IMPORTANT SAFETY NOTICES

PREVENTION OF PHYSICAL INJURY

1. Before disassembling or assembling parts of the copier and peripherals, make sure that the copier power cord is unplugged.
2. The wall outlet should be near the copier and easily accessible.
3. Note that some components of the copier and the paper tray unit are supplied with electrical voltage even if the main switch is turned off.
4. If any adjustment or operation check has to be made with exterior covers off or open while the main switch is turned on, keep hands away from electrified or mechanically driven components.
5. If the start key is pressed before the copier completes the warm-up period (Start key starts blinking red and green alternatively), keep hands away from the mechanical and the electrical components as the copier starts making copies as soon as the warm-up period is completed.
6. The inside and the metal parts of the fusing unit become extremely hot while the copier is operating. Be careful to avoid touching those components with your bare hands.

HEALTH SAFETY CONDITIONS

1. Never operate the copier without the ozone filters installed.
2. Always replace the ozone filters with the specified ones at the specified intervals.
3. Toner and developer are non-toxic, but if you get either of them in your eyes by accident, it may cause temporary eye discomfort. Try to remove with eye drops or flush with water as first aid. If unsuccessful, get medical attention.

OBSERVANCE OF ELECTRICAL SAFETY STANDARDS

1. The copier and its peripherals must be installed and maintained by a customer service representative who has completed the training course on those models.

⚠ CAUTION

2. The RAM board on the system control board has a lithium battery which can explode if replaced incorrectly. Replace the battery only with an identical one. The manufacturer recommends replacing the entire RAM board. Do not recharge or burn this battery. Used batteries must be handled in accordance with local regulations.

SAFETY AND ECOLOGICAL NOTES FOR DISPOSAL

1. Do not incinerate the toner bottle or the used toner. Toner dust may ignite suddenly when exposed to open flame.
2. Dispose of used toner, developer, and organic photoconductor according to local regulations. (These are non-toxic supplies.)
3. Dispose of replaced parts in accordance with local regulations.
4. When keeping used lithium batteries in order to dispose of them later, do not put more than 100 batteries per sealed box. Storing larger numbers or not sealing them apart may lead to chemical reactions and heat build-up.

LASER SAFETY

The Center for Devices and Radiological Health (CDRH) prohibits the repair of laser-based optical units in the field. The optical housing unit can only be repaired in a factory or at a location with the requisite equipment. The laser subsystem is replaceable in the field by a qualified Customer Engineer. The laser chassis is not repairable in the field. Customer engineers are therefore directed to return all chassis and laser subsystems to the factory or service depot when replacement of the optical subsystem is required.

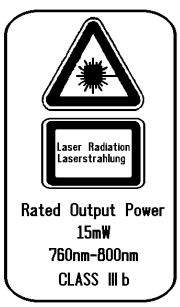
⚠ DANGER

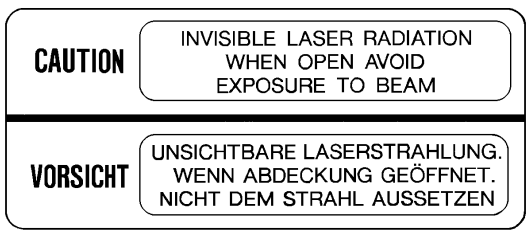
Use of controls, or adjustment, or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

⚠ WARNING FOR LASER UNIT

DANGER: Turn off the main switch before attempting any of the procedures in the Laser Unit section. Laser beams can seriously damage your eyes.

CAUTION MARKING:





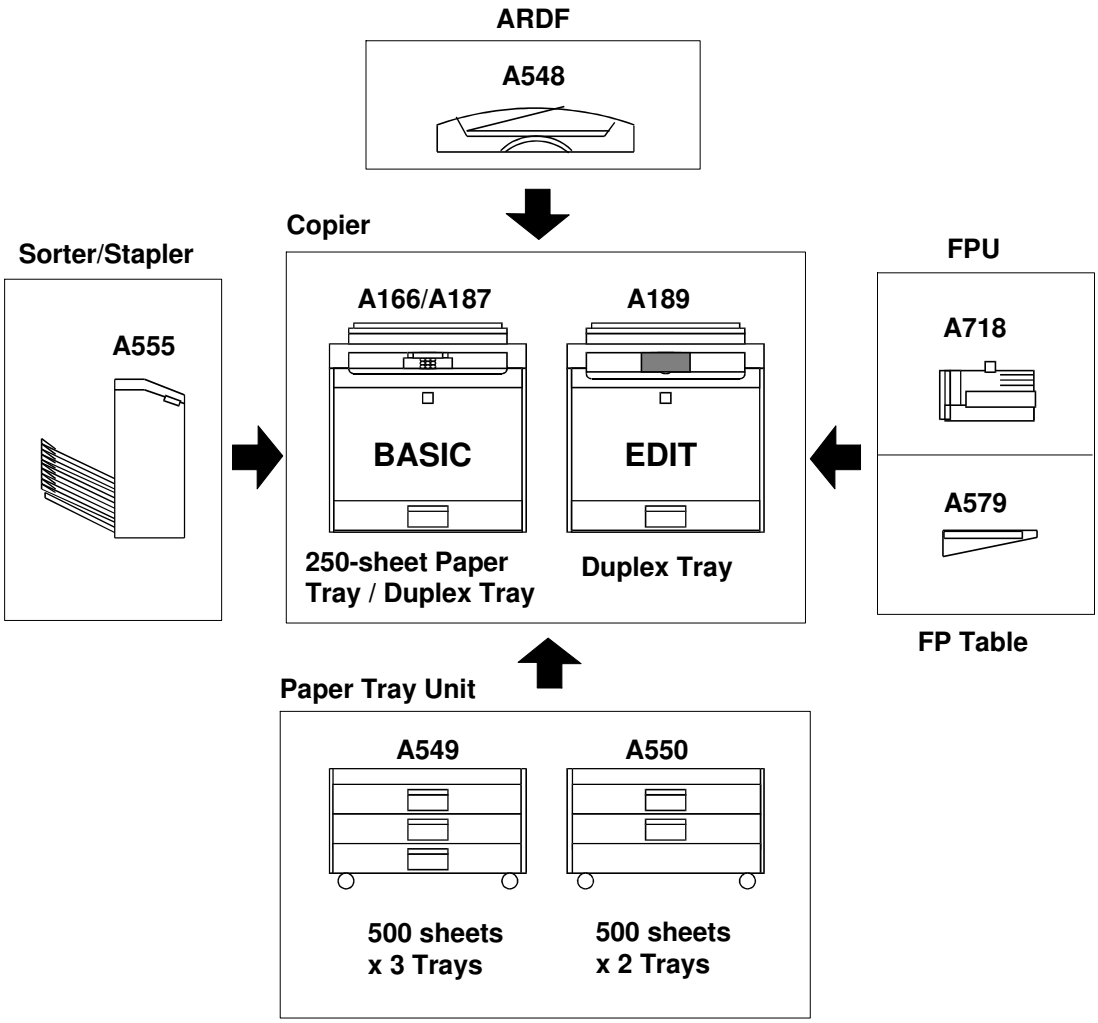
SECTION 1

OVERALL
MACHINE INFORMATION

1. SPECIFICATIONS

1.1 MACHINE CONFIGURATION

	Basic Machine		Edit Machine
	A166	A187	A189
Operation Panel	20-digit 2-line LCD		144 mm x 192 mm Touch Panel Display
Paper Tray Unit	250 Sheets	Duplex	



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1.2 GENERAL SPECIFICATIONS

Configuration: Desk Top

Copy Process: Dry Electrostatic Transfer System

Resolutions: 400 dpi

Gradations: 256 gradations

Originals: Sheet/Book/Object

Original Size: Maximum 11" x 17" /A3

Copy Paper Size:

	Maximum	Minimum
Paper Tray Feed	11" x 17" /A3	5 1/2 x 8 1/2 /A5(S)
Bypass Feed	11" x 17" /A3	5 1/2 x 8 1/2 /A5(L/S), A6(L)

Copy Paper Weight:

Paper Tray Feed	17 to 24 lbs	64 to 90 g/m^2
Bypass Feed	14 to 43 lbs	52 to 157 g/m^2
Auto Duplex Tray	17 to 28 lbs	64 to 104 g/m^2

Reproduction Ratios:

	8 1/2" x 11"/11" x 17" version	A4/A3 version
Enlargement	121, 129, 155, 200, 400%	115, 122, 141, 200, 400%
Full size	100%	100%
Reduction	25, 50, 65, 74, 77, 85, 93%	25, 50, 65, 71, 75, 82, 93%
Programmable	2 user ratios	2 user ratios

Zoom: From 25% to 400 % in 1% steps.

Copying Speed:

	8 1/2" x 11" (S) /A4	11" x 17"/A3
Normal Mode		
Full Color (4 scans)	3 cpm	1.5 cpm
Single Color (C, M Y, K)	21 cpm	11 cpm
Single Color (R, B)	4 cpm	3 cpm
Single Color (G)	3 cpm	2.5 cpm
OHP/Thick Paper Mode		
Full Color (4 scans)	1.5 cpm	1 cpm
Single Color (C, M Y, K)	2.5 cpm	1.5 cpm
Single Color (R, G, B)	2 cpm	1 cpm

First Copy Time:

	8 1/2" x 11" (S) /A4	11" x 17" /A3
Normal Mode		
Full Color (4 scans)	32 seconds	52 seconds
Single Color (K)	15 seconds	20 seconds
Single Color (C, M, Y)	20 seconds	20 seconds
Single Color (R, B)	25 seconds	35 seconds
Single Color (G)	30 seconds	40 seconds
OHP/Thick Paper Mode		
Full Color (4 scans)	50 seconds	70 seconds
Single Color (K)	35 seconds	45 seconds
Single Color (C, M, Y)	35 seconds	45 seconds
Single Color (R, B)	40 seconds	55 seconds
Single color (G)	45 seconds	60 seconds

Warm-up Time: Approx. 6 minutes (at 68°F / 20°C)

Duplexing:

Basic Manual Duplex Model (A166):	Manual Duplexing in full color and Single Color mode
Basic Auto Duplex Model (A187):	Manual & Auto Duplexing in Full Color and Single Color mode
Edit Auto Duplex Model (A189):	Manual & Auto Duplexing in Full Color and Single Color mode
	Duplex can be done on 64-104 g/m^2 paper.
	Manual Duplexing can be done through the Bypass table only, and the user should press the Duplex Side 2 key before coying the reverse side.

Non-Reproduction Area:

Leading Edge:	0.2" ± 0.08" (5 mm ± 2 mm)
Side:	0.08" ± 0.08" (2 mm ± 2 mm)/ Total less than 0.16" (4 mm)
Trailing Edge	Front side 2.5 mm ± 2.0 mm Back side 6.0 ± 2.0 mm (back side trailing edge is adjustable by SP mode from 0.5 to 10 mm)
Copy Number Input:	Number keys, 1 to 99
Copy Number Input (Auto Duplex):	Number keys Single Color - 1 to 50: smaller than A3, 11" x 17" 1 to 30: A3, 11" x17" Full Color 1 to 20: all sizes
Image Density:	Auto/Manual (7 steps)
Automatic Reset:	Yes (10 to 900 seconds or Off)
Paper Capacity:	Tray: 250 sheets x 1 tray (Basic Manual Duplex Model: A166) Bypass: 40 sheets Normal paper (80 g/m^2) 20 sheets OHP 1 sheet Adhesive paper

Toner Replenishment: Black:
Toner Addition (300 g/cartidge)
Color (Y, M, C):
Toner Addition (100 g/cartridge)

Copy Tray Capacity: 100 sheets (11" x 17"/A3 and smaller)

Power Source: 120V/60Hz, 220-240V/50,60 Hz

Maximum Power Consumption: 1.5 kVA

Dimensions (with Platen Cover):

	Width	Depth	Height
Basic Manual Duplex (A166)	620 mm 24.4"	700 mm 27.5"	632 mm 24.9"
Basic Auto Duplex (A187)	620 mm 24.4"	700 mm 27.5"	632 mm 24.9"
Edit Auto Duplex (A189)	620 mm 24.4"	750 mm 29.5"	632 mm 24.9"

Weight: Manual Duplex: 105 kg (231.3 lb)
Auto Duplex: 109 kg (240.1 lb)

Optional Equipment: Automatic Document Feeder (ARDF): A548
Sorter Stapler: A555
Film Projector: A718
Holder for Film Projector Unit: A579
Paper Tray Unit (3 Trays & 2 Trays): A549/A550
Key Counter

1.3 DETECTABLE ORIGINAL SIZE BY PLATEN/ARDF

Size (width x length) [mm]	Platen		ARDF	
	Inch version	Metric version	Inch version	Metric version
A3 (297 x 420)L	No	Yes	No	Yes
B4 (257 x 364)L	No	Yes	No	Yes
A4 (210 x 297)L	No	Yes	Yes	Yes
A4 (297 x 210)S	No	Yes	Yes	Yes
B5 (182 x 257)L	No	Yes	No	Yes
B5 (257 x 182)S	No	Yes	No	Yes
A5 (148 x 210)L	No	No*	No	Yes
A5 (210 x 148)S	No	Yes	No	Yes
B6 (128 x 182)L	No	No	No	Yes
B6 (182 x 128)S	No	No	No	Yes
11" x 17" (DLT)	Yes	No	Yes	Yes
11" x 15"	No	No	Yes	No
10" x 14"	Yes	No	Yes	No
8.5" x 14" (LG)	Yes	No	Yes	No
8.5" x 13" (F4)	No	Yes	No	Yes
8.25" x 13"	No	No	No	No
8" x 13"(F)	No	No	Yes	No
8.5" x 11" (LT)	Yes	No	Yes	Yes
11" x 8.5" (LT)	Yes	No	Yes	Yes
8" x 10.5"	No	No	No	No
8" x 10"	No	No	Yes	No
5.5" x 8.5" (HLT)	No*	No	Yes	No
8.5" x 5.5" (HLT)	Yes	No	Yes	No
A6 (105 x 148)L	No	No	No	No

* : For A5 lengthwise/HLT, SP4-303 can be used to select "Cannot detect original size" or "A5 lengthwise/5.5" x 8.5"(HLT)".

1.4 COPY PAPER SIZE

Size (width x length) [mm]	Trays in the main body				Bypass	Optional S.Stapler
	Paper Tray		Duplex Tray			
	Inch version	Metric version	Inch version	Metric version	All versions	
A3 (297 x 420)L	No	Yes	Yes	Yes	Yes	Yes
B4 (257 x 364)L	No	Yes	Yes	Yes	Yes	Yes
A4 (210 x 297)L	Yes	Yes	Yes	Yes	Yes	Yes
A4 (297 x 210)S	Yes	Yes	Yes	Yes	Yes	Yes
B5 (182 x 257)L	No	Yes	No	Yes	Yes	Yes
B5 (257 x 182)S	No	Yes	No	Yes	Yes	Yes
A5 (148 x 210)L	No	No	No	No	Yes	Yes (1)
A5 (210 x 148)S	No	Yes	Yes	Yes	Yes	Yes (2)
B6 (128 x 182)L	No	No	No	No	Yes	Yes (1)
B6 (182 x 128)S	No	No	No	No	No	No
11" x 17" (DLT)	Yes	Yes	Yes	Yes	Yes	Yes
11" x 15"	Yes	No	Yes	No	Yes	Yes
10" x 14"	Yes	No	Yes	No	Yes	Yes
8.5" x 14" (LG)	Yes	No	Yes	No	Yes	Yes
8.5" x 13" (F4)	Yes	Yes	Yes	Yes	Yes	Yes
8.25" x 13"	No	No	Yes	Yes	Yes	Yes
8" x 13"(F)	No	No	Yes	Yes	Yes	Yes
8.5" x 11" (LT)	Yes	Yes	Yes	Yes	Yes	Yes
11" x 8.5" (LT)	Yes	Yes	Yes	Yes	Yes	Yes
8" x 10.5"	No	No	Yes	No	Yes	Yes
8" x 10"	Yes	No	Yes	Yes	Yes	Yes
5.5" x 8.5" (HLT)	No	No	No	No	Yes	Yes (1)
8.5" x 5.5" (HLT)	Yes	No	Yes	Yes	Yes	Yes (2)
A6 (105 x 148)L	No	No	No	No	Yes	Yes (2)

Yes (1): Stapling is not allowed.
Yes (2): Using the Proof Tray only. Sorter bins cannot be used.

1.5 PAPER SIZES AVAILABLE WITH APS

– For metric machines –

	200 ~ 174	173 ~ 164	163 ~ 142	141 ~ 123	122 ~ 116	115 ~ 101	100 ~ 94	93 ~ 88	87 ~ 83	82 ~ 76	75 ~ 72	71 ~ 66	65 ~ 62	61 ~ 58	57 ~ 51	50 ~
A3	–	–	–	–	–	–	A3	–	B4	–	–	A4L	8.5 x 13	B5L	–	A5L
B4	–	–	–	–	–	A3	B4	–	–	A4L	8.5 x 13	B5L	–	–	A5L	–
A4L	–	–	–	A3	B4	–	A4L	8.5 x 13	B5L	–	–	A5L	–	–	–	–
B5L	–	–	A3	B4	–	A4L	B5L	–	–	A5L	–	–	–	–	–	–
A5L	A3	B4	–	A4L	B5L	–	A5L	–	–	–	–	–	–	–	–	–
A4S	–	–	–	–	–	–	A4S	–	B5S	–	–	A5S	–	–	–	–
B5S	–	–	–	–	–	A4S	B5S	–	–	A5S	–	–	–	–	–	–
A5S	–	–	–	A4S	B5S	–	A5S	–	–	–	–	–	–	–	–	–
8.5 x 11	–	–	–	–	–	–	8.5 x11	–	–	–	–	–	–	–	–	–
11 x 8.5	–	–	–	–	–	–	11x 8.5	–	–	–	–	–	–	–	–	–
8.5 x 13	–	–	–	–	A3	–	8.5 x 13	–	–	A4L	B5L	–	–	–	–	A5L
11 x 15	–	–	–	–	–	–	11x 15	–	–	–	–	–	–	–	–	–

: Not allowed in platen cover mode. L: Lengthwise S: Sideways

– For inch machines –

	200 ~ 177	176 ~ 156	155 ~ 130	129 ~ 122	121 ~ 101	100 ~ 94	93 ~ 86	85 ~ 78	77 ~ 75	74 ~ 66	65 ~ 51	50 ~
11x17	–	–	–	–	–	11x17	11x17	11x15	8.5 x14	–	8.5 x11	5.5 x8.5
11x15	–	–	–	–	–	11x15	11x15	–	8.5 x14	8.5x11	–	5.5 x8.5
8.5x14	–	–	–	–	11 x17	8.5 x14	–	–	8.5 x11	–	–	5.5 x8.5
8.5x11	–	–		11x17	–	8.5 x11	–	–	–	–	5.5 x8.5	–
5.5x8.5	11 x17	11 x15	8.5 x14	8.5 x11	–	5.5 x8.5	–	–	–	–	–	–
8.5x5.5	–	–	–	11 x8.5	–	8.5 x5.5	–	–	–	–	–	–
11x8.5	–	–	–	–	–	11 x8.5	–	–	–	–	8.5 x5.5	–
8x10	–	–	–	11x17	10x14	8x10	–	–	–	–	5.5 x8.5	–
10x14	–	–	–	–	–	10x14	–	8.5 x14	8.5 x11	–	–	5.5 x14
8x13	–	–	–	11x17	–	8x13	–	–	–	–	5.5 x8.5	–

: Not allowed in platen cover mode.

NOTE: 1) The tables show which copy paper size is selected for each original size for zoom ratios from 50 to 200 %.

2) When a zoom ratio is specified, APS automatically selects a paper size that can guarantee the quality of the magnified copy image if there is a paper size available for the equivalent standard reproduction ratio.

3) If paper of the detected size has run out, the machine displays the message "Set xx ▭ paper in tray" and stops the job (copying is enabled).

4) For "–" in the above tables, the machine displays the message "Cannot detect original size" and stops the job (copying is enabled). The selected paper feed tray does not change.

5) When 49% or less or 201% or more is selected, APS works in the same way as described in Note 4 above.

6) APS also supports the by-pass feed table (except for non-standard paper sizes). When a selected paper size can only be fed from the by-pass feed table, the machine displays a warning to instruct the user to use the by-pass feed table.

7) APS does not support A6 and B6 sizes.

1.6 NOISE EMISSION

Sound pressure level (The measurements are made in accordance with ISO 7779 at the operator positions.)

Copier only	Full system*
Less than 61 dB (A)	Less than 65 dB (A)

* Full system: Copier with document feeder, 500 sheets x 3 trays unit, FPU, and a sorter stapler.

Sound power level (The measurements are made in accordance with ISO 7779.)

	Copier only	Full system*
Stand-by	Less than 54 dB (A)	Less than 58 dB (A)
Copying (This value is for the black copy mode.)	Less than 67 dB (A)	Less than 71 dB (A)

* Full system: Copier with document feeder, 500 sheets x 3 trays unit, FPU, and a sorter stapler.

1.7 POWER CONSUMPTION

(1) Maximum power consumption
1.5 kVA

(2) Average power consumption

	A189 Copier	A189 Copier + DJF + Sorter
Standby	0.25 kW	0.5 kW
Warm-up	1.25 kW	1.25 kW
Copying	1.15 kW	1.15 kW
Energy Saver Mode	Value for standby minus 7 W	Value for standby minus 7 W

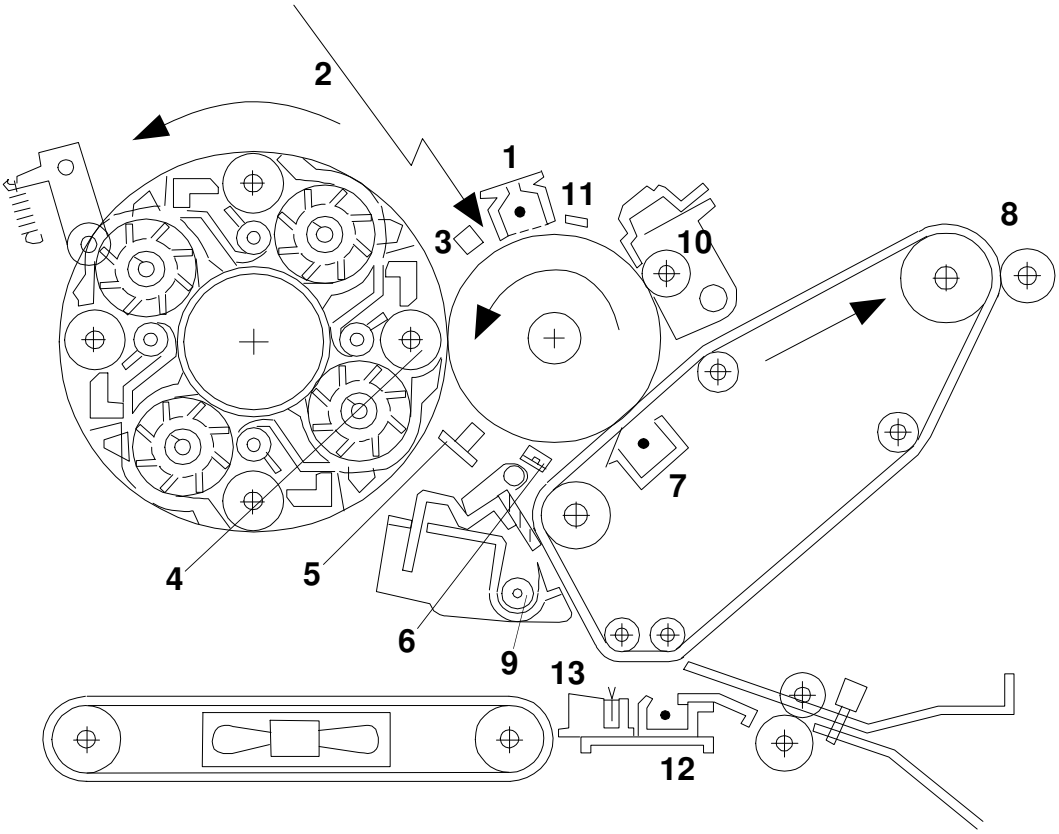
NOTE: 1) Copying was done in the 1C (A3) repeat mode.
2) The power consumption in energy saver mode was measured with the fusing lamp off.

1.8 DISPLAY EDITOR SPECIFICATION

Scanned image	• The copier's scanner scans the image. • Maximum A3/DLT (11" x 17"): Reduced image display
Displayed image	• 144 x 192 mm, 16-gradation (4 bit/dot) monochrome • 640 x 480 dots, 0.33 mm/dot • Reduces the dpi of scanned images to approximately 33 dpi and displays the entire image. • Zoom display: 3 levels (50 dpi, 67 dpi, 100 dpi) • Display processing time: 2 seconds or less
Area specification procedure	• Move the arrow in the screen by using the cursor key and enter a point by pressing the coordinate entry key.

2. MACHINE CONFIGURATION

2.1 COPY PROCESSES AROUND THE DRUM AND BELT



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1. Drum Charge

In the dark, the charge corona unit gives a negative charge to the organic photoconductive (OPC) drum. The grid plate ensures that corona charge is applied uniformly. The charge remains on the surface of the drum because the OPC layer has a high electrical resistance in the dark. The amount of negative charge on the drum is proportional to the negative voltage applied to the drum charge corona wire and casing.

2. Laser Exposure

A laser beam is reflected onto the drum by the polygon and drum mirrors. This forms an electrical latent image on the drum surface. The amount of charge remaining as a latent image on the drum depends on the laser beam intensity.

3. Drum Potential Detection

The drum potential sensor detects the strength of the electric field on the charged drum. The sensor output is one of the signals used in process control.

4. **Development**
   The negatively charged toner is attracted to the latent image on the drum surface. Toner particles are electrostatically attracted to the area of the drum surface where the laser reduced the negative charge on the drum. The development unit is a revolver-type, containing separate development sections for each color toner.

5. **Image Density Detection**
   When the laser forms a sensor pattern on the drum surface, the ID sensor measures the image density of these patterns. The output signal is used in process control to regulate toner supply.

6. **Pre-transfer Lamp**
   After development, the pre-transfer lamp reduces the potential of the image background, right before the first belt transfer (in 2C/3C/4C mode). This ensures that electrostatic attraction between belt and drum is about the same for each color toner transfer, which ensures that the color toner images are synchronized properly.

7. **Belt Transfer**
   Toner on the drum is attracted to the transfer belt by the belt corona unit.

8. **Belt Lubrication**
   The transfer belt lubricant brush applies a small amount of lubricant to the surface of the transfer belt. This aids the belt cleaning blade in removing waste toner from the transfer belt.

9. **Belt Cleaning**
   The cleaning blade removes any toner on the belt after paper transfer.

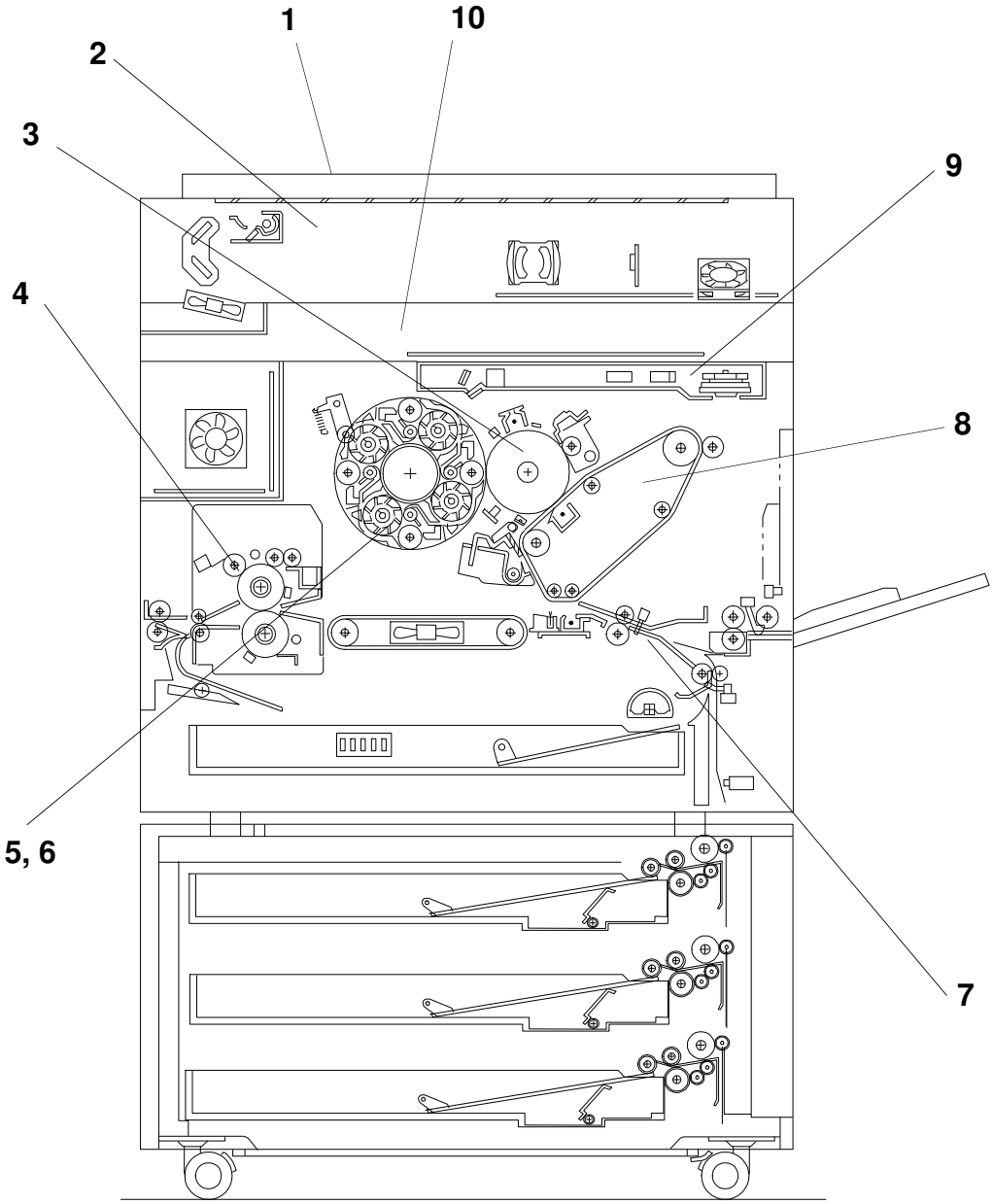
10. **Drum Cleaning**
    The drum cleaning brush roller removes remaining toner from the drum. The cleaning brush also applies lubricant. This aids in drum cleaning.

11. **Quenching**
    The light from the quenching lamp electrically neutralizes the charge on the drum surface. This prepares the drum for the next copy cycle.

12. **Paper Transfer**
    When all toner has been transferred from the drum to the transfer belt, the charged toner on the transfer belt is attracted to the paper by the paper transfer unit. This charge is applied to the underside of the paper.

13. **Paper Separation**
    The copy paper separates from the transfer belt due to the belt's curvature. This curvature allows the paper to naturally fall away from the transfer belt. The discharge brush aids in the separation process by discharging any remaining electric charge from the paper.

3. MAJOR UNIT OVERVIEW



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1. Copier

1. Dimensions (W x D x H):
   Basic machine - 620 x 700 x 632 mm (with paper tray unit: 620 x 700 x 1010)
   Edit machine - 620 x 750 x 632 mm (with paper tray unit: 620 x 750 x 1010)
2. The printer unit, system control unit, and scanner unit are independent modules connected with an interface.

2. Scanner Unit

1. 400 dpi (8 bits/dot) scanning in both main and sub scan directions
2. 3-line CCD with reduction optics
3. Exposure lamp: Halogen lamp
4. 5-phase stepper motor drive

3. Drum Unit

1. The drum unit contains the photoconductor drum, charge corona unit, and cleaning unit
2. Charge corona unit: Single scorotron charge
3. Quenching Lamp: Red LEDs
4. Drive: Synchronized with the transfer belt (dc brushless motor + flywheel); full speed = 105 mm/s
5. Potential sensor and ID sensor included

4. Fusing and Paper Exit Section

1. Fusing: Silicone roller fusing (both hot and pressure rollers)
2. Oil application method: Double roller
3. Cleaning: Roller cleaning for the hot roller
   Cleaning blade for the pressure roller
4. OHP/Thick paper mode: Half speed (52.5 mm/s)

5. Development and Toner Supply

1. Development: Two-component magnetic brush development
2. Development switching: Revolver System
3. Image density control: ID sensor + Potential sensor (Process control)
4. Toner supply
   Black: Screw-in bottle (300 g)
   Color: Sector cartridge (100 g)
5. Toner supply unit: Front of development unit (rotation type)

6. Toner and Developer

1. Color toner: Type E
2. Black toner: Type E
3. Developer: Type F

7. Paper Feed and Transport

1. Paper Tray Unit (A166 copier only)
   - Corner Separation System
   - Front loading tray (250 sheets) + By-pass table
2. Transport: Transport belt with fan
3. Duplex unit (A187, A189 copier only)
   - Duplex unit + By-pass table
4. Paper Tray Unit (option): • 500 sheets x 3 trays (FRR Feed System)
   • 500 sheets x 2 trays (FRR Feed System)

8. Transfer and Belt Drive

1. Transfer belt: Full time contact with the drum
2. Belt transfer: Single corona charge
3. Paper transfer: Single corona charge
4. Registration: Synchronization by the transfer belt H.P. sensor
5. Drive: Synchronized with the drum (same motor)
6. Separation: Curvature separation + discharge brush
7. Transfer cycle: 1 belt rotation/A4
8. Belt cleaning: Counter blade
9. Lubrication: Brush roller with lubricant bar

9. Printer Unit

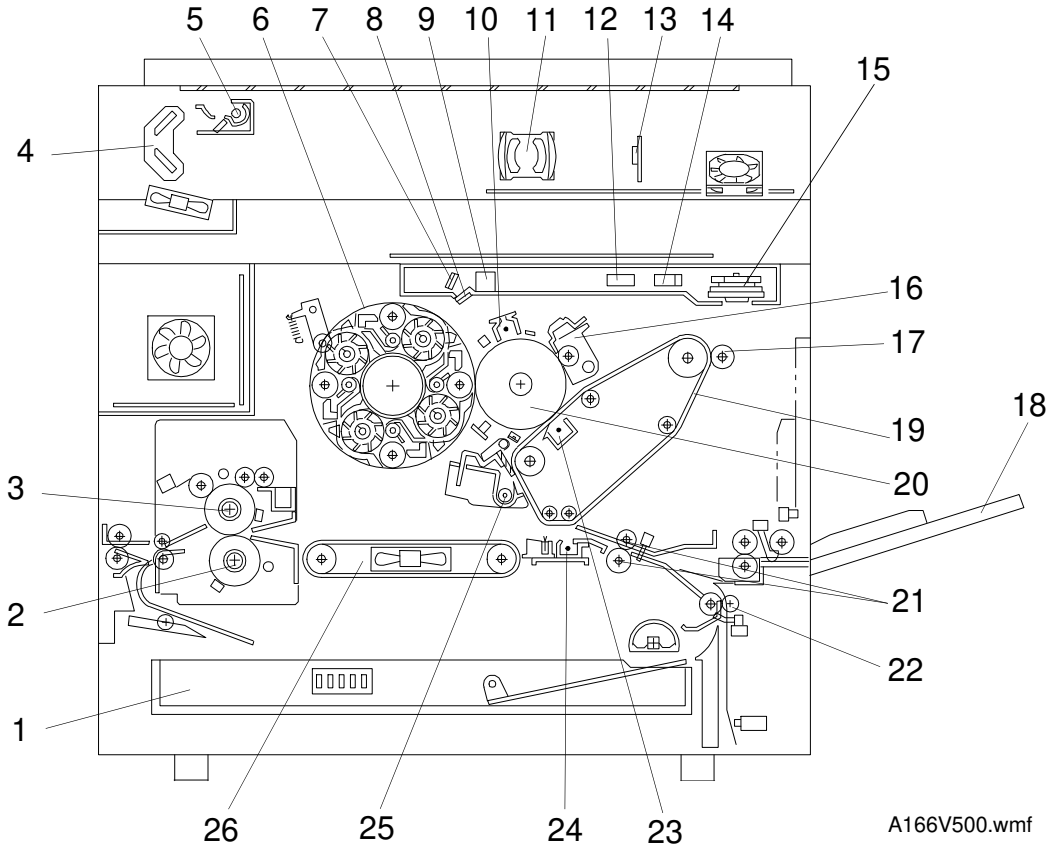
1. Optics: 6-sided polygon mirror + 2 fθ lenses + BTL
2. Polygon motor (16535 rpm), with ball bearing
3. Resolution: 400 dpi
4. Modulation: PM + PWM

10. System Control Unit (SCU)

1. Basic machine: The SCU is on the back side of the operation panel (20-digit 2-line LCD)
2. Edit machine: The SCU is under the scanner unit and connected to the touch panel display (640 x 480 dots).

