RICOH

D176/D177 DETAILED DESCRIPTIONS MANUAL

D176/D177
DETAILED DESCRIPTIONS

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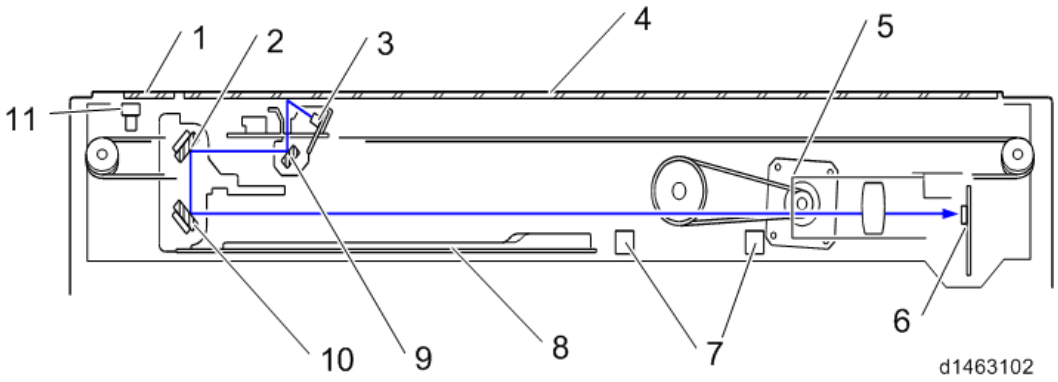
1. SCANNING

1.1 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

1.2 MECHANISM

1.2.1 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).

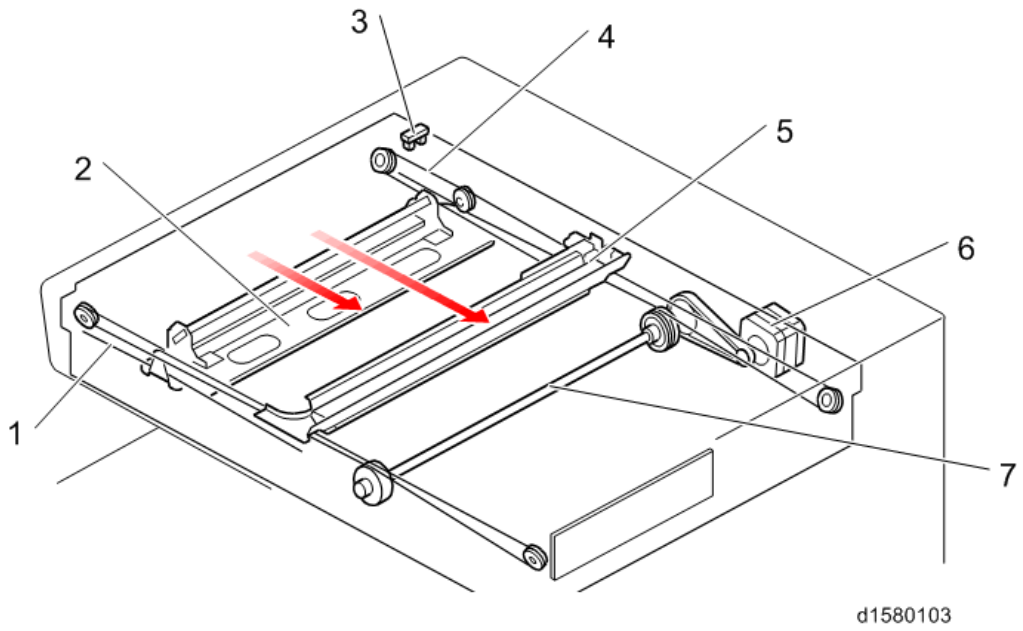
1.2.2 SCANNER

- **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 line color CCD converts shade in the document to 3 color (B, G, and R) electrical 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 collects light for the document read unit. 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 document.
- **White reference seal**
  A white reference seal for shading correction is affixed to the underside of the scale on the left of the MFP. This is read by the scanner and CCD when the power is ON. The data read are temporarily stored in a RAM, and used for correction of document image data.

1.2.3 SCANNER DRIVE

The scanner is driven by a stepping motor via a scanner wire. For each mode, reading is completed in one pass.

Scanner (first carriage) position control uses a Scanner Home Position sensor as a reference. Scanner Home Position is located in the same position as the read position of the sheet-through DF.



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

1.2.4 DOCUMENT SIZE DETECTION

In this MFP, for document size detection, a reflecting sensor (one) is used for the sub scanning direction, and a CCD is used for the main scanning direction.

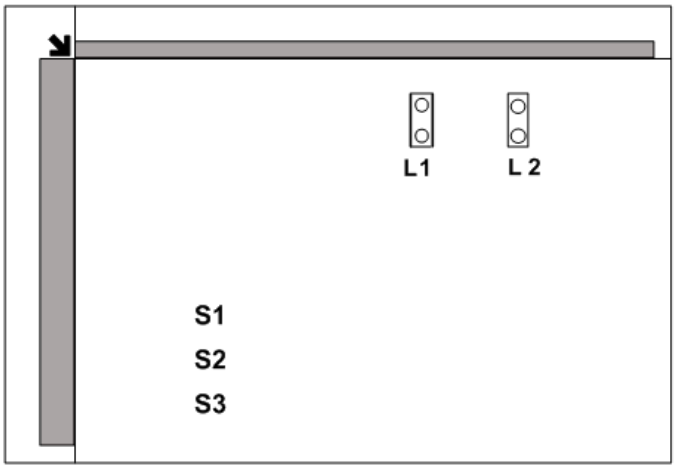
- **Sub scanning direction**

  The document size is detected by ON/OFF of the reflection sensor. 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.



Document size			Sensor response				
Size	Direction	Dimensions (main × sub)	S1	S2	S3	a	b
A3	SEF	297x420	○	○	◎	◎/○	◎
B4	SEF	257x364	○	◎	-	◎/○	◎
A4	SEF	210x297	◎	-	-	◎	-
A4	LEF	297x210	○	○	◎	-	-
B5	SEF	182x257	-	-	-	◎	-
B5	LEF	257x182	○	◎	-	-	-
A5	SEF	148x210	-	-	-	-	-
A5	LEF	210x148	◎	-	-	-	-

NOTE: To determine the main scanning direction (document width), the outermost determination is used (only "◎"is used, "○"is ignored)

◆ **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).

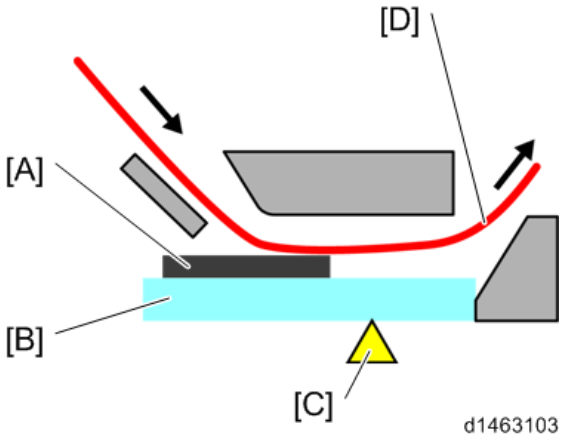
◆ **Other**

- 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.

1.2.5 IMPROVED TOLERANCE TO BLACK LINES WHEN PAPER PASSES THROUGH ADF

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

ADF cross-section diagram



[A]: Sheet

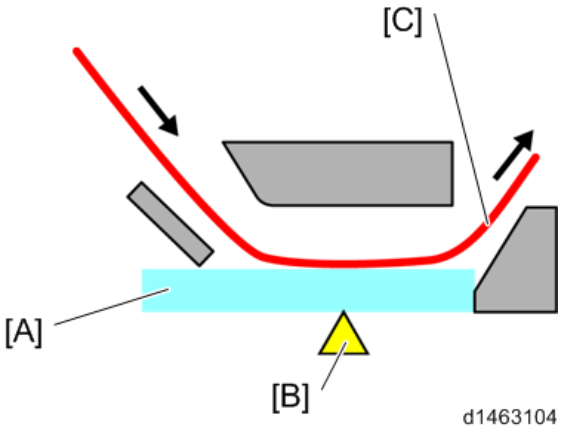
[B]: Target glass

[C]: Read position

[D]: Document

- Reference (conventional mechanism)
  As the document comes in contact with the target 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 target glass, and may give rise to the appearance of black lines.

ADF cross-section diagram



[A]: Target glass

[B]: Read position

[C]: Document

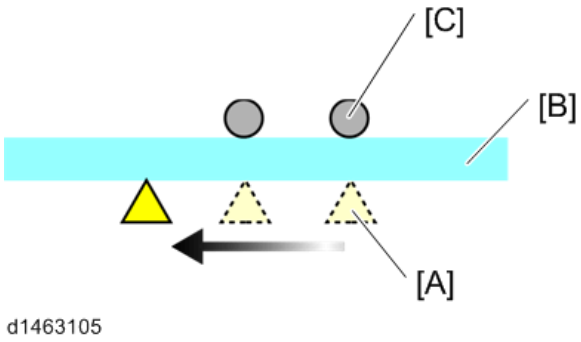
* If black lines due to free dirt particles appear in a short time, such as when users have documents with large amounts of paper scrap, you can return to the original configuration by the following procedure.

- 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 target glass cleaning).

Image diagram



[A]: Read position

[B]: Target glass

[C]: Dirt

NOTE: Dirt/soiling is detected when a document passes through, so the alert will not disappear until reading of the next document begins, even after target glass cleaning is performed.

If dirt/soiling is detected not on the target glass but on the background guide plate, the alert will not disappear even if the glass is wiped.

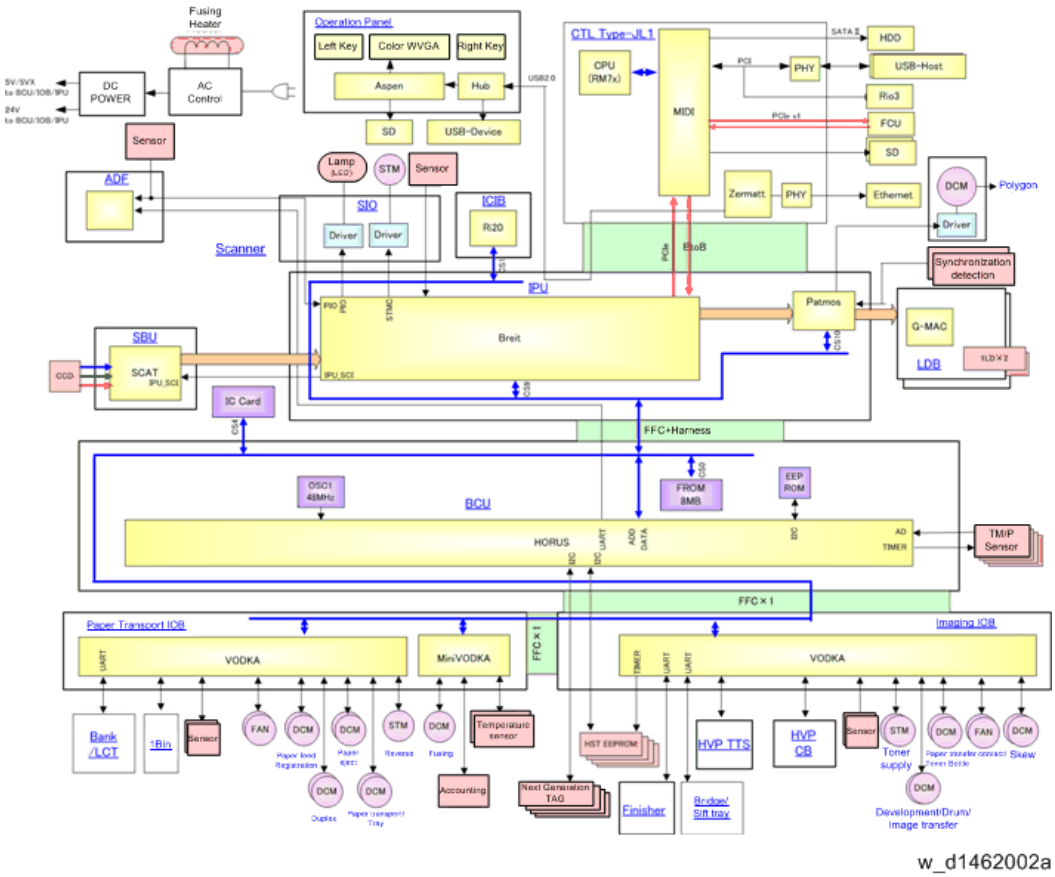
The time required for the first copy is slightly (almost imperceptibly) longer.

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.)

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

2. IMAGE PROCESSING

2.1 STRUCTURAL BLOCK DIAGRAM



2.2 MECHANISM

2.2.1 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: Dirt prevention when using DF:
The read density when using the DF may be lower compared to the pressure plate. A corrected density value can therefore be set by SP4-688-001 (DF Density Adjustment ARDF) or SP4-688-002 (Scan Image Density Adjustment 1-pass DF) above.

◆ SBU Test Mode

There is SP code to create a test pattern which can be used as a diagnostic tool to troubleshoot problems in the SBU:

- SP4-699-001 (SBU Test Pattern Change)
  Pattern 1: fixed value
  Pattern 2: main scanning gradation pattern
  Pattern 3: width scanning gradation pattern
  Pattern 4: main scanning/width scanning lattice pattern
  SBU (SCAT) has a function to generate four test patterns.

2.2.2 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-4 bit/pixels.

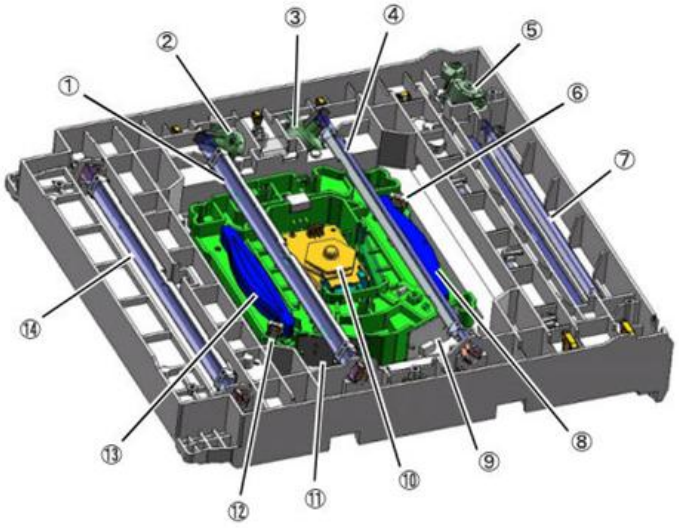
Image processing items	Details
Shading correction	Corrects for uneven scanner lamp lighting, and scatter in CCD light receiving sensitivity.
Line interval correction	Line shift during subscanning magnification/reduction by scanner. Corrects integer part.
Dot correction	Line shift during subscanning magnification/reduction 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 γ 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 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 processing items	Details
Image compression/expansion	Compresses or expands an image.
Printer γ correction	Adjusts exposure amount of photosensitive body relative to image density.
Gradation processing	Applies 600dpi, 4bit 16 value gradation processing.

3. LASER EXPOSURE

3.1 OVERVIEW

Realizes high speed by 4 station (different color) write compatible with a tandem image.



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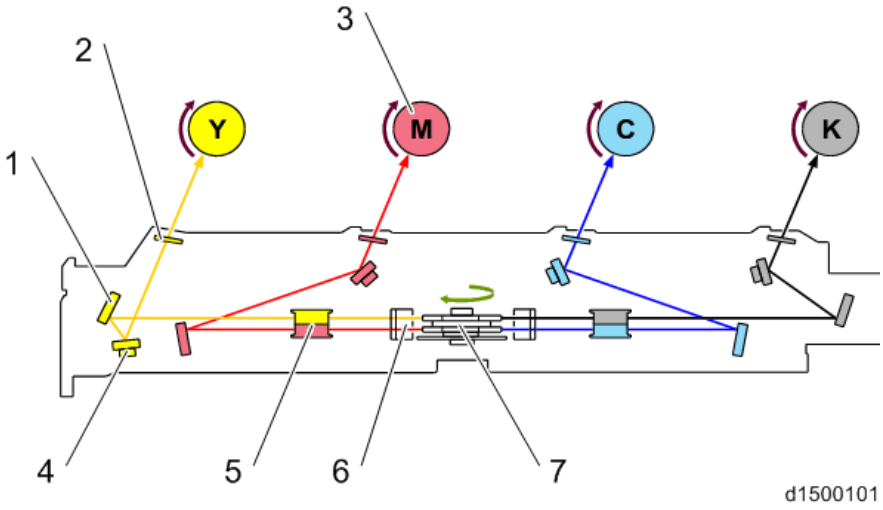
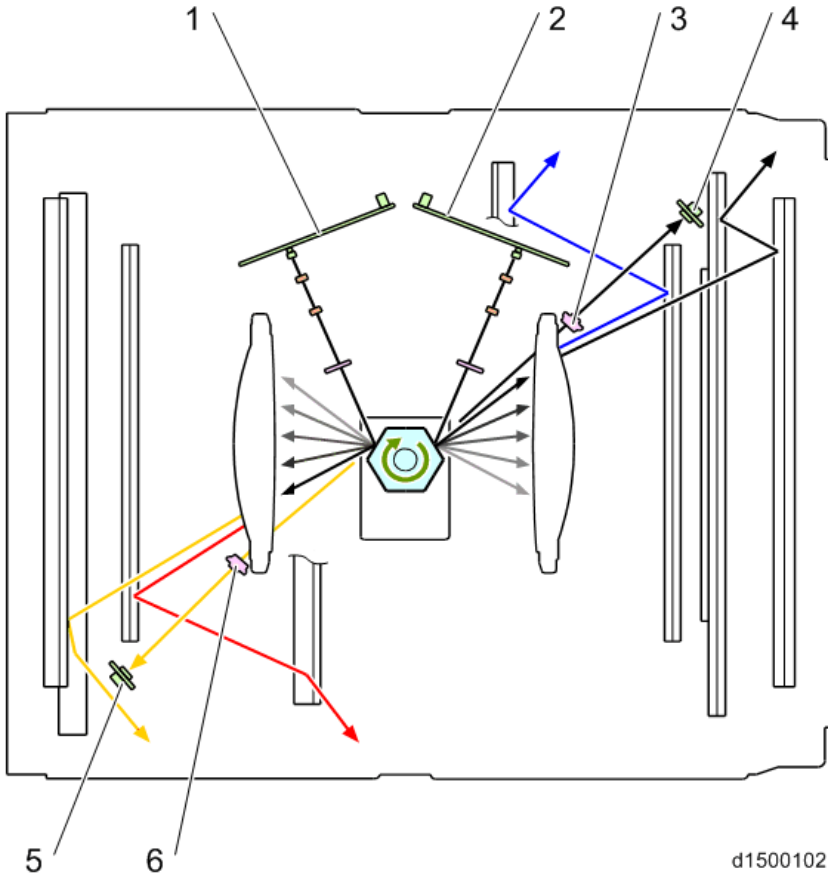
No.	Description	No.	Description
1	2nd Mirror	8	F-theta lens-M/Y
2	Skew Motor	9	LD Drive Board
3	Skew Motor	10	Polygon mirror motor
4	2nd Mirror	11	LD Drive Board
5	Skew Motor	12	Cylinder Lens
6	Cylinder Lens	13	F-theta lens-Bk/C
7	1st Mirror	14	2nd Mirror

3.1.1 PARTS CONSTRUCTION

The write unit comprises a housing and the following main parts:



No.	Description	No.	Description
1	1st Mirror	5	F-theta lens
2	Dustproof Glass	6	Soundproof Glass
3	PCU	7	Polygon mirror motor
4	2nd Mirror		



No.	Description	No.	Description
1	LD Drive Board (M/Y)	4	Synchronizing detector board: Bk/C-S
2	LD Drive Board (Bk/C)	5	Synchronizing detector board: M/Y-S
3	Cylinder Lens (Bk/C)	6	Cylinder Lens (M/Y)

3.2 MECHANISM

3.2.1 LD DRIVE BOARD

The LD Unit is provided with two LD Drive Board. The beam system is as follows:

1 beam type

The LD Drive Board comprises an LD (laser diode), PD (photodiode) and LD control unit.

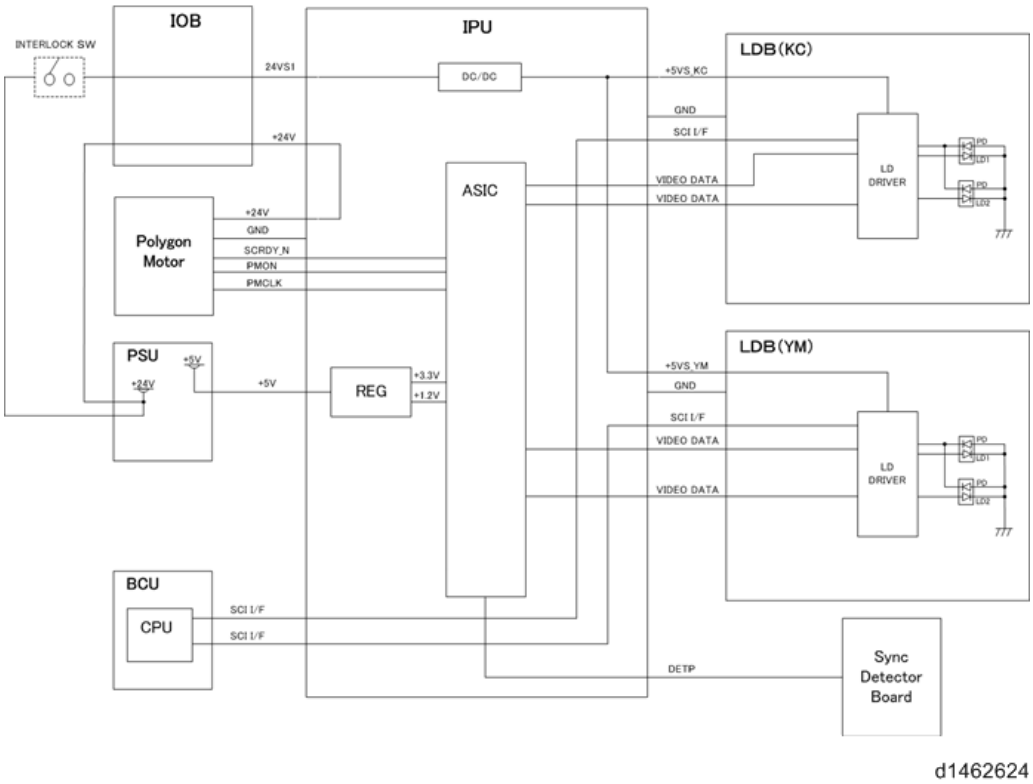
- LD outputs the laser light to the PCU.
- PD continuously detects laser light from LD, and outputs it to the LD control unit.
- The LD control unit adjusts the light amount of LD based on the output signal of PD.

* LD control board adjustment is not required by the market.

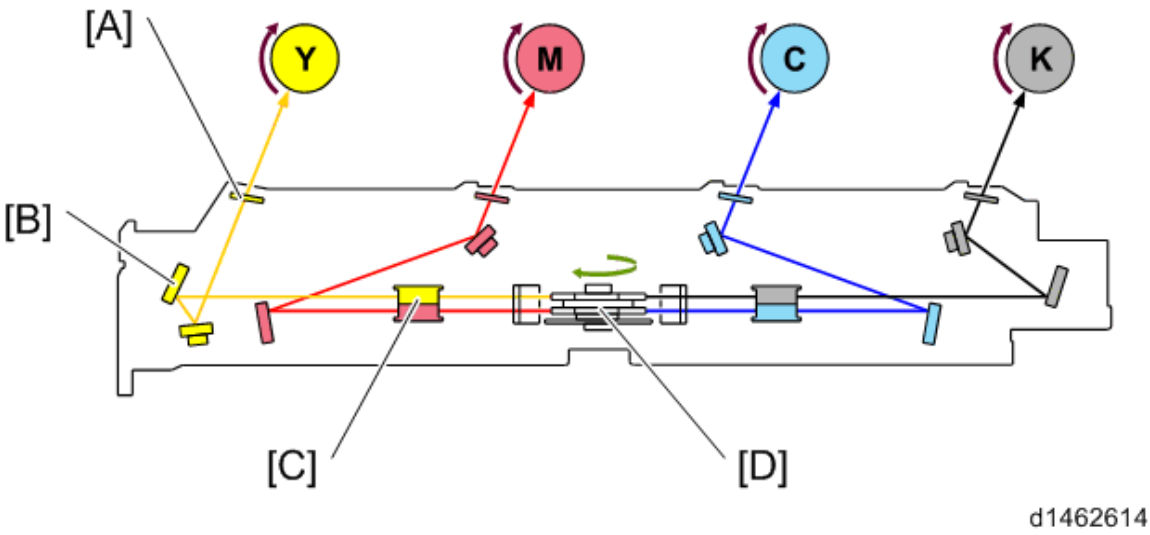
3.2.2 LD SAFETY SWITCH

To prevent the laser beam from irradiating when the Front Cover or Duplex Unit is open, the 5V supply to the LD Drive Board is interrupted when the interlock switch is open.

Circuit diagram



3.2.3 LINE SCANNING MECHANISM



[A]: Dustproof Glass

[B]: 1st Mirror

[C]: F-theta lens

[D]: Polygon mirror motor

1. Mirror, lens

   Laser diodes of each color emit light to match the paper transport timing. After passing through the cylinder lens (laser beam width correction), Polygon mirror motor (main scanning line scan), F-theta lens (dot position correction and optical face tangle error correction), it irradiates drums of each color.

   The F-theta lens has a two-stage integrated construction, and 2 color beam correction is performed with one lens.

2. Polygon mirror motor

   The Polygon mirror motor comprises two (upper and lower) 6-faced mirrors formed in an integral construction (these are combined in one unit).

   In this MFP, 4 color simultaneous write is performed by the LD irradiating a polygon mirror.

   * The rotation speed of the Polygon mirror motor is controlled by LD/ Polygon mirror motor control by F5) mode.

3. Synchronous detection sensor

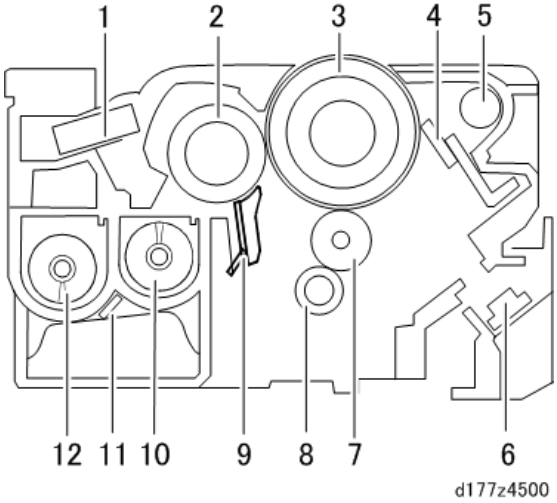
   There are two synchronous detection sensors, i.e., one on the K-C side, and one on the M-Y side. Monochrome LD light is detected by one sensor, and two-color timing is generated from the incident timing.

   In this MFP, one-point synchronization is used. By disposing the synchronous detection sensor at the leading edge of the main scanning line of the image, the image edges of each color are synchronized.

4. Scan line inclination and automatic adjustment mechanism
   A skew adjustment motor is installed in the 2nd mirror on the color LD optical path, and adjusts the scan line inclination.
   To perform automatic image position correction, the motor rotates automatically corresponding to the main scan line inclination. In this way, the main scanning line inclination (skew) is corrected.

4. PCDU (PHOTO CONDUCTOR AND DEVELOPMENT UNIT)

4.1 OVERVIEW



No.	Description	No.	Description
1	Inner pressure adjustment filter	7	Contact charging roller
2	Development roller	8	Cleaning roller (charge roller)
3	OPC drum	9	Doctor blade
4	Cleaning blade	10	Developer supply screw: Right
5	Toner collection auger	11	HST sensor
6	Quenching lamp	12	Developer supply screw: Left

4.2 MECHANISM (PCU)

4.2.1 DRUM DRIVE

Bk and CMY are both driven by motor.

PCU	Drive source
Bk	Black PCU motor*
CMY	Color PCU motor

* The black PCU motor is used to drive both the developing unit and the waste toner bottle.

4.2.2 CHARGE

This device uses a charge roller for all four colors to reduce generation of ozone.
The charge roller, which is a rubber-covered roller that has a metal-made axis, rotates in the forward direction contacting with the drum, and applies a charge to the drum surface uniformly.
The life of the PCU is extended by separating the charge roller from the drum by about 60 µ.
When the charge roller is dirty, an uneven charge is generated, so a cleaning roller always comes in contact which cleans the charge roller.

4.2.3 DRUM CLEANING

Residual transfer toner on the drums is recovered by a cleaning blade. The cleaning blade is installed in the counterclockwise direction to the drum rotation in contact with the drum. The blade peels off impurities such as toner or additives by scraping the drum surface.

4.3 MECHANISM (DEVELOPMENT)

4.3.1 DEVELOPING SYSTEM

A dry two-component magnetic brush developing system is used.
The dry two-component magnetic brush developing system gives a suitable electrostatic charge to the toner using magnetic particles called carriers which form a magnetic brush due to their magnetism, and cause toner to adhere electrostatically to the drum surface.

4.3.2 AGITATION SYSTEM

This device uses a double-screw agitation system (twin-shaft environment development system).
Toner that transported from the toner cartridge to the development unit will be agitated with the developer by two toner transport coils and will be delivered to the development roller.
The amount of developer adhering to the development roller is controlled by a doctor blade, and supplies toner to the surface of the photoconductor unit.

4.3.3 HST SENSOR

A non-contact type HST sensor consisting of an ST sensor and an ID chip (EEPROM) is provided.

◆ **ST sensor**

The toner density in the developer is detected by means of the toner magnetic permeability.

The detection result is regulated as Vt, and used for toner supply control.

◆ **ID chip**

PCDU replacement information and toner density information are stored.

In the ID chip, the following data is stored.

- Model series ID
- New PCDU information
- Color information
- Developer replacement information
- PCU replacement information
- HST sensor serial no., date of manufacture
- Date of unit installation
- Unit total counter at installation (no. of sheets, travel distance)
- Date of unit operation
- Unit total counter during operation (no. of sheets, travel distance)
- Unit parts information
- Total counter
- Total color counter

4.3.4 PRESSURE RELEASE FILTER

To prevent scattering of toner, the air pressure in the developing unit is released via a filter.

4.3.5 DEVELOPER DRIVE

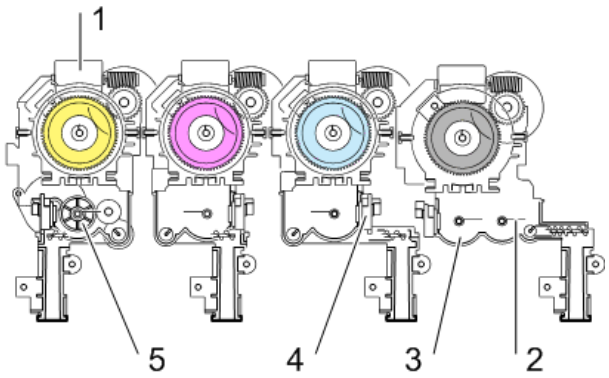
The drive in the following table is used.

A gear for developer screw rotation is provided on the front side of the unit (downstream side).

Drive source (black)	Drive source (color)
Black developer motor	Color developer motor

5. TONER SUPPLY

5.1 OVERVIEW



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No.	Description	No.	Description
1	Toner bottle drive motor	4	Toner end sensor
2	Agitator	5	Toner supply motor
3	Sub-hopper		

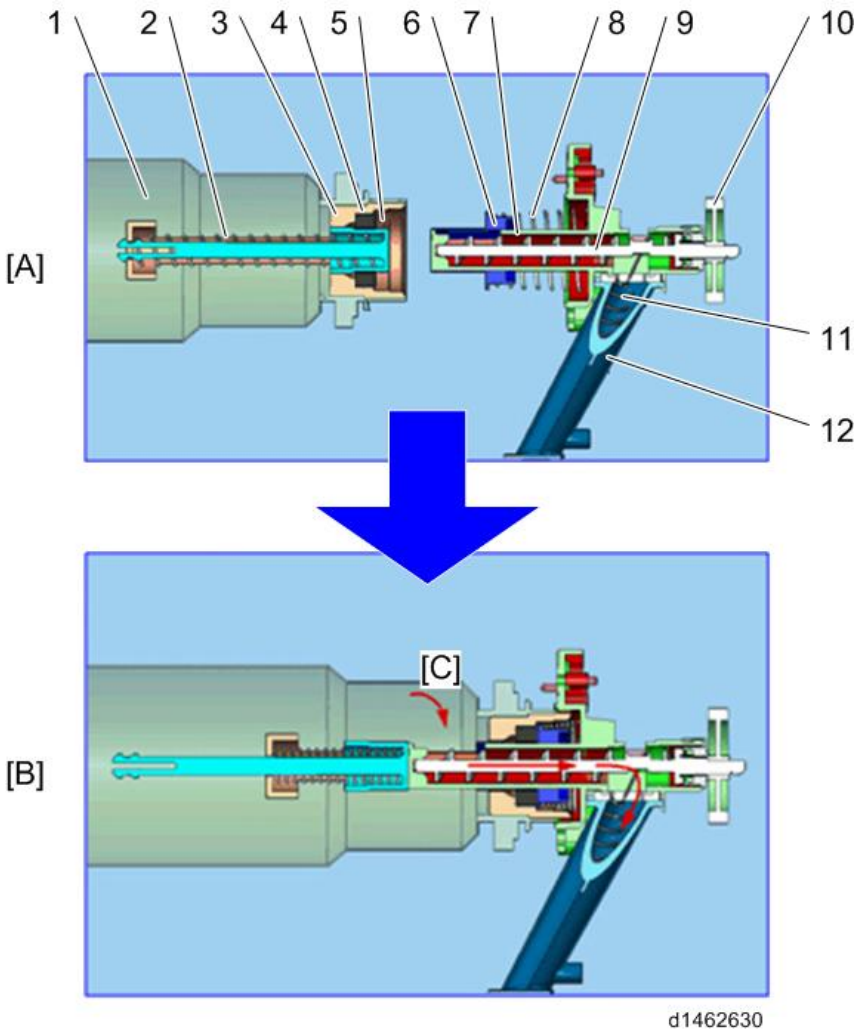
Toner is supplied by a Hi-Act (High Accuracy and Clean Toner) cartridge + sub-hopper.

5.2 MECHANISM

5.2.1 TONER SUPPLY (TONER CARTRIDGE - SUB-HOPPER)

When the toner cartridge is set, the transport nozzle on the side of the unit is inserted into the bottle (Hi-Act system).

When the piezoelectric sensor in the sub-hopper detects there is no toner, the bottle drive motor rotates. The rotation of the bottle drive motor is transmitted to a transport screw via a drive gear, and toner in the bottle is transported horizontally. Due to the screw transport, stable toner supply/enhanced supply precision/reduction of residual toner are achieved.



[A]: Before setting

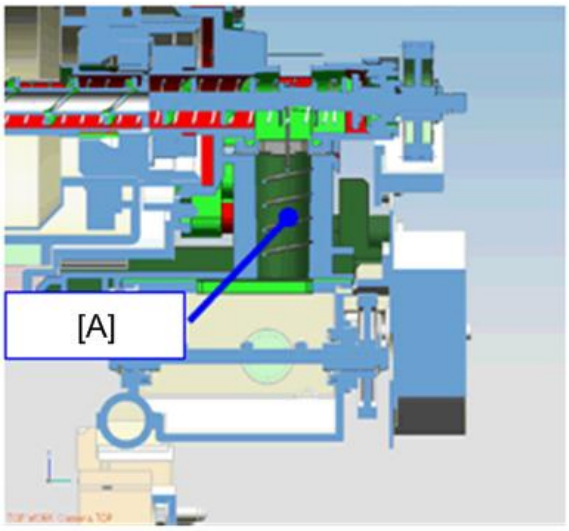
[B]: After setting

[C]: Toner path

No.	Description	No.	Description
1	Toner bottle	7	Transport nozzle
2	Coil spring	8	Coil spring
3	Shutter holder	9	Toner transport screw
4	Seal	10	Drive gear
5	Shutter	11	Rocking spring
6	Shutter	12	Transport pipe

Toner transported by the screw falls directly into the sub-hopper via the transport pipe.

To prevent toner from remaining, a rocking spring is provided in the transport pipe which moves up and down together with the screw.



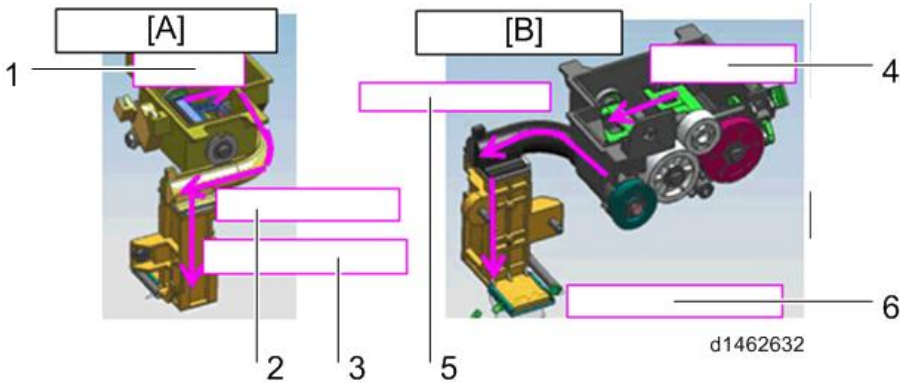
[A]: Rocking spring

5.2.2 TONER BOTTLE ID CHIP

A contact type ID chip is provided in each toner bottle which stores residual toner and various toner counters, toner end history, and model serial number.
Data read and write to TCB is performed by contact with TCB.

5.2.3 TONER SUPPLY (SUB-HOPPER - DEVELOPING UNIT)

The sub-hopper can hold Bk: 24.7 cc (equivalent to 230 sheets of 5% chart), or Color: 19.3 cc (equivalent to 150 sheets of 5% chart) of toner.
Toner which has fallen into the sub-hopper is homogenized by an agitator (Sheet: 2 for BK, 1 for each color).
After being horizontally transported by the screw, toner in the sub-hopper falls directly into the developing unit.



[A]: Sub-hopper: CMY
[B]: Sub-hopper: Bk

1. **Transport by the sheet**
2. **Transport horizontally by the screw**
3. **Vertical drop to the Developer unit**
4. **Transport by the sheet**
5. **Transport horizontally by the screw**
6. **Vertical drop to the Developer unit**

5.2.4 DRIVE

To shorten the recovery time after bottle replacement, the toner cartridge and sub-hopper are driven separately.
The sub-hopper is driven by a stepping motor to reduce supply variations.

5.2.5 TONER NEAR END/END DETECTION

In this device, there are two types of toner near end status.

The detection conditions and detection operation for each status are shown in the following table.

Control overview

Status	Control panel message	Detection conditions
Estimated toner end SP3-101-001～004＝「2」	Control panel banner display: <Toner Cartridge is almost empty. Prepare toner cartridge replacement(s).>	If the residual amount in the toner cartridge falls below SP3-110-001～004 (Near End Thresh) (Default: K 65g, CMY 45g) The lesser of the “toner residual amount computed from the toner supply motor drive time” and the “toner residual amount computed from the pixel count” is taken as the toner residual amount.
Definite toner near end SP3-101-001～004＝「1」	Control panel banner display: <Toner Cartridge is empty. Printing will be suspended soon. Replace the cartridge.>	If the “the toner cartridge residual amount falls below specification” and “the toner end sensor in the sub-hopper has detected toner end” Remarks: When toner end is detected, to use up all the toner in the cartridge, the toner cartridge is rotated for 5 seconds (full use control). After full use control, when the device status has reached “definite near end,” the toner cartridge does not rotate.
Toner end	Control panel pop-up display (alert screen): <Toner has been depleted. Replace Toner Cartridge.>	Toner end is defined by the following conditions (1) or (2): (1) Determination by number of sheets and pixel count (After definite toner near end, count is begun). (2) Determination by Vt output (not related to definite toner near end)

Control Details

◆ **Estimated toner near end**

- The toner residual amount Z (SP3-102-021～024) is taken as the lesser of the toner residual amount Z1 computed from the toner supply motor drive time (SP3-102-001～004) and the toner residual amount Z2 computed from the pixel count (SP3-102-011～014).
- If the condition, toner residual amount Z (SP3-102-021～024) < near end residual amount threshold value (SP3-110-001～004) is satisfied, this is taken as the estimated toner near end.

◆ **Definite toner near end**

Preconditions

- The toner residual amount Z (SP3-102-021～024) is taken as the lesser of the toner residual amount Z1 computed from the toner supply motor drive time (SP3-102-001～004) and the toner residual amount Z2 computed from the pixel count (SP3-102-011～014).
- If the condition, toner residual amount Z (SP3-102-021～024) < sensor near end residual amount threshold value (SP3-120-001～004) is satisfied, toner end sensor detection is begun to determine the definite end. (When the toner residual amount is more than the threshold value, determination by the toner end sensor is not performed).

Sensor detection

- The toner end sensor detects the sensor output with a 200 ms period while the developer motor is ON, and determines whether toner is present or not from the latest 10 counts.
- The determination result is stored in the “no toner counter (SP3-121-001～004)”. (If toner is detected, the counter is cleared).
- If the condition “no toner counter (SP3-121-001～004) > sensor near end determination threshold value (SP3-122-001～004) is satisfied, full use control which rotates the toner bottle for a certain time (SP3-163-001) is performed, and toner presence/absence determination by the toner end sensor is performed again.
- If no toner is detected after full use control determination, it is taken as definite toner near end.

Operation after definite toner near end

- After changing the status to definite toner near end, sheet counter and pixel counter increment is begun to detect toner end.

  SP3-133-011～014 TE Detect :Set Page Cnt:K, C, M, Y

  SP3-133-031～034 TE Detect :Set Pxl Cnt:K, C, M, Y

◆ **Toner end**

Pattern (1): Determination by paper sheet counter/pixel counter

The total sheet counter and pixel counter values after definite toner near end are compared with the threshold values.

If the following “(evaluation method A=TRUE) and (evaluation method B=TRUE) or (evaluation method C=TRUE)” is satisfied, it is determined as toner end.

Determination method A: Sheet counter (SP3-133-011～014) > Sheet counter threshold value (min)

Determination method B: Sheet counter (SP3-133-011～014) > Sheet counter threshold value (max)

Determination method C: Pixel counter (SP3-133-031～034) > Pixel counter threshold value

Pattern (2): Determination by Vt output

When the deviation between the ST sensor output value and ST sensor target value has become large, it is taken as toner end.

After definite toner end has been determined

The difference between the output of the ST sensor (Vt: SP3-210-001～004) and the target value of the ST sensor (Vtref: SP3-230-001～004) is computed as ΔVt, and values of ΔVt larger than the threshold value (SP3-131-001) are integrated as ΣΔVt (SP3-132-001～004).

If the integration valueΣΔVt is larger than the threshold value (SP3-132-002), it is determined to be toner end.

Before definite toner near end is determined (bottle full or estimated toner near end)

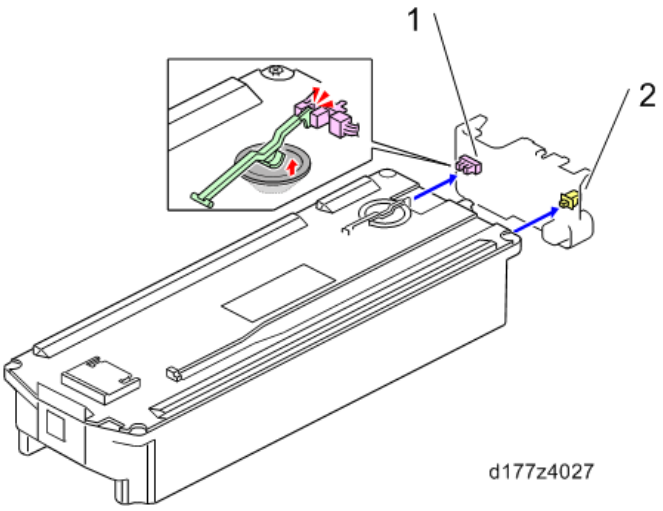
The computation is done in the same way as for definite toner near end, but separate values for the ΔVt threshold value and ΣΔVt threshold value are used.

ΔVt threshold value before NE: SP3-131-011

ΣΔVt threshold value before NE: SP3-131-012

6. WASTE TONER

6.1 OVERVIEW



No.	Description	No.	Description
1	Waste toner bottle set detection switch	2	Waste toner capacity detection sensor

6.2 MECHANISM

6.2.1 WASTE TONER BOTTLE SET DETECTION

A waste toner bottle set detection switch is provided at the rear of the waste toner bottle (device side).

If the waste toner bottle is not set, this switch is OFF, so imaging operation is prohibited, and “Waste toner bottle is not set. Please contact service department.” is displayed on the control panel.

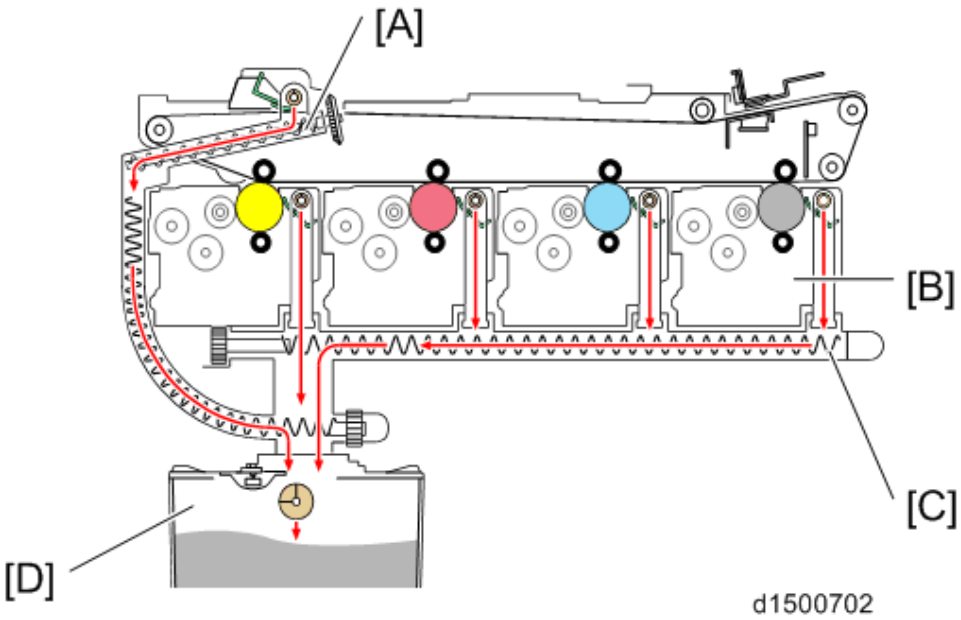
6.2.2 WASTE TONER DRIVE

Driven by black PCU motor.

