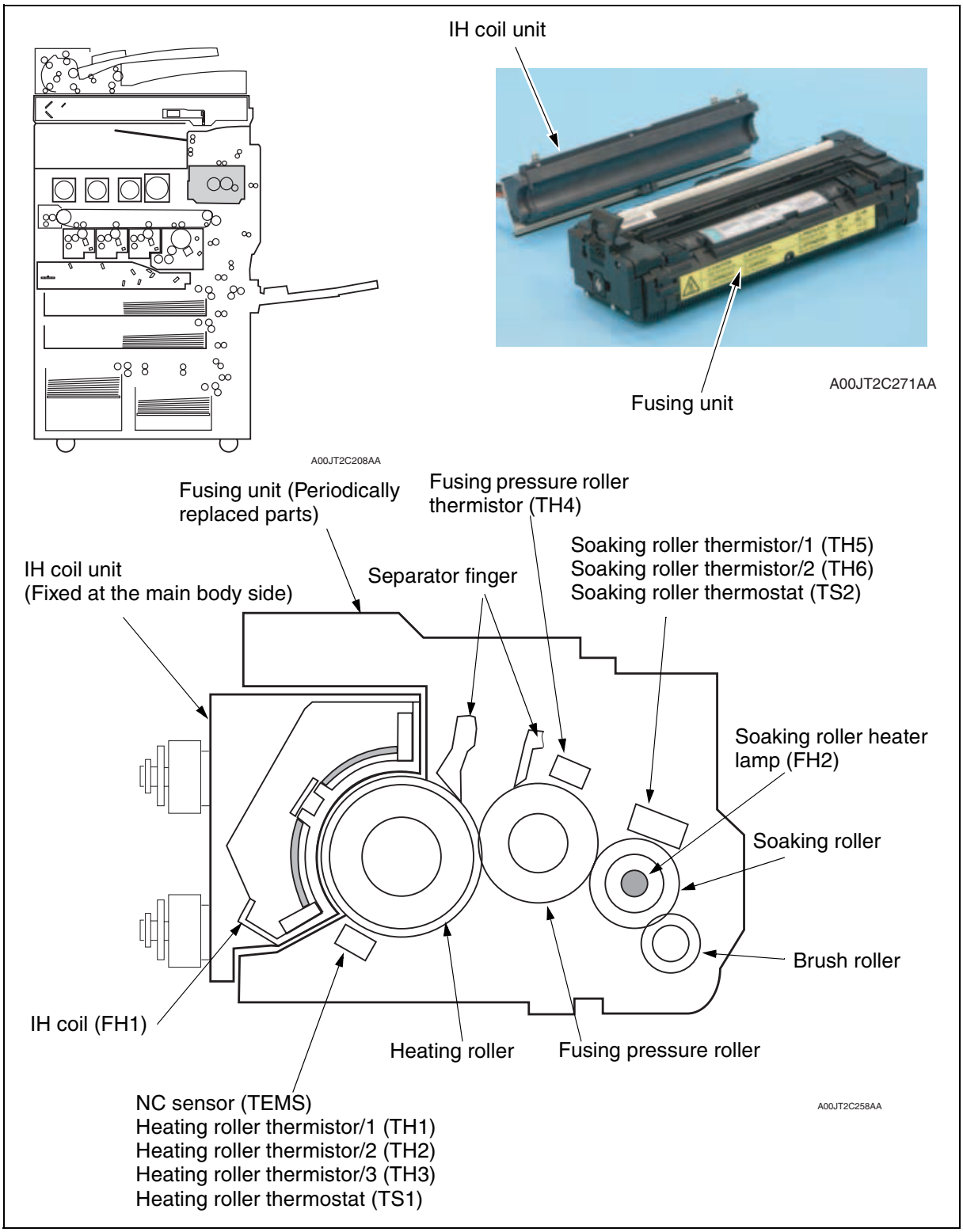
A. Operation

- The tray1 vertical transport roller, the tray2 vertical transport roller and the intermediate roller may speed up, slow down or stop temporarily during paper transportation in order to adjust the paper interval.

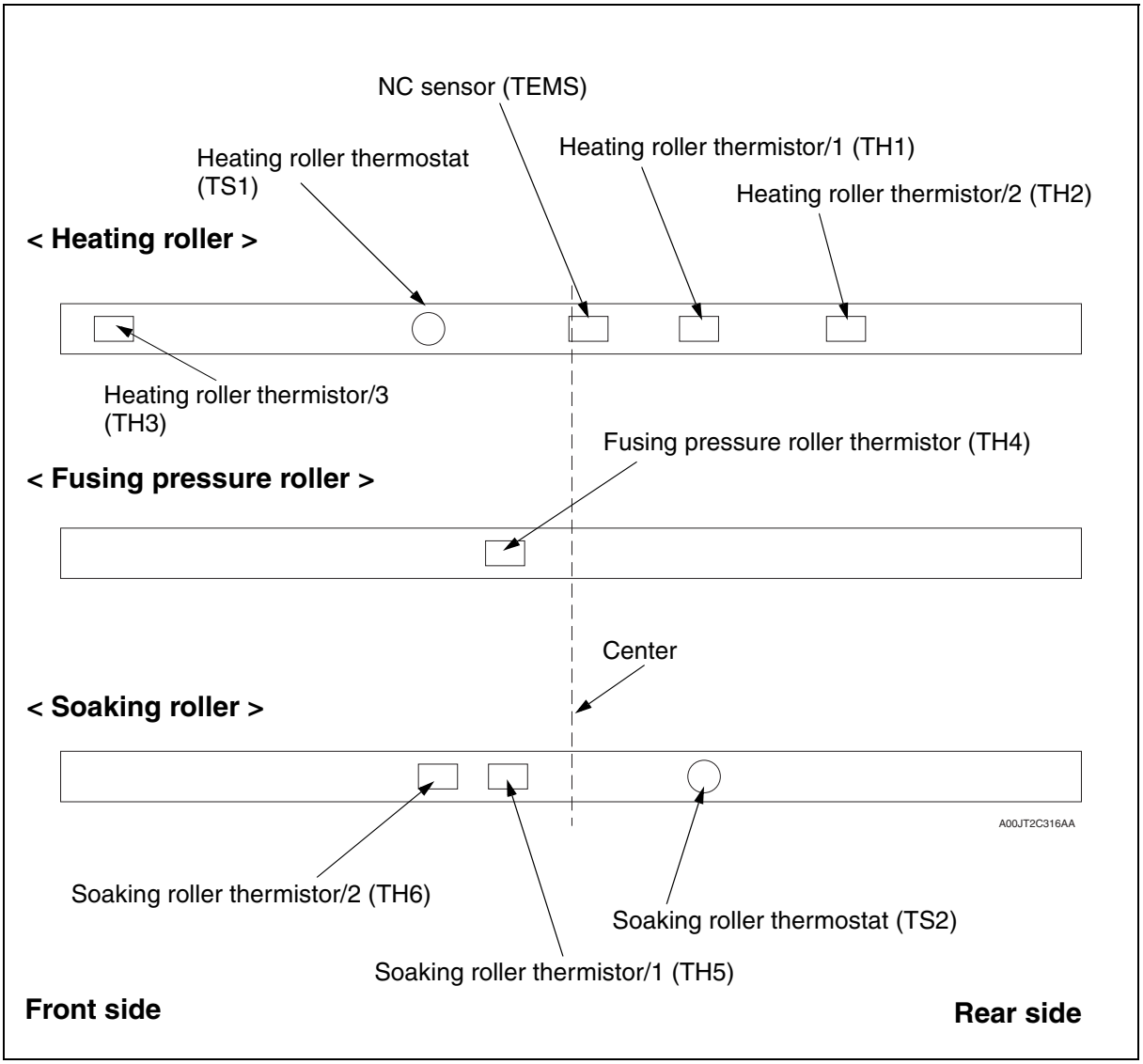


19. Fusing section

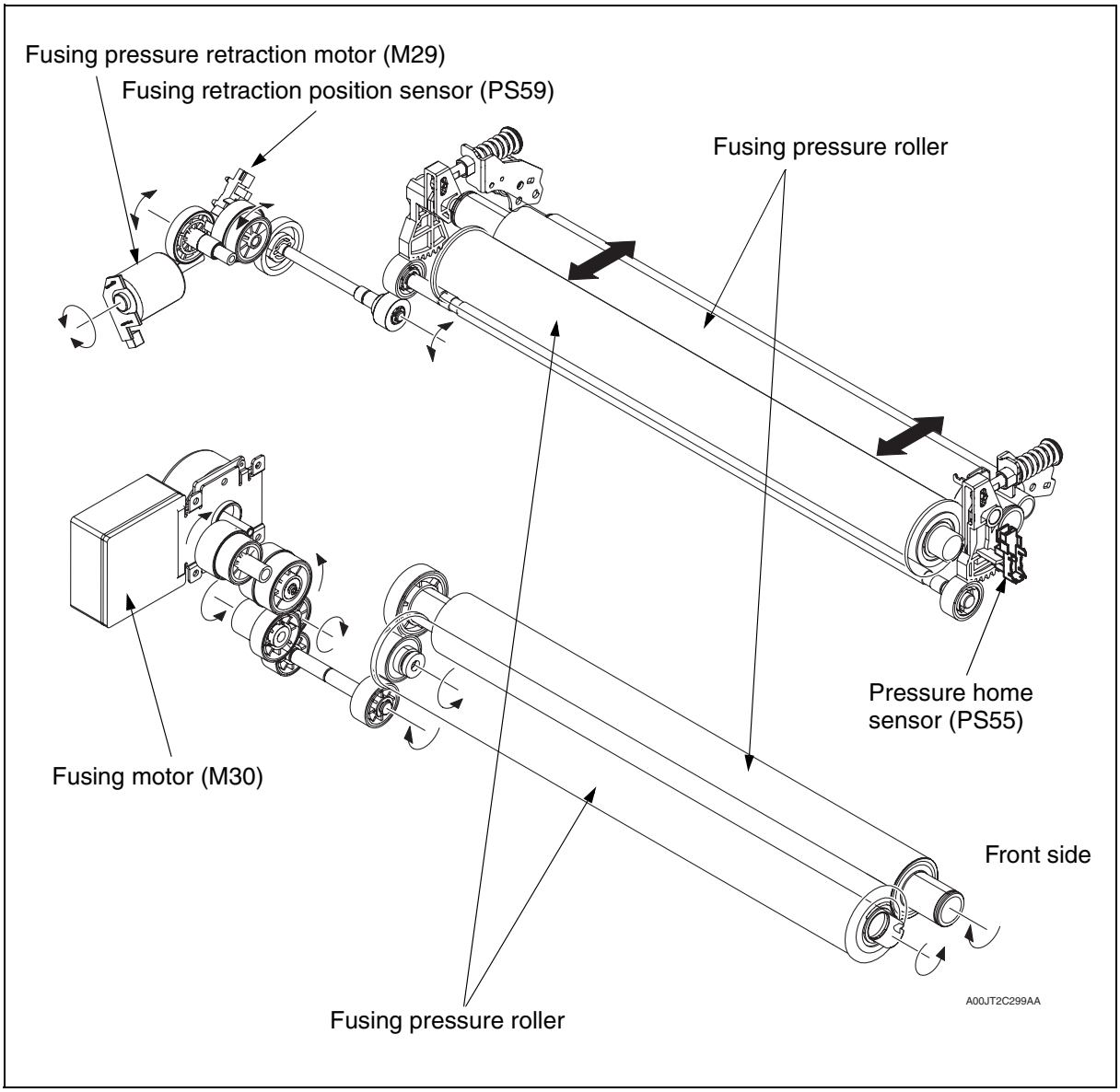
19.1 Composition



(1) Configuration of the temperature detector element of fusing unit



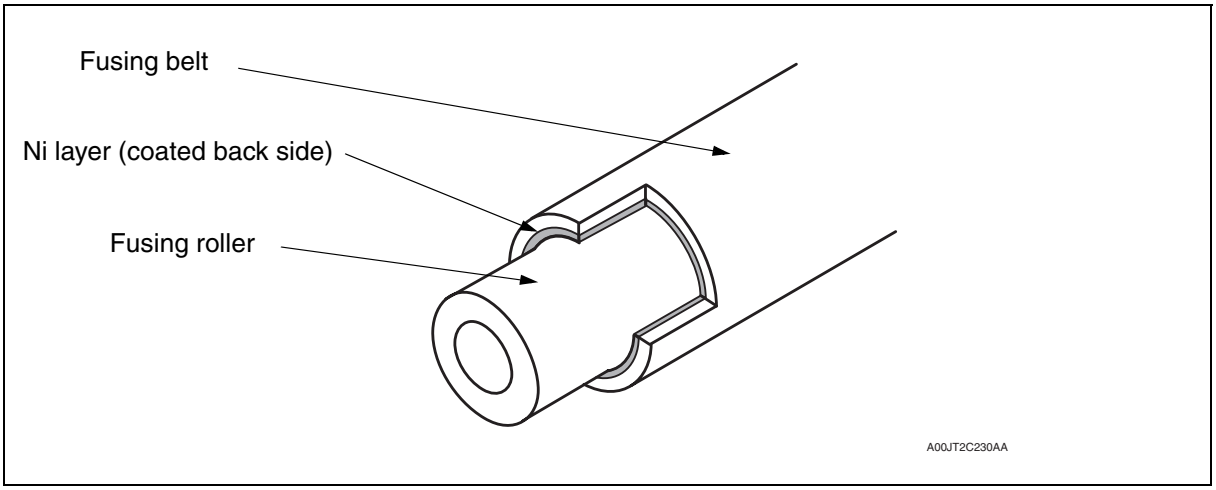
19.2 Drive


Fusing pressure retraction motor (M29)
Fusing retraction position sensor (PS59)
Fusing pressure roller
Pressure home sensor (PS55)
Fusing motor (M30)
Front side
Fusing pressure roller
A00JT2C299AA

19.3 Operation

19.3.1 Heating roller structure

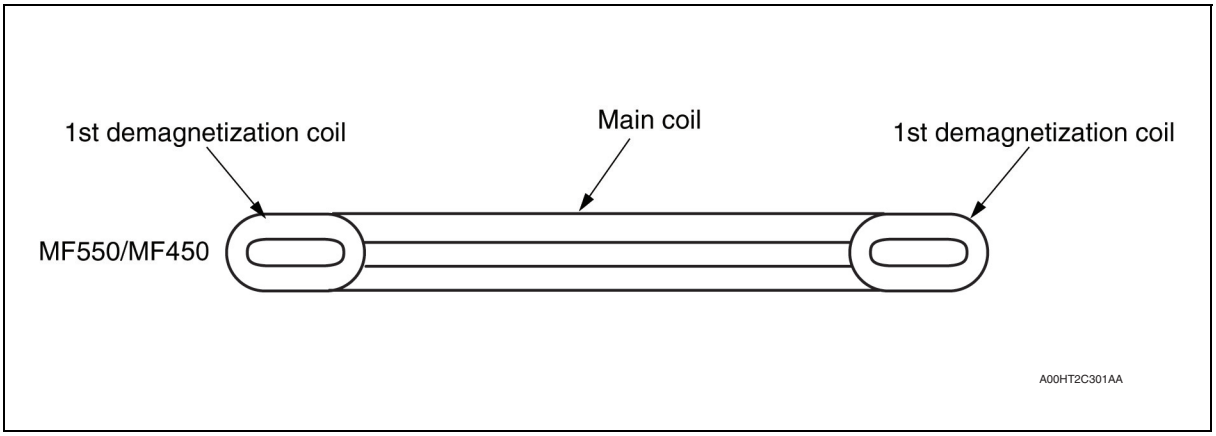
- The inside surface of the heating roller is formed with Ni layer.
- Ni layer of the heating roller is the nonmagnetic conducting layer in which eddy current is generated with magnetic flux.



19.3.2 Whole area heating/Center heating switch control

- The heating system will be switched from whole area heating to center area heating in order to prevent the edge temperature from heating up while the small size paper passes or during standby mode.
- When the demagnetization coil turns ON, the magnetic field around the end of the Main coil is degaussed and only center area of the soaking roller is heated.
- The demagnetization coil is controlled with the heating roller thermistor/3.
- 2 Each demagnetization coil is controlled to turn ON or OFF according to the CD length and the temperature of the heating roller at its end.
- 2 The main coil is identified by the wire color of the + side for correct application in a specific model: orange for MF550/MF450.

2



△2

Demagnetization coil ON conditions	MF550/MF450
	Heating roller end temperature (Degrees centigrade)
CD length (mm)	1st demagnetization coil
265 or more	200 degrees centigrade or more
265 to 240	200 degrees centigrade or more
240 to 190	200 degrees centigrade or more
190 to 90	Around 140 degrees centigrade
Standby	Around 200 degrees centigrade

19.3.3 Fusing roller drive control

A. Fusing pressure roller rotating speed control

- In order to avoid fusing error, the rotation speed of the fusing belt is exchanged according to the paper type or the print mode
- By selecting the gloss mode, fusing speed slows down by 50% from the normal speed.
- Fusing speed is set to 80 mm/s during standby mode.
- The fusing motor stops as IH coil is not conducted during power save mode.

