RICOH

D197/D198/D199/D200/D201/D202

DETAILED DESCRIPTIONS MANUAL

D197/D198/D199/D200/D201/D202 DETAILED DESCRIPTIONS

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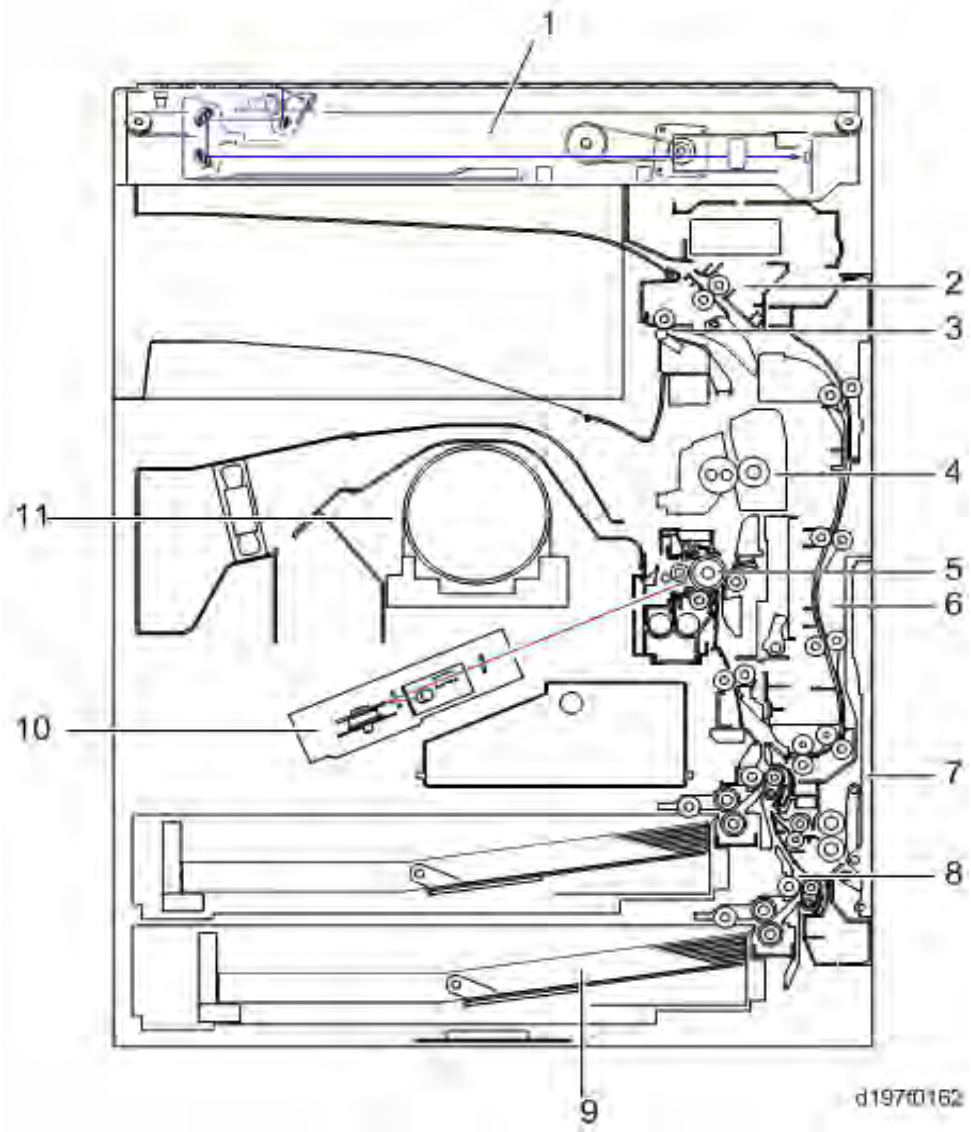
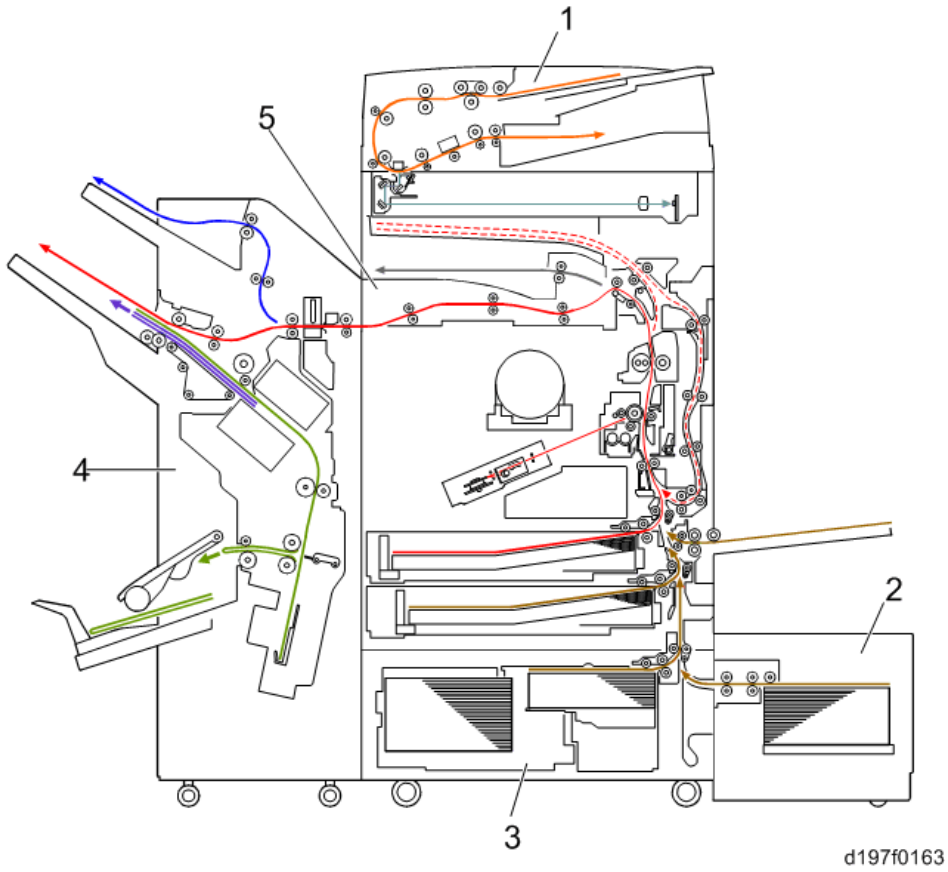
1. OVERVIEW

1.1 COMPONENT LAYOUT

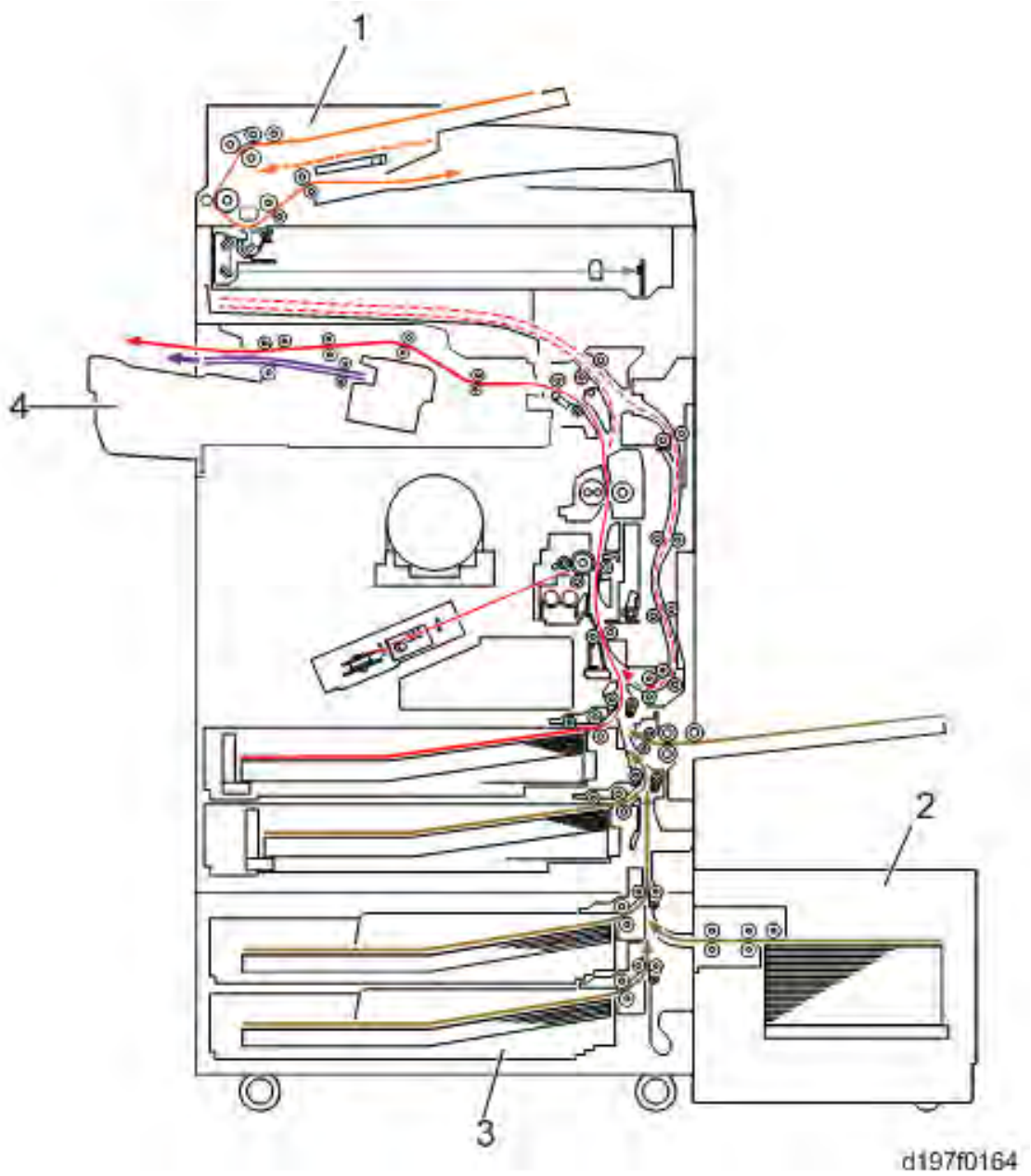


No.	Description	No.	Description
1	Scanner Unit	7	Bypass Tray Unit
2	Reverse Unit	8	Vertical Transport
3	Paper Exit Unit	9	Paper Feed Unit
4	Fusing Unit	10	Laser Unit
5	OPC Drum	11	Toner Supply Unit
6	Duplex Unit		

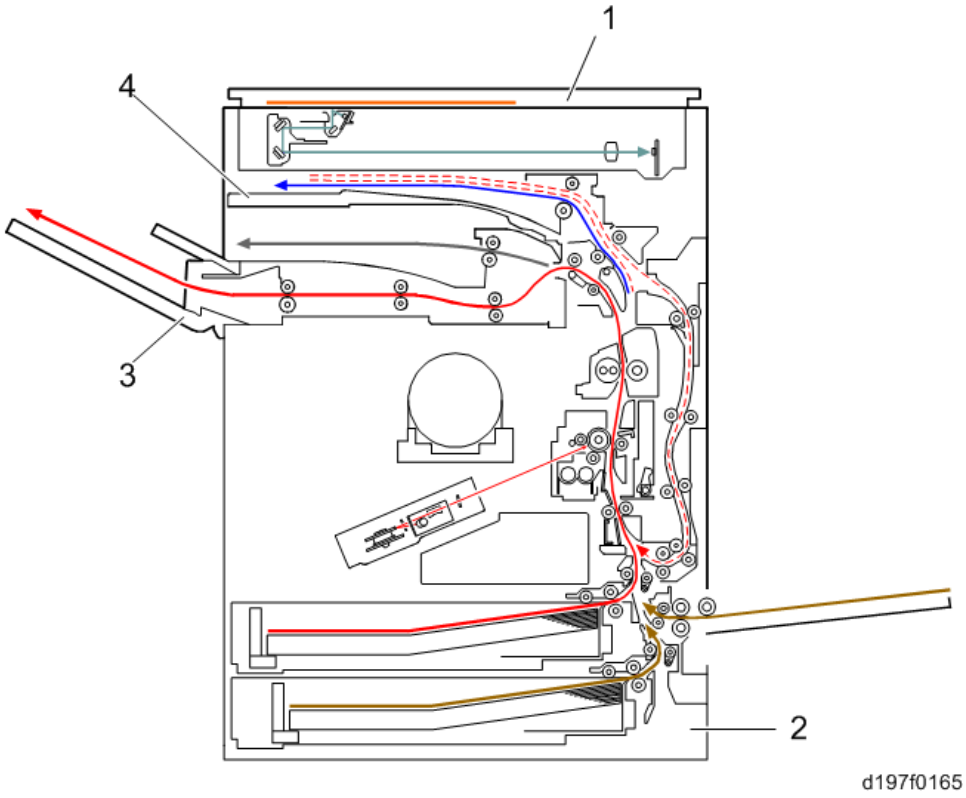
1.2 PAPER PATH



No.	Description	No.	Description
1	ARDF	4	Booklet Finisher
2	LCIT	5	Bridge Unit
3	LCIT (Tandem Tray)		

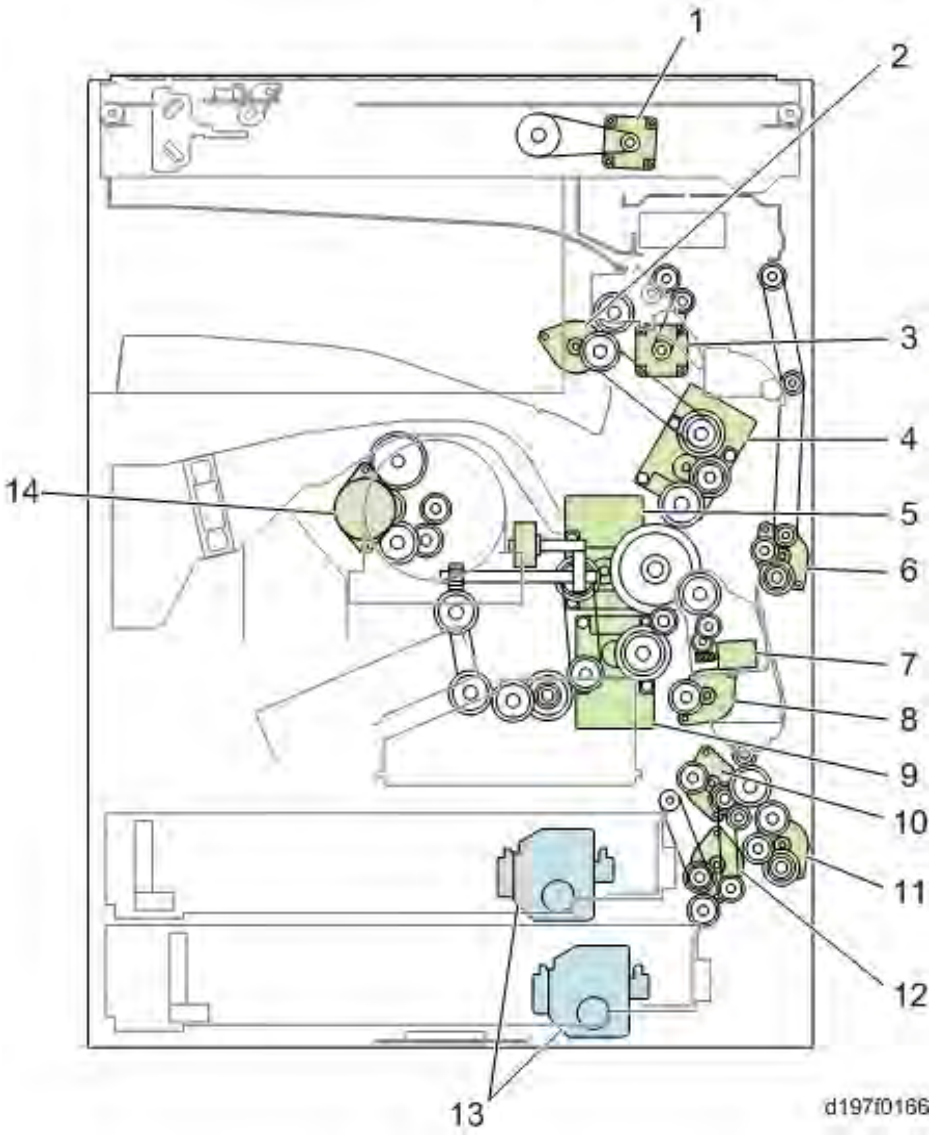


No.	Description	No.	Description
1	ARDF	3	Paper Feed Unit
2	LCIT	4	Internal Finisher



No.	Description	No.	Description
1	Platen Cover	3	Side Tray Unit
2	Paper Feed Unit	4	1 Bin Tray Unit

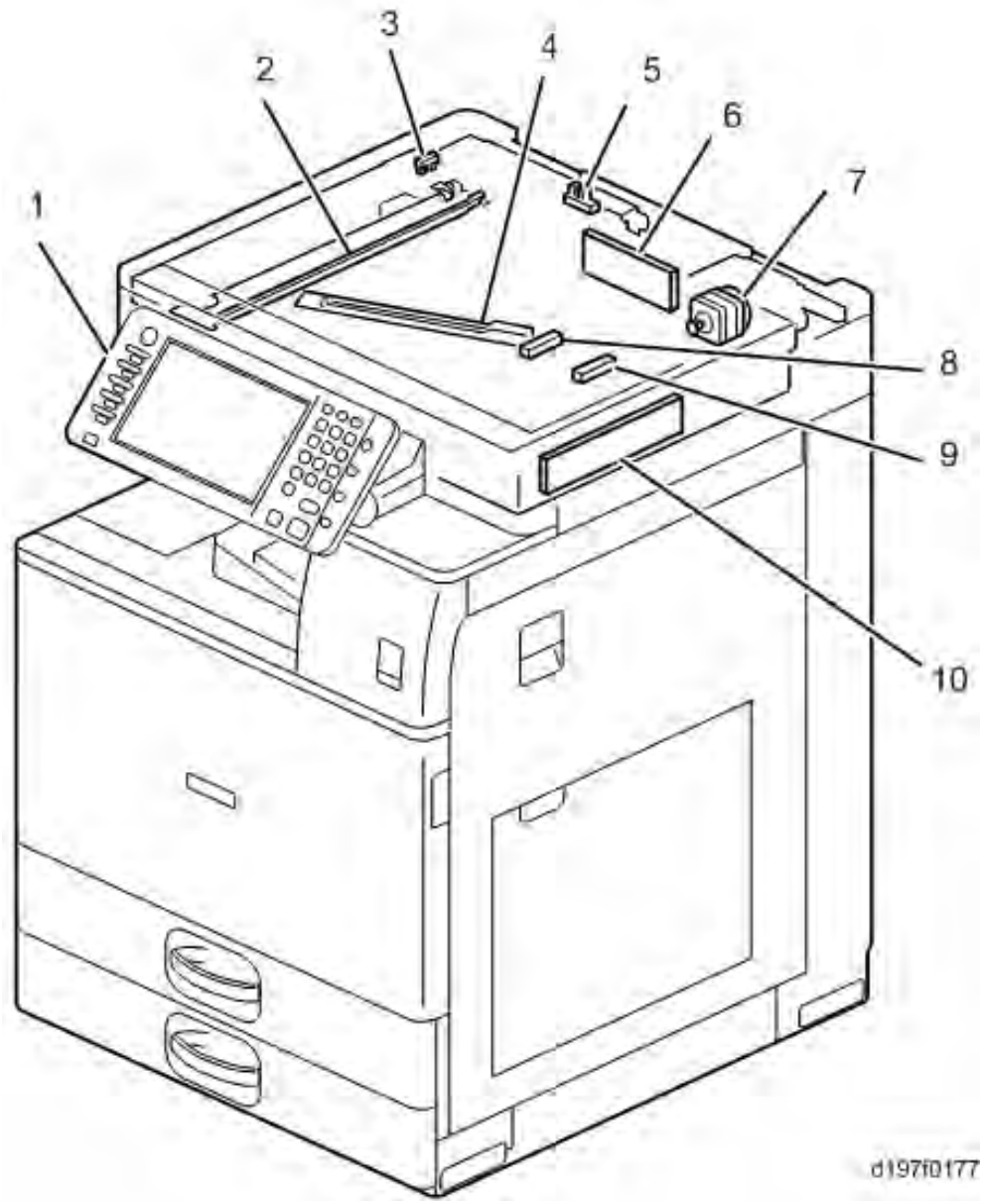
1.3 DRIVE LAYOUT



No.	Description	No.	Description
1	Scanner Motor	8	Registration Motor
2	Paper Exit Motor (D200/D201/D202 only)	9	Development Motor
3	Reverse Motor	10	Vertical Transport Motor
4	Fusing Motor (D200/D201/D202 only) Fusing/paper Exit Motor (D197/D198/D199 only)	11	Duplex/bypass Motor
5	Drum/waste Toner Motor	12	Paper Feed Motor
6	Duplex Entrance Motor	13	Paper Feed Tray Lift Motor
7	Transfer Roller Contact Motor	14	Toner Supply Motor

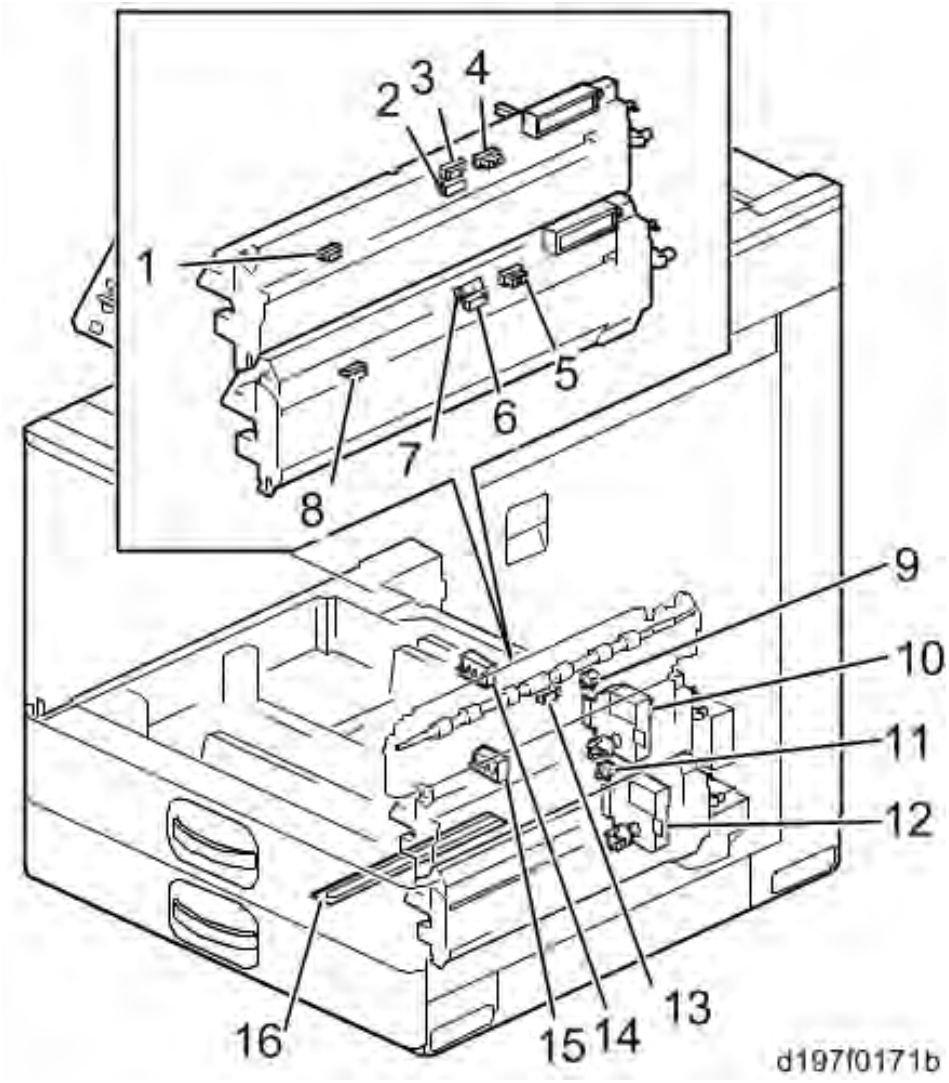
1.4 PARTS LAYOUT

1.4.1 SCANNER UNIT



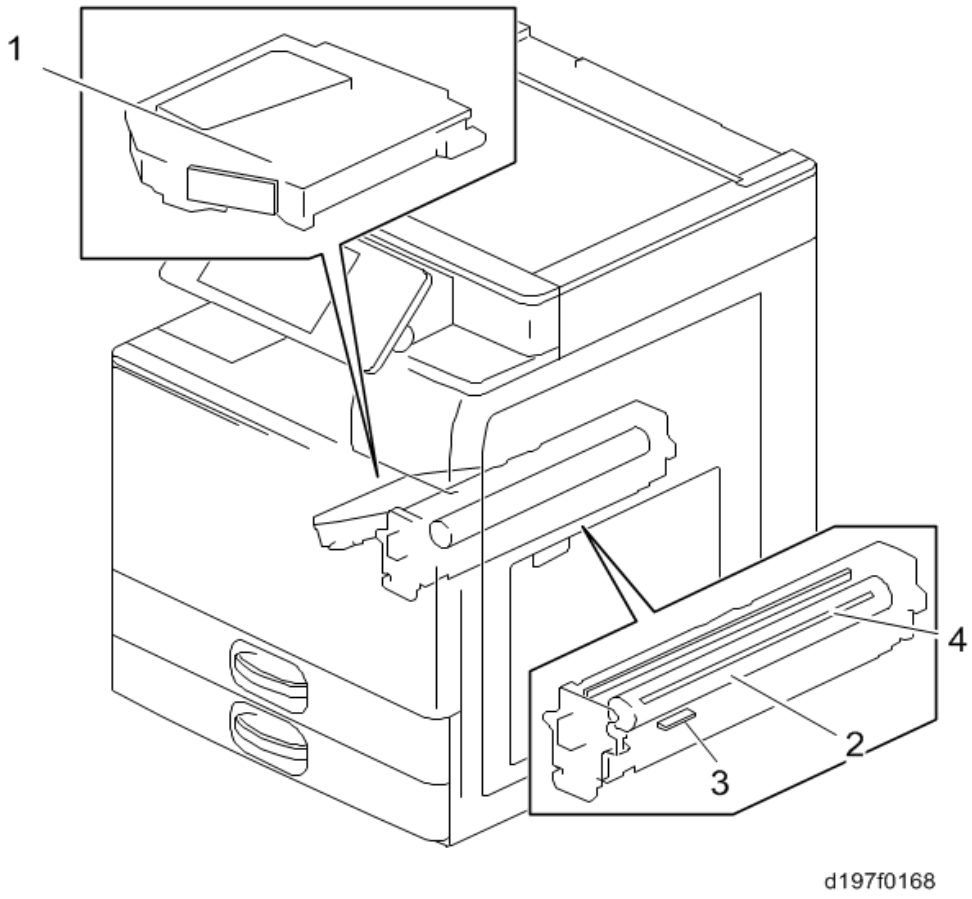
No.	Description	No.	Description
1	Operation panel	6	SIO
2	Scanner lamp unit (LED)	7	Scanner motor
3	Scanner HP sensor	8	APS sensor
4	Anti-condensation heater (Scanner) *Option	9	APS sensor
5	DF-position sensor	10	SBU

