Chapter 6 Principles of Operation CONTENTS

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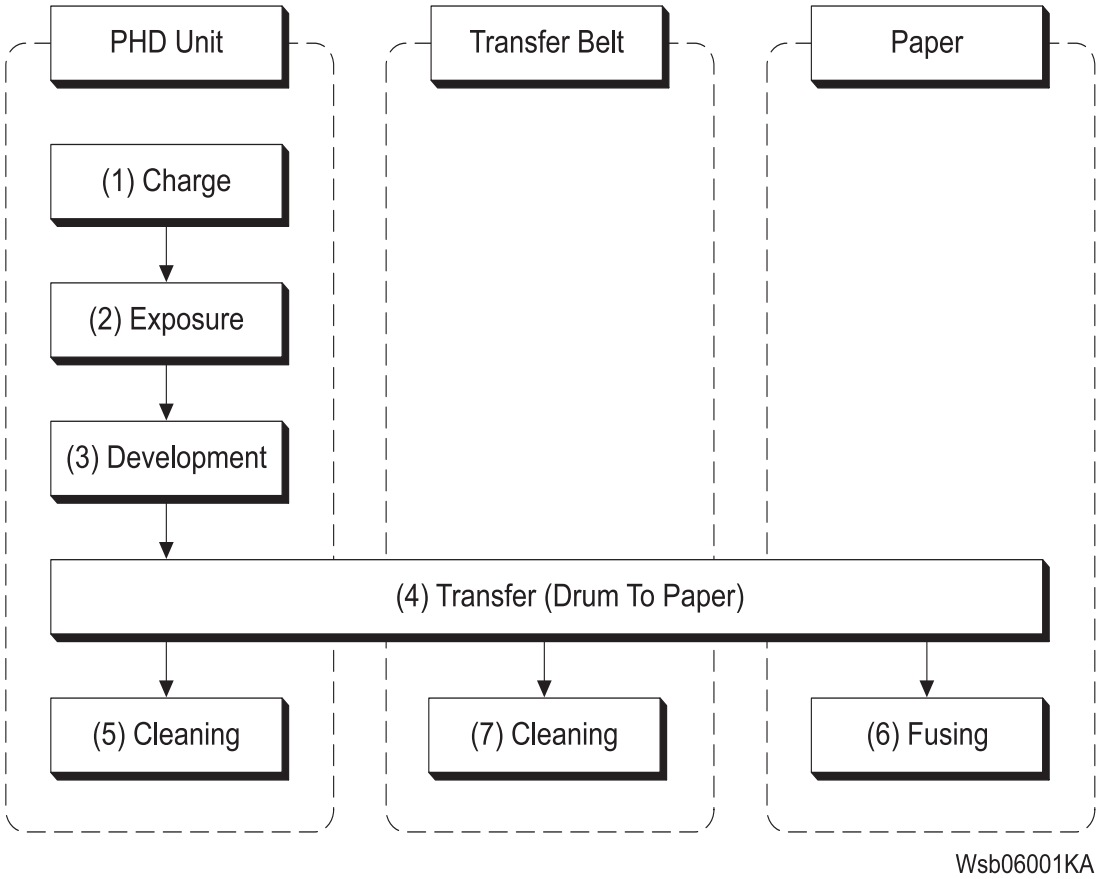
1. Printing Process

1.1 Summary of Printing Process

This printer is a "Full-color laser printer" which applies the principle of an electrophotographic recording system. The tandem system comprising the four color PHD Unit of yellow, magenta, cyan and black (Y, M, C and K) creates the toner image.

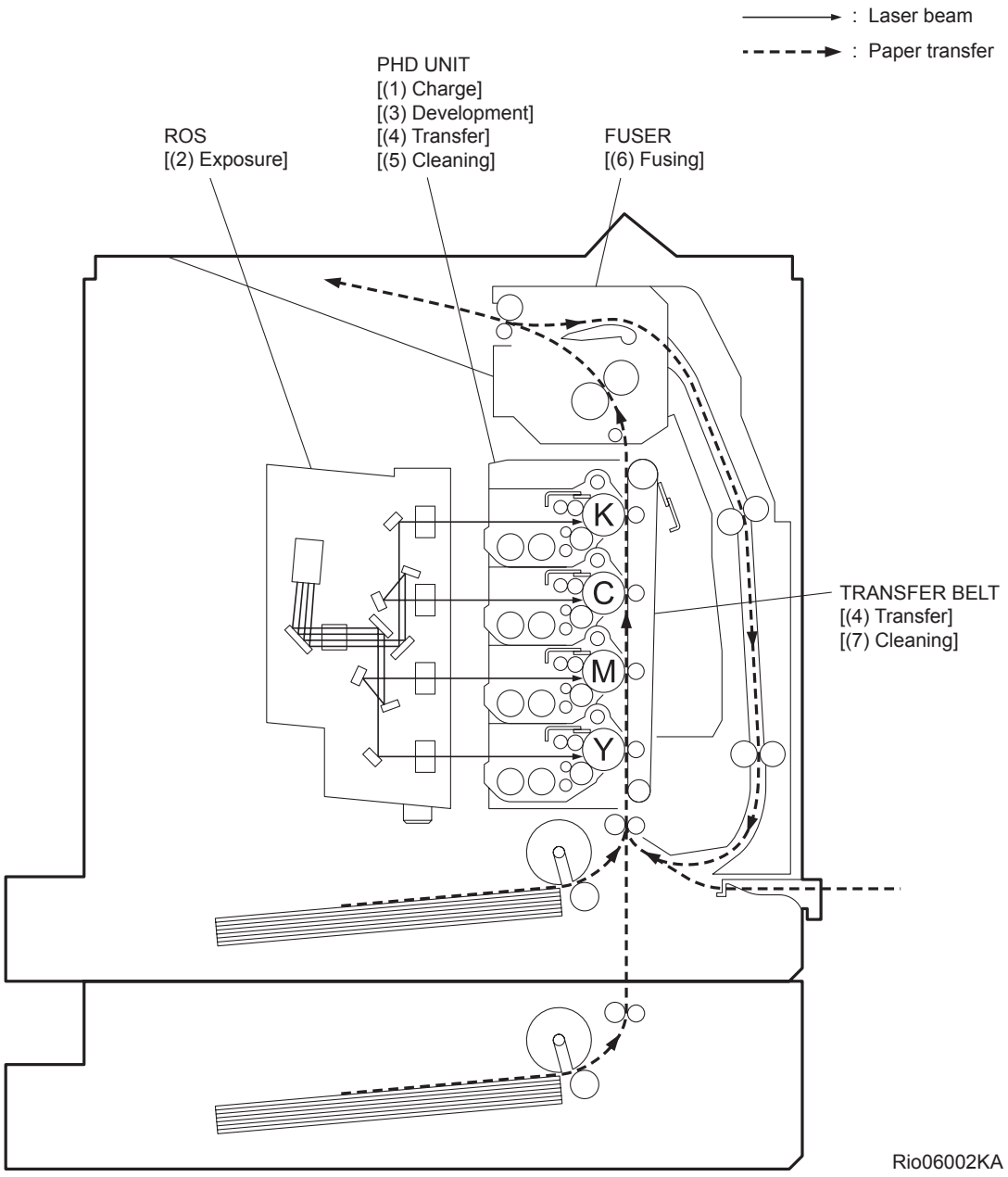
Printing processes of this printer is composed of the basic steps as follows.

(1) Charge:..... Drum surface is charged with electricity.
(2) Exposure: ..... Image unit is exposed to laser beams.
(3) Development: ..... Image is developed with toner.
(4) Transfer: ..... Four-color finished toner image on the Drum is transferred onto the paper.
(5) Cleaning: ..... Remaining toner on the drum is collected.
(6) Fusing:..... Toner on the paper is fixed by heat and pressure.
(7) Cleaning: ..... Remaining toner on the belt is collected.



1.2 Schematic Diagram for Printing Processes

Outline of printing processes is shown in the figure below.

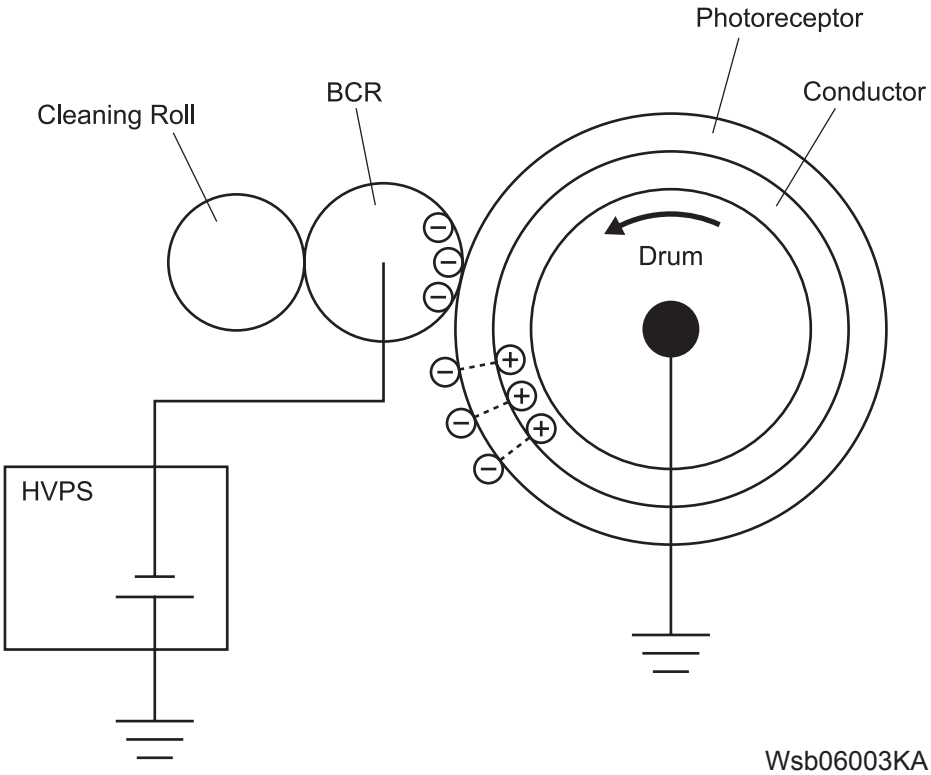


1.3 Description of Printing Process Techniques

1.3.1 Charging with electricity

In the charging process, the drum surface rotating at a constant speed is charged uniformly with negative electricity by the discharge from BCR (Bias Charge Roll).
This process is performed in parallel for yellow, magenta, cyan and black colors.

- The BCR is kept in contact with the drum and rotates following the rotations of the drum.
  BCR is a conductive roll, receives discharge voltage from the High Voltage Power Supply (HVPS) and discharges a negative DC voltage.
- The drum surface is uniformly and negatively charged with DC bias voltage.
  The drum surface is a photoreceptor (which is an insulator in the dark and a conductor in the light) and the drum inside is composed of a conductor.
- The Cleaning Roll is a sponge, which contacts with the BCR to catch the toner.



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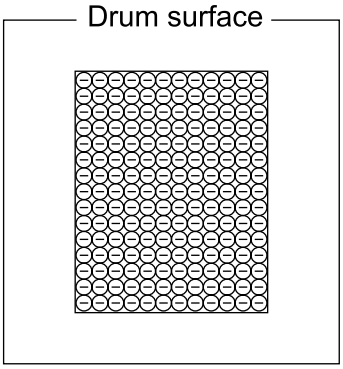

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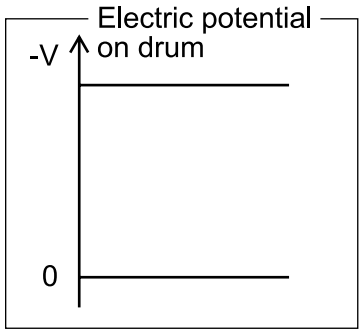

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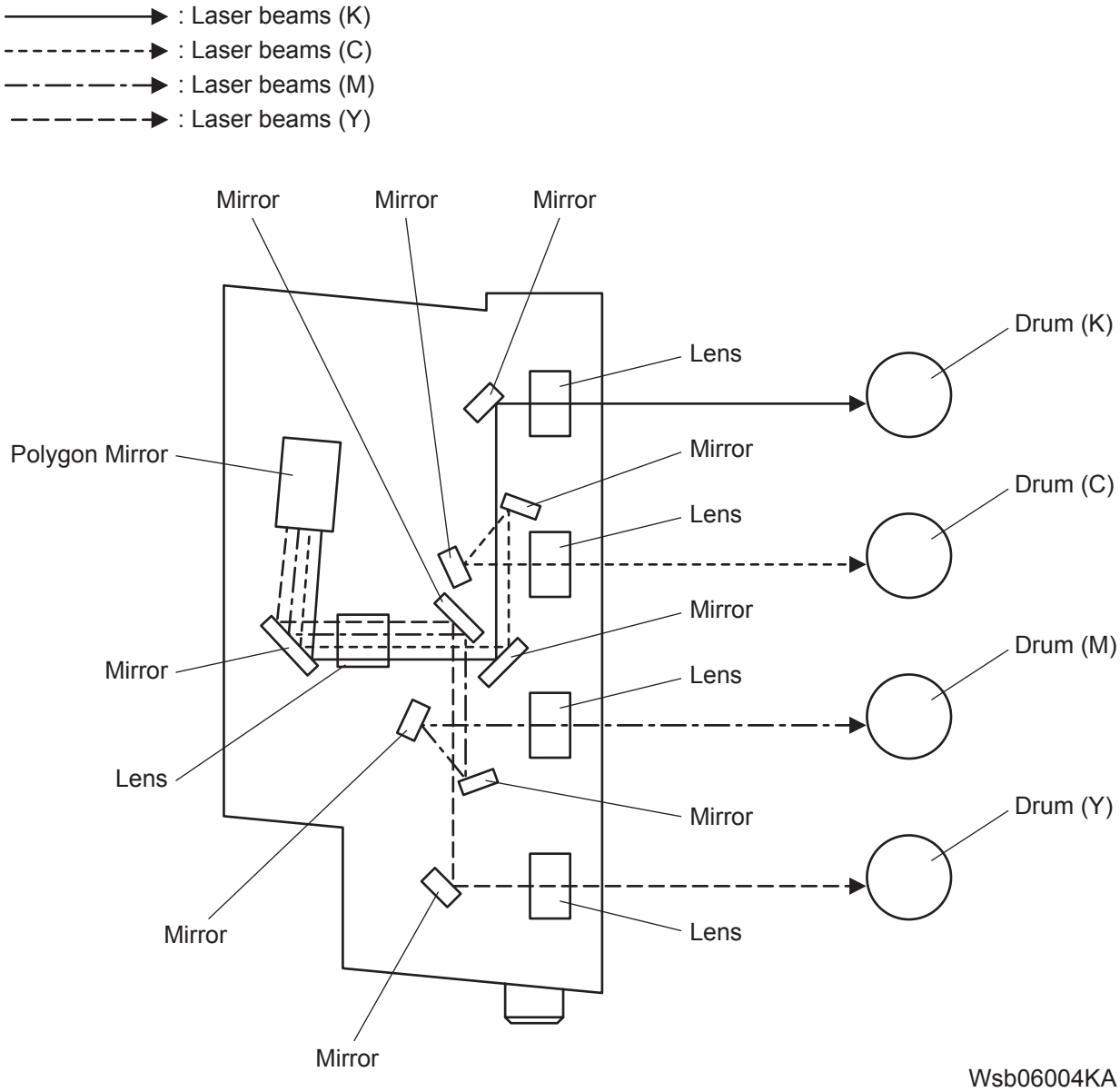
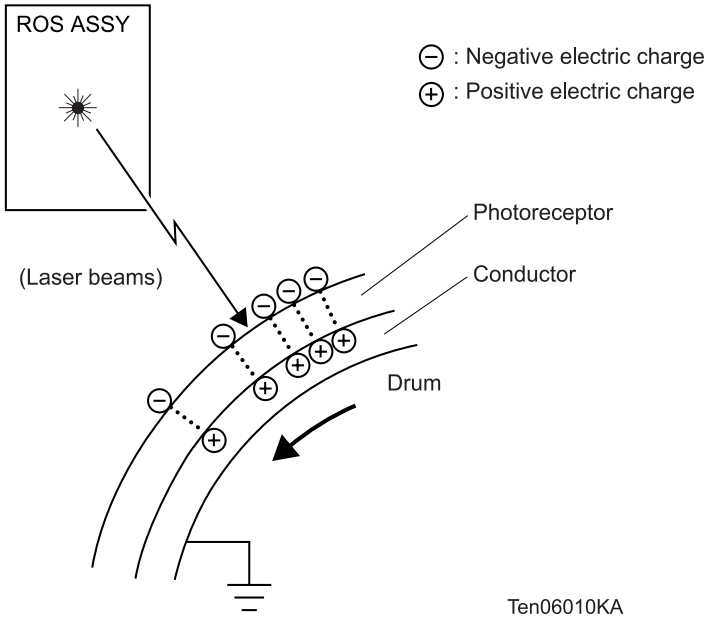
1.3.2 Exposure

In the exposure process, the drum surface charged negatively is scanned by laser beams to form invisible electrostatic latent image on the drum surface.
This process is performed in parallel for yellow, magenta, cyan and black colors.

- Laser beams are emitted from the laser diode in the ROS ASSY. By the rotating polygon mirror, fixed mirror and lens attached to the Scanner Motor Assy of the ROS ASSY, the surface of each color drum is scanned from end to end in the axial direction.



- The laser beam is irradiated according to the printing data (image data) output from the printer controller. The laser beam is output only when printing data is pixels (micro points composing characters or pictures). (The laser diode lights up for parts to be developed by toner, and not for parts that are not to be developed.)
  The drum surface irradiated by the laser beam becomes a conductor, and the negative charge on the drum surface flows to the positive side and the charges cancel each other out so that the potential on the drum surface drops. The part on the surface where potential drops becomes the electrostatic latent image.



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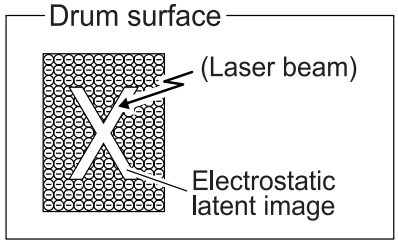

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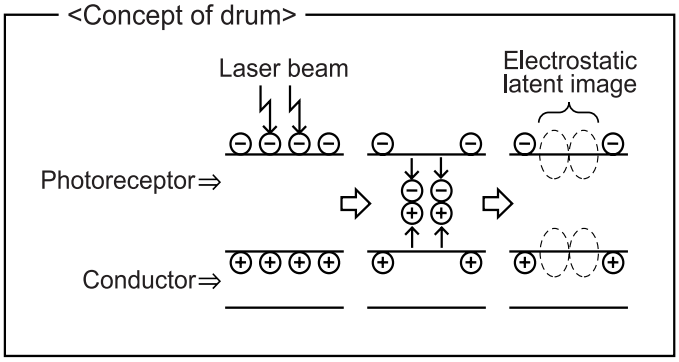

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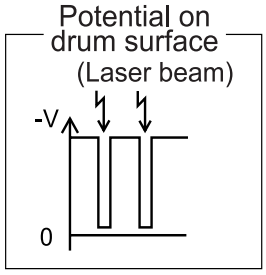

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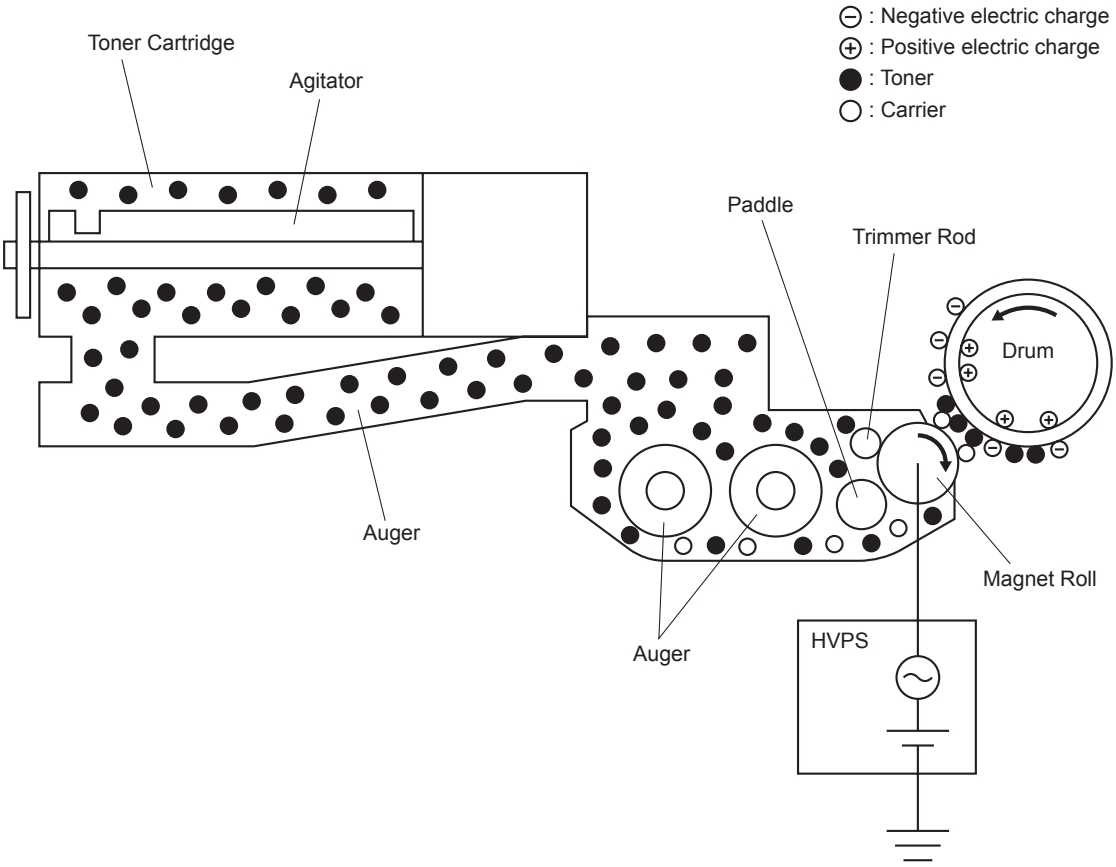
1.3.3 Development

In the development process, toner is electrically attached to the invisible electrostatic latent image on the drum surface to form visible toner image on the drum.
This process is performed in parallel for yellow, magenta, cyan and black color independently.

- The toner in the toner cartridge is agitated by the built-in Agitator and fed into the developer. The Auger is driven by the toner motor.The amount of toner to be consumed according to the print count is calculated and that amount is fed into the developer. This is called "toner dispensation", which is controlled by two types of control, "PCDC" and "ADC". (Refer to 5.3.2 Toner Density Control)

- The toner fed into the developer and the carrier in the developer are agitated by the Auger, and supplied to the Magnet Roll arranged in the vicinity of the drum surface. The toner and carrier are charged by friction due to the agitation (toner in negative, carrier in positive), and they are attracted to one another electrically. As the carrier is a magnetic substance, it is attracted to the Magnet Roll having a magnetic force and a homogeneous layer is formed by the Trimmer Rod.

- The magnet roll is covered by a thin semi-conductive sleeve over the surface. DB (Developing Bias) voltage is supplied to this semiconductor sleeve from the High Voltage Power Supply (HVPS). DB voltage is negative DC voltage combined with AC voltage. The magnet roll is kept at a constant negative voltage against the photoreceptor layer of the drum by DC voltage. Therefore, at the area surface where the negative electric charge on the drum does not decrease, potential is lower than the magnet roll, while the potential is higher than the magnet roll at the area where the negative charge on the drum surface decreases. The AC voltage shakes the developer on the magnet roll surface stimulating the toner to fly to the drum.
  Thus, the toner charged negatively is attracted only to the drum surface area where the negative charge has decreased below that of the magnet roll (electrostatic latent image) and the toner image is formed on the drum.
  Once the toner is adhered on the drum, the negative charge of the toner-bearing portion increases, which decreases the potential and the toner-attracting force of that portion.



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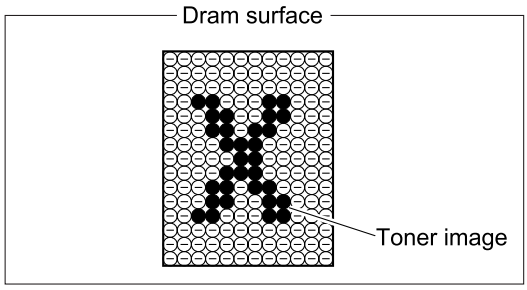

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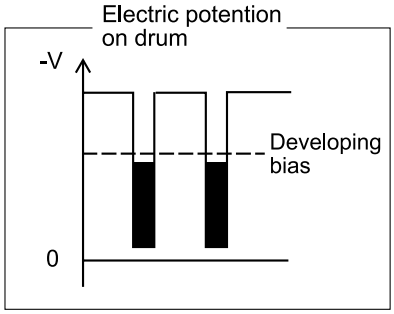

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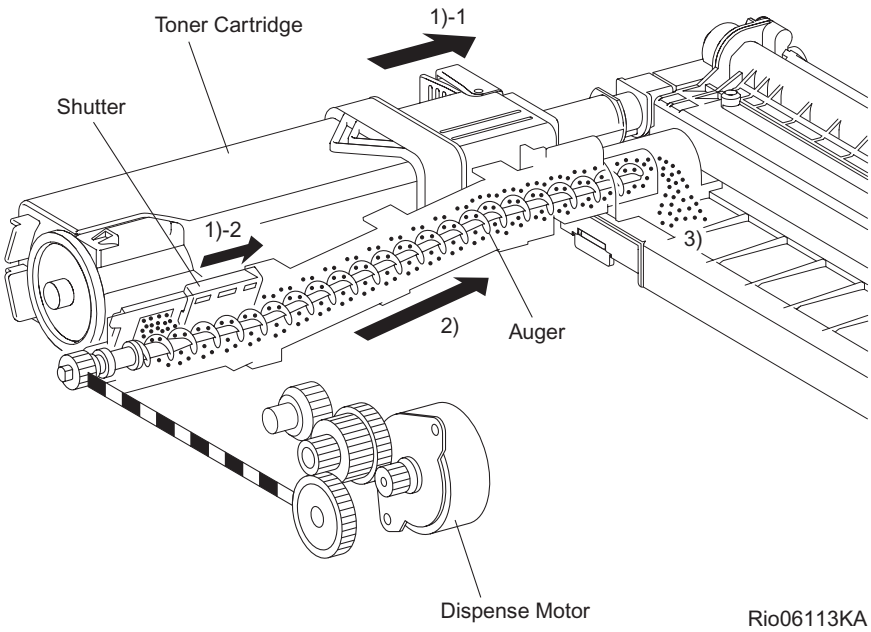
- Toner Dispense Mechanism

  The toner in the toner cartridge goes through the following steps before reaching the developer.