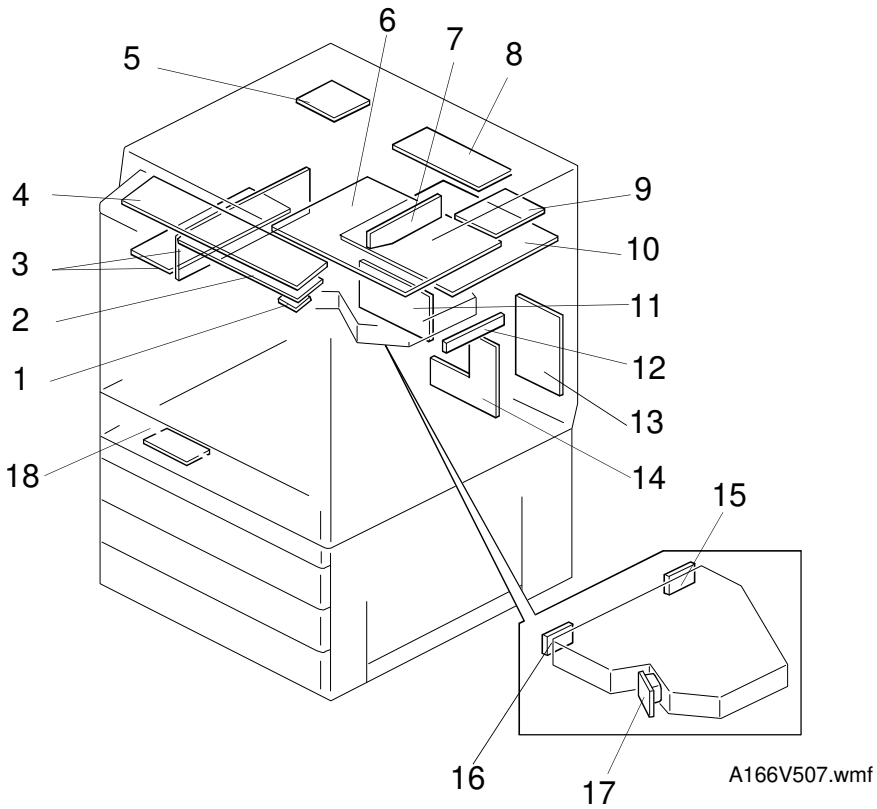
4. PARTS LAYOUT

4.1 MECHANICAL COMPONENT LAYOUT



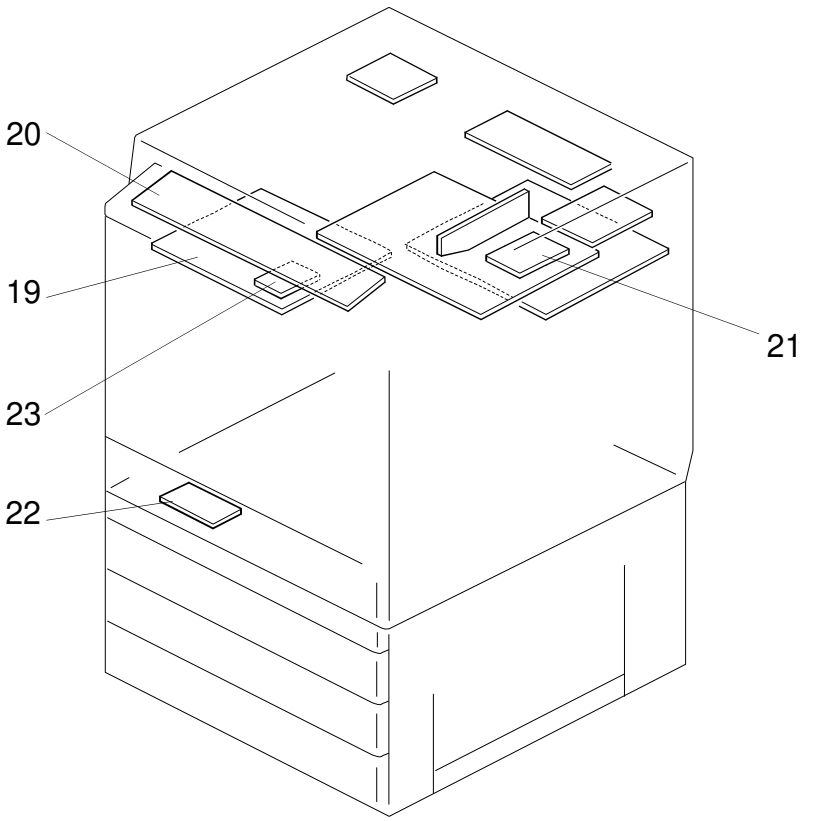
1. Paper Tray (A166) Duplex Tray (A187/189)
2. Pressure Roller
3. Hot Roller
4. 2nd Scanner
5. 1st Scanner
6. Development Unit
7. Drum Mirror
8. Toner Shield Glass
9. BTL
10. Charge Corona Unit
11. Lens
12. 2nd fθ Lens
13. CCD Board
14. 1st fθ Lens
15. Polygon Mirror
16. Drum Cleaning Unit
17. Lubricant Brush
18. By-pass Feed Table
19. Transfer Belt
20. OPC Drum
21. Registration Rollers
22. Relay Roller
23. Belt Transfer Charge Unit
24. Paper Transfer Charge Unit
25. Belt Cleaning Unit
26. Transport Belt

4.2 PCB (A166/A187 COPIERS)



1. RAM Board
2. SCU Board
3. AC Drive/DC Power Supply Board
4. Operation Panel
5. Scanner Motor Drive Board
6. Scanner IPU Board
7. CCD Board
8. Lamp Regulator
9. IDU Board
10. Main Control Board
11. I/O Control Board 2
12. By-pass Paper Width Detection Board
13. I/O Control Board 1
14. High Voltage Supply Board
15. Laser Synchronizing Detector Board 2
16. Laser Synchronizing Detector Board 1
17. LD Drive Board
18. Duplex Control Board **(Except A166)**

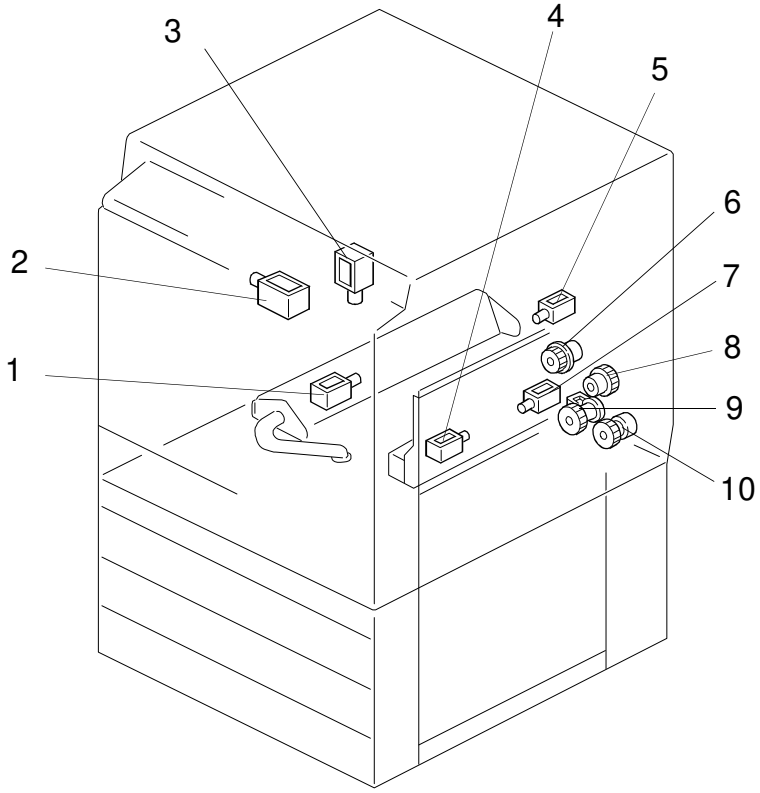
4.3 PCB (A189 COPIER)



A166V508.wmf

19. SCU Board
20. Operation Panel
21. Extended IPU Board
22. Duplex Control Board
23. RAM Board

4.4 SOLENOIDS AND CLUTCHES



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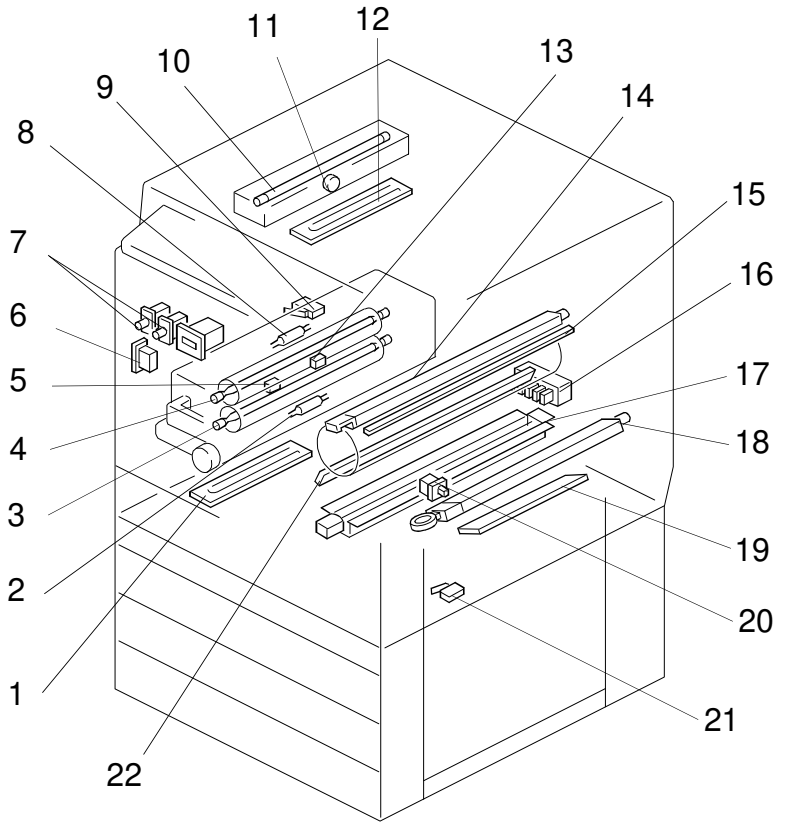
1. Transfer Belt Cleaning SOL
2. Toner Supply Release SOL
3. Junction Gate SOL **(A187/A189 only)**
4. Sub By-pass Feed Pick-up SOL
5. Transfer Belt Lubricant SOL
6. Registration CL
7. Main By-pass Feed Pick-up SOL
8. By-pass Feed CL
9. Paper Feed CL **(A166 only)**
10. Vertical Transport CL

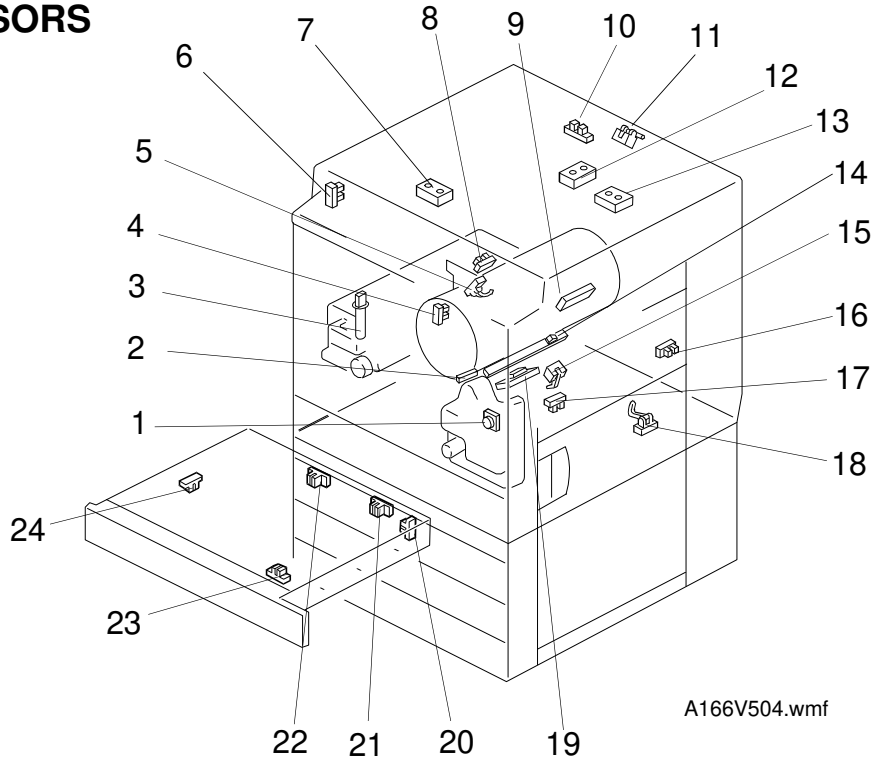
4.5 SWITCHES AND HEATERS



A166V510.wmf

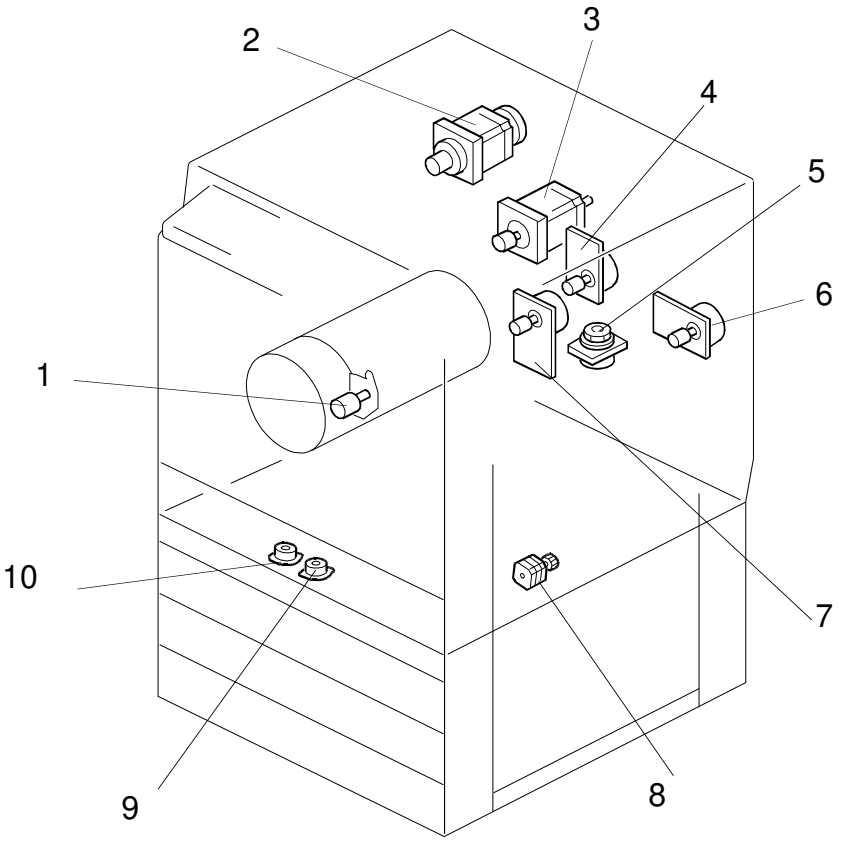
1. Lower Tray Heater
2. Pressure Roller Thermofuse
3. Pressure Roller Lamp
4. Fusing Lamp
5. Pressure Roller Thermistor
6. Main Switch
7. Front Door Switch
8. Fusing Thermofuse
9. Paper Exit Door Switch **(A187/A189 only)**
10. Exposure Lamp
11. Thermostat
12. Optics Anticondensation Heater
13. Fusing Thermistor
14. Charge Corona Unit
15. Quenching Lamp
16. Tray Paper Size SW **(A166 only)**
17. Paper Transfer Charge Unit
18. Belt Transfer Charge Unit
19. Drum Heater
20. By-pass Feed Table SW
21. Vertical Transport SW
22. Pre-transfer Lamp

4.6 SENSORS



1. Used Toner Sensor
2. Color Toner Cartridge Sensor
3. Oil End Sensor
4. Revolver H.P. Sensor
5. Bk Toner Cartridge Sensor
6. Scanner H.P. Sensor
7. Original Width Sensor
8. Paper Exit Sensor
9. Drum Potential Sensor
10. Platen Cover Position Sensor
11. Scanner Unit Lift Sensor
12. Original Length Sensor 1
13. Original Length Sensor 2
14. ID Sensor
15. Registration Sensor
16. Tray Paper End Sensor **(A166 only)**
17. By-pass Feed Paper End Sensor
18. Vertical Transport Sensor
19. Transfer Belt H.P. Sensor
20. Duplex Paper End Sensor **(A187/A189 only)**
21. Duplex Turn Sensor **(A187/A189 only)**
22. Duplex Entrance Sensor **(A187/A189 only)**
23. Side Fence Jogger HP Sensor **(A187/A189 only)**
24. End Fence Jogger HP Sensor **(A187/A189 only)**

4.7 MOTORS



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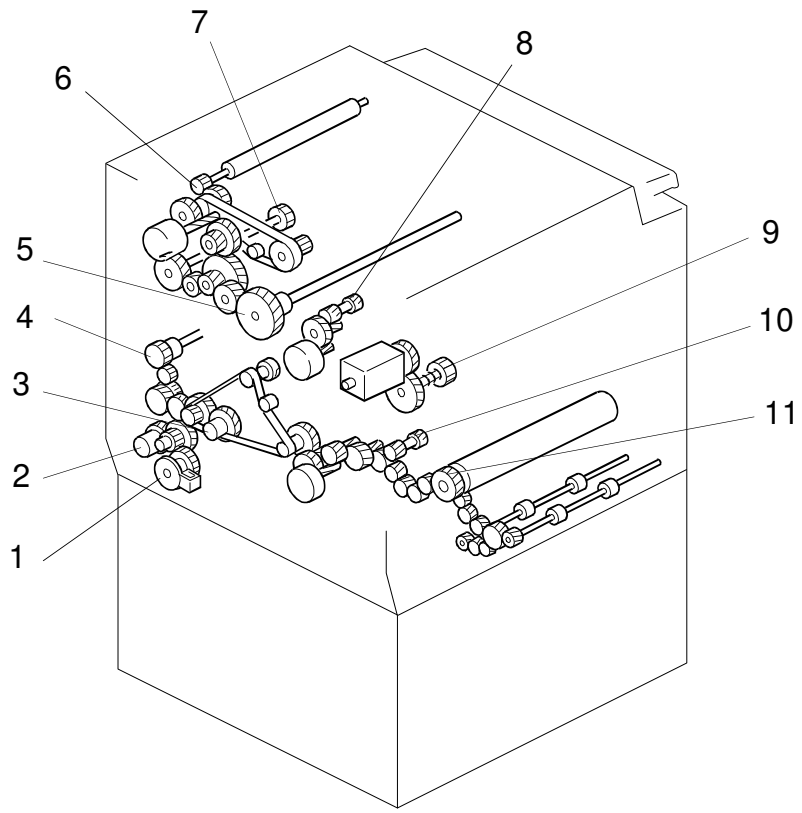
1. Toner Supply Motor
2. Scanner Motor
3. Revolver Drive Motor
4. Development Drive Motor
5. Polygon Motor
6. Drum Motor
7. Main Motor
8. Duplex Feed Motor **(A187/A189 only)**
9. Side Fence Jogger Motor **(A187/A189 only)**
10. End Fence Jogger Motor **(A187/A189 only)**

4.8 DRIVE LAYOUT



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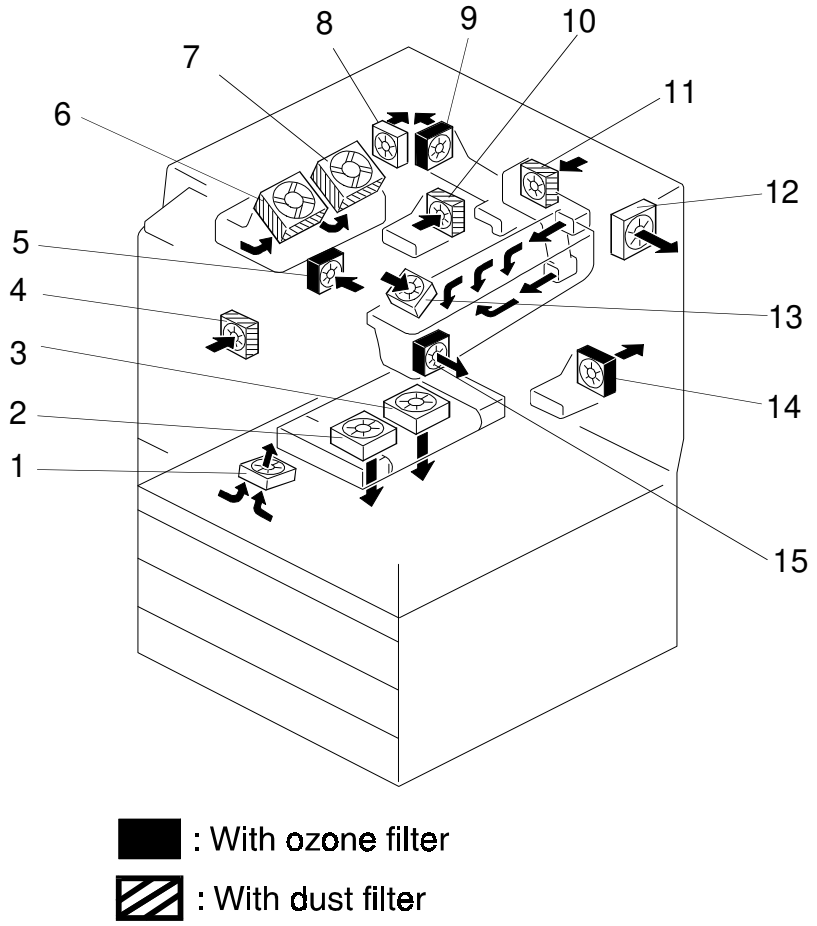
1. Paper Feed Clutch
2. Vertical Transport Clutch
3. Registration Clutch
4. By-pass Feed Clutch
5. Drum Drive Gear
6. Transfer Belt Lubricant Gear
7. Transfer Belt Drive Gear
8. Development Drive Gear
9. Revolver Drive Gear
10. Transport Unit Drive Gear
11. Fusing Unit Drive Gear

4.9 FANS AND AIR FLOW



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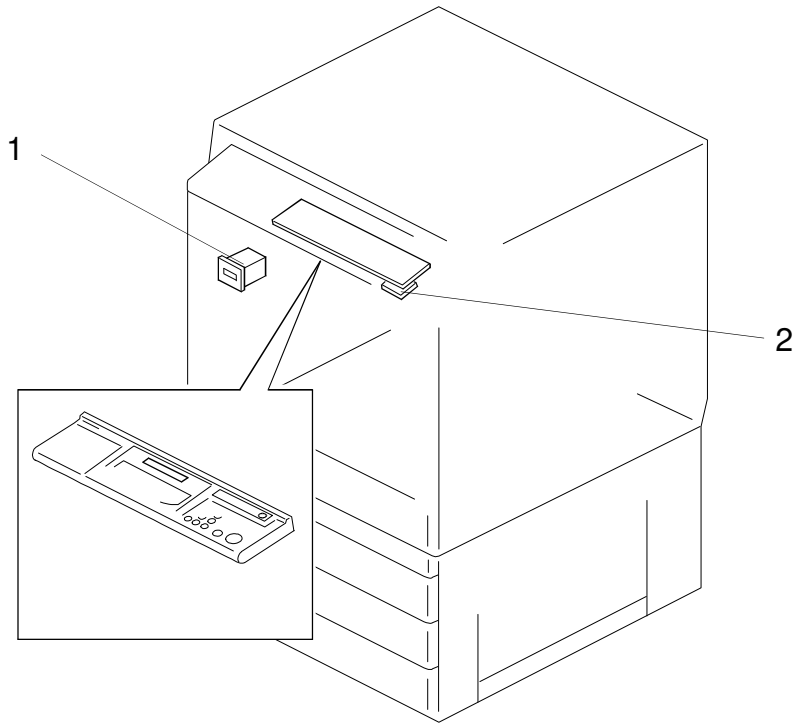
1. Development Inlet Fan
2. Transport Fan 1
3. Transport Fan 2
4. Front Power Supply Board Fan
5. Paper Exit Fan
6. Optics Cooling Fan 1
7. Optics Cooling Fan 2
8. Rear Power Supply Board Fan
9. Exhaust Fan
10. Fusing Fan
11. Charge Inlet Fan
12. Optics Exhaust Fan
13. Scanner Board Cooling Fan
14. Rear Transfer Fan
15. Front Transfer Fan

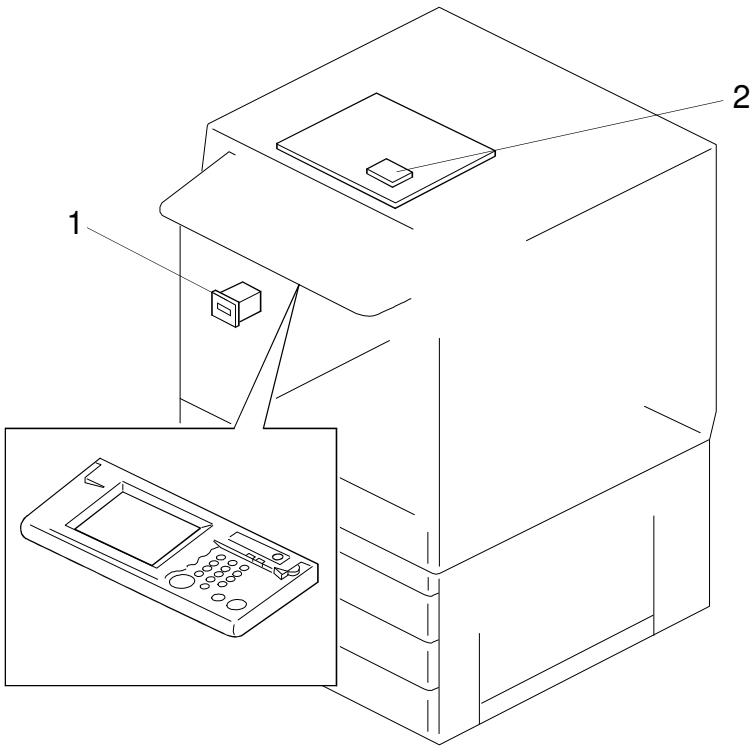
4.10 COUNTERS (A166/A187 COPIERS)



A166V515.wmf

1. Main Counter
2. Back-up Counter (stored in the RAM board on the SCU board)

4.11 COUNTER (A189 COPIER)



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1. Main Counter
2. Back-up Counter (stored in the RAM board on the SCU board)

5. ELECTRICAL COMPONENT LIST

5.1 PRINTED CIRCUIT BOARDS

Symbol	Name	Function	Remarks
PCB1	Lamp regulator	Supplies dc power for the exposure lamp.	
PCB2	Scanner motor drive board	Supplies dc power for the scanner motor.	
PCB3	CCD board	Converts the light reflected from the original into signals.	
PCB4	AC drive/ DC power suppy	Supplies ac and dc power.	
PCB5	Scanner IPU board	Converts the RGB image signal from the CCD to a KCMY signal and sends it to the printer and SCU.	
PCB6	Main control board	Controls the printer sequence.	
PCB7	I/O control board 1	Interfaces the sensors, clutches, solenoids and motors in the printer module with the main control board. Includes temperature and humidity sensors.	
PCB8	I/O control board 2	Interfaces the sensors, clutches, solenoids and motors in the printer module with the main control board.	
PCB9	LD drive board	Controls the LD output.	
PCB10	Laser synchronizing detector board 1	Detects laser main scan synchronization while writing the latent image to the drum.	
PCB11	Laser synchronizing detector board 2	Detects laser main scan synchronization while writing the latent image to the drum.	
PCB12	IDU board	Discriminates image for anti-counterfeiting	
PCB13	By-pass paper width detection board	Detects the paper width in the by-pass feed table.	
PCB14	High voltage supply board	Supplies power to the corona units.	
PCB15	System control unit (SCU) board	Controls the system.	
PCB16	RAM board	Stores the copy process data and counters.	
PCB17	Operation panel	Used to operate the copier.	
PCB18	Extended IPU board	Converts scanned image data and sends it to SCU for the display. Performs image processing on an area specified in the display.	A189 copier only
PCB19	Duplex control board	Controls the duplex unit.	A187/A189 copiers only

5.2 SOLENOIDS

Symbol	Name	Function	Remarks
SOL1	Sub by-pass feed pick-up solenoid	Lowers the pick-up roller.	
SOL2	Main by-pass feed pick-up solenoid	Lowers the pick-up roller.	
SOL3	Toner supply release solenoid	Releases the toner supply motor.	
SOL4	Transfer belt cleaning solenoid	Controls the contact and release operation of the belt cleaning blade.	
SOL5	Transfer belt lubricant solenoid	Controls the contact and release operation of the lubrication brush on the transfer belt.	
SOL6	Junction gate solenoid	Raises the junction gate for the duplex copier.	A187/A189 copier only

5.3 CLUTCHES

Symbol	Name	Function	Remarks
CL1	By-pass feed clutch	Transmits the drive to the by-pass feed section.	
CL2	Registration clutch	Transmits the drive to the registration rollers.	
CL3	Vertical transport clutch	Transmits the drive to the vertical transport section.	
CL4	Paper feed clutch	Transmits the drive to the paper feed section.	A166 copier only

5.4 SWITCHES

Symbol	Name	Function	Remarks
SW1	Main switch	Turns the power to the copier on or off.	
SW2	Front door switch	Cuts the dc line to the high voltage supply board when the front door is open.	
SW3	Front door switch	Cuts the dc line to the main control board and LD unit when the front door is open.	
SW4	Front door switch	Cuts the dc line to the main control board and LD unit when the front door is open.	
SW5	Front door switch	Cuts the dc line to I/O control board 2 when the front door is open.	
SW6	Vertical transport switch	Detects if the vertical transport door is open or closed.	
SW7	By-pass feed table switch	Detects if the by-pass feed table is open or closed.	
SW8	Tray paper size switch	Detects the size of paper on the paper tray.	A166 copier only
SW9	Paper exit door switch	Detects if the paper exit door is open or closed.	A187/A189 copiers only

5.5 LAMPS

Symbol	Name	Function	Remarks
L1	Fusing lamp	Provides heat to the hot roller.	
L2	Pressure roller lamp	Provides heat to the pressure roller.	
L3	Exposure lamp	Applies high intensity light to the original for exposure.	
L4	Quenching lamp (QL)	Neutralizes any charge remaining on the photoconductor.	
L5	Pre-transfer lamp (PTL)	Reduces the charge remaining on the drum before the transfer process is started (except for the image area).	

5.6 HEATERS

Symbol	Name	Function	Remarks
H1	Optics anticondensation heater	Prevents moisture from forming on the optics.	
H2	Drum heater	Prevents moisture from forming around the drum.	
H3	Lower tray heater	Keeps paper dry on the paper feed tray.	

5.7 THERMISTORS

Symbol	Name	Function	Remarks
TH1	Fusing thermistor	Monitors the temperature of the hot roller.	
TH2	Pressure roller thermistor	Monitors the temperature of the pressure roller.	

5.8 THERMOFUSES

Symbol	Name	Function	Remarks
TF1	Fusing thermofuse	Protects the hot roller from overheating.	
TF2	Pressure roller thermofuse	Protects the pressure roller from overheating.	

5.9 THERMOSTAT

Symbol	Name	Function	Remarks
TS1	Thermostat	Prevents the halogen lamp from overheating when it is on for a long time.	

5.10 SENSORS

Symbol	Name	Function	Remarks
S1	Platen cover position sensor	Detects if the platen cover is up or down.	
S2	Scanner unit lift sensor	Detects if the scanner unit is lifted or not.	
S3	Scanner HP sensor	Detects the scanner home position.	
S4	Transfer belt HP sensor	Detects the transfer belt mark.	
S5	Paper exit sensor	Detects a paper jam at the paper exit.	
S6	Color toner cartridge sensor	Detects the presence of color toner cartridges.	
S7	Drum potential sensor	Detects the potential on the drum surface for process control.	
S8	ID sensor	Detects the density of the sensor pattern image on the drum for process control.	
S9	Revolver HP sensor	Detects if the revolver is at the home position.	
S10	Bk toner cartridge sensor	Detects if the black toner cartridge is installed.	
S11	Registration sensor	Detects a paper jam at the registration section.	
S12	Vertical transport sensor	Detects a paper jam at the vertical transport section.	
S13	Used toner sensor	Detects if the used toner tank is full.	
S14	By-pass feed paper end sensor	Detects if there is paper on the by-pass feed table.	
S15	Tray paper end sensor	Detects if there is paper on the paper feed tray.	A166 copier only
S16	Side fence jogger HP sensor	Detects the home position of the duplex unit side fence.	A187/A189 copiers only
S17	End fence jogger HP sensor	Detects the home position of the duplex unit end fence.	A187/A189 copiers only
S18	Duplex paper end sensor	Detects if there is paper in the duplex unit.	A187/A189 copiers only
S19	Duplex entrance sensor	Detects when copy paper comes into the duplex unit.	A187/A189 copiers only
S20	Duplex turn sensor	Detects when copy paper is being reversed in the duplex unit.	A187/A189 copiers only
S21	Original width sensor	Detects the original width.	
S22	Original length sensor 1	Detects the original length.	
S23	Original length sensor 2	Detects the original length.	
S24	Oil end sensor	Detects if there is silicone oil in the oil tank.	

5.11 MOTORS

Symbol	Name	Function	Remarks
M1	Scanner motor	Drives the scanner.	
M2	Polygon motor	Drives the polygon mirror.	
M3	Main motor	Drives the paper feed/transport section and fusing units.	
M4	Drum motor	Drives the drum and transfer belt.	
M5	Toner supply motor	Supplies toner.	
M6	Development drive motor	Rotates the development roller.	
M7	Revolver drive motor	Rotates the revolver unit.	
M8	Side fence jogger motor	Drives the duplex unit side fences.	A187/A189 copiers only
M9	End fence jogger motor	Drives the duplex unit end fences.	A187/A189 copiers only
M10	Duplex feed motor	Drives the paper feed roller in the duplex unit.	A187/A189 copiers only

5.12 FAN MOTORS

Symbol	Name	Function	Remarks
FM1	Optics exhaust fan	Cools the scanner unit.	
FM2	Optics cooling fan 1	Cools the scanner unit.	
FM3	Optics cooling fan 2	Cools the scanner unit.	
FM4	Scanner board cooling fan	Cools the scanner unit.	
FM5	Development inlet fan	Cools the development unit.	
FM6	Rear transfer fan	Blows air out of the transfer belt unit.	
FM7	Transport fan 1	Sucks in air to attract copy paper to the transport belt.	
FM8	Transport fan 2	Sucks in air to attract copy paper to the transport belt.	
FM9	Charge inlet fan	Provides air flow around the charge corona unit and ID sensor.	
FM10	Fusing fan	Cools the development unit.	
FM11	Exhaust fan	Blows air out of the copier.	
FM12	Front transfer fan	Blows air out of the transfer belt unit.	
FM13	Rear power supply board fan	Cools the power supply unit.	
FM14	Paper exit fan	Cools the development unit.	
FM15	Front power supply board fan	Cools the power supply unit.	

5.13 COUNTER

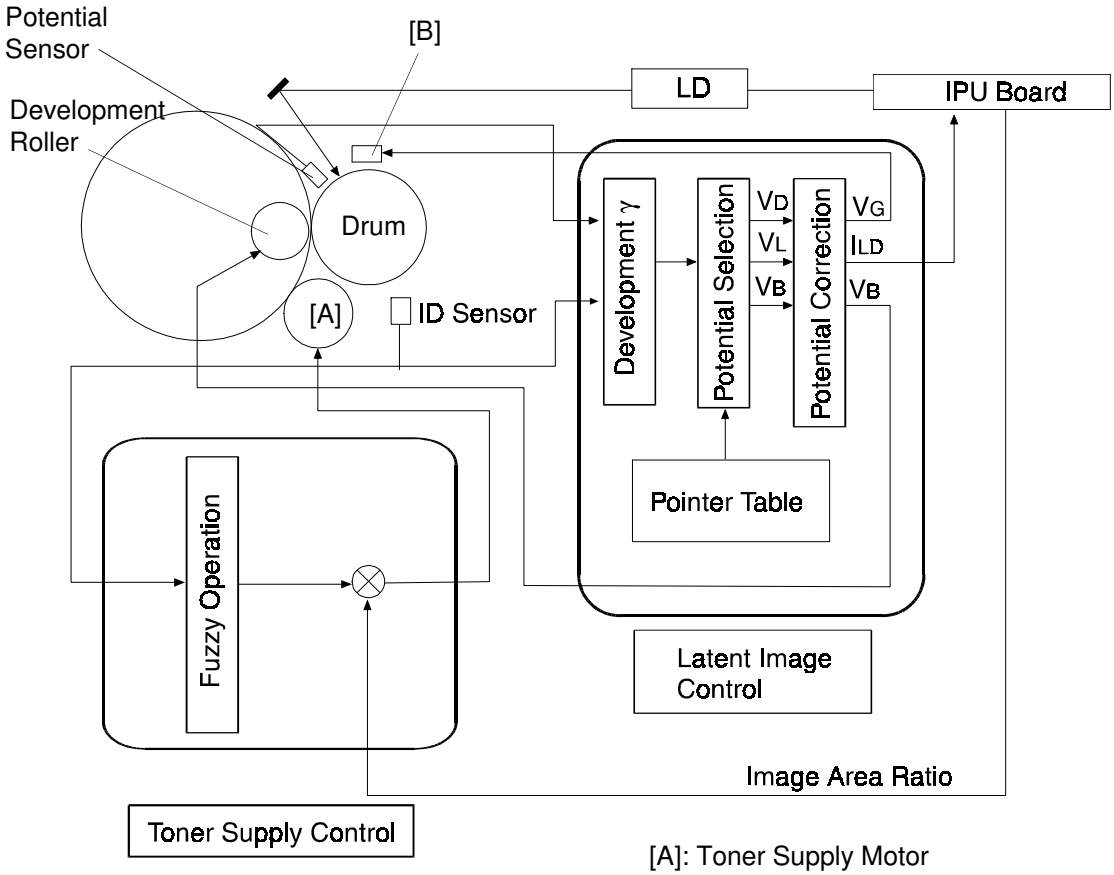
Symbol	Name	Function	Remarks
CO1	Main counter	Counts up the number of scans for Bk and color copying.	