1.4.2 PAPER FEED UNIT



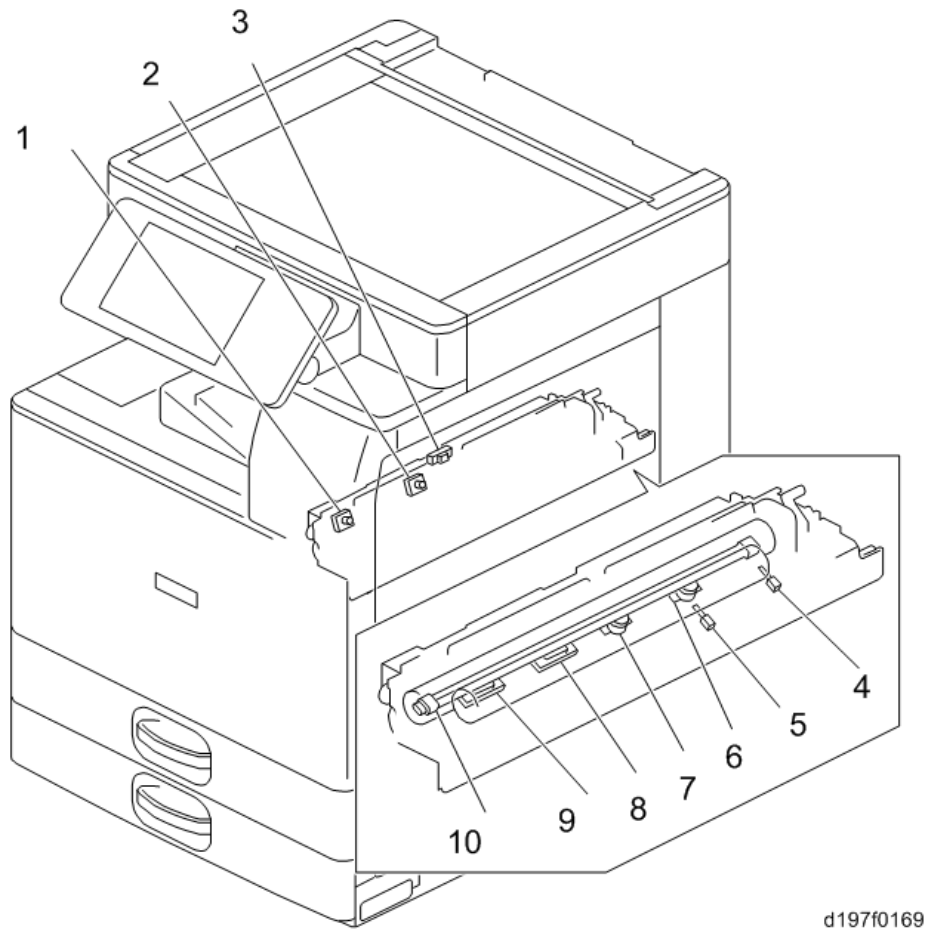
No.	Description	No.	Description
1	1st paper feed sensor	9	1st paper feed tray set switch
2	1st vertical transport sensor	10	1st paper feed tray lift motor
3	1st paper end sensor	11	2nd paper feed tray set switch
4	1st paper feed tray limit sensor	12	2nd paper feed tray lift motor
5	2nd paper feed tray limit sensor	13	Registration sensor
6	2nd vertical transport sensor	14	1st paper feed tray size switch
7	2nd paper end sensor	15	2nd paper feed tray size switch
8	2nd paper feed sensor	16	Anti-condensation heater *Option

1.4.3 LASER UNIT/ PCDU



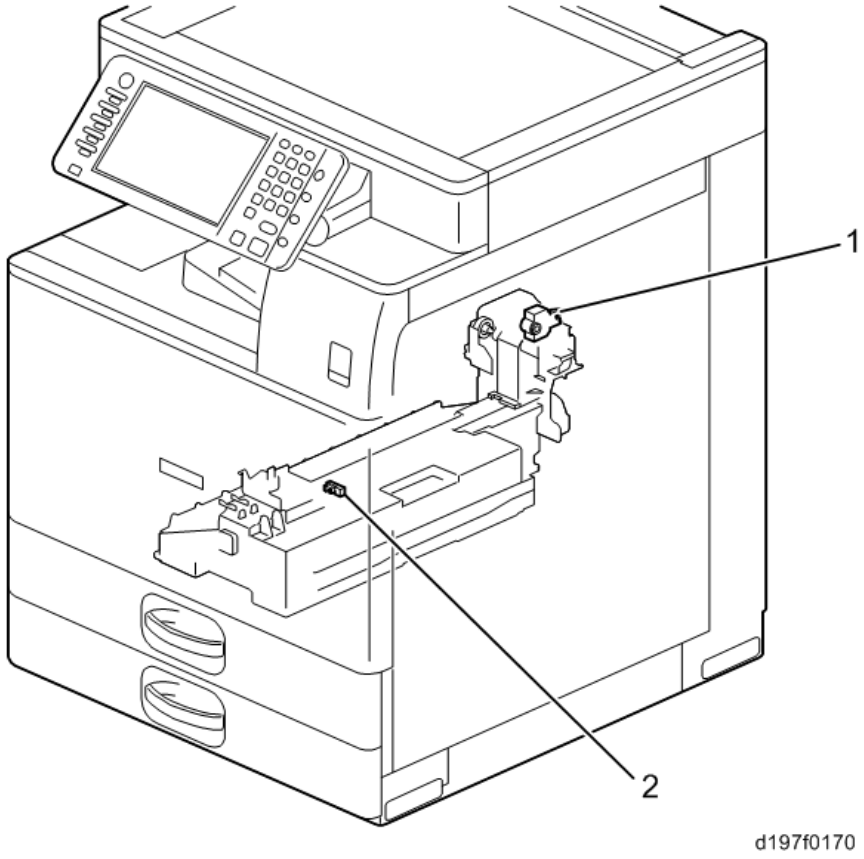
No.	Description	No.	Description
1	Laser Unit	3	TD sensor
2	Quenching lamp	4	PCL (Pre Cleaning Light)

1.4.4 FUSING UNIT



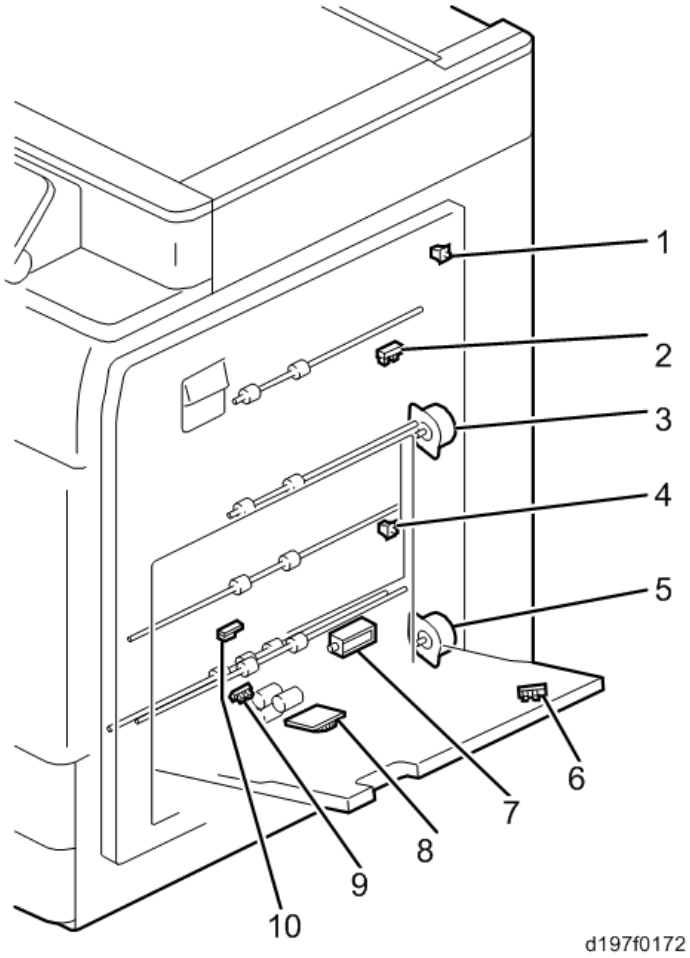
No.	Description	No.	Description
1	Thermopile	6	Thermostat
2	Thermopile	7	Thermostat
3	Fusing exit sensor	8	NC sensor (Center)
4	Pressure roller thermistor (End)	9	NC sensor (End)
5	Pressure roller thermistor (Center)	10	Fusing lamp

1.4.5 WASTE TONER BOTTLE



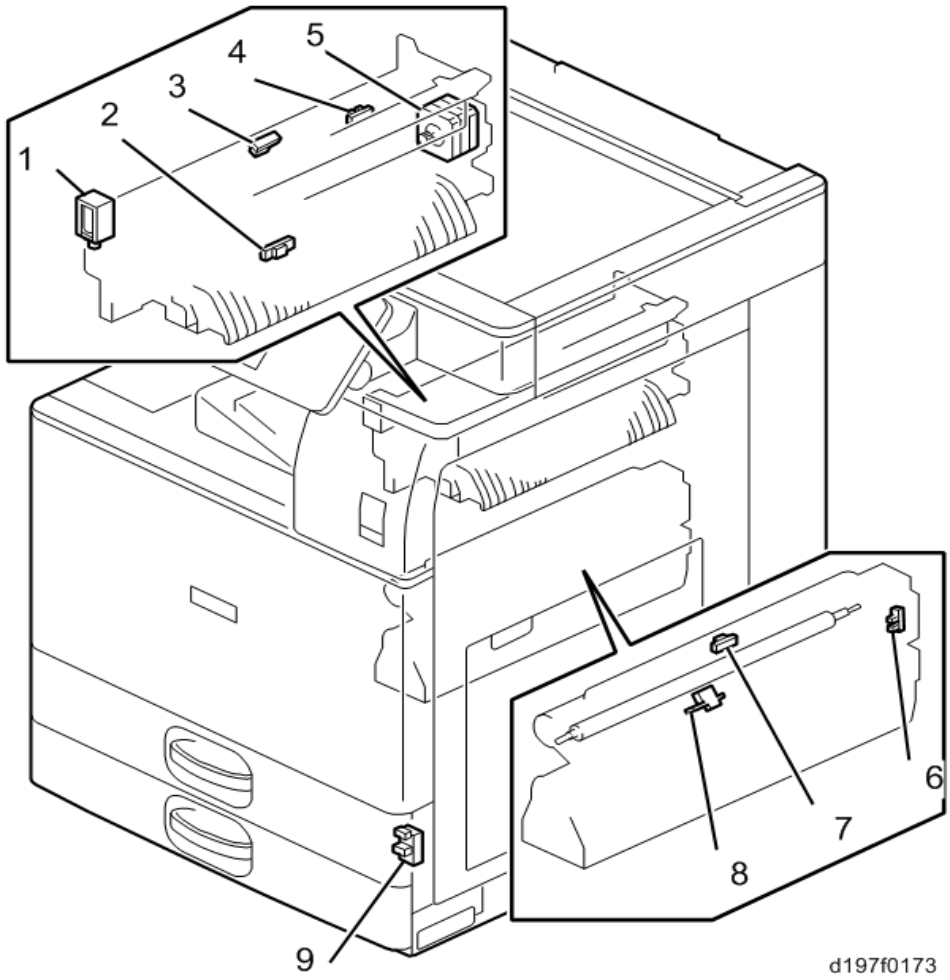
No.	Description	No.	Description
1	Drum/waste toner motor	2	Toner collection full sensor

1.4.6 DUPLEX/BYPASS UNIT



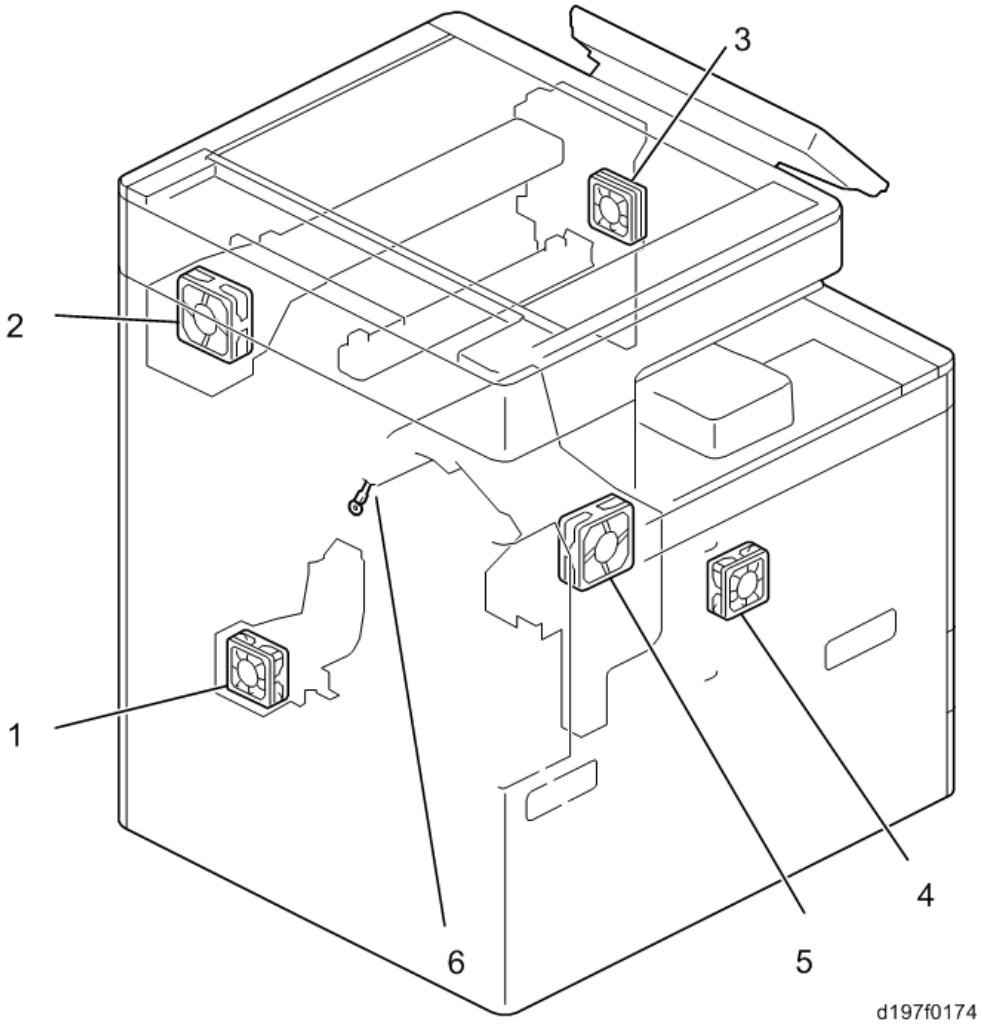
No.	Description	No.	Description
1	Right cover open/close switch	6	Bypass paper length sensor
2	Duplex entrance sensor	7	Bypass pickup solenoid
3	Duplex entrance motor	8	Bypass paper size switch
4	Duplex guide switch	9	Bypass paper end sensor
5	Duplex/bypass motor	10	Duplex exit sensor

1.4.7 PAPER EXIT/ REVERSE UNIT



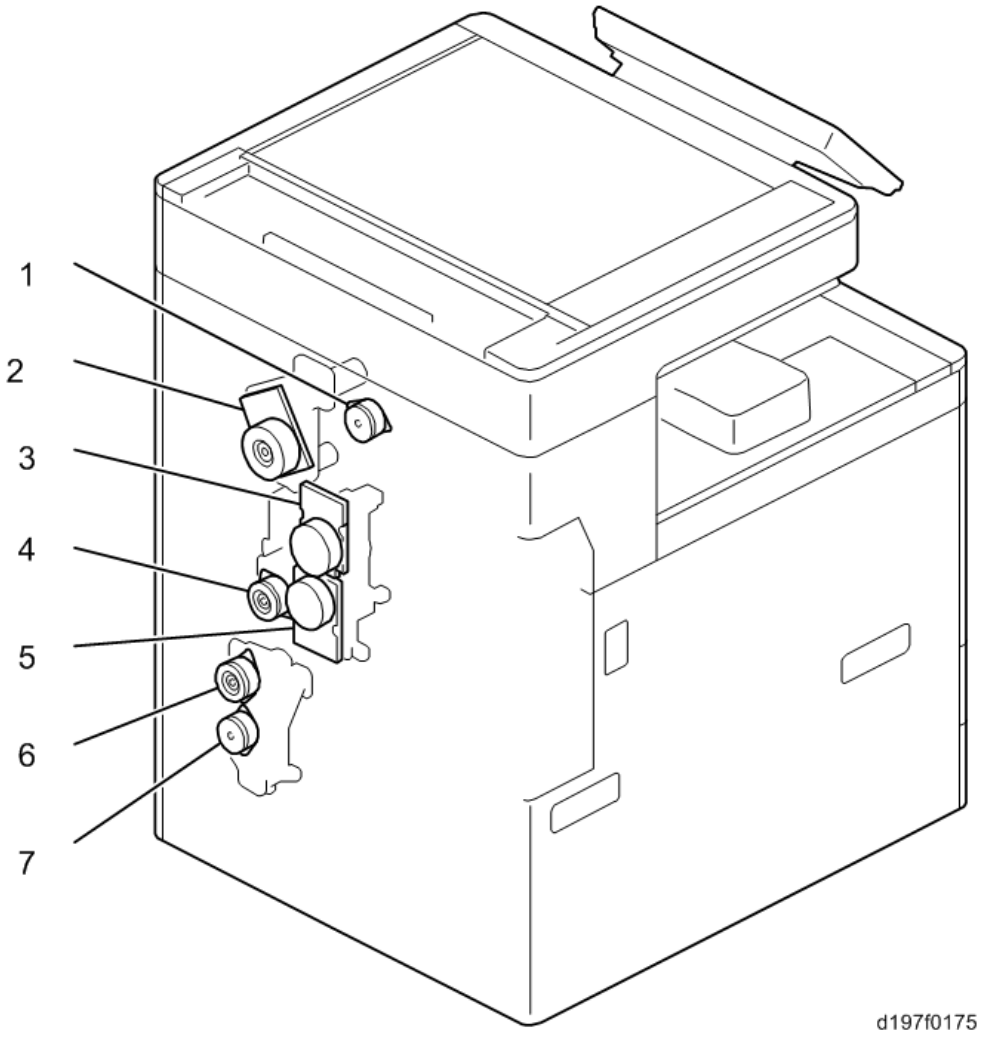
No.	Description	No.	Description
1	Paper exit switching solenoid	6	Transfer unit open/close sensor
2	Paper exit sensor	7	Fusing entrance sensor
3	Reverse sensor	8	Transfer Contact Sensor
4	Paper exit full sensor	9	Temperature / Humidity Sensor
5	Reverse motor		

1.4.8 AIR FLOW



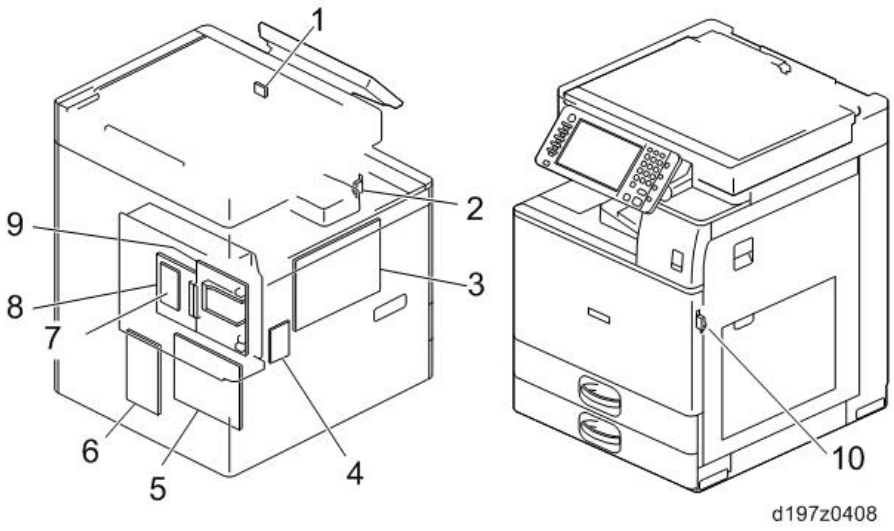
No.	Description	No.	Description
1	Development bearing cooling fan (D200/D201/D202 only)	4	PSU cooling fan(D200/D201/D202 only)
2	Fusing fan	5	Development exhaust fan
3	Paper exit fan	6	Temperature/humidity sensor

1.4.9 DRIVE UNIT



No.	Description	No.	Description
1	Paper exit motor (D200/D201/D202 only)	5	Development motor
2	Fusing motor (D200/D201/D202 only) Fusing/paper exit motor (D197/D198/D199 only)	6	Vertical transport motor
3	Drum/Waste toner motor	7	Paper feed motor
4	Registration motor		

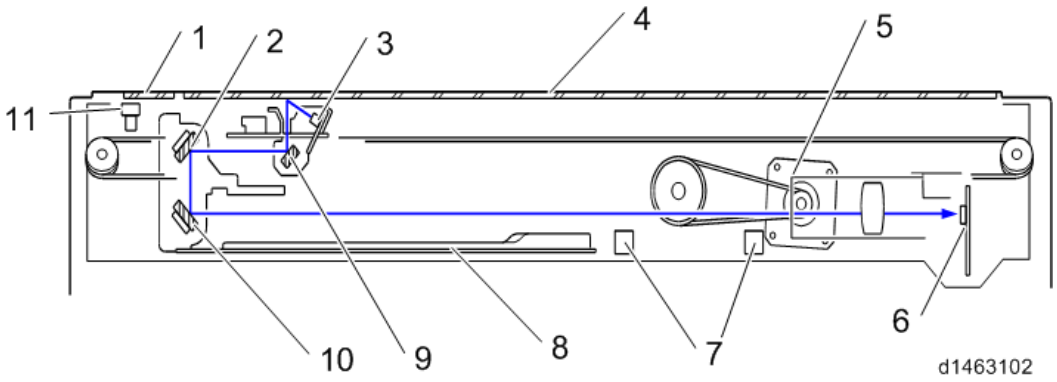
1.4.10 ELECTRICAL COMPONENT



No.	Description	No.	Description
1	Main power switch	6	HVP
2	Interlock switch (Front Cover)	7	IPU-sub (only for machines with an SPDF installed)
3	PSU	8	IPU
4	DHB (Option)	9	Controller Board
5	BCU	10	Interlock Switch (Right Cover)

2. SCANNING

2.1 OVERVIEW



No.	Description	No.	Description
1	Sheet-through exposure glass	7	Original length sensor
2	2nd mirror	8	Anti-condensation heater (Scanner heater)
3	Scanner lamp Unit (LED)	9	1st mirror
4	Exposure glass	10	3rd mirror
5	Scanner motor	11	Scanner Home Position sensor
6	Sensor board unit (SBU)		

The scanner unit comprises a Scanner lamp and Scanner Home Position sensor, first to third mirrors, lens, and CCD. Light from the scanner lamp which has illuminated the document reaches the CCD via the following route.

1st mirror > 2nd mirror > 3rd mirror > lens > CCD

2.2 MECHANISM

2.2.1 READ SYSTEM

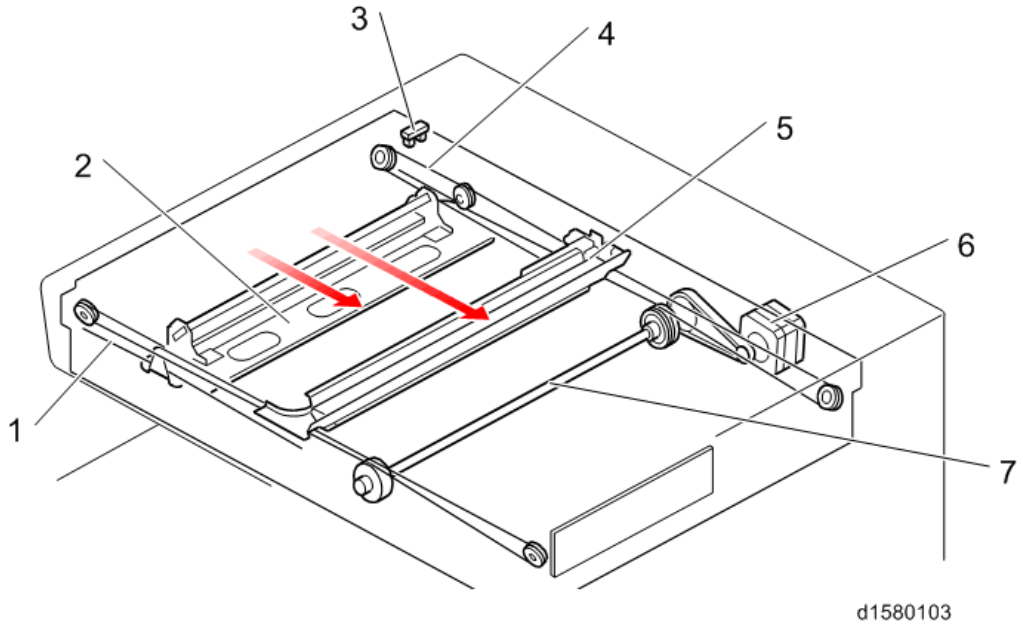
In book mode (pressure plate mode), the scanner scans the document from left to right. When the ADF is used, the scanner is fixed in the home position on the left edge, and the document is transported and read (sheet-through method).

2.2.2 SCANNER

- **Scanner lamp**
  The light source is an LED. The LED emits little heat (low power consumption), and has excellent light output rise characteristics.
- **CCD**
  The 3 lines color CCD converts the intensity of the light reflected onto it from the document into 3 color (Blue, Green and R) digital signals. The use of a 4.7 µm image CCD achieves low-cost and compactness.
- **Reflection plate (reflector)**
  The reflection plate reflects light from the scanner lamp and concentrates light to originals on the exposure glass. The light which illuminates the document is adjusted to be the same on the left and right so as not to cast any shadow on the patched original.
- **White plate**
  A white plate for shading correction is affixed to the underside of the left scale on the scanner unit. This is read by the scanner and CCD when turning on the machine. The read data are temporarily stored in a RAM, and used for correction of original image data.

2.2.3 SCANNER DRIVE

The scanner is driven by a scanner motor [6] (stepping motor) via scanner wires [1, 4]. For each scanning mode, reading is completed by one scanning.
The scanner home position sensor [3] controls the 1st carriage position. This sensor is located in the same position as the read position of the sheet-through DF.



No.	Description
1	Scanner wire: front
2	2nd carriage
3	Scanner Home Position sensor
4	Scanner wire: rear
5	1st carriage
6	Scanner motor
7	Drive axis

2.2.4 DOCUMENT SIZE DETECTION

In this machine, for original size detection, two reflecting sensors are used for the sub scanning direction (length), and a CCD is used for the main scanning direction (width).

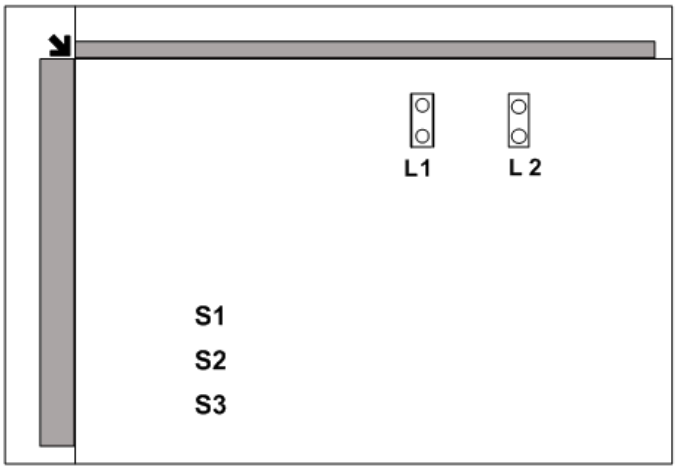
- **Sub scanning direction**

  The document size is detected by ON/OFF of the reflection sensors. A pressure plate open/close sensor is used for the document size detection timing. When the pressure plate open/close sensor has changed from “no cover” to “cover,” the size is determined.

- **Main scanning direction**

  RGB color densities at 3 locations are detected by a CCD, and when any of the RGB densities is 12 digits or more, it is determined that “document is present.”

  A pressure plate open/close sensor is used for the document size detection timing. When the pressure plate open/close sensor is “no cover,” the scanner lamp is moved to the right; when it is “cover,” the Scanner lamp is moved to Home Position while lit, and during this time, the size is read.