  Once the toner cartridge is set and the lever is moved toward the lock position, the JOINT ASSY DISP and the toner cartridge shutter move frontward, opening the toner supply port.
  The toner supplied from the toner cartridge is carried toward the developer by the Auger in the HOUSING ASSY AUGER.
  The Auger is a spiral-shaped part that carries toner forward as it rotates driven by the Dispense Motor in the FRAME ASSY MOT.
  After being carried to the front side of the HOUSING ASSY AUGER, the toner is fed to the developer via the port of the HOUSING ASSY AUGER.



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1.3.4 Transfer (Drum -> Paper)

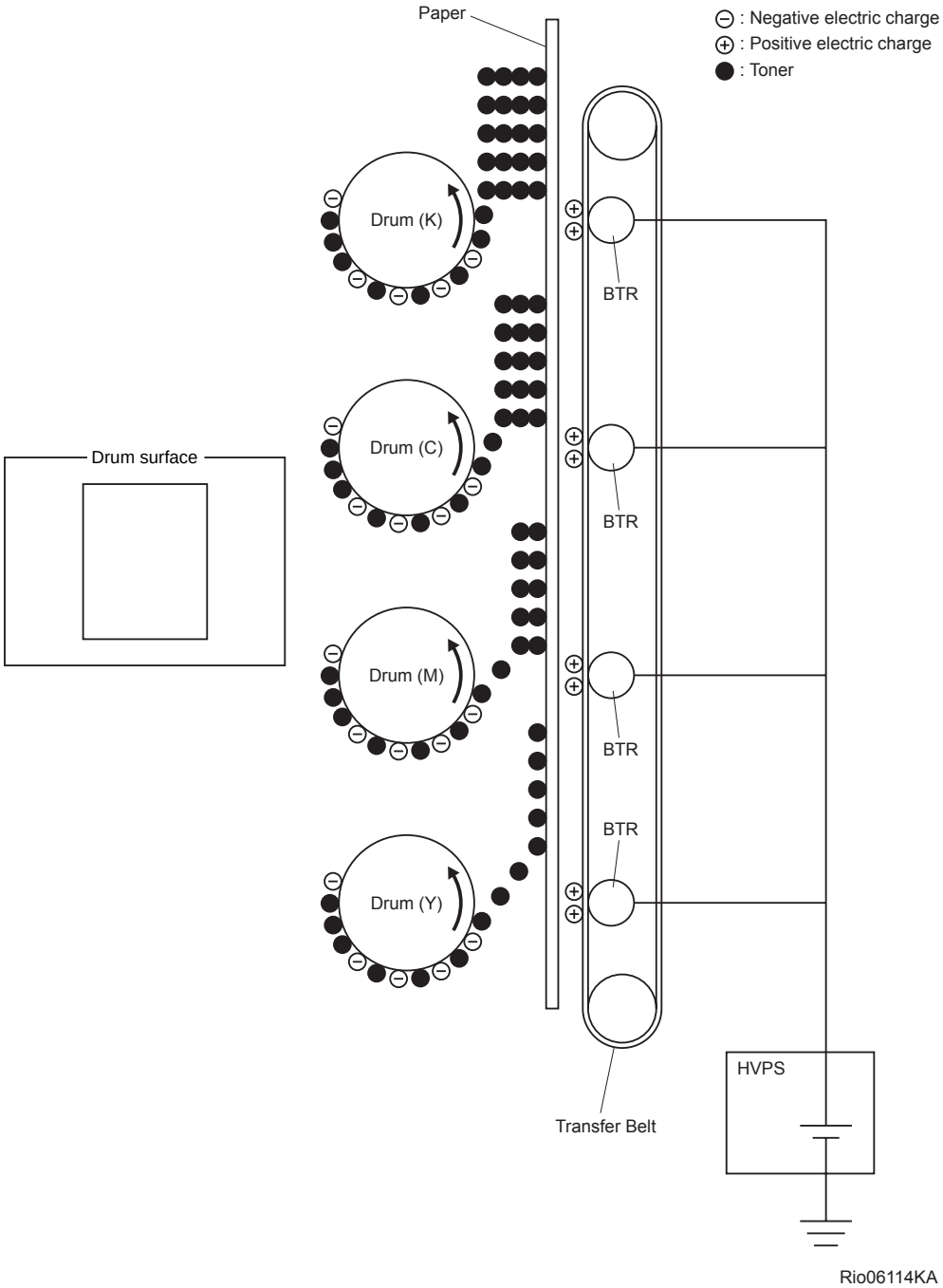
In the transfer process, toner image formed on the drum surface is transferred onto the surface of the paper. The toner is transferred onto the paper in the order of Y, M, C, and K.

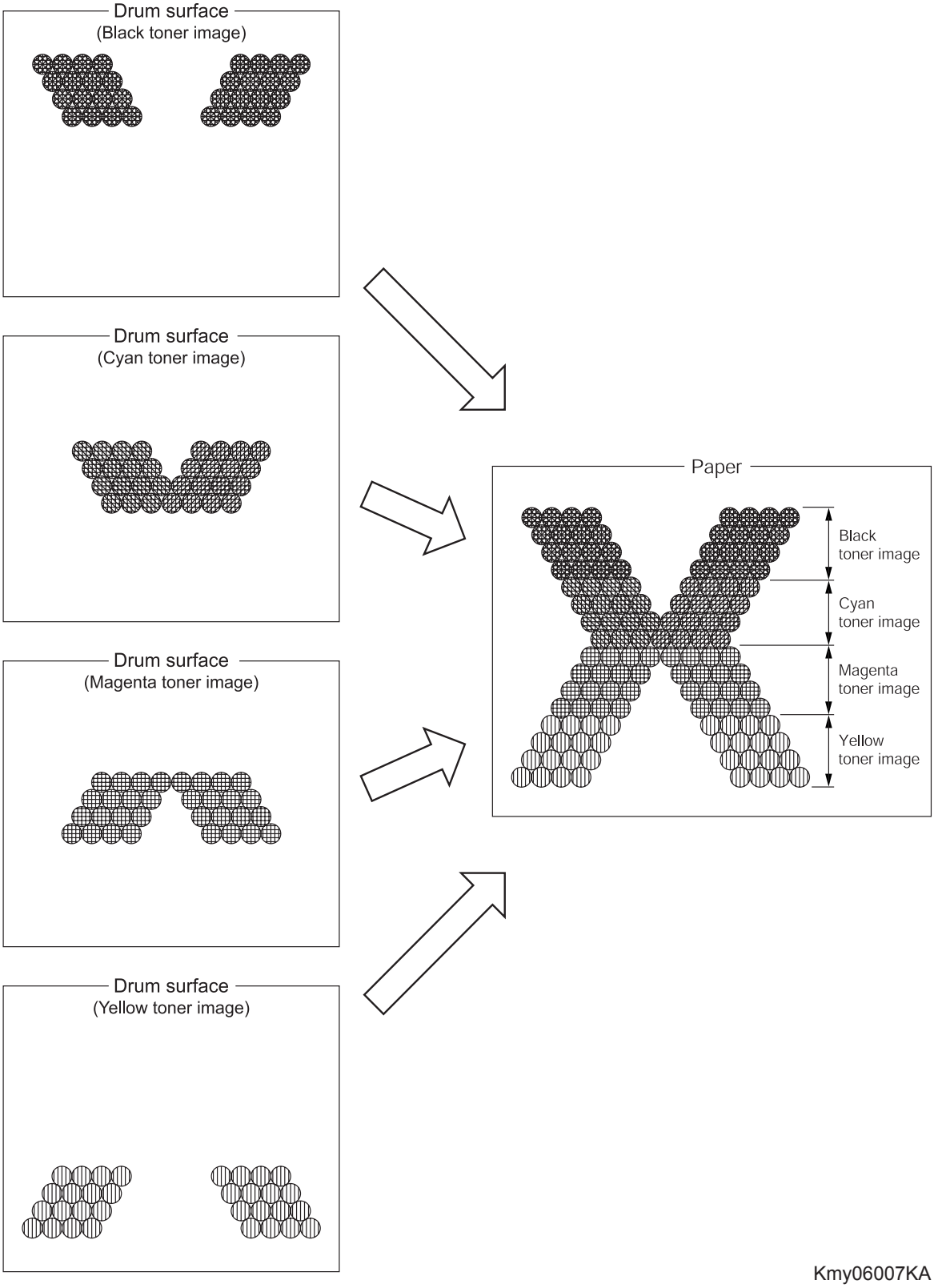
- BTR

  The BTR (Bias Transfer Roll) is a conductive roll, to which the positive voltage is applied from the High Voltage Power Supply (HVPS). The BTR contacts the rear side of the Belt and applies the positive voltage to the Belt.

- Belt

  The Belt is a conductive belt, to which the positive voltage is applied from the BTR. After the negatively charged toner image on the drum surface is drawn by the positive charge on the belt, it is transferred from the drum to the paper. The Belt feeds the paper to the direction of FUSER.




Drum surface
(Black toner image)
Drum surface
(Cyan toner image)
Drum surface
(Magenta toner image)
Drum surface
(Yellow toner image)
Paper
Black toner image
Cyan toner image
Magenta toner image
Yellow toner image
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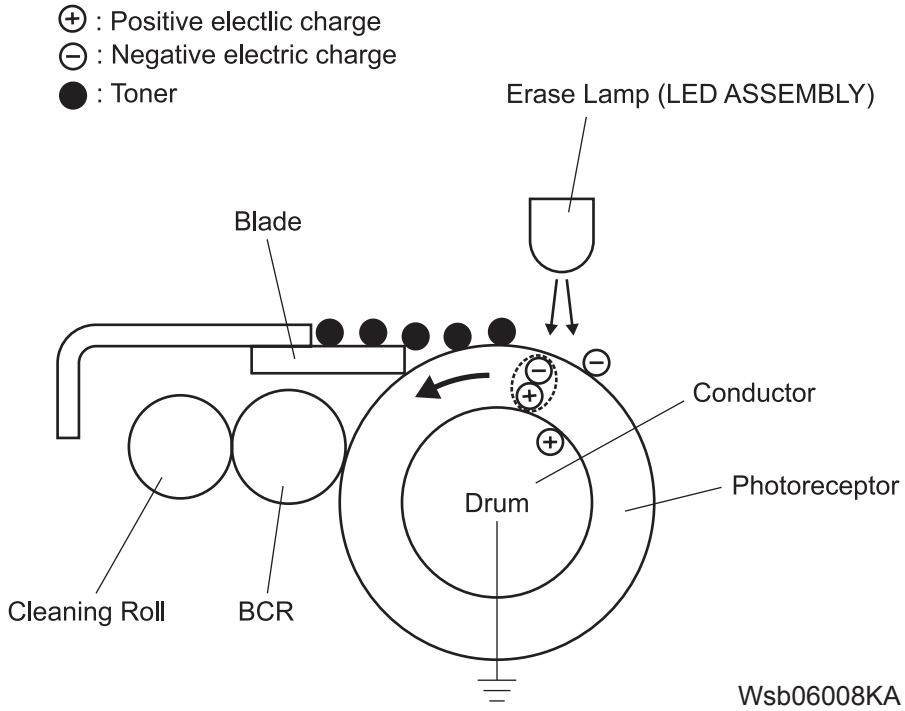
1.3.5 Cleaning

In the cleaning process, excess toner is removed from the drum surfaces, while excess charge is also eliminated from the drum surface.

- Drum cleaning
  The cleaning blade contacts the surface of the drum collecting the excess toner by scraping.
- Cleaning Roll
  The Cleaning Roll contacts the surface of the BCR collecting the foreign matter by scraping.
- Charge cleaning
  When the drum is charged by BCR, any excess charge hinders the drum surface from being uniformly charged, which may lead to print quality problems.
  The excess charge on the surface of the drum is eliminated by irradiating the light of the Erase Lamp (LED ASSEMBLY).

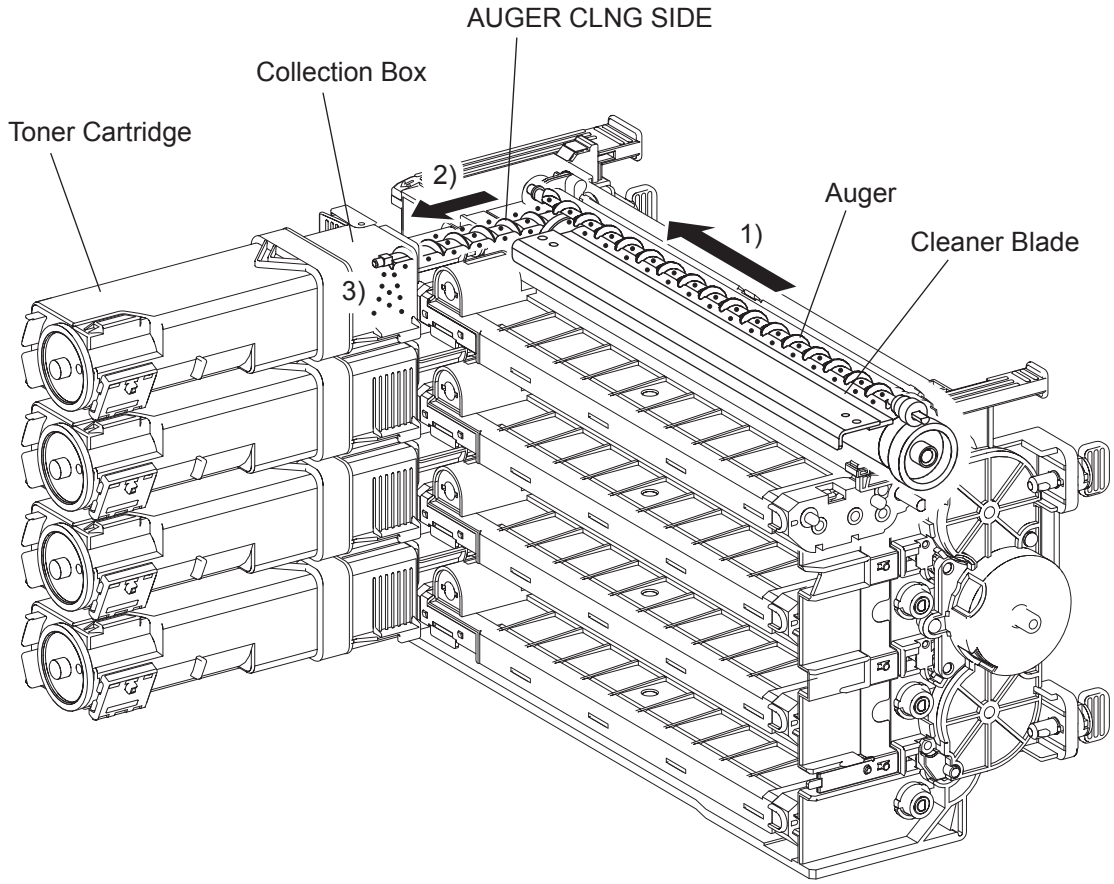


- Excess Toner Collecting

(1) The excess toner is collected by the cleaner blade contacting the drum, and then carried to the AUGER CLNG SIDE by the Auger.

(2) The toner is carried by the AUGER CLNG SIDE to the joint to the collection box in the toner cartridge.

(3) The toner then falls into the collection box in the toner cartridge.



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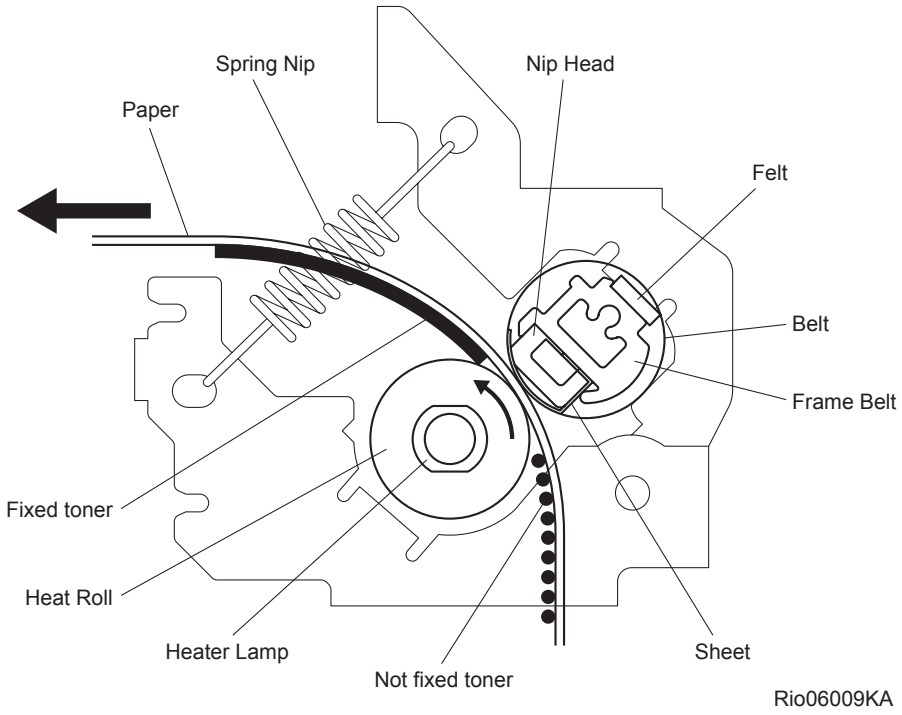
1.3.6 Fusing

In the fusing process, toner is fixed on the paper by heat and pressure.

- Since the finished toner image transferred from the belt can be easily broken by a finger touch, the toner image must be fixed on the paper with the FUSER (fusing unit).
  The toner particles are melted by the HEAT ROLL heated by the Heater lamp and is deposited on the paper under pressure given by the belt opposed against the heat roll.

Conditions to be met to light up the Heater Lamp

	Warm up	Stand by	Printing
Main Heater Lamp	ON	ON/OFF	ON



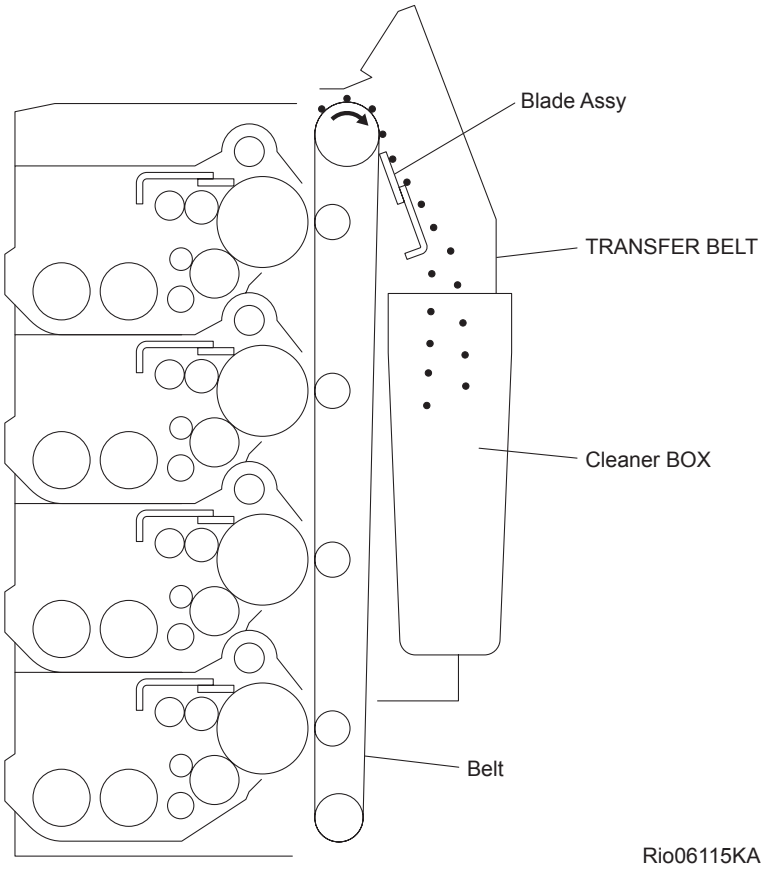
1.3.7 Cleaning (TRANSFER BELT)

In the "Cleaning (TRANSFER BELT)" process, the transfer belt is cleaned by removing the excess toner on its surface (for the density measurement of ADC toner patch).

- Collecting excess toner from the transfer belt

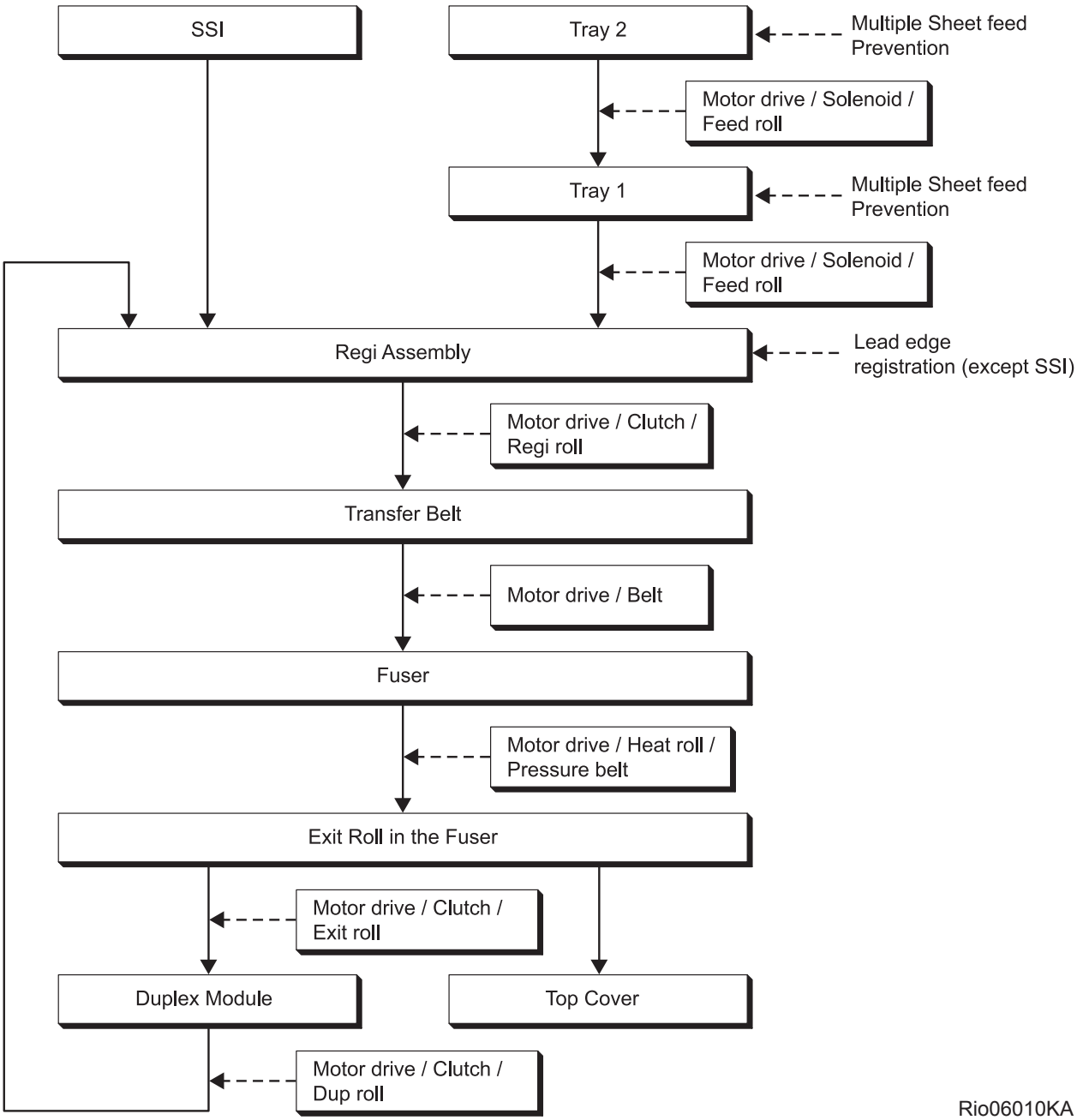
(1) Toner on the TRANSFER BELT is scraped off by the Cleaner Blade that is in contact with the Drum.

(2) The removed toner is dropped into the Cleaner BOX.

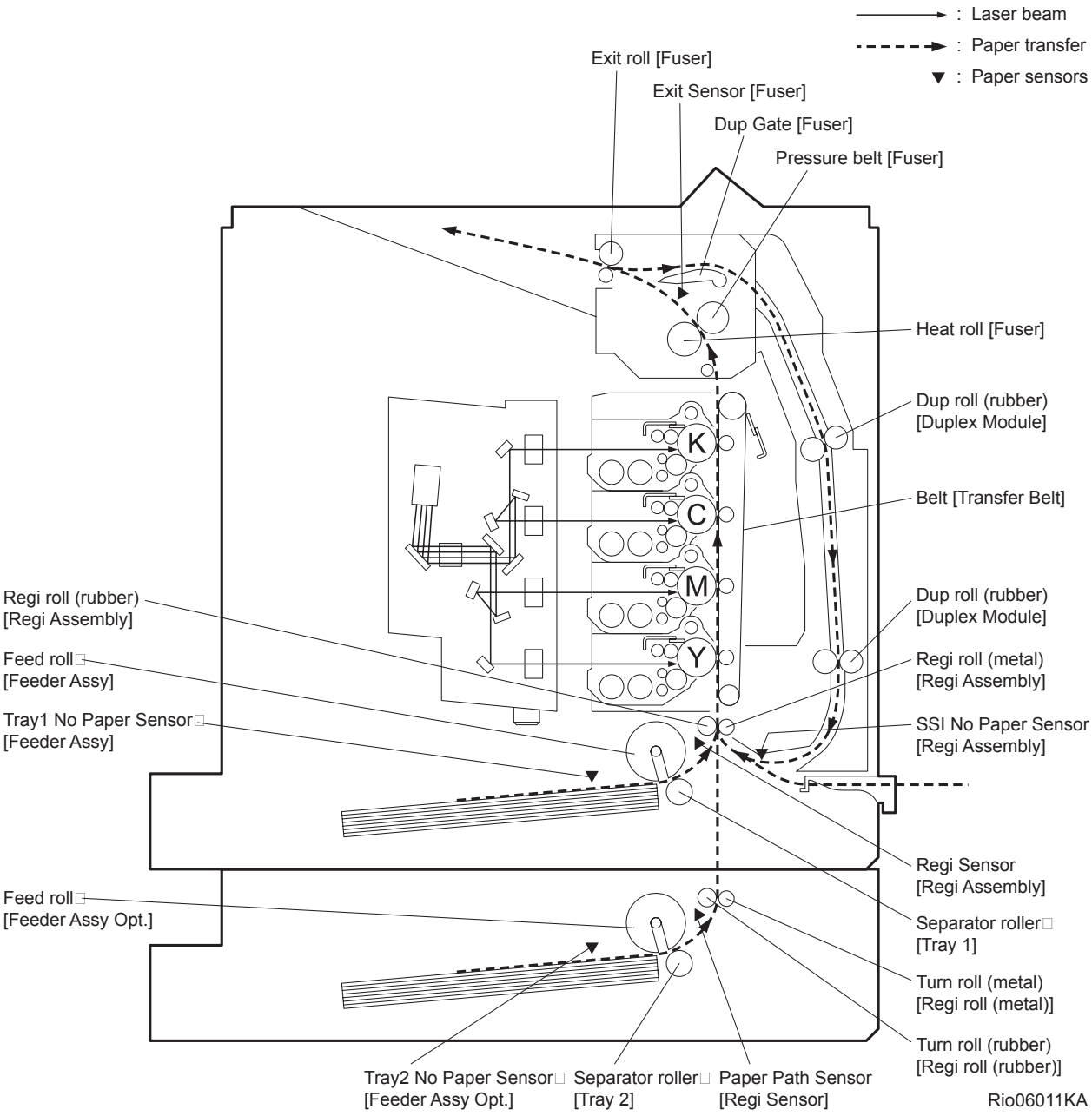


2. Paper Path

2.1 Paper Path



2.2 Layout of Paper Path



3. Functions of Major Functional Components

Major functional components of the printer are described below with illustrations.
These components are classified into the following blocks based on the configuration of the printer.