SECTION 2

DETAILED SECTION DESCRIPTIONS

1. PROCESS CONTROL

1.1 OVERVIEW



[A]: Toner Supply Motor
[B]: Charge Corona Unit

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This machine uses two control methods:

- Latent Image Control (every process control self check)
- Toner Supply Control (every copy)

Latent Image Control

Latent image control controls the development potential to maintain the density of the toner image on the drum. It does this by compensating for variations in drum chargeability and toner chargeability.

The machine uses the drum potential sensor to measure the drum's response to a standard applied voltage. Then it uses the image density (ID) sensor to measure drum reflectivity and the density of a standard sensor pattern. These tests are done during the process control self check, which is done every 150 copies and at other times such as after replacing the developer.

Depending on the results of the self check, the machine adjusts the charge corona voltage, the development bias, and the laser diode current to maintain the correct drum potentials.

Toner Supply Control

Toner supply control maintains a constant amount of toner on the ID sensor pattern. To do this, the machine monitors the response of the ID sensor to a standard pattern printed for each color after every color development cycle and uses this to control the toner supply motor with a fuzzy logic algorithm.

1.2 PROCESS CONTROL MEASUREMENT TIMING

The machine uses outputs from the drum potential sensor and the ID sensor. Some outputs are measured every color development cycle during each copy, and others are only measured during the process control self check procedure.

The following table shows the sensor outputs that are used by process control, and the times that these outputs are measured.

Sensor Output:	Measurement Timing
V_{SG}	Adjusted to 4.0 ± 0.1 V during the process control self check.
V_{SP} for toner supply control [V_{SP}(toner)]	During each copy, after writing each color image to the drum, the laser diode writes the ID sensor pattern for toner supply control on the drum. (This is a single-grade pattern.) The ID sensor measures the density of the developed ID sensor pattern for each color, and this is used as V_{SP}(toner).
Drum Potential	During the process control self check, the laser diode writes a 12-grade gradation pattern for each color on the drum. The drum potential sensor measures the potential on each grade.
V_{SP} for potential control [V_{SP}(pot)]	After the above 12-grade gradation pattern has been developed, the ID sensor measures the density of the developed gradation pattern for each step and stores these values as V_{SP}(pot).

NOTE: V_{SG}: Output voltage from the ID sensor when it measures the bare drum.
V_{SP}: Output voltage from the ID sensor when it measures the image density of a sensor pattern.
Process Control Self Check: See section 4.

1.3 POTENTIAL CONTROL (LATENT IMAGE CONTROL)

1.3.1 Concept

Latent image control adjusts the development potential to maintain the density of the toner image on the drum. It does this by compensating for variations in drum chargeability and toner chargeability.

Development Potential (V_{DP})
The development potential (V_{DP}) is the difference between the development bias voltage and the voltage of areas of the drum that have been discharged by laser exposure at full power. If changes in this potential are not accounted for, the color balance will be poor.

– Factors that change the development potential –

Drum Chargeability
After long usage following installation or PM, drum chargeability will gradually change due to the following factors:

- Dirty charge corona and grid plate
- Changes in the drum characteristics with age (OPC wear) and temperature

Also, as the drum gets older, its sensitivity (response to light) gradually decreases, leading to residual voltage in exposed areas of the drum after laser exposure, and on all areas after quenching.

Toner Chargeability
Toner chargeability varies with humidity, and this affects the image density even if the toner concentration is kept constant.
When humidity is low, toner chargeability increases resulting in lower image density. When humidity is high, toner chargeability decreases resulting in higher image density.

Also, after long usage following installation or PM, the surface of carrier particles is gradually coated with melted toner (this is known as filming). This decreases the toner chargeability.

How the machine maintains the optimum development potential
The machine uses the drum potential sensor to detect changes in the drum's response to a standard applied voltage. It also uses the image density (ID) sensor to detect changes in drum reflectivity and the density of a standard sensor pattern. These tests are done during the process control self check, which is done every 150 copies and at other times such as after the main switch is turned on.

The machine calculates the current V_{DP} from a series of M/A values obtained from image density and potential readings off the 12 grades of the V_{SP} sensor pattern on the drum. To make sure that V_{DP} is kept at an optimum

value, the machine refers to a look-up table of current V_{DP} against V_D, V_L, and V_B (this is known as the pointer table). There are 20 combinations in this table. The machine chooses the combination that is closest to the current V_{DP}, and will use these values of V_D, V_L, and V_B for copying until the next process control self check. The selected combination is based on actual image conditions, using the density of sensor patterns on the drum, so it is better for maintaining good copy quality.

M/A: Amount of toner per unit area on the drum (mg/cm^2)
V_D: Drum potential without exposure - to adjust this, the machine adjusts the charge corona grid voltage (V_G)
V_L: Drum potential with the strongest exposure - to adjust this, the machine adjusts the laser diode input current (I_{LD})
V_B: Development bias

1.3.2 Process Control Self Check

The drum potential process control adjustments take place during the process control self check. This self check is done at three different times.

1. **Forced Process Control Self Check**
   When installing the machine or replacing the developer, the process control self check must be performed (SP 3-126). The machine must be in standby mode for 10 minutes at least before doing this.

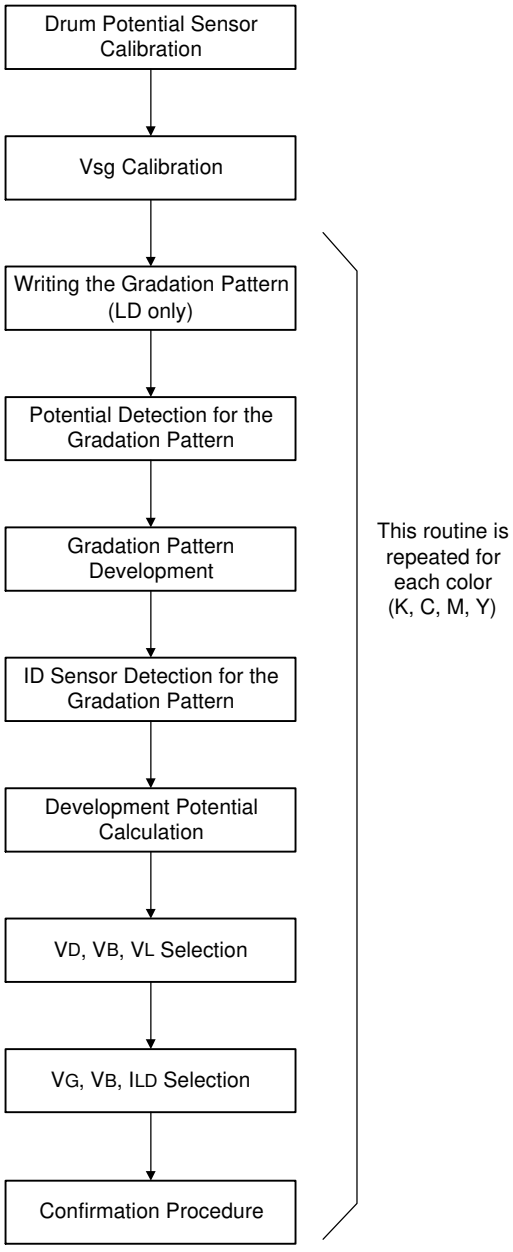
2. **Initial Process Control Self Check**
   After the main switch has been turned on and if the hot roller temperature is below 100 degrees, the process control self check is done automatically. (The setting of SP 3-125 must be kept at 0 for this to be done automatically.)

3. **Interval Process Control Self Check**
   If more than 150 copies have been made since the last process control self check, after the copy job is completed.
   The process control self check itself takes about 3 minutes. However, in addition, the development unit rotates as explained in the following note, so the total time is extended.

NOTE: Forced and Initial Process Control Self Checks:
Just before the end, the development unit rotates 10 revolutions to supply Bk toner to the hopper section. As a result, the total time for the self check is 4 - 5 minutes.

Interval Process Control Self Check:
The drum potential sensor calibration is omitted (see section 1-3-4). However, just before the end, the development unit rotates 10 revolutions to supply black toner. Therefore, the self check takes about 2 - 3 minutes.

1.3.3 Process Control Self Check Procedure



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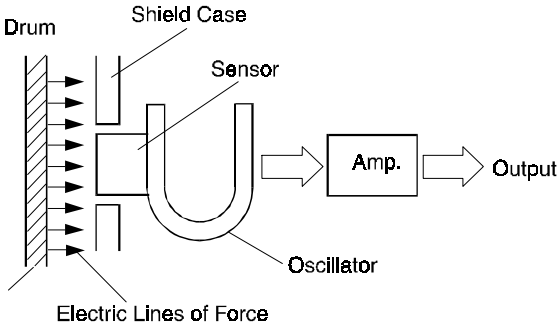
NOTE: In the interval process control self check, the Drum Potential Sensor Calibration step is skipped.

1.3.4 Drum Potential Sensor Calibration



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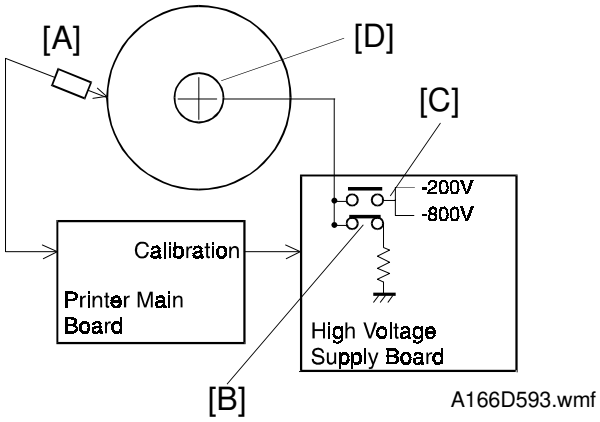

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The drum potential sensor [A] has a detector which detects the strength of the electric field from the electric potential on the drum. Since the output of the sensor is affected by environmental conditions, such as temperature and humidity, the sensor needs to be calibrated. This is done during the process control self check.

The high voltage supply board has two relay contacts. Usually, the relay [B] grounds the drum. However, during the self check, the machine switches the relay [C] to apply a voltage to the drum shaft [D]. In this condition, the drum is isolated from the ground (floating).

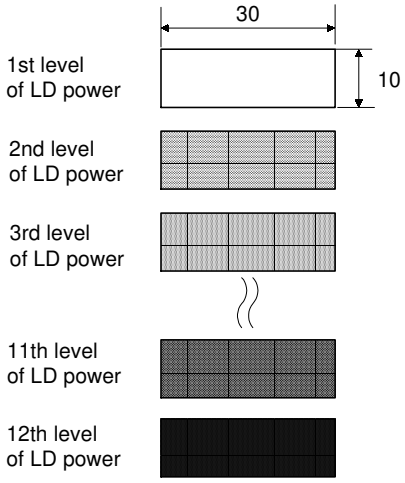
The machine calibrates the sensor output by measuring the output of the drum potential sensor when -200V and when -800V are applied to the drum. (The relationship between potential sensor output and drum potential is linear. So, as a result of determining the output at these two points, the machine can determine the actual drum potential from the potential sensor output.)

During the interval process control self check, this drum potential sensor calibration is not performed. This is because just before the interval process control self check, there is residual voltage on the drum and this affects the output of the potential sensor.

1.3.5 Vsg Calibration

The ID sensor checks the bare drum's reflectivity and calibrates the output of the ID sensor to 4 ± 0.1 V. This compensates for the drum's condition and the ID sensor condition, such as dirt on the surface of the drum or ID sensor.

1.3.6 Writing the Gradation Pattern



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The machine makes a 12-grade pattern on the drum for each color. Each grade is made by changing the LD power. At this stage, the patterns are not developed; they remain as latent images.

1.3.7 Gradation Pattern Potential Detection

The drum potential sensor detects the potential on each grade of the 12-grade sensor pattern latent image, and the output is stored in memory.

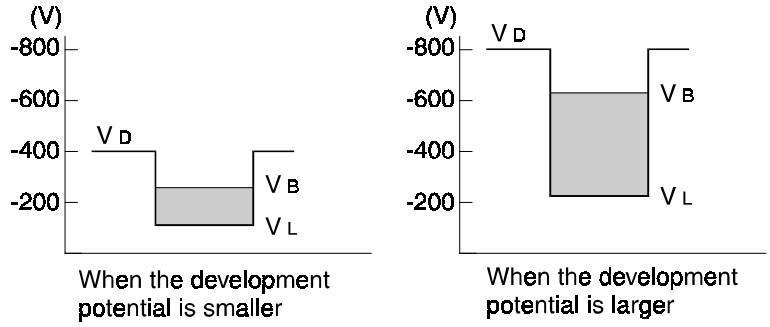
1.3.8 Gradation Pattern Development

The gradation pattern is developed with a fixed development bias.

1.3.9 Gradation Pattern Density Detection

The ID sensor detects the developed gradation pattern (12 grades for each color), and the outputs are stored in memory.

1.3.10 Development Potential Calculation



A166D597.wmf

The development potential (V_{DP}) is the capability to attract toner to the drum and can be shown as: $V_B - V_L$
V_B: Development Bias
V_L: Drum potential after full laser exposure
See the above drawing for two examples.

The machine calculates the approximate current development potential from the sensor readings. This consists of the following steps:

1. The machine converts the gradation pattern densities (from the ID sensor) into an actual toner amount on the drum (M/A) for each grade of the pattern.
2. From the potential and ID sensor outputs, the machine then determines the relationship between the drum potential and the amount of toner developed on the drum. This is known as the development gamma factor.
3. The machine can now calculate the development potential that would be required to obtain the ideal toner density on an area of the drum developed with full laser power, under the machine's present conditions.

1.3.11 V_D, V_B, V_L Selection (Pointer Table)

The machine now adjusts V_D, V_B, and V_L to try to bring V_{DP} to the ideal value. To do this, it uses a pointer table. This is a look-up table in memory of V_{DP} against V_D, V_B, and V_L.

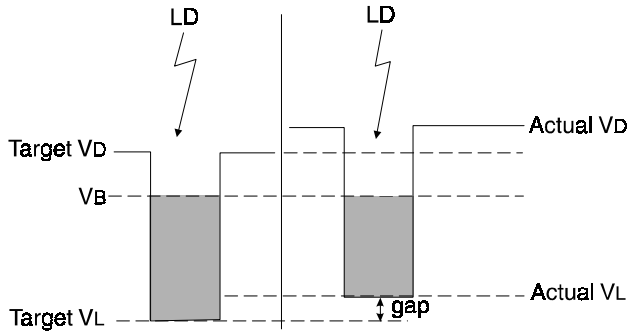
The machine takes the value of V_{DP} calculated in the previous section, and looks for the value of V_{DP} in the pointer table that is closest to this. The machine reads the values of V_D, V_B, and V_L that are in this row of the pointer table.

1.3.12 V_G, V_B, I_{LD} Correction

The machine will then use these values of V_D, V_B, and V_L during copying until the next process control self check. These values are designed to bring the actual V_{DP} to the optimum value for the machine's current condition.

- V_D: Drum potential without exposure - to adjust this, the machine adjusts the charge corona grid voltage (V_G)
- V_L: Drum potential with the strongest exposure - to adjust this, the machine adjusts the laser diode input current (I_{LD})
- V_B: Development bias

1.3.13 Confirmation Procedure



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The calculated V_D and V_L are target potentials for maintaining optimum copy quality. However, residual voltage is not included in these potentials. To correct for this, the machine corrects V_D and V_L.

If V_D cannot be adjusted to within 5V of the target V_D after 40 attempts, the previous V_D is used, and the SC code counter is incremented.

1.3.14 Potential Control in Abnormal Sensor Conditions

You can check the result of the process control self check with SP 3-975. One of the following codes will be displayed.

SP3-975 Process control self check result

Code No.	Error	SP No. (Displays Values Only)	Potential Causes	Note
01	No error			
80	V_{SG}_ave Error		1. ID Sensor 2. Dirty ID Sensor 3. Drum	• Agitate the developer to charge up the toner • Check the ID sensor
81	V_{SG}_ptn Error		1. ID Sensor 2. Dirty ID Sensor 3. Drum	• Agitate the developer to charge up the toner • Check the ID sensor
85	Vmin (color) Difference Error	3-901-1 (Bk) 3-910-2 to 3-910-4	1. ID Sensor 2. Dirty ID Sensor 3. Drum 4. Development Unit	• New or fairly new machine: ID sensor or electrical noise • Check the development unit or drum unit.
90	Development Potential Calibration Error	3-4-1 (Co-efficient) 3-4-2 (Intercept)	1. Faulty Drum Potential Sensor 2. Faulty High Voltage Supply Board (V_B) 3. Faulty Drum (Pin Hole) 4. Drum Grounding Shaft not properly connected 5. Electrical Noise 6. Residual Voltage on the Drum	• Not enough waiting time allowed before the forced process control self check. • Check the drum grounding shaft hood inside the drum. • Check the output voltage at the potential sensor (TP213) on the printer main board with a digital oscilloscope (during the potential calibration).
91	V_D Error at Home Position		1. Improper installation of: -Charge Corona Unit -Drum Potential Sensor -Drum	• Check that the following are installed correctly: -Development Unit -Drum Unit -Charge Corona Unit

Code No.	Error	SP No. (Displays Values Only)	Potential Causes	Note
92	V_{SG} Error	3-2 (V_{SG})	1. ID Sensor 2. Dirty ID Sensor 3. Drum Deterioration	• In a fairly new machine, this is caused by the ID sensor or electrical noise. • Check the ID sensor or the grounding. • If the machine is not new, it is caused by a dirty drum or ID sensor.
93	12-step Pattern Error		1. LD Unit 2. Noise 3. Quenching Lamp	• Check the LD unit or SBU.
94	Development Gamma Calibration Error	3-121-1 to 3-121-4 (gamma MA) 3-122-1 to 3-122-4 (V_K)	1. Development Unit 2. Drum Potential Sensor 3. ID Sensor 4. Electrical Noise	• Larger gamma -Electrical Noise (new or fairly new machine) - Toner Concentration too high (not for a new machine) • Smaller gamma -Toner concentration too low (needs toner agitation) -Development unit installation error -Not enough developer • V_K error Not enough waiting time allowed before the forced process control self check.
95	V_{MIN} Error	3-910-1 (Bk) 3-910-2 to 3-910-4 (Color)	1. ID Sensor 2. Dirty ID Sensor 3. Drum 4. Development Unit 5. Lower Toner Concentration	• New or fairly new machine: ID sensor or electrical noise • Check the development unit or drum unit. • Not new machine: Dirty background
96	V_R Error	3-111	1. Residual Voltage on Drum 2. LD Unit	
99	Others		1. Humidity and Temparature Sensor (on the I/O control board 1) 2. Others	• Operation error (e. g. the door was open during the process control self check)

The following table shows the error codes and their possible causes.

Code No.	Cause / Error	Potential sensor	ID sensor	Development unit	Drum unit	Main charge corona unit	High voltage power supply board	LD	Electrical noise	Short waitting time	Humidity and tinmparature sensor
80	V_{SG}_ave Error	○	❑	Δ	❑	Δ	Δ	Δ	❑	✗	✗
81	V_{SG}_ptn Error	○	❑	Δ	❑	Δ	Δ	Δ	❑	✗	✗
85	Vmin (color) difference Error	○	❑	Δ	❑	Δ	Δ	Δ	❑	✗	✗
90	Development potential calibration error	❑	✗	✗	○	✗	○	✗	❑	❑	✗
91	V_D error at home position	Δ	✗	✗	○	❑	○	Δ	Δ	Δ	✗
92	V_G error	✗	❑	Δ	❑	✗	✗	✗	Δ	✗	✗
93	12-step pattern error	○	✗	✗	○	○	○	❑	Δ	Δ	✗
94	Development γ calibration error	○	○	❑	○	Δ	Δ	Δ	❑	❑	✗
95	V_{min} error	○	○	❑	Δ	Δ	Δ	Δ	❑	✗	✗
96	V_R error	Δ	✗	✗	❑	Δ	Δ	○	Δ	○	✗
99	Others	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	○

❑: Most probable cause ○: Probable cause Δ: Possible cause ✗: No Relation

1.3.15 Abnormal Sensor Conditions (SC)

If V_{200} or V_{800} at drum potential sensor calibration is out of specification or if V_D or V_L do not fall within specification for any color after 40 attempts at adjusting V_G or I_{LD} during the Confirmation Procedure, the machine stops V_D or V_L correction and uses the previous V_G, V_B and I_{LD} values for all colors during copying.

When V_D is not adjustable (SC382) or V_L is not adjustable (SC383), nothing is indicated on the LCD, but the SC counter (SC382 or 383) is incremented.

Related SC codes (see the troubleshooting section for details)

380	Drum potential sensor calibration error	The error is logged.
382	V_D adjustment error	The error is logged.
383	V_{PL} adjustment error	The error is logged.
384	LD writing error for the 12-grade pattern	The error is logged.
385	ID sensor initial adjustment error	The SC Code is displayed. After the main switch is turned off/on, fixed toner supply mode is selected and the machine returns to standby.
386	Vmin error	The error is logged.

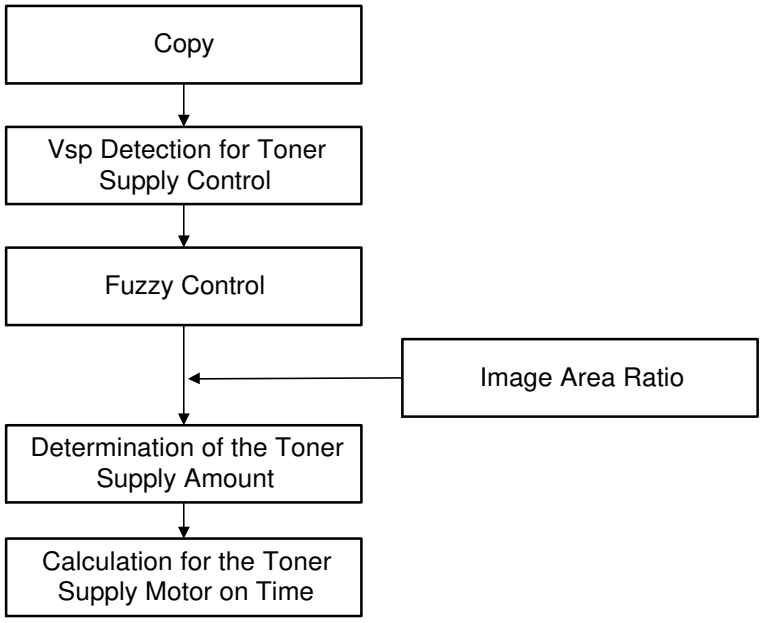
1.4 TONER SUPPLY CONTROL

1.4.1 Toner Supply Control Method

This machine has two toner supply control methods: fuzzy control mode, and fixed supply mode.

Normally this machine uses fuzzy control. The fixed supply method is used only when abnormal conditions occur during the process control self check.

1.4.2 Fuzzy Control Mode



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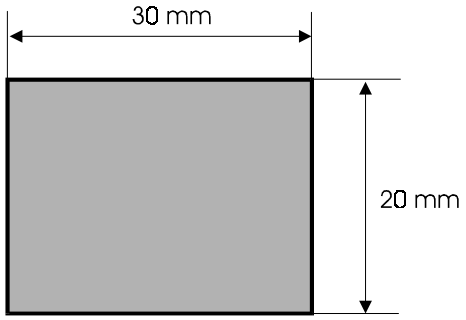
(1) Overview

First, the machine assesses the amount of toner per unit area on the drum (M/A). This is determined from two sensor inputs: Vsg, and Vsp(toner).

The fuzzy logic algorithm then uses the most recent M/A values to assess current toner density conditions.

The output from the fuzzy logic process is then combined with the image area ratio obtained from the image data signal coming from the IPU board. The result of this calculation is the required toner supply amount, and from this, the machine determines the toner supply motor on-time that is needed to supply enough toner.

(2) Vsp for Toner Supply Control, Vsp(toner)



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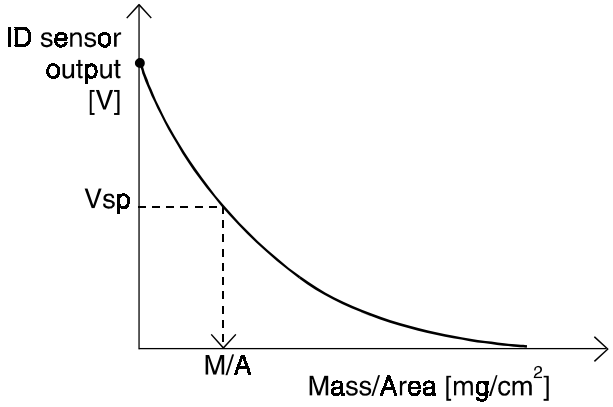
Every time after writing a color toner image on the drum, the laser diode writes a sensor pattern for that color using standard laser diode power. After the pattern is developed, the machine measures the ID sensor output from this pattern and uses the result as Vsp(toner) for that color to control the toner supply. This process is done for each color cycle, every copy.

(3) Calculation of M/A



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First, the machine calculates a value from the current value of VSP(toner). Then, the machine refers to a look-up table in ROM to determine the toner density on the drum (M/A).

M/A: Toner amount per unit area on the drum (mg/cm^2)

(4) Fuzzy Logic Algorithm

The fuzzy logic algorithm has two input factors which are related to the amount of toner on the drum. These are:

- The difference between the average of the previous 10 M/As and the target M/A
- The tendency of the previous 10 M/As

(5) Image Area Ratio

This is a measure of how much toner will be needed for each color on a page. From the image data from the IPU, the machine determines the total amount of the color on the page. It takes into account the grayscale values for each pixel for that color.

1.4.3 Fixed Supply Mode

In fixed supply mode, the machine adds a fixed amount of toner to the developer every copy. Readings from the ID sensor are ignored.

The toner supply ratios for each color in fixed supply mode are defined by SP 2-208-5 to 8.

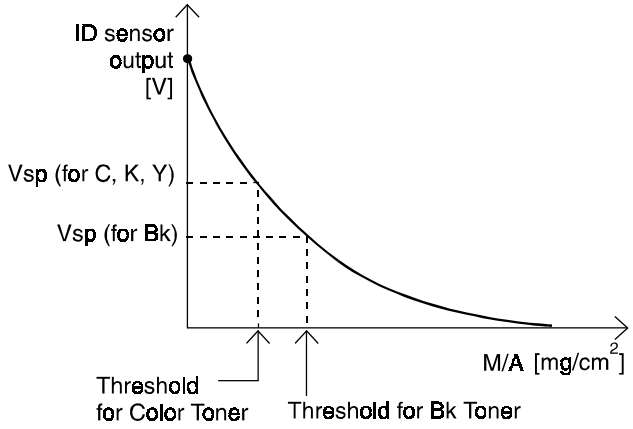
1.4.4 Toner Supply in Abnormal Sensor Conditions

The machine detects an abnormal sensor condition if the detected Vsg value is out of the 4.0 ±0.1 V range three consecutive times during the process control self check. After that SC 385 is displayed and logged. Switching the main switch off/on recovers the machine and the toner supply method falls back to fixed supply mode.

If the abnormal condition is recovered during the next process control self check, the machine selects the fuzzy control mode again automatically.

1.4.5 Toner End Detection

(1) Toner Near-end Detection



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For detecting the toner near-end condition, this machine has two M/A thresholds (one for Bk toner and one for color toner). For each color, the machine counts the number of times that the current M/A is smaller than the threshold for that color. If this condition occurs 5 times consecutively, the machine detects a toner near-end condition.

(2) Toner End Detection

After the machine determines that a toner near-end condition exists for a color, the machine enters the toner end condition for that color after 10 copies, then it stops. But other color modes can be used. For example, if the cyan toner is in an end condition, black and white mode can still be used.

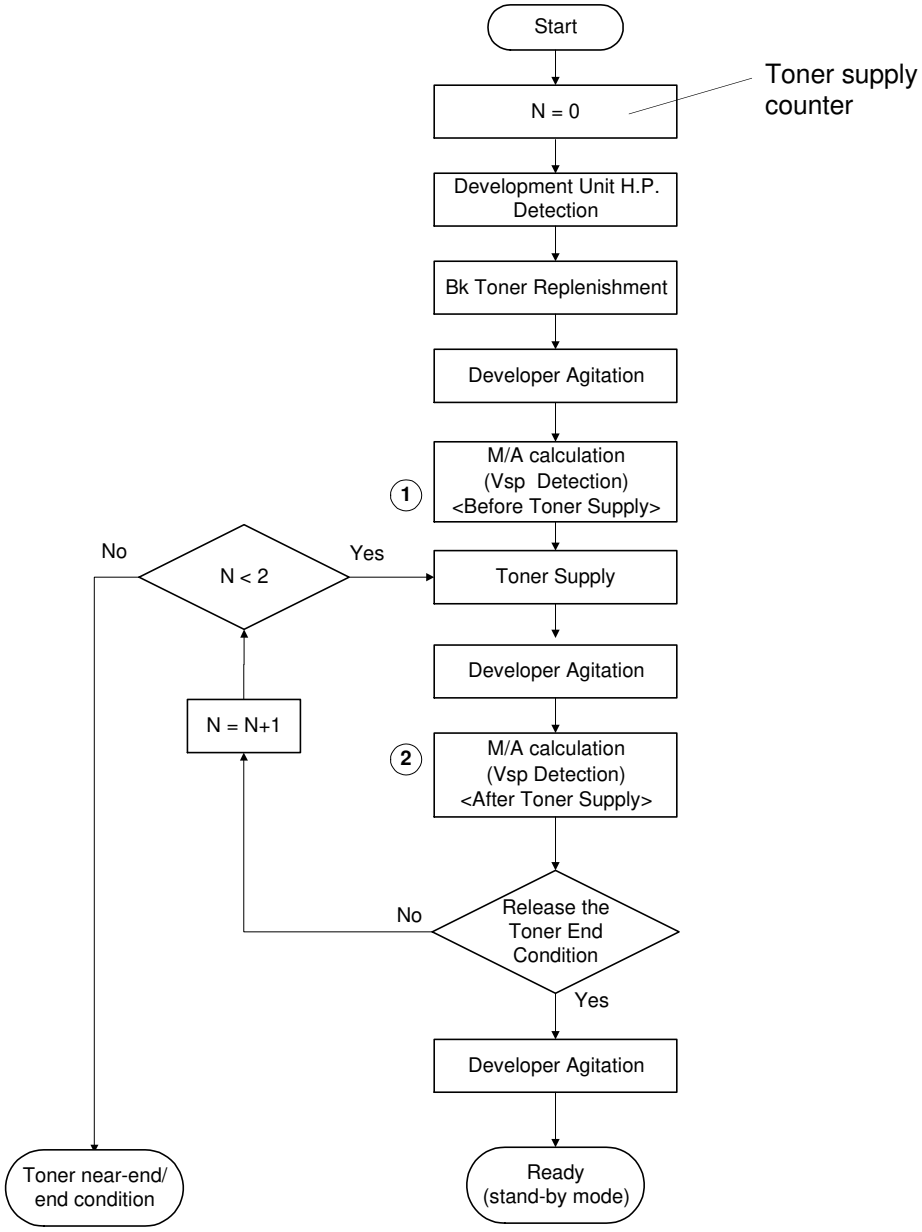
(3) Toner End Recovery

During a toner near-end or end condition, when the main switch is turned off/on or the front cover is opened and closed (including when toner is replaced), the toner end recovery procedure is performed for the color(s) in question.

The toner end recovery procedure is as follows. Also, refer to the flow chart.

1. The machine makes a toner pattern and compares the ID sensor reading from this pattern with a threshold value of M/A (point "1" on the flow chart), then supplies toner.
2. Then, the machine makes another toner pattern and reads the ID sensor output again (point "2" on the flow chart). If the pattern density is good, the machine releases the toner near-end/end condition. If it is not, the machine performs the toner supply routine again.

3. If the pattern density is not good after performing the toner supply two times, the machine goes to the toner near-end/end condition again.



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1.4.6 Developer Agitation

When the developer is replaced, the developer agitation must be performed to replace the toner in the development unit and to agitate the developer and the toner.

This machine has a program for the developer agitation in SP mode (SP 2-225).

When performing the developer agitation for all colors (SP2-225-5)†, the machine automatically performs the following steps.

1 *. The machine makes 12 patterns and calculates a suitable development potential → [Error Code No. 70, 78]**

2 *. The machine replaces the developer for each color. → [Error Code No. 71, 72, 78]**
- It makes a 1 x 1 dot pattern and a 2 x 2 dot pattern
- It agitates the toner and toner

3. The machine performs the process control self check, without the potential sensor calibration. → [Error Code No. 73, 79]**

4. The machine then performs a free run and checks the conditions. → [Error Code No. 74, 75, 79]**
   - It simulates making 10 copies with the 4 x 4 dot pattern.
   - It then checks the M/A and Vsg. (If these values are not in the proper range, the machine will make the pattern again, a maximum of 2 times.)

* : Steps 1 and 2 are performed continuously for each color (Bk → C → M → Y).

** : If an error occurs in any of these steps, one of the these error codes will be generated.

† : When only the black developer was replaced, enter SP2-225-1 in stead of SP2-225-5. When the cyan, magenta, and yellow developers were replaced, enter SP2-225-6 instead of SP2-225-5.

(1) Developer Agitation Result

When an error occurs during the developer agitation (SP2-225)†, the machine stops the sequence and generates/stores the error code in SP3-964. The machine also remembers when the error occurred in the sequence. Therefore, when performing the developer agitation (SP2-225-5)† after recovering the error, the developer agitation (SP2-225-5)† starts from a suitable point in the sequence.

This is the reason why the main switch should not be turned off and on basically after an error occurs.

For the developer agitation, steps 1 and 2 must be performed for all colors completely. This means that when error No. 70 to 72 and 78 is displayed, fix the problem and perform the developer agitation (SP2-225-5)† until the error code does not appear.

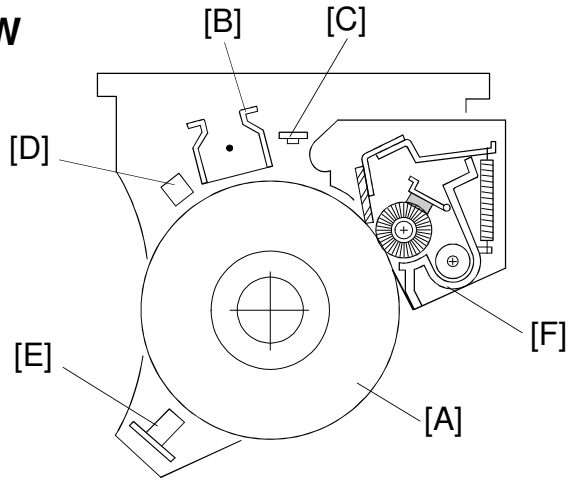
(2) Developer Agiation Error Code Table

Code No.	Error	Causes and Measures
1	No error	–
70	Developer Characteristic Error	When making the 12-grade pattern, the calculated parameters (γ, Vmin, Vk) are not in the proper range. ↓ Wait 10 minutes, then perform the forced process control self check (SP3-126). Check the result with SP3-975 and follow the flow chart for developer agitation in section 3. Installation from the SP3-975 result diamond.
71	M/A Detection Error	In spite of consuming toner, M/A is larger than the proper value. (>M/Aref-0.04) or (>M/Aref) ↓ Check whether ID sensor is dirty. Clean the ID sensor. If the ID sensor is very dirty, check setting of the air duct for the ID sensor. Wait 10 minutes, then perform the forced process control self check (SP3-126). Then perform the developer agitation for all colors (SP2-225-5)†.
72	Toner End	The M/A is smaller than the threshold for toner end condition during the toner replacement in the development unit. ↓ **Note:** When this code is displayed, never turn off the main switch. Make a copy with the color for which a toner end condition has been detected. Then replace the toner cartridge following the guidance on the LCD. After the toner cartridge replacing, perform the developer agitation for all colors (SP2-225-5)†.
73	Process Control Error	Process control self check error between developer agitations. ↓ Check the process control self check result code in SP3-975, then enter the SP2-225-5† without turning the main switch off/on. If this code No. 73 is displayed again, fix the problem using the process control error code table in section 2. (1.3.14.), then perform the developer agitation for all colors (SP2-225-5)†. But if the main switch is turned off and on, wait 10 minutes then perform the forced process control self check, then make 20 full color copies with A4/LT size of the lower side on the C-4 chart. This step finishes the developer agitation.

Code No.	Error	Causes and Measures
74	Free Run Error with Toner End	The M/A is smaller than the threshold for a toner end condition after the free run. ↓ Make a full color copy. Then replace the toner cartridges following the guidance on the LCD. After recovering the toner end condition, perform the developer agitation for all colors (SP2-225-5)†. But if the main switch is turned off and on, wait 10 minutes then perform the forced process control self check, then make 20 full color copies with A4/LT size of the lower side on the C-4 chart. This step finishes the developer agitation.
75	Free Run Error with Dirty Background	Vsg_ptn is smaller than the proper value (≤ Vsg_ave-0.4) after the free run. ↓ Without turning the main switch off/on, perform the developer agitation for all colors (SP2-225-5)†. If this error code is displayed again or the main switch is turned off and on, make full color copies until the dirty background disappears. This step finishes the developer agitation.
78	Developer Agitation Error Before Process Control	When the machine detects an SC or covers open during the developer agitation before the process control self check. ↓ Exit the SP mode to check the SC code. Fix the SC problem with the SC code table in section 7 or check whether the covers are open. Without turning the main switch off/on, perform the developer agitation again (SP2-225-5)†.
79	Developer Agitation Error After the Process Control	When the machine detects an SC or covers open during the developer agitation after the process control self check. ↓ Exit the SP mode to check the SC code. Fix the SC problem with the SC code table in section 7 or check whether the corers are open. Without turning the main switch off/on, perform the developer agitation again (SP2-225-5)†. When the main switch is turned off and on, wait 10 minutes then perform the forced process control self check. After that, make 20 full color copies of the lower part of the C4 chart with A4/LT size, then the procedure is finished.