(1) MF550 fusing speed

Paper type	Print mode	Fusing speed (mm/second)
Plain paper (60 g/m^2 to 90 g/m^2)	Monochrome	264
	Color	216
Thick paper 1/1+ (91g/m^2 to 157 g/m^2)	Monochrome	132
	Color	
Thick paper 2/3/4 (158g/m^2 to 300 g/m^2) Postcard, Envelopes, Label sheet	Monochrome	108
	Color	
OHP	Monochrome	

(1) MF450 fusing speed

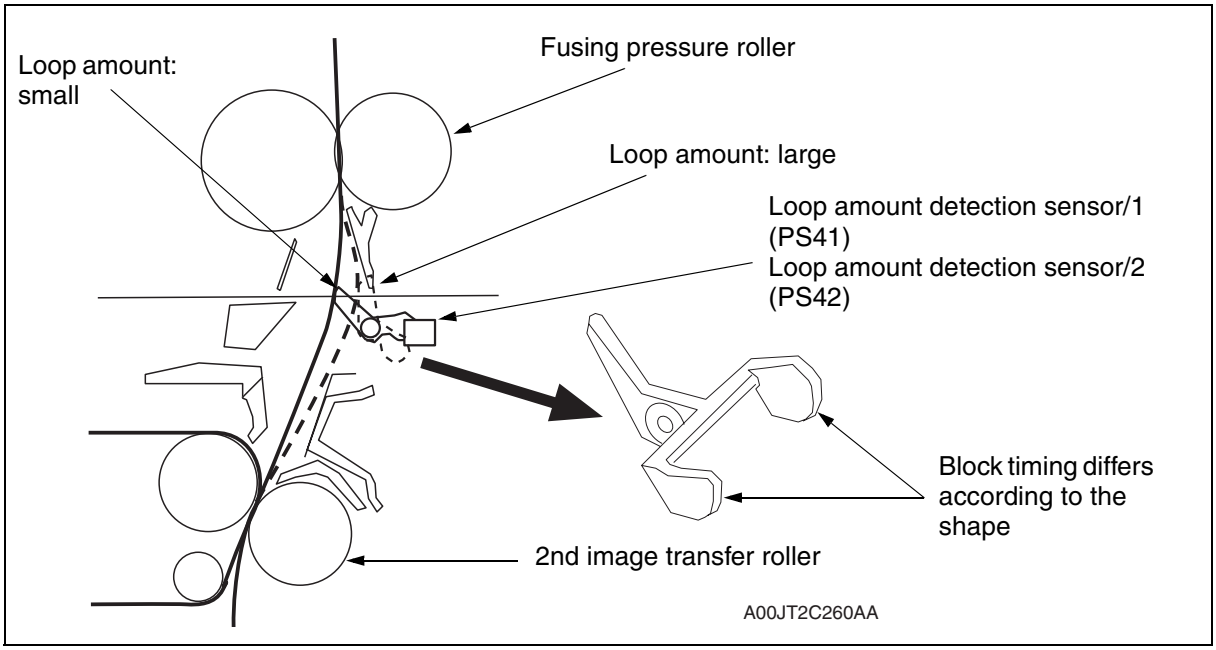
Paper type	Print mode	Fusing speed (mm/second)
Plain paper (60 g/m^2 to 90 g/m^2)	Monochrome	216
	Color	216
Thick paper 1/1+ (91g/m^2 to 157 g/m^2)	Monochrome	132
	Color	
Thick paper 2/3/4 (158g/m^2 to 300 g/m^2) Postcard, Envelopes, Label sheet	Monochrome	108
	Color	
OHP	Monochrome	

19.3.4 Fusing loop control

A. Adjustment of the loop amount

- By creating a paper loop, the speed difference between the fusing and paper conveyance at 2nd transfer part will be adjusted. It prevents the double transferred image or brush effect.
- The fussing speed is controlled (speed up/speed down) according to the amount of paper loop.
- The loop amount detection sensor/1, /2 turns ON in different timing according to the loop amount so that the loop amount can be detected in three stages.

Loop amount detection sensor/1	Loop amount detection sensor/2	Loop amount	Fussing speed
Unblocking	Blocking	large	Speed - up - Fast
Unblocking	Blocking	average	Speed - up - Slow
Blocking	Blocking	small	Slowdown

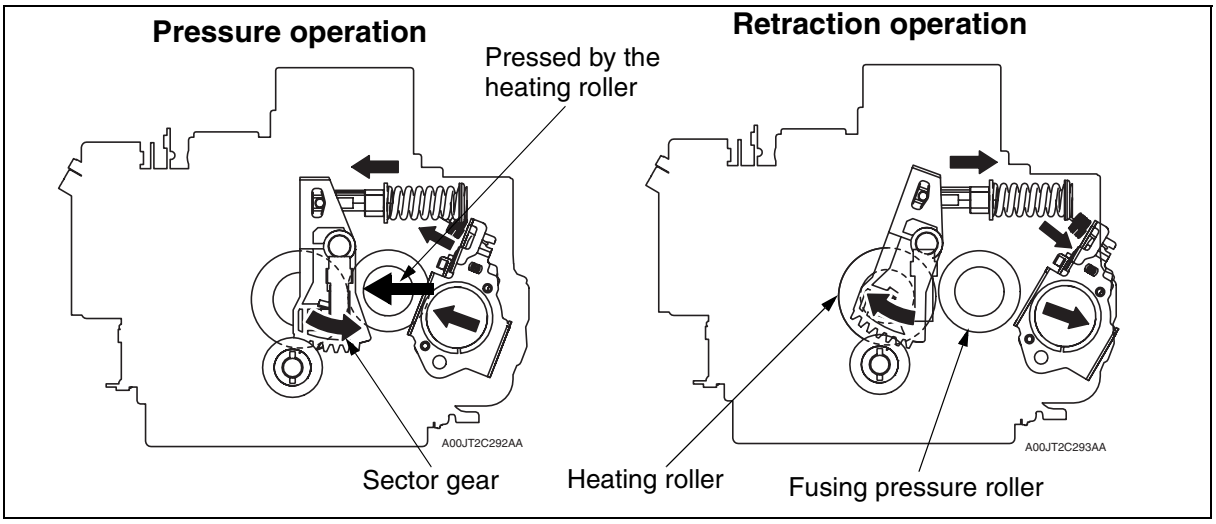


B. Operation flow

1. It starts controlling when the front-edge of the paper reaches to the predetermined position before the fusing pressure roller.
2. When the fusing speed goes faster, the paper will create fewer loops between the 2nd image transfer roller and the pressure roller.
3. The control will finish when the back-edge of the paper passes the predetermined position on the back of the transfer roller.

19.3.5 Fusing pressure roller pressure/retraction mechanism

- To ensure prolonged durability of the heating roller, the heating roller and fusing pressure roller is retracted *1 from the fusing belt during any time other than a print cycle. (The roller is, however, retracted *1 during a print cycle using envelopes.)
  *1: The fusing pressure roller does not completely retract but is slightly pressed to the pressure roller.
- The fusing pressure retraction motor is turned forward or backward to press the pressure roller up against, and retract it from, the heating roller. When the motor rotates, the fan-shaped gear will rotate to move the pressure roller.
- Pressed position of the fusing pressure roller is detected by the roller pressure home sensor. The alienation is detected by the fusing retraction position sensor.
- When there is no change in output of the fusing retraction position sensor even if the given time has passed after the fusing pressure retraction motor started its rotation, it is judged as abnormal spacing and “Trouble code C3101: abnormal in fusing pressure roller pressure welding alienation” message appears.



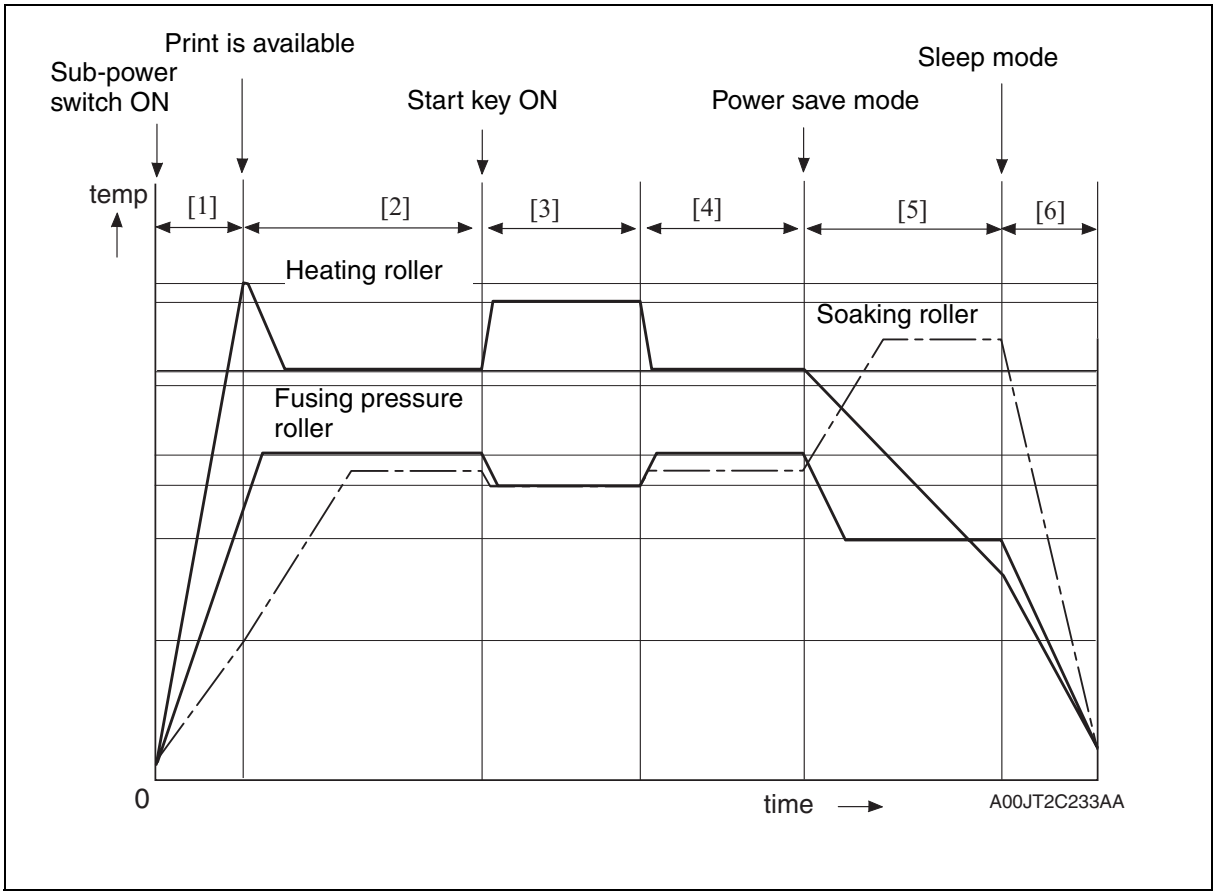
- Pressure/retraction timing

Conditions			Pressure/retraction operation
Warm-up	MF550/ MF450	Heater temperature is less than 150 degrees centigrade	Retraction
		Heater temperature is 150 degrees centigrade or more	Pressure
	MF450: Taiwan only	Heater temperature is less than 160 degrees centigrade	Retraction
		Heater temperature is 160 degrees centigrade or more	Pressure
Standby	Normal		Retraction
Printing	For paper types other than envelopes		Pressure
	For envelopes		Retraction
Power save mode ON	–		Retraction
Heater OFF	–		Retraction

19.3.6 Fusing temperature control

- The surface temperature of the heating roller and the fusing pressure roller are detected to control the amount of the heat of the IH heater and the fusing pressure roller heater lamp in the soaking roller in order to maintain the appropriate fusing temperature.

Example: MF550 temperature control (Plain paper)



[1] Controlled temperature at warm-up
Heating roller temperature: 170 degrees centigrade
Fusing pressure roller temperature: 90 degrees centigrade
△2 Soaking roller temperature: 50 degrees centigrade

[2] Controlled temperature at stand by (normal operation)
Heating roller temperature: 150 degrees centigrade
Fusing pressure roller temperature: 125 degrees centigrade
Soaking roller temperature: 120 degrees centigrade

[3] Printing (Plain/color)
Heating roller temperature: 170 degrees centigrade
Fusing pressure roller temperature: 115 degrees centigrade
Soaking roller temperature: 115 degrees centigrade

[4] Standby (normal operation)
Heating roller temperature: 150 degrees centigrade
Fusing pressure roller temperature: 125 degrees centigrade
Soaking roller temperature: 120 degrees centigrade

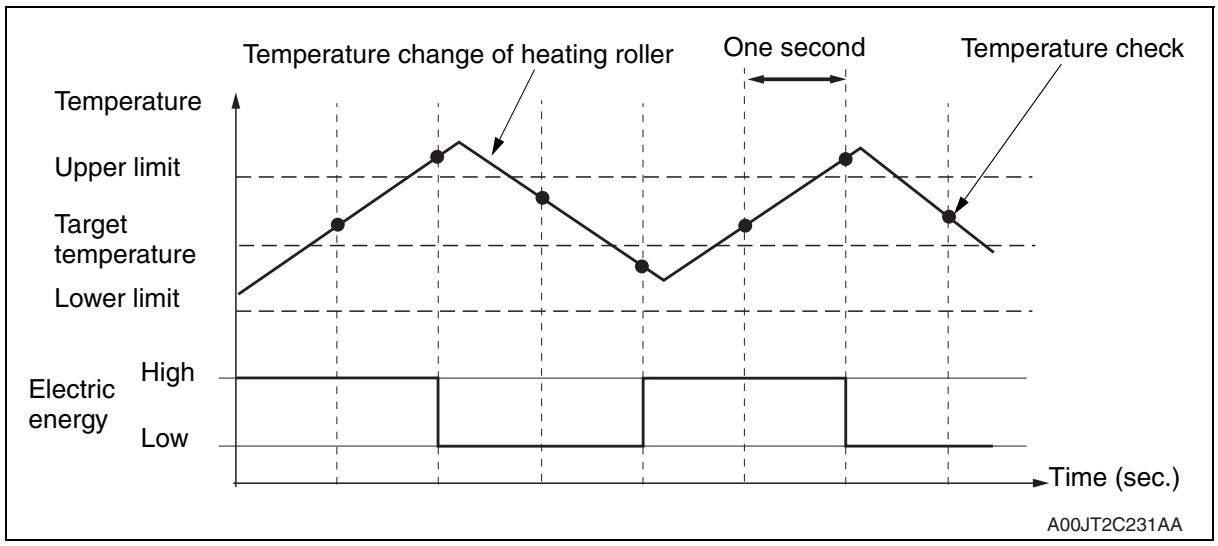
[5] Low power mode
Heating roller temperature: - *1
Fusing pressure roller temperature: 100 degrees centigrade
Soaking roller temperature: 160 degrees centigrade

[6] Sleep mode
Heating roller temperature: - (room temperature)
Fusing pressure roller temperature: - (room temperature)
Soaking roller temperature: - (room temperature)

*1: Temperature is not controlled because the IH heater is OFF.

A. Temperature adjustment control of IH heater

- Temperature of the heating roller is controlled within the given range during warm-up, printing and standby.
- Temperature of the heating roller is measured with the NC sensor, and the temperature change (up/down) is monitored by comparing the current temperature with the value of one second before.
- When the temperature goes up beyond the upper limit, the electric energy goes down.
- When the temperature goes down under the target figure, the electric energy goes up.



B. Operation flow during warm-up

- When the temperature of the heating roller reaches a predetermined level, the pressure roller starts pressing.
- When the temperatures of all rollers go beyond the temperature set for warm-up, printing becomes available.
- If printing request comes, the machine starts printing. If not, the mode goes to “standby temperature control”.
- A different warm-up completion time is set only for the MF450 for Taiwan because of its low power that can be used.

△2 (1) MF550/MF450 warm-up completion temperature

Warm-up	Completion time	Heating roller temperature	Fusing pressure roller temperature	Soaking roller temperature
In monochrome and color	30 seconds	170 degrees centigrade	70 degrees centigrade	50 degrees centigrade

△2 (2) MF550 only for Taiwan warm-up completion temperature

Warm-up	Completion time	Heating roller temperature	Fusing pressure roller temperature	Soaking roller temperature
In monochrome and color	60 seconds	170 degrees centigrade	90 degrees centigrade	50 degrees centigrade

△2 (3) MF450 only for Taiwan warm-up completion temperature

Warm-up	Completion time	Heating roller temperature	Fusing pressure roller temperature	Soaking roller temperature
In monochrome	30 seconds	165 degrees centigrade	70 degrees centigrade	50 degrees centigrade
In color	60 seconds	185 degrees centigrade	100 degrees centigrade	70 degrees centigrade

C. Temperature control during stand-by

- The fusing temperature in the standby state is prevented from being dropped.
- The temperature is controlled by each modes (low temperature, normal, high humidity), within predetermined time from standby control start.
- The temperature is controlled by normal mode, after predetermined time from standby control start.
  * Counted period for standby control includes the printing time.
- Temperature control setting during standby is changed according to the environment condition when the power is turned ON.
  Normal mode: When the fusing pressure roller temperature at start-up is over 60 degrees centigrade and the absolute humidity inside is less than 18.
  Low temperature mode: When the fusing pressure roller temperature at start-up is less than 60 degrees centigrade and the absolute humidity inside is less than 18.
  High humidity mode: When the absolute humidity inside is over18.
  * Absolute humidity: Water volume contained in the air ($1m^3$) in form of vapor regardless of the temperature.
- A different control temperature is set only for the MF450 for Taiwan because of its low power that can be used.

(1) MF550/MF450 control temperature

Environment condition when the power is turned ON	Pressure/ spacing of fusing pressure roller	Rotation of fusing pressure roller	Set temperature of heating roller (Degrees centigrade)	Set temperature of fusing pressure roller (Degrees centigrade)	Set temperature of soaking roller (Degrees centigrade)
Normal	Spacing	Rotation	150	125	120
Low temperature			170	130	125
High humidity			160	130	125

(2) MF450 only for Taiwan control temperature

Environment condition when the power is turned ON	Pressure/ spacing of fusing pressure roller	Rotation of fusing pressure roller	Set temperature of heating roller (Degrees centigrade)	Set temperature of fusing pressure roller (Degrees centigrade)	Set temperature of soaking roller (Degrees centigrade)
Normal	Spacing	Rotation	150	125	120
Low temperature			180	130	125
High humidity			160	130	125

D. Temperature control during printing

- Temperature is controlled to maintain the optimal fusing status when the temperature is getting down due to the paper type, the printing mode, the small size paper or paper passing, or due to warm-up with cooled fusing unit.
  *The controlled temperature shown below is changed according to the environment status, start-up conditions or etc.
- A different control temperature is set only for the MF450 for Taiwan because of its low power that can be used.