- Paper Cassette
- Paper Feeder
- SSI & Regi Assy
- Transfer Belt & Fuser
- ROS ASSY
- TONER CARTRIDGE & Dispenser
- PHD Unit
- Drive
- Electrical
- Duplex
- 250 Paper Feeder

3.1 Paper Cassette

3.1.1 Major functions

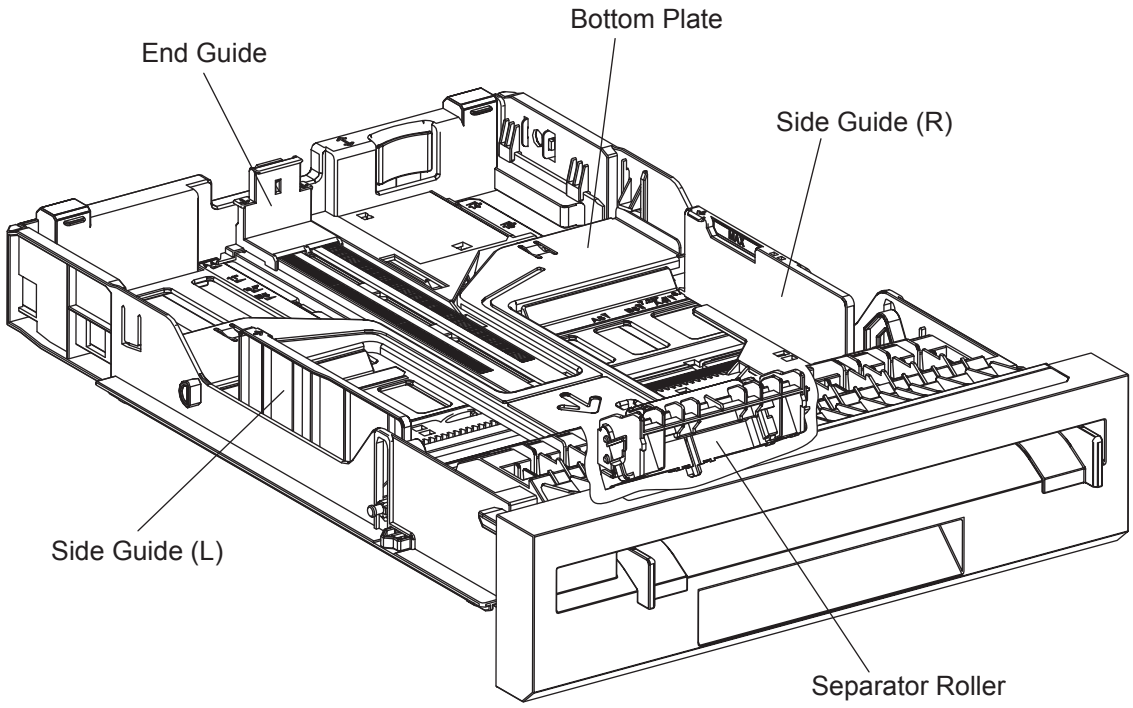
- Guide Side (R/L)
  The Guide Side Assy (R/L) can move at a right angle to the paper transfer direction to align the paper width.

- End Guide
  The Guide End Assy can move in the paper transfer direction to determine the paper size.

- SEPARATOR ROLLER
  The SEPARATOR ROLLER and the FEED ROLLER pinch the paper to prevent multiple sheet feed.

- Bottom Plate
  Bottom plate is locked to the bottom side when paper cassette is pulled out from the paper feeder and unlocked when paper cassette is installed to the paper feeder. Pushes the paper against the feed roll using a spring tension.

3.1.2 Reference diagram



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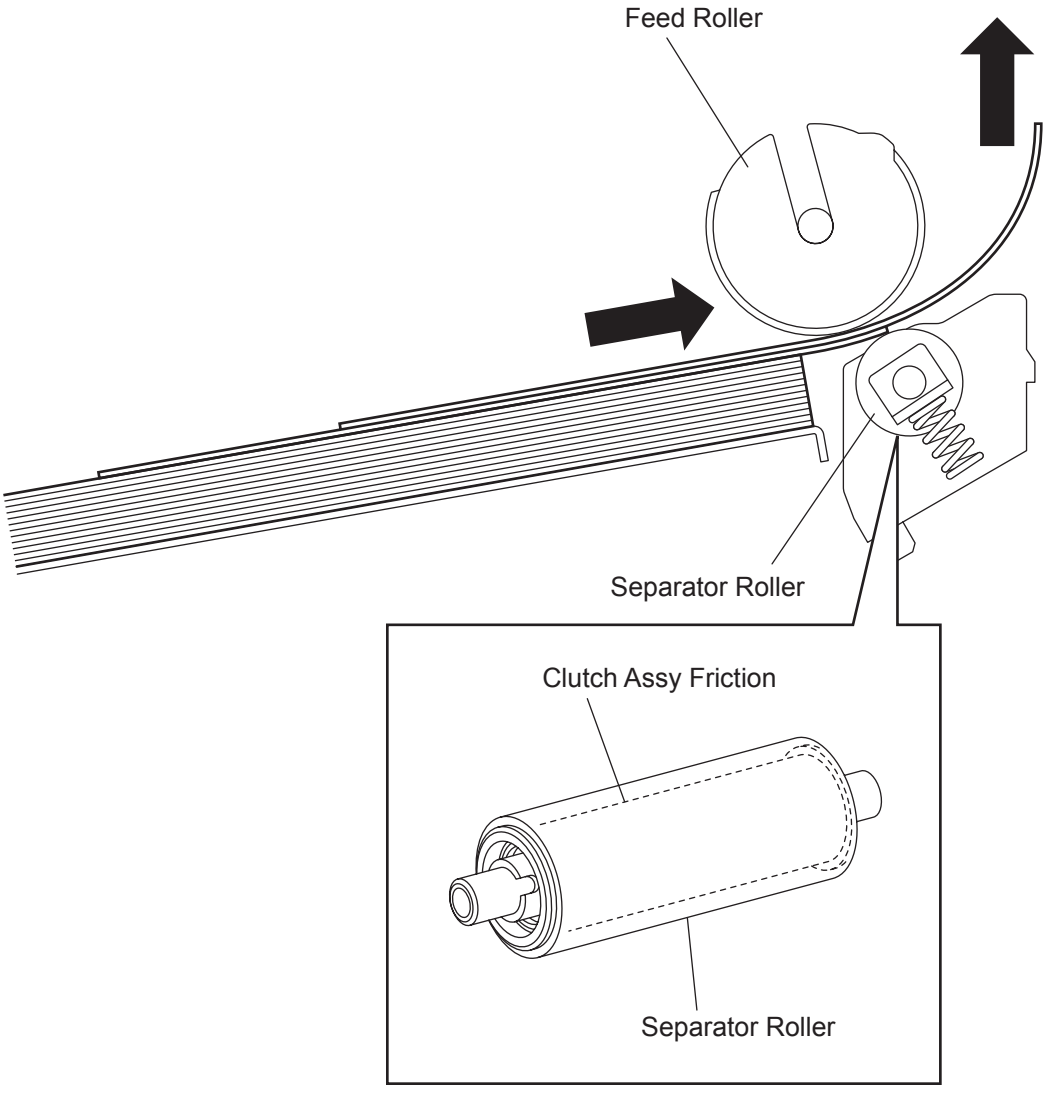
3.1.3 Multiple Sheet Feed Prevention

The sheets set in a tray or cassette are occasionally stuck together along the edges. The stuck sheets cause a multiple sheet feed or a jam. The sheets are fed by the Feed Roll to a position between the Feed Roll and the Separator Roll. Normally, when only one sheet is fed, both the Feed Roll and Separator Roll rotate to allow the sheet to pass. However, when two sheets are fed concurrently, only the Feed Roll rotates and the Separator Roll is locked thereby allowing the upper sheet to pass by being separated from the lower sheet that is stopped by the friction with the Separator Roll at rest.

The Separator Roll is being pushed toward the Feed Roll by spring pressure, and controlled by the torque limiter (Clutch Assy Friction) with which it is coupled.

3.1.4 Reference diagram



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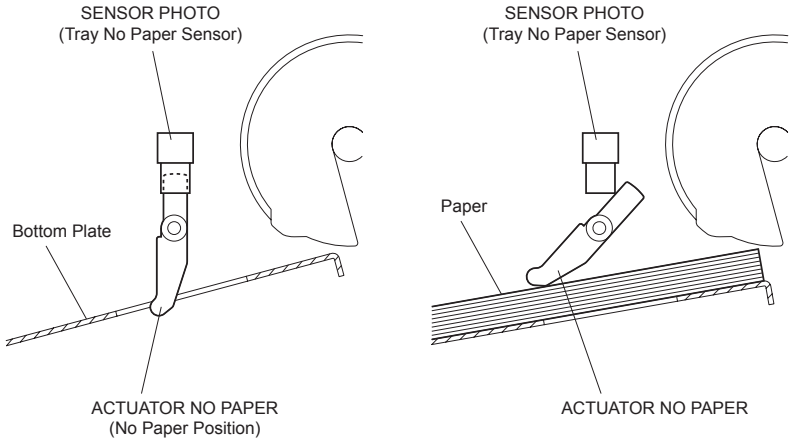
3.2 Paper Feeder

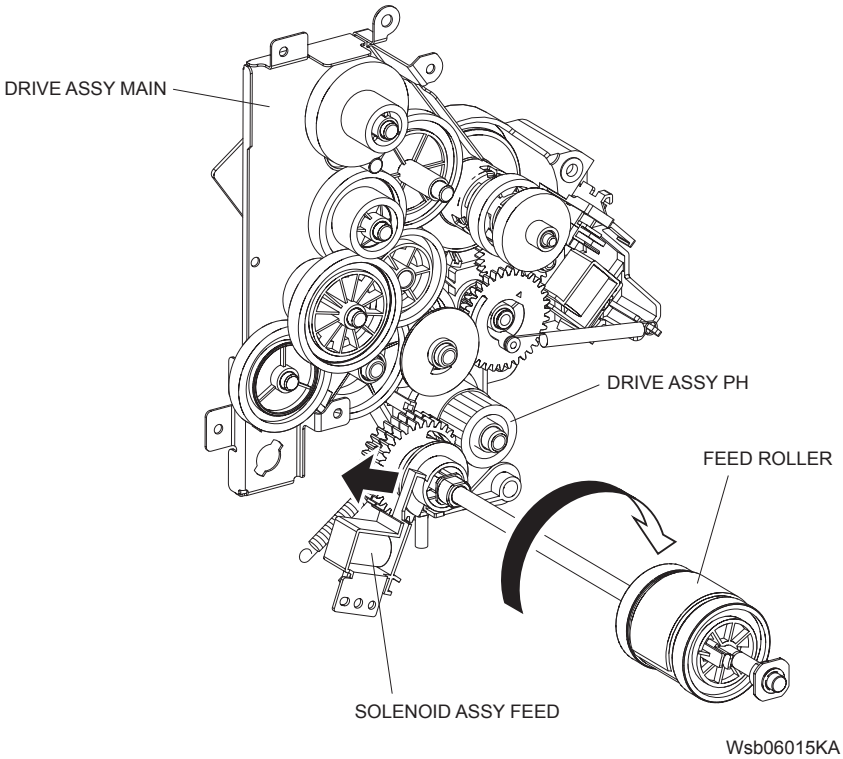
3.2.1 Major functions

- SENSOR PHOTO (No Paper Sensor)
  Detects the presence/absence of paper in the paper tray based on the position of ACTUATOR NO PAPER. (No paper: Sensor beam is intercepted)

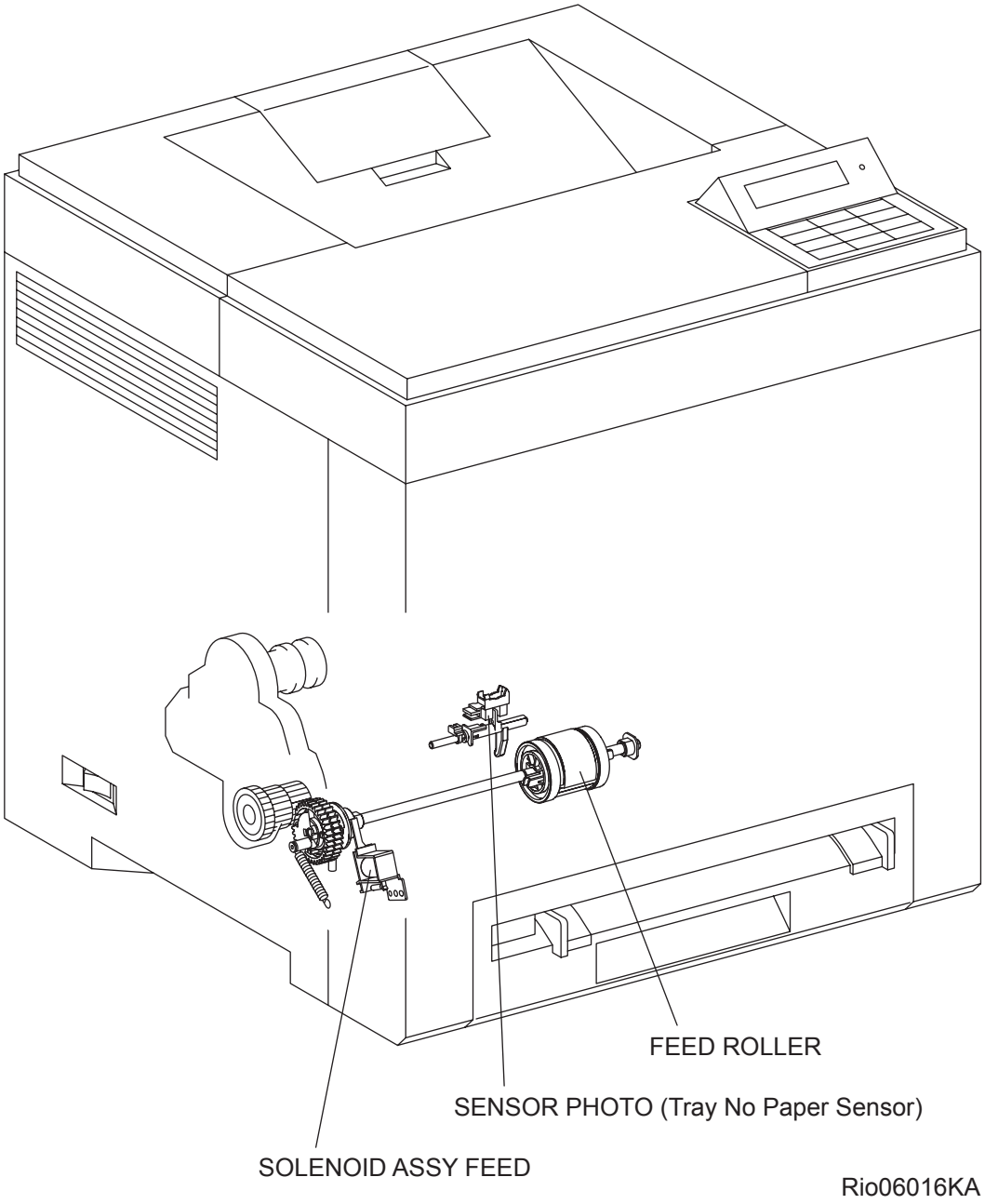


- SOLENOID ASSY FEED
  Transmits the drive from the DRIVE ASSY MAIN to FEED ROLLER. (Refer to 6.4 DRIVE ASSY SUB)

- FEED ROLLER
  When the SOLENOID ASSY FEED operates, the FEED ROLLER starts rotating and the FEED ROLLER feeds the paper. (Refer to 6.4 DRIVE ASSY SUB)



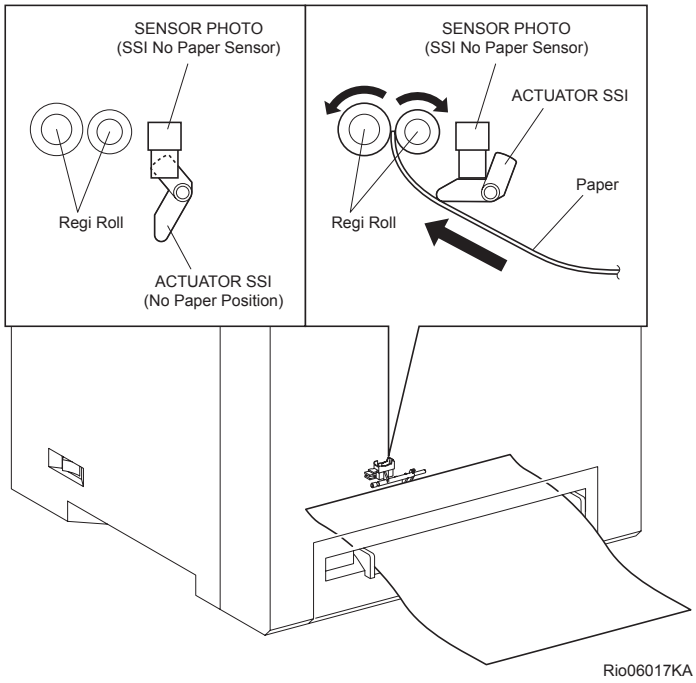
3.2.2 Reference diagram



3.3 SSI & Regi Assy

- SENSOR PHOTO (SSI No Paper Sensor)
  Detects presence/absence of paper in the SSI tray by the change in actuator position.

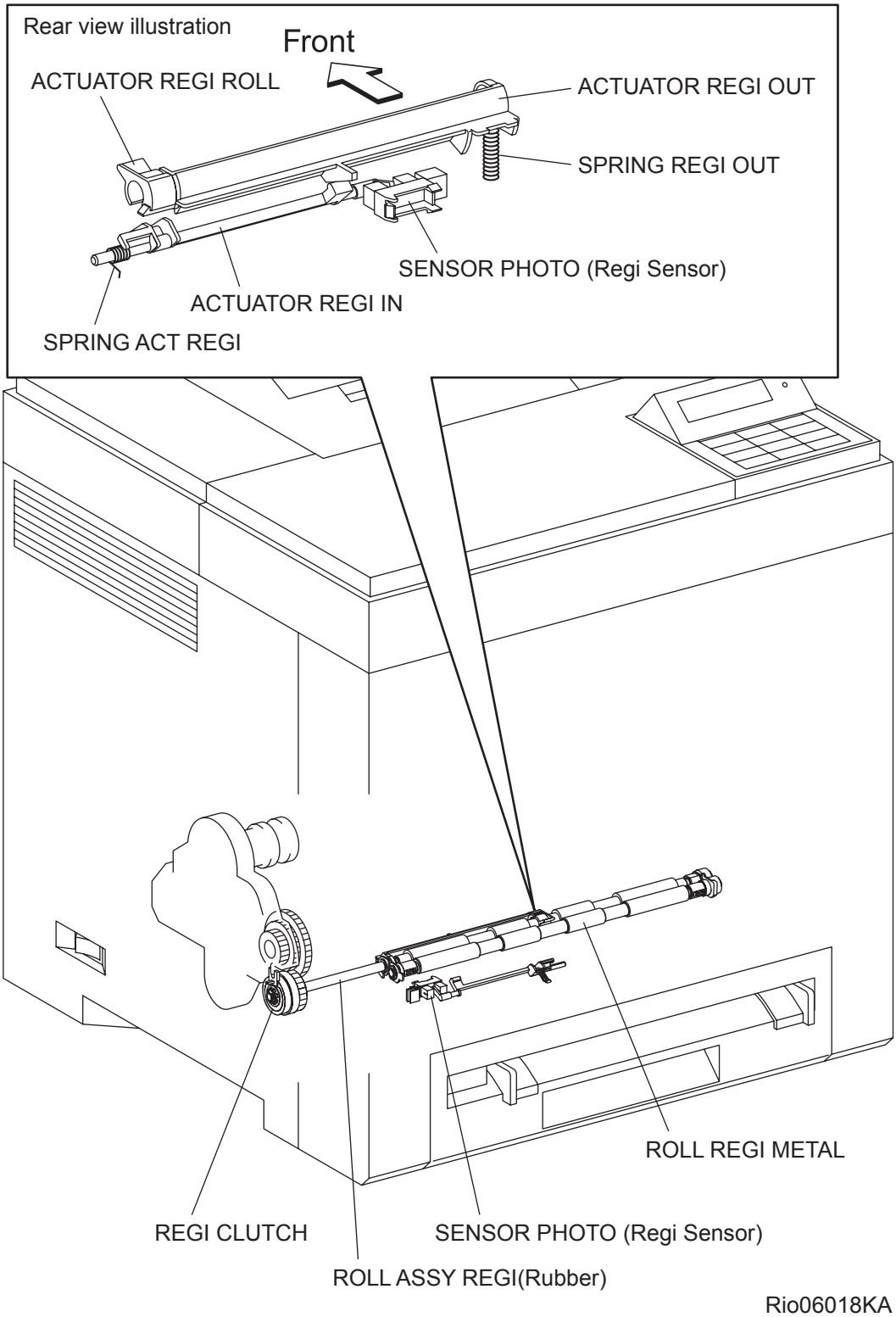
- SSI No Paper Sensor
  Upon detecting the sheet, the Regi Roll rotates for a predetermined duration to feed the sheet. The sheet is fixed between the Rolls so that it may not fall from the SSI.
  The Rolls stop immediately when the Regi Sensor detects the presence of paper.



- SENSOR PHOTO (Regi Sensor)
  It detects when the paper front end reaches the CHUTE ASSY FDR REGI.
  When the paper feeds from the SSI, Regi Sensor is measuring the paper length (size).
  The ON time of Regi Sensor is converted into the paper length.
  ON: The paper activates the actuator.

- Regi Clutch
  CLUTCH ASSY REGI transmits the driving power from the DRIVE ASSY MAIN to ROLL ASSY REGI, and transports the paper from the tray and SSI toward the PHD unit direction. (Refer to 6.4 DRIVE ASSY SUB)
  The timing of sheet feed from the Regi Assy is adjusted by the duration of the Regi Clutch operation so that the toner image on the drum can be transferred to the appropriate position on the sheet.

3.3.1 Reference diagram

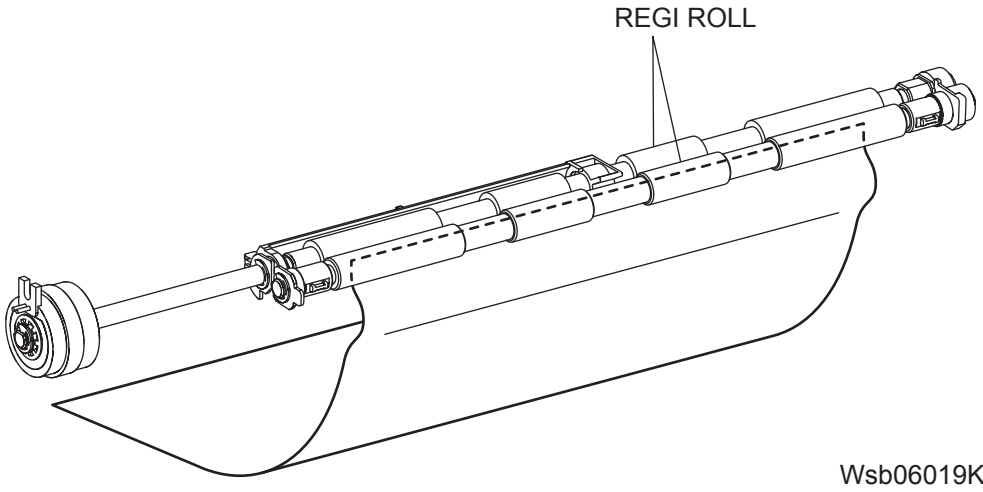


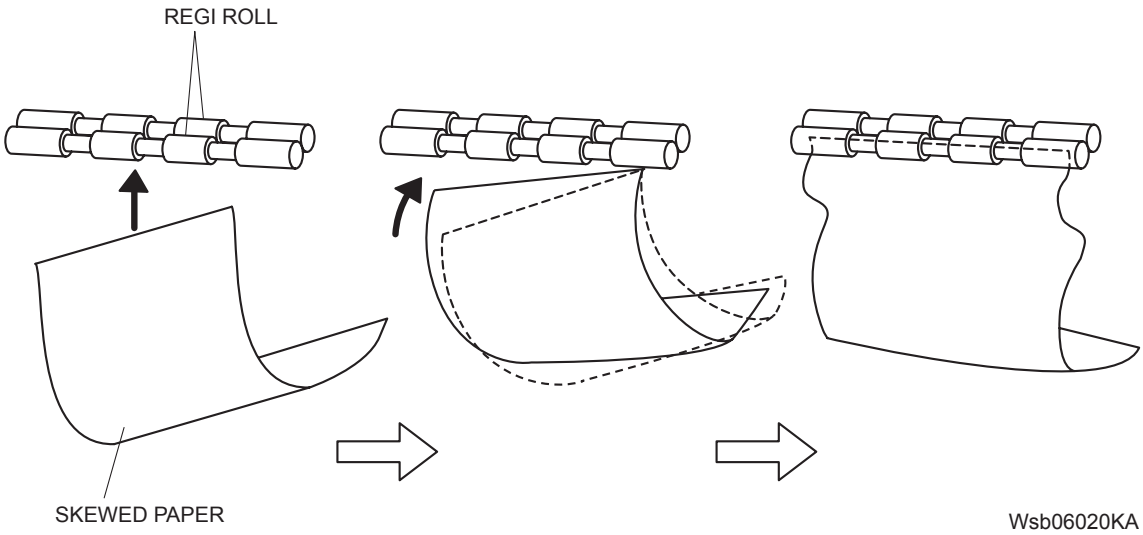
3.3.2 Lead-edge Registration

When a sheet is fed from the Tray to the toner transfer position, the registration of the sheet may not be correctly maintained due to such troubles as misalignment of lead edges in the Tray.To avoid this trouble, the lead edge position needs to be aligned at the Regi part before the sheet is fed to the toner transfer position.

By thrusting the edge of the sheet coming out of the Tray against the Regi Roll that is at rest, the lead edge of the sheet is registered.