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Document size			Sensor response				
Size	Direction	Dimensions (main × sub)	S1	S2	S3	a	b
A3	SEF	297 x 420	Detect	Detect	Detect	Detect	Detect
B4	SEF	257 x 364	Detect	Detect	-	Detect	Detect
A4	SEF	210 x 297	Detect	-	-	Detect	-
A4	LEF	210 x 297	Detect	Detect	Detect	-	-

Document size			Sensor response				
B5	SEF	182 x 257	-	-	-	Detect	-
B5	LEF	257 x 182	Detect	Detect	-	-	-
A5	SEF	148 x 210	-	-	-	-	-
A5	LEF	210 x 148	Detect	-	-	-	-
DLT	SEF	11" × 17"	Detect	Detect	Detect	Detect	Detect
10 x 15	SEF	10" × 15"	Detect	Detect	-	Detect	Detect
USB4	SEF	10" × 14"	Detect	Detect	-	Detect	Detect
LG	SEF	8 1/2" × 14"	Detect	-	-	Detect	Detect
Foolscap	SEF	8 1/2" × 13"	Detect	-	-	Detect	Detect
Folio	SEF	8 1/4" × 13"	Detect	-	-	Detect	Detect
F	SEF	8" × 13"	Detect	-	-	Detect	-
LT	SEF	8 1/2" × 11"	Detect	-	-	Detect	-
LT	LEF	11" × 8 1/2"	Detect	Detect	Detect	-	-
8 x 10	SEF	8" × 10"	Detect	-	-	Detect	-
10 x 8	LEF	10" × 8"	Detect	Detect	-	-	-
Executive	SEF	7 1/4" × 10 1/2"	-	-	-	Detect	-
HLT	SEF	5 1/2" × 8 1/2"	-	-	-	-	-
HLT	LEF	8 1/2" × 5 1/2"	Detect	-	-	-	-

To determine the main scanning direction (document width), the outermost determination is used.

◆ **Sensor state**

The sensor state can be determined in SP mode.

- SP4-301 (Operation Check APS Sensor)
  How to read the screen
  (7)00000000(0)
  0: no document
  1: document present
  When the sensor responds, bit 0 is displayed as “1.”
- SP4-310 (Scan Size Detect Value)
  Viewed from the control panel, labeling positions from rear to front S1-S3 in that order, the RGB density at each position is displayed in digit units (value just before scan is displayed).

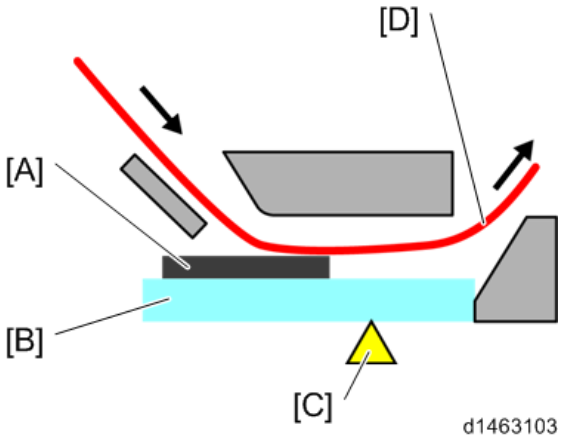
◆ **Other**

- By changing over SP4-305-001 (8K/16K Detection), you can change between A4 size/letter size or Chinese paper size (8×16).
- If the user specifies that the pre-scan lamp is too bright, the brightness pre-scan can be reduced by decreasing the value of SP4-309-004 (Scan Size Detect:Setting LED PWM Duty). However, if the lamp brightness is reduced, size detection precision tolerance to a document with a large number of solid images will be less.

2.2.5 IMPROVED TOLERANCE TO BLACK LINES WHEN PAPER PASSES THROUGH ADF

The original document does not come in contact with the exposure glass, which prevents adhesive dirt (ball pen ink) on the document from adhering to the exposure glass.

ADF cross-section diagram



[A]: Sheet

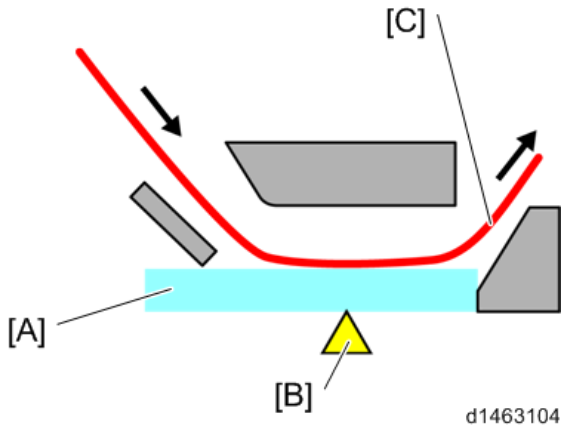
[B]: Exposure glass

[C]: Read position

[D]: Document

- Reference (conventional mechanism)
  As the document comes in contact with the exposure glass, this is useful for dealing with adhesion of free dirt particles (paper scrap, etc.). (Self-cleaning mechanism using paper)
  On the other hand, tacky dirt adhering to the document sticks to the exposure glass, and may give rise to the appearance of black lines.

ADF cross-section diagram



[A]: Exposure glass

[B]: Read position

[C]: Document

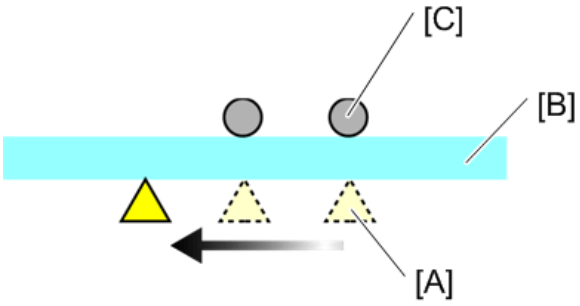
* If black lines due to free dirt particles appear in a short time, such as when users have documents with large amounts of paper scrap, you can return to the original configuration by the following procedure.

- Reference (read position correction)

  By changing SP4-020-001 (Dust Check Dust Detect:On/Off), when dirt/soiling is detected at the read position, the read position may be changed to avoid the dirt/soiling.

  (If it cannot be avoided, an alert is displayed on the control panel advising the user to perform exposure glass cleaning).

Image diagram



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[A]: Read position

[B]: Exposure glass

[C]: Dirt

NOTE: ***1. Dirt/soiling is detected when a document passes through, so the alert will not disappear until reading of the next document begins, even after exposure glass cleaning is performed. If dirt/soiling is detected not on the exposure glass but on the background guide plate, the alert will not disappear even if the glass is wiped. The time required for the first copy is slightly (almost imperceptibly) longer.***

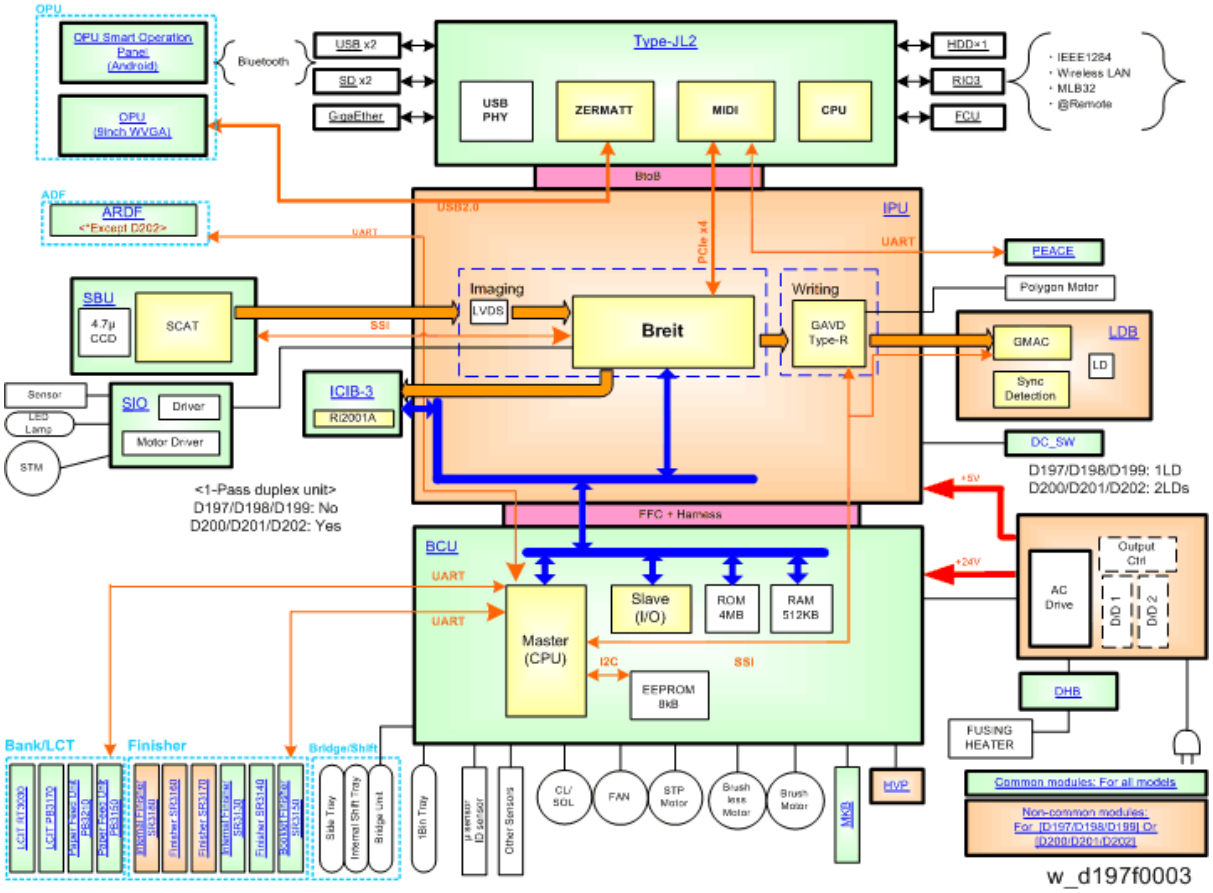
NOTE: ***2. The detection threshold value can be changed using SP4-020-002 (Dust Check Dust Detect:Lvl). (The larger the value is, the smaller the dirt particles that can be detected become.)***

NOTE: ***3. It is prohibited to change the setting of SP4-020-003 (Dust Check Lvl Dust Reject:Lvl).***

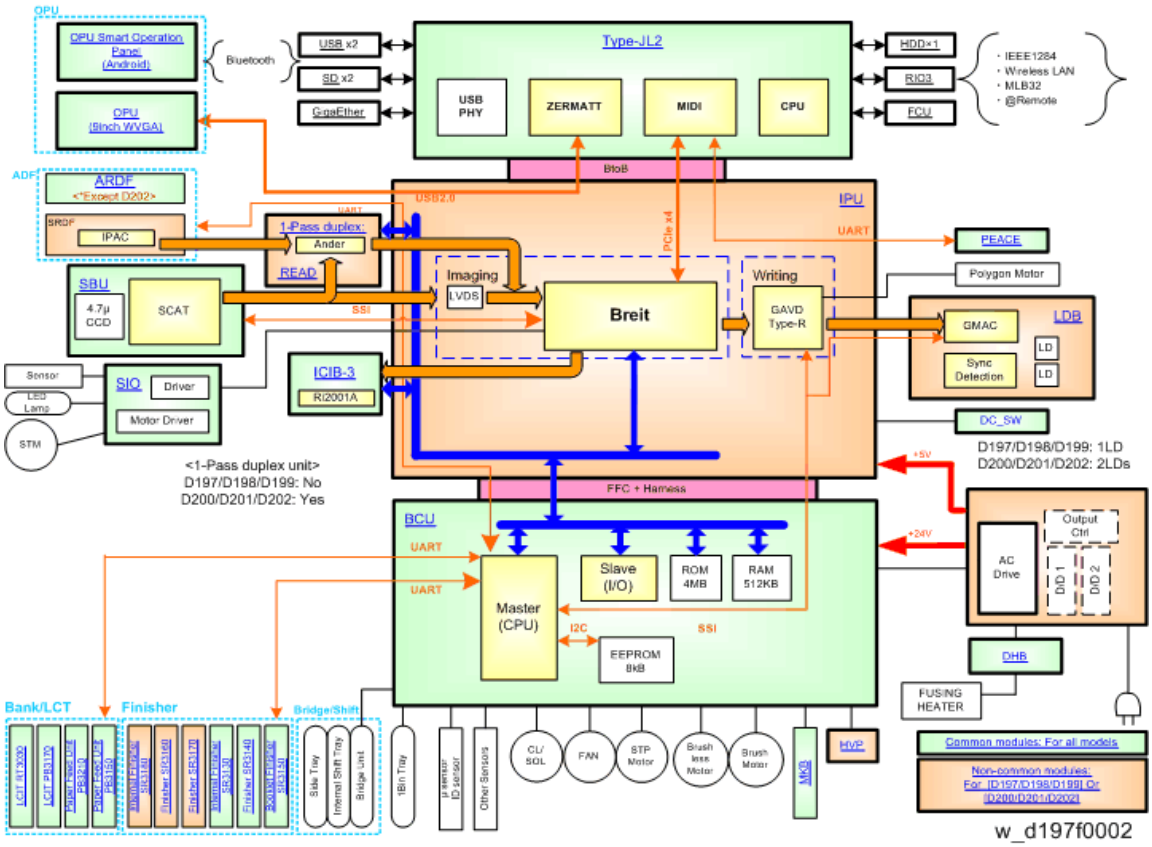
3. IMAGE PROCESSING

3.1 STRUCTURAL BLOCK DIAGRAM

For D197/D198/199 models



For D200/D201/D202 models



3.2 MECHANISM

3.2.1 SBU

◆ **Functions**

Performs Black level correction and White level correction (AGC), Creating the SBU test pattern, and A/D conversion.

◆ **Operation overview**

Samples 2 analog signals (ODD, EVEN) from RGB output from the 3-line CCD by an analog ASIC: SCAT, and converts them to digital signals (output 10 bit) by a built-in 12-bit A/D converter.

The digital signals which are A/D converted by the analog ASIC are output to the IPU as an LVDS signal.

◆ **SP correction value storage**

The SBU correction value is stored in an EEPROM of the BCU. This correction value must be re-adjusted when the lens block is replaced.

- SP4-008 (Sub Scan Magnification Adj)
- SP4-010 (Sub Scan Registration Adj)
- SP4-011 (Main Scan Reg)
- SP4-688-001 (DF Density Adjustment ARDF) or SP4-688-002 (Scan Image Density Adjustment 1-pass DF)

NOTE: ***Dirty Background Adjustment When Using DF: The image density scanned by using the DF may be lower compared to the image density scanned by using the platen. The image density value of DF scanning can be adjusted by SP4-688-001 (DF Density Adjustment ARDF) or SP4-688-002 (Scan Image Density Adjustment 1-pass DF) above.***

3.2.2 IPU

- **Image processing function overview**

  The image signals from the SBU are subjected to various image processing, and output to the controller (memory) via a PCI bus. The image signals from the controller (memory) are received via the PCI bus, and output to the LDB via a GAVD (the LDB is provided in the write unit).

  The image signals from the SBU are subjected to various image processing, and output to the FCU via the PCI bus (for direct fax application transmission).

- **Image processing overview (copy application)**

  Digital signal data output from the SBU is subjected to shading correction and line interval correction, as well as image processing, which are performed by the IPU. Finally, the data is sent to the MFP unit as digital signals-2 bit/pixels.

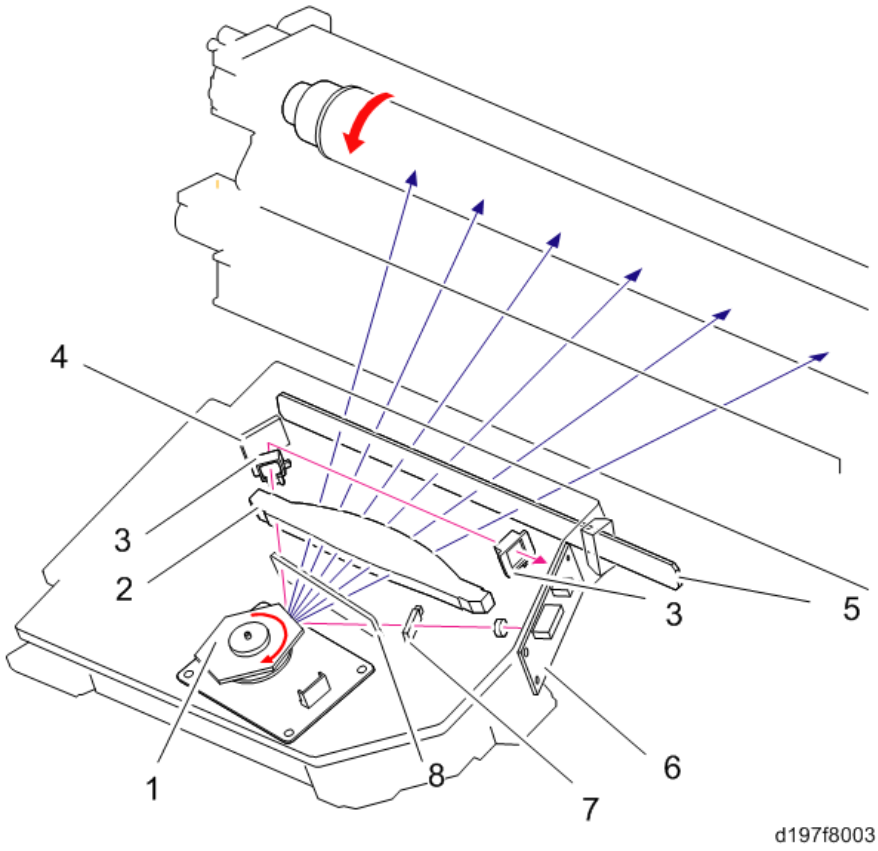
Image processing items	Details
Shading correction	Corrects for uneven scanner lamp lighting, and scatter in CCD light receiving sensitivity.
Line interval correction	Line shift during subscanning magnification/reduction by scanner. Corrects integer part.
Dot correction	Line shift during subscanning magnification/reduction by scanner. Corrects below decimal point.
Vertical line correction	Corrects a vertical striped image during sheet-through ADF.
Image area separation	Determines text parts and photo parts of image.
Scanner gamma correction	Corrects scatter of image data relative to exposure amount. From reflectivity linear to density linear.
Filter	Performs image sharpness adjustment and removes moire.
ADS	Performs natural complexion removal in full color mode.
Color compensation preprocessing	Determines hue in masking mode, and improves chromaticity.
Color compensation	Converts RGB data to density value CMYK data of color materials.

Image processing items	Details
Image magnification change	Arbitrarily changes main scanning magnification, subscanning fixed image reduction and magnification of scanner image.
Image shift function	Shifts image data in the main scanning or subscanning directions.
Image binarization function	In scanner mode, outputs a binary signal.
Image mask	Masks an area outside a frame of an arbitrary region in scanner or printer data.
Image compression/expansion	Compresses or expands an image.
Printer gamma correction	Adjusts exposure amount of photosensitive body relative to image density.
Gradation processing	Applies 600dpi, 4bit 16 value gradation processing.

4. PLOTTER PROCESS

4.1 LASER EXPOSURE

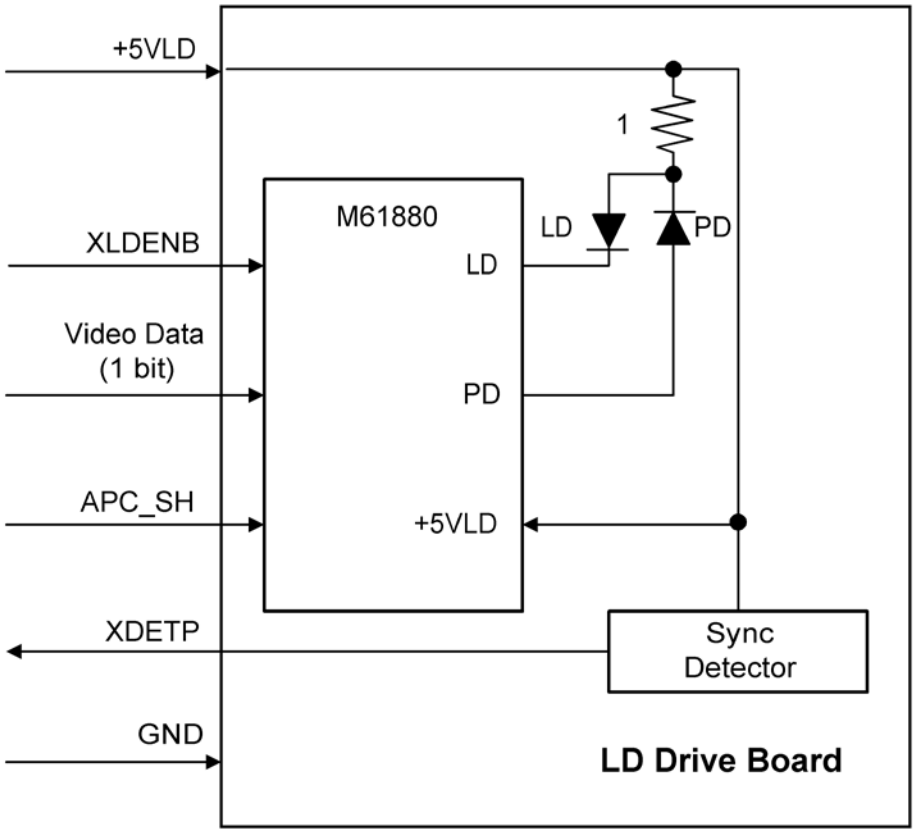
4.1.1 OVERVIEW



	Name
1	Polygon Mirror
2	F-theta Lens
3	Synchronization Detector Lens
4	Synchronization Detector Mirror
5	Toner Shield Glass
6	LD Board
7	Cylindrical Lens
8	Shield Glass

NOTE: ***The LD drive board controls both the laser output and laser synchronization mechanism. The machine cuts off the power supply to the LD drive board if the front or right cover is opened.***

4.1.2 AUTO POWER CONTROL (APC)



The LD driver IC drives the laser diode. To prevent the intensity of the laser beam from changing because of the temperature, the machine monitors the current passing through the laser diode (LD). The machine adjusts the current to the laser diode by comparing it with the reference level from the reference circuit.

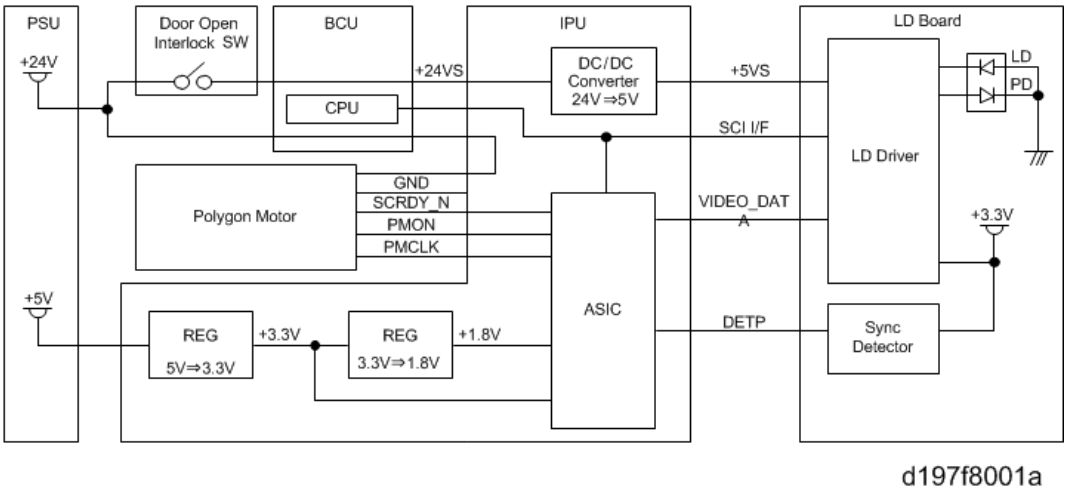
This auto power control is done just after the machine is turned on and during printing.

The laser diode power is adjusted on the production line.

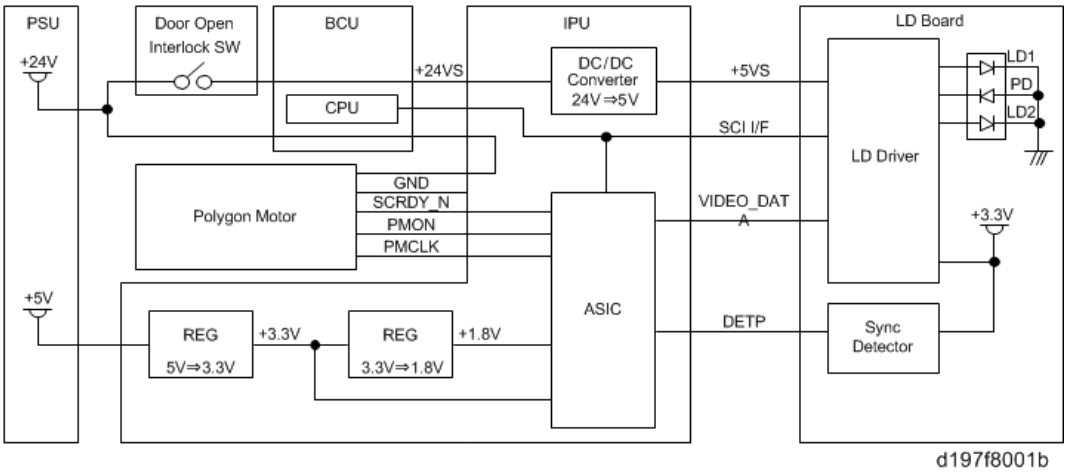
NOTE: ***Do not touch the variable resistors on the LD unit in the field.***

LD Safety Switch

For D197/D198/D199 models



For D200/D201/D202 models

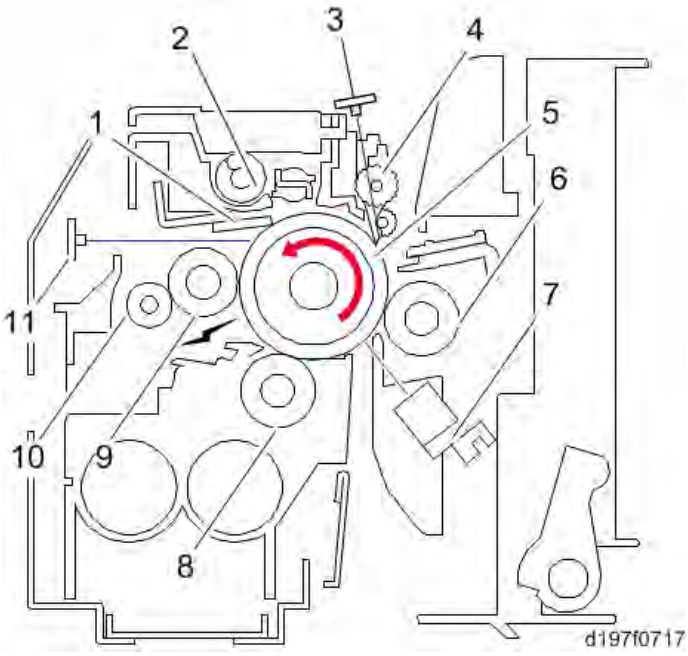


"+24V" goes through the BCU and is converted to "+5VS" on the IPU. "+5VS" is supplied to the LD Board. The interlock switch turns off when the front cover or the right door is opened. As a result, the power supply ("+24VS") to the BCU is cut off.

This system prevents unexpected laser emission, and ensure user safety and technician safety.

4.2 PCU

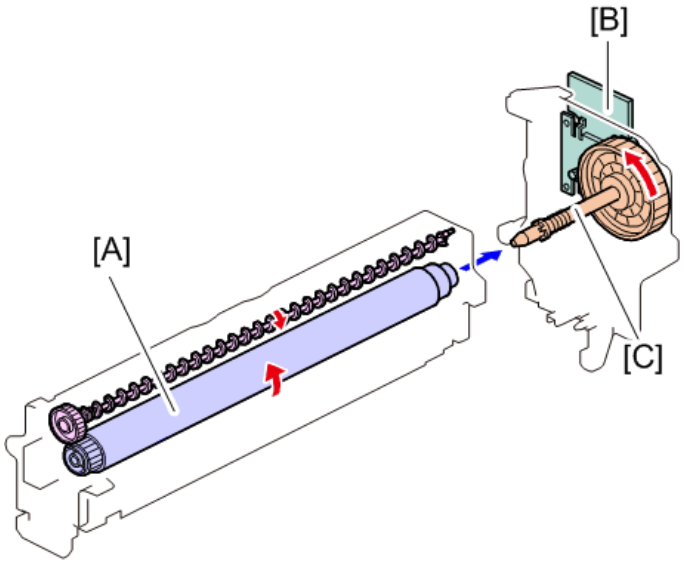
4.2.1 OVERVIEW



No.	Part Name	No.	Part Name
1	Cleaning Blade	7	ID Sensor
2	Toner Collection Coil	8	Development Sleeve
3	PCL (Pre Cleaning Light) *1	9	Charge Roller
4	Pick-off Pawl	10	Brush Roller
5	OPC Drum	11	Quenching Lamp
6	Transfer Roller		

*1 New feature. The PCL decreases the electro-static adhesion force generated around the OPC drum and remaining toner to enhance cleaning efficiency.

