



KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

bizhub c450

SAFETY AND IMPORTANT WARNING ITEMS

Read carefully the Safety and Important Warning Items described below to understand them before doing service work.

IMPORTANT NOTICE

Because of possible hazards to an inexperienced person servicing this product as well as the risk of damage to the product, KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. (hereafter called the KMBT) strongly recommends that all servicing be performed only by KMBT-trained service technicians.

Changes may have been made to this product to improve its performance after this Service Manual was printed. Accordingly, KMBT does not warrant, either explicitly or implicitly, that the information contained in this Service Manual is complete and accurate.

The user of this Service Manual must assume all risks of personal injury and/or damage to the product while servicing the product for which this Service Manual is intended.

Therefore, this Service Manual must be carefully read before doing service work both in the course of technical training and even after that, for performing maintenance and control of the product properly.

Keep this Service Manual also for future service.

DESCRIPTION ITEMS FOR DANGER, WARNING AND CAUTION

In this Service Manual, each of three expressions “ DANGER”, “ WARNING”, and “ CAUTION” is defined as follows together with a symbol mark to be used in a limited meaning.

When servicing the product, the relevant works (disassembling, reassembling, adjustment, repair, maintenance, etc.) need to be conducted with utmost care.

-  **DANGER:** Action having a high possibility of suffering death or serious injury
-  **WARNING:** Action having a possibility of suffering death or serious injury
-  **CAUTION:** Action having a possibility of suffering a slight wound, medium trouble, and property damage

Symbols used for safety and important warning items are defined as follows:

	:Precaution when servicing the product.		General precaution		Electric hazard		High temperature
	:Prohibition when servicing the product.		General prohibition		Do not touch with wet hand		Do not disassemble
	:Direction when servicing the product.		General instruction		Unplug		Ground/Earth

SAFETY WARNINGS

[1] MODIFICATIONS NOT AUTHORIZED BY KONICA MINOLTA BUSINESS TECHNOLOGIES, INC.

KONICA MINOLTA brand products are renowned for their high reliability. This reliability is achieved through high-quality design and a solid service network. Product design is a highly complicated and delicate process where numerous mechanical, physical, and electrical aspects have to be taken into consideration, with the aim of arriving at proper tolerances and safety factors. For this reason, unauthorized modifications involve a high risk of degradation in performance and safety. Such modifications are therefore strictly prohibited. The points listed below are not exhaustive, but they illustrate the reasoning behind this policy.

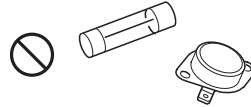
Prohibited Actions

DANGER

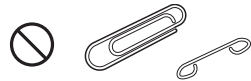
- Using any cables or power cord not specified by KMBT.



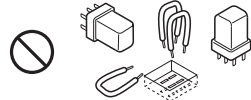
- Using any fuse or thermostat not specified by KMBT. Safety will not be assured, leading to a risk of fire and injury.



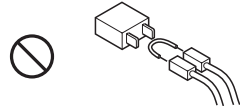
- Disabling fuse functions or bridging fuse terminals with wire, metal clips, solder or similar object.



- Disabling relay functions (such as wedging paper between relay contacts)



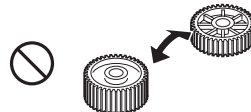
- Disabling safety functions (interlocks, safety circuits, etc.) Safety will not be assured, leading to a risk of fire and injury.



- Making any modification to the product unless instructed by KMBT



- Using parts not specified by KMBT



[2] POWER PLUG SELECTION

In some countries or areas, the power plug provided with the product may not fit wall outlet used in the area. In that case, it is obligation of customer engineer (hereafter called the CE) to attach appropriate power plug or power cord set in order to connect the product to the supply.

Power Cord Set or Power Plug



WARNING

- Use power supply cord set which meets the following criteria:
 - provided with a plug having configuration intended for the connection to wall outlet appropriate for the product's rated voltage and current, and
 - the plug has pin/terminal(s) for grounding, and
 - provided with three-conductor cable having enough current capacity, and
 - the cord set meets regulatory requirements for the area.

Use of inadequate cord set leads to fire or electric shock.



- Attach power plug which meets the following criteria:
 - having configuration intended for the connection to wall outlet appropriate for the product's rated voltage and current, and
 - the plug has pin/terminal(s) for grounding, and
 - meets regulatory requirements for the area.

Use of inadequate cord set leads to the product connecting to inadequate power supply (voltage, current capacity, grounding), and may result in fire or electric shock.



- Conductors in the power cable must be connected to terminals of the plug according to the following order:
 - Black or Brown: L (line)
 - White or Light Blue: N (neutral)
 - Green/Yellow: PE (earth)



Wrong connection may cancel safeguards within the product, and results in fire or electric shock.

[3] CHECKPOINTS WHEN PERFORMING ON-SITE SERVICE

KONICA MINOLTA brand products are extensively tested before shipping, to ensure that all applicable safety standards are met, in order to protect the customer and customer engineer (hereafter called the CE) from the risk of injury. However, in daily use, any electrical equipment may be subject to parts wear and eventual failure. In order to maintain safety and reliability, the CE must perform regular safety checks.

1. Power Supply

Connection to Power Supply

WARNING

- Check that mains voltage is as specified.

Connection to wrong voltage supply may result in fire or electric shock.



- Connect power plug directly into wall outlet having same configuration as the plug.

Use of an adapter leads to the product connecting to inadequate power supply (voltage, current capacity, grounding), and may result in fire or electric shock.

If proper wall outlet is not available, advice the customer to contact qualified electrician for the installation.



- Plug the power cord into the dedicated wall outlet with a capacity greater than the maximum power consumption.

If excessive current flows in the wall outlet, fire may result.



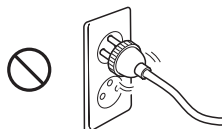
- If two or more power cords can be plugged into the wall outlet, the total load must not exceed the rating of the wall outlet.

If excessive current flows in the wall outlet, fire may result.



- Make sure the power cord is plugged in the wall outlet securely.

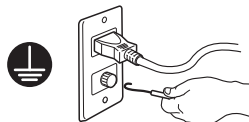
Contact problems may lead to increased resistance, overheating, and the risk of fire.



- Check whether the product is grounded properly.

If current leakage occurs in an ungrounded product, you may suffer electric shock while operating the product.

Connect power plug to grounded wall outlet.



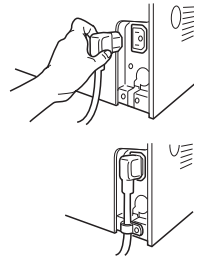
Power Plug and Cord

WARNING

- When using the power cord set (inlet type) that came with this product, make sure the connector is securely inserted in the inlet of the product.

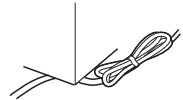
When securing measure is provided, secure the cord with the fixture properly.

If the power cord (inlet type) is not connected to the product securely, a contact problem may lead to increased resistance, overheating, and risk of fire.



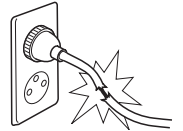
- Check whether the power cord is not stepped on or pinched by a table and so on.

Overheating may occur there, leading to a risk of fire.



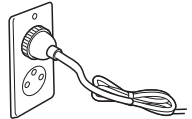
- Check whether the power cord is damaged. Check whether the sheath is damaged.

If the power plug, cord, or sheath is damaged, replace with a new power cord (with plug and connector on each end) specified by KMBT. Using the damaged power cord may result in fire or electric shock.



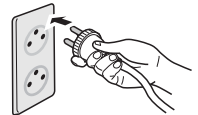
- Do not bundle or tie the power cord.

Overheating may occur there, leading to a risk of fire.



- Check whether dust is collected around the power plug and wall outlet.

Using the power plug and wall outlet without removing dust may result in fire.



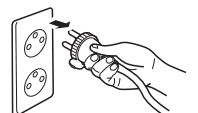
- Do not insert the power plug into the wall outlet with a wet hand.

The risk of electric shock exists.



- When unplugging the power cord, grasp the plug, not the cable.

The cable may be broken, leading to a risk of fire and electric shock.

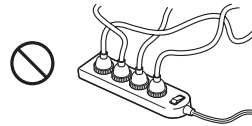


Wiring

WARNING

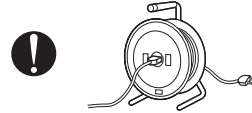
- Never use multi-plug adapters to plug multiple power cords in the same outlet.

If used, the risk of fire exists.



- When an extension cord is required, use a specified one. Current that can flow in the extension cord is limited, so using a too long extension cord may result in fire.

Do not use an extension cable reel with the cable taken up. Fire may result.



2. Installation Requirements

Prohibited Installation Places

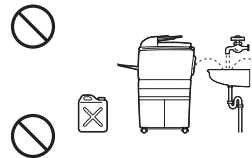
WARNING

- Do not place the product near flammable materials or volatile materials that may catch fire.

A risk of fire exists.

- Do not place the product in a place exposed to water such as rain.

A risk of fire and electric shock exists.

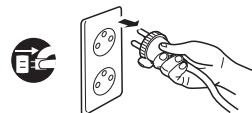


When not Using the Product for a long time

WARNING

- When the product is not used over an extended period of time (holidays, etc.), switch it off and unplug the power cord.

Dust collected around the power plug and outlet may cause fire.



Ventilation

CAUTION

- The product generates ozone gas during operation, but it will not be harmful to the human body.

If a bad smell of ozone is present in the following cases, ventilate the room.

- a. When the product is used in a poorly ventilated room
- b. When taking a lot of copies
- c. When using multiple products at the same time



Stability

CAUTION

- Be sure to lock the caster stoppers.

In the case of an earthquake and so on, the product may slide, leading to a injury.

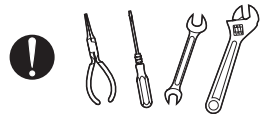


Inspection before Servicing

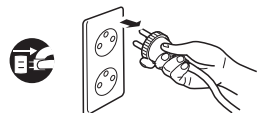
CAUTION

- Before conducting an inspection, read all relevant documentation (service manual, technical notices, etc.) and proceed with the inspection following the prescribed procedure, using only the prescribed tools. Do not make any adjustment not described in the documentation.

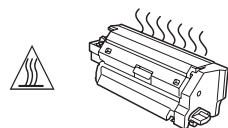
If the prescribed procedure or tool is not used, the product may break and a risk of injury or fire exists.



- Before conducting an inspection, be sure to disconnect the power plugs from the product and options.
When the power plug is inserted in the wall outlet, some units are still powered even if the POWER switch is turned OFF. A risk of electric shock exists.



- The area around the fixing unit is hot.
You may get burnt.



Work Performed with the Product Powered On

WARNING

- Take every care when making adjustments or performing an operation check with the product powered.

If you make adjustments or perform an operation check with the external cover detached, you may touch live or high-voltage parts or you may be caught in moving gears or the timing belt, leading to a risk of injury.



- Take every care when servicing with the external cover detached.

High-voltage exists around the drum unit. A risk of electric shock exists.



Safety Checkpoints

WARNING

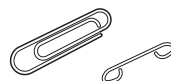
- Check the exterior and frame for edges, burrs, and other damage.

The user or CE may be injured.



- Do not allow any metal parts such as clips, staples, and screws to fall into the product.

They can short internal circuits and cause electric shock or fire.



- Check wiring for squeezing and any other damage.

Current can leak, leading to a risk of electric shock or fire.



- Carefully remove all toner remnants and dust from electrical parts and electrode units such as a charging corona unit.

Current can leak, leading to a risk of product trouble or fire.



- Check high-voltage cables and sheaths for any damage.

Current can leak, leading to a risk of electric shock or fire.



Safety Checkpoints

WARNING

- Check electrode units such as a charging corona unit for deterioration and sign of leakage.

Current can leak, leading to a risk of trouble or fire.



- Before disassembling or adjusting the write unit (P/H unit) incorporating a laser, make sure that the power cord has been disconnected.

The laser light can enter your eye, leading to a risk of loss of eyesight.



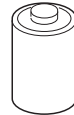
- Do not remove the cover of the write unit. Do not supply power with the write unit shifted from the specified mounting position.

The laser light can enter your eye, leading to a risk of loss of eyesight.



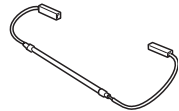
- When replacing a lithium battery, replace it with a new lithium battery specified in the Parts Guide Manual. Dispose of the used lithium battery using the method specified by local authority.

Improper replacement can cause explosion.



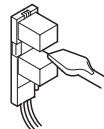
- After replacing a part to which AC voltage is applied (e.g., optical lamp and fixing lamp), be sure to check the installation state.

A risk of fire exists.



- Check the interlock switch and actuator for loosening and check whether the interlock functions properly.

If the interlock does not function, you may receive an electric shock or be injured when you insert your hand in the product (e.g., for clearing paper jam).



- Make sure the wiring cannot come into contact with sharp edges, burrs, or other pointed parts.

Current can leak, leading to a risk of electric shock or fire.



Safety Checkpoints

WARNING

- Make sure that all screws, components, wiring, connectors, etc. that were removed for safety check and maintenance have been reinstalled in the original location. (Pay special attention to forgotten connectors, pinched cables, forgotten screws, etc.)

A risk of product trouble, electric shock, and fire exists.



Handling of Consumables

WARNING

- Toner and developer are not harmful substances, but care must be taken not to breathe excessive amounts or let the substances come into contact with eyes, etc. It may be stimulative.

If the substances get in the eye, rinse with plenty of water immediately. When symptoms are noticeable, consult a physician.



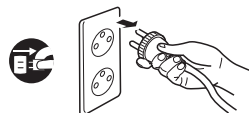
- Never throw the used cartridge and toner into fire.
You may be burned due to dust explosion.



Handling of Service Materials

CAUTION

- Unplug the power cord from the wall outlet.
Drum cleaner (isopropyl alcohol) and roller cleaner (acetone-based) are highly flammable and must be handled with care. A risk of fire exists.



- Do not replace the cover or turn the product ON before any solvent remnants on the cleaned parts have fully evaporated.

A risk of fire exists.



Handling of Service Materials



CAUTION

- Use only a small amount of cleaner at a time and take care not to spill any liquid. If this happens, immediately wipe it off.

A risk of fire exists.



- When using any solvent, ventilate the room well.
Breathing large quantities of organic solvents can lead to discomfort.



[4] Used Batteries Precautions

ALL Areas

CAUTION

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer.

Dispose of used batteries according to the manufacturer's instructions.

Germany

VORSICHT!

Explosionsgefahr bei unsachgemäßem Austausch der Batterie.

Ersatz nur durch denselben oder einen vom Hersteller empfohlenen gleichwertigen Typ.

Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

France

ATTENTION

Il y a danger d'explosion s'il y a remplacement incorrect de la batterie.

Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur.

Mettre au rebut les batteries usagées conformément aux instructions du fabricant.

Denmark

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering.

Udskiftning må kun ske med batteri af samme fabrikat og type.

Levér det brugte batteri tilbage til leverandøren.

Finland, Sweden

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu.

Vaiha paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin.

Hävittä käytetty paristo valmistajan ohjeiden mukaisesti.

VARNING

Explosionsfara vid felaktigt batteribyte.

Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren.

Kassera använt batteri enligt fabrikantens instruktion.

Norway

ADVARSEL

Eksplosjonsfare ved feilaktig skifte av batteri.

Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten.

Brukte batterier kasseres i henhold til fabrikantens instruksjoner.

[5] FUSE

CAUTION**Double pole / neutral fusing****ATTENTION****Double pôle / fusible sur le neutre.**

[6] LED Radiation Safety

- This product is a copier which operates by means of a LED (light emitting diodes) exposure system. There is no possibility of danger from the LED optical radiation, because the LED optical radiation level dose not exceed the accessible radiation limit of class 1 under all conditions of operation, maintenance, service and failure.

WARNING INDICATIONS ON THE MACHINE

Caution labels shown are attached in some areas on/in the machine.
When accessing these areas for maintenance, repair, or adjustment, special care should be taken to avoid burns and electric shock.

 **High voltage**



 **High temperature**

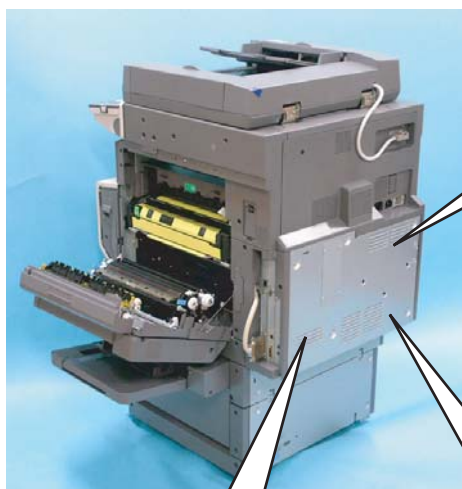


 **High voltage**



 **High temperature**

4037P0C501DA



 **High voltage**

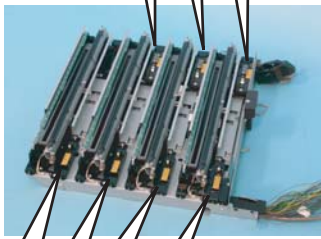
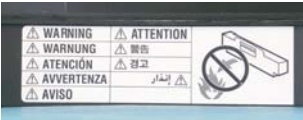
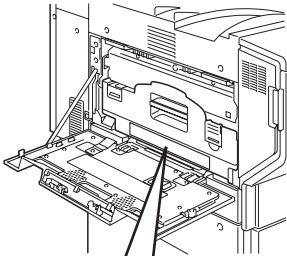
 **High voltage**



 **High voltage**



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High voltage



4037P0C503DA

 CAUTION:

- You may be burned or injured if you touch any area that you are advised not to touch by any caution label. Do not remove caution labels. If any caution label has come off or soiled and therefore the caution cannot be read, contact our Service Office.



KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

bizhub c450

Main Unit

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, show  to the left of the revised section.
A number within  represents the number of times the revision has been made.
- To indicate clearly a section revised, show  in the lower outside section of the corresponding page.
A number within  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.

2005/03	1.0	—	Issue of the first edition
Date	Service manual Ver.	Revision mark	Descriptions of revision

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bizhub C450

Outline

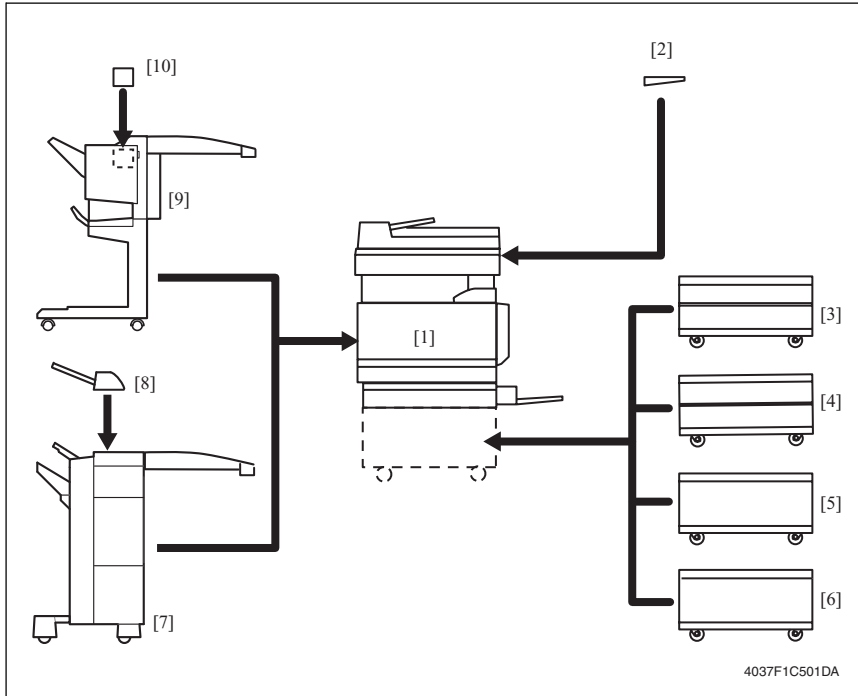
Composition/Operation

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Outline

1. System configuration

1/2 System Front View



[1] Machine

[2] Working Table WT-501

[3] Paper Feed Cabinet PC-202

[4] Paper Feed Cabinet PC-102

[5] Desk DK-501

[6] Paper Feed Cabinet PC-402

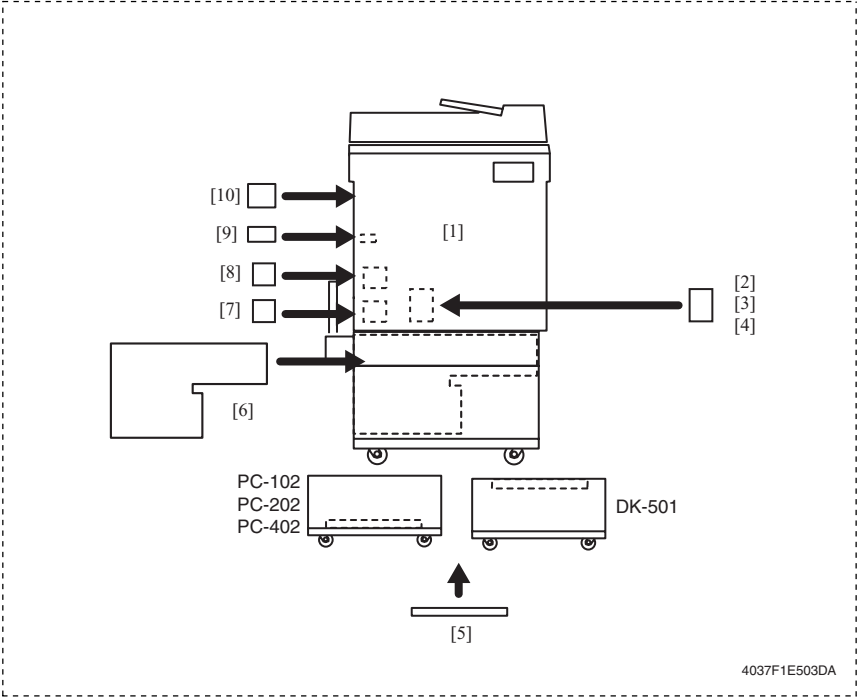
[7] Finisher FS-507

[8] Job Separator JS-601

[9] Finisher FS-603

[10] Punch Kit PK-501

2/2 System Rear View



- | | |
|----------------------------|--------------------------------|
| [1] Machine | [6] Image Controller IC-402 |
| [2] Fax Kit FK-502 | [7] Video Interface Kit VI-502 |
| [3] Mount Kit MK-703 | [8] Local Interface Kit EK-702 |
| [4] Mount Kit MK-704 | [9] Mechanical Counter MC-501 |
| [5] Dehumidifier Heater 1C | [10] Key Counter Kit KIT-1 |

2. Product specifications

2.1 Type

Type	Desktop-type printer integrated with scanner
Copying System	Electrostatic dry-powdered image transfer to plain paper
Printing Process	Tandem-type indirect electrostatic recording system
PC Drum Type	OPC (organic photo conductor)
Scanning Density	Equivalent to 600 dpi
Exposure Lamp	White rare-gas fluorescent lamp 30 W
Print Density	Equivalent to 600 dpi in main scanning direction × 1800 dpi in sub scanning direction
Platen	Stationary (mirror scan)
Original Scanning	Scanning in main scanning direction with a CCD (one-shot reading system)
Registration	Rear left edge
Paper Feeding System (Standard)	Multiple Bypass: 150 sheets
Three-way system	Tray1: 250 sheets Tray2: 500 sheets
Exposure System	Four-LED exposure
Developing System	HMT developing system
Charging System	DC comb electrode Scorotron system with electrode cleaning function (manual)
Image Transfer System	Intermediate transfer belt system
Paper Separating System	Selecting either application of nonwoven fabric bias or resistor grounding + low-pressure paper separator claws
Fusing System	Belt fusing

2.2 Functions

Types of Original	Sheets, books, and three-dimensional objects	
Max. Original Size	A3 or 11 × 17	
Multiple Copies	1 to 999	
Warm-up Time	99 sec. or less (at ambient temperature of 23° C/73.4° F and rated source voltage)	
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)	
First Copy Time	(Tray1, A4, full size)	
	Monochrome print	5.5 sec. or less
	Color print	8.5 sec. or less
Copying Speed for Multi-copy Cycle (A4, 8-1/2 × 11)	Monochrome print	1-sided: 45 copies/min.; 2-sided: 37 copies/min.
	Color print	1-sided: 35 copies/min.; 2-sided: 31 copies/min.
Fixed Zoom Ratios	Full size	×1.000
	Reduction	Metric Area: ×0.500, ×0.707, ×0.816, ×0.866 Inch Area: ×0.500, ×0.647, ×0.733, ×0.785
	Enlargement	Metric Area: ×1.154, ×1.224, ×1.414, ×2.000 Inch Area: ×1.214, ×1.294, ×1.545, ×2.000
Variable Zoom Ratios	×0.250 to ×4.000	in 0.001 increments

2.3 Types of Paper

Paper Source		Tray1	Tray2	Multiple Bypass
Copy paper type	Plain paper (60 to 90 g/m ² / 16 to 24 lb)	○	○	○
	Translucent paper	—	—	—
	OHP transparencies (crosswise feeding only)	○ (20 sheets or less)	—	○ (20 sheets or less)
	Thick paper 1 (91 to 150 g/m ² / 24-1/4 to 40 lb)		○ (150 sheets or less)	
	Thick paper 2 (151 to 209 g/m ² / 40-1/4 to 55-1/2 lb)			
	Thick paper 3 (210 to 256 g/m ² / 55-3/4 to 68 lb) *1			
	Postcards		—	
	Envelopes	○ (10 sheets or less)	—	○ (10 sheets or less)
	Labels	○ (20 sheets or less)	—	○ (20 sheets or less)
Copy paper dimensions	Max. (width × length)	311.1 × 457.2 mm 12-1/4 × 18 inches	297 × 432 mm 11 × 17 inches	311.1 × 457.2 mm 12-1/4 × 18 inches
	Min. (width × length)	90 × 139.7 mm 3-1/2 × 5-1/2 inches	140 × 182 mm 5-1/2 × 8-1/2 inches	90 × 139.7 mm 3-1/2 × 5-1/2 inches

*1: Image is not guaranteed when thick paper 3 is used.

Optional Paper Feed Cabinet : Only the plain paper and thick paper 1 to 3 weighing 60 to 90 g/m² (16 to 24 lb) is reliably fed.

Automatic Duplex Unit : Only the plain paper and thick paper 1 to 3 weighing 64 to 90 g/m² (17 to 24 lb) is reliably fed.

2.4 Maintenance

Machine Durability	1000,000 prints or 5 years, whichever is earlier
--------------------	--

2.5 Machine Specifications

Power Requirements	Voltage:	AC 110 V, 120 V, 127 V, 220-240 V
	Frequency:	50/60 Hz ± 3.0 Hz
Max Power Consumption		Less than 1500 W (120 V, 12 A / 220 - 240 V, 8 A)
Dimensions		706 (W) × 765 (D) × 908 (H) mm 27-3/4 (W) × 30 (D) × 35-3/4 (H) inches
Space Requirements		1014 (W) × 765 (D) mm *2 40 (W) × 30 (D) inches *2
Mass		Approx. 125 kg / 275-1/2 lb (without IU)

*2: The indicated spaced requirements represent the space required to fully extend the bypass tray.

2.6 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 % (with a fluctuation of 20 %/h)

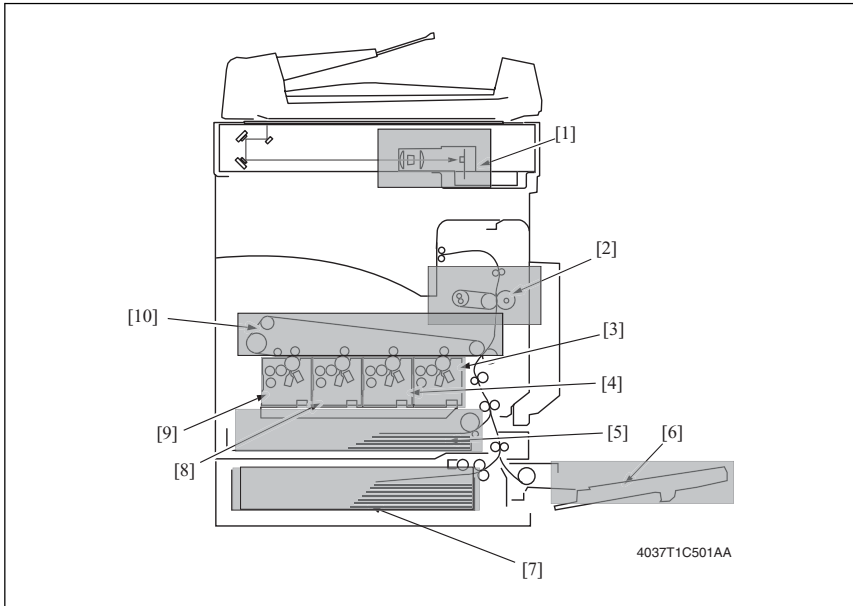
2.7 Built-in Controllers

Type	Built-in type controller	
CPU	PPC750 FX 600 MHz	
Printer Driver	PCL5e/c Emulation PCL6 (XL 2.1) Emulation PostScript 3 Emulation (3011)	
Scan Driver	TWAIN driver	
OS Compatibility	Server	Windows NT 4.0, 2000, or Server 2003
	Client	Windows 98 Second Edition, Windows Me, Windows 2000, Windows XP, or Windows NT 4.0 (SP6a) MacOS 9.2 or later or MacOS X 10.2 or 10.3
Interface	Standard: Ethernet (10Base-T or 100Base-TX) Optional: USB 1.1, USB 2.0, or IEEE 1284	

NOTE

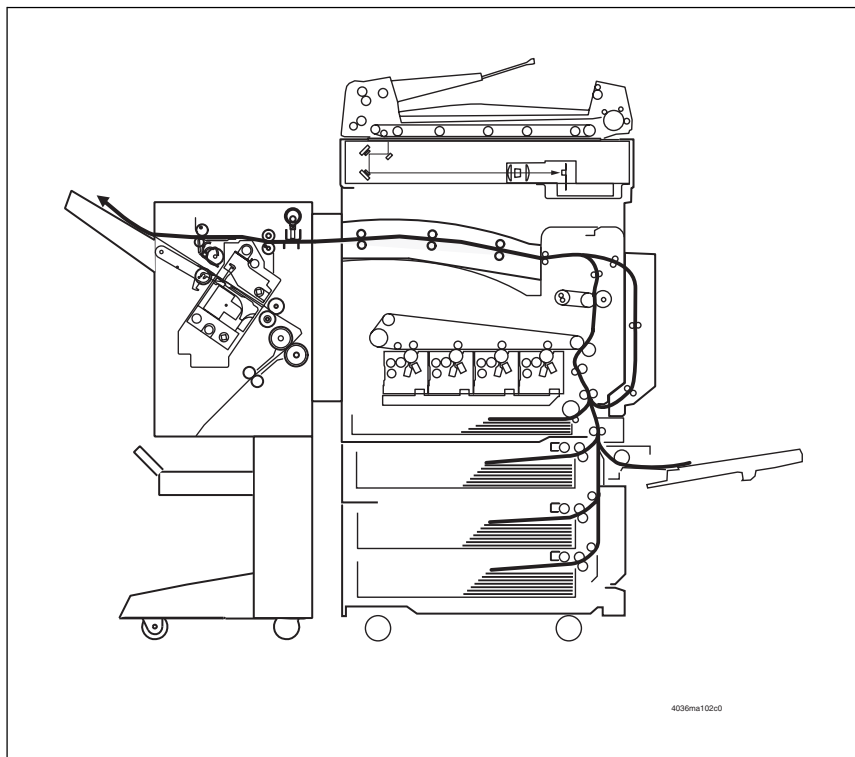
- These specifications are subject to change without notice.

3. Center cross section

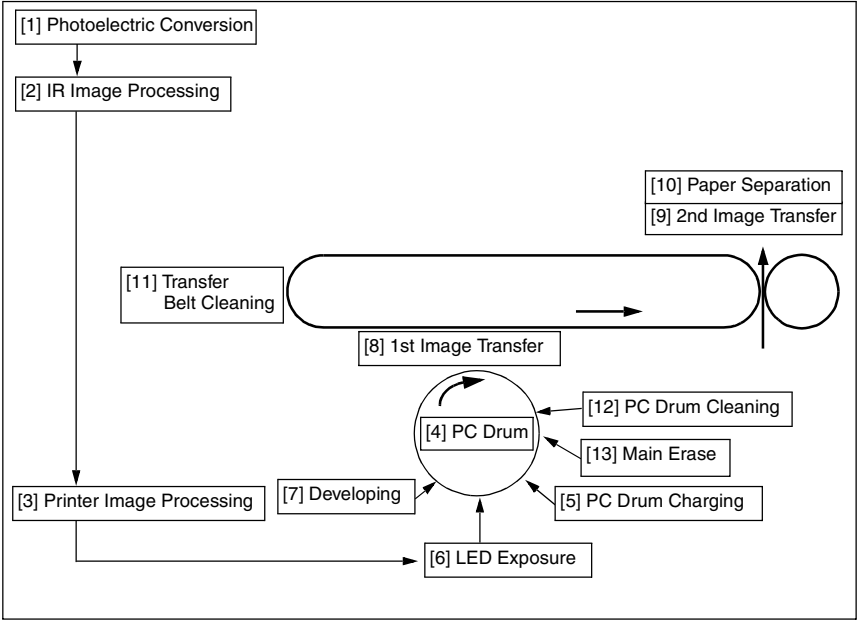


- | | |
|--------------------|-------------------------|
| [1] CCD Unit | [6] Multiple Bypass |
| [2] Fusing Unit | [7] Tray2 |
| [3] Imaging Unit/K | [8] Imaging Unit/M |
| [4] Imaging Unit/C | [9] Imaging Unit/Y |
| [5] Tray1 | [10] Transfer Belt Unit |

4. Paper path



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	• The video signals (C, M, Y, and K) go through some corrections. Following digital-to-analog conversion, these signals are used for the control of the intensity level of the LED.
[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	• A negative DC charge layer is formed on the surface of the PC Drum.
[6]	LED Exposure	• The surface of the PC Drum is irradiated with LED light and an electrostatic latent image is thereby formed.
[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.

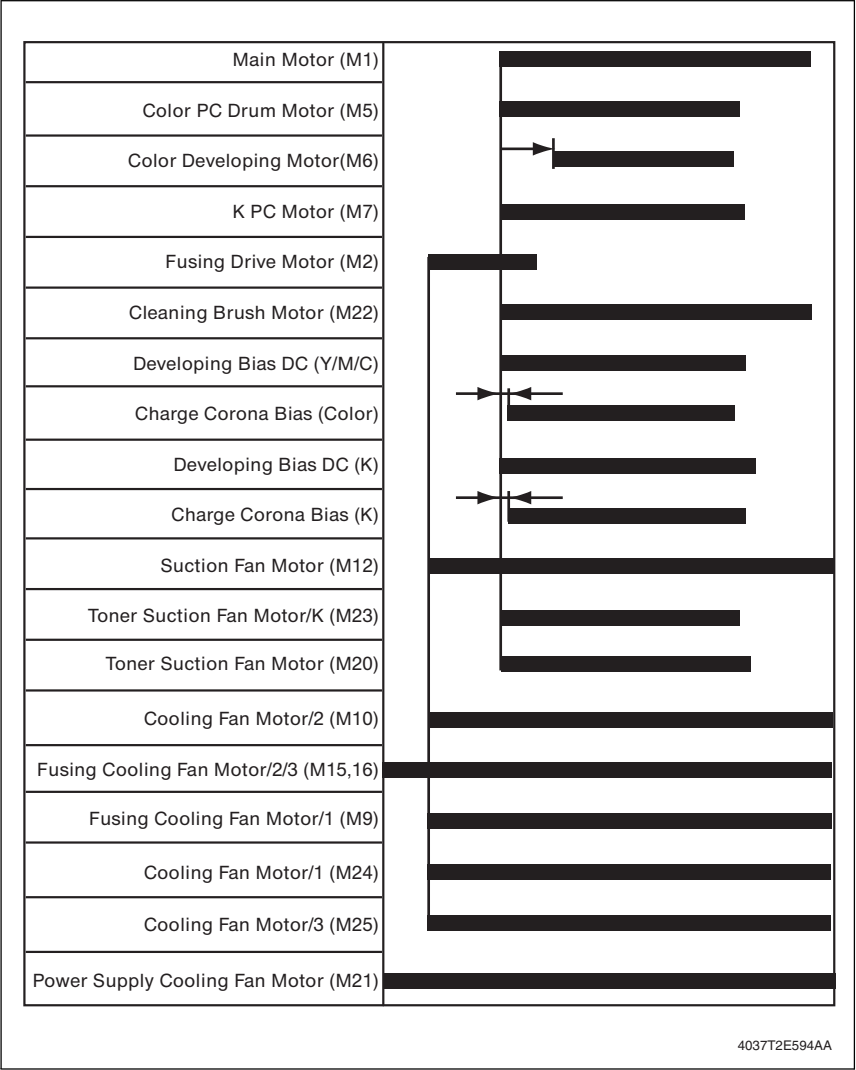
[10]	Paper Separation	• The paper, which has undergone the 2nd image transfer process, is neutralized so that it can be properly separated from the Transfer Belt by the Paper Separator Claws.
[11]	Transfer Belt Cleaning	• A charge is applied to the Transfer Belt. By potential difference, residual toner on the surface of the Transfer Belt is collected for cleaning.
[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.

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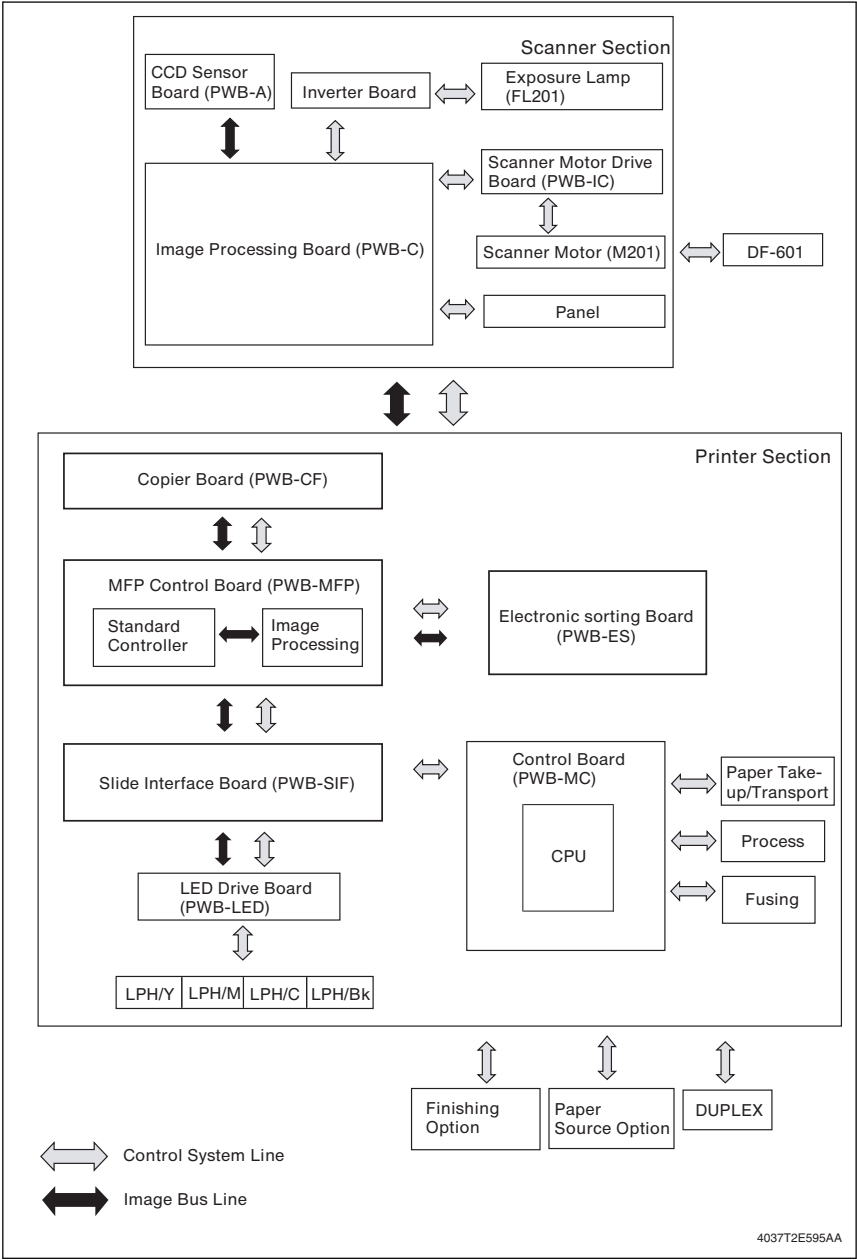
Composition/Operation

6. Overall composition

6.1 Timing chart at machine power up

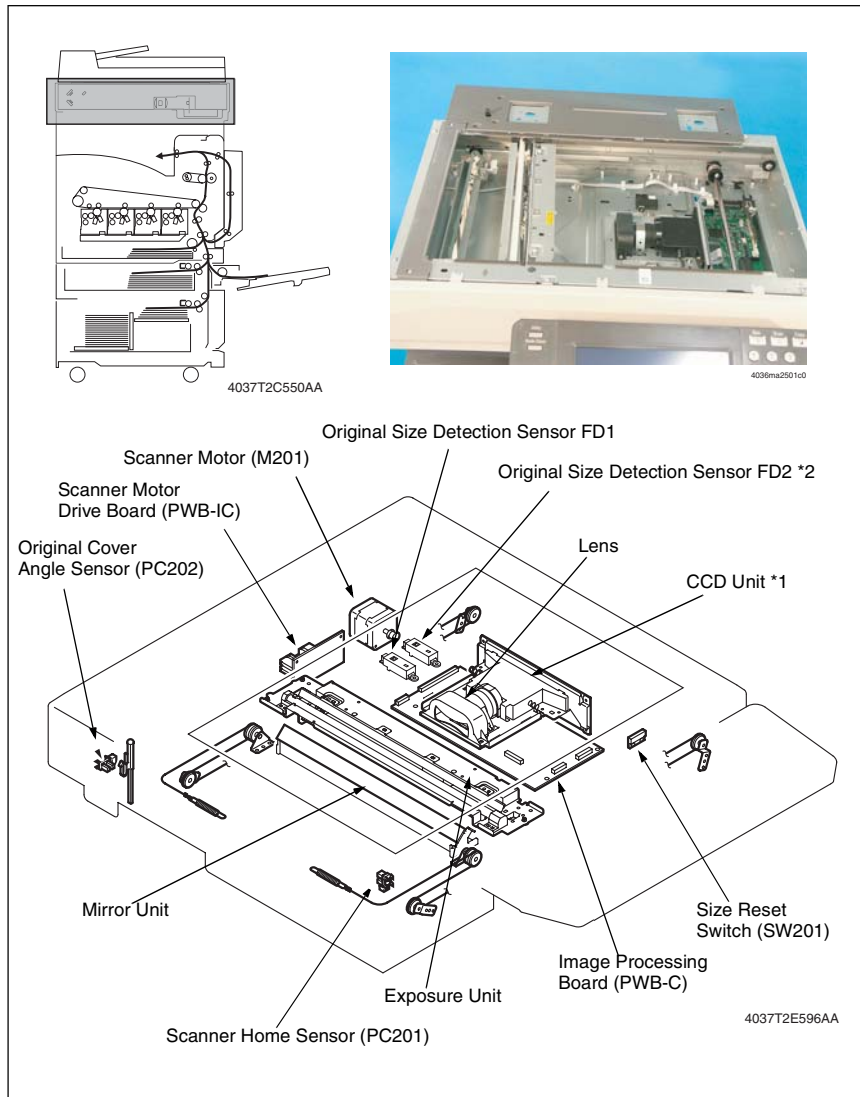


6.2 Control block diagram

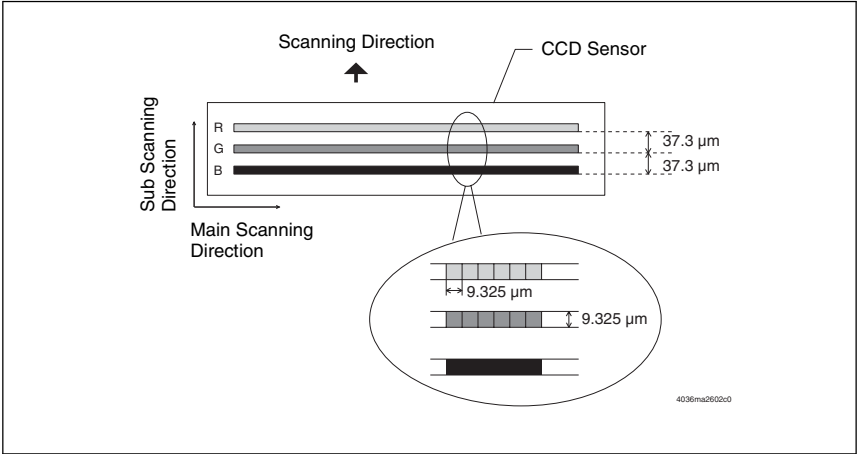


7. Scanner section (IR section)

7.1 Composition

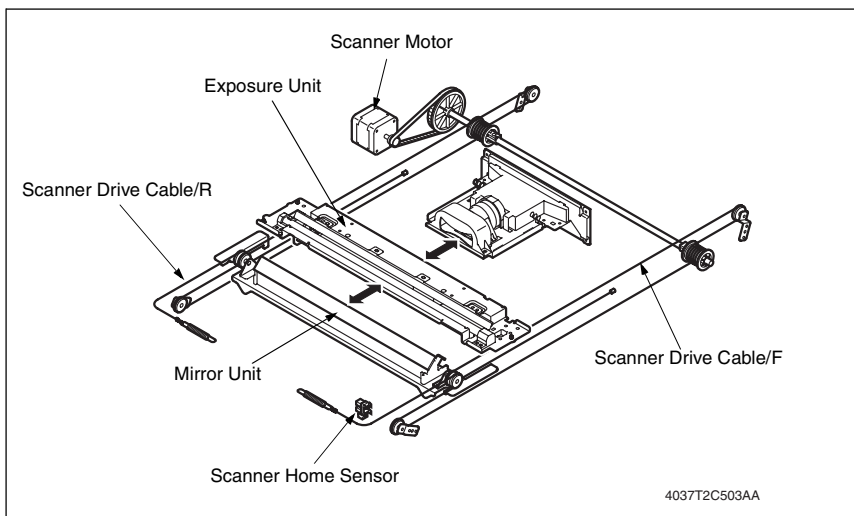


*1: CCD Unit



*2: Europe, China, Central America (220-240V Areas), North America Only.
Countries other than the above-mentioned are standard settings

7.2 Drive



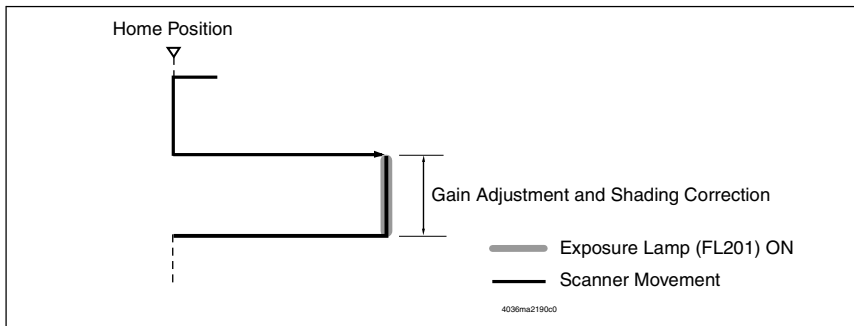
7.3 Operation

7.3.1 Scan and Exposure Lamp control

A. When the Power Switch is turned ON

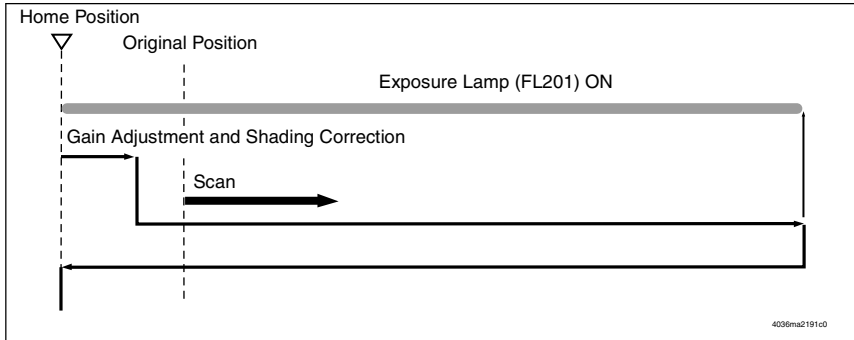
1. The Exposure Unit moves in the return direction until the Scanner Home Sensor is activated. It does not move if the Scanner Home Sensor is already activated.
2. The Exposure Unit moves in the scan direction and stops at a position under the shading correction sheet.
3. The gain value of the CCD Sensor 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 Scanner Home Sensor. This position serves as the home position.

* The same operation is performed for the auto and manual exposure control.



B. When the Start key is pressed

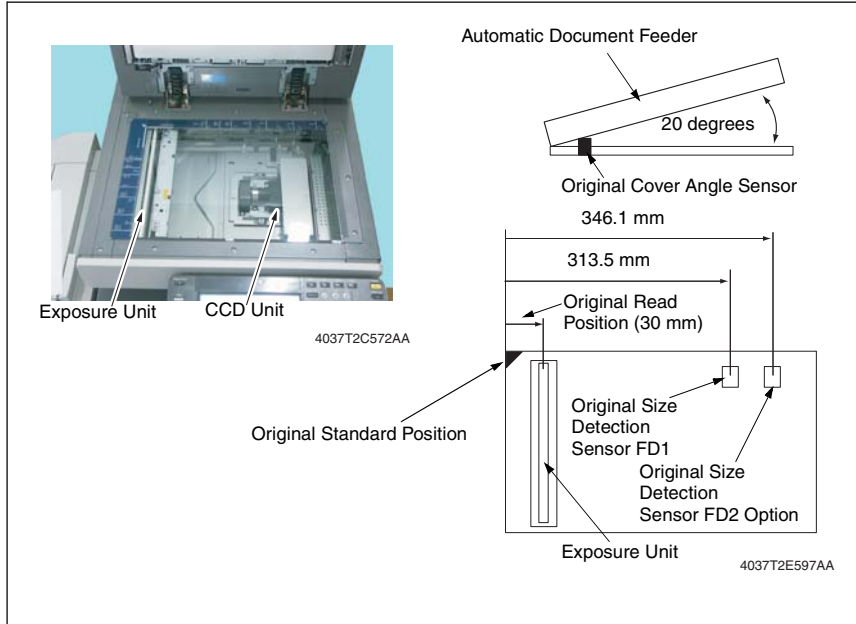
1. The Exposure Lamp turns ON when the Start key is pressed.
2. The gain adjustment is made when the Exposure Unit moves past the point under the shading sheet. Thereafter, a shading correction is made.
3. The Exposure Unit starts a scan motion with the original position.
4. After completing the scan motion for the original, the Exposure Unit temporarily stops and the Exposure Lamp goes out.
5. The Exposure Unit makes a return motion and stops at the home position. Each of the R, G, and B data is stored in memory during a single scan motion. The Exposure Unit therefore makes only a single scan motion even for a multi-copy cycle.



7.3.2 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 length 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.



- The Image Processing Board determines the original size based on the combination of detections made by the original size sensors and the CCD.
- An original of an irregular size is rounded to the nearest standard size.

Metric Area & China Areas

Table 1

Sensor FD1	CCD Width (mm)							
	~153.0	~187.0	~200.0	~215.0	~225.0	~261.5	~275.0	278.1~`
OFF	A5R	B5R	16KR	A4R	B5	B5	16k	A4
ON	-	-		-	FLS	B4	8k	A3

Table 2

Sensor		CCD Width (mm)											
FD1	FD2*	~143	~153	~187	~200	~213	~220.9	~225	~261.5	~274.7	~284.4	284.5~	
OFF	OFF	Invoice R	A5R	B5R	16KR	A4R	Letter R		B5	16K	Letter	A4	
ON	OFF					FLS	FLS	FLS					
OFF	ON												
ON	ON								B4	8K	11X17	A3	

*: Option

Inch Areas

Table 1

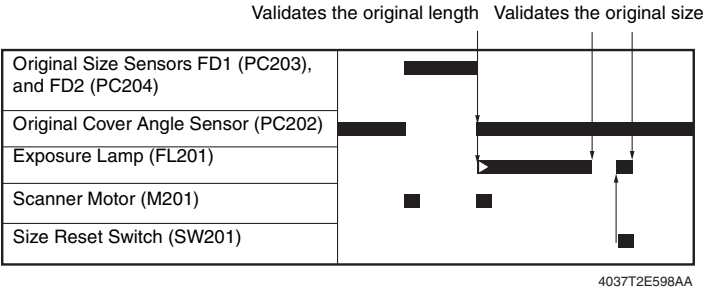
Sensor FD1	CCD Width (mm)		
	~144.7	~220.9	~221.0
OFF	Invoice R	Letter R	Letter
ON		Legal	11 x 17

Table 2

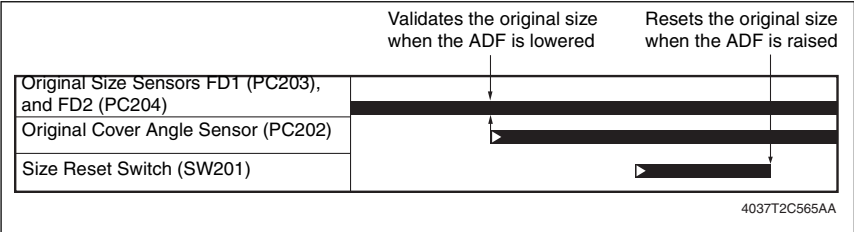
Sensor		CCD Width (mm)											
FD1	FD2*	~143	~153	~187	~213	~220.9	~225	~262	~284.4	284.5~			
OFF	OFF	Invoice R	A5R	B5R	A4R	Letter R		B5	Letter	A4			
ON	OFF				FLS	FLS	FLS						
OFF	ON					Legal							
ON	ON					Legal		B4	11X17	A3			

*: Option

B. Detection Timing (When Placed on Original Glass)



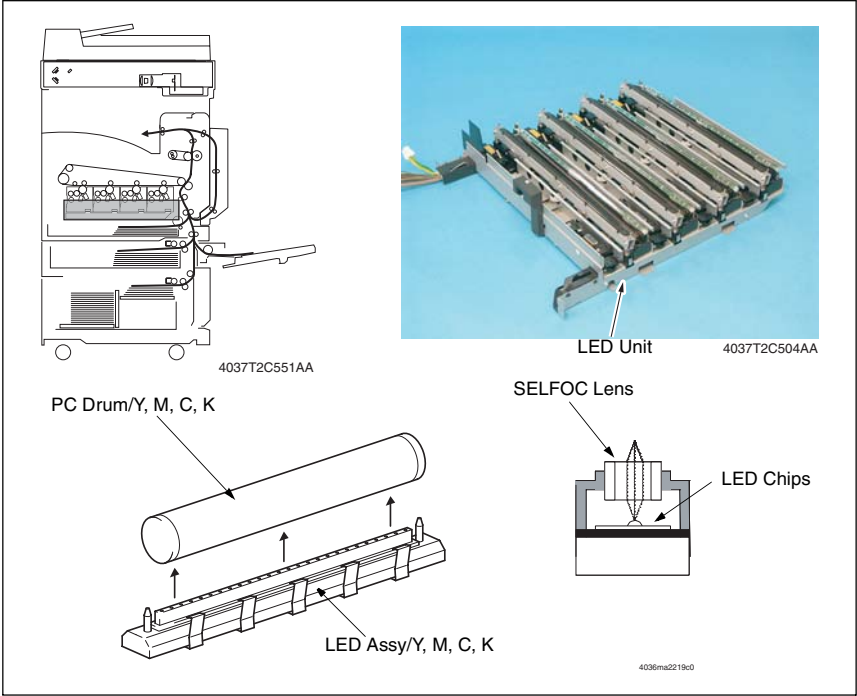
C. Detection Timing (When the ADF is Used)



- The original size is validated if the Start key is pressed with the ADF in the raised position.

8. Write section (PH section)

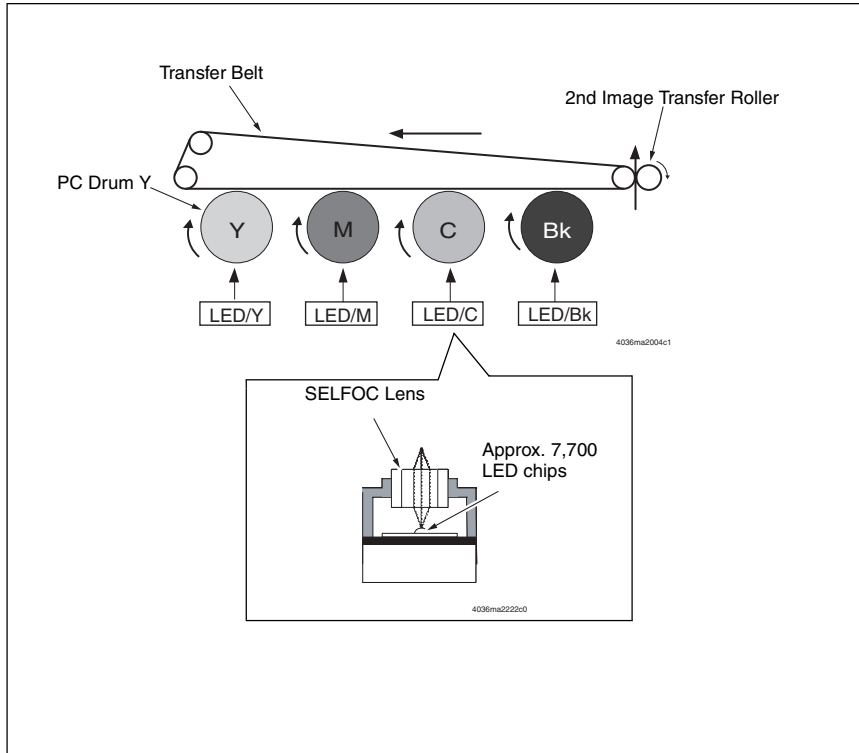
8.1 Composition



8.2 Operation

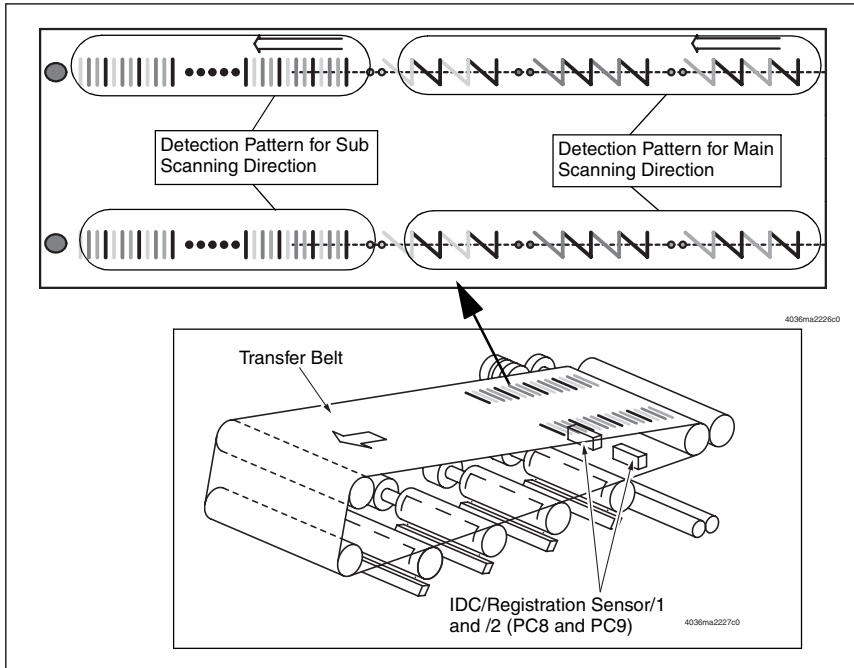
8.2.1 Outline

- Each of the PC Drums is irradiated with LED light and an electrostatic latent image is thereby formed.
- The LED print head is a fixed scanning type exposure system that includes approx. 7,700 LED chips (600 dpi) arranged in the main scanning direction and a SELFOC lens array, or SLA that brings rays of light emitted by the LED chips to a focus on the surface of the PC Drum to form a full-size image.
- The special service jig for cleaning the surface of the LED print head should be used, since a special coating is applied to the surface of the SLA to prevent ozone from sticking to it.