6.2.3 WASTE TONER RECOVERY PATH (PCU/IMAGE TRANSFER UNIT)

Waste toner from the PCU and Image transfer unit is collected in the transport path at the front of the device, and recovered from one location in the waste toner tank.

- **PCU waste toner transport path**
  Waste toner recovered by the cleaning blade is transported from the rear of the PCU to the transport path on the device by the waste toner transport coil.
- **Image transfer unit waste toner transport path**
  Waste toner recovered by the Image transfer cleaning unit is transported from the rear of the Image transfer cleaning unit to the transport path at the front of the device by the waste toner transport coil.



[A]: Image transfer unit waste toner transport path
[B]: PCDU
[C]: PCU waste toner transport path
[D]: Waste toner bottle

6.2.4 WASTE TONER BOTTLE FULL DETECTION

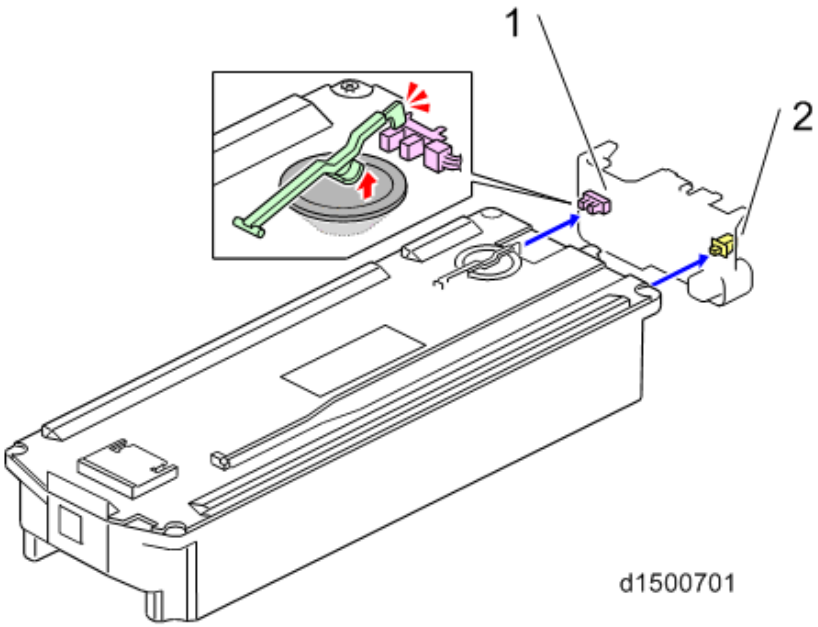
A waste toner capacity detection sensor is provided at the top of the waste toner bottle. When the waste toner in the bottle has reached approximately 90%, the capacity detection sensor lifts up a filler, and blocks the waste toner capacity detection sensor. After sensor detection, the remaining number of days of use is computed by the pixel counter.

- **Full detection flow**

5. When waste toner reaches approximately 90% of the bottle capacity, the full detection

sensor switches ON.

6. When the waste capacity detection sensor switches ON, the days remaining counter is decremented.
7. Days remaining counter: At 15 days to go, a ＠Remote warning is given (only in models with ＠Remote connection).
8. Days remaining counter: At 5 days to go, a control panel message (Waste toner bottle is nearly full. Please contact service department.) is displayed. (Nearly full)
9. Days remaining counter: At 0 days to go, a control panel warning is displayed, and the device stops.

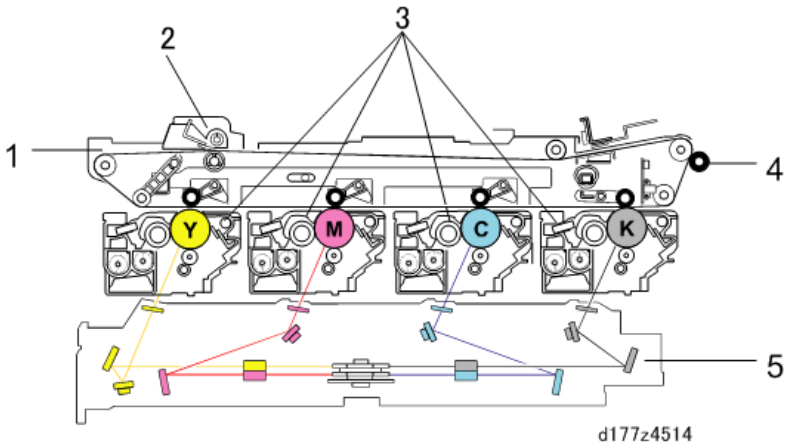


NOTE: After the full detection sensor switches ON, before nearly full, if the waste toner capacity detection sensor has been switched OFF, it is determined that the waste toner bottle has not been replaced, and countdown of the days remaining counter continues. (The count value of the days remaining counter displays the days remaining from when the waste toner capacity detection sensor was first switched ON.)

7. IMAGE TRANSFER AND PAPER TRANSFER

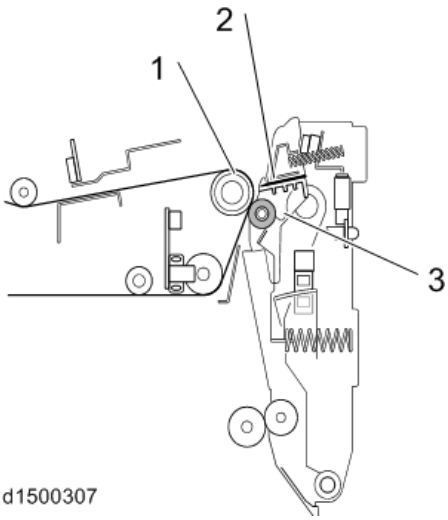
7.1 OVERVIEW

7.1.1 IMAGE TRANSFER UNIT



No.	Description	No.	Description
1	Image Transfer Unit	4	Paper Transfer Roller
2	Image Transfer Belt Cleaning Unit	5	Laser Exposure Unit
3	PCDU		

7.1.2 PAPER TRANSFER UNIT

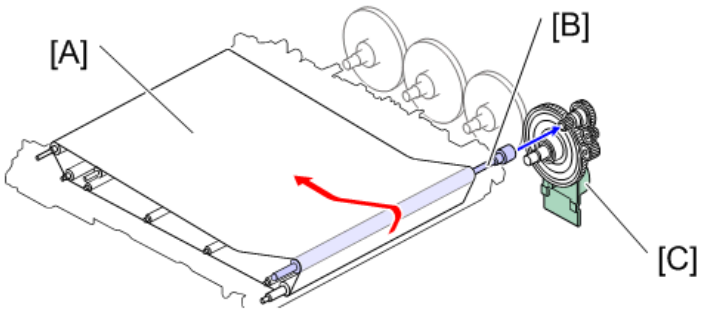


No.	Description	No.	Description
1	Image Transfer Drive Roller	3	Paper Transfer Roller
2	Discharge plate		

7.2 IMAGE TRANSFER UNIT MECHANISM

7.2.1 DRIVE MECHANISM

The Image transfer belt is driven by the PCU motor: Black via the gear and the ITB drive roller.



d1500301

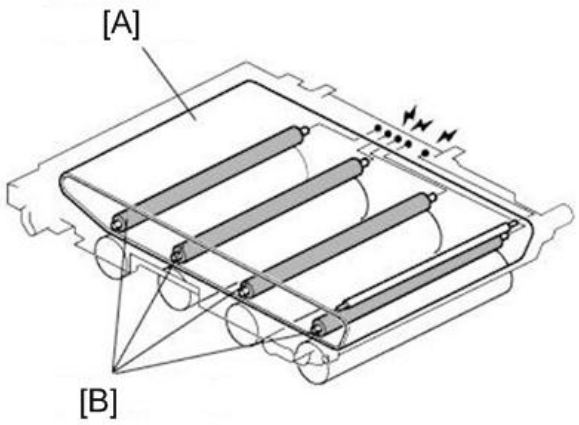
[A]: Image Transfer Belt

[B]: Image Transfer Drive Motor

[C]: PCU Motor: Black

7.2.2 TRANSFER BIAS

The bias to the Image transfer belt is applied to the image transfer roller of each color from the transfer power pack.



d1462633

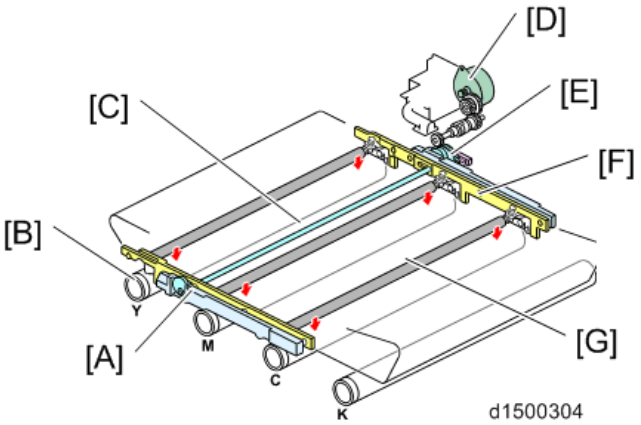
[A]: Image transfer belt

[B]: image transfer roller

The 5 springs, in order from the right (double-side unit), consist of “C (cyan), secondary transfer, BK (black), Y (yellow) and M (magenta)” transfer bias terminals.

7.2.3 ITB CONTACT AND RELEASE

To prevent early deterioration of the color photosensitive drum, the Image transfer belt unit is provided with a contact/separation mechanism and, during monochrome printing, separation of the Image transfer belt from the color photosensitive drum is controlled. Contact/separation of the Image transfer belt unit is performed via a gear from an ITB contact and release motor (also used as a magenta toner supply motor). Separation or contact is detected by a ITB contact and release sensor.



[A]: Slider

[B]: Drum

[C]: Contact and Relerse Cam

[D]: ITB contact and release motor (also used as a magenta toner supply motor)

[E]: ITB contact and release sensor

[F]: Guide

[G]: Image Transfer Roller

7.2.4 IMAGE TRANSFER BELT DRIVE CONTROL

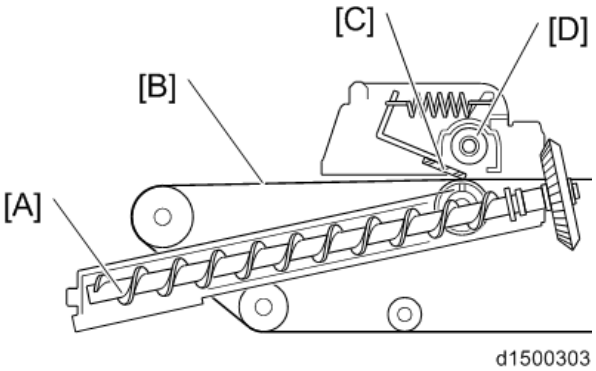
FG Control is performed (Frequency Generator control: ensures precision of motor operation)

7.2.5 IMAGE TRANSFER FLOW

By arranging the imaging sequence in the order Y > M > C > Bk, cyan is laid on top of magenta, which increases tolerance to image blurring and image reddening when dark blue is output, and improves image quality.

7.3 IMAGE TRANSFER BELT CLEANING MECHANISM

Image transfer cleaning is performed by a cleaning blade (counter method).
Due to downsizing of machine width, the cleaning unit is installed on top of the Image transfer unit. Therefore, to replace the cleaning unit, replacement must be performed after taking out the Image transfer unit and inverting it.
Compared to previous models, toner cleaning is improved, so a solid lubricant (and coating brush roller) are not used.



[A]: Toner collection auger
[B]: Image Transfer Belt
[C]: Image Transfer Cleaning Blade
[D]: Toner collection auger

7.4 PAPER TRANSFER UNIT MECHANISM

7.4.1 PAPER TRANSFER MECHANISM

A bias is applied to the ITB drive roller to transfer the image on the Image transfer belt to the paper (repulsion transfer). As there is no paper between the Image transfer roller and toner image, this method is not easily affected by paper conditioning.
Also, toner adsorption on the paper is facilitated by the static charge eliminator of the Paper Transfer unit (no charge is applied).

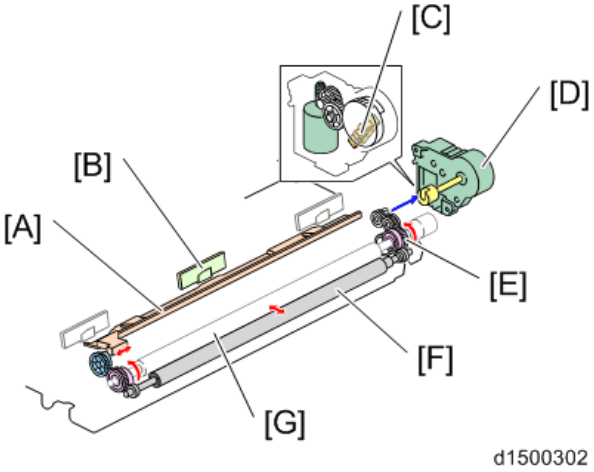
7.4.2 PTR (PAPER TRANSFER ROLLER) DRIVE

The rotation of the Paper transfer roller follows that of the ITB drive roller.

7.4.3 PTR (PAPER TRANSFER ROLLER) CONTACT AND SEPARATION

If the Paper transfer roller is permanently in contact with the Image transfer belt, toner on the Image transfer belt moves to the roller and soils the underside of the paper surface, therefore the Paper transfer roller is separated during Process Control or MUSIC control (it is not separated during real-time process control).

Separation of the paper transfer roller is achieved by transmitting the drive of the paper transfer contact motor via the ITB unit joint.



[A]: TM/P sensor (center) shutter

[B]: TM/P sensor (center)

[C]: Paper transfer roller Home Position sensor

[D]: Paper transfer contact and release motor

[E]: Cam

[F]: Paper transfer roller

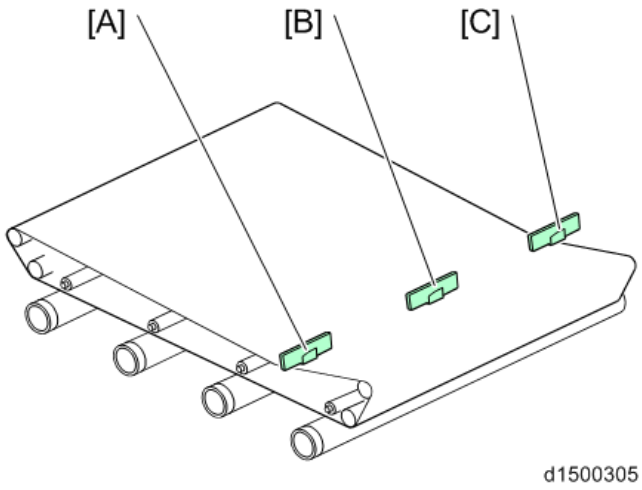
[G]: Image transfer drive roller

7.4.4 SEPARATION

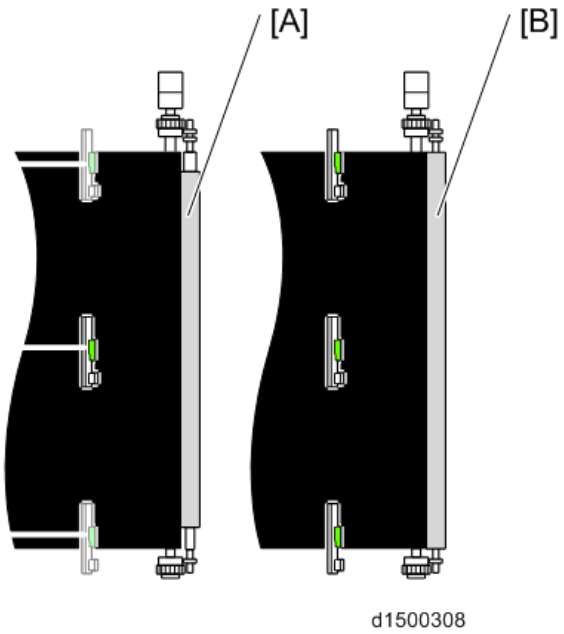
To achieve transfer paper separation, a curvature separation method which separates the Paper transfer roller and Image transfer belt is employed.

7.4.5 TM/P SENSOR

The TM/P sensor (center) is provided with a shutter mechanism which prevents soiling of the sensor due to toner scattering and collects dust by means of a plate.
As in the case of Paper transfer roller separation, the shutter is driven by transmitting the drive of the Paper transfer contact motor via an ITB transfer unit joint.



[A]: TM/P sensor (front)
[B]: TM/P sensor (center)
[C]: TM/P sensor (rear)

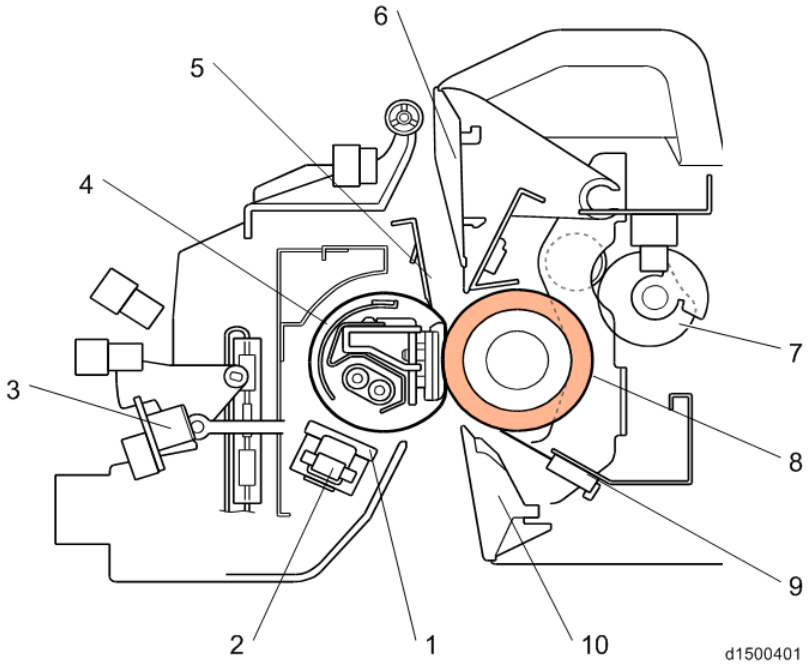


[A]: Paper transfer roller (standard)
[B]: Paper transfer roller (option)

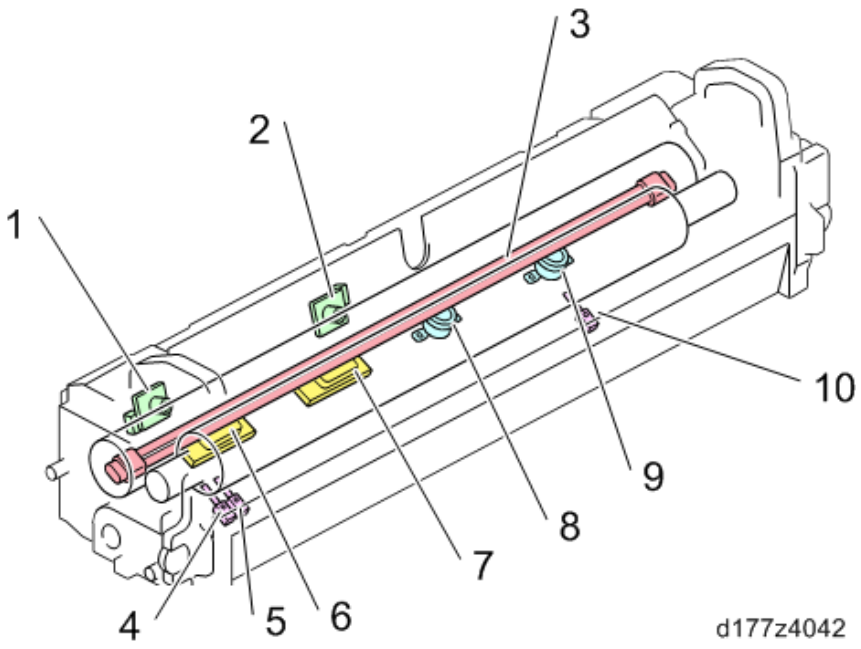
8. FUSING

8.1 OVERVIEW

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



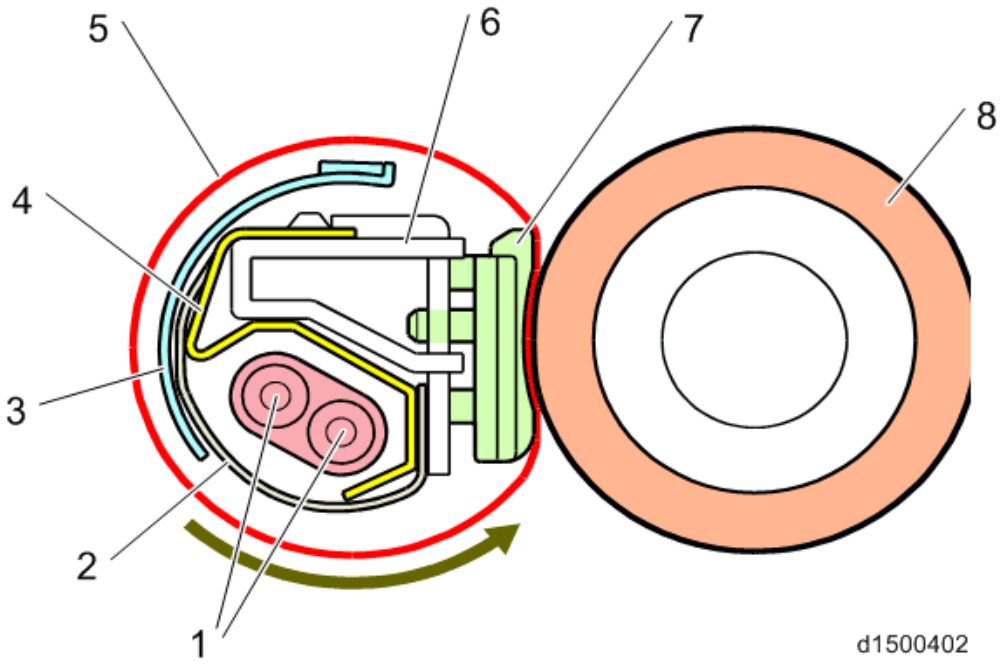
No.	Description	No.	Description
1	Heating roller thermostats	6	Exit guide plate
2	Non-contact Thermistor	7	Pressure roller drive cam
3	Thermopile	8	Pressure roller
4	Heating Sleeve	9	Pressure roller thermistor: Center, End
5	Stripper Plate	10	Entrance guide plate



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

8.2 MECHANISM

8.2.1 QSU-DH FIXING SYSTEM



No.	Description	No.	Description
1	Fusing lamps	5	Fusing belt
2	Edge shield (both sides)	6	Stay
3	Shield	7	Nip pad
4	Reflector	8	Pressure roller

A Fusing 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	620W
Edge	350W

- **Nip pad**

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

- **Reflector**

  Transmits heat efficiently to the left of the Fusing belt.

- **Shield**

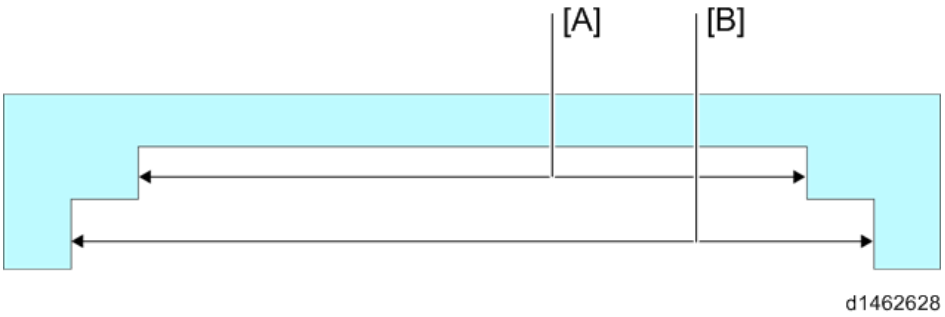
  Ensures that light from the heater is not transmitted to the Fusing belt edge (prevents excessive edge temperature rise when printing small size paper).

- **Flanges**

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

8.2.2 HEATER LIGHT-UP/SHIELD CONTROL

To prevent excessive edge temperature rise when printing small size paper, the light-up pattern of the center/edge heaters and shield plate position are changed depending on the paper size.



[A]: Position 1

[B]: Position 2 (home position, no shield)

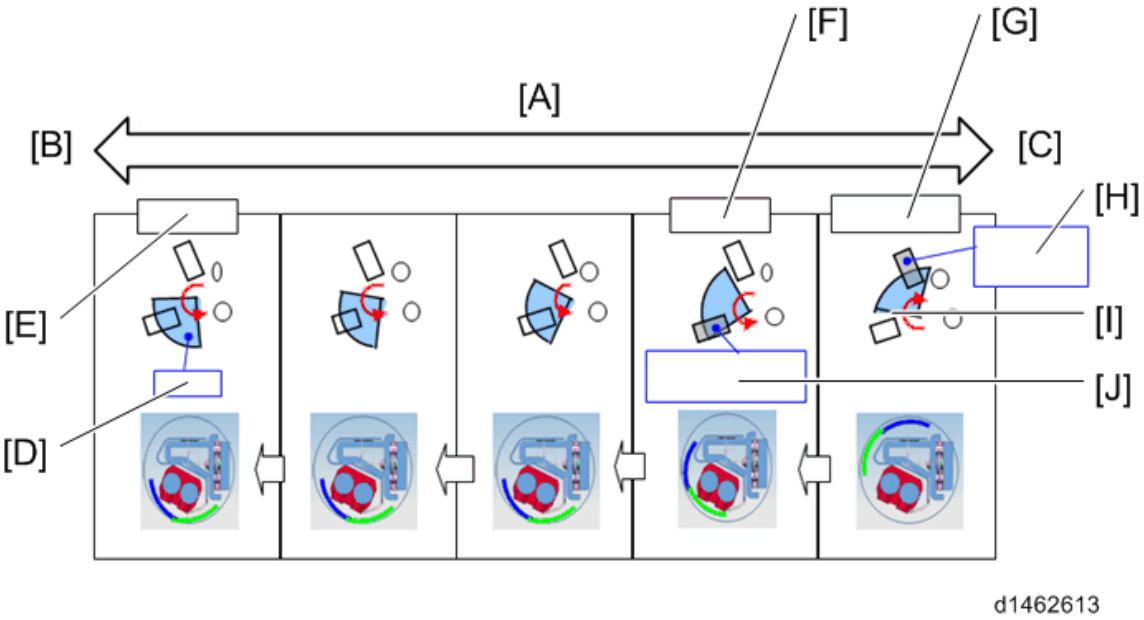
◆ **Basic operation**

After paper feed begins, depending on the rise of edge temperature, the shield is moved to a suitable position. The shield has 9 positions including the home position.

Depending on the unit temperature and continuous paper feed time, the edge heater is switched ON/OFF, and the shielding is adjusted.

◆ **Shield drive**

The shield is driven by a Fusing shield drive motor on the MFP.



[A]: Shield operating range

[B]: Shield width (large), motor cw

[C]: No shield, motor ccw

[D]: Filler

[E]: Position 8

[F]: Position 1

[G]: Home position

[H]: Shield sensor 1 (to detect HP)

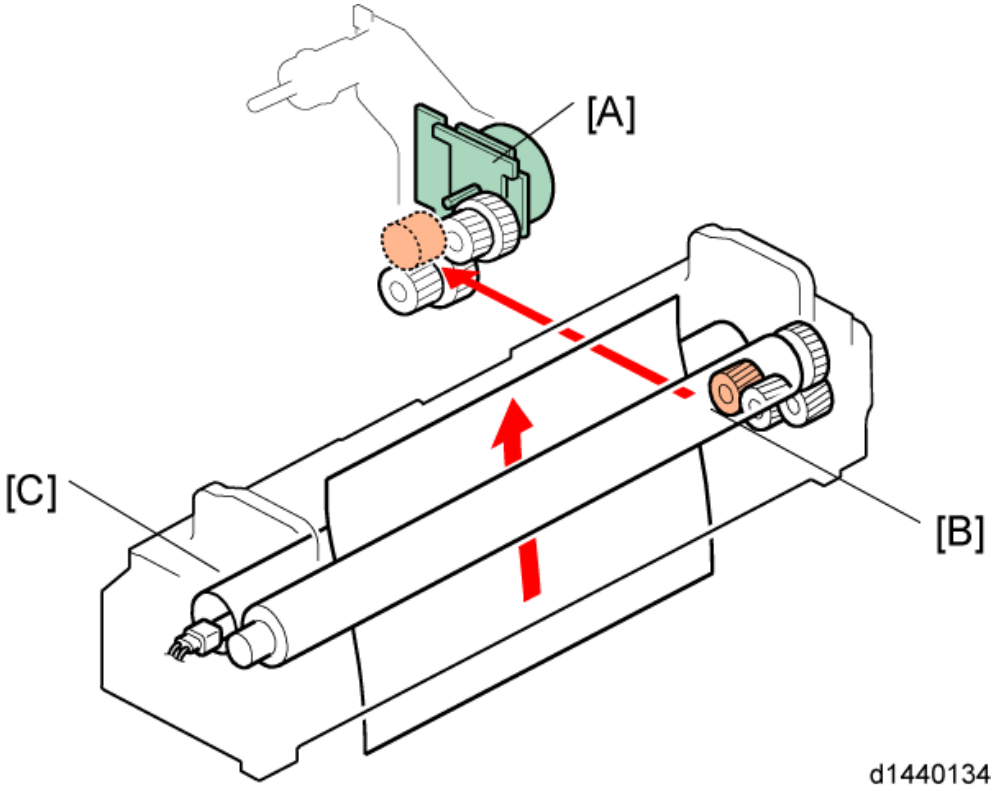
[I]: Reference edge

[J]: Shield sensor 2 (to detect reference edge)

8.2.3 FUSING DRIVE

The Pressure roller [B] is driven by the Fusing motor [A].

The Fusing belt [C] is driven by the Pressure roller (drag rotation).



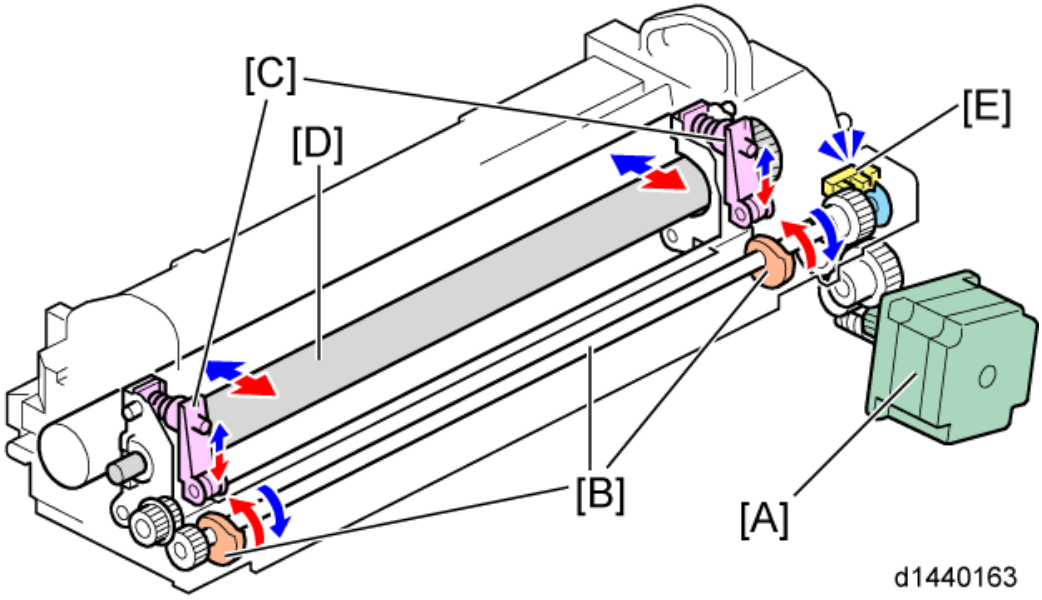
8.2.4 PRESSURE RELEASE MECHANISM

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

A pressure lever [C] is released by the drive of the Paper exit/pressure release motor [A], and the Pressure roller [D] separates from the Fusing belt.

The pressure roller HP sensor [E] detects the encoder [B], and determines the position of the Pressure roller.

After replacing the Pressure roller, if the sensor does not detect the encoder for 3 times continuously after a job is completed, SC569-00 is generated.



* The shape of the motor differs in some places from the actual MFP.

8.2.5 FUSING TEMPERATURE CONTROL

- **Warm-up mode**

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

  When fusing warm-up is completed, the Fusing 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 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 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 MFP 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.

8.2.6 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**

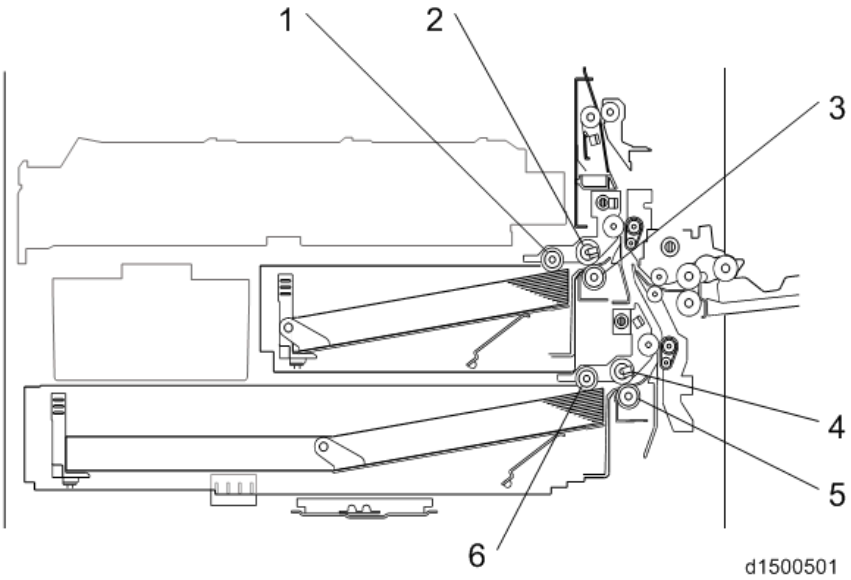
Depending on the paper size, it may not be possible to determine the points on the fixing belt which tend to rise in temperature by a sensor.

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.)

9. FEED / TRANSPORT PART

9.1 OVERVIEW



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)

9.2 FEED / TRANSPORT PART

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

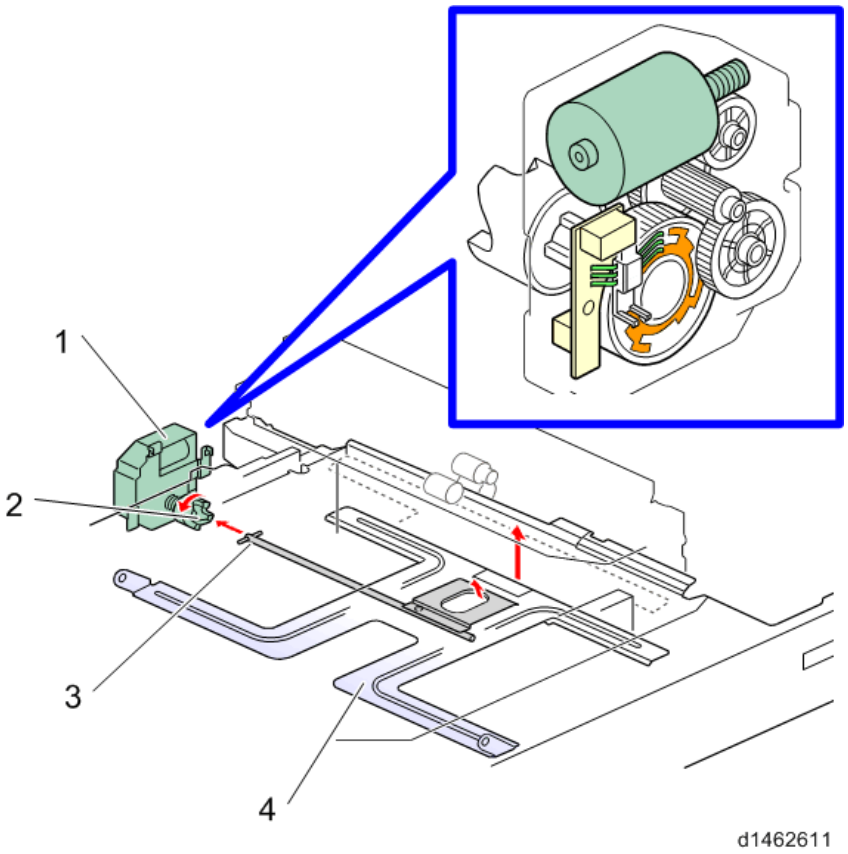
Tray	Paper size	Loading number of sheets	Corresponding paper thickness
1st paper tray	A4 landscape - A5 landscape	550 sheets	52～300g/m^2
2nd paper tray	SRA3 - postcard	550 sheets	52～300g/m^2
By-pass feed tray	SRA3 - postcard	100 sheets	52～300g/m^2
Duplex unit	SRA3 - A6 portrait	Interleave	52～169g/m^2

9.2.1 TRAY BASE PLATE LIFT

When the paper feed tray is set in the MFP, 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 base plate is lifted. The tray base plate lifts until the paper surface pushes the Pick-up roller up, the upper limit sensor switches OFF (interrupt), and the MFP enters paper feed standby mode.

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



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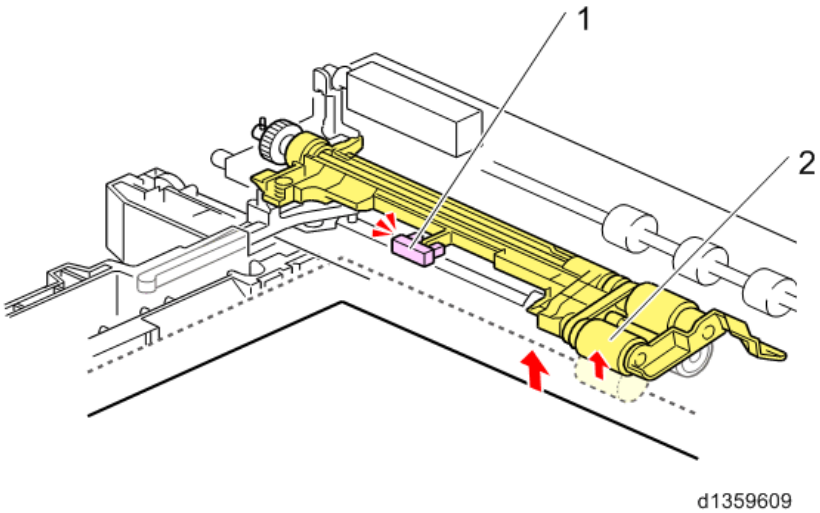
No.	Description	No.	Description
1	Lifting motor	3	Tray rear axis
2	Coupling	4	Tray bottom plate



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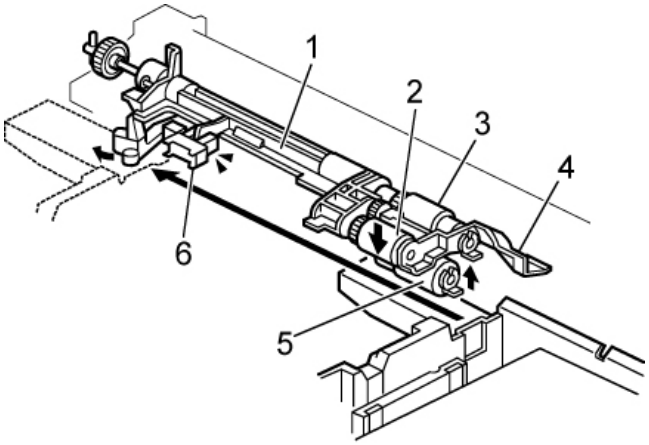
No.	Description	No.	Description
1	Upper limit sensor	2	Pick-up roller

9.2.2 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 MFP, 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 MFP 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.



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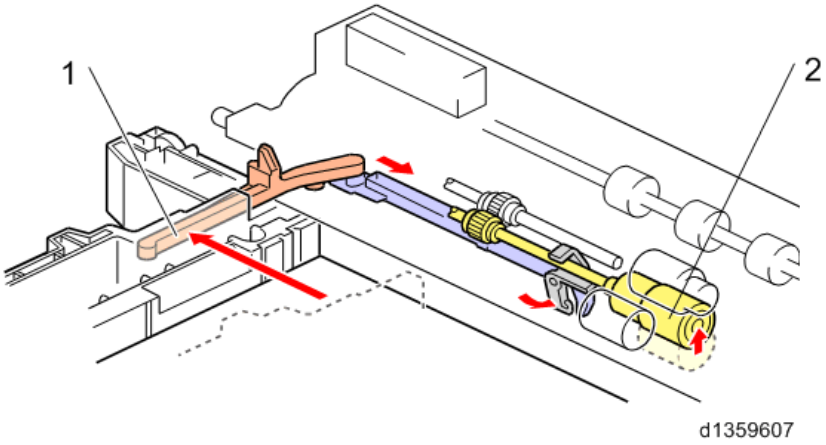
No.	Description	No.	Description
1	Pickup arm	4	Feed guide
2	Pick-up roller	5	Friction roller
3	Feed roller	6	Upper limit sensor



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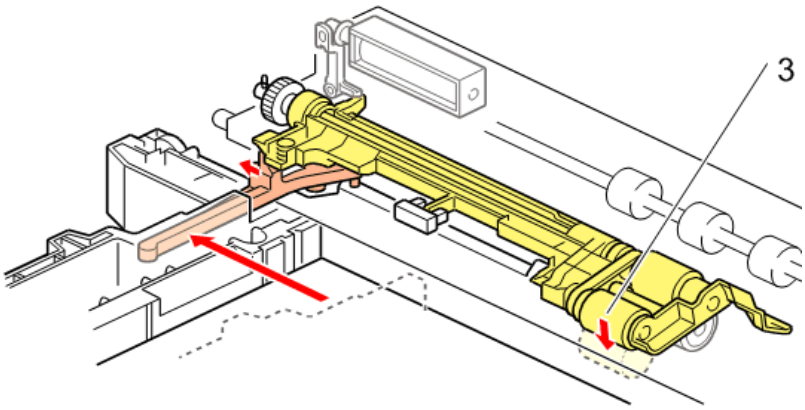

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No.	Description	No.	Description
1	Pick-up arm	3	Pick-up roller
2	Friction roller		

9.2.3 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 solenoid switches OFF and the pick-up roller contacts 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.**

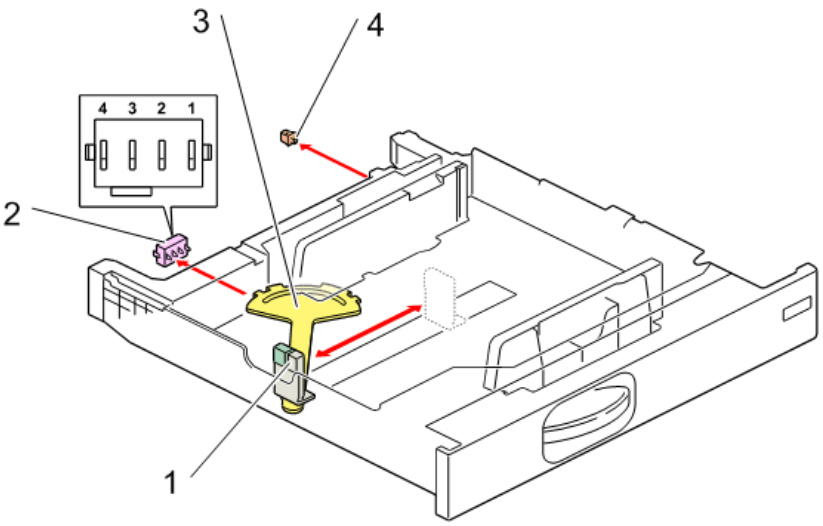
9.2.4 PAPER SIZE DETECTION (1ST PAPER TRAY)

Size cannot be detected only with set detection.

- 1st tray settings:
  A4 LEF, LT LEF, B5 LEF, and A5 LEF (select with UP mode, default is A4 LEF)

9.2.5 PAPER SIZE DETECTION (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 another switch.
If there has been a change in the pattern, “MFP 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	End fence	3	Size detection filler
2	Size detection switch	4	Tray set detection switch

- 2nd tray detection sizes:
  SRA3, A3, B4, A4 SEF, LT SEF, B5 SEF, A4 LEF, B5 LEF, and A5 LEF

- 2nd tray size detection patterns

Size	Knob			
	4	3	2	1
SRA3(12"×18")	1	0	1	0
A3(DLT)	0	1	0	0
B4(LG)	0	0	1	1
	0	1	1	1
A4 portrait	1	1	1	0
LT portrait	1	1	0	0
B5 portrait	1	0	0	0
A4 landscape(LT landscape)	0	0	0	1
B5 landscape(Exe landscape)	0	0	1	0
A5 landscape	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)”: SP5-181-002～6).