4.2.2 OPC DRUM DRIVE MECHANISM



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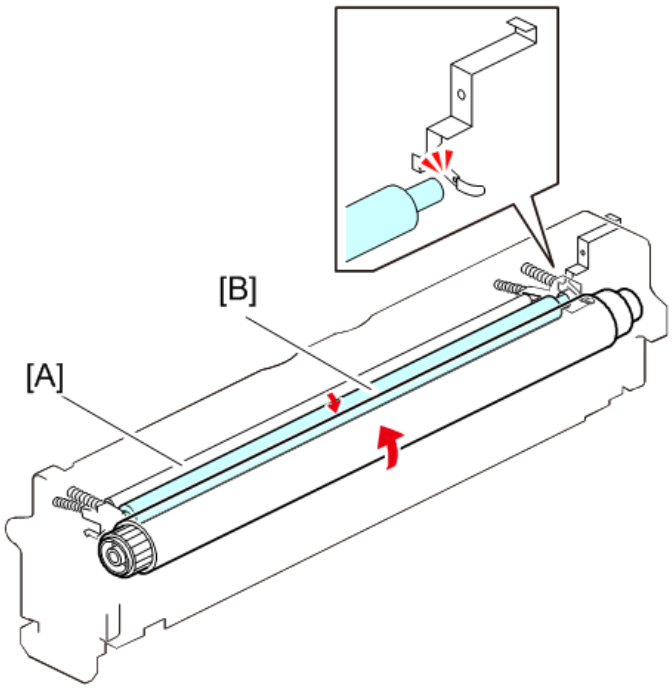
The drum/waste toner motor [B] drives the OPC drum [A] through gears and the drum drive shaft [C].

4.2.3 DRUM CHARGE



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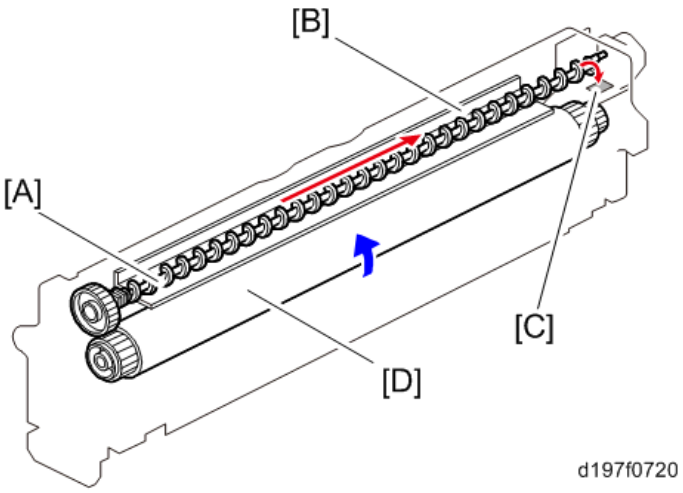
Charging to the drum is performed by the charge roller [B]. The charge roller always contacts the surface of the drum and applies a charge bias.

A power pack applies the bias to the charge roller via a receptacle and electrode terminal. Dirt can easily adhere to the charge roller because the roller always contacts to the drum with the pressure spring. Therefore, the brush roller [A] is in contact with the charge roller for cleaning.

4.2.4 DRUM CLEANING, TONER DISCARDING



A counter blade cleaning system is employed for the drum cleaning. The system is a cleaning method that a cleaning blade [B] removes toner on the drum by always contacting the blade in the counter direction against the drum rotation. Toner scraped off by the blade is transferred by the toner collection coil [A] from the front side to the rear side, to be discarded into the waste toner bottle via the transportation route [C] in the rear of the drum. Depending on the job conditions, used toner may be discarded by the toner recycle/discard switch mechanism. Paper dusts that adhere to the edge of the cleaning blade are removed by rotating the drum [D] in the reverse direction after job end.

4.2.5 ID SENSOR

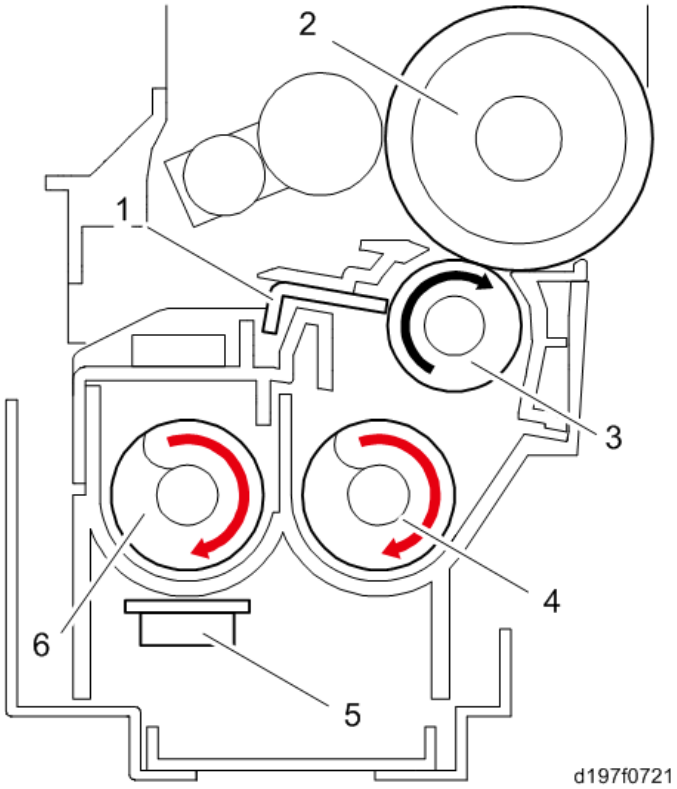
The ID sensor is used to keep image density by changing the value of ID sensor standard, development bias, drum potential and LD power with Vsp and Vsg.

The ID sensor performs on the following timings:

1. When the machine has been unused beyond the time determined and the printed sheet count has exceeded the predetermined value.
2. When the temperature and/or humidity has changed over the ranges, and the machine restarts the engine (i.e. the main power is turned on, warming-up after the fusing-off mode, and the front cover is closed.)
3. When the machine is processing a job that has more than the number of sheets predetermined (job is interrupted) or when the machine has completed a job that has the number of sheet predetermined.

4.3 DEVELOPMENT

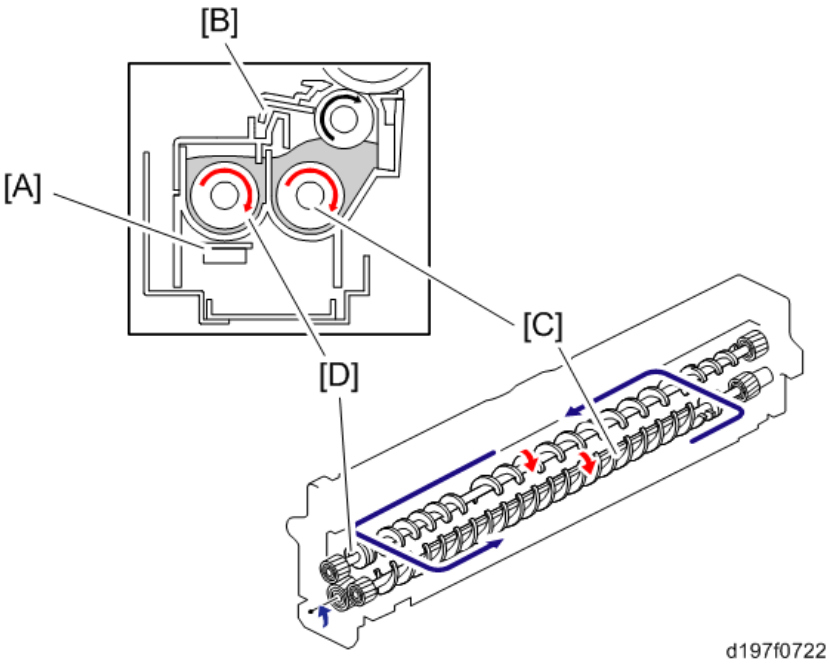
4.3.1 OVERVIEW



The development unit consists of the following parts.

	Description		Description
1	Doctor Blade	4	Mixing Auger 2
2	OPC Drum	5	TD Sensor
3	Development sleeve	6	Mixing Auger 1

4.3.2 DEVELOPMENT MECHANISM

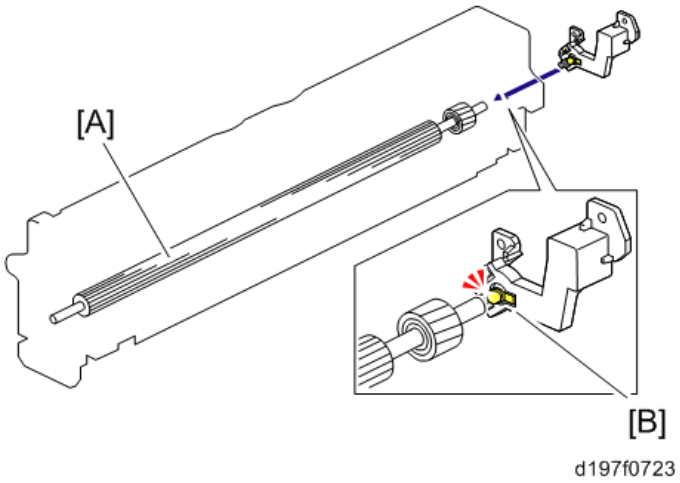


This machine uses a dry two-component magnetic brush development system.

This machine uses 2 mixing augers [C] and [D] to keep the developer evenly mixed. Mixing auger 2 [C] transports excess developer, scraped off the development roller by the doctor blade [B], towards the rear of the machine. Mixing auger 1 [D] returns the excess developer, along with new toner, to the front of the mixing assembly. Here the developer is reapplied to the development roller.

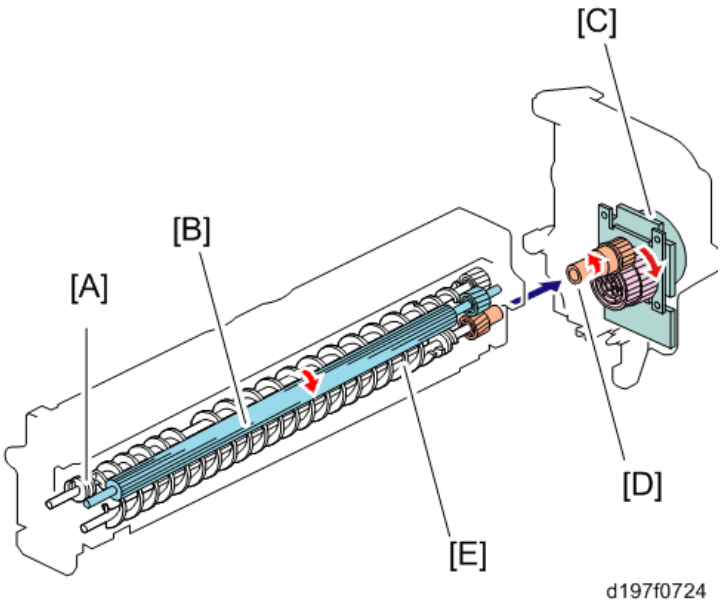
TD sensor [A] detects the toner density in the development unit.

4.3.3 DEVELOPMENT BIAS



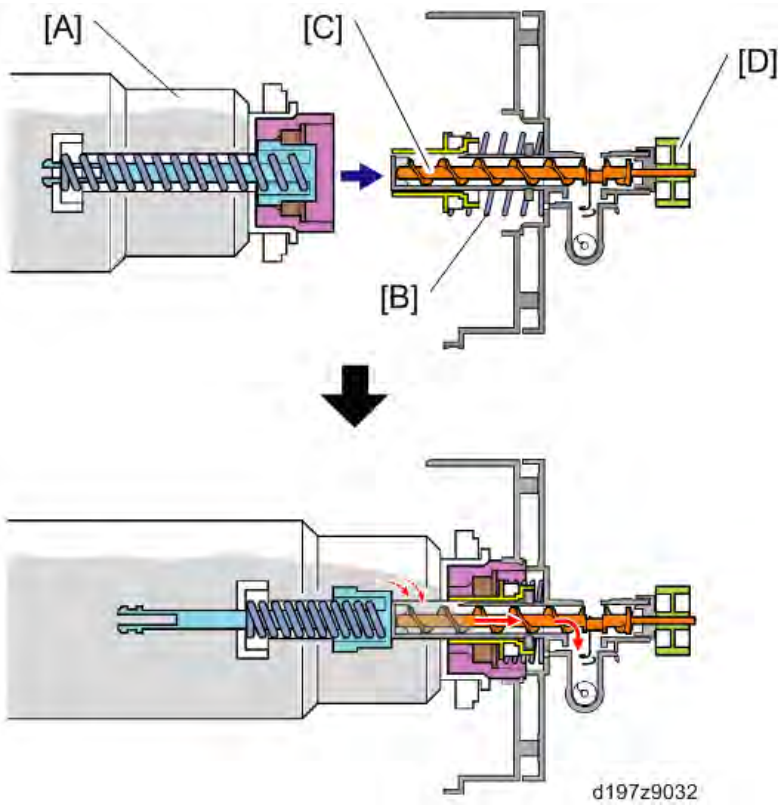
Development bias is performed by power pack and is applied to development sleeve [A] via development sleeve drive shaft and bias terminal [B].

4.3.4 DRIVE



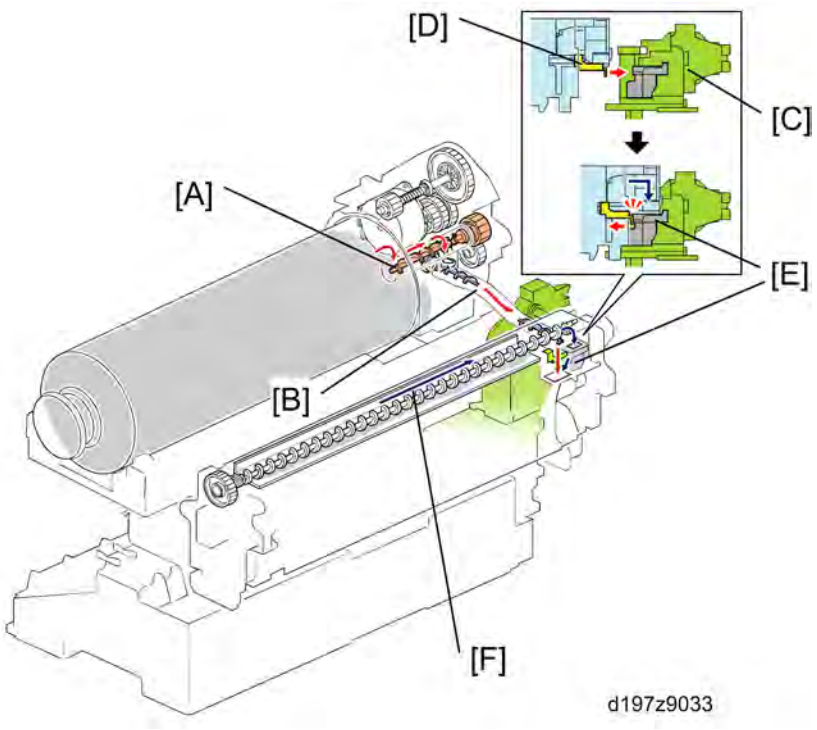
The development motor [C] drives the mixing auger 1 [A], mixing auger 2 [E] and development sleeve [B] through serration gear [D].

4.3.5 TONER SUPPLY



When the toner bottle [A] is set, the transport nozzle [B] on the side of the main machine is inserted into the bottle (Hi-ACT system).

The drive of the toner supply motor is transmitted to the toner transport screw [F] through the drive gear [E], which transports the toner in the bottle horizontally. Transporting by screw provides a stable and accurate toner supply and low toner remaining.



Toner transported by the screw [A] falls directly into the development unit from the sub-hopper via the transport pipe [B]. To avoid toner from remaining, a coil screw is provided in the transport pipe. When the PCDU is put in the machine, the sub-hopper [C] slides the shutter [D] on the bottle assembly and the toner goes to the entrance [E] of the development unit.

4.3.6 TONER DENSITY CONTROL

Only PID mode controls the toner density

Mode	Toner supply decision	TD Sensor Reference Value	Toner Supply Amount	Toner End Detection
PID	Compares Vt with a Vref	ID sensor control corrects the TD sensor reference value.	The toner supply amount Is calculated with the difference between Vt and Vtref.	Available

4.3.7 TONER END DETECTION

The TD sensor detects toner near end.

If the difference between the TD sensor output and the target value is equal or larger than the near end threshold, the machine regards a “possible” toner near end exists. The machine then proceeds calculating with the condition. If the integrated value is equal or larger than near end total threshold, the machine determines that a “true” toner near end exists. The toner near end indicator blinks on the operation panel at this time.

If the difference of the TD sensor output and the target value is less than the near end threshold twice in a row, the toner near end indicator is turned off.

If the difference of the TD sensor output and the target is equal or larger than the end threshold, the machine regards a “possible” toner end exists. The machine then proceeds calculating with the condition. If the integrated value is equal or larger than the toner end total threshold, the machine determines that a “true” toner end exists.

4.3.8 TONER END RECOVERY

In a toner end condition or toner near end condition, if the front cover is kept open for more than 5 seconds and then it is closed, the machine changes to a toner end recovery mode. You must keep the main power on when you replace the toner bottle or toner end recovery will not work.

4.3.9 TONER SUPPLY IN ABNORMAL SENSOR CONDITIONS

◆ **ID sensor**

Readings are abnormal if any of the following conditions occur:

- Vsg < or = 2.5V
- Vsg < 3.5V when maximum power (254) is applied
- Vsp > or = 2.5V
- (Vsg – Vsp) < 1.0V

ID sensor power required to make the standard output reaches the maximum value (254)

The above ID sensor values can be checked using SP2-220.

When this is detected, the machine changes the value of Vref to the previous value then does the toner density control process (in a similar way to sensor control mode 2).

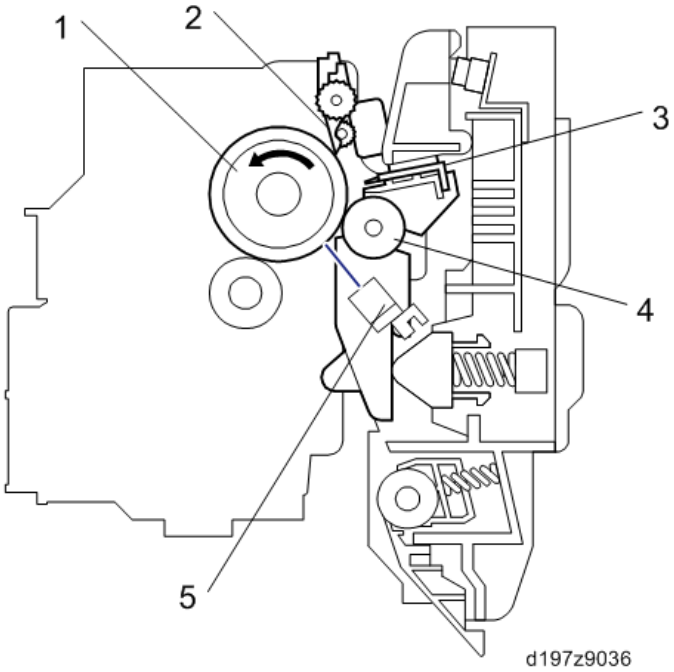
No SC code is generated if the ID sensor is defective.

◆ **TD Sensor**

The TD sensor is checked every copy. If the readings from TD sensor become abnormal, the machine changes the toner density control mode to fixed supply mode 2, and the toner supply amount per page is always 200 ms, regardless of the value of SP2-925. Then at the end of a job (if the optional fax unit is installed), or 100 copies after the TD sensor error was detected (if no fax unit is installed), an SC code is generated (SC390) and the machine must be repaired. The 100-copy threshold can be adjusted with SP 2-992.

4.4 TRANSFER/ SEPARATION

4.4.1 OVERVIEW

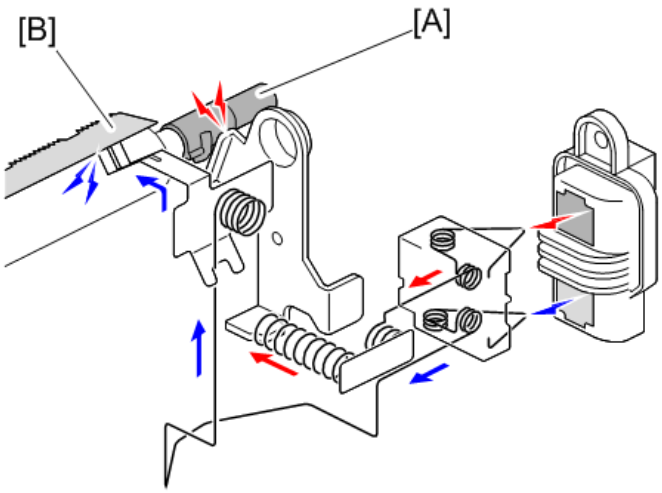


	Description		Description
1	OPC Drum	4	Transfer Roller
2	Pick-off Pawl	5	ID Sensor
3	Discharge Plate		

The machine uses a transfer roller [4], which touches the surface of the OPC drum [1]. The high voltage supply board supplies a positive current to the transfer roller, which attracts the toner from the drum onto the paper. The current depends on the paper width, paper type, and paper feed tray.

The curvature of the drum and the discharge plate [3] help the paper to separate from the drum. The high voltage supply board also supplies a negative dc voltage to the discharge plate. The drum/waste toner motor drives the transfer roller through the OPC drum [1].

4.4.2 TRANSFER ROLLER UNIT CHARGE



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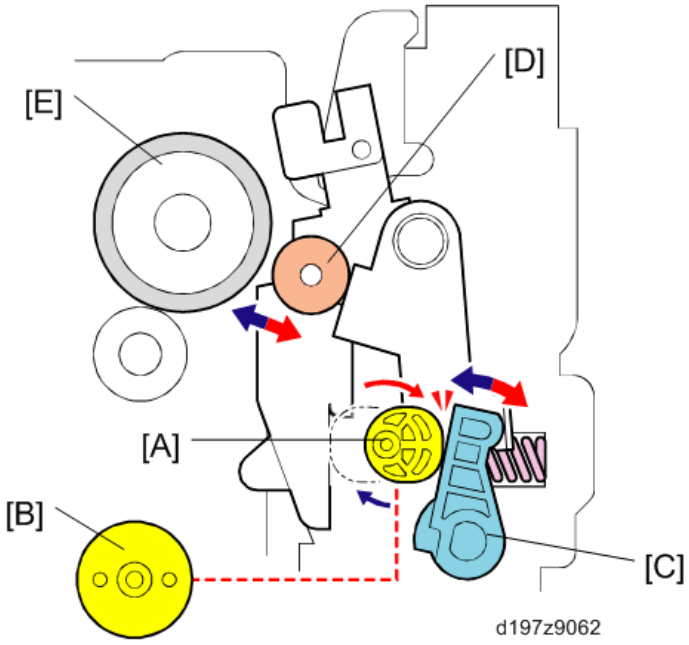
The high voltage supply board supplies a positive current to the transfer roller [A], which attracts the toner from the drum onto the paper. The current depends on the paper width, paper type, and paper feed tray.

The curvature of the drum and the discharge plate [B] help the paper to separate from the drum.

The high voltage supply board also supplies a negative dc voltage to the discharge plate [C], which helps the paper to separate from the drum.

4.4.3 TRANSFER ROLLER CONTACT AND RELEASE MECHANISM

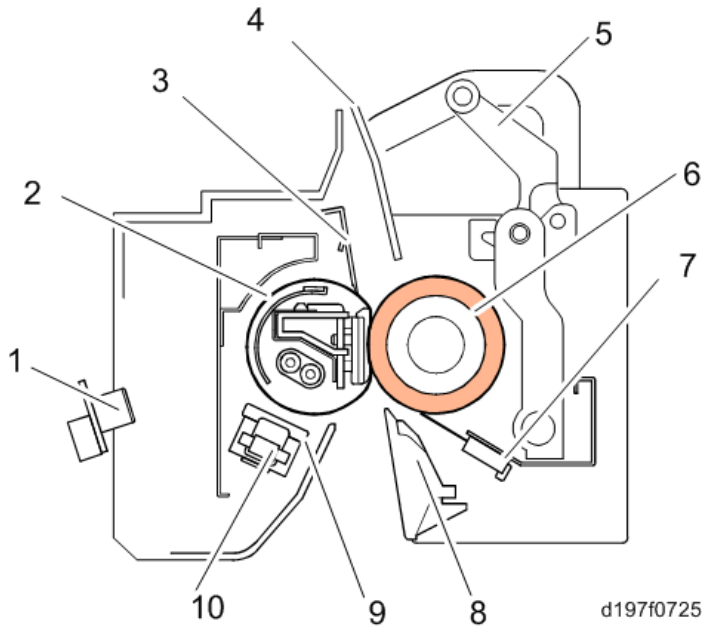
This machine has the transfer roller contact and release mechanism to prevent dirt and distortion. A transfer roller contact cam [A] is installed in the front right side of the mainframe. A transfer roller contact motor [C] drives the cam. This cam is eccentric cam. As a result of this shape, the transfer roller contact cam moves the transfer roller contact arm [C] by its rotation. The transfer roller [D] and OPC drum [E] are separated by the movement of the transfer roller contact arm during the process control, discarding toner or when the main power is turned off.



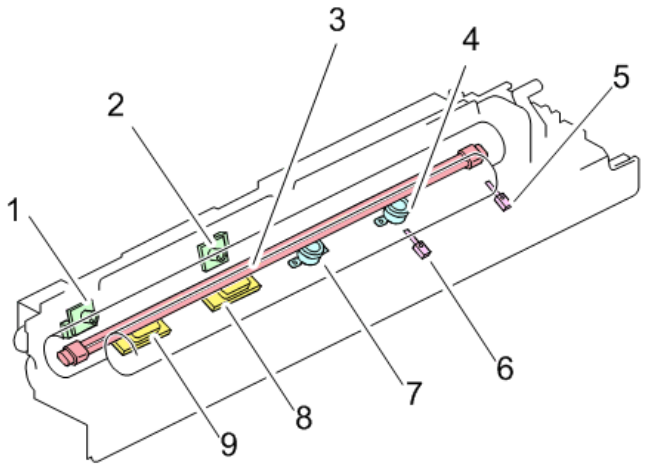
4.5 FUSING

4.5.1 OVERVIEW

This product employs a QSU-DH fixing system wherein a heater emits light to heat a fusing belt.



No.	Description	No.	Description
1	Thermopile	6	Pressure Roller
2	Heating Sleeve Belt	7	Pressure Roller Thermistor
3	Stripper Plate	8	Fusing Entrance Guide Plate
4	Fusing Exit Guide Plate	9	Thermostat
5	Pressurize/depressurize Lever	10	NC Sensor



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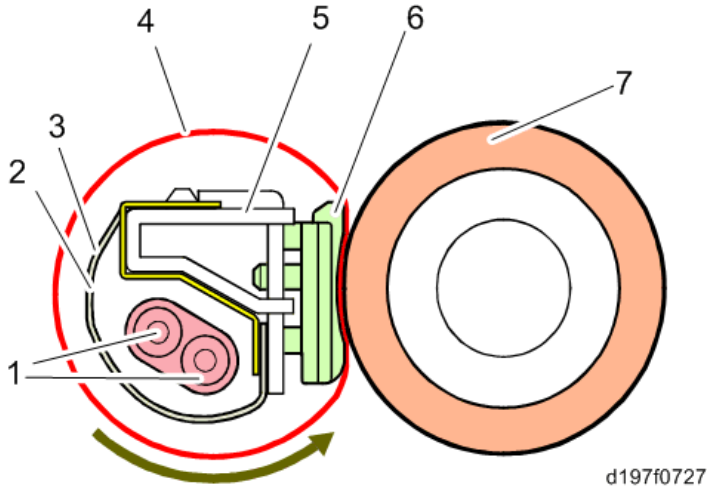
No.	Description	No.	Description
1	Thermopile (edge)	6	Thermistor (center)
2	Thermopile (center)	7	Thermostat (center)
3	Fusing lamp	8	Non-contact Thermistor (center)
4	Thermostat (edge)	9	Non-contact Thermistor (end)
5	Thermistor (edge)	10	

4.5.2 MECHANISM

◆ QSU-DH Fixing System



No.	Description	No.	Description
1	Halogen heater (Fusing Lamps)	5	Stay
2	Light Shielding Plate (at both ends)	6	Nip Pad (soaking plate method)
3	Reflector	7	Pressure Roller
4	Heating Sleeve Belt		

The heating sleeve belt is driven by drag rotation following a Pressure roller, and presses a Nip pad against the Pressure roller to fix toner on the paper.