(1) MF550/MF450 control temperature

Paper type (Same control in monochrome and color)	Heating roller setting temperature (Degree centigrade)	Fusing pressure roller setting temperature (Degree centigrade)	Soaking roller setting temperature (Degree centigrade)
Plain paper (Duplex print)	170	115	115
Plain paper/glossy mode (Duplex print)	150		
Thick paper 1	170		
Thick paper 1+	180		
Thick paper 2, 3, 4	185		
Thick paper 1 (Duplex print)	170		
Thick paper 1+ (Duplex print)	180		
Thick paper 2, 3, 4 (Duplex print)	185		
Envelopes	180		
Postcards	185		
Long paper/ When the paper length is over 457 mm (MF450 only)	170		
OHP: Black-and-white print only	140		

(3) MF450 only for Taiwan control temperature

Paper type (Same control in monochrome and color)	Heating roller setting temperature (Degree centigrade)	Fusing pressure roller setting temperature (Degree centigrade)	Soaking roller setting temperature (Degree centigrade)
Plain paper (Duplex print)	165	115	115
Plain paper/glossy mode (Duplex print)	150		
Thick paper 1	170		
Thick paper 1+	180		
Thick paper 2, 3, 4	185		
Thick paper 1 (Duplex print)	170		
Thick paper 1+ (Duplex print)	180		
Thick paper 2, 3, 4 (Duplex print)	185		
Envelopes	180		
Postcards	185		
Long paper/ When the paper length is over 457 mm	170		
OHP: Black-and-white print only	140		

E. Fusing temperature control during printing.

- Fusing temperature control prevents declining of the image stability as well as reduces curling of the paper, uneven waxing, offset, etc., according to the paper type to be used.
- Fusing temperature control can be set from “Service mode/machine/fusing temperature”.
- Adjust the fusing temperature at heating side first. If the further adjustment is necessary, adjust on the pressure side.

Paper type	Heated site (Heating roller temperature)	Pressured side (Fusing pressure roller temperature)
Plain paper	- 20 °C to + 5 °C (step: 5 °C)	- 20 °C to + 5 °C (step: 5 °C)
OHP		
Thick paper 1, 1+		
Thick paper 2		
Thick paper 3		
Thick paper 4		
Postcards		
Envelopes	- 5 °C to + 5 °C (step: 5 °C)	- 5 °C to + 5 °C (step: 5 °C)

F. Temperature control during low power mode

- The IH coil stops to reduce the power consumption at low power mode and make temperature control by lowering the fusing temperature.
- Usually the pressure roller stops at low power mode though, the roller rotates slightly every certain period to prevent the brush roller from being distorted.

△2

Machine models	Pressure/ spacing of fusing pressure roller	Rotation of fusing pressure roller	Set temperature of heating roller (Degree centigrade)	Set temperature of fusing pressure roller (Degree centigrade)	Set temperature of soaking roller (Degree centigrade)
MF550/ MF450	Spacing	Stop	- *1	100	160

*1: The temperature of the pressure roller is not controlled because the IH coil is turned OFF.

19.3.7 Protection from abnormally high temperature

- The machine provides protection against abnormally high temperature of the fusing unit in the following three steps.

A. < Soft protection >

- When the controlled temperature of each roller is detected higher than the predetermined value for more than 1 second, the temperature is judged to be abnormally high, and the trouble code appears.
- When the trouble code is displayed, printing will be prohibited.

Roller name	Sensor name	Detected temperature (Degrees centigrade)	Trouble code	
Heating roller	NC sensor: TEMS	225	C3725	Fusing high temperature abnormality_NC sensor
	Heating roller thermistor/2: TH2	270	C3721	Fusing high temperature abnormality_heating center
	Heating roller thermistor/3: TH3	285	C3722	Fusing high temperature abnormality_heating edge
Fusing pressure roller	Fusing pressure roller thermistor: TH4	215	C3723	Fusing high temperature abnormality_pressure
Soaking roller	Soaking roller thermistor/1: TH5	200	C3724	Fusing high temperature abnormality_Soaking

B. < Hard protection >

- Next level is provided when the level 1 cannot detect due to CPU overrun.
- The heater relay, through the electronic control board, is turned OFF in the second level operation to block the power supply to the IH heater and the heater lamp.
- When the controlled temperature of each roller is detected higher than the predetermined value, the temperature is judged to be abnormally high, and the trouble code appears.
- Through these control procedures, the power supply to the IH heater and heater lamps can be shut down before the thermostat is activated in the third level. It thereby suppresses damage to the fusing unit itself.

Roller name	Sensor name: code	Controlled temperature (Degrees centigrade)	Trouble code	
Heating roller	Heating roller thermistor/1: TH1	195	C3721	Fusing high temperature abnormality_heating center
	Heating roller thermistor/2: TH2	225		
	Heating roller thermistor/3: TH3	220	C3722	Fusing high temperature abnormality_heating edge
Soaking roller	Soaking roller thermistor/1: TH5Soaking roller thermistor/2: TH6	165	C3724	Fusing high temperature abnormality_Soaking

C. < Overheat protection >

- If the abnormal high temperature of soft protection/hard protection cannot be detected due to thermistor trouble, thermostat blocks the power supply to each heater lamp.
- The thermostat rating is 210 degrees centigrade for both the heating roller thermostat and the pressure roller thermostat.
- The ratings do not, represent the actual surface temperature of the corresponding rollers, since the thermostats are installed in a non-contact fashion with respect to each of the rollers.

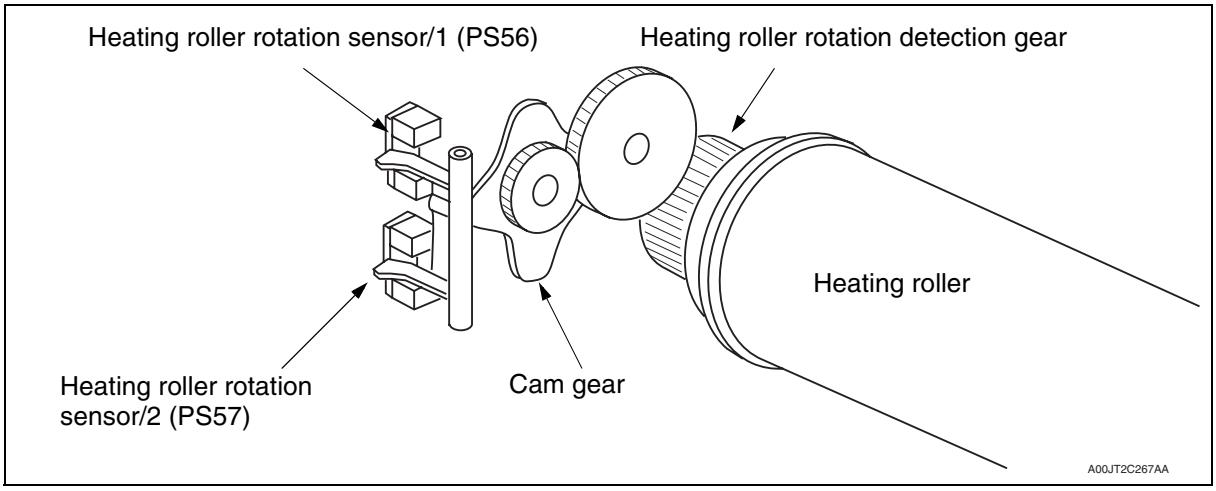
19.3.8 Sensor disconnection detection control

- If the temperature of the NC sensor/thermistor fails to reach the specified temperature in the given period after the warm-up started, the sensor is judged to have disconnection, and the trouble code will appear.

Roller name	Sensor name: code	Trouble code	
Heating roller	NC sensor: TEMS	C3925	Fusing high temperature abnormality_NC sensor
⚠2 Heating roller	Heating roller thermistor/2: TH2	C3921	Fusing high temperature abnormality_heating center
Heating roller	Heating roller thermistor/3: TH3	C3922	Fusing high temperature abnormality_heating edge
Fusing pressure roller	Fusing pressure roller thermistor: TH4	C3923	Fusing high temperature abnormality_pressure
Soaking roller	Soaking roller thermistor/1: TH5	C3924	Fusing high temperature abnormality_Soaking

19.3.9 Heating roller rotate detection

- If the heating roller doesn't rotate even after the IH heater is conducted, an appropriate temperature measurement and temperature control cannot be made. If the IH heater is ON without rotating of the heating roller for a long time, the heat concentrate on the certain area and the roller may get damaged due to the heat.
- If the heating roller doesn't rotate even after the IH heater ON, the trouble message for heater roller rotating failure appear. (C3102)
- As two heating roller rotation sensors are used, the rotation can be detected even if either sensor get broken, which improves the safety.



19.3.10 Detection of a new fusing unit

- When a new fusing unit is installed in the machine, the life counter is automatically cleared through the machine's capability of detecting a new fusing unit.
- The new unit is detected when the sub power switch is turned ON.

19.3.11 PPM control

- PPM (PCM) control is made to secure the paper space and reduce the number of printing per minutes so that the center temperature of the heating roller and pressure roller can be reduced, which prevents the edge temperature from going up.
- △2 With this PPM control, the productivity is decreased by between 40 to 90% compared with the normal mode.
- Select the correction rate by three judgment steps, make the PPM control in minimum rate.
  Ex: In case the 1st judgment: 70%, 2nd judgment: 60%, 3rd judgment: 100%, it will control with 60% correction rate.
- PPM control makes the judgment in every given period to print with the corrected PPM control
  Ex: In case the printing of 55 sheets/minute with 60% correction rate, it will be 33 sheets/minute.
- The speed is adjusted (up/down) by 10% in every given period.

△2 **Example: MF550 PPM control**

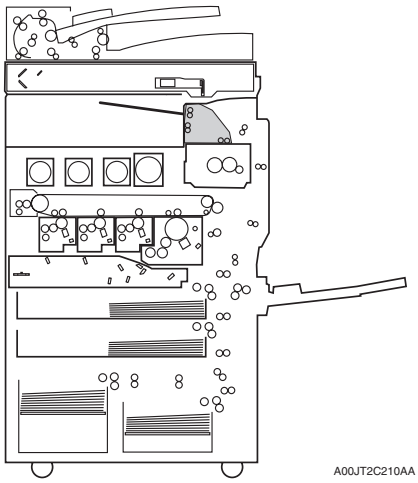
<table>
<tr><th>Judgement</th><th>Measurement time</th><th colspan="2">Criteria</th><th>Corrected rate</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">5 seconds after print starts</td><td colspan="2">Low temperature mode when print starts and the temperature inside the unit is 18 degrees centigrade or below</td><td>70%</td></tr>
<tr><td colspan="2">Other than above</td><td>100%</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">60 seconds after print start</td><td colspan="2">Low temperature mode when print starts and the temperature inside the unit is 18 degrees centigrade or below</td><td>70%</td></tr>
<tr><td rowspan="5">Other than above</td><td>Central temperature of the heating roller is lower than setting value by up to 15 degrees centigrade
Central temperature of the fusing pressure roller is lower than setting value by up to 35 degrees centigrade</td><td>100%</td></tr>
<tr><td>Central temperature of the heating roller is lower than setting value by between 15 to 25 degrees centigrade
Central temperature of the fusing pressure roller is lower than setting value by up to 5 degrees centigrade</td><td>80%</td></tr>
<tr><td>Central temperature of the heating roller is lower than setting value by over 25 degrees centigrade
Central temperature of the fusing pressure roller is lower than setting value by up to 5 degrees centigrade</td><td>70%</td></tr>
<tr><td>Central temperature of the heating roller is lower than setting value by between 15 to 25 degrees centigrade
Central temperature of the fusing pressure roller is lower than setting value by between 5 to 35 degrees centigrade</td><td>70%</td></tr>
<tr><td>Central temperature of the heating roller is lower than setting value by over 25 degrees centigrade
Central temperature of the fusing pressure roller is lower than setting value by between 5 to 35 degrees centigrade</td><td>60%</td></tr>
</table>

Judge-ment	Measurement time	Criteria		Corrected rate
2	60 seconds after print start	Other than above	Central temperature of the heating roller is lower than setting value by up to 15 degrees centigrade Central temperature of the fusing pressure roller is lower than setting value by over 35 degrees centi-grade	70%
			Central temperature of the heating roller is lower than setting value by between 15 to 25 degrees centigrade Central temperature of the fusing pressure roller is lower than setting value by over 35 degrees centi-grade	60%
			Central temperature of the heating roller is lower than setting value by over 25 degrees centigrade Central temperature of the fusing pressure roller is lower than setting value by over 35 degrees centi-grade	50%
3	60 seconds for single side/ 120 seconds for duplex after print start	CD length is 290mm or more		100%
		CD length is 190 to 290mm	System speed is 155 to 108mm/s and temperature inside the unit is over 18 degrees centigrade	100%
			System speed is 155 to 108mm/s and temperature inside the unit is 18 degrees centigrade or less	80%
		CD length is 145 to 190mm	Central temperature of the heating roller is less than 240 degrees centigrade	100%
			Central temperature of the heating roller is 240 to 250 degrees centigrade	50%
			Central temperature of the heating roller is 250 degrees centigrade or more	40%
		CD length is 90 to 145mm	Central temperature of the heating roller is less than 220 degrees centigrade	100%
			Central temperature of the heating roller is 220 to 230 degrees centigrade	90%
			Central temperature of the heating roller is 230 to 240 degrees centigrade	70%
			Central temperature of the heating roller is 240 to 250 degrees centigrade	50%
			Central temperature of the heating roller is 250 degrees centigrade or more	40%

△2

20. Paper exit section

20.1 Composition



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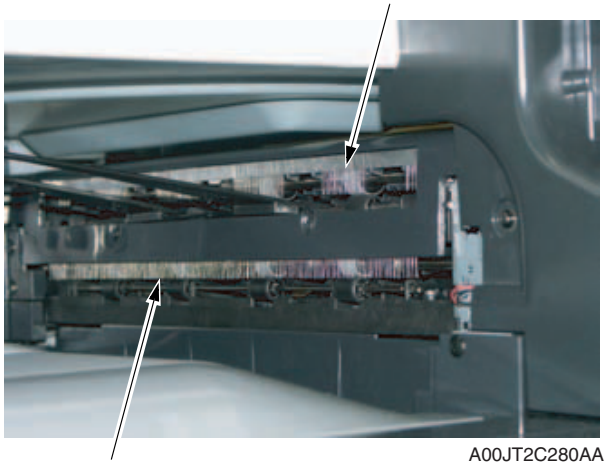

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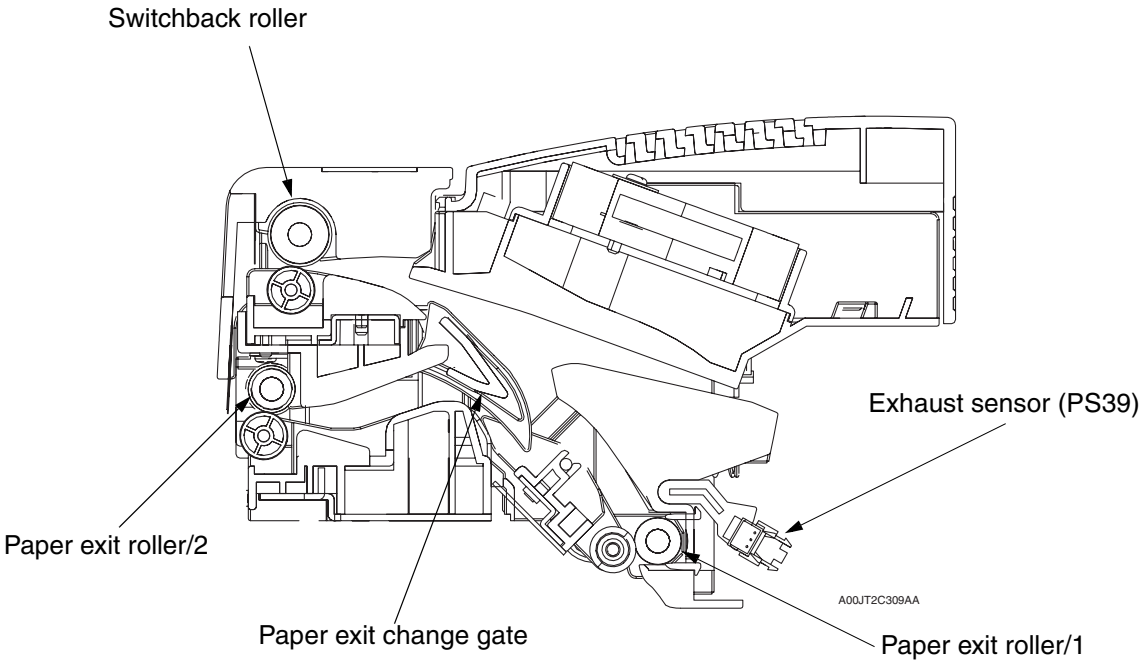