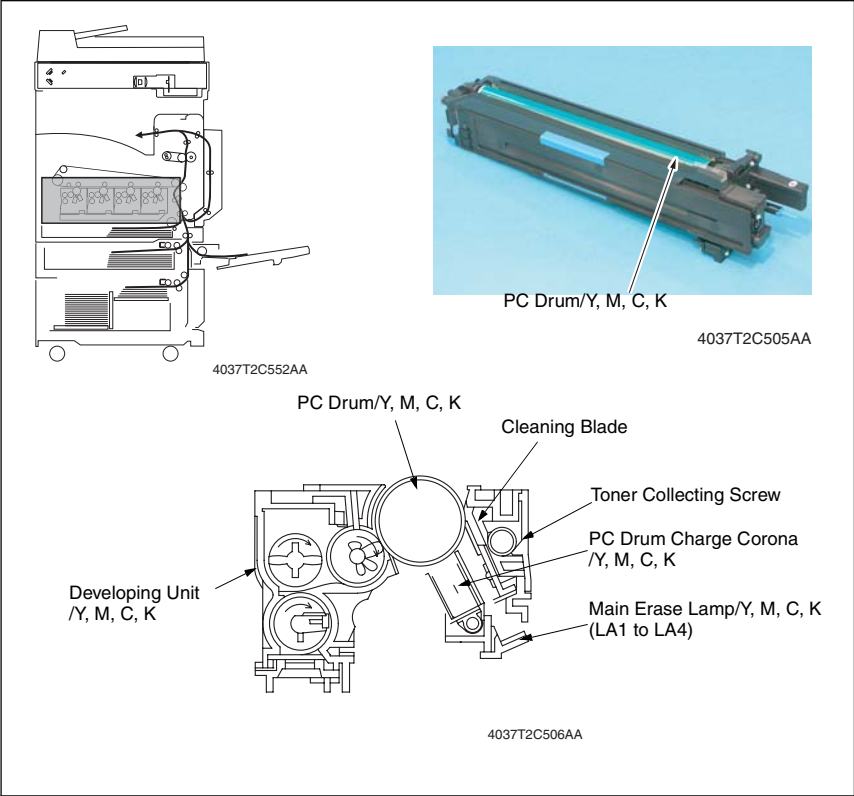
8.2.2 Color Shift Correction System

- In a tandem engine, in which an independent image reproduction process is provided for each of the four different colors of toner. Incorrect color registration, or color shift, is therefore more likely to occur due to each of the LED assemblies being out of correct position. The color shift correction system automatically detects any misalignment among the different colors, correcting it both in the main scanning and sub scanning directions.
- The color shift detection sequence proceeds as follows. A detection pattern each in the sub scanning direction is produced at the front and rear on the Transfer Belt. Each of IDC/Registration Sensor/1 and /2 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 main scanning direction is next produced at the front and rear on the Transfer Belt. Each of IDC/Registration Sensor/1 and /2 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 (varying the timing at which the LED is turned ON).
- The color shift correction is made when the Left Door is opened and closed, the Transfer Belt is removed and reinstalled, the IU is removed and reinstalled, the Power Switch is turned OFF and ON, or an image stabilization sequence is carried out from the control panel.

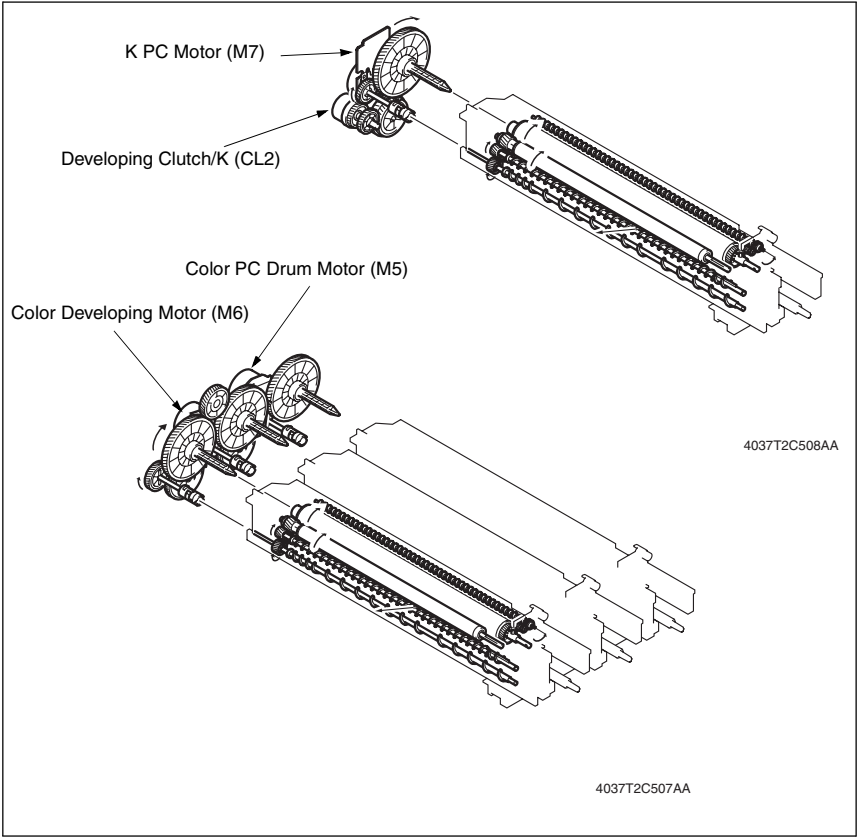


9. Imaging Unit section (IU section)

9.1 Composition



9.2 Drive



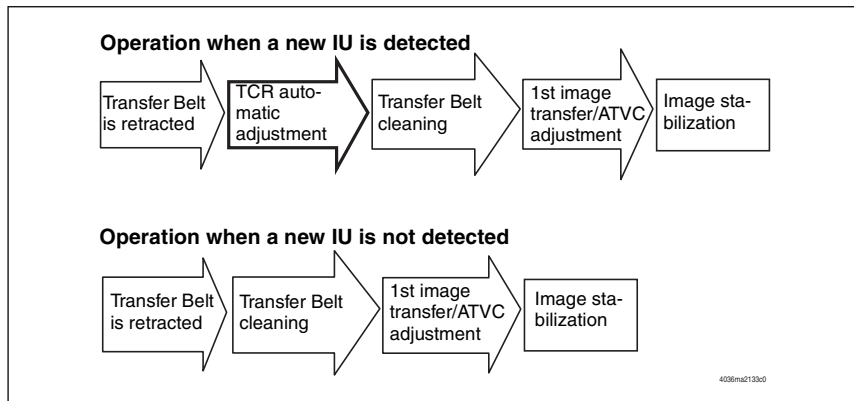
9.3 Operation

9.3.1 IU Life control

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

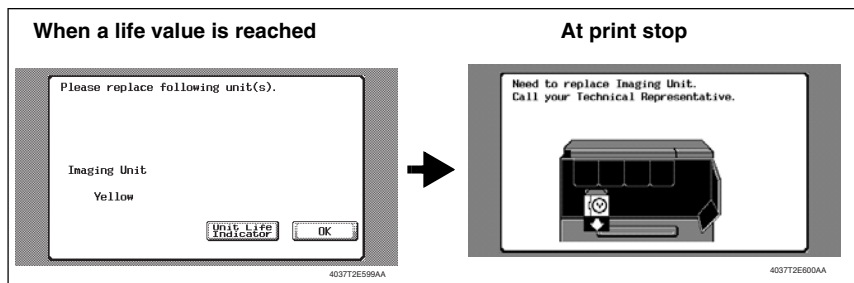
A. New IU detection

- new IU is detected when 24 V is turned ON as the 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.



B. When life is reached

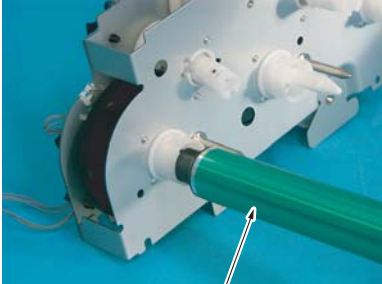
- The IU Life Counter is used to keep track of IU life.
- When the life value is reached, a warning message is given on the screen. When a pre-determined number of printed pages are produced after the life value has been reached, the machine inhibits the initiation of a new print cycle with a message prompting the user to replace the IU given on the screen.



- The warning screen and IU replacement screen change when the settings are changed for "Display PM Parts Lifetime" and "Unit Change" available from the Tech. Rep. mode and "IU Life Stop Setting" available from the Security mode.

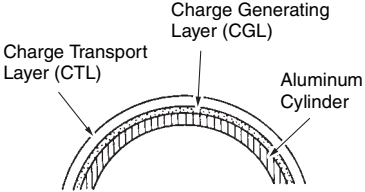
10. Photo Conductor section

10.1 Composition



PC Drum/Y, M, C, K

4037T2C509AA



Charge Generating Layer (CGL)

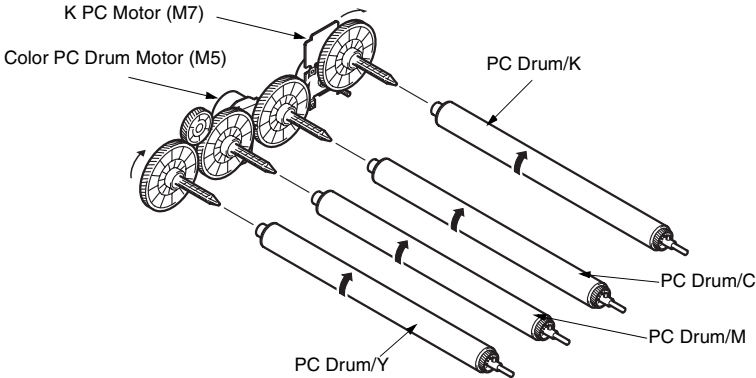
Charge Transport Layer (CTL)

Aluminum Cylinder

4036ma238e0

Key	Name	Function/System
[1]	PC Drum/Y, M, C, K	• Forms an image of each of different colors. • OPC drum (φ30 mm)

10.2 Drive



K PC Motor (M7)

Color PC Drum Motor (M5)

PC Drum/K

PC Drum/C

PC Drum/M

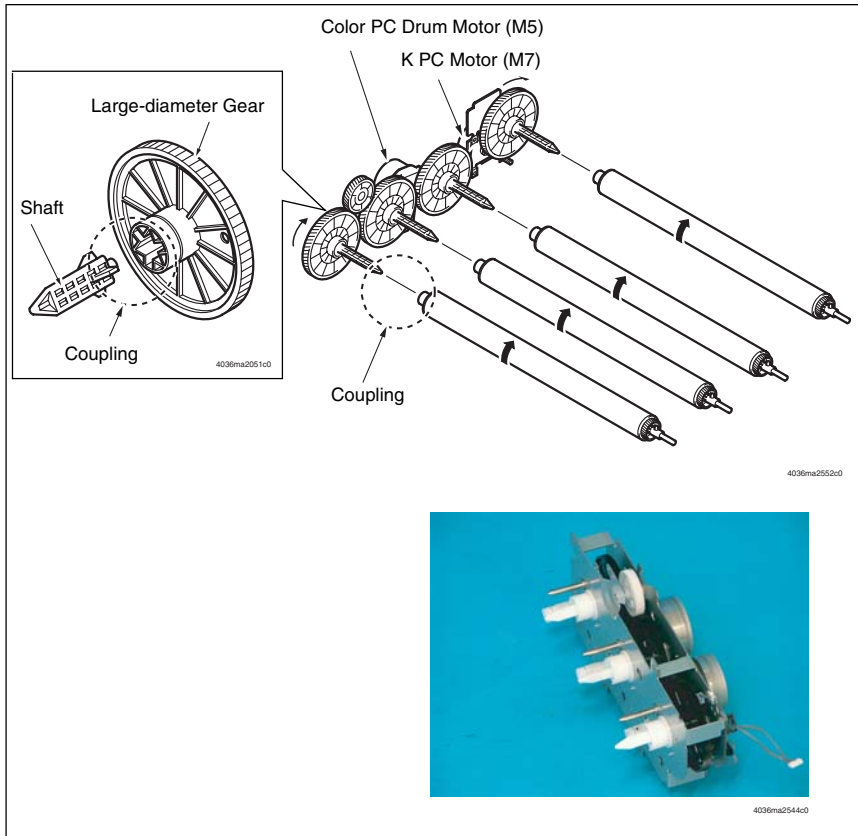
PC Drum/Y

4037T2C510AA

10.3 Operation

10.3.1 PC Drum Drive mechanism

- Two independent PC Drum motors 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 Motor drives the PC Drum/K.
- Gears having a large diameter are used to enhance rotating accuracy of the PC Drums.
- The use of gears having a large diameter provides a large number of gear teeth, which suppresses uneven pitch and eccentricity.
- 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.



10.3.2 PC Drum Phase control

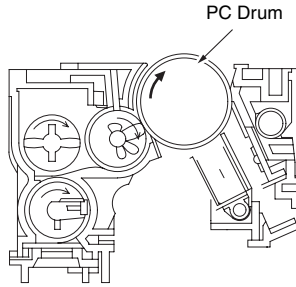
- To enhance image quality, sensors are used to detect operating conditions while the PC Drum turns, thereby providing drum drive control.

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.

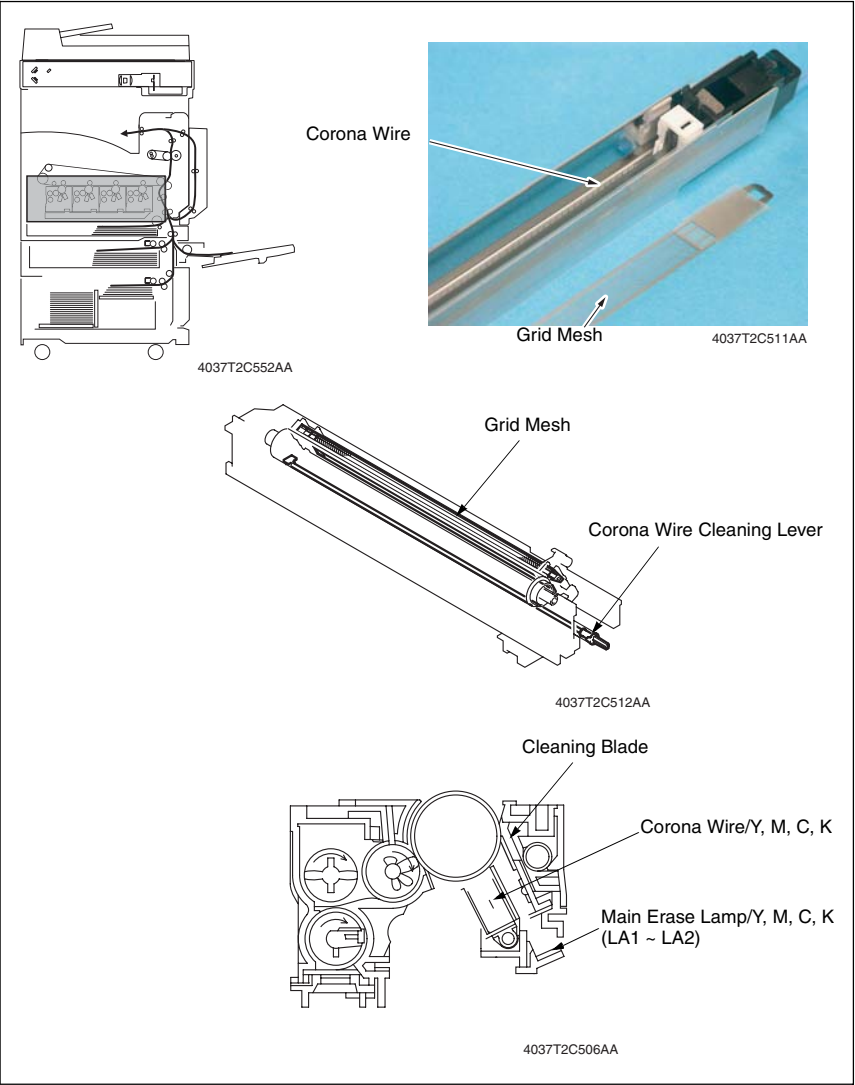
A. PC Drum small amount rotation timing

- The PC Drum is turned the small amount when a predetermined threshold value of the cumulative PC Drum driven distance is exceeded during a multi-print cycle or when intermittent print cycles are consecutively run with an intermission of less than a predetermined period of time between them.



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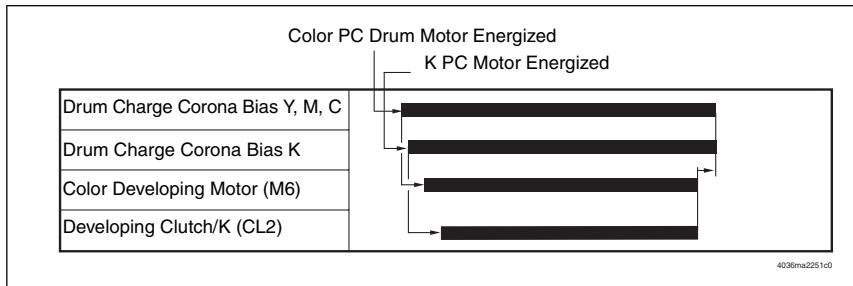
11. Charge Corona section



11.1 Operation

11.1.1 PC Drum Charge Corona ON/OFF control

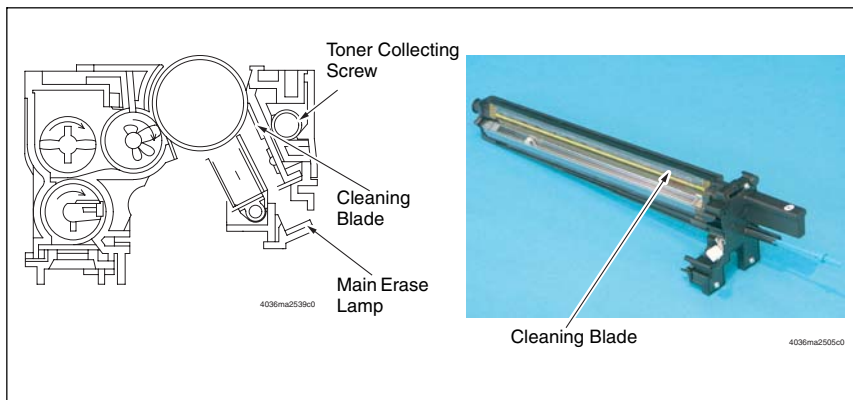
- The grid voltage (Vg) applied to the Grid Mesh is controlled through the image stabilization control.



11.1.2 Cleaning/Main Erase mechanism

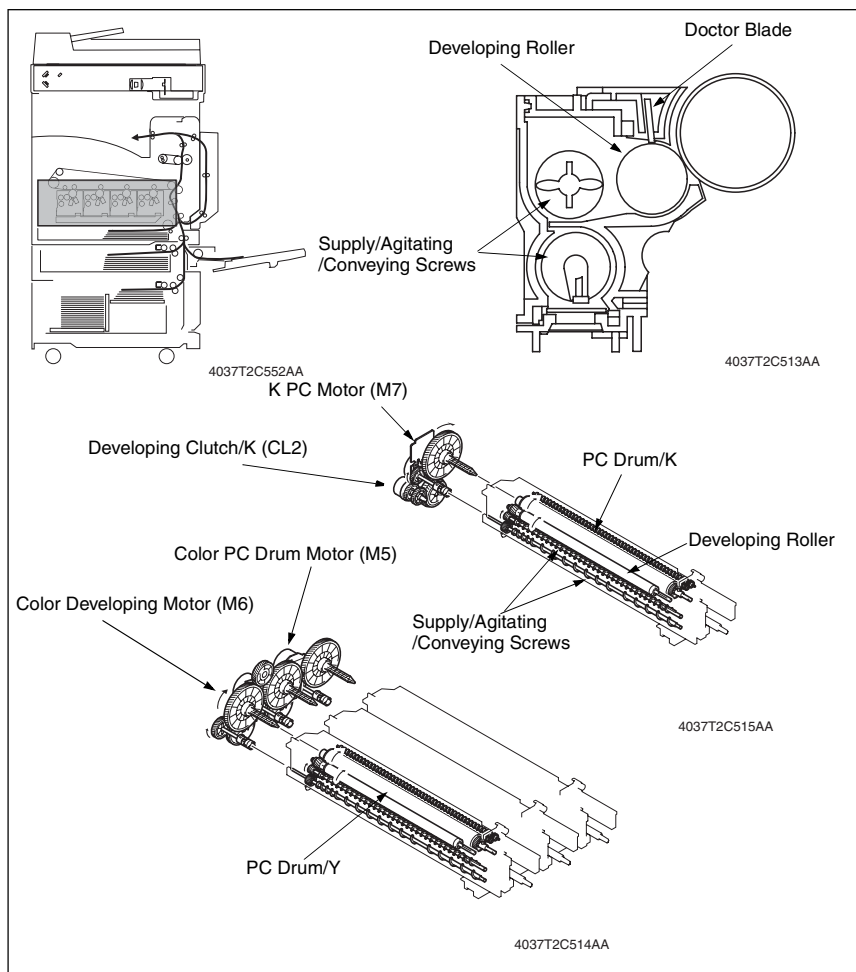
A. Cleaning/main erase operation

- The Cleaning Blade is pressed up against the surface of the PC Drum, scraping residual toner off the surface (forward blade system).
- Toner, which has been scraped off the surface of the PC Drum, is fed by the Toner Collecting Screw back toward to the Conveying Screw in the rear of the machine. It is then collected in the Waste Toner Collecting Box.
- The surface of the PC Drum after the image transfer process is irradiated with light from the Main Erase Lamp. This neutralizes any potential left on the surface of the PC Drum.

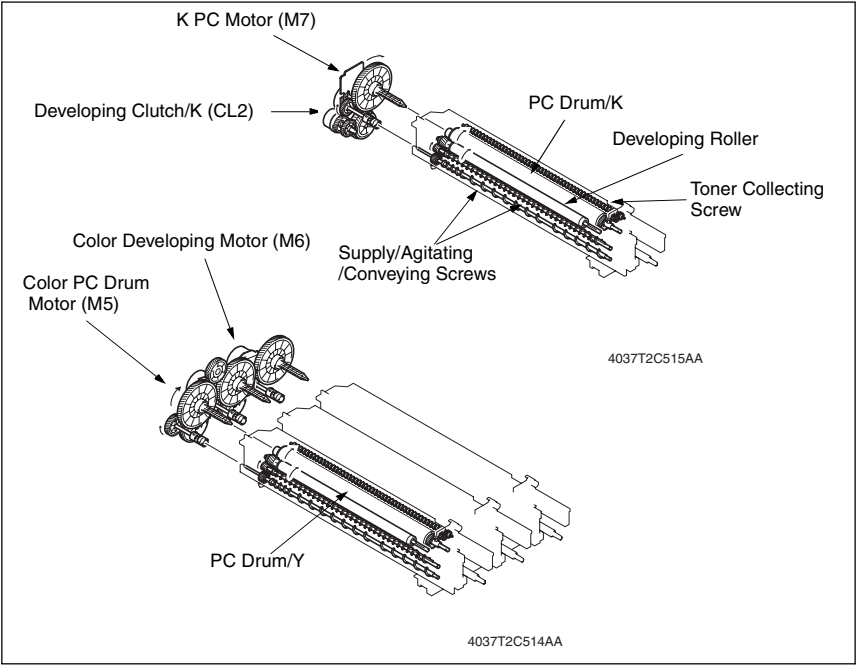


12. Developing section

12.1 Composition

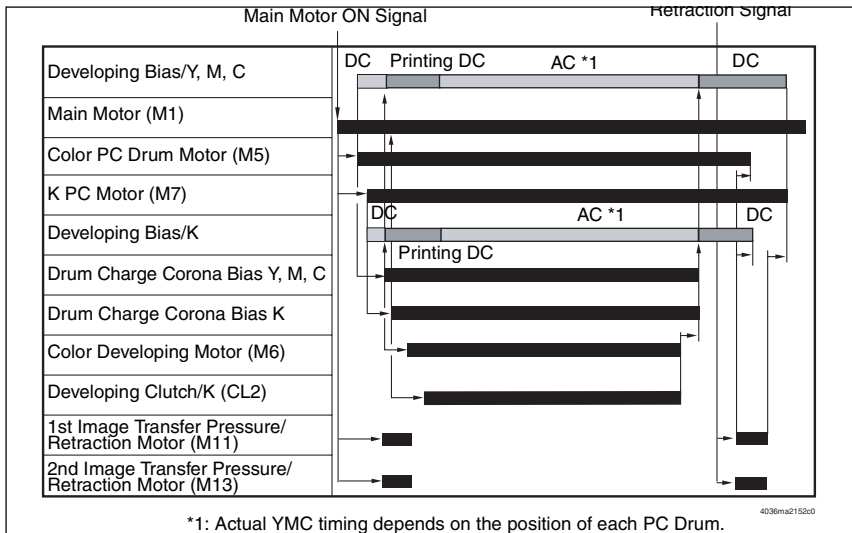


12.2 Drive



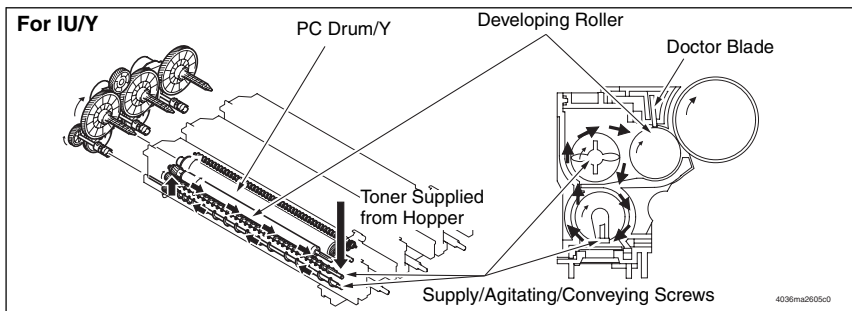
12.3 Operation

12.3.1 Developing Drive control



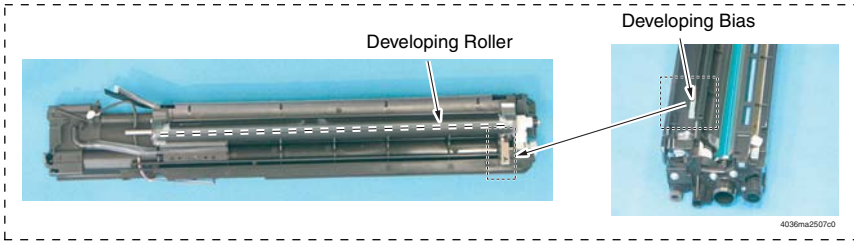
12.3.2 Developer flow

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. Because of the magnetic pole positioning of the Developing Roller, the developer is conveyed onto the upper part of 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.



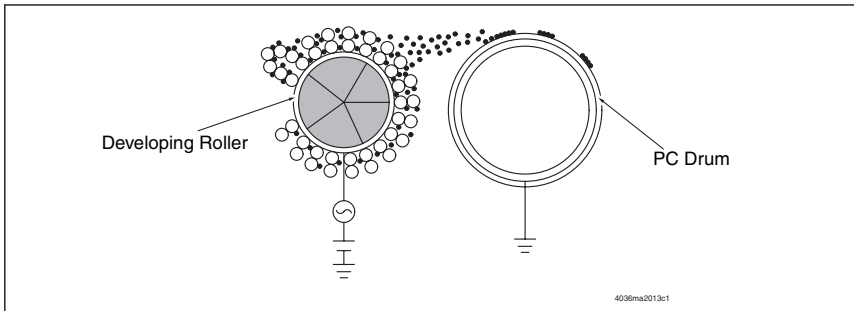
12.3.3 Developing bias

- 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.
- In addition to the negative DC component, AC voltage is applied during development to help toner to be attracted more easily to the surface of the PC Drum. This AC component is applied only while development is taking place. At any other timing, only the DC(-) Vdc is applied.
- The developing bias (Vdc) is supplied from High Voltage Unit/2.



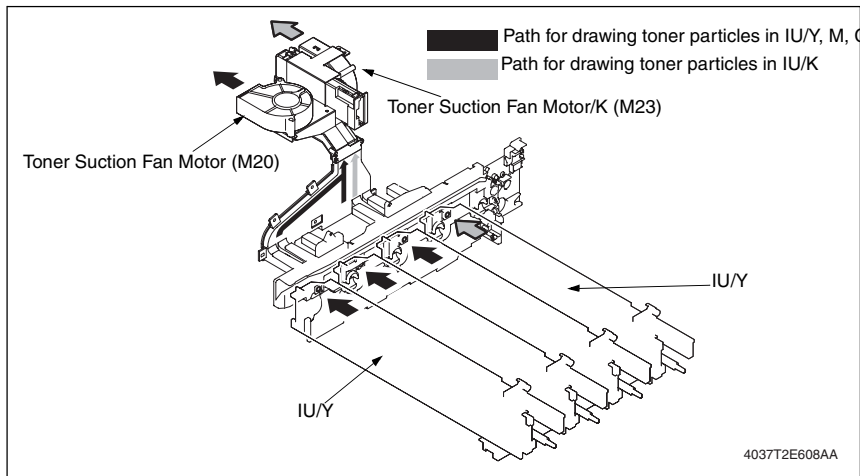
12.3.4 HMT (High grade Micro Toning) development

- 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.



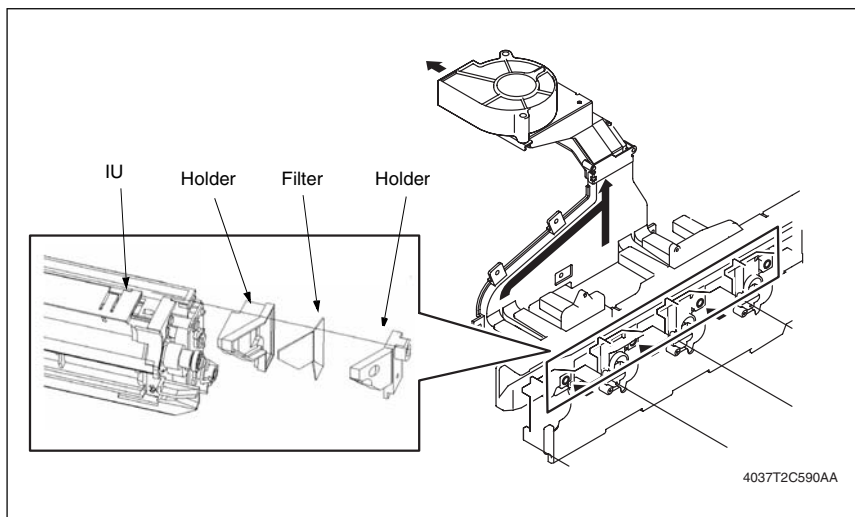
12.3.5 Developer Scattering Preventive Mechanism

- To prevent the image and the machine interior from being dirtied, the Toner Suction Fan Motor (M20) and Toner Suction Fan Motor/K (M23) are incorporated to trap toner particles rising up inside the machine.



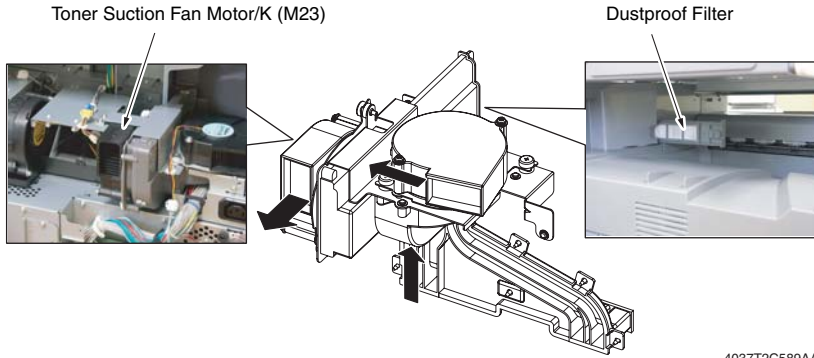
A. IU/YMC

- For IU/YMC, a filter is installed behind the IU and toner particles are trapped by the Toner Suction Fan Motor during development.



B. IU/K

- The system speed is high in the monochrome print mode and scattering developer cannot be removed if the same mechanism as that incorporated in the IU/YMC is used. A new fan motor and a new filter with a large capacity are installed instead of the filter originally installed in the IU/K. Developer scattering during developing is thereby suppressed.



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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, and Y is an optical type, while that for 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.
- Only when a new Imaging Unit is installed in the machine, an automatic adjustment is made of each of these TCR Sensors. The sensors cannot be adjusted manually.
- The target T/C is 8 % both for color and K. This T/C can, however, be changed using "TCR Level" of "Image Adjust" available from the Tech. Rep. mode.

A. Optical TCR sensor

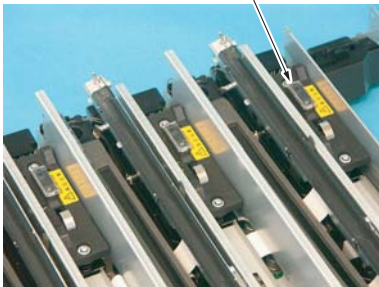
- A bias is applied to the TCR Sensor window to prevent toner from sticking to it. There is a magnetic brush provided for the Conveying Screw portion to clean the surface of the window.
- The sensor portion is separated from the Developing Section (Imaging Unit). When the TCR Sensor is replaced, it is necessary to replace the Imaging Unit with a new one.
- This represents the fact that the TCR Sensor is adjusted only when a new Imaging Unit is installed. In addition, if the LPH Unit is to be replaced, it is necessary to remove the TCR Sensor from the old LPH Unit and mounted it in the new LPH Unit.

B. Magnetic TCR Sensor

- 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.
- 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

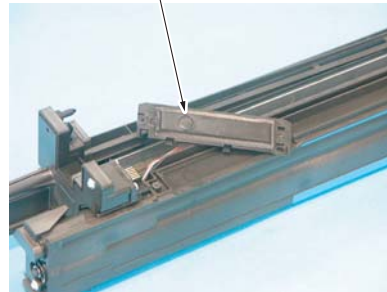
Optical TCR Sensor



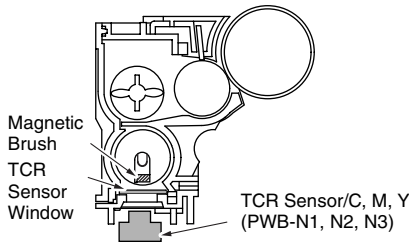
4039ma2508c0

TCR Sensor/K

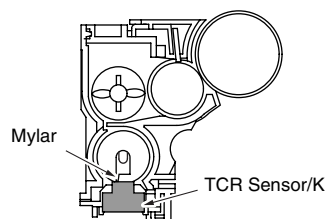
Magnetic TCR Sensor



4039ma2504c0



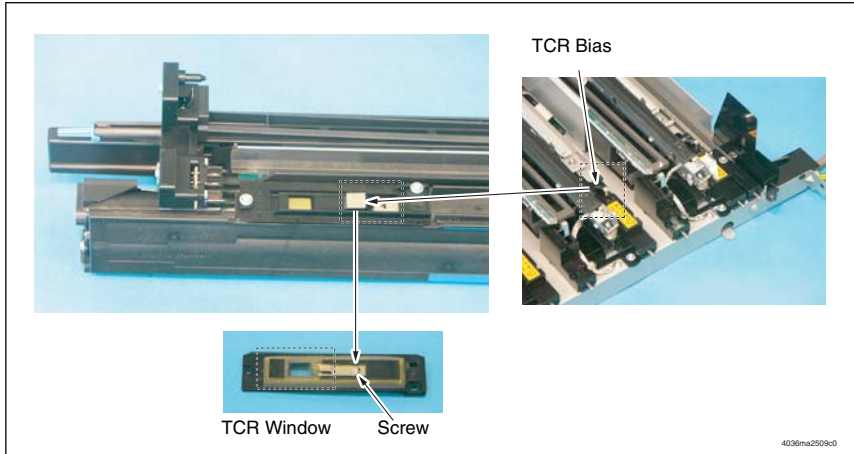
4039ma2187c0



4039ma2188c0

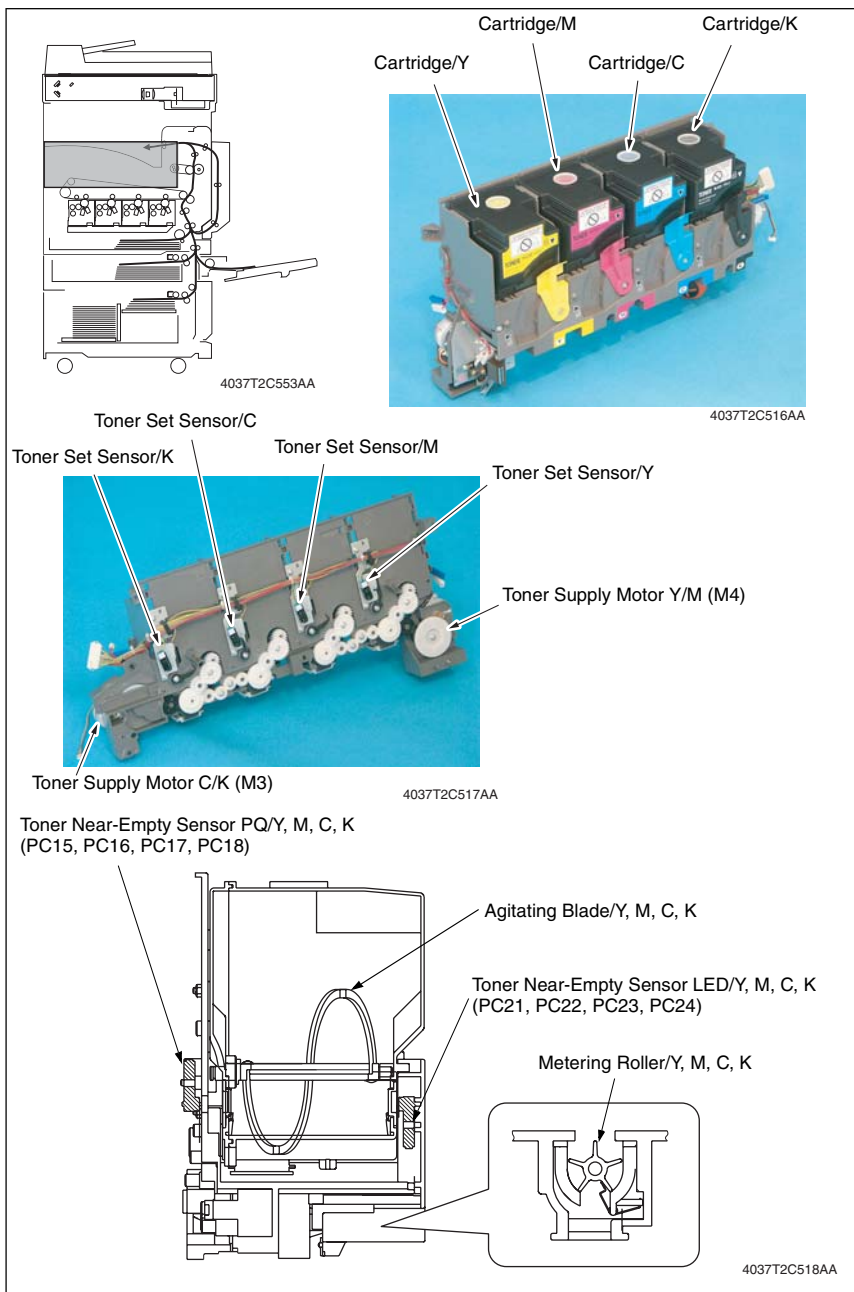
C. TCR window bias

- Since the optical TCR Sensor is used for C, M, and Y, a bias is applied to the TCR window to prevent toner from sticking to it. No bias is applied to the TCR Sensor for K, which is the magnetic type.
- The bias is applied from the bias terminal of the LED Unit by way of the mounting screw of the TCR window to the TCR window.



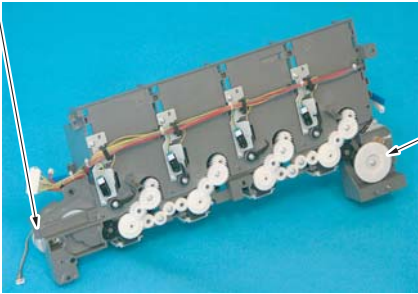
13. Toner Supply section

13.1 Composition



13.2 Drive

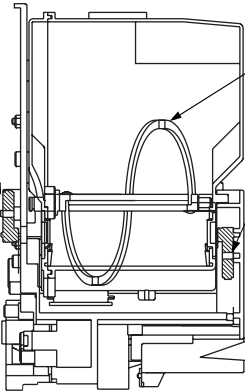
Toner Supply Motor C/K (M3)



Toner Supply Motor Y/M (M4)

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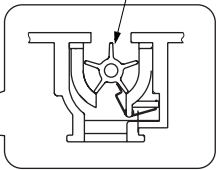
Toner Near-Empty Sensor PQ/Y, M, C, K (PC15, PC16, PC17, PC18)



Agitating Blade/Y, M, C, K

Toner Near-Empty Sensor LED/Y, M, C, K (PC21, PC22, PC23, PC24)

Metering Roller/Y, M, C, K



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13.3 Operation

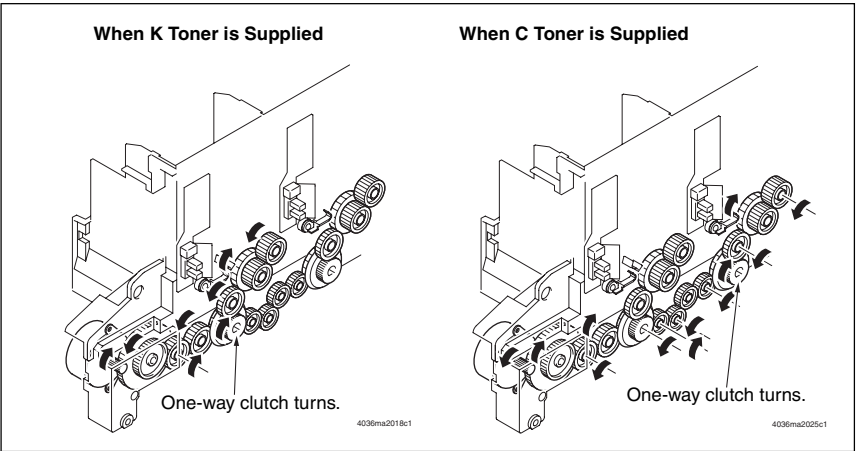
13.3.1 Toner Replenishing mechanism/control

A. Toner replenishing mechanism

- Toner is supplied from the Toner Cartridge of each color to the Imaging Unit of each color according to the T/C detected by the corresponding TCR Sensor.
- A single Toner Supply Motor is turned either forward or backward to supply toner of two different colors (Toner Supply Motor for K and C, and Toner Supply Motor for Y and M).

Toner Supply Motor C/K (M3)	K Toner	C Toner
Turned forward	Energized	Deenergized
Turned backward	Deenergized	Energized

Toner Supply Motor Y/M (M4)	Y Toner	M Toner
Turned forward	Energized	Deenergized
Turned backward	Deenergized	Energized



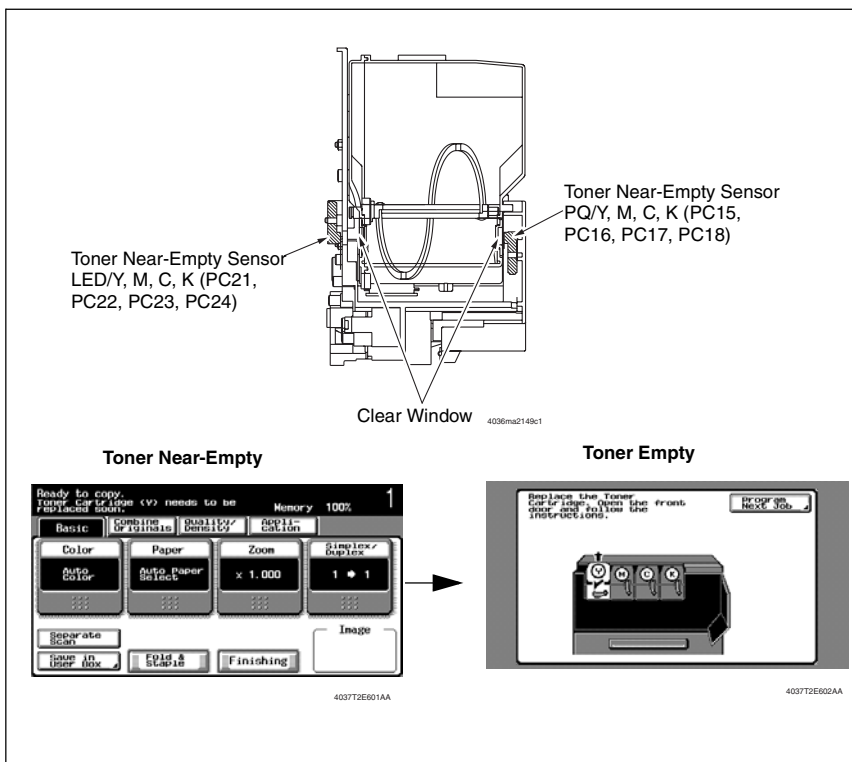
- Replenishing operation
 1. Drive of the Toner Supply Motor is transmitted through a gear train to the drive gears of the Toner Cartridges of two colors. A one-way clutch is used for each of these drive gears, meaning that the drive gear turns in one direction only. Either one of these two drive gears is turned according to whether the Toner Supply Motor turns forward or backward.
 2. As the drive gear turns, the Metering Roller turns to replenish the supply of a pre-determined amount of toner for the Imaging Unit. Rotation of the drive gear also turns the Agitating Blade of the Toner Cartridge to agitate toner in the Toner Cartridge.

B. Toner replenishing control

- T/C is detected when the Developing Clutch/K (CL2) is energized for K or when the Color Developing Motor (M6) is energized for C, M, and Y (during a copy cycle).
- The actual reading of T/C taken is compared with the T/C setting made in "TCR Level" of "Image Adjust" available from the Tech. Rep. mode. Based on this comparison, the toner replenishing time is determined.
- Since toner replenishing is possible only while the developer is being agitated, the maximum toner replenishing time is fixed. If it is not possible to replenish the supply of the required amount of toner within this maximum replenishing time, the remainder time is stored in memory and added to the replenishing time for the next replenishing sequence.

13.3.2 Toner Near-Empty and Toner Empty detection control

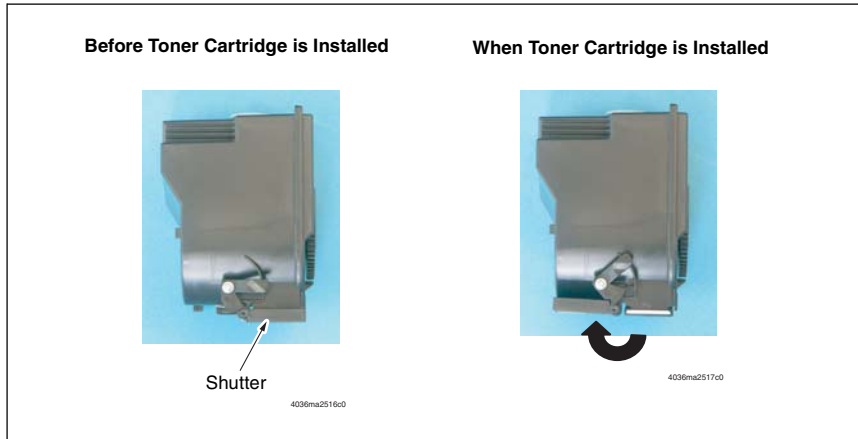
- A toner near-empty/empty condition is detected by the Toner Near-Empty Sensor PQ and LED mounted on each of the Toner Cartridges.
- A toner empty condition is detected by the TCR Sensor.
- Detection timing
 1. The number of times is detected, in which the sensor remains activated for a given period of time or more while the Agitating Blade turns one complete turn. If this count reaches two, a toner near-empty condition is detected and the machine gives a corresponding warning display.
 2. A toner empty condition is detected if the T/C reading taken by the TCR Sensor is lower by 0.5% than the target value for a given continuous period of time after the toner near-empty condition has been detected. The machine is then brought to a stop.
 3. The toner empty condition is reset if the Toner Near-Empty Sensor remains deactivated for a given period of time or more after the Toner Cartridge set lever has been unlocked and locked or the Power Switch has been turned OFF and ON.



- A different toner empty screen is displayed if "User" is selected for "Unit Change" available from the Tech. Rep. mode.

13.3.3 Shutter mechanism

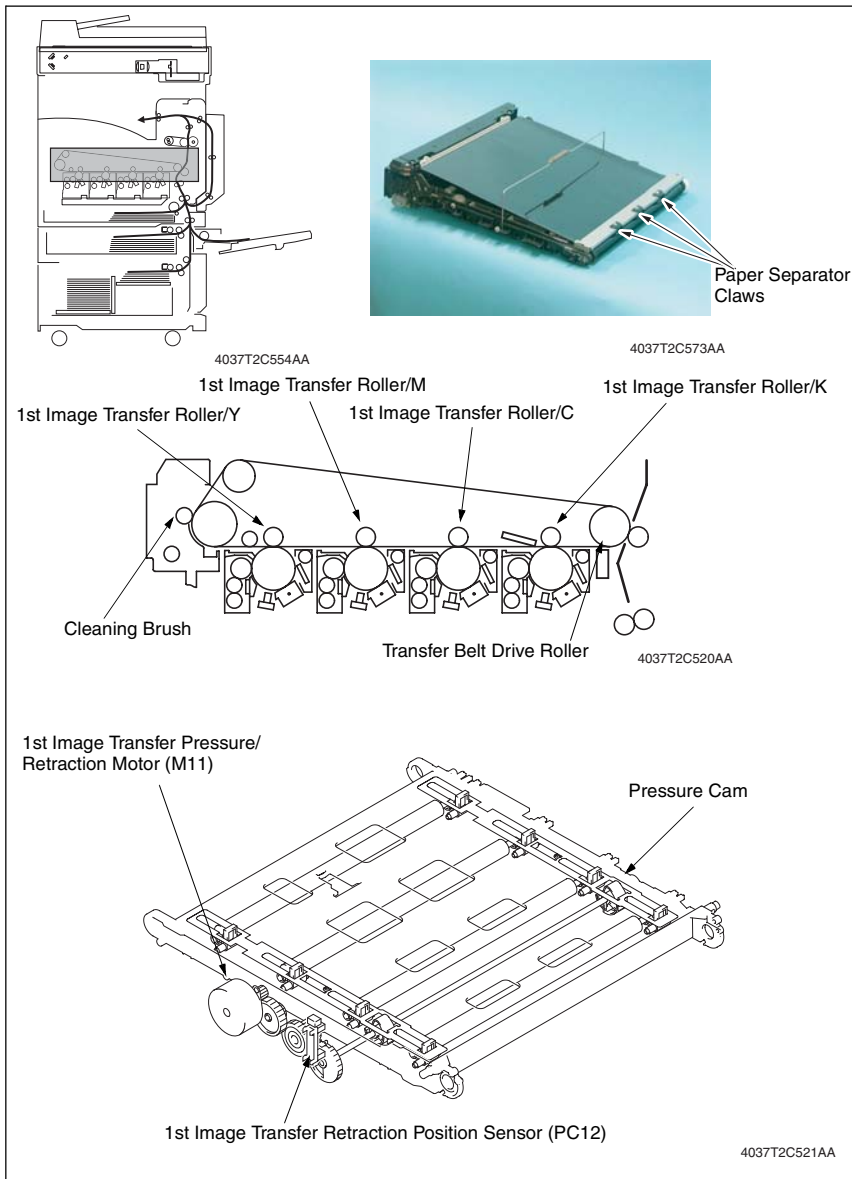
- To prevent toner from being spilled when the Toner Cartridge is removed from the machine, there is a shutter mechanism provided. When the Toner Cartridge is installed in the machine, the shutter opens.



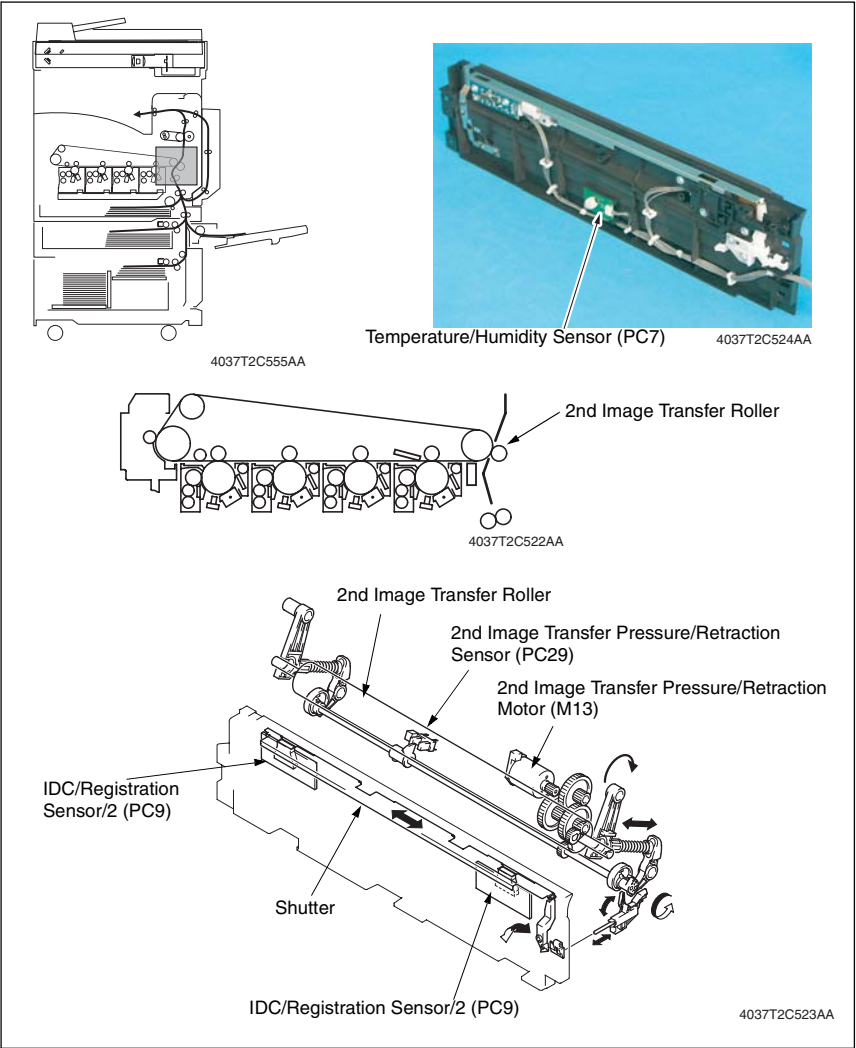
14. Transfer Corona section

14.1 Composition

14.1.1 1st Image Transfer section

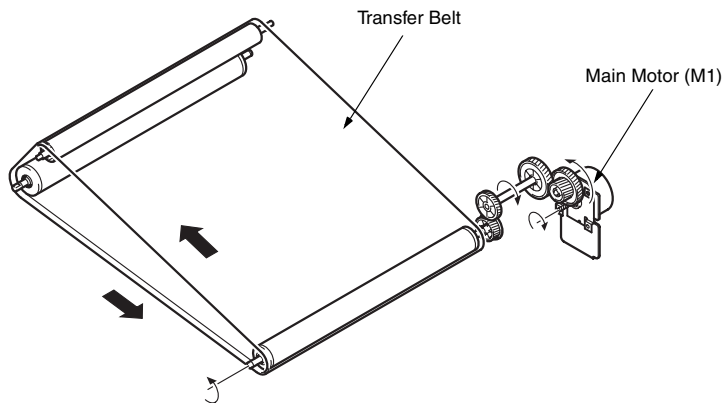


14.1.2 2nd Image Transfer section

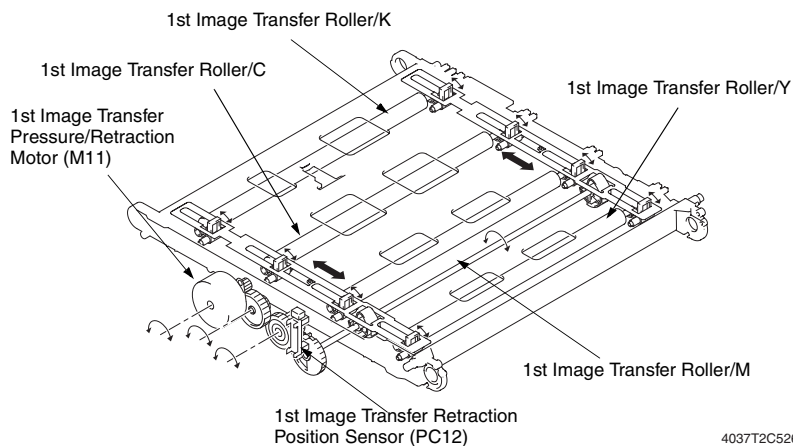


14.2 Drive

14.2.1 1st Image Transfer section

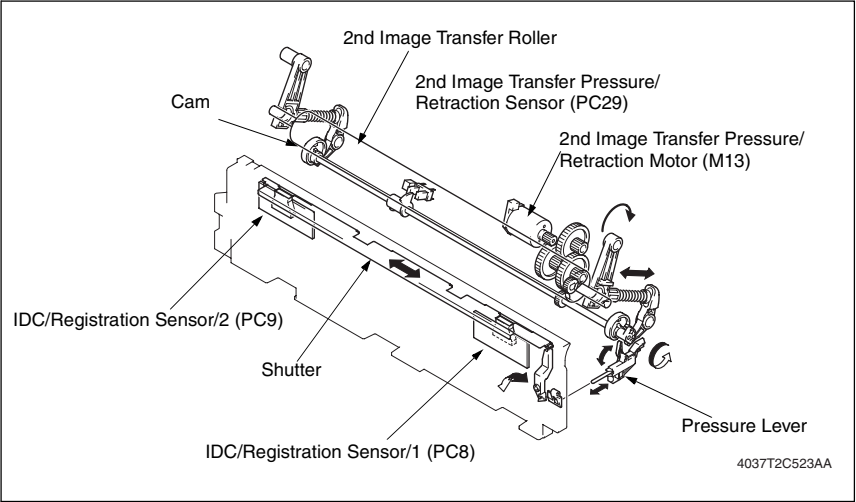


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14.2.2 2nd Image Transfer section



14.3 Operation

14.3.1 Transfer Belt speed control

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

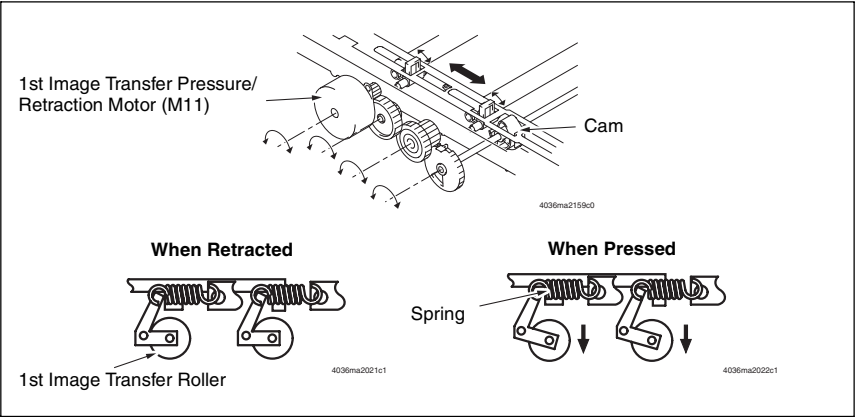
Paper Type	Print Mode	Main Motor Speed (mm/s)
Plain paper	Monochrome	215
	Color	165
	ACS	
Thick paper 1, 2, 3; envelopes, OHP transparencies, Glossy Mode	—	60

14.3.2 1st Image Transfer Roller mechanism

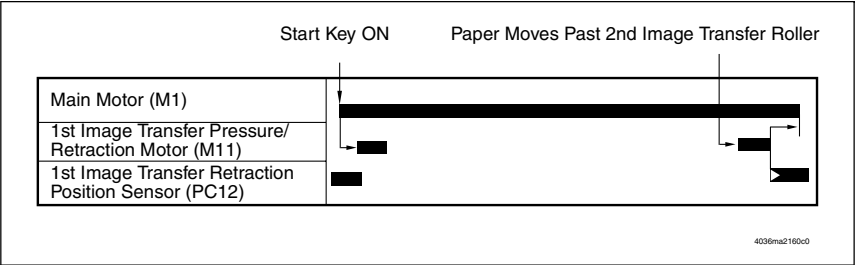
- The machine is provided with a mechanism that presses the 1st Image Transfer Rollers up against the inside of the Transfer Belt during the 1st image transfer stage. The 1st Image Transfer Pressure/Retraction Motor (M11) provides the drive for this operation.
- The 1st Image Transfer Retraction Position Sensor detects the 1st Image Transfer Roller at its retracted position.
- The pressure position is determined through pulse control.