The heater emits light, and a point on the left of the Fusing belt which is heated moves in an anticlockwise direction so that heat is transmitted up to the contact point with the Pressure roller.

- Heater

  Comprises two parts

  Number of watts of heater:

Center	800 W
Edge	412 W

- Nip pad

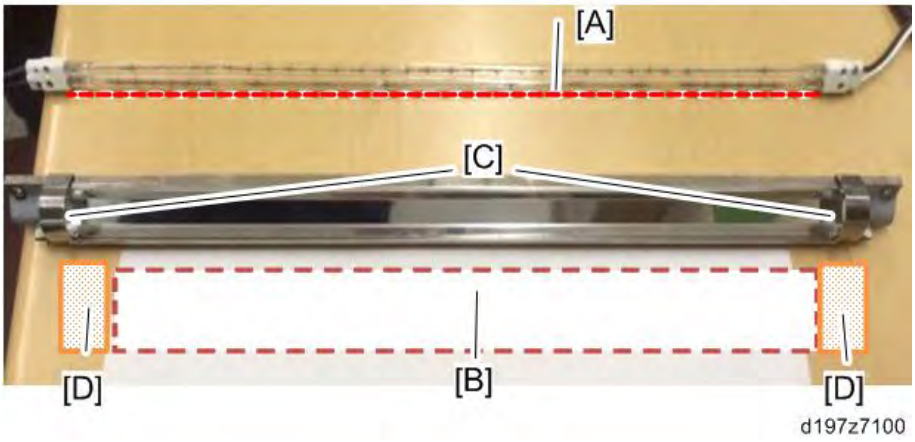
  Presses against the Pressure roller to form a fixing nip. The top surface is covered with a slippery sheet.

  Light shielding plate and Soaking Plate

  The heating sleeve belt unit in this model has light shielding plates and soaking plates to prevent the fusing sleeve from damage by temperature increase where paper does not pass through in a consecutive paper feeding.

When handling an A3 (SEF) or A4 (LEF) sheet

A cylindrical-shaped light shielding plate [C] covers the ends [D] of fusing lamp [A] where paper does not pass through and thus the temperature rises, to lower the heat conductivity for the ends of sleeve belt.

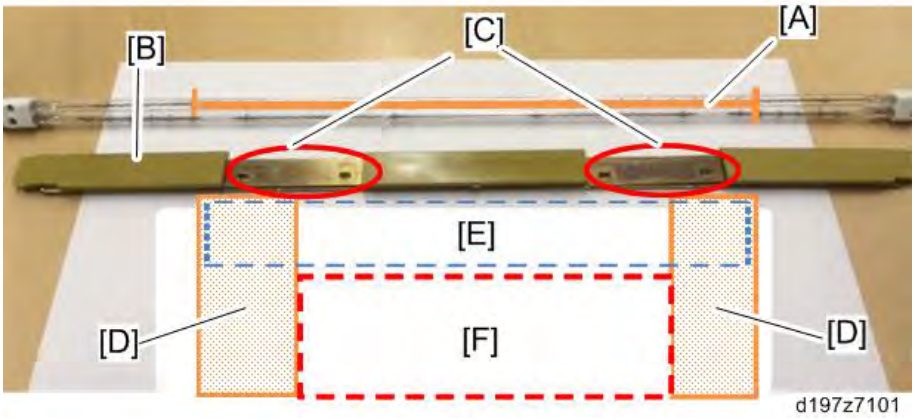


	Description
[A]	Area where fusing lamp lights up
[B]	Print width of A3 (SEF) / A4 (LEF)
[C]	Light shielding plates
[D]	Areas where paper does not pass through and thus the temperature increases

When handling an A4 (SEF) or smaller sheet

The machine lights up only the fusing lamp for center [A]. At this time, the temperature increases around the area [D] – the gap between the lightning part of the fusing lamp [A] and the edge of a sheet being handled – where paper does not pass through.

To prevent the heating sleeve belt unit from damage caused by the temperature increase, soaking plates [C] which are made of a high heat conductive material is supplied on the nip pad [B] to release the heat.



	Description
[A]	Area where fusing lamp lights up
[B]	Nip pad
[C]	Soaking plates
[D]	Areas where paper does not pass through and thus the temperature increases
[E]	Print width of A4 (SEF)
[F]	Print width of small size

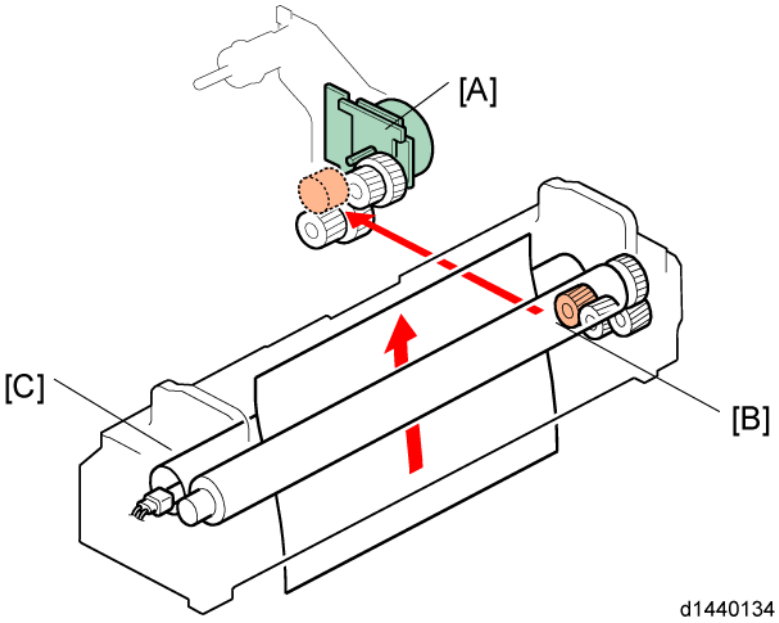
- Reflector

  Transmits heat efficiently to the left of the Fusing belt.
- Flanges

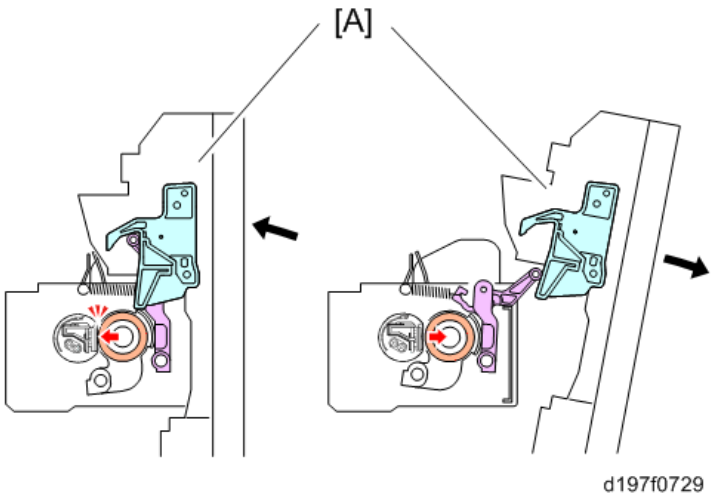
  Situated on both ends of the Fusing belt. They maintain the shape of the belt.

◆ **Fusing Drive**

The pressure roller [B] is driven by the fusing motor or fusing/paper exit motor [A]. The fusing belt [C] is driven by the pressure roller (drag rotation).



◆ **Pressure Release Mechanism**



To easily remove paper in the event of a jam in the fixing unit, a pressure release mechanism is provided.

The pressing or releasing movement is applied together with the right cover [A] open/close: When the right cover is closed, pressure is applied. When the right cover is open, the pressure is released.

◆ Fusing Temperature Control

- Warm-up mode

  After power ON, fusing warm-up begins. The fusing motor or fusing/paper exit motor is switched ON, the halogen heater is energized, and the fusing temperature is increased to the “reload target temperature.”

  When the fusing warm-up is completed, the fusing motor or fusing/paper exit motor is switched ON for a certain time, and the fusing temperature is maintained at the “reload target temperature.”

- Standby mode

  After fusing reload, when a certain time has elapsed, power supply to the halogen heater is switched OFF, and the fusing motor or fusing/paper exit motor is switched OFF. At the same time, the temperature is maintained at the “standby target temperature (SP1107-001)” by the halogen heater.

  In standby mode, the Fusing motor or fusing/paper exit motor is switched ON intermittently.

- Printing ready mode

  After returning to standby mode, the halogen heater is re-energized, and the fusing temperature is raised to the “printing ready target temperature.” If printing is not required, the machine again enters the standby mode after a certain time has elapsed.

  If printing is required in standby mode during return, the halogen heater is energized, the fusing temperature is increased to “target temperature after reload/after paper feed,” and the print job starts.

◆ **CPM Down Control**

To maintain image quality and MFP quality, this MFP has a low-temperature CPM mode and high-temperature CPM mode, and implements 3 levels of CPM down according to the usage situation and MFP state.

- Low-temperature CPM mode

  In a low-temperature environment, the fixing heater cannot keep up, and it may be difficult to maintain the fixing target temperature. To handle this, the detection temperature of the fixing center thermopile is checked at given intervals, and if the detection temperature during the check is below a threshold value, the CPM is decreased by 1 level.

  This low temperature CPM reduction is performed in the following 3 levels:

<CPM down level>

Mode	Level
Normal CPM	100%
CPM down 1	80%
CPM down 2	65%
CPM down 3	50%

- Hot CPM mode

  To shorten warm-up time and reduce the TEC value, this MFP employs a fixing unit with a low heat capacity.

  For this reason, the temperature of those parts of the fixing belt where paper does not pass easily increases, and the outside of the paper width may get extremely hot. In order to prevent the belt breakage due to this excessive temperature rise, CPM down is implemented depending on the usage conditions. CPM down can be implemented in the following 3 levels depending on the detection temperature of the temperature detection sensor, or the paper passage time.

NOTE: ***The down level % is a value for the case where a typical paper (Normal paper: A3/DLT/LT/A4) passes through the SEF. There may be some differences depending on paper size/paper thickness.***

<CPM down level>

Mode	Level
Normal CPM	100%
CPM down 1	80%
CPM down 2	50%
CPM down 3	30%

CPM down determination using a temperature detection sensor

The temperature detection sensor is checked at given intervals, and if the detection temperature is above a threshold value, the CPM is decreased by 1 level.

Since the points at which temperature tends to increase depend on the paper size, the sensor used is changed depending on the paper size.

Paper width (length)	Check sensor
A3/DLT/B4	Fixing thermistor (pressure end part)
LT/A4	Fixing thermopile (end)
B5/A5/B6/A6	Fixing thermistor (pressure center)

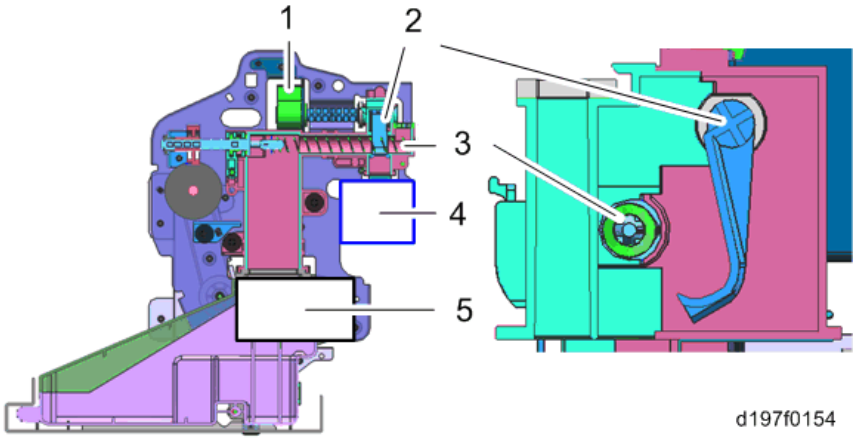
- CPM down determination using paper passage time

  Depending on the paper size, it may not be possible to determine the points on the fixing belt which tend to rise in temperature by a sensor.

  Therefore, time conditions are also used to determine CPM down, and if continuous paper passage time is above a threshold value, CPM is decreased by 1 level.

  (When CPM down is performed by time conditions, CPM does not increase thereafter.)

4.6 WASTE TONER



1: Recycling Shutter Solenoid
2: Recycling Shutter
3: Waste Toner Transfer Coil
4: Development Unit
5: Waste Toner Bottle

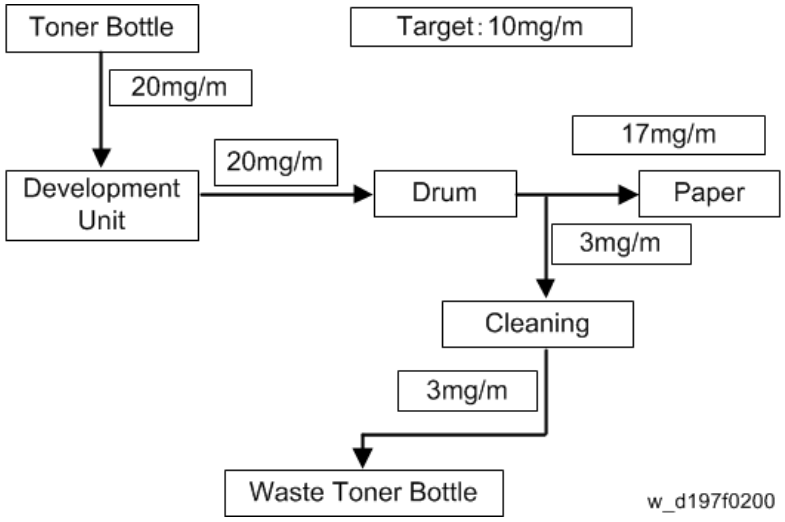
4.6.1 TONER DISCARDING

◆ **Overview**

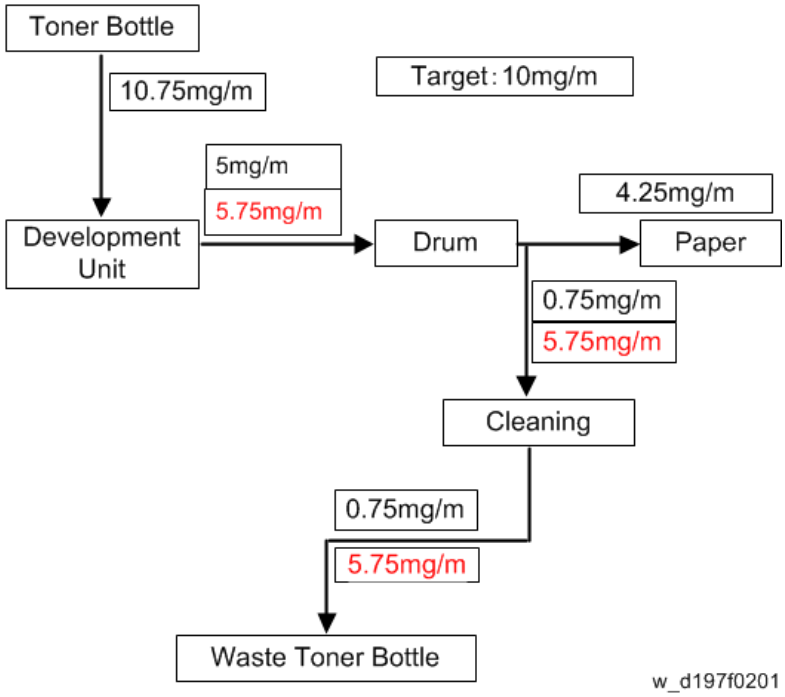
Since printing with low toner coverage ratio leaves much uncharged toner in the development unit, which degrades developer soon, the toner supply system of this model always consumes over 3% coverage of toner. All the used toner is collected into the waste toner bottle. In the condition of fewer than 3% coverage, the machine makes a belt pattern on the drum after printing a job and forcibly consumes toner. The waste toner stored in the cleaning unit by the belt pattern goes to the waste toner bottle.

The following figures illustrate the overview in the case that the toner consumption amount of 3% coverage is 10 mg/m.

6% Coverage (Toner consumption ratio = 20 mg/m)



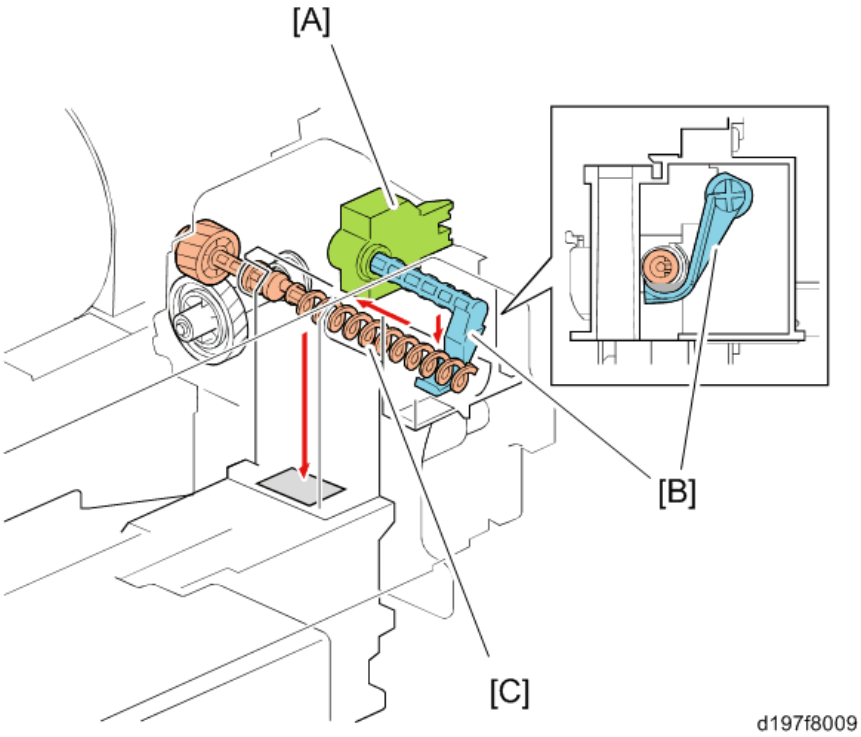
1.5% Coverage (Toner consumption ratio = 5 mg/m)



NOTE: ***Red letters indicate the toner amount that the belt patterns forcibly consume.***

4.6.2 MECHANISM

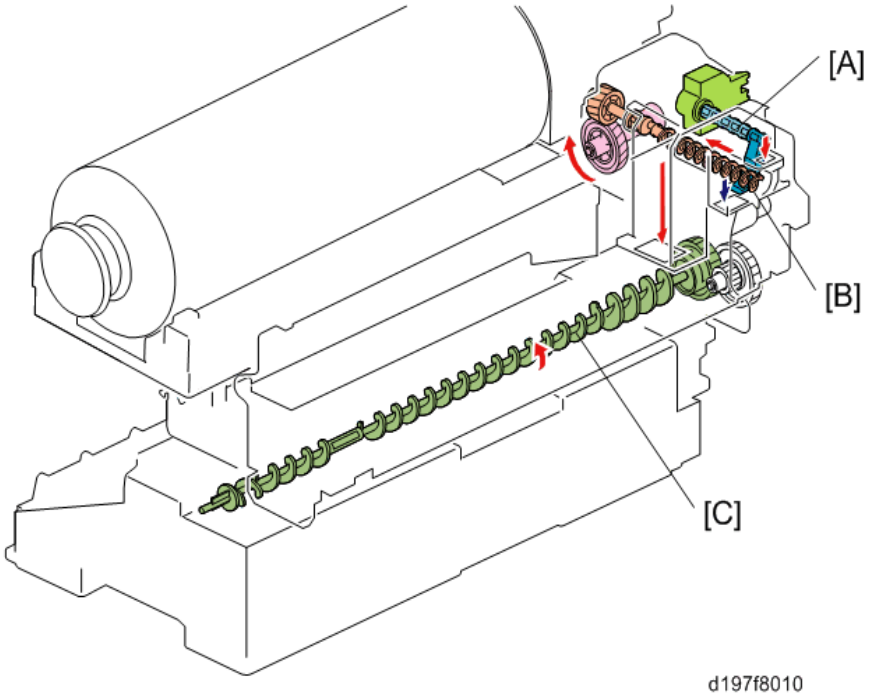
Discarding Toner



When the machine is not in the toner recycling mode, the recycling shutter solenoid [A] moves the recycling shutter [B]. As a result, the recycling shutter closes the hole underneath the waste toner transfer coil [C]. Collected toner from the OPC drum is transported to the left side by the waste toner transfer coil, and then collected toner falls into the waste toner bottle.

4.6.3 WASTE TONER BOTTLE

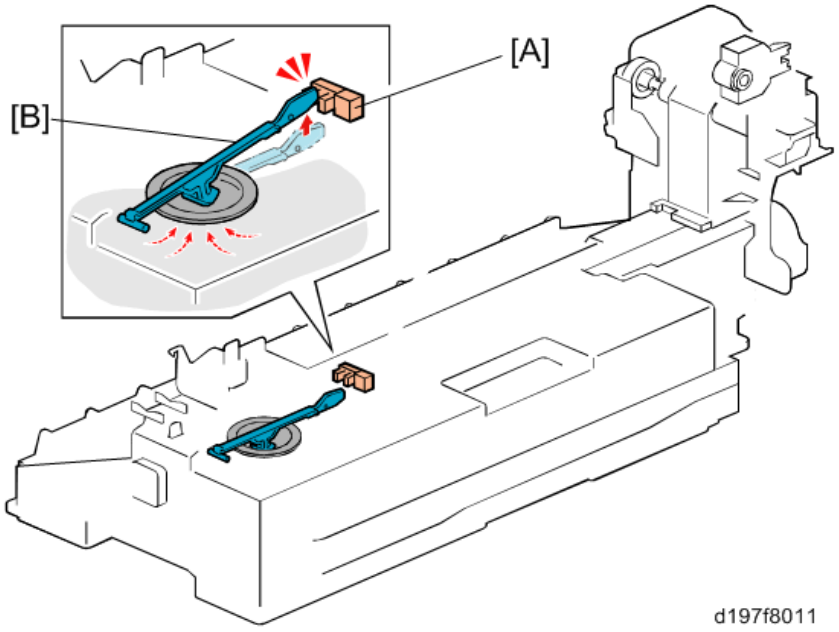
◆ **Waste Toner Bottle Drive Mechanism**



When the recycling shutter solenoid [A] moves the recycling shutter, collected toner is transported to the left side by the waste toner transfer coil [B] and falls into the development unit. The collected toner in the waste toner bottle is moved to the front side by the waste toner transport coil [C]. As a result, the height of the collected toner is kept level.

The drum/waste toner motor drives the waste toner transfer coil [B] and waste toner bottle screw [C]. In this model, there is no set detection mechanism for waste toner bottle.

◆ **Toner Collection Full Detection Mechanism**



The machine has the toner collection full sensor [A] which is located above the feeler [B] of the waste toner bottle. When the amount of collected toner in the waste toner bottle reaches about 90%, the feeler [B] is lifted and interrupts the toner collection full sensor. After the machine detects that the waste toner bottle is full based on the coverage counter or page counter, whichever comes first, the pixel counter calculates the remaining days for the waste toner bottle replacement. When the machine prints 7,500 sheets after detecting a toner near end, the toner remaining status is changed to the toner end. SP3-810-011 allows you to adjust the duration between a toner near end and toner end.

The remaining day counter = 15 days: the machine informs the status via @remote (If connected).

The remaining day counter = 5 days: the machine displays the message that indicates near full condition on the operation panel.

The remaining day counter = 0 day: the machine displays a warning on the operation panel and it stops the machine.

◆ **(Reference) Waste Toner Bottle Life (Sheet count)**

Coverage 3%: 460K

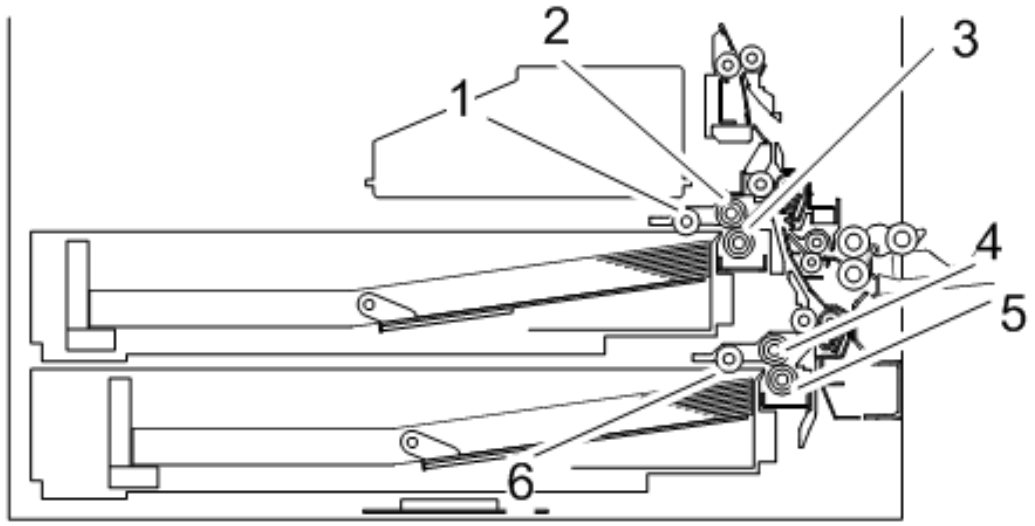
Coverage 6%: 320K

Coverage 10%: 230K

*D201 model / 5 pages per job

5. PAPER FEED & TRANSPORT

5.1 OVERVIEW



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No.	Description	No.	Description
1	Pick-up roller (1st paper tray)	4	Feed roller (2nd paper tray)
2	Feed roller (1st paper tray)	5	Friction roller (2nd paper tray)
3	Friction roller (1st paper tray)	6	Pick-up roller (2nd paper tray)

5.1.1 PAPER TRAY OVERVIEW

The paper feed tray consists of 2 stages, i.e., a main double tray and a bypass feed tray. By using both the 1st and 2nd tray as universal trays, a space-saving two-step feed is enabled.

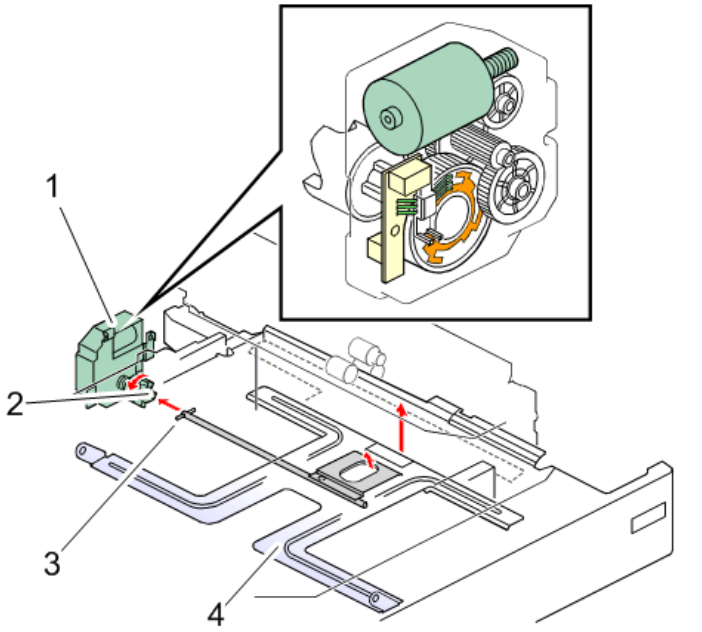
Tray	Paper size	Loading number of sheets	Corresponding paper thickness
1st/2nd paper tray	A3 - postcard	550 sheets	60 – 300 g/m^2
Bypass feed tray	12 x 18 - postcard	100 sheets	52 – 300 g/m^2
Duplex unit	A3 - postcard	Interleave	52 – 256 g/m^2

5.1.2 TRAY BOTTOM PLATE LIFTING

When the paper feed tray is set in the machine, the set switch at the rear of the tray switches ON, and it is detected that the tray is set.