3.3.3 Reference diagram



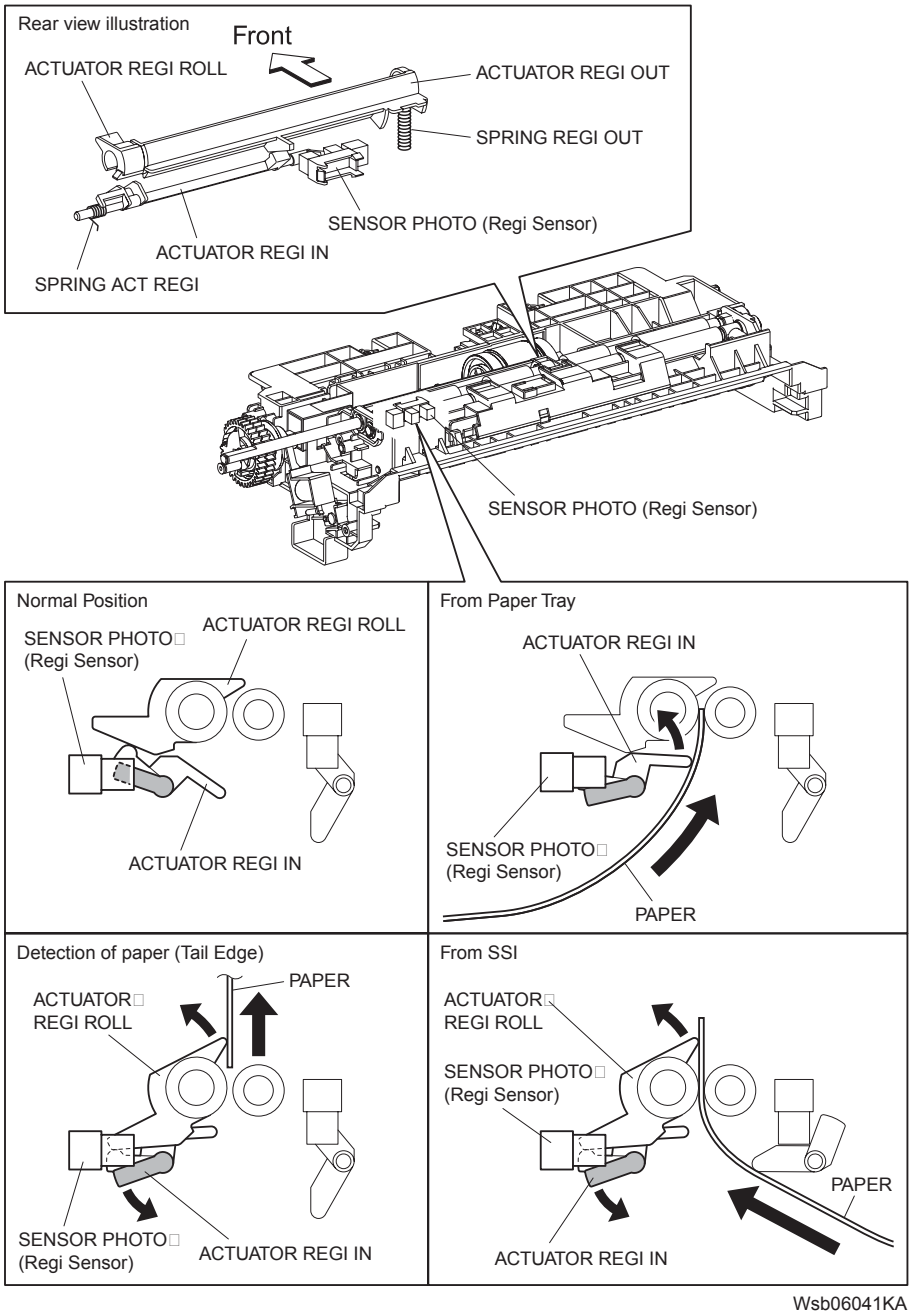


3.3.4 Control of paper size

The printer doesn't have switches for detecting paper size, and only length of paper is detected by the Regi Sensor when feeding paper. If printing data and paper size don't match, error is sent to the ESS.

3.3.5 Paper detection by the Regi Sensor

Since the paper path from the SSI to the Regi Sensor and that from the Paper Tray to the Regi Sensor are different, the Regi Sensor is provided with the ACTUATOR REGI IN and the ACTUATOR REGI ROLL. The ACTUATOR REGI ROLL detects the sheet from the SSI and detects the tail edge of the paper from the paper tray. The ACTUATOR REGI IN detects the lead edge of the paper from the paper tray. However, the movement of ACTUATOR REGI IN does not affect that of ACTUATOR REGI ROLL.



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3.4 Transfer Belt & Fuser

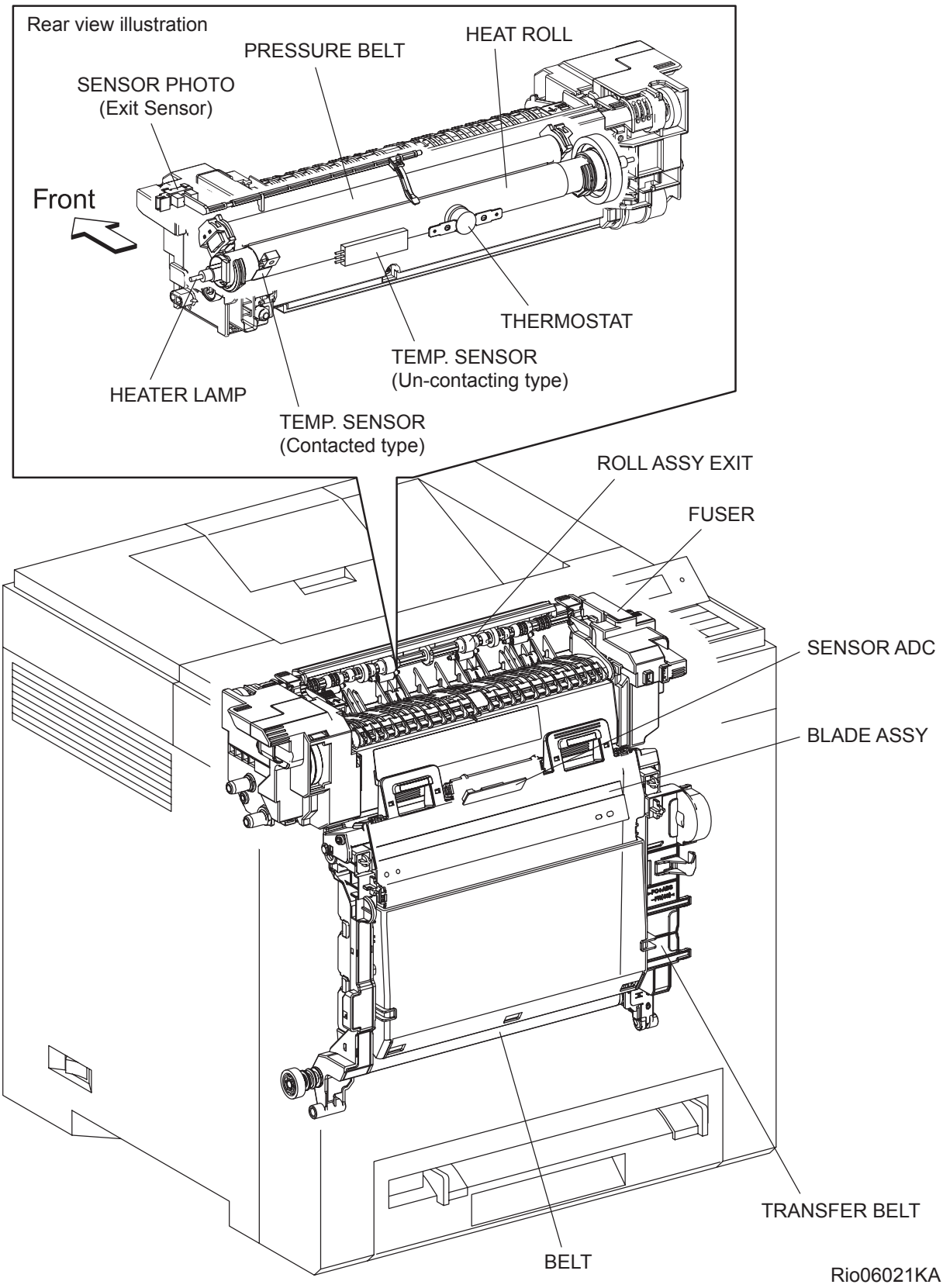
3.4.1 Major functions

- Transfer Belt
  - Belt
    Belt feeds the paper to the direction of FUSER
  - SENSOR ADC
    SENSOR ADC reads the toner patch on the BELT, and converts it to voltage value. Voltage value is used to control the density of toner. (Refer to 5.3.1 Potential Control)

- FUSER
  The FUSER fixes toner which was transferred onto the paper but not fixed by the heat and pressure and feeds paper before and after being fixed.
  The FUSER mainly consists of the following parts:
  - Heat Roll
  - Heater Lamp
  - Thermostat
  - Temp. Sensor
  - Pressure Belt
  - Roll Assy Exit
  - Exit Sensor

  - Exit Sensor
    Detects passage of print after fixed based on the change of position of the actuator.

3.4.2 Reference diagram



3.5 ROS ASSY

3.5.1 Major functions

- ROS ASSY

  ROS ASSY is an exposure unit that generates laser beams to form electrostatic latent image on the drum surface.

  In this manual, the ROS ASSY is referred to as ROS.

  The ROS mainly consists of the following parts:

  - LD PWB
  - Scanner ASSY
  - SOS PWB
  - Lens
  - Mirror
  - Window

• LD PWB

The LD PWB is comprised of four LDs (laser diodes) corresponding to Y, M, C, and K.
Each LD converts the electric signals of incoming image data into laser wave or pulse. In order to stabilize the laser light quantity during formation of an electrostatic latent image, the LD PWB always monitors the laser light quantity to adjust it to the appropriate level. This is called "APC (auto power control)".

• Scanner Assy

The Scanner Assy is comprised of the Scanner Motor that rotates at a constant speed and the Polygon Mirror that is mounted on the motor shaft.
The laser light output from the LD is irradiated onto the Polygon Mirror via the Mirror.
The Polygon Mirror, provided with six reflecting mirror faces, changes the reflection angle of the laser light as it rotates by the Scanner Motor, thereby allowing the laser light to scan the drum along its axial direction. Scanning is performed using one reflecting mirror face for each line.

• SOS PWB

The SOS sensor on the SOS (start of scan) PWB converts an incoming laser beam, upon detection, to an electric signal as the reference signal for starting scanning and transmits this signal to the PWBA MCU.
The SOS sensor signals are used to synchronize the starting point of the laser-beam scanning with the starting point of the image writing.

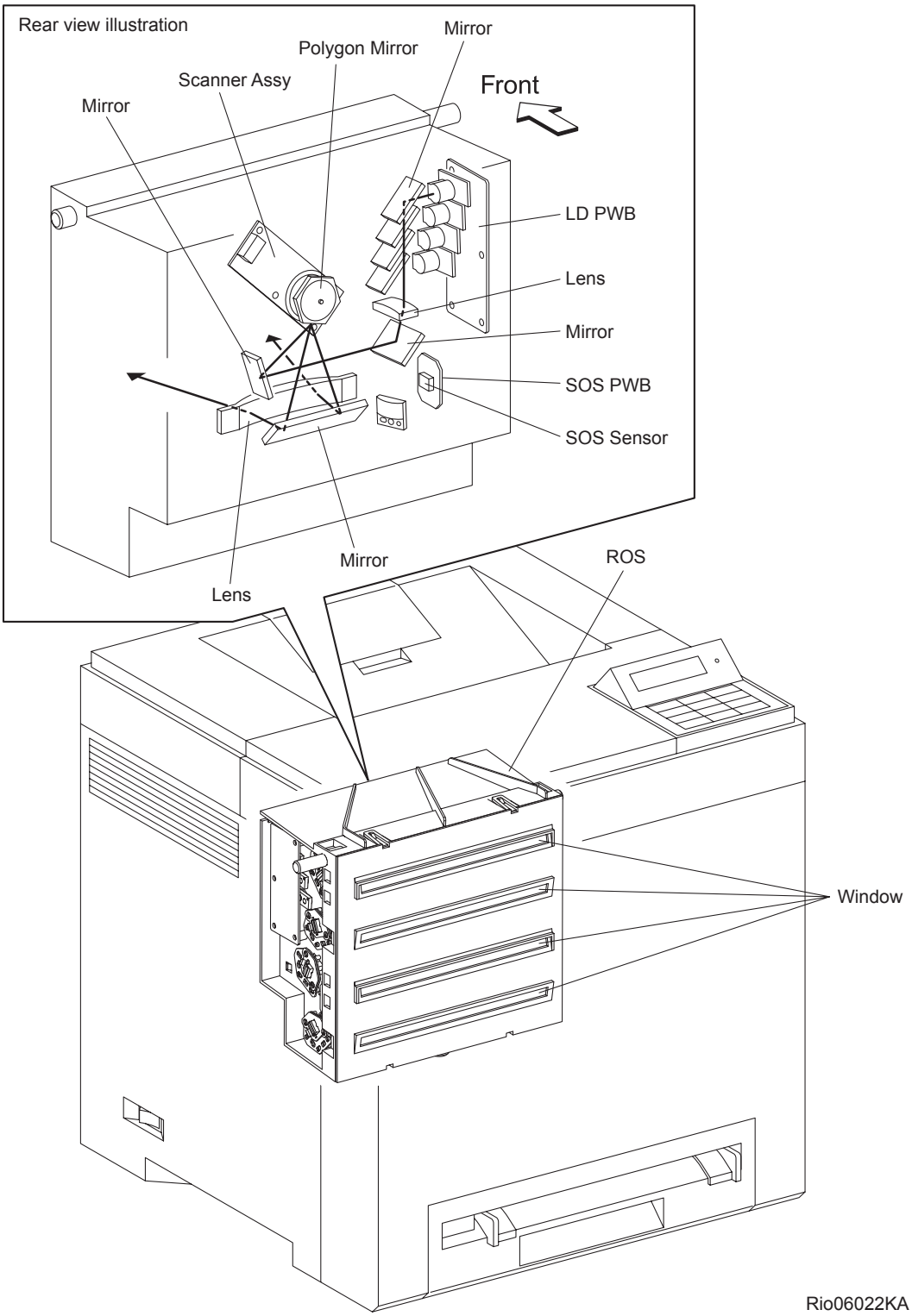
• Lens

• Mirror

• Window

The laser light reflected from the Polygon Mirror reaches the drum surface via the Lens, Mirror, and Window. The Lens corrects aberration, the Mirror secures an optical path, and the Window prevents foreign matters from entering the ROS.

3.5.2 Reference diagram



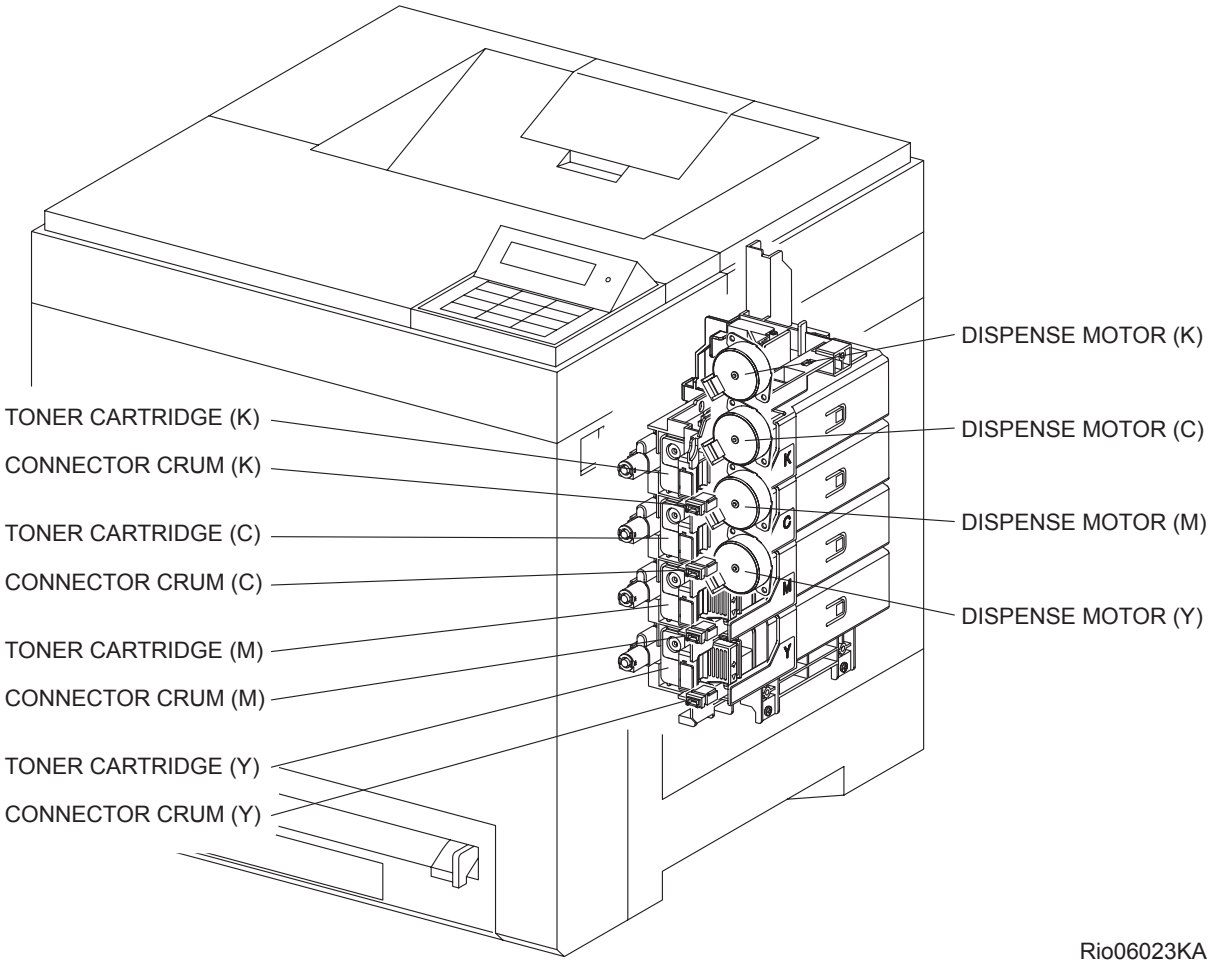
3.6 TONER CARTRIDGE & DISPENSER

3.6.1 Major functions

- CONNECTOR CRUM (Customer Replaceable Unit Memory)
  The CONNECTOR CRUM reads and writes the data of the CRUM.
  Printer specific information is stored.

- DISPENSE MOTOR (Y/M/C/K)
  The dispense motor supplies the drive to the Agitator and Auger in the TONER CARTRIDGE, and supplies toner to the developer.

3.6.2 Reference diagram



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3.7 PHD Unit

3.7.1 Major functions

- PHD Unit

  PHD Unit carries out a series of operation in the print process such as charging, and transfer.

  PHD Unit mainly consists of the following parts.

  Developer is an equipment which develops images in the print process.

• Drum (Y)	• Developer (Y)
• Drum (M)	• Developer (M)
• Drum (C)	• Developer (C)
• Drum (K)	• Developer (K)

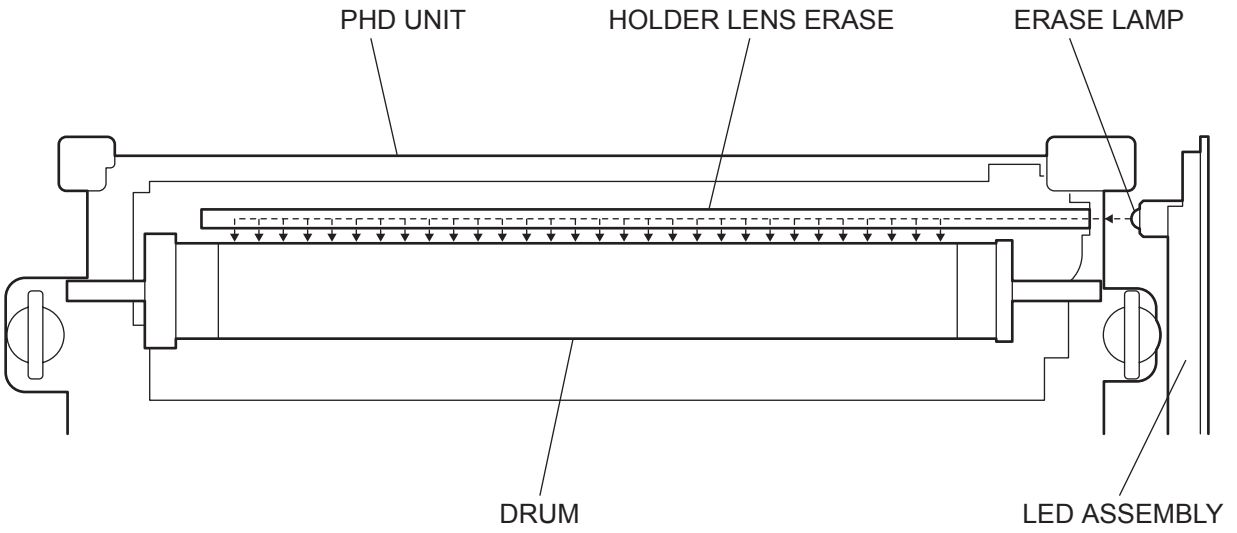
- CRUM

  PHD specific information is stored.

- Erase Lamp (LED ASSEMBLY)

  The light of the LED is reflected by the HOLDER ASSY Erase.

  The light of the LED eliminates the charge on the drum.



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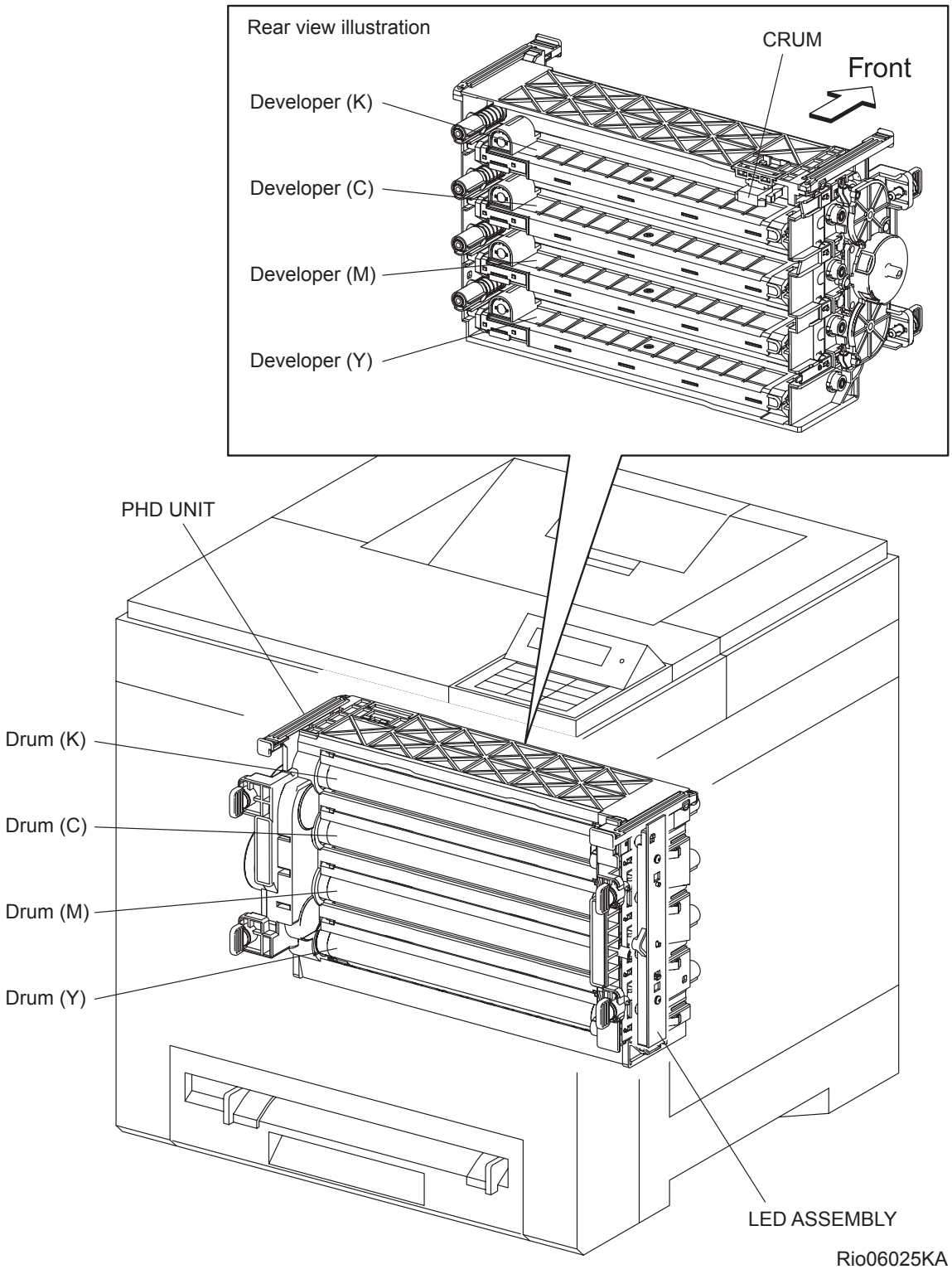
3.7.2 Reference diagram



3.8 Drive

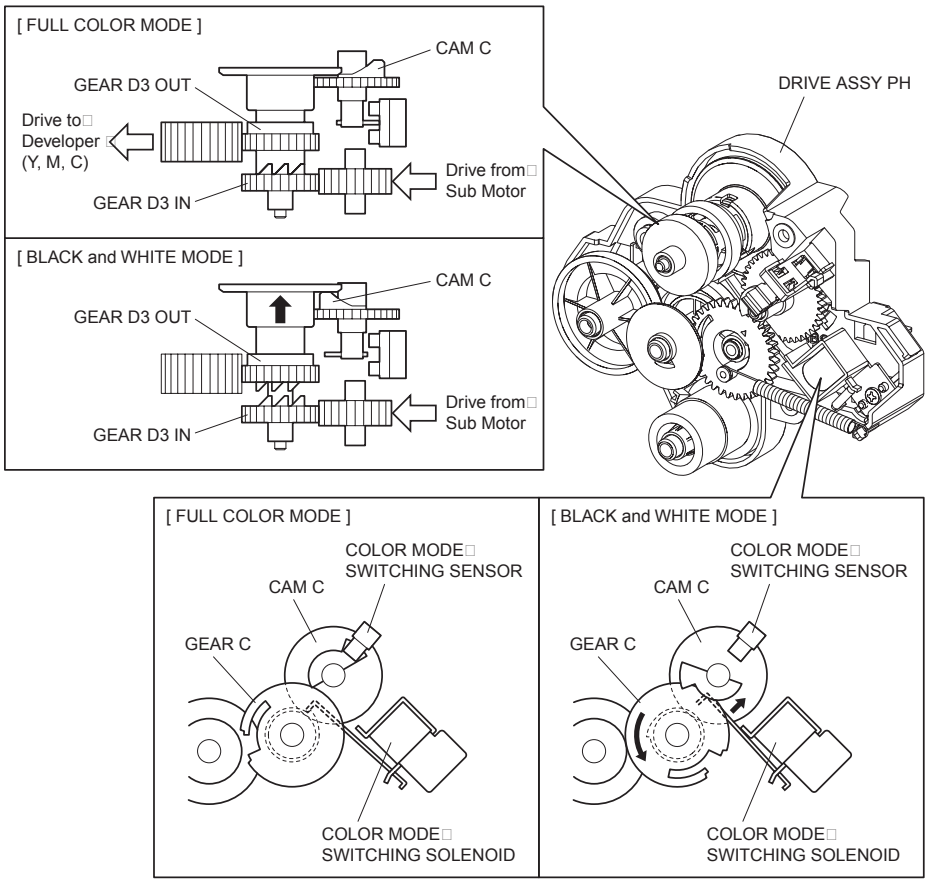
3.8.1 Major functions

- DRIVE ASSY MAIN (Refer to 6.1 DRIVE ASSY MAIN)
  Supplies the drive to parts as follows.