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.
- Retraction operation
 1. When the drive gear turns backward, the pressure cam also turns backward, pushing to move the Sliding Plate.
 1. 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.



• Operation timing



B. Pressure position changing mechanism

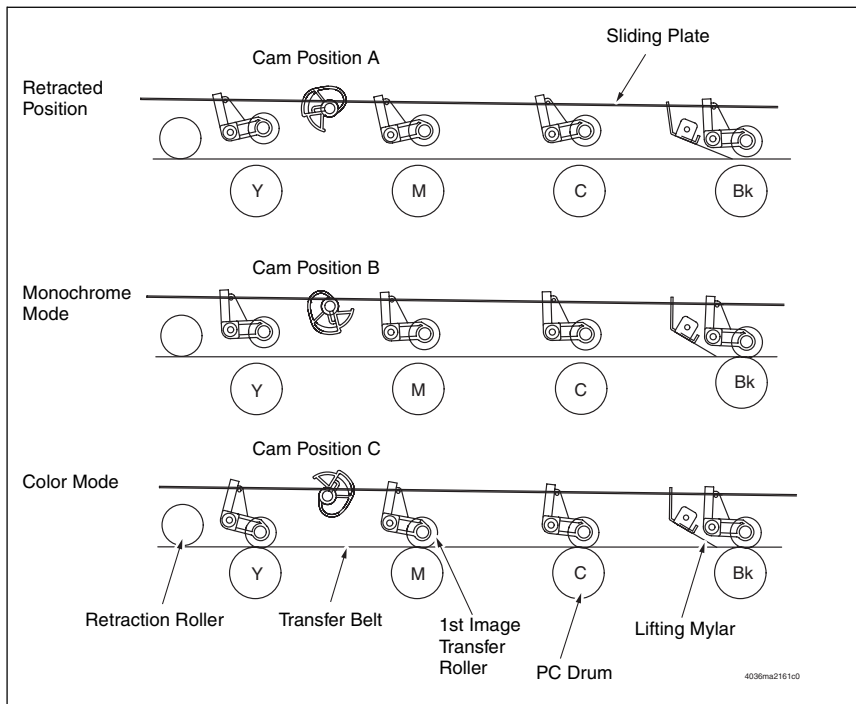
- To extend the service life of the PC Drum/Y, M, C, the pressure position of the 1st Image Transfer Roller is changed between the monochrome mode and the color mode. In the monochrome mode, the 1st Image Transfer Roller/Y, M, C is left in the retracted position and the PC Drum/Y, M, C is stopped.
- 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.

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.

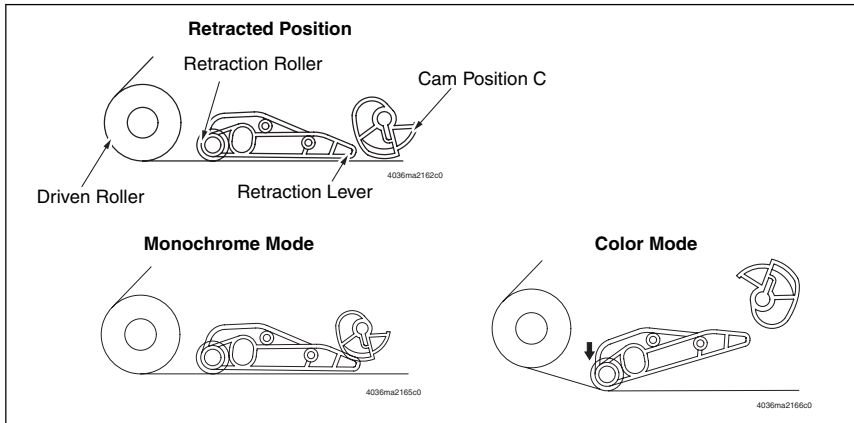
Monochrome mode:

- 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.



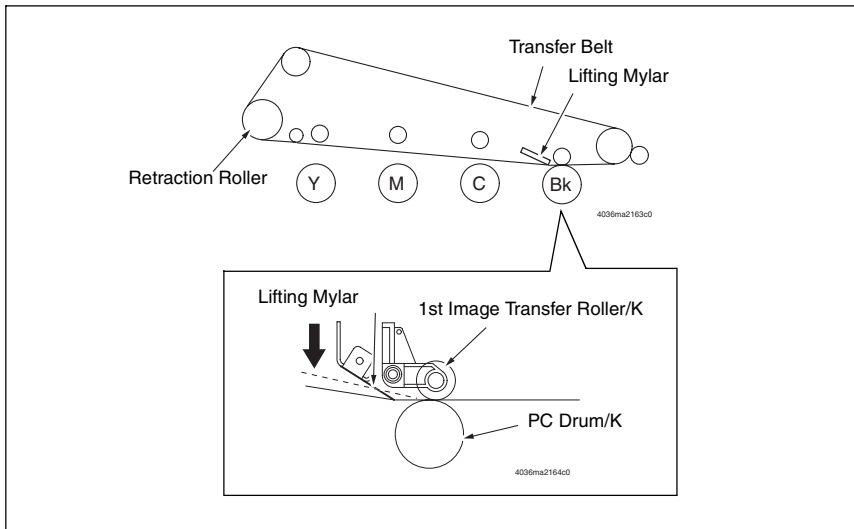
C. Retraction mechanism

- At the same time that the pressure position is changed, the Retraction Roller moves up and down to change the position of the image transfer on the surface of the Transfer Belt to suit the specific mode, either monochrome or color.
- Like the pressure position changing mechanism, the position at which the pressure cam is stopped is changed to move the Retraction Lever, which results in the Retraction Roller being moved up and down.



D. Backup mechanism

- Since the Retraction Roller changes the belt path so that the Transfer Belt does not touch the PC Drum/Y, M, C in the monochrome mode, the nip width between the Transfer Belt and PC Drum/K at the 1st Image Transfer Roller/K will become smaller, thus resulting in possible void images. To prevent this from occurring, there is Lifting Mylar installed before the 1st Image Transfer Roller/K to help maintain a good nip width.

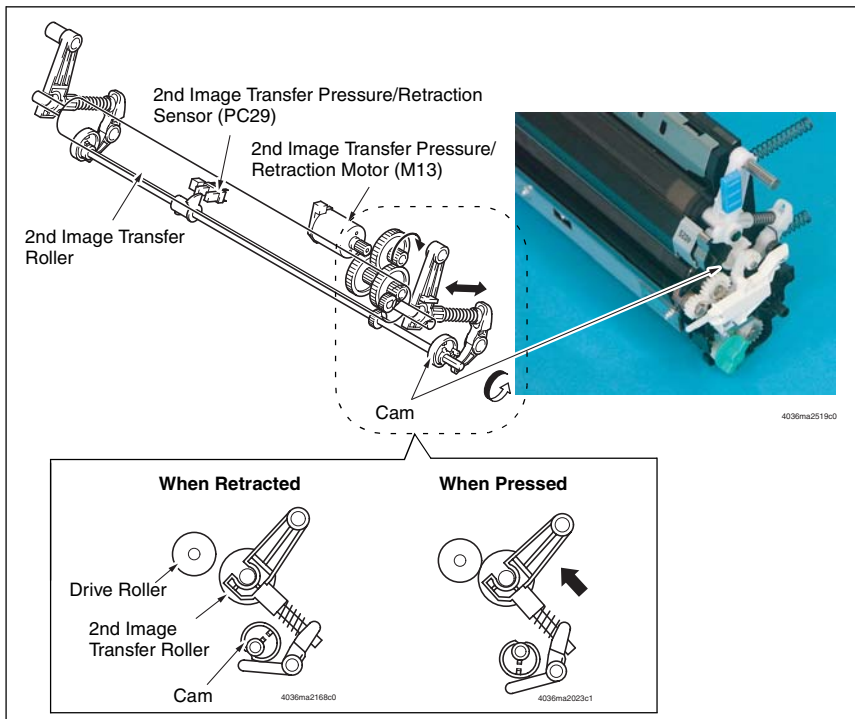


14.3.3 2nd Image Transfer Roller pressure mechanism

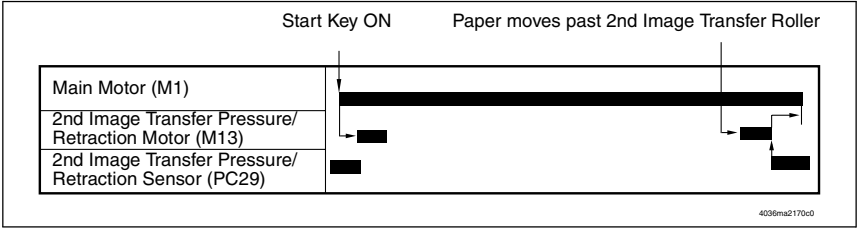
- The machine is provided with a mechanism that presses the 2nd Image Transfer Roller up against, and retracts it from, the Transfer Belt to prevent the 2nd Image Transfer Roller from being dirtied due to patterns produced for purposes other than an actual copying operation, which may be a pattern produced during the image stabilization sequence or other function.

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 rotation of the drive gear turns the pressure cam a half turn, which pushes down the Pressure Lever. This causes the 2nd Image Transfer Roller to be pressed up against the Transfer Belt.
3. At this time, the 2nd Image Transfer Pressure/Retraction Sensor detects whether the 2nd Image Transfer Roller is located at the pressure position.
4. When the motor is energized a second time, the pressure cam turns another half turn. This releases the Pressure Lever, which moves the 2nd Image Transfer Roller to, and stops it at, the retracted position.



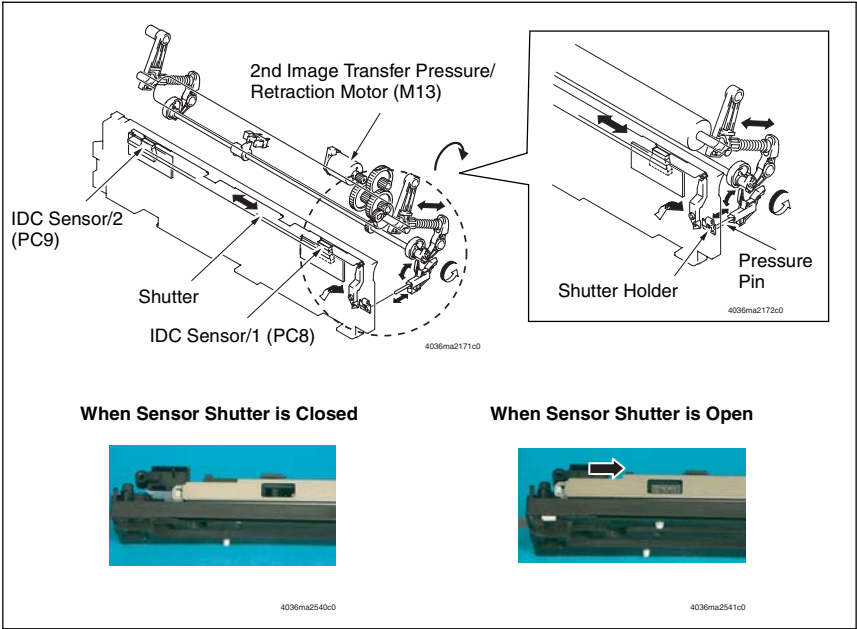
• Operation Timing



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.

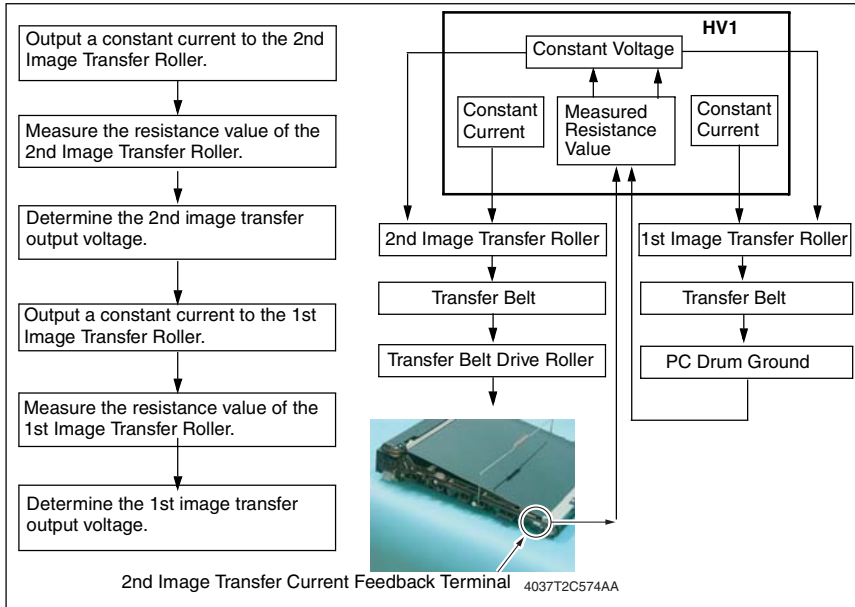
2nd Image Transfer Roller	Shutter
Retracted	Open
Pressed	Closed



14.3.5 ATVC (Auto Transfer Voltage Control)

- To optimize image transfer output, the machine is provided with ATVC control, or Auto Transfer Voltage Control. The control lets a constant current flow through each of the Image Transfer Rollers. Then, from the voltage detected, the resistances of the 1st Image Transfer Roller, 2nd Image Transfer Roller, and Transfer Belt are measured. The optimum image transfer output voltages applied to the 1st and 2nd Image Transfer Rollers during printing are thereby automatically adjusted.

A. Overview of ATVC operation



B. 1st image transfer ATVC operation

- The 1st image transfer constant current for each color of toner output from the DC power Supply/1 is fed back to the DC power Supply/1 via the 1st Image Transfer Roller, Transfer Belt, and PC Drum ground. This allows the resistance of the Transfer Belt to be measured.
A common ATVC is set for Y, M, and C.
- The measured resistance is used as the basis for determining the optimum 1st image transfer voltage for each color of toner.

C. 2nd image transfer ATVC operation

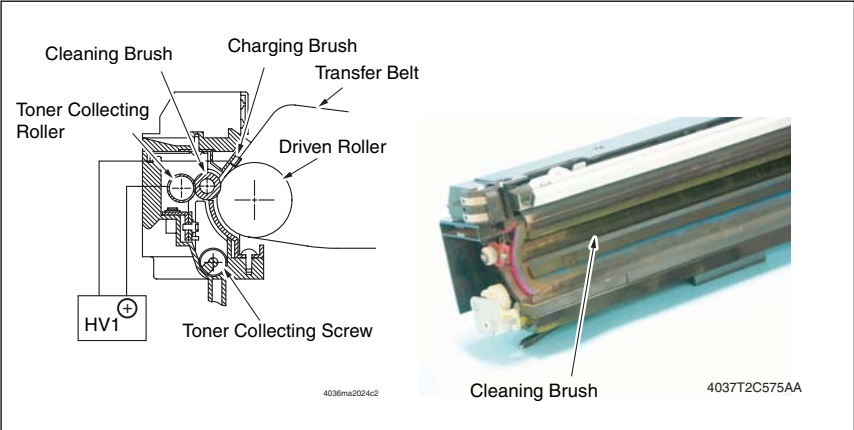
- The 2nd image transfer constant current output from the DC power Supply/1 is fed back to the DC power Supply/1 via the 2nd Image Transfer Roller, Transfer Belt, and Transfer Belt Drive Roller. This allows the resistance of the Transfer Belt to be measured.
- The measured resistance, together with the 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.

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

- The 1st and 2nd image transfer ATVC operations are carried out immediately before the execution of image stabilization control.
- The control operation is not, however, performed in Image Stabilizer Mode 3.
- The control operation is performed when the threshold value of the change in interior temperature is exceeded.

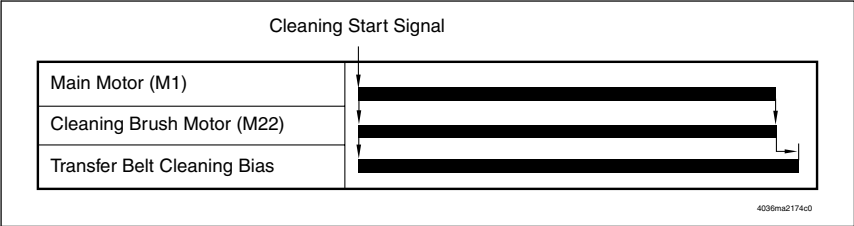
14.3.6 Transfer Belt cleaning

- 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 Cleaning Brush Motor provides the drive for this system.
- The Charging Brush is located on the upstream side of the Cleaning Brush. A bias (+DC) is applied to the Toner Collecting Roller to let current flow through the Cleaning Brush, Transfer Belt, and Charging Brush. Through potential difference involved, toner left on the surface of the Transfer Belt is conveyed to the Toner Collecting Roller.



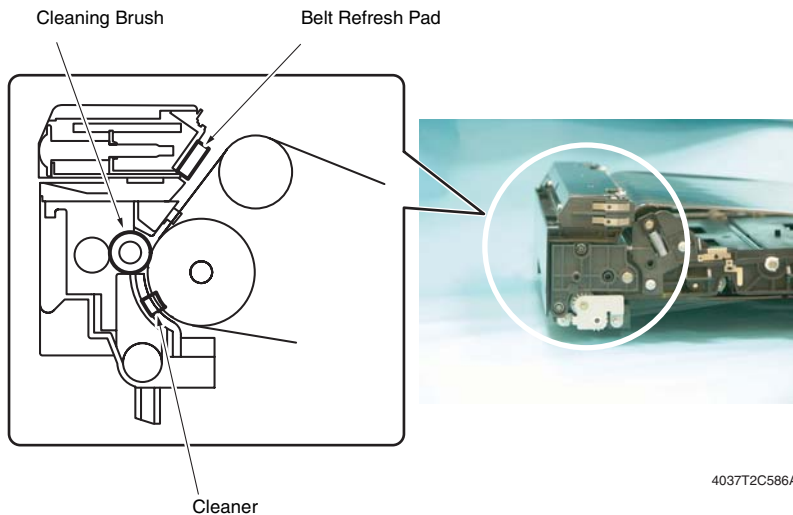
A. Operation timing

- Since there is a possibility of the machine being stopped with toner left on the Transfer Belt, the machine operates the Transfer Belt cleaning sequence when the Power Switch is turned ON, or when the Right Door, Left Door, or Front Door is opened and closed.



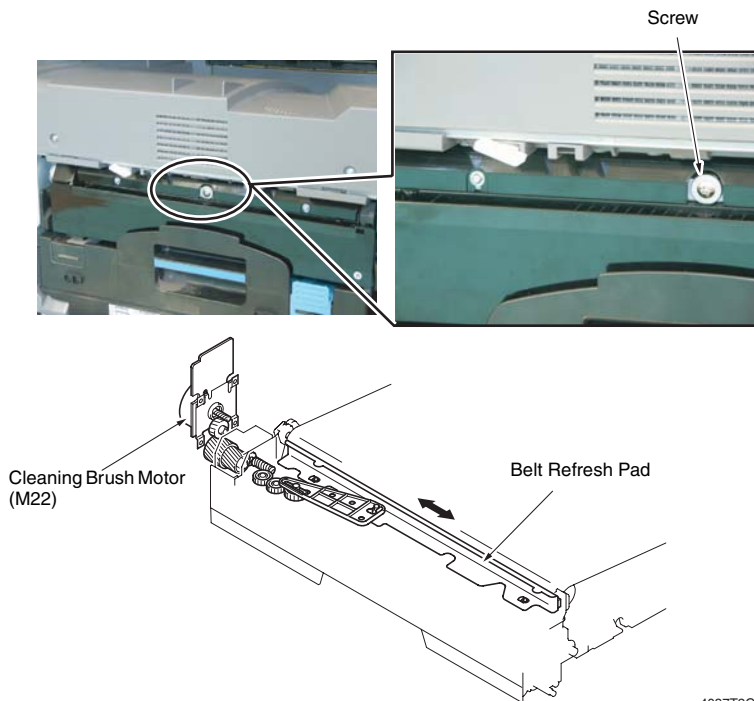
14.3.7 Transfer Belt Filming Cleaning Mechanism

- A cleaning mechanism is provided for refreshing the surface of the Transfer Belt when filming occurs on the belt.
- The cleaning section for the Transfer Belt is provided with a Cleaner, Belt Refresh Pad, and a Cleaning Brush. The Belt Refresh Pad is pressed against the surface of the Transfer Belt to clean it using the Service Mode and through manual operation.



A. Operation

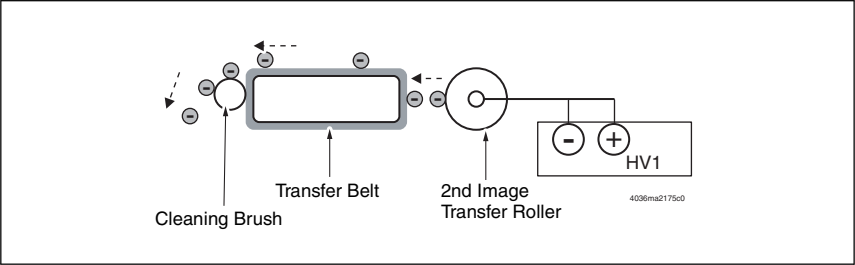
- Loosening one screw provided at the Transfer Belt cleaning section will allow the Belt Refresh Pad to be pressed against the surface of the Transfer Belt.
- Drive of the Cleaning Brush Motor is transmitted to the Belt Refresh Pad and a cleaning sequence is carried out.



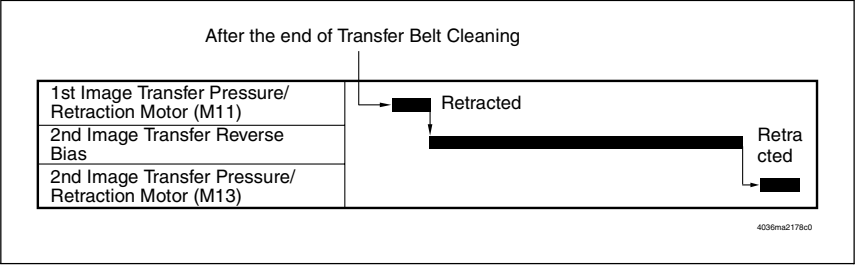
4037T2C591AA

14.3.8 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.

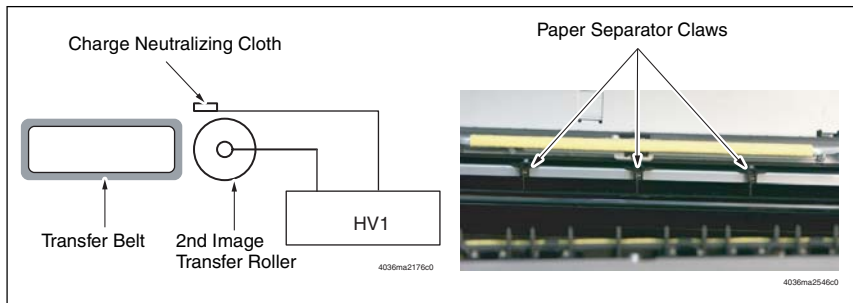


- Operation timing
- The sequence is carried when the Main Power Switch and the Auxiliary Power Button are turned ON or the cover is opened and closed when a print cycle has been abnormally terminated due to a misfeed or malfunction.
- The sequence is also carried out at the end of a print cycle that is run after the cumulative number of printed pages produced has exceeded 100, or during a print cycle that is run after the cumulative number of printed pages produced has exceeded 120, since the previous cleaning operation.
- At this time, the cumulative number of printed pages counts up 1 for 216 mm or less of printed paper FD length, and 2 for more than 216 mm of printed paper FD length.



14.3.9 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/1 according to the paper type and the environmental conditions, and whether the print cycle is for printing the 1st side or 2nd.
- Also provided are the three Transfer Belt Paper Separator Claws that properly separate paper after the 2nd image transfer stage from the Transfer Belt.

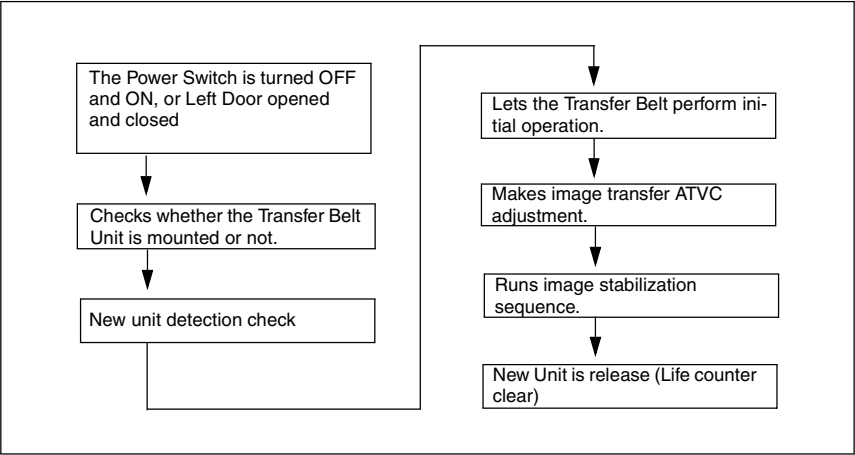


- Switching of output of the Charge Neutralizing Cloth

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	
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.

14.3.10 Detection of New Transfer Belt Unit

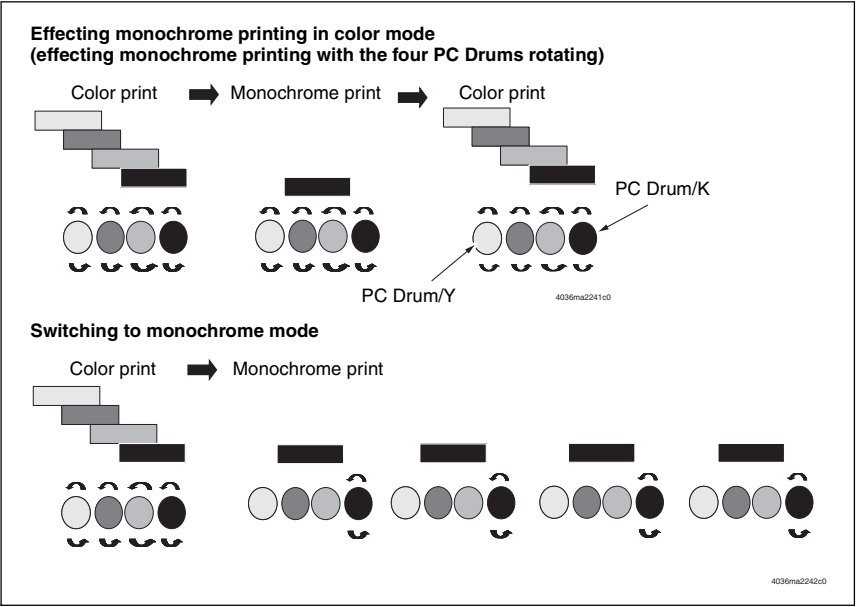
- When a new Transfer Belt Unit is installed in the machine, the life counter is automatically cleared through new unit detection.
- The new unit detection is made when the Power Switch is turned OFF and ON or the Left Door is opened and closed.
- New unit detection timing/operation



14.3.11 ACS control

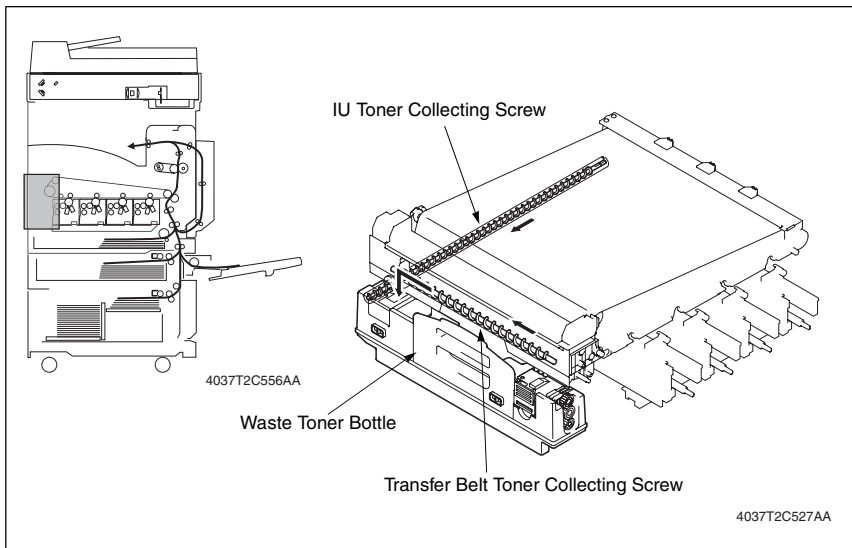
- This machine adopts ACS control, which controls switching of the print mode according to the number of the continuous monochrome originals to achieve both a higher copying productivity and longer service life of the consumables. This control functions in the ACS mode only. (ACS: Auto Color Selection)
- In the ACS control, the number of the continuous monochrome originals is checked when the color originals are switched to the monochrome ones. If the number of the continuous monochrome originals is less than a predetermined value, monochrome printing is made in the color mode. If, however, the number of the continuous monochrome originals is the predetermined value or more, the print mode is switched to monochrome since the time wasted for PC Drum rotation is larger than the time loss required for switching to the monochrome mode.
- The ACS control does not function until the number of the continuous monochrome originals has been counted. Accordingly, ACS control is provided only within the range of the number of the originals scanned for the first set of copies. This will result in ACS control not necessarily functioning at the optimum performance.
- This function works most effectively in the following conditions:
 - For the 2nd set of copies onward in electronic sorting
 - Printing using job programs
 - Multiple Enlargement mode

Paper Size	Effecting monochrome printing in color mode	Switching to monochrome mode
A4/Letter	3 sheets or less	4 sheets or more
A4R/Letter R	2 sheets or less	3 sheets or more
B4/11 × 14	2 sheets or less	3 sheets or more
A3/11 × 17	1 sheet or less	2 sheets or more

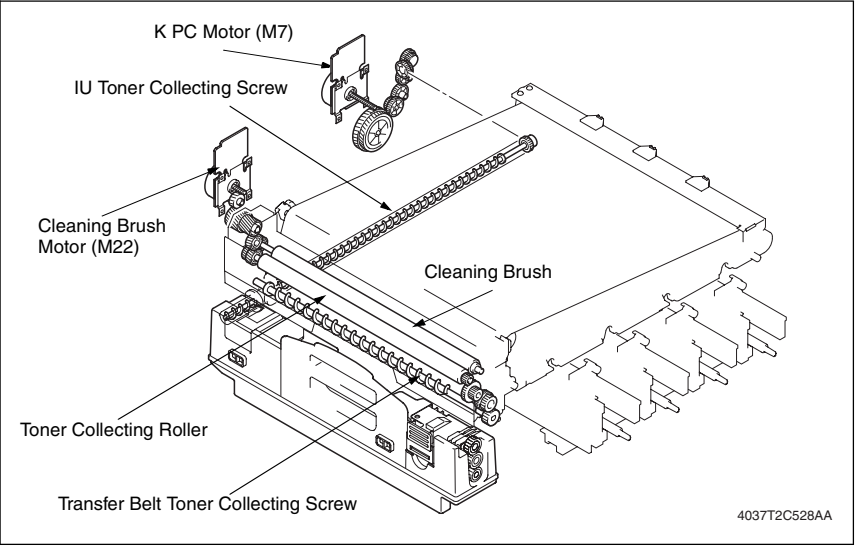


15. Toner Collecting section

15.1 Composition



15.2 Drive



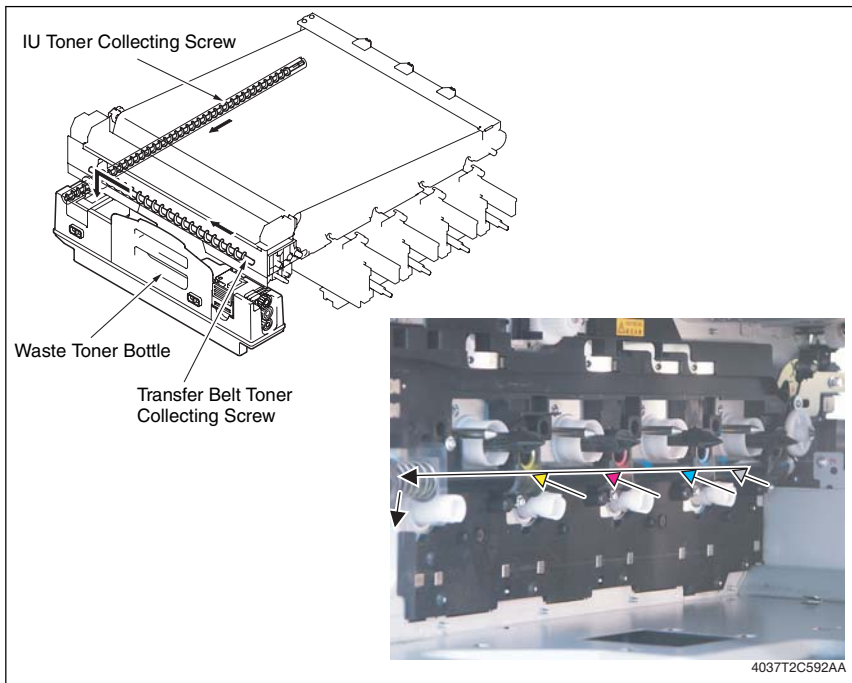
bizhub C450

Composition/Operation

15.3 Operation

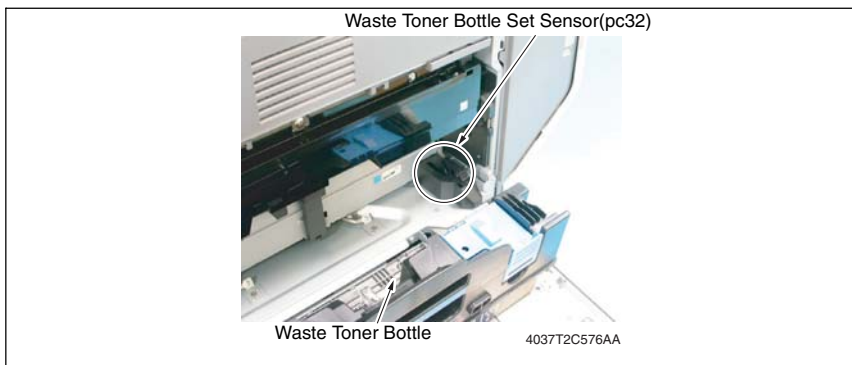
15.3.1 Toner collecting mechanism

- 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 Bottle.



15.3.2 Waste Toner Bottle-in-position detection

- The Waste Toner Bottle Set Sensor is provided to detect a Waste Toner Bottle loaded in position. Timing for this detection is when the Power Switch is turned OFF and ON, or the Left Door is opened and closed. If the Waste Toner Bottle is found to be out of position, the machine inhibits the initiation of a new print cycle.



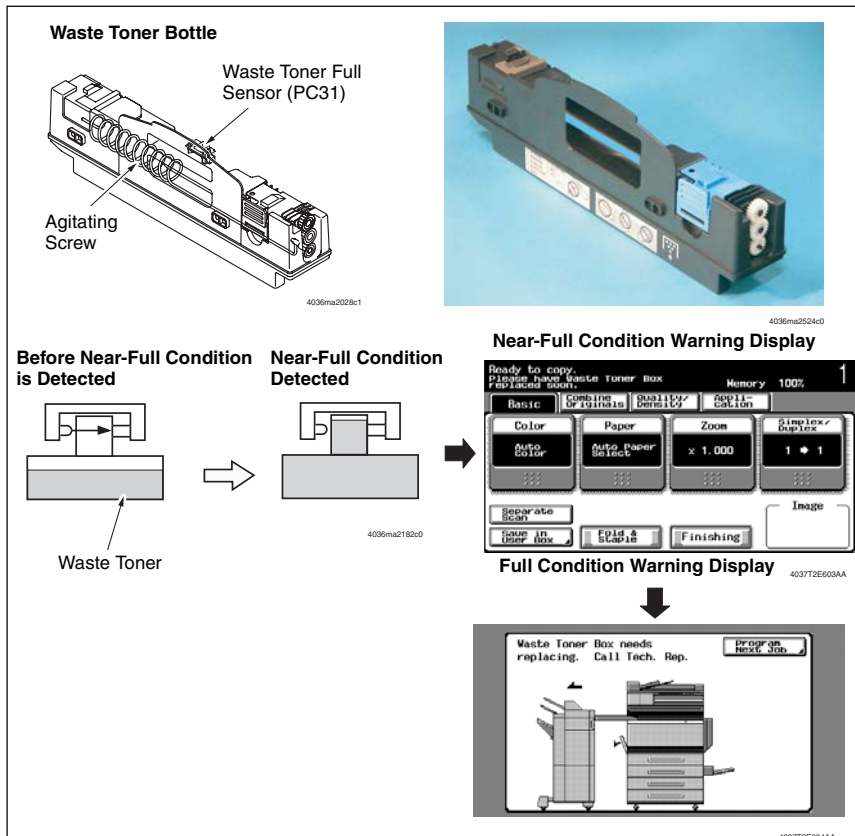
15.3.3 Waste Toner Near-Full/Full detection control

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 Bottle is nearly full of waste toner.
- At this time, a corresponding warning (near-full warning) is given on the control panel.
- To prevent false detection, an Agitation Screw is mounted in the Waste Toner Bottle so that the waste toner is accumulated in the bottle evenly.

B. Waste toner full detection control

- At the same time that the waste toner near-full condition has been detected, the counter exclusive for the waste toner inside of the machine starts counting. When the counter reaches about 8k, the machine determines that the Waste Toner Bottle is full and stops operation.
- 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.
- After the Waste Toner Bottle 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.

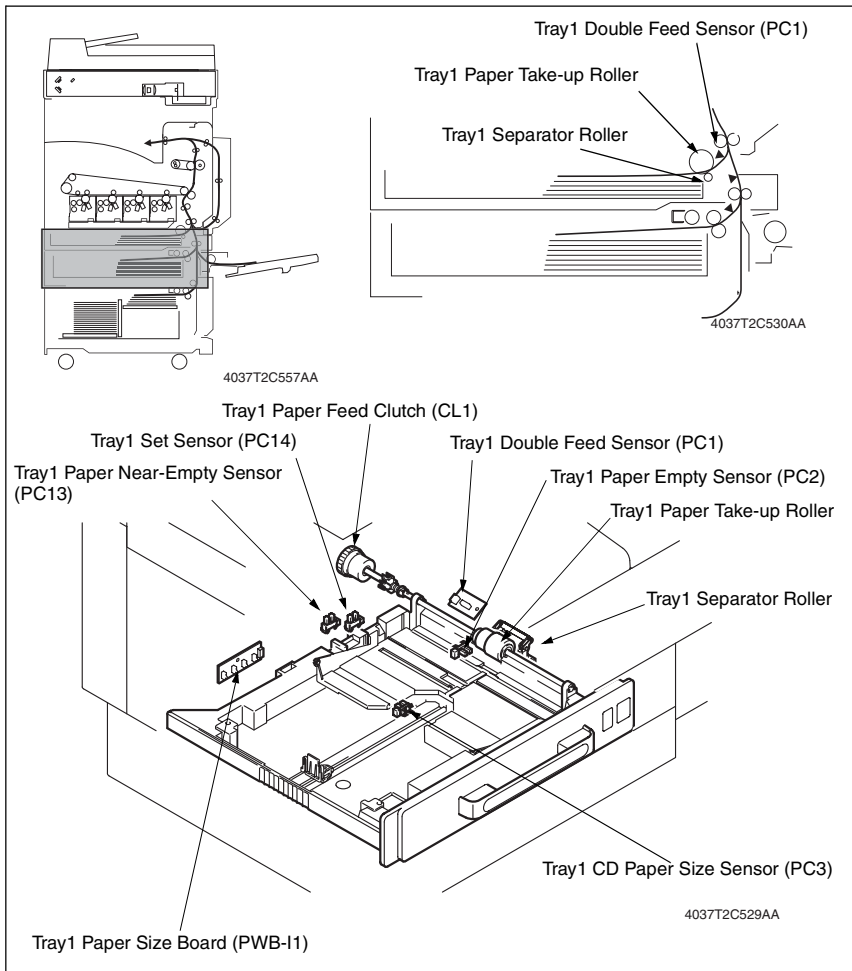


- A different toner full warning screen is displayed if "User" is selected for "Unit Change" available from the Tech. Rep. mode.

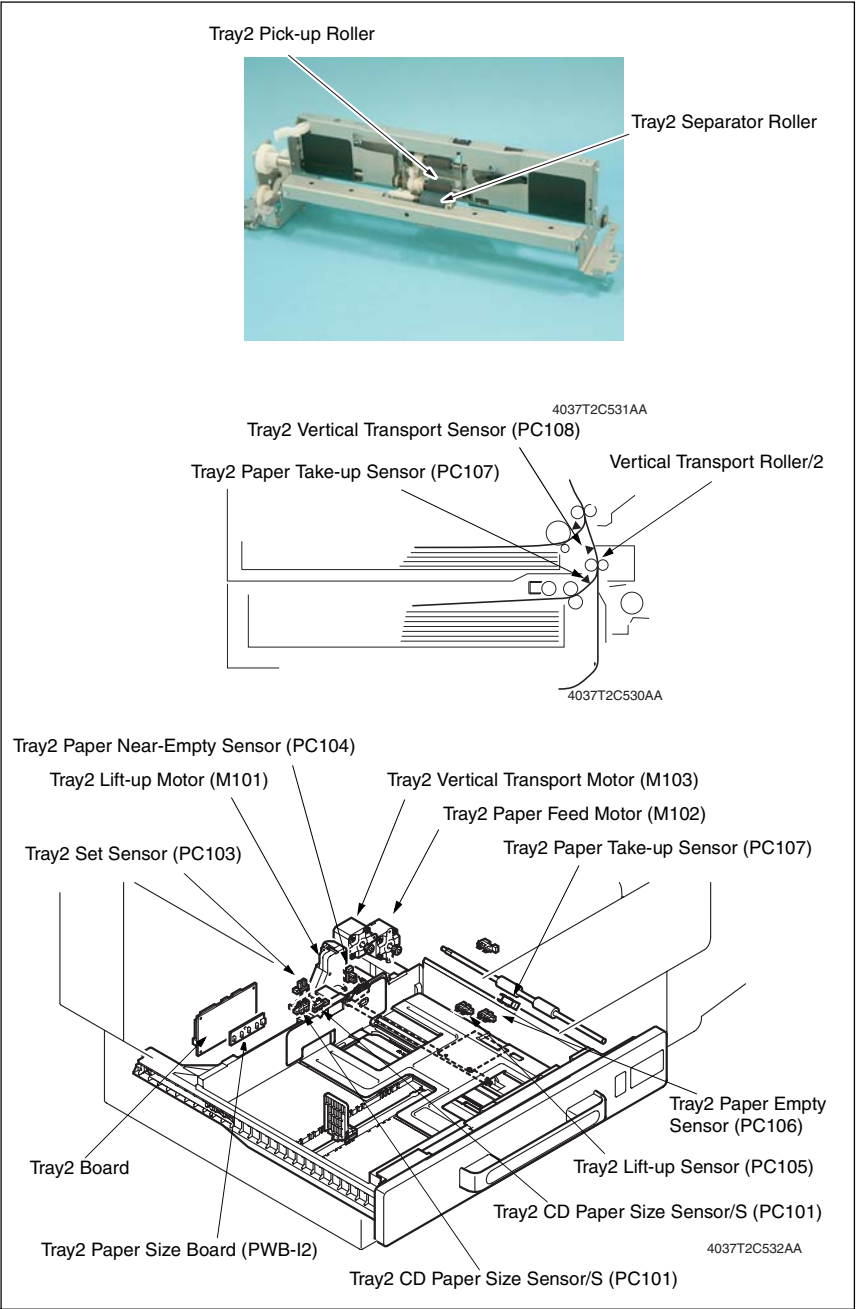
16. Paper feed section

16.1 Composition

16.1.1 Tray1

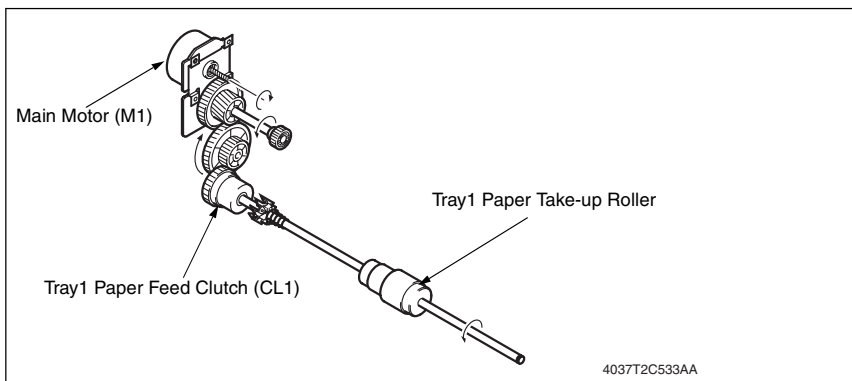


16.1.2 Tray2

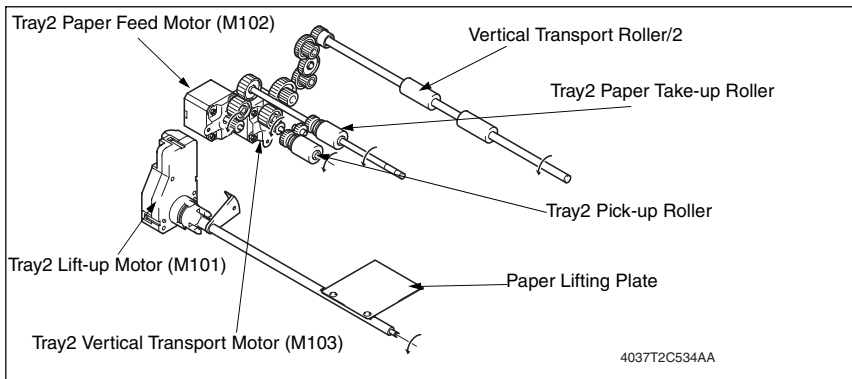


16.2 Drive

16.2.1 Tray1

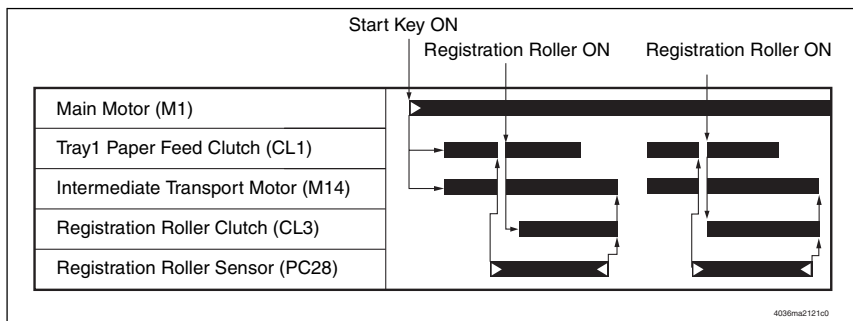


16.2.2 Tray2



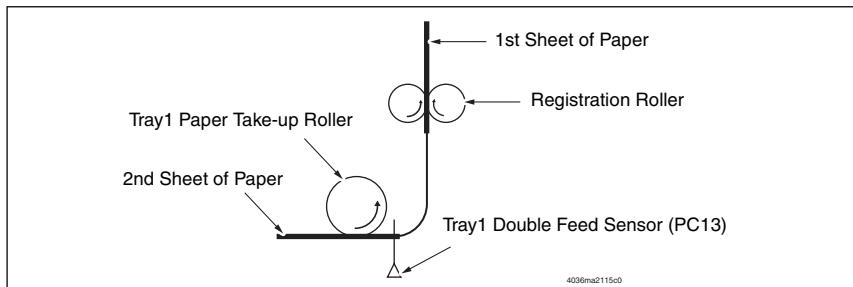
16.3 Operation

16.3.1 Paper Take-up control (Tray1)



16.3.2 Tray1 double feed control

- To reduce paper misfeed involved with double feed, the Tray1 Double Feed Sensor is provided at a point immediately after the Tray1 Paper Take-up Roller.
- If the second sheet of paper reaches the Tray1 Double Feed Sensor during the paper take-up sequence for the first sheet of paper, the paper take-up motion is delayed to allow an appropriate distance between two successive sheets of paper.



16.3.3 Deceleration control

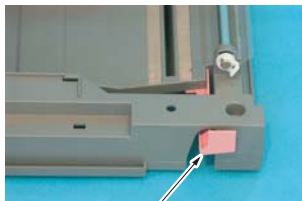
- Deceleration control is provided only when paper is fed from Tray2, Tray3, Tray4, LCC, or Bypass with a system speed of 215 mm/sec., 165 mm/sec., or 60 mm/sec. The Tray2 Vertical Transport Motor (M103), Tray3 Transport Roller Motor (M120-PF), Tray4 Transport Roller Motor (M121-PF), and Transport Roller Motor (M2-LCT) are controlled so that the period of time that begins when the paper take-up sequence is started and ends when the leading edge of the paper reaches the Registration Roller becomes a predetermined value. The control thereby prevents a paper misfeed from occurring and ensures productivity.
- The deceleration control is provided based on the information on the timing, at which the Tray2 Vertical Transport Sensor (PC108), Tray3 Vertical Transport Sensor (PC117-PF), Tray4 Vertical Transport Sensor (PC126-PF), and LCT Vertical Transport Sensor (PC2-LCT) are activated.

16.3.4 Paper supply level detection control

- There is a window in the front cover of the cassette for indicating the paper supply level.
- When the Paper Lifting Plate goes up, a red lever appears in the window. The lower the level of the paper stack, the more the red portion is visible.



Paper Supply Level Indicator in Cassette Front Cover



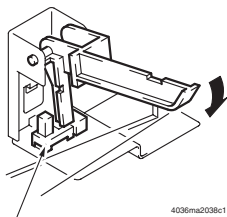
Lever

16.3.5 Paper Near-Empty/Paper Empty detection

- When the Paper Near-empty Sensor is blocked, a corresponding warning display is given on the control panel.
- The paper supply level when a paper near-empty condition is detected is about 50 ± 30 sheets.
- The Paper Empty Sensor detects a paper empty condition.

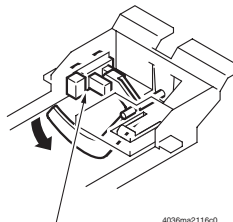
Tray1

A Near-empty Condition



Tray1 Paper Near-empty Sensor (PC13)

An Empty Condition



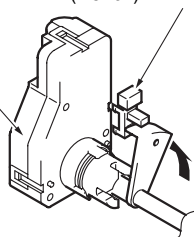
Tray1 Paper Empty Sensor (PC2)

Tray2

A Near-empty Condition

Tray2 Paper Near-empty Sensor (PC104)

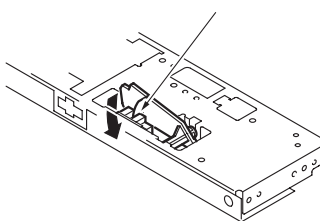
Tray2 Lift-up Motor (M101)



4036ma2017:c1

An Empty Condition

Tray2 Paper Empty Sensor (PC106)



4036ma2612:c0

16.3.6 Tray1 paper type setting

- The paper type is set from the control panel. Control is provided on the machine side differently as detailed below depending on the paper type setting made.

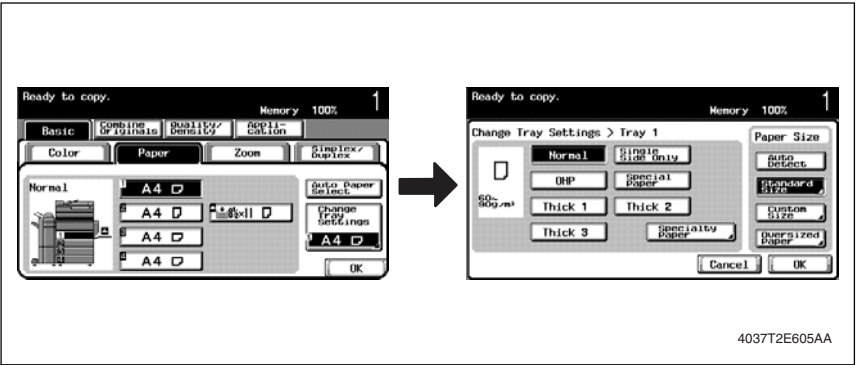
Paper Type	System Speed (mm/s)	Heating Roller Set Temperature (°C)	1st Image Transfer	2nd Image Transfer	Vg	Vdc	Gamma Table
Plain paper	Monochrome mode 215	195	×	○	○	×	○
	Color/ACS mode 100	190					
Plain paper*1	60	160	×	○	○	×	○
Thick paper 1							
Thick paper 2							
Thick paper 3							
2nd side thick paper 3							
Envelopes							
OHP transparencies		190					
		170 (when the absolute humidity or the machine interior temperature exceeds the threshold value*2)					

○: Varies depending on the paper type
x: Not vary

*1: Glossy mode

*2: The temperature threshold value of OHP is absolute humidity 18 g/m³.
The machine interior temperature threshold value of OHP is 16 °C.

- Select thick paper 3 to use postcards.
- Select thick paper 1 to use labels.



16.3.7 Paper size detection control

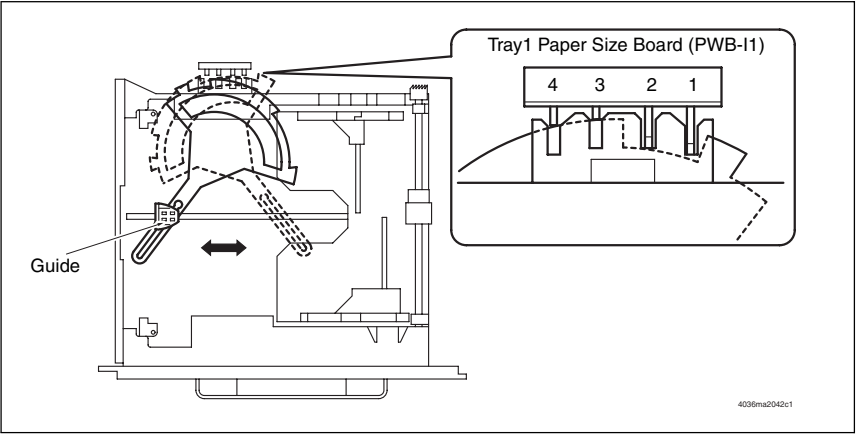
- The width size (CD) and length size (FD) of the paper are detected. The paper size is determined based on the combination of these two sizes detected.

A. Tray1
Metric Area

Tray1 Paper Size Board (PWB-I1)				Tray1 CD Paper Size Sensor (PC3)	Paper Size
SW1	SW2	SW3	SW4		
ON	OFF	ON	OFF	H	A6R
ON	OFF	ON	OFF	L	A5
OFF	ON	OFF	ON	H	B6R
OFF	ON	OFF	ON	L	B5
OFF	OFF	ON	OFF	H	A5R
OFF	OFF	ON	OFF	L	A4
ON	ON	ON/OFF	OFF	H	B5R
OFF	OFF	OFF	ON	L	A4R
ON	ON	ON	OFF	L	B4
ON	ON	ON	ON	L	A3
OFF	ON	ON	ON	L	A3 Wide
ON	OFF	OFF	OFF	L	FLS

Inch Area

Tray1 Paper Size Board (PWB-I1)				Tray1 CD Paper Size Sensor (PC3)	Paper Size
SW1	SW2	SW3	SW4		
OFF	OFF	ON	OFF	H	5.5 × 8.5R
OFF	OFF	ON	OFF	L	8.5 × 11
OFF	OFF	ON	ON	L	8.5 × 11R
OFF	ON	OFF	ON	L	Executive
OFF	ON	ON	OFF	H	Executive R
ON	OFF	ON	OFF	L	5.5 × 8.5
ON	ON	ON	OFF	H	8.5× 14
ON	ON	ON	ON	L	11 × 17
OFF	ON	ON	ON	L	A3 Wide



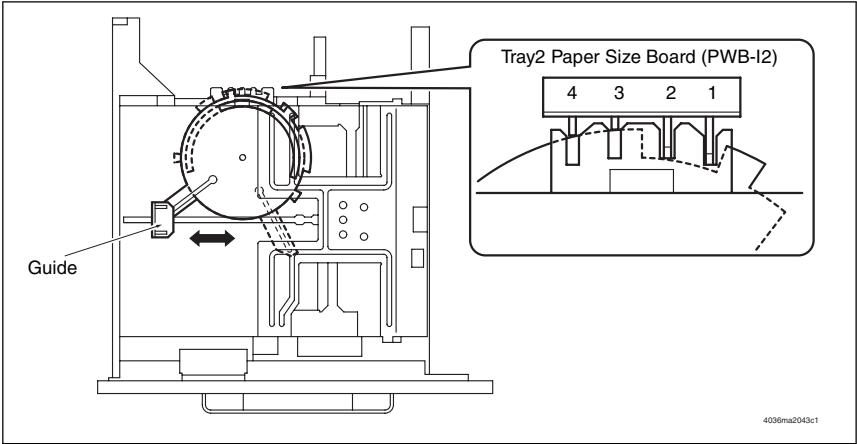
B. Tray2

Tray2 Paper Size Board (PWB-I2)				Tray2 CD Paper Size Sensor/S (PC101)	Tray2 CD Paper Size Sensor/L (PC102)	Paper Size
SW1	SW2	SW3	SW4			
OFF	OFF	ON	ON	H	L	B5
ON/OFF	ON	ON	ON	L	L	A5R *1
ON/OFF	ON	ON	ON	H	L	A4
ON	ON	OFF	ON	L	L	B5R
ON	ON/OFF	OFF	OFF	L	H	A4R
OFF	OFF	OFF	ON	H	L	B4
OFF	ON/OFF	OFF	OFF	H	L	A3
ON	ON	ON	ON	L	L	5.5 × 8.5 *2
ON	ON	ON	ON	H	H	Letter
OFF	ON	ON	OFF	L	H	Letter R
OFF	OFF	OFF	ON	L	H	Legal
ON	ON	ON	ON	L	L	Invoice R
OFF	ON	OFF	OFF	H	H	11 × 17
OFF	OFF	OFF	OFF	L	H	FLS(8 × 13) *3
OFF	OFF	OFF	OFF	L	H	Folio *3 (8-1/4 × 13)
OFF	OFF	OFF	OFF	L	H	8-1/2 × 13 *3
OFF	OFF	OFF	OFF	L	H	FLS *3
OFF	ON	ON	ON	H	H	K16
OFF	OFF	ON	OFF	H	H	K8

*1: Metric Area only

*2: Inch Area only

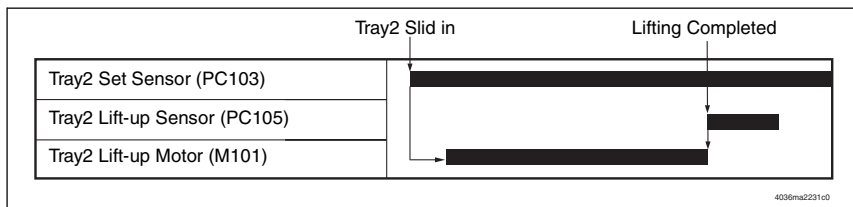
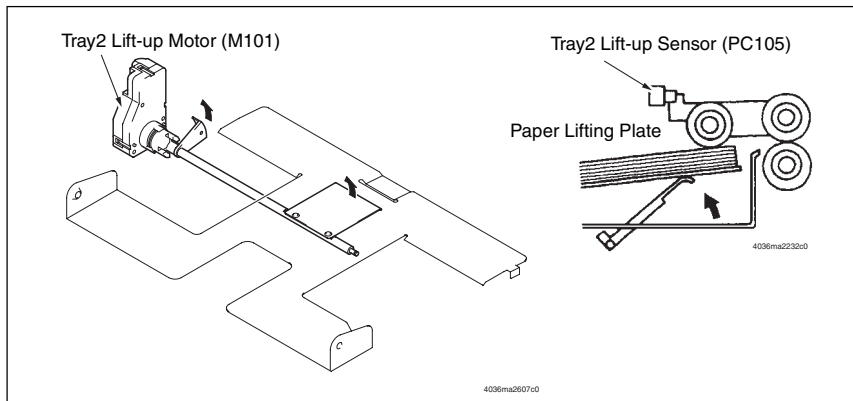
*3: Detected if selected using “FLS Paper” available from Tech. Rep. mode



16.3.8 Tray2 paper lifting motion control

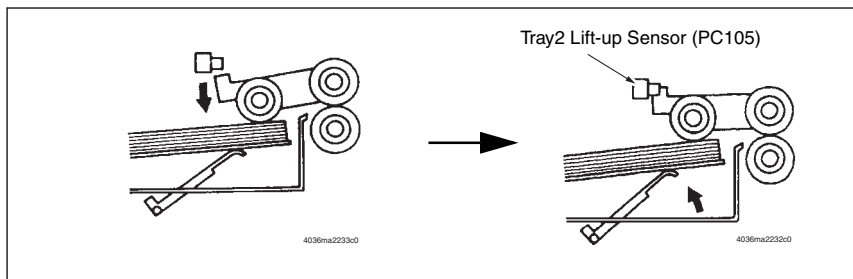
A. When Tray2 is slid in

- The paper lifting motion is started if the Tray2 Lift-up Sensor is unblocked with Tray2 slid in the machine.
- When the Tray2 Lift-up Sensor is blocked after the paper lifting motion has been started, the motor is deenergized.