The coupling between the shaft at the rear of the tray and the lift motor then engages, the motor rotates, and the tray bottom plate is lifted. The tray bottom plate lifts until the paper surface pushes up the pick-up roller, the upper limit sensor switches OFF (interrupt), and the machine enters the paper feed standby mode.

When the tray is removed, the coupling is released, and the tray bottom plate moves down. The lift motor then rotates until the coupling returns to the home position.



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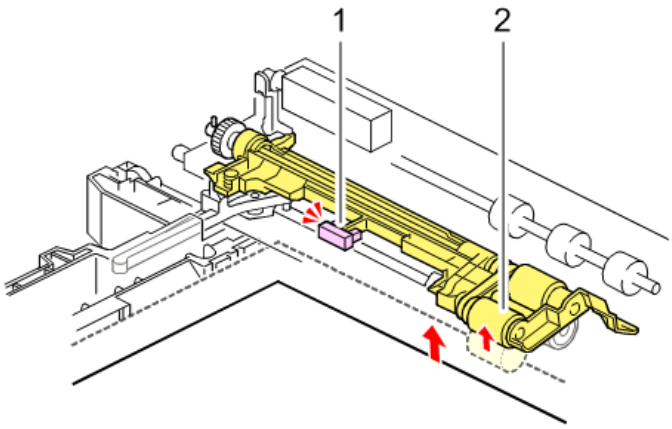
No.	Description	No.	Description
1	Tray lift motor	3	Tray rear axis
2	Coupling	4	Tray bottom plate



d197f0704

No.	Description	No.	Description
1	Upper limit sensor	2	Pick-up roller

5.1.3 PAPER FEED MECHANISM

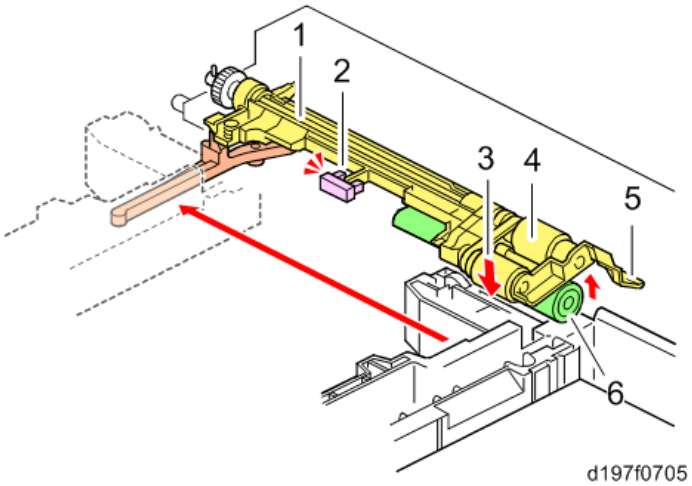
The paper feed unit employs an RF system.

In a conventional FRR system, transport of 2 sheets at a time is prevented by reverse rotation of the separating roller, but in the RF system, paper separation is assisted by the resistance of a separating roller with a torque limiter (reverse drive is not performed).

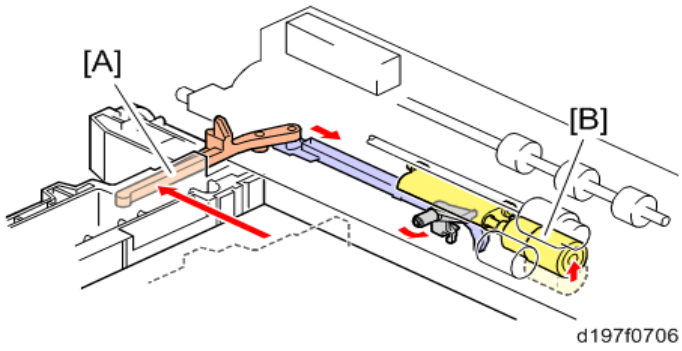
When the paper feed tray is set in the machine, an arm is pressed, the friction roller comes in contact with the feed roller, and the pick-up roller contacts the top of the paper (to prevent paper remaining, when the paper feed tray is withdrawn, the arm returns and contact with the rollers is released).

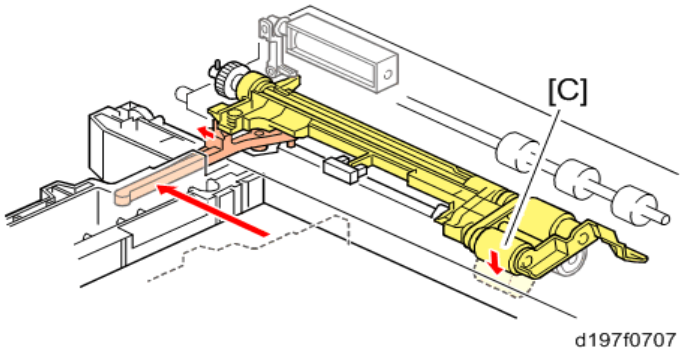
The machine enters paper supply standby mode when the tray bottom plate moves up. When the paper feed motor is switched ON, the rollers rotate and paper is supplied.

The roller holder functions as a paper guide and roller clip ring. The roller holder prevents the paper from winding up.



No.	Description	No.	Description
1	Pickup arm	4	Feed roller
2	Upper limit sensor	5	Feed guide
3	Pick-up roller	6	Friction roller





No.	Description	No.	Description
1	Pick-up arm	3	Pick-up roller
2	Friction roller		

5.1.4 PAPER FEED TRANSPORT MECHANISM

In order to maintain a proper interval of each paper, this machine has a paper feed sensor near the paper feed roller to adjust the timing of paper feeding.

STEP1 **The Paper feed motor is switched ON, and the first sheet is supplied.**

STEP2 **The paper feed motor switches OFF right before the rear edge of the first sheet completely passes the paper feed roller.**

STEP3 **The pick-up arm lowers the pick-up roller, which makes the pick-up roller contacting with the surface of the paper when the rear edge of the first sheet finishes passing the paper feed roller.**

STEP4 **The paper feed motor switches ON to supply the second sheet of paper when the first sheet is transported for a predetermined distance by the downstream transport roller.**

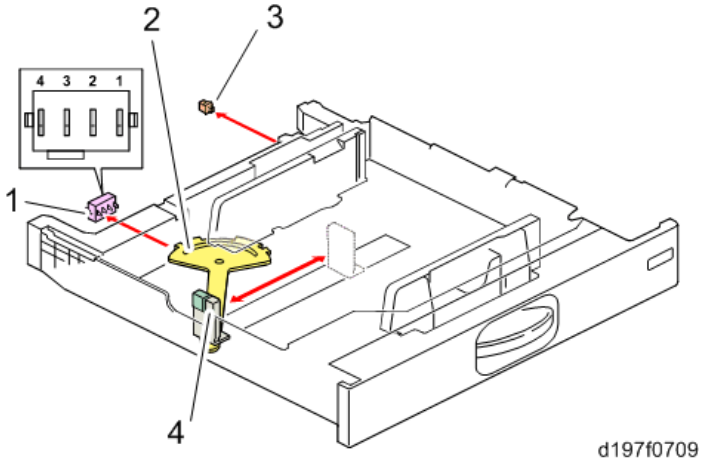
5.1.5 PAPER SIZE DETECTION (1ST / 2ND PAPER TRAY)

The end fence interlocking rotation detection plate is an automatic detection system which recognizes patterns by a 4-position push switch.

Size is detected by the detection patterns of knobs 1, 2, 3, and 4. Tray set is detected by the tray set switch.

If there has been a change in the pattern, “machine tray automatic size detection” control is performed continuously.

If the paper size is selected manually by user setting, the automatic size detection is overridden.



No.	Description	No.	Description
1	Size detection switch	3	Tray set switch
2	Size detection feeler	4	End fence

- Tray detection sizes:

  SRA3, A3, B4, A4 SEF, LT SEF, B5 SEF, A4 LEF, B5 LEF, and A5 LEF

- Tray size detection patterns

Size	Knob			
	4	3	2	1
A3(DLT)	0	1	0	0
B4(LG)	0	0	1	1
	0	1	1	1
A4 SEF	1	1	1	0
LT SEF	1	1	0	0
B5 SEF	1	0	0	0
A4 LEF (LT LEF)	0	0	0	1
B5 LEF (Exe LEF)	0	0	1	0
A5 LEF	0	1	0	1

* “0” is switch ON (PUSH), “1” is switch OFF.

* The figures in parentheses are automatic detection sizes which can be switched over in SP mode

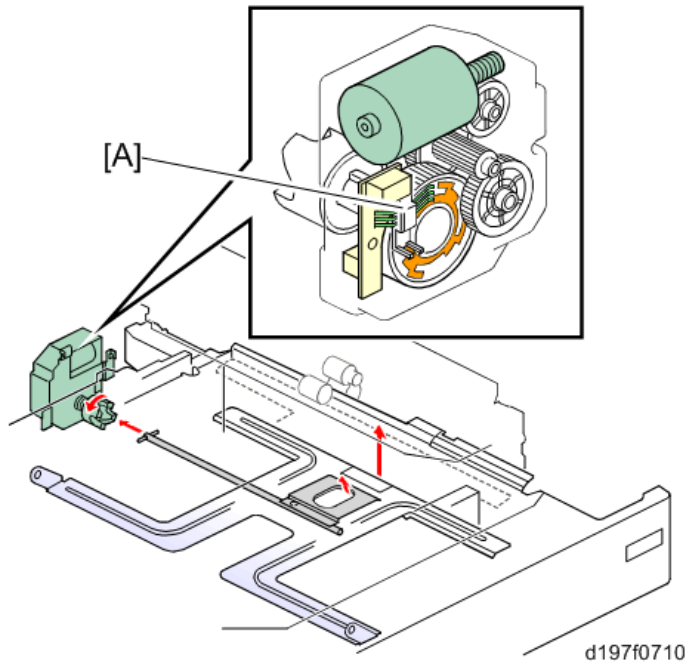
(for SP settings, see “SP mode (paper supply transport)” : SP5-181-005 to 008, SP5-131-001).

* Exe LEF=10.5" x 7.25"

* If a pattern other than the above is detected, “Unknown Pattern” is displayed on the control panel.

5.1.6 REMAINING PAPER DETECTION

When the tray lift motor rotates, the remaining paper detection sensors 1, 2 built into the motor switch ON (pass) or OFF (interrupt). Paper remaining in the paper feed tray is detected by a combination of this ON/OFF.

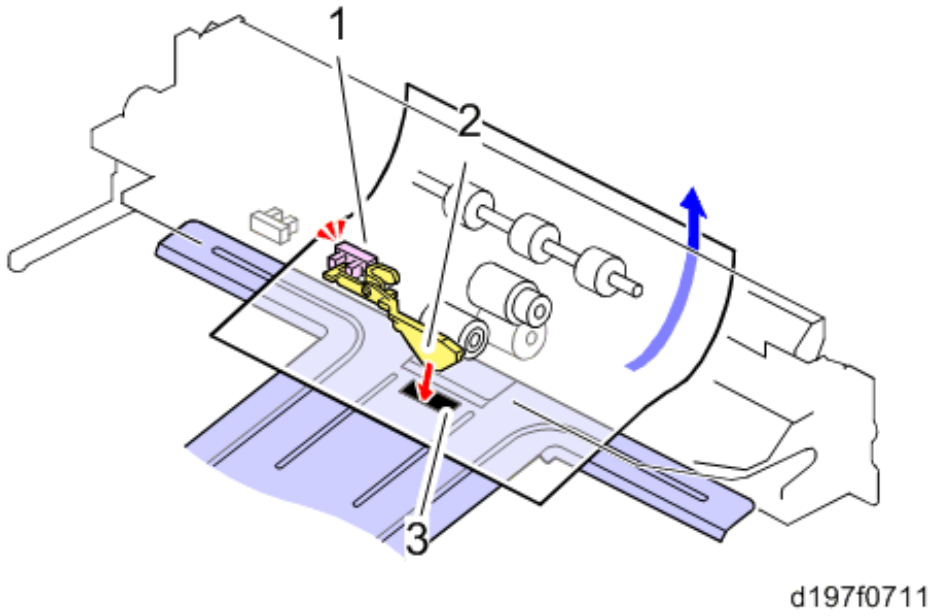


There are the following 4 remaining paper detection levels:

Remaining paper status	100%	70%	30%	10%
Remaining paper status sensor 1	ON	OFF	OFF	ON
Remaining paper status sensor 2	ON	ON	OFF	OFF
Control panel remaining paper display	Bar 4	Bar 3	Bar 2	Bar 1

5.1.7 PAPER END DETECTION

When there is no more paper in the paper feed tray, the leading edge of the paper end feeler falls into a notch in the tray bottom plate, and the paper end detection sensor at the rear edge of the end feeler switches ON (pass).

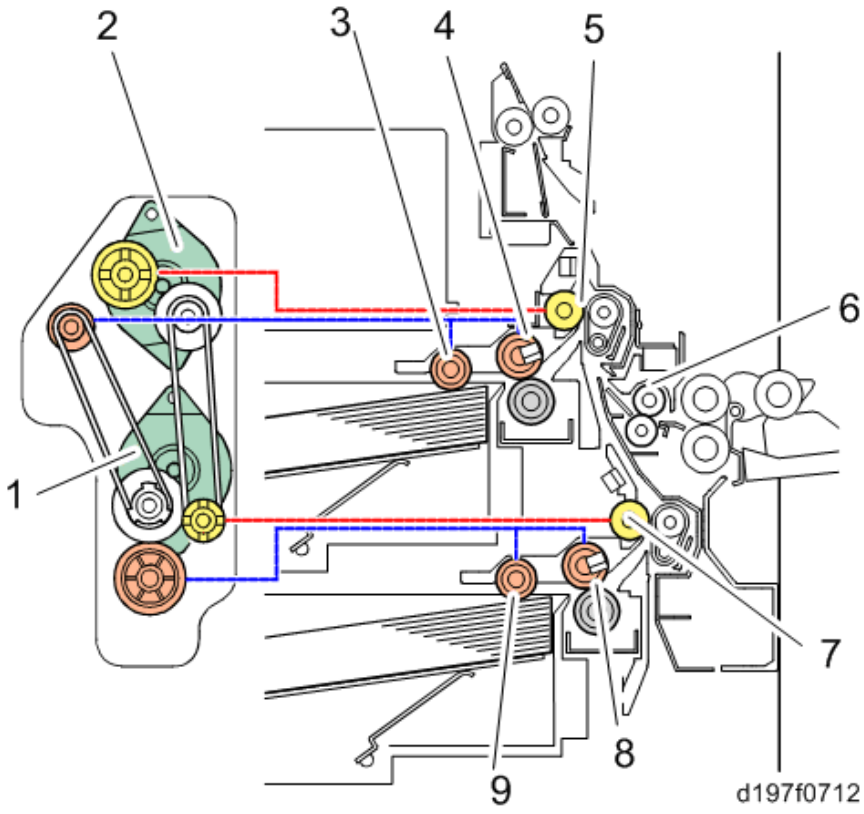


No.	Description	No.	Description
1	Paper end sensor	3	Notch
2	End feeler		

5.1.8 PAPER FEED DRIVE

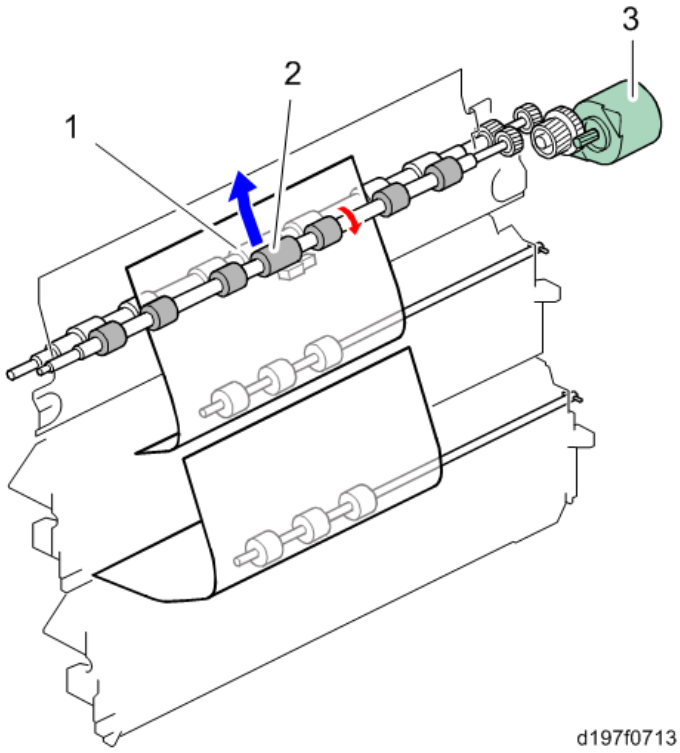
The 1st/2nd pick-up rollers and 1st/2nd paper feed rollers are driven by the paper feed motor. The 1st/2nd separating rollers are driven by the vertical transport motor.

A bypass transport roller is driven by a duplex/bypass motor, and the registration roller is driven by the registration motor.



No.	Description	No.	Description
1	Paper feed motor	6	Bypass transport roller
2	Vertical transport motor	7	Vertical transport roller (2nd tray)
3	Pick-up roller (1st tray)	8	Paper feed roller (2nd tray)
4	Paper feed roller (1st tray)	9	Pick-up roller (2nd tray)
5	Vertical transport roller (1st tray)		

Registration roller corrects skews of paper to match a leading edge of an image on the drum with paper selections. The registration roller (Driven) employs a plastic roller to correct skews. The registration roller (Drive) employs a rubber roller to enhance its transport capability. Registration buckle for each tray or paper type can be adjustable with SP1-003.

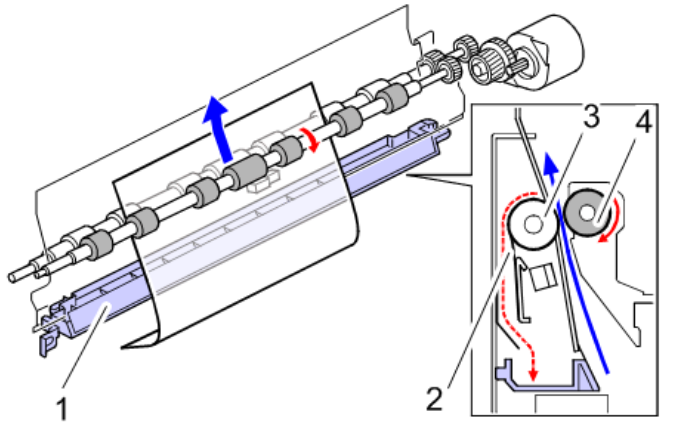


d197f0713

No.	Description	No.	Description
1	Registration roller (Driven)	3	Registration motor
2	Registration roller (Drive)		

5.1.9 PAPER POWDER REMOVAL MECHANISM

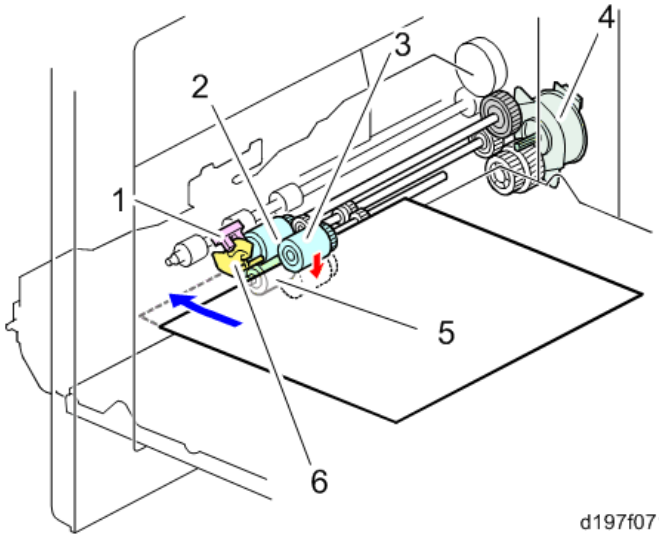
The registration part of the machine removes paper scrap by 1 paper removal sheet in contact with the driven roller (resin). Paper scrap removed by the paper removal sheet is collected in a paper removal container.



d197f0714

No.	Description	No.	Description
1	Paper powder removal container	3	Registration roller (Driven)
2	Paper powder removal sheet	4	Registration roller (Drive)

5.2 BYPASS FEED SECTION



d197f0715

No.	Description	No.	Description
1	Bypass paper end sensor	4	Bypass/Duplex motor
2	Bypass paper feed roller	5	Bypass Reverse roller
3	Bypass pick-up roller	6	Paper detection filler

5.2.1 BYPASS FEED PAPER/SEPARATION MECHANISM

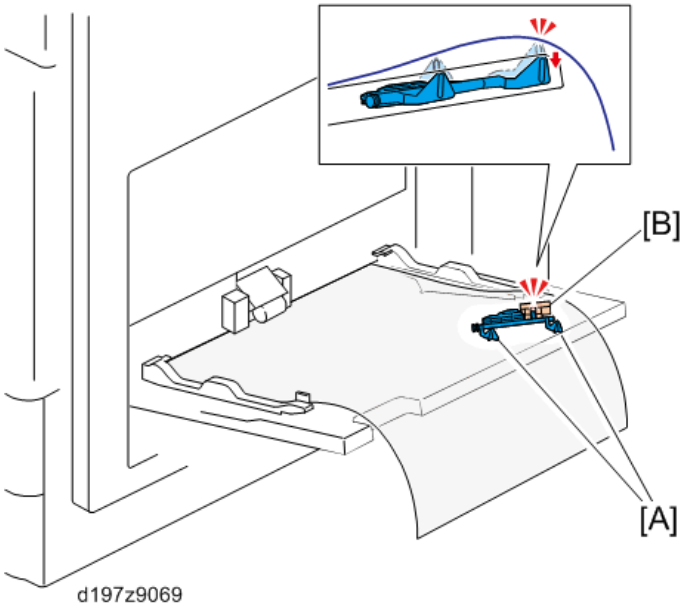
The manual paper feed mechanism employs an FRR system. The bypass feed unit comprises a paper feed roller, reverse roller and bypass pick-up roller.

When the paper feed tray is selected and the machine is started, the bypass pick-up solenoid is switched OFF, and paper is supplied by the duplex/bypass motor (CCW).

*1 The bypass pick-up roller does not come in contact with the paper surface by default. It is opposite to the paper feed tray.

5.2.2 BYPASS FEED PAPER SIZE DETECTION

Paper size width detection is performed by a bypass feed size detection switch (rotary switch).
The bypass feed size detection switch has a rotation plate which rotates together with the side fence of the bypass feed table, and detects the paper size.
Paper portrait/landscape is determined by a length detection sensor.
Two feelers [A] for the bypass paper length sensor [B] are added to the rear of the tray to prevent a false detection in paper length detection caused by floating on the rear of paper when large size paper is set without pulling out the extension bypass tray.



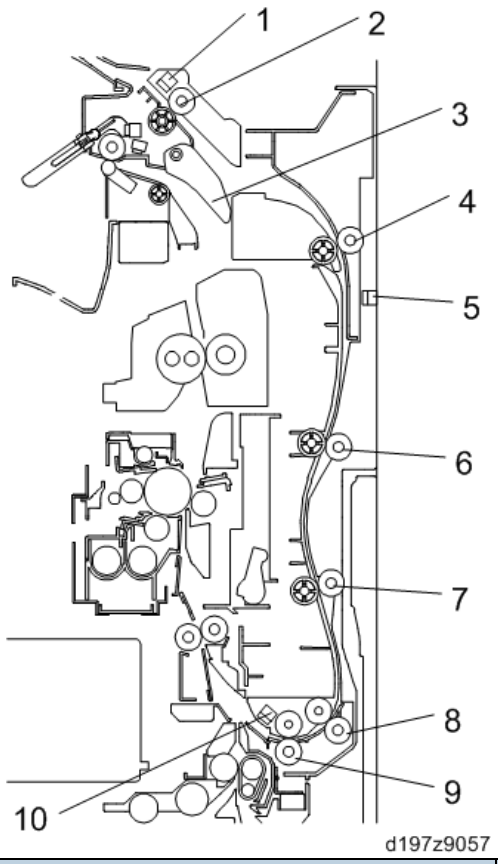
5.2.3 BYPASS FEED PAPER END DETECTION

To detect bypass feed paper end, a paper detection filler and bypass feed paper end sensor are provided.
When the paper is set, the bypass paper end sensor switches ON (interrupt), and paper set is detected.
When there is no more paper, a detection filler falls into a hole in the bypass feed table, the bypass paper end sensor switches OFF (pass), and paper end is detected.

5.2.4 BYPASS PAPER FEED DRIVE

The paper feed roller, reverse roller and pick-up roller are driven by the duplex/bypass feed motor.

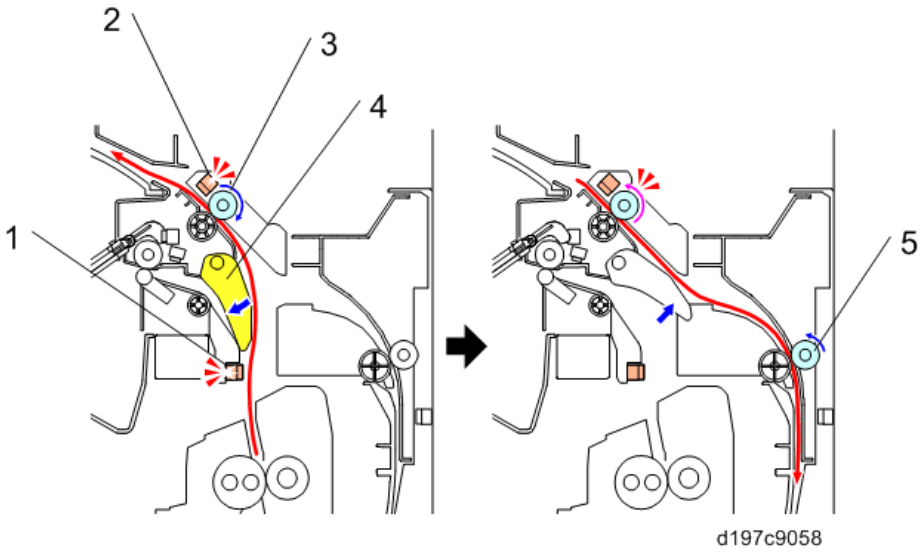
5.3 DUPLEX SECTION



No.	Description	No.	Description
1	Reverse sensor	6	Duplex entrance roller 2
2	Reverse roller	7	Duplex transport roller 1
3	Junction gate	8	Duplex transport roller 2
4	Duplex entrance roller 1	9	Duplex exit roller
5	Duplex entrance sensor	10	Duplex exit sensor

5.3.1 TRANSPORT REVERSE MECHANISM

The paper passes through the junction gate, and is transported to the reverse tray by the reverse roller. After the trailing edge of paper has left the fusing exit sensor, the junction gate is moved to the duplex path direction and the reverse motor starts rotating reversely.



No.	Description	No.	Description
1	Fusing exit sensor	4	Junction gate
2	Reverse sensor	5	Duplex entrance roller 1
3	Reverse roller		

5.3.2 DUPLEX DRIVE

The rollers are driven by the following motors:

Rollers	Drive sources
Reverse roller	Reverse motor
Duplex entrance roller 1	Duplex entrance motor
Duplex entrance roller 2	Duplex entrance motor
Duplex transport roller 1	Duplex/bypass motor
Duplex exit roller	Duplex/bypass motor

5.3.3 INTERLEAVE MECHANISM

The duplex unit performs interleave to reduce the overall duplex copying time.