2. DRUM UNIT

2.1 OVERVIEW



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The drum unit consists of the drum [A], the charge corona unit [B], the quenching lamp [C], the drum potential sensor [D], the ID sensor [E], and the cleaning unit [F].

An organic photoconductor drum (diameter: 80 mm) is used in this machine. The cleaning unit is at the upper right side of the drum, and the cleaning component faces downwards. It is a part of the drum unit, and is removed and attached with the drum as a unit. This prevents toner from spilling out of the cleaning unit.

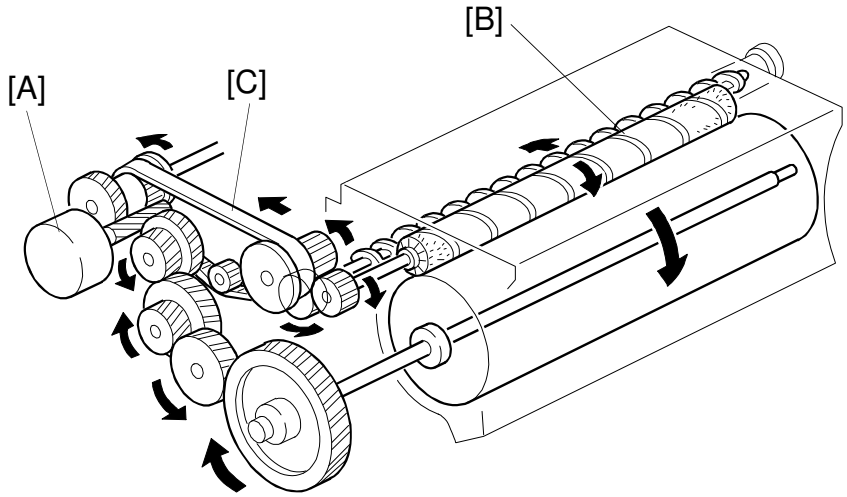
2.1.1 OPC Drum Characteristics

An OPC has the characteristics of:

1. Being able to accept a high negative electrical charge in the dark. (The electrical resistance of a photoconductor is high in the absence of light.)
2. Dissipating the electrical charge when exposed to light. (Exposure to light greatly increases the conductivity of a photoconductor.)
3. Dissipating an amount of charge in direct proportion to the intensity of the light. That is, where stronger light is directed to the photoconductor surface, a smaller voltage remains on the OPC.
4. Being less sensitive to changes in temperature (when compared to selenium F type drums).
5. Being less sensitive to changes in rest time (light fatigue). This makes it unnecessary to compensate development bias voltage for variations in rest time.

2.2 MECHANISMS

2.2.1 Drive Mechanism



A166D602.wmf

The drum is driven by the drum motor [A], which is a brushless motor. This motor contains a drive controller circuit, which controls the drum rotation.

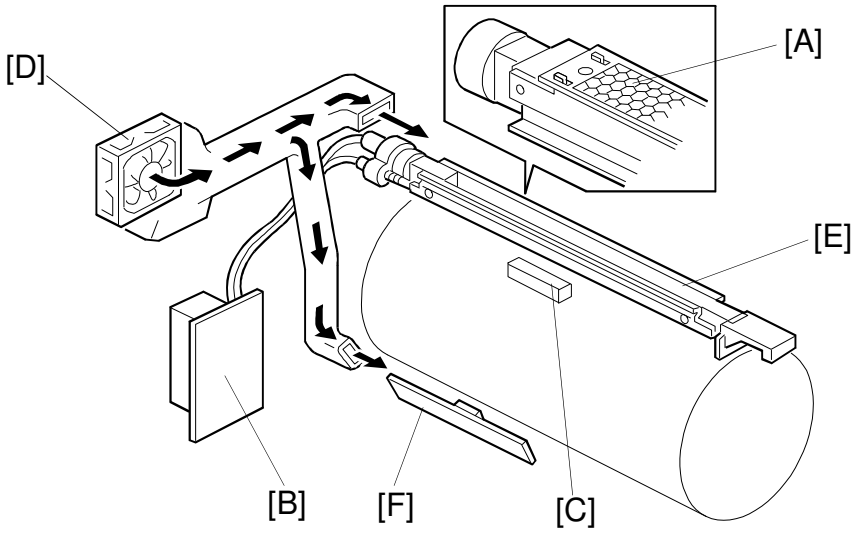
A fly-wheel on the end of the drum shaft stabilizes the rotation speed. This prevents banding on copies.

The cleaning mechanism is also driven by the drum motor. The drive from the drum motor is transmitted to the cleaning brush [B] via the timing belt [C].

The drum speed is 105 mm/s.

The drum motor also drives the transfer belt.

2.2.2 Drum Charge



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This copier uses a single corona wire scorotron system to charge the drum.

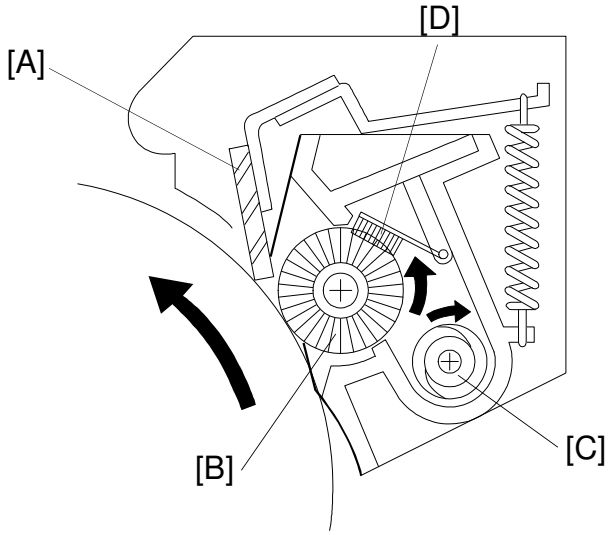
The single corona wire applies a negative charge to the drum surface (–670V is the standard voltage). The honeycombed stainless steel grid plate [A] makes the corona charge uniform and controls the amount of negative charge on the drum surface by applying the negative grid bias voltage.

The high voltage supply board [B] gives a constant corona voltage (–5 kV) to the corona wire, and controls the grid voltage to maintain proper image density.

The drum potential sensor [C] checks the drum surface voltage. The machine uses the output to maintain a constant development potential (see the Process Control section for more details).

The charge fan [D] provides a flow of air through the corona unit in order to prevent an uneven build up of negative ions. This helps maintain even image density and keeps the ID sensor [F] clean.

2.2.3 Drum Cleaning



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This copier uses a counter blade system with a lubricant bar to clean the drum.

1. Counter Blade

The cleaning blade [A] is angled against drum rotation by the pressure spring. The counter blade system has the following advantages:

- Less wearing of the cleaning blade edge
- High cleaning efficiency

The cleaning pressure is continuously applied with a pressure spring. The cleaning brush [B] spreads out the toner remaining on the drum, which makes it easier for the cleaning blade to remove. The brush collects toner from the drum surface and the toner remaining on the drum is scraped off by the cleaning blade [A]. The toner falls onto the toner collection coil [C]. The toner collection coil transports the toner to the used toner tank.

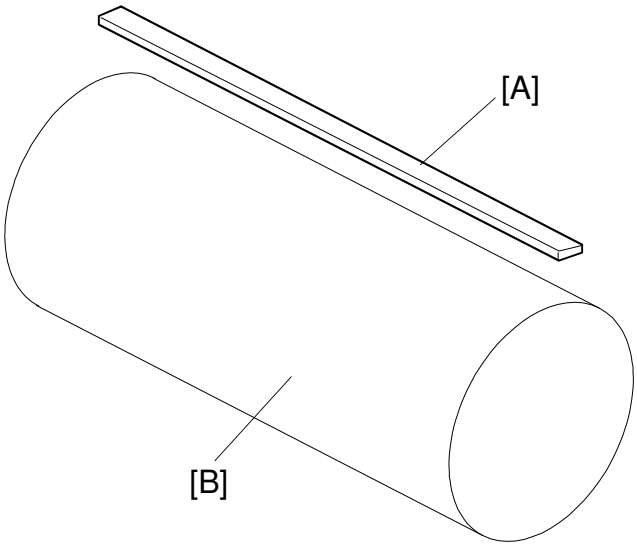
At the end of the copy job, the drum motor turns in reverse for about 7 mm (0.06 s) to remove the accumulated toner at the edge of the cleaning blade. The accumulated toner is then removed from the drum by the cleaning brush.

2. Lubricant Bar

The lubricant bar [D] applies lubricant to the drum via the cleaning brush. The lubricant bar presses against the cleaning brush in due to its own weight and a spring's pressure.

The lubricant bar system improves cleaning efficiency, resulting in improved image sharpness.

2.2.4 Quenching



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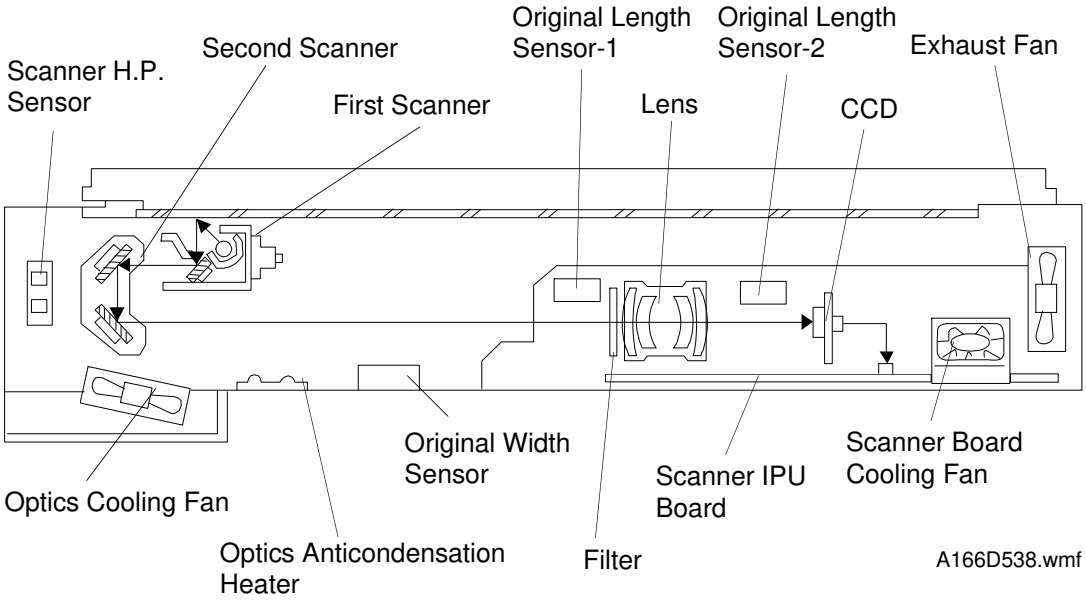
In preparation for the next copy cycle, light from the quenching lamp [A] neutralizes any charge remaining on the drum [B].

The quenching lamp turns on at the same time as the drum motor activates.

Red LEDs are used for the quenching lamp to reduce ultra-violet light that would cause light fatigue on the OPC drum.

3. SCANNER UNIT

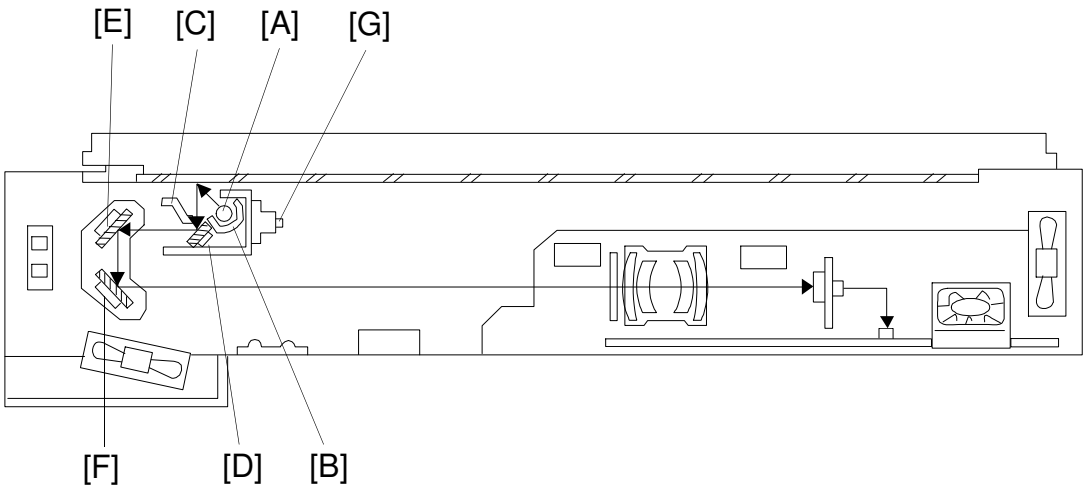
3.1 OVERVIEW



An image of the original illuminated by the exposure lamp (a halogen lamp) is reflected onto a color CCD (Charge Coupled Device) via the 1st, 2nd, and 3rd mirrors, filter, and lens. The filter removes infra-red; this is particularly important for glossy photos containing black areas, which can appear reddish in copies.

The number of scans depends on the copy mode (black, full color, auto color select, or single color). The scanner moves 4 times at most, once for each development cycle. The order of the cycles is black, cyan, magenta, and yellow. The CCD is a one-chip color CCD with an RGB color filter. The scanning resolution is 400 dpi (5,000 pixels).

3.2 SCANNER



A166D538-2.wmf

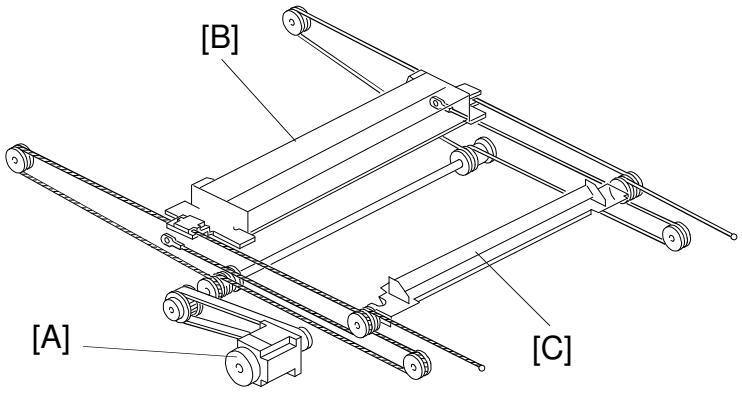
The 1st scanner consists of the exposure lamp [A], main [B] and sub [C] reflectors, and 1st mirror [D]. This model uses a halogen lamp with eight elements and a frosted surface for the exposure lamp. This ensures even exposure in the main scan direction.

The exposure lamp is energized by a dc supply to avoid uneven light intensity caused by power fluctuations while the 1st scanner moves in the sub scan direction. The sub reflector is shaped so that light will expose the original evenly. This reduces shadows on pasted originals.

The 1st [D], 2nd [E], and 3rd [F] mirrors have glass on the reverse sides to increase their weight. This prevents the mirrors from vibrating.

The thermoswitch [G] in the 1st scanner protects against overheating. It will turn off at around 140°C.

3.3 SCANNER DRIVE



A166D539.wmf

A five-phase stepper motor [A] drives the scanner. The 1st [B] and 2nd [C] scanners are driven by this scanner drive motor [A] via 2 scanner wires. The wires at the front side and the rear side are the same, for easy assembly.

In full size mode, the 1st scanner speed is 105 mm/s during scanning, and 720 mm/s when the scanner returns. The 2nd scanner speed is half that of the 1st scanner.

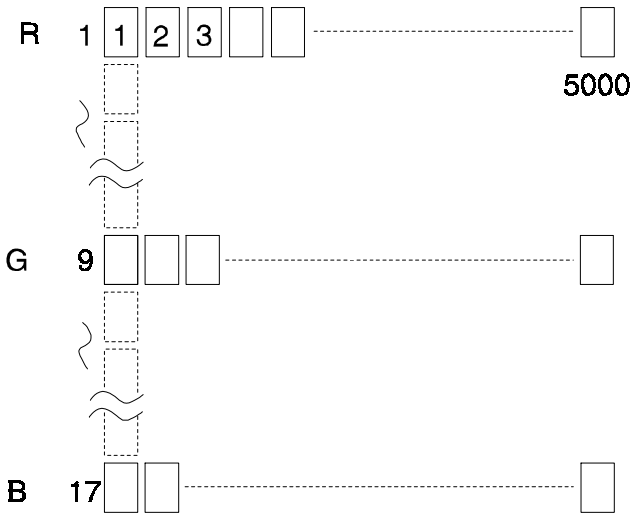
	Forwarding Speed	Returning Speed
Full Size Mode	105 (mm/s)	720 (mm/s)
Reduction or Enlargement Mode	105/M (mm/s)	720 (mm/s)

In reduction or enlargement mode, the scanning speed depends on the magnification ratio (M: 0.25 to 4.00) i.e., 105/M mm/s. The returning speed is always the same (720 mm/s). The image length change in the sub scan direction is done by changing the scanner speed, and in the main scan direction it is done by image processing on the scanner IPU board.

The number of scans depends on the color selection mode as shown in the following table:

Mode		Number of Scans	Development Order
Black and White		1	Bk
Auto Color Selection	For Black and White Originals	1	Bk
	For Colored Originals	4	Bk → C → M → Y
Single Color	For C, M, Y	1	C, M, Y
	For B, G, R	2	C → M, C → Y, M →Y
Full Color		4	Bk → C → M → Y

3.4 COLOR CCD



A166D540.wmf

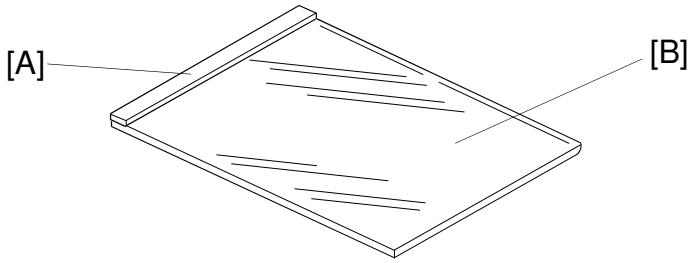
The color CCD converts light reflected from the original into three analog signals, one for each of the three basic colors Red, Green, and Blue. The signals are called the R, G, and B signals. Each of the four scans (for toner colors YMCK) uses all three signals (RGB).

The CCD consists of three lines of 5000 elements at a resolution of 400 dpi (15.7 dots/mm). To make the R, G, and B signals, each line has a color separation filter (R, G, or B).

The lines are spaced 8 pixels apart for full size magnification. To correct for these spacings, the R, G, and B signals must be synchronized. This is done by delay memories in the scanner IPU board (refer to the Image Processing section).

The CCD is mounted on the board with the lens block (the assembly is known as the SBU: Sensor Board Unit). Therefore, to replace the CCD, replace the SBU.

3.5 WHITE PLATE SCANNING



A166D541.wmf

There is a white plate [A] for auto shading, stuck on the exposure glass [B] underneath the left scale. When this white plate is exposed, the output from all the CCD elements in a line should in theory be equal, but actually they are not, because of the following:

* Variations in sensitivity between elements of the CCD

* Variations in characteristics of lens and mirror reflectivity

* Loss of brightness toward the ends of the exposure lamp

To correct for this uneven output from the CCD elements, the light reflected from the white reference plate is scanned. This is known as auto shading.

Auto shading is done every copy cycle at the scanner home position before starting the first scan.

3.6 SCANNER IPU BOARD

The scanner IPU board processes the RGB signal received from the CCD board and controls the following under directions from the main control board.

1. Controls the exposure lamp on/off switching and the voltage

2. Controls the speed of the scanner drive motor

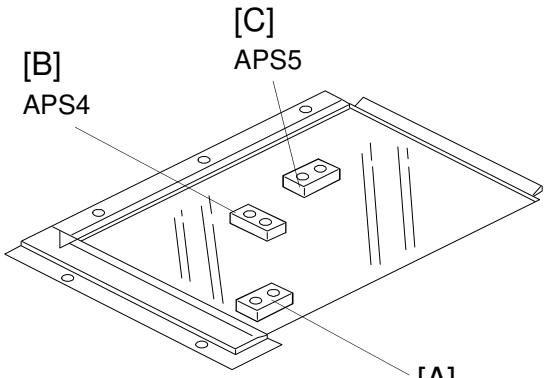
3. Detects the original paper size

4. Controls on/off switching for the four fans

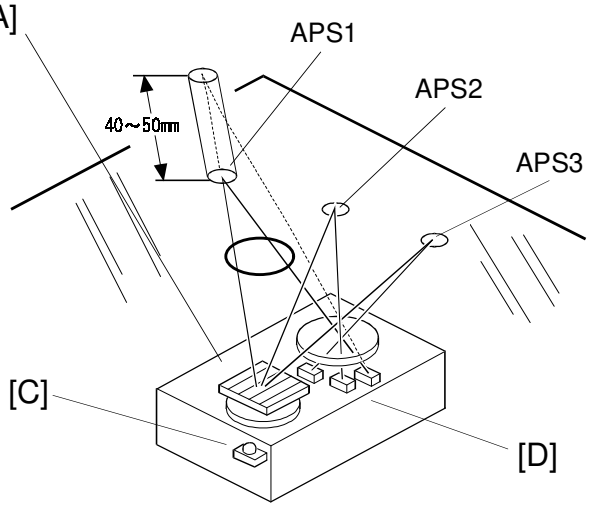
5. Supplies the clock signal for the CCD board

6. Detects the home position of the scanner unit

3.7 ORIGINAL SIZE DETECTION



A166D542.wmf

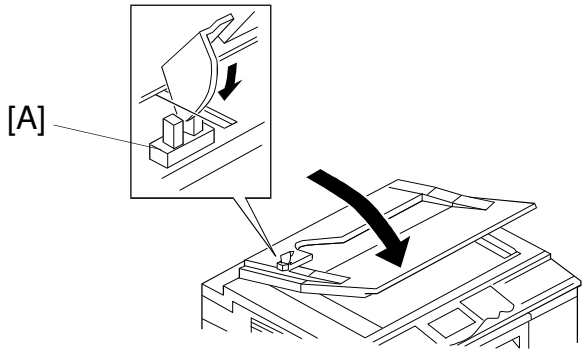


A166D543.wmf

There are three reflective sensors (APS sensors) in the optics cavity for the original size detection. The original width sensor [A] detects the original width, while the original length sensor -1 [B] and original length sensor -2 [C] detect the original length.

Inside the original width sensor [A], there is an LED [C] and three photoelectric devices [D].

The light generated by the LED is broken up into three beams, and each beam scans a different point of the exposure glass. The original length sensors [B], [C] use only one beam. If the original or platen cover is present over the scanning point for a particular sensor, the beam is reflected. Each reflected beam activates a photoelectric device.



A166D544.wmf

Original Size		APS1	APS2	APS3	APS4	APS5	
A4/A3 Version (metric)	LT/DLT Version (inch)						
A3	11x17	1	1	1	1	1	
B4	10x14	1	1	1	1	0	
F (8"x13")	8 1/2x14	1	1	1	0	0	
A4-L	8 1/2x11	0	1	1	0	0	
A4-S	11x8 1/2	0	0	1	1	1	
B5-L	-	0	1	0	0	0	
B5-S	-	0	0	1	1	0	
A5-L	5 1/2x8 1/2	0	0	0	0	0	See Note
A5-S	8 1/2x5 1/2	0	0	1	0	0	

L: Lengthwise S: Sideways

NOTE:
This machine cannot recognize the original size when A5 lengthwise/HLT paper or smaller is set on the exposure glass. Therefore, when all sensor outputs are off, the machine will either detect A5 lengthwise/HLT or cannot detect original size (this depends on SP 4-303).

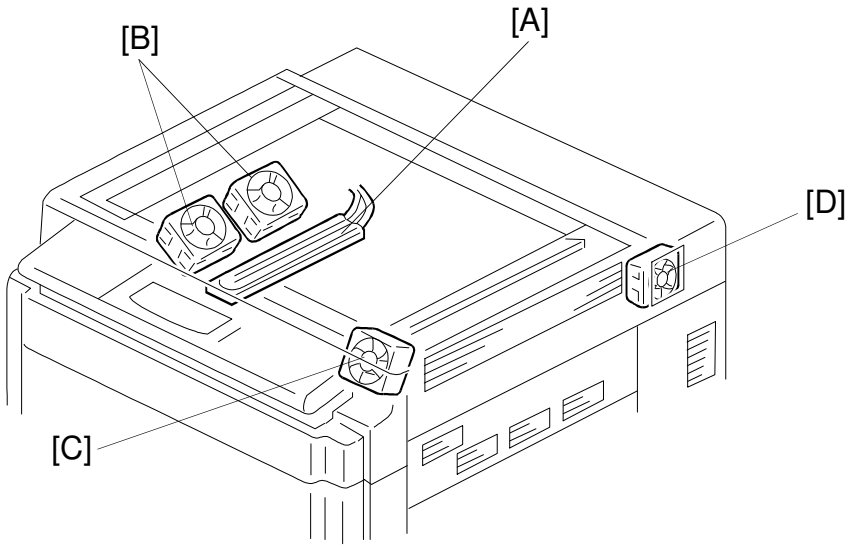
While the main switch is on, these sensors are active and the original size data is always sent to the main CPU. However, the main CPU checks the data only when the platen cover is opened.

The check is done when the platen cover position sensor [A] turns on. This is when the platen is positioned about 15 cm above the exposure glass. At this time, only the sensors located underneath the original receive the reflected light and are on. Other sensors are off.

The main CPU can recognize the original size from the on/off signals from the sensors. If the copy is made with the platen open, the main CPU decides the original size from the sensor outputs when the start key is pressed.

This original size detection method eliminates the necessity for a pre-scan and increases the machine's productivity.

3.8 OTHERS



A166D545.wmf

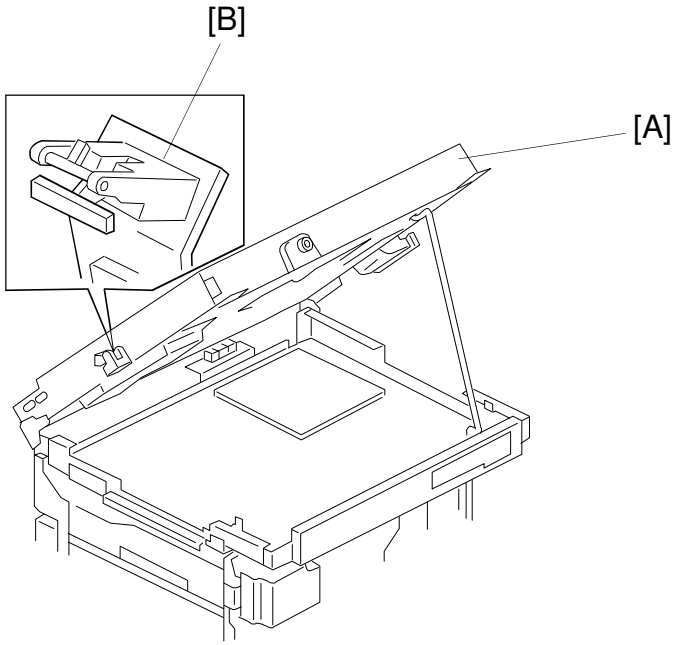
(1) Anti-condensation Heater

An anti-condensation heater [A] is installed on the left side of the optical base plate. It turns on when the main switch is off, to prevent moisture from forming on the optics.

(2) Fans

1. Optics Cooling Fan
   Two optics cooling fans [B] are located at the left side of the optics cavity. These fans blow air into the optics cavity to prevent the exposure lamp and optics cavity from overheating during copy cycles. This fan rotates only when the exposure lamp is on.
2. Scanner Board Cooling Fan
   The scanner board cooling fan [C] blows air into the optics cavity to keep the scanner IPU board and the SBU from overheating. This fan rotates always when the main switch is on.
3. Optics Exhaust Fan
   The optics exhaust fan [D] is located at the right side of the optics cavity under the lens housing cover. This fan blows air out to keep the scanner motor, the scanner motor drive board, the lamp regulator, and IDU board from overheating. This fan rotates only when the exposure lamp is on.

(3) Scanner Unit

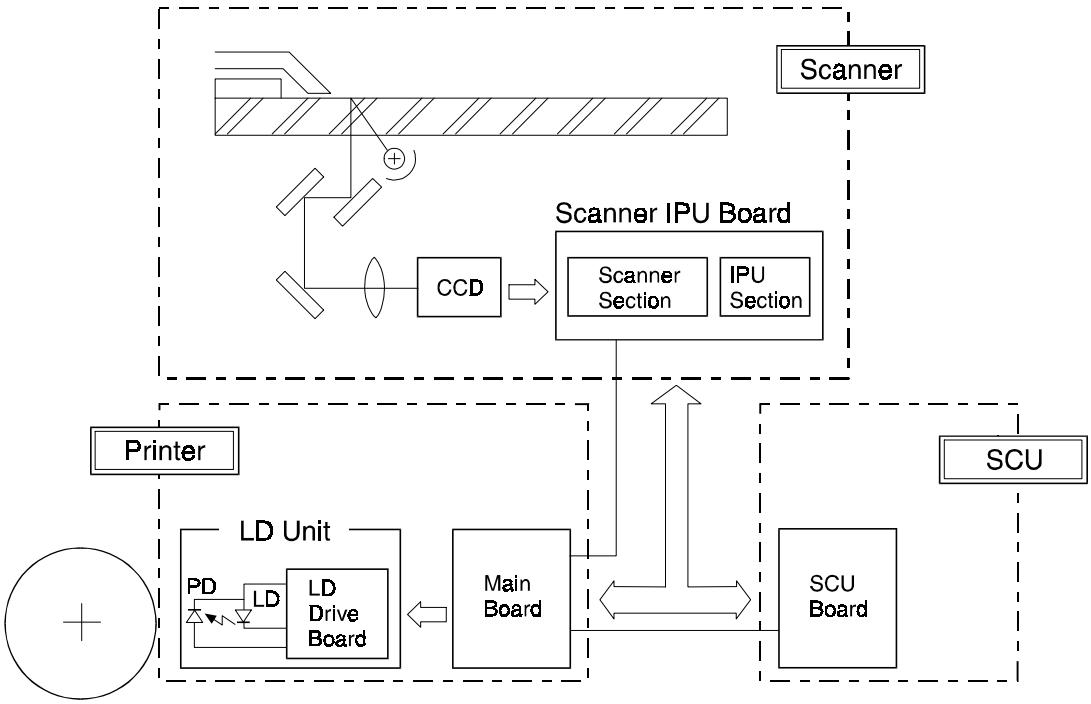


A166D546.wmf

For field servicing, the scanner unit [A] can be opened. When the scanner unit is lifted, the actuator of the scanner unit lift sensor [B] moves out of the sensor. Then, for safety, the CPU disables the scanner motor. The start key stays red under this condition.

4. IMAGE PROCESSING

4.1 OVERVIEW

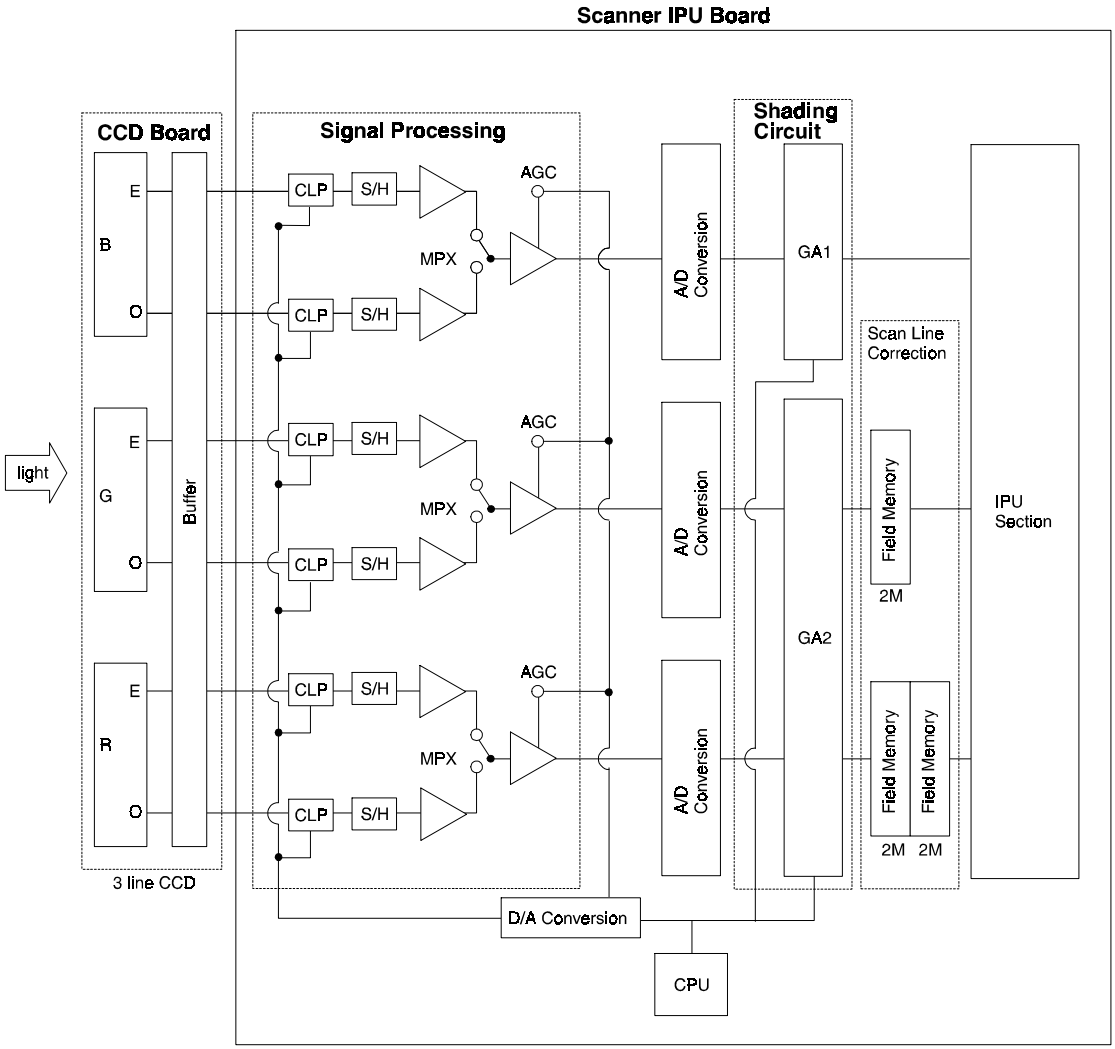


A166D500.wmf

The light from the halogen lamp is reflected by the original onto the CCD board. The CCD board has a CCD (Charge Coupled Device) with a three-line (RGB) filter. The reflected light is converted to analog image data signals, and these are transferred to the scanner IPU board. The scanner IPU board does the following: A/D conversion (to 8-bit data), shading, D/A conversion for compensations, scan line correction, and image processing. The processed digital video signals (4 bits per pixel for each color: K, C, M, Y) are sent to the printer unit through the data bus. Note that the 8-bit data is converted to 4-bit data; this is to reduce processing time in the printer section.

The SCU board contains default settings for the various video processes.

4.2 SCANNER SECTION BLOCK DIAGRAM



A166D501.wmf

CLP (Clamp): Defines the standard black level signals for the black signal.
S/H (Sample and Hold): Samples the analog image data signals.
MPX (Multiplexer): Combines the even-pixel and odd-pixel analog signals.
AGC (Auto Gain Control): Controls the amplification factor for the signals, using the white level data feedback signal.

4.3 SCANNER SECTION

4.3.1 Photoelectric Conversion

The color CCD converts the light reflected from the original into RGB analog signals (4.475 MHz for each signal: even-pixel and odd-pixel). Each CCD line has 5,000 pixels and the resolution is 400 dpi (15.7 pixels/mm).

4.3.2 Signal Processing

(1) Signal Amplification
Odd-pixel and even-pixel RGB analog signals from the CCD are amplified by operational amplifiers.

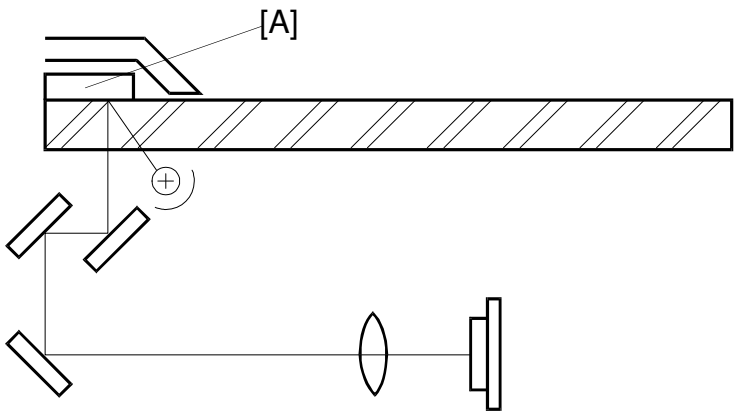
(2) Signal Composition
The amplified signals (even-pixel and odd-pixel for each RGB color) are combined by the MPX before A/D conversion.

(3) Feedback
The CPU on the scanner IPU board receives the feedback data for white level and black level from the shading circuits and feeds it to the CLPs and the operational amplifiers through the D/A converter (see section 4.3.5, D/A conversion). The feedback data from the CPU are updated every time the main switch is turned on.

4.3.3 A/D Conversion

The A/D Converter converts the analog signals (each RGB color) to digital signals of 8 bits (256 grades) per pixel.