B. During a copy cycle

- As paper is consumed, the Paper Take-up Roller gradually lowers to unblock the Tray2 Lift-up Sensor. The Tray2 Lift-up Motor is then energized again to lift the paper stack. When the Tray2 Lift-up Sensor is then blocked, the Tray2 Lift-up Motor is deenergized.
- The sequence of these operations is repeated to keep constant the pressure between the Paper Take-up Roller and paper stack (paper take-up pressure) regardless of the amount of paper still available for use.

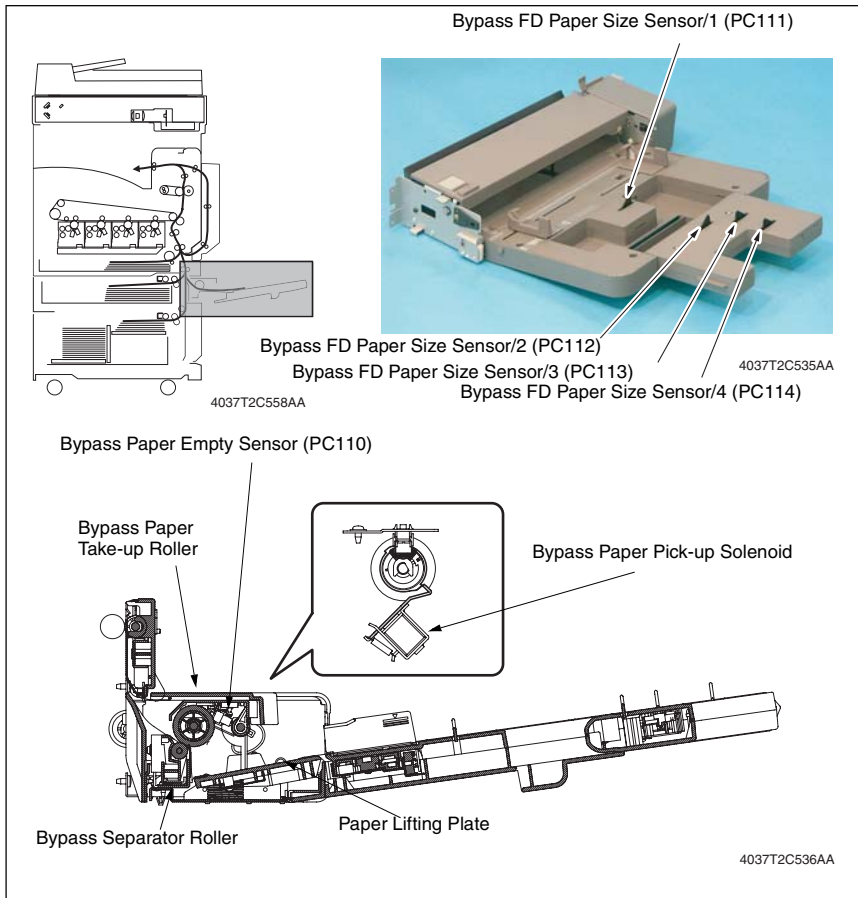


16.3.9 Deceleration Control

- When paper is fed from Tray2, Tray3, Tray4, LCC, or Bypass, the corresponding Transport Motor is controlled so that the period of time that begins when the paper take-up sequence is started and ends when the leading edge of the paper reaches the Registration Roller becomes a predetermined value. The control thereby prevents a paper mis-feed from occurring and ensures productivity.
- The deceleration control is provided based on the information on the period of time that begins when the corresponding Paper Feed Motor is energized or FEED signal is turned ON and ends when the corresponding Vertical Transport Sensor is activated.
- With the addition of this control, double feed control at the time of paper feed from Tray2, Tray3, Tray4, LCC, and Bypass has been discontinued.

17. Bypass section

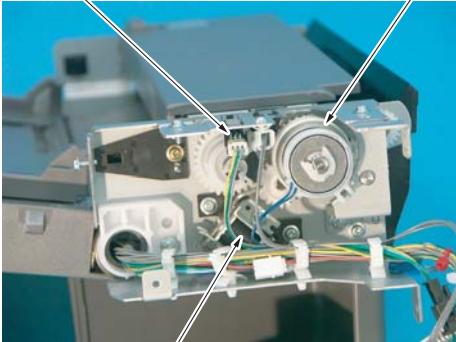
17.1 Composition



17.2 Drive

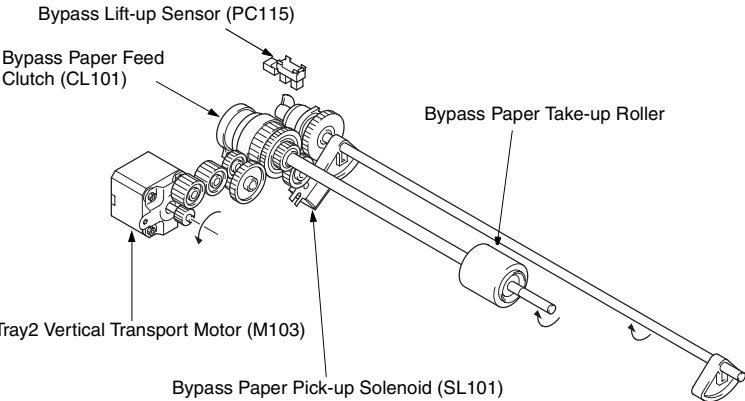
Bypass Lift-up Sensor (PC115)

Bypass Paper Feed Clutch (CL101)



Bypass Paper Pick-up Solenoid (SL101)

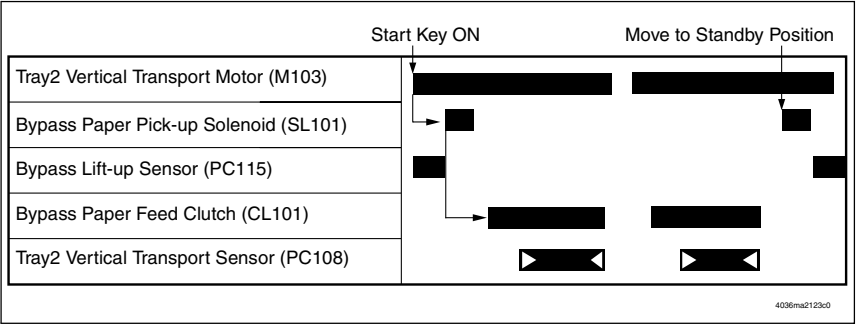
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4037T2C538AA

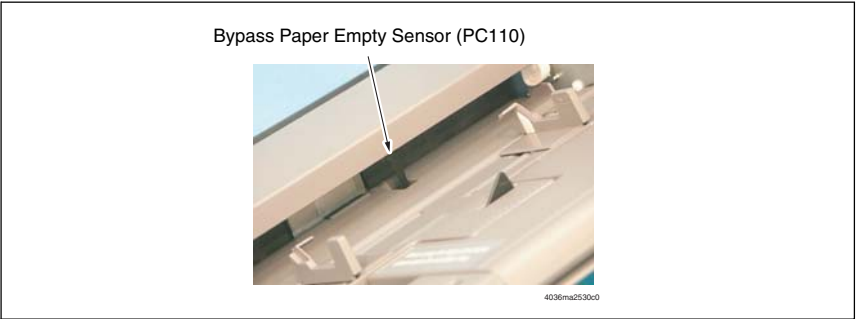
17.3 Operation

17.3.1 Bypass Paper Take-up control



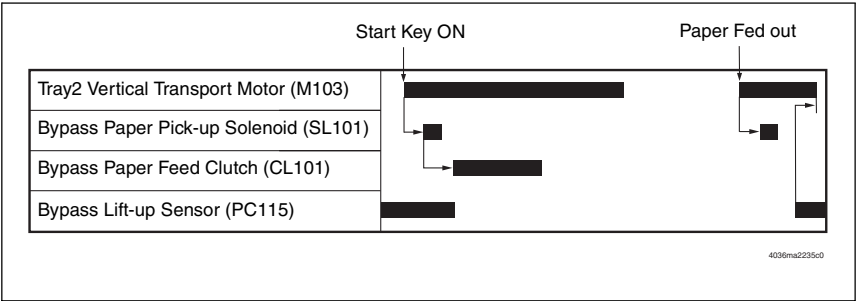
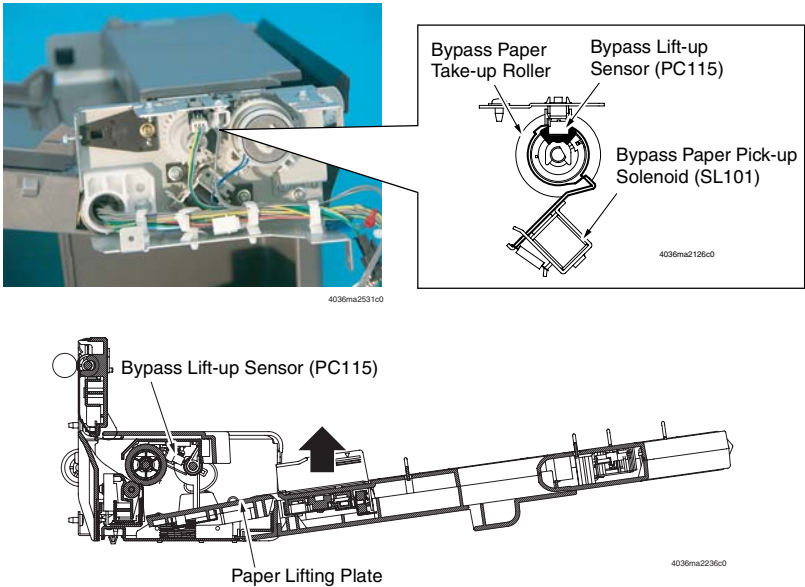
17.3.2 Paper Empty detection

- The Bypass Paper Empty Sensor detects a paper empty condition in the Bypass Section.



17.3.3 Bypass Paper Lifting Motion Control

- At the start of a Bypass paper take-up sequence, the Bypass Paper Pick-up Solenoid is energized to raise the Paper Lifting Plate so that the sheet of paper can be taken up. When the print cycle is completed, the Bypass Paper Pick-up Solenoid is energized again to return the Paper Lifting Plate to the standby position.



17.3.4 Paper size detection

- The size of the paper loaded in the Bypass Section is detected by the combination of ON or OFF positions of the four Bypass FD Paper Size Sensors and the Bypass Paper Size Unit.
- Moving the Paper Guide varies the resistance value of the Bypass Paper Size Unit VR.

Metric Area

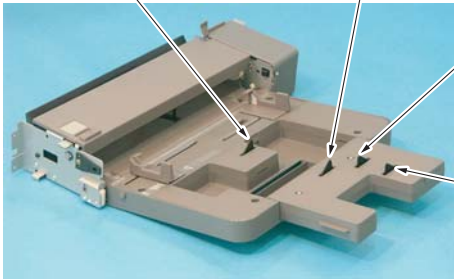
Bypass FD Paper Size Sensor/1 (PC111)	Bypass FD Paper Size Sensor/2 (PC112)	Bypass FD Paper Size Sensor/3 (PC113)	Bypass FD Paper Size Sensor/4 (PC114)	Bypass Paper Size Unit (VR1)	Paper Size Detected
				Width (mm)	
OFF	OFF	OFF	OFF	80 to less than 115	A6R
				115 to 144 inclusive	B6R
				196 to 225 inclusive	A5
				242 to 268 inclusive	B5
ON	OFF	OFF	OFF	133 to 164 inclusive	A5R
				169 to less than 196	B5R
				196 to 225 inclusive	A4R
				225 to less than 288	Letter
ON	ON	OFF	OFF	288 to 330 inclusive	A4
				188 to 235 inclusive	FLS
ON	ON	ON	OFF	201 to 231 inclusive	Legal
				268 to 288 inclusive	11 × 14
ON	ON	ON	ON	255 to less than 288	11 × 17
				288 to less than 301	A3
				301 to 330 inclusive	A3 Wide

Inch Area

Bypass FD Paper Size Sensor/1 (PC111)	Bypass FD Paper Size Sensor/2 (PC112)	Bypass FD Paper Size Sensor/3 (PC113)	Bypass FD Paper Size Sensor/4 (PC114)	Bypass Paper Size Unit (VR1)	Paper Size Detected
				Width (mm)	
OFF	OFF	OFF	OFF	115 to 144 inclusive	B6R
				201 to 231 inclusive	5.5 × 8.5
				242 to 282 inclusive	Executive
ON	OFF	OFF	OFF	125 to 155 inclusive	5.5 × 8.5R
				169 to less than 201	Executive R
				201 to 231 inclusive	Letter R
				225 to less than 288	Letter
ON	ON	OFF	OFF	288 to 330 inclusive	A4
				188 to 235 inclusive	FLS
				201 to 231 inclusive	Legal
ON	ON	ON	OFF	242 to less than 268	B4
				268 to 288 inclusive	11 × 14
				255 to less than 288	11 × 17
ON	ON	ON	ON	288 to less than 301	A3
				301 to 330 inclusive	A3 Wide

Bypass FD Paper Size
Sensor/1 (PC111)

Bypass FD Paper Size
Sensor/2 (PC112)

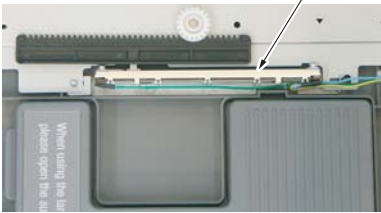


Bypass FD Paper Size
Sensor/3 (PC113)

Bypass FD Paper Size
Sensor/4 (PC114)

4036ma2532c0

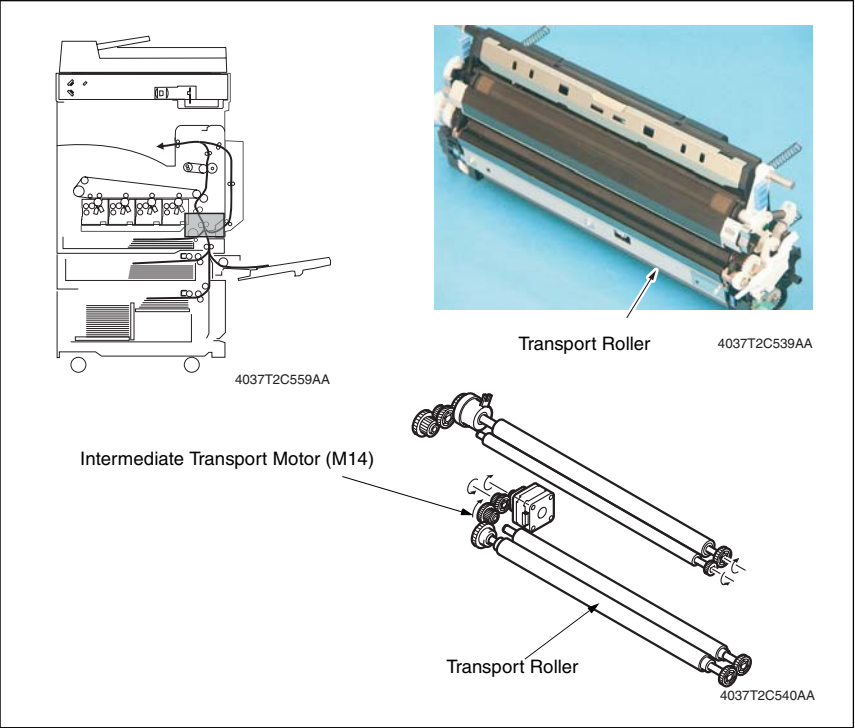
Bypass Paper Size Unit (VR1)



4036ma2533c0

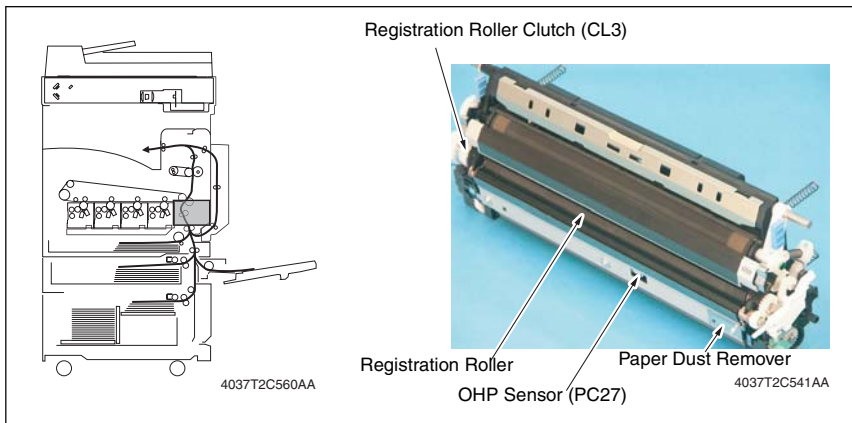
18. Conveyance section

18.1 Composition

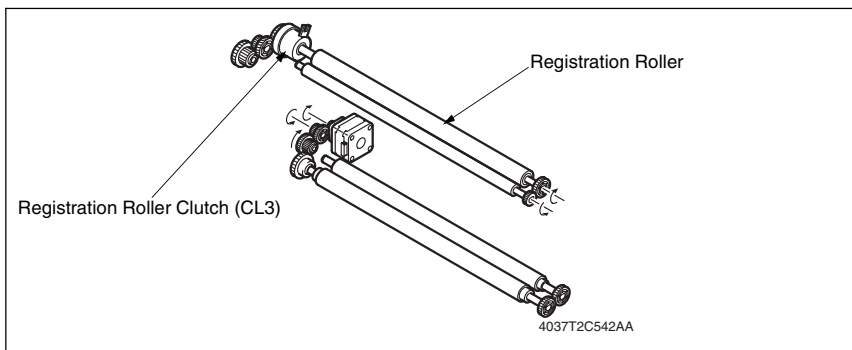


19. Registration Roller section

19.1 Composition



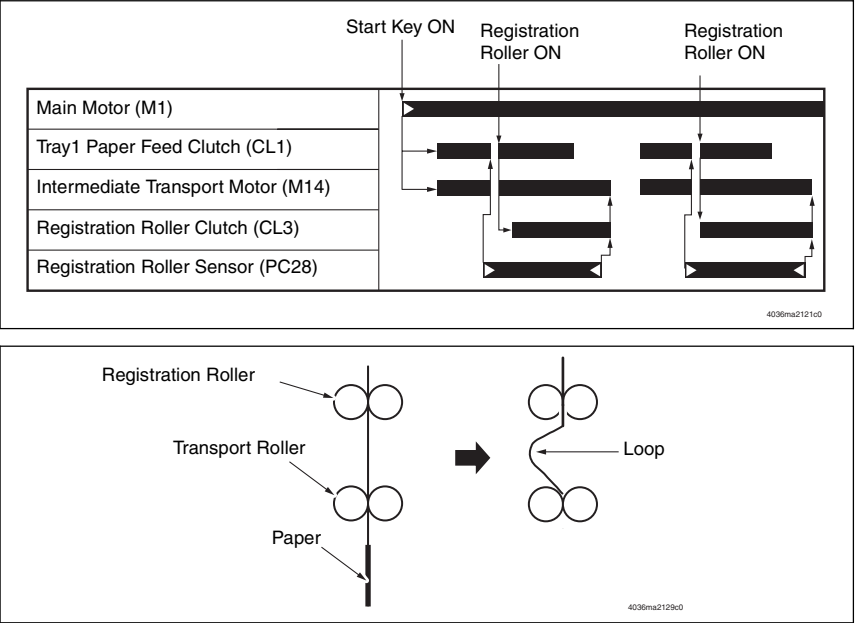
19.2 Drive



19.3 Operation

19.3.1 Registration Roller control

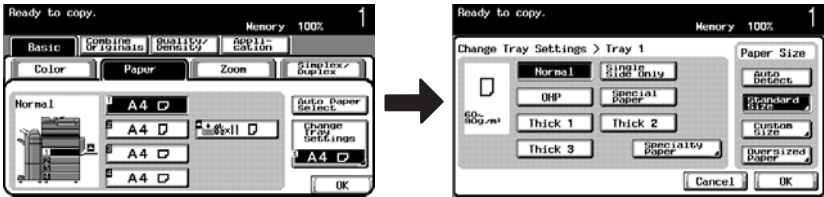
- A loop is formed in the paper between the Transport Roller and Registration Roller during the paper transportation to correct skewed paper feeding. The amount of the paper loop can be adjusted using "Loop Adjust" of the Tech. Rep. mode. The ON timing of the Intermediate Transport Motor as the motor is restarted is varied by changing this setting. (This adjustment should be made when a tilted image is printed due to paper skew or a Z-folded paper misfeed occurs at the Registration Roller.)
- "Top Margin" available from the Tech. Rep. mode should be adjusted based on the image writing start timing. (This adjustment should be made if the image on the copy deviates in the FD direction.)



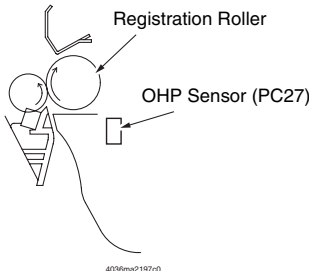
19.3.2 OHP detection

- To prevent failed prints of OHP film, whether or not the paper type fed through is a piece of OHP film is detected using the OHP Sensor.
- OHP detection is made after a loop has been formed in the paper at the Registration Roller. If the paper type setting made on the control panel does not match the results of OHP detection, the machine stops copying and gives a paper misfeed warning display.

Position on Paper Type Setting Dial or paper type set from control panel	Results of OHP Sensor (PC27) Detection	Operation
OHP	Other than OHP	Determines that there is mismatch of paper type, bringing all mechanisms to an immediate stop. Gives a warning message that there is mismatch of paper type on the display.
Other than OHP	OHP	



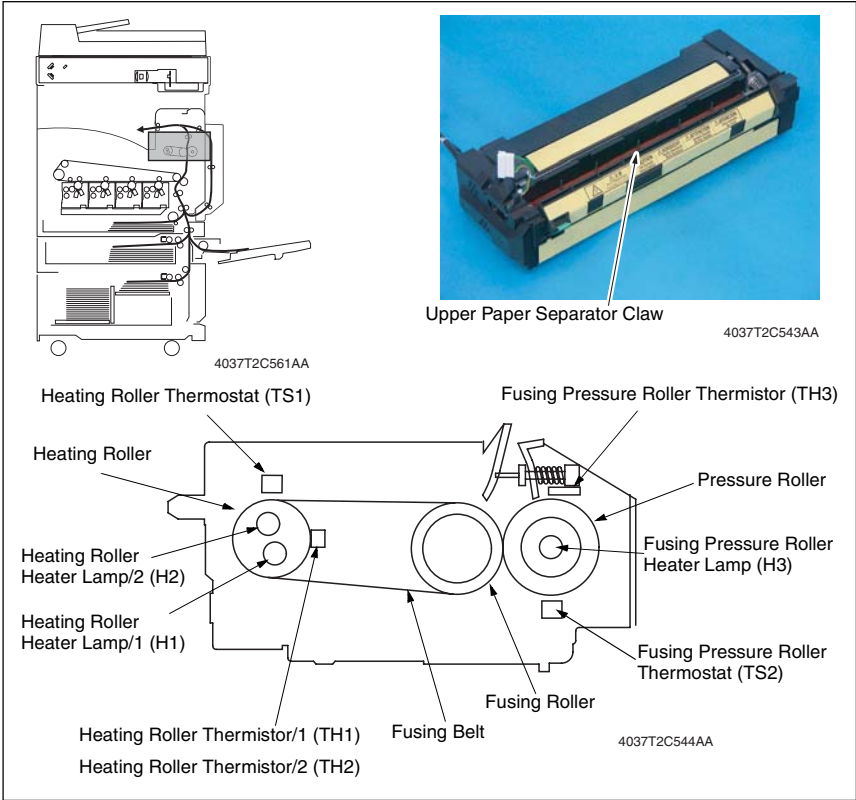
4037T2E605AA



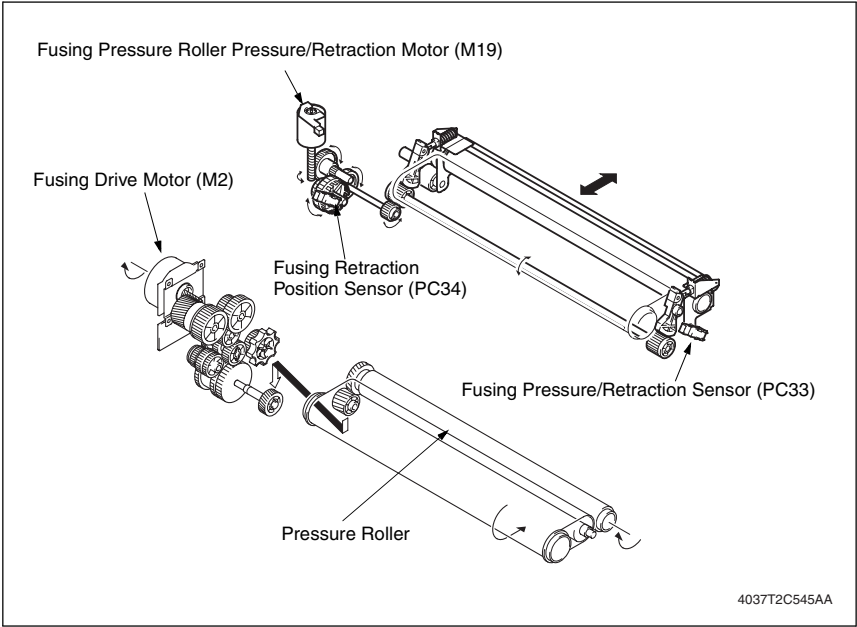
4036ma2197c0

20. Fusing section

20.1 Composition



20.2 Drive



20.3 Operation

20.3.1 Fusing Roller drive control

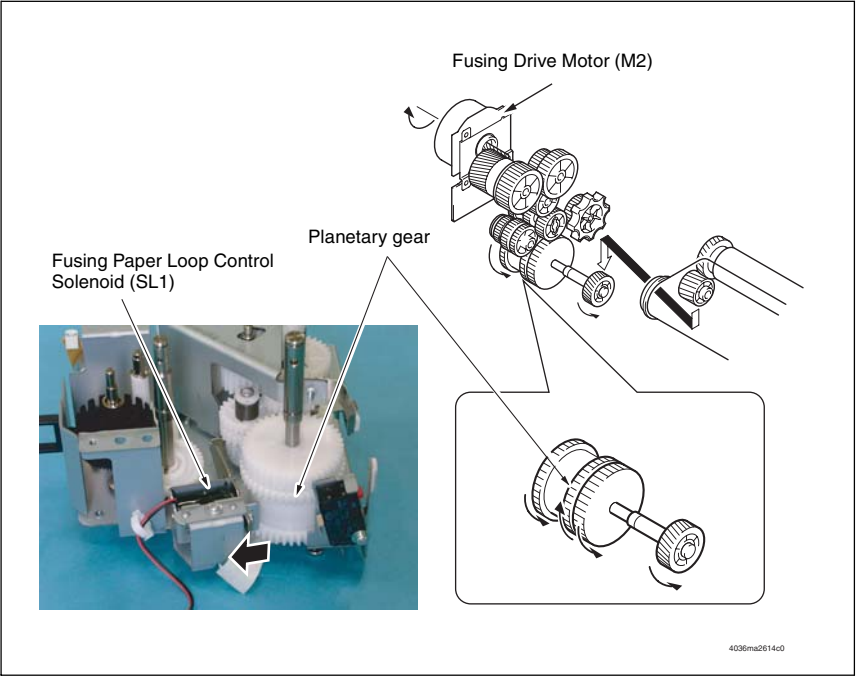
A. Speed change control

- Drive for the Fusing Unit is provided by the Fusing Drive Motor.
- To prevent poor fusing performance, the speed of the Fusing Drive Motor is changed in three steps according to the type of paper used and the copy mode.

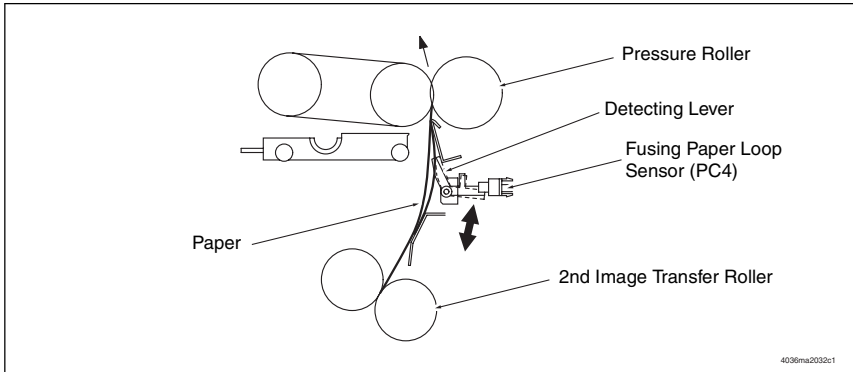
Paper Type/Copy Mode	Fusing Speed (mm/sec)
Plain paper/Monochrome	215
Plain paper/ACS or color	165
Special paper, high gloss paper	60

B. Speed stabilization

- To prevent double transferred image or brush effect, the difference between the fusing speed and paper transport speed during image transfer is corrected.
- The fusing speed is made either faster or slower than the system speed.
- The two-step speed control is accomplished using the Fusing Paper Loop Control (solenoid) and planetary gears. When the Fusing Paper Loop Control (solenoid) is deenergized, the planetary gears rotate, which sets lower speed. When the solenoid is energized, the planetary gears stop and the higher speed is selected.

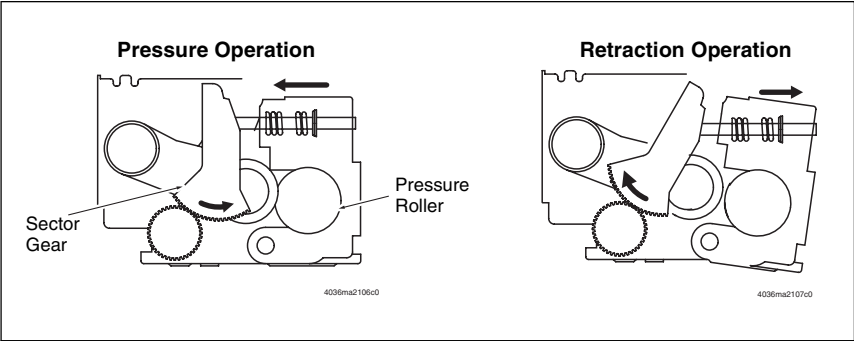


1. The fusing speed in the beginnings is set to the higher speed, thereby forming a loop in the paper between the 2nd Image Transfer Roller and the Fusing Roller.
2. When the length of the loop becomes small to deactivate the Fusing Paper Loop Sensor, the fusing speed is switched to the lower level.
3. When the length of the loop becomes large to activate the Fusing Paper Loop Sensor, the fusing speed is again switched to the higher level.
4. The sequence of these operations is repeated so that the fusing speed is automatically changed in two steps according to the loop length. This effectively makes for the difference between the fusing speed and paper transport speed during image transfer.



20.3.2 Fusing Roller pressure/retraction mechanism

- To ensure prolonged durability of the Fusing Belt, the Pressure Roller is retracted from the Fusing Belt during any time other than a print cycle. (The roller is, however, retracted during a print cycle using envelopes.)
- The Fusing Pressure Roller Pressure/Retraction Motor is turned forward or backward to press the Pressure Roller up against, and retract it from, the Fusing Belt.
- The Fusing Pressure/Retraction Sensor detects the pressed position of the Pressure Roller. The retracted position of the Pressure Roller is determined by counting a predetermined number of encoder pulses from the pressed position using the Fusing Retraction Position Sensor.
- In reality, the retracted position is where the Pressure Roller is lightly pressed against the Fusing Belt.



• Pressure/Retraction Timing

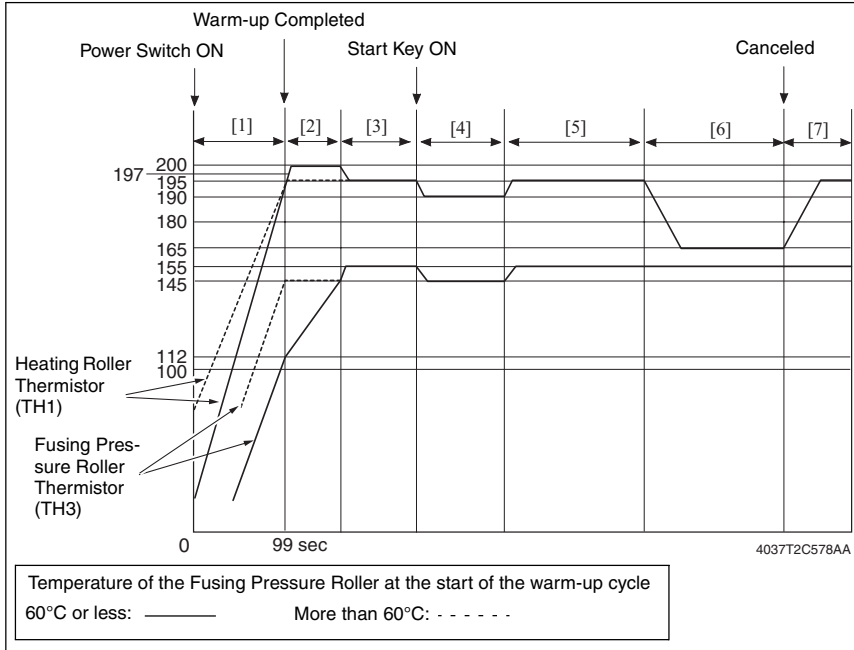
Conditions		Pressure/Retraction Operation
Power Switch ON	Not retracted position	Pressure → Retraction
Warm-up	Heater less than 100 °C	Retraction
	Heater 100 °C or more	Retraction → Pressure
	At end	Pressure → Retraction
Standby	—	Retraction
Copy *1	At start	Retraction → Pressure
	At end	Pressure → Retraction
Power Save mode ON	—	Retraction
Heater OFF (cover open, malfunction, etc.)	—	Retraction

*1: Retracted (lightly pressed) condition for envelopes

20.3.3 Fusing temperature control

- The surface temperatures of the Heating Roller and Pressure Roller are detected using thermistors and the corresponding Heater Lamps are turned ON or OFF as necessary to maintain the set fusing temperature.

Temperature Control during the first-in-the-morning warm-up and setting using plain paper



During the warm-up cycle

Heating Roller temperature: 197°C *1

- [1] Fusing Pressure Roller temperature: 112°C *1

*1: If the temperature of the Fusing Pressure Roller at the start of the warm-up cycle is 60°C or less.

In standby state

Heating Roller temperature: 200°C *2

- [2] Fusing Pressure Roller temperature: 145°C

*2: If the temperature of the Fusing Pressure Roller at the start of the warm-up cycle is 60°C or less.

In standby state (if the temperature of the Fusing Pressure Roller exceeds 145°C after the warm-up cycle has been completed)

- [3] Heating Roller temperature: 200°C -> 195°C *3

Fusing Pressure Roller temperature: 145°C -> 155°C *3

*3: If the temperature of the Fusing Pressure Roller at the start of the warm-up cycle is 60°C or less

During a copy cycle

Heating Roller temperature: 190°C *4

- [4] Fusing Pressure Roller temperature: 145°C *4

*4: For plain paper/color copy

In standby state

Heating Roller temperature: 195°C

- [5] Fusing Pressure Roller temperature: 155°C

- [6] Power Save

- [7] In standby state

A. Warm-up

- Four different types of warm-up control are employed for varying the set temperature of each roller, thereby preventing fusing performance from being degraded due to environmental changes.
- Priority is given to the high humidity control.

Warm-up completed state	Heating Roller Temperature (°C)	Pressure Roller Temperature (°C)	Remarks
First-in-the-morning warm-up completed (Fusing Pressure Roller temperature is 60 °C or less)	197	112	If a multi-print cycle is run immediately after the warm-up cycle has been completed, the machine produces one printed page only and resumes the print cycle for the rest of printed pages to be produced after the Fusing Pressure Roller temperature reaches 130 °C.
Ordinary warm-up completed (Fusing Pressure Roller temperature exceeds 60 °C)	195	145	-
High humidity warm-up completed (machine interior humidity is 70 % or more)	195	155	Priority is given to this mode if the humidity is 70% or more.
Recovery from Power Save	195	-	Temperature control during Power Save is 165 °C for the Heating Roller and 155 °C for the Fusing Pressure Roller.

B. During a copy cycle

- To achieve the intended level of fusing performance, the set temperature of each roller is varied according to the paper type.

Paper Type	Heating Roller Set Temperature (°C)	Pressure Roller Set Temperature (°C)
Plain paper (215 mm/s)	195	145
Plain paper (165 mm/s)	190	145
Plain paper (60 mm/s)	160	130
2nd side plain paper (215 mm/s)	185	145
2nd side plain paper (165 mm/s)	185	145
2nd side plain paper (60 mm/s)	160	130
Thick paper 1	175	130
Thick paper 2	185	130
Thick paper 3	185	130
2nd side thick paper 1	170	130
2nd side thick paper 2	175	130
2nd side thick paper 3	175	130
Envelopes	185	130
OHP (when the absolute humidity or the machine interior temperature is at the threshold value or less)	190	170
OHP (when the absolute humidity or the machine interior temperature exceeds the threshold value)	170	160

*: The temperature threshold value of OHP is absolute humidity 18 g/m³.

*: The machine interior temperature threshold value of OHP is 16 °C.

C. In standby

- The fusing temperature in the standby state is prevented from being dropped.

Standby state		Heating roller temperature (°C)	Pressure roller temperature (°C)
When the pressure roller temperature is over 60 °C at the start-up of warm-up		195	145
When the pressure roller temperature is 60 °C or less at the start-up of warm-up	The pressure roller temperature is less than 145 °C during warm-up	200	145
	The pressure roller temperature is between 145 °C and 165 °C during warm-up	195	155
Machine interior humidity 70% or higher (high humidity)		195	155

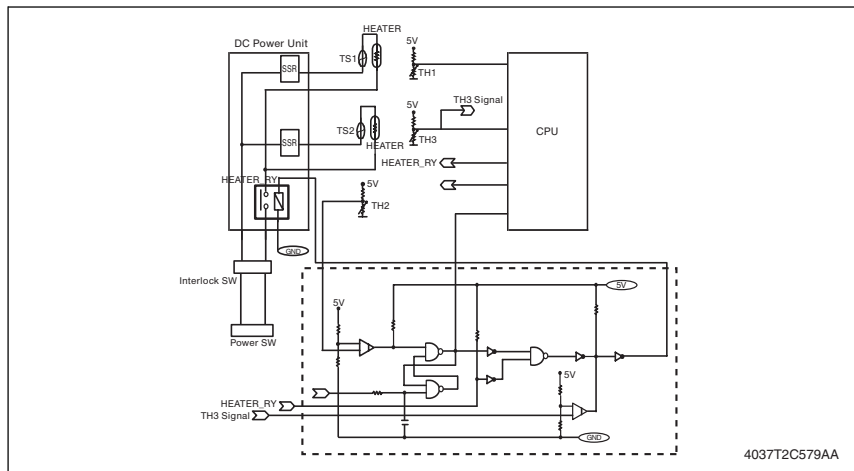
D. Power Save

- Temperature control is provided with a decreased fusing temperature so that power consumption in the standby state can be minimized.

Mode	Heating Roller Set Temperature (°C)	Pressure Roller Set Temperature (°C)
Power Save	165	155

20.3.4 Protection against abnormal conditions

- The machine provides the machine provides protection against abnormally high temperature of the Fusing Unit in the following three steps.
 1. When the Heating Roller Thermistor/1 detects 245°C, or the Fusing Pressure Roller Thermistor detects 205°C (before the temperature control) or 230°C (during the temperature control), the machine displays the malfunction code representing an abnormally high temperature and prohibits the initiation of a new copy cycle. (This is an ordinary detection of a malfunction of an abnormally high temperature.)
 2. A different protection is provided when the CPU overruns, becoming unable to detect the malfunction of an abnormally high temperature. If the Heating Roller Thermistor/1, 2 detects 250°C, or the Fusing Pressure Roller Thermistor detects 235°C, the heater relay of the DC Power Supply is turned OFF through the Control Board. Power supply to each of the heater lamps is then shut down.
If the temperature detected by the Heating Roller Thermistor/1 and Fusing Pressure Roller Thermistor thereafter decreases, the heater relay is turned ON again and supply of power to the heater lamps is resumed. The sequence of these operations is repeated until the CPU recovers from the overrun and becomes able to detect the malfunction of an abnormally high temperature. This control allows the power supply to each of the heater lamps to be shut down before the corresponding thermostat operates. Heating Roller Thermistor/2 is, however, protected: it turns ON the heater relay only after the power switch is turned OFF and ON or the malfunction is reset. Through these control procedures, the power supply to the heater lamps can be shut down before the thermostat is activated. It thereby suppresses damage to the Fusing Unit itself.
 3. If detection of the abnormally high temperature through approaches 1 and 2 above is not possible due to a defective thermistor or other reason, the thermostat comes into play to shut down the power supply to each of the heater lamps. The Heating Roller Thermostat is rated at 210°C, while the Fusing Pressure Roller Thermostat is rated at 180°C. The ratings do not, however, 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. (Ordinary protection against high temperatures)



20.3.5 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 Power Switch is turned ON or the Right Door is opened and closed.

20.3.6 PPM control

- PPM (printed pages/min.) control is provided to ensure the condition of one power outlet for one system and, at the same time, good fusing performance during continuous paper feeding.
- Only the Heating Roller Heater Lamp is preferentially turned ON during a print cycle. In a continuous print cycle, therefore, the surface temperatures of the Heating Roller and Fusing Pressure Roller decrease, resulting in the fusing performance of the printed image being degraded. Fusing performance is therefore estimated based on the surface temperature of the Pressure Roller. The printed pages/min value is decreased according to the paper length and system speed, thereby achieving the intended level of fusing performance of the printed images (toner).

A. Plain paper

- When the surface temperature of the Fusing Pressure Roller is a predetermined temperature or less with the machine interior temperature at 18°C or less, PPM (printed pages/min) is decreased.

System Speed	Paper Length (mm)	Printed pages/min (PPM) when the Fusing Pressure Roller temperature is decreased		
		Standard temperature	135 °C or less	125 °C or less
215 mm/sec Color print	216 or less	45	40	36
	217 to 297 inclusive	34	30	27
	298 to 381 inclusive	27	24	21
	382 to 432 inclusive	24	21	19
165 mm/sec Monochrome print	216 or less	35	31	28
	217 to 297 inclusive	26	23	21
	298 to 381 inclusive	21	18	17
	382 to 432 inclusive	19	17	15

B. Color OHP

- Different types of PPM control are provided according to the mode, regardless of the interior temperature or the Pressure Roller surface temperature during the print cycle.
- The control does not cover the monochrome mode and any paper size other than A4 and Letter.

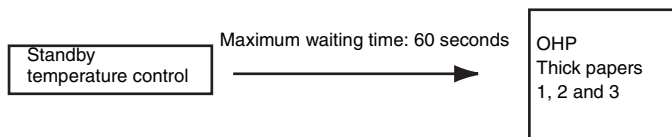
Mode	Printed pages/min (PPM) of A4 and Letter
OHP continuous paper feed mode	8
OHP + OHP Interleave mode *1	5

*1: PPM control is provided only when OHP transparencies are fed through the machine for OHP + OHP Interleave.

20.3.7 Wait Control While Using OHP or Thick Paper

- When using OHP (OHP interleaves), thick papers 1, 2 and 3, a control system is provided to delay printing operation until the fusing temperature reaches the print control temperature as the exit roller marks are imprinted on the papers if the papers pass immediately after standby temperature control.
- If the temperature at the start of a print cycle is higher than the Heating Roller temperature setting, the heater lamp is turned OFF and the Fusing Drive Motor is energized.
- If the temperature at the start of a print cycle is lower than the Heating Roller temperature setting, the heater lamp is turned ON.
- When it does not reaches the imprint set temperature after 60 seconds at the maximum, release WAIT and start printing operation.

* The same Wait Control is carried out for the Glossy Mode.



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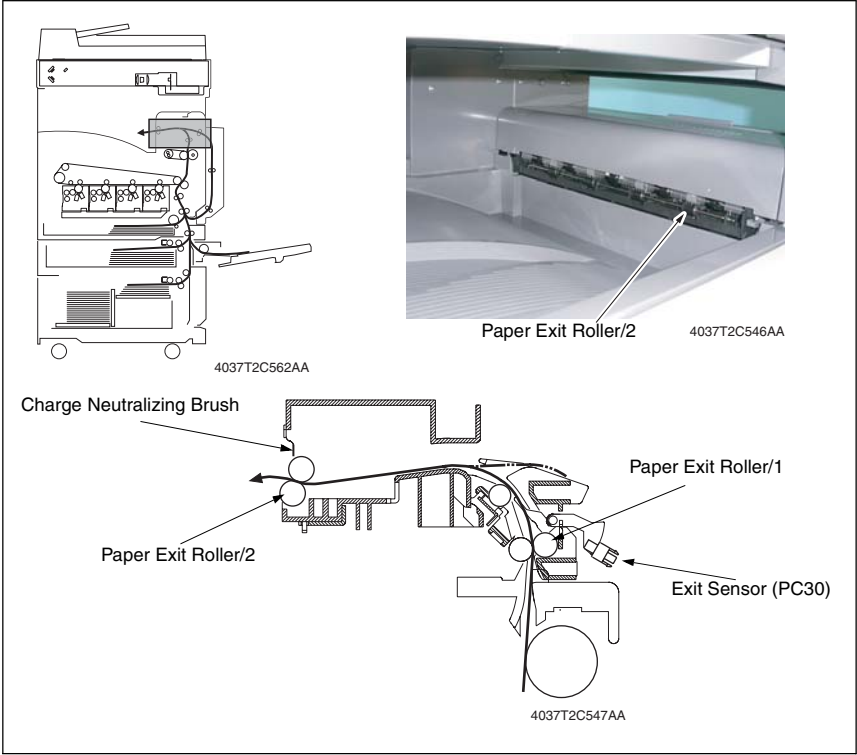
20.3.8 WAIT control under low temperature environment

- In case of monochrome print (system speed:215 mm/s), the pressure roller temperature is maintained by delaying the feeding timing of the 1st paper for a set time to secure the intended level of fusing performance.

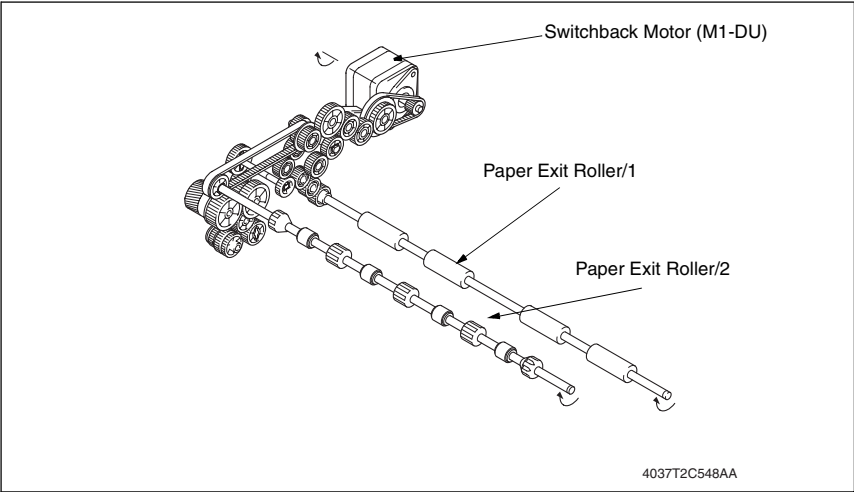
Low temperature environment	18 °C or less
Delayed time of paper feeding timing	6 sec.

21. Paper exit section

21.1 Composition



21.2 Drive



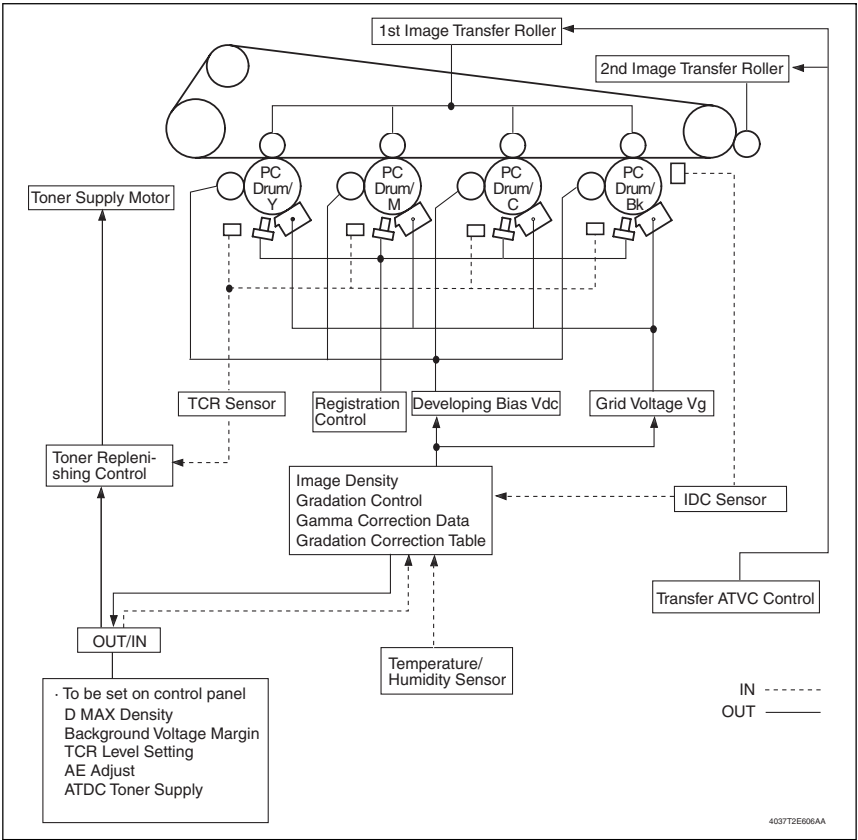
22. Image stabilization control

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 intensity control - Max. density control - Registration control (color shift correction) - Gamma correction control	IDC Sensor Temperature/Humidity Sensor
To stabilize toner density	TCR control (Y, M, C, K)	TCR Sensor
To stabilize image transfer	- Image transfer output control 1st image transfer ATVC 2nd image transfer ATVC	Temperature/Humidity Sensor

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



22.2 Operation

22.2.1 IDC Sensor LED intensity control

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

22.2.2 Max. density control

- The developing bias (Vdc) is adjusted to control changes in the solid density resulting from variations in developing characteristics and LED 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 Sensor detects the amount of toner sticking to them.
- The correction data appropriate for each color is selected based on the correction data with four different levels for each color.
- The developing bias and grid voltage values that result in the maximum density are calculated from the detected data 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 Gamma correction control

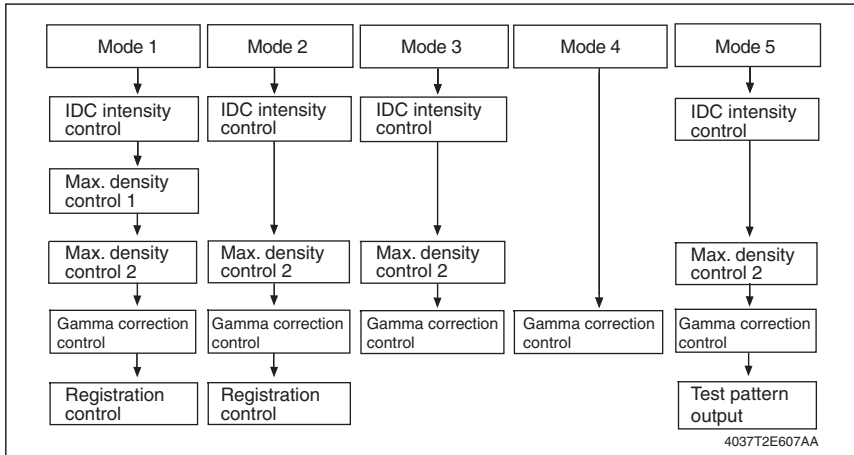
- The intensity of LED in all gradation levels is adjusted to correct changes in gradation characteristics to a linear one. The changes in gradation characteristics are caused by variations in the PC Drum sensitivity and developing characteristics and changes with time and in environment.
- Patterns are produced on the surface of the Transfer Belt and the IDC Sensor detects the amount of toner sticking to them.
- The Gamma correction data is calculated using the density measurements of different gradation levels. The optimum LED intensity is set for each of the different gradation levels.

22.3 Operation timing

Mode	Operation Timing
Mode 1	Reset + Stabilizer mode; a new IU is detected; a new Transfer Belt Unit is detected
Mode 2	Stabilizer mode; Left Door is opened and closed; Front Door is opened and closed (IU removed and reinstalled)
Mode 3	At the end of a print cycle making a given number of printed pages*1; Power Switch is turned ON; at the end of a print cycle following reset from Sleep; at the end of a print cycle following an event, in which the interior temperature upper limit threshold value is exceeded
Mode 4	At the end of a print cycle making a given number of printed pages
Mode 5	Gradation correction

*1: Vg and Vdc are readjusted if the gamma correction data falls outside a predetermined range during the last image stabilization control.

22.4 Operation flow



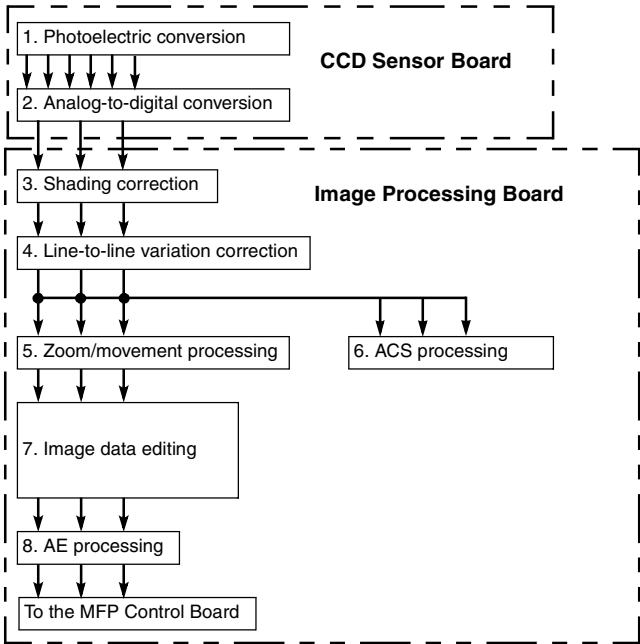
* The ATVC control is performed simultaneously with the IDC intensity control.

* Max. density control 1: A pattern is produced on the Transfer Belt using the Vdc data of four different levels as reference for each color and the adequate Vdc is thereby set.

Max. density control 2: A pattern is produced on the Transfer Belt using the Vdc data of four different levels with reference to the Vdc data used last and the adequate Vdc is thereby set.

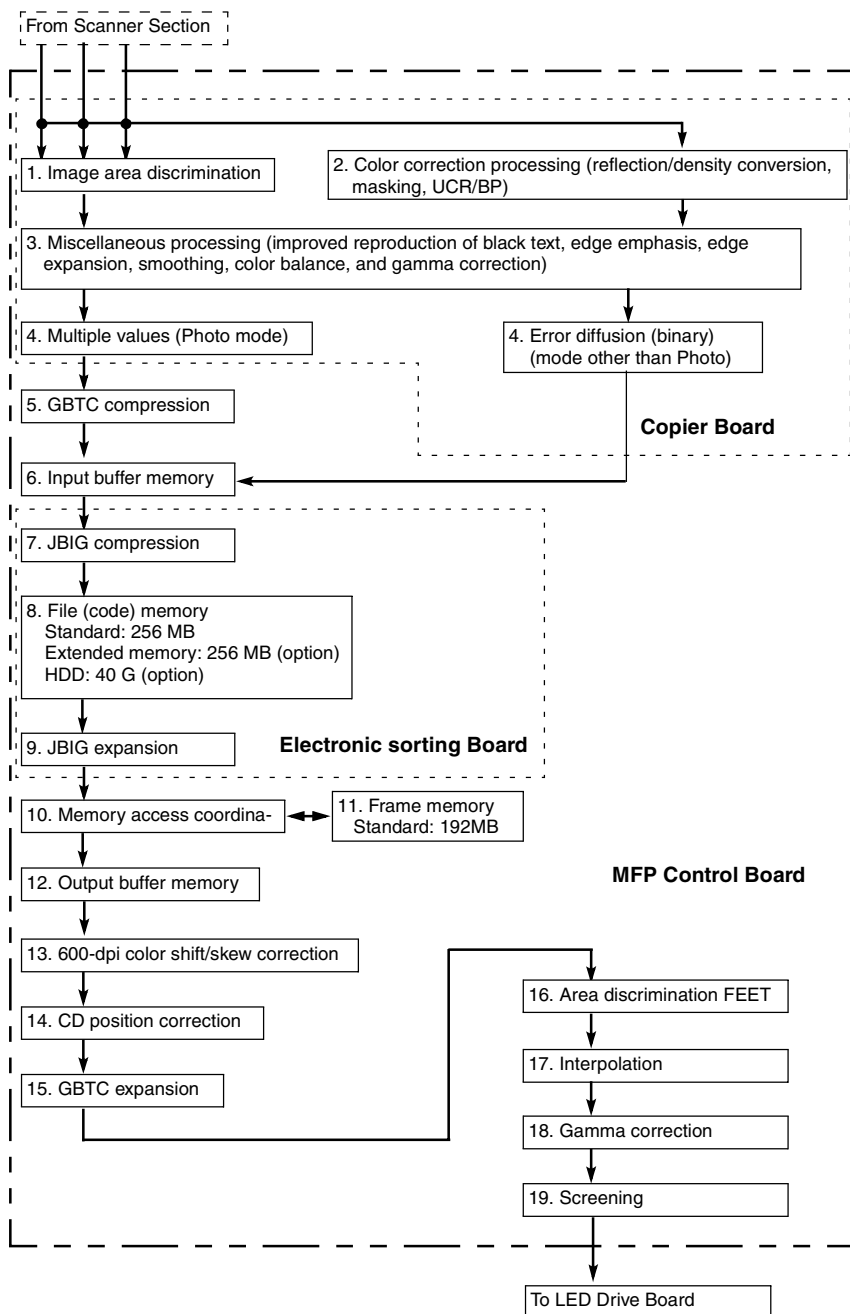
23. Image processing

23.1 Scanner section image processing block diagram



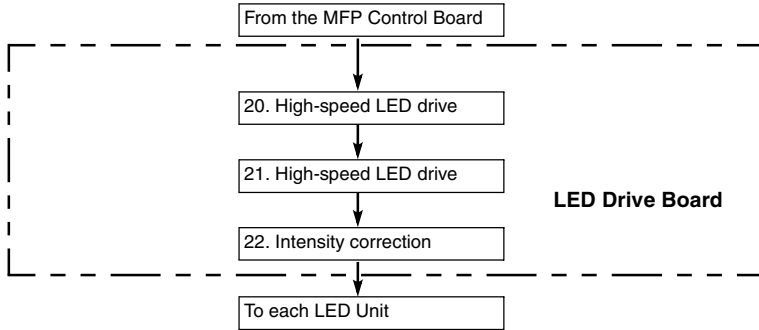
- The following detail the image processing operations performed by the Scanner Section.
 1. A reduction type CCD Sensor is used to read the light reflected off the original and convert the optical data to a corresponding electric signal. To make data processing faster, data transfer and output are done 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.
 5. FIFO memories are used to enlarge or reduce the image. The image is enlarged by increasing the number of data readings and reduced by decreasing the number of data readings.
 6. 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.
 7. R, G, and B data are then converted to value and color component data for adjustments of saturation, lightness, and hue.
 8. The scanning area is divided into two in the FD direction. The lightness histogram generated through ACS processing is tallied for each four gradation levels. A lightness histogram is then created for AE processing. The AE level of the original is determined based on this histogram and AE processing is performed.
- The R, G, and B image data is transmitted to MFP Control Board on the Write Section through the interface cable.