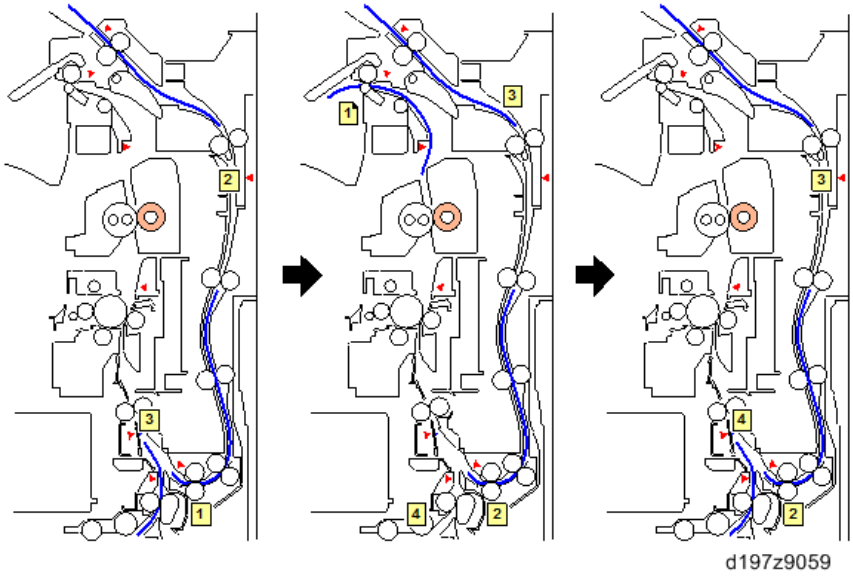
<Paper exit from machine>

Length	No. of interleaves
Less than 216 mm	3
216-432 mm	2
*When bypass/duplexing (regardless of paper sizes)	1

<1bin exit from machine>

Length	No. of interleaves
Less than 216 mm	2
216-432 mm	1

- 3 sheet leave

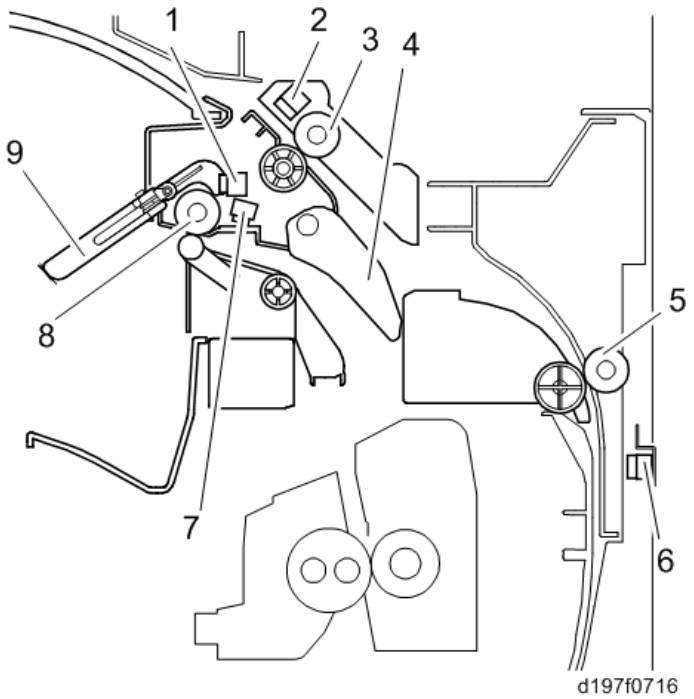


Back side of 1st sheet -> Back side of 2nd sheet -> Back side of 3rd sheet -> Front side of 1st sheet -> Back side of 4th sheet -> Front side of 2nd sheet

- 2 sheet leave

Back side of 1st sheet -> Back side of 2nd sheet -> Front side of 1st sheet -> Back side of 3rd sheet -> Front side of 2nd sheet

5.4 PAPER EXIT UNIT



No.	Description	No.	Description
1	Paper exit full sensor	6	Duplex entrance sensor
2	Reverse sensor	7	Paper exit sensor
3	Reverse roller	8	Paper exit roller
4	Junction gate	9	Paper exit full feeler
5	Duplex entrance roller		

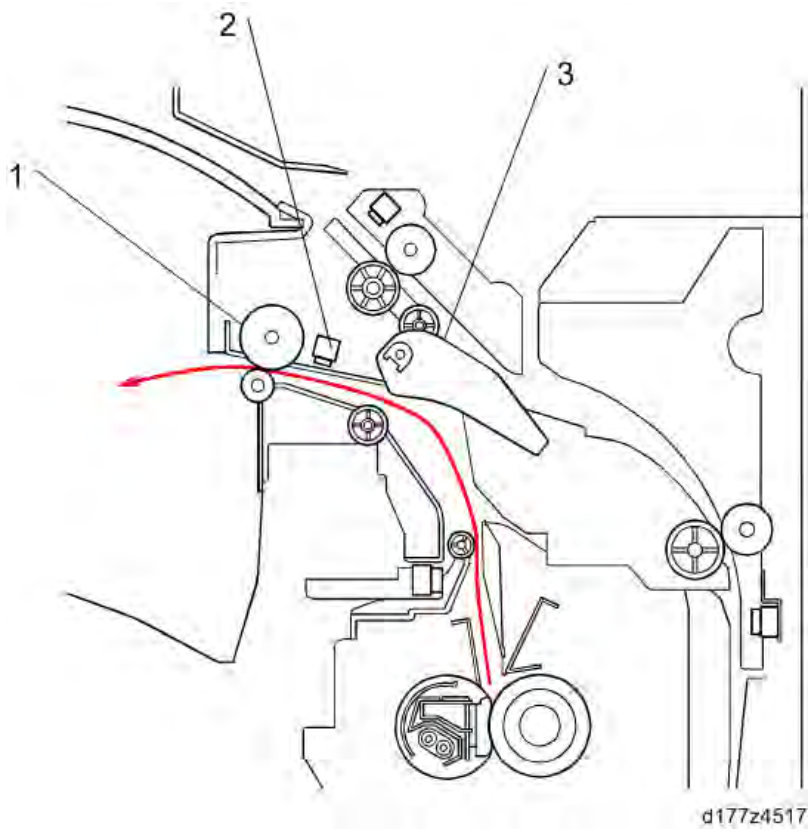
5.4.1

5.4.2 DELIVERY LOCATION CHANGE-OVER

The paper transported from the fusing unit is changed over by the junction gate in the “machine paper exit/bridge unit” direction or the “reverse tray/1 bin unit” direction.

◆ **Machine paper exit/bridge unit direction**

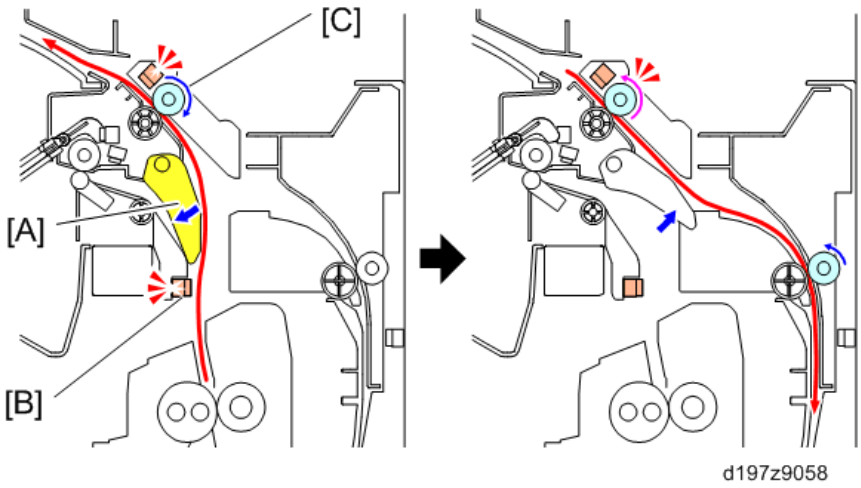
1. The registration sensor switches ON.
2. The fusing/ paper exit motor (*D197/D198/D199) or the paper exit motor (*D200/D201/D202) switches ON (CCW).
3. When the rear edge of the paper leaves the paper exit roller, the fusing/paper exit motor or the paper exit motor switches OFF.



No.	Description
1	Paper exit roller
2	Paper exit sensor
3	Junction gate

◆ **Reverse tray/1 bin unit direction**

4. Registration sensor switches ON.
5. The reverse motor switches ON (CCW).
6. Before the leading edge of the paper reaches the junction gate [A], the junction gate moves in the reverse tray/1 bin unit direction.
   * If the junction gate is in the reverse tray/1 bin unit direction, the junction gate is not changed over.
7. After the trailing edge of the paper has left the fusing exit sensor [B], the exit junction solenoid switches OFF.
8. When the trailing edge of the paper leaves the reverse roller [C], the reverse motor switches OFF.



5.4.3 PAPER EXIT FULL AND JAM DETECTION

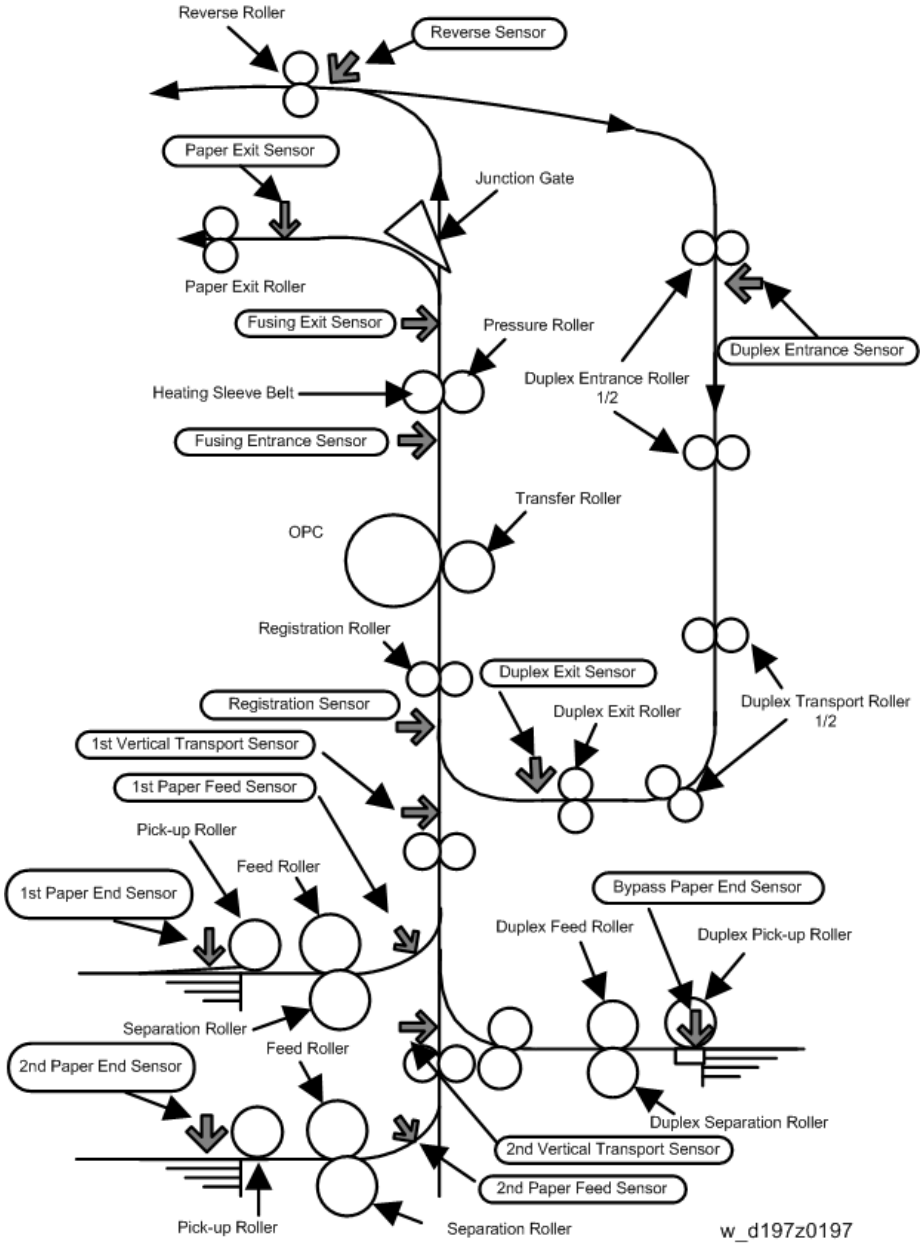
◆ **The paper exit full sensor detects paper exit jam.**

When outputs push up the paper exit full feeler, the paper exit full sensor detects that standard output tray is full of outputs and a jam message is displayed after a job end.

◆ **Paper exit sensor**

When a sheet of paper stays in the paper exit unit, the paper exit sensor detects the paper jam and a jam message is displayed.

5.5 PAPER PATH AND SENSOR LOCATIONS



5.5.1 INTERVALS OF ROLLERS

Module	From	To	Interval (mm)
1st Paper Feed Unit	Pick-up Roller (1st tray)	Feed Roller (1st tray)	30.0
	Feed Roller (1st tray)	1st Vertical Transport Roller	43.0
2nd Paper Feed Unit	Pick-up Roller (2nd tray)	Feed Roller (2nd tray)	30.0
	Feed Roller (2nd tray)	2nd Vertical Transport Roller	43.0
	2nd Vertical Transport Roller	1st Vertical Transport Roller	96.9
Registration Unit	1st Vertical Transport Roller	Registration Roller	84.8
	Registration Roller	Transfer Roller	83.5
Fusing Unit	Transfer Roller	Heating Sleeve Belt	102.9
Paper Exit Unit	Heating Sleeve Belt	Paper Exit Roller	138.5
Reverse Unit	Heating Sleeve Belt	Reverse Roller	138.5
	Reverse Roller	Duplex Entrance Roller 1	131.3
Duplex Unit	Duplex Entrance Roller 1	Duplex Entrance Roller 2	120.1
	Duplex Entrance Roller 2	Duplex Transport Roller 1	89.6
	Duplex Transport Roller 1	Duplex Transport Roller 2	84.0
	Duplex Transport Roller 2	Duplex Exit Roller	27.1
	Duplex Exit Roller	Registration Roller	88.0
Bypass Feed Unit	Duplex Pick-up Roller	Duplex Feed Roller	30.0
	Duplex Feed Roller	Duplex Transport Roller	24.5
	Duplex Transport Roller	1st Vertical Transport Roller	56.0

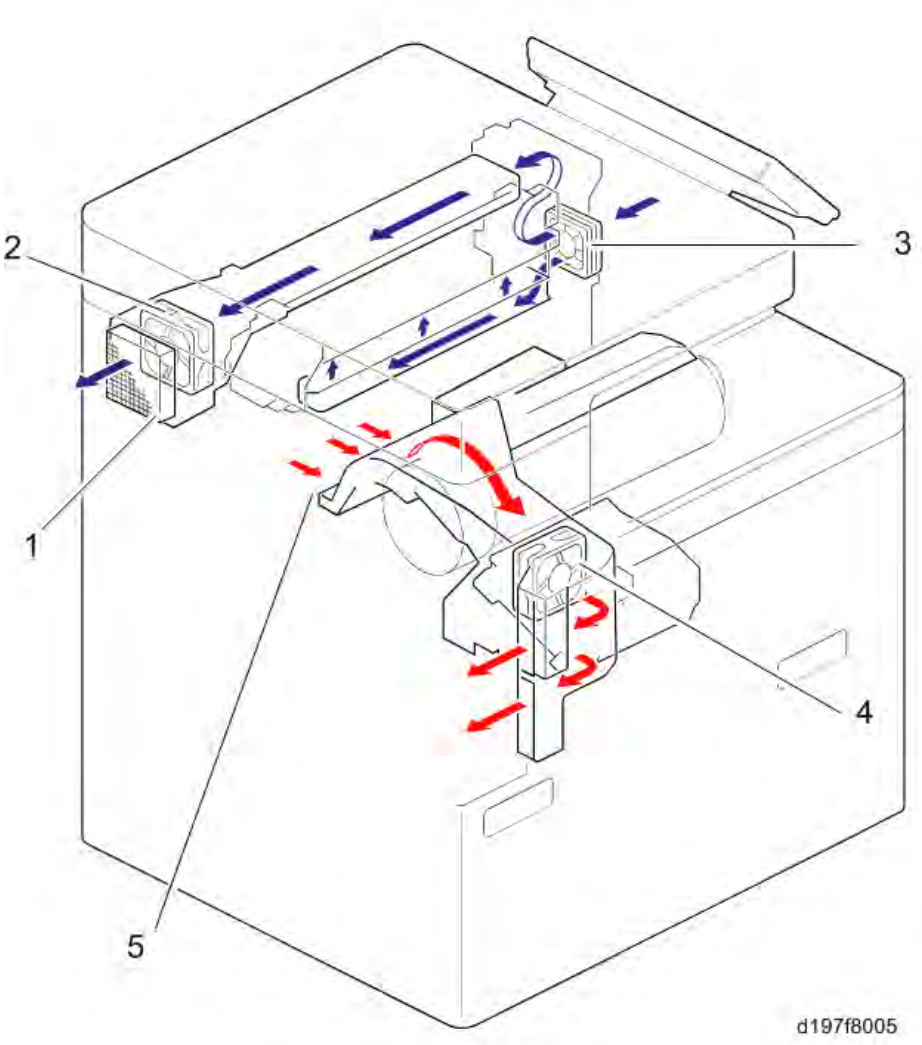
5.5.2 INTERVALS OF SENSORS

Module	From	To	Interval (mm)
1st Paper Feed Unit	Feed Roller (1st tray)	1st Paper Feed Sensor	5.0
	1st Vertical Transport Roller	1st Vertical Transport Sensor	16.8
2nd Paper Feed Unit	Feed Roller (2nd tray)	2nd Paper Feed Sensor	5.0
	2nd Vertical Transport Roller	2nd Vertical Transport Sensor	24.3
	2nd Vertical Transport Sensor	1st Vertical Transport Sensor	88.7
Registration Unit	Registration Sensor	Registration Roller	17.0
Paper Exit Unit	Paper Exit Sensor	Paper Exit Roller	17.0
Reverse Unit	Reverse Roller	Reverse Sensor	14.0
Duplex Unit	Duplex Entrance Roller 1	Duplex Entrance Sensor	34.0
	Duplex Exit Roller	Duplex Exit Sensor	17.1
1-bin Unit	Reverse Sensor	1-bin Exit Roller	-

6. AIR FLOWS (FAN CONTROL)

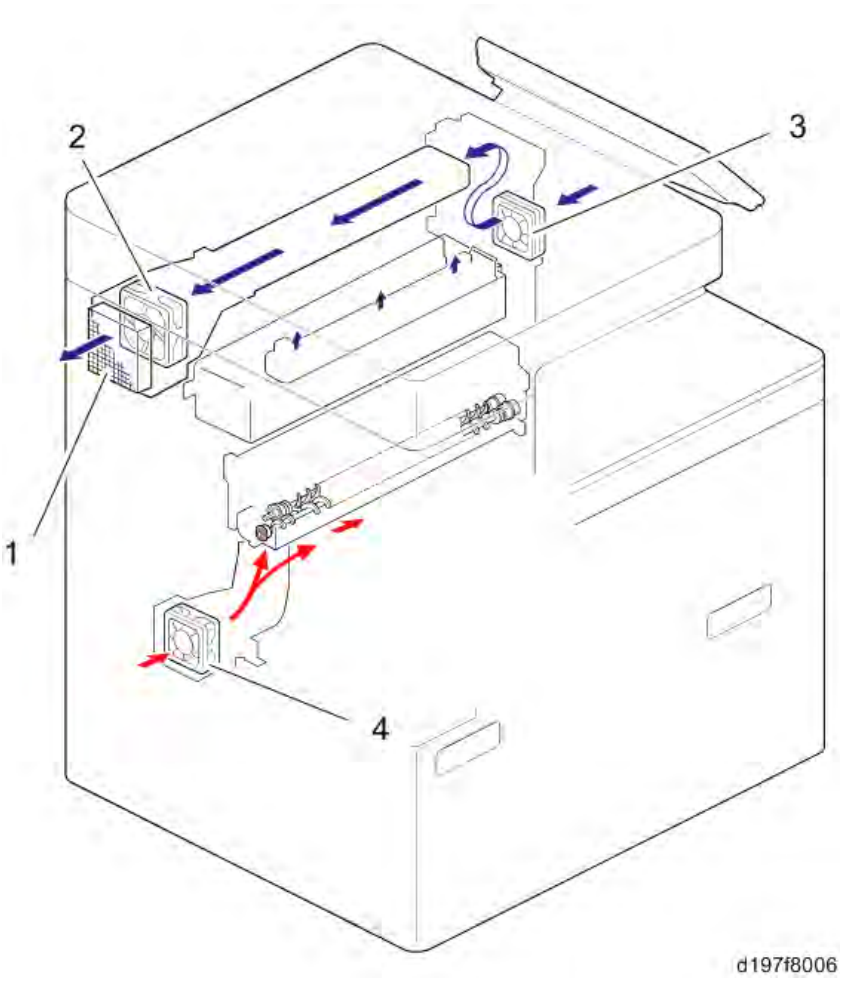
6.1 OVERVIEW

Around the Development Unit / Laser Unit



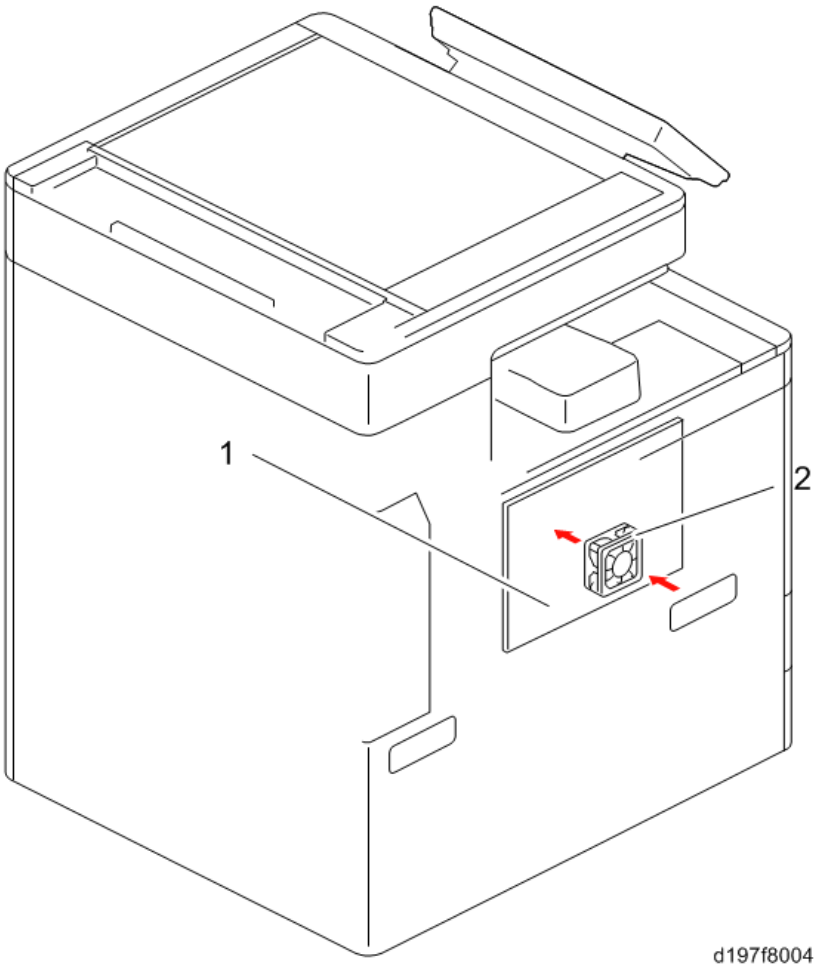
No.	Part Name
1	Odor filter
2	Fusing fan
3	Paper exit fan
4	Development exhaust fan
5	Dust filter

Around the Fusing Unit and Development Unit



No.	Part Name
1	Odor filter
2	Fusing fan
3	Paper exit fan
4	Development bearing cooling fan (D200/D201/D202 only)

Around the PSU



No.	Part Name
1	PSU board
2	PSU cooling fan (D200/D201/D202 only)

6.2 MECHANISM

By installing the duct corresponding to each fan, the air flow is efficiently controlled to a cooling target. Moreover, improvement in quietness and energy-saving efficiency is achieved by performing stepwise operation of the fan according to the imaging temperature.

6.2.1 COOLING OF PSU

The PSU is cooled by the PSU cooling fan, cooling the PSU board directly. Note that the PCU cooling fan is installed on D200/D201/D202 models only.

6.2.2 COOLING OF DEVELOPMENT UNIT

The cooling for development unit is provided by a development bearing cooling fan that takes air in from the rear of the machine outside and applies the air to the bearing of mixing auger and bottom side of the development unit.
Note that the development bearing cooling fan is installed on D200/D201/D202 models only.

6.2.3 COOLING OF PCDU

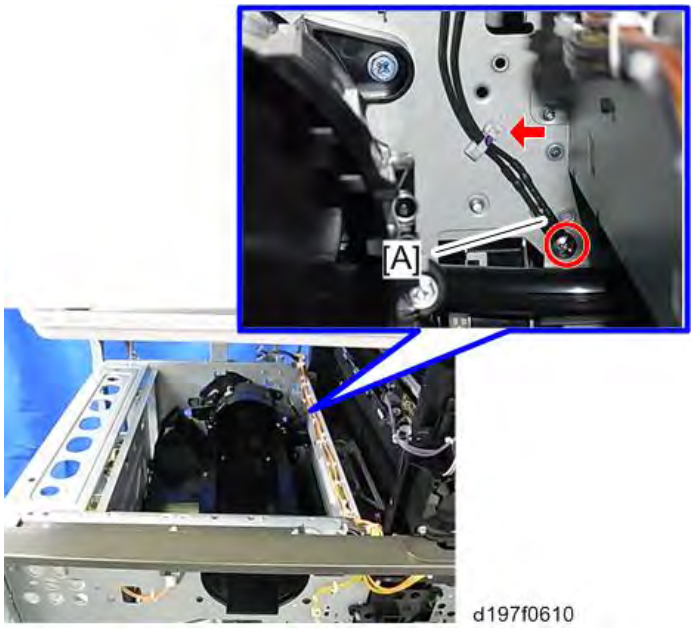
Air taken in from the PCDU cleaning unit is taken out from the left rear exhaust. An air-flow duct is installed at between the fusing unit and the toner bottle, to suppress excessive temperature rise of the toner bottle.

6.2.4 COOLING OF FUSING UNIT

Air taken in from the paper exit fan at the front is discharged from the fusing fan at the rear to outside the machine. By cooling the paper immediately after fusing, it is used for not only cooling of the paper exit sensor but also reduction of stored heat of stack paper and reduction of curl are realized. This also serves to prevent dew condensation of the paper discharge guide sheet. As a measure against odor, an odor filter is installed downstream from the fusing fan.

6.2.5 CRISIS MANAGEMENT WHEN TEMPERATURE RISES IN THE MFP

In order to suppress excessive temperature rise in the MFP and maintain equipment quality, a temperature detection sensor (imaging temperature sensor (thermistor)) [A] is installed in the MFP. The imaging temperature sensor (thermistor) detects the temperature environment in the MFP, and controls cooling operation.



◆ **Overview of cooling operation in the machine**

The temperature in the machine is detected during output and after output, and the interior of the machine is cooled by fan operation (stepwise operation of fan, prolonged fan rotation after paper has passed through) according to the temperature inside the machine.
However, if the temperature inside the machine rises significantly due to passing a large volume of paper, in addition to fan operation, the CPM is specified to control the temperature in the machine.

◆ **The Conditions of Fans Operation**

The following table illustrates how/when the fans operate under the specific conditions of the main machine.

Condition	Development Exhaust Heat Fan	Paper Exit Fan	Fusing Fan	Development Bearing Cooling Fan*2	PSU Cooling Fan*2
Warm-up	Stops	Stops	Stops	Stops	Stops
Standby	Rotates in low speed	Stops	Rotates in low speed	Stops	Stops
During printing	Rotates	Rotates	Rotates	Rotates	Rotates
After printing	Rotates in low speed *1	Stops*1	Rotates in low speed*1	Stops*1	Stops*1
Abnormal (Jams)	Stops	Stops	Stops	Stops	Stops

*1 When the temperature in the machine reaches 45.5 degrees, these fans keep revolving until the temperature decreases by two degrees.