4.3.4 Shading Circuit



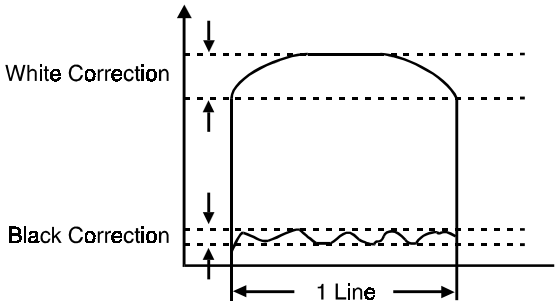
A166D502.wmf

(1) Shading Compensation (GA1, GA2)

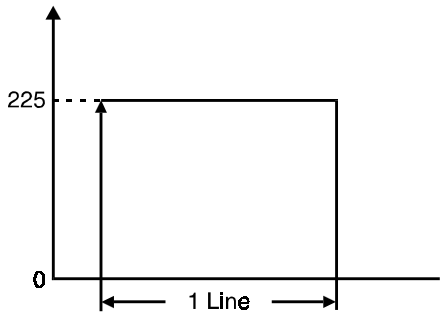
Before scanning each original, the machine generates a reference white waveform (also known as "white shading data") by scanning 5 mm of the white reference plate [A] in the sub-scan direction (this equals 79 lines at 100% magnification).

The white shading data is calculated for each pixel across the main scan. To do this for a particular pixel, it takes the white levels for that pixel on each of the main scan lines taken from the white reference plate, and calculates a value from these. The white waveform is made by repeating this process for each pixel across the main scan.

To improve image reproduction for high density areas, the machine also measures the black shading data. It does this by reading the black video level at the first 4 pixels of the CCD, which should be black because these pixels are masked off. The average of the 4 pixels is represented as the black shading data for one CCD scan line.



A166D503.wmf



A166D504.wmf

The video signal for each pixel obtained during image scanning is corrected by the shading circuit as follows:

$$\frac{\text{(Video data for each pixel)} - \text{(Black shading data for each line)}}{\text{(White shading data for each pixel)} - \text{(Black shading data for each line)}} \times 255$$

The white shading data are updated before every first scanning (2C and 4C mode) or every scanning (1C mode). The black shading data are updated every scan line. The white shading data corrects the image data for irregularities in the CCD and the optics across the main scan. The black shading data corrects the image data for any changes in black level with time, as the machine scans down the page.

(2) Main Scan Timing

The GA1 block generates the synchronization signal for the CCD to scan and for feedback.

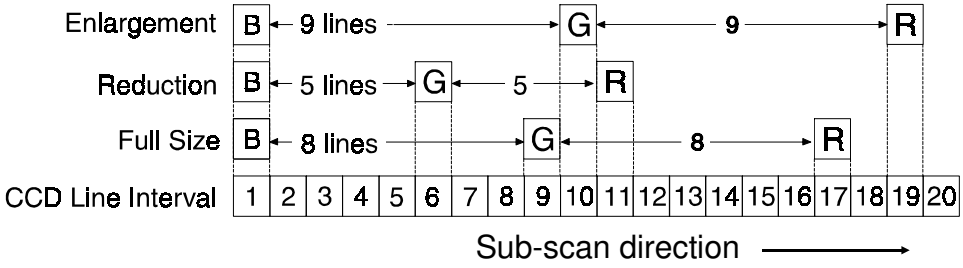
(3) Sub Scan Timing

The GA1 and GA2 blocks generate the synchronization signal for the scan line correction.

4.3.5 D/A Conversion

The CPU monitors the digital feedback signals from the shading circuits and calculates correction factors. Then the D/A circuit converts the signals from the CPU into analog signals and feeds them back to the operational amplifiers and the CLPs (see section 4.3.2.(3)). Black shading data is fed back to the CLPs to decide the reference black level. This is done every CCD pixel to calibrate the black level, to avoid drifts in the signal with time.

4.3.6 Scan Line Correction



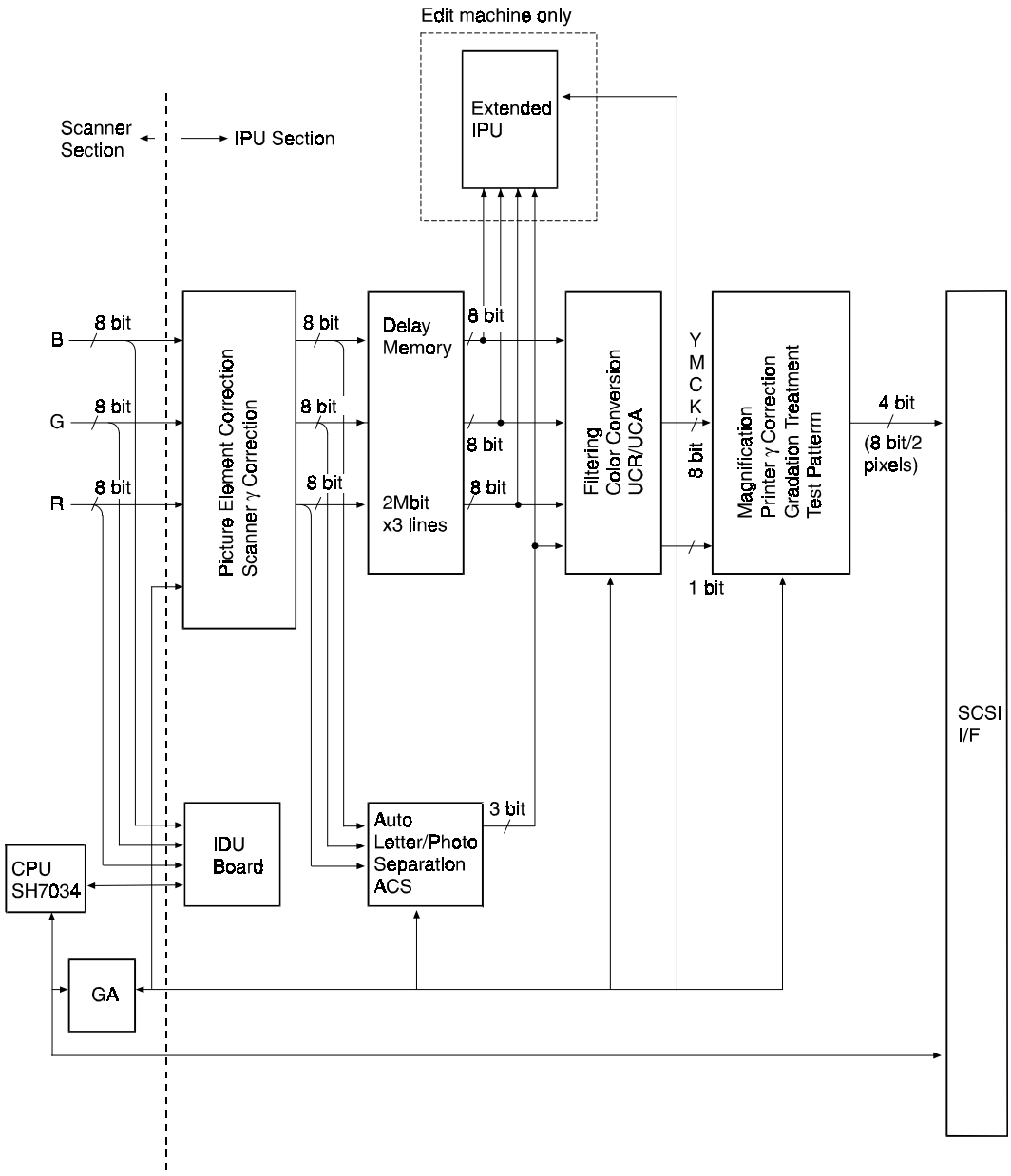
A166D505.wmf

The three CCD lines providing the RGB signals are spaced 8 lines apart on the original image, when full size magnification is used. To compensate for this discrepancy, the line correction circuits synchronize the output timing of the RGB signals to the IPU section by storing the scan data for each line in memory. As the discrepancy between RGB video signals changes depending on the magnification ratio, the correction data is calculated as follows:

- B: Standard (No correction)
- G: (8 lines) x (Magnification ratio)
- R: (16 lines) x (Magnification ratio)

If this calculation does not result in an integer, the correction data is set to the closest integer, but further correction is needed (refer to 4.5.1 (1) Picture Element Correction).

4.4 IPU SECTION BLOCK DIAGRAM

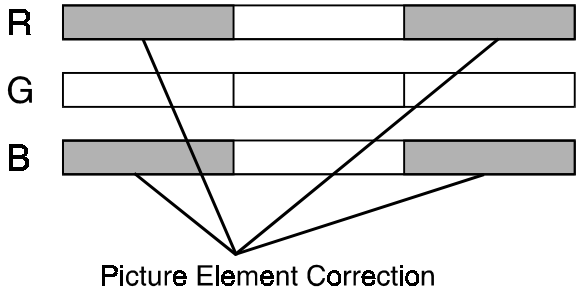


A166D506.wmf

4.5 IPU SECTION

4.5.1 Picture Element Correction and Scanner Gamma Correction

(1) Picture Element Correction



A166D509.wmf

The Picture Element Correction circuit does two things.

1. Completion of the Scan Line Correction process

The discrepancy in the spacing of the RGB signals from the CCD in the subscan direction is corrected by the line correction circuit in the scanner section (refer to 3-6. Scan Line Correction). However, if the correction data corresponding to the magnification ratio is not an integer, then further correction is needed to synchronize the RGB signals.

2. Correction if the CCD is not perpendicular to the light

If the CCD board is not perpendicular to the light axis, the position of each pixel is different from the original image position. This difference becomes larger towards the ends. Under this condition, vertical black lines (in the subscan direction) at the left and right edges of the original are colored because the Y, M, and C toner dots are not properly positioned. (An example of this is the vertical lines at the right and left edges of the C4 color chart.)

Therefore, the CCD line spacing is also corrected here. The target areas for this correction are shown above. The green CCD line is taken as a standard, and the ends of the red and blue lines are corrected. The vertical line correction level can be changed using SP mode (SP 4-932-1 to 4-932-4).

(2) Scanner Gamma Correction (RGB Gamma)

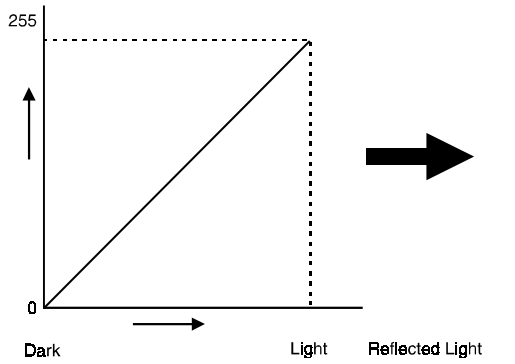


Fig. 1

A166D507.wmf

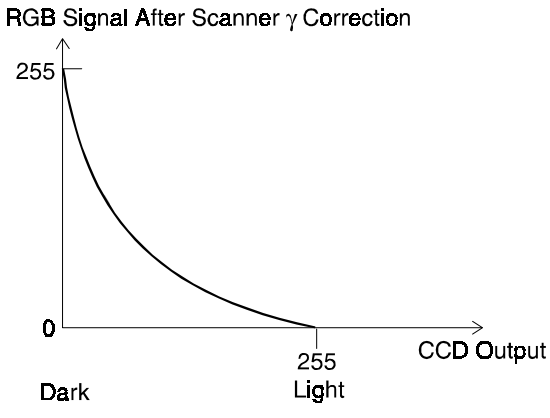


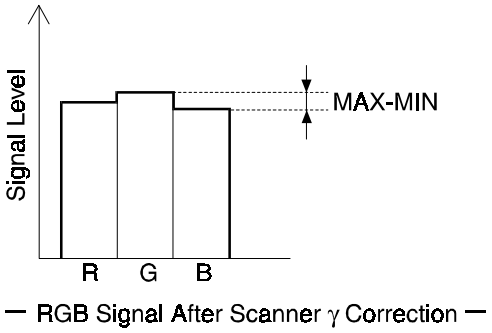
Fig. 2

A166D508.wmf

The RGB video signals detected by the CCD are converted to 8-bit digital signals in the scanner section and sent to the IPU section. These signals are proportional to the light intensity reflected from the original image (Fig. 1). However, the IPU section converts the signal levels as shown in figure 2 by using a gamma correction table in order to improve the accuracy of RGB to CMY color conversion, which is done later in the image process. The same table is used for R, G, and B signals. The scanner γ correction converts the video signal levels as follows:

	Dark (Black)	Light (White)
Scanner Input (RGB)	0	255
After γ Correction (RGB)	255	0
↓ Color Conversion		
Printer Output (CMY)	255	0

4.5.2 ACS (Auto Color Selection)



A166D510.wmf

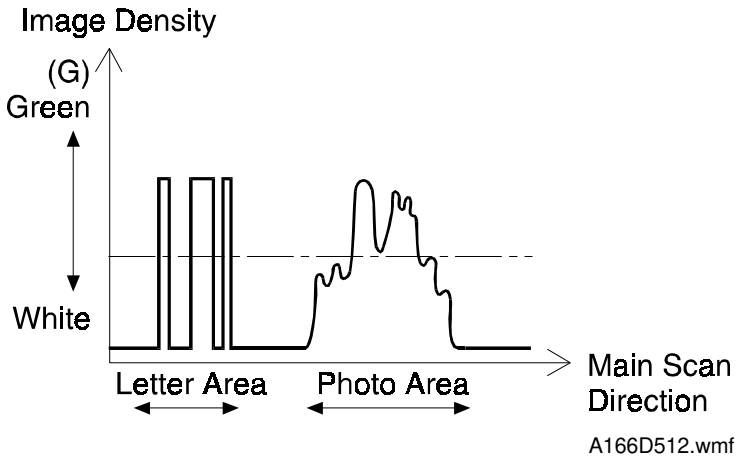
Auto color selection mode determines if an original is black/white or color. Then black copy mode or full color mode is automatically selected to match the original.

To recognize if the original has a color area or not, the RGB video signals are compared. If the maximum difference among RGB signal levels (MAX-MIN in the above diagram) is within a certain range, the original is considered to be black and white.

During the 1st scanning cycle, the latent image is developed with the amount of black toner as specified by the gamma-corrected RGB video signals. If the original does not have any color areas, the 2nd scanning is aborted and the developed image is transferred from the transfer belt to the copy paper. Then the black and white copy comes out. If the original has a color area, copying resumes in the full color copy mode (4 scans).

Users can maximize the quality of their output by selecting priority for Bk or Full color original in ACS mode, using a User Tool (the default is for Bk). The Bk setting prevents the UCR process from reducing the image density too much in low image density photo areas. This is explained in more detail in the section on UCR; see section 4.5.4.(6).

4.5.3 Auto Letter/Photo Separation

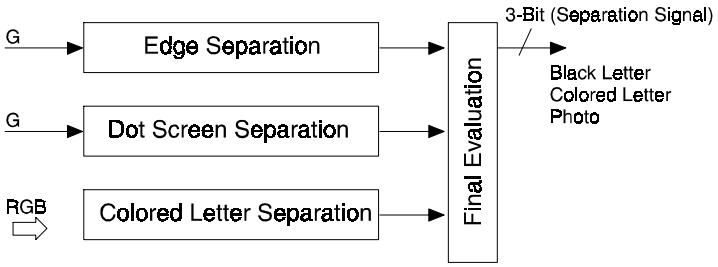


In auto letter/photo mode, the original image is separated into letter and photo areas (dot screen areas).

NOTE: "Letter" refers to an original or area of an original that contains text and/or line drawings.

Generally, letter areas have strong contrast between the image and the background. However, photo areas (dot screen areas) have a less extreme range of contrast levels.

By using these characteristics and the following separation methods, the original image is separated into black letter areas, colored letter areas, and photo areas in the final evaluation circuit.



A166D513.wmf

(1) Edge separation
The edge of letters and line diagram elements are separated by using the following characteristics:
Strong contrast, continuity of black or color pixels, continuity of white pixels around the black or color pixels
The machine can do this by referring to the green signal only.

(2) Dot screen separation
Dot screen areas are separated from non-dot screen areas (mainly letters) by using the following characteristics:
White pixels are not detected around the non-white pixels in dot screen areas. The machine can do this by referring to the green signal only.

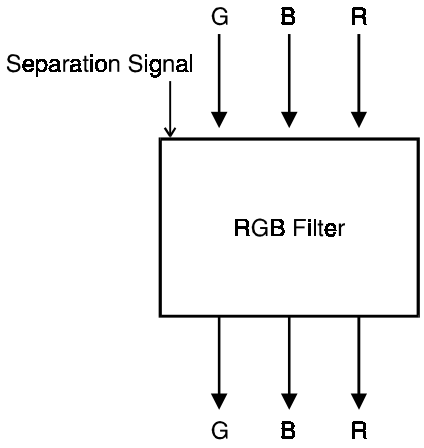
(3) Colored letter separation
Black pixels and color pixels in letter areas are identified by determining the difference among RGB maximum signal levels and the output levels of RGB video signals.

The separation signal accompanies the data as it passes to the further stages of image processing. The separation signal tells the image processing circuits whether the data is Black Letter, Color Letter, or Photo. The letter areas are processed in letter mode and the photo areas are processed in photo mode in the subsequent image processing steps.

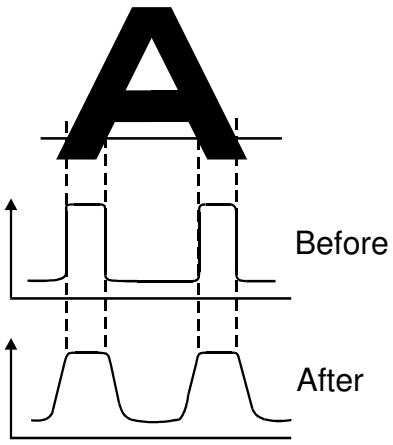
Auto letter/photo separation is mostly effective only for small letters or thin line diagram elements. If there are big letters or solid line drawing elements in the original, only the edges of these are processed using letter mode; the inner regions are processed using photo mode.

4.5.4 Filtering and Color Conversion

(1) RGB Smoothing Filter



A166D514.wmf

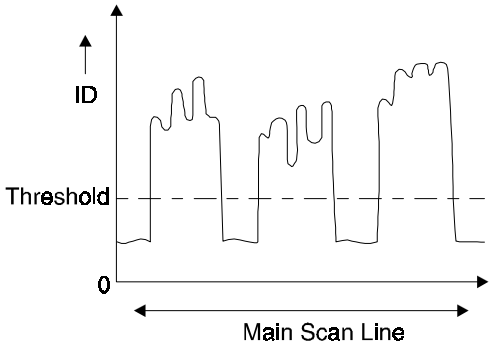


A166D515.wmf

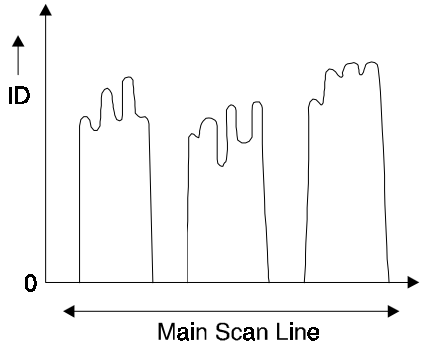
Depending on the results of auto letter/photo separation, the appropriate software filters are applied to the RGB video signals. The RGB smoothing filter is only applied to photo areas; signals from letter areas are not filtered.

(2) Background Density Control and ADS (Auto Image Density Selection)

a. Background Density Control



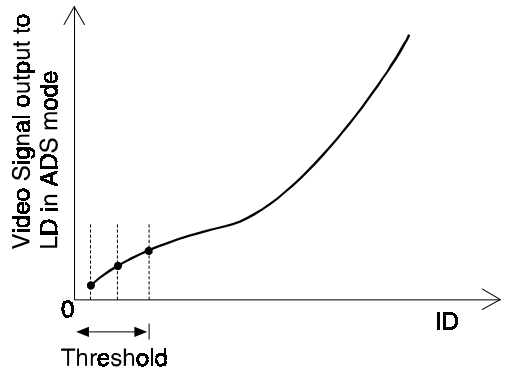
A166D522.wmf



A166D524.wmf

This function removes low ID image signals (background) that are less than a certain threshold. The threshold that is applied depends on the color mode (single color or full color). For each of these modes, the user can select a different threshold.

b. ADS (Auto Image Density Selection)



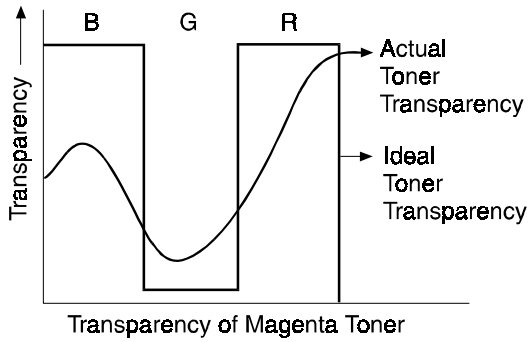
A166D523.wmf

In ADS, the user does not set the threshold; the machine calculates it, guided by input from the user (there are 4 settings for each mode: B/W or F/C).

In full color mode, after the first scanning (Bk) the machine calculates the threshold for removing background by referring to the RGB data taken from the whole of the original.

In black and white mode, the machine calculates the threshold for each pixel by referring to neighboring pixels.

(3) Color Conversion



A166D516.wmf

RGB video signals from each scanning cycle are converted to YMCK video signals using a matrix. The contents of the matrix depend on the selected modes. The transparency of each color toner is not ideal, as shown above. Color conversion compensates for the difference between ideal and actual characteristics.

The following modes affect the matrix operation:
Color conversion mode, Pastel mode, Color balance mode, Original mode (Printed Photo, Glossy Photo, Copied Photo), RGB toner correction mode

Toner \ Original Color	Bk	R	Y	G	C	B	M	W
Y	1	1	1	1	0	0	0	0
M	1	1	0	0	0	1	1	0
C	1	0	0	1	1	1	0	0
Bk	1	0	0	0	0	0	0	0

Color Conversion Table

a. **Color conversion mode**
Color conversion mode is a user feature, not to be confused with color conversion (RGB to CMYK) described above. In color conversion mode, a selected color (C/M/Y/R/G/B/K/W) on an original that falls within the recognition thresholds for that color is converted into a different color on the copy. Up to 4 colors can be converted at one time. Colors that can be converted to are C/M/Y/R/G/B/K/W, and 1 user color (edit machine only). Color conversion is done by changing the parameters of the matrix.
For example, when changing Yellow to Black, the coefficients for the Yellow video signal become as follows:
Y: 1, M: 1, C: 1, Bk: 1

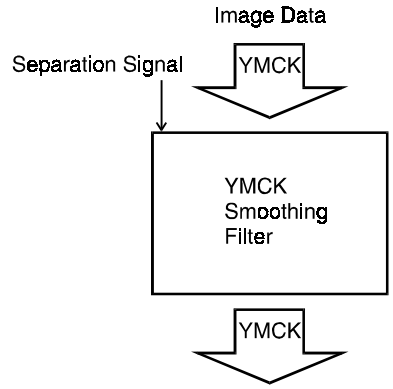
b. **Pastel mode**
In pastel mode, the parameters of the matrix are changed, and the output of the combined YMCK data is shifted to a value between 100 % and 25 %. There are 9 steps, and the value used depends on the user's selection.

c. **Color balance mode**
In color balance mode, the data output for each color (YMCK) are adjustable independently in 9 steps by changing the parameters of the matrix.

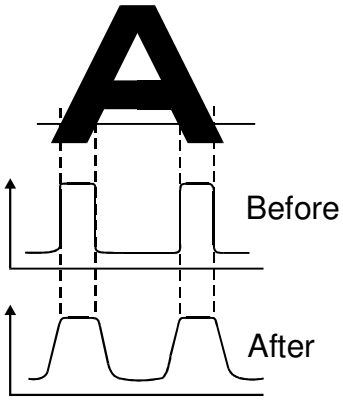
d. **Original mode**
This machine has three types of original mode for photo mode (Printed Photo, Glossy Photo, and Copied Photo). The most suitable matrix for the original type is applied using the "0" key. (See the operation manual.)

e. **RGB toner correction mode**
The toner mixing ratios for single colors (R/G/B) are adjustable (SP 5-611-1 to 5-611-6). The adjustments are valid for single color copy mode only.

(4) YMCK Smoothing



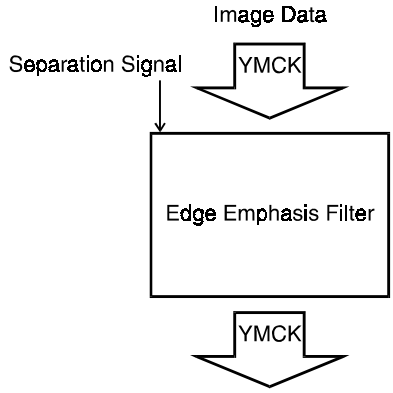
A166D518.wmf



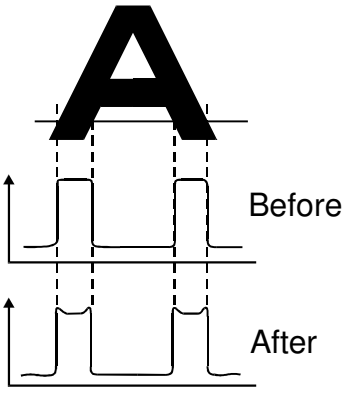
A166D519.wmf

The YMCK filter smooths the image data in photo areas only to give a softer image.

(5) Edge Emphasis Filter (High Contrast Filter)



A166D520.wmf



A166D521.wmf

The high contrast filter improves text and graphic elements in letter mode areas by making the edges in the copy stand out more clearly.

By changing the effect of the RGB smoothing filter, the YMCK smoothing filter, and the high contrast filter, the image can be made sharper or softer. The user can adjust this over 5 levels from the image adjustment screen.

(6) UCR (Under Color Removal)

Principle

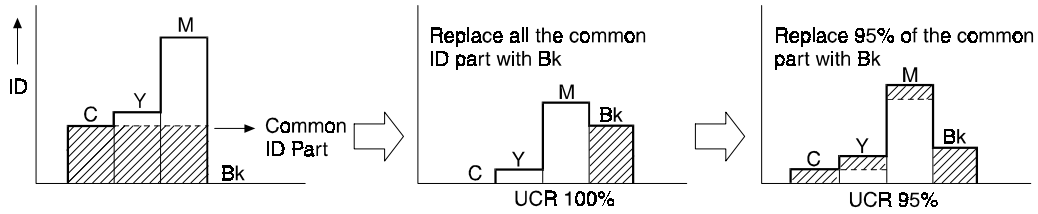


Fig. 7 A166D525.wmf

Getting the right colors using YMC toner addition does not always work perfectly. For example, if for each color (YMC) the same quantity of toner is put on the paper, ideally the image should become black, but in reality it becomes a dark color, such as dark blue.

To compensate for this, an equal portion of the common ID value for each color is subtracted. This reduces the amount of color toner on the paper, and a proportional amount of black toner is added. This process is known as UCR.

The UCR ratio is the percentage of the common ID value for YMC that is subtracted and converted to Black. In the above example, where the UCR ratio is 100%; the entire common ID value is subtracted from Y, M, and C, and converted to Bk.

In actual use, the UCR ratio depends on the color mode and the image density. For example, when the UCR ratio is 95%, 95% of the entire common ID value is subtracted from Y, M, and C, and converted to Bk.

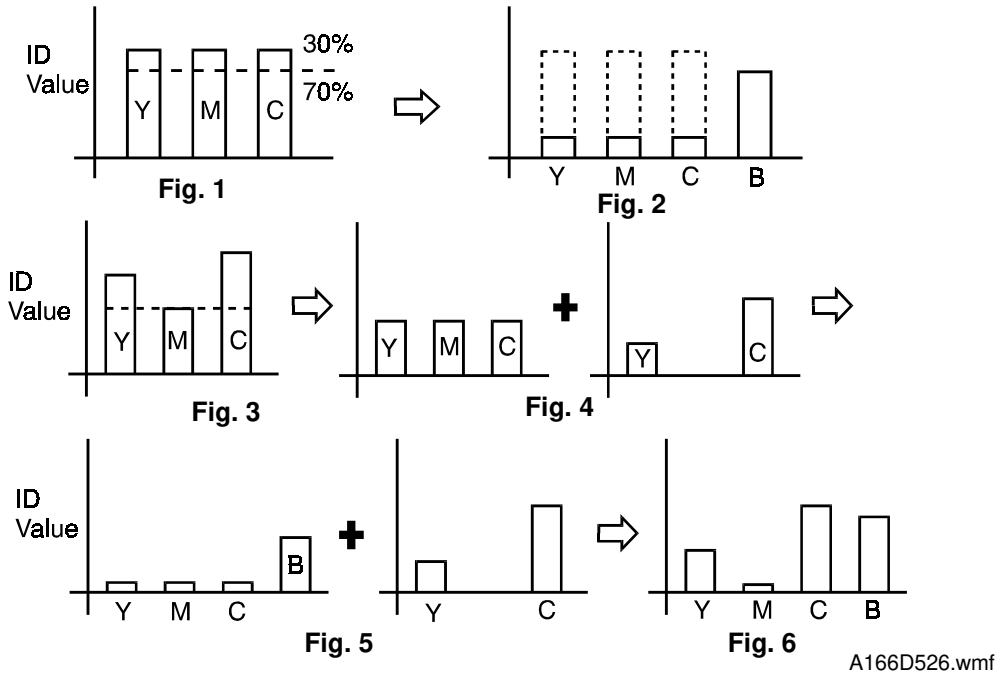


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

A166D526.wmf

In this example, the UCR ratio is 70%.

For a Black Image

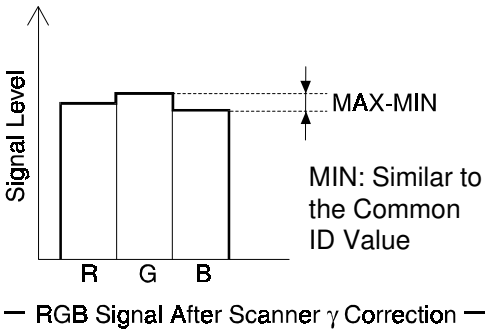
When a black image is copied, the ID values for all colors are equal (figure 1). For each color, the ID value is reduced by the UCR ratio (70% in the example). A black ID value equal to the 70% reduction is added to compensate for the color ID reduction (figure 2).

For a Color Image

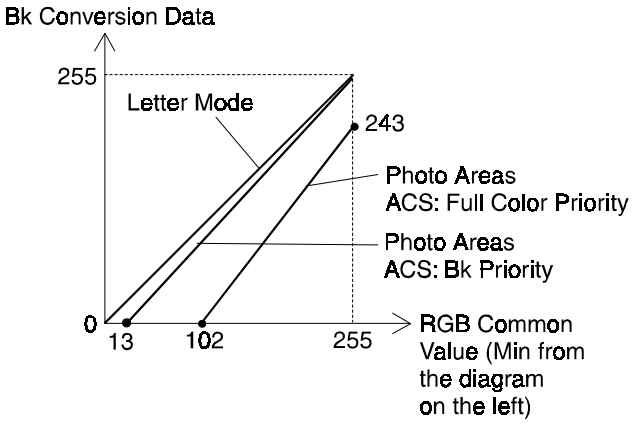
When a color image is copied, the color ID values are different from one another (figure 3). It is treated in two steps.

1. The ID value for this image is broken down into two parts (figure 4): a set of values equal to the lowest color ID value, and the remainders of the two higher values.
2. The part with the equal values is treated as a black image (see figures 1 and 2), using the 70% UCR ratio. The resulting amounts are then added to the remainders from step 1 (figure 5). The final result gives us the ID value for each color and for black (figure 6).

Changes in UCR Ratio with Image Density and Copy Mode



A166D510.wmf



A166D511.wmf

- Letter Areas -

The UCR ratio in letter areas is always 100%.

- Photo Areas, with ACS Priority set to Bk -

In photo areas, when the user sets the ACS priority to Bk, UCR begins to replace color toner with Bk toner at low image densities (when MIN is about 13). This is to prevent the UCR process from reducing the image density too much in low image density areas.

At this point, the UCR ratio is zero. As shown in the graph above right, it gradually rises with image density, and the UCR ratio is about 100% when MIN is 255.

- Photo Areas, with ACS Priority set to Full Color -

When the user sets the ACS priority to Full Color, the UCR process does not begin to replace color toner with Bk toner until a low-medium image density (when MIN is about 102).

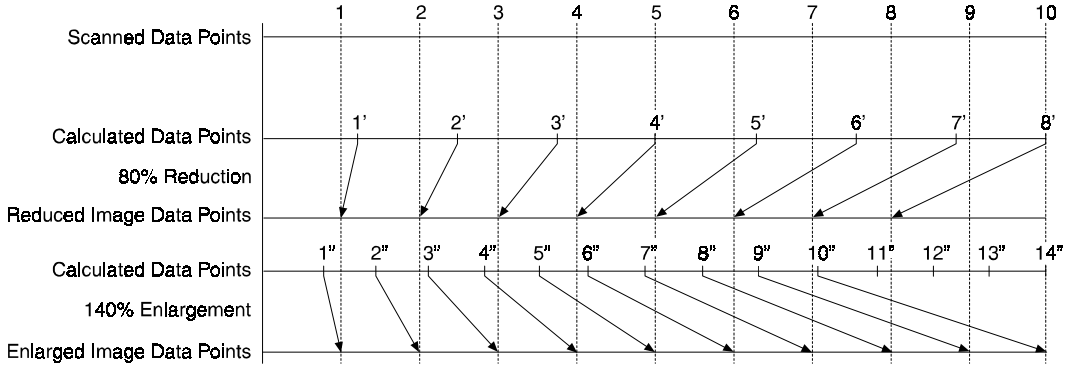
At this point, the UCR ratio is zero. It gradually rises with image density, and the UCR ratio is about 95% when MIN is 255.

UCA (Under Color Addition)

Using only UCR processing, the copy lacks depth. So, a specified ratio of toner is always added for each color (YMC only). The amount of additional toner is proportional to the density of that color on the copy. It is only done in letter areas.

The UCA level can be adjusted with SP 5-602-2.

4.5.5 Main Scan Magnification



A166D527.wmf

Reduction and enlargement in the sub scan direction are done by changing the scanner speed. However, reduction and enlargement in the main scan direction are handled by an LSI on the IPU Board.

Scanning and laser writing are done at a fixed pitch (the CCD elements cannot be squeezed or expanded). So, to reduce or enlarge an image, imaginary points are calculated that would correspond to a physical enlargement or reduction of the image. The correct image density is then calculated for each of the imaginary points based on the image data for the nearest two true points. The calculated image data then becomes the new (reduced or enlarged) image data.

NOTE: The actual calculations for main scan magnification are performed following the polynomial convolution method. This mathematical process is beyond the scope of a service manual and will not be covered here.

4.5.6 Gamma Correction (Printer Gamma)

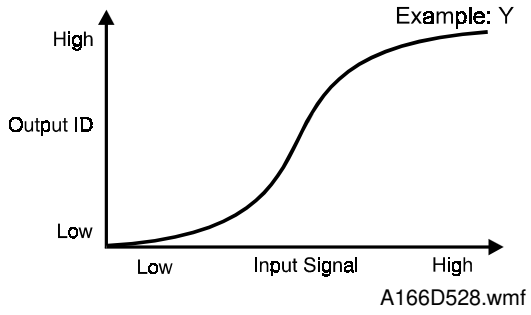


Fig. 1

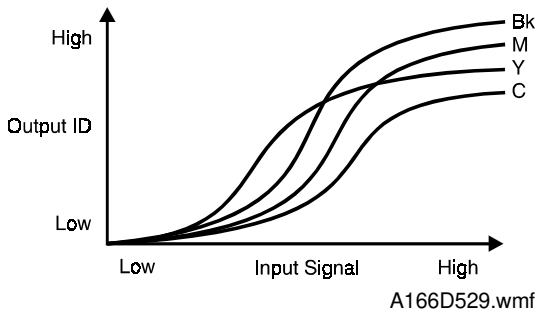


Fig. 2

(1) KCMY Gamma

Ideally, the gamma curves for Yellow, Magenta, Cyan, and Black should be identical, as shown in figure 1. However, they are not, because electrical components always vary slightly, resulting in varying gamma curves, as shown in figure 2.

To compensate for this discrepancy, the Auto Color Calibration (ACC) procedure can be done if color reproduction is becoming unsatisfactory. ACC makes new gamma curves for each color in each mode (letter, photo, Bk letter, glossy photo). After ACC, the gamma curve for each color can be adjusted with service programs (see Replacement and Adjustment, section 6-4, Image Processing)

Using these programs, each gamma curve can be adjusted using 4 different modes: ID max., High ID, Middle ID, and Low ID, as shown on the following page. If the previous gamma curve was better, it can be recalled. Also, the factory settings can be loaded using SP 5-610-4.