23.2 Write section image processing block diagram 1



- The following detail the image processing operations performed by MFP Control Board on the Write Section.
 1. Each image area, whether it is a color edge area, black edge area, dot area, or a continuous gradation area, is discriminated to optimize edge emphasis and smoothing just right for the image.
 2. The color component data are converted to the Y, C, M, 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.
 3. Other types of processing performed are the improved reproduction of black text, edge emphasis, edge expansion, smoothing, color balance, and gamma correction.
 4. In Photo mode, 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.
 5. Each of Y, M, C, and K image data is compressed to reduce data volume only in the Photo mode.
 6. Temporarily stores the GBTC-compressed image data.
 7. The stored image data is compressed in the JBIG (Joint Bi-level Image experts Group) format.
 8. Stores the compressed image data.
 9. The image data read from the file memory is uncompressed through a method in a reverse way of JBIG compression.
 10. Spreads out the image data stored in the file memory to the frame memory and performs the following control functions: delaying outputs to make up for the distance between the PC Drums of Y, M, C, and K and adjusting the different speeds between the Scanner and the Write Section.
 11. Stores the Y, M, C, and K image data.
 12. Temporarily stores the image data output from the frame memory.
 13. Corrects skew in the print position at 600 dpi to ensure correct alignment in the main scanning direction between each of the Y, M, C, and K LPH assemblies and the PC Drums.
 14. Corrects any deviation in the print start position in the main scanning direction that occurs when each of the Y, M, C, and K LPH assemblies illuminates the surface of the corresponding PC Drum.
 15. Expands the image data using the method opposite to that used in GBTC compression.
 16. Discriminates the edges of text and line figures and, according to the results of the area discrimination, performs the Fine Edge Enhanced Technology (FEET) operation.
 17. In order to prevent the gradation balance from changing, interpolation converts the resolution only for the continuous gradation areas when resolution changes from 600 dpi to 1,800 dpi when using FEET.
 18. 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.
 19. Creates the density distribution of a predetermined pattern to enable outstanding gradation reproduction.

23.3 Write section image processing block diagram 2

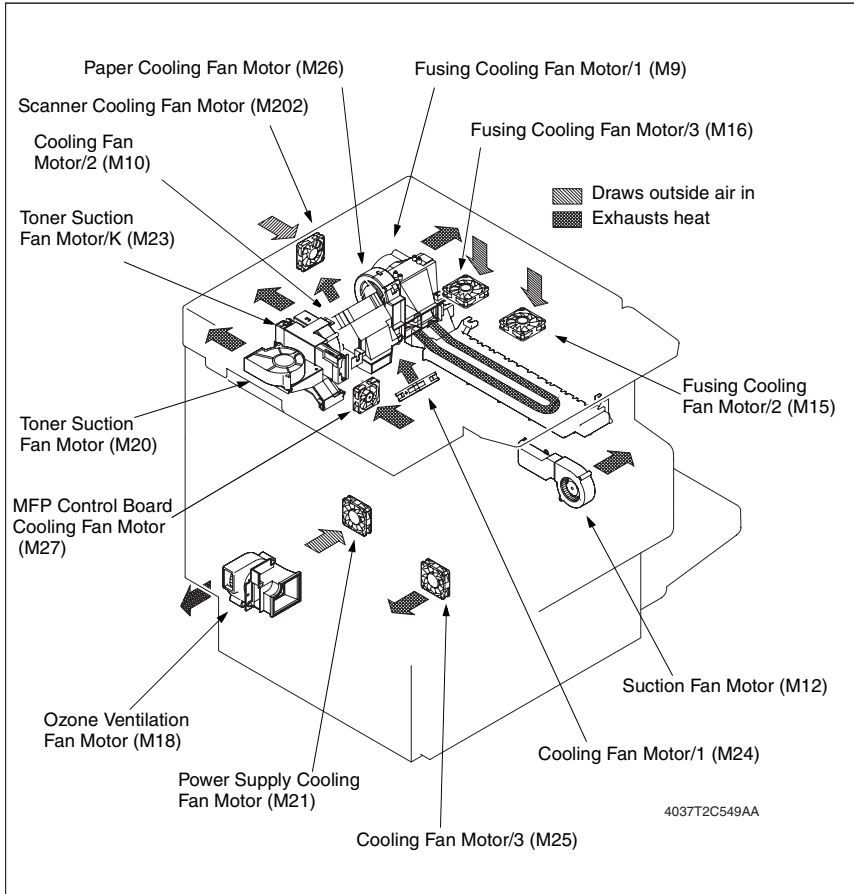


20. Corrects skew in the print position at 1,800 dpi to ensure correct alignment in the main scanning direction between each of the Y, M, C, and K LPH assemblies and the PC Drums.
21. Rearranges the image data, which has undergone the processes up to screening, so that the LEDs can then be illuminated and transfer the corrected image data.
22. Adjusts the variations in each of the LEDs, approx. 7,700 chips, to ensure that each emits a uniform intensity of light.

24. Other control

24.1 Fan control

24.1.1 Construction



24.1.2 Operation**A. Fan control**

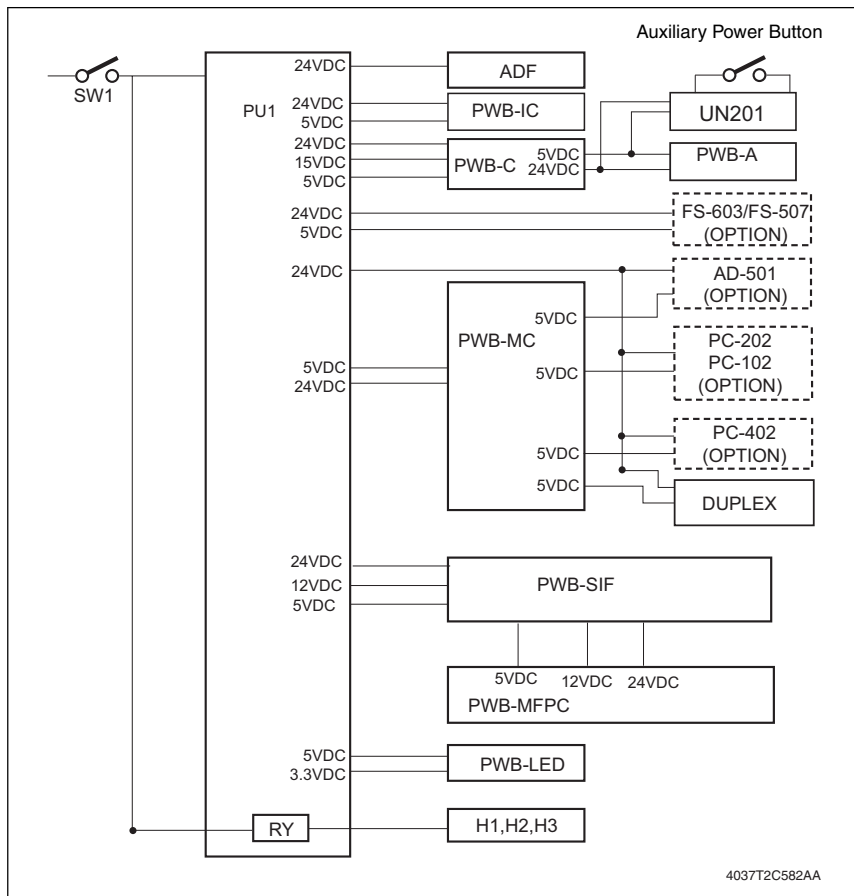
Motor Name	Paper Passage Mode	Control Conditions
Power Supply Cooling Fan Motor (M21)	—	• Turns at full speed when the Color PC Drum Motor (M5) or K PC Motor (M7) is energized • Turns at half speed when the Color PC Drum Motor (M5) or K PC Motor (M7) is deenergized • Deenergized in Sleep mode
Ozone Ventilation Fan Motor (M18)	—	• Turns at full speed when the Color PC Drum Motor (M5) or K PC Motor (M7) is energized • Turns at full speed for the period from 0 to 120 sec. after the Color PC Drum Motor (M5) or K PC Motor (M7) has been deenergized • Turns at half speed for the period from 121 to 900 sec. after the Color PC Drum Motor (M5) or K PC Motor (M7) has been deenergized and then is deenergized. • Deenergized in conditions other than above
Toner Suction Fan Motor (M20)	—	• Turns at full speed when either the Color PC Drum Motor (M5) or Color Developing Motor (M6) is energized • Deenergized in conditions other than above
Toner Suction Fan Motor/K (M23)	-	• Turns at full speed when either the K PC Motor (M7) or Developing Clutch/K (CL2) is energized • Deenergized in conditions other than above
Fusing Cooling Fan Motor/2 and /3 (M15 and M16)	OHP or OHP interleaves	• Turns at full speed when the Main Motor (M1) is energized • Turns at full speed for the period of 10 sec. after the Main Motor (M1) has been deenergized
	Mode other than above	• Turns at full speed when the Main Motor (M1) is energized and the Exit Sensor (PC 30) is activated • Turns at full speed for 10 sec. after the Main Motor (M1) has been deenergized
	In standby	• Turns at half speed
Suction Fan Motor (M12)	—	• Turns at full speed when either the Main Motor (M1) or Fusing Drive Motor (M2) is energized • Turns at full speed for 30 sec. after the Main Motor (M1) and Fusing Drive Motor (M2) have been deenergized and then is deenergized
Cooling Fan Motor/2 (M10)	—	• Turns at half speed 30 sec. after the above event
Fusing Cooling Fan Motor/1 (M9)	—	• Turns at full speed when the Main Motor (M1) and Fusing Drive Motor (M2) are energized • Turns at full speed for 30 sec. after the Main Motor (M1) and Fusing Drive Motor (M2) have been deenergized and then is deenergized
	—	• Turns at half speed 30 sec. after the above event

Motor Name	Paper Passage Mode	Control Conditions
Paper Cooling Fan Motor (M26)	OHP or OHP interleaves	• Turns at full speed if the machine interior temperature exceeds 16°C when the Main Motor (M1) is energized and the Exit Sensor (PC30) is activated • Deenergized if the machine interior temperature is 16°C or less when the Main Motor (M1) is energized and the Exit Sensor (PC30) is activated • Turns at full speed for 10 sec. after the Main Motor (M1) has been deenergized if the Main Motor (M1) is deenergized and the machine interior temperature exceeds 16°C • Deenergized when the Main Motor (M1) is deenergized if the Main Motor (M1) is deenergized and the machine interior temperature is 16°C or less
	Mode other than above	• Turns at half speed when the Main Motor (M1) is energized and the Exit Sensor (PC30) is activated *1 • Turns at half speed for 10 sec. after the Main Motor (M1) has been deenergized *1 *1: Operation can be switched between full speed and half speed by selecting the Cooling Fan Speed function available from the Service Mode.
Cooling Fan Motor/1 (M24)	-	• Turns at full speed when either the Main Motor (M1) or Fusing Drive Motor (M2) is energized • Turns at full speed for 30 sec. after the Main Motor (M1) and Fusing Drive Motor (M2) have been deenergized, and then turns at half speed
	-	• Deenergized 30 sec. after the above event
Cooling Fan Motor/3 (M25)	-	• Turns at full speed when either the Main Motor (M1) or Fusing Drive Motor (M2) is energized • Turns at full speed for 30 sec. after the Main Motor (M1) and Fusing Drive Motor (M2) have been deenergized, and then turns at half speed
	-	• Deenergized 30 sec. after the above event
Scanner Cooling Fan Motor (M202)	-	• Turns at full speed while the Exposure Lamp (FL201) remains ON
MFP Control Board Cooling Fan Motor (M27)	-	• Turns at full speed while the power remains ON

24.2 Parts Operated When the Power Switch and Auxiliary Power Button are turned ON

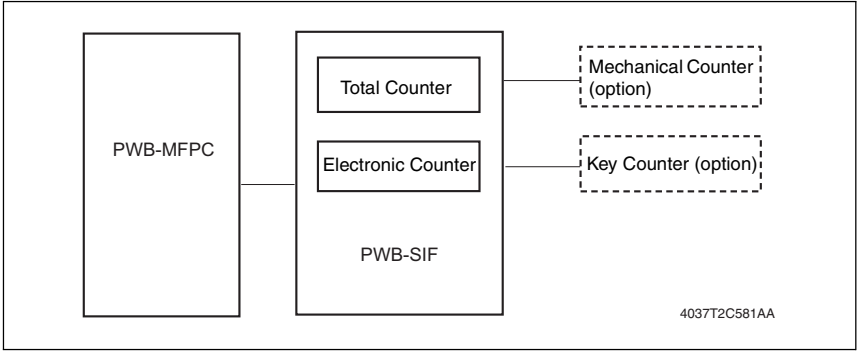
24.2.1 Parts operated when the Power Switch and Auxiliary Power Button are turned ON

- When the Auxiliary Power Button is turned ON, the Control Board detects it and sends a control signal to the DC Power Supply.
- The DC Power Supply then supplies 3.3V DC, 5V DC, 15V DC, and 24V DC to all PWBs and options. It also turns ON the relays in the PWBs, supplying AC power to each of the heater lamps.



24.3 Counter control

24.3.1 Construction



Name	Function/System
Total Counter	- Shows the cumulative number of copies made in all copy modes - A mechanical counter driven by an electric signal - Counts one when an exit signal is applied to it
Electronic Counter	- Displays the cumulative number of copies and prints made in each of the following copy and print modes - Black, full color, mono color, and 2 color - Total Counter, Size Counter, 2-Sided Copy Counter, 2-Sided Print Counter, and Scanner Counter - Counts one when an exit signal is applied to it
Mechanical Counter (option)	- Counter for exclusively counting monochrome copies - Since the Total Counter is available as standard, the number of color copies can be calculated by subtracting the Monochrome Counter count from the Total Counter count. - Counts one when an exit signal is applied to it
Key Counter (option)	- The counter that disables copying when counting the predetermined number of copies - 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



KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

Automatic Document Feeder

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A number within  represents the number of times the revision has been made.
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A number within  represents the number of times the revision has been made.

NOTE

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- 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.
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2005/03	1.0	—	Issue of the first edition
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Outline

1. Product specification

1.1 Type

Name	Duplexing Document Feeder	
Type	Paper Take-Up	Paper Take-Up from top of stack
	Transport	Endless Belt Transport Mode
	Turnover	Loop Turnover Mode
	Paper Exit	U-turn Turnover + Switchback U-Turn Turnover Mode (only in 1-Sided Mode)
Installation	Screw cramp to the main unit	
Document Alignment	Center	
Document Loading	Face up	

1.2 Functions

Modes	Standard Mode	1-Sided Mode / 2-Sided Mode
	Thick Paper Mode	1-Sided Mode
	Mixed Original Detection Mode	1-Sided Mode / 2-Sided Mode

1.3 Paper type

Type of Document	Standard Mode Plain Paper	1-Sided Mode 35 to 128 g/m ² (9.25 to 34 lb)
		2-Sided Mode 50 to 110 g/m ² (13.25 to 29.25 lb)
	Thick Paper Mode Plain Paper	1-Sided Mode 129 to 210 g/m ² (34.25 to 55.75 lb)
	Mixed Original Detection Mode Plain Paper	1-Sided / 2-Sided Mode 50 to 110 g/m ² (13.25 to 29.25 lb)
Detectable Document Size*1	Metric area: B6R to A3 Inch area : 5.5 × 8.5R / 5.5 × 8.5 to 11 × 17	
Capacity	Standard Mode / Mixed Original Detection Mode	Document Feed Table: 100 sheets (80 g/m ² , 21.25 lb)
		Original Exit Tray: 100 sheets (80 g/m ² , 21.25 lb)
	Thick Paper Mode	Document Feed Table: 38 sheets (210 g/m ² , 55.75 lb)
		Original Exit Tray: 38 sheets (210 g/m ² , 55.75 lb)

*1 For the Combined Original Detection Mode, Refer to the Mixed Original Detection Enabled Size Combination Table.

1.4 Paper feed prohibited originals

- If fed, trouble occurrence will be highly possible.

Type of Original	Possible Trouble
Sheets stapled or clipped together	Take-up failure, damaged sheet, defective drive mechanism due to jammed staples or clips
Sheets glued together	Take-up failure, damaged sheet
Sheets of 211 g/m ² (56.25 lb) or more	Take-up failure, Sheets misfed
Sheets of 110 g/m ² (29.25 lb) or more in 2-Sided Mode	Take-up failure, Sheets misfed
Sheets folded, torn or wrinkled	Take-up failure, damaged sheet
Sheets severely curled	Sheets misfed due to being dog-eared or fed in askew
OHP Film (Transparency Film)	Take-up failure, Sheets misfed
Label Paper	Take-up failure, Sheets misfed
Offset Master Paper	Take-up failure, Sheets misfed
Sheets clipped or notched	Damaged sheet, Sheets misfed
Sheets patched	Patched part folded or torn sheet, Sheets misfed

1.5 Paper feed not guaranteed originals

- If fed, paper feed will be possible to some extent but trouble occurrence will be possible.

Type of Original	Possible Trouble
Sheets lightly curled (Curled amount: 10 - 15 mm)	Dog-eared, exit failure
Heat Sensitive Paper	Edge folded, exit failure, transport failure
Ink Jet Paper	Take-up failure, transport failure
Sheets with smooth surface (Coated Paper)	Take-up failure, transport failure
Intermediate paper	Take-up failure, transport failure
Paper immediately after paper exit from the main unit	Take-up failure, transport failure
Paper with many punched holes (e.g., loose leaf) limited to vertical feeding	Multi-page feed due to flashes from holes
Sheets with 2 to 4 holes	Transport failure
Sheets two-folded or Z-folded (A3, B4 or 11 × 17)	Transport failure, image deformation
Sheets with rough surface (e.g., letterhead)	Take-up failure
Sheets penciled	Contamination
Sheets folded	Image deformation, multi-page feed, take-up failure
Sheets other than detectable-size sheets	Image deficit
Sheets of less than 35 g/m ² (9.25 lb)	Take-up failure

1.6 Mixed original feed chart

For Metric

	Max. Original Size	297 mm		257 mm		210 mm		182 mm	148 mm
Mixed Original Size		A3	A4	B4	B5	A4R	A5	B5R	A5R
297 mm	A3	OK	OK	-	-	-	-	-	-
	A4	OK	OK	-	-	-	-	-	-
257 mm	B4	OK	OK	OK	OK	-	-	-	-
	B5	OK	OK	OK	OK	-	-	-	-
210 mm	A4R	OK*	OK*	OK	OK	OK	OK	-	-
	A5	NG	NG	OK	OK	OK	OK	-	-
182 mm	B5R	NG	NG	OK*	OK*	OK	OK	OK	-
148 mm	A5R	NG	NG	NG	NG	NG	NG	OK	OK

For Inch

	Max. Original Size	11		8.5			5.5
Mixed Original Size		11 × 17	8.5 × 11	8.5 × 14	8.5 × 11R	5.5 × 8.5	5.5 × 8.5R
11	11 × 17	OK	OK	-	-	-	-
	8.5 × 11	OK	OK	-	-	-	-
8.5	8.5 × 14	OK*	OK*	OK	OK	OK	-
	8.5 × 11R	OK*	OK*	OK	OK	OK	-
	5.5 × 8.5	NG	NG	OK	OK	OK	-
5.5	5.5 × 8.5R	NG	NG	NG	NG	NG	OK

OK	Mixed Original Feed available (Tilted with in 1.5 % or less)
NG	NO. Mixed Original Feed
-	Can not Set Original
*	Tilted with in 2 % or less is 80 %

1.7 Machine specifications

Power Requirements	DC24V (supplied from the main unit)
	DC5V (generated within the Automatic Document Feeder)
Max. Power Consumption	60 W or less
Dimensions	586 mm (W) × 519 mm (D) × 135 mm (H) 23 inch (W) × 20.5 inch (D) × 5.25 inch (H)
Weight	14.2 kg (31.25 lb)

1.8 Operating environment

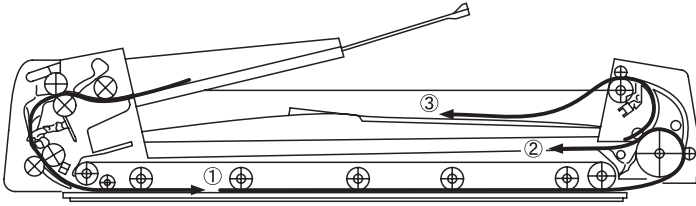
Conforms to the operating environment of the main unit.

NOTE

- These specifications are subject to change without notice.

2. Paper Feed Path

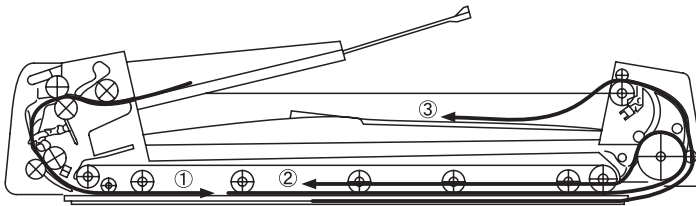
2.1 1-Sided Mode



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1: Document feed (1st side scanned) 2: Conveyance, Reverse 3: Document exit

2.2 2-Sided Mode

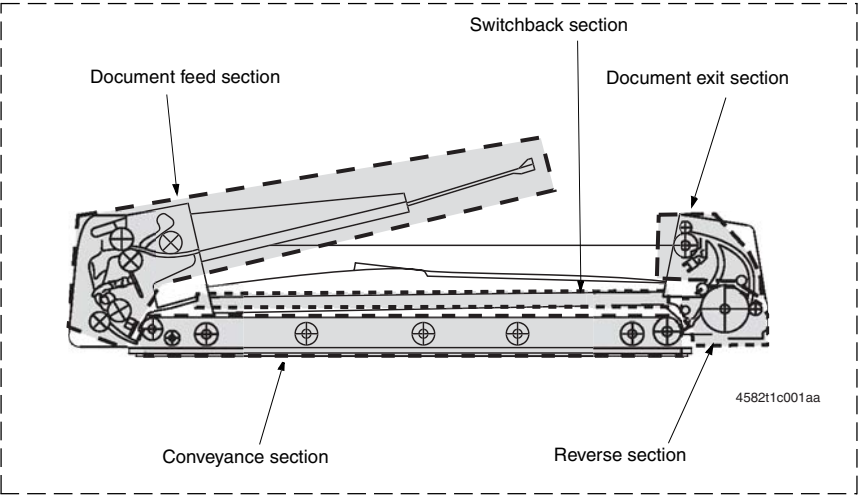


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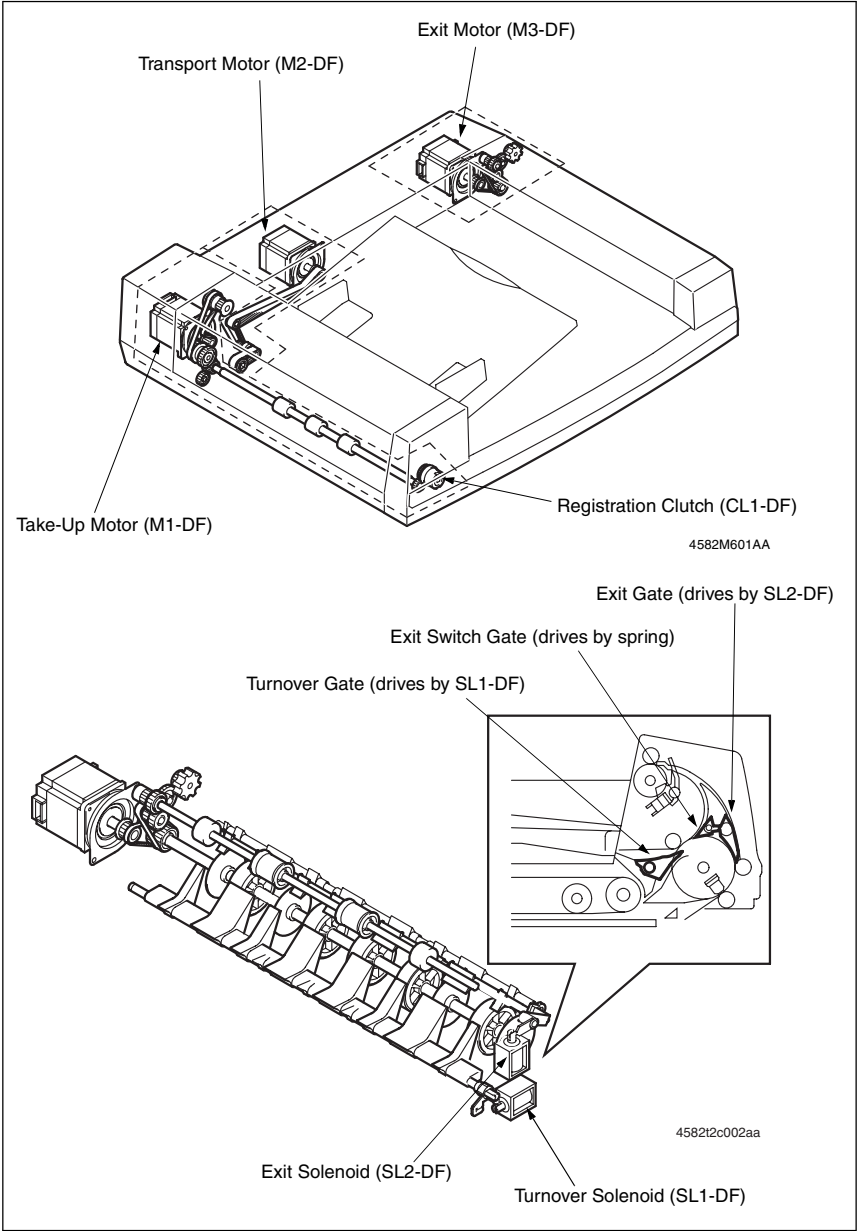
1: Document feed (1st side scanned) 2: Conveyance, Reverse (2nd side scanned)
3: Document exit

Composition/Operation

3. Composition



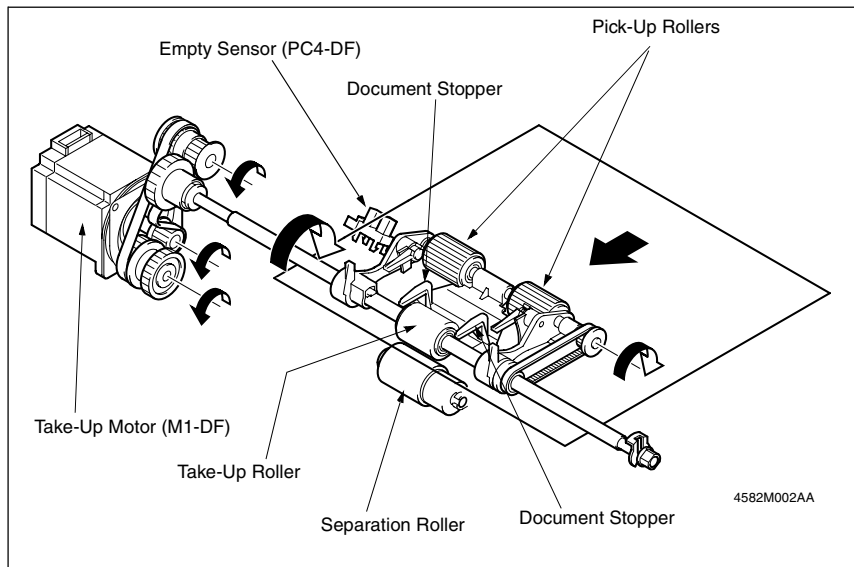
4. Drive



5. Operation

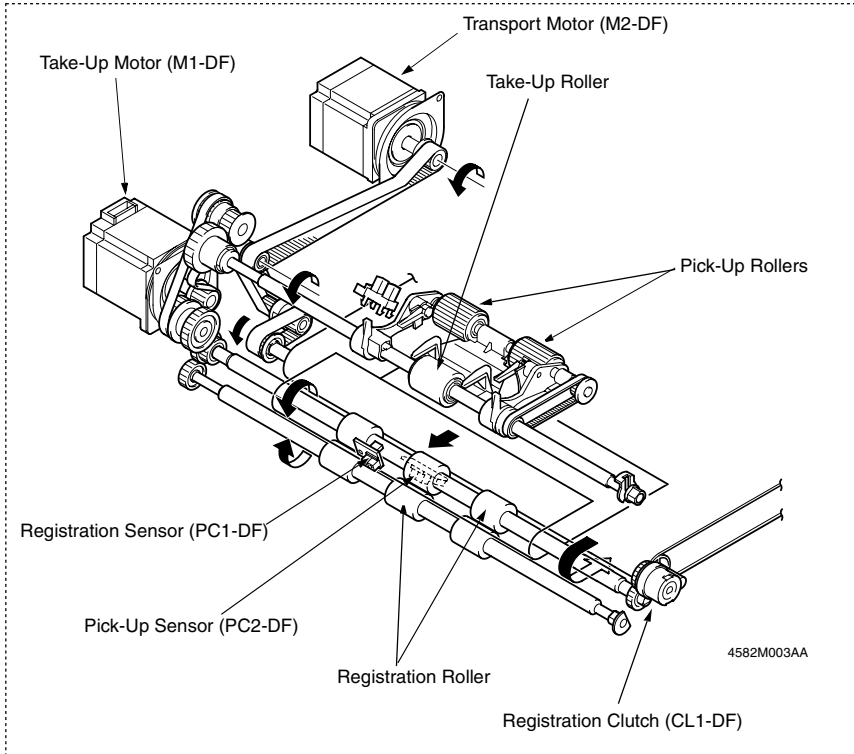
5.1 Document pick-up mechanism

- The Document Pick-Up Section consists of the Document Stoppers, Pick-Up Rollers, Take-Up Roller and Separation Roller, and this section is driven by the Take-Up Motor.
- The Pick-Up Rollers stay at their upper position during the standby state and are lowered when taking-up an original.
- The Document Stoppers stay at their lower position during the standby state and retract to their upper position when taking-up an original. The originals are separated and only one sheet is taken-up by the Take-Up and Separation Rollers.
- A torque limiter is installed to the Separation Roller to provide the separating operation.



5.2 Document take-up/transport mechanism

- The Pick-Up and Take-Up Rollers are rotated by the Take-Up Motor and an original is taken-up and transported to the Registration Roller.
- Then, the original is transported onto the Original Glass by the Registration Roller driven by the Take-Up Motor, and the Transport Belt driven by the Transport Motor.



A. Document take-up operation flow

Registration Clutch: ON
↓
Take-Up Motor: Forward Rotation
↓
Pick-Up Rollers go down and rotated via timing belt & gears
↓
At the same time, Document Stoppers go up
↓
An original is taken-up and transported.
↓
A loop is formed to correct the skew feeding after Registration Sensor is activated.
↓
Take-Up Motor: OFF
↓
Registration Clutch: OFF (release of Registration Roller)
Take-Up Motor: Backward Rotation
↓
The original is transported.
↓
Pick-Up Sensor: ON
↓
Start of the original size detection in the feeding direction
↓
Take-Up Motor: OFF

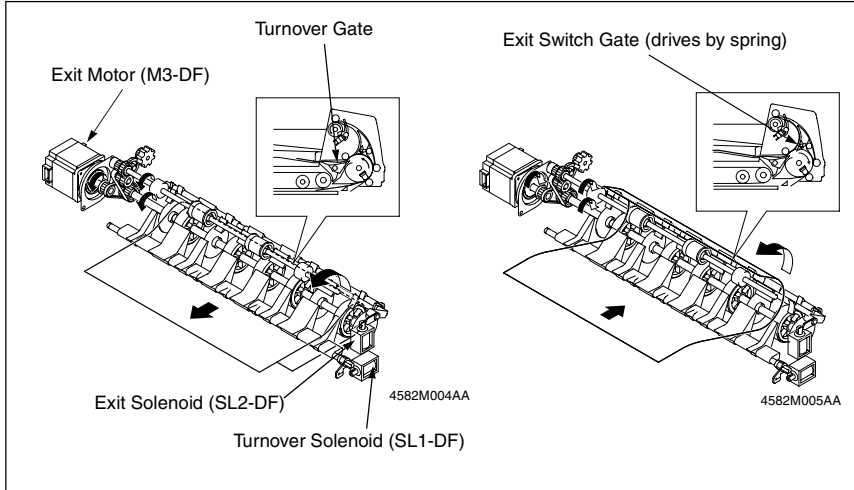
B. Document transport operation flow

Transport Motor: Forward Rotation
↓
Take-Up Motor: Backward Rotation
↓
The original is transported onto the Original Glass.
↓
The original size is determined when Registration Sensor: OFF
↓
Take-Up Motor: OFF when Pick-Up Sensor: OFF
↓
Transport Motor: OFF when the original is reached to its reference position
↓
Registration Clutch: ON

5.3 Document exit mechanism

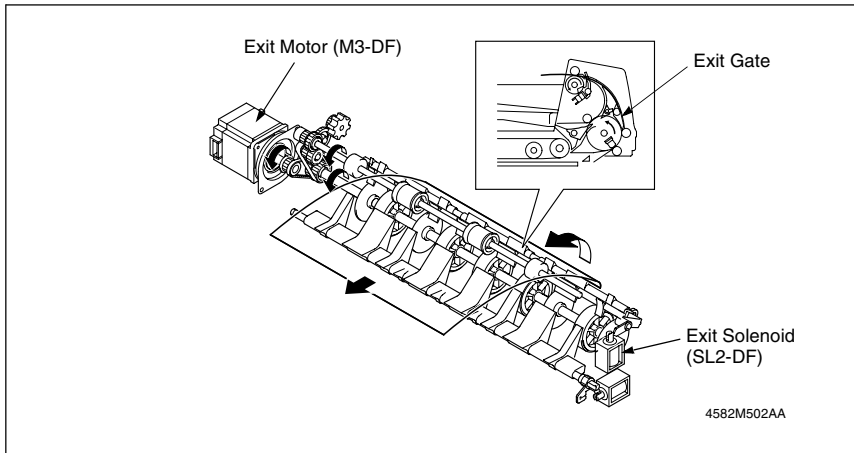
5.3.1 1-sided mode

- The original transported by the Transport Belt is sent to the switchback section and then ejected onto the Exit Tray with its face-down in order to keep the original pages in proper order.



5.3.2 2-sided mode

- In the 2-Sided Mode, an original which has had its 2nd side scanned is ejected onto the Exit Tray without the turn-over motion. (Face-down Ejection)



5.3.3 Exit operation flow

A. Document exit motion in 1-sided mode

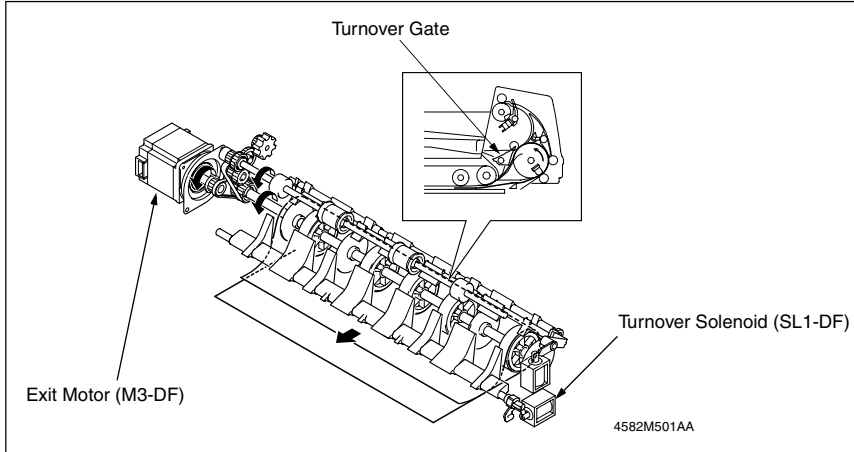
Exit Motor: Forward Rotation
↓
Transport Motor: Forward Rotation
↓
The original is transported to the switchback section.
↓
Transport Motor: OFF after the original leaves from the Transport Belt
↓
Exit Motor: OFF after passing a specified time from Turnover Sensor: OFF
↓
Exit Motor: Backward Rotation
↓
The original is transported to the Exit Roller.
↓
The rotation speed of the Exit Motor is reduced before the Exit Sensor goes OFF.
↓
The original is ejected on the Exit Tray with lower speed.
↓
Exit Motor: OFF

B. Document exit motion in 2-sided mode

Exit Solenoid: ON
↓
Exit Motor: Forward Rotation
↓
Transport Motor: Forward Rotation
↓
The original is transported to the exit section.
↓
Transport Motor: OFF after the original leaves from the Transport Belt
↓
Turnover Sensor: OFF
↓
Exit Solenoid: OFF after passing a specified time
↓
The rotation speed of the Exit Motor is reduced before the Exit Sensor goes OFF.
↓
The original is ejected on the Exit Tray with lower speed.
↓
Exit Motor: OFF

5.4 Turnover mechanism (2-sided mode)

- In the 2-Sided Mode, an original which has its 1st side scanned is turned-over and then transported to the scan position again for the 2nd side scanning.



A. Turnover operation flow

```

Exit Motor: Forward Rotation
↓
Transport Motor: Forward Rotation
↓
Turnover Solenoid: ON (Switching of paper path in turnover section)
↓
Turnover Sensor: ON
↓
Transport Motor: OFF
↓
Exit Motor: OFF
↓
Transport Motor: Backward Rotation
↓
Exit Motor: Forward Rotation
↓
Starts the original transportation to its scan position
↓
Turnover Sensor: OFF
↓
Turnover Solenoid: OFF
↓
Exit Motor: OFF
↓
Transport Motor: OFF
  
```

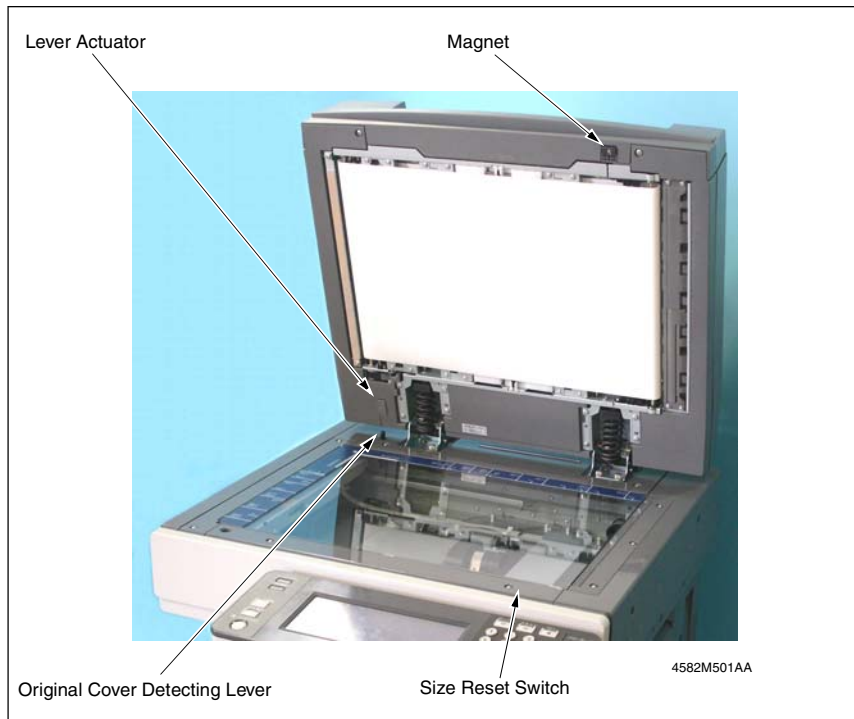
5.5 Raised/lowered position detecting mechanism

5.5.1 Document size detection

- The 20 degree Open Detection Mechanism enables the main unit to detect the document size when the DF is used as the Original Cover of the main unit, there is the Lever Actuator provided in the DF body that blocks or unblocks a sensor to initiate a reconfirmation of the original size as read by the original size detection sensors.

5.5.2 Raised/lowered position detection

- The Raised/Lowered Position Detection Mechanism uses a magnet installed in the DF body to allow the main unit to know that the DF is raised or lowered. This magnet actuates the Size Reset Switch on the main unit to perform this operation.



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KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

Automatic Duplex Unit

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Outline

1. Product specifications

1.1 Type

Name	Duplex Unit
Type	Switchback and Circulating Duplex Unit
Installation	Mounted on the right side door of main unit
Document Alignment	Center

1.2 Paper type

Paper Type	Plain paper	60 to 256 g/m ² (16 to 68 lb)
Paper Size	A5R to A3 Wide, 5.5 × 8.5R to 12 × 18	
Print paper size	width	139.7 to 311.2 mm (5.5 × 12.25 inch)
	length	176.0 to 457.2 mm (7 × 18 inch)

1.3 Machine specifications

Power Requirements	DC 24 V ± 10 % (supplied from the main unit)	
	DC 5 V ± 5 % (supplied from the main unit)	
Dimensions	109 mm (W) × 440 mm (D) × 344 mm (H) 4.25 inch (W) × 17.25 inch (D) × 13.5 inch (H)	
Weight	2.9 kg (6.5 lb)	

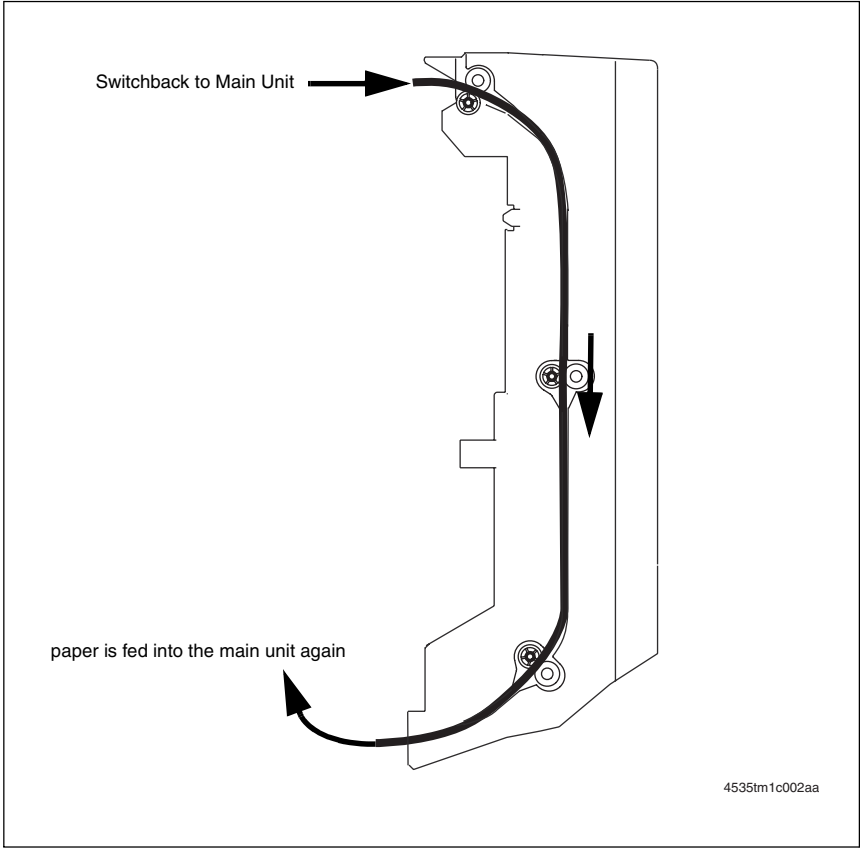
1.4 Operating environment

Conforms to the operating environment of the main unit.

NOTE

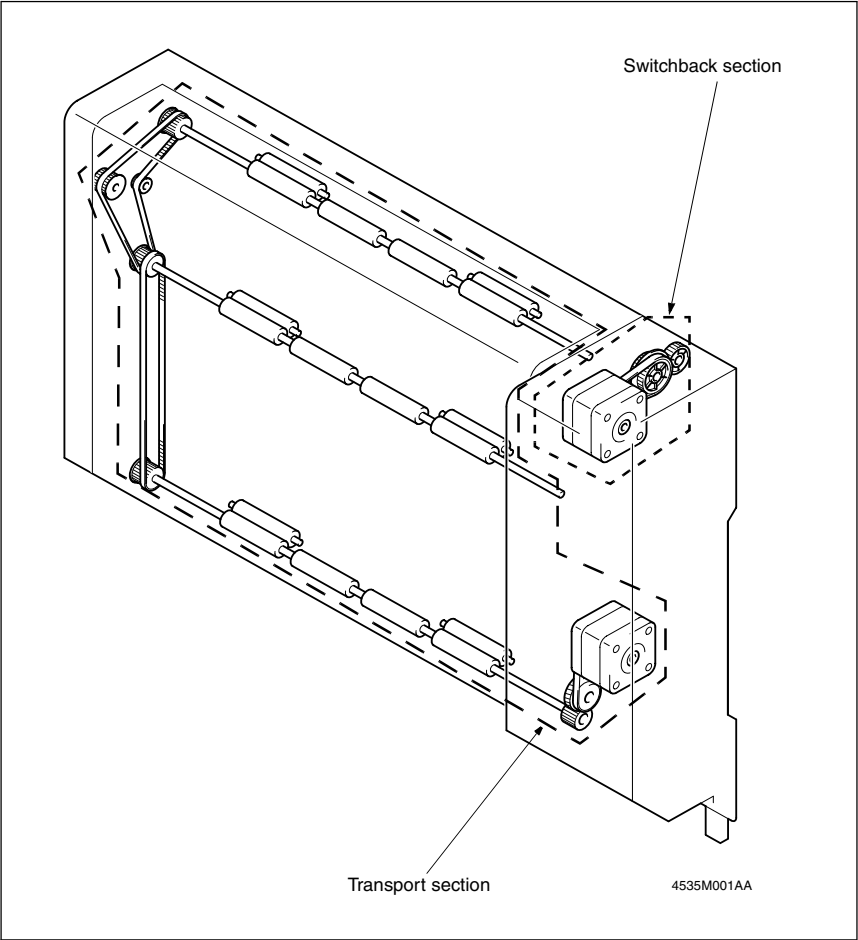
- **These specifications are subject to change without notice.**

2. Paper Feed Path



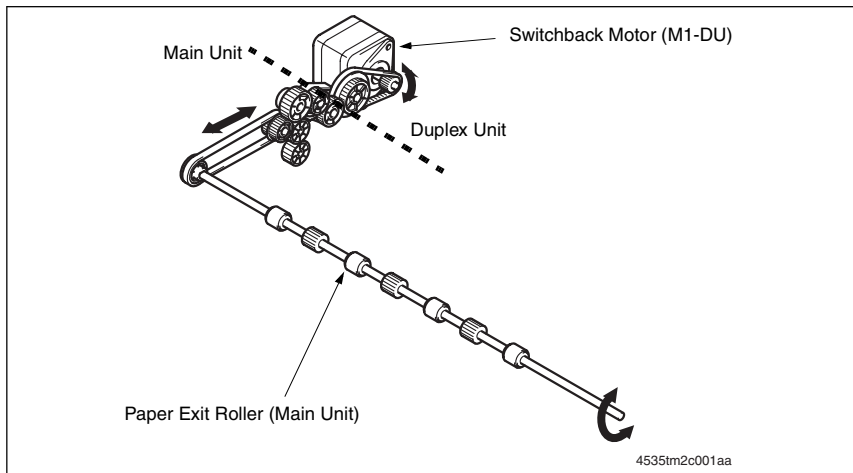
Composition/Operation

3. Composition

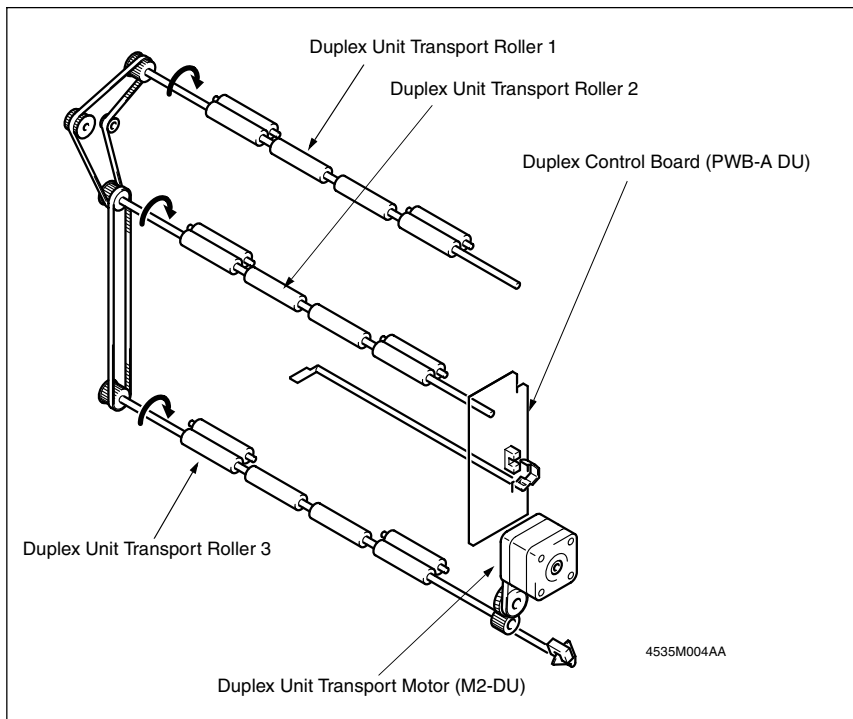


4. Drive

4.1 Switchback Drive



4.2 Transport Drive

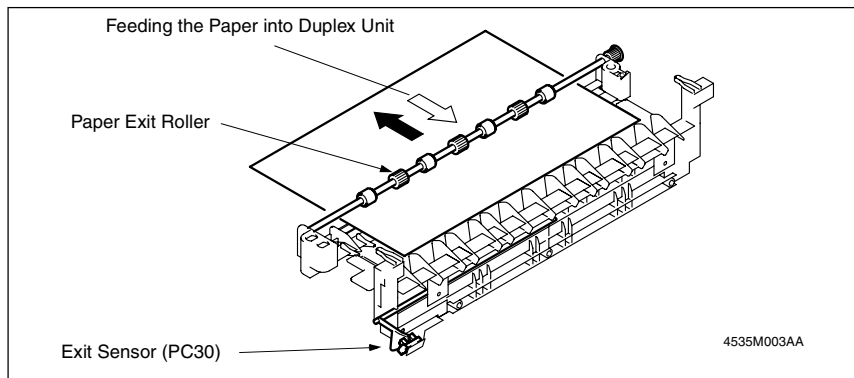


5. Operation

5.1 Switchback mechanism

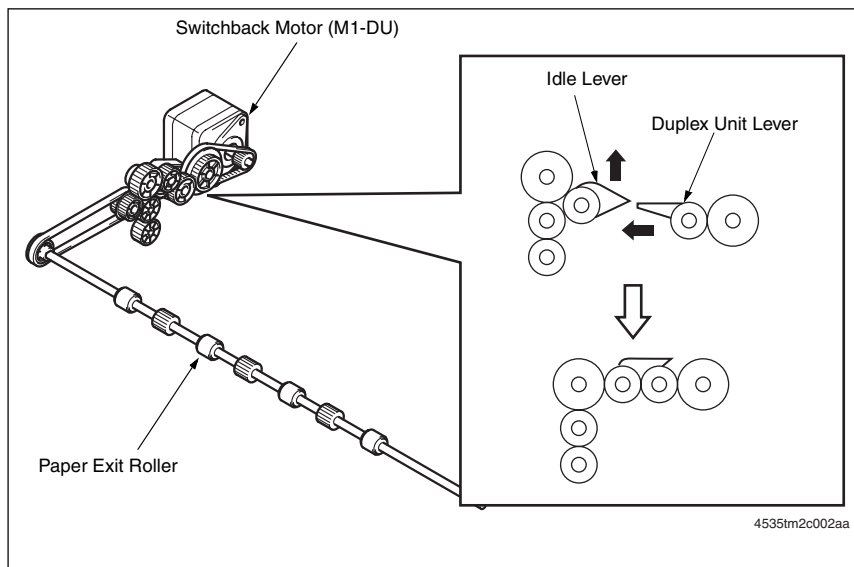
5.1.1 Switchback operation

- The Paper Exit Roller of the main unit is used to subject the 1-sided print to a switchback sequence so that the 1-sided print is to be transported through the Duplex Unit.



5.1.2 Paper exit roller drive coupling mechanism

- When the Duplex Unit is mounted, the tip of the Duplex Unit Lever raises the Idle Lever to cut off the drive from the main unit (Fusing Rollers) and the Paper Exit Roller is driven by the Switchback Motor.



5.1.3 Switchback Motor Control

- Rotation of the Switchback Motor is controlled by the signals output from the Duplex Control Board.

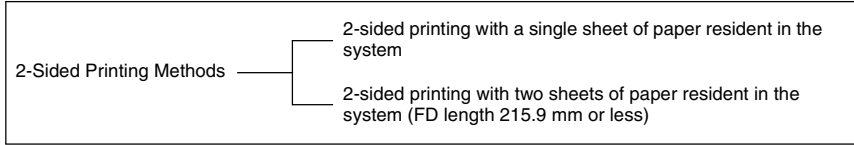
5.2 Transport Control

5.2.1 Duplex Unit Transport Motor Control

- Rotation of the Duplex Unit Transport Motor is controlled by the signals output from the Duplex Control Board.

5.2.2 2-sided printing method

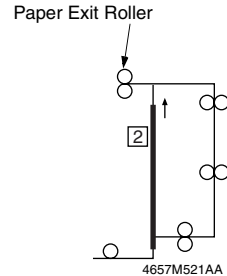
- The following two types of 2-sided printing methods are available.



A. Operations in 2-sided printing with a single sheet of paper resident in the system

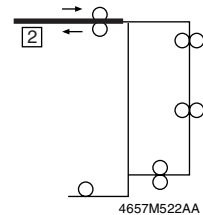
Operation 1

- The first sheet of paper is taken up and fed in from the main unit drawer and the main unit starts the first print cycle to produce the print image of the second page of the original.



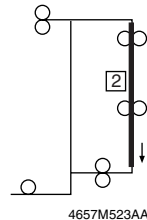
Operation 2

- Immediately before the 1-sided print leaves the Paper Exit Roller, the direction of rotation of the Paper Exit Roller is reversed and the 1-sided print is transported toward and into the Duplex Unit.



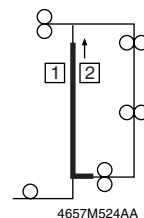
Operation 3

- The 1-sided print moves through the Duplex Unit and is directly subject to the second print cycle without being stopped.



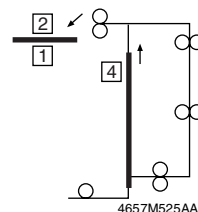
Operation 4

- The main unit carries out the second print cycle to produce the print image of the first page of the original on the other side of the 1-sided print.

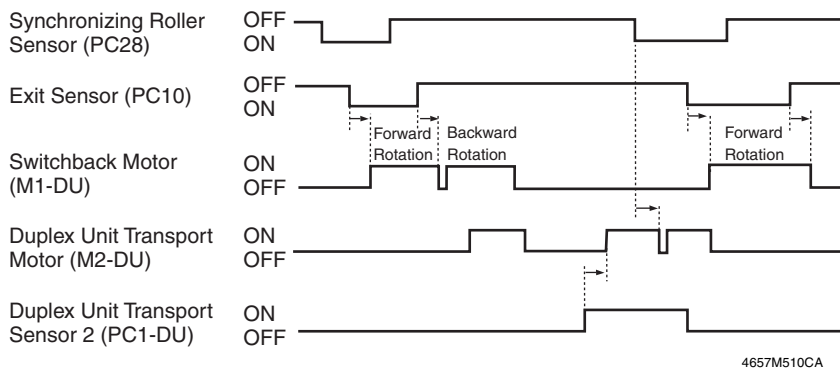


Operation 5

- While feeding the first 2-sided print out of itself, the main unit carries out the first print cycle for the second sheet of paper to produce the print image of the fourth page of the original.

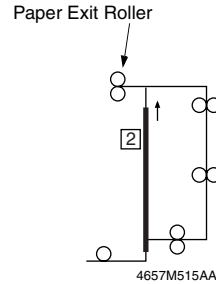


- Steps 2 through 5 are repeated.
- **A4, 2 originals, 1 to 2 print mode**

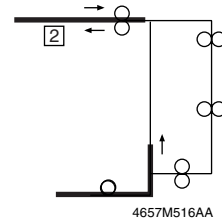


B. Operations in 2-sided printing with two sheets of paper resident in the system**Operation 1**

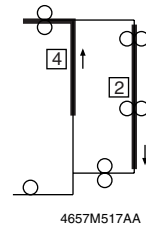
- The first sheet of paper is taken up and fed in from the main unit drawer and the main unit starts the first print cycle to produce the print image of the second page of the original.

**Operation 2**

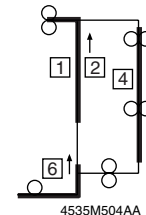
- Immediately before the first 1-sided print leaves the Paper Exit Roller, the direction of rotation of the Paper Exit Roller is reversed and the first 1-sided print is transported toward and into the Duplex Unit.
- At the same time, the second sheet of paper is taken up and fed into the main unit.

**Operation 3**

- The main unit carries out the first print cycle for the second sheet of paper to produce the print image of the fourth page of the original.
- At the same time, the first 1-sided print is transported through the Duplex Unit.

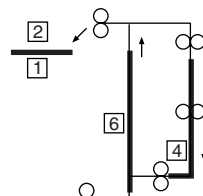
**Operation 4**

- The main unit produces the print image of the first page of the original on the first 1-sided print that has been fed through the Duplex Unit.
- At the same time, the second sheet of paper is subjected to a switchback sequence at the exit section and fed into the Duplex Unit.
- At the same time, the third sheet of paper is taken up and fed into the main unit.



Operation 5

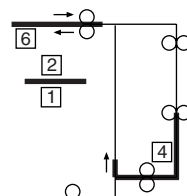
- While feeding the first 2-sided print out, main unit produces the print image of the 6th page of the original on the third sheet of paper.
- The second sheet of paper will wait in front of the Duplex Unit Transport Roller 3 until the third sheet of paper has been operated switch back sequence.



4535M505AA

Operation 6

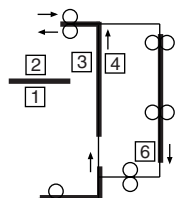
- Immediately before the first 1-sided print leaves the Paper Exit Roller, the direction of rotation of the Paper Exit Roller is reversed and the first 1-sided print for the third sheet is transported toward and into the Duplex Unit.
- At the same time, the second sheet of paper is fed into the main unit again.