*2 D200/D201/D202 only

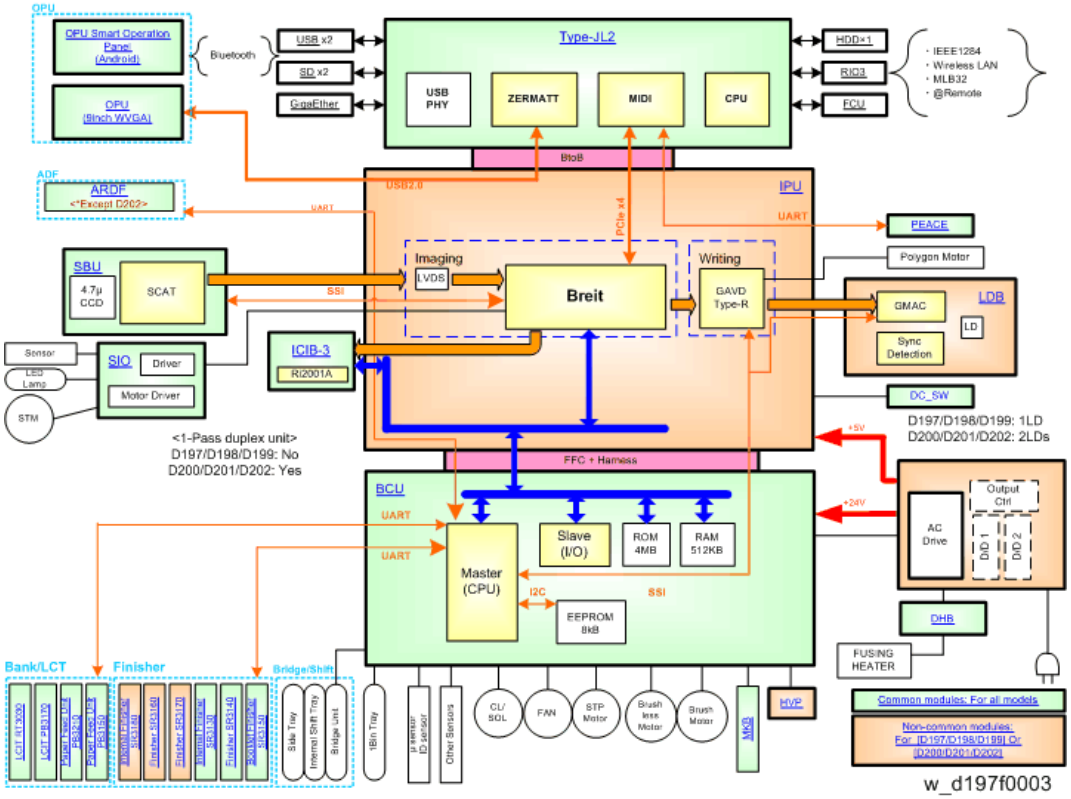
◆ **Print Duty Control**

9. The machine repeats a 16-page-print and 25-second-pause. The following two messages will alternatively appear on the operation panel.
   "The printing speed is now being limited, because the internal cooling fan is active."
   "Internal cooling fan is active."
10. All the fan motors in the machine works after printing and standby. The message will appear on the operation panel.
    "Internal cooling fan is active."
11. If the temperature of the image processing unit reaches under the pre-set temperature, the machine turns to the normal control.

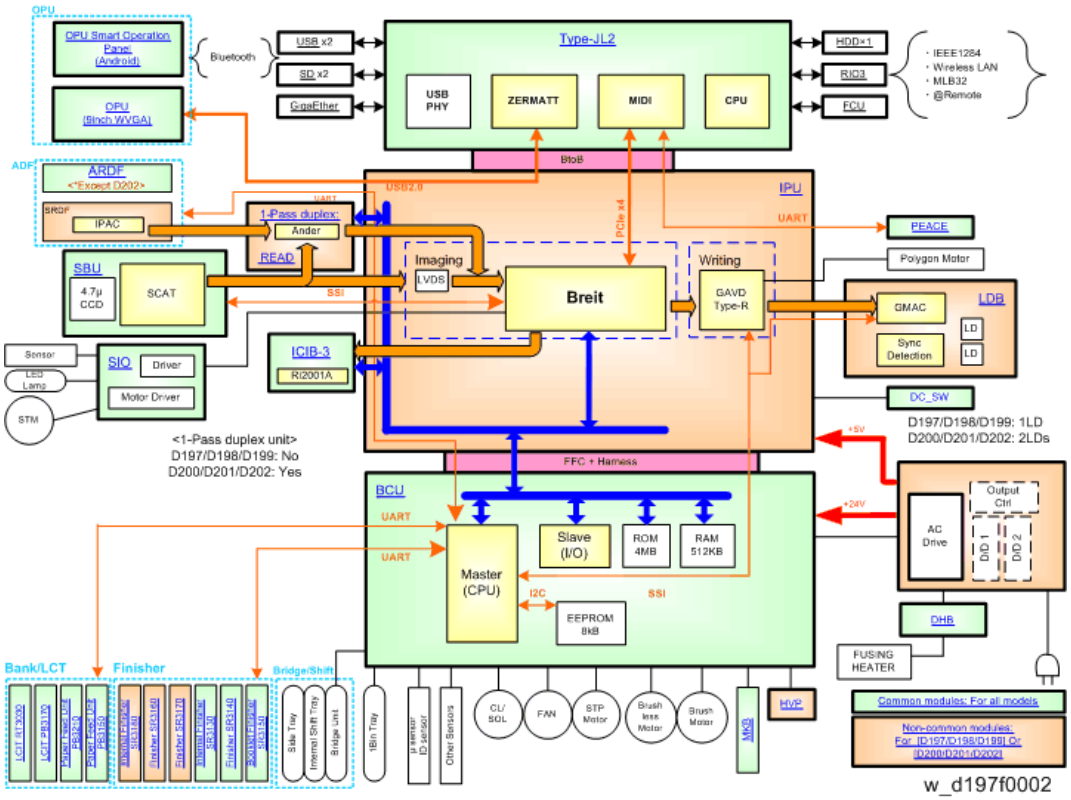
7. ELECTRICAL PARTS

7.1 BLOCK DIAGRAM

For D197/D198/D199 models



For D200/D201/D202 models



7.1.1 BOARD OUTLINE

Controller

Controls the MFP system overall. Comprises an MIPS CPU, controller ASIC, IO control ASIC, and RAM.

SBU

Read control circuit which performs analog signal processing and AD image conversion of the CCD read image.
It also has an IPU I/F, and controls scanner input output signals according to CPU commands.

SIO

Circuit which controls generation of SBU power, scanner internal sensor I/F, carriage drive stepping motor and LED drive.

LDB

LD control circuit which drives the laser diode by a universal driver.

BCU

Controls the engine, as well as MFP engine sensor, motor and solenoid (The BCU has the IOB functions).

IPU

Processes digital signals by an IPU.

IPU-Sub

Processes digital signals from the image sensor in the SPDF.

FCU

Controls the fax program.

OPU

Controls the control panel.

HVPS

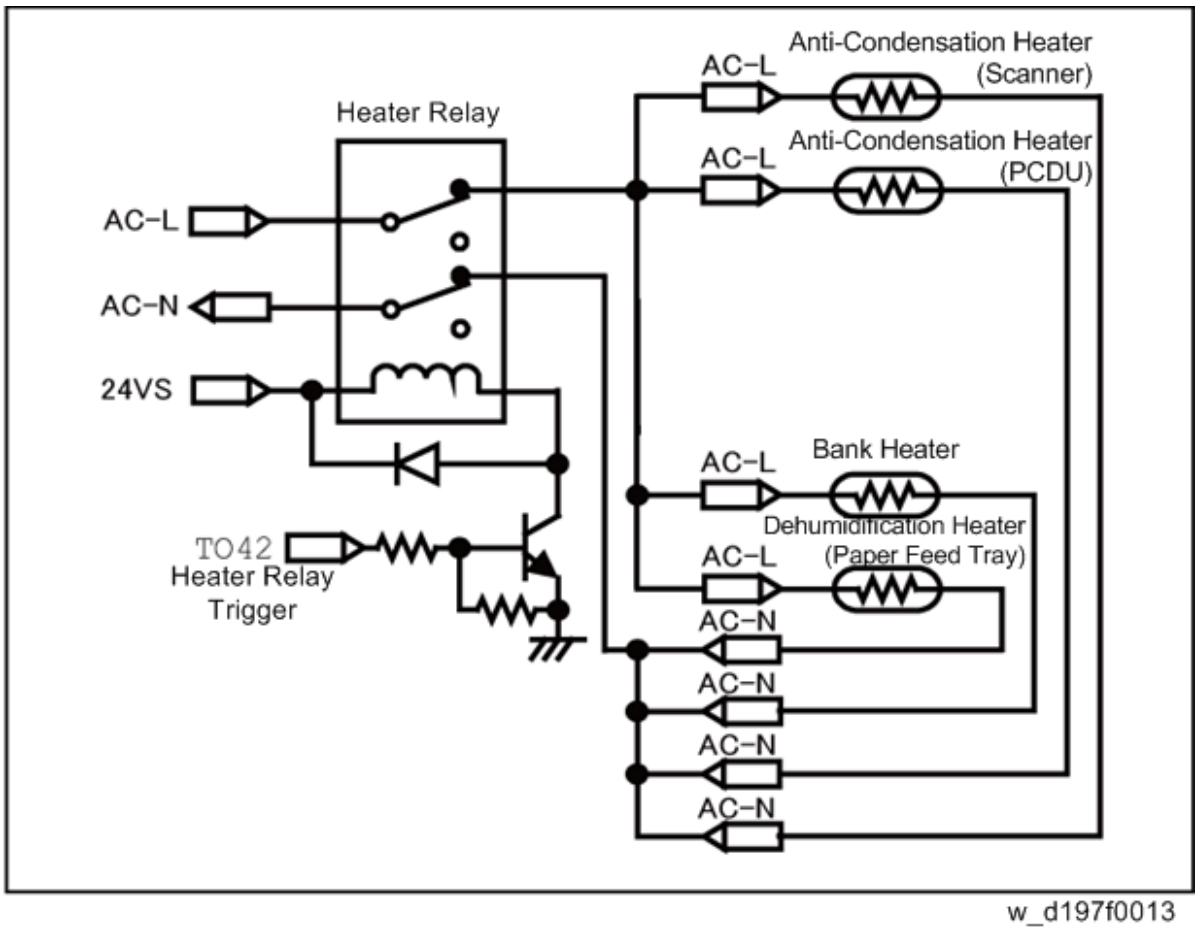
Generates the high-voltage power required for process control. The HVPS consists of two units: TTS for transfer and CB for charging/developing.

PSU

Generates DC power from a commercial AC power supply, and supplies it to each control circuit.
Comprises an A/C drive circuit for controlling the fusing lamp.

7.2 FEED TRAY DEHUMIDIFIER HEATER, SCANNER/PCDU ANTI-CONDENSATION HEATER

7.2.1 CIRCUIT CONFIGURATION



If a heater is used in the main machine, it is required that the harness from the heater sub-board is connected to the BCU. When this harness is connected to the BCU, the supply power is controlled based on the main machine operation and the setting of SP5-805-001 as shown in the following table.

Heater	SP5-805-001	Plug-in	Sleep Mode	JAM/ Door Open/ SC	Stand-by Mode/ Fusing Unit Off Mode	Printing
Dehumidification Heater (Paper Feed Tray: Standard)	0 (OFF)	On	On	Off	Off	Off
	1 (ON)	On	On	On	On	Off
Dehumidification Heater (Paper Feed Tray: Option)	0 (OFF)	On	On	Off	Off	Off
	1 (ON)	On	On	On	On	Off
Anti-condensation heater (Scanner)	0 (OFF)	On	On	Off	Off	Off
	1 (ON)	Disabled*				
Anti-condensation heater (PCDU)	0 (OFF)	On	On	Off	Off	Off
	1 (ON)	Disabled *				

* If SP5-805-001 is set to “1” (ON), disconnect the harnesses of anti-condensation heaters (Scanner and PCDU) manually to disable. Otherwise, the followings may occur:

- Malfunctions such as toner fixation
- Failure or deterioration of the stabilizer in the scanner due to temperature rise

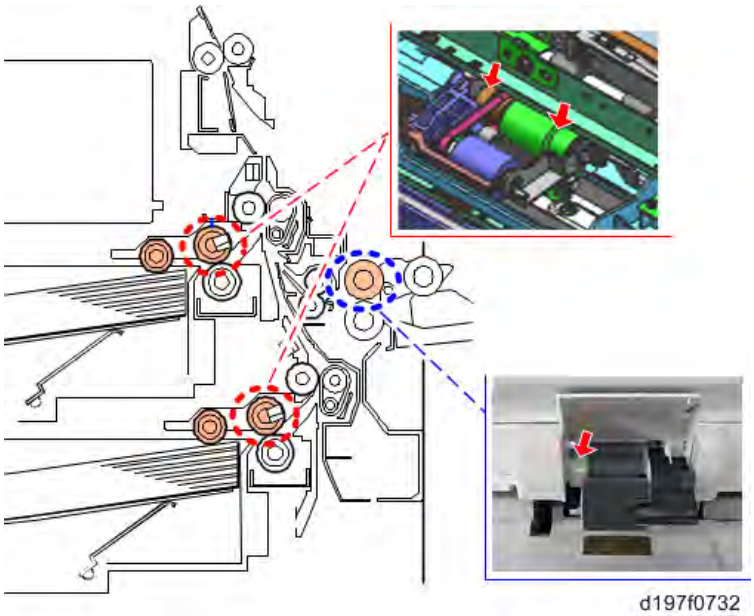
NOTE: ***As the heater circuit of this machine comprises of a single system, the machine cannot control the heaters for paper feed trays and for the main machine individually. If the SP is set to “1” (ON), all the heaters are turned on even though the machine is in “Sleep Mode” or “Fusing Unit Off Mode”. Activating the anti-condensation heaters (Scanner and PCDU) in “Sleep Mode” or “Fusing Unit Off Mode” causes a part failure in the machine. Be sure to deactivate these heaters (Scanner and PCDU) beforehand.***

8. ONE-WAY CLUTCHES

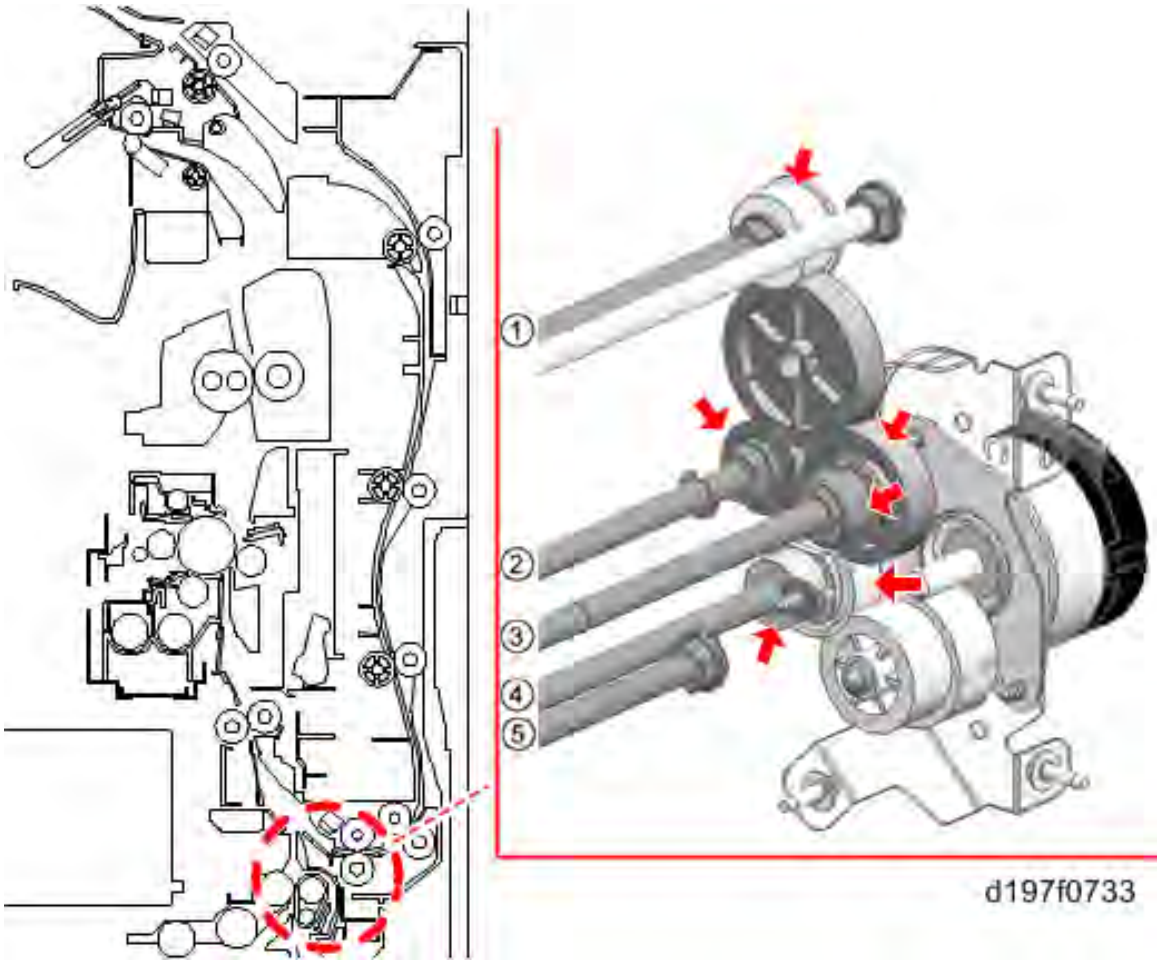
This machine adapts one-way clutches, used for paper feed mechanism.

Each one-way clutch locations are pointed below.

8.1 PAPER FEED/BYPASS



8.2 DUPLEX



No.	Description
(1)	Duplex exit roller
(2)	Bypass Paper Feed Roller
(3)	Bypass Pick-up Roller
(4)	Bypass Separation Roller Drive Shaft
(5)	Bypass Separation Roller

9. PROCESS CONTROL

9.1 IMAGE DENSITY CONTROL (PROCESS CONTROL)

9.1.1 OUTLINE

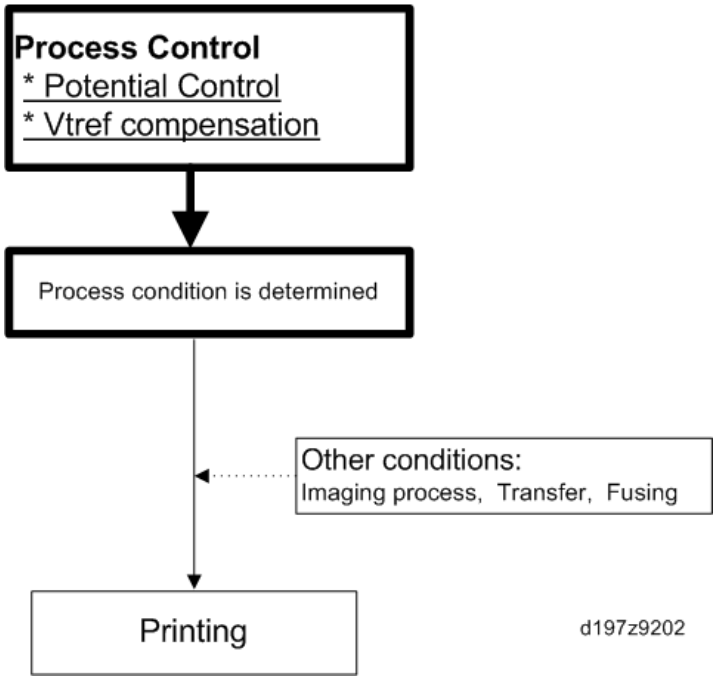
Process control is a system that adjusts the image creation process to maintain a constant image density. Process control is executed at the following conditions.

	Trigger	Operative Condition	Notes
1	▪ Power ON ▪ Recovering from Energy Saver ▪ Closing the front cover	▪ When a certain time passes after the previous job end, and when a certain number of sheets are printed after the last process control at the previous Power ON, recovering from Energy Saver mode or closing the front cover. ▪ When a new PCDU is detected. ▪ When the TD sensor detects a toner end before turning the power on.	No retry if an SC occurs during adjusting.
2	Job End	When the job end counter becomes more than the threshold.	▪ Process Control clears the Job end counter.
3	Job Interruption	When the job interrupt counter becomes more than the threshold.	Process control clears the job interrupt counter.
4	Non-use (Idle)	▪ When the non-use time counter becomes more than the threshold. ▪ When significant environmental changes occur after the last job end.	Available only when the energy saver mode is off.
5	Manual process control	When SP 3-011-001 is executed.	-

The process control consists of the following features.

- Potential Control (Charge/Development Bias and LD power Control)
- Vtref Compensation

Flowchart: From Process Control to Printing



9.1.2 POTENTIAL CONTROL

Potential Control adjusts Charge/Development bias and LD power to maintain a constant image output.

Charge roller, development roller, OPC drum and laser unit involve with imaging process.

Charge bias (Vc) is a bias for charge roller. Applying a charge bias to the OPC drum increases the potential of the OPC drum.

Development bias (Vb) is a bias for development roller. When a development bias is applied to developer (carrier), the OPC drum which is charged the opposite bias from development part attracts toner.

Development potential (Vd – Vb) is the ability to attract the toner to the OPC drum. A larger development potential increases the amount of toner adhesion.

In image density adjusting, the potential control process creates an ID pattern patch using the “bias for ID pattern creation” which has a lower density and lower Charge/Development bias than for printing.

With the results of Vsp (the ID sensor output from ID pattern patch) and Vsg (the ID sensor output from bare surface of the OPC drum), the potential control process adjusts the development bias so that the amount of toner adhesion becomes a specified target value.

Charge/Development Bias is done with the following operation. The operation time differs depending on the line speed.

- ID sensor Vsg Adjustment

  The machine adjusts the LED strength of the ID sensor so that the value of Vsg (the charge which is detected from the bare surface of the OPC drum) is in the range of 4.0V ±0.5V. When Vsg is detected as not within the target range three times, SC370 (ID sensor error) appears.

- Developer Stirring (0 to 5 seconds)

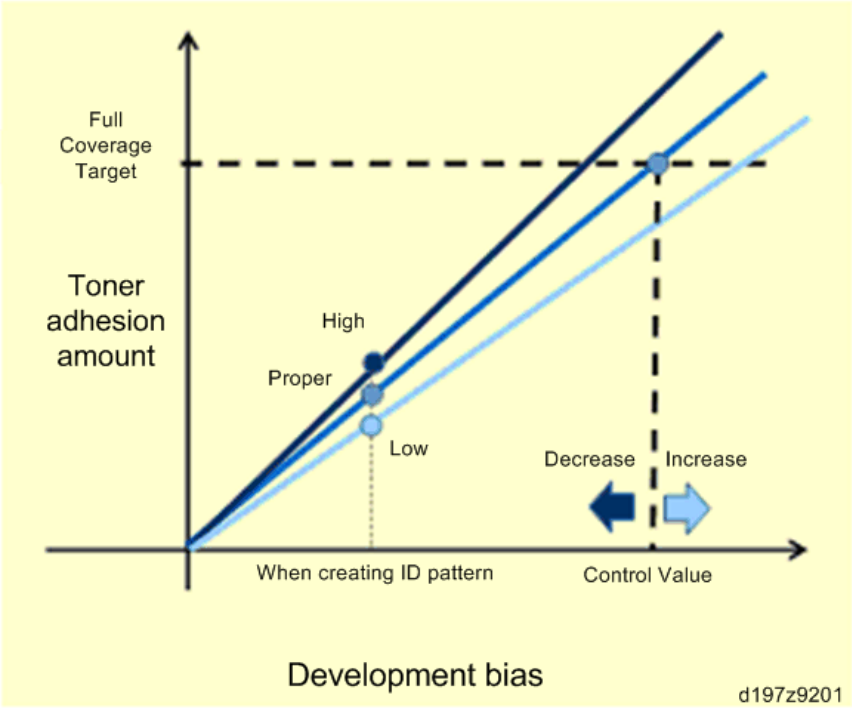
  The machine agitates the developer and reads the µ sensor output.

- Bias Compensation

  The machine compensates the development bias (Vb) with the following Vsp/Vsg rate. The machine also compensates Charge bias (Vc) and LD power based on the Vb result.

Vsp/Vsg	Toner Density	Vb Compensation SP
High	High	SP3-235-011
Slightly high	Slightly high	SP3-235-012
Proper	Proper	SP3-235-013
Slightly low	Slightly low	SP3-235-014
Low	Low	SP3-235-015

Fig. 1: Relation b/w Dev. bias and Toner adhesion amount



9.1.3 VTREF COMPENSATION

To maintain a constant/proper toner density, the toner density in the developer must be controlled as well as the bias control. Vtref is the target of the toner density in the developer.

- Vtref Determination
  With the output of ID sensor and μ sensor in ID sensor detection, the machine determines the Vtref used for the reference value for μ sensor.

9.1.4 TD SENSOR INITIAL SETTING WHEN A NEW PCDU IS INSTALLED

When a new PCDU is set in the mainframe, this is detected by the machine as a new PCDU, and the initial μ count (the output from the μ sensor of initial developer setting) is determined after entering the TD sensor initial setting mode. The TD sensor initial setting is done as follows.

- Starting the developer initial setting
  The new unit detecting mechanism performs the TD sensor initial setting.
- Developer Agitation
  The developer is stirred, with the development roller and the transport coil rotating (30 seconds).
- Initial μ Count Detection
  The machine detects the μ sensor output while mixing the developer, and stores the output as the initial μ count. The followings are the stored data location in machine types.
  - D197/D198: SP3-030-062 Initial μ count (Line speed 3)
  - D199/D200: SP3-030-121 Initial μ count (Line speed 2)
  - D201/D202: SP3-030-061 Initial μ count (Line speed 1)
- Vt Calculation
  The machine refers to the initial μ count with the above SP according to the machine type and calculates Vt with the difference of the present μ count.
- If the initial μ count detected is out of the upper/lower output limit, the machine displays a TD sensor calibration error (SC360-01).
- After replacing an AIT and performing the initial TD sensor setting, the machine forcibly executes the process control.

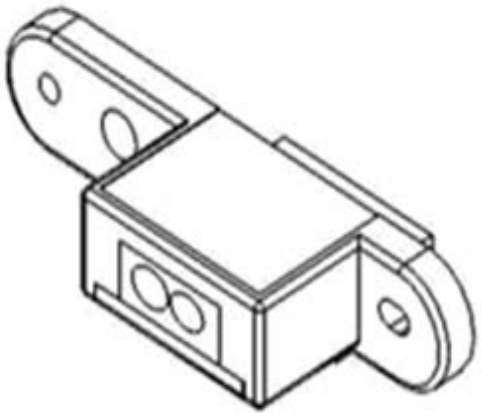
9.2 MECHANISM

9.2.1 SENSOR COMPOSITION

Sensor	Description
ID sensor	Used to measure the amount of toner that adhered on the OPC drum
TD Sensor	Used to measure the toner density in the developer

9.2.2 ID SENSOR

An ID sensor consists of a light-receiving element located at the opposite position of LED.
It detects the amount of toner adhered using reflection from the LED.



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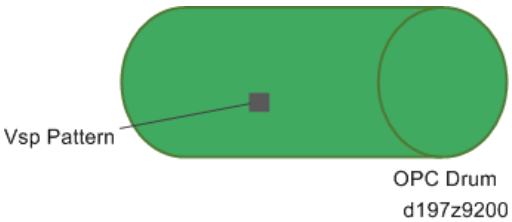
ID sensor is fixed in the right cover of the mainframe and detects the patch density formed on the center of the OPC drum.



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9.2.3 TD SENSOR

In this model, a non-contact toner density (TD) sensor, which we call µ sensor, is used for the toner density control.
The TD sensor is attached on the lower side of the development unit. Unlike HST sensor, the board of TD sensor is exposed. So there is a cover around the sensor to protect the sensor and to maintain a good contact condition of the sensor and development unit.
The TD sensor measures the permeability of the developer without contacting from outside of the case, and converts the measured value to the toner density.
According to the toner density measured by this sensor, the proper amount of toner is supplied to the developer.
A counter corresponding to the frequency is used as the unit of TD sensor output. Thus, unlike HST sensor which directly detects Vt, the TD sensor output is converted into Vt for the toner supply control.
In the TD sensor, there is an ID chip storing the machine identification information, the running distance information of Development unit and PCU, and other information used by the image density control.