  • (C/M/Y/K) Drum
  • Transfer Belt
  • Regi
  • Feeder

- DRIVE ASSY SUB
  Supplies the drive to parts as follows.
  • Fuser
  • Developer (C/M/Y/K)

- DRIVE ASSY PH
  DRIVE ASSY PH transmits the driving force from the DRIV ASSY SUB to relevant parts.
  The transmission channel is changed by the COLOR MODE SWITCHING SOLENOID in the DRIVE ASSY PH to allow the driving force of the DRIVE ASSY MAIN to reach the Black Developer only. This is performed to ensure that the Yellow, Magenta, and Cyan Developers cannot be rotated by the DRIVE ASSY SUB during B/W printing.
  The COLOR MODE SWITCHING SENSOR detects the status of the transmission route (whether it is set for B/W or full color).



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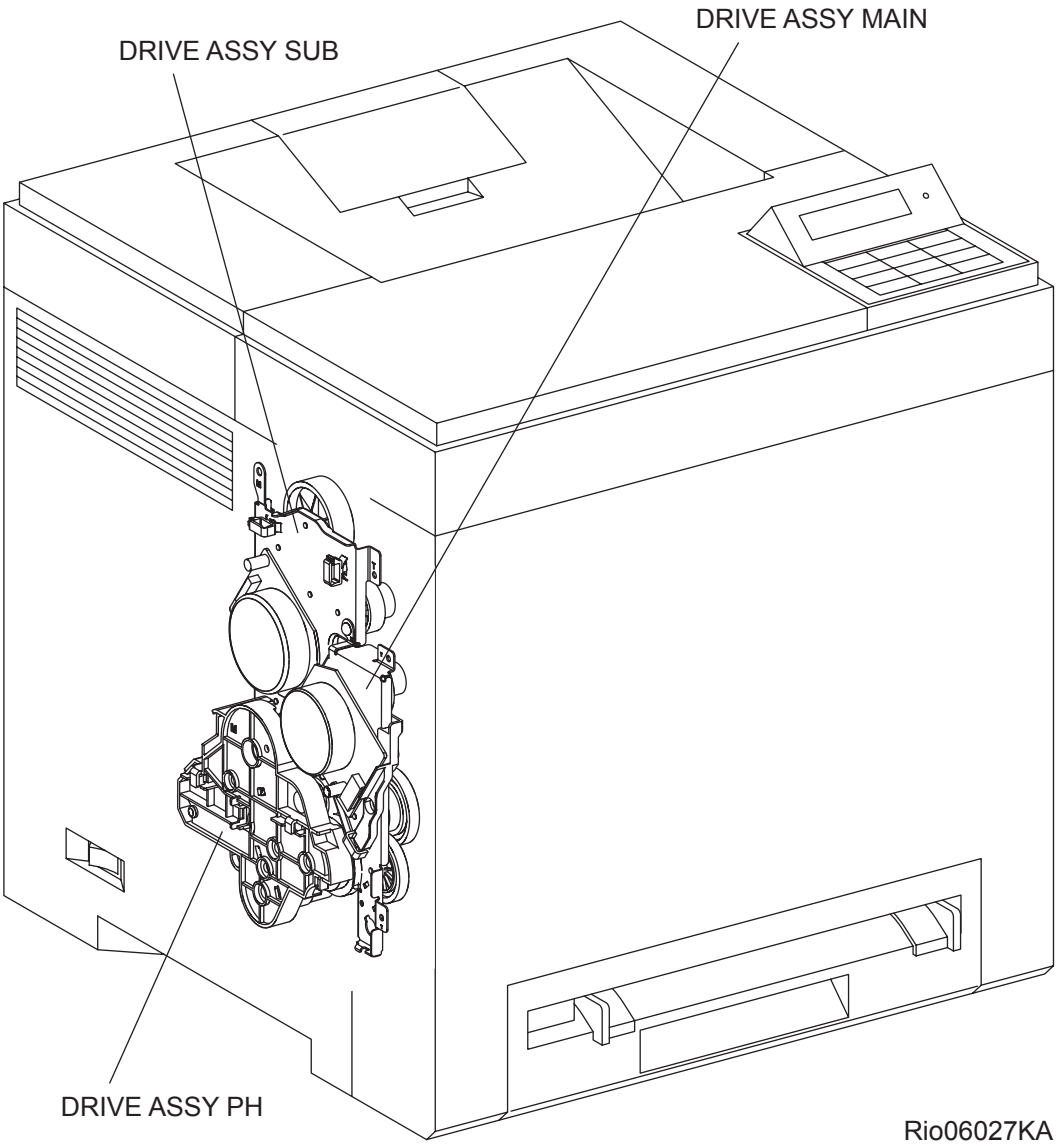
3.8.2 Reference diagram



3.9 Electrical

3.9.1 Major functions

- FAN
  Dissipates heat out of the printer to prevent the printer from overheating.

- SWITCH
  The SWITCH turns ON/OFF the AC power supply of the printer.

- Low Voltage Power Supply (LVPS)
  The LVPS is provided in two types, 120V and 240V.
  Supplies AC power from the power source to the FUSER heater and generates and supplies stable low voltage DC power used for the logic circuit, etc.
  LVPS contains control circuit for the heater of the FUSER, in addition to the power circuit.

- Machine Control Unit (MCU)
  Controls printing operation based on the communication with the print controller and information from the sensor/switch.
  Major functions are as follows:
  - Communication with the ESS.
  - Receive of information from the sensors or switches.
  - Control of Motor in DRIVE ASSY MAIN and DRIVE ASSY SUB.
  - Distributing low voltage DC power output from LVPS to each component
  - Control of ROS

- High Voltage Power Supply (HVPS)
  Supplies high voltage to the following parts in the Transfer Belt and Developer to perform charging, development, and primary transfer.
  - BCR
  - BTR
  - Developer

- PWBA EEPROM
  Information unique to the printer is stored.

- Electronic Sub System (ESS)
  The ESS connected to the MCU controls the entire system (Diagnostic, Interface and Image processing).

- HUMIDITY SENSOR
  HUMIDITY SENSOR reads the temperature/humidity within the printer and converts the values to voltage values.

- OPERATOR PANEL
  OPERATOR PANEL displays the state of the printer using LED.

- INTERLOCK SWITCH
  INTERLOCK SWITCH is a switch that cuts the +24VDC power supply to the HVPS or Motor, etc. upon the opening of the Front Cover.

- Network Protocol Adaptor
  The Network Protocol Adapter for making the protocol (Netware IP, WSD, SNMPv3, HTTPS) of an option possible.

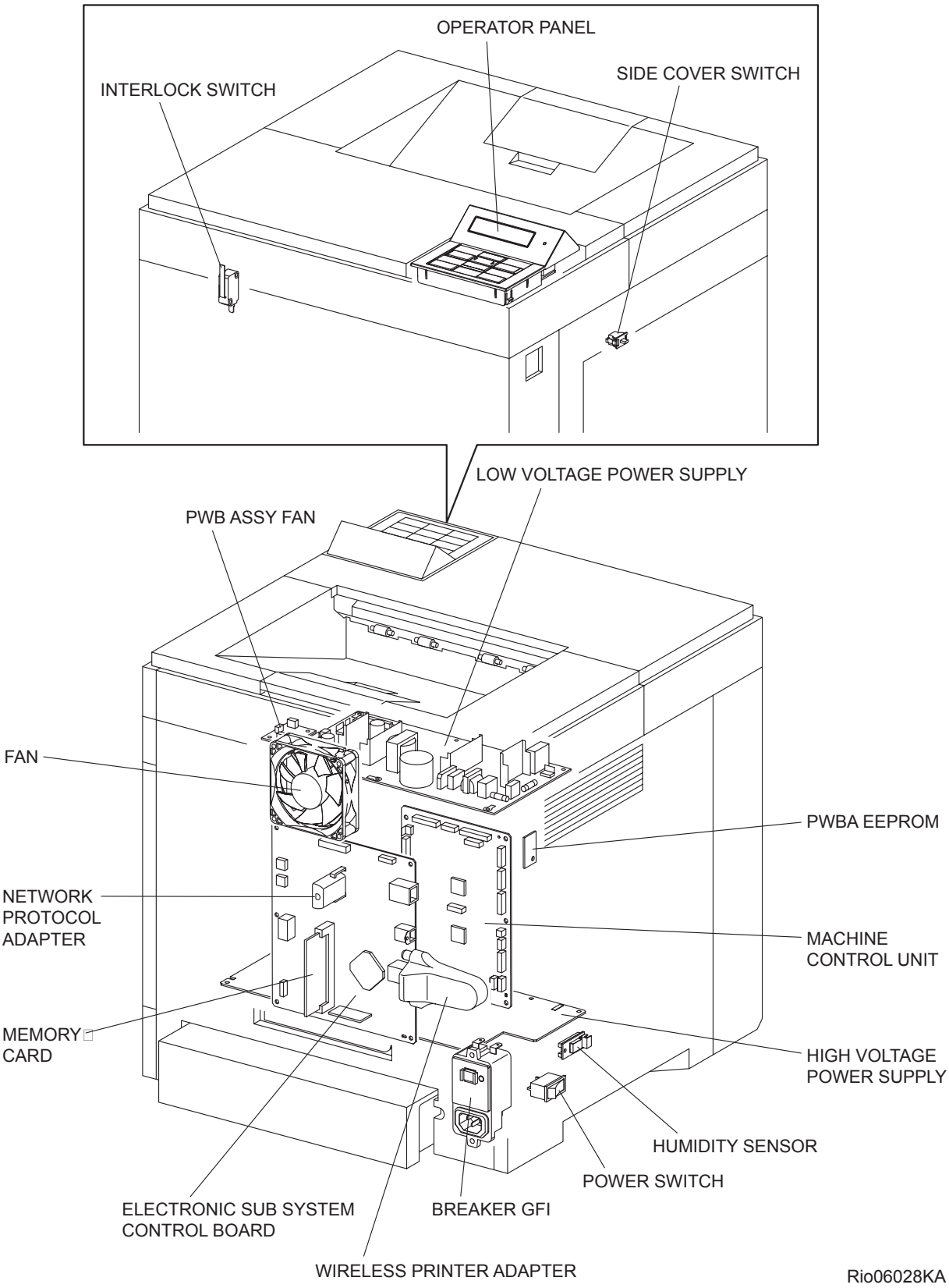
- Wireless Printer Adapter
  An adapter for enabling the network connectivity of the printer by wireless.

- SIDE COVER SWITCH
  SIDE COVER SW is a switch that detects the right side cover open.

- BREAKER GFI
  Opens the circuit upon detecting any voltage or current or leakage current that exceeds the rating of the AC power supply.

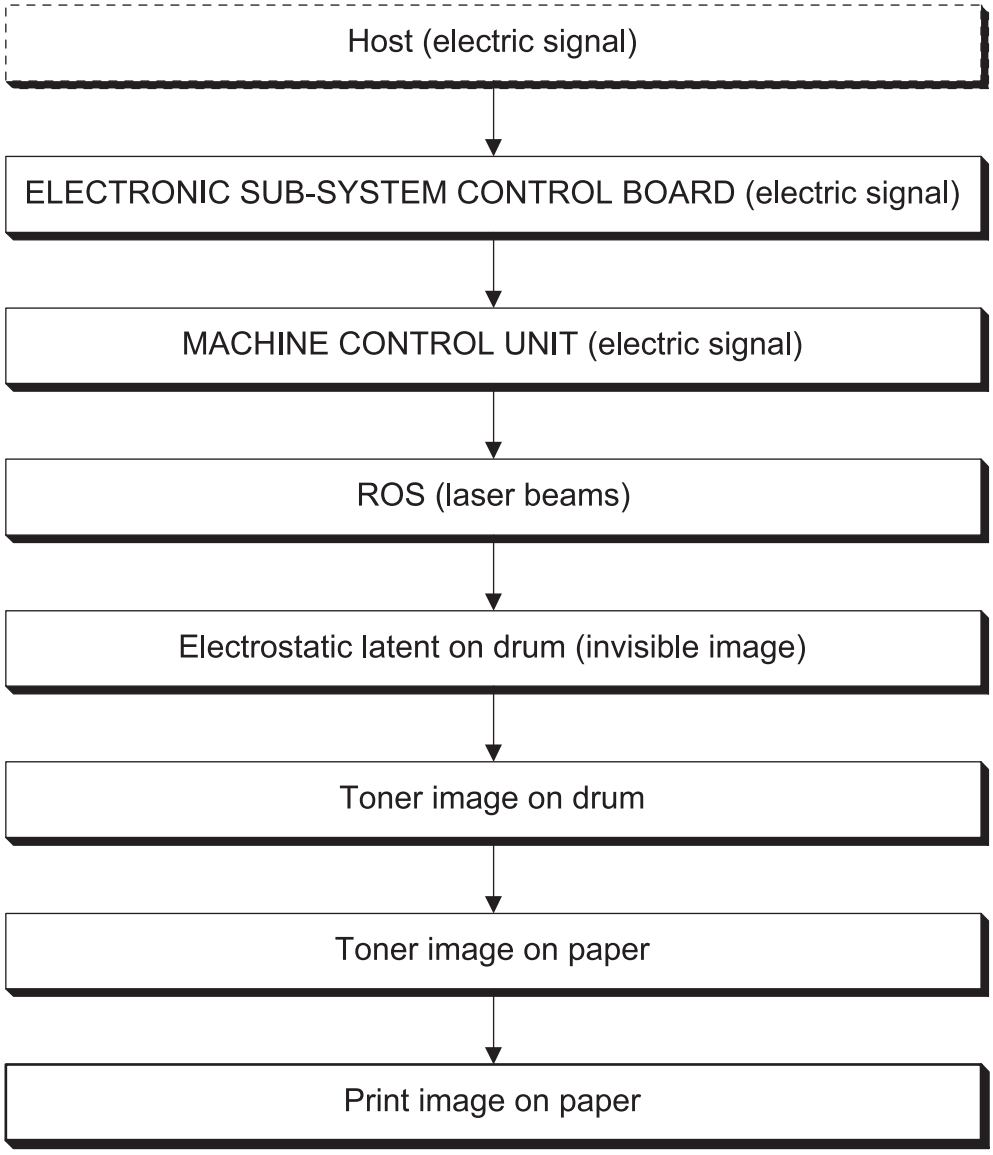
- PWB ASSY FAN
  Rotation of FAN is Controlled into a half by "PWB ASSY FAN".

3.9.2 Reference diagram



3.9.3 Data Flow

Print data (electric signal) from the printer controller flows as shown below until it is turned into a print.



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3.10 Duplex

3.10.1 Major functions

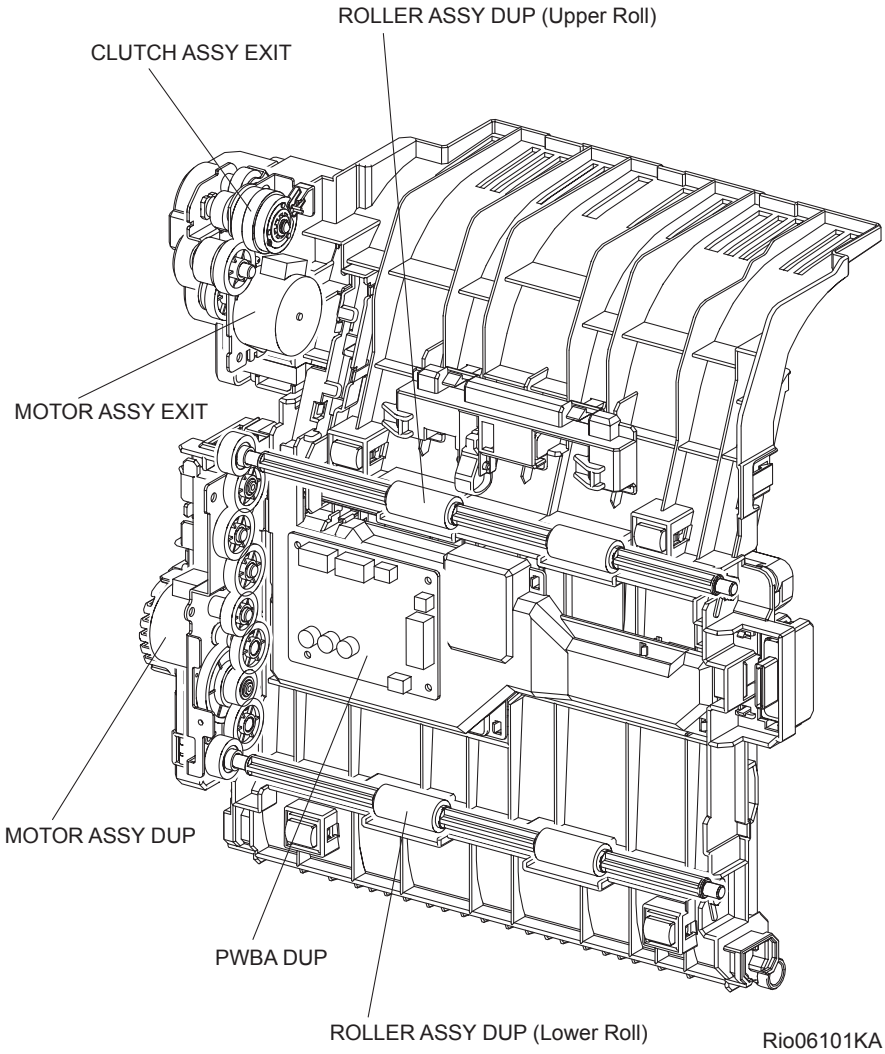
- CLUTCH ASSY EXIT
  Transmits the drive from the MOTOR ASSY EXIT to Roll Assy Exit in the FUSER.
  When the clutch operates, the Roll Assy Exit rotates in the reverse direction.
  The clutch is stopped when the paper reached the Duplex.

- MOTOR ASSY DUP
  The MOTOR ASSY DUP supplies the driving power to the Lower Roll (ROLLER ASSY DUP) and Upper Roll (ROLL ASSY DUP1). (Refer to 6.5 DRIVE ASSY DUP)

- MOTOR ASSY EXIT
  The MOTOR ASSY EXIT supplies the driving power to the Roll Assy Exit in the FUSER. (Refer to 6.5 DRIVE ASSY DUP)

- PWBA DUP
  The PWBA DUP controls motor and clutch.

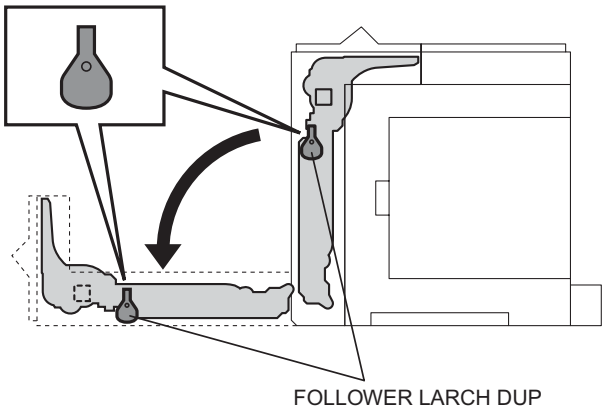
3.10.2 Reference diagram



3.10.3 Removing DUPLEX

The SIDE BUTTON allows you to do one of opening the FRONT COVER and removing the DUPLEX. Switching between these two functions can be made by the FOLLOWER LATCH DUP.

- Due to its weight balance, the FOLLOWER LATCH DUP is oriented in the same direction regardless of whether the FRONT COVER is open or not, thereby allowing the two functions to be switched.



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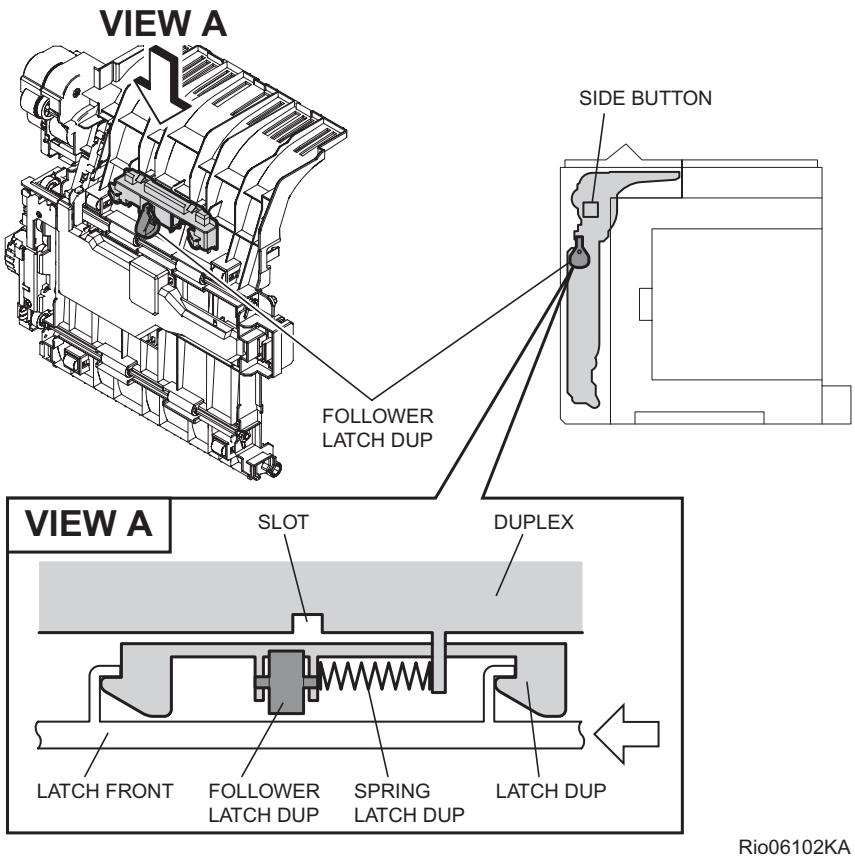
<When FRONT COVER is closed: DUPLEX is upright>
Since the FOLLOWER LATCH DUP is not fit into the SLOT on the DUPLEX, pushing the SIDE BUTTON causes the LATCH FRONT and LATCH DUP to move left locked together at the hooks, allowing only the FRONT COVER to open (leaving the DUPLEX secured to the FRONT COVER).



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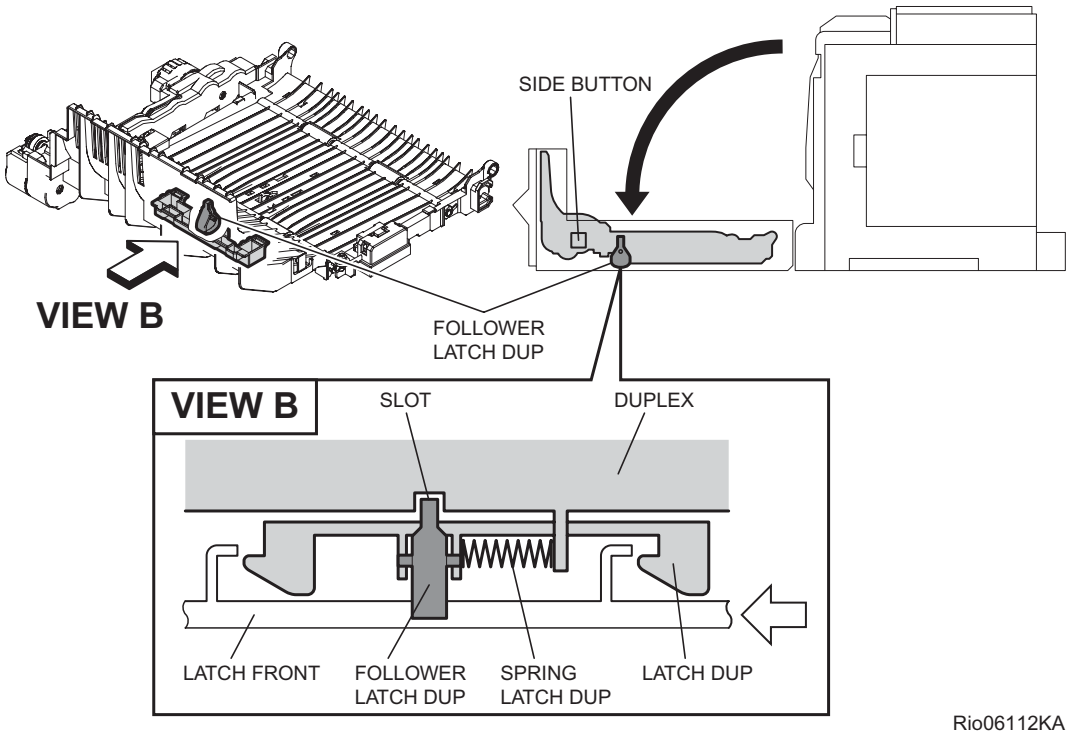
<When FRONT COVER is open: DUPLEX lies flat>
Since the FOLLOWER LATCH DUP is not fit into the SLOT on the DUPLEX, pushing the SIDE BUTTON causes the LATCH FRONT and LATCH DUP disengaged, allowing the DUPLEX to be unlocked from the FRONT COVER.