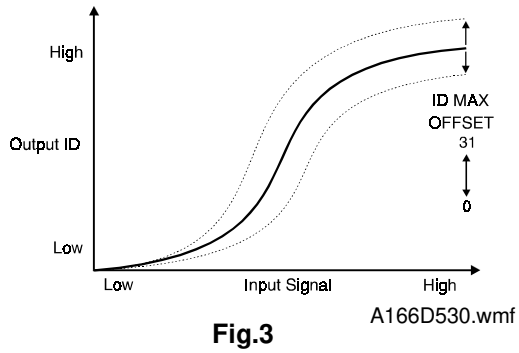


Fig.3

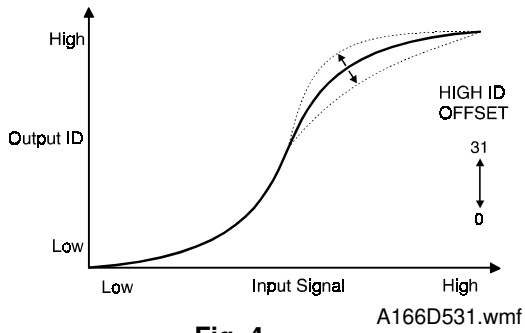


Fig. 4

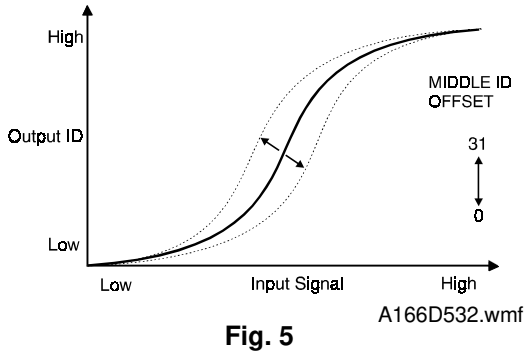


Fig. 5

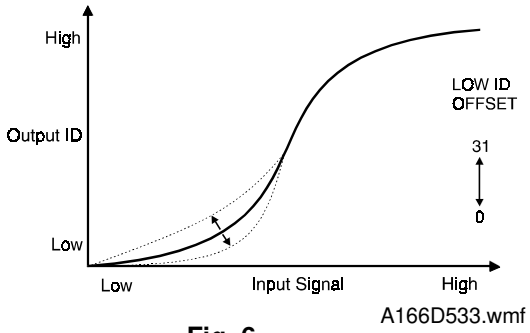


Fig. 6

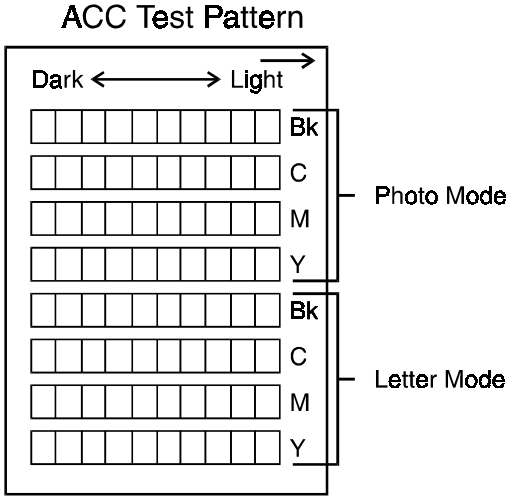
- ID max. -
This mode is used to adjust the total image density level as shown in figure 3.

– High ID –
The High ID mode should be used to adjust the image density between Level 6 and Level 9 of the color gradation scale on the C-4 test chart (figure 4).

– Middle ID –
The Middle ID mode should be used to adjust the image density between Level 3 and Level 7 of the color gradation scale on the C-4 test chart (figure 5).

– Low ID –
The Low ID mode should be used to adjust the image density between Level 2 and Level 5 of the color gradation scale on the C-4 test chart (figure 6).

(2) ACC Test Pattern



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The IPU board firmware has a test pattern that has eight 10-step gradation scales for each color (KCMY) for Letter mode and Photo mode.

–ACC (Auto Color Calibration)–

This machine automatically calibrates the printer gamma curve when the user selects ACC.

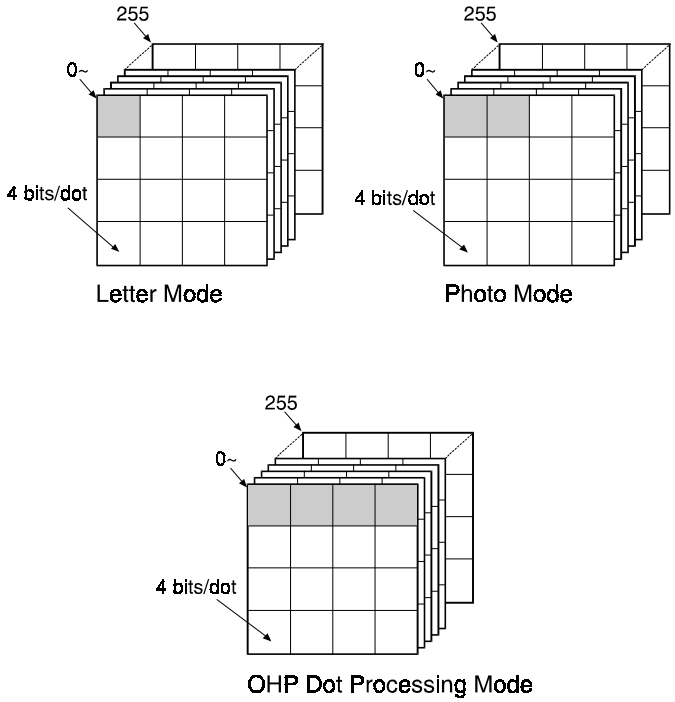
When ACC is activated, the machine prints out an ACC Test Pattern. After the user puts the test pattern on the exposure glass correctly, the machine scans the test pattern and corrects the printer gamma by comparing the ideal settings with the current image density.

The machine scans eight lines, one for each color (KCMY) in letter mode, and one for each color in photo mode.

After performing ACC, the machine resets the settings of the offset for each color in High, Middle, and Low ID to the default (15). The machine calculates the actual ID max based on data from the ACC scan.

The corrected printer gamma curves can be adjusted further using SP mode, as discussed on the prevous page (see Replacement and Adjustment, section 6-4, Image Processing).

4.5.7 Gradation Treatment (Dither Processing)



A166D535.wmf

In this machine, 4 x 4 dot dither patterns (4 bits/dot) convert the 8-bit data to 4-bit data before it goes to the printer. This speeds up data processing in the printer. The result is that for each pixel, the output can have only 16 grades per color. However, the dither matrixes are designed so that for a 4 x 4 pixel unit on the output, there are 256 possible grades for each color. The resulting printout looks very much like a 256-grade output.

There are 256 dither patterns for each mode (Letter, Photo, OHP). The elements in the dither matrix are each 4-bit. To generate the output, the machine converts each 8-bit pixel in the original to the 4-bit pixel in the same position in one of the dither patterns. The 8-bit value of the pixel in the original determines the dither pattern (0-255) that is used for that pixel. For example, if the pixel value is 100, it is replaced with the 4-bit value in the same position in dither pattern 100.

In Letter mode, the dither patterns are made with 1 x 1 dot units, to obtain fine resolution.

In Photo mode, the dither patterns are made with 2 x 1 dot units. Using the larger unit, the resolution is less fine, but the output is softer, which is more suitable for Photo mode.

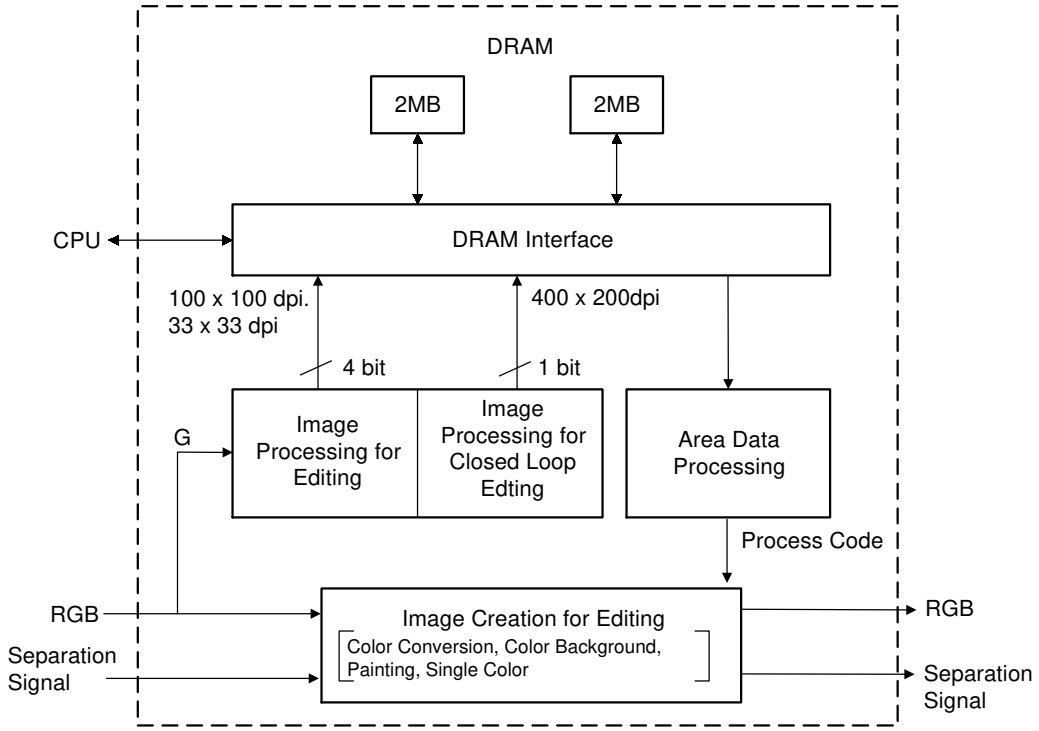
This machine has an OHP dot processing feature for OHP mode, which uses another set of dither patterns made of 4 x 1 dot units. In general, results from using a 4 x 1 dot unit allow more light to pass through the OHP sheets.

4.6 CPU

The CPU (16-bit) controls the image data and the timing in the scanner and IPU sections.

4.7 EXTENDED IPU (EDIT MACHINE ONLY)

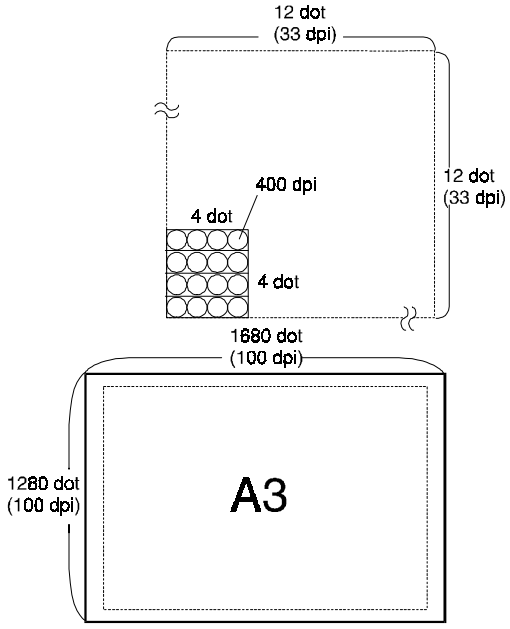
Extended IPU Block Diagram



A166D536.wmf

The extended IPU has the following functions:
Image processing for the display monitor, Area data processing, and Image creation for editing

To process an A3 size image (which is the maximum size for the display monitor), the extended IPU has two 2MB memories.



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(1) Image processing for the display monitor

– Image processing for Editing –

400 dpi image data (from the Green signal only) is converted to 100 dpi and 33 dpi, and these are both kept in the memory.

33 dpi image data is used for the full size display. 100 dpi image data is used for the 300% enlargement display. Each dot is made from 4-bit signals.

– Image processing for Closed Loop Editing –

The machine uses closed loop editing mode to locate borders. In closed loop editing mode, 400 dpi image data is converted to 400 x 200 dpi and are kept in the memory for greater accuracy. However, the data is only one-bit.

Resolution	Enlargement	Dots/unit
100 dpi	300%	4 x 4
67 dpi	200%	Calculated by CPU
50 dpi	150%	Calculated by CPU
33 dpi	100%	12 x 12

(2) Area data processing
Area information edited by an operator is processed in the SCU and is sent to the extended IPU through the CPU as area data. In the area data processing block, area data is processed depending on the selected copy modes (such as magnification, image shift) and is coded as process codes (for Under color, Painting, and Single Color) and is sent to the Image creation for editing circuit.

(3) Image creation for editing
Image data is processed by referring to the area data and the process codes. Then, the edited image is made in the Image creation circuit.

4.8 OTHERS

4.8.1 Interface

The scanner unit and the printer unit are independent modules controlled by the SCU (System Control Unit).

4.8.2 IPU Board Test

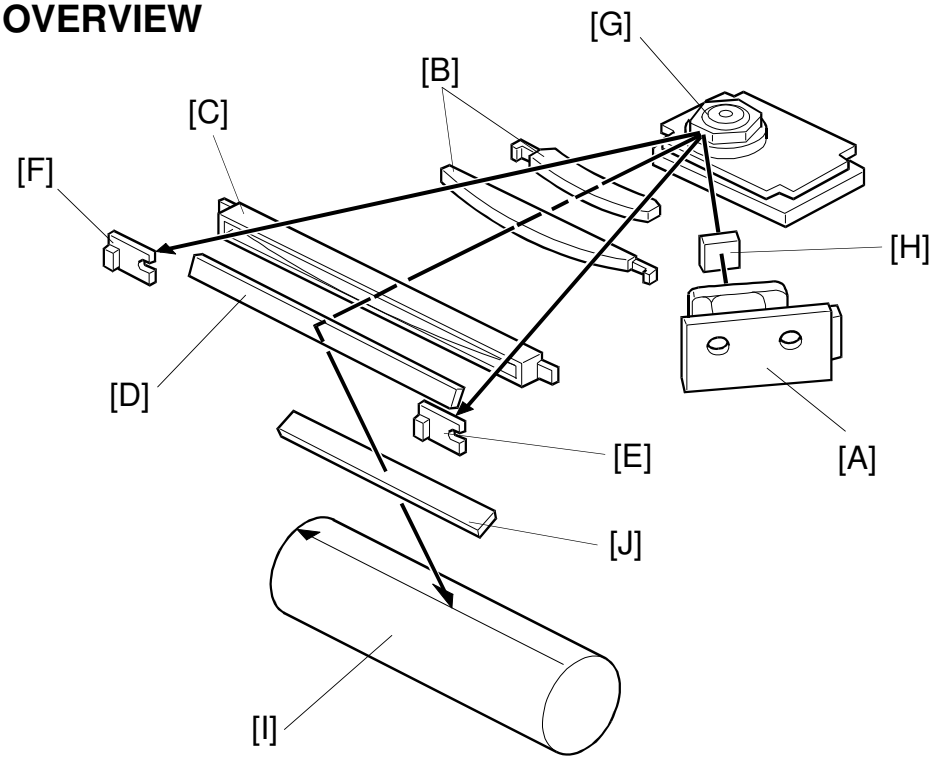
The Scanner IPU Board contains some LSIs, DRAM, SRAM, and other parts that control the LSIs, DRAM, and SRAM. These parts are connected to each other in a complex manner.

In SP mode, there are test programs to identify if the board is defective or not (SP 4-904-1 ~ 3: 01=OK, 00=NG, do all three tests).

SP4-904-1 SP4-904-2	Checks the scanner IPU.
SP4-904-3	Checks the extended IPU. (Edit machine only)

5. LASER EXPOSURE

5.1 OVERVIEW



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A: Laser Diode Unit
B: F-theta Lenses
C: Barrel Toroidal Lens (BTL)
D: Drum Mirror
I: OPC Drum
E: Laser Synchronization Detector Board-1
F: Laser Synchronization Detector Board-2
G: Polygon Mirror Motor
H: Cylindrical Lens
J: Shield Glass

This machine uses a laser diode to produce electrostatic images on an OPC drum [I]. The laser diode unit converts image data from the printer main board into laser pulses, and the optical components direct these pulses to the drum.

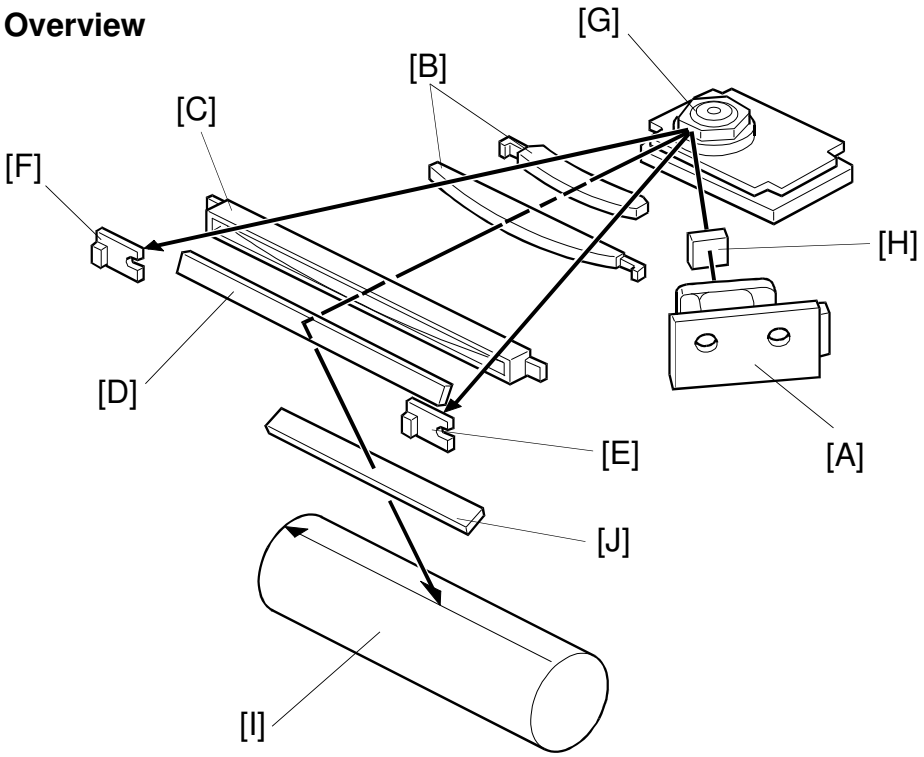
There are 16 gradations for each pixel using the laser pulses, controlled through power modulation and pulse width modulation. However, to produce a high quality copy image, dithering during image processing results in a possible 256 grades for each color for each 4 x 4 pixel unit.

Exposure of the drum by the laser beam creates the latent image. The laser beam makes the main scan while drum rotation controls the sub scan.

The strength of the beam is about 1.1 mW on the drum surface at a wavelength of 780 nm.

5.2 OPTICAL PATH

5.2.1 Overview



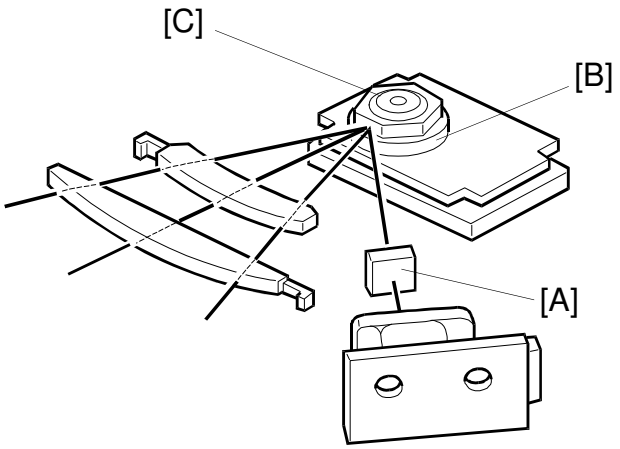
A166D613-2.wmf

The output path from the laser diode to the drum is shown above.

The LD unit [A] outputs the laser beam to the polygon mirror [G] through the cylindrical lens [H].

The polygon mirror reflects a full main scan line with a single surface of the mirror. The laser beam goes through the f-theta lens [B] and BTL [C].
The drum mirror [D] reflects the laser beam to the drum [I] through the toner shield glass [J].

The laser synchronizing detector boards [E, F] determine the main scan starting position, and detect variations in the time required to make a main scan.



A166D614.wmf

5.2.2 Cylindrical Lens

The laser beam is focused by the cylindrical lens [A], and sent to the polygon mirror.

5.2.3 Polygon Mirror

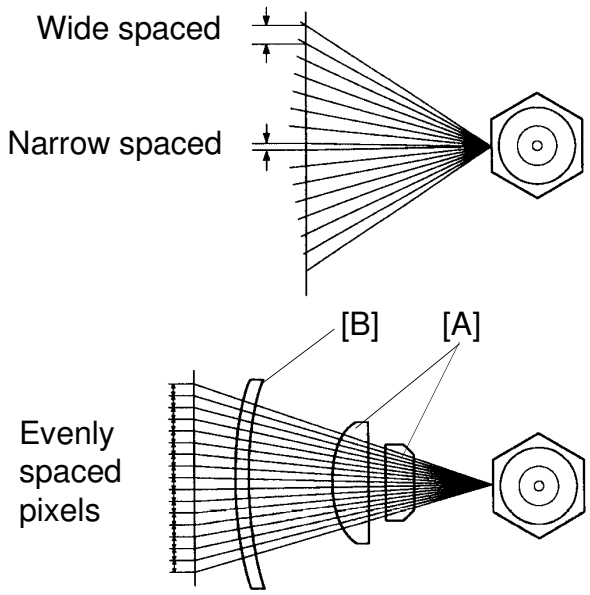
The polygon mirror assembly consists of the polygon motor [B] and the polygon mirror itself [C].

As the mirror rotates, it reflects the laser beam across the drum, via the f-theta lens, BTL, and drum mirror. One main scan line is made by the beam reflected from one face of the polygon mirror.

The mirror is precisely ground to enable high reflectivity and to prevent pixel misalignment on the drum in both the main scan and sub scan directions.

The polygon mirror motor rotates at 16,535 rpm. One rotation corresponds to six main scans.

5.2.4 F-theta Lenses and the BTL

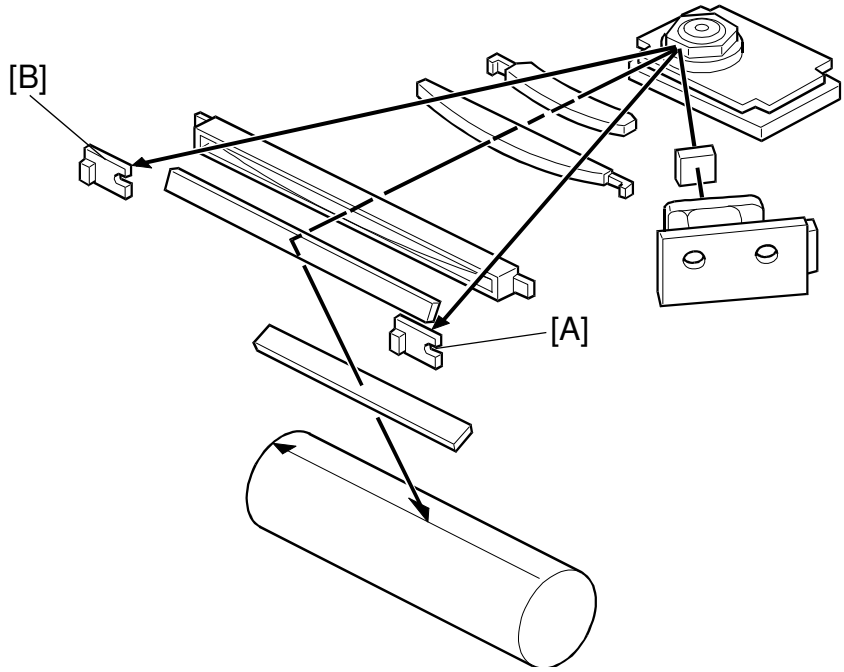


A166D615.img

The angles between pixels are equal. However, if the beam were to go directly to the drum as shown in the upper illustration, the spacing between pixels would differ with the angle of the beam. The pixels near the end of the drum would be further apart than those near the middle of the drum. The pixels would also be slightly thicker toward the ends of the drum than in the middle.

The f-theta lenses [A] and BTL [B] correct for this by deflecting the beam slightly inward to ensure uniform picture element spacing and diameter. The f-theta lenses and BTL also correct for irregularities in the polygon mirror face, focusing irregular beams onto the correct part of the drum.

5.2.5 Laser Synchronizing Detector Boards



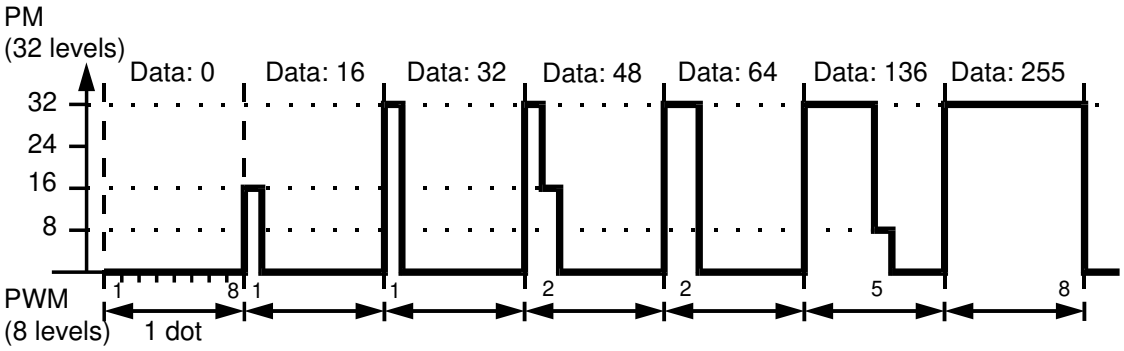
A166D613-3.wmf

Some of the optical components are made of plastic, and may expand and contract with changes of temperature. If this happens, the number of pulses in the laser main scan across the drum will vary. To counteract the effects of this, the machine adjusts the gap between laser pixels to keep the number of laser pulses in each main scan constant.

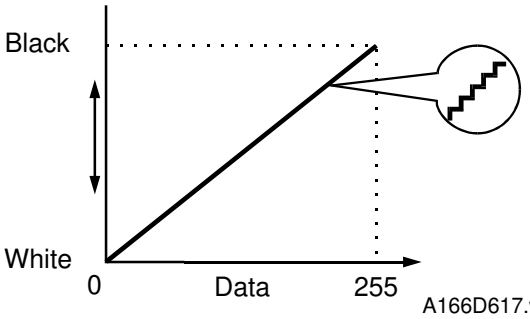
To do this, the machine has two laser synchronizing detector boards. They are used to determine the number of clock pulses between the start and end of each main scan. (These clock pulses are from the base clock, which is at a much higher frequency than the laser pixel frequency.)

The laser synchronizing detector board-1 [A] synchronizes the main scan start timing. At the other side, the laser synchronizing detector board-2 [B] counts the number of clock pulses since detector board-1 was activated; from this count and from the current laser pixel frequency, the machine can calculate how many laser pixels there were across the main scan.

5.3 GRADATION CONTROL (LASER POWER MODULATION)



A166d616.wmf



A166D617.wmf

To make the latent image, the laser beam illuminates the image area of the drum surface. The longer the laser is on and the stronger its intensity is, the darker the developed pixel becomes. Modulating (changing) the width of the pulse makes the on time of the laser longer or shorter. There are eight possible pulse width levels in this model.

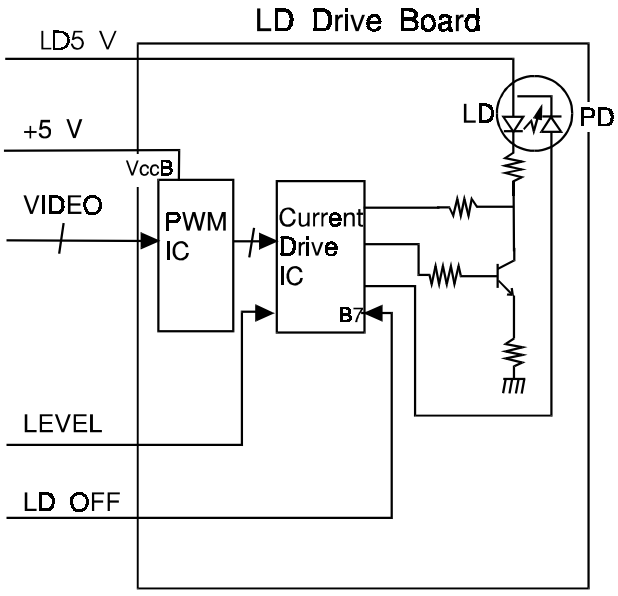
While the laser is on to make one dot, the intensity of the laser is controlled by power modulation (PM). The laser's intensity is controlled by the amount of current sent to the laser diode. Modulating the power makes the laser brighter or dimmer. There are 32 possible power levels, or laser intensity levels.

The laser engine can use the 8 pulse width levels and 32 power levels to create the 256 possible grayscale values for each pixel. However, in this machine, out of the possible 256 grades for each dot, only 16 are actually used. Dithering creates 256 grades for each color, when taken in 4 x 4 pixel units.

The power is modulated ONLY at the end of the active part of the on/off cycle of the laser pulse. For example (see the diagram above), to make a pixel with a grayscale value of 48, the laser pulse width level for that pixel will be 2. The first period of the pulse will be at the full power (32), and the second pulse will be at power 16 to make up the remainder of the 48 (32 + 16 = 48).

The LD power for each grade is defined by process control.

5.4 AUTO POWER CONTROL (APC)



A166D618.wmf

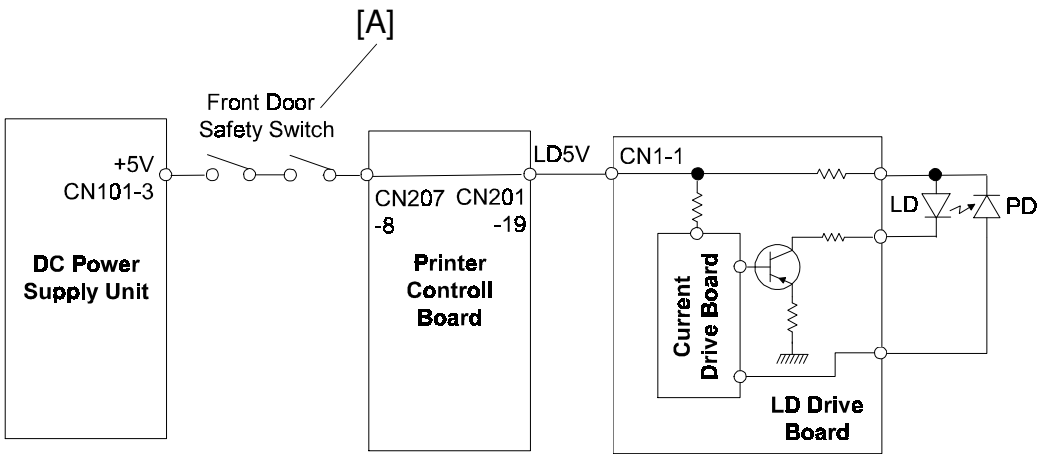
Even if a constant electric current is applied to the laser diode, the intensity of the output light changes with the temperature. The intensity of the output decreases as the temperature increases.

In order to keep the output level constant, the output light intensity is monitored through a photodiode (PD) enclosed in the laser diode. The photodiode passes an electrical current that is proportional to the light intensity. The output is not affected by temperature, so it faithfully reflects the changes in the LD output, without adding anything itself.

Just after the main switch is turned on, the current drive IC on the LD drive board excites the laser diode at full power (power level 32) and stores the output of the photodiode as a reference. The IC monitors the current passing through the photodiode. Then it increases or decreases the current to the laser diode as necessary, comparing it with the reference level. Such auto power control is done during printing while the laser diode is active.

The laser power level is adjusted on the production line. Do not touch the variable resistors on the LD unit in the field.

5.5 LD SAFETY SWITCHES



A166D620.wmf

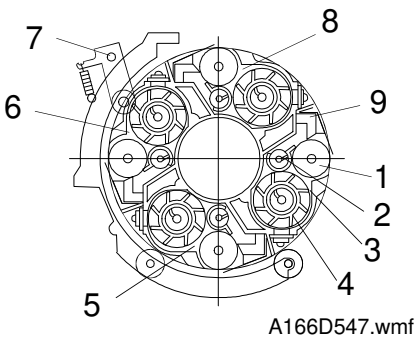
To ensure that the laser beam does not accidentally switch on during servicing, there are two safety switches located at the front door. These two switches [A] are installed in series on the LD 5 V line coming from the dc power supply board.

When the front cover is opened, the power supply to the laser diode is interrupted.

6. DEVELOPMENT UNIT

6.1 OVERVIEW

The CMYK development unit is a revolver type, and is composed of the development and toner supply sections for each color (CMYK).
When this unit rotates counter-clockwise, the toners are developed in the order Bk, C, M, and Y.



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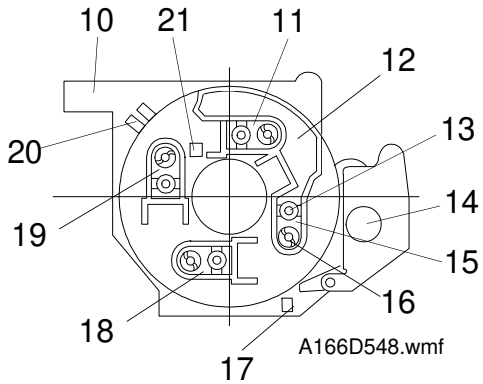
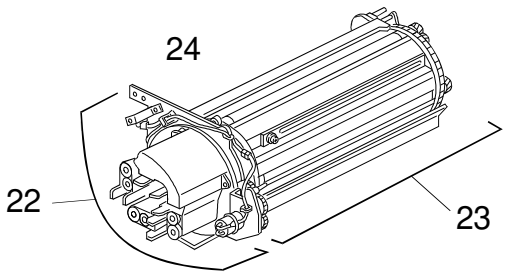


A166D548.wmf

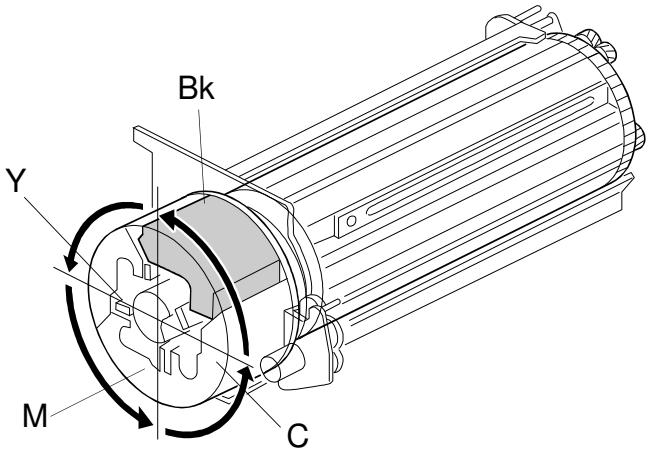


A166D549.wmf

1. Development Roller
2. Transfer Auger
3. Bk Development Section
4. Outer Paddle
5. Cyan Development Section
6. Magenta Development Section
7. Revolver Locker Arm
8. Yellow Development Section
9. Doctor Blade
10. Developer Stay
11. Yellow Toner Supply Section
12. Bk Toner Hopper
13. Toner Supply Roller
14. Toner Supply Motor
15. Bk Toner Supply Section
16. Inner Paddle
17. Color Toner Cartridge Sensor
18. Cyan Toner Supply Section
19. Magenta Toner Supply Section
20. Revolver H.P. Sensor
21. Bk Toner Cartridge Sensor
22. Hopper Section
23. Development Section
24. Development Unit

6.2 MECHANISMS

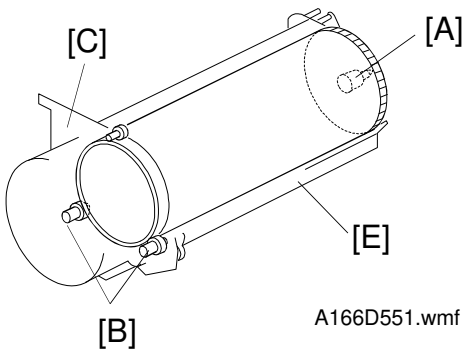
6.2.1 Revolver Development Mechanism



A166D550.wmf

The Development Unit is a revolver body which is composed of development sections for each color (KCMY). This unit rotates counter-clockwise in 90-degree steps to develop each color in order (KCMY). This mechanism allows the size of the main frame to be reduced.

(1) Revolver Drive



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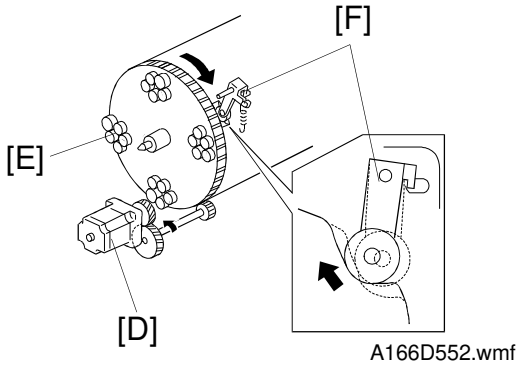

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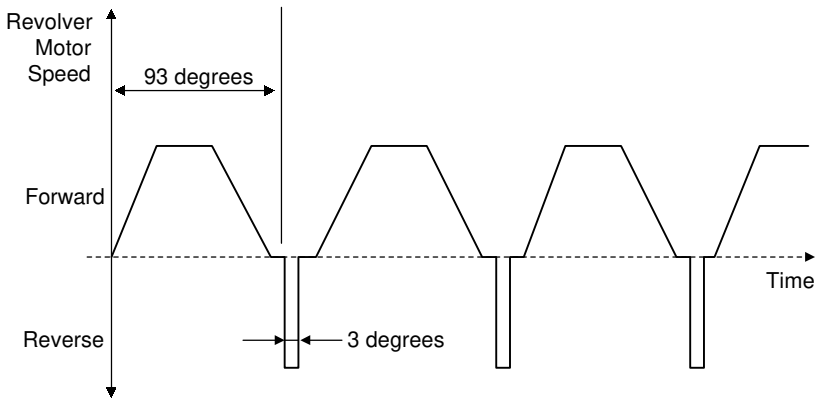

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The center pin [A] at the rear and the two revolver support rollers [B] on the development stay [C] keep the development unit in the proper position. The revolver drive motor [D] rotates the development unit [E] about the center pin.

The revolver drive motor, which is a stepper motor, rotates the development unit 93 degrees counter-clockwise, then 3 degrees clockwise to keep the 90-degree rotation for each color; this method allows the revolver locking arm [F] to secure an exact 90-degree rotation.

When the revolver rotates, the toner supply release solenoid moves the toner supply motor away from the revolver unit.