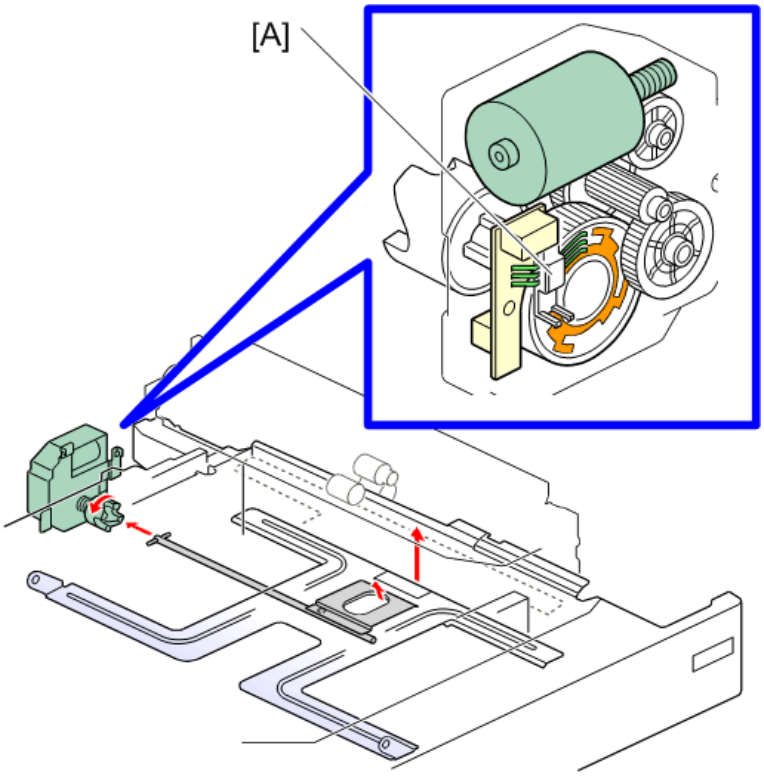
* SRA3=320×450mm(12.6"×17.7")

* Exe LEF=10.5"×7.25"

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

9.2.6 REMAINING PAPER DETECTION

When the 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.



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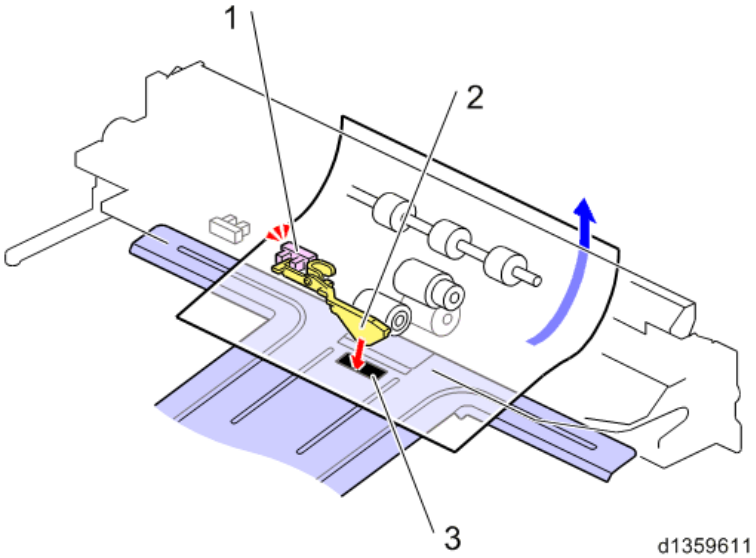
There are the following 4 remaining paper detection levels:

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

9.2.7

Paper end detection

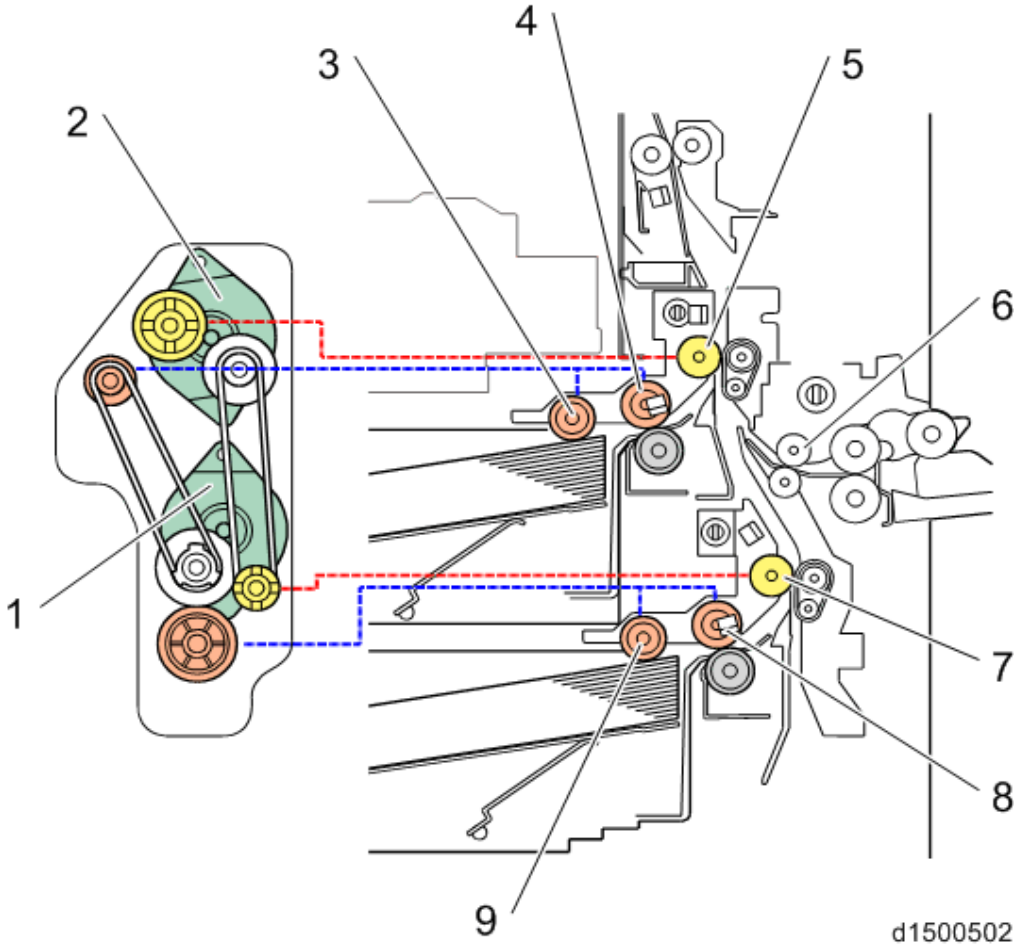
When there is no more paper in the paper feed tray, the leading edge of the paper end filler falls into a notch in the base plate, and the paper end detection sensor at the rear edge of the end filler switches ON (pass).



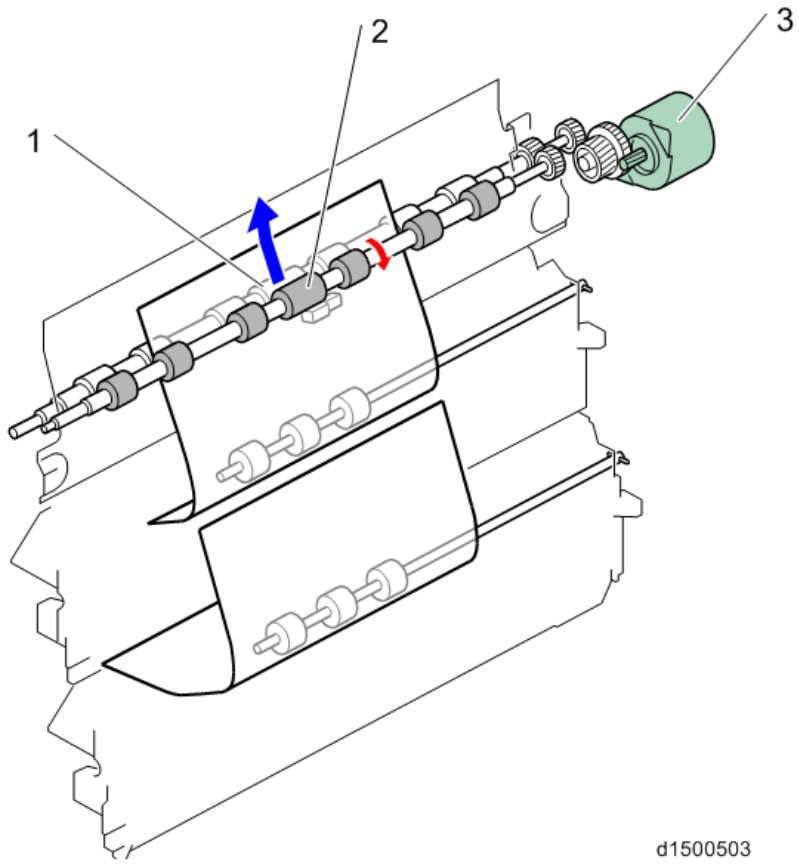
No.	Description	No.	Description
1	Paper end sensor	3	Notch
2	End filler		

9.2.8 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 transport motor.
The manual insertion transport roller is driven by a By-pass/Duplex motor, and the registration roller is driven by a registration motor.



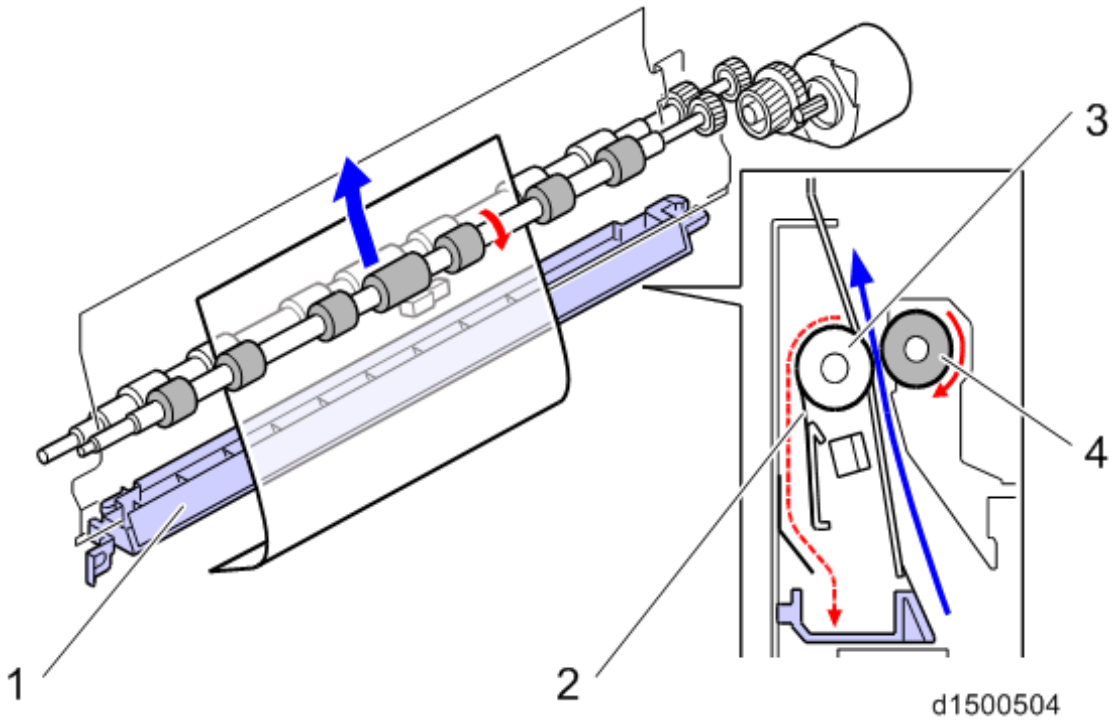
No.	Description	No.	Description
1	Paper feed motor	6	By-pass transport roller
2	Transport motor	7	Transport roller (2nd tray)
3	Pick-up roller (1st tray)	8	Paper feed roller (2nd tray)
4	Paper feed roller (1st tray)	9	Pick-up roller (2nd tray)
5	Transport roller (1st tray)		



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

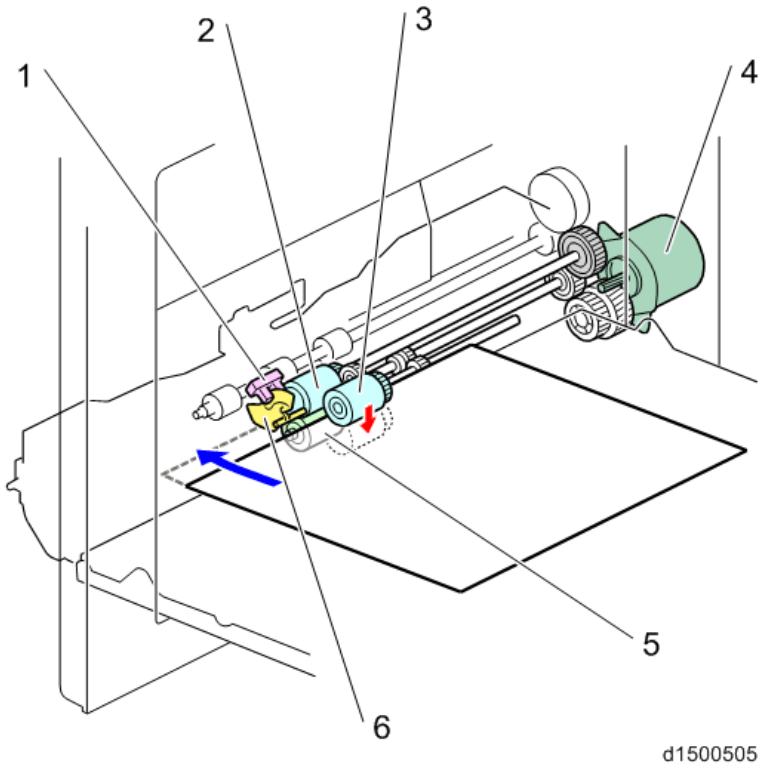
9.2.9 PAPER POWDER REMOVAL MECHANISM

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



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

9.3 BY-PASS FEED SECTION



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

9.3.1 BY-PASS FEED PAPER/SEPARATION MECHANISM

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

When the paper feed tray is selected and the MFP is started, the by-pass pick-up solenoid is switched OFF, and paper is supplied by the By-pass/Duplex motor (CCW).

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

9.3.2 BY-PASS FEED PAPER SIZE DETECTION

Paper size width detection is performed by a by-pass feed size detection switch (rotary switch). The by-pass feed size detection switch has a rotation plate which rotates together with the side fence of the by-pass feed table, and detects the paper size.
Paper portrait/landscape is determined by a length detection sensor.

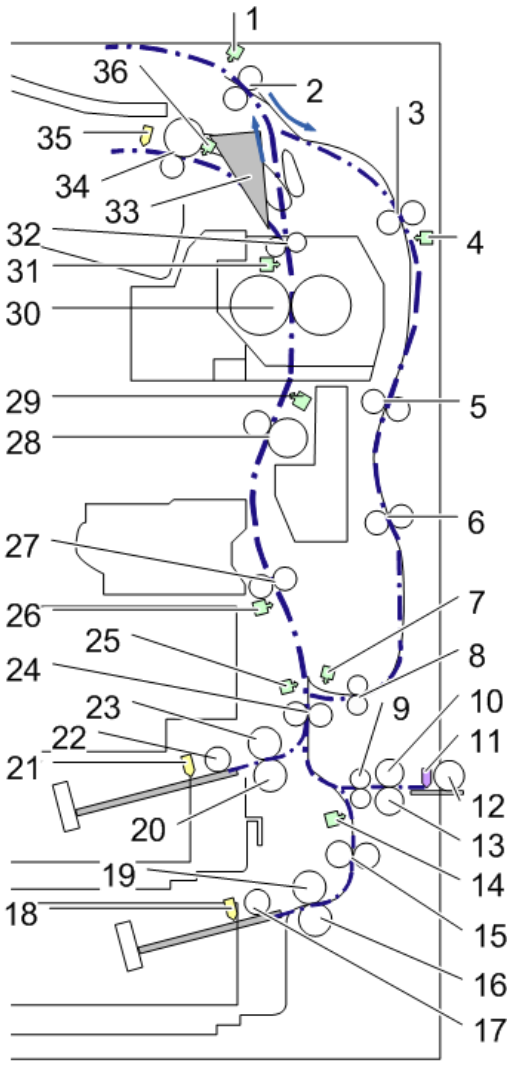
9.3.3 BY-PASS FEED PAPER END DETECTION

To detect by-pass feed paper end, a paper detection filler and by-pass feed paper end sensor are provided.
When the paper is set, the by-pass feed 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 by-pass feed table, the by-pass feed paper end sensor switches OFF (pass), and paper end is detected.

9.3.4 BY-PASS PAPER FEEDER DRIVE

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

9.4 DUPLEX SECTION



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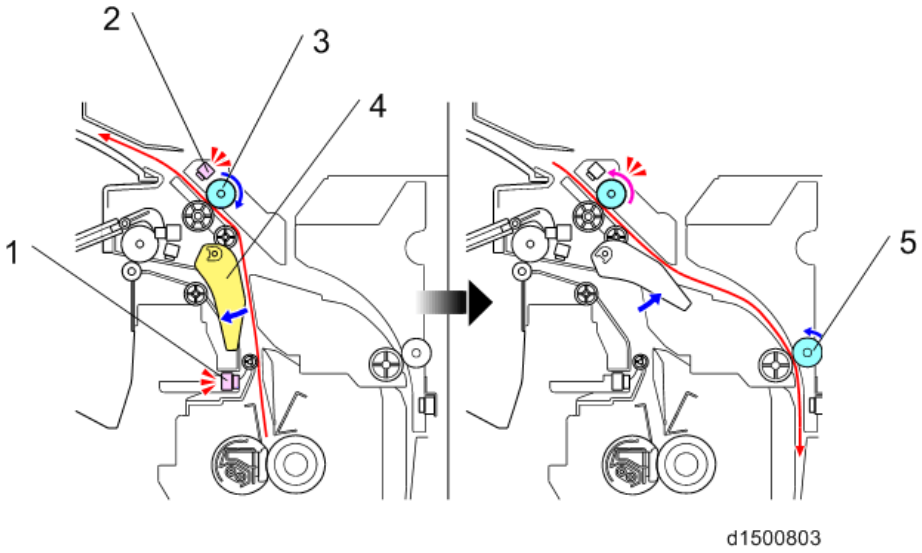
No.	Description	No.	Description
1	Inversion sensor	19	Paper feed roller 2
2	Inversion roller	20	Reverse roller 1
3	Duplex entrance roller 1	21	Paper end sensor 1
4	Duplex entrance sensor	22	Pick-up roller 1
5	Duplex entrance roller 2	23	Paper feed roller 1
6	Duplex transport roller	24	First transport roller
7	Duplex exit sensor	25	Transport sensor 1
8	Duplex outlet roller	26	Registration sensor
9	By-pass feed transport roller	27	Registration roller
10	By-pass feed roller	28	Paper transfer roller
11	By-pass paper end sensor	29	Fusing entrance sensor

No.	Description	No.	Description
12	By-pass pick-up roller	30	Heating roller
13	By-pass reverse roller	31	Fusing exit sensor
14	Second transport roller	32	Fusing exit roller
15	Vertical transport roller 2	33	Paper separating claw
16	Reverse roller 2	34	Paper exit roller
17	Pick-up roller 2	35	Paper exit full sensor
18	Paper end sensor 2	36	Paper exit sensor

9.4.1 TRANSPORT INVERSION MECHANISM

The paper passes through an ejection splitting claw, and is transported to the double-side unit by a reverse rotation sensor and reverse rotation roller.



No.	Description	No.	Description
1	Fixing outlet sensor	4	Paper eject claw
2	Inversion sensor	5	Duplex inlet roller 1
3	Inversion roller		

9.4.2 DUPLEX DRIVE

The rollers are driven by the following motors:

Rollers	Drive sources
Inversion roller	Inversion motor
Duplex inlet roller 1	Duplex inlet motor
Duplex inlet roller 2	Duplex inlet motor
Duplex transport roller 1	By-pass feed/duplex motor
Duplex outlet roller	By-pass feed/duplex motor

9.4.3 INTERLEAVE MECHANISM

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

<Paper eject from MFP>

Length	No. of interleaves
Less than 216mm	3
216-432 mm	2
432-457.2 mm	1

＜1bin eject from MFP＞

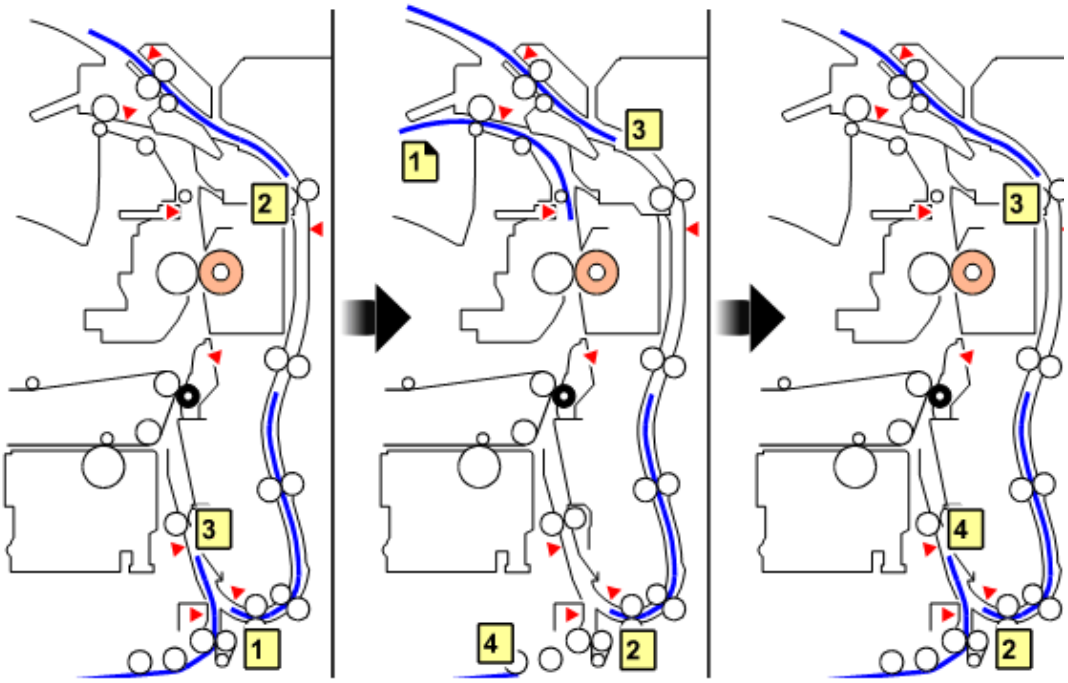
Length	No. of interleaves
Less than 216mm	2
216-432 mm	1

- 3 sheet leave

  1 sheet undersurface -> 2 sheet undersurface -> 3 sheet undersurface -> 1 sheet top surface -> 4 sheet undersurface -> 2 sheet top surface
- 2 sheet leave

  1 sheet undersurface -> 2 sheet undersurface -> 1 sheet top surface -> 3 sheet undersurface -> 2 sheet top surface -> 4 sheet undersurface

◆ **Flow of 3-sheet leave**



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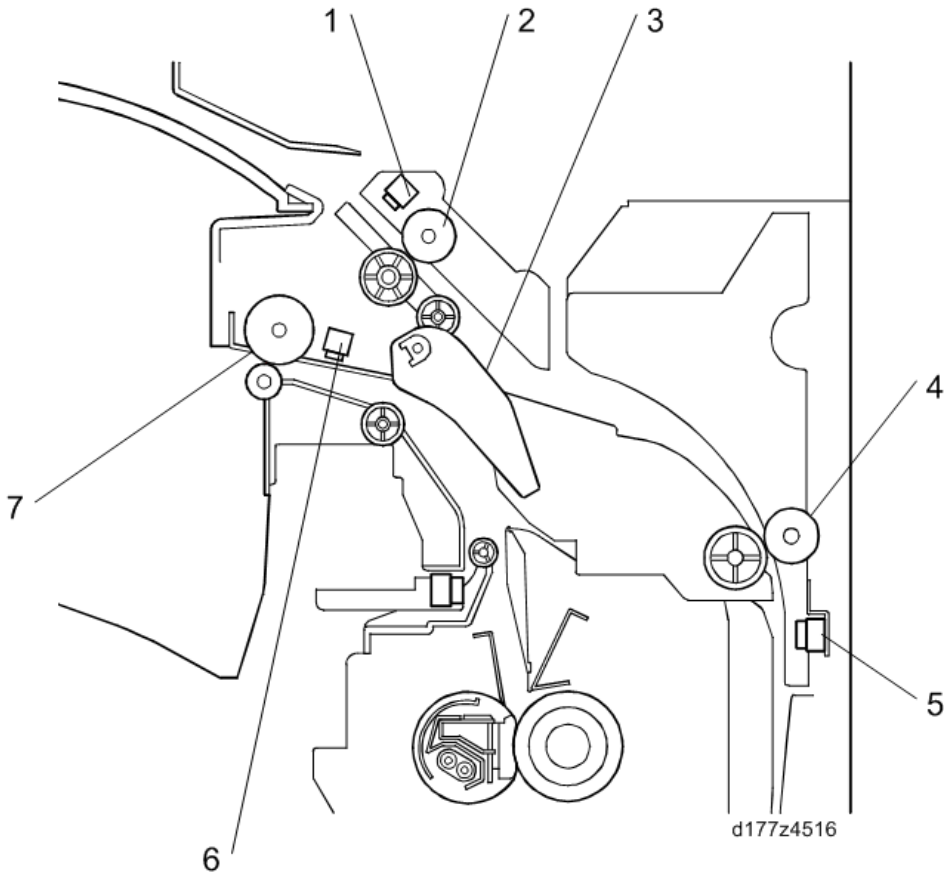
9.5 PAPER EJECT UNIT



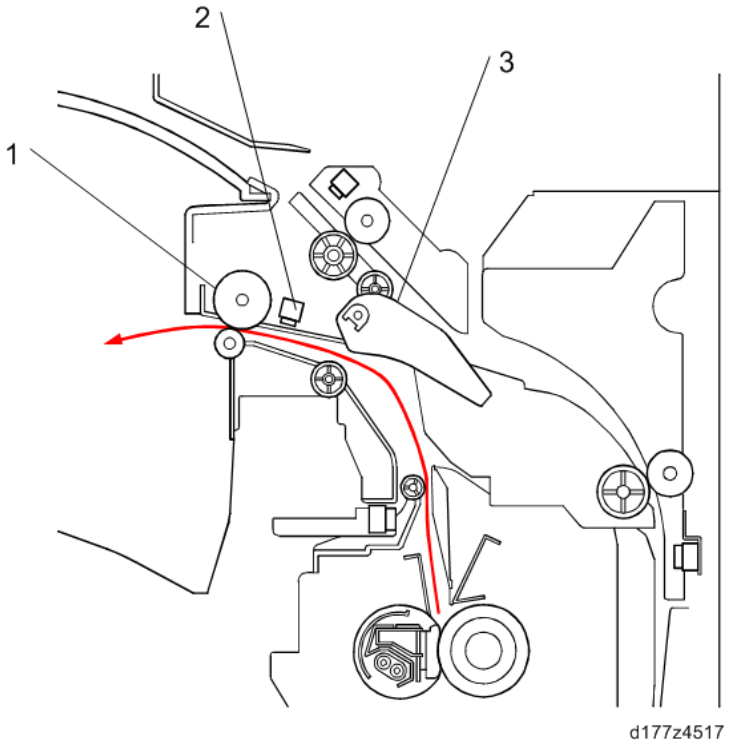
No.	Description	No.	Description
1	Inversion Sensor	5	Duplex Entrance Sensor
2	Inversion Roller	6	Paper Exit Sensor
3	Paper separating claw	7	Paper Exit Roller
4	Duplex Entrance Roller 1		

9.5.1 DELIVERY LOCATION CHANGE-OVER

The paper transported from the fixing unit is changed over by the ejection splitting claw in the “MFP paper eject/intermediate unit” direction or the “double-side unit/1 bin” direction.

◆ **MFP paper eject/intermediate unit direction**

1. The resist sensor switches ON.
2. The paper eject/pressure release motor switches ON (CCW).
3. When the rear edge of the paper leaves the paper eject roller, the paper eject/pressure release motor switches OFF.

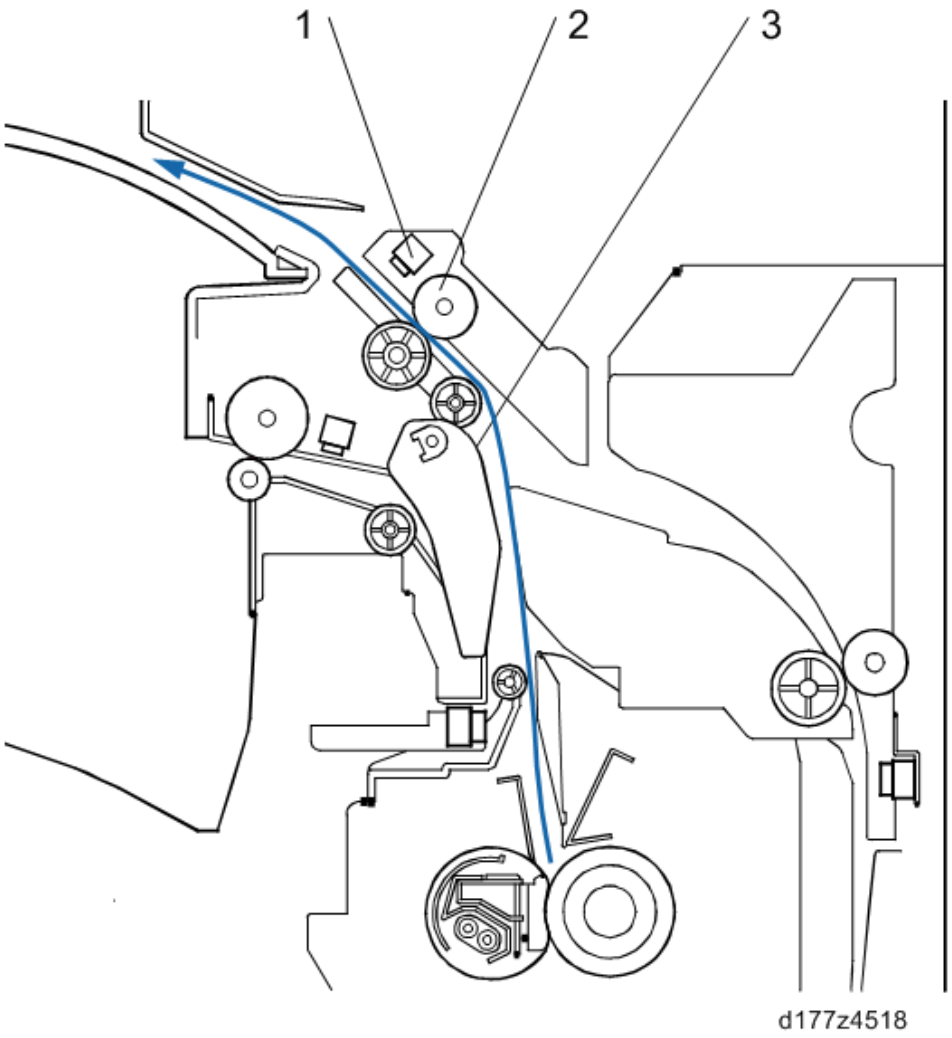


No.	Description
1	Paper eject roller
2	Paper eject sensor
3	Paper eject claw

◆ **Duplex unit/1 bin direction**

1. Registration sensor switches ON.
2. The inversion motor switches ON (CCW).
3. Before the leading edge of the paper reaches the paper eject claw, the paper eject claw moves in the duplex unit/1 bin direction.

   * If the claw is in the duplex unit/1 bin direction, the claw is not changed over.
4. Before reversed the paper, the claw solenoid switches OFF.
5. When the rear edge of the paper leaves the inversion roller, the inversion motor switches OFF.



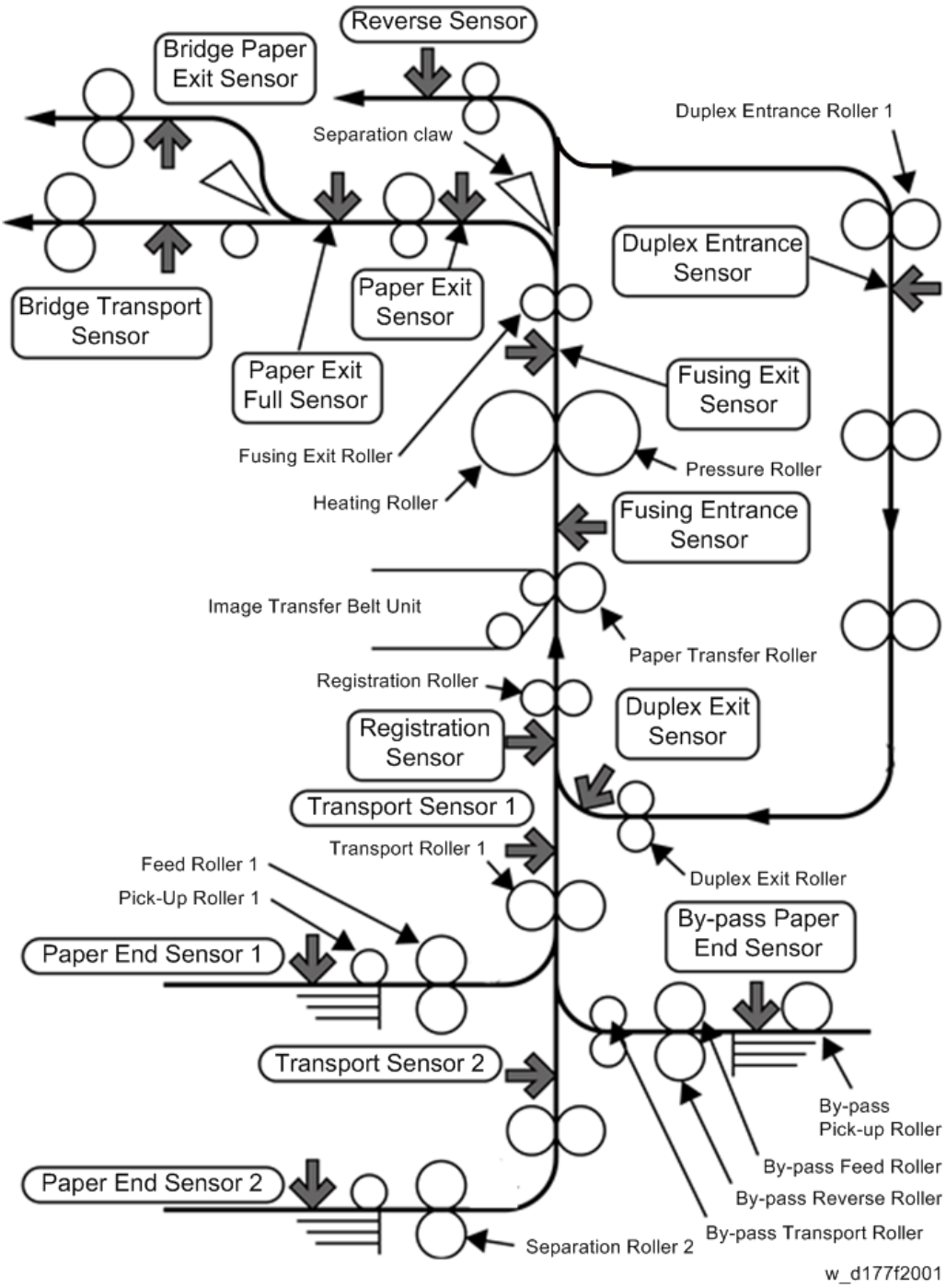
No.	Description
1	Inversion sensor
2	Inversion roller
3	Paper eject claw

9.5.2 PAPER EJECT JAM DETECTION

- **Paper eject jam detection**

  Paper eject jam is detected by the paper eject sensor.

9.6 DRIVE/SENSOR LAYOUT



9.6.1 TRANSPORT ROLLER DRIVE SOURCE

Output	Drive source
Pick-up roller 1	Paper feed motor
Paper feed roller 1	
Pick-up roller 2	
Paper feed roller 2	
First transport roller	Transport motor
Second transport roller	
Registration roller	Registration motor
Paper eject roller	Paper eject motor
Inversion roller	Inversion motor
Duplex inlet roller 1	Duplex inlet motor
Duplex inlet roller 2	
Duplex transport roller 1	By-pass feed/duplex motor
Duplex outlet roller	
By-pass feed transport roller	
By-pass pick-up roller	
By-pass feed roller	
By-pass Reverse roller	
Image transfer drive roller (belt)	Image transfer motor
Paper transfer roller	Image transfer drive roller(Follows rotation of intermediate transfer belt)
Fixing drive roller	Fixing motor

9.6.2 CLAW/PICKUP ARM DRIVE SOURCE

Output	Drive source	Default position	Application
Pick-up roller 1	First solenoid	Pressure contact when OFF	Loaded paper contact/separation change-over
Pick-up roller 2	Second solenoid	Pressure contact when OFF	Loaded paper contact/separation change-over
Paper eject claw	Claw solenoid	Paper eject path open when OFF	MFP paper eject/intermediate or 1 bin/two-face path change-over
By-pass pick-up roller	By-pass feed solenoid	Clearance when OFF	Loaded paper contact/separation change-over

9.6.3 INTER-ROLLER TRANSPORT PATH

Distance units: mm

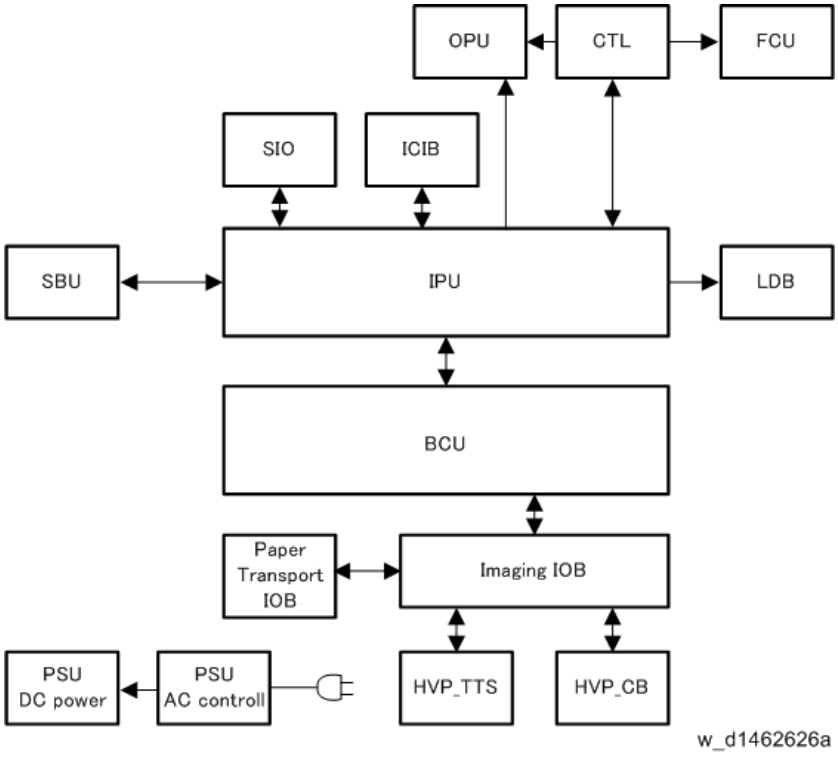
Md	From	To	Distance
First paper feed	First pick-up roller	First paper feed roller	30.0
	First paper feed roller	First transport roller	43.0
Second paper feed	Second pick-up roller	Second paper feed roller	30.0
	Second paper feed roller	Second transport roller	43.0
	Second transport roller	First transport roller	96.9
Registration	First transport roller	Registration roller	86.8
	Registration roller	Paper transfer roller (image transfer position)	95.5
Fixing	Paper transfer roller (nip)	Fixing roller (nip)	85.0
	Fixing roller (nip)	Fixing outlet roller	55.7
Paper eject	Fixing roller (nip)	Paper eject roller	143.6
Two-way distribution	Fixing roller (nip)	Inversion roller	143.6
	Inversion roller	Duplex inlet roller 1	131.3
Duplex re-supply	Duplex inlet roller 1	Duplex inlet roller 2	120.4
	Duplex inlet roller 2	Duplex transport roller 1	90.9
	Duplex transport roller 1	Duplex outlet roller	110.2
	Duplex outlet roller	Registration roller	94.7
By-pass feed	By-pass Pick-up roller	By-pass Paper feed roller	30.0
	By-pass Paper feed roller	By-pass transport roller	24.5
	By-pass transport roller	First transport roller	56.0

9.6.4 SENSOR POSITION

Md	From	To	Distance
First paper feed	First transport roller	First transport sensor	16.8
Second paper feed	Second transport roller	Second transport sensor	24.3
	Second transport sensor	First transport sensor	88.7
Registration	Registration sensor	Registration roller	17.2
Paper eject	Paper eject sensor	Paper eject roller	17.0
Two-way distribution	Inversion roller	Inversion sensor	14.0
Duplex	Duplex inlet roller 1	Duplex inlet sensor	25.0
	Duplex outlet roller	Duplex outlet sensor	15.0
1 bin	Inversion sensor	1 bin paper eject roller	—

10. ELECTRICAL PARTS

10.1 BLOCK DIAGRAM



10.2 BOARD OUTLINE

10.2.1 CONTROLLER

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

10.2.2 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.

10.2.3 SIO

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

10.2.4 LDB

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

10.2.5 BCU

Controls the engine.

10.2.6 IPU

Processes digital signals by an IPU.

10.2.7 IOB

Controls the MFP engine sensor, motor and solenoid.

10.2.8 FCU

Controls the fax program.

10.2.9 OPU

Controls the control panel.

10.2.10 HVP(COMPOSITE HIGH-VOLTAGE POWER SUPPLY TTS/CB)

Generates the high-voltage power required for process control. Divided into two units, i.e., transfer (TTS) and electrostatic/developing (CB).

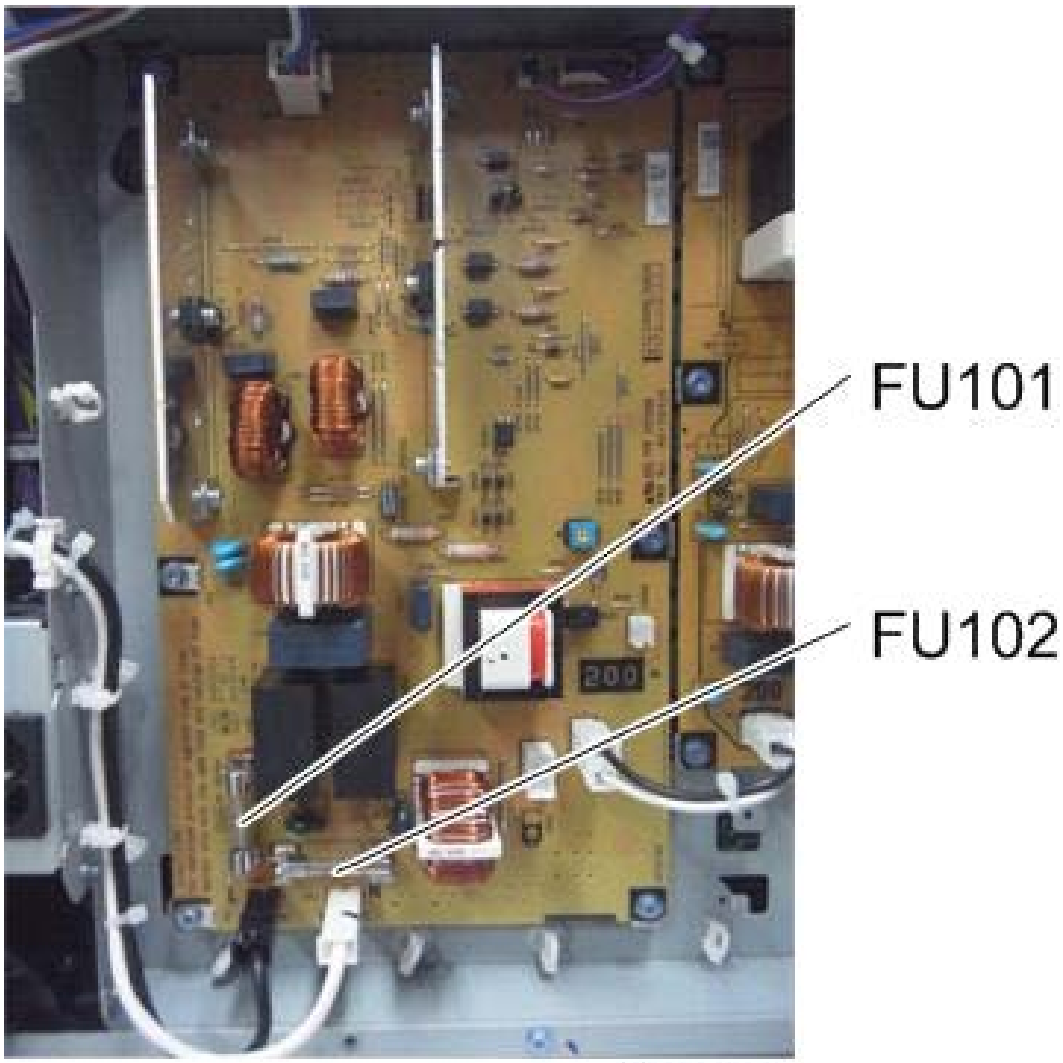
10.2.11 PSU

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 fixing heater.