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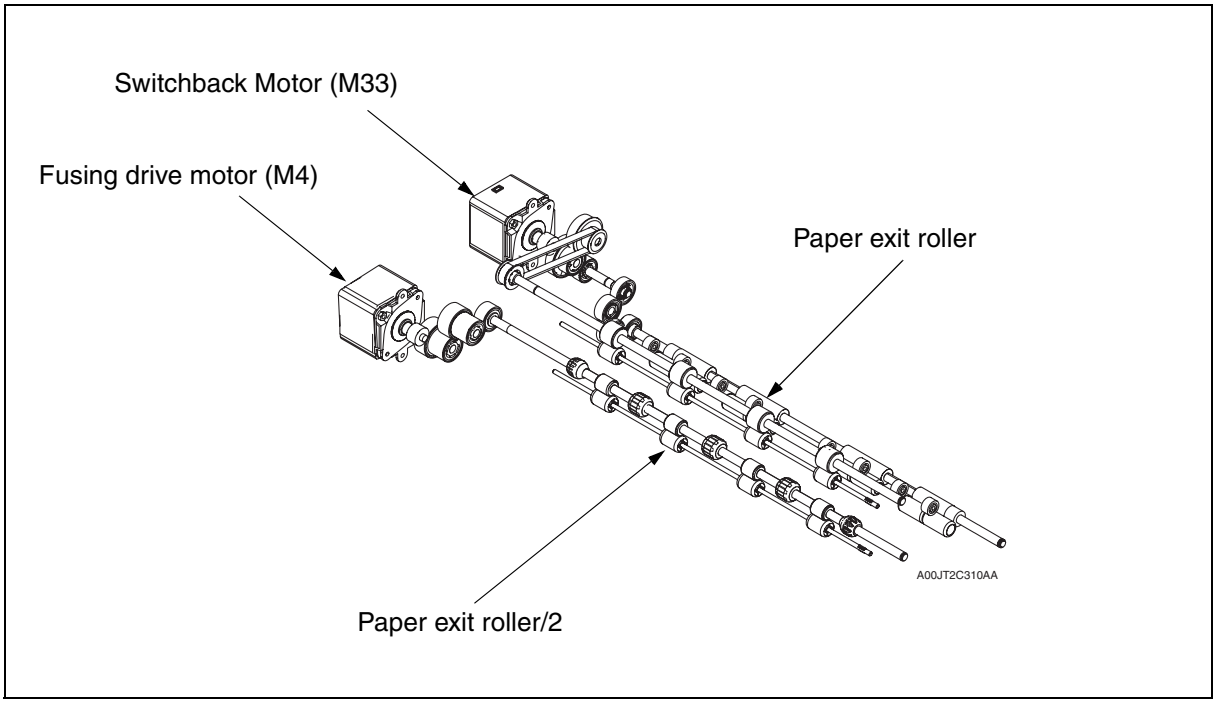
20.2 Drive

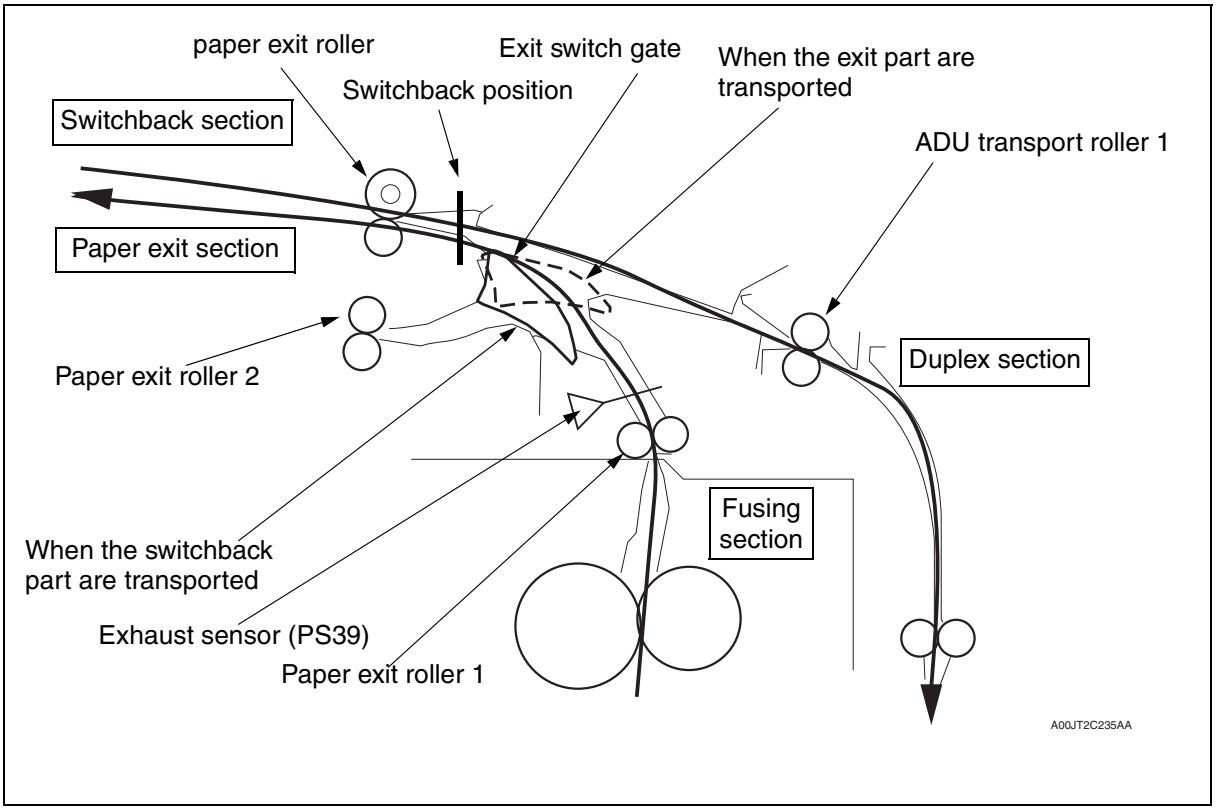
- The exit and switch roller are driven by the exclusive motor.

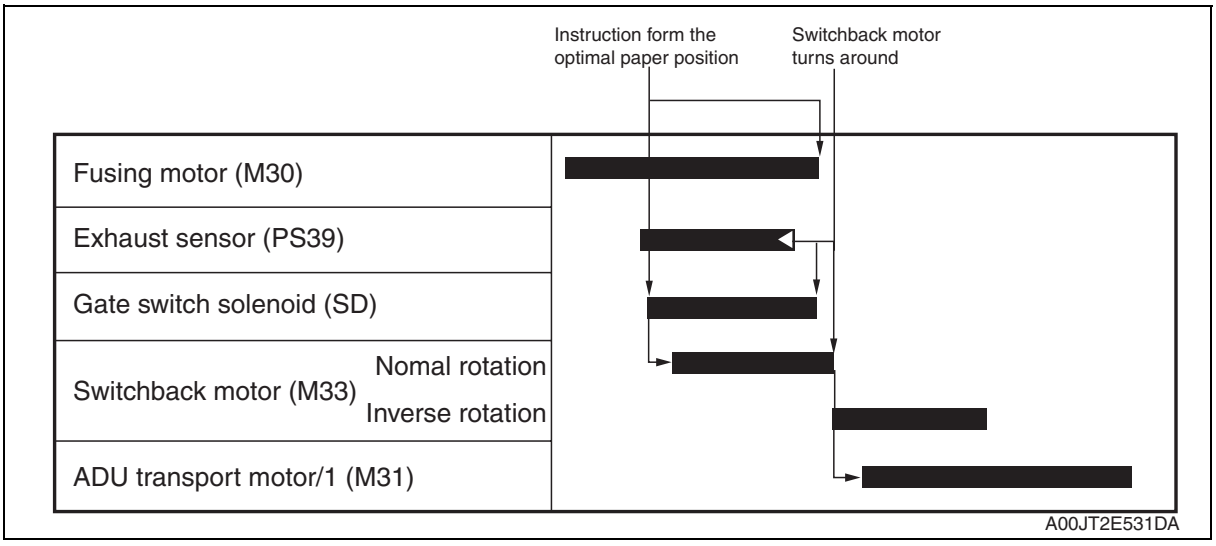


20.3 Operation

20.3.1 Switchback control

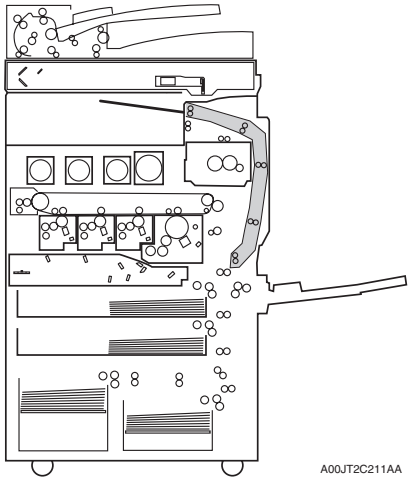
- When the fusing is completed on the first side of duplex print, switchback snap is switched down to transport the sheet to the switchback part. When the fusing is completed on the sheet of single print or second side of duplex print, the sheet is transported to the exit section.
- The paper transported to the switchback part stops at the switchback position and then the switchback roller turns around to transport the sheet to the duplex section.
- Before the switchback roller starts to turn the opposite direction, the exit switch gate is switched to the upward direction.





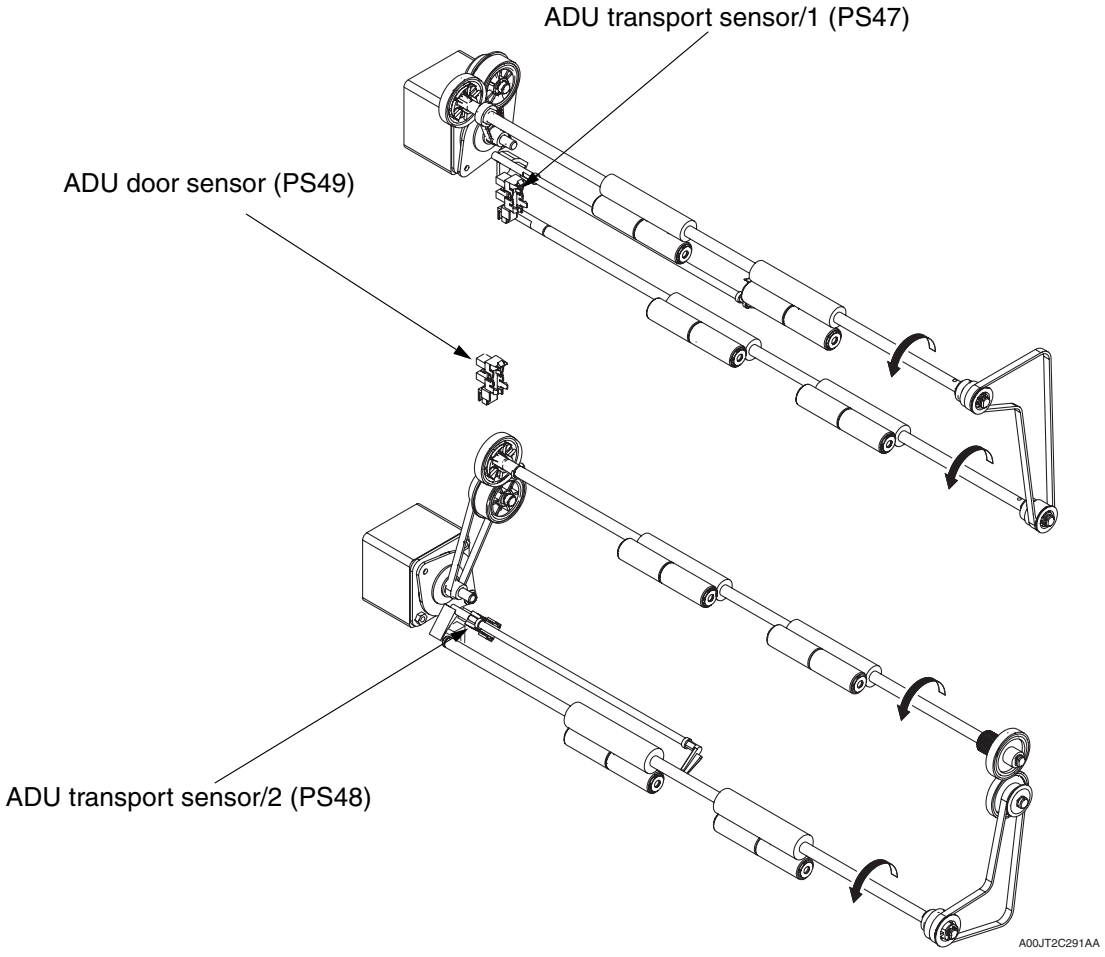
21. Duplex section

21.1 Composition



A00JT2C211AA

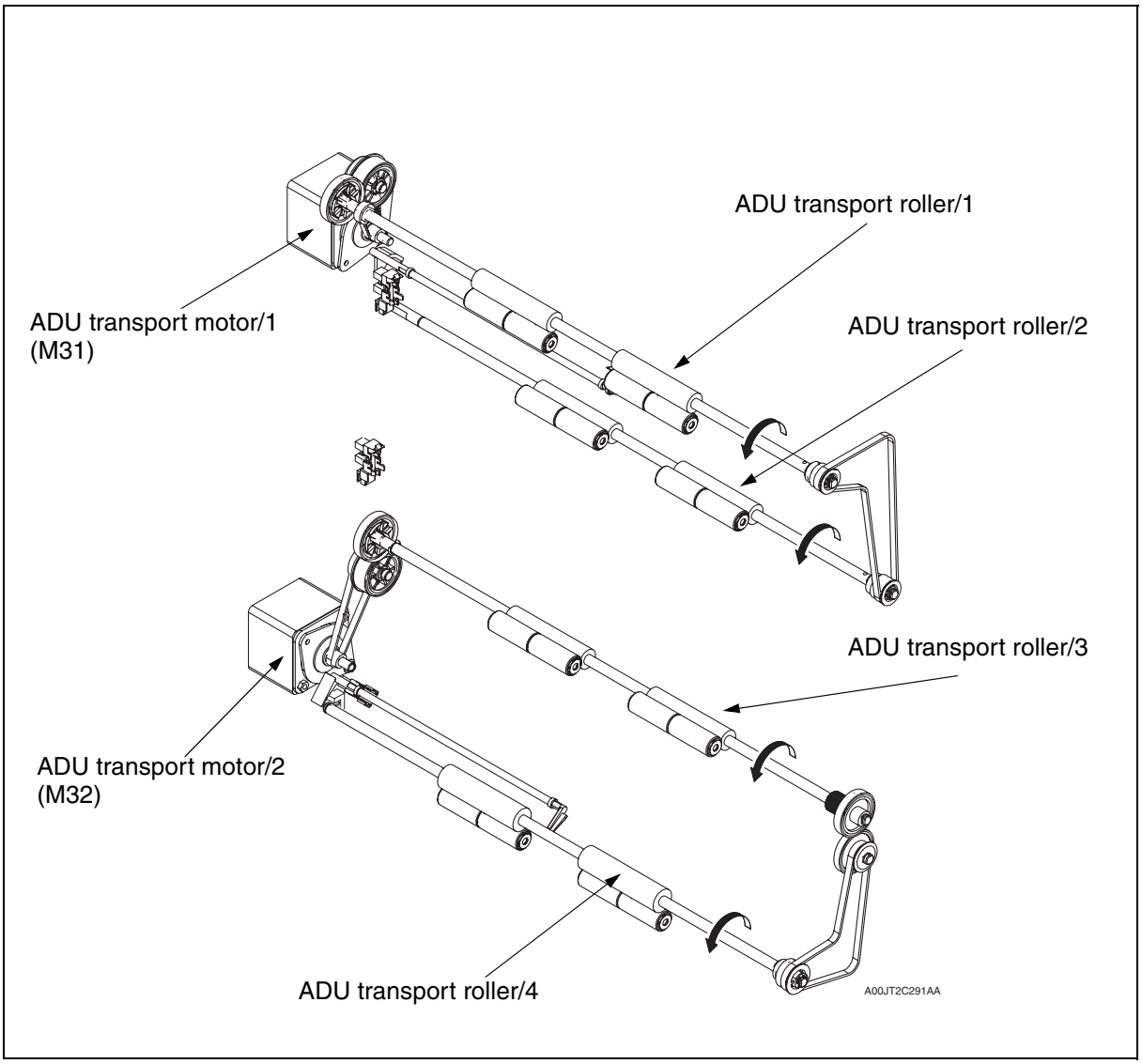
A00JT2C275AA



A00JT2C291AA

21.2 Drive

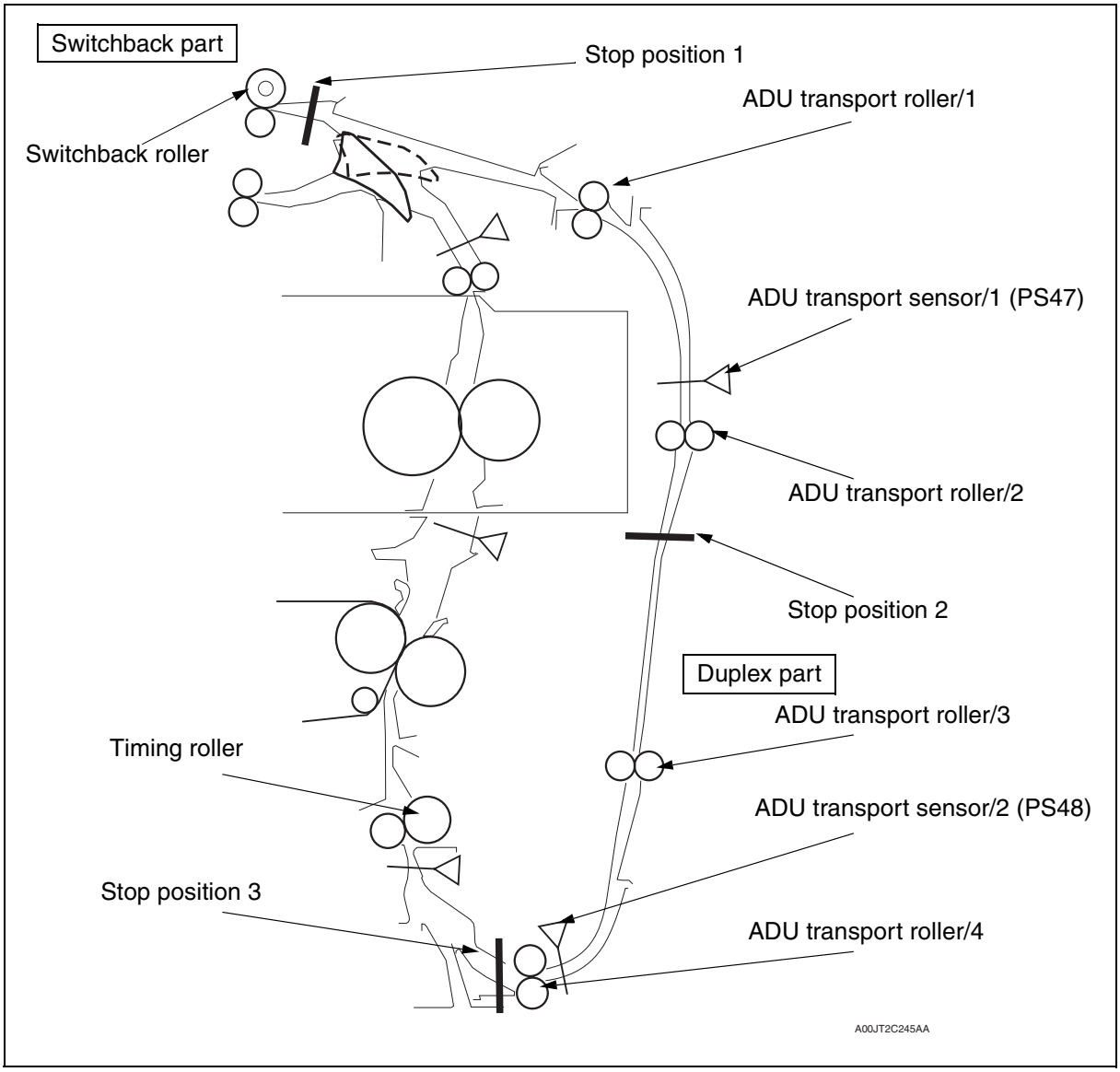
21.2.1 Duplex unit drive



21.3 Operation

21.3.1 Duplex unit transport control

- The paper transported to the switchback part stops at the stop position 1 and then the switchback roller turns around to transport the sheet to the duplex unit.
- When a sheet of paper being less than 127 mm is passing by the ADU transport roller/2 in the duplex unit, if the preceding paper has not reached the timing roller, the sheet stops at the stop position 2.
- The paper transported to the duplex part always stops at the stop position 3 and wait until paper is re-supplied.
- When the paper is supplied, it is transported to the timing roller.