4535M506AA

Operation 7

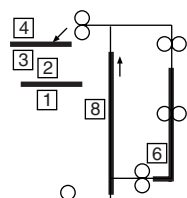
- The main unit carries out the first print cycle for the second sheet of paper to produce the print image of the third page of the original.
- At the same time, the first 1-sided print for the third is transported through the Duplex Unit.
- At the same time, the forth sheet of paper is taken up and fed into the main unit.



4535M507AA

Operation 8

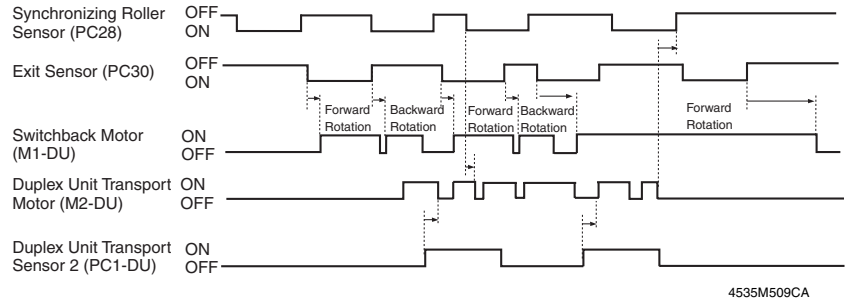
- While feeding the second 2-sided print out, main unit produces the print image of the 8th page of the original on the fourth sheet of paper.
- The third sheet of paper will wait in front of the Duplex Unit Transport Roller 3 until the fourth sheet of paper has been operated switch back sequence.



4535M508AA

- Steps 6 through 8 are repeated.

• **A4, 2 originals, 2 to 2 print mode**





KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

PC-102/PC-202

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Outline

1. Product specifications

1.1 Type

Name	2 way Paper Take-Up Cabinet
Type	Front loading type 2 way paper take-up device
Installation	Desk type
Document Alignment	Center

1.2 Paper type

Paper Type	Plain paper	56 to 256 g/m ² (15 to 68 lb)
	Recycled paper	60 to 90 g/m ² (16 to 24 lb)
Paper Size	A5R to A3, 5.5 × 8.5R to 11 × 17	
Capacity	3rd Drawer	500 sheets (80 g/m ² , 21.25 lb)
	4th Drawer	500 sheets (80 g/m ² , 21.25 lb)

1.3 Machine specifications

Power Requirements	DC 24 V ± 10 % (supplied from the main unit)
	DC 5 V ± 5 %
Max. Power Consumption	75 W or less
Dimensions	570 mm (W) × 263 mm (H) × 548 mm (D) 22.5 inch (W) × 10.25 inch (H) × 21.5 inch (D)
Weight	PC-102:22.0 kg (48.5 lb)
	PC-202:25.9 kg (57 lb)

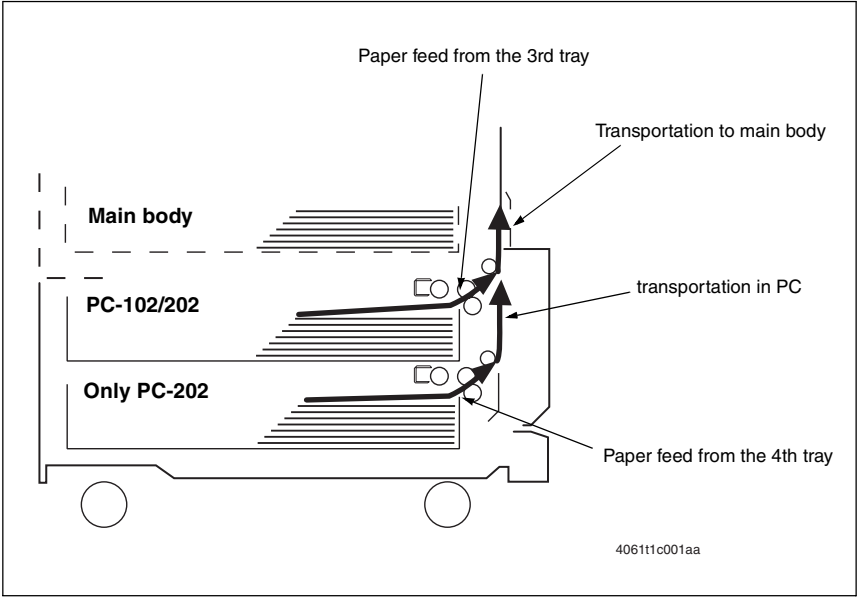
1.4 Operating environment

Conforms to the operating environment of the main unit.

NOTE

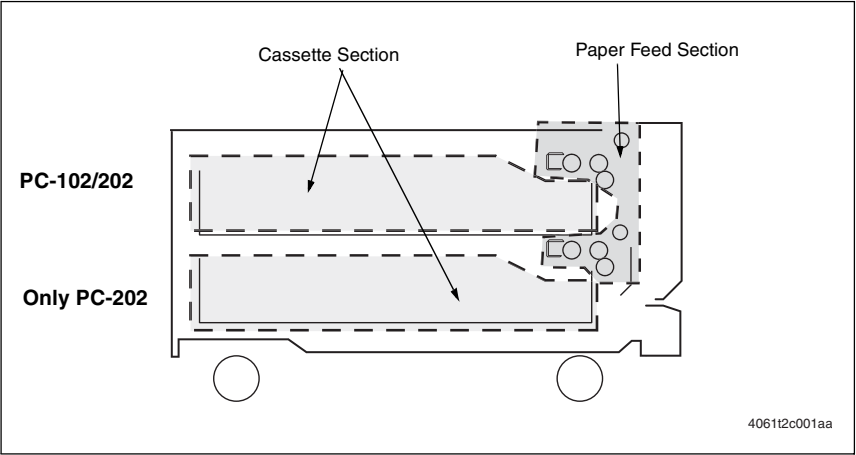
- **These specifications are subject to change without notice.**

2. Paper Feed path

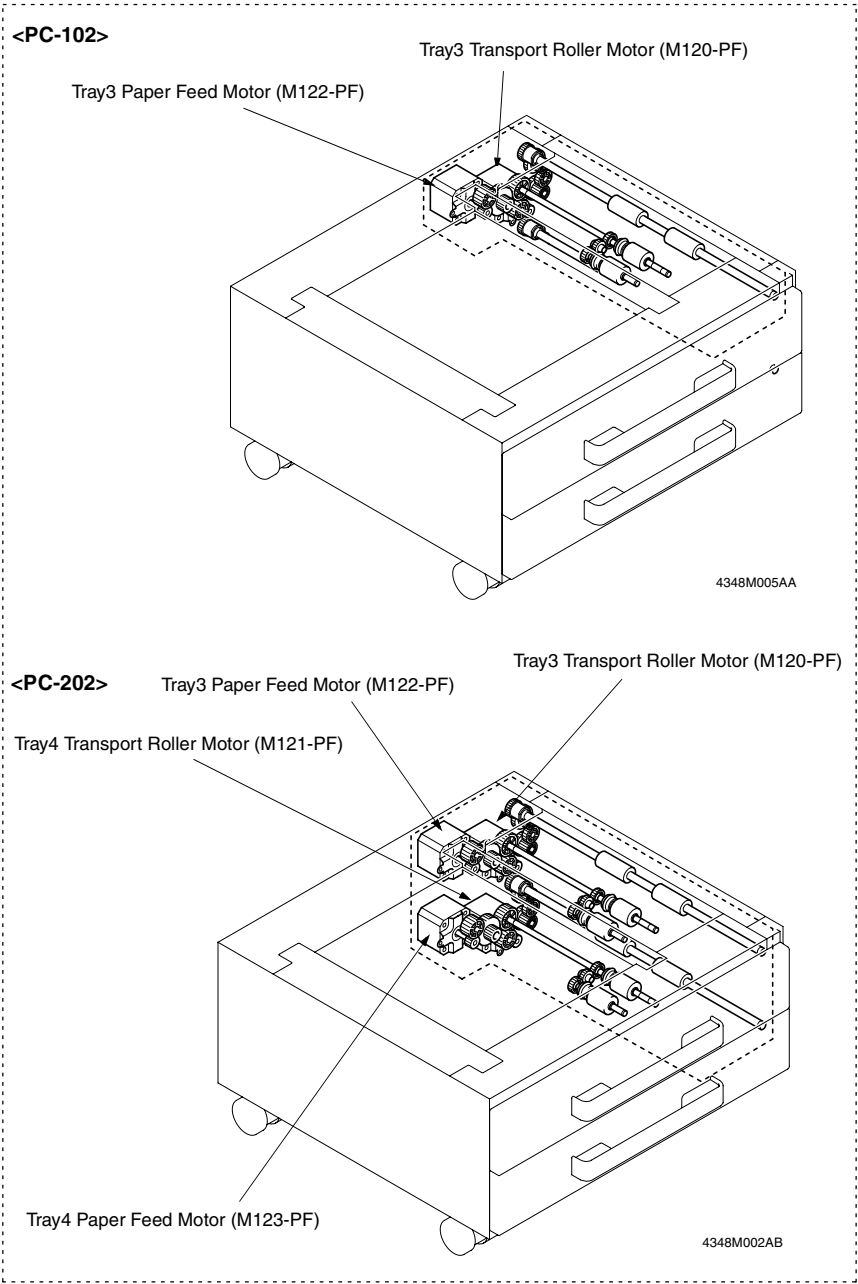


Composition/Operation

3. Composition



4. Drive system

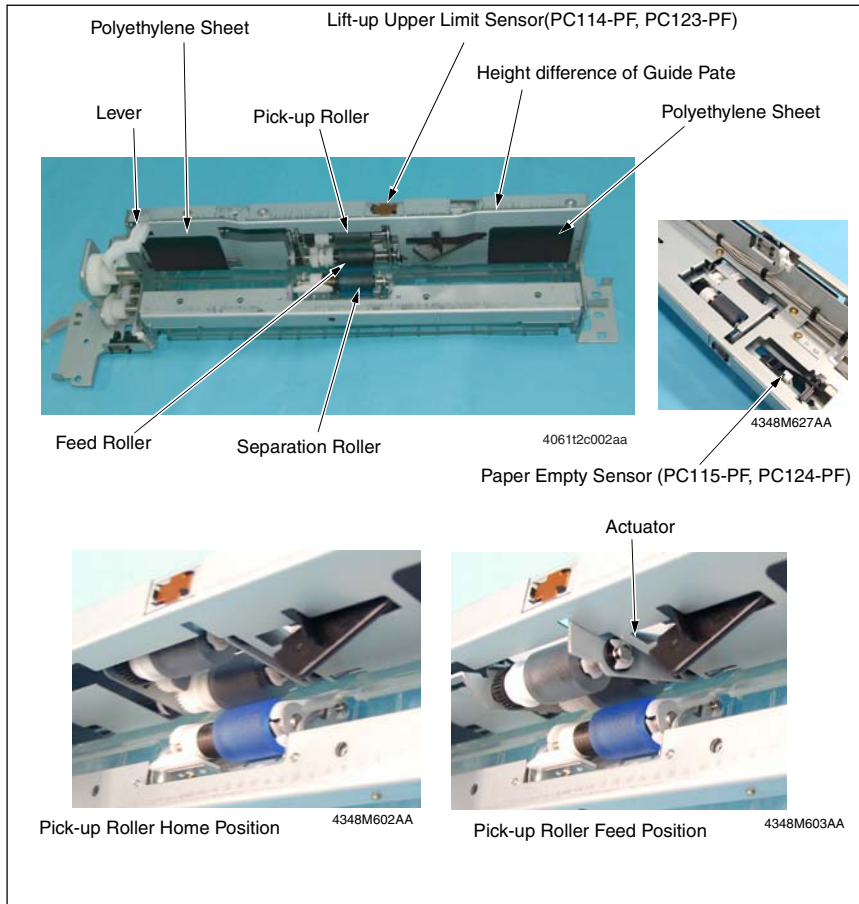


5. Operations

5.1 Paper Feed Section

5.1.1 Vertical transport drive mechanism

- The Paper Feed Motor drives the Pick-up Roller and Paper Take-up Roller to take up and feed a sheet of paper into the main unit.
- Then, the Transport Roller Motor transports the paper through the vertical transport section.
- The Pick-up Roller takes up sheets of paper and the Paper Take-up and Separation Rollers ensure that only one sheet of paper is separated and fed into the main unit.
- When the drawer is slid in, the lever is pushed to lower the Pick-up Roller.
- The Lift-up Upper Limit Sensor then detects the upper limit position when the paper lifting plate is raised.
- The Paper Empty Sensor detects when paper in the drawer runs out.
- The polyethylene sheet and Height difference of Guide Plate reduces resistance between a curled sheet of paper and guide, thereby preventing skewed feeding.

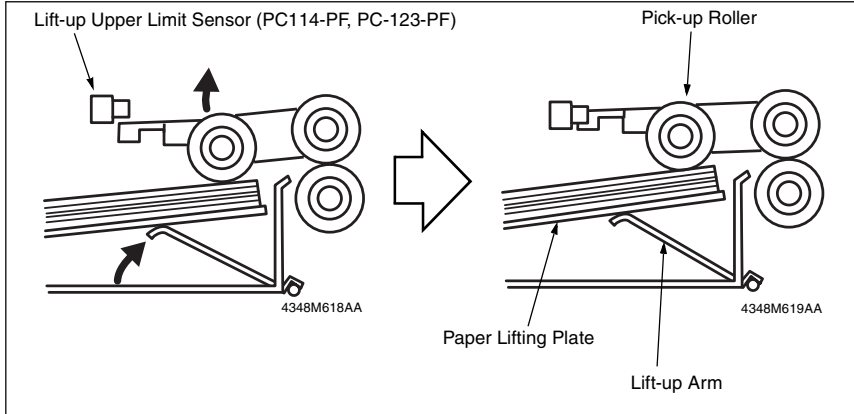


5.1.2 Paper lifting motion

- When the drawer is slid into the main unit and the Set Sensor is activated, the Lift-up Motor starts rotating to raise the Paper Lifting Plate.
- The paper stack of the drawer pushes up the Pick-up Roller. When the upper limit position is detected through the action of the actuator, it stops raising the paper lifting plate.
- As paper is consumed during the print cycle and the Pick-up Roller is lowered, the Lift-up Motor is energized until the Lift-up Upper Limit Sensor is blocked again.

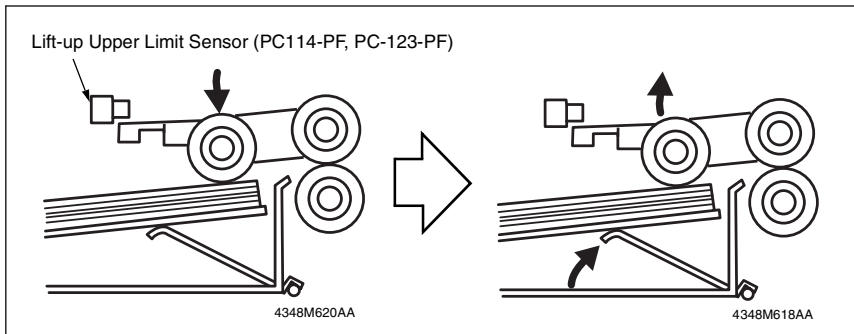
A. When the drawer is slid in

1. The paper lifting plate goes up and the top surface of the paper stack pushes up the roller.
2. The lifting motion stops as soon as the sensor detects the upper limit position.



B. During a print cycle

1. As the paper is consumed, the sensor is unblocked.
2. The paper lifting plate goes up.

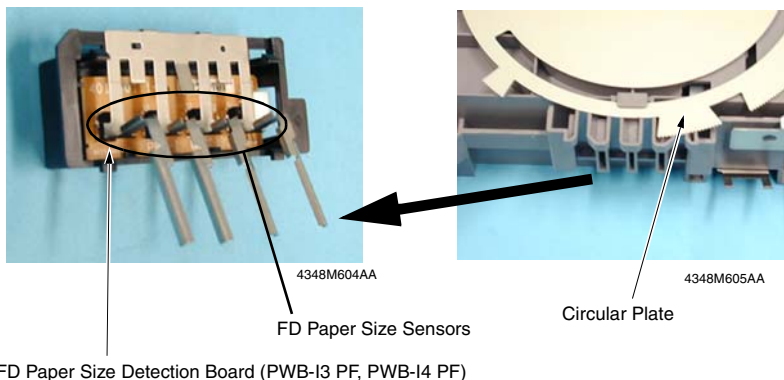


5.2 Cassette Section

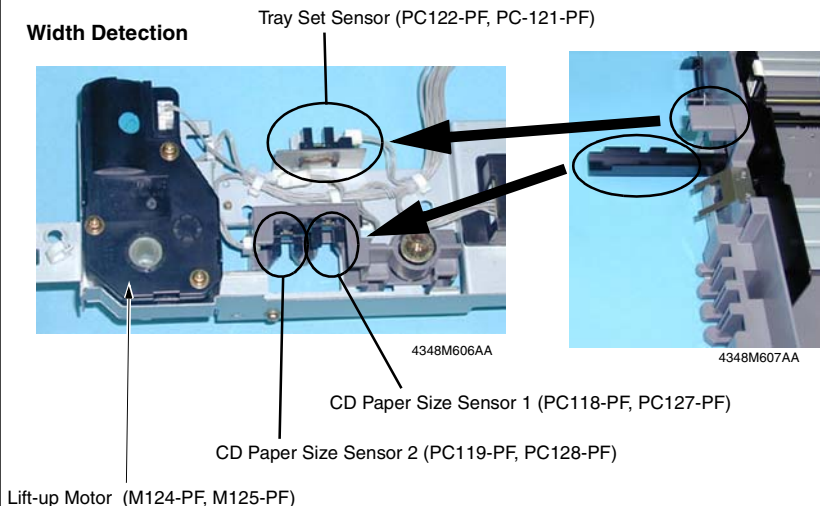
5.2.1 Paper size detection

- When the Trailing Edge Stop of the drawer is moved, the circular plate located on the bottom of the drawer turns, allowing the four FD Paper Size Sensors on the FD Paper Size Detection Board.
- Moving the Edge Guide activates or deactivates the two CD Paper Size Sensors through the cutout in the lever.
- The combination of the four FD Paper Size Sensors and two CD Paper Size Sensors that are either activated or deactivated determines the size of the paper loaded in the drawer.
- The Tray Set Sensor detects that the drawer is slid into position as it is slid in.

Length Detection

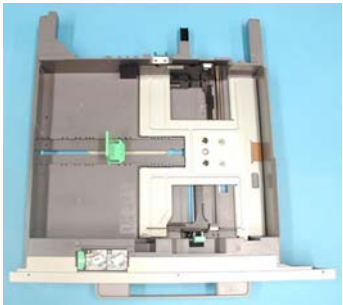


Width Detection

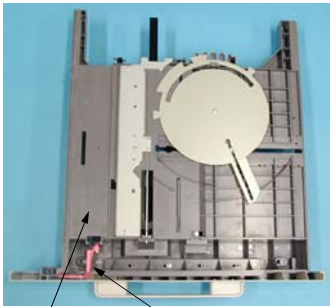


5.2.2 Paper level indicator mechanism

- All drawers now use the universal paper size tray for greater functionality.
- There is a window in the front cover of the drawer that serves as the Paper Level Indicator showing the amount of paper that is still available for use.
- A red lever is attached to the paper lifting plate of the drawer and as the paper lifting plate raises, the red lever becomes visible in the window.
- The more the red lever is visible, the lesser the amount of paper will be available for use.



4348M608AA



4348M609AA

Cassette bottom plate

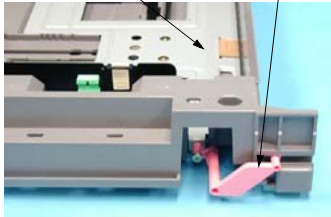
paper lifting plate

Lever



4348M610AA

Paper Level Indicator on the front cover of the drawer



4348M611AA

Operated by the paper lifting plate of the drawer



KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

PC-402

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5.2.2 Shift Gate drive mechanism 7

5.2.3 Shifter drive mechanism 7

5.2.4 Paper empty detection 8

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Outline

1. Product specification

1.1 Type

Name	Large Capacity Cabinet
Type	Front loading type LCC
Installation	Desk type
Document Alignment	Center

1.2 Paper type

Paper Type	Plain paper	56 to 256 g/m ² (15 to 68 lb)
	Recycled paper	60 to 90 g/m ² (16 to 24 lb)
Paper Size	A4, 8.5 × 11	
Capacity	2500 sheets (80 g/m ² , 21.25 lb)	

1.3 Machine specifications

Power Requirements	DC 24 V ± 10 % (supplied from the main unit)	
	DC 5 V ± 5 %	
Max. Power Consumption	45 W or less	
Dimensions	570 mm (W) × 263 mm (H) × 548 mm (D) 22.5 inch (W) × 10.25 inch (H) × 21.5 inch (D)	
Weight	25.9 kg (57 lb)	

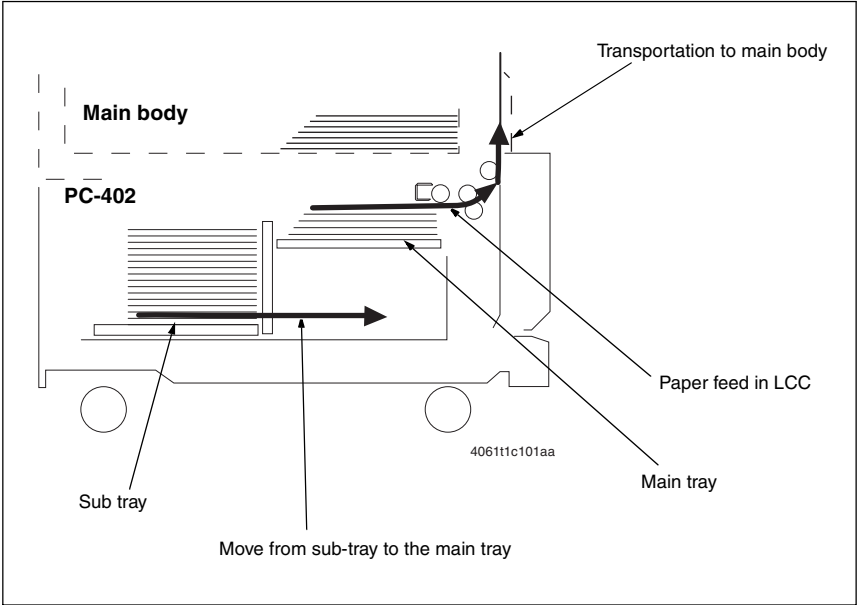
1.4 Operating environment

Conforms to the operating environment of the main unit.

NOTE

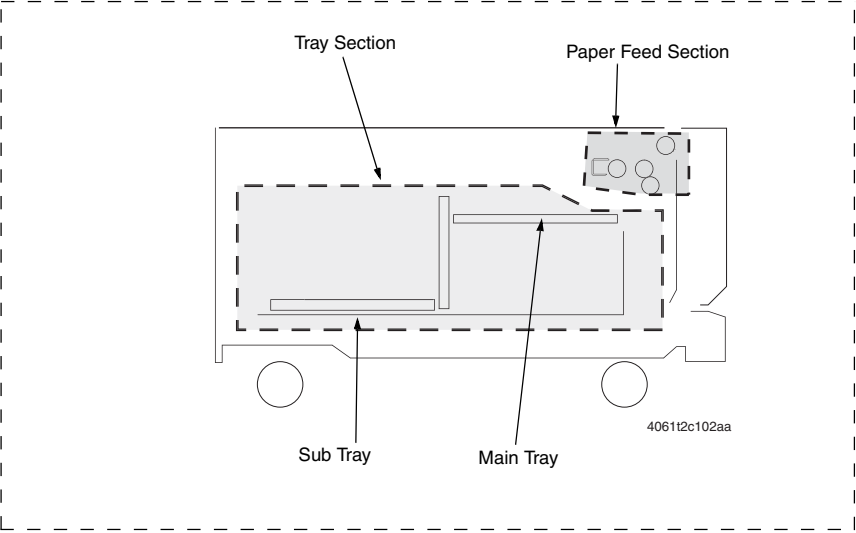
- **These specifications are subject to change without notice.**

2. Paper Feed Path

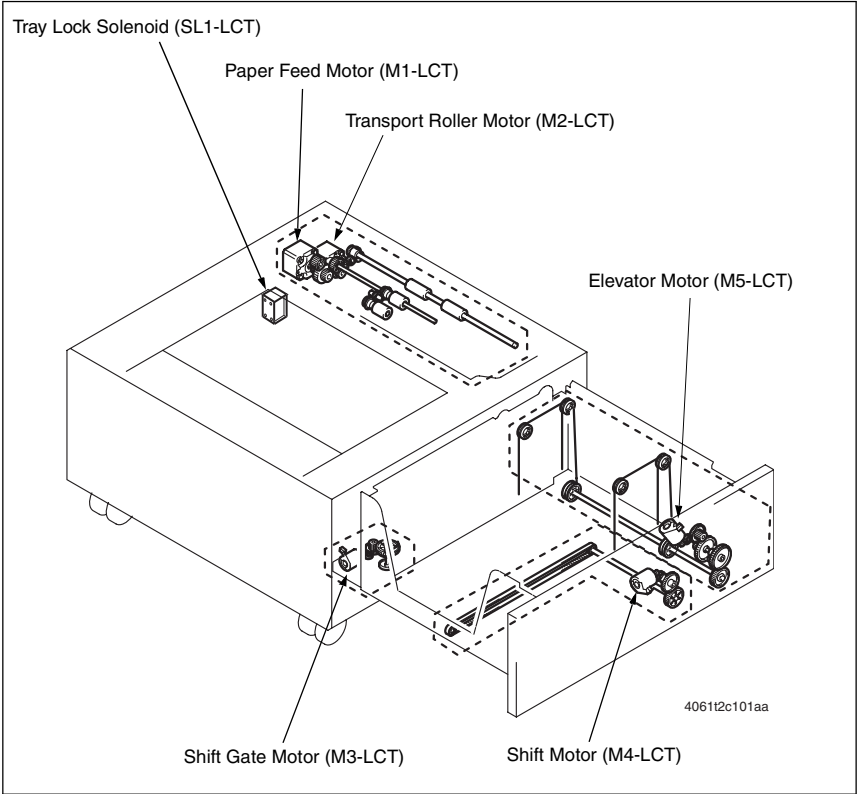


Composition/Operation

3. Composition



4. Drive

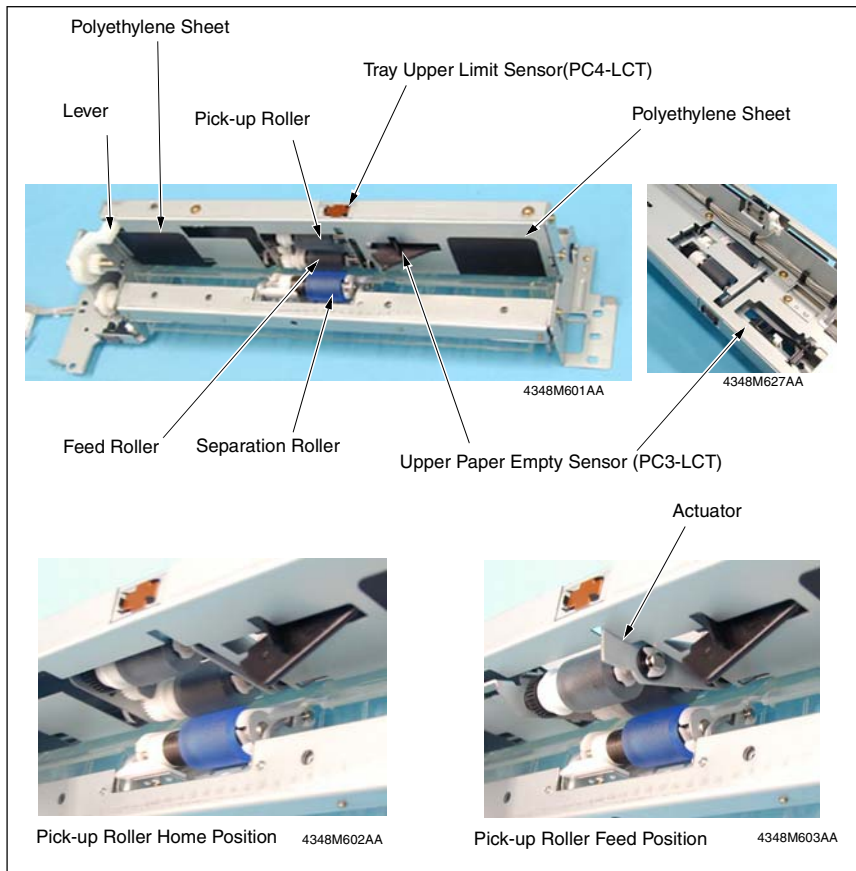


5. Operations

5.1 Paper Feed Section

5.1.1 Paper Feed drive mechanism

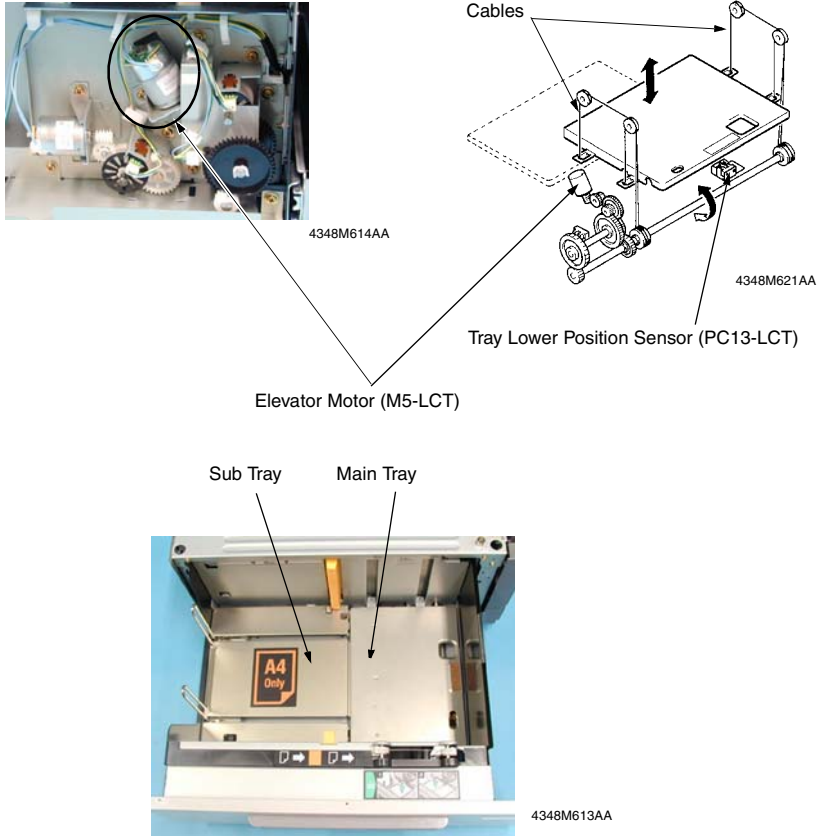
- The Paper Feed Motor drives the Pick-up Roller and Paper Take-up Roller to take up and feed a sheet of paper into the main unit.
- Then, the Transport Roller Motor transports the paper through the vertical transport section.
- The Pick-up Roller takes up sheets of paper and the Paper Take-up and Separation Rollers ensure that only one sheet of paper is separated and fed into the main unit.
- When the drawer is slid in, the lever is pushed to lower the Pick-up Roller.
- The Tray Upper Limit Sensor then detects the upper limit position when the paper lifting plate is raised.
- The Upper Paper Empty Sensor detects when paper in the drawer runs out.



5.2 Tray Section

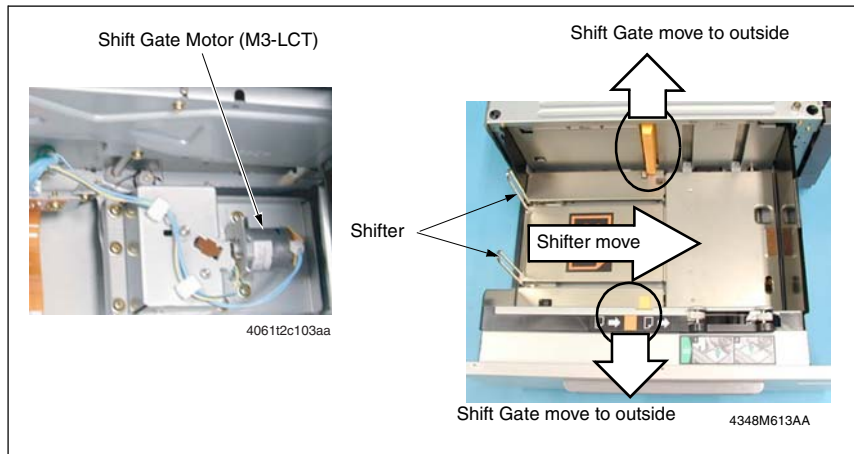
5.2.1 Elevator tray mechanism

- The Main Tray is suspended by the cables at the front and rear.
- As the Elevator Motor turns forward or backward, the cables are wound to raise or lower the tray.
- The Tray Lower Position Sensor detects the tray at its lower limit position.



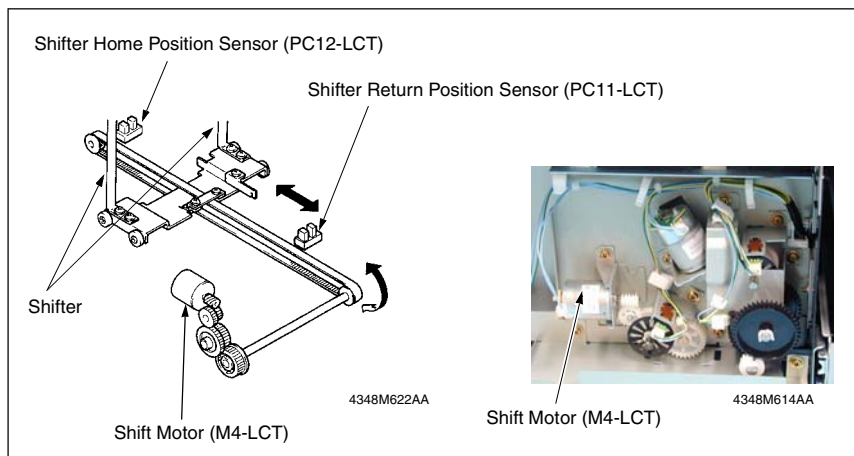
5.2.2 Shift Gate drive mechanism

- If the Main Tray runs out of paper, while the Sub Tray is loaded with paper, the paper stack on the Sub Tray is moved to the Main Tray.
- At this time, the Shift Gate Motor is energized to retract the front and rear Shift Gates.



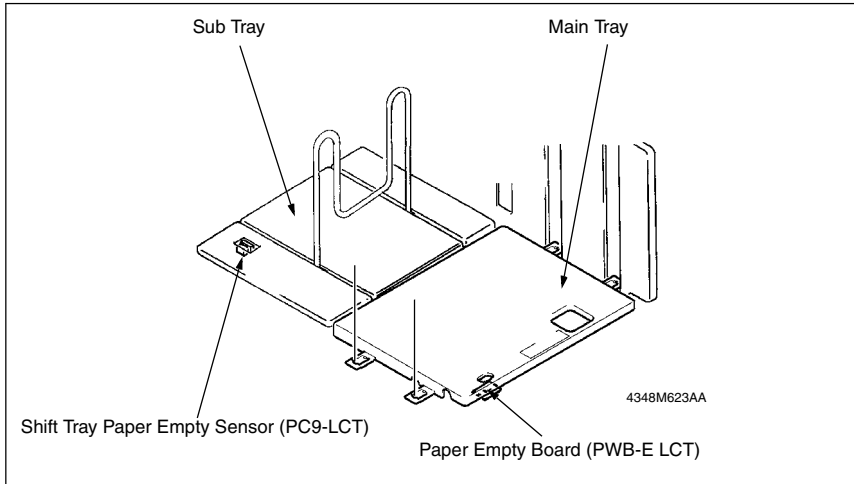
5.2.3 Shifter drive mechanism

- Then, the Shift Motor is energized to move the Shifter so that the paper stack on the Sub Tray is moved onto the Main Tray.
- The Shifter continues moving and stops when the Shifter Return Position Sensor is activated. When the Drawer Release button is thereafter pressed, the Shifter starts moving and stops as soon as the Shifter Home Position Sensor is activated.



5.2.4 Paper empty detection

- Paper empty detection of Main Tray is performed by Paper Empty Board.
- Paper empty detection of Sub Tray is performed by Shift Tray Paper Empty Sensor.





KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

FS-507

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Outline

1. Product specification

1.1 Type

Type	Multi Staple Finisher
Installation	Freestanding
Document Alignment	Center
Supplies	Staple Cartridge
Option	Job separator (JS-601). Sweden Punch Kit (PK-506)

1.2 Functions

No. of Holes	Metric: 4holes, Inch: 2holes / 3holes,	
Modes	Normal	Group, Sort, Group Offset, Sort Offset, Sort Staple, Group staple
	Punch	Group Punch, Sort Punch, Group Offset Punch, Sort Offset Punch, Sort Staple Punch

1.3 Paper type

- Remove the Finisher off the Copier for feeding the long paper.
- The maximum loading capacity shown is for when loading the single type of paper (80g/m²)

1.3.1 Group, Group offset

Paper Type	Paper Size	Weight	Tray Capacity	Exit Tray	No. of Sheets to be Stapled
Plain paper	B5R/B5 to A3 Wide 5.5 × 8.5R/ 5.5 × 8.5 to 13 × 19	60 to 90 g/m ² 16 to 24 lb	250 sheets	1st paper exit tray	-
Thick paper		60 to 256 g/m ² 16 to 68 lb	20 sheets		
OHP Film					
Translucent paper					
Envelope					
Label paper					
Letterhead					

1.3.2 Sort, Sort offset

Paper Type	Paper Size	Weight	Tray Capacity	Exit Tray	No. of Sheets to be Stapled
Plain paper	B5R/B5 to A3 Wide 7.25 × 10.5R/ 7.25 × 10.5 to 13 × 19	60 to 209 g/m ² 16 to 55.5 lb	3,000 sheets (A4R, 8.5 × 11R or smaller); 1,500 sheets (B4, 8.5 × 14 or larger)	2nd paper exit tray	-
Thick paper					

1.3.3 Sort staple/Group staple

Paper Type	Paper Size	Weight	Tray Capacity	Exit Tray	No. of Sheets to be Stapled
Plain paper	B5R/B5 to A3 7.25 × 10.5R/ 7.25 × 10.5 to 11 × 17	60 to 90 g/m ² 16 to 24 lb *1	3,000 sheets (A4R, 8.5 × 11R or smaller); 1,500 sheets (B4, 8.5 × 14 or larger)	2nd paper exit tray	50 sheets *2, *3

*1 : Cover Mode - 91 to 209 g/m², 24.25 to 55.5 lb.

*2 : The number of Sheets to be Stapled is limited for high-density images.

(Color Wise 3: 20 sheets x 20 sets)

*3 : 35 sheets when using Color Copy 90 paper.

1.4 Stapling

Staple Filling Mode	Dedicated Staple Cartridge Mode (5,000 staples)	
Staple Detection	Available (Nearly Empty: 20 remaining staples)	
Stapling Position *1	Rear: Diagonal 45 ° 1 point	A4, A3
	Front: Diagonal 45 ° 1 point	8.5 × 11, 11 × 17
	Rear: Diagonal 28 ° 1 point	B5, B4
	Front: Diagonal 28 ° 1 point	
	Rear: Parallel 1 point	A4R, A5R
	Front: Parallel 1 point	8.5 × 11R, 8.5 × 14
	Side: Parallel 2 points	A4, A4R, A3, B5, B5R, B4 8.5 × 11, 8.5 × 11R, 8.5 × 14, 11 × 17
Manual Staple	None	

*1 : For 1 point stapling, adjust it in parallel or diagonal according to the length in CD direction.

Parallel: CD direction 182 to 216 mm, 7.25 × 8.5

Diagonal: CD direction 216 to 297 mm, 8.5 × 11.75

1.5 Sort and staple capacity

- (Reference: Actual value) Determined by number of Sets or number of Sheets based on number of bindings.

A. Number of stacked paper

No. of Sheets to be Stapled	No. of Sets	No. of Sheets
2 pages	100 sets	200 Sheets
3 to 5 pages	80 sets	400 Sheets
6 to 10 pages	60 sets	600 Sheets
11 to 20 pages	40 sets	800 Sheets
21 to 30 pages	60 sets	1800 Sheets
31 to 40 pages	60 sets	2400 Sheets
41 to 50 pages	60 sets	3000 Sheets

1.6 Hole Punch

No. of Holes	Metric: 4holes, Inch: 2holes / 3holes
Punch dust full detection	non

1.7 Machine specifications

Power Requirements	DC 24 V (supplied from the main unit)
	DC 5 V (generated by Finisher)
Max. Power Consumption	63 W or less
Dimensions	538 mm (W) × 978 mm (H) × 637 mm (D) 21.25 inch (W) × 38.5 inch (H) × 25 inch (D)
Weight	39.2 kg (86.5 lb)

1.8 Operating environment

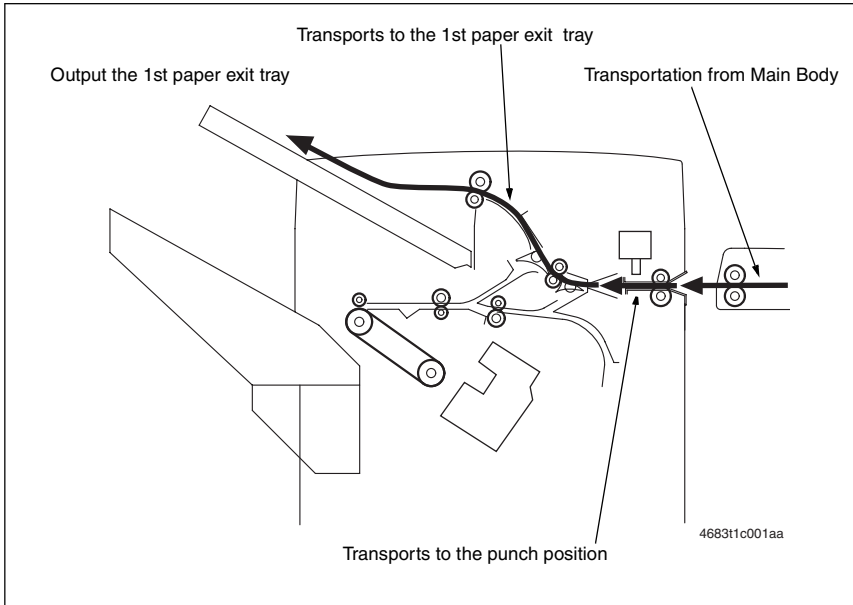
Conforms to the operating environment of the main unit.

NOTE

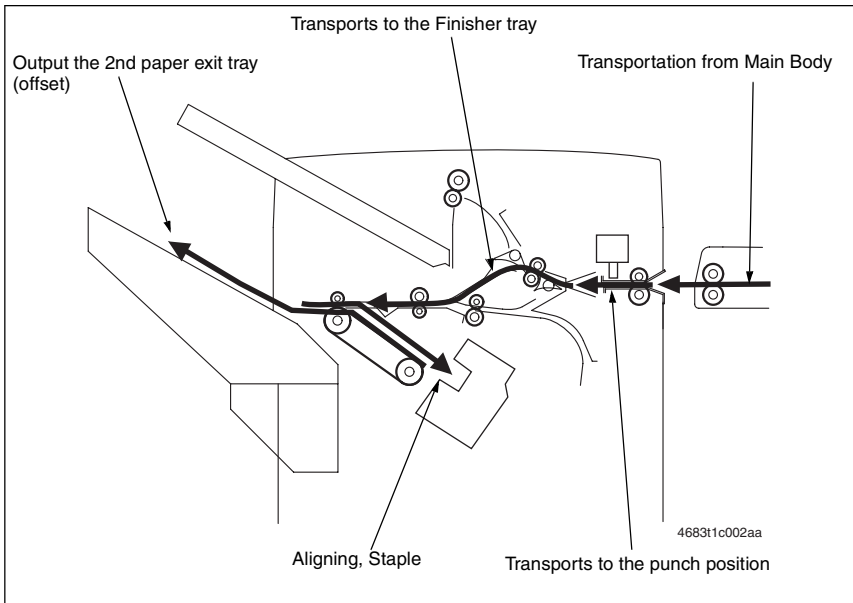
- These specifications are subject to change without notice.

2. Paper Feed Path

2.1 Output the 1st paper exit tray

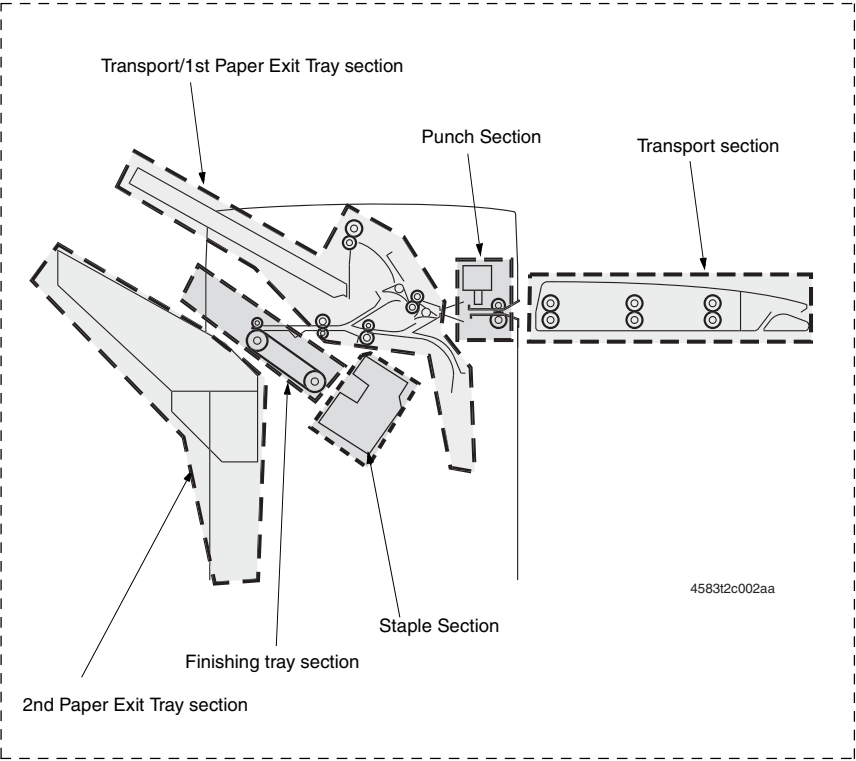


2.2 Output the 2nd paper exit tray

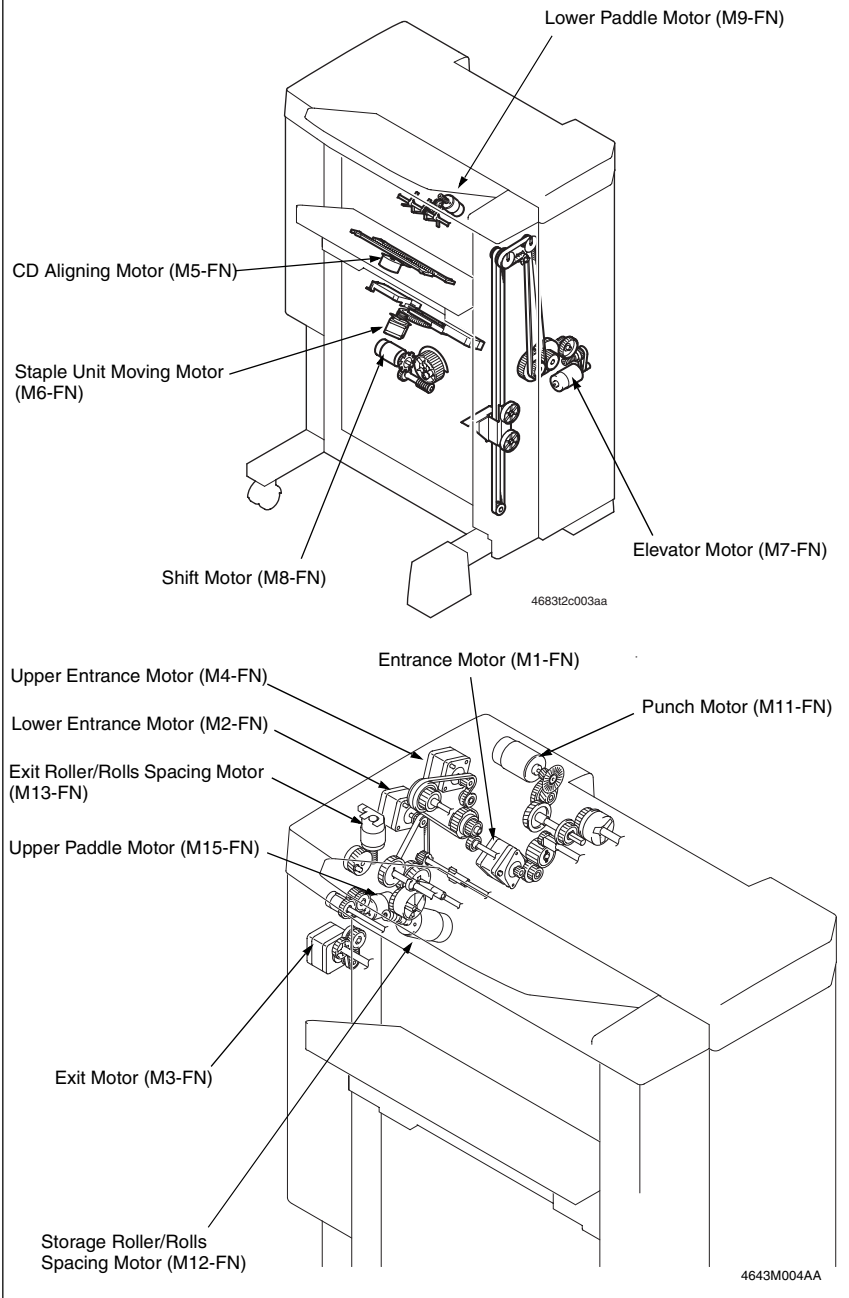


Composition/Operation

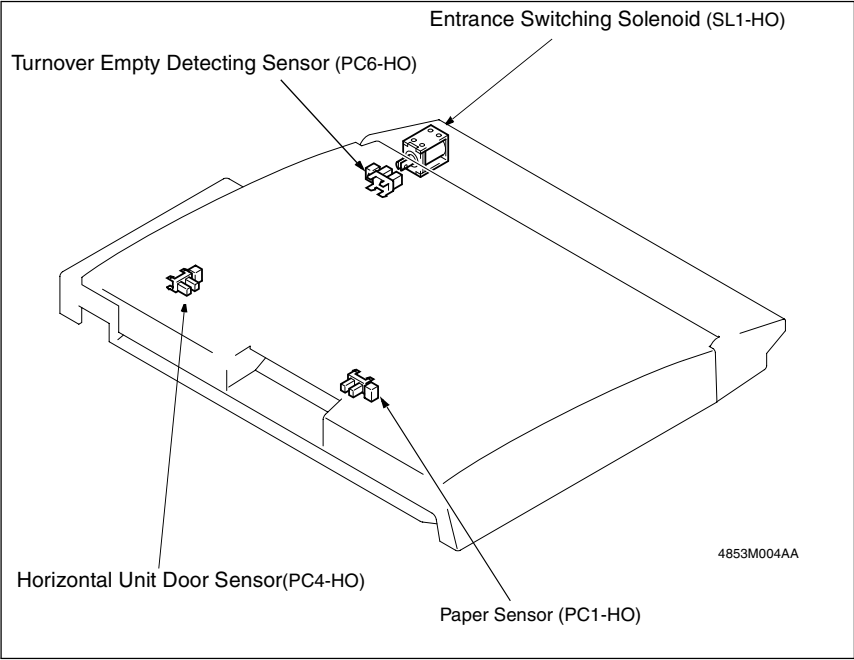
3. Composition



4. Drive



A. Horizontal Transport



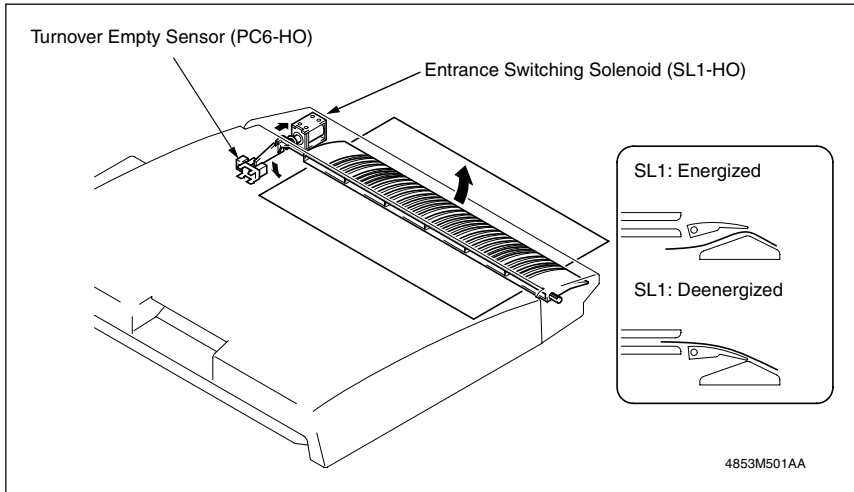
5. Operations

5.1 Horizontal transport unit

5.1.1 Paper transport mechanism

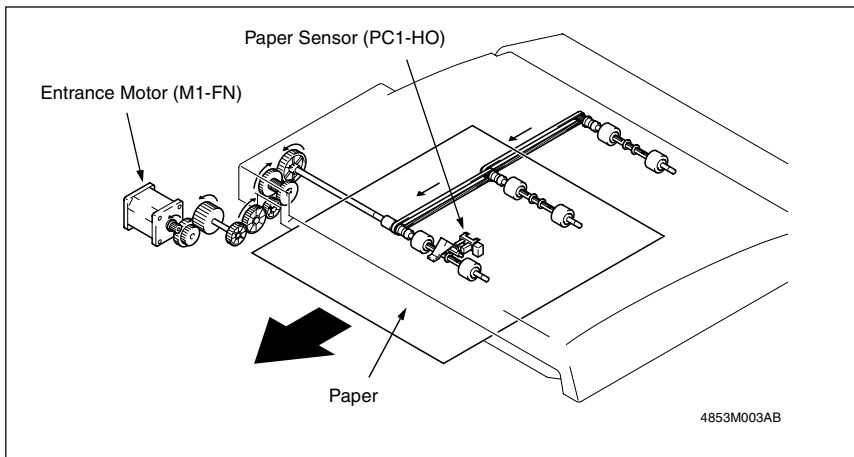
A. Paper path switching mechanism

- The paper fed from the main unit moves through either one of the two different paper paths.
- A solenoid is used to select the paper path.
For switchback sequence during 2-sided printing: Solenoid energized
For transport onto the Finisher: Solenoid deenergized



B. Finisher paper transport mechanism

- A motor is employed to transport paper onto the Finisher.
- The Paper Sensor functions to detect a sheet of paper present in the Horizontal Transport Unit.

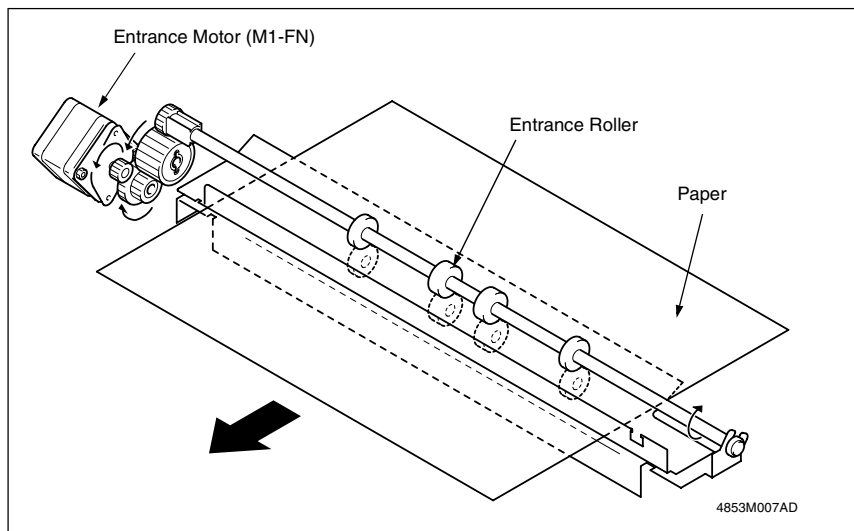


5.2 Paper transport

5.2.1 Paper transport mechanism

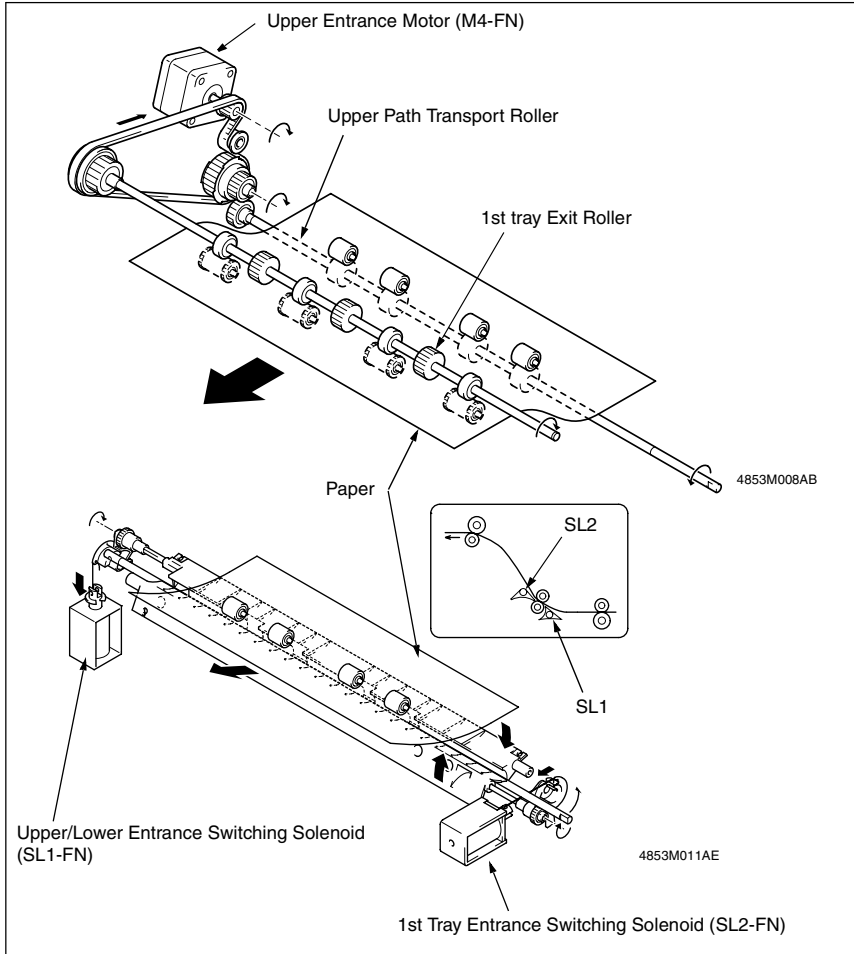
A. Entrance section paper transport mechanism

- The Entrance Roller is turned to transport the paper into the Finisher as the Entrance Motor is energized.