Fuses

Name	Output connector	Capacity	Part number	Market exchange possible
		Voltage	Part name	Remarks
FU101	CN985 (Fixing center heater) CN986 (Fixing edge heater)	15A	11071241	Yes
		AC	TLC-15A-N4	Installed on AC control board
FU102	CN988 (DC power supply)	15A	11071241	Yes
		AC	TLC-15A-N4	Installed on AC control board
FU3	CN912(IOB、SIO)	8A	11071283	Yes
		24V	FBT 250V 8A(EM)	Installed on DC power supply
FU4	CN917 (Interlock switch [IOB])	8A	11071283	Yes
		24V	FBT 250V 8A(EM)	Installed on DC power supply
FU5	CN917 (Interlock switch [IOB])	8A	11071283	Yes
		24V	FBT 250V 8A(EM)	Installed on DC power supply
FU7	CN913(FIN) CN914(BANK)	8A	11071283	Yes
		24V	FBT 250V 8A(EM)	Installed on DC power supply

Fuse Position



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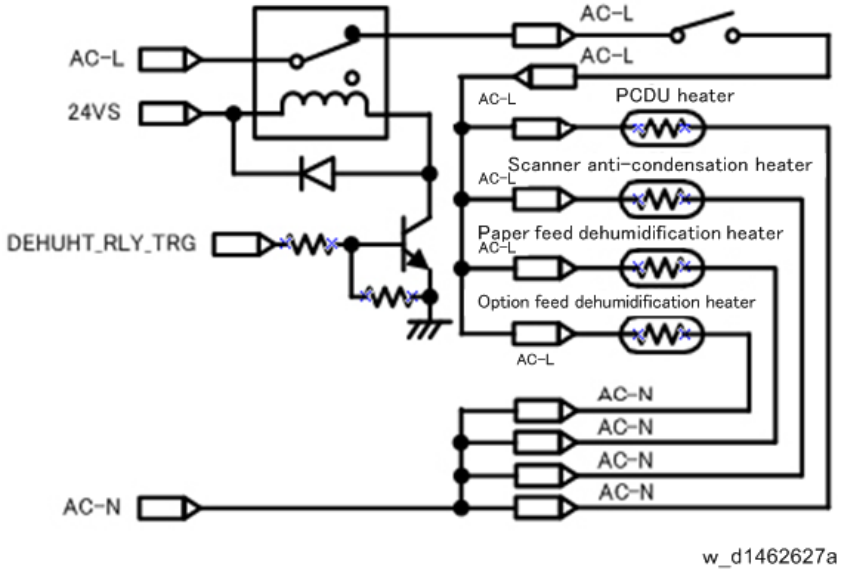
10.3 FEED TRAY DEHUMIDIFIER HEATER, SCANNER/PCDU ANTI-CONDENSATION HEATER

10.3.1 CIRCUIT CONFIGURATION



The power circuit of the scanner anti-condensation heater and drum dehumidifier heater is linked to the switch of the paper feed heater. Therefore, when the paper feed heater power is turned OFF, all heater is de-energized. In addition, the operation is controlled so as not to exceed the maximum power.

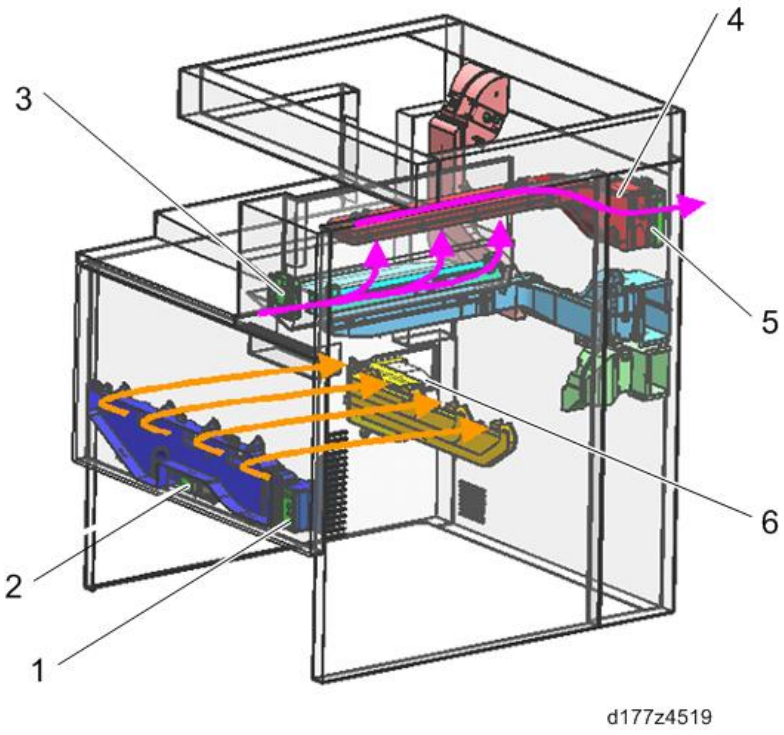
Dehumidification heater switch ON

Heater	SP mode	Plug-in	Energy saving	Waiting	Action
Paper feed dehumidification heater	OFF	Energized	Energized	De-energized	De-energized
	ON	Energized	Energized	Energized	De-energized
Option feed dehumidification heater	OFF	Energized	Energized	De-energized	De-energized
	ON	Energized	Energized	Energized	De-energized
Scanner anti-condensation heater	OFF	Energized	Energized	De-energized	De-energized
	ON	Energized	Energized	Energized	De-energized
PCDU heater	OFF	Energized	Energized	De-energized	De-energized
	ON	Energized	Energized	energized	De-energized

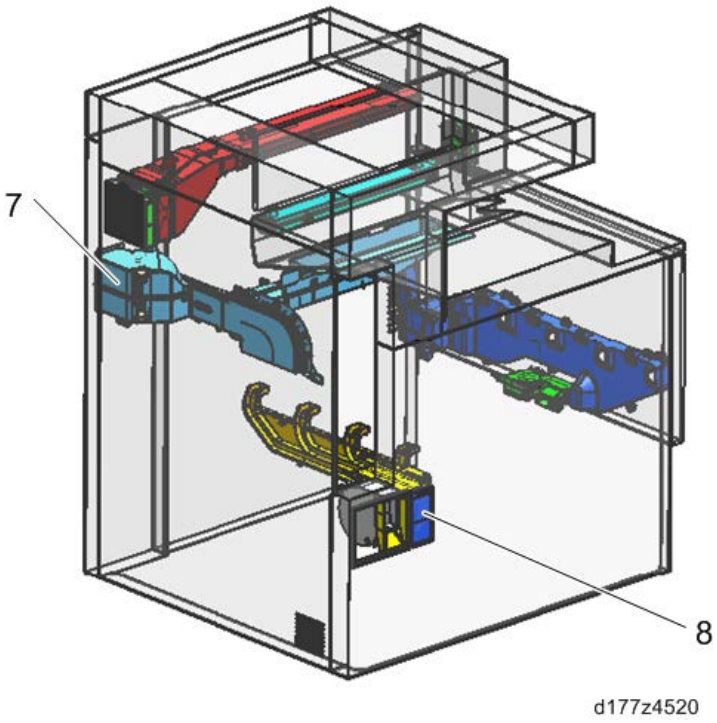
11. AIR FLOWS (FAN CONTROL)

11.1 OVER VIEW

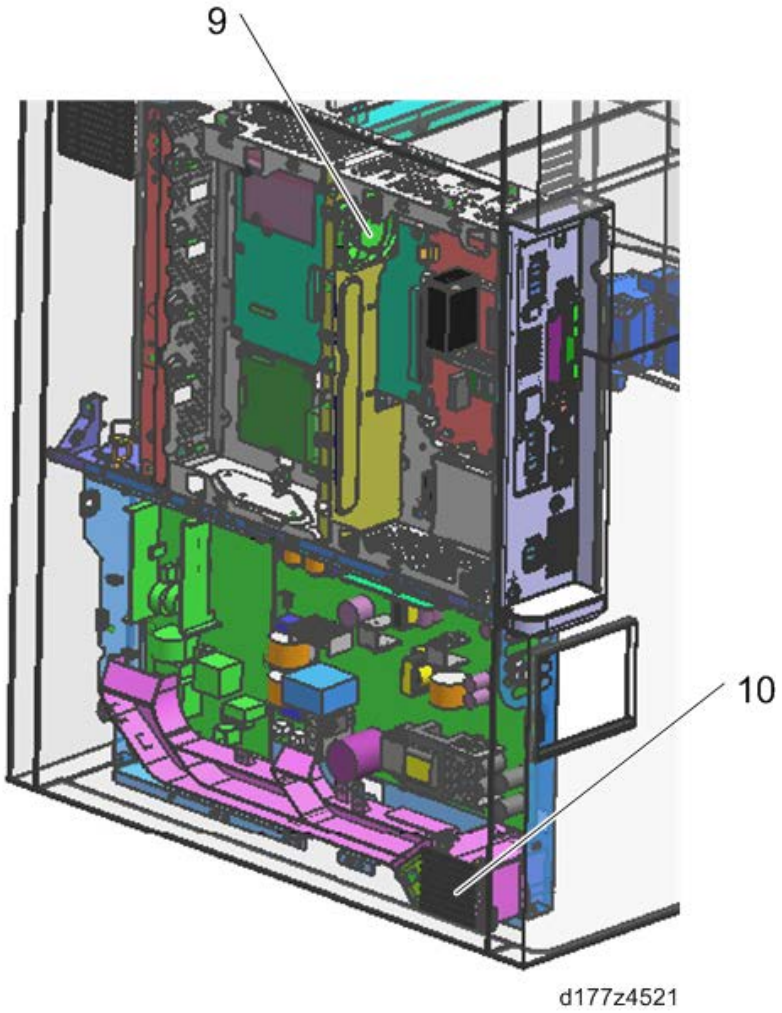
Imaging system (front)



Imaging system (rear)



Electric system



No.	Part name
1	Developing air intake fan / right
2	Developing air intake fan / left
3	Paper discharge cooling fan
4	Fixing heat discharge fan
5	Odor filter
6	Ozone exhaust fan
7	Toner supply cooling fan
8	Ozone filter/Dust filter
9	Electric box cooling fan
10	PSU cooling fan

11.2 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.

11.2.1 COOLING OF PSU

Air taken in by the PSU cooling fan is guided near the cooling target by the duct, and is efficiently cooled. Moreover, temperature rise inside the MFP is controlled by discharging air in the PSU box outside the MFP with the PSU heat discharge fan*.

* D150/D149/D148 only.

11.2.2 COOLING OF TONER SUPPLY PARTS

Air taken in with the toner supply cooling fan is guided to circulate around the toner bottle, and is discharged from the side of the delivery tray to outside the MFP. It is aimed to achieve heat insulation from the stack paper to the toner bottle by reducing the melting point of the toner. Keep in mind that the shape of the duct differs in D150/D149/D148, and D147/D146.

11.2.3 COOLING OF PCDU PARTS

By discharging air taken in from two fans, the developing air intake fan / right and developing air intake fan / left at the front, from the ozone exhaust fan at the rear, a uniform air flow is attained and efficient cooling is realized. Discharge of ozone and scattering of toner are prevented by installing an ozone filter and a dust filter in front of the ozone exhaust fan.

11.2.4 COOLING OF FIXING PARTS

Air taken in from the paper discharge cooling fan at the front is discharged from the fixed heat discharge fan at the rear to outside the MFP. By cooling the paper immediately after fixing, not only cooling of the fixing outlet 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 fixing heat discharge fan.

11.2.5 COOLING OF ACTUATOR

Air taken in from the drive cooling fan* is discharged from the main body exhaust fan* to outside the MFP.

* D150/D149/D148 only.

11.2.6 COOLING IN CONTROLLER BOX

Air is circulated by the electric box cooling fan installed in the controller box, preventing temperature rise in the controller box.

11.2.7 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 MFP**

The temperature in the MFP is detected during output and after output, and the interior of the MFP is cooled by fan operation (stepwise operation of fan, prolonged fan rotation after paper has passed through) according to the temperature inside the MFP.

However, if the temperature inside the MFP 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 MFP.

◆ **Cooling operation during output**

Perform cooling operation under the following conditions.

Imaging temperature	～34	34	35	36	37	38	40[*1]
Fixing heat discharge fan	○	○	○	○	○	○	○
Ozone exhaust fan	20%	30%	40%	40%	40%	40%	40%
Toner supply cooling fan	○	○	○	○	○	○	○
Developing air intake fan / Right			○	○	○	○	○
Developing air intake fan / left	○	○	○	○	○	○	○
Paper discharge cooling fan[*2]	○	○	○	○	○	○	○
PSU fan[*2]	○	○	○	○	○	○	○
Electric box cooling fan [*2]	○	○	○	○	○	○	○

* The operation start temperature can be modified by SP.

*1 If the imaging temperature reaches 40°C each fan will continue operating until it falls by 2°C.

*2 Operating condition:

When the time interval from the previous job is less than 10 minutes. Or, when the time interval from the previous job is more than 10 minutes, and 5 minutes have elapsed from start of MFP.

◆ **Cooling operation after output**

Usually, after output, fan operation is suspended.

If the temperature in the MFP after output is high, fan rotation is continued after output to cool the interior of the MFP.

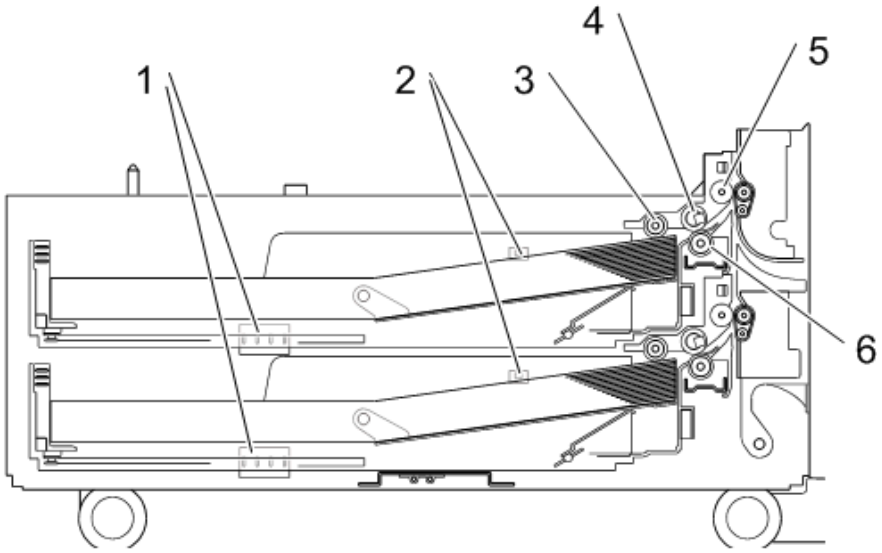
12. PAPER FEED UNIT PB3210

12.1 SPECIFICATION / PARTS LAYOUT

12.1.1 SPECIFICATION

Item	Specification
Type	Front loading type feed table
Linear velocity	73-350mm/s
Feed system	RF system
Paper feed tray stages / capacity	550 sheets×2 stages（80g/m^2)
Paper sizes	SRA3 SEF, A3 SEF, A4 SEF, A4 LEF, A5 LEF, B4 SEF, B5 SEF, B5 LEF, 12"×18" SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×11" SEF, $8^1/_2$"×11" LEF, undefined size
Paper thickness	52-300g/m^2
Power source	DC24V±10%, 5V±5%, AC100V±10%
Dimensions (width × depth × height)	587×685×247 mm
Weight	Less than 20.1 kg (not including packaging materials or other items in package)
Service life	3000K sheets or 5 years
Maximum power consumption	Less than 21W

12.1.2 PARTS LAYOUT



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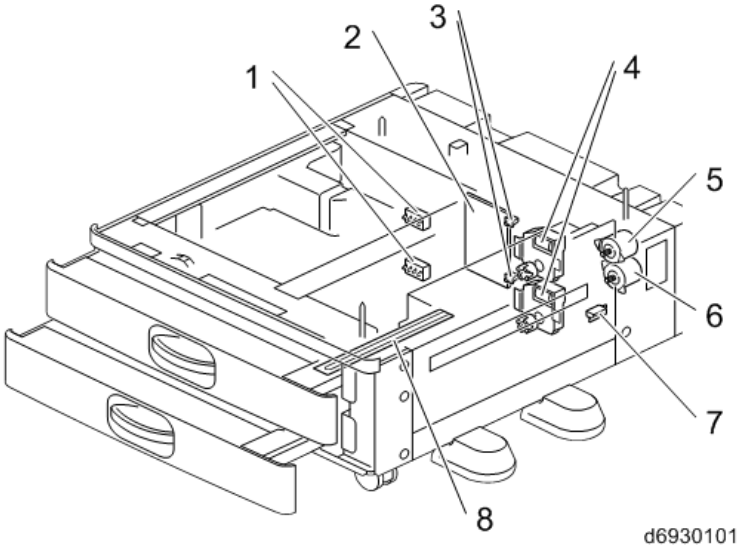
No.	Description	No.	Description
1	Tray set detection sensor	9	Transport motor
2	Paper end sensor	10	Vertical transport cover open/close switch
3	Paper size detection switch	11	Vertical transport sensor
4	Bank control board	12	Feed roller
5	Paper feed motor	13	Friction roller
6	Tray lift motor	14	Pickup roller
7	Lift sensor	15	Paper feed sensor
8	Pickup solenoid	16	Dehumidifying heater



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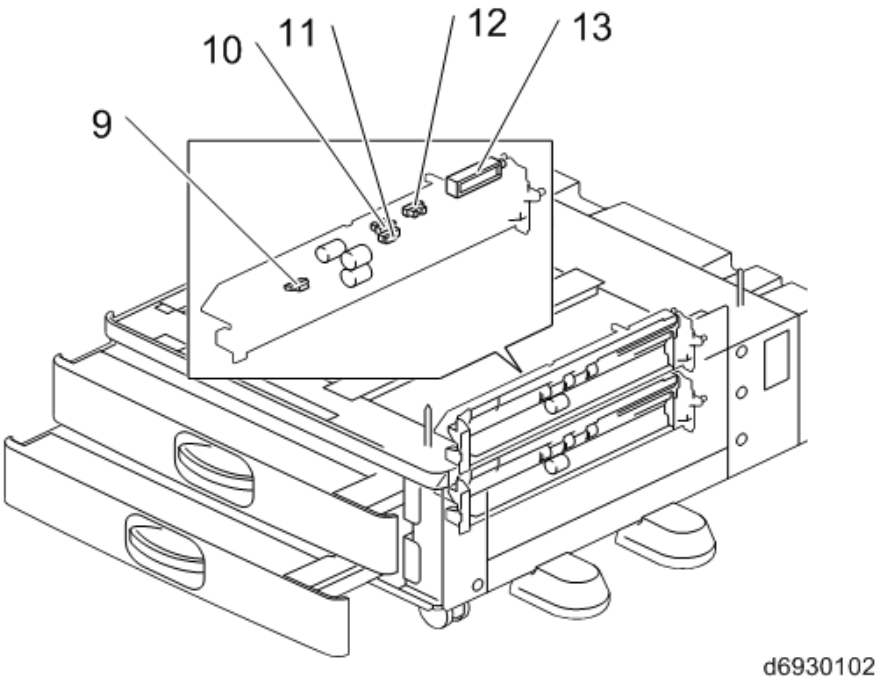


No.	Description	No.	Description
1	Paper size detection switch	8	Dehumidifying heater
2	Bank control board	9	Paper feed sensor
3	Tray set detection switch	10	Paper end sensor
4	Tray lift motor	11	Transport sensor
5	Paper feed motor	12	Limit sensor
6	Transport motor	13	Pick-up solenoid
7	Transport cover open/close switch		

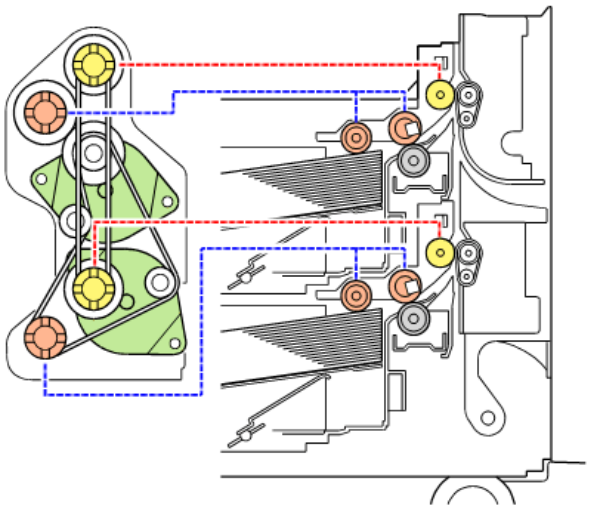
12.2 MECHANISM

12.2.1 PAPER FEED SEPARATION MECHANISM

Paper feed is an RF paper feed system. The paper feed unit comprises a Pickup roller, Feed roller and Friction roller. These rollers are high durability.

12.2.2 DRIVE MECHANISM

Pick-up roller, Feed roller are driven by the paper feed motor. Transport roller is driven by the transport motor. Not driven Friction roller.



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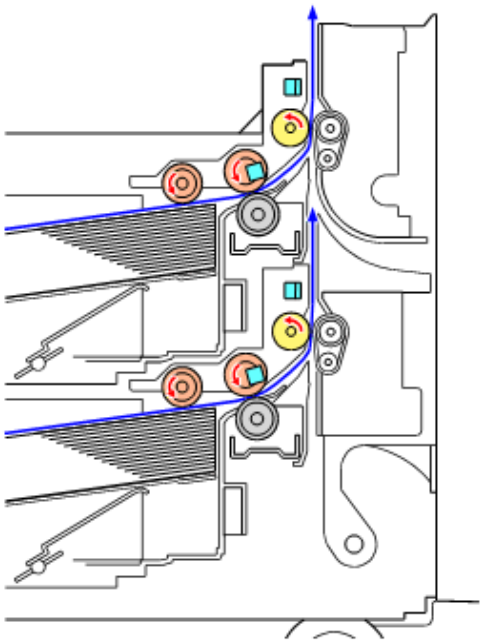
12.2.3 FRICTION ROLLER/ PICKUP ROLLER RELEASE MECHANISM

When the paper feed tray is set, the Friction roller comes in contact with the Feed roller, and the Pickup roller contacts the uppermost transfer sheet.
However, when the paper feed tray is pulled out, to prevent paper dropout, the contact between the Feed roller and Friction roller, and between Pickup roller and transfer sheet is released.

12.2.4 PAPER FEED TRANSPORT MECHANISM

In this MFP, to maintain a fixed clearance between sheets, a paper feed sensor is provided between the Pickup roller and the Feed roller, which adjusts the paper feed timing.



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STEP5 **Switch the Paper feed motor ON, and supply the first sheet.**

STEP6 **To prevent transport of the next sheet, the pickup solenoid switches ON just before the trailing edge of the first sheet leaves the Pickup roller, and the Pickup roller separates from the paper surface.**

STEP7 **Just before the trailing edge of the first sheet leaves the Paper feed motor, the paper feed motor switches OFF.**

However, at this time, when the Paper feed sensor detects no sheet (when the second sheet is not transported to the paper feed sensor position), pre-feed is performed without switching the Paper feed motor OFF.

Pre-feed is as follows.

6. The pickup solenoid switches OFF, and the second sheet of paper is transported to the Paper feed sensor position.
7. When the trailing edge of the second sheet passes the Feed roller, the Paper feed motor is switched OFF. The pickup solenoid remains OFF.

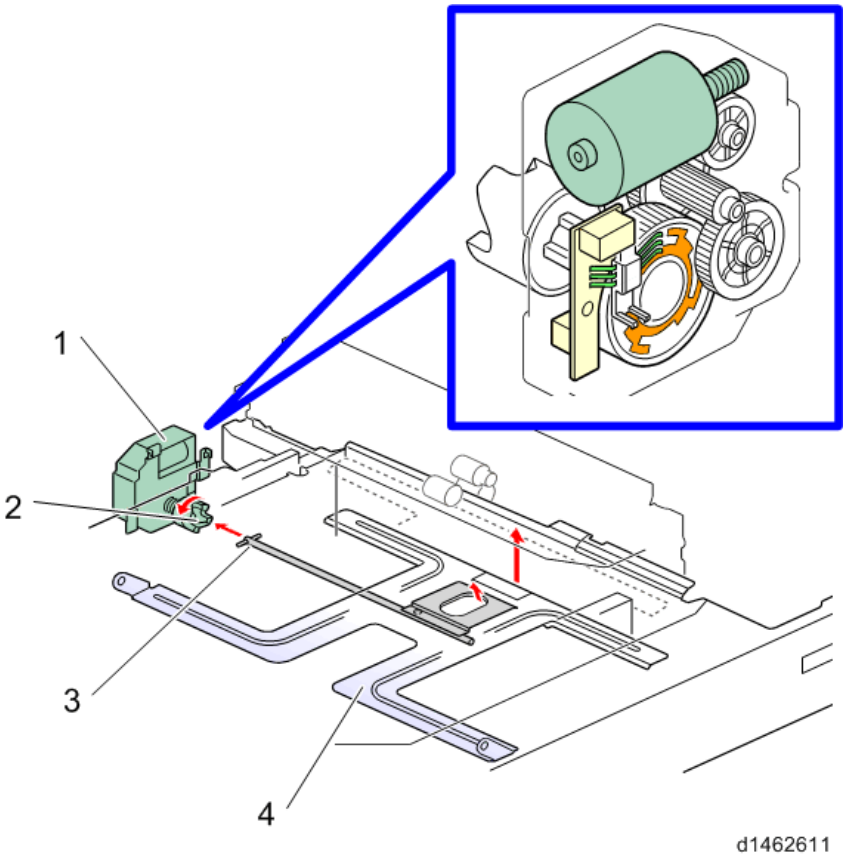
STEP8 **Just before the trailing edge of the first sheet passes the Feed roller, the pickup solenoid is switched OFF, and the Pickup roller is brought in contact with the paper surface.**

STEP9 **When the first sheet is transported a predetermined distance by the downstream transport roller, the Paper feed motor is switched ON to supply the second sheet.**

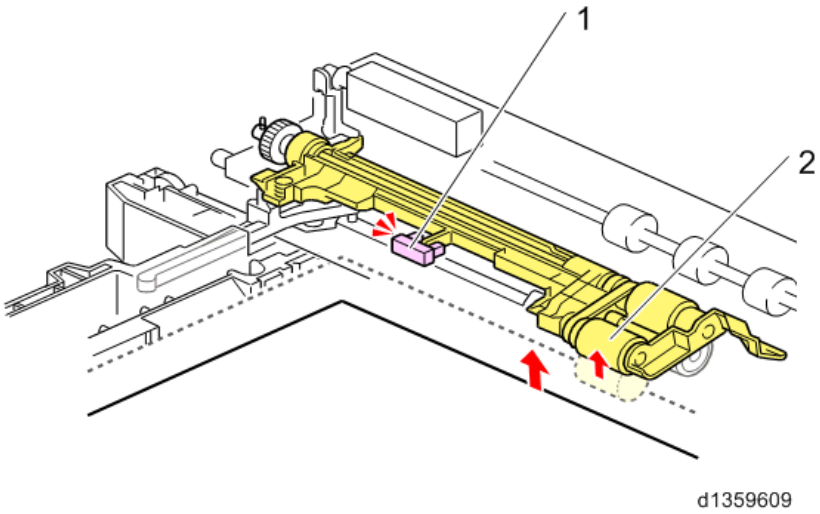
12.2.5 TRAY BASE PLATE LIFT

When the paper feed tray is set in the main unit, the set switch switches ON, and it is detected that the tray is set. At this time, the coupling of the lift motor engages with the shaft at the rear of the tray, the motor rotates, and the tray base plate is lifted up. The paper surface pushes up the Pickup roller, the tray base plate is lifted until the upper limit sensor switches OFF (interrupt), and the printer enters the standby mode.

When the paper feed tray is removed, the coupling is disengaged, and the base plate descends. At this time, the lift motor rotates until the coupling returns to the home position.



No.	Description	No.	Description
1	Lift motor	3	Tray rear side shaft
2	Coupling	4	Tray base plate

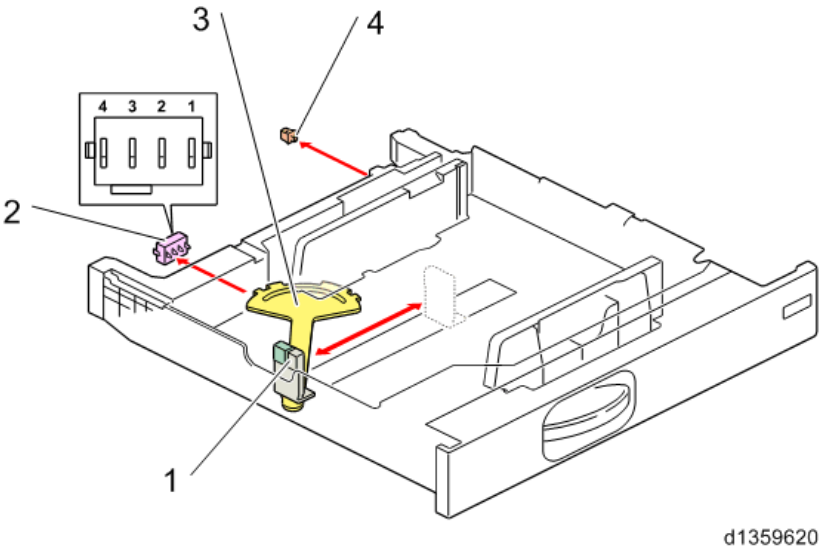


No.	Description	No.	Description
1	Limit sensor	2	Pick-up roller

12.2.6 PAPER SIZE DETECTION

The end fence interlocks mechanically with the size detection filler, and when the end fence is moved, the size detection filler also moves.

When the Paper feed tray is set, 4 size detection switches switch ON/OFF depending on the position of the size detection filler. Paper size is detected by a combination of these switches.



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

◆ **Size detection switch operation**

Paper size	Size detection switch			
	SW4	SW3	SW2	SW1
SRA3 (12”×18”)	1	0	1	0
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

12.2.7 REMAINING PAPER DETECTION/PAPER END DETECTION

◆ **Remaining paper detection**

Detection of paper remaining in the Paper feed tray is performed by a combination of ON (contact/non-contact) of contact-type remaining detection plates (printed circuits) CN-3, CN-5.

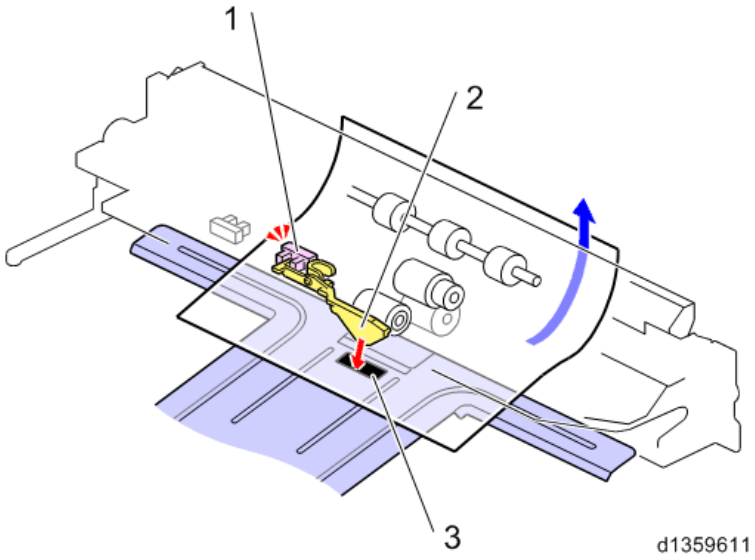
When not much paper remains and the Tray lift motor rotates, it switches ON or OFF due to the remainder detection plates CN-3, CN-5 and terminals in the motor.

The following 4 remainder detections are performed:

Remainder state	100%	70%	30%	10%
CN-3	OFF	ON	ON	OFF
CN-5	OFF	OFF	ON	ON
Control panel remainder display	4 bars	3 bars	2 bars	1 bar

◆ **Paper end detection**

When the paper in the Paper feed tray is exhausted, the paper end sensor switches ON (Transparent) due to the end filler.



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

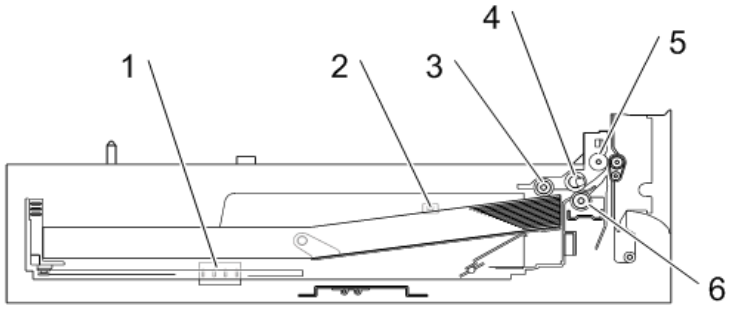
13. PAPER FEED UNIT PB3150

13.1 SPECIFICATION / PARTS LAYOUT

13.1.1 SPECIFICATION

Item	Specification
Type	Front loading type feed table
Linear velocity	73-450mm/s
Feed system	RF system
Paper feed tray stages / capacity	550 sheets×2 stages（80g/m^2)
Paper sizes	SRA3 SEF, A3 SEF, A4 SEF, A4 LEF, A5 LEF, B4 SEF, B5 SEF, B5 LEF, 12"×18" SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×11" SEF, $8^1/_2$"×11" LEF, undefined size
Paper thickness	52-300g/m^2
Power source	DC24V±10%, 5V±5%, AC100V±10%
Dimensions (width × depth × height)	587×685×120 mm
Weight	Less than 10.9 kg (not including packaging materials or other items in package)
Service life	3000K sheets or 5 years
Maximum power consumption	Less than 19 W

13.1.2 PARTS LAYOUT



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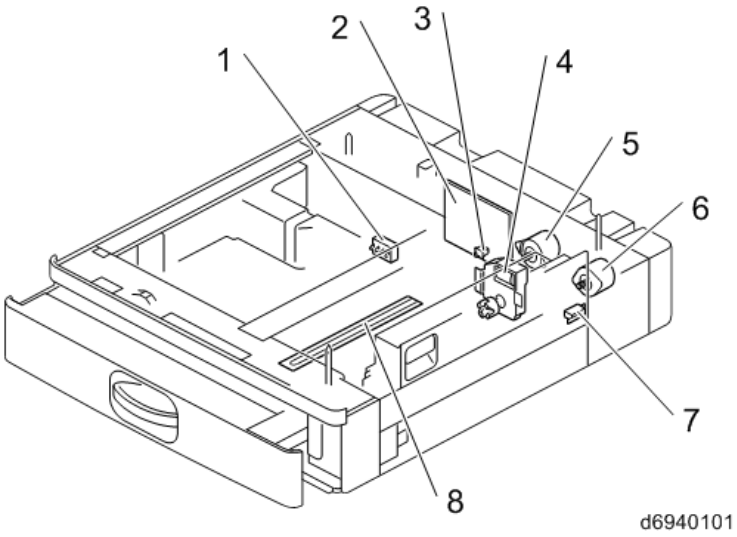
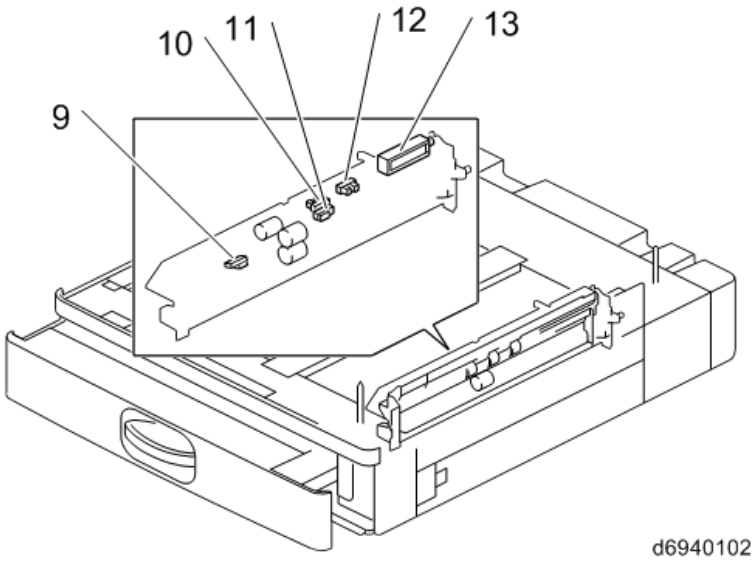
No.	Description	No.	Description
1	Paper size detection switch	4	Feed roller
2	Tray set detection switch	5	Transport roller
3	Pickup roller	6	Friction roller





No.	Description	No.	Description
1	Paper size detection switch	8	Dehumidifying heater
2	Control board	9	Paper feed sensor
3	Tray set detection switch	10	Paper end sensor
4	Tray lift motor	11	Vertical transport sensor
5	Paper feed motor	12	Limit sensor
6	Transport motor	13	Pickup solenoid
7	Vertical transport cover open/close switch		

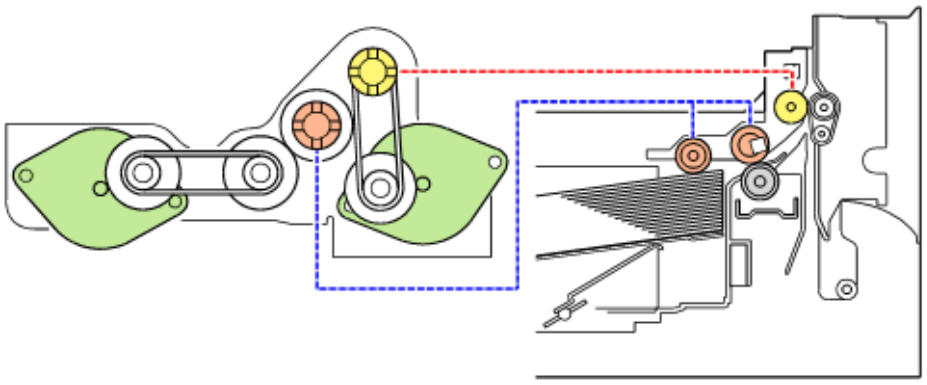
13.2 MECHANISM

13.2.1 PAPER FEED SEPARATION MECHANISM

Paper feed is an RF paper feed system. The paper feed unit comprises a Pickup roller, Feed roller and Friction roller. These rollers are high durability.

13.2.2 DRIVE MECHANISM

Pick-up roller, Feed roller are driven by the paper feed motor. Transport roller is driven by the transport motor. Not driven Friction roller.



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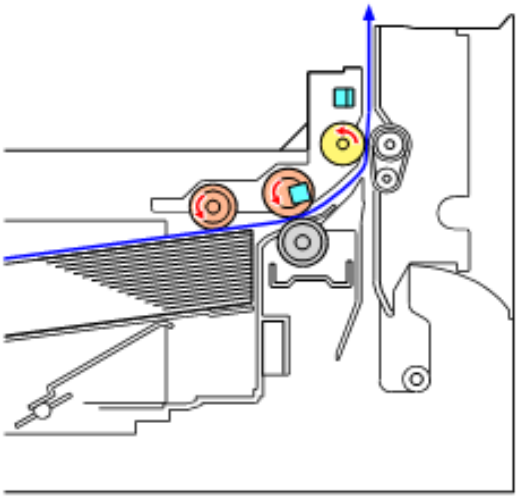
13.2.3 SEPARATING ROLLER/PICKUP ROLLER RELEASE MECHANISM

When the paper feed tray is set, the Friction roller comes in contact with the Feed roller, and the Pickup roller contacts the uppermost transfer sheet.
However, when the paper feed tray is pulled out, to prevent paper dropout, the contact between the Feed roller and Friction roller, and between Pickup roller and transfer sheet is released.

13.2.4 PAPER FEED TRANSPORT MECHANISM

In this MFP, to maintain a fixed clearance between sheets, a paper feed sensor is provided between the Pickup roller and the Feed roller, which adjusts the paper feed timing.



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STEP10 **Switch the Paper feed motor ON, and supply the first sheet.**

STEP11 **To prevent transport of the next sheet, the pickup solenoid switches ON just before the trailing edge of the first sheet leaves the Pickup roller, and the Pickup roller separates from the paper surface.**

STEP12 **Just before the trailing edge of the first sheet leaves the Paper feed motor, the paper feed motor switches OFF.**

However, at this time, when the Paper feed sensor detects no sheet (when the second sheet is not transported to the paper feed sensor position), pre-feed is performed without switching the Paper feed motor OFF.

Pre-feed is as follows.

8. The pickup solenoid switches OFF, and the second sheet of paper is transported to the Paper feed sensor position.
9. When the trailing edge of the second sheet passes the Feed roller, the Paper feed motor is switched OFF. The pickup solenoid remains OFF.

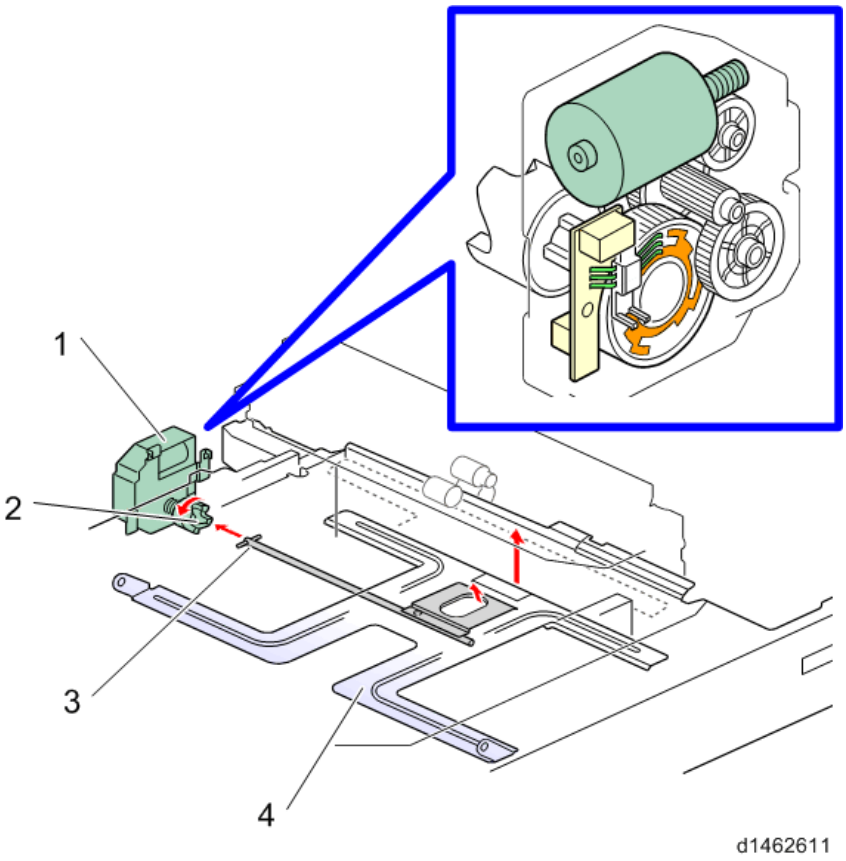
STEP13 **Just before the trailing edge of the first sheet passes the Feed roller,the pickup solenoid is switched OFF, and the Pickup roller is brought in contact with the paper surface.**

STEP14 **When the first sheet is transported a predetermined distance by the downstream transport roller, the Paper feed motor is switched ON to supply the second sheet.**

13.2.5 TRAY BASE PLATE LIFT

When the paper feed tray is set in the main unit, the set switch switches ON, and it is detected that the tray is set. At this time, the coupling of the lift motor engages with the shaft at the rear of the tray, the motor rotates, and the tray base plate is lifted up. The paper surface pushes up the Pickup roller, the tray base plate is lifted until the upper limit sensor switches OFF (interrupt), and the printer enters the standby mode.

When the paper feed tray is removed, the coupling is disengaged, and the base plate descends. At this time, the lift motor rotates until the coupling returns to the home position.



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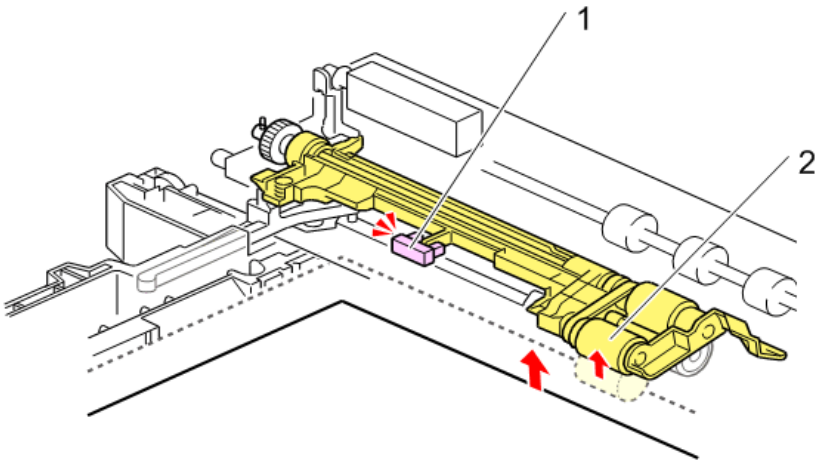
No.	Description	No.	Description
1	Lift motor	3	Tray rear side shaft
2	Coupling	4	Tray base plate



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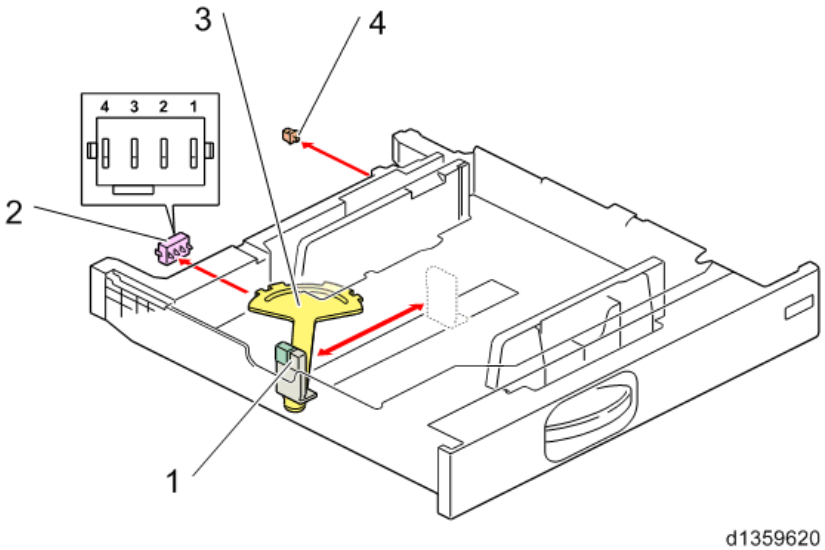
No.	Description	No.	Description
1	Limit sensor	2	Pick-up roller

13.2.6 PAPER SIZE DETECTION

The end fence interlocks mechanically with the size detection filler, and when the end fence is moved, the size detection filler also moves.

When the Paper feed tray is set, 4 size detection switches switch ON/OFF depending on the position of the size detection filler. Paper size is detected by a combination of these switches.