21.3.2 Duplex print

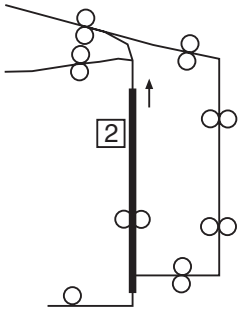
- Duplex print changes its control method according to the paper length.

Paper size		Duplex print method
Lower limit	Upper limit	
-	Less than 217 mm	Three alternative paper feed
217 mm or more	Less than 433 mm	Two alternative paper feed
433 mm or more	Less than 459 mm	One paper feed

A. 1 sheet alternate supply

Operation 1

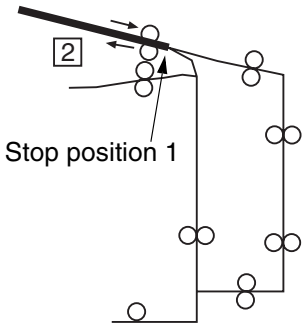
- One sheet of paper is supplied and the image of the second page is printed.



A00JT2C236AA

Operation 2

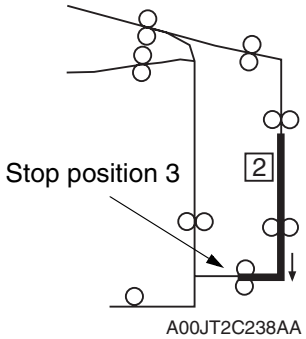
- After the paper transported to the switchback part stops at the stop position 1, the switchback roller turns around to send the sheet to the duplex part (Switchback).



A00JT2C237AA

Operation 3

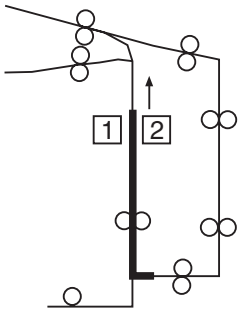
- The paper transported to the duplex part is transported to the stop position 3 faster than the system speed.
- It stops at the stop position 3.



A00JT2C238AA

Operation 4

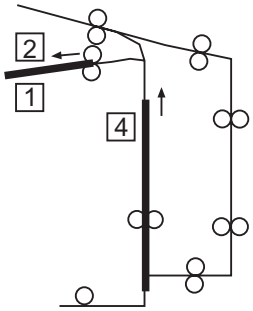
- The image of the first page is printed on the paper re-supplied from the duplex section.



A00JT2C239AA

Operation 5

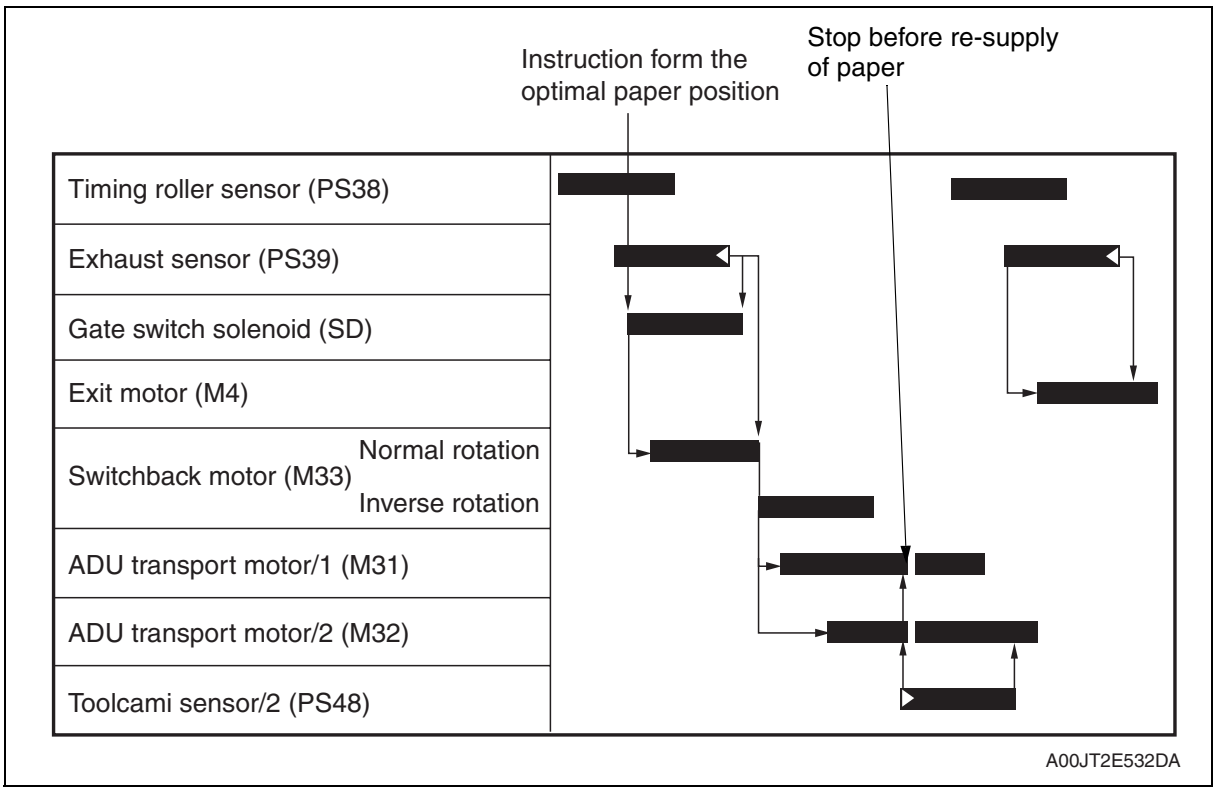
- Exhaust the first sheet of the paper.
- At the same time, the image of fourth page is printed on the second sheet.



A00JT2C240AA

- Steps 2 through 5 are repeated.

- **One sheet A4-size original at double sided print**
- When the re-supplied paper length is less than 217 mm, only the ADU transport motor/2 turns ON.

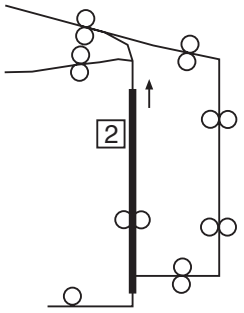


A00JT2E532DA

B. 2 sheets alternate supply

Operation 1

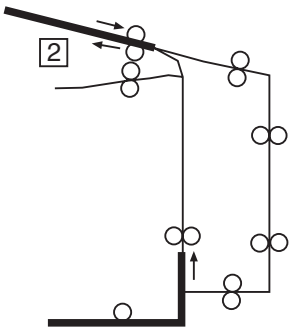
- The first sheet of paper is supplied and the image of the second page is printed.



A00JT2C236AA

Operation 2

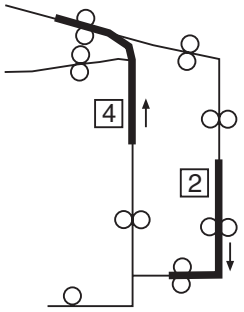
- First sheet of the paper is turned around at the switchback part and transported to the duplex part.
- At the same time, the second sheet of paper is supplied.



A00JT2C242AA

Operation 3

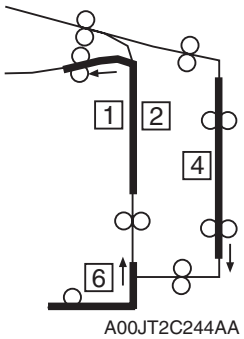
- The image of the fourth page is printed on the second sheet of paper.
- At the same time, the first sheet of the paper is sent trough the duplex part and stops at the stop position 3.



A00JT2C243AA

Operation 4

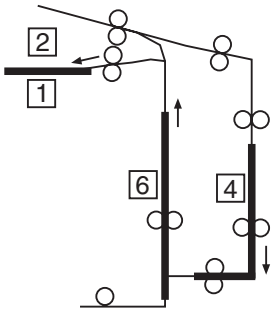
- The first sheet of the paper is re-supplied and an image of the first page is printed on.
- The second sheet of paper is turned around at the switch-back part and transported to the duplex part.
- At the same time, the third sheet of paper is supplied.



A00JT2C244AA

Operation 5

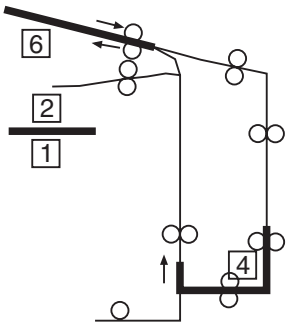
- Exhaust the first sheet of paper.
- At the same time, the image of the sixth page is printed on the third sheet of paper.
- The second sheet of the paper stands by at the stop position 3 until the paper pitch for third sheet is assured.



A00JT2C246AA

Operation 6

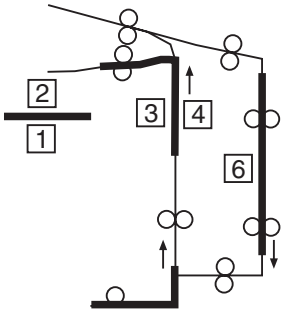
- The third sheet of paper is turned around at the switch-back part and transported to the duplex part.
- At the same time, the second sheet of the paper is re-supplied.



A00JT2C247AA

Operation 7

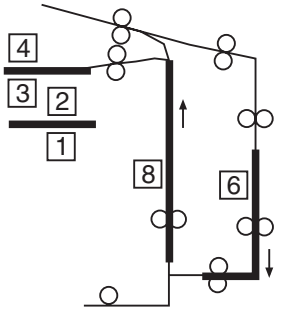
- The image of the third page is printed on the second sheet of paper.
- At the same time, the third sheet of paper is transported in the duplex part.
- At the same time, the fourth sheet of paper is supplied.



A00JT2C248AA

Operation 8

- Exhaust the second sheet of the paper.
- At the same time, the image of eighth page is printed on the fourth sheet of the paper.
- The third sheet of paper stands by at the stop position 3 until the paper pitch for the fourth sheet is assured.



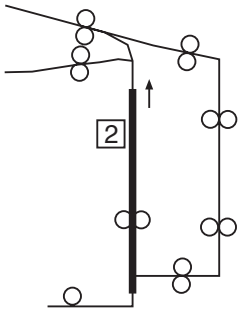
A00JT2C249AA

- Steps 6 through 8 are repeated.

C. 3 sheets alternate supply

Operation 1

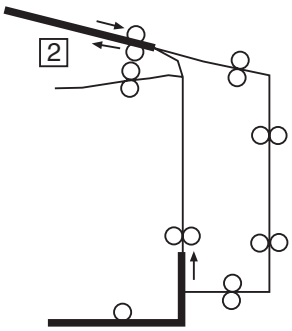
- The first sheet of paper is supplied and the image of the second page is printed.



A00JT2C236AA

Operation 2

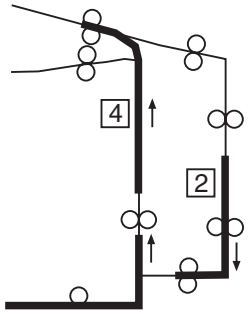
- The first sheet of paper is turned around at the switchback and transported to the duplex part.
- At the same time, the second sheet of paper is supplied.



A00JT2C242AA

Operation 3

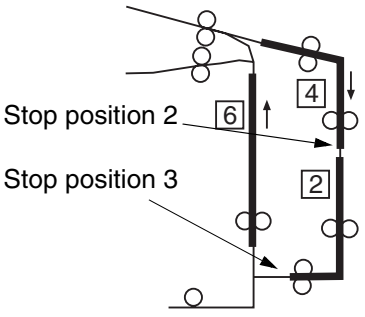
- The image of fourth page is printed on the second sheet of the paper and the paper is transported to the switchback part.
- At the same time, the first sheet of the paper is transported and stops at the stop position 3.
- At the same time, the third sheet of paper is supplied.



A00JT2C250AA

Operation 4

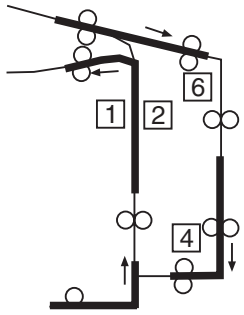
- The image of sixth page is printed on the third sheet of the paper.
- At the same time, the second sheet of the paper is turned around at switchback part, transported to the duplex part and stops at the stop position 2.
- The first sheet of the paper stands by at the stop position 3 until the paper pitch for third sheet is assured.



A00JT2C251AA

Operation 5

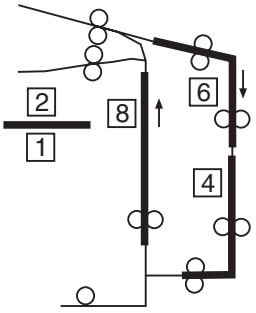
- First sheet of the paper is re-supplied and an image of the first page is printed on, then it is transported to the paper exist part.
- At the same time, the second sheet of the paper is transported to the stop position 3.
- At the same time, the third sheet of the paper is turned around at the switchback part and then transported to the duplex part.
- At the same time, the fourth sheet of the paper is supplied.



A00JT2C252AA

Operation 6

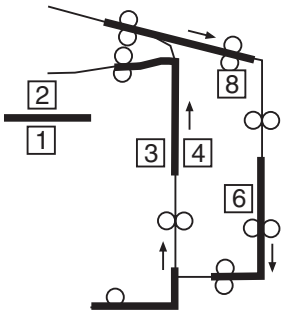
- Exhaust the first sheet of paper.
- At the same time, the image of the eighth page is printed on the fourth sheet of paper.
- The third sheet of the paper is transported to the stop position 2 and stops there.
- The second sheet of the paper stands by at the stop position 3 until the paper pitch for fourth sheet is assured.



A00JT2C253AA

Operation 7

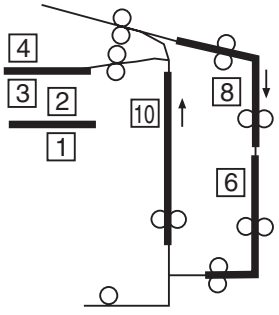
- The second sheet of the paper is re-supplied and the image of the third page is printed on, then it is transported to the paper exist part.
- At the same time, the third sheet of the paper is transported to the stop position 3.
- At the same time, the fourth sheet of the paper is turned around at the switchback part and then transported to the duplex part.
- At the same time, the fifth sheet of the paper is supplied.



A00JT2C254AA

Operation 8

- Exhaust the second sheet of paper.
- At the same time, the image of tenth page is printed on the fifth sheet of the paper.
- At the same time, the fourth sheet of the paper is transported to the stop position 2 and stops there.
- The third sheet of the paper stands by at the stop position 3 until the paper pitch for fifth sheet is assured.



A00JT2C255AA

- Steps 7 through 8 are repeated.