(2) Revolver H.P. Detection

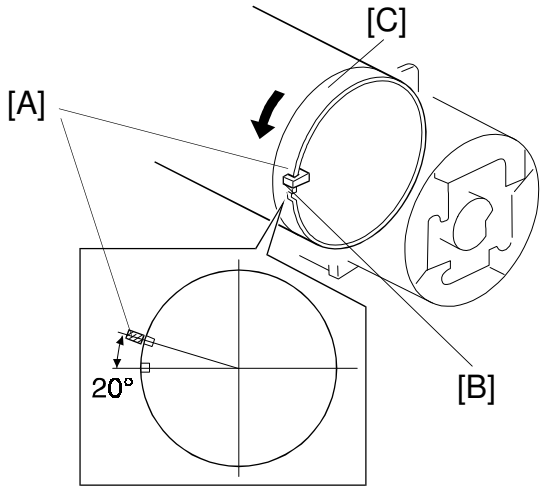


Fig. 1 A166D553.wmf

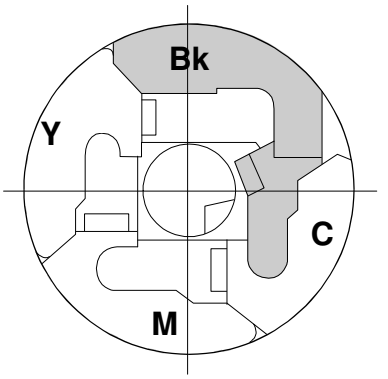


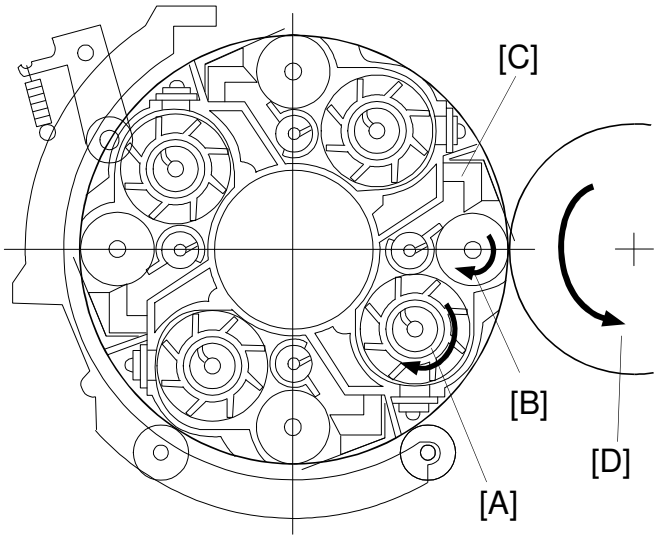
Fig. 2 A166D564.wmf

The revolver H.P. sensor [A] is at the front side of the development unit (figure 1). The revolver home position is the position at which Bk toner is developed on the drum (figure 2).

There is a notch [B] on the revolver frame ring [C]. After the revolver H.P. sensor detects the notch, the revolver rotates 20 degrees counter-clockwise, then stops. This is the revolver H.P. process and is performed after every copy job. But after a black and white copy job, this process is not performed (the unit is already at home position).

After the main switch is turned on or the front cover is reset (copy jam recovery), the revolver H.P. process is also performed to send back the Bk development section to the position for development.

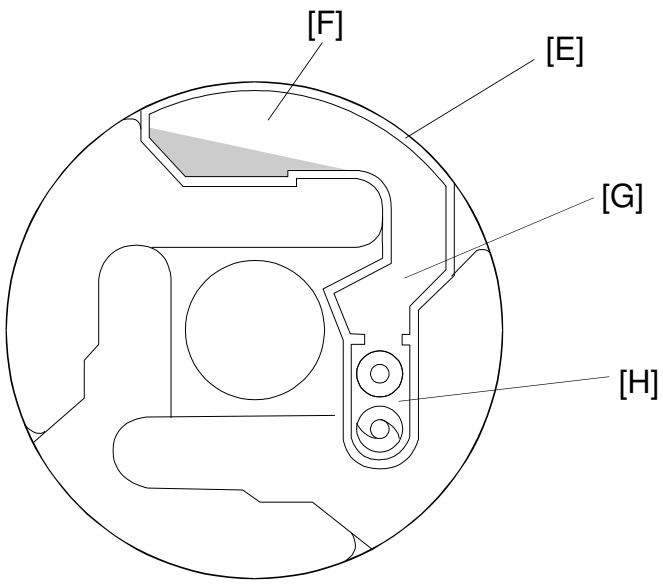
6.2.2 Development Mechanism



A166D554.wmf

The development unit contains four development mechanisms in one body, one for each color. Each development section is reduced in size with respect to previous models, and can hold 400 g (1 package) of developer.

The developer from the dual mixing roller [A] is attracted to the surface of the development roller [B] by the magnets inside the development roller. The attracted developer is trimmed to the desired thickness by the doctor blade [C], and it is then carried to the drum [D] where the latent image is developed.

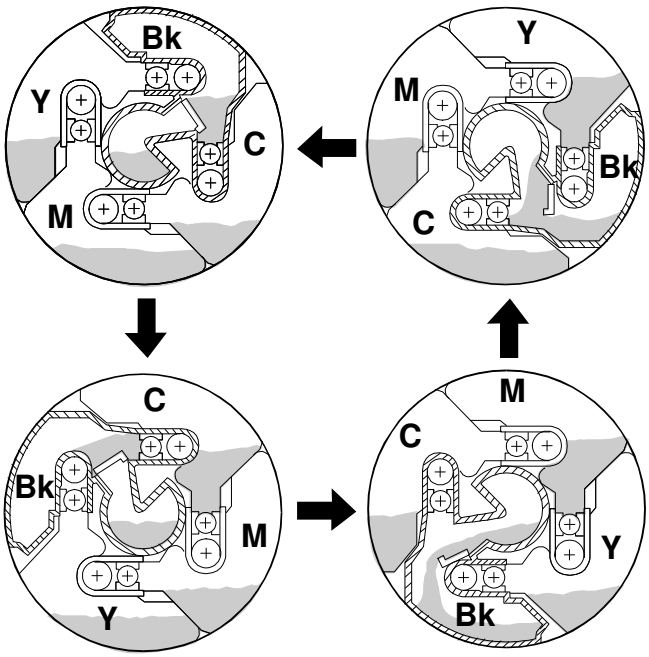


A166D563-2.wmf

Each color has a hopper [E]. The hopper is divided into a main hopper [F], a sub hopper [G], and a toner supply section [H].

6.2.3 Toner Mixing

Mechanism



A166D556.wmf

Toner mixing supplies toner from the cartridges to the sub hoppers.

Toner mixing is performed by rotating the development unit (the entire revolver unit).

Note how the Bk cartridge opens and closes as the revolver turns.

Timing

The revolver rotates at particular times to prevent errors in toner end detection. This rotation has two purposes; one is to supply toner to the hopper (especially important for Black toner; see section 6.2.4), the other is to agitate the toner in the hopper.

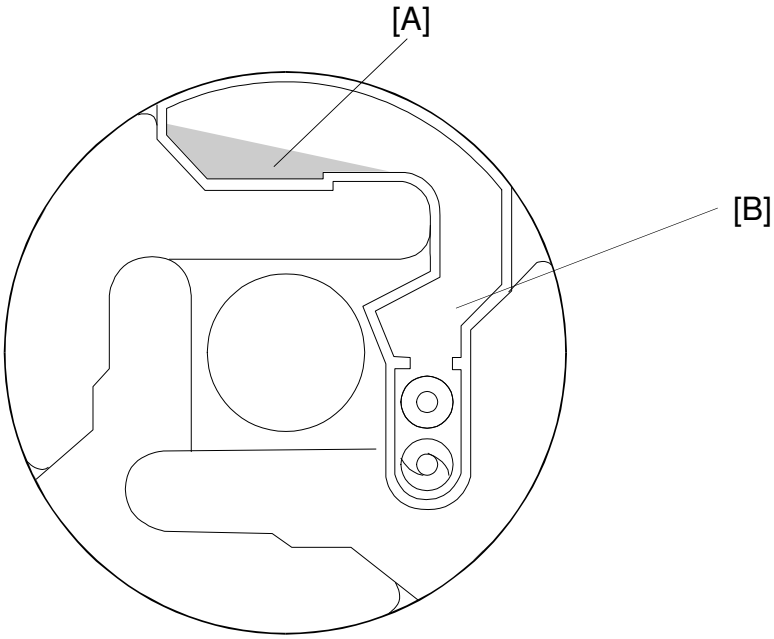
- Toner Supply to the Hopper -

When making multiple copies in black and white mode, the revolver is not rotated. So, toner might not be supplied to the hopper section and this might cause an error with toner end detection. To prevent this, the revolver is rotated at the following times to supply toner to the hopper section.

1. After the main switch has been turned on and the process control self check has been performed, the development unit rotates ten times.
2. During transfer belt lubrication after the last copy job has been completed and if more than 50 copies have been made since the last cleaning mode, the development unit rotates twice.
3. After the interval process control self check (default: every 150 copies), the development unit rotates 5 times.
4. When the sum of the LD output levels for calculating the image area integration data is over a certain level, the machine temporarily stops the copy job until the development unit has rotated 10 times.

   When the development unit rotates, the machine stops the development unit for 2 seconds at the 180-degree and 270-degree positions from the revolver home position (these are the Y and M development positions). This is to make sure that enough Bk toner passes from the cartridge to the hopper and toner supply roller (in the normal position, the shutter is closed, and toner cannot enter the hopper).

- Toner Agitation -



A166D563.wmf

During a multiple copy job in 1C mode (Bk, C, M, and Y single-color copy mode), the development unit does not rotate after the required color development section has been rotated into position. This might cause a toner end detection error because the toner is not carried from the main hopper section [A] to the sub hopper section [B] during copying. To prevent this, the development unit rotates at the following times.

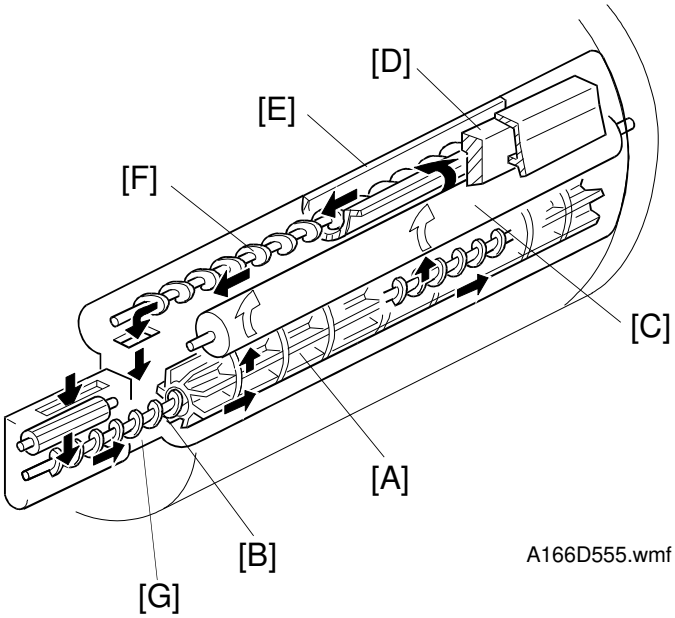
1. **Bk**
   In Bk & White mode, every 50 copies, even if it is during a continuous copy job, the machine temporarily stops the copy job and the development unit rotates once.

2. **C, M, and Y**
   In C, M, or Y single-color copy mode, the development unit rotates once every 50 copies (only for multiple copy jobs).

NOTE: When the timings of the toner supply and toner agitation coincide, the machine performs the operation that needs the most rotations.

6.2.4 Developer Mixing

Mechanism

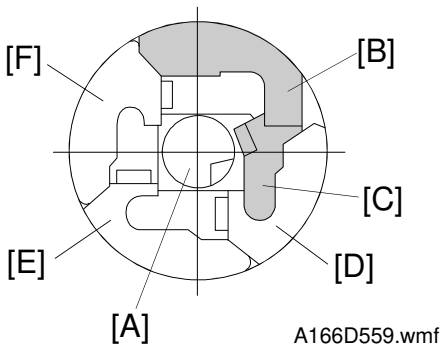


This mechanism supplies toner from the sub hopper to the development roller.

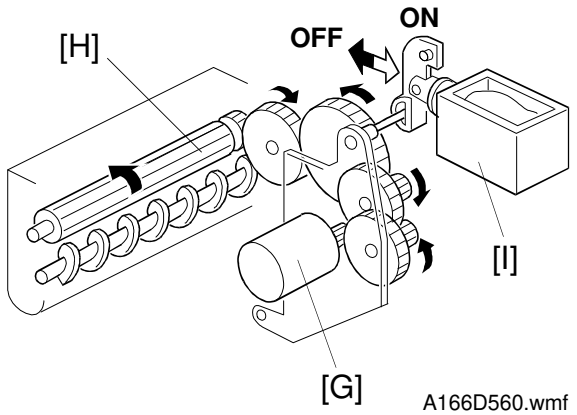
The dual mixing roller is composed of the outer paddle [A] and the inner auger [B]. This carries developer to the rear and supplies developer to the development roller [C].

The developer removed by the doctor plate [D] goes into the transfer auger case [E], is carried to the front by the transfer auger [F], and falls into the dual mixing roller case [G]. The developer is mixed when the process control self check, toner supply recovery, or development is performed. (It is done for one color at a time, in the order KCMY, with the developer that is currently at the development position.)

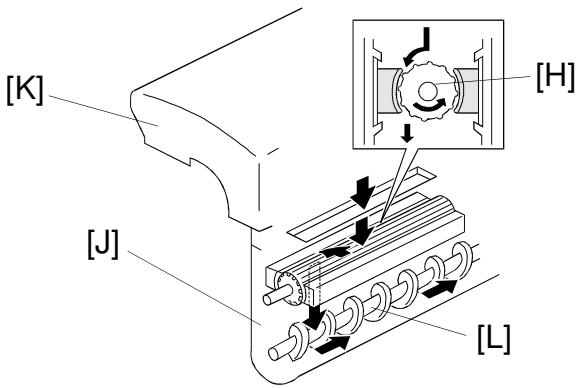
Timing



A166D559.wmf



A166D560.wmf



A166D658.wmf

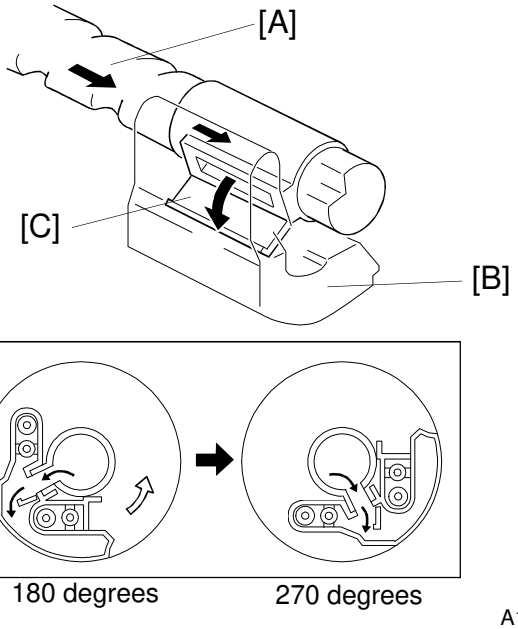
Toner supply for a particular color is performed only when the development section for that color is at the development position.

The Bk toner cartridge [A] is installed at the center of the development unit, and is separated from the Bk hopper section [B] and the Bk toner supply section [C]. The color cartridges (CMY) [D, E, F] are installed around the Bk toner cartridge and each contain a hopper mechanism.

For C, M, and Y toner the process is as follows:

1. The toner supply motor [G] is switched on/off by a fuzzy control process based on toner concentration on a standard ID sensor pattern. The toner supply motor is located at the front side of the development unit and drives the toner supply roller [H] via gears.
   While the development unit rotates, the toner supply solenoid [I] turns on to prevent the drive from the toner supply motor from turning the toner supply roller.

2. When the toner supply roller [H] turns, toner moves from the hopper section [K] to the toner supply section [J]. Then toner is carried to the rear by the inner auger [L] of the dual mixing roller.



A166D562.wmf

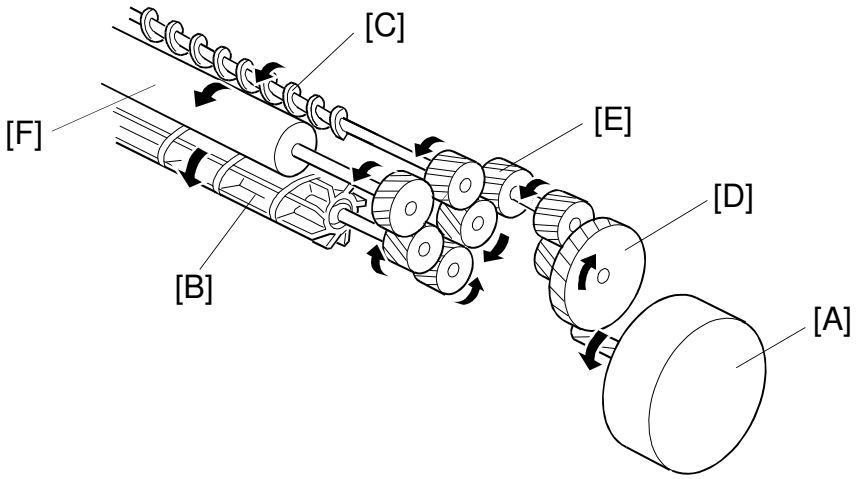
3. Then toner is supplied to the development section by the dual mixing roller.

For Bk toner the process is as follows:

1. First, the development unit must be rotated to get Bk toner out of the cartridge [A] and into the hopper section [B]. When the Bk hopper section has rotated 180 degrees from the home position, the toner supply shutter [C] opens as a result of gravity. While the Bk hopper is between 180 and 270 degrees, Bk toner is supplied from the cartridge [A] to the Bk hopper [B]. Then, at some time while the Bk hopper is between 270 and 0 degrees, the toner supply shutter [C] closes again to prevent toner from flowing backwards.

   Steps 2, 3, and 4 are the same as steps 1 to 3 for C, M, and Y toner.

6.2.5 Development Roller Drive



A166D557.wmf

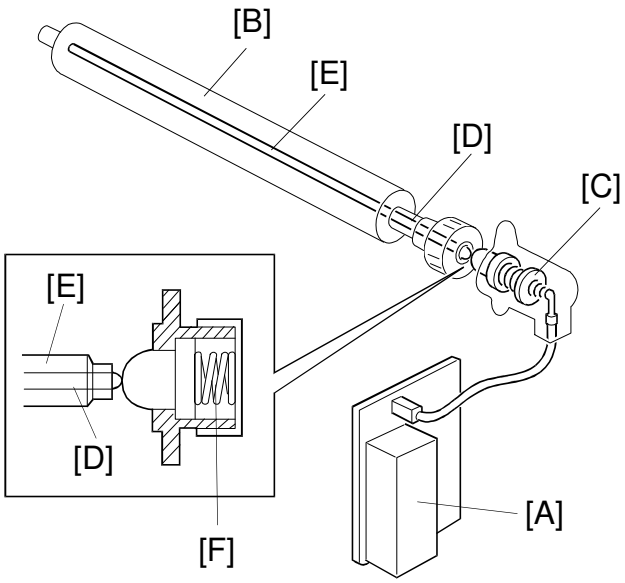
Because the development unit is a revolver unit, there is only one development motor [A], which drives the color development roller that is at the development position.

When the development motor turns, the development roller which is at the development position [F], the dual mixing roller [B], and the transfer auger [C] are driven via idle gears 1 [D] and 2 [E].

While the development unit (the revolver unit) rotates, the development motor [A] rotates the idle gears [D, E] so that they will mesh with the gears on the revolver unit easily.

If the development motor does not rotate, the gears will not mesh smoothly and toner may be dislodged. This toner may be attracted to the drum, leading to dirty background.

6.2.6 Development Bias



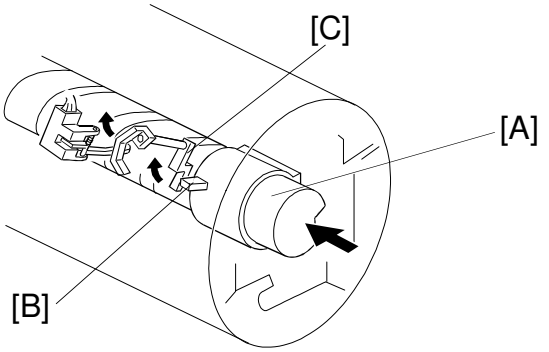
A166D558.wmf

The high voltage supply board [A] applies the development bias (ac and dc) to the development roller [B] that is currently in position through the bias terminal [C].

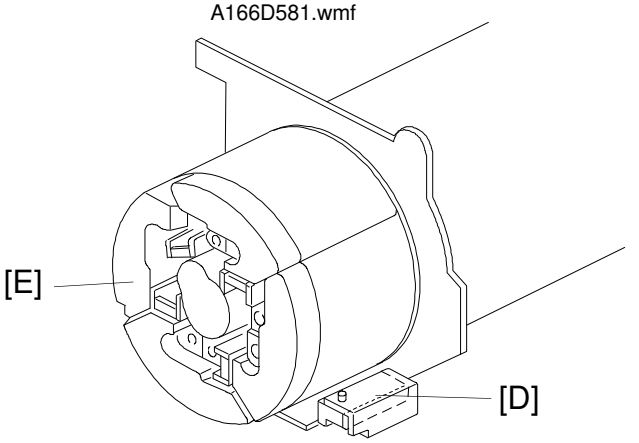
The development roller is composed of the roller, development sleeve, and magnet shaft [E]. When the development roller rotates, the development roller and sleeve rotate, but the magnet shaft does not; if the magnet shaft rotated, spilt toner would get into the contact between it and the bias terminal more easily. The bias terminal has a spring [F] to push it against the magnet shaft to prevent poor terminal contact when it reaches the development position.

While the development unit rotates, dc bias is applied from the high voltage supply board. When the development roller is about to contact the bias terminal, this dc bias prevents any toner dislodged during gear meshing from being attracted to the drum (also see section 6.2.5: Drive Mechanism).

6.2.7 Toner Cartridge Detection



A166D581.wmf



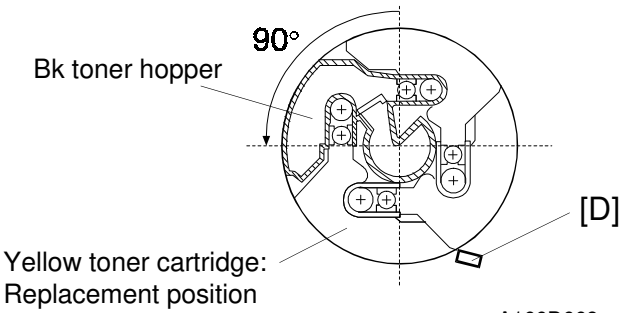
A166D565.wmf

This machine has two toner cartridge sensors to detect the presence of the toner cartridges.

(1) Bk Toner Cartridge Detection

When a Bk toner cartridge [A] is installed at the center of the development unit, the hook [B] on the Bk toner cartridge pushes the sensor actuator [C], and the machine detects that a toner cartridge has been installed. The sensor only actuates when the revolver is at home position.

(2) Color Toner Cartridge Detection

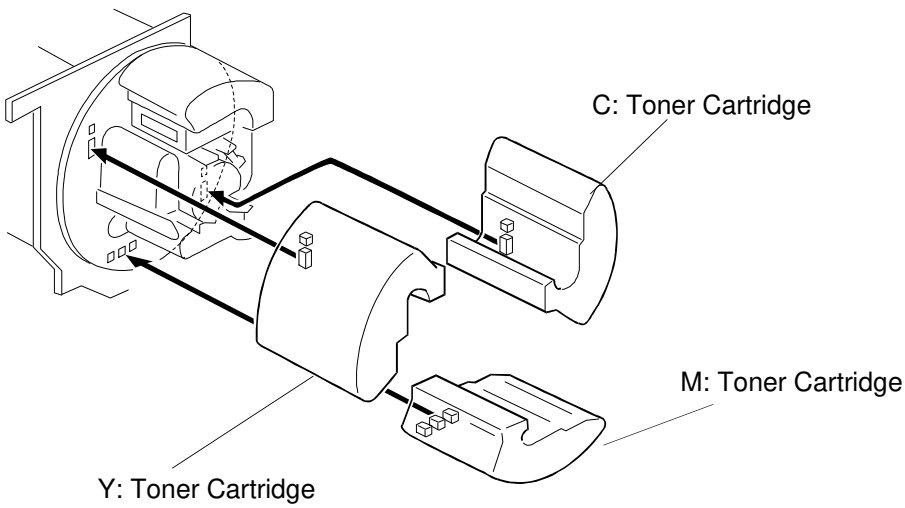


A166D668.wmf

The color toner cartridge sensor [D] is located at the lower right side of the development unit. While the development unit rotates, this sensor (which is a reflective photosensor) detects the presence of each color toner cartridge (CMY).
When the revolver is in the home position (Bk toner development position), the machine can detect the Bk cartridge and magenta cartidge at the same time. The yellow and cyan cartridges are detected when the cartridge is in the replacement position (see Revolver Positioning - Toner End Condition for more about the replacement position).

Yellow: 90° from the revolver home position
Cyan: 270° from the revolver home position
(See Timing Chart No. 17)

6.2.8 Color Toner Positioning Pin



A166D566.wmf

Each color toner cartridge has pins at the rear side. The pins are at different positions on the cartridge to prevent a color cartridge from being installed at the wrong color position.

6.2.9 Revolver Positioning

This section explains how the revolver moves the various color toners into position in the various modes. For a fuller explanation of how the revolver, drum, and belt move in each of the modes, see the "Transfer Belt Unit" section.

(1) In 1C Mode (Bk, C, M, and Y)

After the start key has been pressed, the machine moves the selected color development section to the position for development. In black and white mode, the development unit does not rotate because the Bk development section has been already moved to the position for development by the revolver H.P. process.

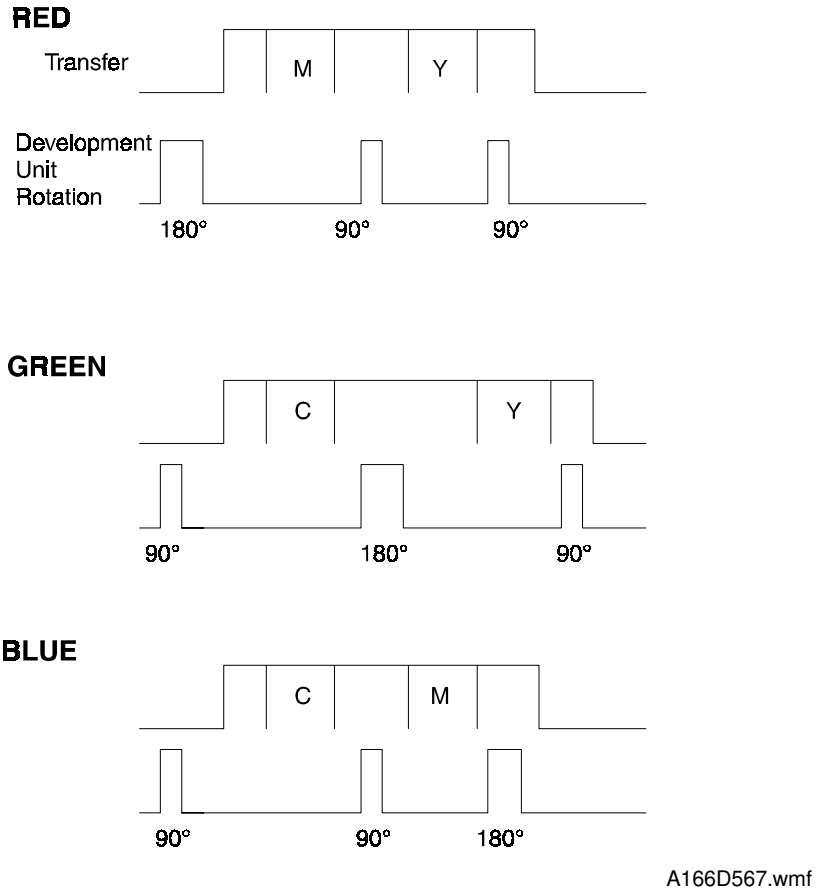
The first copy speed depends on the color, because the time needed to rotate each color into position for the first copy is different. (See the table)

After the copy job, the machine performs the revolver H.P. process to send the Bk development section back to the position for development. In black and white mode, the revolver H.P. process is not needed, because the revolver is already at home position.

1st Copy Time (reference)

	A4 Sideways (seconds)	**A3 (seconds)**
Bk	Less than 15	Less than 20
C	Less than 20	Less than 20
M	Less than 20	Less than 20
Y	Less than 20	Less than 20

(2) In 2C Mode (R, G, and B)



A166D567.wmf

	CPM	
	A4/Letter sideways	**More than A4/Letter sideways**
R	4	3
G	3	2.5
B	4	3

After the start key has been pressed, the machine moves the first color development section to the position for development. For B or G, the first color is Cyan, so the revolver must turn 90 degrees, and for R, the first color is Magenta, so the revolver must turn 180 degrees.

After the first toner color has been transferred to the drum, the development unit rotates the second color development section into position.

- For R, the revolver must turn from Magenta to Yellow, which is 90 degrees.
- For G, the revolver must turn from Cyan to Yellow, which is 180 degrees.
- For B, the revolver must turn from Cyan to Magenta, which is 90 degrees.

For Green, copying takes longer than for red or blue. This is because the revolver has to rotate 180 degrees to move the second color into position. Toner is likely to cross over to the drum when development roller gears are meshing and unmeshing during revolver rotation. (See sections 6.2.5: Drive Mechanism, and 6.2.6: Development Bias.) So, the revolver must rotate so that the areas of the drum that touch the revolver during that time will arrive at a non-image area on the transfer belt. Because of this, the 180-degree rotation is divided into two steps, and the transfer belt has to make an extra turn.

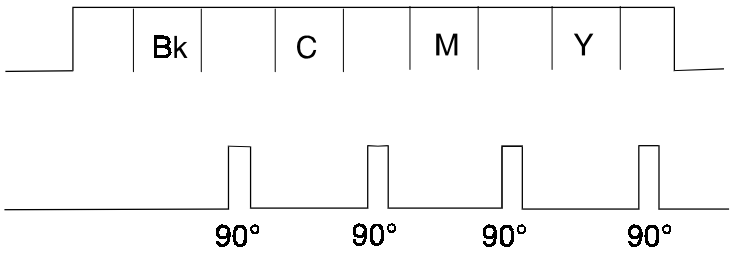
The same happens if the image area is longer than A4/Letter sideways. The non-image area on the drum is too short for the revolver to turn the next color into position within the same transfer belt rotation, so the belt has to make an extra turn to allow the revolver to rotate. This is true for R, G, or B. (So larger than A4/Letter sideways for Green requires two extra turns of the belt.)

This matter will be dealt with in more detail in the "Transfer Belt Unit" section.

Between copies of a multi-copy job, the revolver must turn 270 degrees.

After a copy job, the development unit is sent back to the first color development position. Then, the machine performs the revolver H.P. process and stops.

(3) In 4C Mode (Full Color Mode)



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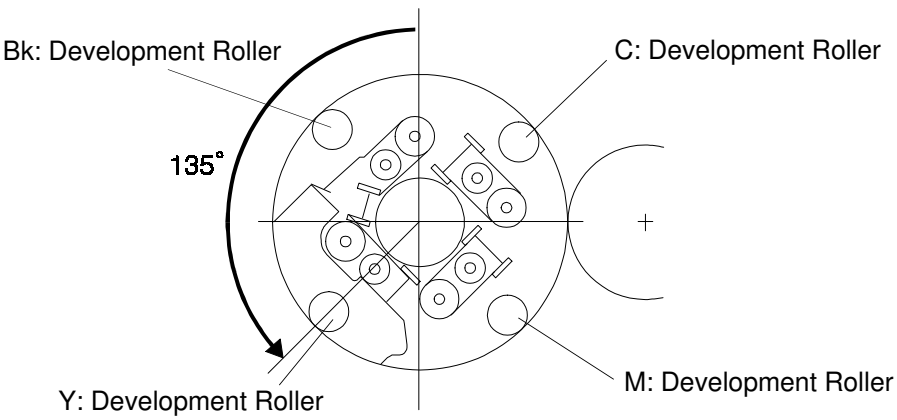
After the start key has been pressed, the development unit rotates the four colors into position in order. Each step is 90 degrees, so the revolver turns in the same way as in 2C mode for Red or Blue; no extra belt turn is needed for an 180-degree turn of the revolver (however, only a 90-degree turn is needed between copies of a multi-copy job). After a copy job, the machine performs the revolver H.P. process.

(4) During the Process Control Self Check

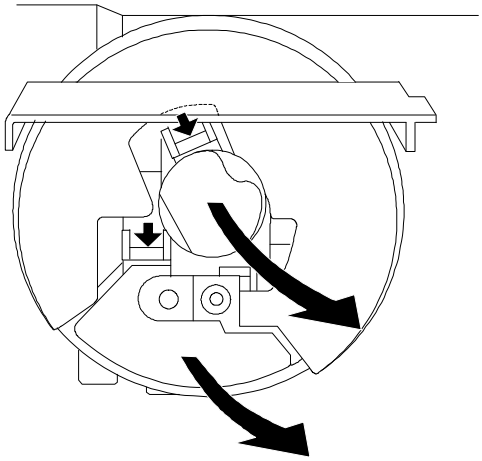


A166D569.wmf

After the main switch is turned on, the machine performs the revolver H.P. process, then the process control self check. During the potential sensor calibration and the confirmation procedure, the development unit rotates 135 degrees (halfway between two color positions), to prevent toner from being attracted to the drum. Then the machine measures the drum potential voltage or corrects the drum potential. After the process control self check, the machine performs the revolver H.P. process again, then the development unit rotates 5 times for toner replenishment.

(5) When there is a Toner End Condition

Bk toner and yellow toner replacement position



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When the machine detects a toner near end condition, the machine sends the empty color cartridge to the replacement position.
When the machine detects a toner end condition, the machine sends the empty color cartridge to the replacement position and stops the job.
After the toner cartridge is replaced and the front cover is closed, the machine performs the revolver H.P. process.

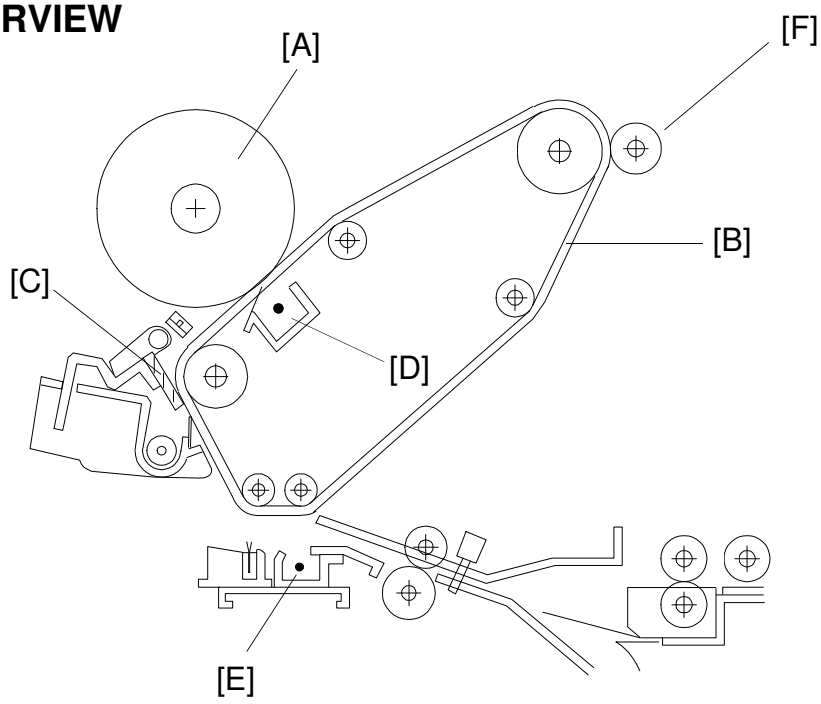
Only for Bk toner:

After the revolver H.P. process, the revolver rotates 10 times to supply the Bk toner in the cartridge to the hopper section. While the revolver rotates, it stops for 2 seconds at 180 degrees and 270 degrees from the revolver H.P. position to supply more toner to the hopper section.

After that, the machine sends the development section containing the new toner cartridge to the position for development, then performs the toner recovery procedure. (See section 2-1, Process Control.)