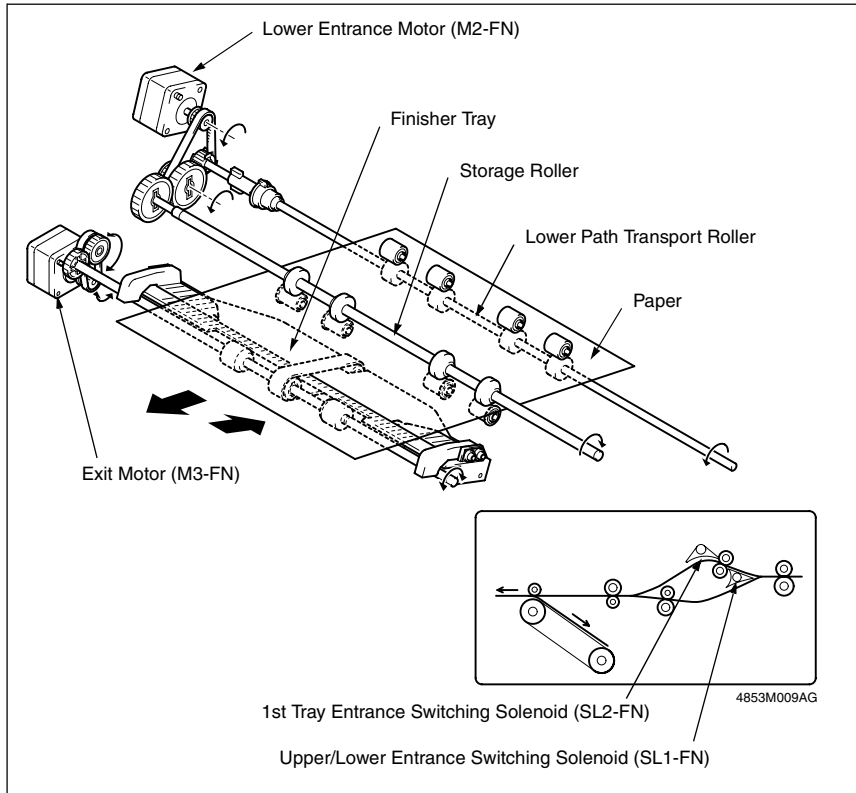
B. 1st paper exit tray paper transport mechanism

- Paper transport to the 1st paper exit tray takes place when the Finisher is in the Group mode.
- The Upper Path Transport Roller and 1st TrayExit Roller turn to transport the paper into the 1st paper exit tray as the motor is energized.
- The 1st Tray Entrance Switching Solenoid and Upper/Lower Entrance Switching Solenoid are energized to select the paper path into the 1st paper exit tray .



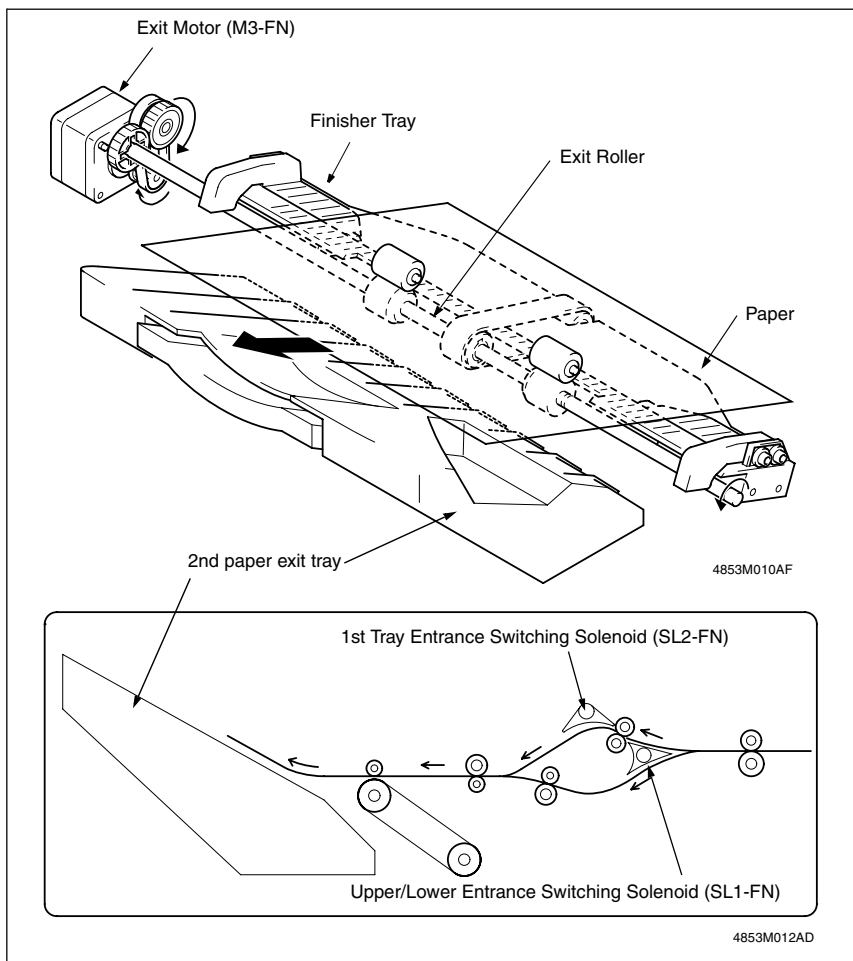
C. Finisher tray paper transport mechanism

- Paper transport to the Finisher Tray takes place when the Finisher is in the Staple mode.
- As the Lower Entrance Motor is energized, the Storage Roller turns to transport the paper toward the exit direction.
- By turning the Exit Motor backward, paper is transported onto the Finisher Tray.
- Either the upper paper path or lower paper path is used to transport paper onto the Finisher Tray.
- The upper paper path is selected when the Upper/Lower Entrance Switching Solenoid is energized, while the 1st paper exit tray Entrance Switching Solenoid is deenergized.
- The lower paper path is selected when the Upper/Lower Entrance Switching Solenoid is deenergized.



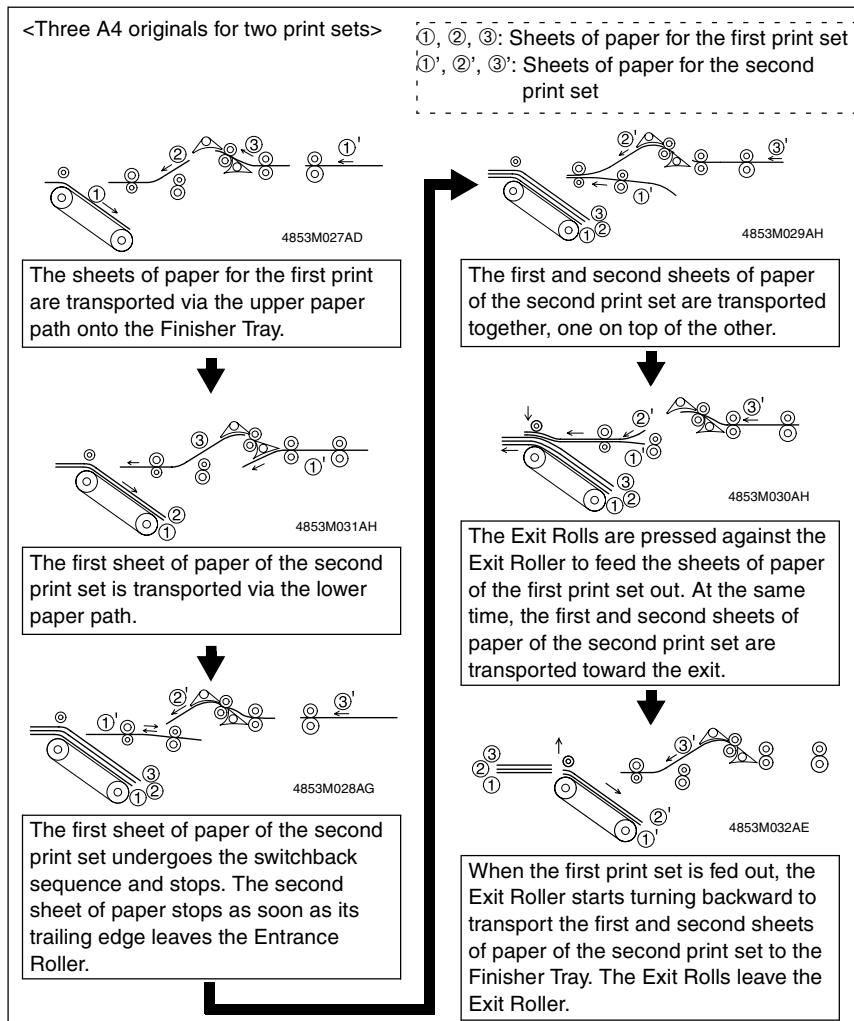
D. 2nd paper exit tray paper transport mechanism

- Paper transport to the 2nd paper exit tray takes place when the Finisher is in the Sort or Group mode.
- As the motor is energized, the Exit Roller turns to transport the paper into the 2nd paper exit tray.
- Either the upper paper path or lower paper path is used to transport paper onto the 2nd paper exit tray.
- The upper paper path is selected when the Upper/Lower Entrance Switching Solenoid is energized, while the 1st Tray Entrance Switching Solenoid is deenergized.
- The lower paper path is selected when the Upper/Lower Entrance Switching Solenoid is deenergized.



5.2.2 Paper switchback mechanism

- When the last paper of the first print set is transported onto the Finisher Tray during a multi-print cycle in the Sort Staple mode, the first paper of the subsequent print set, which is to be next transported, undergoes a switchback sequence. The paper for the switchback is transported via the lower paper path.
- The second paper of the second print set is placed over the paper which has undergone the switchback sequence. After the first print set has been fed into the 2nd paper exit tray, the first and second sheets of paper of the second print set are together transported onto the Finisher Tray.
- The switchback sequence of the paper is performed by turning the motor backward, which turns the Lower Path Transport Roller and Storage Roller backward.
- The sheet of paper to be transported next to the one subjected to the switchback sequence is transported via the upper paper path.
- No switchback sequence is carried out if the interval between sheets of paper is wide as when using paper of a large size.



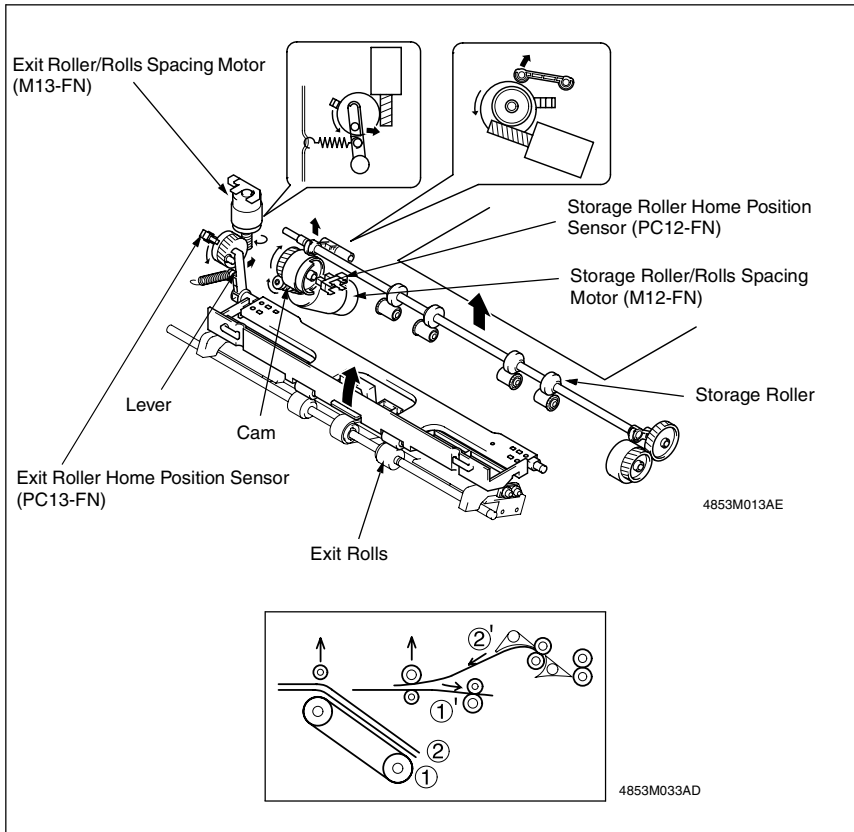
5.2.3 Roller/rolls spacing mechanism

A. Storage roller/rolls spacing mechanism

- The Storage Roller briefly stops when the first sheet of paper completes a switchback sequence during a multi-print cycle in the Sort Staple mode. If, however, paper measures 217 mm or more in the FD direction, the leading edge of the second sheet of paper reaches the Storage Roller before the roller stops turning. The Storage Roller is therefore raised up to allow a given clearance from the Storage Rolls.
- The Storage Roller is spaced from the Storage Rolls as a cam is turned by the corresponding motor.

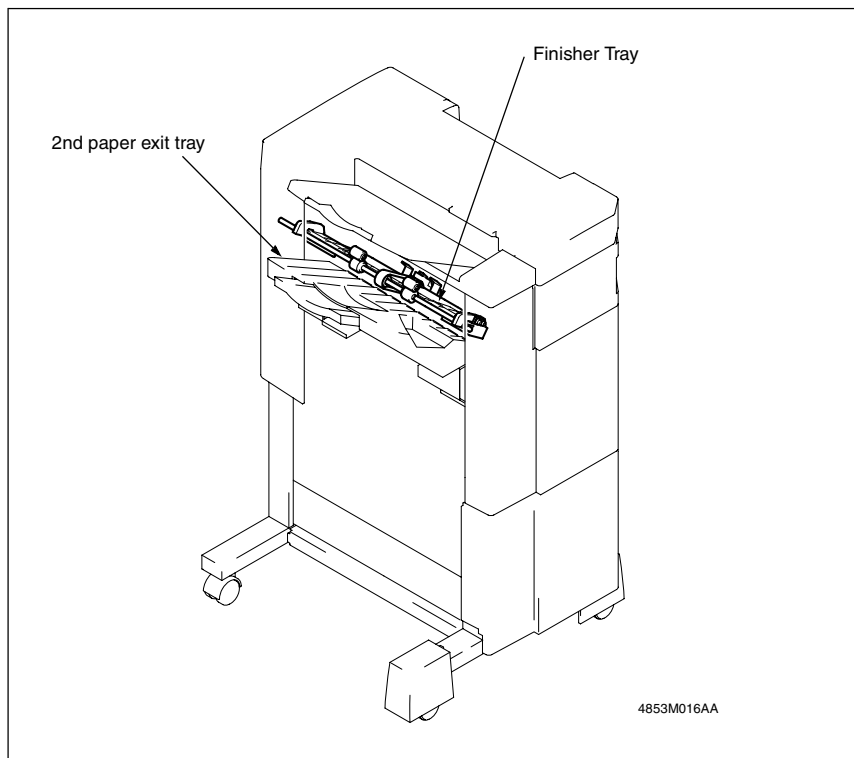
B. Exit roller/rolls spacing mechanism

- Paper needs to be temporarily transported to the Finisher Tray in the Staple mode, which makes it necessary to raise the Exit Rolls to provide a given clearance from the Exit Roller.
- After the stapling sequence has been completed, the Exit Rolls are lowered and pressed against the Exit Roller so that the paper can be fed out.
- The Exit Rolls are spaced from the Exit Roller as a lever is moved to the right and left by the cam which is rotated by the motor.



5.3 Finisher tray

- Sheets of paper are properly aligned and stapled together on the Finisher Tray before being fed out into the 2nd paper exit tray.

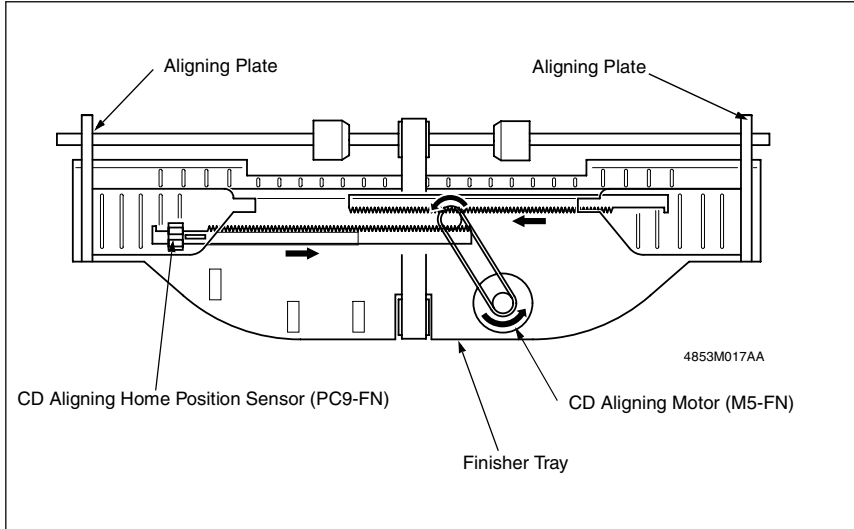


5.3.1 Paper aligning mechanism

- The Aligning Plate is moved and the Paddles are turned to align paper correctly for stapling.

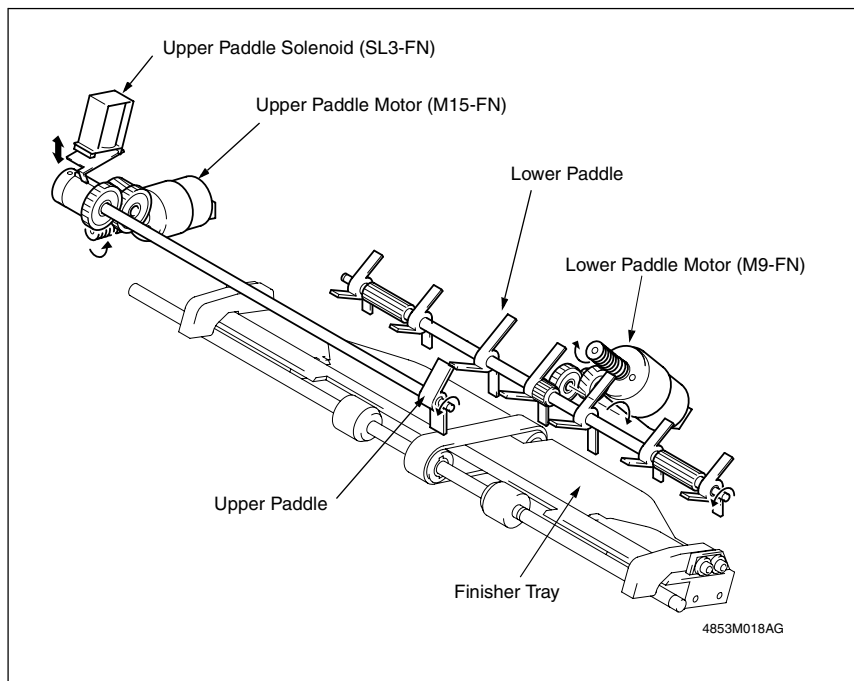
A. Aligning plate

- The Aligning Plate is moved to align the paper in the crosswise direction with reference to the center position of the Finisher Tray.
- The Aligning Plate is moved as the CD Aligning Motor turns forward or backward.
- The CD Aligning Home Position Sensor detects the Aligning Plate at its home position. The movement of the Aligning Plate is determined with this home position used as the reference.
- The movement of the plate is varied depending on the width of the paper.



B. Paddles

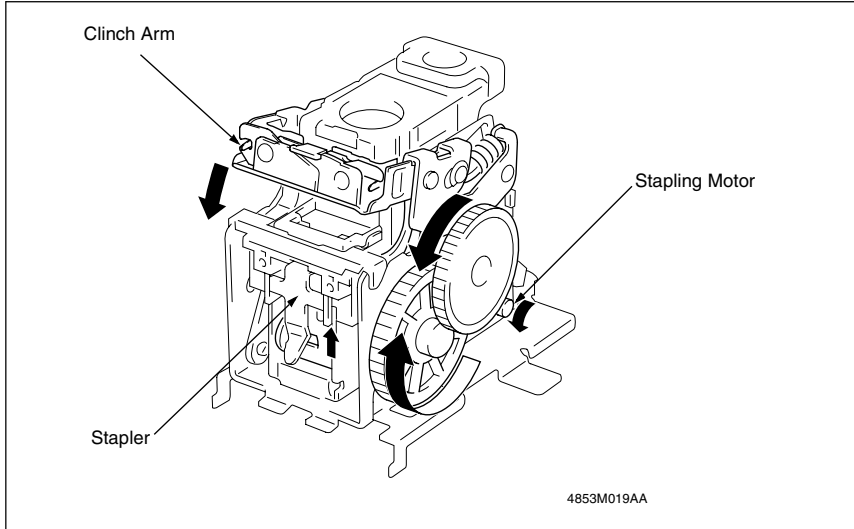
- The Upper and Lower Paddles are turned to align the paper in the feeding direction.
- The Upper Paddles are turned by the Upper Paddle Motor and Upper Paddle Solenoid.
- The Lower Paddles are turned by the Lower Paddle Motor.



5.4 Stapling

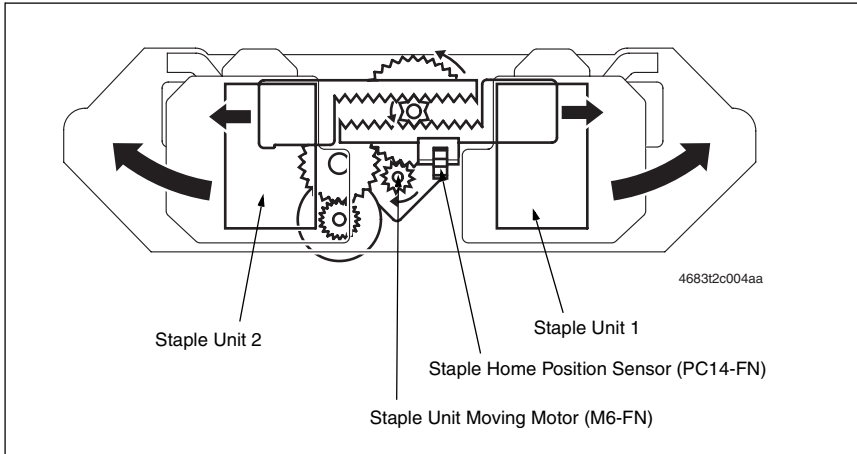
5.4.1 Stapling mechanism

- The Staple Unit performs the stapling action.
- When the Stapling Motor turns, the Clinch Arm lowers. Then the Stapler moves up to drive a staple into paper and the staple is formed.
- Staple position are rear corner at a point and front corner at a point and side at two points.



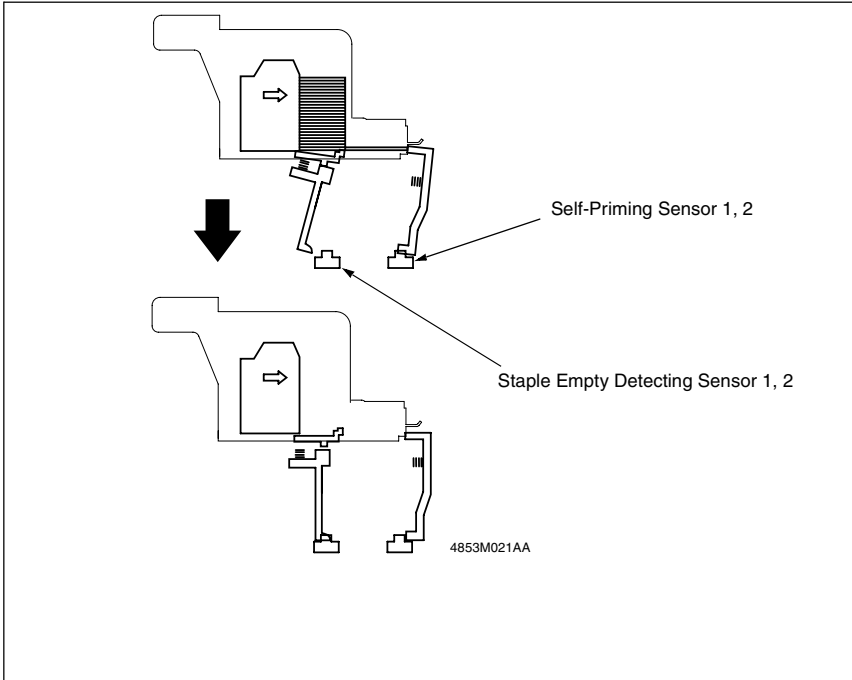
5.4.2 Staple unit moving mechanism

- Staple Unit is moved by the Staple Unit Moving Motor.
- The Staple Home Position Sensor detects Staple Unit at respective home positions. The Staple Unit is moved with reference to this home position.



5.4.3 Staple sheet empty detection

- The Staple Empty Detecting Sensor is used to detect whether there is a staple sheet or not in the Staple Cartridge.
- When there are about 20 staples left in the Staple Cartridge, a staple sheet empty condition results and a staple-empty display is given on the control panel of the main unit.
- If a staple sheet empty condition is detected during a stapling sequence, that particular sequence is continued until it is completed. A staple empty display is then given.
- After a new Staple Cartridge has been loaded, the Stapling Motor is energized until the Self-Priming Sensor detects loaded staples (L), thereby feeding the staple sheet to the stapling position.



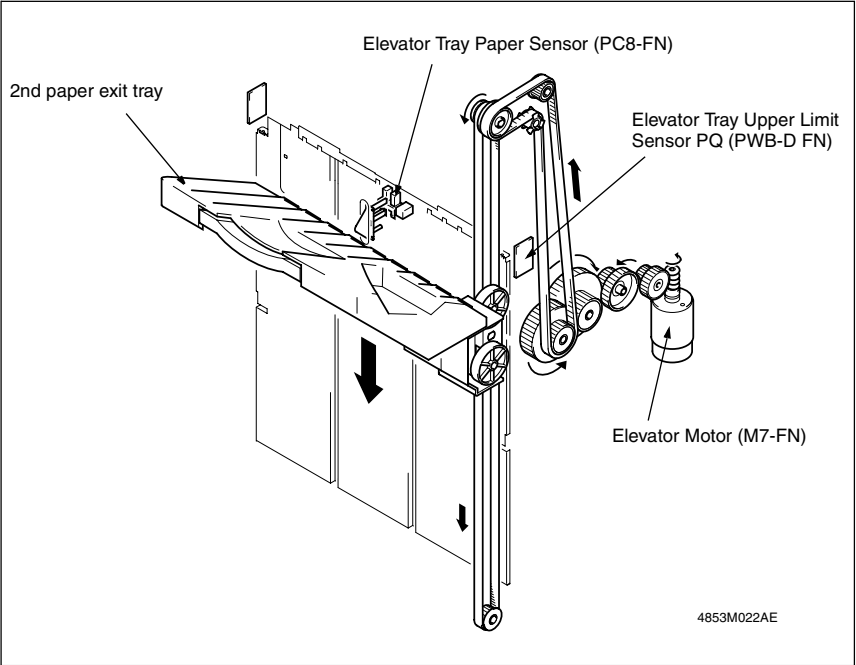
5.5 2nd paper exit tray

- The 2nd paper exit tray moves up or down according to certain conditions.

5.5.1 2nd paper exit tray ascent/descent mechanism

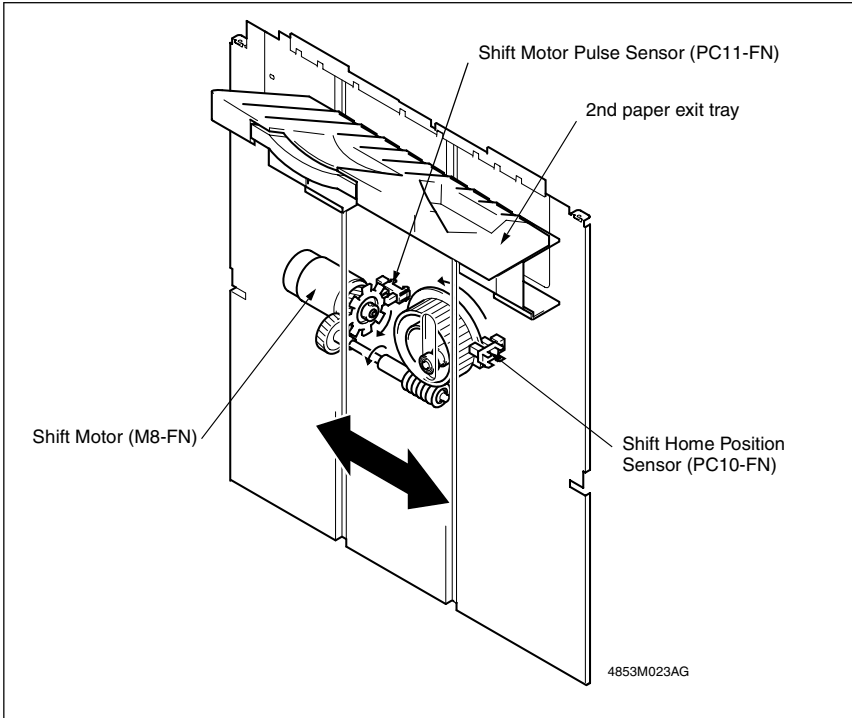
- The 2nd paper exit tray is moved up or down by the Elevator Motor that turns forward or backward.

Condition	2nd paper exit tray	Control
Standby	Stationary at the upper limit position.	The position at which the Elevator Tray Upper Limit Sensor PQ (PWB-D FN) detects the 2nd paper exit tray .
Paper fed into tray	Lowers to the lower limit position depending on the number of sheets of paper to be fed into the tray.	If the Elevator Tray Upper Limit Sensor PQ (PWB-D FN) is activated while paper is being fed into the tray, the tray is lowered until the sensor is deactivated.
Paper removed from tray	Moves up to the upper limit position.	If the Elevator Tray Paper Sensor (PC8-FN) is unblocked when paper is removed from the tray, the tray is raised until the sensor is blocked.
Overload detected	Moves down and then up after paper has been fed into tray.	Lowrs the tray for a given period of time, then raises it to the upper limit position. An overcurrent is detected in the Elevator Motor during this period.



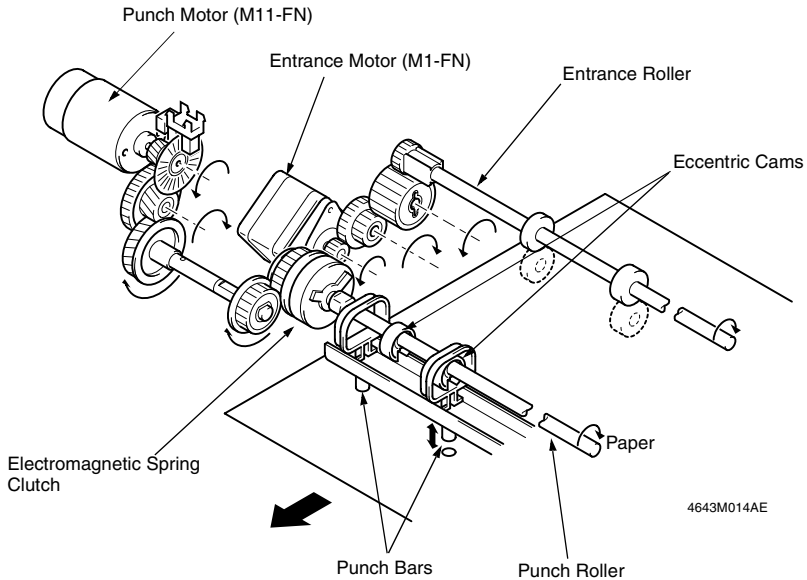
5.5.2 2nd paper exit tray shifting mechanism

- When in the offset mode, the 2nd paper exit tray is moved to the front and rear by a motor to stack print sets in a sawtooth manner so that each print set is offset with respect to the others.
- The Shift Home Position Sensor detects the 2nd paper exit tray at its home position.



5.6 PUNCH MECHANISM

- The paper being transported through the Finisher is briefly stopped and holes are made in a space near its trailing edge.
- When the Punch Motor is energized and the electromagnetic spring clutch fitted to the Punch Roller is energized, the Punch Bars move up and down to make holes in the paper.



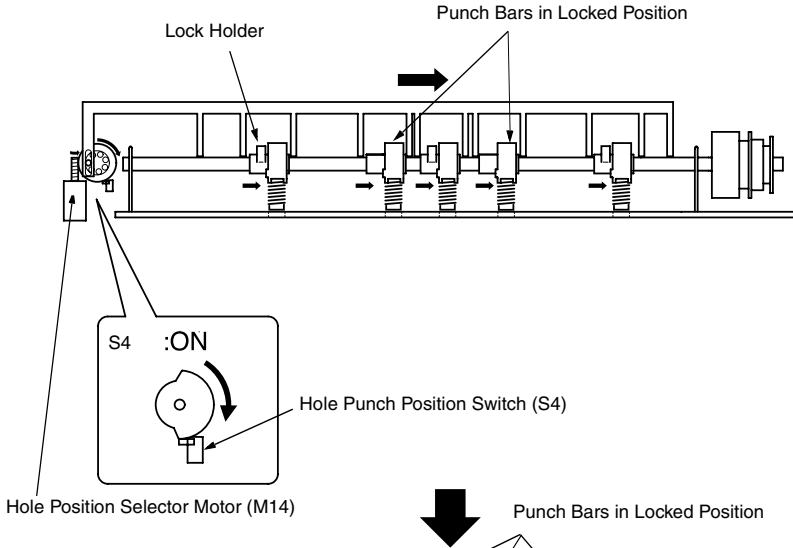
5.6.1 Punch Operation

1. The Entrance Motor is energized and paper is allowed into the Finisher.
2. The trailing edge of the paper moves past the Paper Sensor of the Horizontal Transport Unit.
3. A given period of time thereafter, the Upper Entrance Motor or Lower Entrance Motor is deenergized to bring the paper to a stop.
4. The electromagnetic spring clutch is energized to turn the Punch Roller and the eccentric cams.
5. The Punch Bars move up and down to make holes in the paper.
6. The Upper Entrance Motor or Lower Entrance Motor is energized to transport the paper.

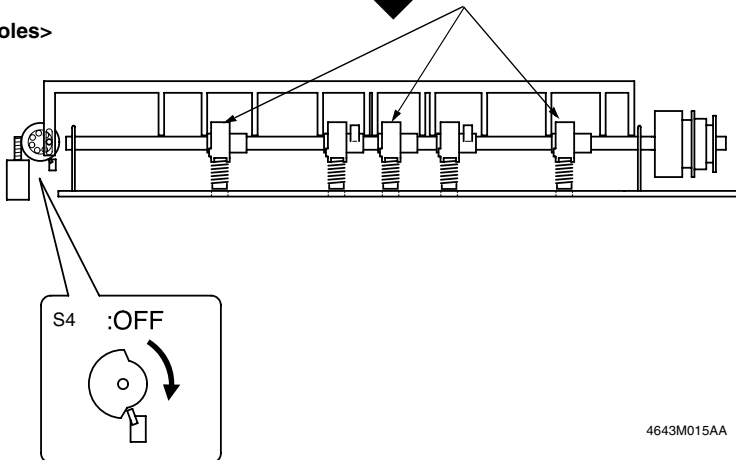
5.6.2 Inch area

- The Hole Position Selector Motor and Hole Punch Position Switch are employed to move the lock holder as necessary to select the hole positions (2 or 3 holes).

<2 holes>



<3 holes>



4643M015AA



KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

JS-601

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, show  to the left of the revised section.
A number within  represents the number of times the revision has been made.
- To indicate clearly a section revised, show  in the lower outside section of the corresponding page.
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2005/03	1.0	—	Issue of the first edition
Date	Service manual Ver.	Revision mark	Descriptions of revision

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4. Operation 4

4.1 Job tray paper transport mechanism 4

Blank Page

Outline

1. Product specification

1.1 Type

Name	Job separator
Installation	Fixed to Finisher
Document Alignment	Center

1.2 Functions

Modes	Non-Sort (in the fax or printer output mode)
-------	--

1.3 Paper type

Paper Type	Paper Size	Weight	Tray Capacity
Plain paper	A5R to A3 5.5 × 8.5R to 11 × 17	60 to 90 g/m ² 16 to 24 lb	100 sheets: A4, 8.5 × 11 (80 g/m ² , 21.75 lb) 50 sheets: except A4, 8.5 × 11 (80 g/m ² , 21.75 lb) (Height: up to 28 mm, 1 inch)

1.4 Machine specifications

Power Requirements	DC 5 V, DC 24 V (supplied from Finisher)
Dimensions	341 mm (W) × 149 mm (H) × 527 mm (D) 13.5 inch (W) × 5.75 inch (H) × 20.75 inch (D)
Weight	1.75 kg (3.75 lb)

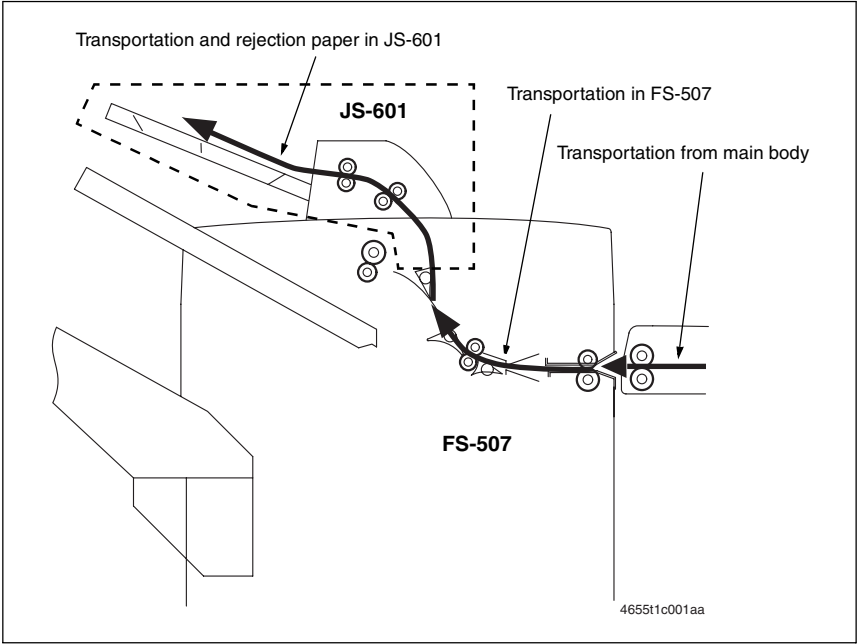
1.5 Operating environment

Conforms to the operating environment of the main unit.

NOTE

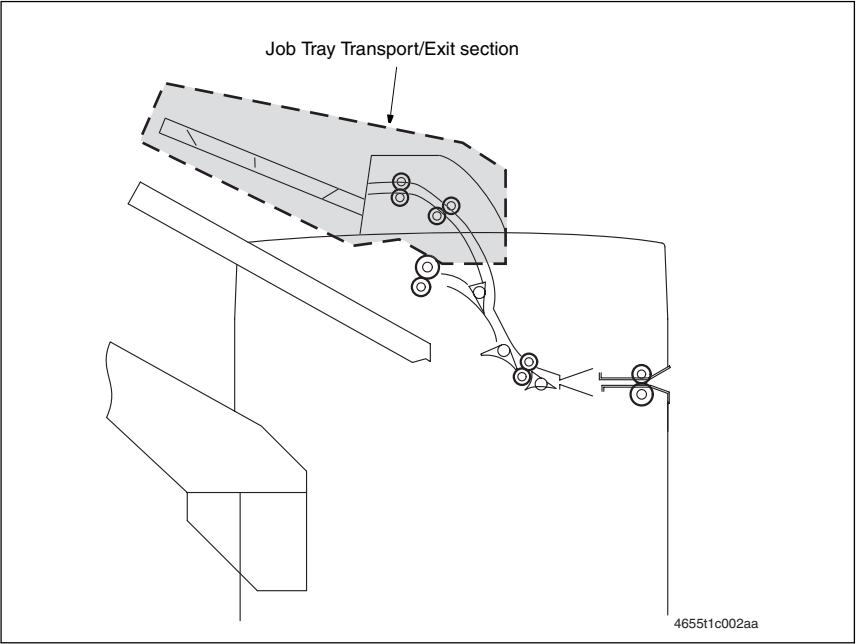
- These specifications are subject to change without notice.

2. Paper Feed Path



Composition/Operation

3. Composition



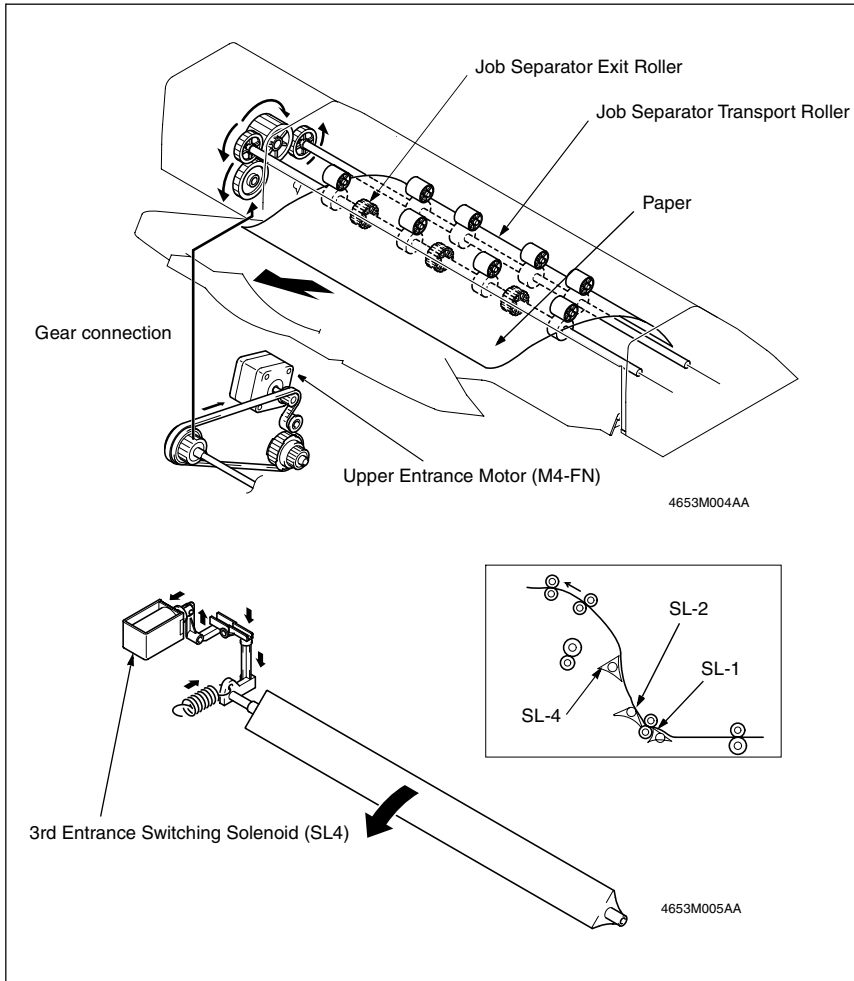
JS-601

Composition/Operation

4. Operation

4.1 Job tray paper transport mechanism

- The Job Separator Transport Roller and Job Separator Exit Roller turn to transport the paper into the Job Tray as the motor is energized.
- The 1st Tray Entrance Switching Solenoid, Upper/Lower Entrance Switching Solenoid, and 3rd Entrance Switching Solenoid are energized to select the paper path into the Job Tray.





KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

FS-603

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Outline

1. Product specification

1.1 Type

Type	Multi Staple Finisher with Saddle (Booklet)
Installation	Freestanding
Document Alignment	Center
Supplies	Staple Cartridge

1.2 Functions

Modes	Normal	Group, Sort, Group Offset, Sort Offset, Sort Staple Center Staple & Fold
	Punch (Option)	Group Punch, Sort Punch, Group Offset Punch, Sort Offset Punch, Sort Staple Punch

1.3 Paper type

- Remove the finisher off the Copier for feeding the long paper.
- The maximum loading capacity shown is for when loading the single type of paper (80g/m²)

1.3.1 Group, Group offset

Plain Paper	Paper Size	Weight	Tray Capacity *1			Exit Tray	No. of Sheets to be Stapled
Envelop OHP Film Label Paper Thick Paper	B5R/B5 to A3 wide 5.5 × 8.5R/ 5.5 × 8.5 to 12.25 × 18	60 to 90 g/m ² 16 to 24 lb	No. of Sheet Height	A4R / 8.5×11R or smaller 1000 150 mm	B4/ 8.5×14 or larger 500 75 mm	1st paper exit tray	-
		60 to 256 g/m ² 16 to 68 lb	20 sheet				

*1: Controlled by whichever reached earlier

1.3.2 Sort, Sort offset

Paper Type	Paper Size	Weight	Tray Capacity			Exit Tray	No. of Sheets to be Stapled
Plain Paper	A5,B5R/B5 to A3 8.5 × 11R/ 8.5 × 11 to 11 × 17	60 to 90 g/m ² 16 to 24 lb	No. of Sheets Height	A4R / 8.5×11R or smaller 1000 150 mm	B4/ 8.5×14 or larger 500 75 mm	1st paper exit tray	-
			Controlled by whichever reached earlier				

1.3.3 Sort staple

Paper Type	Paper Size	Weight	Tray Capacity			Exit Tray	No. of Sheets to be Stapled	
Plain Paper Thick Paper	B5R/B5 to A3 8.5 × 11R/ 8.5 × 11 to 11×17	Normal Mode 60 to 90 g/m ² 16 to 24 lb	No. of Sheets Height No. of Sets	A4R / 8.5×11R or smaller	B4/ 8.5×14 or larger	1st paper exit tray	Normal Mode *1	
				1000 150 mm	500 75 mm		A4R/ 8.5× 11R or smaller	B4/ 8.5×14 or larger
		Cover Mode 60 to 209 g/m ² 16 to 55.5 lb	Controlled by whichever reached earlier				2 to 50	2 to 25

* The number of Sheets to be Stapled is limited for high-density images.
(Color Wise: 20 sheets x 20 sets)

1.3.4 Center Staple & Fold

Paper Type	Paper Size	Weight	Tray Capacity	Exit Tray	No. of Sheets to be Stapled
Plain Paper	A4R, B4, A3 8.5 × 11R/ 11 × 17	60 to 90 g/m ² 16 to 24 lb	10 sets (No. of Sheets to be Stapled: 6 to 15 sheets) 20 sets (No. of Sheets to be Stapled: 2 to 5 sheets)	2nd paper exit tray	Black copy 2 to 15 sheets (Max. 60 pages) Other copy 2 to 10 sheets (Max. 40 pages)

1.4 Stapling

Staple Filling Mode	Dedicated Staple Cartridge Mode (5000 staples)	
Staple Detection	Available (Nearly Empty: 40 remaining staples)	
Stapling Position	Rear: Parallel 1 point	B5R/B5 to A3, 8.5× 11R / 8.5× 11 to 11 × 17
	Front: Parallel 1 point	
	Side: Parallel 2 points	
	Center: Parallel 2 points	
Manual Staple	None	
Folding Mode	Roller Pressure Folding	
Folding Position	Center of Paper	

1.5 No. of sheets to be stapled (sort staple)

A. A4R, 8.5× 11R or smaller

No. of Sheets to be Stapled	No. of Sets		
	Rear: Parallel	Center: Parallel	Front: Parallel
2	100	40	40
3 to 5	80	40	40
6 to 10	60	40	40
11 to 20	30	30	30
21 to 30	30	30	30
31 to 50	30 sets or 1000 sheets		

B. B4, 8.5× 14 or larger

No. of Sheets to be Stapled	No. of Sets		
	Rear: Parallel	Center: Parallel	Front: Parallel
2	100	50	50
3 to 5	80	40	40
6 to 10	40	40	40
11 to 20	30 sets or 1000 sheets		
21 to 25			

1.6 Machine specifications

Power Requirements	DC 24 V (supplied from the main unit)
	DC 5 V (generated by Finisher)
Max. Power Consumption	65 W or less
Dimensions	601 mm (W) × 933 mm (H) × 603 mm (D) 23.75 inch (W) × 36.75 inch (H) × 23.75 inch (D)
Weight	41.6 kg (91.75 lb)

1.7 Operating environment

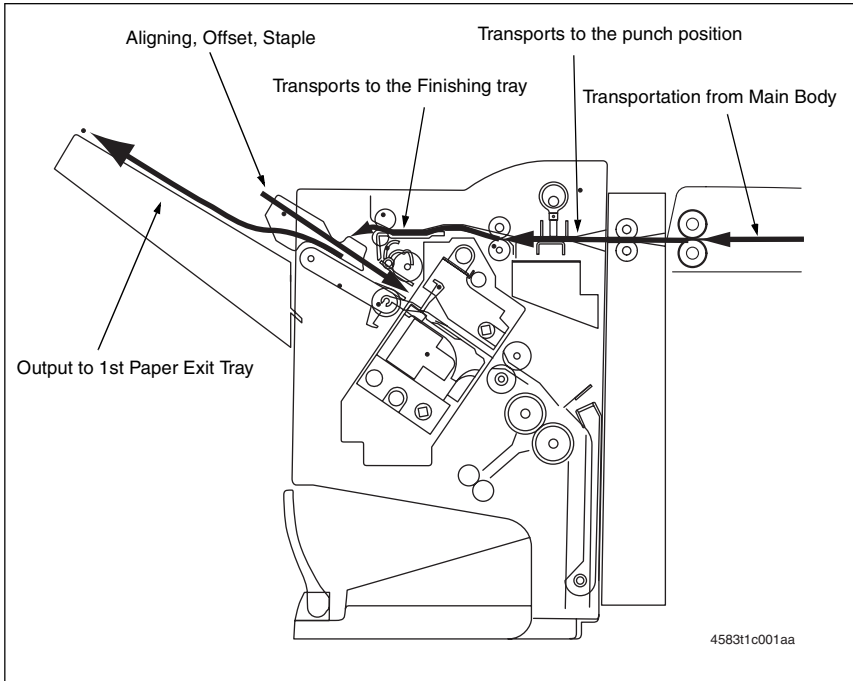
Conforms to the operating environment of the main unit.

NOTE

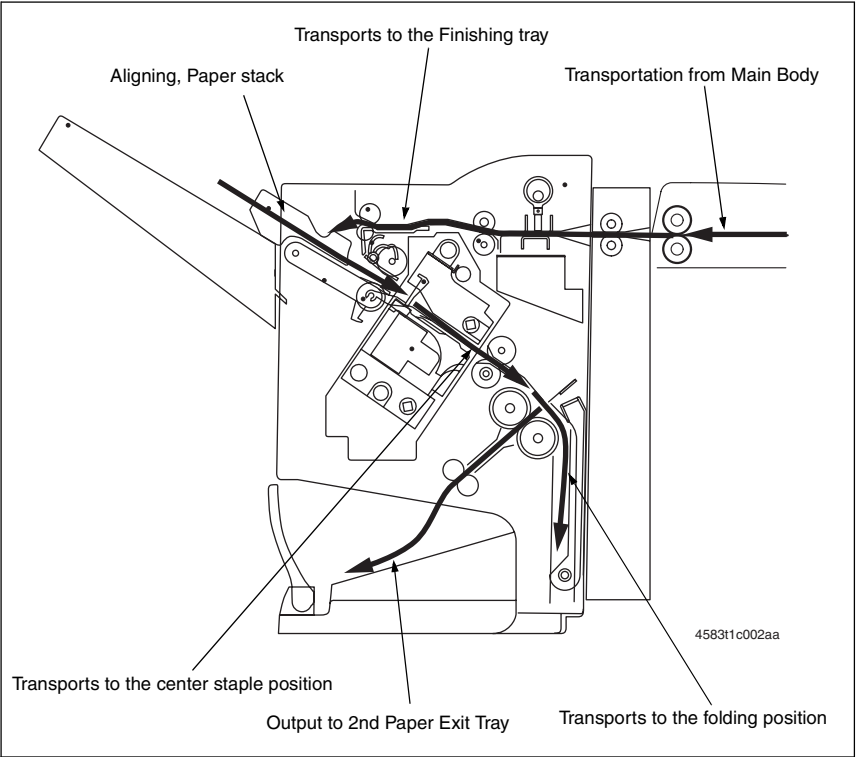
- These specifications are subject to change without notice.

2. Paper Feed Path

2.1 Output the 1st paper exit tray



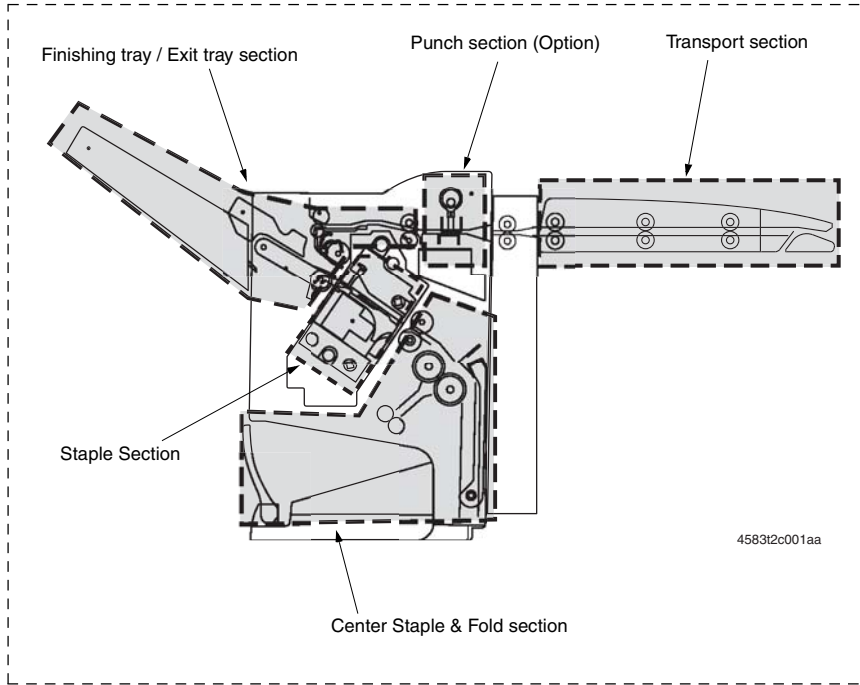
2.2 Output the 2nd paper exit tray



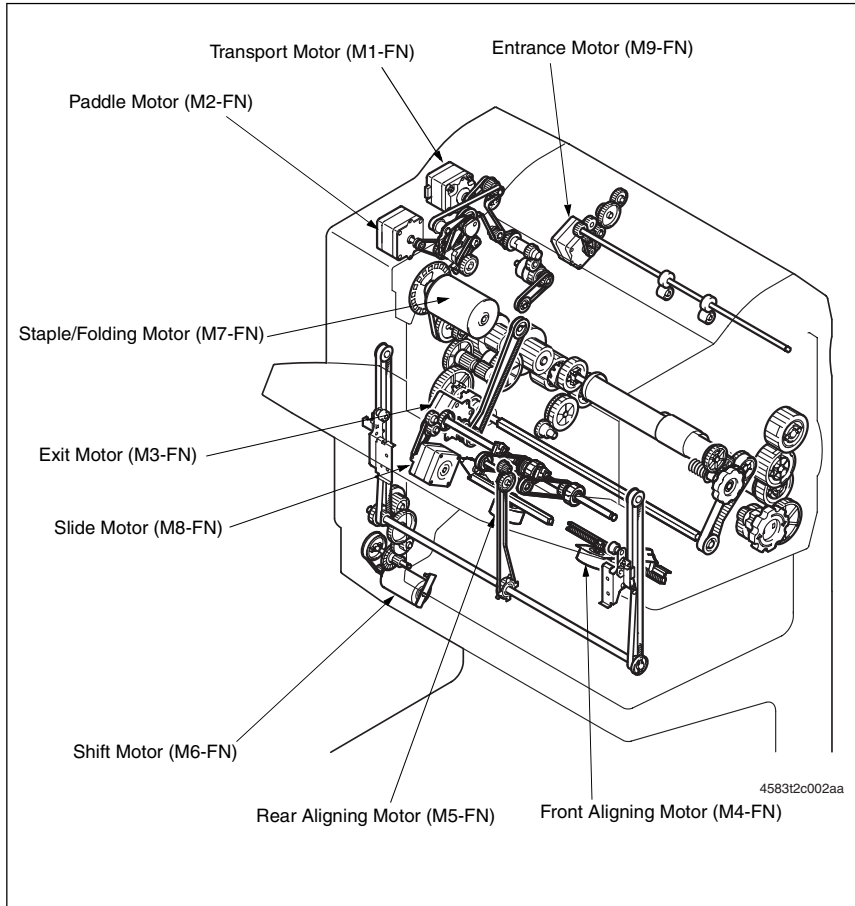
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Composition/Operation

3. Composition



4. Drive

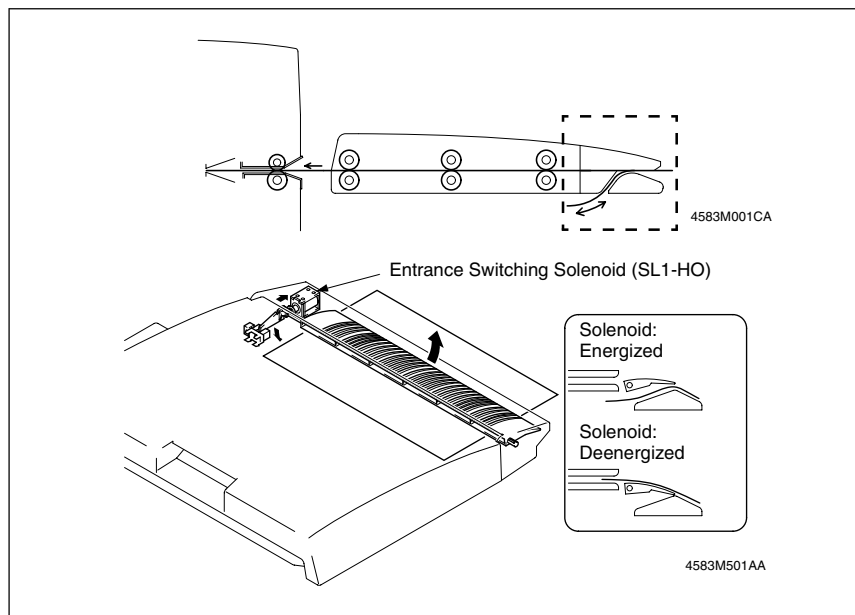


5. Operation

5.1 Transport Section

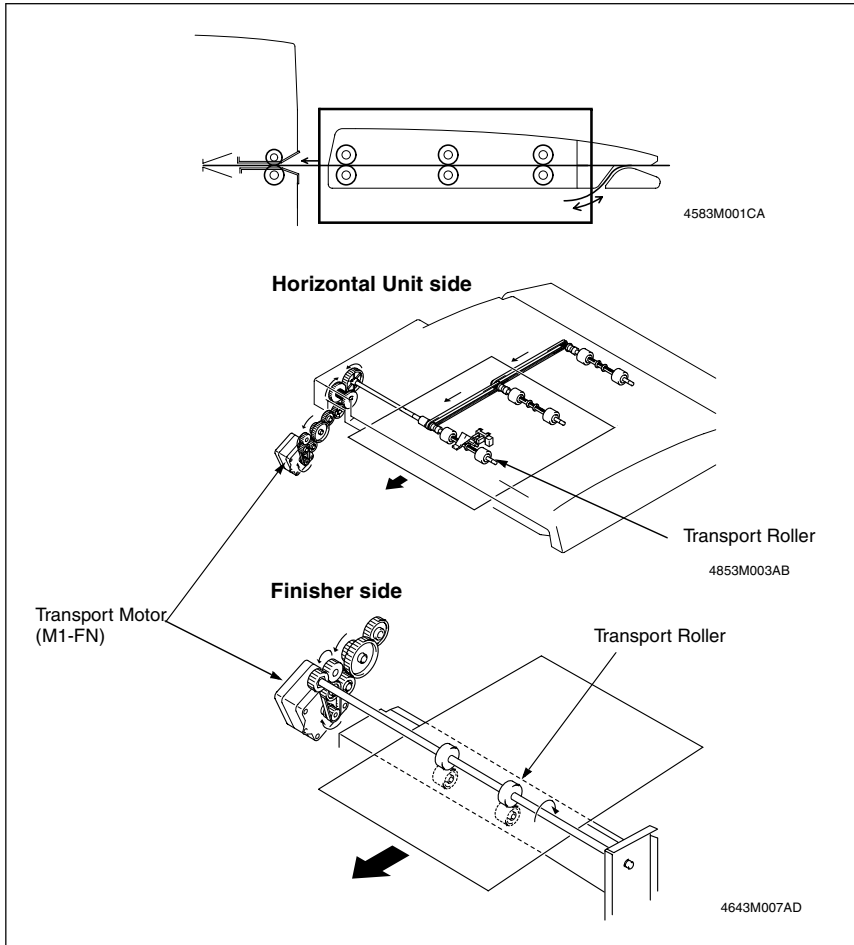
5.1.1 Paper path switching mechanism

- The path along which the paper is transported is selected with the Entrance Switching Solenoid.
- During a 2-sided print mode, the solenoid is energized to feed the paper into the lower path and then feed it back to the main unit.
- In a 1-sided print mode, and when a 2-sided printed page is fed in the 2-sided print mode, the Entrance Switching Solenoid is deenergized so that the paper can be transported to the Finisher.