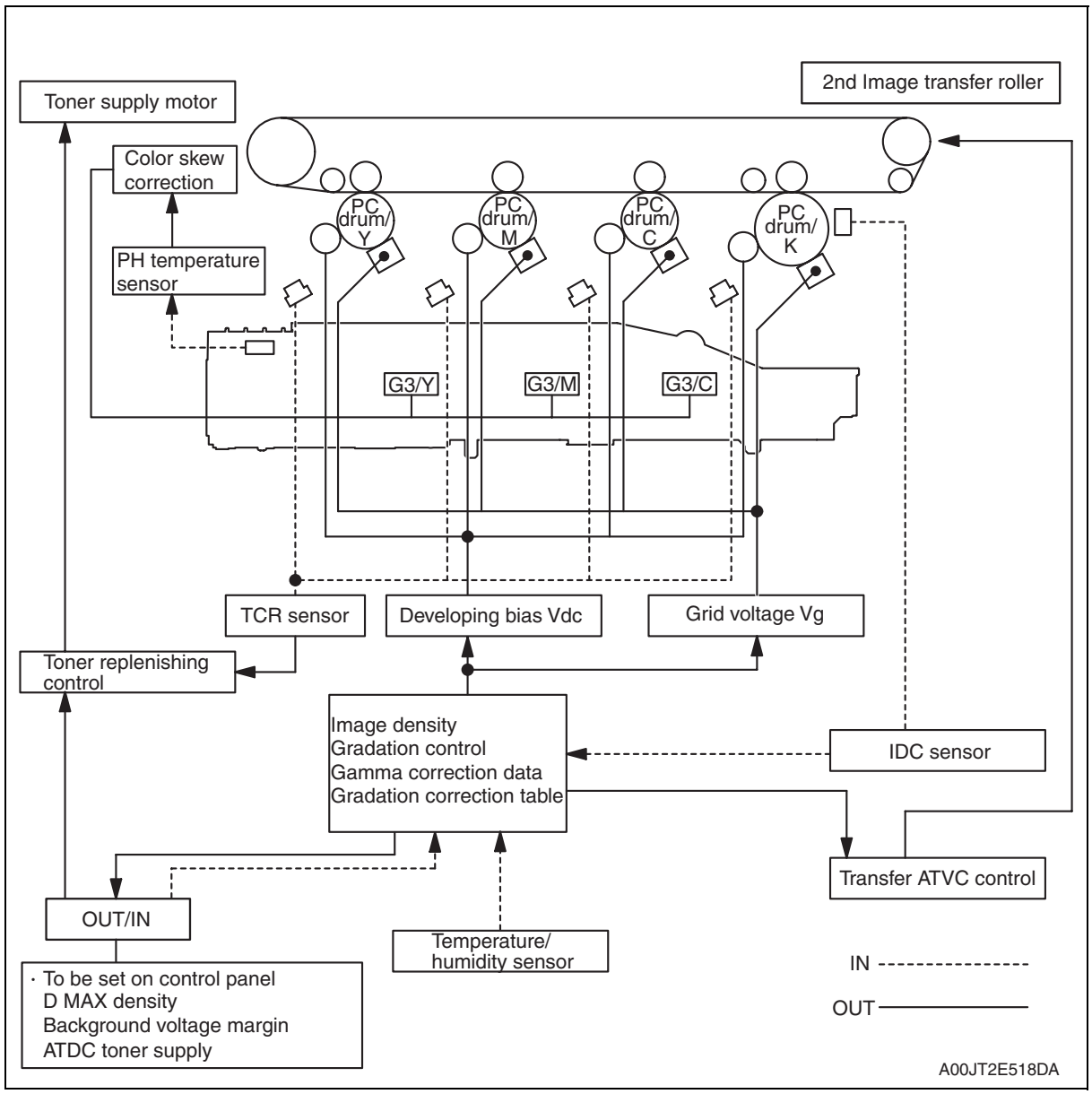
22. Image stabilization control

22.1 Overview

- The machine provides the following image stabilization control to ensure stabilized copy image.

Purpose	Control	Control means
To stabilize image density To stabilize gradation	• IDC registration sensor adjustment control • Max. density adjustment control • LD intensity adjustment control • Registration control (color shift correction) • Gamma correction control	IDC registration sensor Temperature/humidity sensor PH temperature sensor
To stabilize toner density	* TCR control (Y,M,C,K)	TCR sensor
To stabilize image transfer	* Image transfer output control 2nd image transfer ATVC	Temperature/humidity sensor

* An explanation is given of the control for each section.



22.2 Operation

22.2.1 IDC registration sensor adjustment control

- Controls changes in characteristics due to change with time and contamination of the transfer belt and IDC registration sensor, part-to-part variations in the sensors, and change of environment.
- The intensity (current value) of the IDC registration sensor is adjusted on the surface of the transfer belt, on which no toner sticks (background level).

22.2.2 Max. density adjustment control

- The developing bias (Vdc) is adjusted to control changes in the solid density resulting from variations in developing characteristics and IDC registration sensor intensity, variations in sensitivity of the PC drum, and changes in the environment, durability, and the amount of charge in toner.
- Patterns are produced on the surface of the transfer belt and the IDC registration sensor detects the amount of toner sticking to them.
- Referring to the detected data and the environment data taken by the temperature/humidity sensors, the developing bias value that results in the appropriate maximum density is calculated and stored in memory.
- Thereafter, the grid voltage (Vg) value, including the background margin adjustment value, is calculated and stored in memory.

22.2.3 LD (laser diode) intensity adjustment control

- It adjusts the variation in reproducibility of the thin line and the reverse outline, which is resulting from the variations in electrostatic characteristics of the PC drum, developing characteristics and transfer characteristics in terms of individual difference, environment and durability, to make it the target level.
- It produces detection patterns on the surface of the transfer belt with the given level of LD intensity and detects the output value of IDC sensor.
- LD intensity is calculated from the detected IDC sensor data.

22.2.4 Gamma correction control

- The intensity of LD in all gradation levels is adjusted to correct changes in gradation characteristics to a linear one. The changes in gradation characteristics are caused by variations in the PC drum sensitivity and developing characteristics and changes with time and in environment.
- It produces gradation patterns on the transfer belt and calculates gradation characteristics output by the current engine with the IDC registration sensor.
- The gamma correction data is calculated using the density measurements of different gradation levels. The optimum LD intensity is set for each of the different gradation levels

22.3 Operation sequence

Sequence	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
1	IDC registration sensor adjustment	IDC registration sensor adjustment	Registration	Registration	IDC registration sensor adjustment
2	Dmax density adjustment 1	Dmax density adjustment 2	Gamma correction 2	-	Dmax density adjustment 2
3	LD light intensity adjustment 1	LD light intensity adjustment 2	-	-	LD light intensity adjustment 2
4	Dmax density adjustment 2	Registration	-	-	Gamma correction 1
5	LD light intensity adjustment 2	Gamma correction 1	-	-	-
6	Registration	-	-	-	-
7	Gamma correction 1	-	-	-	-

* Max. density adjustment control 1: Use default for characteristic tilted value and Vdc value.
  Max. density adjustment control 2: Use previous setting value for characteristic tilted value and Vdc value.

* LD (laser diode) intensity adjustment control 1: Use default for LD intensity for adjustment pattern.
  LD (laser diode) intensity adjustment control 2: Use previous setting value for LD intensity for adjustment pattern.

Gamma correction 1: Performs normal gamma correction.
Gamma correction 2: Performs simplified gamma correction.

22.4 Operation timing

A. Image stabilization when not printing

Mode	Operation condition
Mode 1	• A new transfer belt is detected • IU units are removed and installed. • A new IU is detected (Image stabilization sequence is executed only for a new IU that has been installed) • Skew adjustment is reset (Service mode) • After initialization and image stabilization (Service mode)
Mode 2	• The main power switch is turned ON • The trouble codes and jam messages are reset • After image stabilization control is discontinued, a door is closed. • While a warning code is being displayed, the front door is opened and closed. • Image stabilization (Service mode)
Mode 4	• The threshold of PH temperature change is detected during the standby state or during a print cycle.
Mode 5	• Gradation Adjust

B. Image stabilization during printing

Mode	Operation condition	Operation timing
Mode 2	• Temperature change inside the machine is detected. (The machine detects absolute humidity that reaches the threshold temperature change for the first time since the image stability sequence performed last time.) • When gamma correction data are out of the specified range in the last image stabilization sequence, Vg and Vdc are adjusted again. • The last color registration adjustment was not successful. (Alert codes P-21 or P-22)	• When the print mode changes from monochrome to color • At the end of a print cycle
Mode 3	• The predetermined count is detected. *1 and 2 (For details, see, in the following page, image stabilization execution flow based on a count while a print cycle is progressing.)	• When the print mode changes from monochrome to color • At the end of a print cycle
	• When a print job includes many pages, no image stabilization may be performed during the printing. In this case, the machine forcefully execute image stabilization.*1 (For details, see, in the following page, image stabilization execution flow based on a count while a print cycle is progressing.)	• Between each print set after the predetermined count is reached. • When the predetermined count is reached, the machine stops printing and the image stabilization is executed.
Mode 4	• If the machine detects the threshold PH temperature change, only the color registration correction is executed. (For details, see, in the following page, image stabilization execution flow based on a count while a print cycle is progressing.)	• When the print mode changes from monochrome to color • When the count of remaining pages reaches the predetermined count, the machine stops printing and the image stabilization is executed. • At the end of a print cycle

*1 When the gamma correction data are out of the specified range in the last image stabilization sequence, image stabilization control of mode 2 is executed.

*2:A copy of A4 size or equivalent is counted as one.

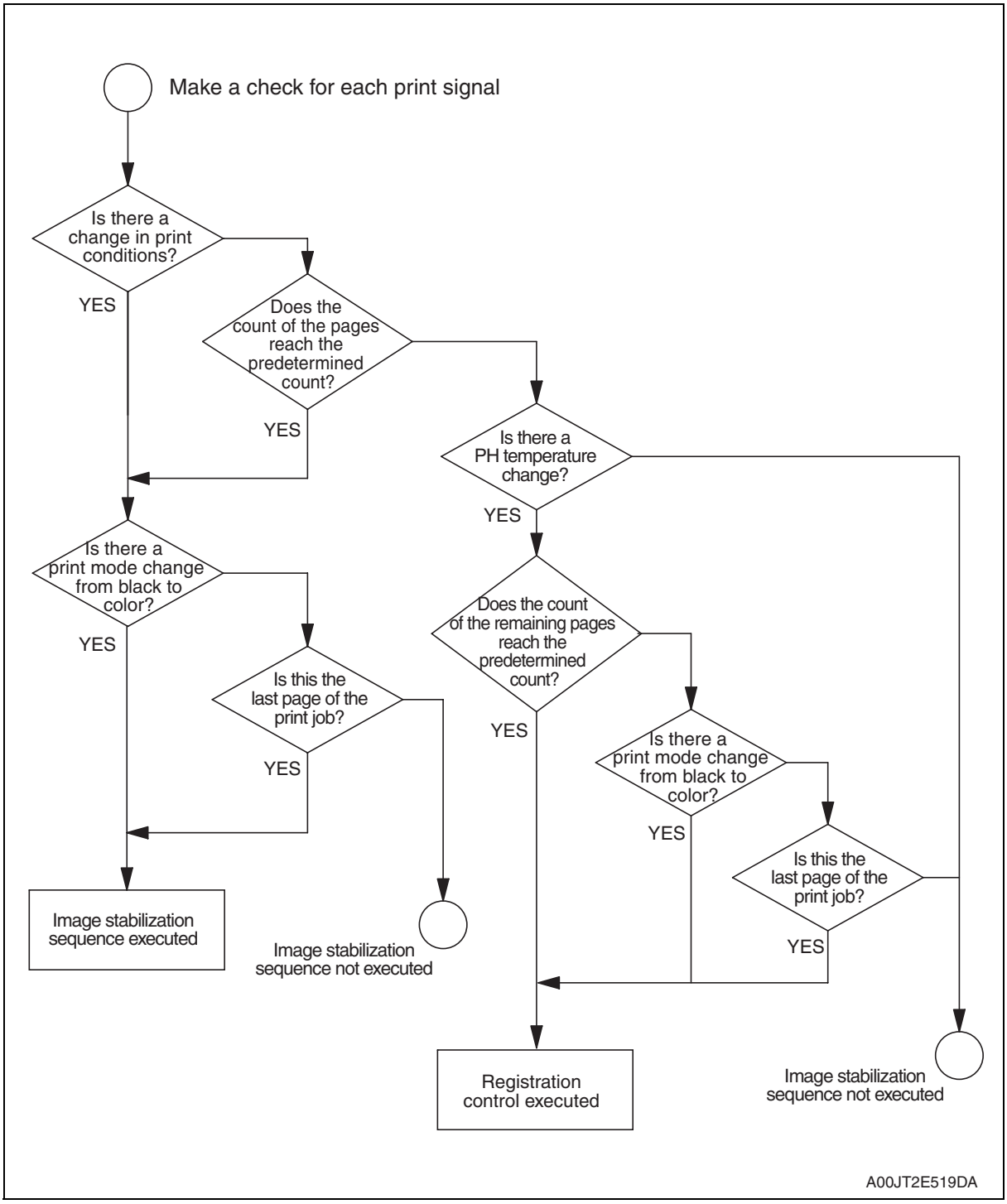
△2 • MF550

Paper length in the sub scanning direction	Count
216 mm or less	1
Over 216 mm and up to 432 mm	2
Over 432 mm	3

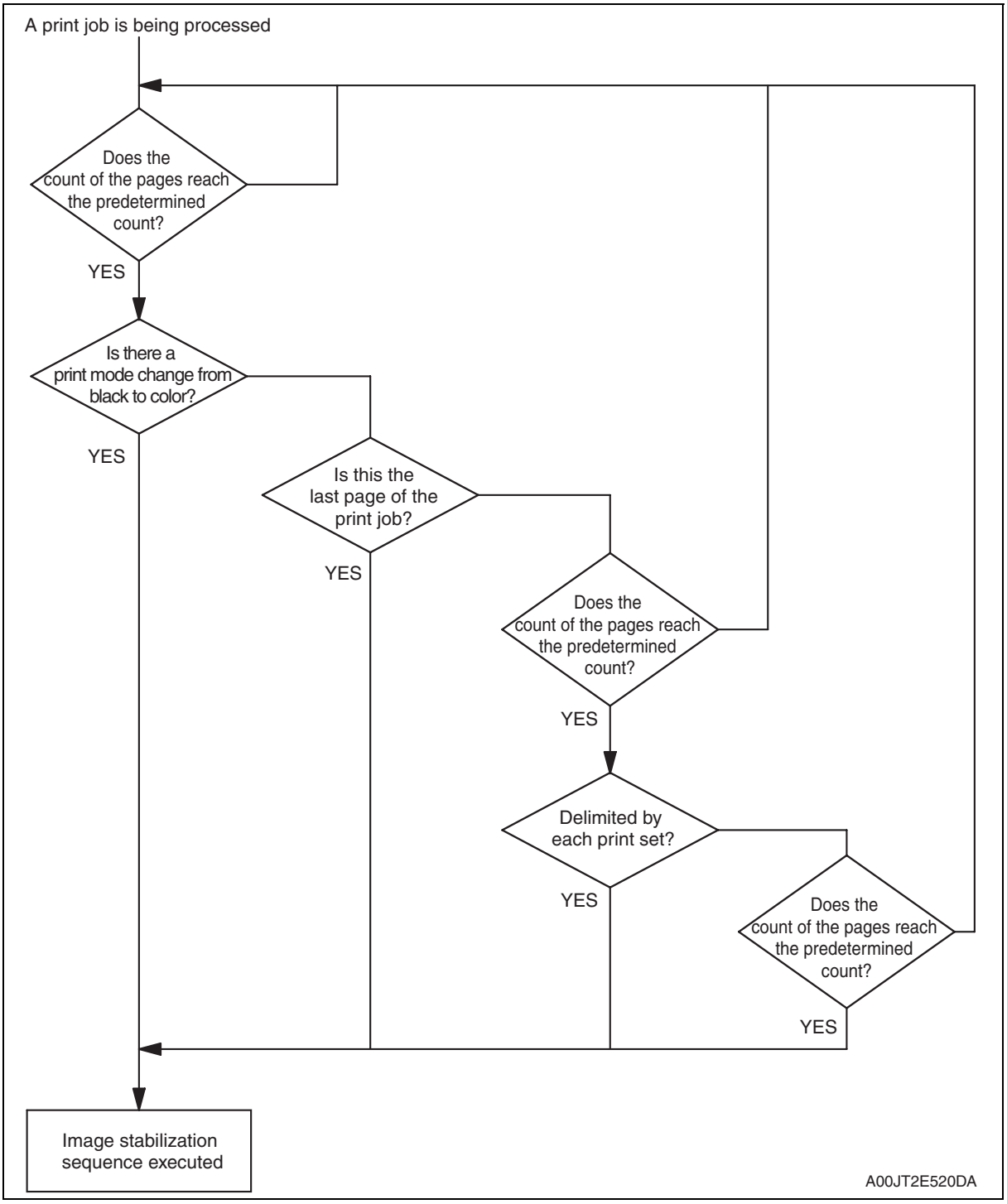
• MF450

Paper length in the sub scanning direction	Count
216 mm or less	1
Over 216 mm and up to 432 mm	2
Over 432 mm and up to 648 mm	3
Over 648 mm and up to 864 mm	4
Over 864 mm and up to 1080 mm	5
Over 1080 mm	6