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

◆ **Size detection switch operation**

Paper size	Size detection switch			
	SW4	SW3	SW2	SW1
SRA3 (12”×18”)	1	0	1	0
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

13.2.7 REMAINDER DETECTION / PAPER END DETECTION

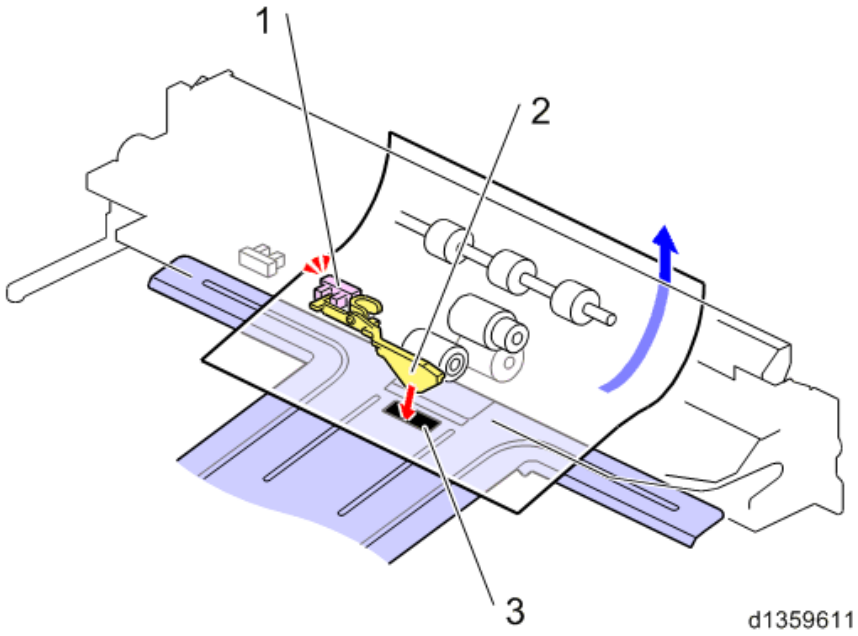
◆ **Remainder detection**

The paper remaining in the Paper feed tray is detected by a combination of ON/OFF states (contact/non-contact) of contact type remainder detection plates (boards) CN-3 and CN-5. When the amount of paper remaining decreases, and the lift motor rotates, the remainder detection plates CN-3, CN-5 in the motor are switched ON or OFF by contacts.
The following 4 types of remainder detection can be performed.

Remainder state	100%	70%	30%	10%
CN-3	OFF	ON	ON	OFF
CN-5	OFF	OFF	ON	ON
Control panel remainder display	4 bars	3 bars	2 bars	1 bar

◆ **Paper end detection**

When the paper in the Paper feed tray is exhausted, the paper end sensor switches ON (Transparent) due to the end filler.



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

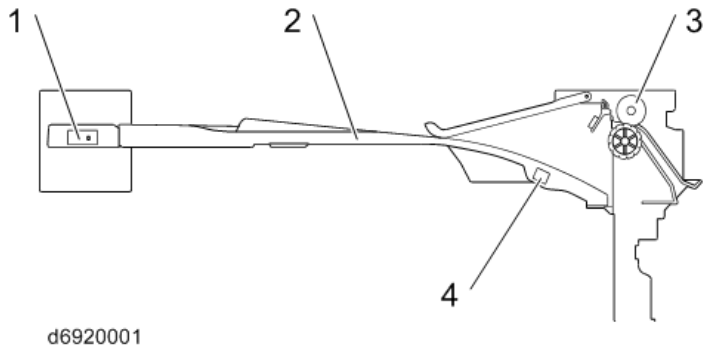
14. 1 BIN TRAY BN3110

14.1 SPECIFICATION / PARTS LAYOUT

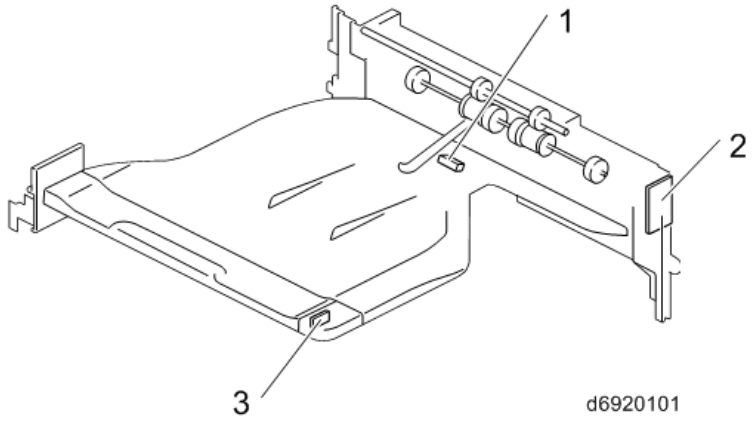
14.1.1 SPECIFICATION

Item	Specification
Type	Cabinet installation, paper received from right
Linear velocity	73-512 mm/sec
Sizes which can be accommodated	SRA3 SEF, A3 SEF, A4 SEF, A4 LEF, A5 SEF, A5 LEF, A6 SEF, B4 SEF, B5 SEF, B5 LEF, B6 SEF, 12"×18" SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×11" SEF, $8^1/_2$"×11" LEF, $5^1/_2$"×$8^1/_2$" SEF, undefined size
Paper thicknesses which can be accommodated	52-300g/m^2
No. of bins	1 bin
No. of sheets which can be accommodated	125 (up to 80g/m^2)
Power source	Supplied from main machine (DC5V±5%).
Maximum power consumption	For copy: Less than 0.15W
Dimensions (width x depth x height)	444×450×150 mm (except for projecting parts)
Weight	Less than 1.4 kg (not including decalcomania paper, packaging materials and other items in package)
Service life	3000k sheets or 5 years

14.1.2 PARTS LAYOUT



No.	Description	No.	Description
1	LED	3	Outlet roller
2	Paper tray	4	Paper detection sensor



No.	Description	No.	Description
1	Paper detection sensor	3	LED
2	Control board		

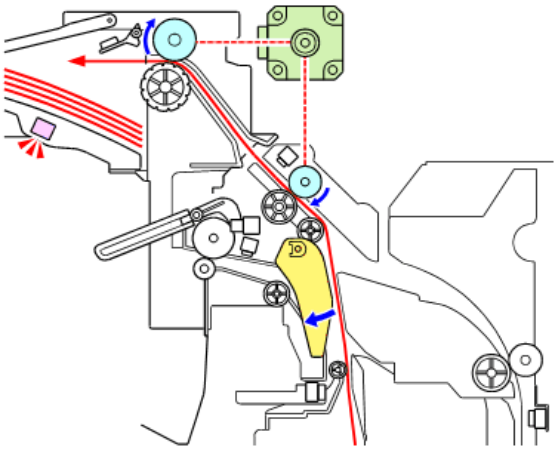
14.2 MECHANISM

14.2.1 PAPER DETECTION DISPLAY

A paper detection sensor is installed in the 1 bin unit. When paper is detected, the 1 bin tray lights up.

14.2.2 PAPER EJECTION ROLLER DRIVE MECHANISM

The 1 bin paper ejection roller is driven by the main motor via a gear and timing belt.



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14.2.3 PAPER EJECTION MECHANISM

Paper transported from the main paper ejection unit is ejected to the 1 bin tray by the paper ejection roller.

15. INTERNAL SHIFT TRAY SH3070

15.1 SPECIFICATION / PARTS LAYOUT

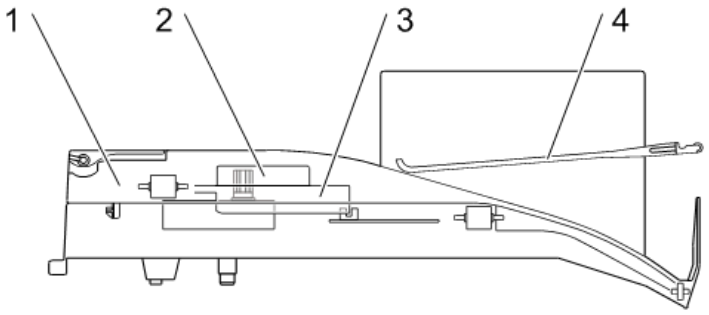
15.1.1 SPECIFICATION

Item	Specification
Type	Case installation, paper ejection tray displacement system
Linear velocity	73-450 mm/sec
Sizes which can be accommodated	A3 SEF, A4 SEF, A4 LEF, A5 SEF, A5 LEF, A6 SEF, B4 SEF, B5 SEF, B5 LEF, B6 SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×11" SEF, $8^1/_2$"×11" LEF, $5^1/_2$"×$8^1/_2$" SEF, 12"×18" SEF, undefined size
	Width: 90-320 mm, length[*2]:148-600 mm (stack quality is guaranteed to 432 mm)
Paper thicknesses which can be accommodated	52-300g/m^2
Sizes which can be shifted	A3 SEF, A4 LEF, A4 SEF, A5 LEF, A5 SEF, A6 SEF, B4 SEF, B5 LEF, B5 SEF, B6 SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×11" LEF, $8^1/_2$"×11" SEF, $5^1/_2$"×$8^1/_2$" SEF, 12"×18" SEF
	Width: 90-320 mm, length[*2]:148-600 mm (stack quality is guaranteed to 432 mm)
No. of bins	1 bin (can be shifted)
No. of sheets which can be accommodated[*1]	A4, $8^1/_2$"×11" or smaller: 250 B4, $8^1/_2$"×14" or larger: 125
Power source	Supplied from main printer (24V DC±10%, 5V DC ±5%).
Maximum power consumption	Less than 4.3W
Dimensions (width×depth×height)	420×489×107 mm (except for projecting parts)
Weight	Less than 1.4 kg (not including packaging materials and other items in package)
Service life	1200k sheets or 5 years

*1 80g/m^2 or less (paper exceeding 80g/m^2 is calculated by weight)

*2 Up to 1280 mm in SP mode.

15.1.2 PARTS LAYOUT



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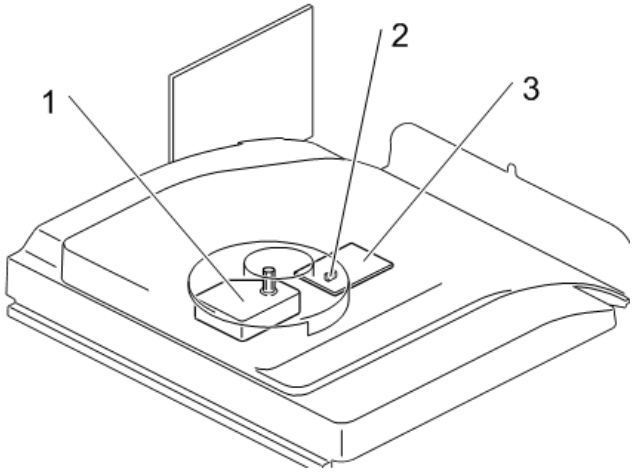
No.	Description	No.	Description
1	Upper tray	3	Rotating plate
2	Interlocking plate	4	Filler



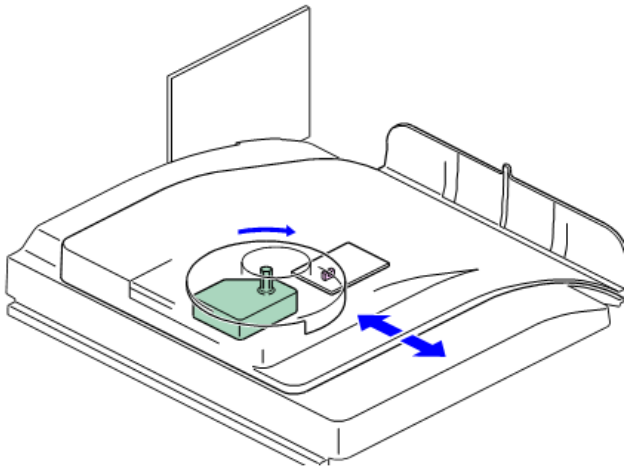
d6910101

No.	Description	No.	Description
1	Shift motor	3	Control board
2	Position sensor		

15.1.3 MECHANISM

15.1.4 UPPER TRAY DRIVE MECHANISM

The upper tray is moved by the shift motor via a rotor plate and interlocking plate.



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15.1.5 POSITION DETECTION

With this option, a position sensor is installed, which is switched ON (pass)/OFF (interrupt) by a filler of rotating plate.

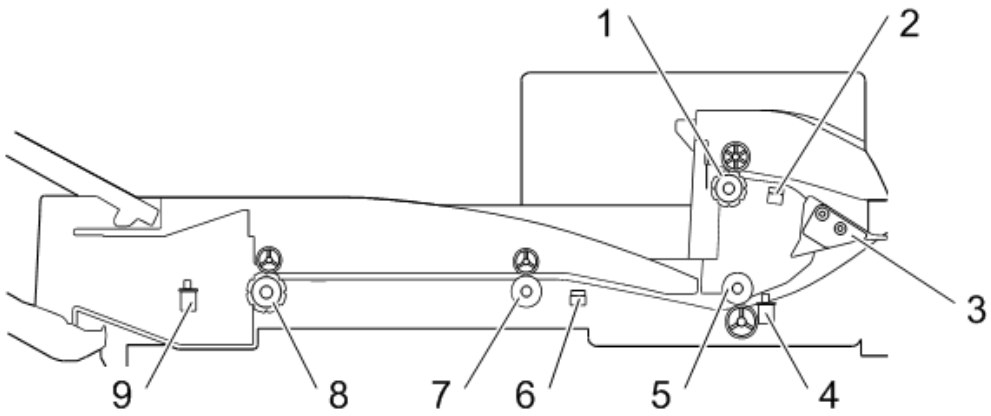
16. SIDE TRAY TYPE M3

16.1 SPECIFICATION / PARTS LAYOUT

16.1.1 SPECIFICATION

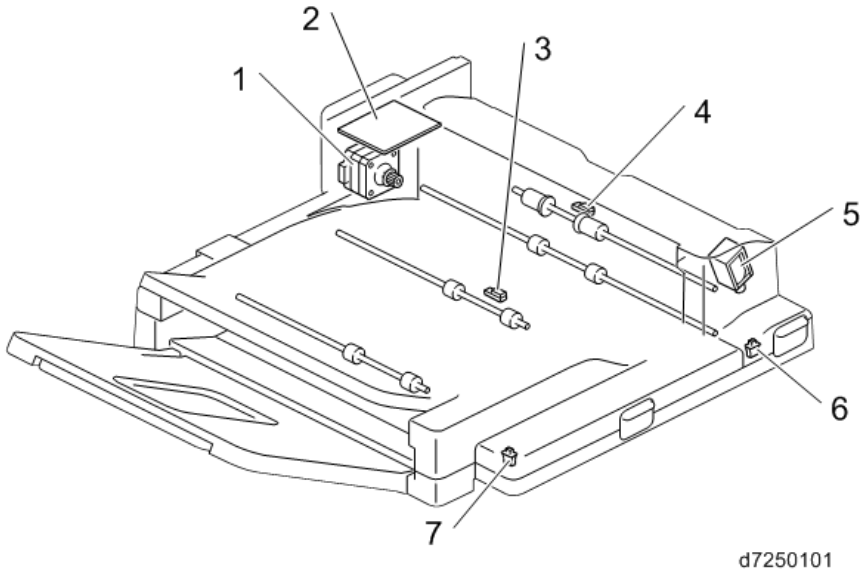
Item	Specification
Linear velocity	73-450 mm/sec
Sizes which can be handled	Upper paper output: Paper width 90-320 mm, Paper feed direction length 148-600 mm Left paper output: Paper width 90-320 mm, Paper feed direction length 148-457.2 mm
Paper thicknesses	Upper paper output and left paper output are 52-300g/m^2.
Upper paper output capacity	250 sheets (A4, $8^1/_2$"×11" or smaller), 80g/m^2 125 sheets (B4, $8^1/_2$"×14" or larger), 80g/m^2
Left paper output capacity	125 sheets, 80g/m^2
Power source	Supplied from main printer (24V DC±10%, 5V DC ±5%).
Maximum power consumption	Less than 12W
Dimensions (width×depth×height)	Smaller than 800×549×156 mm
Weight	Less than 3.8 kg (not including transfer paper, packaging materials, and other items in package)

16.1.2 PARTS LAYOUT



d7250001

No.	Description	No.	Description
1	Paper ejection roller	6	Left paper output sensor
2	Upper paper output sensor	7	Transport roller 2
3	Paper separating claw	8	Transport roller 3
4	Paper output cover switch	9	Paper tray set detection switch
5	Transport roller 1		



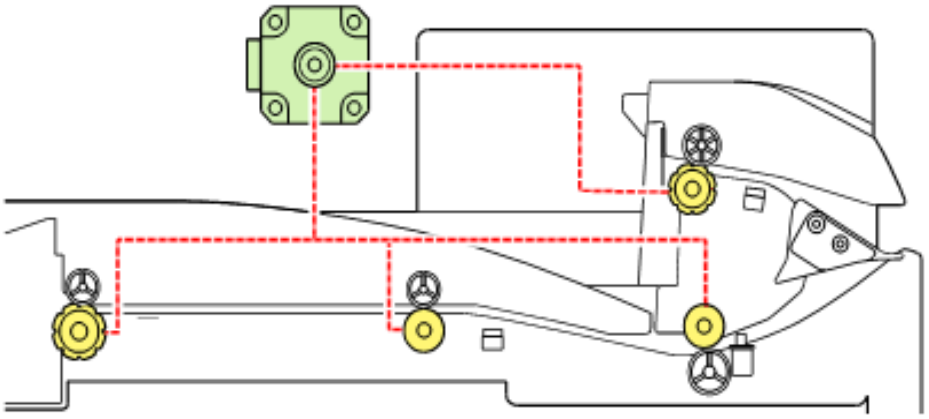
d7250101

No.	Description	No.	Description
1	Drive motor	5	Paper separating claw solenoid
2	Control board	6	Paper output cover set detection switch
3	Left paper output sensor	7	Paper tray set detection switch
4	Upper paper output sensor		

16.1.3 MECHANISM

16.1.4 DRIVE MECHANISM

The paper reject roller and transport rollers 1-3 are driven by a paper eject drive motor via gears and a timing belt.



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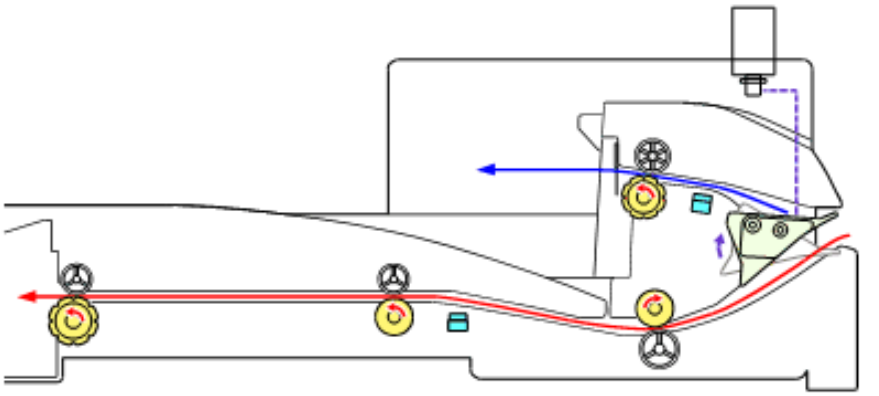
16.1.5 PAPER TRANSPORT MECHANISM

Paper transported from the printer eject unit is changed over between the upper eject tray and left eject tray by a paper eject claw.

Paper delivered to the upper eject tray is ejected by a paper eject roller. A paper eject sensor is provided in the paper eject transport path to detect any paper jams.

At the same time, paper delivered to the left eject tray is transported by a transport roller. A left paper eject sensor is provided in the transport path to detect any paper jams.



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17. INTERNAL FINISHER SR3130

17.1 SPECIFICATION / PARTS LAYOUT

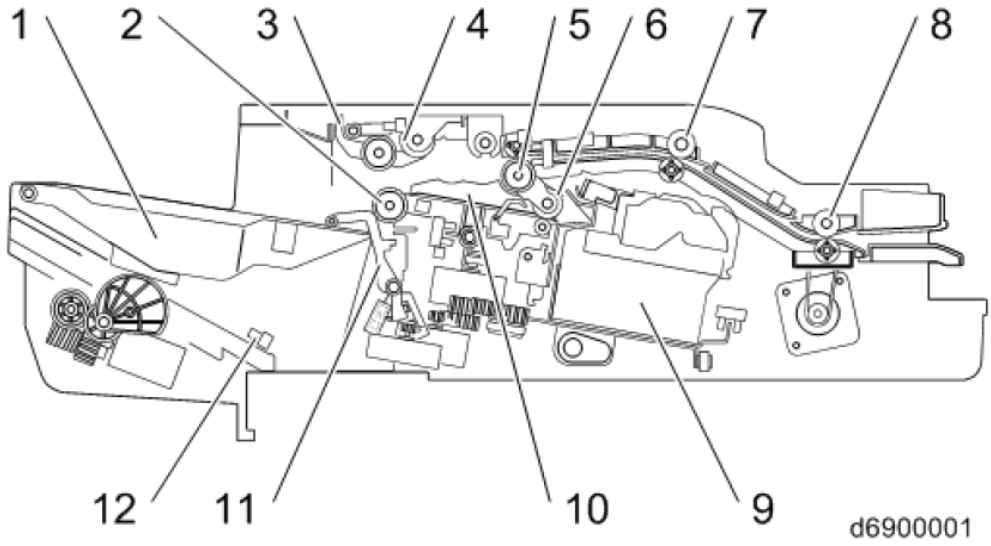
17.1.1 FINISHER PART SPECIFICATIONS

Item	Specification
Type	Case system
Shift tray	Yes
No. of sheets which can be accommodated	A4, $8^1/_2$×11 or smaller: 500 / height: lower than 57mm B4, $8^1/_2$×14 or larger: 250 / height: lower than 28.5mm
Paper thicknesses which can be handled	52g/m^2-300g/m^2
Up/down shift function	No
Left/right shift function	Yes
Stapling function	Yes
Punching function	Option
Remainder detection	No
Full-load detection	Yes
Paper detection	No
Power consumption	Less than 47W (24V DC /2A)
Power source	24V DC (supplied from main printer), 5V SC (generated by FIN board), SELV (super-low voltage secondary power supply)
Dimensions (width×depth×height)	546×523×170 mm
Mass	12.8kg or less

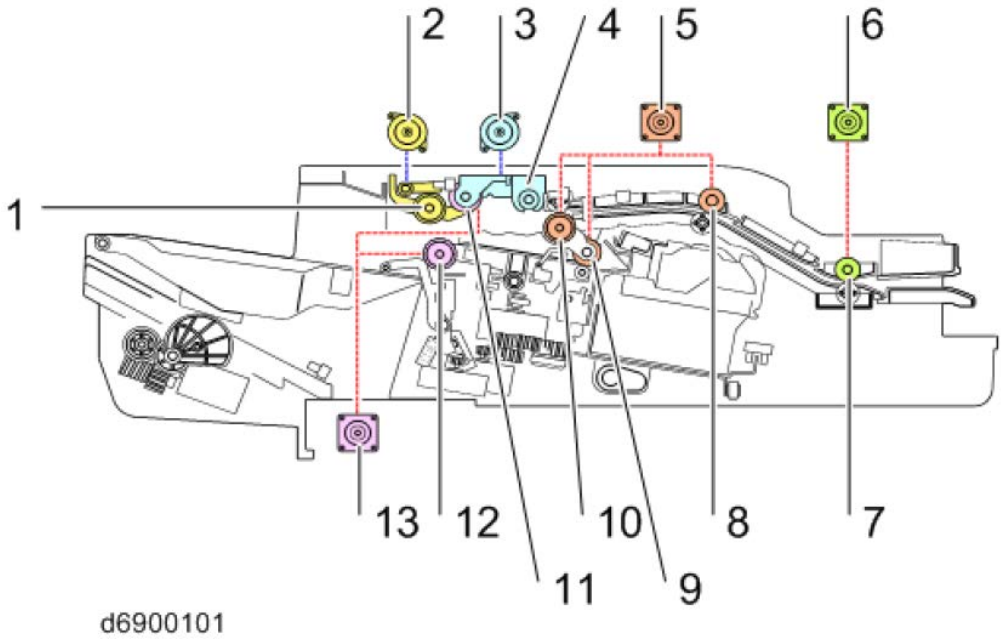
17.1.2 STAPLER UNIT SPECIFICATIONS

Item	Specification
No. of sheets which can be stitched	A3 SEF, B4 SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×13" SEF, $8^1/_4$"×14" SEF, $8^1/_4$"×13" SEF: 30 A4 LEF / SEF, B5 LEF / SEF, $8^1/_2$"×11" LEF / SEF, $7^1/_4$"×$10^1/_2$" LEF / SEF: 50 When loading mixed widths: 30
Sizes which can be stitched	A3 SEF, B4 SEF, 11"×17" SEF, $8^1/_2$"×14" SEF, $8^1/_2$"×13" SEF, $8^1/_4$"×14" SEF, $8^1/_4$"×13" SEF A4 LEF / SEF, B5 LEF / SEF, $8^1/_2$"×11" LEF / SEF, $7^1/_4$"×$10^1/_2$" LEF / SEF
Thicknesses which can be stitched	52g/m^2 -105g/m^2 The quality of sheets of paper which are thinner than 64g/m^2 is not guaranteed. No. of sheets to be stitched decreases when sheets of paper are thicker than 64g/m^2, depending on the weight..
Stitching position	Top, bottom, 2 positions on the left, 2 positions on the top
Staple supply	Refill charge to dedicated staple cartridge
Stitching capacity	5000 / cartridge

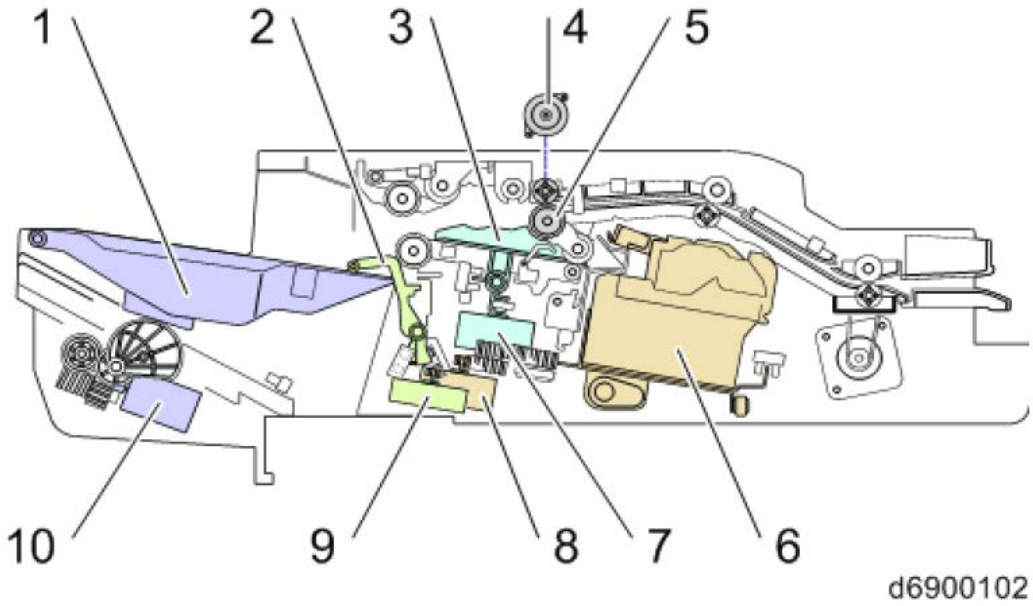
17.1.3 PARTS LAYOUT



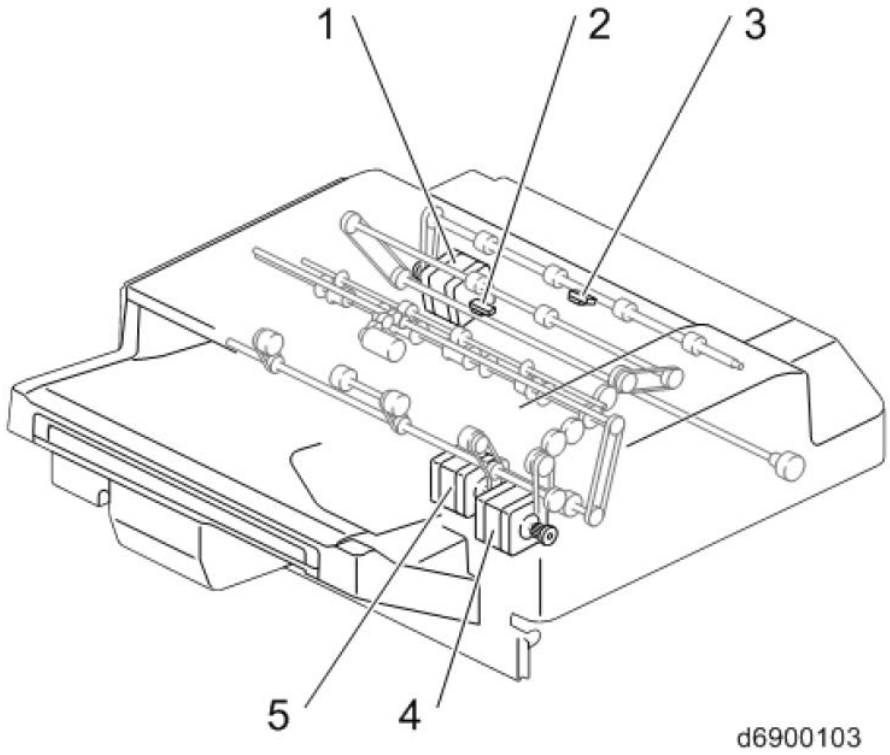
No.	Description	No.	Description
1	Paper output tray	7	Transport roller
2	Paper ejection roller	8	Inlet roller
3	Paper output open/close guide plate	9	Stapler
4	Strike roller	10	Staple tray (jogger)
5	Shift roller	11	Paper bail
6	Return roller		



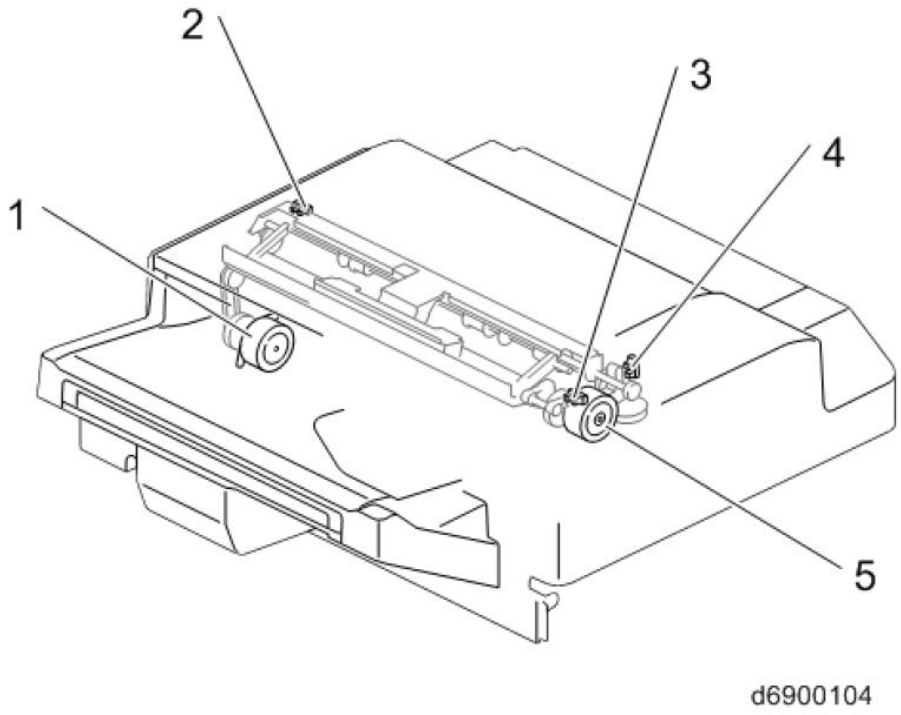
No.	Description	No.	Description
1	Paper output open/close guide plate	8	Transport roller
2	Paper output open/close guide plate motor	9	Return roller
3	Strike roller motor	10	Shift roller
4	Strike roller unit	11	Strike roller
5	Transport motor	12	Paper ejection roller
6	Inlet motor	13	Paper output motor
7	Inlet roller		



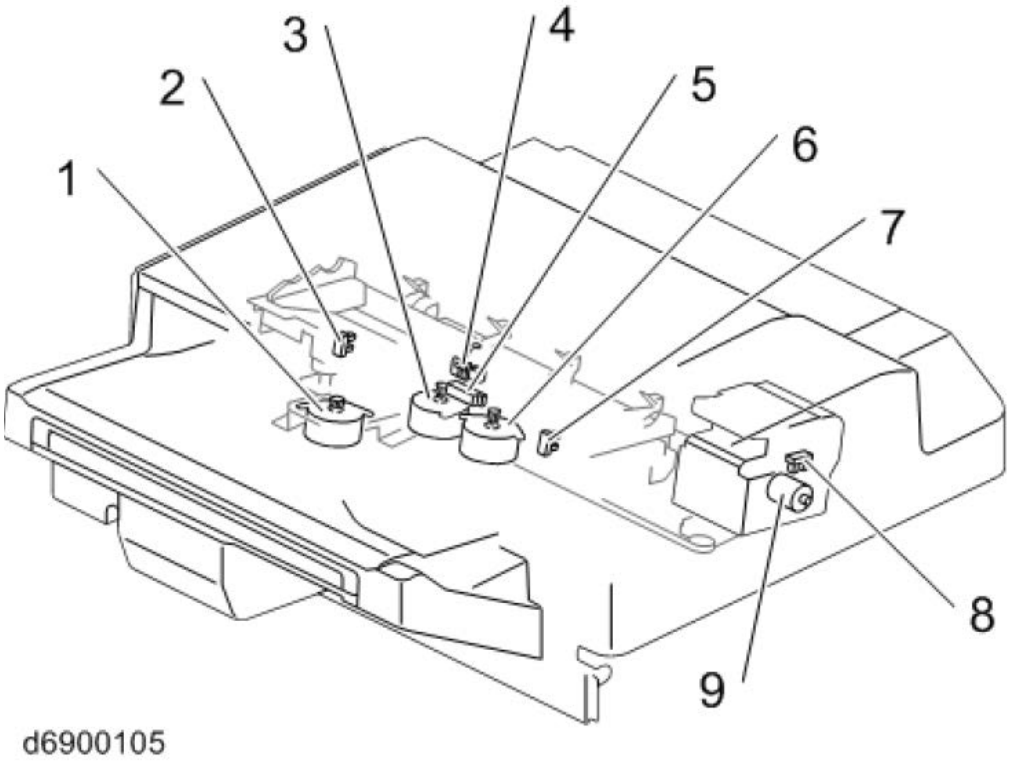
No.	Description	No.	Description
1	Paper output tray	6	Stapler
2	Paper bail	7	Jogger motor
3	Staple tray (jogger)	8	Stapler displacement motor
4	Shift motor	9	Paper bail motor
5	Shift roller	10	Tray lift motor



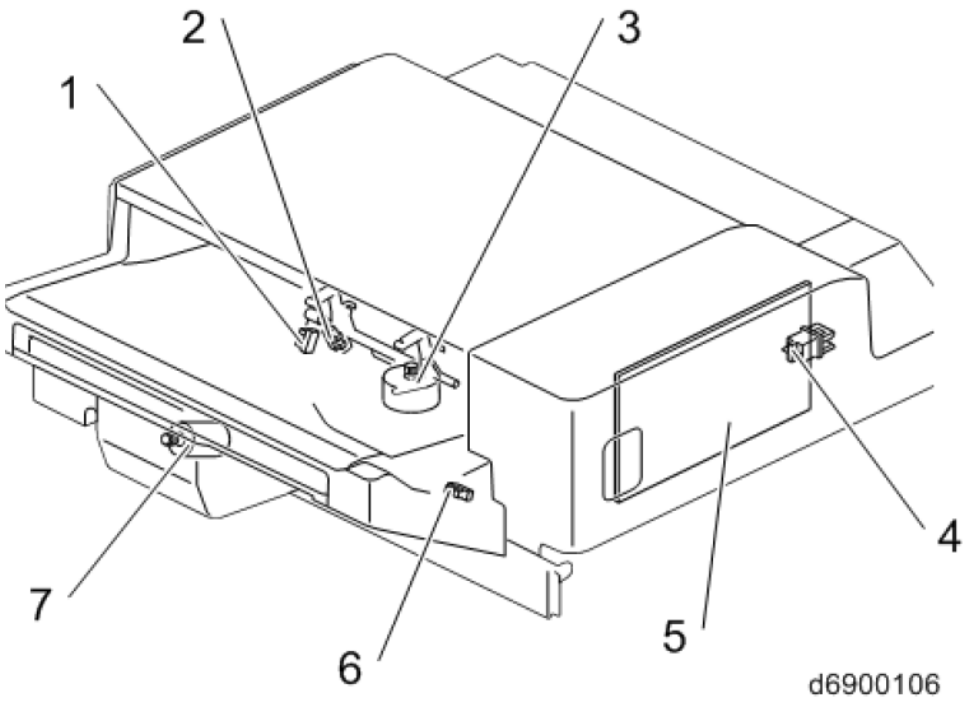
No.	Description	No.	Description
1	Inlet motor	4	Transport motor
2	Transport sensor	5	Paper output motor
3	Inlet sensor		



No.	Description	No.	Description
1	Strike roller motor	4	Shift roller Home Position sensor
2	Strike roller Home Position sensor	5	Paper output guide plate motor
3	Paper output guide plate Home Position sensor		



No.	Description	No.	Description
1	Stapler displacement motor	6	Jogger fence motor (front)
2	Jogger fence Home Position sensor (rear)	7	Jogger fence Home Position sensor (front)
3	Jogger fence motor (rear)	8	Stapler Home Position sensor
4	Paper detection sensor	9	Stapler motor
5	Stapler tray jam detection sensor		



No.	Description	No.	Description
1	Paper bail Home Position sensor	5	Main control board
2	Paper surface detection sensor	6	Full detection sensor
3	Paper bail motor	7	Tray lift motor
4	Cover open/close switch		

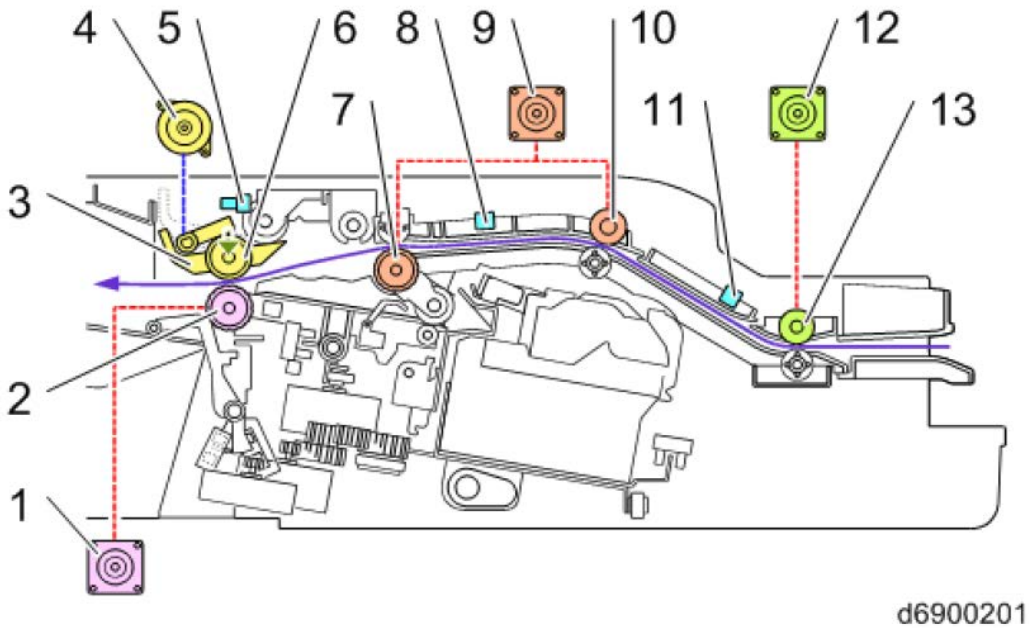
17.2 MECHANISM

17.2.1 STRAIGHT PAPER EJECTION MECHANISM

Paper ejected from the printer unit is transported by a transport roller and eject roller via an inlet roller. These are driven by inlet motor, transport motor and eject motor which permit linear speed correspondence. The paper output driven roller stands by at a certain distance from the paper output roller,
and its descent/ascent is performed by an eject guide plate movable motor depending on the detection timing of the sensors (motor operates CW/CCW).
The paper eject open/close guide plate descent/ascent timings are as follows:

- Descent: Paper rear edge passes inlet sensor
- Ascent: Paper rear edge passes transport sensor

The eject guide plate is provided with an Home Position sensor which detects the home position during ascent.



No.	Description	No.	Description
1	Paper output motor	8	Transport sensor
2	Paper output roller	9	Transport motor
3	Paper output open/close guide plate	10	Transport roller
4	Paper output guide plate motor	11	Inlet sensor
5	Paper output open/close guide plate Home Position sensor	12	Inlet motor
6	Paper output driven roller	13	Inlet roller
7	Shift roller		

17.2.2 SHIFT EJECT MECHANISM

As with straight eject, shift eject is also done by transporting the paper to a transport roller and an eject roller via an inlet roller.

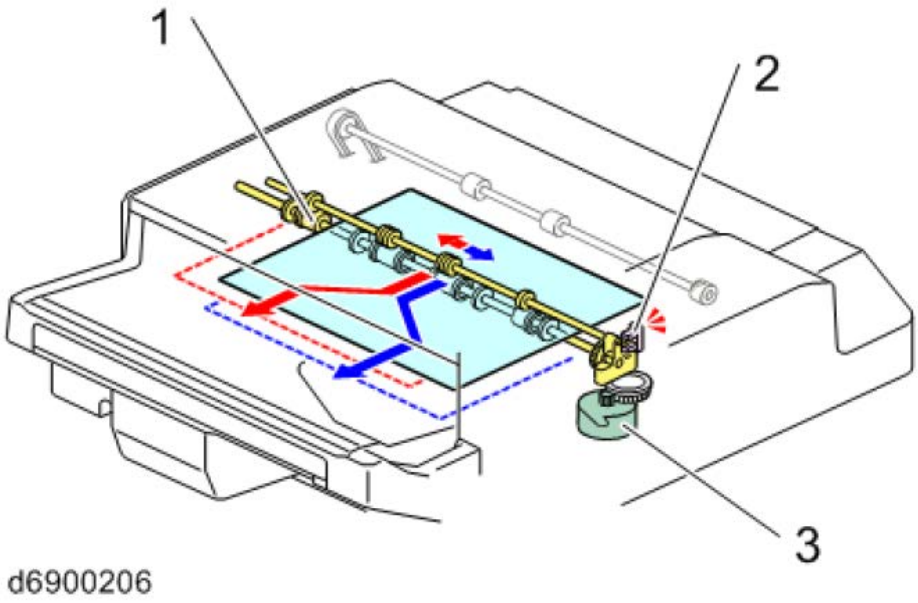
In shift operation, a shift roller is moved from front to back during transport by the driver of a shift motor.

Shift roller operation timings are as follows:

- Shift operation: Paper rear edge passes inlet sensor
- Return to original position: Paper rear edge passes transport sensor

The shift roller detects the home position by a Home Position sensor.

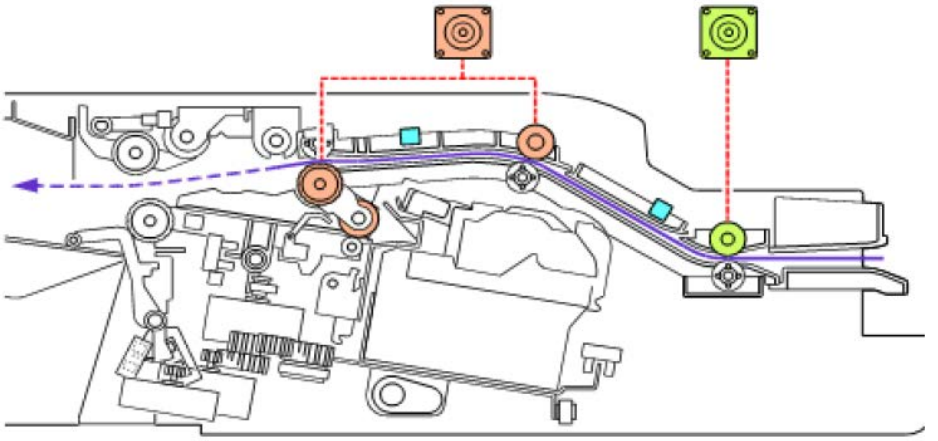
The shift roller motor operates CW/CCW, and shifts the paper from front to back. The home position is located at the back of the displacement range, and is detected by an Home Position sensor.



No.	Description	No.	Description
1	Shift roller	3	Shift motor
2	Shift roller Home Position sensor		

17.2.3 STAPLE EJECT MECHANISM

Staple eject requires that transported paper is temporarily stored in a staple tray. After rear edge detection of the transported paper is performed by a transport sensor, a strike roller unit descends and transports it to a staple tray.