3.11 250 Paper Cassette

3.11.1 Major functionsÅiPaper CassetteÅj

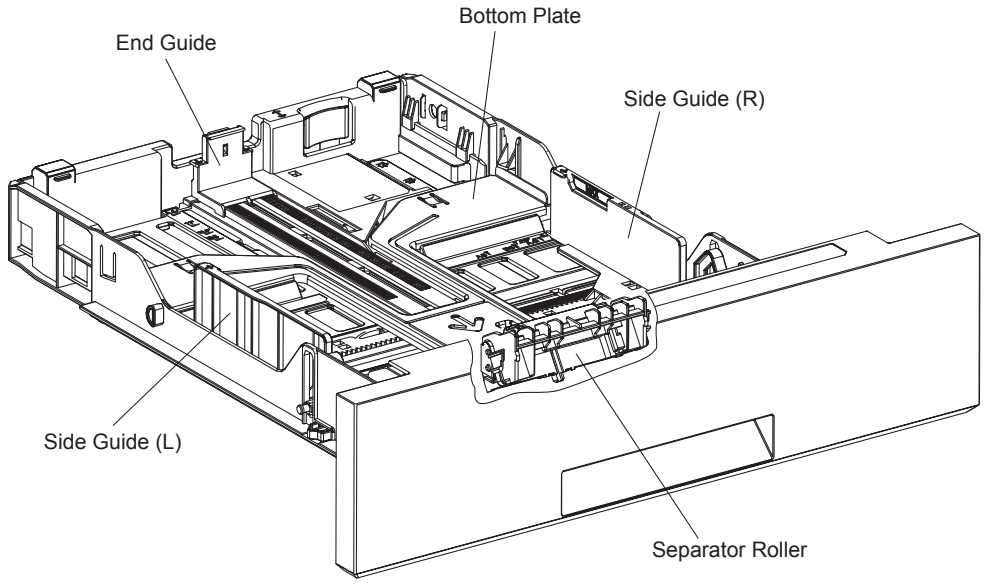
- Guide Side (R/L)
  The Guide Side Assy (R/L) can move at a right angle to the paper transfer direction to align the paper width.

- End Guide
  The Guide End Assy can move in the paper transfer direction to determine the paper size.

- SEPARATOR ROLLER
  The SEPARATOR ROLLER and the FEED ROLLER pinch the paper to prevent multiple sheet feed.

- Bottom Plate
  Bottom plate is locked to the bottom side when paper cassette is pulled out from the paper feeder and unlocked when paper cassette is installed to the paper feeder. Pushes the paper against the feed roll using a spring tension.

3.11.2 Reference diagram



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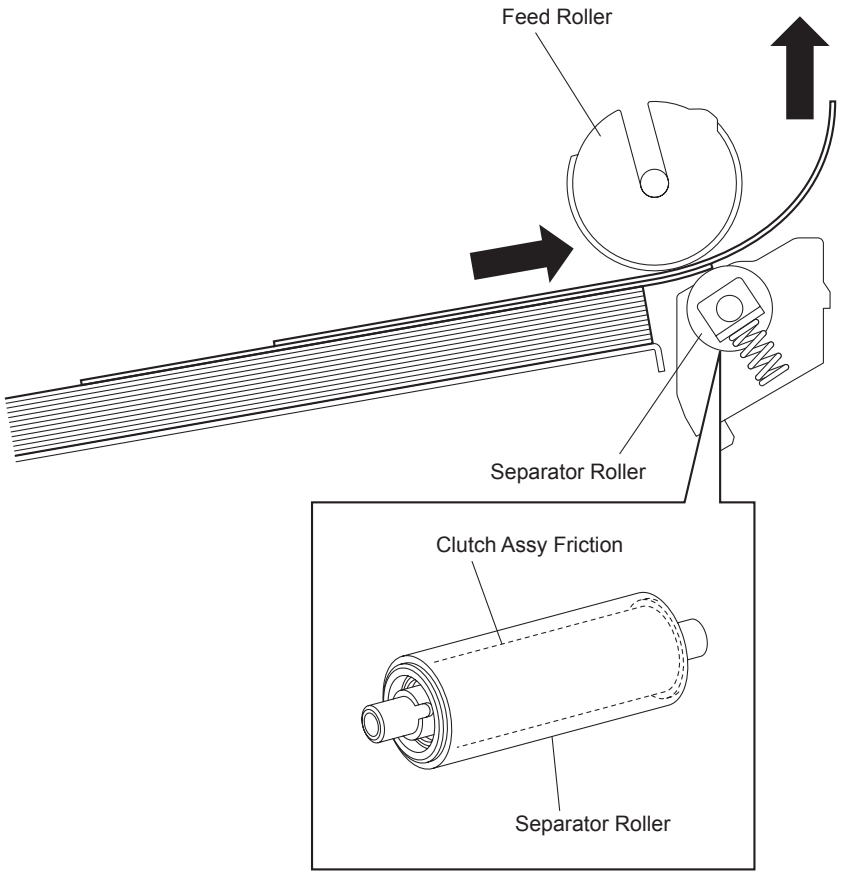
3.11.3 Multiple Sheet Feed Prevention

The sheets set in a tray or cassette are occasionally stuck together along the edges. The stuck sheets cause a multiple sheet feed or a jam. The sheets are fed by the Feed Roll to a position between the Feed Roll and the Separator Roll. Normally, when only one sheet is fed, both the Feed Roll and Separator Roll rotate to allow the sheet to pass. However, when two sheets are fed concurrently, only the Feed Roll rotates and the Separator Roll is locked thereby allowing the upper sheet to pass by being separated from the lower sheet that is stopped by the friction with the Separator Roll at rest. The Separator Roll is being pushed toward the Feed Roll by spring pressure, and controlled by the torque limiter (Clutch Assy Friction) with which it is coupled.

3.11.4 Reference diagram



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3.11.5 Major functions (Paper Feeder)

- SENSOR PHOTO (No Paper Sensor)
  Detects the presence/absence of paper in the paper tray based on the position of ACTUATOR NO PAPER. (No paper: Sensor beam is intercepted)

- SOLENOID ASSY FEED
  Transmits the drive from the MOTOR ASSY OPTIN to FEED ROLLER. (Refer to 6.6 DRIVE ASSY OPTION FDR)

- FEED ROLLER
  When the SOLENOID ASSY FEED operates, the FEED ROLLER starts rotating and the FEED ROLLER feeds the paper. (Refer to 6.6 DRIVE ASSY OPTION FDR)

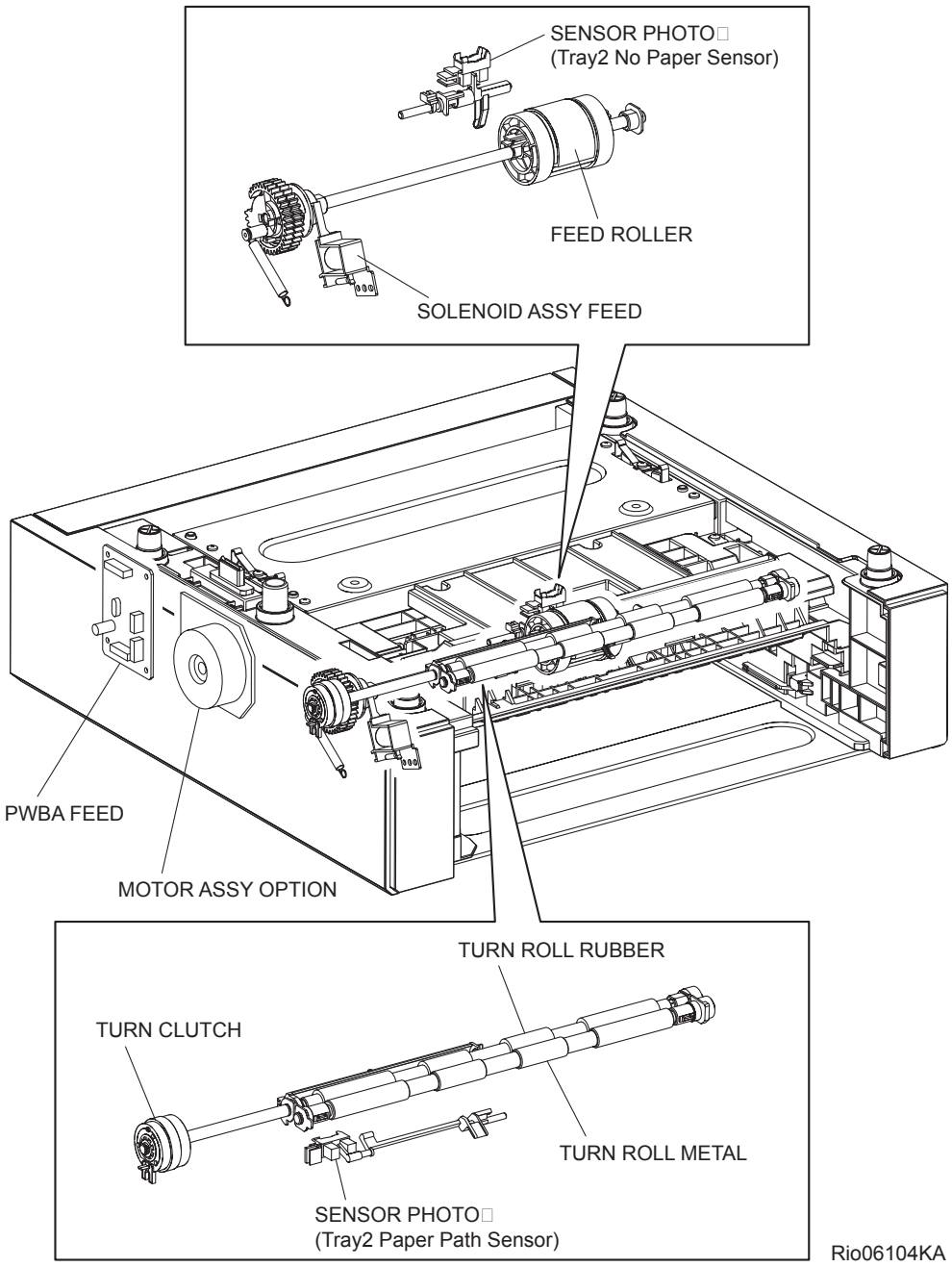
- SENSOR PHOTO (Paper Path Sensor)
  It detects when the paper front end reaches the CHUTE ASSY TURN.
  ON: The paper activates the actuator.

- TURN CLUTCH
  Transmits the drive from the MOTOR ASSY OPTION to TURN ROLL RUBBER and TURN ROLL METAL.

- MOTOR ASSY OPTION
  The MOTOR ASSY OPTION is driving the rolls of the option feeder. (Refer to 6.6 DRIVE ASSY OPTION FDR)

- PWBA FEED
  The PWBA FEED controls motor, sensor and clutch.

3.11.6 Reference diagram



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4. MODES

4.1 Operation Modes

For the operation of the printer, the following four modes are provided.

- READY mode
  The printer is ready for printing.
- PRINTING mode
  The printer is under printing.
- Sleep mode (Energy star)
  The printer is under power saving.
- Deep sleep mode
  The printer is under power saving.

5. Control

5.1 Control of Paper Size

The printer doesn't have switches for detecting paper size, and only length of paper is detected by the Regi Sensor when feeding paper. If printing data and paper size don't match, error is sent to the ESS.

5.2 ROS Light Quantity Control

The image data are entered to the laser diodes in the ROS as electric signals (data are expressed with high and low voltage values), and the laser diodes convert the image data from electric signals to optical signals (data are expressed with blinking laser beams).
Variations in light quantity of laser beams or variations in optical system (such as lenses) or drum sensitivity cannot attain a proper electrostatic image, therefore, the laser beam light quantity is monitored and controlled by the laser diodes.
The ROS in this printer has four laser diodes for yellow, magenta, cyan, and black respectively, and the light quantity is automatically adjusted for each color.

5.3 Process Control

For a stable printing, the parameters related to the image forming must be corrected as necessary. The control of the entire printing process including parameter correction control is called "process control". Mainly, the process control is performed in the following two methods, both of which are performed after every 25 cumulative prints upon termination of a print run or during a continuous run.:

- Potential control
- Toner density control

To supplement these two controls, the following controls are provided:

- High Area Coverage Mode
- Admix Mode

5.3.1 Potential Control

To attain stable printing image density, the drum charging voltage, the developing DC voltage and the ROS light amount are adjusted according to the developing capability of each color carrier that varies momentarily. The adjusted drum charging voltage, the developing DC voltage and the ROS light amount are fed back to keep the printing image density constant.

The outline of control is as follows.

1) The HUMIDITY SENSOR (temperature and humidity sensor) detects the temperature and humidity.
2) The patches of respective colors (yellow, magenta, cyan, and black) for the potential control are generated and transferred on the Belt.
3) The ADC Sensor (density sensor) detects the density of the patch on Belt.
4) The drum charging voltage, the developing DC voltage and the ROS light amount are adjusted for each color according to the detected patch density.

5.3.2 Toner Density Control

The toner density must be kept constant to attain stable printing image. The control system for this purpose is called toner density control.

1) PCDC (Pixel Count Dispense Control)

The quantity of the toner to be consumed in the developing process is calculated by counting the video signals entered to the ROS. The quantity of the toner to be consumed is calculated by the toner dispensing time. The toner motor is driven based on the calculated toner dispensing time when supplying the toner to the developer.

2) ADC (Auto Density Control)

The patches of respective colors (yellow, magenta, cyan, and black) for the toner density control are generated under specified potential condition, and transferred on the Belt. The ADC Sensor measures this density. The measured value is compared with the reference value. If the toner density is lower, the toner dispense quantity is increased at the next printing, or if the toner density is higher, the toner dispense quantity is reduced at the next printing. The toner dispense quantity is calculated by the toner dispense time. This calculation is made for each color.

5.3.3 High Area Coverage Mode

A continuous printing of any image of area coverage exceeding extra toner dispense capability causes the toner density in the developer to be lowered.

The High Area Coverage Mode postpones the next page feed and dispenses the toner during this time, if the toner dispense time reached the specified value during a continuous printing.

5.3.4 Admix Mode

This mode prevents the toner density from being lowered, whenever the value of the toner density control patch measured by the ADC Sensor falls far below the standard value, by performing extra toner dispensation. If the toner density level cannot be recovered even after this operation, it is judged that the toner has run out.

5.3.5 ADC Sensor Adjustment

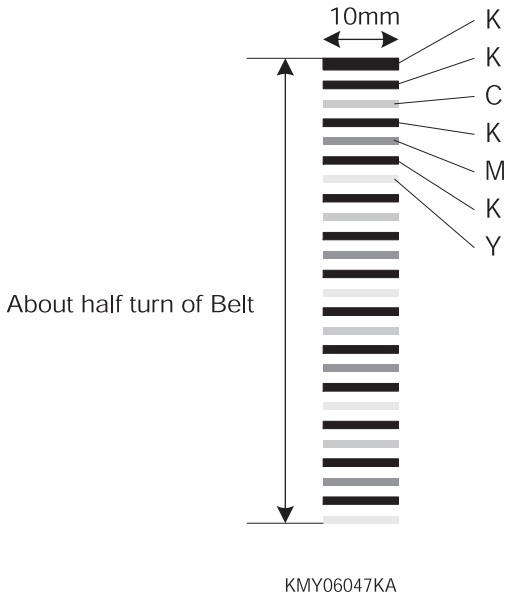
The ADC Sensor is a reflection type sensor that irradiates the light from its LED onto the target and detects the reflected light at its photoreceptor and outputs electric signals responsive to the amount of the detected light. To ensure an accurate patch density measurement, the surfaces of the ADC Sensor is cleaned to remove soil due to toner, etc., and the light amount adjustment is made so that the reflected light amount satisfies the prescribed value, when creating the patch for potential control and toner density control.

5.4 Color Registration Control

The printer uses a tandem system where the drums and developers are arranged respectively for each of yellow, magenta, cyan, and black colors. Since the images are formed on the drum of each color to be overlaid one another, a color shift may occur. The color registration control calculates how much the registration is shifted, and adjusts the ROS write timing.
The lateral registration control adjusts all of four colors in lateral directions.

The color registration control is made from a change in inside temperature and the print count at the execution of the process control.
The control is outlined below:

1) With no toner on the Belt, the output value of ADC Sensor is measured to determine the threshold value.
2) The patches for color registration control are generated on the Belt. These patches are composed of 10mm lines of K, C, K, M, K, and Y in this order.



3) The density of patches generated by the ADC Sensor is read.
4) The shift correction amount is calculated from the threshold value determined in 1) and the patch density measured in 3).
5) The ROS write timing is changed according to the shift correction amount.

5.5 Fuser Control

5.5.1 Fuser temperature control

As for the fuser temperature control, the target temperature is set, then the Heat Roll surface temperature is controlled so that it can meet the target value by turning on/off the Heater Lamp.

Temperature of individual area of the Heat Roll is detected by the Fuser Non-Contact Sensor (NCS) in the middle of the Heat Roll and the Temp Sensor at the edge of it. When the temperature detected is higher than the target value, the Heater Lamp will be turned OFF. When the temperature is below the target value, the Heater Lamp will be turned ON.

The target temperature setting varies depending on the time of Warm-up, Printing, or Process Control. The target temperature varies according to such environmental factors as the interior temperature detected by the Sensor Hum Temp.

5.5.2 Cooling down

As the printing continues, the temperature distribution in the Heat Roll becomes uneven both in the paper feed and non-paper feed areas. Cooling Down suspends paper feeling for a certain period of time so that the Heat Roll temperature distribution can be uniform.
When the temperature of the Heat Roll edge is high, cooling down is performed to lower the temperature to the target value.

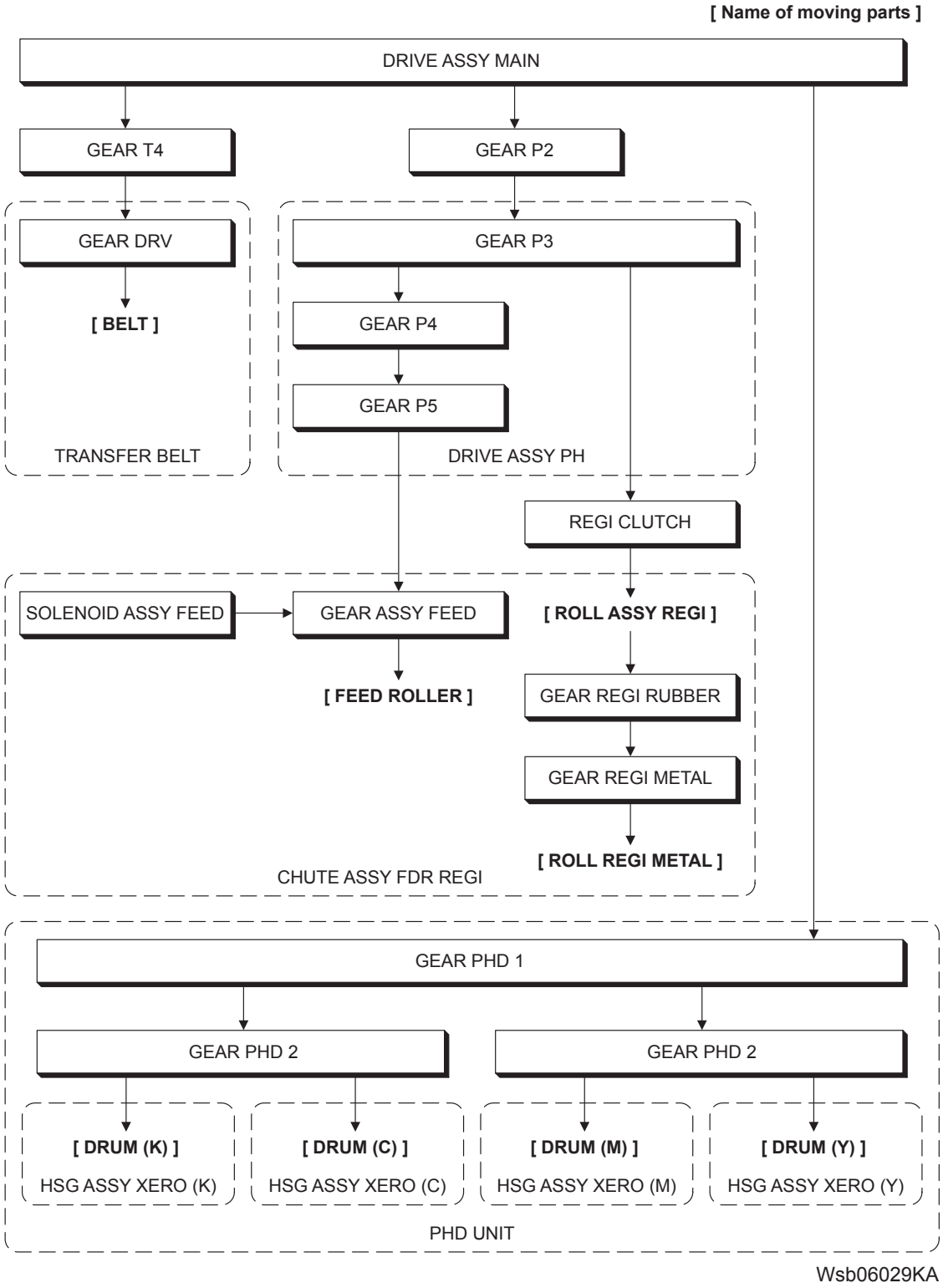
5.5.3 Sensor Warm-up

The Fuser NCS (Non Contact Sensor) at the center of the Heat Roll will be lose its accuracy of detecting temperature when the temperature of the Sensor itself is below -5°C. Therefore, the Sensor will be warmed up when the temperature is below -5°C. This action is called Sensor Warm-up.

6. Drive Transmission Route

6.1 DRIVE ASSY MAIN

Rotation power of the DRIVE ASSY MAIN is transmitted through the route below.



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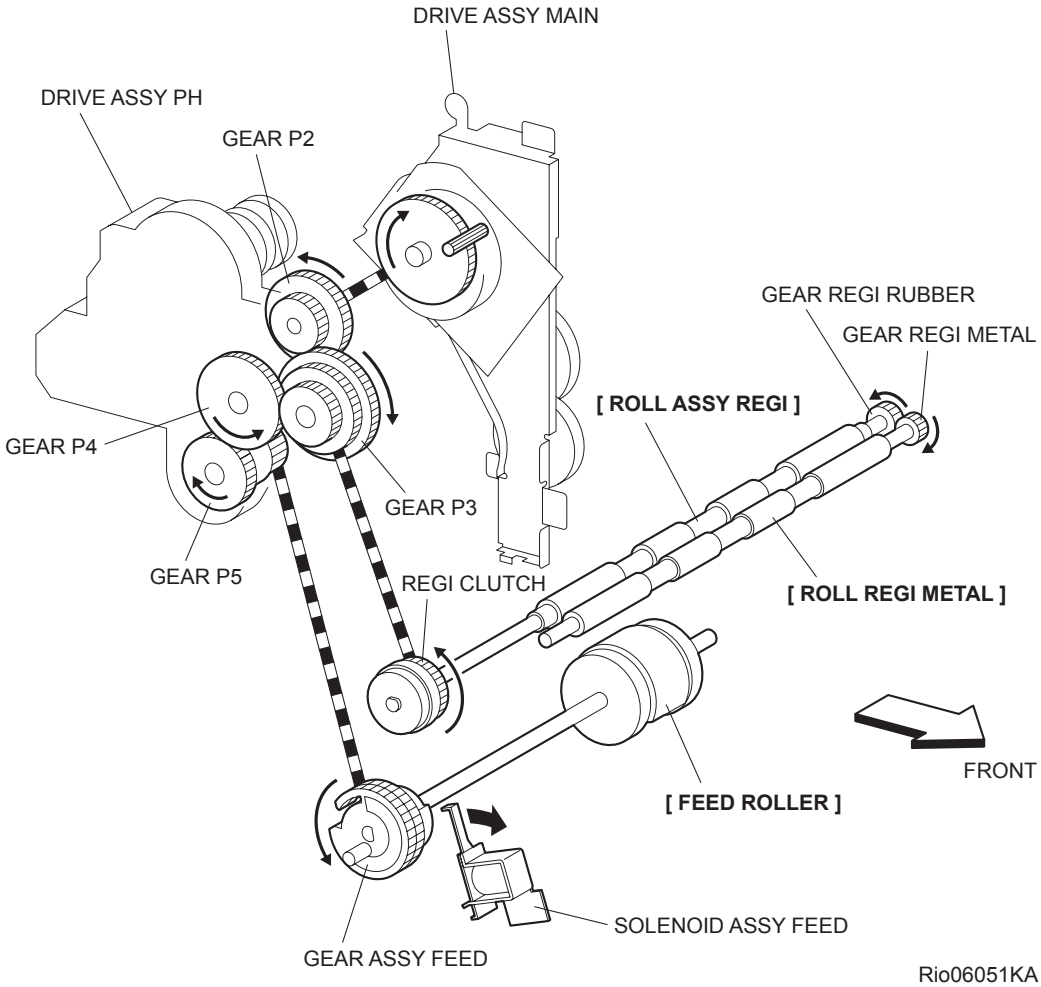
[PAPER FEED DRIVE]

[Name of moving parts]

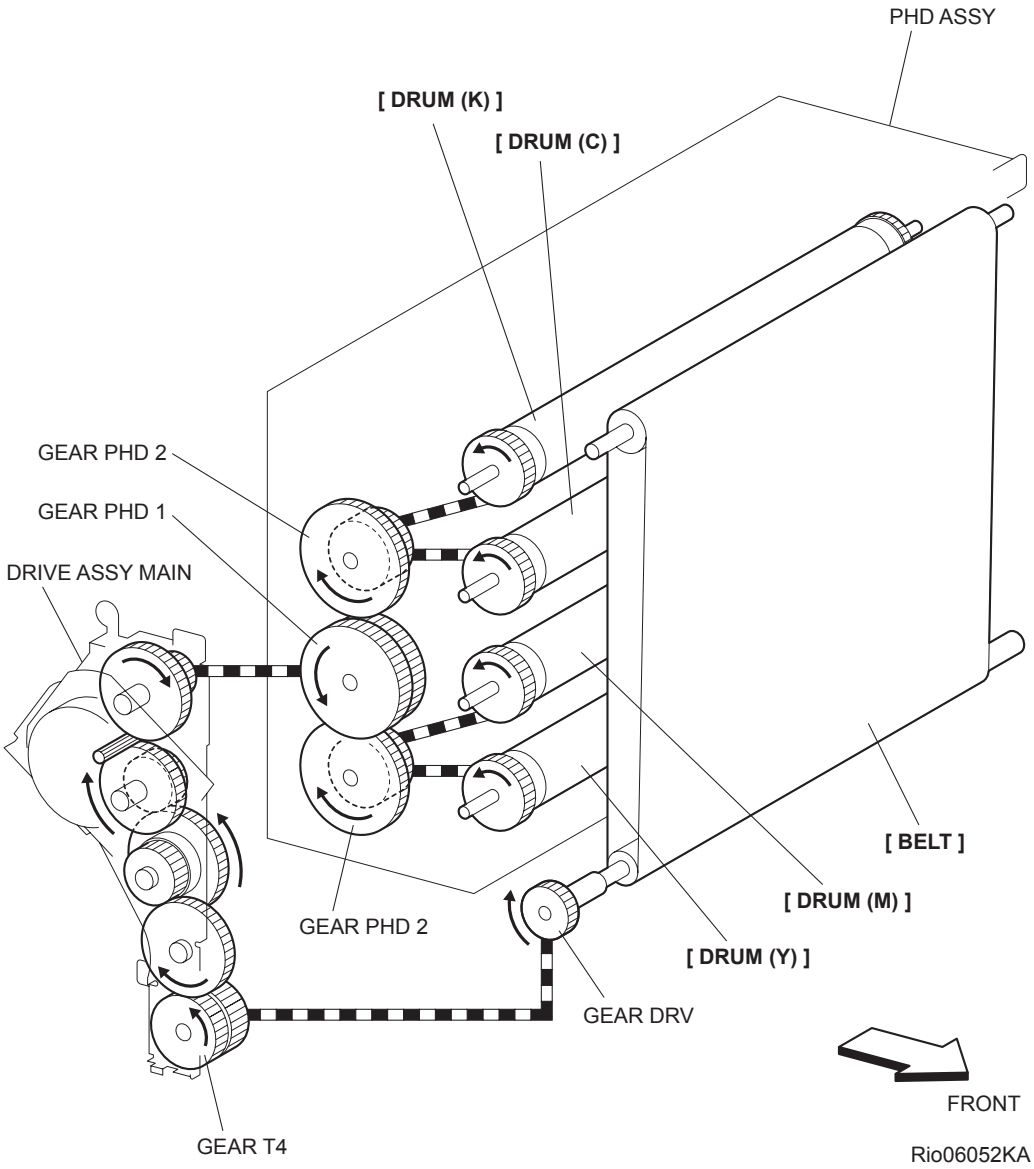
: Indicates the engagement of gears.