C. Basic image stabilization operation flow

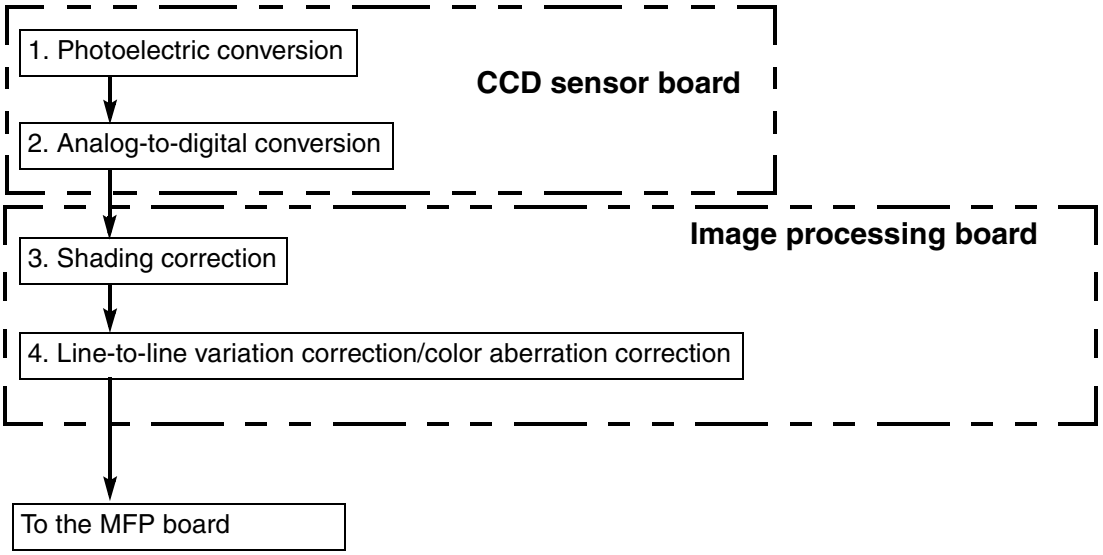


D. Image stabilization execution flow based on a count while a print cycle is progressing



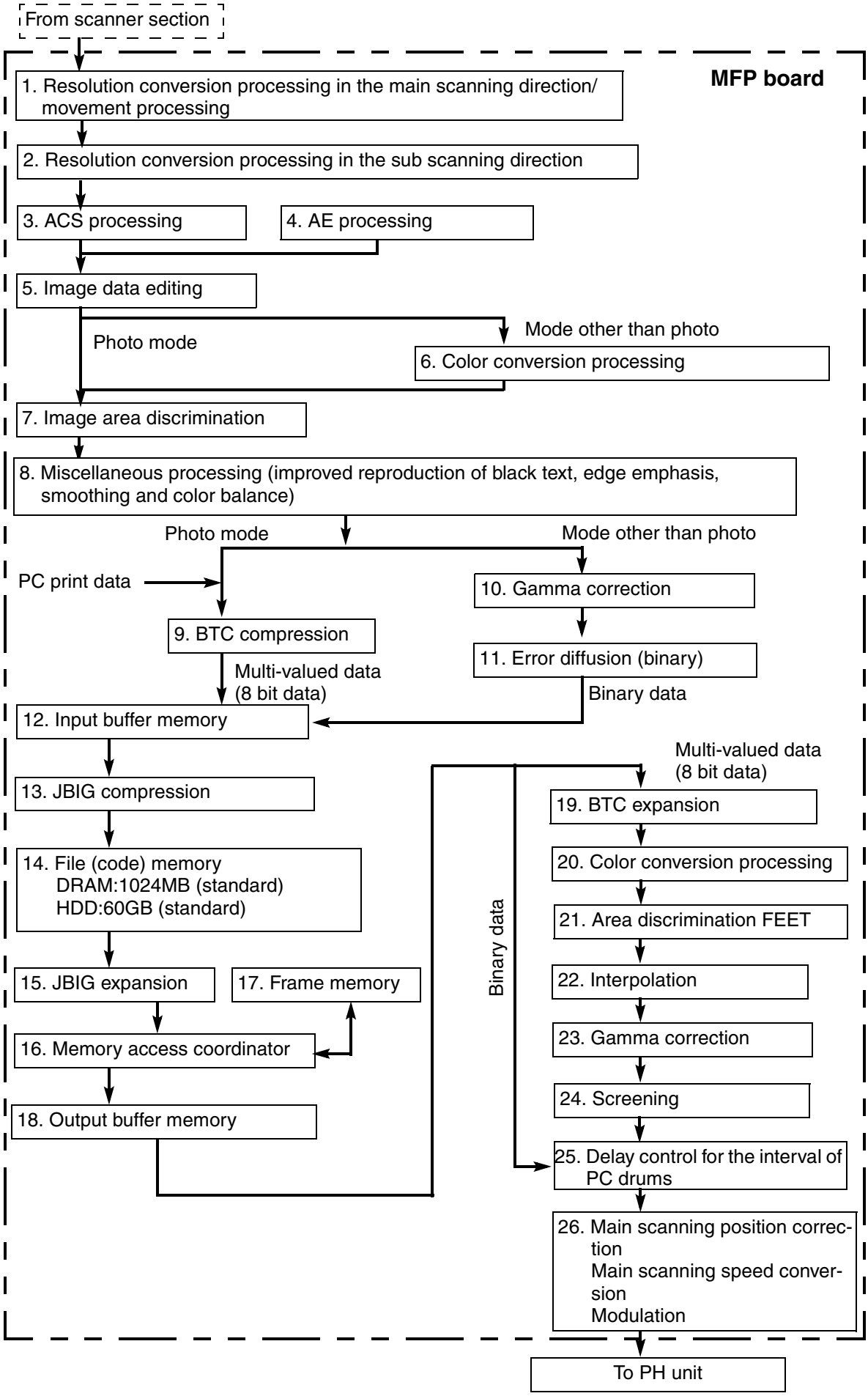
23. Image processing

23.1 Scanner section image processing block diagram



- The following detail the image processing operations performed by the scanner section.
  1. A reduction type CCD sensor is used to read the light reflected off the original and convert the optical data to a corresponding electric signal. To make data processing faster, data transfer and output are done through two channels, one for even-numbered pixels and the other for odd-numbered pixels.
  2. The odd and even analog signals output from the CCD sensor chips are synthesized to form a single string of signal data which is in turn converted to 8-bit digital signals (256 gradation levels).
  3. A correction is made of errors that occur due to variations in sensitivity of each CCD chip and the light distribution varying along the length of the exposure lamp. The shading correction is made by holding the peak value, i.e., the maximum value of readings taken of multiple lines, to prevent adverse effects on the image due to dust on the shading sheet.
  4. Memory called FIFO is employed to compensate for a deviation in the scanning position of the original, which represents a gap between two adjacent CCD chips, thereby matching the output timing of R, G, and B data. Also, the color aberration of the lens is compensated at this time.
- The image data is transmitted to MFP board on the write section through the interface cable.

23.2 Write section image processing block diagram



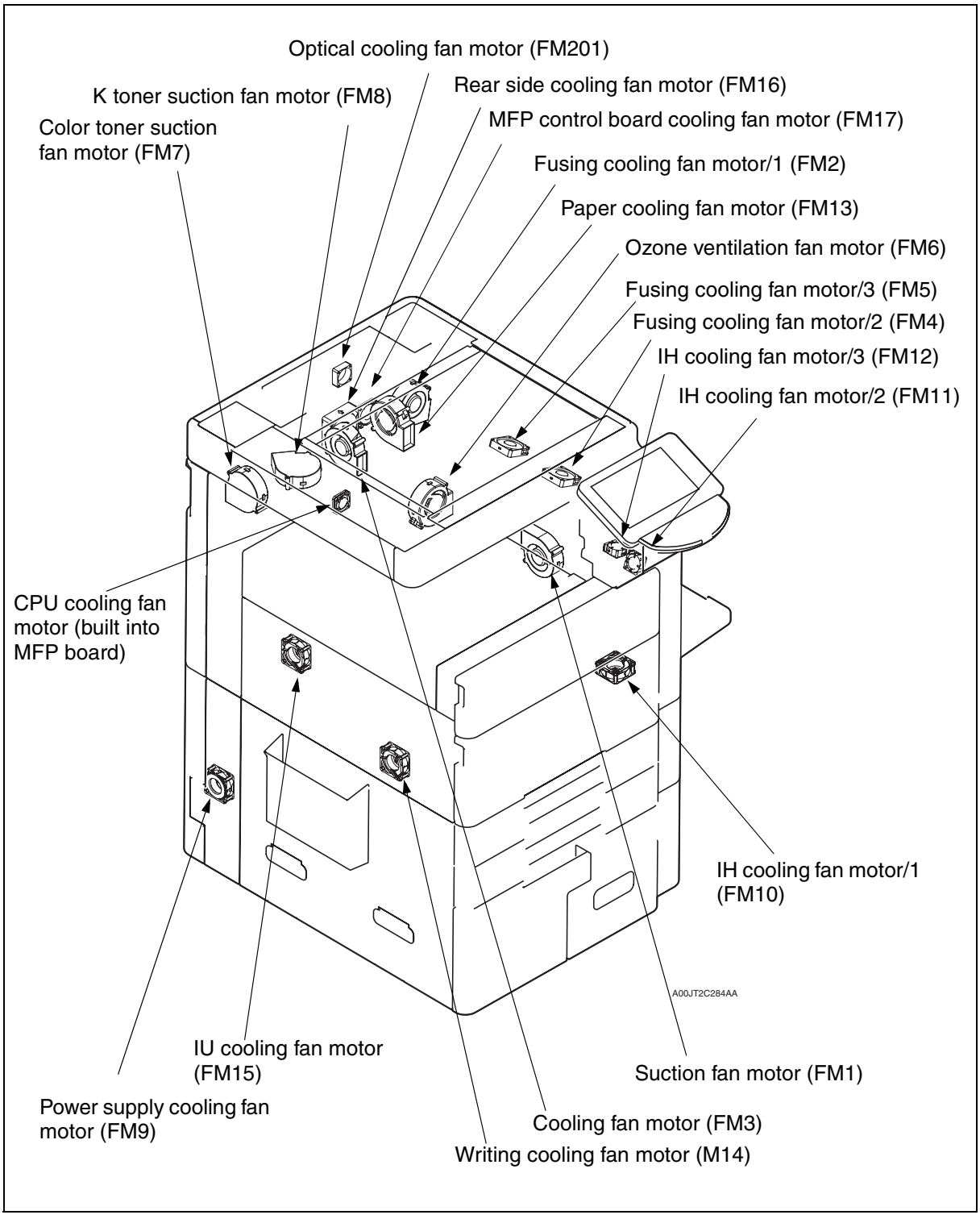
- The following detail the image processing operations performed by MFP board on the Write section.
  1. FIFO memory is used to enlarge or reduce images in the main scanning direction. The image is enlarged by increasing the number of data readings and reduced by decreasing the number of data readings.
  2. Reduction processing is conducted in sub scanning direction. No processing is done at same size or zoom, but at reduction, the lines are thinned out.
  3. The scanning area is divided into multiple blocks. The ratio of color or monochrome is calculated for each of these blocks. The machine then determines whether the entire original is colored or monochrome. A histogram of lightness is also created for later AE processing.
  4. The scanning area is divided into two in the FD direction. The lightness histogram for AE processing is generated by the lightness histogram generated through ACS processing. The AE level of the original is determined based on this histogram and AE processing is performed.
  5. R, G, and B data are then converted to value and color component data for adjustments of saturation, lightness, and hue.
  6. When copying in a mode other than photo mode, the color component data (R, G, B) are converted to Y, M, C, and K density data. Also, the masking processing, which compensates for the deviation in the spectral reflection characteristics of the toner, and UCR/BP processing are performed on the image data.
  7. Each image area, whether it is a color edge area, black edge area, dot area, or a continuous gradation area, is discriminated.
  8. Other types of processing performed are the improved reproduction of black text, edge emphasis, smoothing and color balance.
  9. In photo mode and PC print, each image data of R, G, B is compressed to reduce the consumption of data capacity.
  10. Binary data gets gamma correction at this time. Makes the necessary corrections so that the printed gradations have linear characteristics, since the image density of the input image data is not directly proportional to that of the printed image because of the changing developing and PC drum characteristics.
  11. In photo mode and PC print, the image is processed as multi-valued data (8-bit data). In any mode other than photo, the error diffusion method is employed to process the image as binary (1-bit) data.
  12. Temporarily stores the BTC-compressed image data and error diffusion data.
  13. The stored image data is compressed in the JBIG (Joint bi-level image experts group) format.
  14. When copying in a photo mode or making PC print, the R, G, and B image data are stored. When coping in a mode other than photo mode, the Y, M, C, and K image are stored.
  15. The image data read from the file memory is uncompressed through a method in a reverse way of JBIG compression. At this time, image rotating or sorting processing is conducted.
  16. JBIG image data are expanded in the frame memory.
  17. When copying in the photo mode or making PC print, each image data of R, G, and B are stored to reduce data volume. When copying in a mode other than photo mode, the binary data of Y, M, C, and K are stored.
      For PS printing, multi-valued data of Y, M, C, and K are stored.
  18. Temporarily stores the image data output from the frame memory.
  19. Image data is expanded using the method opposite to that used in BTC compression. Only when copying in a photo mode (multi-valued data) or making PC pint, the steps from “19. BTC expansion” to “24. Screening” are performed.

20. When copying in a photo mode or making PC print, the R, G, and B data is converted to the Y, M, C, and K density data. Also, the masking processing, which compensates for the deviation in the spectral reflection characteristics of the toner, and UCR/BP processing are performed on the image data.
    For PS printing, multi-valued data of Y, M, C, and K are stored and there is no need of converting or processing those data.
21. Edge of letter and lineal drawing gets area discrimination and FEET processing is conducted according to the discrimination result.
22. When FEET processing is conducted, interpolation is done so that no influence is given to continuous gradation portion.
23. Multi-valued data (photo mode) gets gamma correction at this time. Makes the necessary corrections so that the printed gradations have linear characteristics, since the image density of the input image data is not directly proportional to that of the printed image because of the changing developing and PC drum characteristics.
24. Creates the density distribution of a predetermined pattern to enable outstanding gradation reproduction.
25. Image data of the file memory is developed to the frame memory and output delay control for the interval of PC drums, Y, M, C, K is conducted.
26. Correct the shear in printing start position in the main scanning direction, which occurs when each PH unit of Y, M, C, K is exposed on the PC drum. Adjust the processing speed in the board (main scanning) to conform to the input processing speed. The laser is emitted according to the laser intensity information.

24. Other control

24.1 Fan control

24.1.1 Construction



24.1.2 Operation

A. Function

Motor name	Control conditions
Suction fan motor (FM1)	• Paper will be sucked between transfer part and fusing part, so it will have a stable behavior and go smoothly into the fusing roller. The air inside will be exhausted outside the unit. • A Dust filter/Vertical transfer are mounted inside the ventilation duct in order to remove dust the suction fan sucked with the air inside the unit.
Fusing cooling fan motor/ 1 (FM2)	• Odor accumulated in the fusing part is absorbed by the odor filter to be removed. • Heat accumulated inside the unit will be discharged outside in order to avoid temperature increase etc., at the fusing part.
Cooling fan motor/1 (FM3)	• Heat accumulated inside the unit will be discharged outside in order to avoid temperature increase etc, at the transfer part or the fusing part.
Fusing cooling fan motor/ 2 (FM4) Fusing cooling fan motor/ 3 (FM5)	• Odor accumulated between TC part and fusing part is absorbed by the odor filter to be removed. • In order to keep the temperature between TC part and fusing part as well as motor part, heat accumulated inside the unit will be discharged.
Ozone ventilation fan motor (FM6)	• A white belt may occur on the image because of the lower sensitivity of the PC drum due to ozone accumulated around the PC drum charge corona. In order to avoid this trouble, ozone filter removes the ozone inside the PC drum charge corona to keep the sensitivity of the PC drum. • Ozone accumulated around PC drum charge corona will be absorbed by ozone filter and be removed.
Color toner suction fan motor (FM7)	• Toner fume attached to the surface of the color IU is absorbed to be removed outside.
K toner suction fan motor (FM8)	• Toner fume attached to the surface of the K_IU is absorbed to be removed outside.
Power supply cooling fan motor (FM9)	• Heat accumulated inside the unit will be discharged outside in order to avoid temperature increase etc, at the power part.
IH cooling fan motor/1 (FM10)	• Heat accumulated inside the unit will be discharged outside in order to avoid temperature increase at the IH power used for fusing part.
IH cooling fan motor/2 (FM11) IH cooling fan motor/3 (FM12)	• In order to avoid the temperature increase around IH power used for the fusing part, the outside air is sucked into the unit to cool it.
Paper cooling fan motor (FM13)	• In order to avoid toner adhesion to other things, outside air is sent to ejected paper to cool it down.
Writing cooling fan motor (FM14)	• In order to avoid the temperature increase around PH, the outside air is sucked into the unit to cool it.
IU cooling fan motor (FM15)	• In order to avoid the temperature increase around TC part, IU part, transfer unit, etc., the outside air is sucked into the unit to cool it.
Rear side cooling fan motor (FM16)	• Heat accumulated inside the unit will be discharged outside in order to avoid temperature increase at rear side of the unit, such as the board box.
MFP control board cooling fan motor (FM17)	• Heat accumulated inside the unit will be discharged in order to avoid temperature increase at the printer control board.
Scanner cooling fan motor (FM201)	• Heat accumulated inside the IR part will be discharged in order to avoid temperature increase at the scanner motor.