5.1.2 Finisher paper transport mechanism

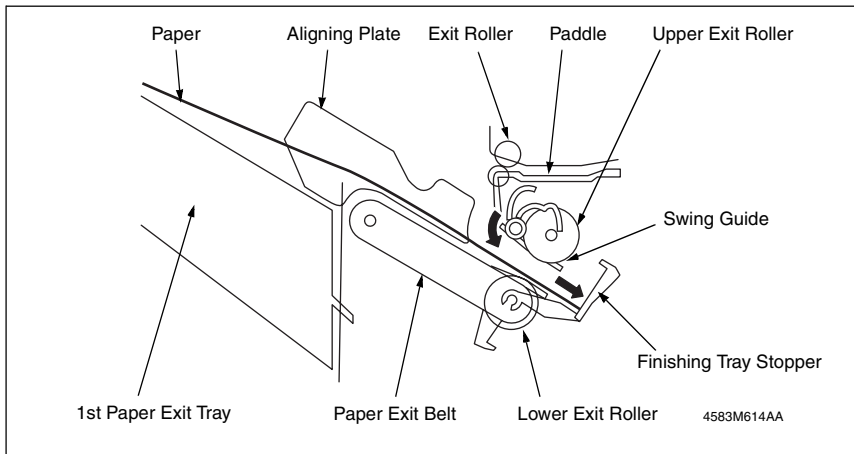
- Drive from the Transport Motor turns the Transport Roller to transport paper fed from the main unit onto the Finisher.
- The Transport Roller on the Finisher side is driven by the Transport Motor to feed the paper through the Finisher.



5.2 Finishing tray mechanism

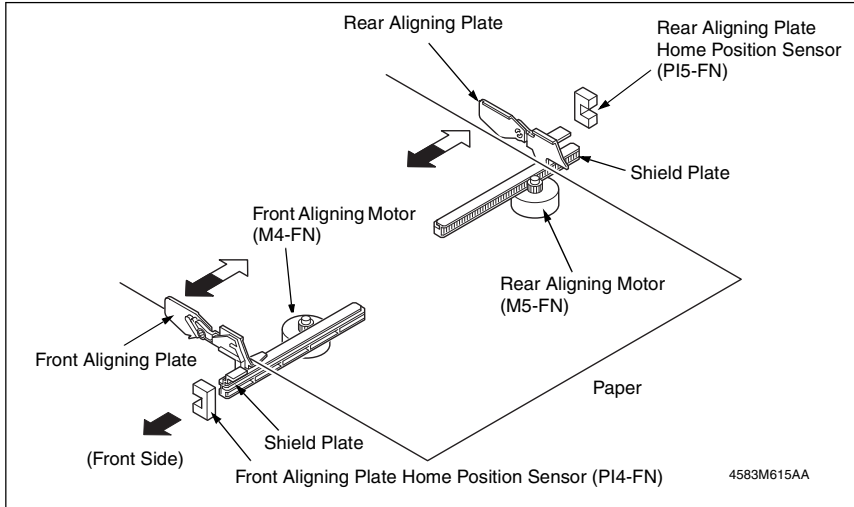
5.2.1 Paper stacking with finishing tray

- After the paper has been fed through the Exit Roller, the paper drops onto the Finishing Tray. Then, the Paddle taps the top of the paper twice (once for the additional sheets) so that the trailing edge of the paper reaches the Finishing Tray Stopper.
- After Paddle operation is finished, Swing Guide will be lowered to prevent curling of paper.
- The Paddle Motor provides the drive for the Paddle and its home position is detected with the Paddle Home Position Sensor.



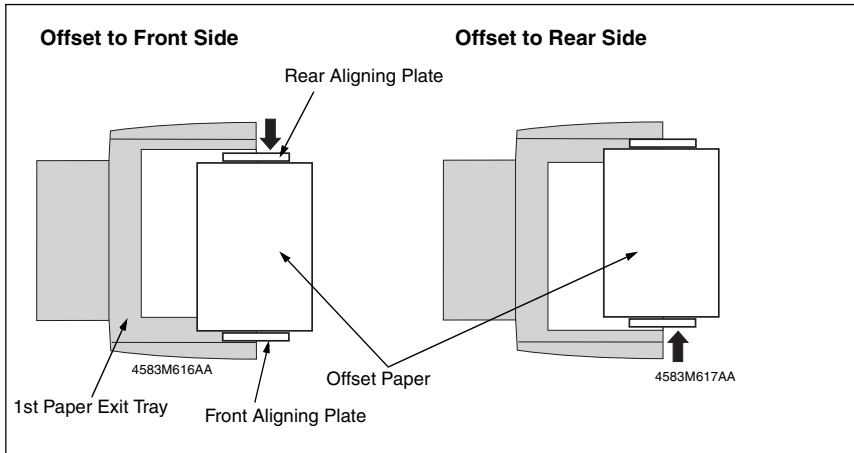
5.2.2 Aligning mechanism

- Two Aligning Plates are moved by drive of the Front, or Rear Aligning Motor in the forward or reverse direction.
- The Aligning Plates home position is detected with the Front, or Rear Aligning Plate Home Position Sensor. With reference to this home position, the amount of movement of the Aligning Plate is determined.



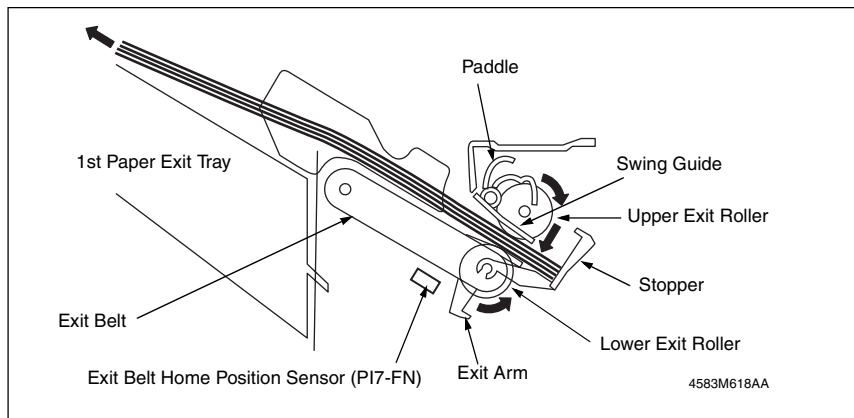
5.2.3 Offsetting operation

- Whenever the paper is stacked, it is moved toward the front or rear side by the Front or Rear Aligning Plate. Accordingly, the offsetting operation is made whenever the paper is fed onto the Finishing Tray.



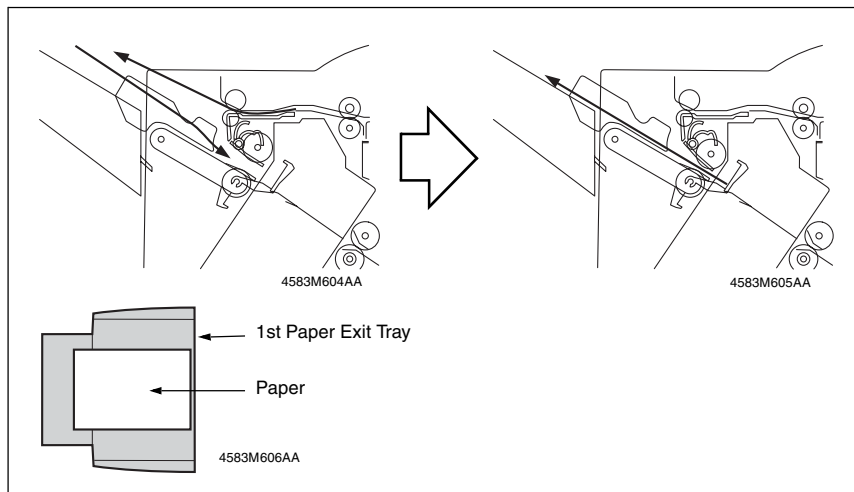
5.2.4 Exiting operation

- The Paddle, driven by the Paddle Motor, makes the Swing Guide move down and then the paper is taken up with the Upper, and Lower Exit Arm.
- Next, the Exit Motor rotates in the forward direction to transport the paper taken up with the Exit Rollers toward the Exit Section by the Exit Rollers and the Exit Arm.
- The Exit Belt Home Position Sensor turns OFF and then the Swing Guide moves up after the Motor has been driven for a given number of pulses. The Exit Motor is driven to transport a stack of paper with the Exit Arm, of the Exit Belt, rotating in synchronization with the Lower Exit Roller onto the 1st Paper Exit Tray.



5.2.5 Group mode, Sort mode

- Paper is taken back onto the Finishing Tray and then fed out onto the 1st Paper Exit Tray.

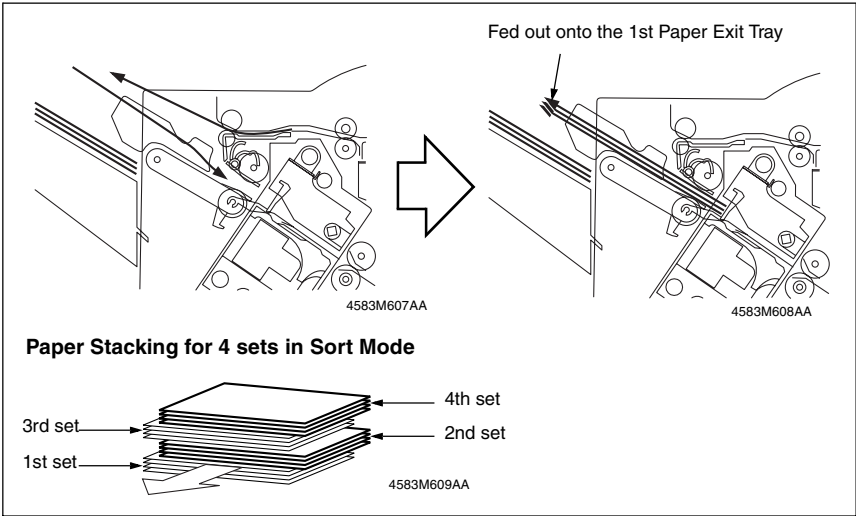


Paper Transport



5.2.6 Offset mode

- In the Offset Mode, Paper is taken back onto the Finishing Tray and shifted to the front or rear side with the Aligning Plate. Then, a stack of paper per set is fed out onto the 1st Paper Exit Tray.
- However, even if printing has not been completed for all sets of prints, when 10 sheets for the large size whose length is longer than 300mm or 30 sheets for the small size whose length is shorter than 299mm are stacked, a set of sheets is fed out onto the 1st Paper Exit Tray.

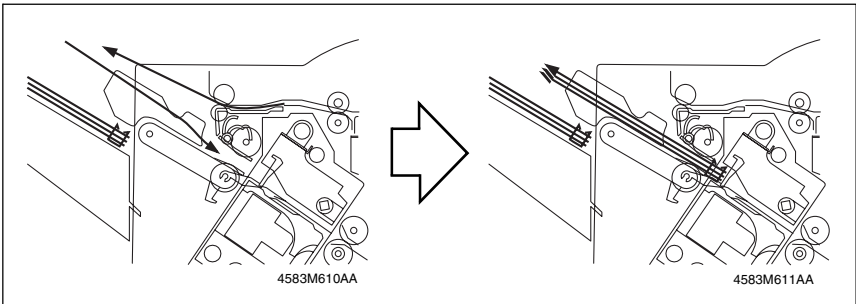


Paper Transport

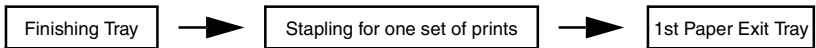


5.2.7 Staple Mode

- In the Staple Mode, when one complete set of prints is fed out onto the Finishing Tray, stapling is performed. A stack of stapled paper is then fed out onto the 1st Paper Exit Tray.

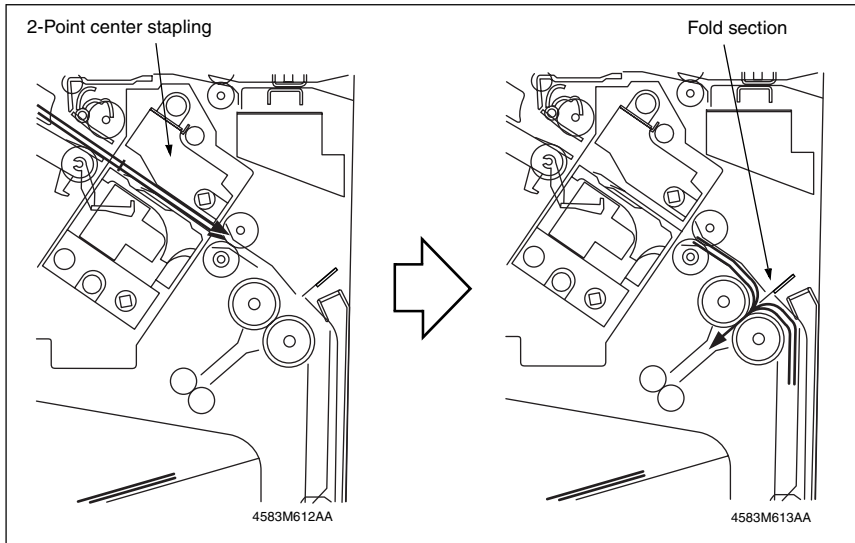


Paper Transport

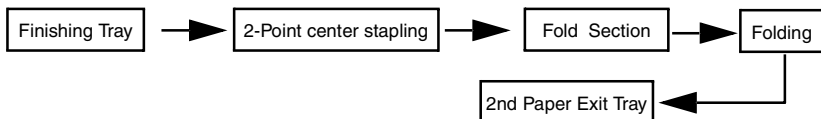


5.2.8 Center Staple & Fold mode

- In Staple section, A stack of paper fed onto the Finishing Tray is stapled (at two places) and then transported to the Fold Section.
- The paper transported to the Fold section is folded, and then fed out onto the 2nd Paper Exit Tray.
- The maximum number of the Center Staple & Fold.
 Black copy : 2 to 15 sheets (Max. 60 pages)
 Other copy : 2 to 10 sheets (Max. 40 pages)



Paper Transport



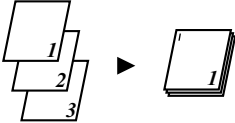
5.3 Staple unit

5.3.1 Types and positions of staples

- Shown here are the different stapling positions used with the FS-601.

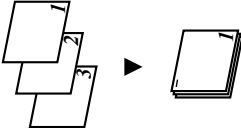
Type	Paper Size (Metric area)	Paper Size (Inch area)
Corner stapling (Rear)	B5, B5R, A4, A4R, B4, A3	8.5×11, 8.5×11R, 8.5×14, 11×17
Corner stapling (Front)		
2-Point side stapling		
2-Point center stapling	A4R, B4, A3	8.5×11, 11×17

Corner stapling (Rear)



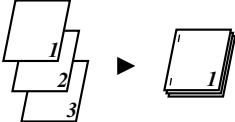
C4004o082AA

Corner stapling (Front)



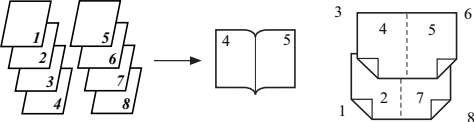
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2-Point side stapling



C4004o083AA

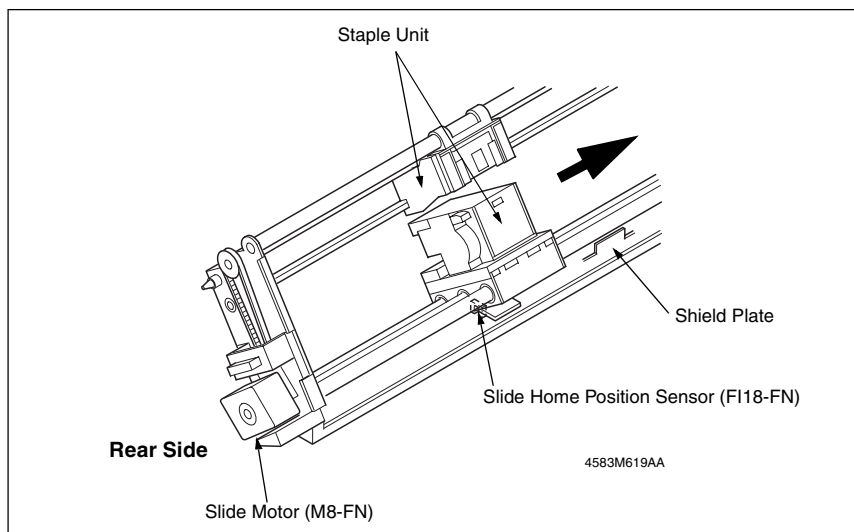
2-Point center stapling



C4004o079BA

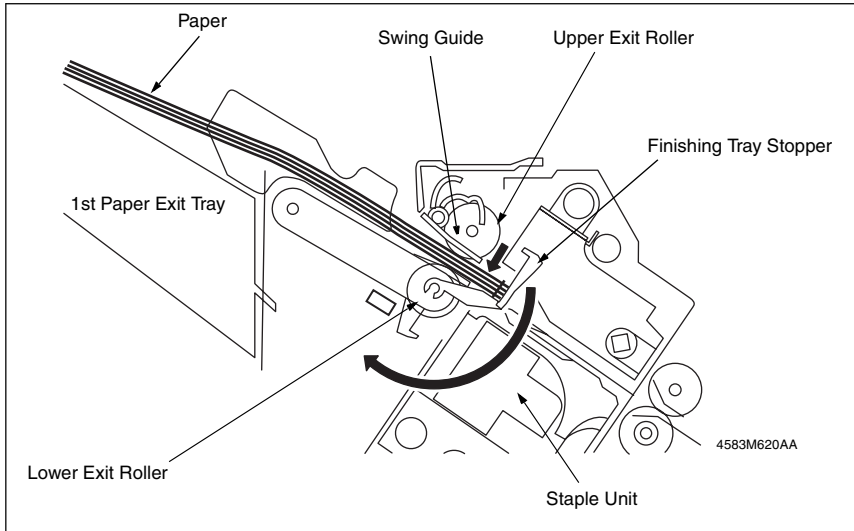
5.3.2 Staple unit moving mechanism

- When the Power Switch is turned ON, or the Front Door is opened and closed, the Staple Unit is moved to the front side with the forward rotation of the Slide Motor and stopped at the position where the Slide Home Position Sensor located at the bottom of the Staple Unit is blocked by the Light Shield Plate.
- The Staple Unit is moved to the rear side with the backward rotation of the Slide Motor and stopped at its standby position.
- This standby position is determined by the number of pulses input to the Slide Motor since it is a stepping type motor.



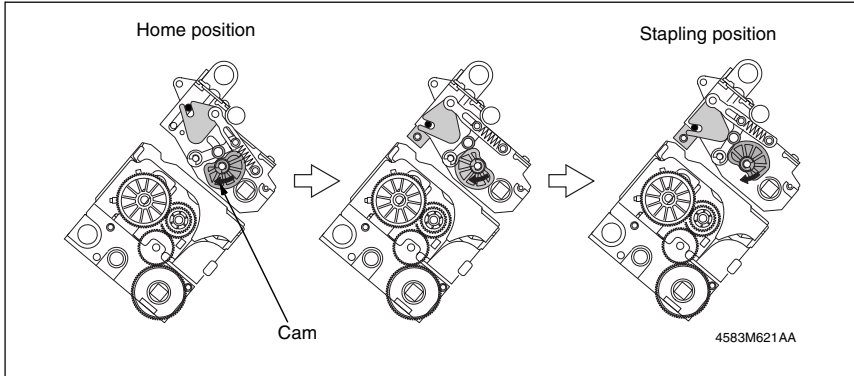
5.3.3 Staple operation

- After the paper stacking and alignment operation on the Finishing Tray have been completed, a stack of paper is taken up with the Upper, and Lower Exit Rollers by moving the Swing Guide down with the Paddle Motor rotating in the reverse direction.
- Stapling is performed by moving the Staple Unit according to the specified stapling position. However, if stapling is made at one place at the rear side, it is made at the stand-by position without movement of the Stapler Unit.
- If the Staple Unit is moved toward the front side, the Finishing Tray Stopper is lowered.



5.3.4 Staple unit

- The Stapling operation is accomplished by a Cam rotated once with the Staple/Folding Motor.
- The Home position of this Cam is detected with the Staple Drive Home Position Sensor. If the Staple Drive Home Position Sensor is OFF, the Staple/Folding Motor rotates in the forward direction until the Sensor is blocked or the signal is ON, which designates that the position of the Cam is ready for the next stapling operation.
- The Staple Detecting Sensor detects if the Staple Cartridge is in the Unit and if the staples are in the Staple Cartridge.
- A Self-Priming Sensor detects if the staples are positioned at the end of the Staple Cartridge.
- This Finisher is equipped with the safety protection mechanism. The Staple/Folding Motor will not be turned ON without an ON condition (with Swing Guide closed) of the Front and Rear Staple Safety Switches.



5.3.5 Staple unit moving control

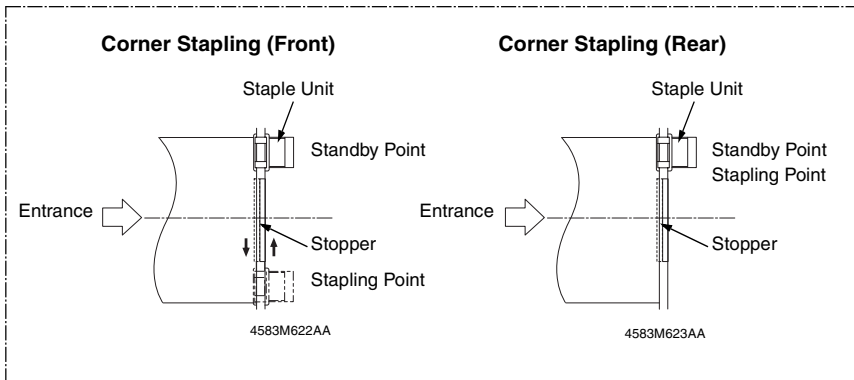
- The Staple Unit is moved with the Slide Motor and its home position is detected with the Slide Home Position Sensor.
- Regardless of the staple mode or paper size, the staple unit always returns to the standby position on the rear side.

<For the Corner stapling Front Position>

The Staple Unit stands by on the rear side, and then move to the staple position corresponding to the paper size at each stapling operation.

<When the Corner stapling Rear Position is used>

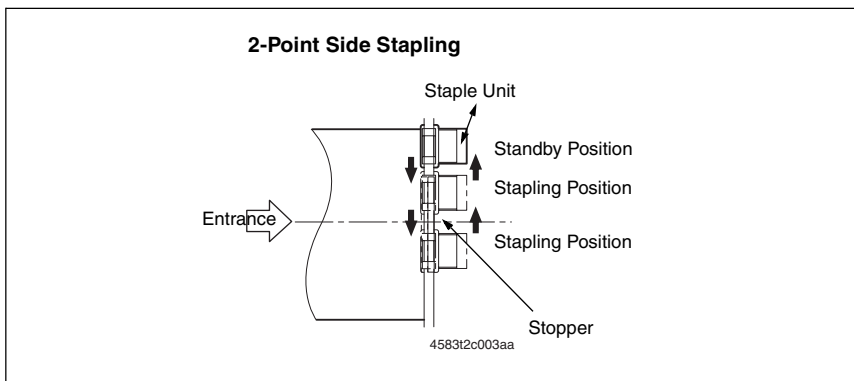
- The Staple Unit is at the home position on the rear side. The staple position is the same as standby home position. The staple position of 2-point stapling at the rear side is used only for B5R.



<For 2 point side stapling Operation>

The Staple Unit stays at the home or the rear side, and then moves to the stapling position at each of stapling operation.

The order of stapling is first the rear side, and then the front side.

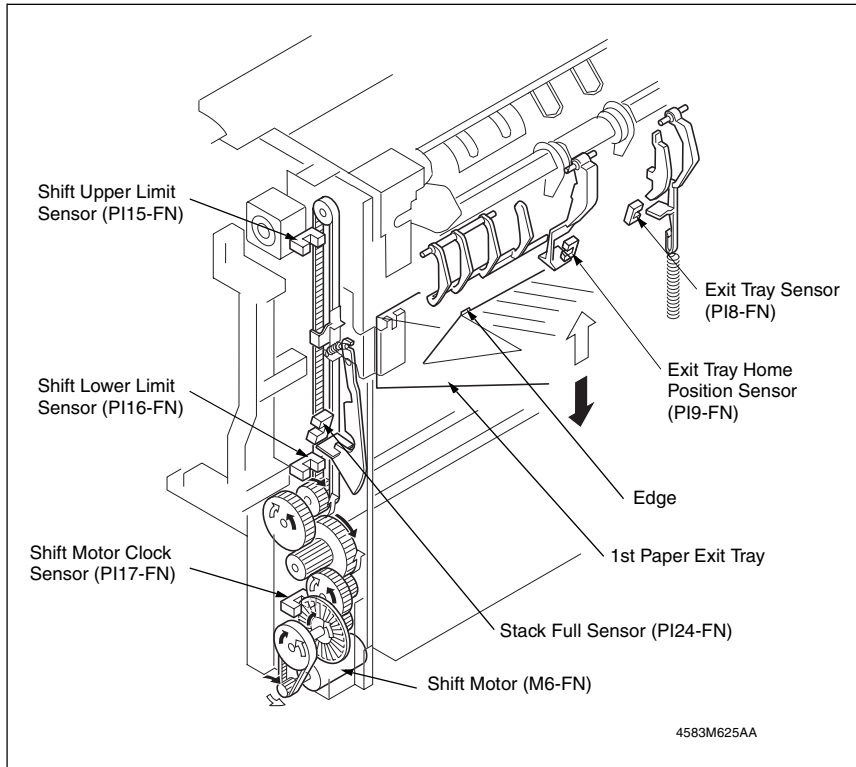


<For 2-point Center stapling operation>

The 2-point center stapling operation is the same as 2-point side stapling.

5.3.6 1st Paper Exit Tray mechanism

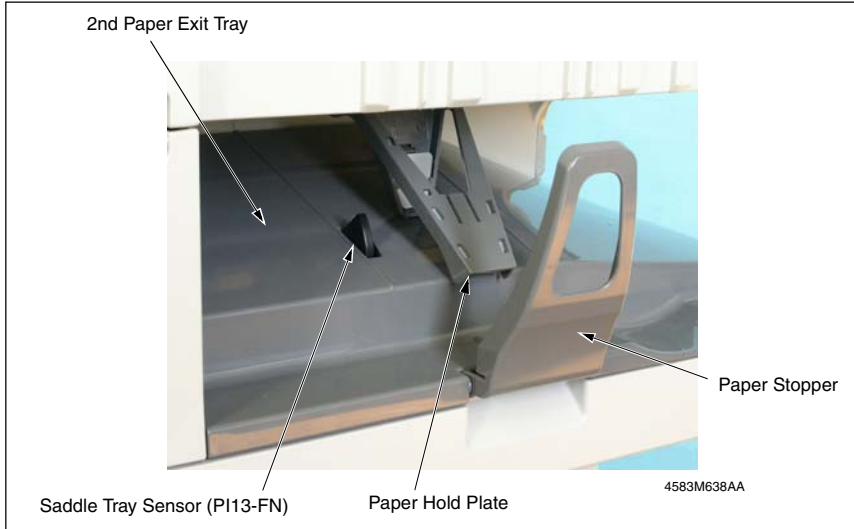
- The 1st Paper Exit Tray is moved up or down by drive from the Shift Motor and the Exit Tray Sensor detects if the paper is stacked on the 1st Paper Exit Tray.
- The Exit Tray Home Position Sensor detects if the 1st Paper Exit Tray is at its home position.
- If the paper is stacked on the 1st Paper Exit Tray, home position is at the top side of paper and if not, the home position is at the edge of the 1st Paper Exit Tray.
- When the main power is turned ON, the 1st Paper Exit Tray is returned to its home position by drive of the Shift Motor.
- After the paper has exited from the Finishing Tray and has been stacked onto the 1st Paper Exit Tray, the 1st Paper Exit Tray is moved down by the Shift Motor driven for a given number of clock pulses.
- The Clock pulse detection is generated with the Shift Motor Clock Sensor and the 1st Paper Exit Tray is returned to its home position for the next stacking operation.
- The Upper limit position of the 1st Paper Exit Tray is detected with the Shift Upper Limit Sensor. When the Shift Upper Limit Sensor is turned ON, (upward movement) drive from the Shift Motor is stopped.
- The Lower limit position of the 1st Paper Exit Tray is detected with the Shift Lower Limit Sensor. When the Shift Lower Limit Sensor is turned ON, (downward movement) drive from the Shift Motor is stopped.
- The Stack Full Sensor detects if an excessive amount of stacking is made due to the height of the stacked paper of large sizes or of mixed sizes.



5.4 Center Staple & Fold Section

5.4.1 2nd paper Exit Tray

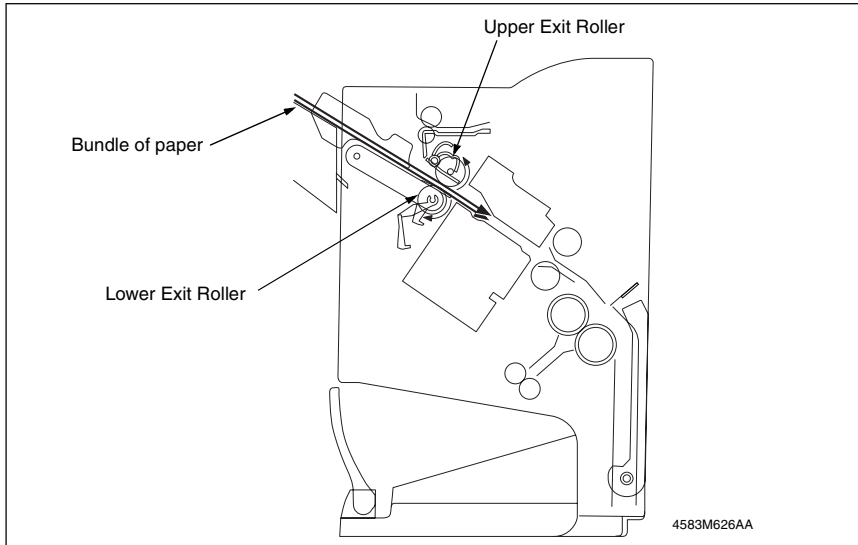
- The 2nd Paper Exit Tray is fixed and all the paper stacked as a booklet is exited onto this Tray.
- The Saddle Tray Sensor detects if the paper is stacked on the 2nd Paper Exit Tray, but does not detect a paper jam.



5.4.2 Transport operation in Center Staple & Fold section

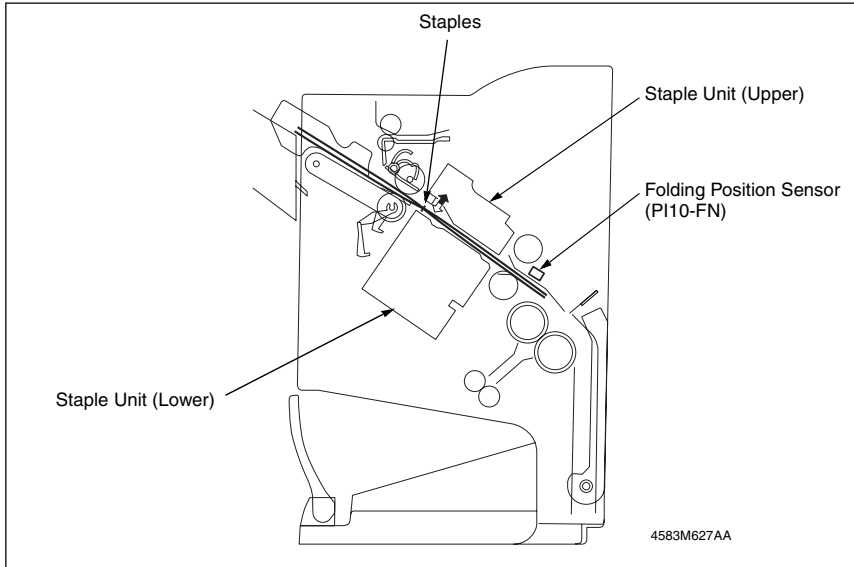
A. Paper transport

- After a stack of paper has been aligned on the Finishing Tray, it is taken up with the Upper and Lower Exit Rollers. With the rotation of the Upper and Lower Exit Rollers, a stack of paper is transported into the Stapling Section.



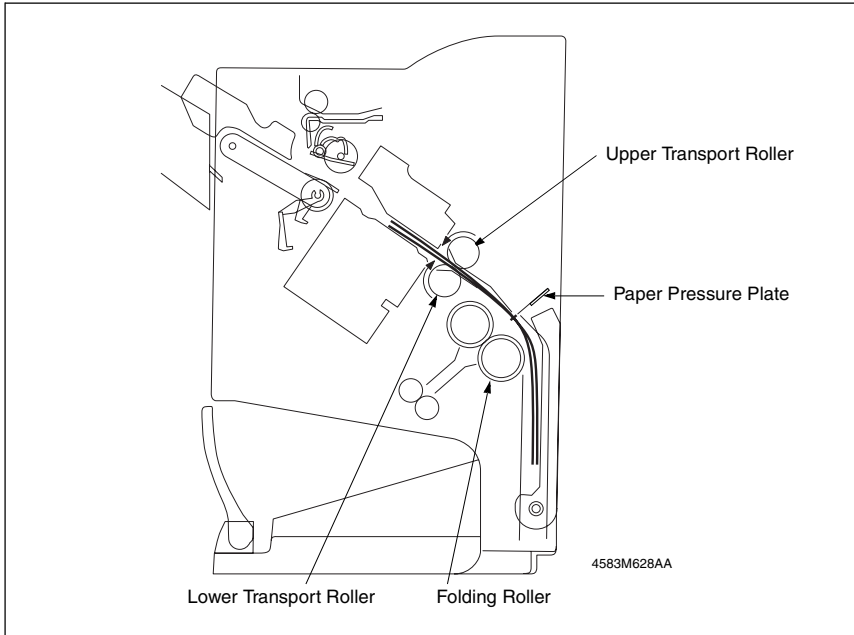
B. Stapling

- The stack of paper is further transported and temporarily stopped when the center area of the paper (the area where stapling will be made) has reached the position of the staples in the Staple Unit. Then, a stapling operation is cycled at the center area with the Staple Unit.



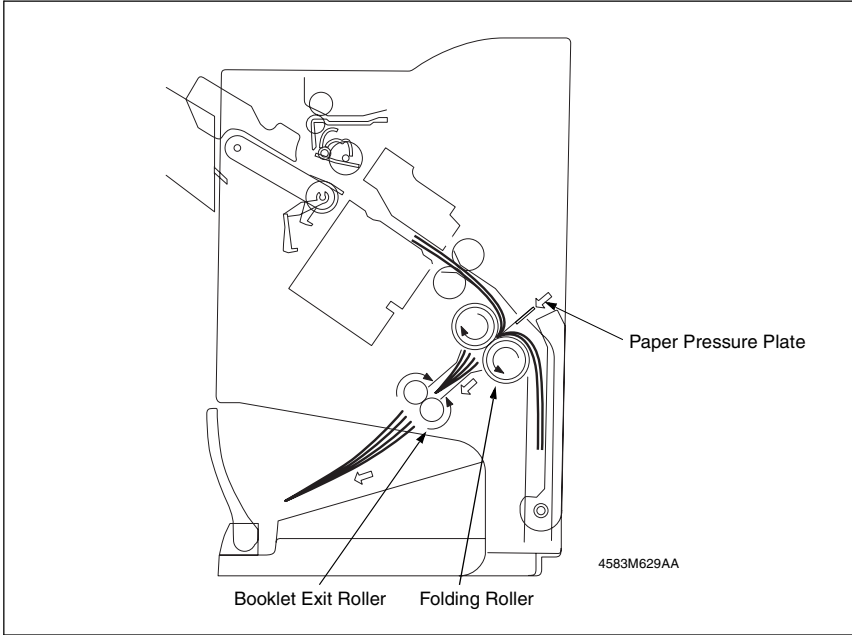
C. Booklet Transport

- Next, the stack of paper that was stapled is transported to the paper folding / exit position with the Transport Rollers. The Paper folding / exit position is the position where the center of the paper (where stapled) is of the same height as that of the Paper Pressure Plate and nip area of the Folding Rollers.



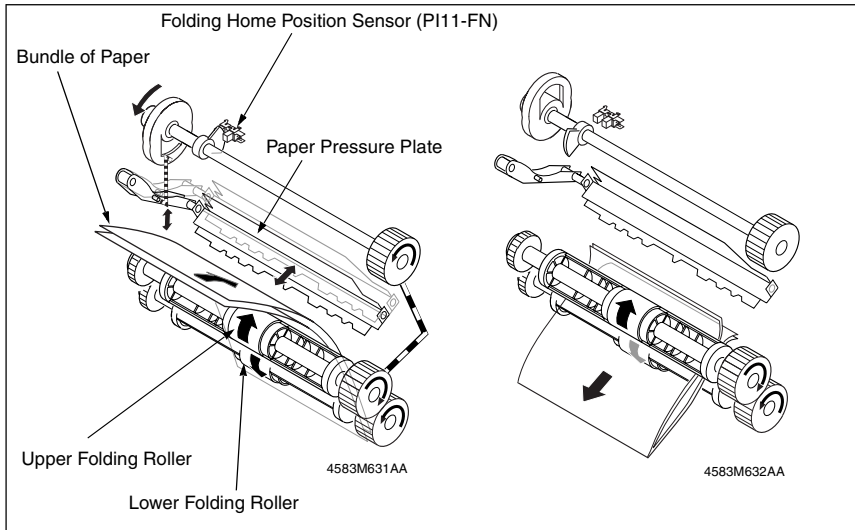
D. Folding/exit

- The Paper Pressure Plate presses the center of the paper to transport the paper toward the Paper Folding Rollers. Then the Paper Folding Rollers take up and fold the paper and feed the stack of paper onto the 2nd Paper Exit Tray through the Folding, and the Booklet Exit Rollers.



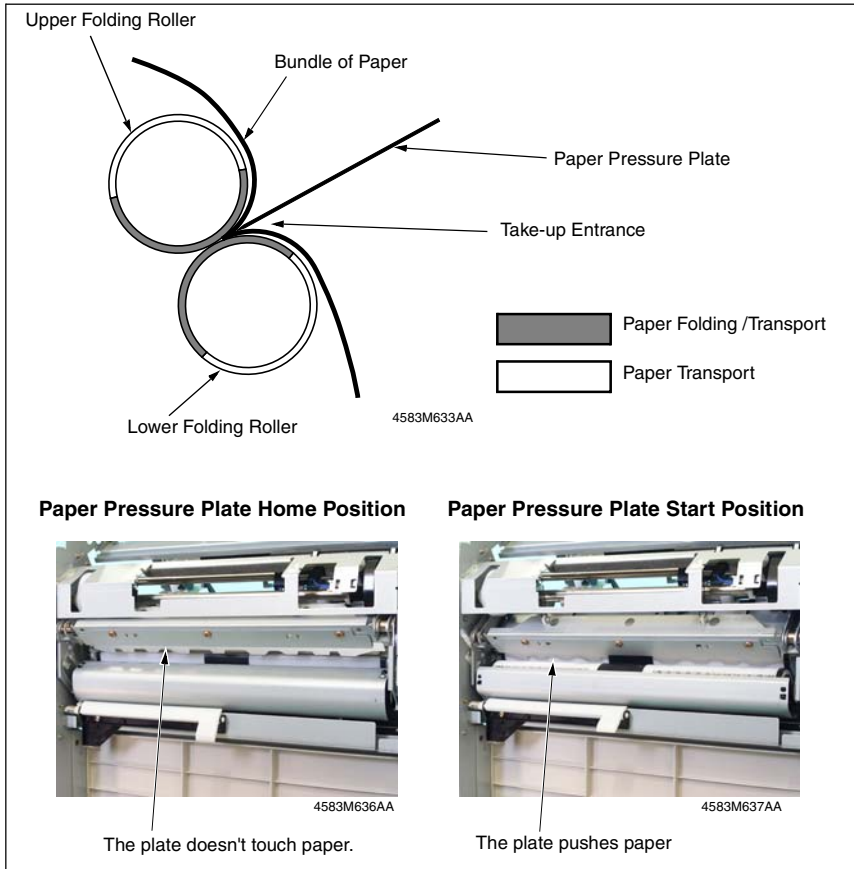
5.4.3 Folding mechanism

- The Paper Folding Mechanism consists of the Folding Rollers and Paper Pressure Plate.
- They are driven by the Staple/ Folding Motor respectively through the combination of the Gears and Cams etc. This Motor drive is monitored with the Staple/ Folding Motor Clock Pulse Sensor.
- The Folding Position Sensor is mounted to detect the position of the Folding Rollers and the Pressure Plate. The stack of folded paper is transported with the Folding Rollers and then exits via the Booklet Exit Rollers.



5.4.4 Paper folding start position

- Paper folding is created by the Paper Folding Plate and the Paper Pressure Plate. At the same time when the Folding Rollers start to rotate, the Paper Pressure Plate starts pressing the stack of paper to the contact area of the Paper Folding Rollers.
- For half of the Folding Rollers, no rubber material is used except at the center and both ends of the Folding Rollers. This half of the Upper and the Lower Folding Rollers, contacts each other at the center and both ends, and is only used to transport the paper, thus preventing wrinkles.
- The other half of the Upper and the Lower Folding Rollers, contacts each other completely, thereby folding and then transporting the paper.





KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

PK-501/PK-4/ PK-131

2005.03

KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. Ver. 1.0

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, show  to the left of the revised section.
A number within  represents the number of times the revision has been made.
- To indicate clearly a section revised, show  in the lower outside section of the corresponding page.
A number within  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.

2005/03	1.0	—	Issue of the first edition
Date	Service manual Ver.	Revision mark	Descriptions of revision

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Outline

1. Product specification

1.1 Functions

No. of Holes (optional)	Metric : 4holes
	Inch : 2holes / 3holes

1.2 Paper type

Paper Type	Paper Size		Weight	Tray Capacity	Exit Tray	No. of Sheets to be Stapled
Plain Paper Thick Paper	4 holes	A4, A3	60 to 209 g/m ² 16 to 55.5 lb	-	Elevator Tray	-
	2 holes	8.5 × 11R/ 8.5 × 11, 8.5 × 14, 11 × 17				
	3 holes	8.5 × 11, 11 × 17				

1.3 Machine specifications

Power Requirements	Supplied from FS-603
Dimensions	90 mm (W) × 170 mm (H) × 560 mm (D) 3.75 inch (W) × 6.75 inch (H) × 22 inch (D)
Weight	2.6 kg (5.75 lb)

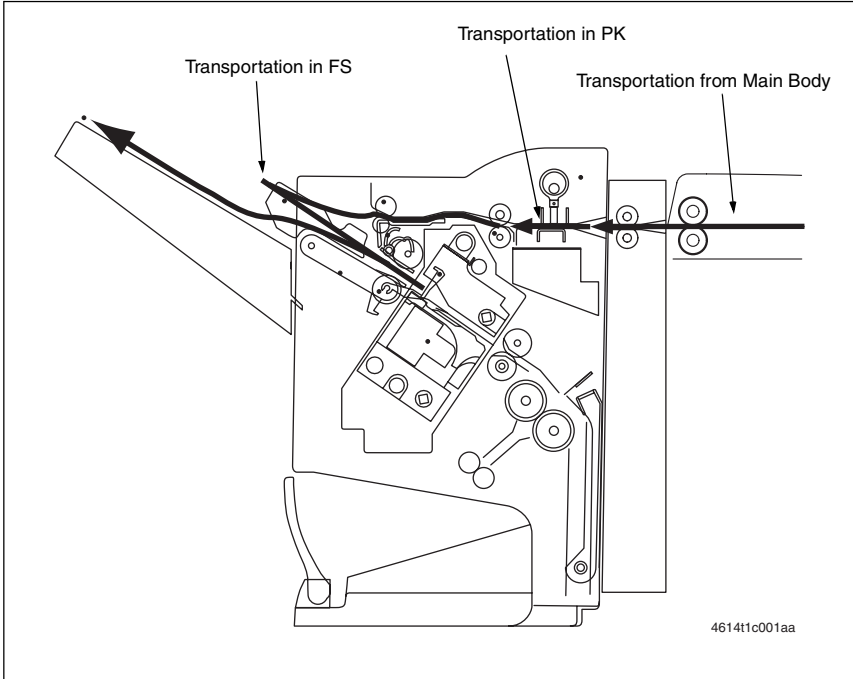
1.4 Operating environment

Conforms to the operating environment of the main unit.

NOTE

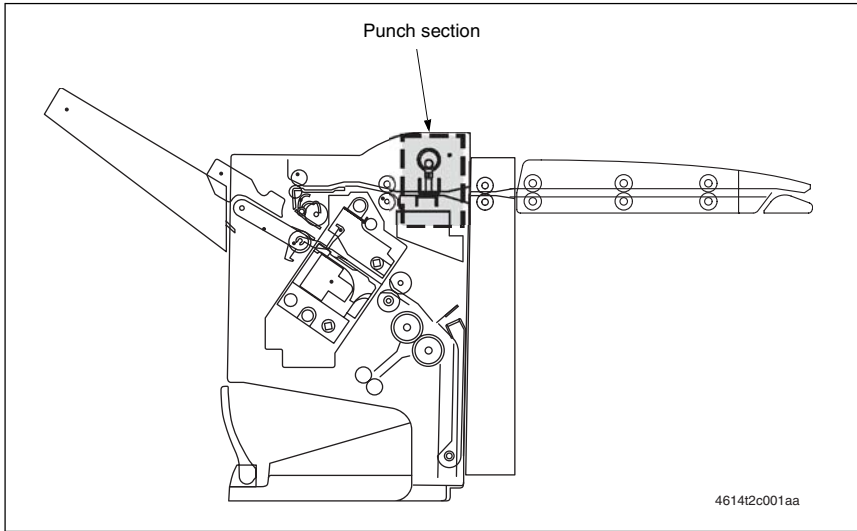
- These specifications are subject to change without notice.

2. Paper Feed Path

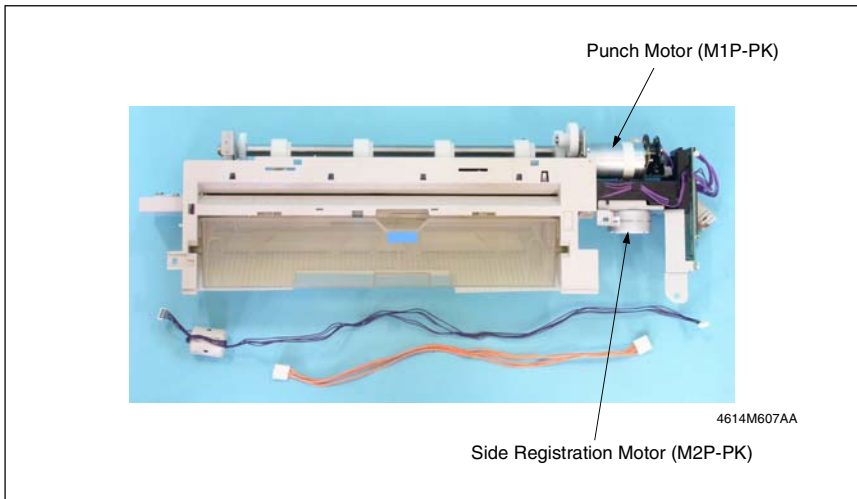


Composition/Operation

3. Composition



4. Drive

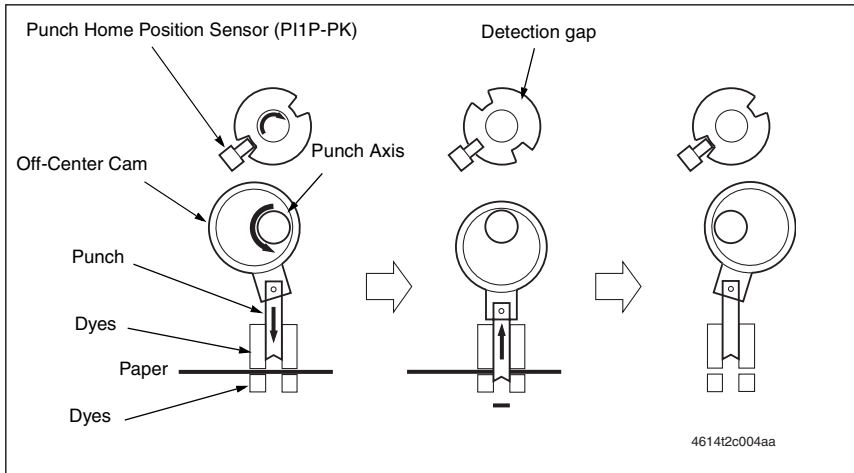


5. Operations

5.1 Punching operation

5.1.1 4 holes punch

- The Punch Section consists of the Dyes Section and the Punch Blade Section
- The Punch, which is attached to the Off-Center Cam of the Punch Axis, is driven by the Punch Motor and creates the punching operation with a reciprocating movement converted from the rotation movement of the Punch Axis.
- The Punching operation for the first sheet of paper completes when the Punch Home Position Sensor is switched ON from OFF after the Punch Axis turns 180 deg. in the forward direction.
- The Punching operation for the second sheet of paper is made when the Punch Axis turns 180 deg. in the reverse direction.
 1. Punch Axis Stops at Home Position.
 2. Punch Axis rotates by 90 deg. in forward direction and punch holes are made.
 3. Punch Axis rotates by another 90 deg. in forward direction and punch operation is completed.



5.1.2 2 / 3 holes punch

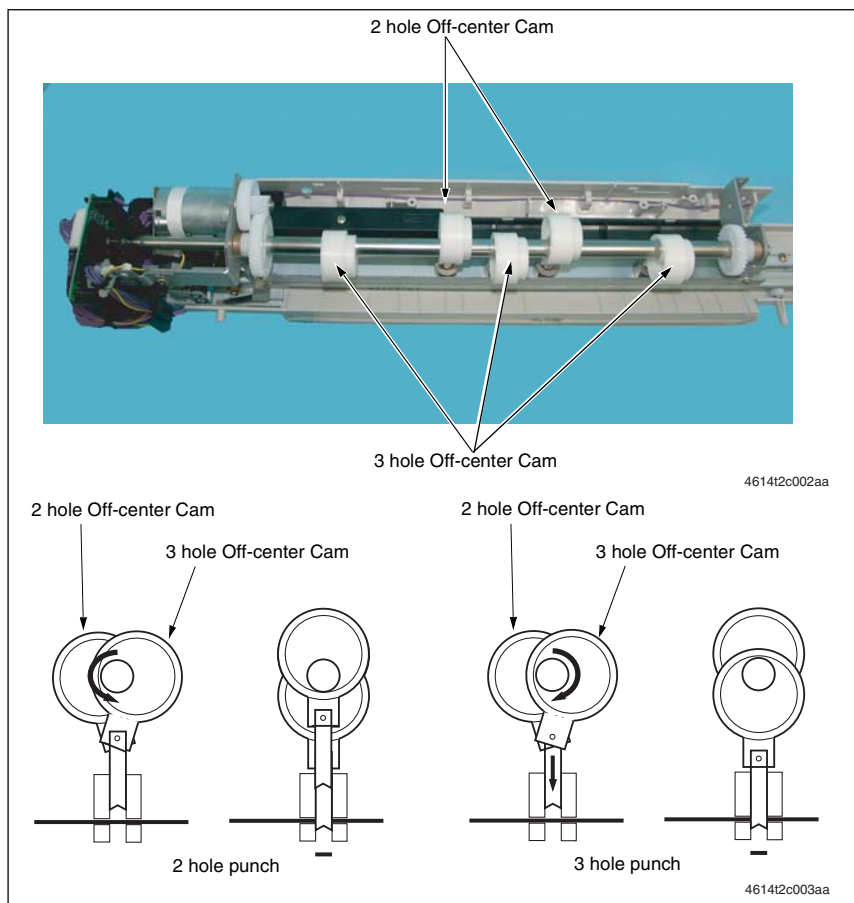
- Switch the number of punch holes between 2 and 3 by changing the rotating direction of the punch Motor.
- The punch control is the same with the one for 4 Punch holes.

A. 2 holes punch

- The Punching operation for the first sheet of paper completes when the Punch Home Position Sensor is switched ON from OFF after the Punch Axis turns 180 deg. in the forward direction.
- The Punching operation for the second sheet of paper is made when the Punch Axis turns 180 deg. in the reverse direction.

B. 3 holes punch

- The Punching operation for the first sheet of paper completes when the Punch Home Position Sensor is switched ON from OFF after the Punch Axis turns 180 deg. in the reverse direction.
- The Punching operation for the second sheet of paper is made when the Punch Axis turns 180 deg. in the forward direction.

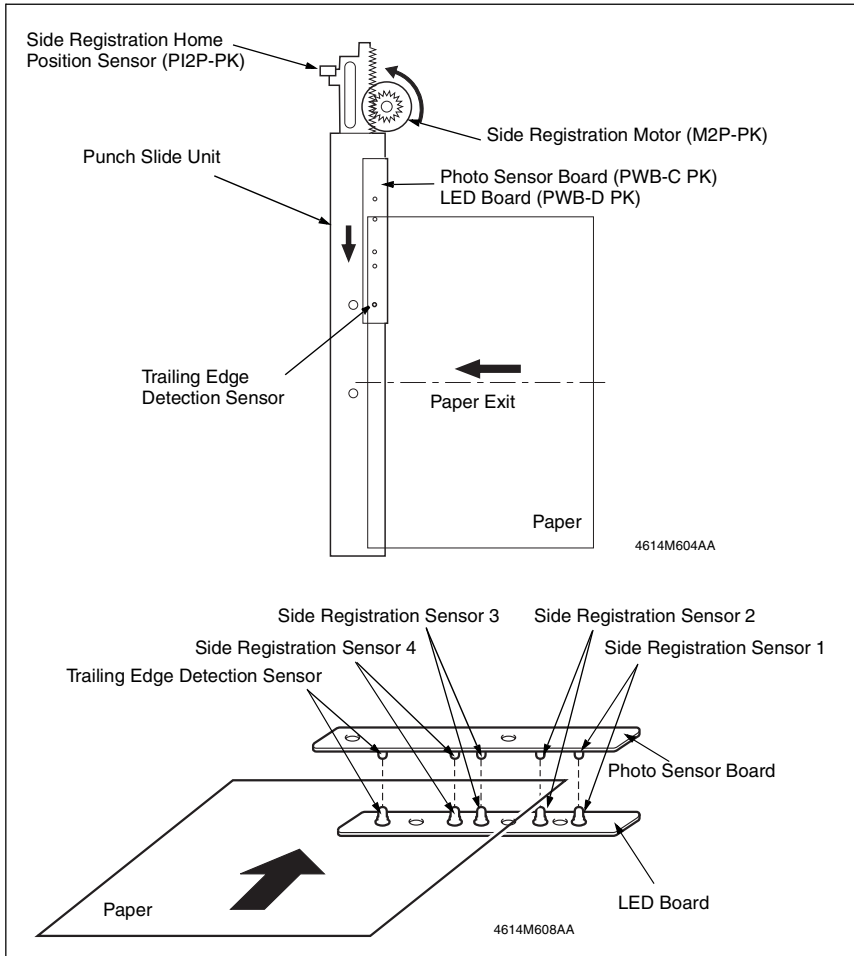


5.2 Side registration operation

- The Side registration drive for the Punch Slide Unit is made by the Side Registration Motor.
- The Home position of the Punch Slide Unit is detected with the Side Registration Home Position Sensor.
- The Punch Slide Unit detects the trailing edge of the paper with the Trailing Edge Detection and the Side Registration Sensors and then moves to the position of the trailing edge according to the size of the paper. And paper edge is detected by means the LED light emitted from LED Board and received by the Photo Sensor Board.

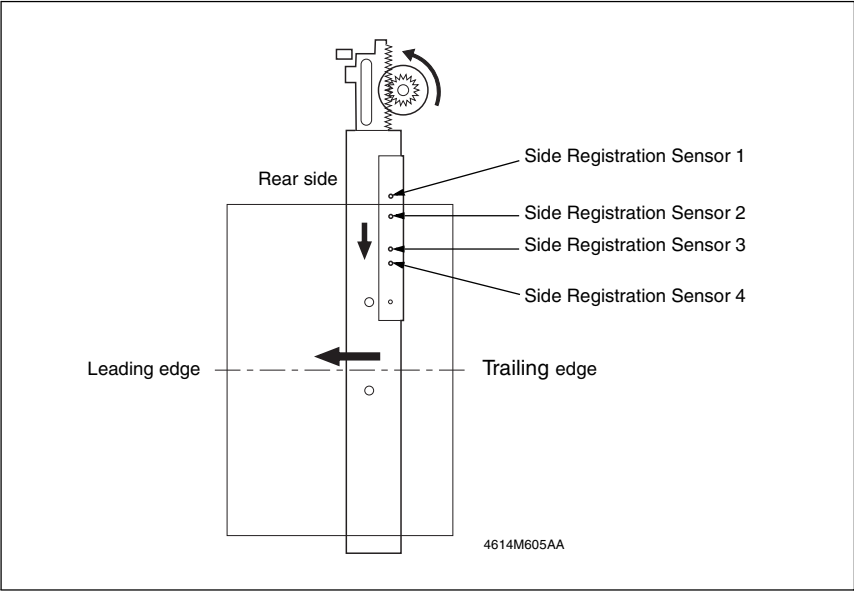
A. Operation 1

1. Trailing Edge Detection Sensor detects paper leading edge.
2. Side Registration Motor rotates.
3. Punch Slide Unit moves toward front side.



B. Operation 2

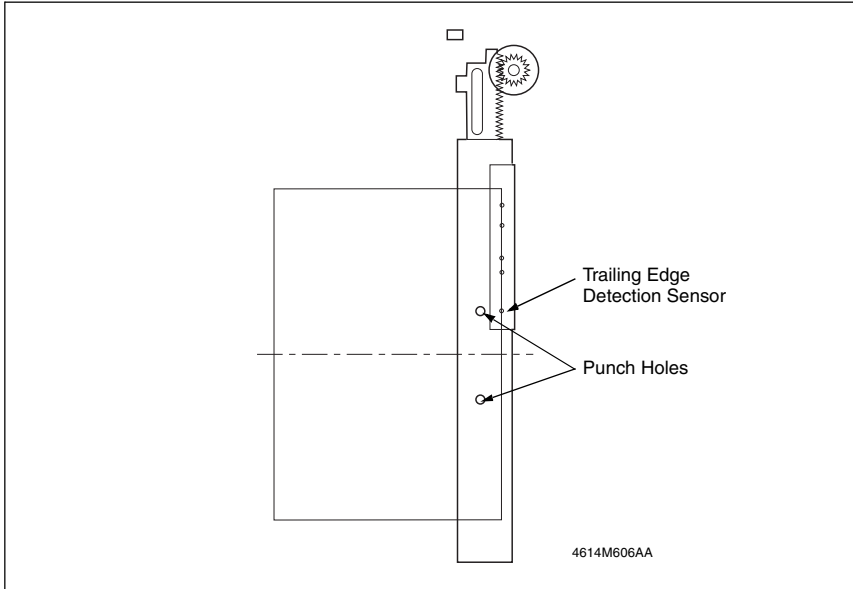
- 1. Side Registration Sensor detects paper edge at rear side.
- 2. Side Registration Motor moves Punch Slide Unit at the specified position.
- 3. Punch Slide Unit stops.



Name	Function
Side Registration Sensor 1	• Detects paper edge (A3, A4, 8.5×11, 11×17)
Side Registration Sensor 2	• Detects paper edge (B4, B5)
Side Registration Sensor 3	• Detects paper edge (A4R, 8.5×11R, 11×14)
Side Registration Sensor 4	• Detects paper edge (B5R)

C. Operation 3

1. Paper Trailing Edge Sensor detects paper trailing edge.
2. Transport Motor is stopped.
3. Paper transport is stopped.
4. Punch Motor is driven to punch holes.
5. Transport Motor is driven, at the same time, Side Registration Motor is driven in reverse direction.
6. Punch Slide Unit is returned to its home position.





KONICA MINOLTA

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Use of this manual should be strictly supervised to
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