[DRUM and BELT DRIVE]

[Name of moving parts]

: Indicates the engagement of gears.



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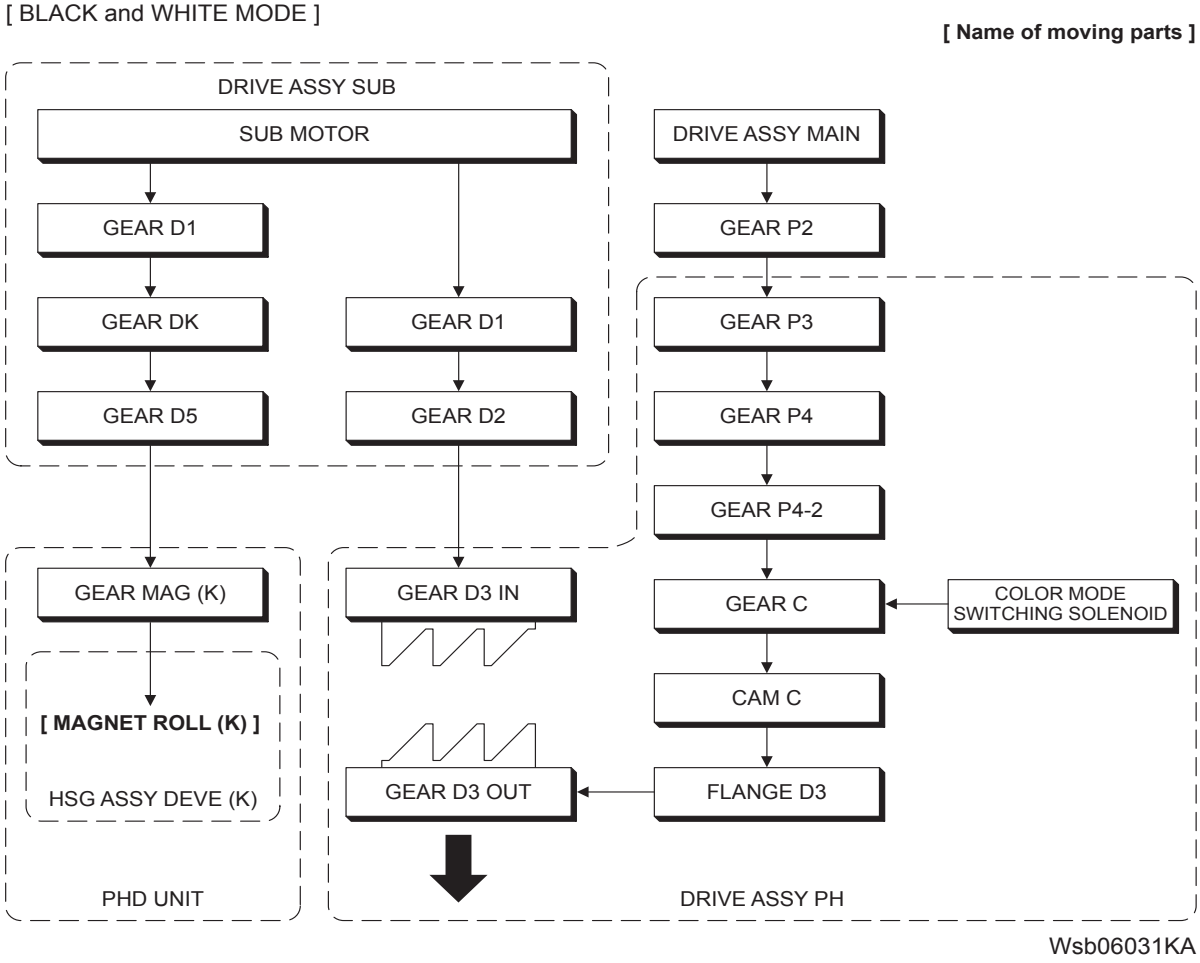
6.2 DRIVE ASSY MAIN and DRIVE ASSY SUB DRIVE

Rotation power of the DRIVE ASSY MAIN and DRIVE ASSY SUB are transmitted through the route below.

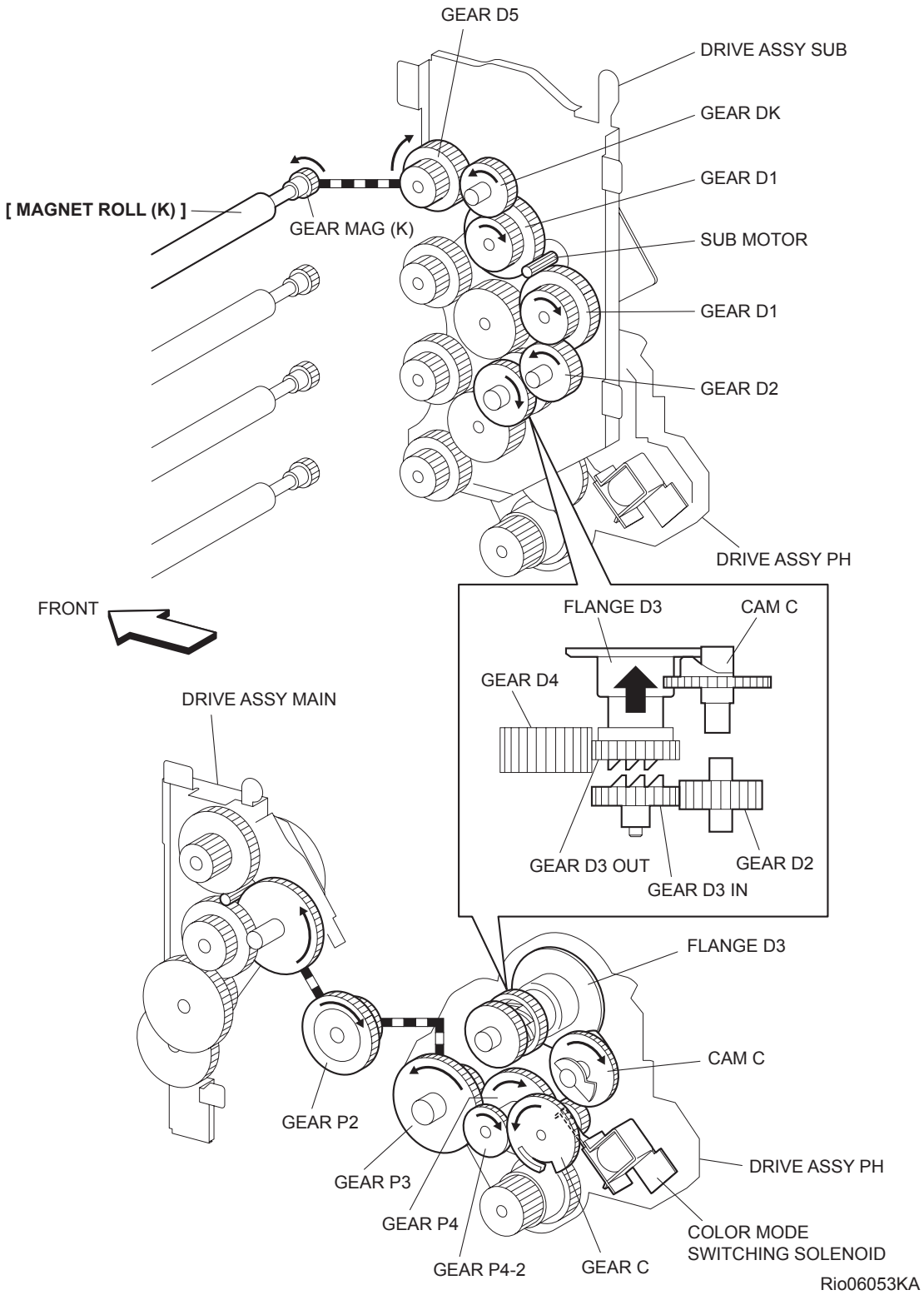
[BLACK and WHITE MODE]



[BLACK and WHITE MODE]

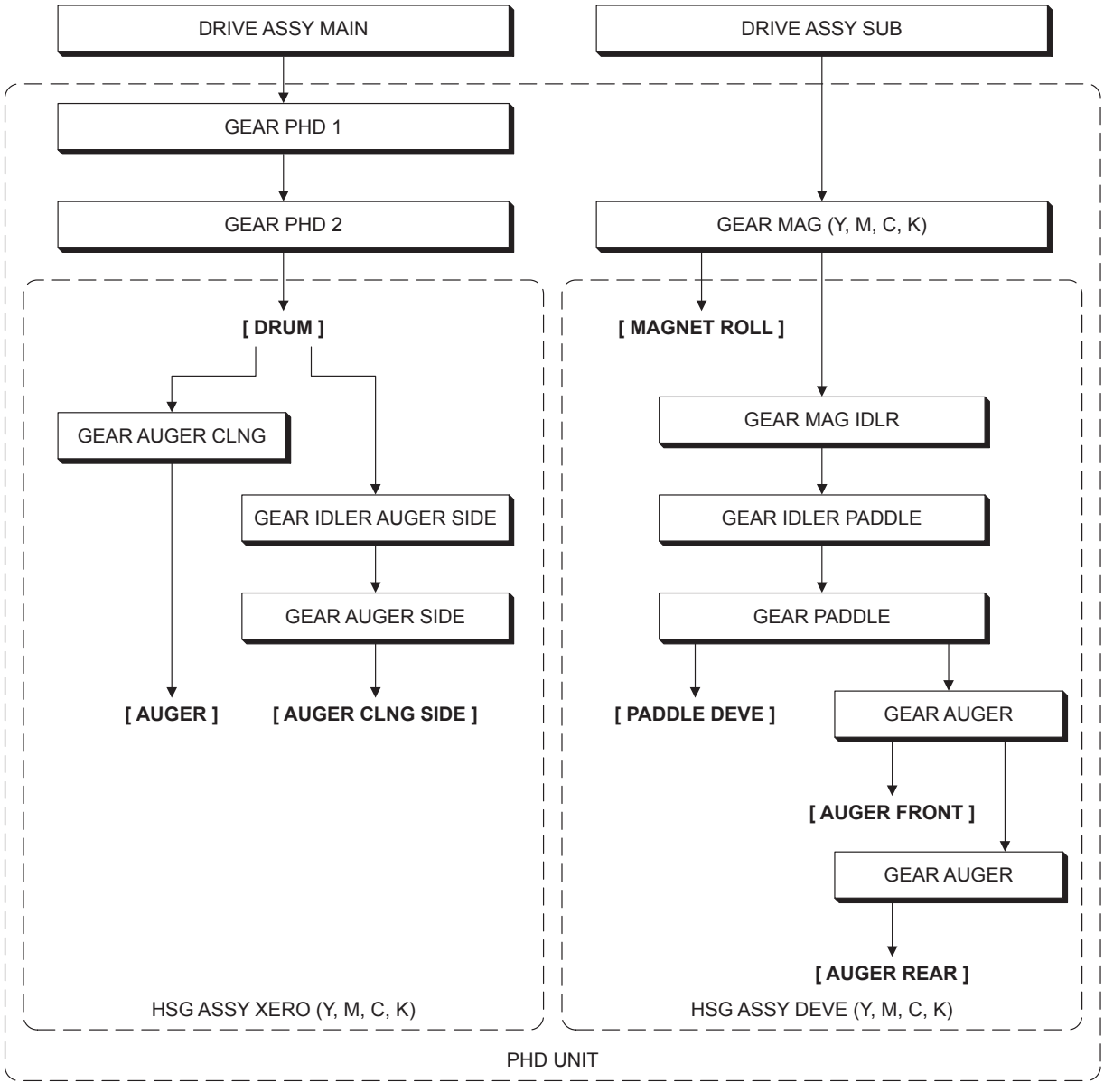
[Name of moving parts]

: Indicates the engagement of gears.



[DEVELOPMENT and EXCESS TONER COLLECTING]

[Name of moving parts]



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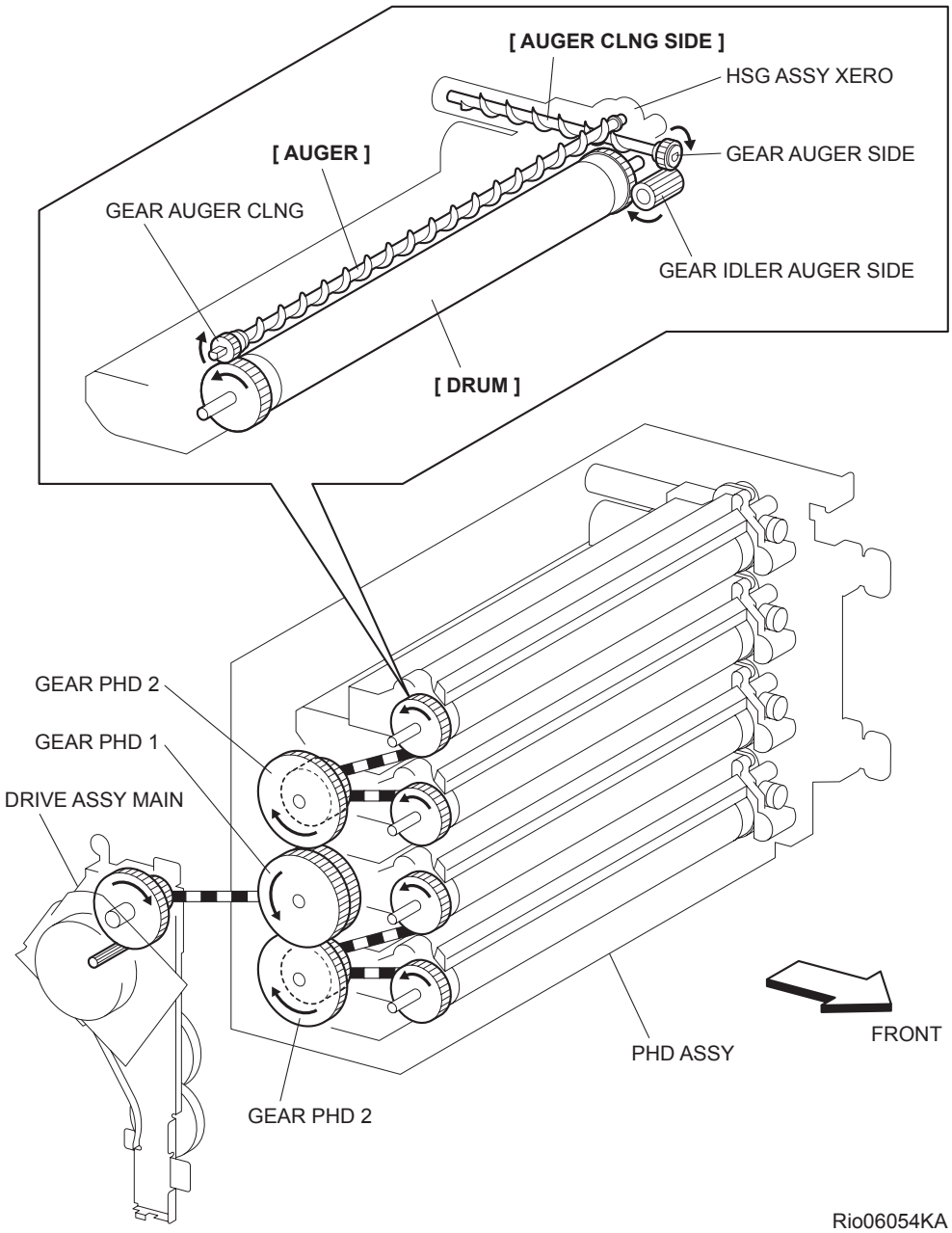
[EXCESS TONER COLLECTING DRIVE]

[Name of moving parts]

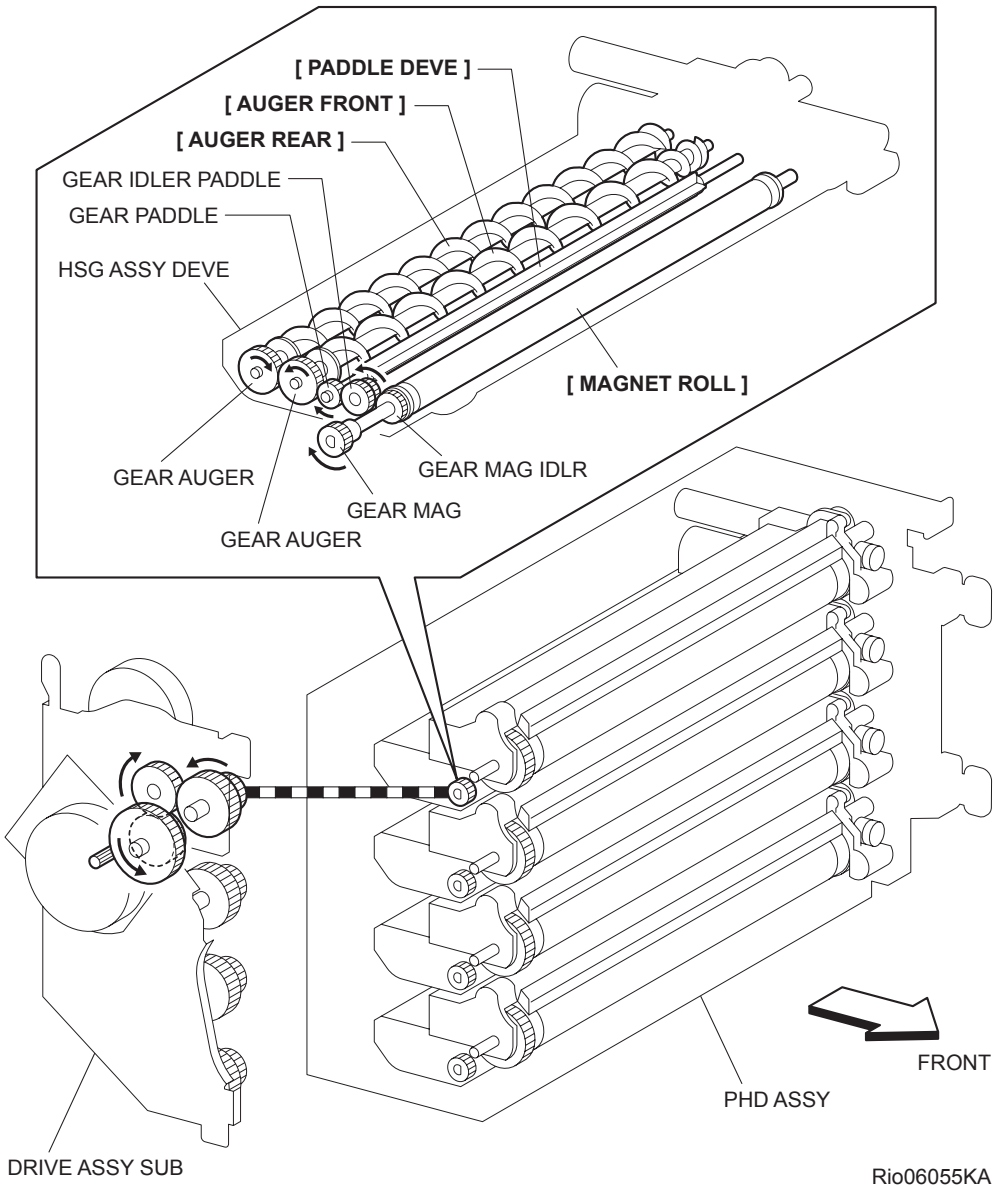
: Indicates the engagement of gears.



[DEVELOPMENT DRIVE]

[Name of moving parts]

: Indicates the engagement of gears.



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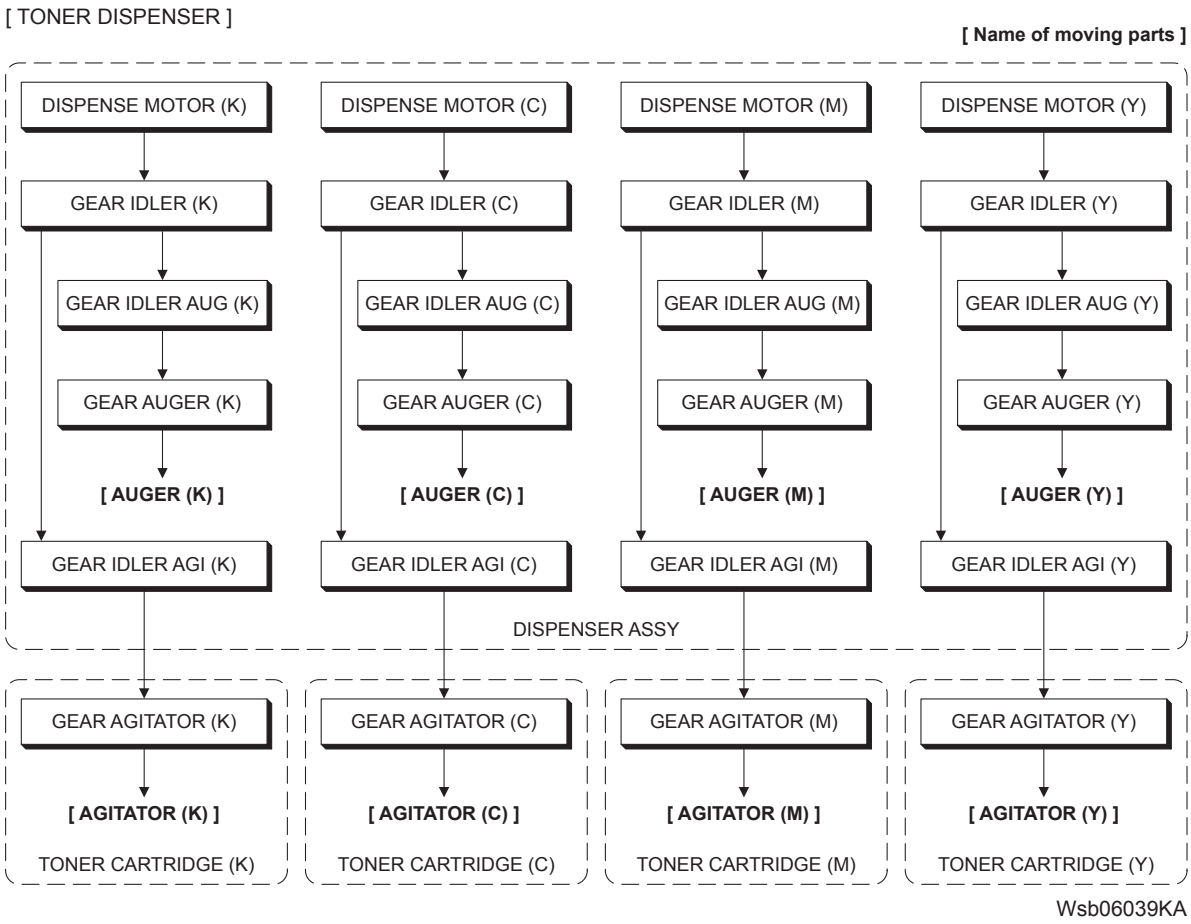
6.3 TONER DISPENSER (Y, M, C, K)

Rotation power of the TONER DISPENSER drives the agitator and the auger in the TONER CARTRIDGE.

[TONER CARTRIDGE]

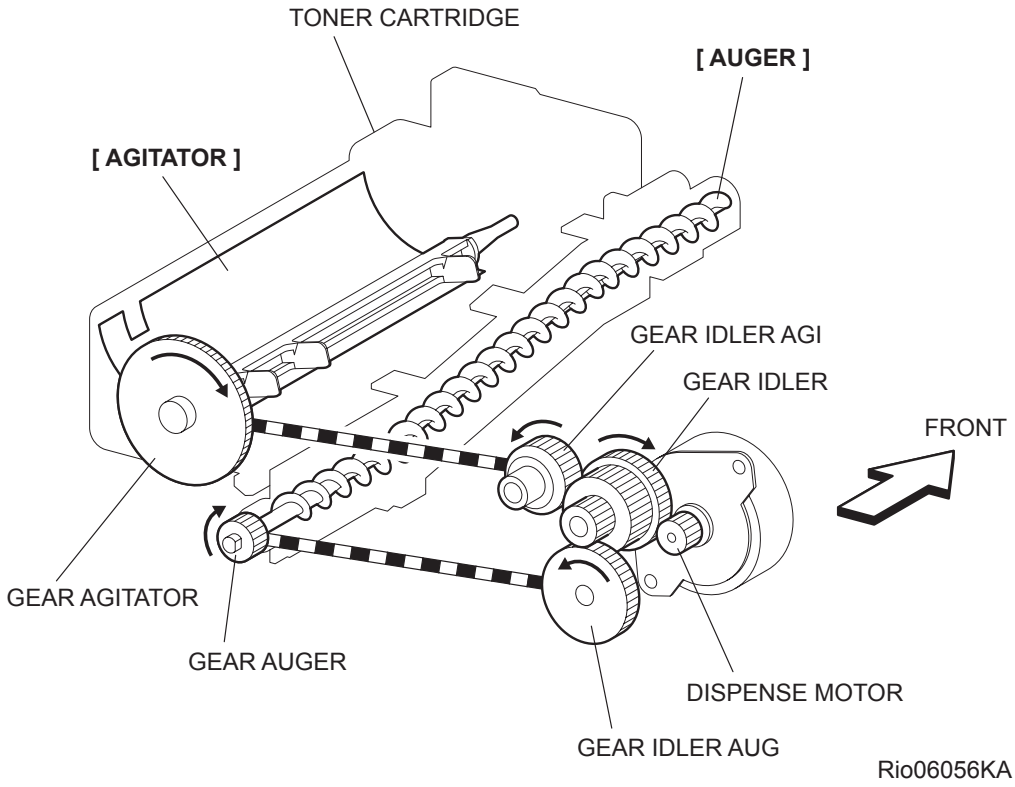


[TONER CARTRIDGE]

[TONER DISPENSER]

[Name of moving parts]

: Indicates the engagement of gears.