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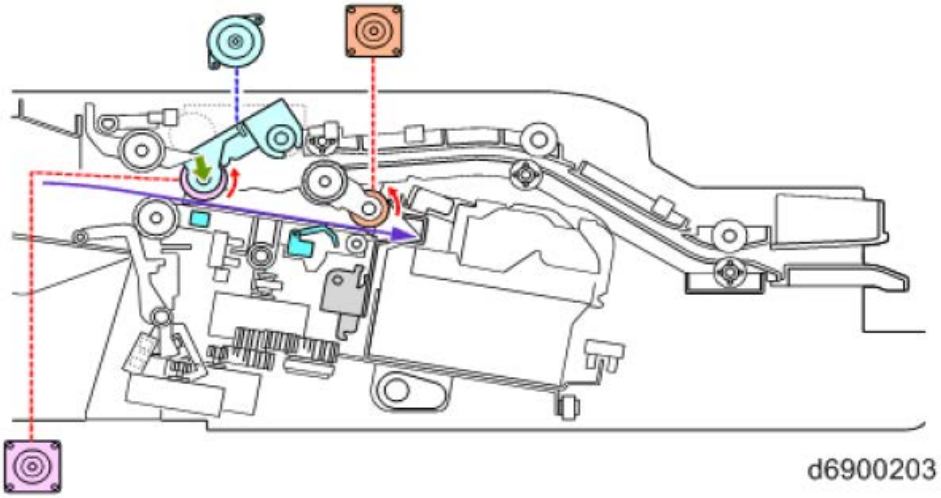

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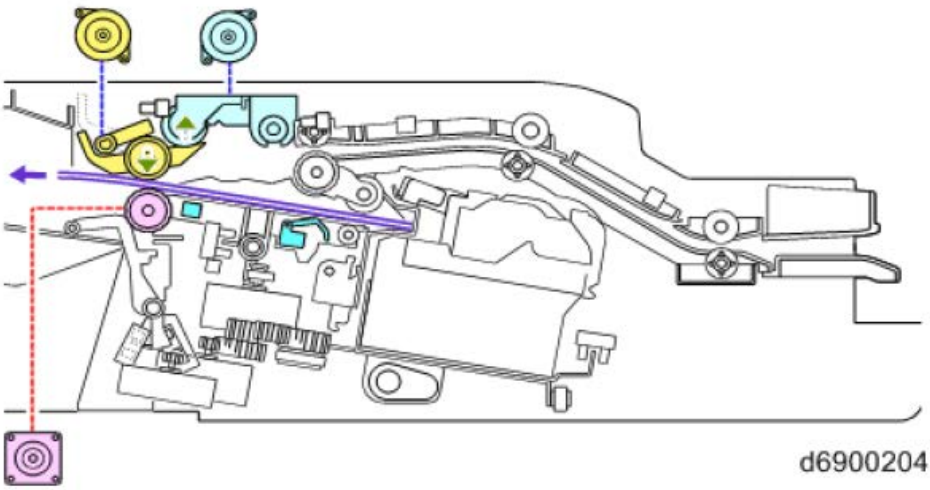

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◆ **Strike roller ascent/descent mechanism**

The strike roller unit is made to ascend/descend by a strike roller up/down drive motor (the motor operates CW/CCW), and its position is detected by an Home Position sensor. The strike roller rotates in the opposite direction to the transport roller, and has the function of transporting paper to the back of the staple tray.

◆ **Paper rear edge alignment mechanism**

The rear edge of paper transported by the strike roller is made to project against a paper rear-edge alignment fence by a return roller. It rotates continuously until the bundle of paper is ejected after it is stapled.

The return roller is driven from a transport roller via a gear, and is always situated above the stapler tray. A driven roller is installed on the side of the stapler tray which reduces wear of the return roller.

◆ **Paper detection on stapler tray**

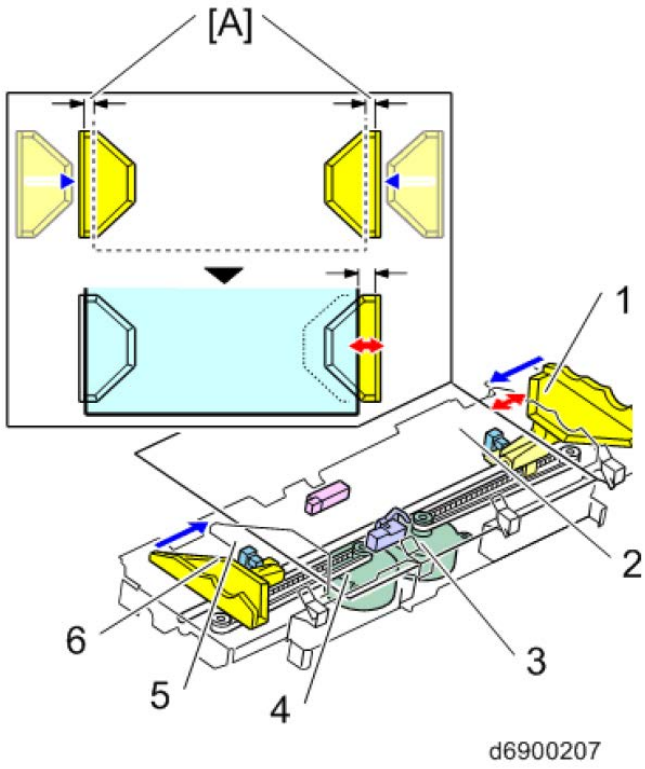
The stapler tray is provided with the following sensors which detect paper status in the tray.

- Paper jam in tray: tray jam sensor
- Paper present/absent in tray: paper detection sensor

◆ **Jogger mechanism (paper alignment)**

Paper transported to the stapler tray is aligned one sheet at a time by a jogger fence. The jogger fence is driven forwards and backwards independently, and aligns the paper with the tray center. Jogger fence drives are installed at the front and back. For the home position, Home Position sensors are also installed at the front and back.

Paper alignment is performed when the jogger fence moves from the Home Position, and stands by 7 mm from the paper to be stapled. When the paper is then transported to the tray, the back of the jogger fence moves according to the paper size and aligns the paper. The back of the jogger fence stands by 7 mm away, and performs paper alignment 7 mm in front of the jogger fence, so it moves a total of 14 mm. While paper alignment is performed, the jogger fence stands by 7 mm away, and repeats the movement.



[A] : 7mm

No.	Description	No.	Description
1	Jogger fence (rear)	4	Jogger fence displacement motor (front)
2	Jogger fence Home Position sensor (rear)	5	Jogger fence Home Position sensor (front)
3	Jogger fence displacement motor (rear)	6	Jogger fence (front)

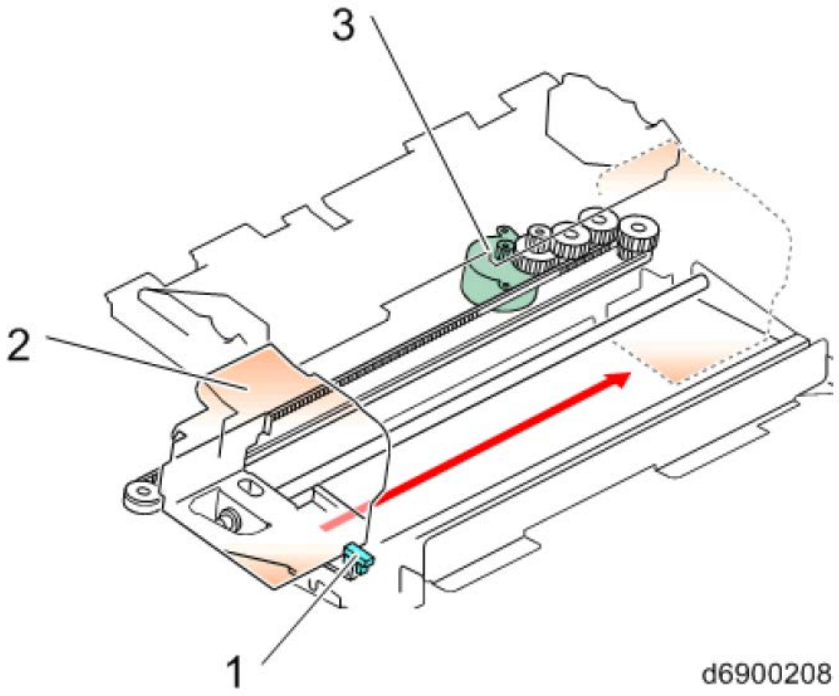
◆ **Stapler movement mechanism**

Stapler specification is as follows:

- There are three stapling positions, i.e., one front parallel, one back parallel and two parallel.
- 30 large sheets or 50 small sheets can be stapled.

To change the stapling position, a mechanism is provided which moves the stapler.

The stapler is moved by a stapler motor, and the home position is detected by an Home Position sensor.



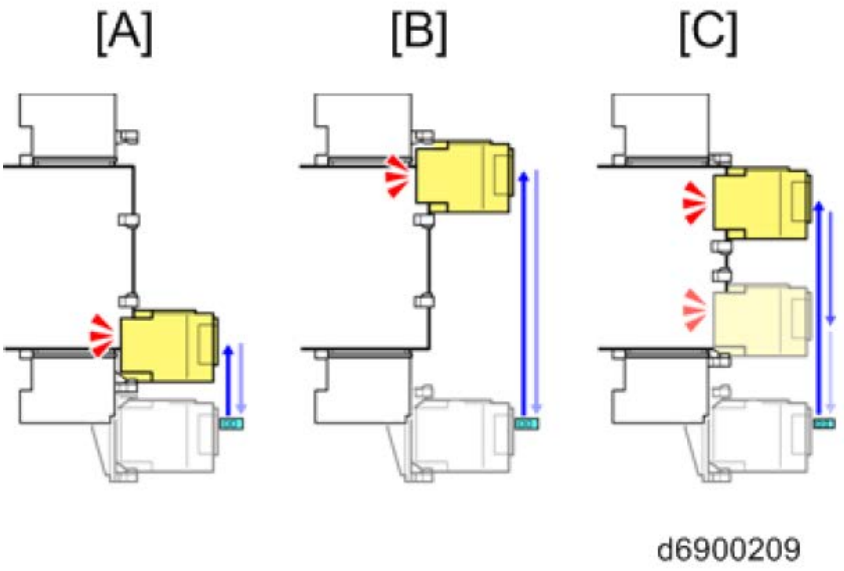
No.	Description	No.	Description
1	Stapler Home Position sensor	3	Stapler displacement motor
2	Stapler		

The stapler moves from the home position to the paper size to be stapled, and temporarily stands by. Next, the paper is transported, and after the jogger operation (paper alignment), stapling is performed.

The following picture shows the stapler standby position according to various stapling positions. From the left, there is front parallel one position, back parallel one position, and parallel two positions.

For parallel two positions, the first staple is inserted from the front, and it then moves to the back to perform stapling.

Stapling is performed back and forth, i.e., the second staple is back > front, the third staple is front > back, etc.



[A]: Front parallel, one position

[B]: Back parallel, one position

[C]: Parallel, two position

- **Paper eject (bundle eject)**

  After stapling, the eject paper open/close guide plate descends, and ejects the bundle of paper while gripping it with the eject roller.

17.2.4 PAPER PRESS MECHANISM

For ejected paper, a paper press unit is provided to immobilize the paper above the tray. It is driven by a paper press drive motor (motor operates CW/CCW)

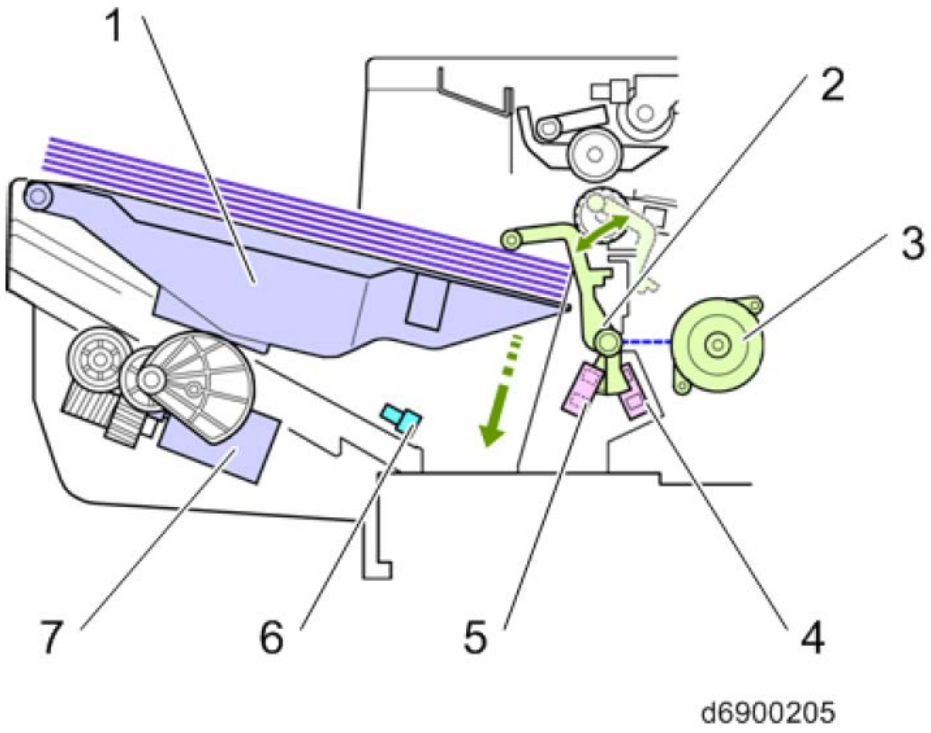
The paper press unit is provided with a paper surface detection sensor which detects the upper part of the paper, and an Home Position sensor which detects the home position of the paper press unit. The paper surface detection sensor detects the number of sheets in the tray, and if the number is large, it descends the tray to a suitable position.

17.2.5 TRAY DRIVE MECHANISM

The eject tray has a mechanism which descends the tray to a suitable position. This is driven by a tray drive motor (motor operates CW/CCW). It operates when the paper surface detection sensor cannot detect paper in the tray, and descends the eject tray until detection is performed.

17.2.6 TRAY FULL DETECTION MECHANISM

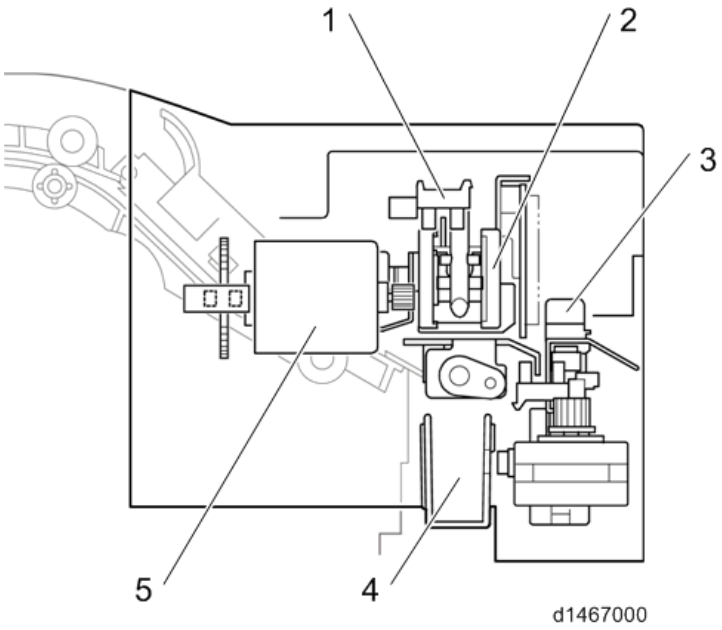
When the eject tray descends to its maximum, a full detect sensor below is covered by the eject tray filler, and it is detected that the top of the tray is full. During full tray detection, paper transport is temporarily stopped. After the paper bundle is released, the tray is raised to a suitable position, and the eject operation is repeated.



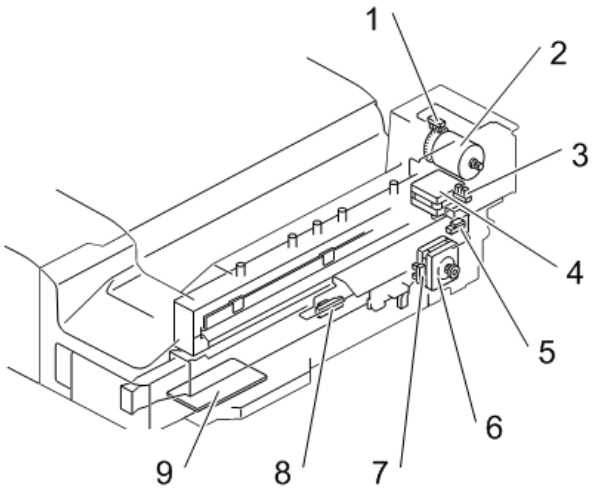
No.	Description	No.	Description
1	Paper output tray	5	Paper bail Home Position sensor
2	Paper bail	6	Full detection sensor
3	Paper bail drive motor	7	Tray lift motor
4	Paper surface detection sensor		

18. PUNCH UNIT PU3040

18.1 PARTS LAYOUT



No.	Description	No.	Description
1	Punch unit Home Position sensor	4	Hopper
2	Punch unit	5	Punch unit motor
3	Horizontal registration detection unit		



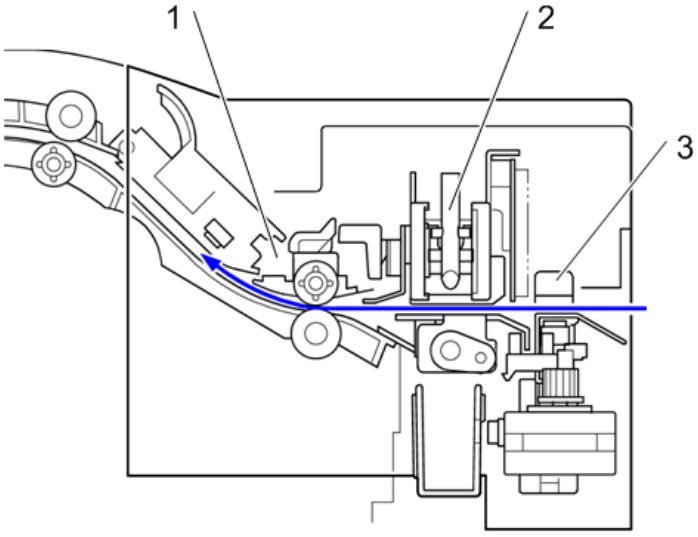
d7160201

No.	Description	No.	Description
1	Punch unit pulse detection sensor	6	Horizontal registration travel unit displacement motor
2	Punch unit motor	7	Horizontal registration travel unit Home Position sensor
3	Horizontal registration detection sensor	8	Hopper full detection sensor
4	Horizontal registration detection unit displacement motor	9	Punch unit control board
5	Horizontal registration detection unit Home Position sensor		

18.2 MECHANISM

18.2.1 TRANSPORT MECHANISM

Paper output from the main printer unit passes through the horizontal registration detection unit, and is transported to the punch unit and finisher inlet transport unit.



d1467001

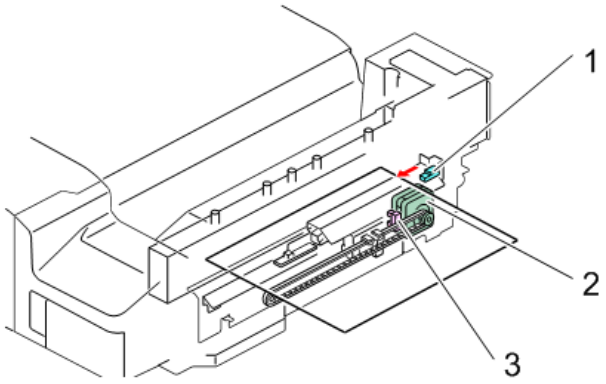
No.	Description	No.	Description
1	Finisher inlet transport unit	3	Horizontal registration detection unit
2	Punch unit		

18.2.2 HORIZONTAL REGISTRATION DETECTION UNIT DISPLACEMENT MECHANISM

When the inlet sensor of the finisher unit detects the leading edge of the paper, the horizontal registration detection unit displacement motor is driven, and the horizontal registration of the paper is measured, The horizontal registration detection unit is provided with a horizontal registration detection unit Home Position sensor which detects the home position.

18.2.3 HORIZONTAL REGISTRATION DETECTION UNIT MECHANISM

The horizontal registration detection unit is provided with a horizontal registration detection sensor, which measures the horizontal registration (offset) of the paper relative to the punch unit position by detecting it.

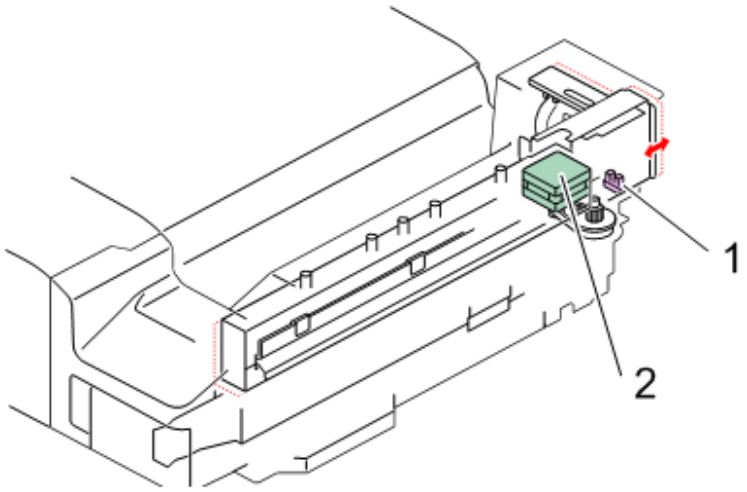


d7160202

No.	Description	No.	Description
1	Horizontal registration detection sensor	3	Horizontal registration detection unit Home Position sensor
2	Horizontal registration detection unit displacement motor		

18.2.4 PUNCH UNIT DISPLACEMENT MECHANISM

A mechanism is provided to move the punch unit using information from the horizontal registration detection sensor. In this way, punch holes can be accurately inserted in the paper. The punch unit is moved by the horizontal registration travel unit displacement motor. The unit is also provided with a horizontal registration travel unit Home Position sensor which detects the home position.

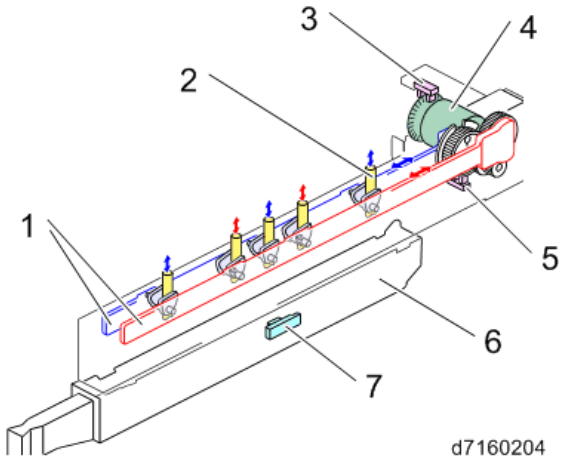


d7160203

No.	Description	No.	Description
1	Horizontal registration travel unit Home Position sensor	2	Horizontal resist travel unit move motor

18.2.5 PUNCH MECHANISM

The punching operation is driven by the punch unit motor, a punch pin being moved up and down by moving a link via a gear. After punching, punching powder falls into the hopper under the unit and is collected. The hopper is provided with a punching powder full detection sensor so that punching powder does not overflow in the container. Since the punch motor is a DC motor, the motor shaft has an encoder, and a punch motor rotation detection sensor which detects pulses is provided. The punch unit also has a mechanism to change the punching position according to the destination.



No.	Description	No.	Description
1	Link	5	Punch position detection sensor
2	Punch pin	6	Hopper
3	Punch motor rotation detection sensor	7	Hopper full detection sensor
4	Punch motor		

18.2.6 PUNCHING POSITION CHANGE-OVER MECHANISM

The punch unit is provided with a mechanism which changes the punching position according to the destination.

- Japan: 2 holes
- North America: 2/3 holes
- Europe: 2/4 holes
- Northern Europe: 4 holes

A punching position detection sensor which detects change of punching position is also provided.

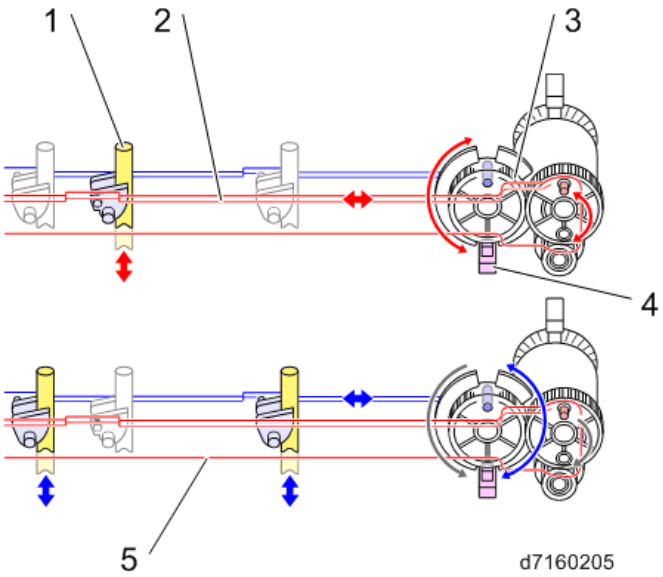
◆ **2 holes**

A position which does not move is taken as the 2-hole home position, and a 1st drive gear performs CW/CCW operation. In 2-hole operation, only one link moves, and moves the punch pin.

◆ **3 or 4 holes**

The position where the 1st drive gear has rotated forward by 180° is taken as the 3 or 4-hole home position. The 1st drive gear permits movement of the punch pin by CW/CCW operation.

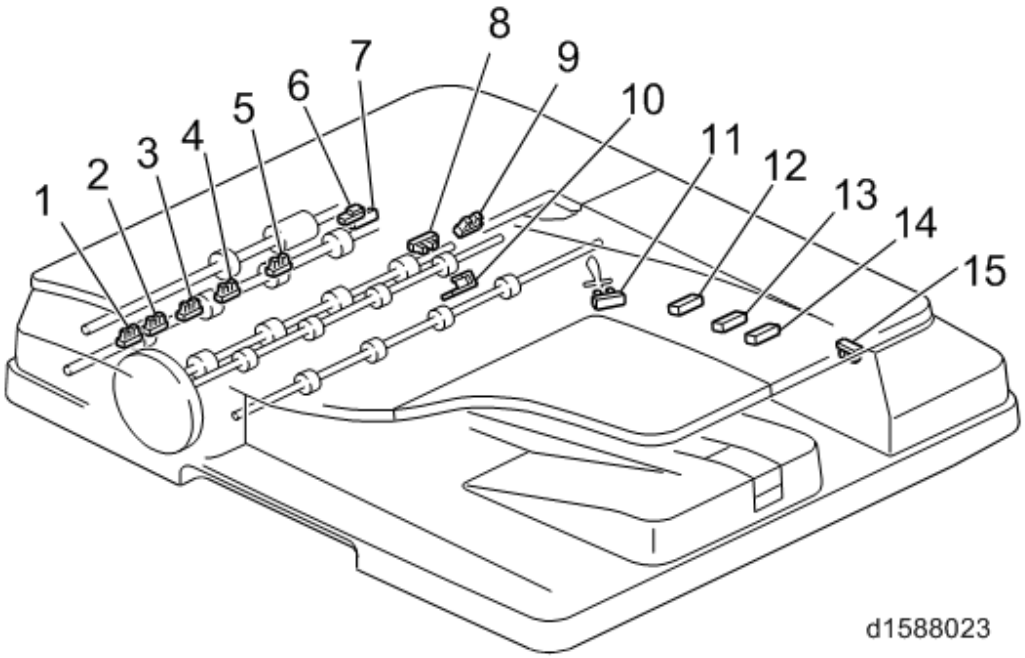
In 3 or 4-hole operation, two links move, and move the punch pin.

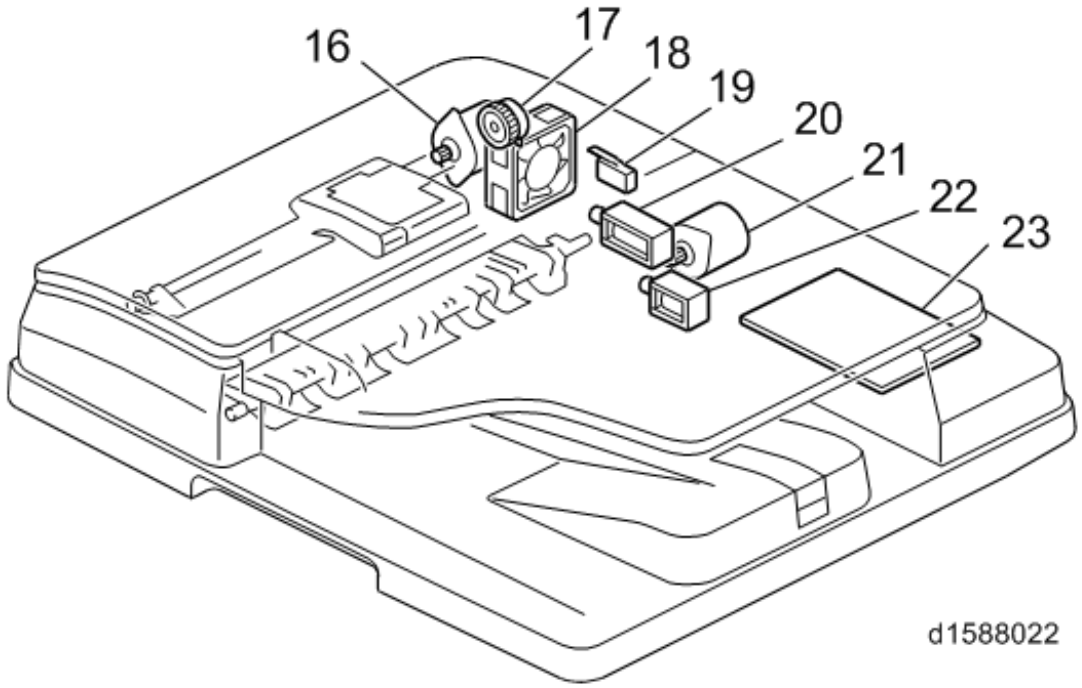


No.	Description	No.	Description
1	Punch pin	4	Punching position detection sensor
2	2-hole link	5	3/4-hole link
3	1st drive gear		

19. ARDF DF3090

19.1 PARTS LAYOUT





No.	Description	No.	Description
1	Original Width Sensor (LL)	13	Original Length Sensor (M)
2	Original Width Sensor (L)	14	Original Length Sensor (L)
3	Original Width Sensor (M)	15	ADF Position Sensor
4	Original Width Sensor (S)	16	Transport Motor
5	Original Width Sensor (SS)	17	Paper Feed Clutch
6	Skew Correction Sensor	18	Cooling Fan Motor
7	Registration Sensor	19	Cover Switch
8	Exit Sensor	20	Pick-up Solenoid
9	Original Set Sensor	21	Feed Motor
10	Stamp Solenoid	22	Inverter Solenoid
11	Original Sensor	23	Main Board
12	Original Length Sensor (S)	-	-

19.2 MECHANISM

19.2.1 ORIGINAL DETECTION

When an original is placed on the original tray correctly, the edge of the original pushes up the feeler of the original sensor.

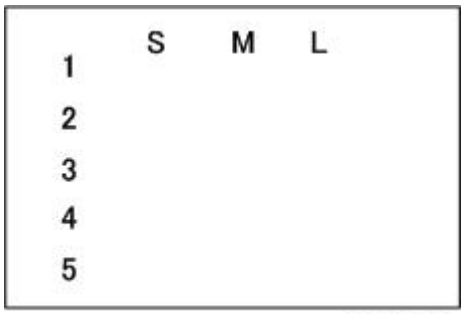
19.2.2 ORIGINAL SIZE DETECTION / ORIGINAL SET DETECTION MECHANISM

Five original width sensors detect the width of the original just when the leading edge of the original passes the interval sensor. Three original length sensors on the original table detect the length. These two pieces of size information summarize the original size.

Size (Width x Length)		Width Detection					Length Detection		
		1	2	3	4	5	S	M	L
1	A3 SEF (297 x 420)	On	On	On	On	On	On	On	On
2	B4 SEF (257 x 364)	On	On	On	-	-	On	On	On
3	A4 SEF (210 x 297)	On	On	-	-	-	On	On	-
4	A4 LEF (297 x 210)	On	On	On	On	On	-	-	-
5	B5 SEF (182 x 257)	On	-	-	-	-	On		-
6	B5 LEF (257 x 182)	On	On	On	-	-			-
7	A5 SEF (148 x 210)	On	-	-	-	-			-
8	A5 LEF (210 x 148)	On	On	-	-	-			-
9	B6 SEF (128 x 182)	-	-	-	-	-			-
10	B6 LEF (182 x 128)	On	-	-	-	-	-	-	-
11	11" x 17" SEF (DLT)	On	On	On	On	-	On	On	On*
12	11" x 15" SEF	On	On	On	On	-	On	On	On*
13	8 1/2" x 11" SEF (LT)	On	On	-	-	-	On	-	-
14	11" x 8 1/2" LEF (LT)	On	On	On	On	-	-	-	-

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

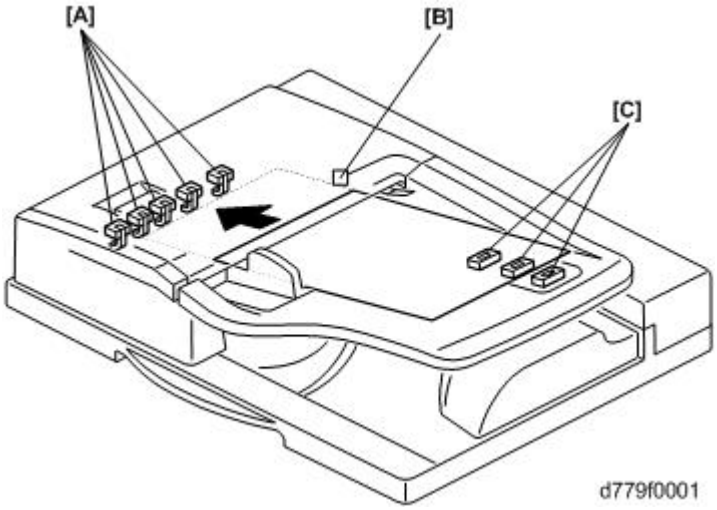
Sensor Position



d779f0002

When an original is placed on the original tray correctly, the edge of the original pushes up the feeler of the original sensor.

- Set the aligned originals face up into the ADF.



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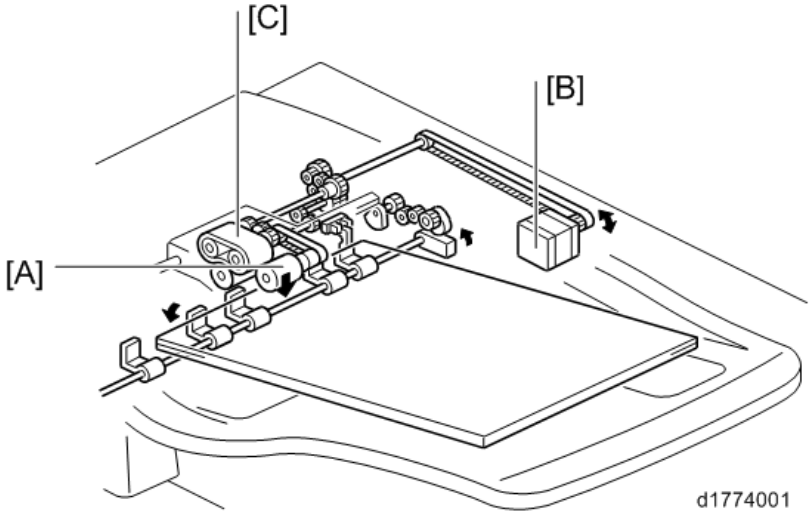
	Description
A	Original Width Sensors
B	Original Set Sensor
C	Original Length Sensors

19.2.3 PAPER FEED / SEPARATION MECHANISM

The separation mechanism uses the RF method

When set the originals and press “Start”, the Paper feed solenoid is turned ON and the Pickup Roller [A] goes down to the original. At this time, the Paper Feed Motor [B]Switches on and Pickup Roller and Paper Feed Motor[B] start rotating. Then a sheet of paper is fed.



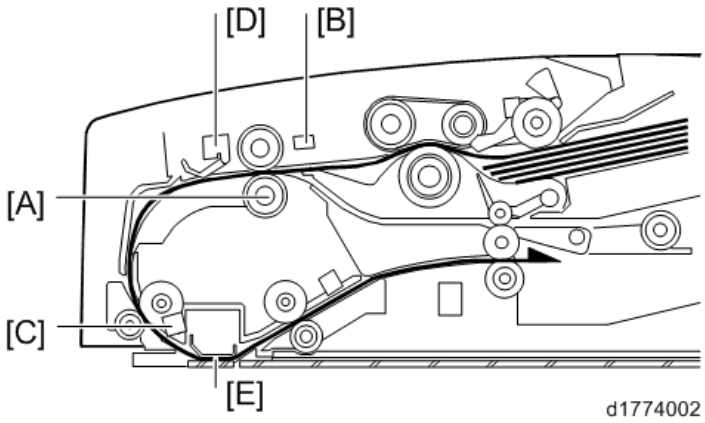
	Description
A	Pickup Roller
B	Paper Feed Motor
C	Paper Feed Belt

19.2.4 SKEW CORRECTION MECHANISM / REGISTRATION MECHANISM

- Skew Correction

  The skew correction sensor [B] detects the leading edge of the original after it passes through the separation area. When the leading edge reaches the Entrance Transport Roller [A], the paper is fed a bit more so that it bumps into the entrance roller, to make slack for skew adjustment.
- Registration Mechanism

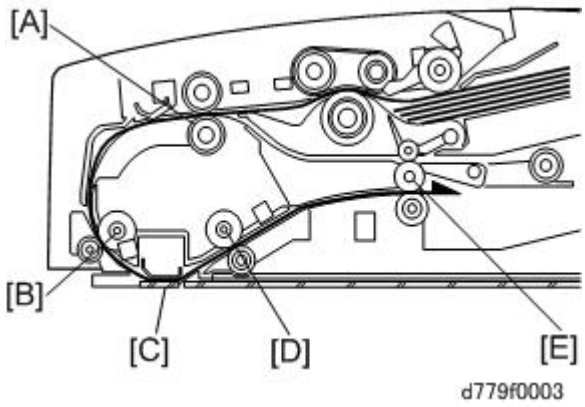
  The Registration Sensor[C] controls the leading edge position of the photo conductor.



A	Pullout Roller
B	Skew Correction Sensor
C	Registration Sensor
D	Original Width Sensor
E	Photo Reflection Sensor

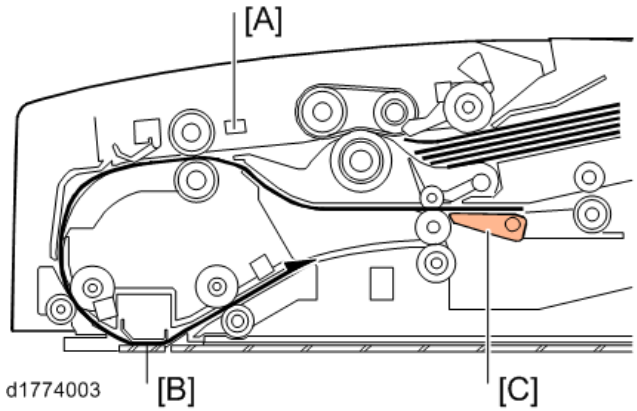
- Transport Mechanism (Simplex)

  Originals are transported by the Pullout roller[A] and the Entrance Transport roller [B] to the Photo Reflection Sensor[E], which scans the image information. After this process, the originals are made to exit by the Exit Transport Roller[D] and the Exit Driven roller[E].



	Description
A	Pullout Roller
B	Entrance Transport Roller
C	Photo Reflection Sensor
D	Exit Transport Roller
E	Exit Driven roller

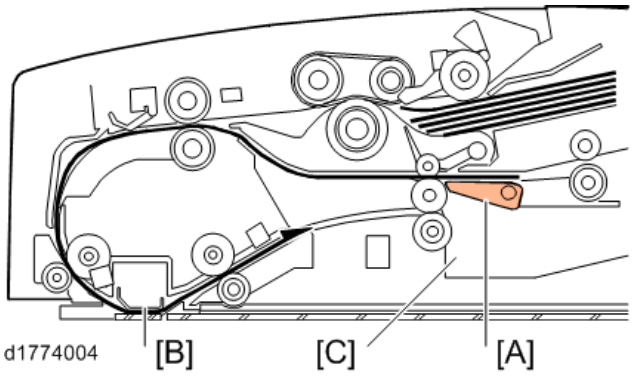
- Transport Mechanism (Duplex)
  When Originals are detected by the Skew Correction Sensor [A], the Transport motor switches OFF and stops. After the process of the skew correction, the originals are re-transported to the Photo Reflection Sensor[E], which scans the image information of the first side(front) . Then the Reverse Solenoid switches On and the Stopper Pawl[B] opens. By that process, the originals are transported to the Paper Feed Reverse Roller. At this timing, the Transport Motor stops and the Reverse Solenoid switch off.

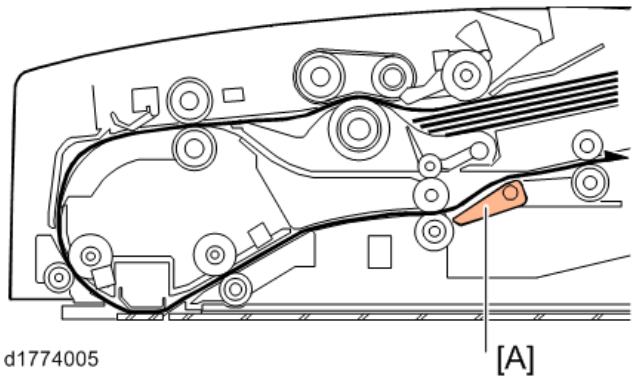


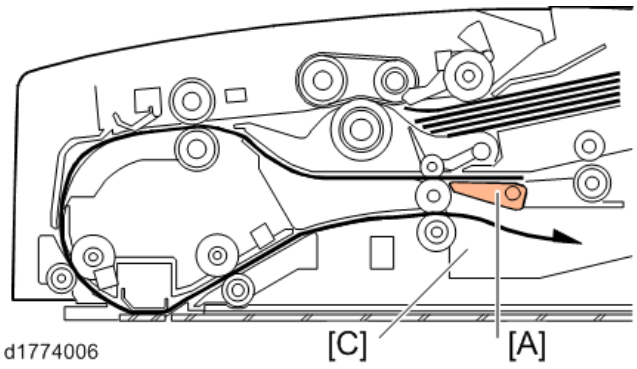
	Description
A	Skew Correction Sensor
B	Photo Reflection Sensor
C	Stopper Pawl

The originals, which entered the reverse roller, are re-fed going through the upper surface of the Stopper Pawl[C]. When the originals reach the Photo Reflection Sensor[B], the image information of the second side(back) is scanned.

The two sides (front/back) of an original need to be inverted. This is to make the order of the sheets on the Exit Tray correct. Therefore, the Reverse Solenoid switches ON and the originals are transported to the Reverse roller again. After the inversion, the originals exit onto the Exit Tray.







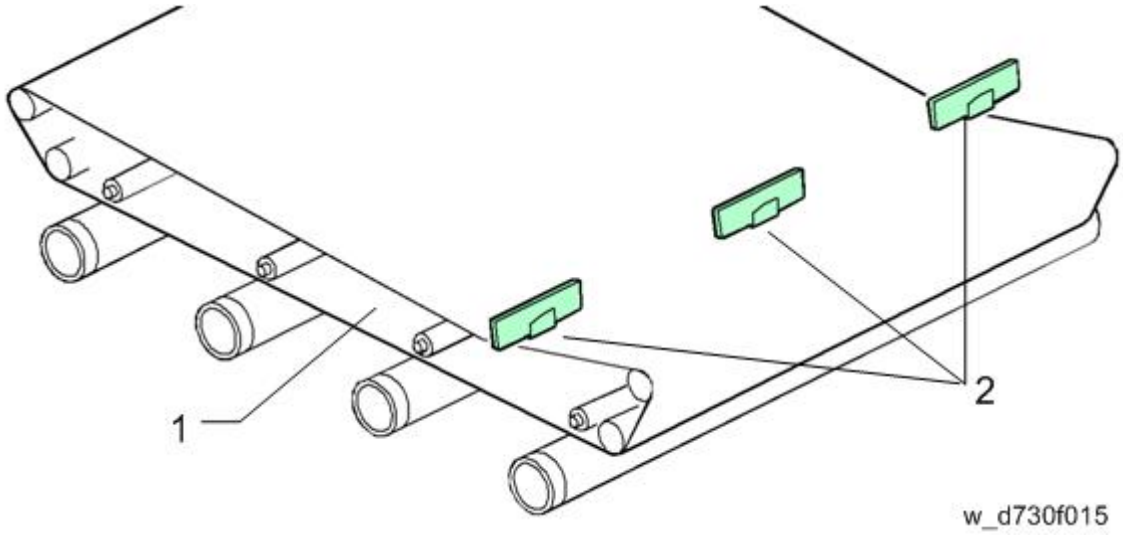
19.3 MECHANISM

19.3.1 SENSOR CONSTRUCTION

The ID Sensors (also called the P sensors, or the TM/P sensors) are used to measure the amount of toner on the Transfer Belt and to correct any errors in color registration. The TD sensor (also called the HST sensor) is used to measure the toner density in the developer..

19.3.2 OUTLINE OF THE ID SENSORS

The ID sensors are fixed onto the main frame, against the surface of the Transfer Belt. Color registration is checked by all three sensors; the Front, Center, and Rear.
Toner density detection is done by the center sensor only.



No.	Name
1	Image Transfer Belt
2	ID Sensors

19.3.3 OUTLINE OF THE TD SENSOR

The TD sensor is a non-contact toner density sensor. It measures the magnetic permeability of the developer from the outside of the development unit, and converts the value into the toner density.
The TD sensor is relatively unaffected by dirt because the sensor can operate outside the case, without the sensor core contacting the developer. This sensor is used to control toner supply.
An ID chip, in which the following information is stored, is installed inside the TD sensor;

- Unique Model information,
- Information about the running distance of the development unit and the PCU
- Information for image density control

19.4 PROCESS CONTROL

19.4.1 OUTLINE

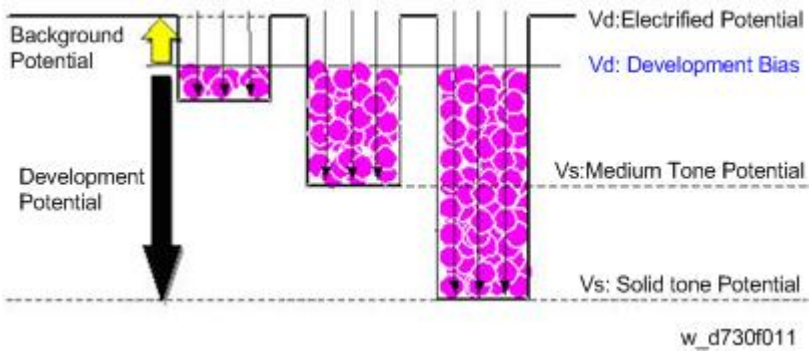
Process control adjusts the condition of the imaging hardware to maintain a constant image density. Process control is executed at the following times.