Motor name	Control conditions
Exit cooling fan motor/1, /2, /3 (FM101, FM102, FM103)	• In order to avoid toner attachment while the exit plate kit is used, outside air is applied to the paper to cool it. • Fan motor for the exit plate kit (0T-503)

B. Fan control

Motor name	Control	Control conditions (outline)
Suction fan motor (FM1)	Stop	• Plug-in/Sub-power switch OFF • In standby • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	-
	Full speed	• At warm-up, initial operation, image stabilization • When cleaning the transfer belt • When printing
Power supply cooling fan motor/1 (FM2)	Stop	• Plug-in/Sub-power switch OFF • When sleep • In standby • When updating the firmware
	Half speed	• In standby or low-power • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Full speed *1	• At warm-up, initial operation, image stabilization, function*1, or printing • When cleaning the transfer belt • When printing
Cooling fan motor (FM3)	Stop	• Plug-in/sub-power switch OFF • When in low power or sleep • When updating the firmware • At paper-jam, in trouble, or when the front door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	• In standby
	Full speed	• At warm-up, initial operation, image stabilization • When printing
Fusing cooling fan motor/2 (FM4) Fusing cooling fan motor/3 (FM5)	Stop	• Plug-in/sub-power switch OFF • In low-power or sleep • When updating the firmware • In standby or low-power • At paper-jam, in trouble, or when the front door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	• In standby
	Full speed *2	• At warm-up, initial operation, image stabilization • When cleaning the transfer belt • When printing

Motor name	Control	Control conditions (outline)
Ozone ventilation fan motor (FM6)	Stop	• Plug-in/sub-power switch OFF • In sleep • When updating the firmware
	Half speed	• In standby, low power • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Full speed *1	• At warm-up, initial operation, image stabilization, function • At toner replenishing, after detecting charge leakage • When printing
Color toner suction fan motor (FM7)	Stop	• Plug-in/sub-power switch OFF • At warm-up, low power, or initial operation • At low power, or sleep • At paper-jam, in trouble, or when the door is open. • All drive systems are OFF due to the cause except paper jam, trouble, or door being open.
	Half speed	-
	Full speed	• At image stabilization, toner replenishing, after detecting charge leakage • When printing
K toner suction fan motor (FM8)	Stop	• Plug-in/sub-power switch OFF • At warm-up, low power, or initial operation • At low power, or sleep • At paper-jam, in trouble, or when the door is open. • All drive systems are OFF due to the cause except paper jam, trouble, or door being open.
	Half speed	-
	Full speed	• At image stabilization, toner replenishing, after detecting charge leakage • When printing
Power supply cooling fan motor (FM9)	Stop	• When sleep
	Half speed	• Plug-in/sub-power switch OFF • At stand by, low power • When updating the firmware • At paper-jam, in trouble, or when the door is open. • All drive systems are OFF due to the cause except paper jam, trouble, or door being open.
	Full speed	• At warm-up, initial operation, image stabilization, function • At toner replenishing, after detecting charge leakage • When printing
IH cooling fan motor/1 (FM10)	Stop	• Plug-in/sub-power switch OFF • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the front door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	• In standby
	Full speed	• At warm-up, initial operation, image stabilization • When printing

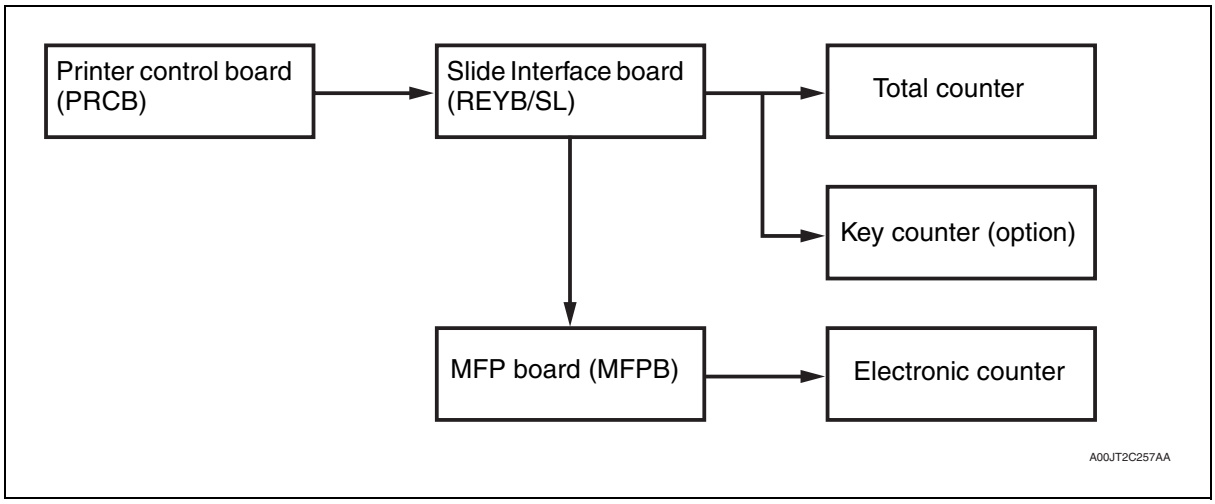
Motor name	Control	Control conditions (outline)
IH cooling fan motor/2 (FM11) IH cooling fan motor/3 (FM12)	Stop	• Plug-in/sub-power switch OFF • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	-
	Full speed *2	• At warm-up, initial operation, image stabilization • When printing
Paper cooling fan motor (FM13)	Stop	• Plug-in/sub-power switch OFF • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the front door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	• In standby • When the front door is open
	Full speed	• At warm-up, initial operation, image stabilization • When cleaning the transfer belt • When printing
Writing cooling fan motor (FM14)	Stop	• Plug-in/sub-power switch OFF • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the front door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	• In standby
	Full speed *1	• At warm-up, initial operation, image stabilization • When printing
IU cooling fan motor (FM15)	Stop	• Plug-in/sub-power switch OFF • In standby • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	-
	Full speed	• At warm-up, initial operation, image stabilization • When cleaning the transfer belt • When printing
Rear side cooling fan motor (FM16)	Stop	• Plug-in/sub-power switch OFF • In standby • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	-
	Full speed *1	• At warm-up, initial operation, image stabilization • When cleaning the transfer belt • When printing

Motor name	Control	Control conditions (outline)
MFP control board cooling fan motor (FM17)	Stop	• Plug-in/sub-power switch OFF • In low-power or sleep • When updating the firmware • At paper-jam, in trouble, or when the door is open • All drive systems are OFF due to the cause except paper jam, trouble, or door being open
	Half speed	• In standby
	Full speed	• At warm-up • At initial operation, image stabilization • When printing
Optical cooling fan motor (FM201)	Full speed	• While the exposure lamp (FL201) is ON
Exit cooling fan motor/3 (FM103)	Full speed	• When paper is discharged
Exit cooling fan motor/1, /2 (FM101, FM102)	Full speed	• When the paper size is bigger than B5 at paper discharging.

*1: It rotates in full speed for 30 seconds after the mode is changed.
*2: It rotates in full speed for 10 seconds after the mode is changed.
Half speed control: When switching from stop to half speed control, the fan will rotate at full speed and then will rotate at half speed.

24.2 Counter control

24.2.1 Construction



Name	Function/system
Total counter	• Displays the cumulative number of copies and prints of all jobs. • A mechanical counter driven by an electric signal • Counts one when an exit signal is applied to it
Electronic counter	• Number of total copies/prints in copy/print/scan/fax mode will be displayed on the screen as described below. • Black, full color, mono color, and 2 color • Total counter, large size counter, color total (copy + printer), print counter, scan counter, fax TX counter, fax RX counter, No. of originals counter, No. of prints counter, total duplex counter • Counts one when an exit signal is applied to it
Key counter (option)	• When charging prints by using the key counter, copies cannot be made with out the key counter. However PC prints and fax TX/RX service are available without the key counter. • Displays the cumulative number of copies while the key counter is being mounted. • A mechanical counter driven by an electric signal • Counts one when a paper take-up start signal or image forming start signal, whichever occurs earlier, is applied to it

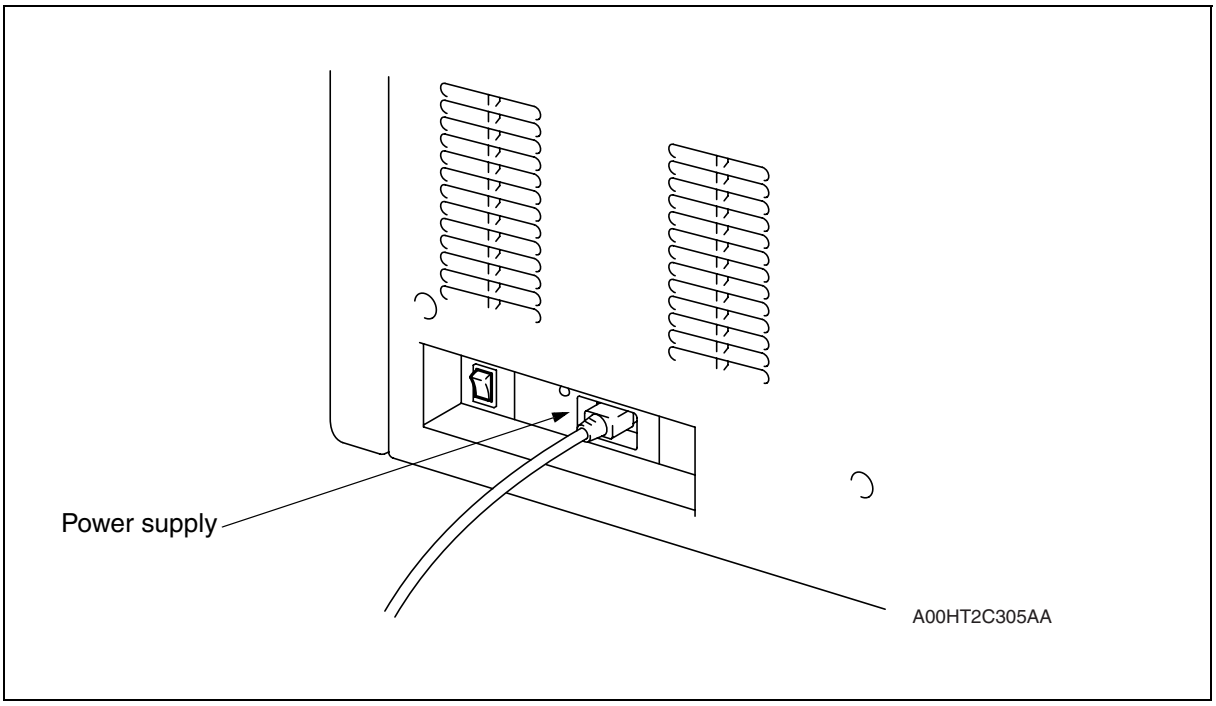
NOTE

- **The counting modes can be selected at [billing setting] of service mode. For details, see [Field service/adjustment/setting/billing setting].**

2 24.3 Power supply unit

A. MF550/MF450

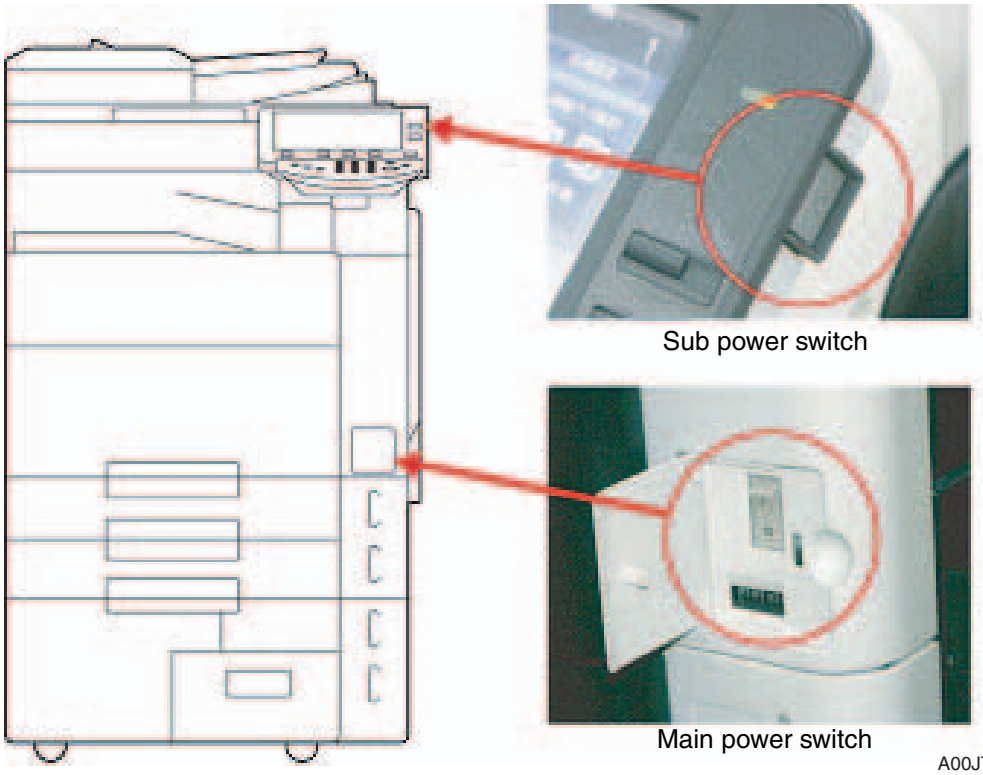
- The main body uses a single outlet.



24.4 Parts operated when the main power switch and sub power switch are turned ON

24.4.1 Parts operated when the main power switch and sub power switch are turned ON

- When the sub power switch is turned ON, MFP board detects it and sends a control signal to the DC power supply through the printer control board.
- The DC power supply then supplies 3.3 VDC, 5VDC, 12VDC, 15V DC, and 24 V DC to all PWBs and options. It also turns ON the relays in the PWBs and power can be supplied to the IH heater and the heater lamp.

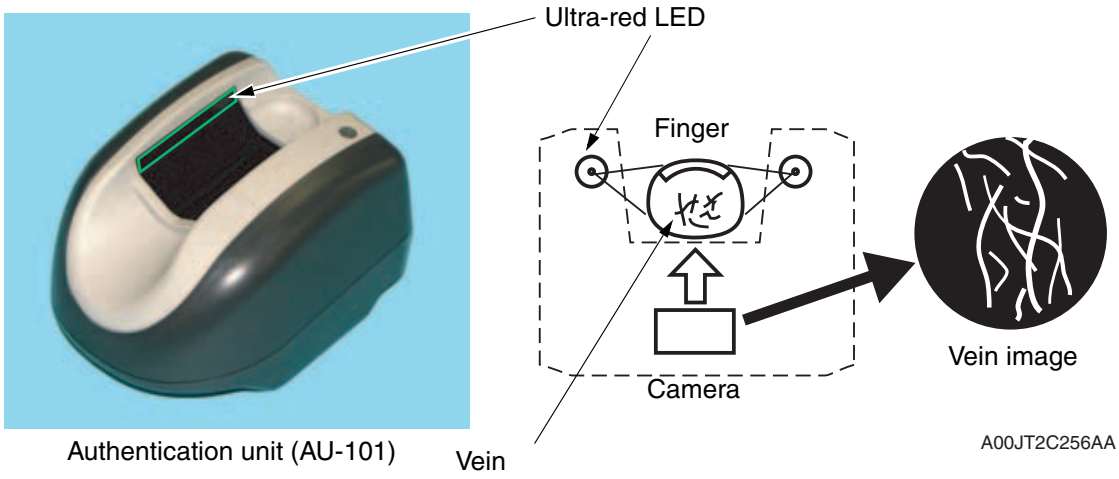


NOTE

- **To turn OFF the main power switch, turn OFF the sub power switch before and make sure that blue lighting of the start key turns orange and then goes out. (Check that power supply to the HDD is shut down. Turning OFF the main power switch while the HDD is running could result in a defective HDD.)**
- **To turn OFF and ON the main power switch, first turn OFF the main power switch and wait for 10 sec. or more before turning it ON again. If a setting value or values in the tech. rep. mode are changed, it takes 10 sec. or more to incorporate the setting changes properly in the machine.**
- **Power switch OFF/ON procedure**
  1. Turn OFF the sub power switch.
  2. Turn OFF the main power switch.
  3. Wait for 10 sec.
  4. Turn ON the main power switch.
  5. Turn ON the sub power switch.

24.5 Authentication unit (Biometric type) (AU-101)

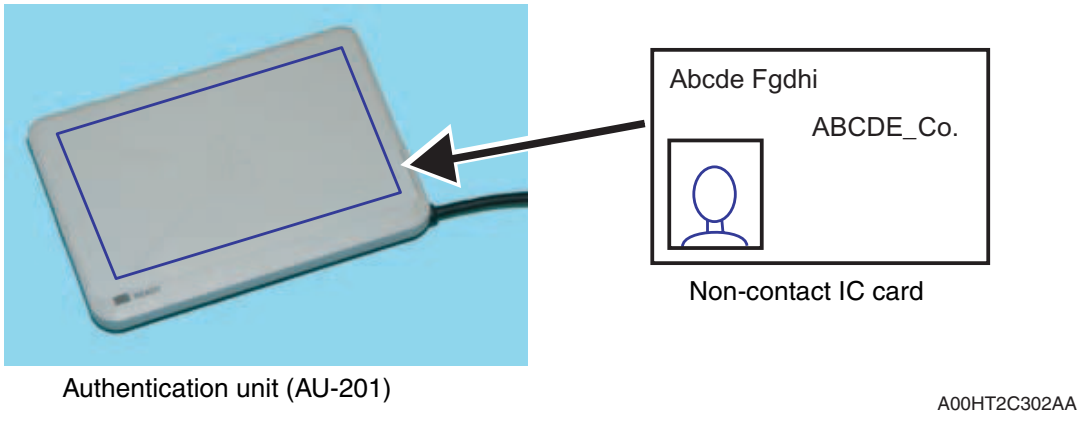
- A finger vein pattern is used for personal identification.
- Vein patterns are inside the body and cannot be visually recognized. This makes vein patterns extremely difficult to forge or falsify. The vein pattern authentication system can provide high security.
- With ultra-red LED radiation, a finger vein pattern is captured by camera and its image is created. The vein pattern image is registered and a person can be identified if the person's vein pattern matches the registered one at the time of user authentication.



Authentication unit (AU-101)

24.6 Authentication unit (IC card type: AU-201)

- A non-contact IC card, such as an employee ID card, is used for personal identification.
- 3 The system supports the communications protocol in compliance with Type A, Type B, and Felica (Type C) of ISO14443.
- 3 Only Felica and Type A cards can be used for MF550, and MF450 machines.
- Simply placing the IC card on the authentication unit will let the unit read the data from the card.



Authentication unit (AU-201)

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