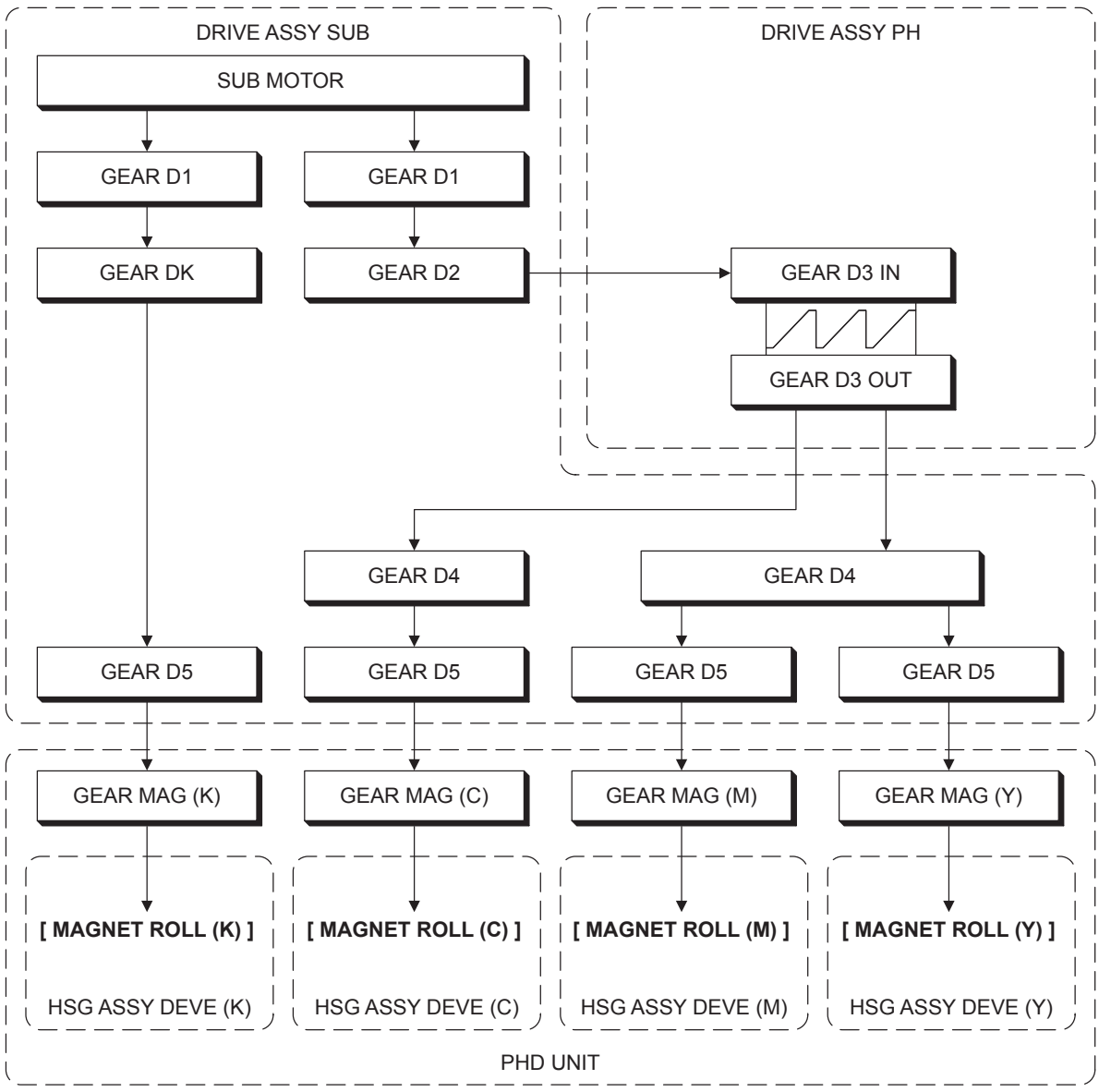
6.4 DRIVE ASSY SUB

Rotation power of the DRIVE ASSY SUB is transmitted through the route below.

[PAPER HANDLING]

[FULL COLOR MODE]

[Name of moving parts]



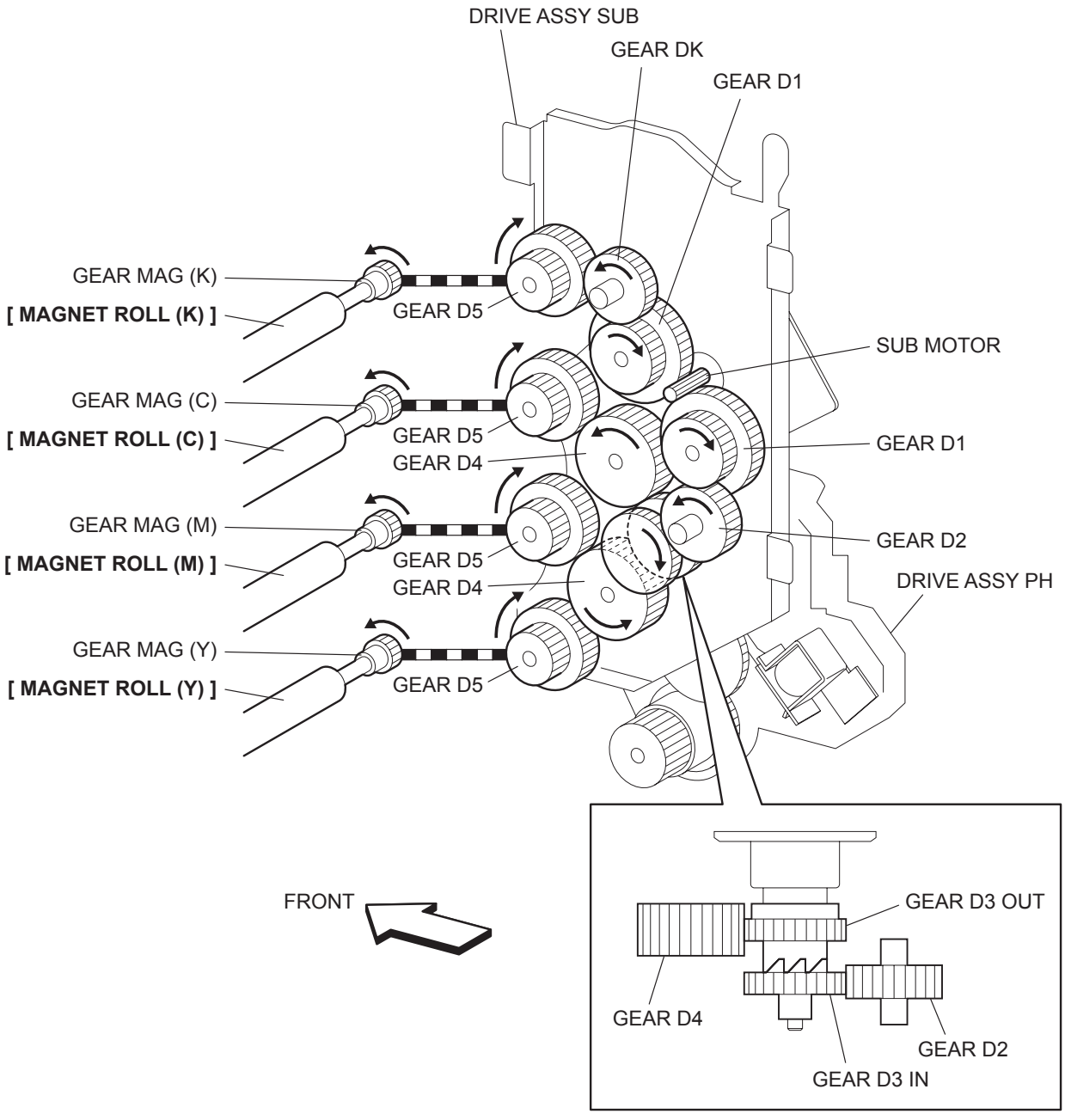
Wsb06033KA

[PAPER HANDLING]

[FULL COLOR MODE]

[Name of moving parts]

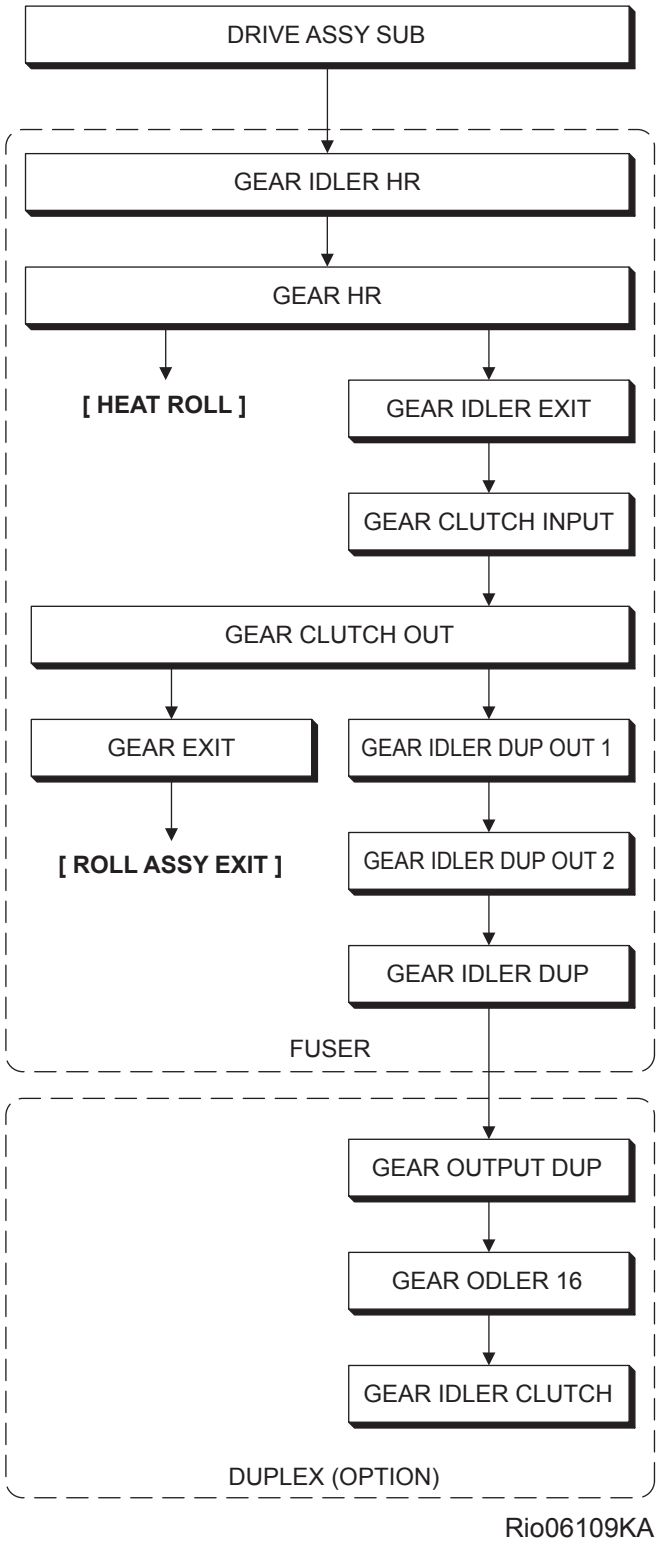
: Indicates the engagement of gears.



Rio06057KA

[SIMPLEX MODE]

[Name of moving parts]

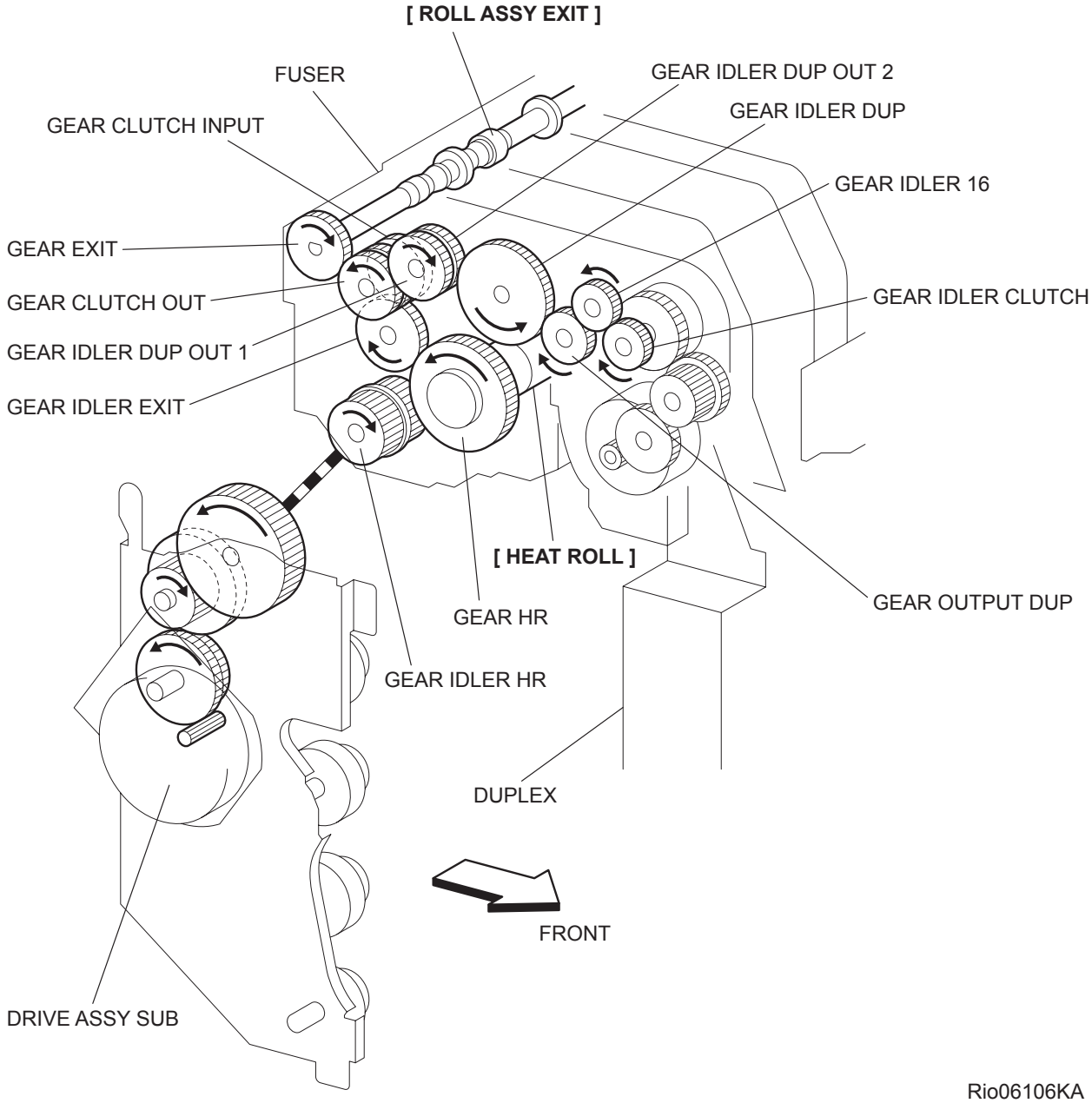


Rio06109KA

[SIMPLEX MODE]

[Name of moving parts]

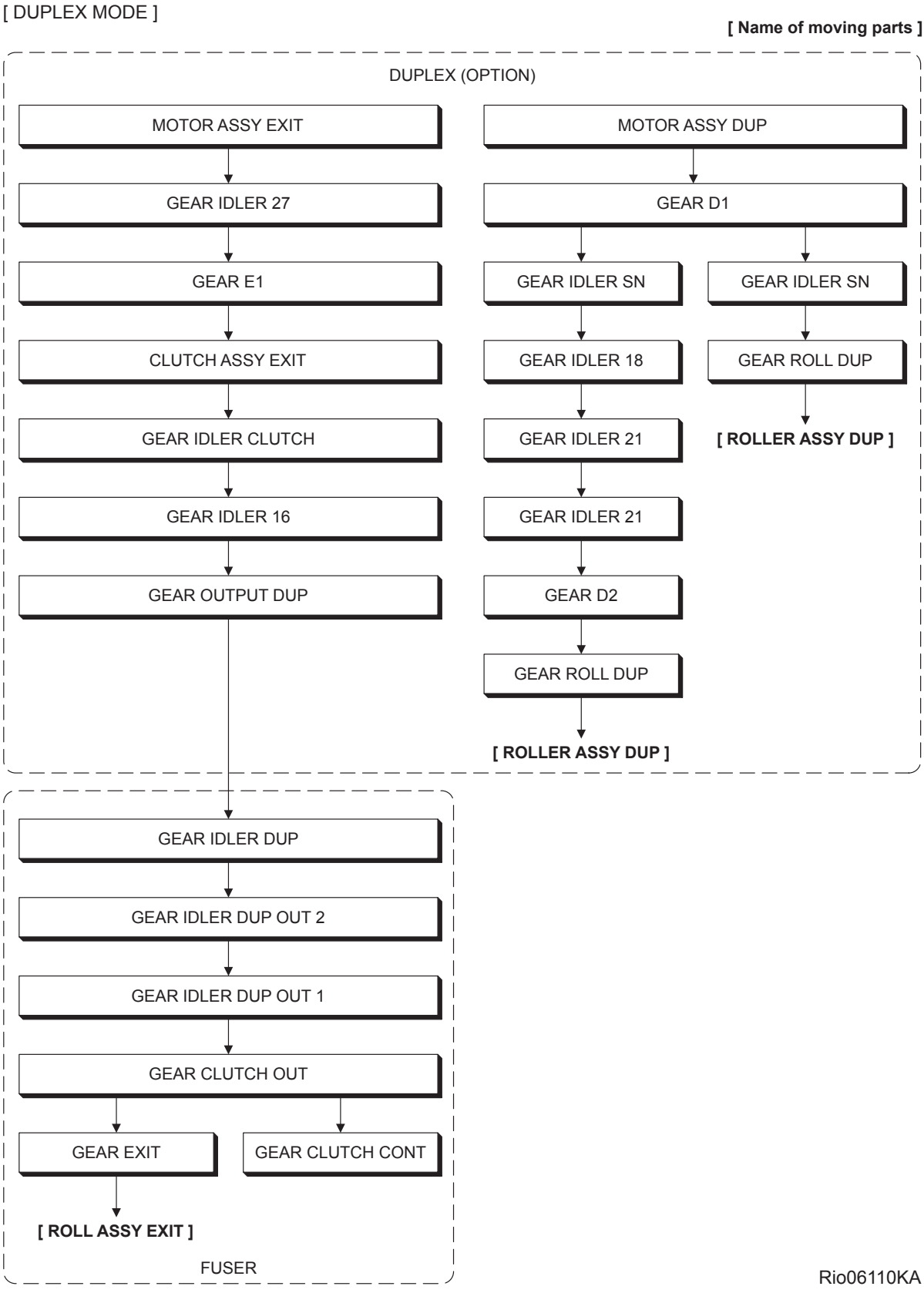
: Indicates the engagement of gears.



Rio06106KA

6.5 DRIVE ASSY DUP

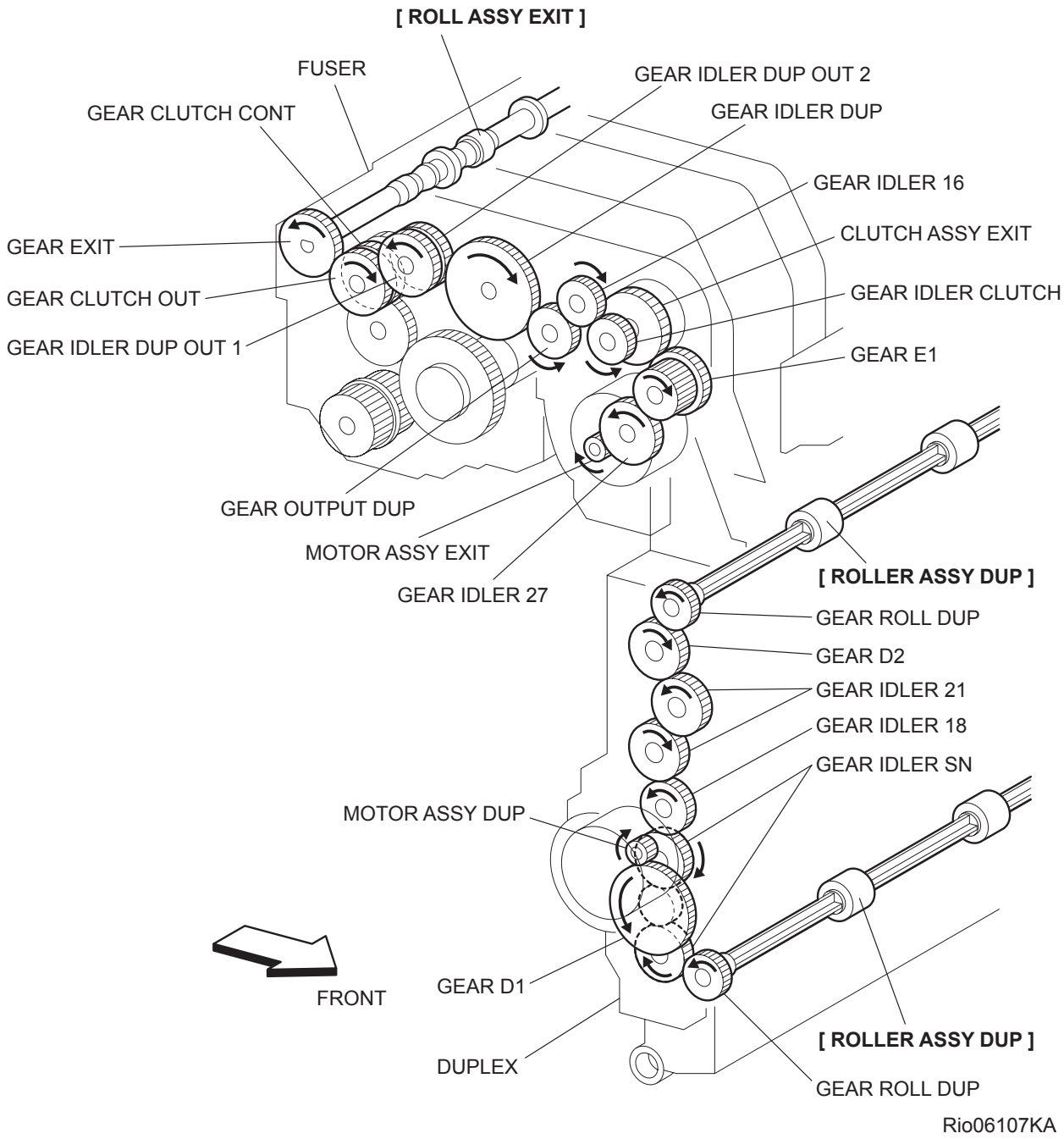
Rotation power of the DRIVE ASSY DUP is transmitted through the route below.



[DUPLEX MODE]

[Name of moving parts]

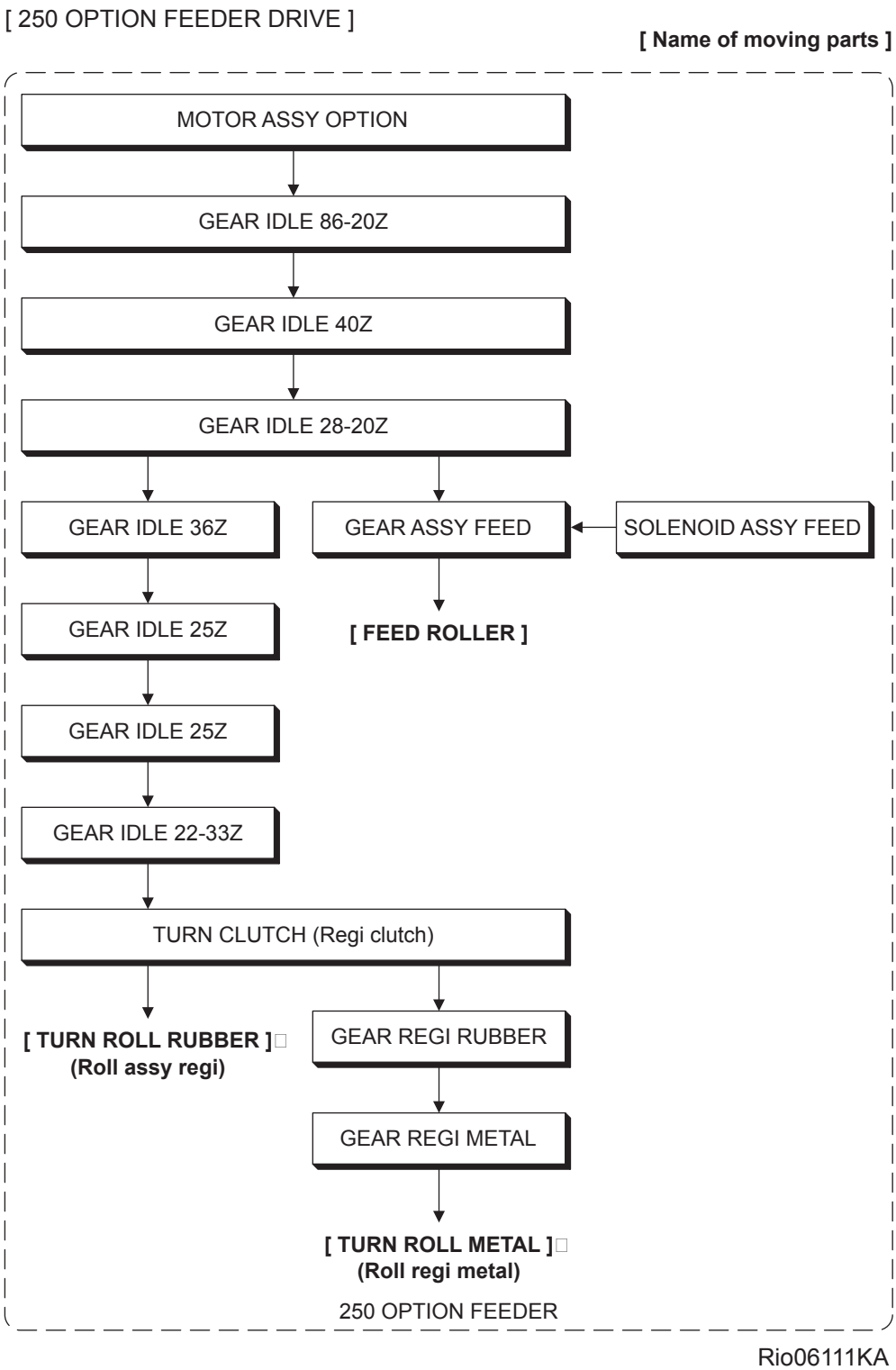
: Indicates the engagement of gears.



Rio06107KA

6.6 DRIVE ASSY OPTION FDR

Rotation power of the DRIVE ASSY OPT FDR is transmitted through the route below.



Rio06111KA

[250 OPTION FEEDER DRIVE]

[Name of moving parts]

: Indicates the engagement of gears.