	Process Control	Operative Condition	Notes	Related SPs
1	PowerON ProCon :Se	When a certain time has passed after the previous job end	Except when recovering from an SC or jam	SP3-530-001 SP3-530-002 SP3-530-003 SP3-530-004 SP3-530-005 SP3-530-006 SP3-530-007 SP3-530-008
2	JobEnd ProCon :Set	When the value of the job end counter becomes more than the threshold	At job end	SP3-534-001~004 SP3-534-011~014
3	Interrupt ProCon :Set	When the value of the job interrupt counter	Interruption 2-point	SP3-533-001~004

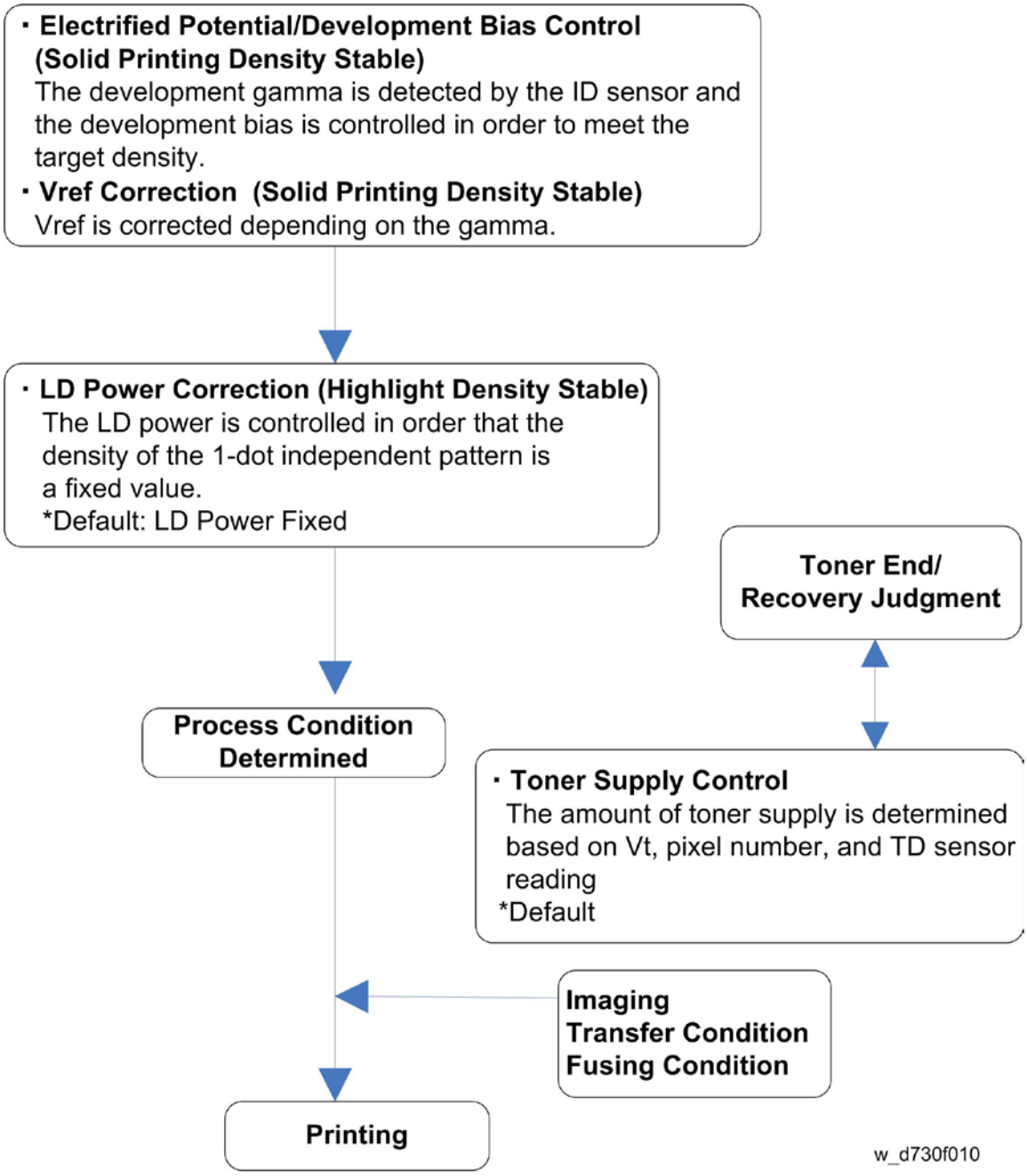
	Process Control	Operative Condition	Notes	Related SPs
		becomes more than the threshold	Synchronizing is operated	SP3-533-011~014
4	Non-useTime Procon :Set	When the value of the non-use time counter becomes more than the threshold	-	SP3-531-001~004
5	Manual ProCon :Exe	When SP 3-011 is used	-	SP3-011-001~005
6	Toner End Recovery	After the Toner End Status is cleared (Recovery is NOT done in the near end status)	-	-
7	Initial Developer Setting Process Control	When the machine detects that new developer has been added.	-	-

19.4.2 THE PROCESS CONTROL PROCEDURE

The potential of the unexposed drum is called the electrified potential (Vd), whereas the potential when toner starts to adhere to the drum is called the development bias (Vb).
Toner starts to adhere to the drum in proportion to the potential when the value of potential becomes more than Vb. The value (coefficient) which shows the relation between the potential and the amount of adhesion is called development gamma.



In addition to the development gamma and the potential, the toner density in the developer needs to be controlled. This is done to maintain the proper toner density (the amount of toner adhesion).
The target figure for the toner density in the developer is called Vtref.
Process Control is done as shown in the following chart, which includes development gamma determination, Vtref correction, and LD power control.


· Electrified Potential/Development Bias Control (Solid Printing Density Stable)
The development gamma is detected by the ID sensor and the development bias is controlled in order to meet the target density.
· Vref Correction (Solid Printing Density Stable)
Vref is corrected depending on the gamma.
· LD Power Correction (Highlight Density Stable)
The LD power is controlled in order that the density of the 1-dot independent pattern is a fixed value.
*Default: LD Power Fixed
Toner End/ Recovery Judgment
Process Condition Determined
· Toner Supply Control
The amount of toner supply is determined based on Vt, pixel number, and TD sensor reading
*Default
Imaging
Transfer Condition
Fusing Condition
Printing
w_d730f010

19.4.3 ELECTRIFIED POTENTIAL / DEVELOPMENT BIAS, VTREF CORRECTION

Electrified Potential/ Development Bias, Vtref Correction are done with the following method.

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 background on the Transfer Belt) will be in the range of 4.0V ±0.5V. When Vsg is detected as not within the target range three times, SC400 (ID sensor error) will be detected.

  NOTE: SP3-320-031/032/033（Vsg Error Counter）
  SP3-320-013（Vsg Upper Threshold）
  SP3-320-014（Vsg Lower Threshold

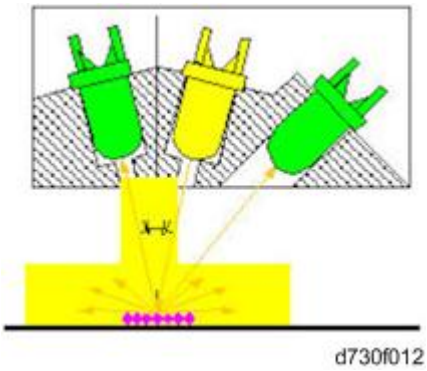
- Developer Stirring（5 seconds）

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

  NOTE: SP3-539-001（Dev Agitating Time :Set）

- Pattern Creation/ Density Detection
  - 5 patterns are created on the transfer belt and detected by each ID sensor, with the Charge/ Development Bias adjusted for each pattern.
  - The ID sensor contains an LED and two types of photo detector. The sensor detects the reflection from the LED with the positive photo detector (REG) and the diffusion photo detector (DIF).

Positive photo detector (REG) LED Diffusion Photo Detector (DIF)



- Use of the development gamma to control Vtref
  This decides the charge voltage and development bias

19.4.4 LD POWER CONTROL

LD Control is set with SP3-600-002(Process Control/ Select ProCon: LD Control).

- To use a fixed LD Power
  Change the SP setting to [Fixed]. LD strength is fixed with SP2-221-001～004.
- To control LD Power by Process Control (Default)
  - The LD power is determined by process control.
  - The LD strength is adjusted based on a table which is determined by the Development Bias Control and Vtref Correction.

19.4.5 TONER SUPPLY CONTROL

The Toner Supply Type can be selected with SP3-400-001～004 (Toner Supply Type: Select).

- Fixed Amount Supply

  ・Fixed
  ・PID
  ・DANK (Vtref Fixed)
  ・DANK (Vtref Correction) (Default)

- Supply Time

  The toner supply time is calculated based on the supply rate of SP3-401-001～004(DrvTime: Setting)

- Toner Supply PID

  PID (Proportion Integral Differential)
  The amount of toner supply is calculated based on the pixel information and TD sensor information.

- MBD(ANC) Control

  ANC (Active Noise Control)
  The supply timing is controlled in order that the developer density in the development unit would be minimized, adding ANC control to the original PID Control.

19.4.6 DEVELOPER INITIAL SETTING

When a new PCDU is set in the main frame, this is detected by the machine as a new PCDU, and Vtcnt (TD sensor control v) is determined after entering the developer initial setting mode. The developer initial setting is done as follows.

- Starting the developer initial setting
  The initial setting is triggered when the machine detects that new developer was added.
- Developer Agitation
  The developer is stirred, with the development roller and the transport coil rotating (30 seconds).
- Vncnt Value Adjustment
  The machine adjusts the Vncnt value in order that Vt (the TD sensor output) is 2.3 ±0.2V while developer is stirred (around 10 seconds).
- Forced toner supply (when the machine is newly installed)
  Forced toner supply must be done because toner is not supplied to the toner supply path when the machine is newly installed (this takes 6 to 8 seconds).
  When the developer initial setting is completed successfully, the system moves to the next process, the PCDU initial setting, with the Vtref proceeded as a TD sensor output, which is collateral for the Vtcnt. If the value of Vt is not within ± 0.2V of the target value (SP3-030-031 to 034), a TD sensor control error is displayed (SC372 to SC375).
  Process control and automatic color correction must be done forcibly after the developer initial setting when the AIT has changed.

19.5 MUSIC (AUTOMATIC COLOR REGISTRATION CORRECTION)

19.5.1 CORRECTION TIMING

The machine creates correction patterns, measures the image position by reading the correction patterns, and corrects the writing position.

	Operative Condition	Notes
1	Power switch just turned on, or recovering from the energy save mode	Mode b or mode a is done See notes *1 and *2 below.
2	When printing (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended, when the main scan magnification changes to be more than a set value, or when the number of pages printed becomes more than a set number)	Mode b is done
3	End of printing (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended, or when the number of pages printed becomes more than a set number)	Mode b is done
4	Front cover opening/ closing (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended)	Mode b is done
5	Waiting (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended)	Mode b is done
6	New detection of the AIT/ duplex transfer belt	Mode a is done

*1 Mode a: adjusted two times

*2 Mode b: adjusted once

To operate modes a/ b/ c manually, use the following SPs..

- SP2-111-001 (Mode a)

  The same procedure as the Color Registration Correction in the Initial Setting [Adjustment Management]
- SP2-111-002 (Mode b)
- SP2-111-003 (Mode c)

  After changing the laser writing unit, or when a major color registration error occurs
- SP2-111-004 (Mode d)

  After the laser writing unit is changed.

Color registration errors can be corrected only by the mode c when the error is large. After mode c is completed, the mode a/b must be operated.

19.5.2 MUSIC ERROR JUDGMENT

When MUSIC is done, the results must be checked for each color. SP2-194-007 shows whether MUSIC was OK or NG, and SP2-194-010 to 012 show the details of the result.

- SP2-194-007（Execution Result）
- SP2-194-010 (Error Result: C)
- SP2-194-011 (Error Result: M)
- SP2-194-012 (Error Result: Y)

Detection Result	Meaning
0	MUSIC not executed
1	Correction Succeeded: Sampling is conducted correctly and the correction is completed
2	Sampling Failed (When the MUSIC pattern failed to be detected)
3	Detection Patterns Lack (When the number of lines detected is smaller than the fixed number)
4	Not In Use
5	The sampled data is beyond the correction range.

Correction Operation Outline

10. The machine corrects the ID sensor output by Vsg adjustment
11. The machine creates the MUSIC pattern on the transfer belt with toner of each color.
12. The machine reads the MUSIC pattern on the transfer belt and detects the positions of the line patterns.
13. The machine calculates the amount of color registration or skew from the detected positions.
14. The machine determines the correction for the color registration, by calculating the required main scan magnification shift, main scan magnification shift, main scan registration shift, and sub scan registration shift from the detected positions.

19.6 AMPLITUDE CONTROL

19.6.1 OUTLINE

- The gap of the amplitude creates color shift
- The phase tends to shift while a continuous drive because the speed of the motors are adjusted for each color

The motors are controlled in order to cancel the amplitude of each color as a solution for these problems.
This machine also follows the idea and adopts the method.

19.6.2 TIMING OF JUDGMENT

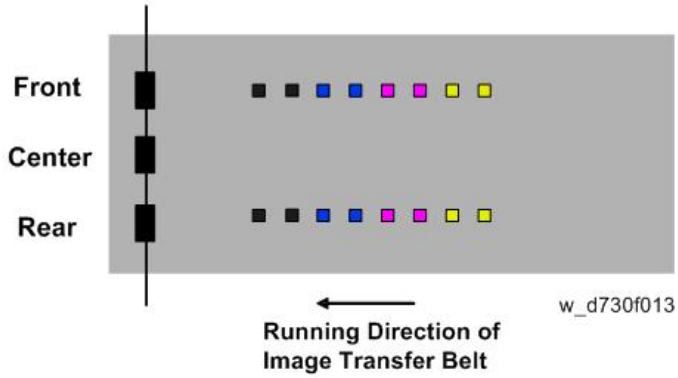
The patterns on the transfer belt are read and the amount of the amplitude of the speed change (by the MUSIC sensor).
The drum phase sensor correlates the amplitude with the positional information of the drum rotation.
The operation result is saved into SP1-903-003(B), 1-903-004(FC).
If the result is lower than 5 micrometers, the amplitude correction is not done.

19.6.3 DRUM DEVELOPMENT MOTOR OPERATION

Though the drum development motor rotates regardless of the amplitude, the amplitude control starts when the position of the rotational direction is detected. Amplitude control is not done and the motor continues rotating when there is no change in the sensor output, which could be caused by damage to the drum phase sensor or disconnection of a harness.

19.6.4 REAL TIME PROCESS CONTROL

During printing, 5 mm patterns are created outside the normal imaging area on the transfer belt, and the image density is corrected in the real time, to improve printing of solid areas. However, note that if the optional Imageable Area Extension Unit is installed, this process is disabled.



Normally, the real time control is done once every 10 sheets, but it could be done once every 5 sheets depending on the density detection level.
The frequency depends on the following SPs.
SP3-301-001: RTP Pattern:Set:Create Intrvl:BW
SP3-301-002: RTP Pattern:Set:Create Intrvl:FC

To see the latest result, check the following SPs. If there is an error, the result will not be updated.
SP3-300-001 to 004 RTP Pattern:Disp:M/A(Latest):Each Color
SP3-300-001 to 004 RTP Pattern:Disp:M/A(Target):Each Color

19.7 IBACC

19.7.1 OUTLINE

IBACC (Intermediate Belt type of inner ACC) maintains the quality of gradation in the images. To do this, the machine makes a gradation pattern on the transfer belt, and measures variations in density between the middle to the highlight tone, which solid printing control cannot correct perfectly. The machine feeds back variations in the density to the image-processing parameters (the digital gamma correction table).

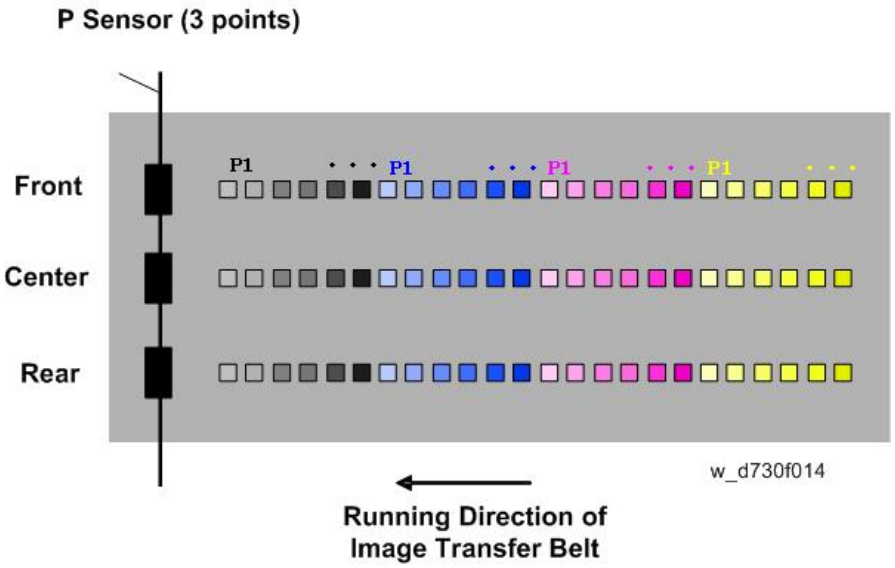
19.7.2 OPERATION TIMING

IBACC must be done in the shortest time possible, in cooperation with process control. This is because the process requires time to adjust. If the ON/OFF setting of IBACC operation (SP3-600-030) is ON, IBACC is done at the time of normal process control. If the setting is OFF, the IBACC is not done.

Before the IBACC procedure, the machine determines whether IBACC can be done, based on the engine condition. If there is an error in the latest process control, the following IBACC is considered to be unnecessary.

19.7.3 PATCH PATTERN

16x16 patterns are created. The order of the tones depends on the image processing layout, as the single-tone patterns are creatable in the station pitch area.
There are patterns for 600 dpi and 1200 dpi.



20. PROCESS CONTROL

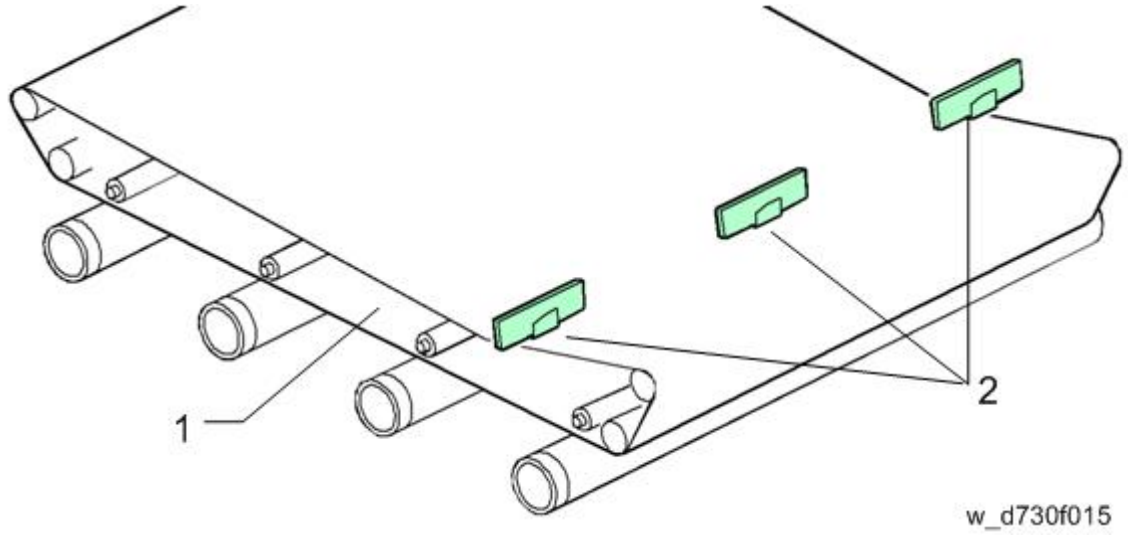
20.1 MECHANISM

20.1.1 SENSOR CONSTRUCTION

The ID Sensors (also called the P sensors, or the TM/ID sensors) are used to measure the amount of toner on the Transfer Belt and to correct any errors in color registration. The TD sensor (also called the HST sensor) is used to measure the toner density in the developer..

20.1.2 OUTLINE OF THE ID SENSORS

The ID sensors are fixed onto the main frame, against the surface of the Transfer Belt. Color registration is checked by all three sensors; the Front, Center, and Rear.
Toner density detection is done by the center sensor only.



No.	Name
1	Image Transfer Belt
2	ID Sensors

20.1.3 OUTLINE OF THE TD SENSOR

The TD sensor is a non-contact toner density sensor. It measures the magnetic permeability of the developer from the outside of the development unit, and converts the value into the toner density.

The TD sensor is relatively unaffected by dirt because the sensor can operate outside the case, without the sensor core contacting the developer. This sensor is used to control toner supply.

An ID chip, in which the following information is stored, is installed inside the TD sensor;

- Unique Model information,
- Information about the running distance of the development unit and the PCU
- Information for image density control

20.2 PROCESS CONTROL

20.2.1 OUTLINE

Process control adjusts the condition of the imaging hardware to maintain a constant image density. Process control is executed at the following times.

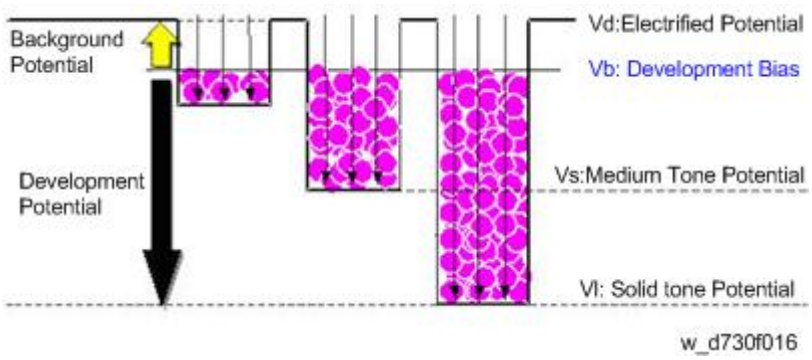
	Process Control	Operative Condition	Notes	Related SPs
1	PowerON ProCon :Se	When a certain time has passed after the previous job end	Except when recovering from an SC or jam	SP3-530-001 SP3-530-002 SP3-530-003 SP3-530-004 SP3-530-005 SP3-530-006 SP3-530-007 SP3-530-008
2	JobEnd ProCon :Set	When the value of the job end counter becomes more than the threshold	At job end	SP3-534-001~004 SP3-534-011~014
3	Interrupt ProCon :Set	When the value of the job interrupt counter	Interruption 2-point	SP3-533-001~004

	Process Control	Operative Condition	Notes	Related SPs
		becomes more than the threshold	Synchronizing is operated	SP3-533-011~014
4	Non-useTime Procon :Set	When the value of the non-use time counter becomes more than the threshold	-	SP3-531-001~004
5	Manual ProCon :Exe	When SP 3-011 is used	-	SP3-011-001~005
6	Toner End Recovery	After the Toner End Status is cleared (Recovery is NOT done in the near end status)	-	-
7	Initial Developer Setting Process Control	When the machine detects that new developer has been added.	-	-

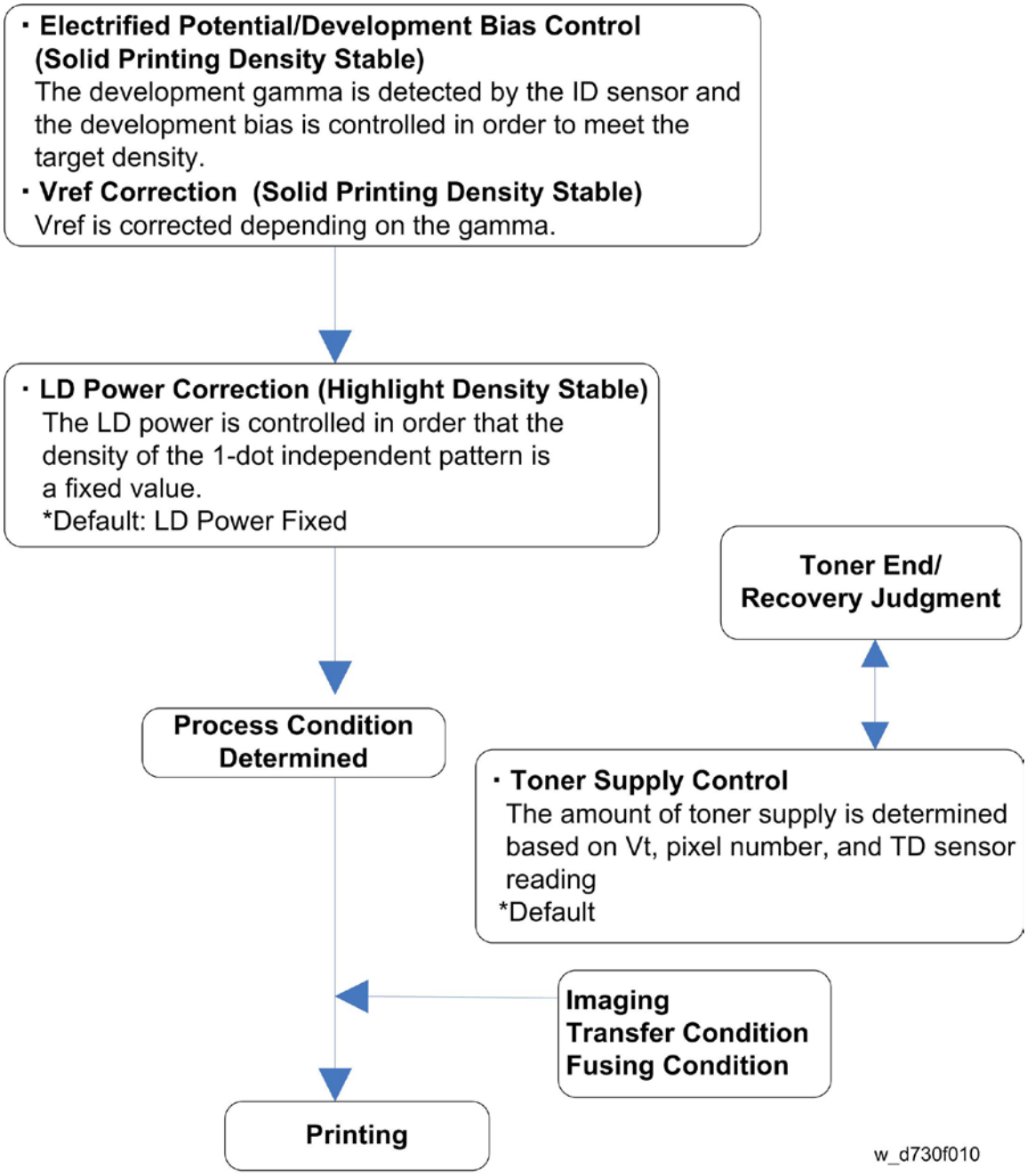
20.2.2 THE PROCESS CONTROL PROCEDURE

The potential of the unexposed drum is called the electrified potential (Vd), whereas the potential when toner starts to adhere to the drum is called the development bias (Vb).

Toner starts to adhere to the drum in proportion to the potential when the value of potential becomes more than Vb. The value (coefficient) which shows the relation between the potential and the amount of adhesion is called development gamma.



In addition to the development gamma and the potential, the toner density in the developer needs to be controlled. This is done to maintain the proper toner density (the amount of toner adhesion).
The target figure for the toner density in the developer is called Vtref.
Process Control is done as shown in the following chart, which includes development gamma determination, Vtref correction, and LD power control.



20.2.3 ELECTRIFIED POTENTIAL / DEVELOPMENT BIAS, VTREF CORRECTION

Electrified Potential/ Development Bias and Vtref Correction are done with the following method.

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 background on the Transfer Belt) will be in the range of 4.0V ±0.5V. When Vsg is detected as not within the target range three times, SC400 (ID sensor error) will be detected.

  NOTE: SP3-320-031/032/033（Vsg Error Counter）
  SP3-320-013（Vsg Upper Threshold）
  SP3-320-014（Vsg Lower Threshold

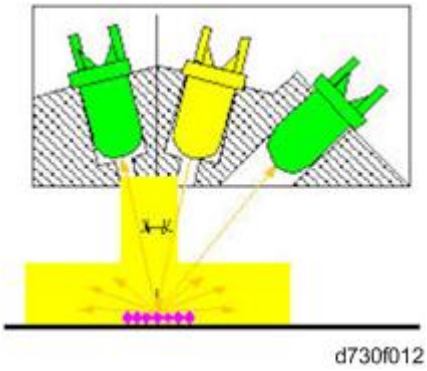
- Developer Stirring（5 seconds）

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

  NOTE: SP3-539-001（Dev Agitating Time :Set）

- Pattern Creation/ Density Detection
  - 5 patterns are created on the transfer belt and detected by each ID sensor, with the Charge/ Development Bias adjusted for each pattern.
  - The ID sensor contains an LED and two types of photo detector. The sensor detects the reflection from the LED with the positive photo detector (REG) and the diffusion photo detector (DIF).

Positive photo detector (REG) LED Diffusion Photo Detector (DIF)



- Use of the development gamma to control Vtref
  This decides the charge voltage and development bias

20.2.4 LD POWER CONTROL

LD Control is set with SP3-600-002(Process Control/ Select ProCon: LD Control).

- To use a fixed LD Power
  Change the SP setting to [Fixed]. LD strength is fixed with SP2-221-001～004.
- To control LD Power by Process Control (Default)
  - The LD power is determined by process control.
  - The LD strength is adjusted based on a table which is determined by the Development Bias Control and Vtref Correction.

20.2.5 TONER SUPPLY CONTROL

The Toner Supply Type can be selected with SP3-400-001～004 (Toner Supply Type: Select).

- Fixed Amount Supply

  ・Fixed

  ・PID

  ・DANK (Vtref Fixed)

  ・DANK (Vtref Correction) (Default)

- Supply Time

  The toner supply time is calculated based on the supply rate of SP3-401-001～004(DrvTime: Setting)

- Toner Supply PID

  PID (Proportion Integral Differential)

  The amount of toner supply is calculated based on the pixel information and TD sensor information.

- MBD(ANC) Control

  ANC (Active Noise Control)

  The supply timing is controlled in order that the developer density in the development unit would be minimized, adding ANC control to the original PID Control.

20.2.6 DEVELOPER INITIAL SETTING

When a new PCDU is set in the main frame, this is detected by the machine as a new PCDU, and Vtcnt (TD sensor control v) is determined after entering the developer initial setting mode. The developer initial setting is done as follows.

- Starting the developer initial setting
  The initial setting is triggered when the machine detects that new developer was added.
- Developer Agitation
  The developer is stirred, with the development roller and the transport coil rotating (30 seconds).
- Vncnt Value Adjustment
  The machine adjusts the Vncnt value in order that Vt (the TD sensor output) is 2.3 ±0.2V while developer is stirred (around 10 seconds).
- Forced toner supply (operated only when a machine is newly installed)
  Forced toner supply is done automatically because toner is not supplied to the toner supply path when the machine is newly installed (this takes 6 to 8 seconds). When the developer initial setting is completed successfully, the system moves to the next process, the PCDU initial setting, with the Vtref proceeded as a TD sensor output, which is collateral for the Vtcnt. If the value of Vt is not within ± 0.2V of the target value (SP3-030-031 to 034), a TD sensor control error is displayed (SC372 to SC375).
  Process control and automatic color correction are done automatically after the developer initial setting when the PCDU has been changed, if you set SP3-701 to "1" before replacing the PCDU.

20.3 MUSIC (AUTOMATIC COLOR REGISTRATION CORRECTION)

20.3.1 CORRECTION TIMING

The machine creates correction patterns, measures the image position by reading the correction patterns, and corrects the writing position.

	Operative Condition	Notes
1	Power switch just turned on, or recovering from the energy save mode	Mode b or mode a is done See notes *1 and *2 below.
2	When printing (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended, when the main scan magnification changes to be more than a set value, or when the number of pages printed becomes more than a set number)	Mode b is done
3	End of printing (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended, or when the number of pages printed becomes more than a set number)	Mode b is done
4	Front cover opening/ closing (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended)	Mode b is done
5	Waiting (when a certain time has passed or the temperature has changed by a certain amount since the previous job ended)	Mode b is done
6	New detection of the PCDU/ duplex transfer belt	Mode a is done

*1 Mode a: adjusted two times

*2 Mode b: adjusted once

To operate modes a/ b/ c manually, use the following SPs..

- SP2-111-001 (Mode a)
  The same procedure as the Color Registration Correction in the Initial Setting [Adjustment Management]:
- SP2-111-002 (Mode b)

- SP2-111-003 (Mode c)
- SP2-111-004 (Mode d)

  After the laser writing unit is changed.

  Mode d is the same as doing mode c then mode a.

  Normally in the field, we should only use mode d.

  NOTE: Color registration errors can be corrected only by the mode d when the error is large.

20.3.2 MUSIC ERROR JUDGMENT

When MUSIC is done, the results must be checked for each color. SP2-194-007 shows whether MUSIC was OK or NG, and SP2-194-010 to 012 show the details of the result.

- SP2-194-007（Execution Result）
- SP2-194-010 (Error Result: C)
- SP2-194-011 (Error Result: M)
- SP2-194-012 (Error Result: Y)

Detection Result	Meaning
0	MUSIC not executed
1	Correction Succeeded: Sampling is conducted correctly and the correction is completed
2	Sampling Failed (When the MUSIC pattern failed to be detected)
3	Detection Patterns Lack (When the number of lines detected is smaller than the fixed number)
4	Not In Use
5	The sampled data is beyond the correction range.

Correction Operation Outline

15. The machine corrects the ID sensor output by Vsg adjustment
16. The machine creates the MUSIC pattern on the transfer belt with toner of each color.
17. The machine reads the MUSIC pattern on the transfer belt and detects the positions of the line patterns.
18. The machine calculates the amount of color registration or skew from the detected positions.
19. The machine determines the correction for the color registration, by calculating the required main scan magnification shift, main scan magnification deviation, main scan registration shift, and sub scan registration shift from the detected positions.

20.4 AMPLITUDE CONTROL

20.4.1 OUTLINE

- Output quality varies due to the differences among the amplitude of the four motors for each color.
- Phase fluctuation tends to be created while continuous drive because the speed of each motors differ.

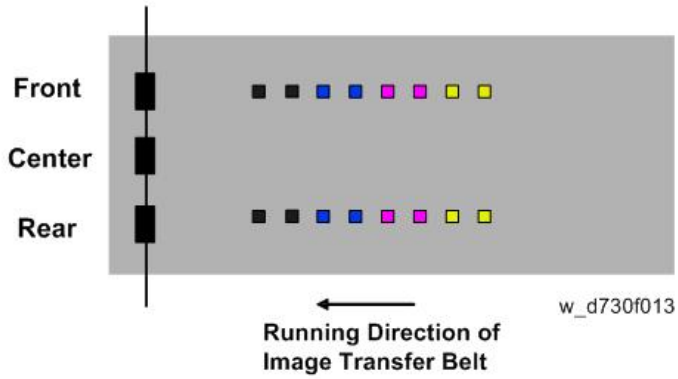
The motors are controlled in order to reduce the phase fluctuation of each color. This system is a solution for those problems above.
This machine also follows this idea and adopts the method of the predecessors.

20.4.2 TIMING OF JUDGMENT

The patterns on the transfer belt are read and the amount of the amplitude of the speed change (by the MUSIC sensor).
The drum phase sensor correlates the amplitude with the positional information of the drum rotation.
The operation result is saved into SP1-903-003(B), 1-903-004(FC).
If the result is lower than 5 micrometers, the amplitude correction is not done.

20.5 REAL TIME PROCESS CONTROL

During printing, 5 mm patterns are created outside the normal imaging area on the transfer belt, and the image density is corrected in the real time, to improve printing of solid areas. However, note that if the optional Imageable Area Extension Unit is installed, this process is disabled.



Normally, the real time control is done once every 10 sheets, but it could be done once every 5 sheets depending on the density detection level.
The frequency depends on the following SPs.
SP3-301-001: RTP Pattern:Set:Create Intrvl:BW
SP3-301-002: RTP Pattern:Set:Create Intrvl:FC

To see the latest result, check the following SPs. If there is an error, the result will not be updated.
SP3-300-001 to 004 RTP Pattern:Disp:M/A(Latest):Each Color
SP3-300-001 to 004 RTP Pattern:Disp:M/A(Target):Each Color

20.6 IBACC

20.6.1 OUTLINE

IBACC (Intermediate Belt type of inner ACC) maintains the quality of gradation in the images. To do this, the machine makes a gradation pattern on the transfer belt, and measures variations in density between the middle to the highlight tone, which solid printing control cannot correct perfectly. The machine feeds back variations in the density to the image-processing parameters (the digital gamma correction table).

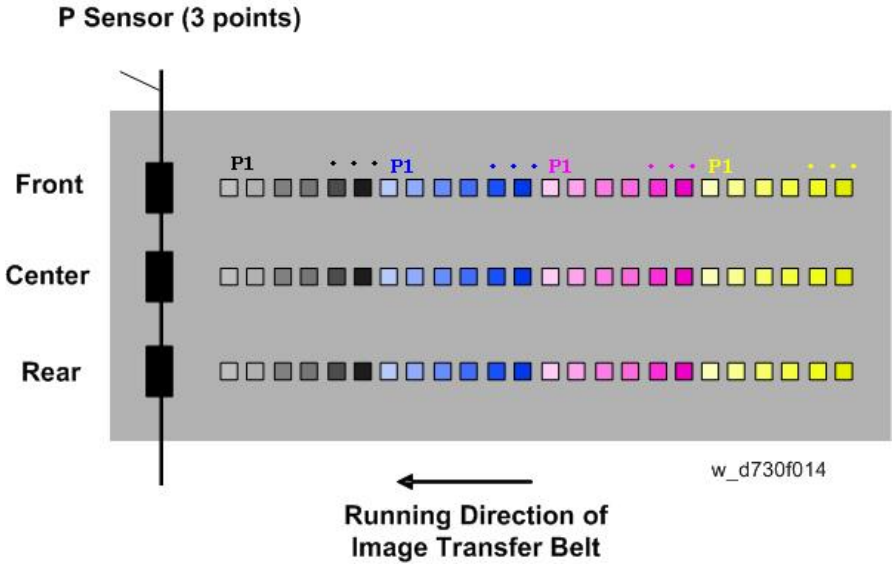
20.6.2 OPERATION TIMING

IBACC must be done in the shortest time possible, in cooperation with process control. This is because the process requires time to adjust. If the ON/OFF setting of IBACC operation (SP3-600-030) is ON, IBACC is done at the time of normal process control. If the setting is OFF, the IBACC is not done.

Before the IBACC procedure, the machine determines whether IBACC can be done, based on the engine condition. If there is an error in the latest process control, the following IBACC is considered to be unnecessary.

20.6.3 PATCH PATTERN

16x16 patterns are created. The order of the tones depends on the image processing layout. There are patterns for 600 dpi and 1200 dpi.



21. INTERNAL FINISHER SR3180

21.1 SPECIFICATION / PARTS LAYOUT

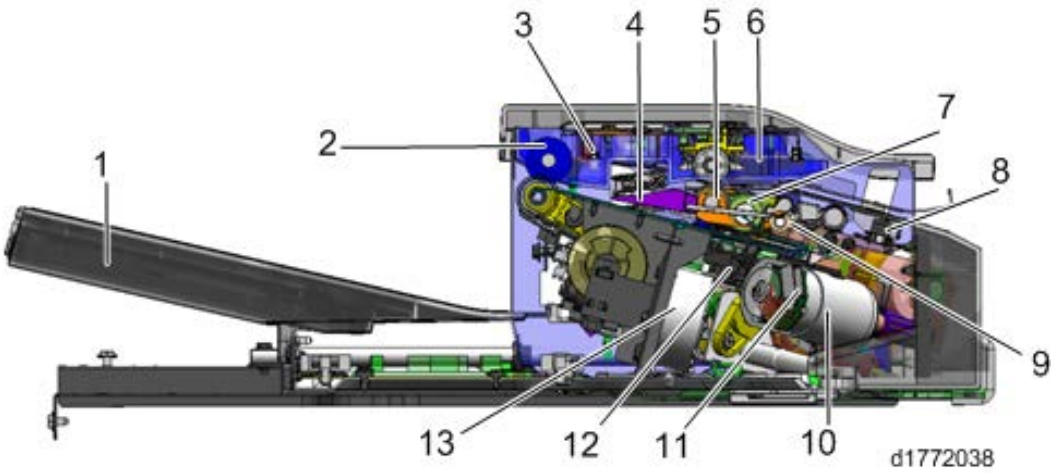
21.1.1 FINISHER PART SPECIFICATIONS

Item	Specification
Type	Case system
Shift tray	Yes
No. of sheets which can be accommodated	A4, $8^1/_2$×11 or smaller: 250 B4, $8^1/_2$×14 or larger: 125 (for Ricopy PPC paper: 6200)
Paper thicknesses which can be handled	52g/m^2-300g/m^2
Up/down shift function	No
Left/right shift function	Yes
Stapling function	Yes
Punching function	No
Remainder detection	No
Full-load detection	Yes
Paper detection	No
Power consumption	Less than 30W
Power source	24V DC (supplied from main frame), 5V SC (generated by FIN board), SELV (super-low voltage secondary power supply)
Dimensions (width×depth×height)	435×515×150 mm
Mass	Less than 9.8 kg

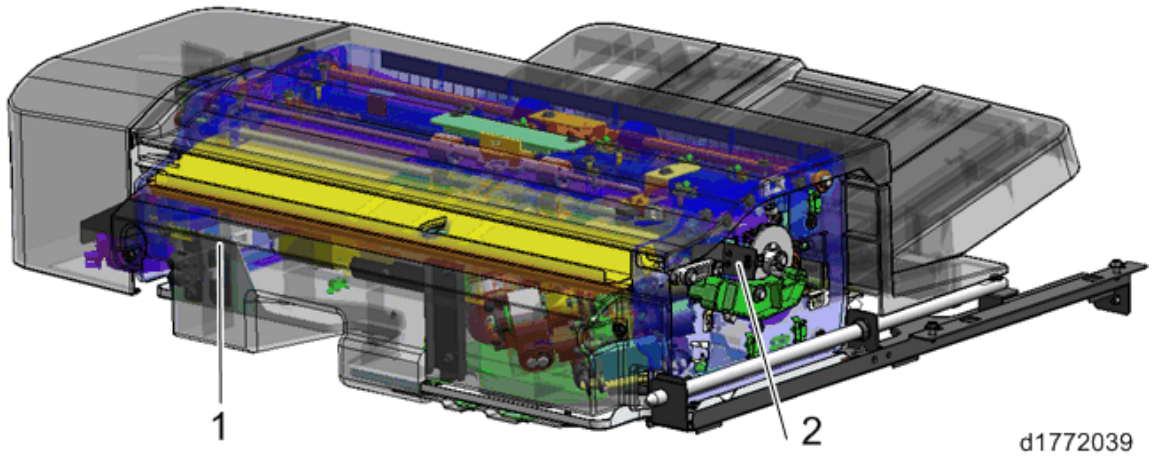
21.1.2 STAPLER UNIT SPECIFICATIONS

Item	Specification
No. of sheets which can be stitched	2 to 5 sheets
Sizes which can be stitched	A3 SEF - B5 SEF / DLT SEF - LT SEF
Thicknesses which can be stitched	54g/m2-80g/m2
Stitching position	1 position (Top Slant)
Staple supply	No
Stitching capacity	No

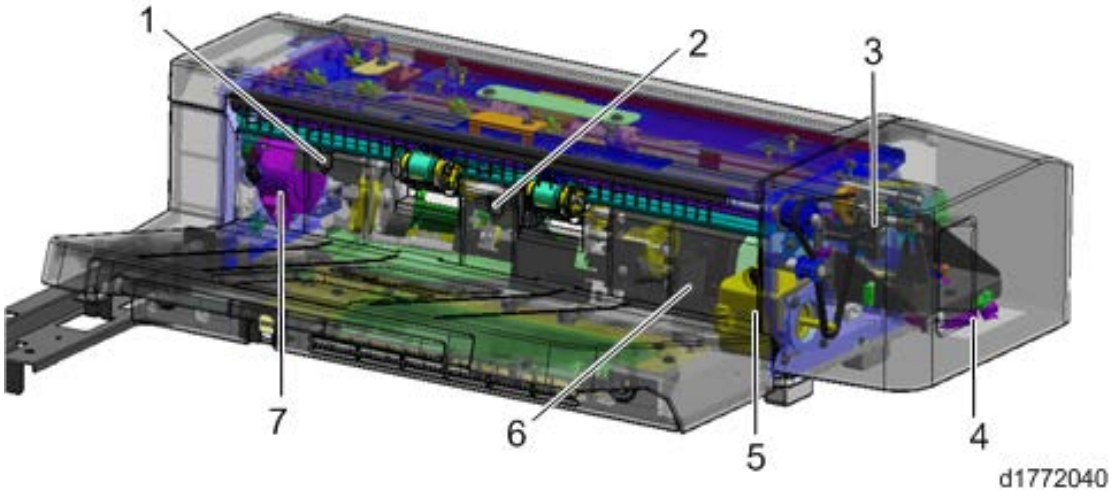
21.1.3 PARTS LAYOUT



No.	Description	No.	Description
1	Paper output tray	8	Entrance sensor
2	Paper output roller / Paper output belt	9	Rear edge presser
3	Paper output sensor	10	Stapler drive motor
4	Junction claw	11	Stapler
5	Shift roller	12	Stapler home position sensor
6	Registration sensor (Side-to-side)	13	Paper output pressure motor
7	Reverse roller		



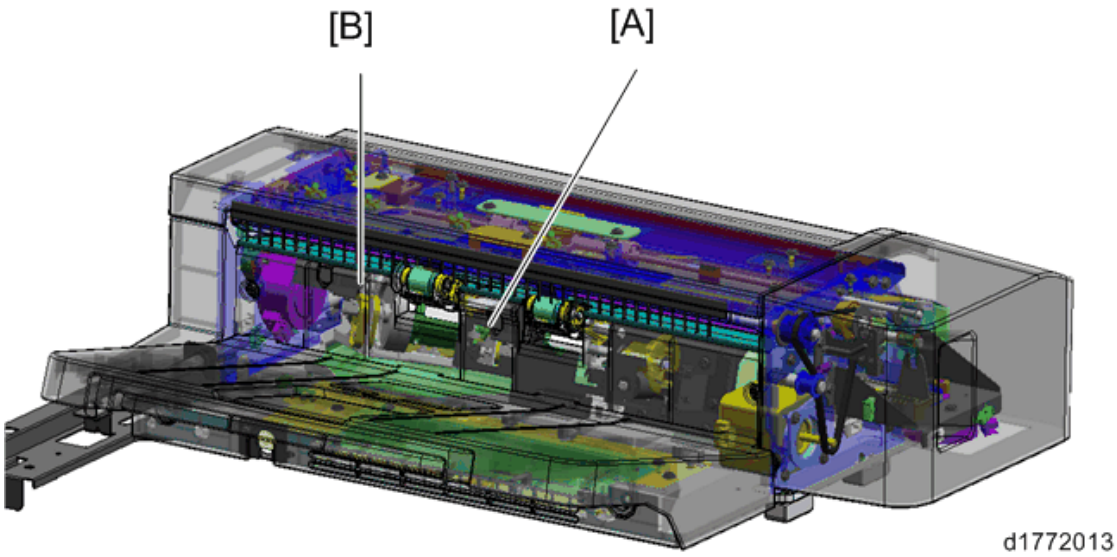
No.	Description	No.	Description
1	Open/close door switch	2	Junction solenoid motor HP sensor



No.	Description	No.	Description
1	Paper output full detection sensor 2 (for stapling)	5	Transport motor
2	Paper output full detection sensor 1	6	Paper output pressure HP sensor
3	Shift HP sensor	7	Junction Solenoid Motor
4	Shift motor		

21.2 MECHANISM

21.2.1 TRAY FULL DETECTION MECHANISM

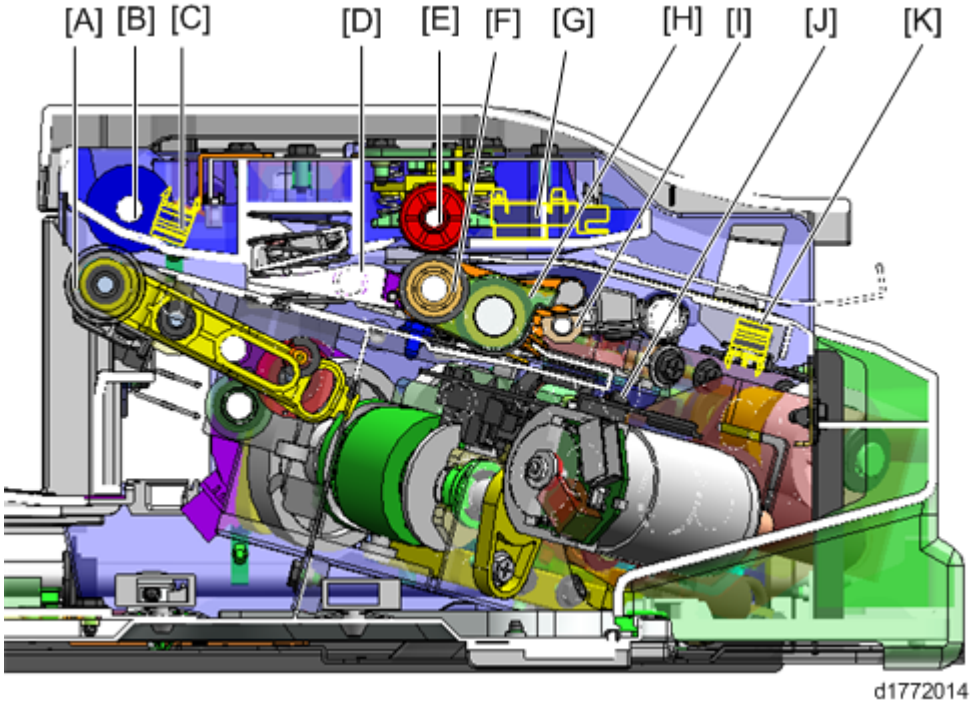


When any of the Paper output full detection sensor 1 [A] or the Paper output full detection sensor (for stapling) [B] detects paper, it detects that the paper output tray is full. Paper transportation is temporarily stopped during full tray detection. Paper ejection will be restarted after the bundle of paper is released.

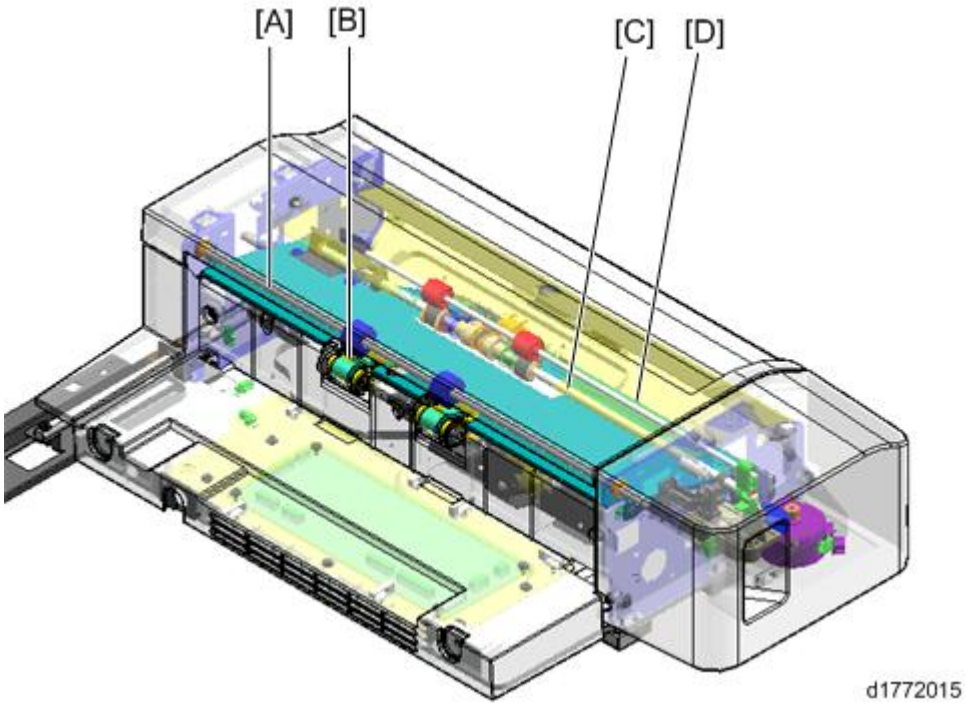
The Paper output full detection sensor 1 is located at the center against the main-scan direction (Side-to-Side direction), and detects the amount of all the output paper.

On the other hand, when stapling, the height of paper around the stapled area is higher than other area. The paper output full detection sensor 2 (for stapling) is installed at the staple area, and is dedicated to detect the amount of stapled output paper.

21.2.2 STRAIGHT PAPER EJECTION / SHIFT EJECTION MECHANISM

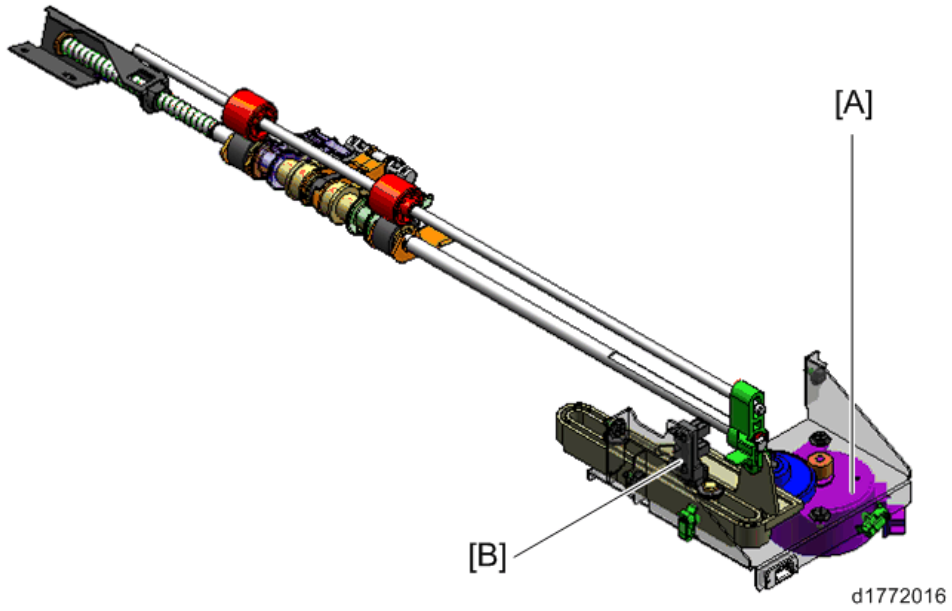


As for straight paper ejection, paper exported from the main frame is relayed to the paper output roller [B] and Paper output belt [A] via the shift rollers ([E] and [F]). Shift ejection adopts this mechanism as well. An installed transport motor drives the shift rollers, reverse rollers and paper output rollers for the straight paper ejection.



For shift operation, a shift motor drives the transporting paper to the front/back after the paper passes over the paper output roller, while the shift rollers ([C] and [D]) are nipping the sheets. Nipping the paper by the paper output rollers can prevent paper shifts during the shift operation, so paper output rollers ([A] and [B]) move from its home position (Strong pressurize position) to the pressure release position.

21.2.3 SHIFT MECHANISM



- Shift roller operation timing

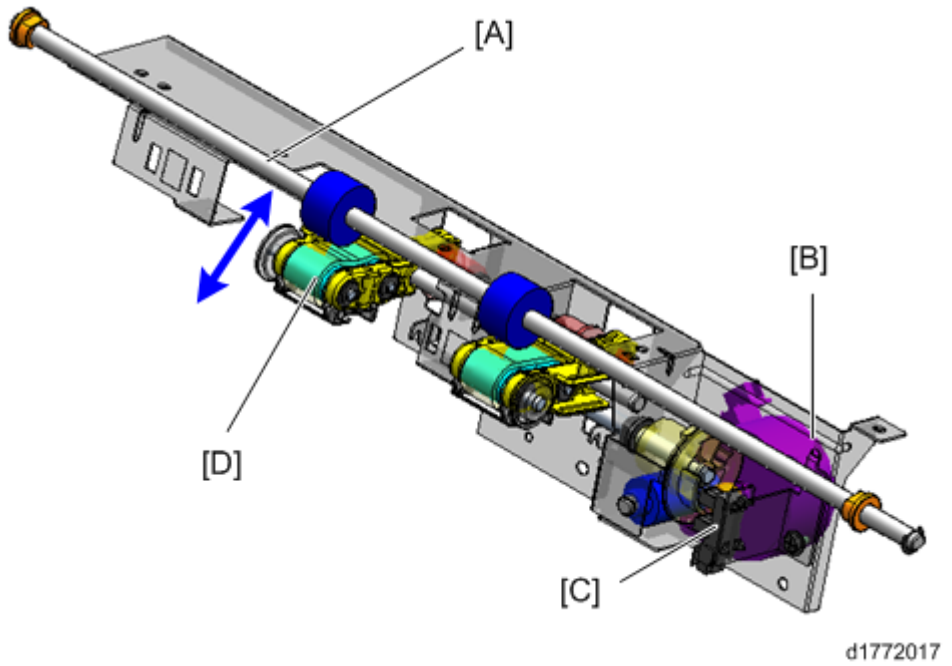
Shift roller starts a shift operation where the distance between the trailing edge of paper and the paper output roller on the main frame is 10mm, which is controlled with the later movement amount of the motor (pulse) based on the leading edge of paper is reached at the entrance sensor as the standard.

Shift motor [A] rotates CW/CCW and shifts paper to the front or back.

The shift amount is 20mm for the front side, 10mm for the back side.

The home position is located at the back of the displacement range, and is detected by the shift roller home position sensor [B].

21.2.4 PAPER OUTPUT ROLLER / PAPER OUTPUT BELT RELEASE MECHANISM



	Description
[A]	Paper output roller (drive)
[B]	Paper output pressure motor
[C]	Paper output pressure HP sensor
[D]	Paper output belt (driven)

- Pressure release timing of paper output roller

  * When waiting (before paper reception): Strong pressurize position.

  * When paper is transported: pressure release position.

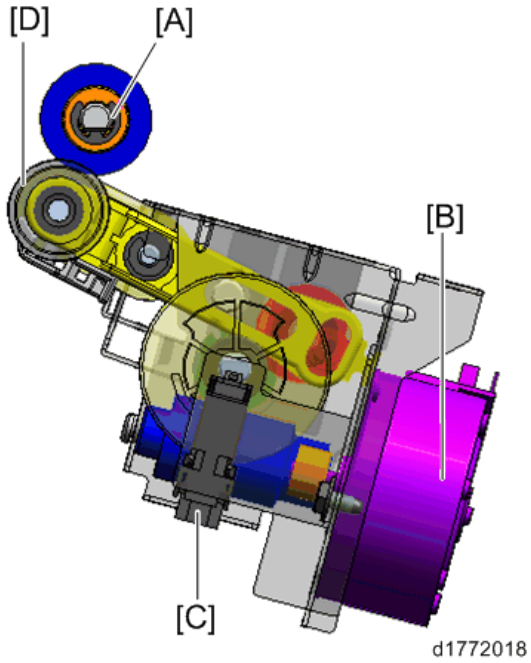
  * When shift operation ended: strong pressurize position; operates based on shift motor operation ended.

  Paper output rollers / Paper output belt ([A] and [D]) receive paper at the pressure release position for smooth shift operation during paper transportation.
  After the shift operation is completed, the roller moves from the pressure release position to the strong pressurize position for paper transportation and ejection.
  There are three positions for paper output roller: Home position (strong pressurize position), pressure release position and weak pressurize position. According to conditions, the positions move to the blue arrow direction.
  Paper output pressure motor [B] rotates CW/CCW, and drives the paper output belt (driven) [D] to the strong pressurize position or weak pressurize position. Paper output pressure HP sensor [C] detects its home position.

Details of each position

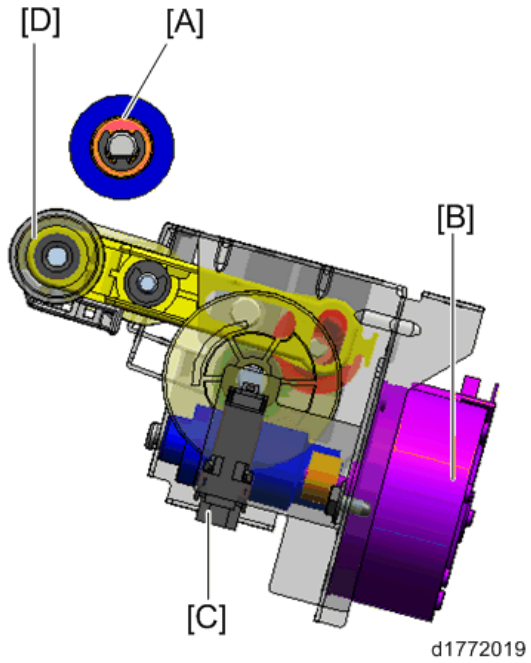
- Strong pressurize position

  This is used for paper transportation including feeding out the bundle of paper (stapled paper stack), and paper output. At the strong pressurize position, not only the pressure power is increased by the motor [B], but also the paper output roller (drive) [A] and the paper output belt (driven) [D] are contacted together to nip the paper firmly.



- Pressure release position

  This is used for shift operation. With releasing the paper output roller/paper output belt nip provides a smooth shift operation.

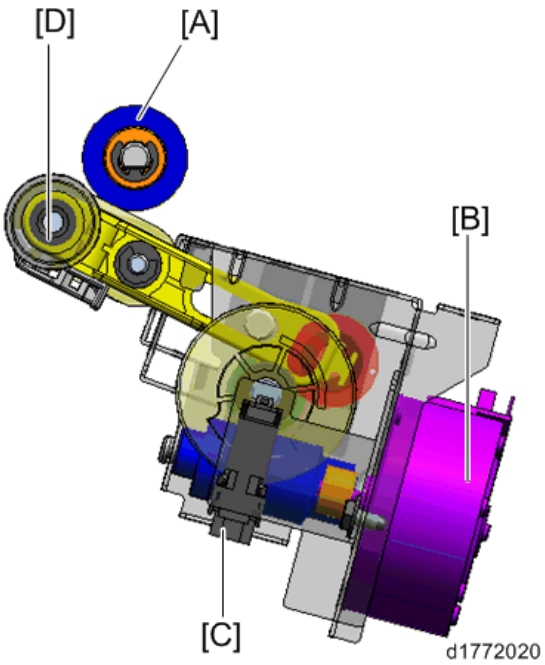


- Weak pressurize position

  This is used for staple operation and transporting the next sheets of paper with the sheets of paper gets stacked at the stacking area.

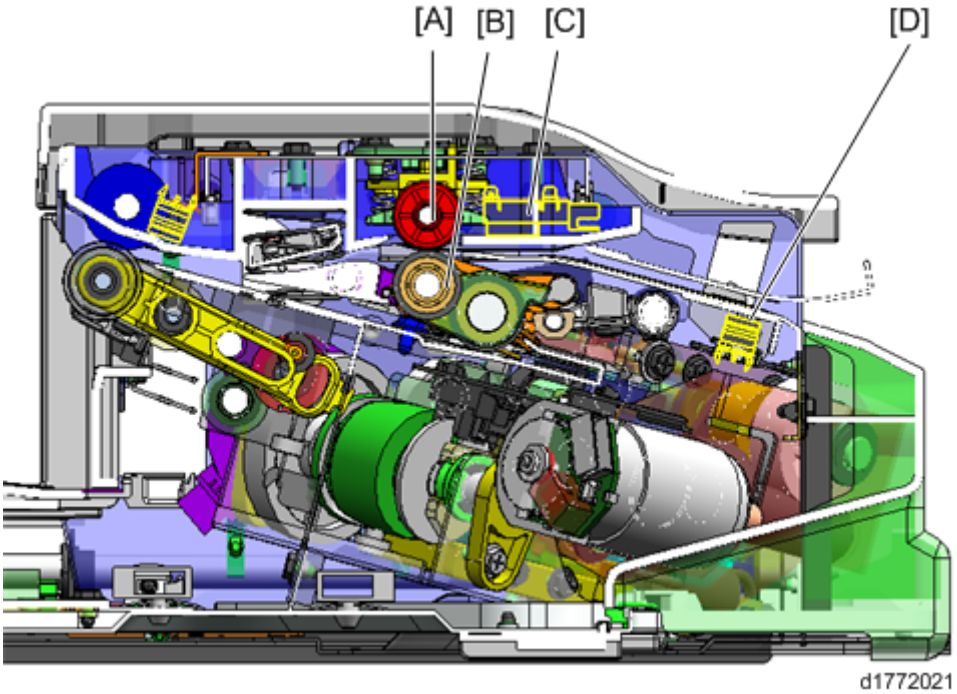
  At the weak pressurize position, not only the pressure power is decreased by the motor [A], but also the position of the paper output belt (driven) is moved to contact the middle of the belt with the paper output roller (drive).

  The weak pressurize position intends to avoid dirt/offset which is generated by rubbing the stacked paper and the next sheets of paper, when transporting the next sheets.



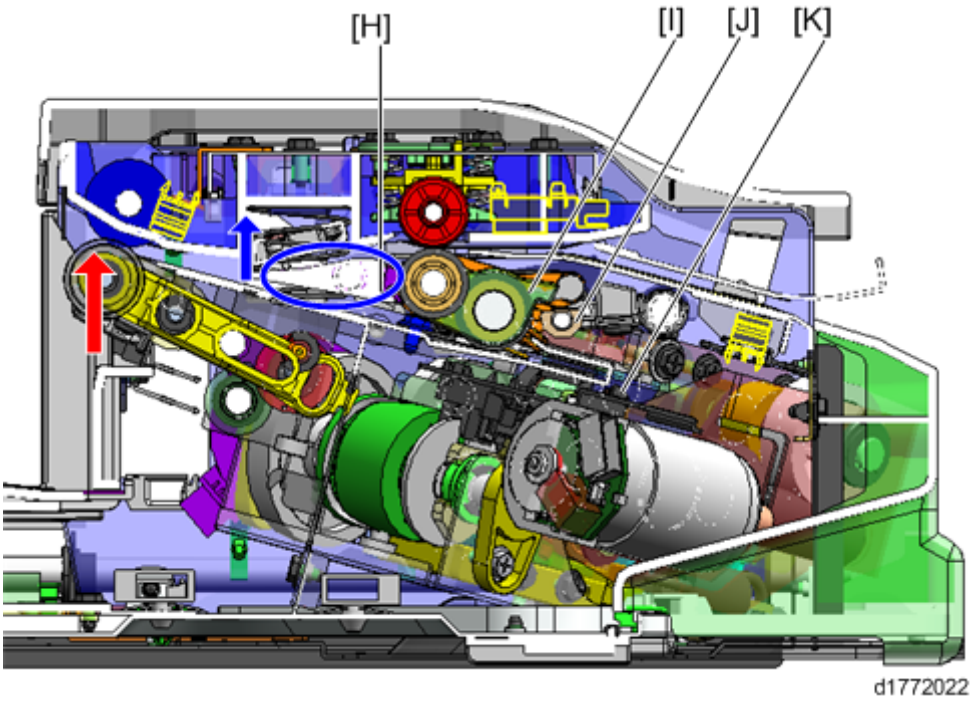
21.2.5 STAPLE EJECT MECHANISM

- Transport/adjustment of the paper position (Home position)



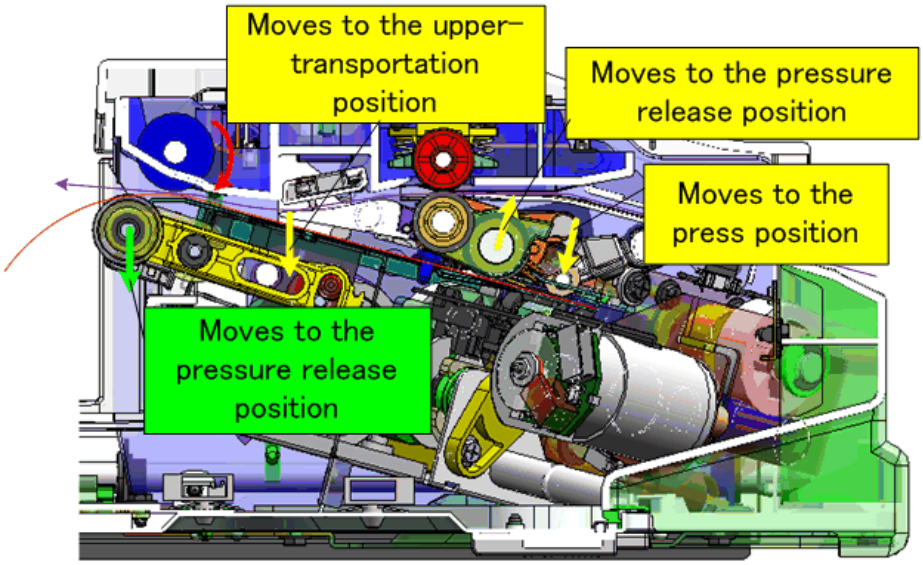
This option has no jogger; Registration adjustment during paper transportation by a sensor can adjust the position of the main-scan (Side-to-Side) direction.
The front edge of paper transported from the main frame is detected by the entrance sensor [D] and the rear edge passes the paper output rollers of the main frame. The shift rollers ([A] and [B]) perform the shift operation as transporting the paper to a position where the side-to-side registration sensor [C] can detect the rear edge of the paper. The paper output roller and paper output belt move to the pressure release position during shift operation.

- Stack (Position pattern B)



After a shift operation is completed, the paper output rollers move to the strong pressurize position and received the paper from shift rollers. After the rear edge of paper is completely passed the junction claw, the paper output roller will be applied counter-rotating, and paper is transported to the stacking area, and then passed through the reverse rollers [H]. At this time, the junction claw [J] moves to the lower-transportation position (the claw's edge is raised: shown as the blue allow and circle) to lead paper to the stacking area.
After paper is transported to the reverse rollers, the paper output rollers move to the pressure release position to perform the shift operation for the next sheets (shown as the red allow).
With the transported paper hits the standard fence [K], the alignment for paper transport direction (main-scan direction) is performed. Once paper stacked, the trailing edge presser [I] moves to the press position (the reverse rollers move to the pressure release position) and retains the stacked paper.

- Second sheet transport/adjustment (Position pattern A)



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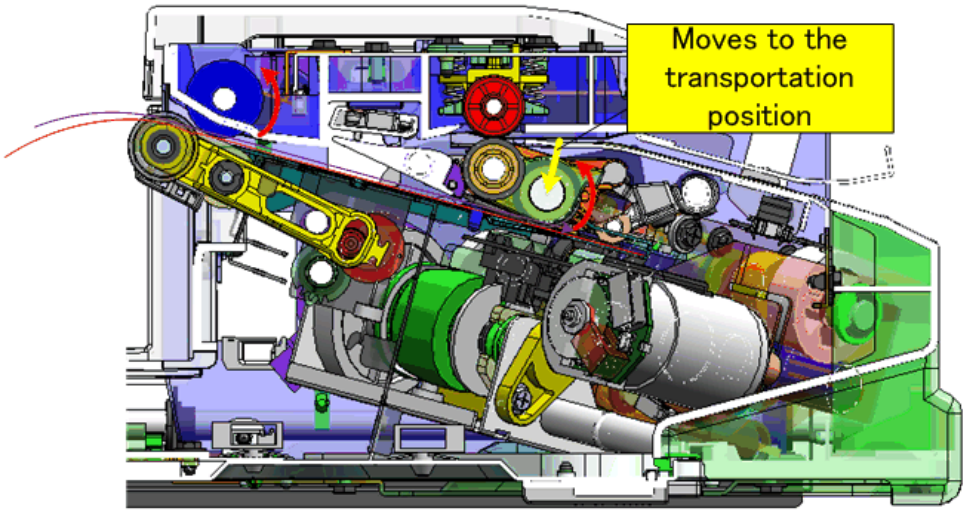
After the first sheet stacked, the second shift operation is performed in the same way as the first sheet. At this moment, the stacked paper keep retained with the trailing edge presser.

- Second sheet stack



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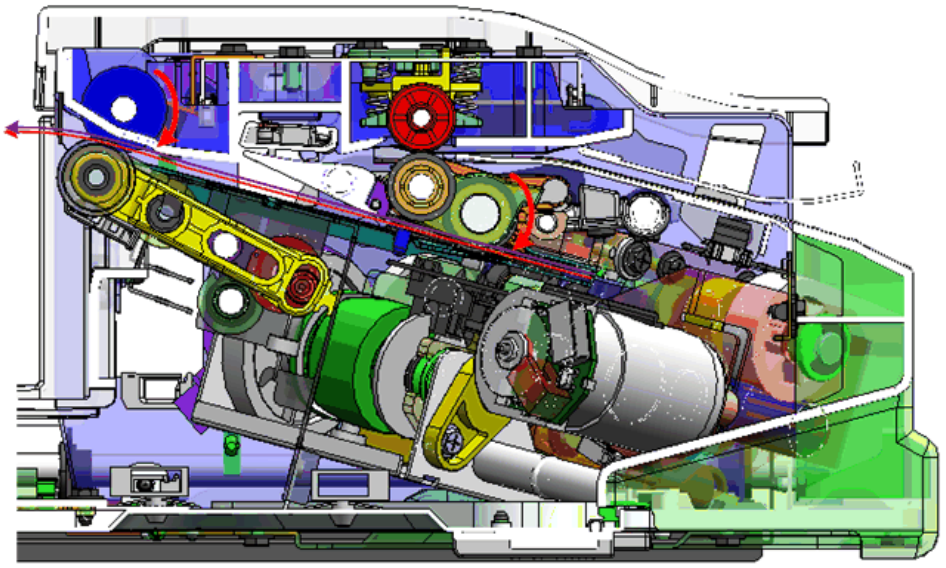
After a first shift operation is completed, the paper output rollers and paper output belt move to the weak pressurizes position and transport the paper to the stacking area. The reverse rollers then receive the paper. This procedure applies to the third and later sheets. The trailing edge presser retains the stacked paper and transports the second and later paper with sliding on the stacked paper.

- Paper Bundle (stapled stack) ejection (Pattern C)



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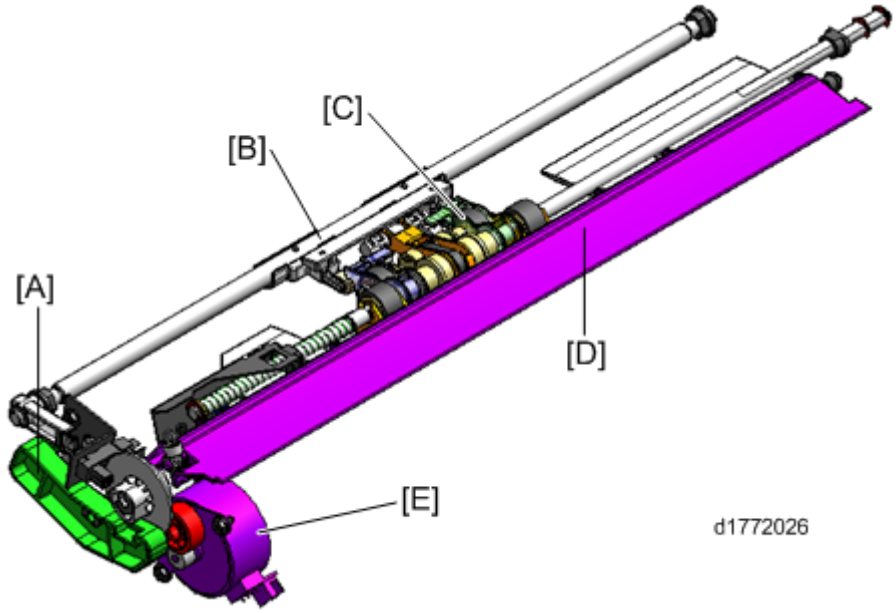
After specified sheets are stacked, the paper bundle is stapled and exported by paper output rollers and paper output belt. If the staple method is set to “double” in User program, the paper bundle is slightly moved and applied a second staple after the first stapling.

21.2.6 JUNCTION CLAW / TRAILING EDGE PRESSER MECHANISM



Junction solenoid motor [E] drives a junction claw [D], a trailing edge presser [B] and reverse rollers [C]. Junction solenoid motor HP sensor [A] detects the home position.

◆ **Operation timing**

- Junction claw

  < Upper-transportation position Lower-transportation position>

  It is when the rear edge of paper reached at the point where 10mm ahead of the front edge of the junction claw. The paper position is managed with motor pulse control based on the entrance sensor.

  < Lower-transportation position Upper-transportation position>

  It is when the rear edge of paper reached at the standard fence and the trailing edge presser moved to the press position.

- Trailing edge presser (Reverse roller)

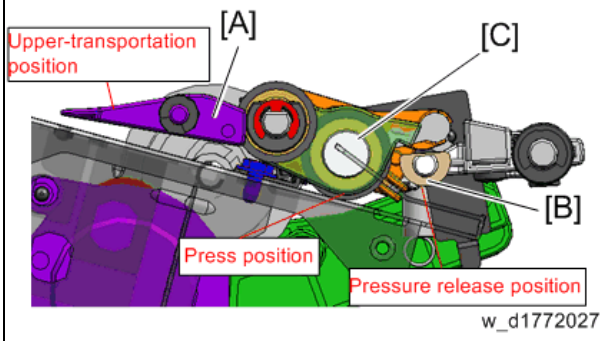
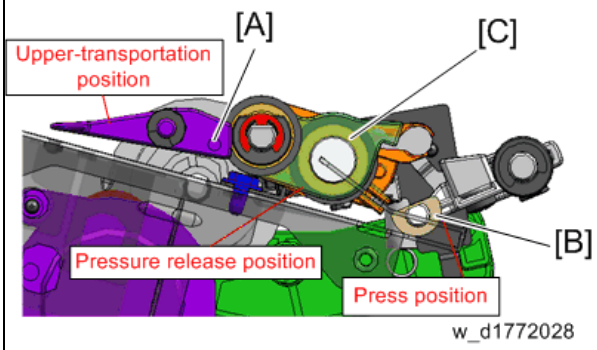
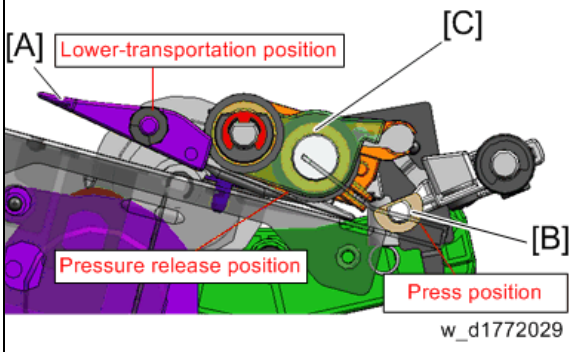
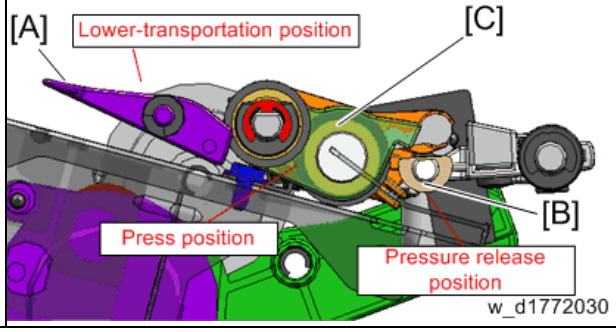
  < Press position Pressure release position>

  It is when the rear edge of paper reached at the position of the Reverse roller.

  < Pressure release position Press position>

  It is when the rear edge of paper reached at the standard fence.

The junction solenoid motor rotates CW and switches the junction claw and the trailing edge presser (Reverse roller). The positions of the junction claw, trailing edge presser and reverse roller vary in the following 4 position patterns.

	Figure	[A] Junction claw	[B] Trailing edge presser	[C] Reverse roller
Home Position *		Upper-transportation position	Pressure release position	Press position
Position pattern A		Upper-transportation position	Press position	Pressure release position
Position pattern B		Lower-transportation position	Press position	Pressure release position
Position pattern C		Lower-transportation position	Pressure release position	Press position

* The home position is at “Junction claw: Upper-transportation position” and “Trailing edge

presser: Pressure release position", and is detected by the junction solenoid motor HP sensor.

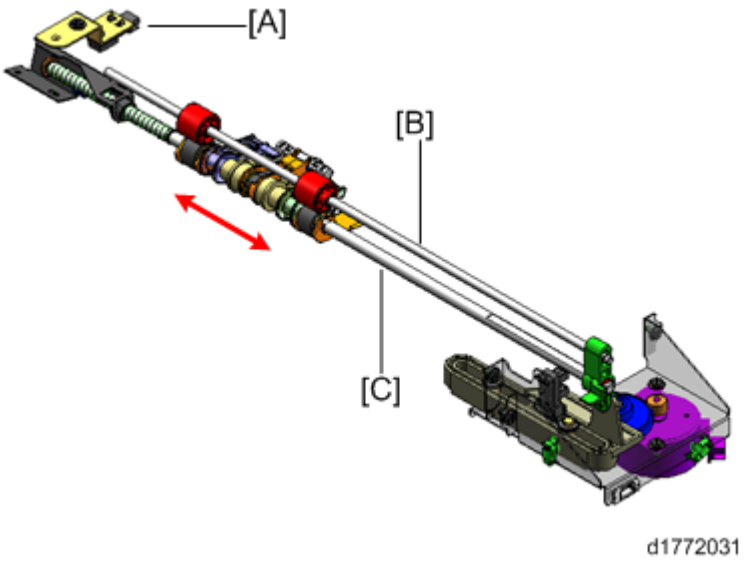
21.2.7 SUB-SCAN DIRECTION (TRANSPORTING DIRECTION) JOGGER MECHANISM

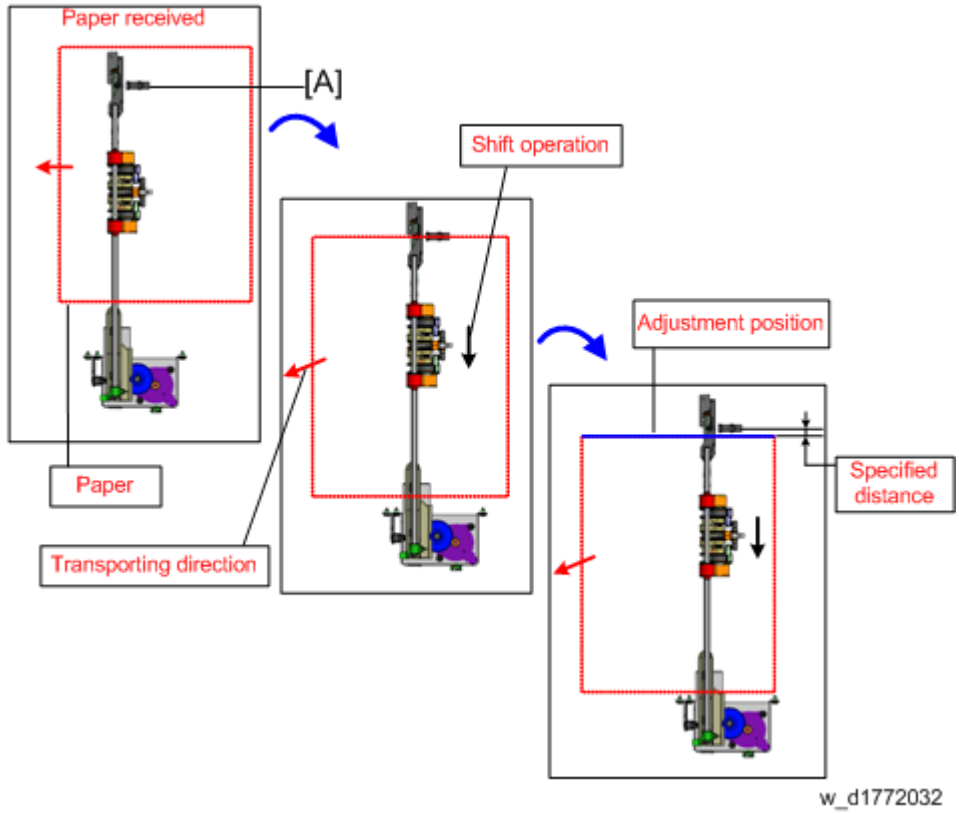
Paper transported to the stacking area by the paper output rollers is delivered to the reverse roller. Paper alignment for the sub-scan direction is performed by the reverse rollers with hitting the rear edge of paper to the standard fence.

21.2.8 PAPER DETECTION ON THE STACK GUIDE PLATE

The paper output sensor detects paper when there is paper on the stack guide plate.

21.2.9 SHEET EDGE FACE ALIGNMENT MECHANISM (MAIN-SCAN DIRECTION)





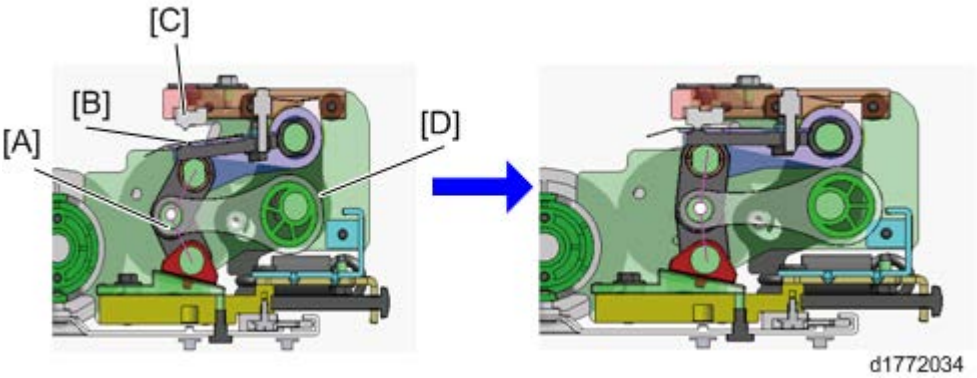
This option has no jogger mechanism; Sheet edge face alignment with shift operation and registration sensor performs the alignment for main-scan (Side-to-Side) direction.
Shift operation is performed when the trailing edge of paper reached at 10mm from the paper output roller of the main frame after paper transported to the shift roller ([B] and [C]). The paper position is managed with motor pulse control based on the entrance sensor. The paper shifts to a position that the sub-scan (leading edge) registration sensor [A] can detect. The shift operation stops where the paper moves to a specified distance after the detection. These operations apply to each paper, and, thus, can align all the edge of each paper (blue line shown as above).

21.2.10 STAPLER MECHANISM

The staple operation in this option applies a crimping method. V-shaped teeth fit to the sheets, press to make a teeth-mark, and crimp on the mark applying a pressure of 220 kg.
This option performs two stapling operations per a single stapling as follows.

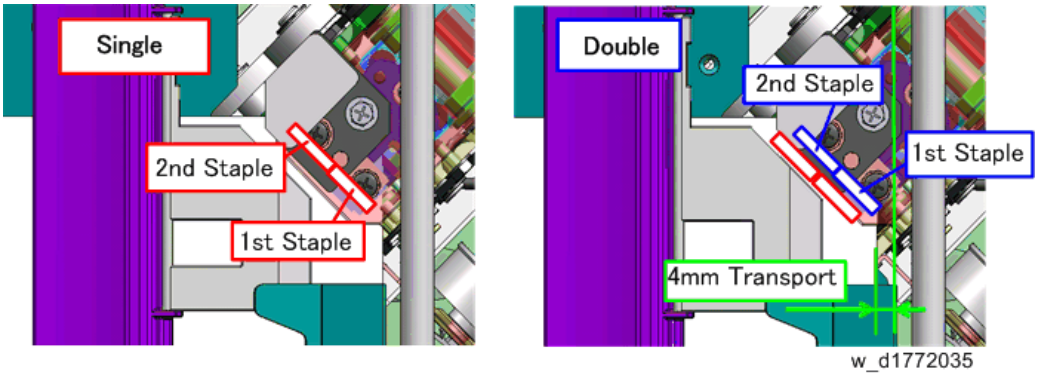
[Moving to the first staple position Stapling Moving to the second staple position

Stapling Moving back to the home position]



Stapling is performed with pressurizing to the upper tooth [C] and the lower tooth [B] that are engaged by the pressure cam [D] stretching the pressure link [A]. Moving and stapling operation for the stapler are driven by the stapler drive motor. The home position can be detected by Stapler home position sensor.

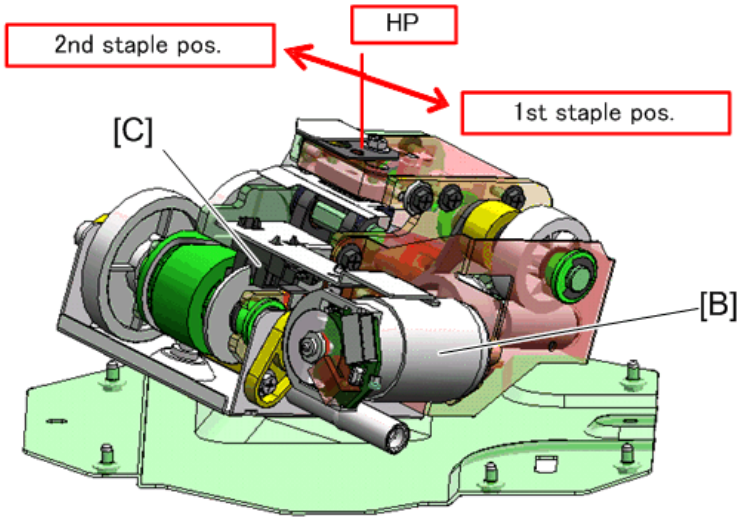
- Double/Single



It is difficult to adjust the bond strength because it depends on the degree of entwining fibers of the paper bundle. Setting to Single or Double stapling allows you to adjust the bond strength.
Single applies one staple operation.
Double applies once more with the same operation as the first staple at the 4mm transported position from the first. The transport motor transports the paper for transportation after the first stapling.

- Bundle eject
  After stapling, the trailing edge presser is released. Bundle of paper is ejected by paper output roller.

21.2.11 STAPLER MOVEMENT MECHANISM



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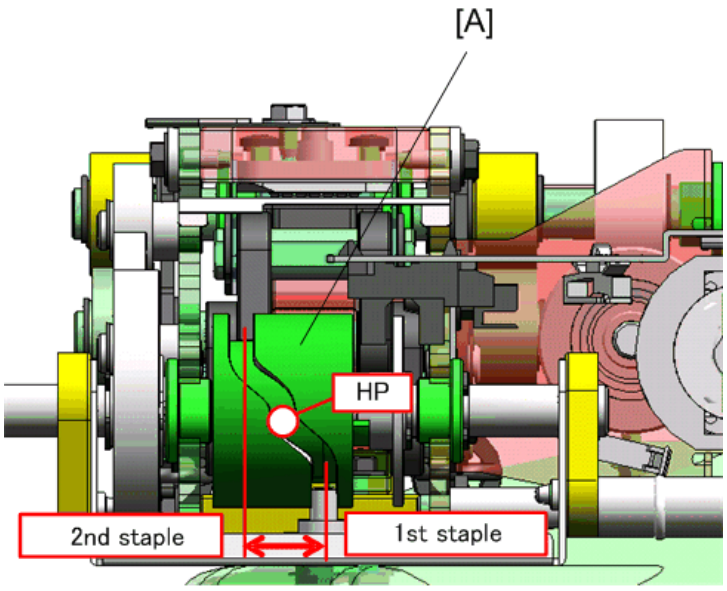

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This stapler, which needs to staple twice for a single staple position, has a moving mechanism to operate a stapling.

The moving cam, which is located in the stapler unit and has a groove on the body, and a securing pin perform the moving operation when stapling. The moving and stapling is operated by the staple motor [B] and the home position is detected by the Stapler home position sensor [C].