7. TRANSFER BELT UNIT

7.1 OVERVIEW



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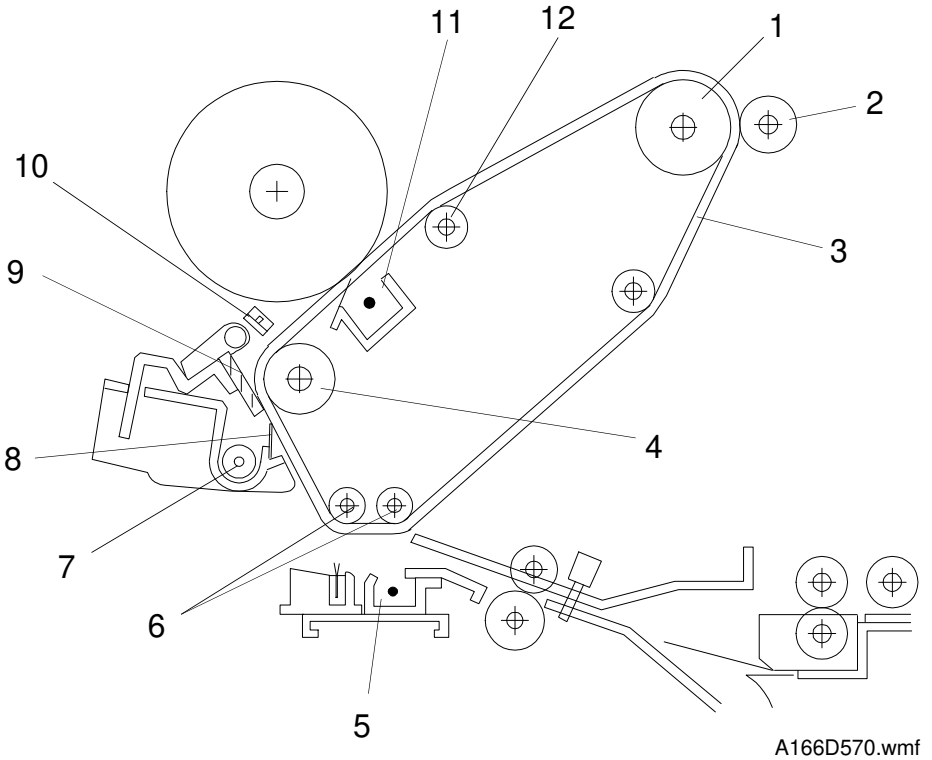
This machine has a transfer belt. Each single color image developed on the drum [A] is transferred separately to the transfer belt [B] by the transfer belt corona unit [D]. After all single color images have been transferred to the transfer belt, the full color image is then transferred to the copy paper by the paper transfer corona unit [E]. The belt is long enough to hold an image of A3 length, with some space to spare.

A single color image (Bk, C, M, or Y) is transferred in one transfer cycle, so at most four transfer cycles are performed during the full color copy process. They are performed in the order Bk, C, M, Y. However, the belt may need to rotate more than once per cycle, depending on paper size and color mode.

The transfer belt corona unit [D] applies positive bias voltage from the rear side of the transfer belt and attracts the negatively charged toner from the drum onto the transfer belt. The bias stays on throughout the copy job.

When all color toners have been transferred to the belt, copy paper is fed to the transfer belt. After the toner has been transferred to the copy paper, the transfer belt cleaning blade [C] moves into contact with the belt to remove any toner remaining on the transfer belt. The lubricant brush [F] applies a small amount of lubricant to the surface of the transfer belt to help the cleaning blade remove toner from the transfer belt.

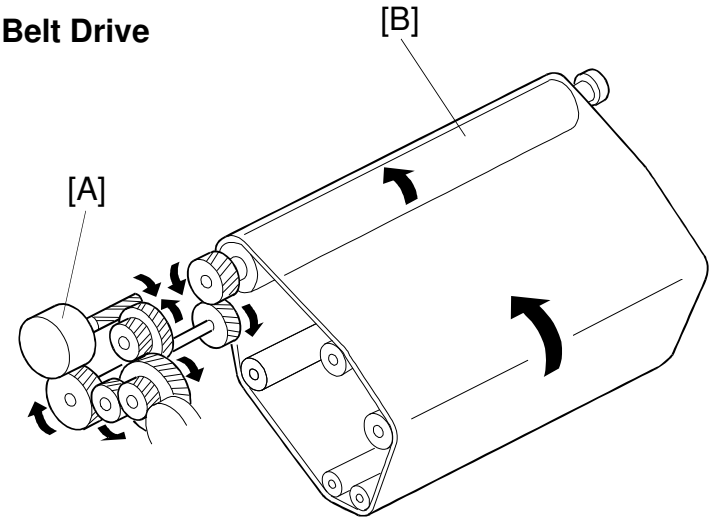
7.2 LAYOUT



1. Belt Drive Roller
2. Lubricant Brush
3. Transfer Belt
4. Cleaning Support Roller
5. Paper Transfer Corona Unit
6. Paper Transfer Support Rollers
7. Toner Collection Coil
8. Entrance Seal
9. Cleaning Blade
10. PTL
11. Belt Transfer Charge Unit
12. Transfer Belt Tension Roller

7.3 BELT TRANSFER

7.3.1 Transfer Belt Drive



A166D571.wmf

The drum motor [A], which is a 24V dc brushless motor, drives the transfer belt (through the drive roller [B]), as well as the drum. (The drum and belt always turn at the same time.) The transfer belt always contacts the drum and rotates in one direction. The transfer belt unit has a release lever at the front to free the transfer belt from the drum. The transfer belt H.P. sensor aligns each color image on the transfer belt by detecting the sensor patch on the belt.

In OHP and thick paper mode, the drum motor changes to half speed while the image is being transferred to the paper. This is because these types of paper need more time in the fusing unit for the toner to be fused to the paper properly. Also, the number of transfer belt rotations per copy depends on color mode and copy paper size. (See the table.) This will be explained later in this section in more detail.

Color Mode	Paper Size	
	Less than A4/Letter Sideways	More than A4/Letter Sideways
1C	1	1
2C (R, B)	2	3
2C (G)	3	4
4C	4	7

Unit: Number of rotations

NOTE: 1) The number of rotations in this table does not include the rotation that is required to move the first color toner into position.
2) This table shows the rotation of the transfer belt in single-copy mode.

1. 1C Mode (Bk, C, M, Y)

Black

1. After the start key has been pressed, the drum motor starts, and the drum and transfer belt turn continuously. The revolver does not move because the black development section is already in place.
2. Shortly after the laser writes the image to the drum, the belt bias turns on, and stays on until the end of the copy run (this is true for all modes).

C, M, or Y

1. After the start key has been pressed, the drum motor starts, and the drum and transfer belt turn.
2. The revolver then rotates the required color development section into position, and the laser writes the image to the drum.
3. The development unit goes back to the revolver H.P. position after the toner has been transferred to the paper.

Multi-copy Mode

In multiple copy mode, the image of the second copy on the drum is transferred to the transfer belt almost immediately after the previous toner image, without detecting the belt mark. (There is no need to synchronize latent images in 1C Bk, C, M, Y modes.)

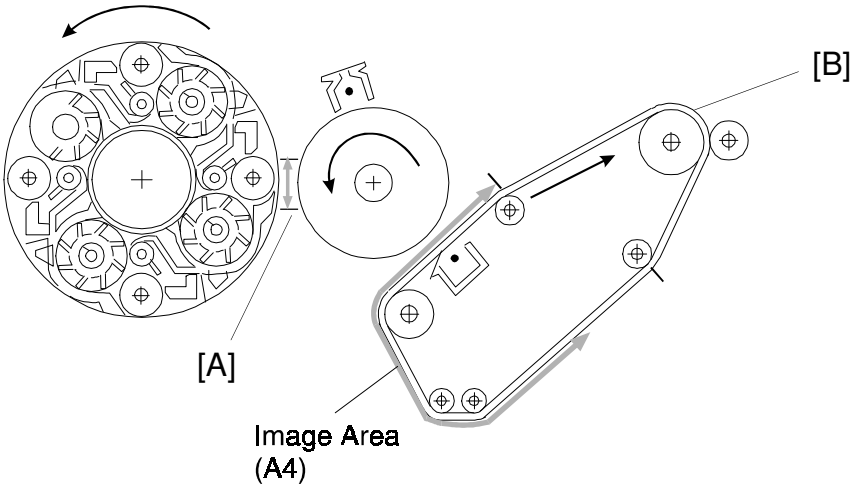
2. 2C Mode for Red and Blue

2C and 4C modes use more than one color toner. Because of this, the following points have to be kept in mind.

- The toner images on the transfer belt have to be synchronized (the leading edge of the toner image on the drum for the second color must arrive at the leading edge of the toner image that is already on the belt for the first color). To synchronize the latent images, the laser starts to write to the drum when the transfer belt home position has been detected.

Continued on the next page

- Between colors, the revolver must rotate. When one of the development rollers is near the drum, especially while the revolver is locking into place, there is a chance of toner crossing over to the drum [A] (see "Development"). Therefore, revolver rotation must be timed so that areas of the drum facing the revolver when a development roller is near the drum always arrive at a non-image area on the belt [B].



A166D659.wmf

1. After the start key has been pressed, the drum motor starts, and the drum and transfer belt turn continuously.
2. The revolver motor then moves the first color development section into position. For Red, the first color is Magenta, so the revolver has to turn 180 degrees. For Blue, the first color is Cyan, so the revolver has to turn 90 degrees. (See the "Development Unit" section for the positions of the color development sections in the revolver.)
3. The next time the transfer belt reaches home position, the laser starts to write the image data for the first color to the drum.
4. When the toner on the drum rotates past the transfer belt, the transfer bias pulls the toner image off the drum and onto the belt.
5. Then, the revolver must move the next color development section into position. For Red, the next color is Yellow, and for Blue, the next color is Magenta. For either of these, the revolver has to turn 90 degrees.

   When copying on A4/Letter size sideways paper or shorter, there is

enough time for the revolver to move the second color development section into position before the next transfer belt home position is detected. However, when copying on paper that is longer than A4 sideways, there is no time to do this within the same transfer belt rotation (the non-image area on the belt is too short). Therefore, the transfer belt has to make an extra rotation, and the revolver rotates the next time that the area of the drum at the revolver corresponds to a non-image area on the belt. Then, the next time transfer belt home position is detected, the laser can write to the drum. In summary, copy paper longer than A4/LT sideways needs an extra belt rotation, so copying takes longer.

6. Between copies of a multi-copy run, the revolver has to rotate 270 degrees to move the first color section back into position (the revolver cannot rotate in reverse). The transfer belt rotates once while this is done, so there is also a belt rotation between copies, even when copying on paper A4 sideways or shorter.
7. After the end of the copy run, the development home positioning routine is done.

3. 2C Mode for Green

1. After the start key has been pressed, the drum motor starts, and the drum and transfer belt turn.
2. The revolver motor then moves the Cyan development section into position. The revolver has to turn 90 degrees.
3. The next time the transfer belt reaches home position, the laser starts to write the image data for Cyan to the drum.
4. When the drum rotates past the transfer belt, the transfer bias pulls the toner image off the drum and onto the belt.

5. Then the revolver must move the next color development section into position. For Green, the next color is Yellow, and the revolver has to turn 180 degrees.
   Even when copying on paper that is A4/LT sideways or shorter, there is not enough time for the revolver to rotate the complete 180 degrees all in one step before areas of the drum corresponding to an image area on the belt arrive at the revolver position. Therefore, the revolver rotates 90 degrees, and waits until the non-image areas come around the next time before rotating the other 90 degrees. This means that the belt has to rotate one more time for 2C Green mode.
   In addition, for paper longer than A4/LT sideways, another extra belt rotation is needed for the same reasons explained for 2C Red/Blue mode.
6. Between copies of a multi-copy run, the revolver has to rotate 180 degrees to move the first color section back into position. The transfer belt rotates once while this is done, so there is also a belt rotation between copies.

4. 4C Mode

The revolver rotates 90 degrees between each color cycle. The process for revolver and transfer belt rotation is the same as for 2C mode for Red or Blue (except that the revolver only has to turn 90 degrees between copies of a multi-copy run).

5. OHP/Thick Paper Mode

In OHP/thick paper mode, the drum speed changes to half after the last color image is transferred to the transfer belt. After the drum speed is changed, the transfer belt also rotates at half-speed. Then the machine waits for transfer belt home position to align the image on the paper and to allow the transfer belt speed to stabilize at half-speed. Half-speed is used for OHP or thick paper after toner transfer because fusing temperature and pressure have to be applied for a longer time.

6. Summary

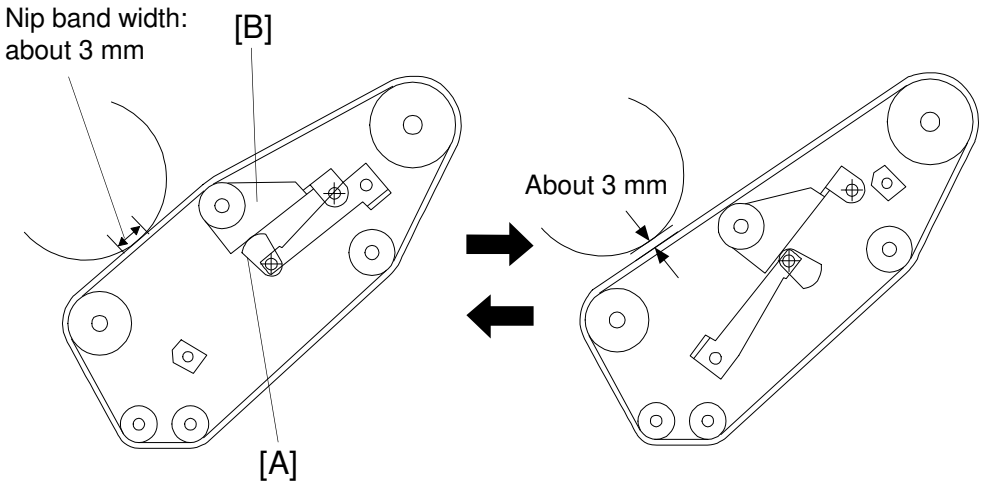
The following table shows the number of transfer belt rotations needed per copy for each of the various modes described above (except for OHP/thick paper mode). It does not include the belt rotations that take place during toner replenishment and other procedures. This explains why copying speed depends on the selected mode and copy paper size.

1C - Continuous transfer to the belt (no synchronization of toner images on the belt is needed)

		Preliminary	1st Color	Revolver Positioning	2nd Color	Between Pages
2C	R,B < A4 Paper	1	1	–	1	1
	R,B > A4 Paper	1	1	1	1	1
	G < A4 Paper	1	1	1	1	1
	G >A4 Paper	1	1	2	1	1

		Preliminary	1st Color	Revolver Positioning	2nd Color	Revolver Positioning
4C	< A4 Paper	1	1	–	1	–
	> A4 Paper	1	1	1	1	1
		3rd Color	Revolver Positioning	4th Color	Between Pages	
	< A4 Paper	1	–	1	1	
	> A4 Paper	1	1	1	1	

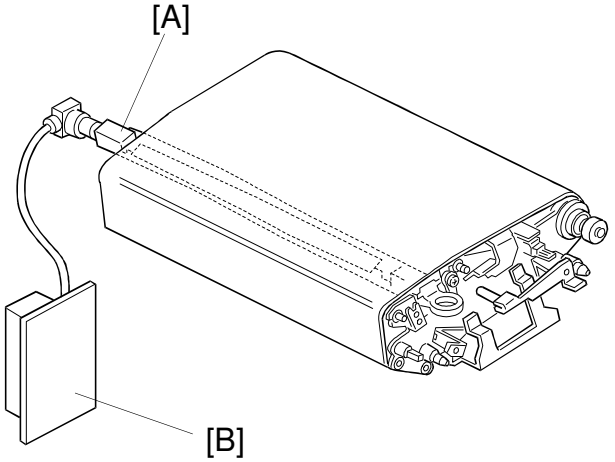
7.3.2 Transfer Belt Release Mechanism



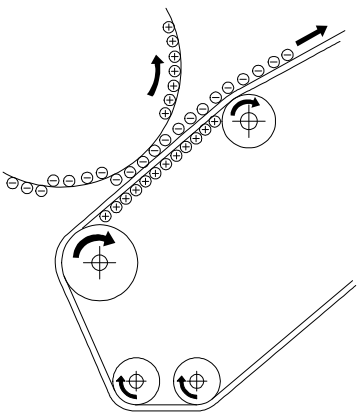
A166D572.wmf

The transfer belt unit has a release lever at the front side of the drum. This is because the transfer belt unit always contacts the drum during normal operation (the nip band width is about 3 mm), but must be moved away from the drum to remove the transfer belt unit. Moving the release lever rotates the release lever cams [A]. The tension bracket [B] and tension roller are shifted by the cams and make a gap of about 3 mm between the drum and the transfer belt.

7.3.3 Belt Transfer Bias



A166D573.wmf



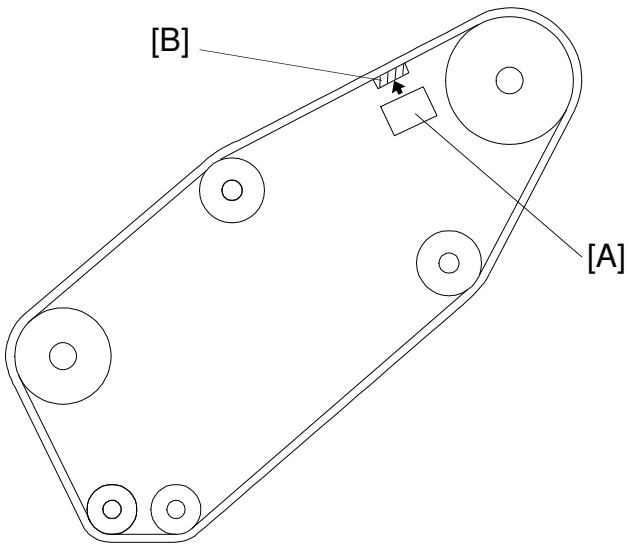
A166D574.wmf

The belt transfer charge unit [A] is a corona unit at the reverse side of the transfer belt. It attracts toner to the transfer belt. The high voltage supply board [B] applies a positive bias voltage to the transfer belt via the belt transfer corona unit.

During the second and subsequent image transfer cycles, a positive voltage higher than that used in the first cycle must be applied to the transfer belt to attract the next color toner from the drum to the transfer belt. This is because a) the attraction between the belt and the toner on the drum is reduced if there is a layer of toner already on the belt, b) there is residual voltage on the belt after the first color transfer. To minimize toner scattering, the voltage is not raised after the second cycle (also, further residual voltage effects and reductions in attraction between belt and toner on the drum are not so significant after the second cycle).

Belt transfer current [μA]					
Mode		1C	2C	3C	4C
Standard Speed Mode	1C	70	–	–	–
	4C	50	100	100	100

7.3.4 Belt Mark Detection

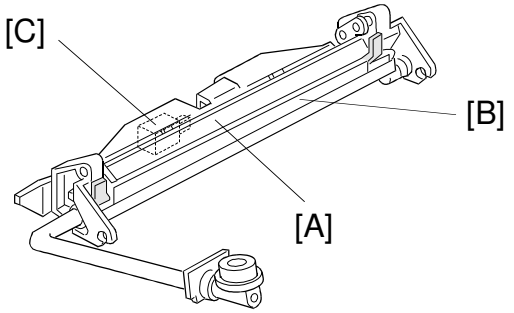


A166D575.wmf

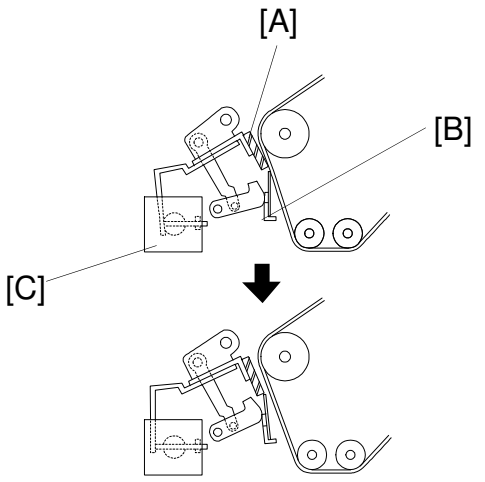
The transfer belt H.P. sensor [A] aligns the position of the image on the belt for each color. The use of this sensor allows the belt transfer unit mechanism to be more simpler than in other machines (e.g. the switchback mechanism for A109 copiers is not needed). So, in this machine, the transfer belt only needs to rotate one way during copying. This sensor is also used for the paper registration timing.

The photosensor actually detects the belt mark [B] which is a gold-colored patch on the edge of the belt. The patch at the front of the belt has a white mark. This mark should always be at the front when installing a new belt.

7.3.5 Transfer Belt Cleaning



A166D576.wmf



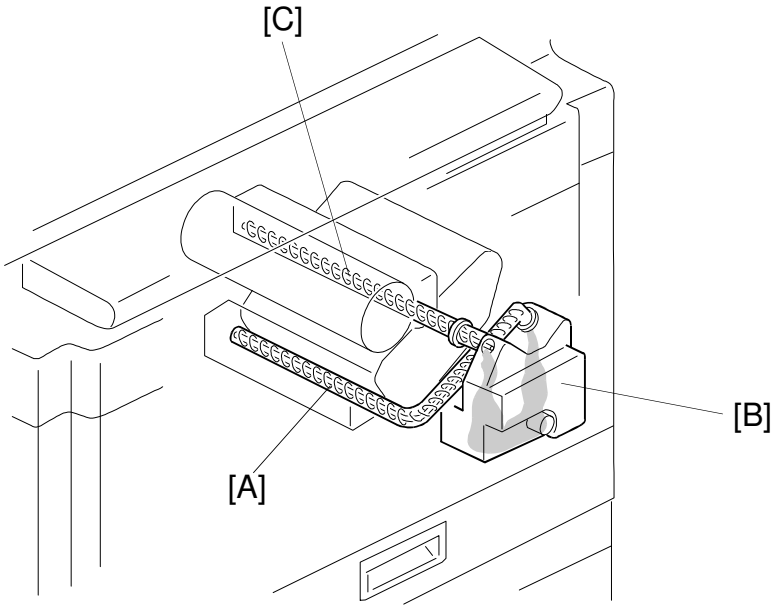
A166D577.wmf

After the toner image on the transfer belt is transferred to the paper, the toner remaining on the transfer belt is removed by the cleaning blade [A], which is a counter blade. The entrance seal [B] prevents the removed toner from falling onto the paper transfer unit or paper.

The cleaning solenoid [C] contacts and releases the blade and seal from the belt. The timing for contacting the cleaning blade and entrance seal to the transfer belt depends on the paper size. This is because contacting the cleaning unit to the transfer belt changes the tension of the transfer belt, and this causes a discrepancy while the image is being transferred to the belt.

1. A4/Letter Size or Smaller (216 mm or smaller in the subscan direction)
   The cleaning blade and the entrance seal contact the transfer belt just after the last color for the copy has been transferred to the transfer belt. The cleaning blade and the entrance seal are released from the transfer belt just after the first color for the next copy has been transferred to the transfer belt.
2. A3/Double Letter Size (larger than 216 mm in the subscan direction)
   The cleaning blade and the entrance seal contact the transfer belt just after the toner image for the copy has been transferred to the paper. The cleaning blade and the entrance seal are released from the transfer belt just after the first color for the next copy has been transferred to the transfer belt.

7.3.6 Toner Collection



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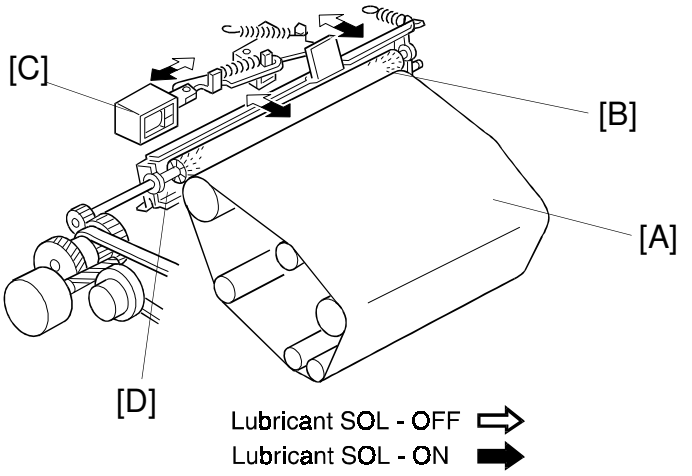
In the transfer belt unit, the toner collection coil [A] at the front side of the transfer belt unit transports the removed toner from the transfer belt cleaning unit to the toner collection bottle [B].

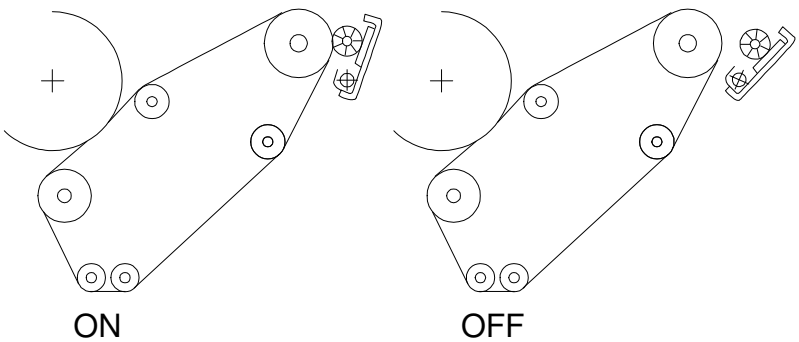
In the drum area, the toner collection coil [C] in the drum cleaning unit transfers the removed toner from the drum cleaning unit to the toner collection bottle.

The used toner sensor (a piezoelectric sensor) is inside the toner collection bottle. After this sensor detects that the bottle is full, the used toner lamp on the operation panel blinks. Then, after 250 copies, the machine stops the copy job.

7.3.7 Belt Lubricant Mechanism



A166D579.wmf



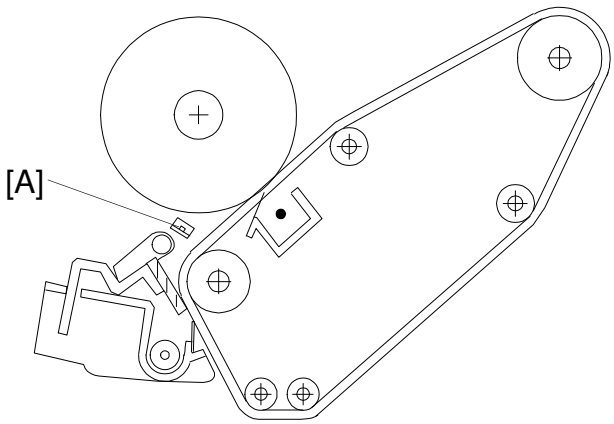
A166D580.wmf

Using the machine leads to toner filming on the belt. Toner filming reduces the efficiency of toner separation from the belt. A small amount of lubricant is regularly applied to the surface of the transfer belt [A] to help the cleaning blade easily remove toner from the transfer belt and to help toner to transfer to the paper.

The lubricant brush [B] distributes lubricant from the lubricant bar [D] to the transfer belt. Basically, the lubricant brush is away from the transfer belt and contacts the belt under the control of the lubricant brush solenoid [C]. The lubricant brush contacts after the following conditions:

- After the last copy job is completed and more than 50 copies have been made since the last lubrication.
- In ARDF mode, every 150 copies, even if it is during a continuous copy job. The machine temporarily stops the copy job (for about 15 s) until the lubrication is completed. Then it resumes the rest of the copy job.

7.3.8 PTL (Pre-transfer Lamp)



A166D582.wmf

When the belt transfer charge unit switches on, the transfer belt receives a +ve charge. Because the drum has a -ve charge, the belt will be attracted to the drum.

However, when there is toner on the transfer belt, there is a big reduction in this attraction. There is no toner on the transfer belt before the first color transfers to the belt. When there is toner on the transfer belt (before the second, third, and last colors transfer to the belt), the attraction between the drum and the belt is reduced. The difference in attraction is most noticeable between the first and second color transfers (at the first color transfer, there is no toner on the belt, but at the second toner transfer, the first color toner is already on the belt). For later color transfers, the attraction does not change so much, because there is already toner on the belt.

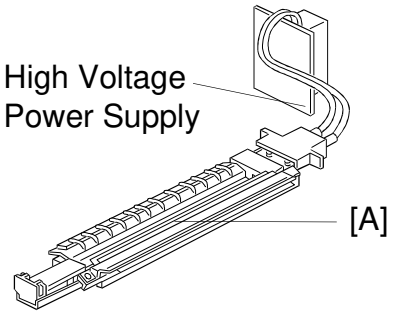
The difference in strength of attraction of the belt to the drum between the different color cycles means that color images may not be synchronized correctly on the belt, as the position of the belt changes.

To counteract this problem, the PTL [A] exposes the drum to reduce the potential of the white areas of the image before the first color toner is transferred to the belt (it does not switch on for later toner transfers). The reduction of the -ve drum potential reduces the attraction between belt and drum to the same sort of level as when there is already toner on the belt. This means that the synchronization of color toner images on the belt will be better.

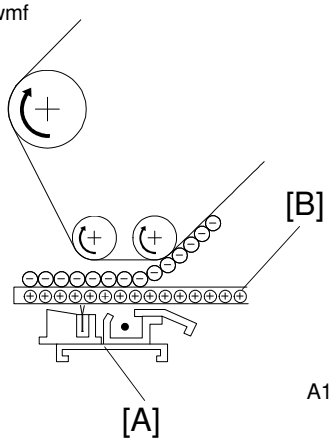
The PTL is especially effective for images that have a high proportion of white areas, where the attraction between drum and belt will be large.

7.4 PAPER TRANSFER

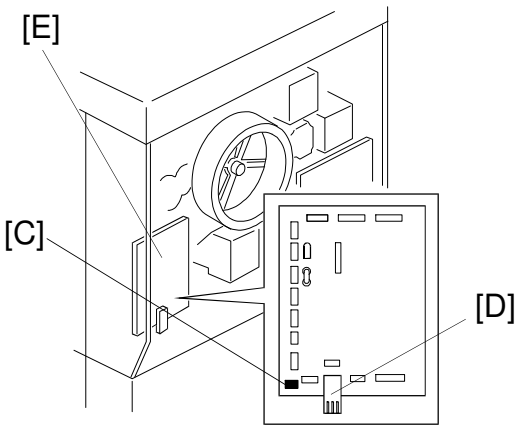
7.4.1 Paper Transfer Bias



A166d583.wmf



A166D584.wmf



A166D585.wmf

The paper transfer corona unit [A] transfers toner on the transfer belt to the paper [B]. The machine controls the paper transfer bias current by referring to the readings from the thermo-sensor [C] and humidity sensor [D] on the I/O control board 1 [E] . The bias also depends on the selected paper mode such as normal and OHP/Thick paper (see the table on the following page for some of the settings).

For the first 15 mm at the leading edge of the paper, the paper transfer bias current is increased to attract the paper to the transfer belt. This prevents poor transfer at the leading edge of the paper.

For the last 10 mm at the trailing edge of the paper, the paper transfer bias current is reduced to prevent the paper from discharging to the belt.

To prevent the paper transfer corona unit from attracting toner from the belt at the wrong time, the machine always applies a negative voltage (–1.7 kV) to the corona wire and the case except during toner transfer to the paper.

Mode			Normal Condition			High Temperature & High Humidity			Low Temperature & Low Humidity		
			1C	2C	4C	1C	2C	4C	1C	2C	4C
Normal Paper	Front	Leading edge	200	300							
		Image area	100	200	200			[Normal Condition Value]-50			[Normal Condition Value]+50
		Trailing edge	70	120							
	Back	Leading edge	400	500							
		Image area	150	250	250			[Normal Condition Value]-50			
		Trailing edge	100	150							
Thick Paper	Front	Leading edge	300	300							
		Image area	100	200	200			[Normal Condition Value]-50			
		Trailing edge	100	130							
	Back	Leading edge	400	500							
		Image area	150	200	250			[Normal Condition Value]-50			
		Trailing edge	100	150							
OHP	Front	Leading edge	300	300							
		Image area	150	350	350						
		Trailing edge	100	100							

NOTE: 1) The normal condition defaults depend on SP modes 2-301-23 to 70, but they should not be adjusted in the field.

2) ▭ : The same as for "Normal Condition".

3) Units: µA

7.4.2 Paper Discharge

The paper transfer unit has a discharge brush which is grounded to the main frame. This brush discharges the electric charge remaining on the paper to help the paper separate from the transfer belt. The curvature of the transfer belt also helps the paper to separate from the transfer belt.

7.4.3 Uniform Transfer Belt Charge

The transfer belt is grounded via each roller.

However, especially in multiple copy run mode, there may be residual voltage in the image area on the belt. This residual voltage affects the image of the next copy job.

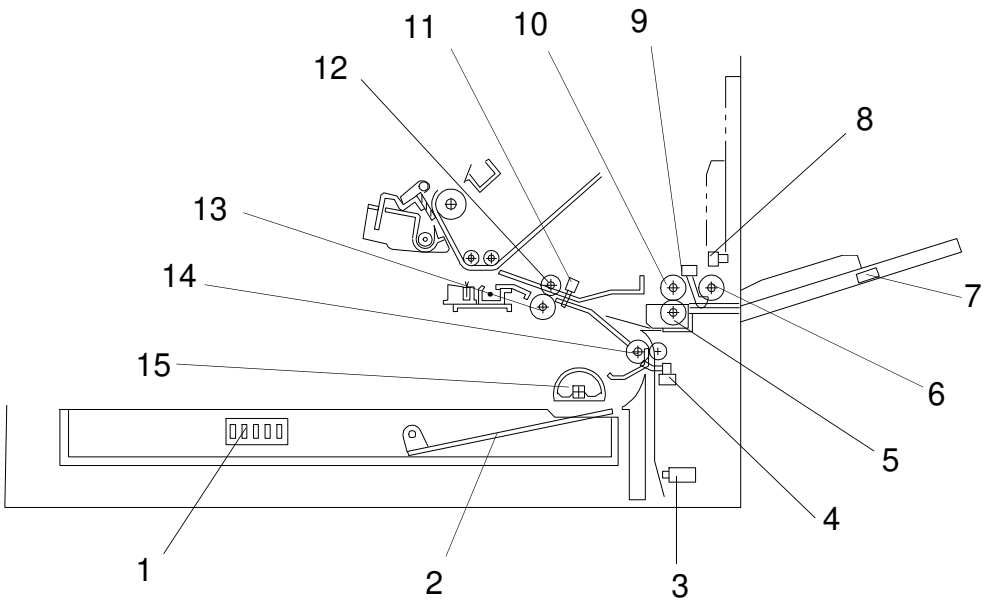
To remove the residual voltage, the machine applies a voltage just after the start key is pressed, while the transfer belt is rotating.

This makes the potential of the belt surface even, then the potential is grounded by the grounded rollers.

This current can be changed using SP 2-918 (50 to 500 μA) if copy quality symptoms indicate that the transfer belt charge is not uniform.

8. PAPER FEED AND REGISTRATION

8.1 OVERVIEW

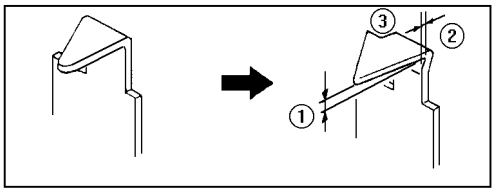


A166D630.wmf

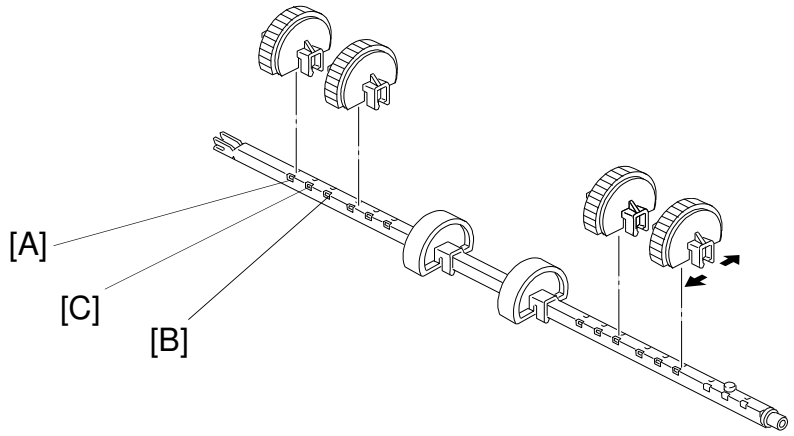
1. Paper Tray Size Switch (A166 only)
2. Tray Bottom Plate (A166 only)
3. Vertical Transport Switch
4. Vertical Transport Sensor
5. Separation Roller
6. By-pass Pick-up Roller
7. By-pass Paper Width Detection Board
8. By-pass Feed Table Switch
9. By-pass Feed Paper End Sensor
10. By-pass Feed Roller
11. Registration Sensor
12. Upper Registration Roller
13. Lower Registration Roller
14. Vertical Transport Roller
15. Paper Feed Roller (A166 only)

8.2 PAPER TRAY MECHANISM (A166 COPIER ONLY)

8.2.1 Paper Feed Drive Mechanism



A166D607.wmf

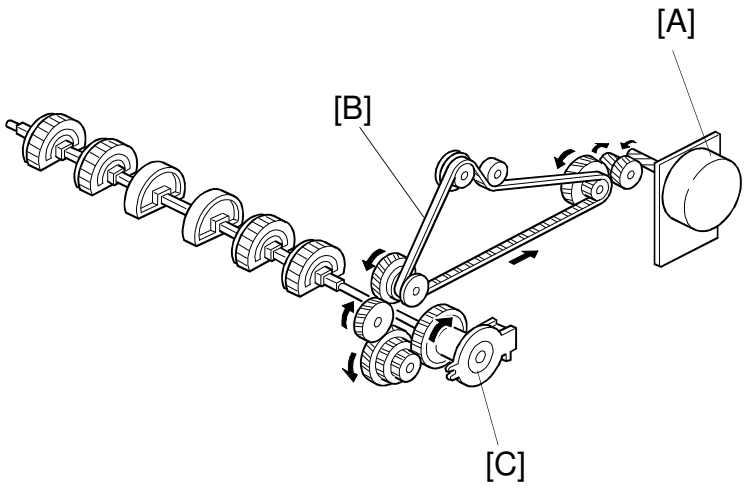


A166D608.wmf

This paper feed mechanism uses the corner separation system. The shape of the corner separators is as shown above. These corner separators have the following advantages.

- Dog ear problems are reduced by the shape at ① and ②.
- Multiple paper feeding are reduced by the shape at ③.

There are two extra holes for each paper feed roller on the paper feed roller shaft for use when multiple feed or paper jams occur. The factory-set position of the paper feed roller is hole [C], which is most suitable for A4, LT and B size paper. Another [B] is especially suitable for B size paper. The other, [A], is a general position for A size. If paper jams or non-feed errors occur for users who mainly use B size paper, change the paper feed roller position to [B].

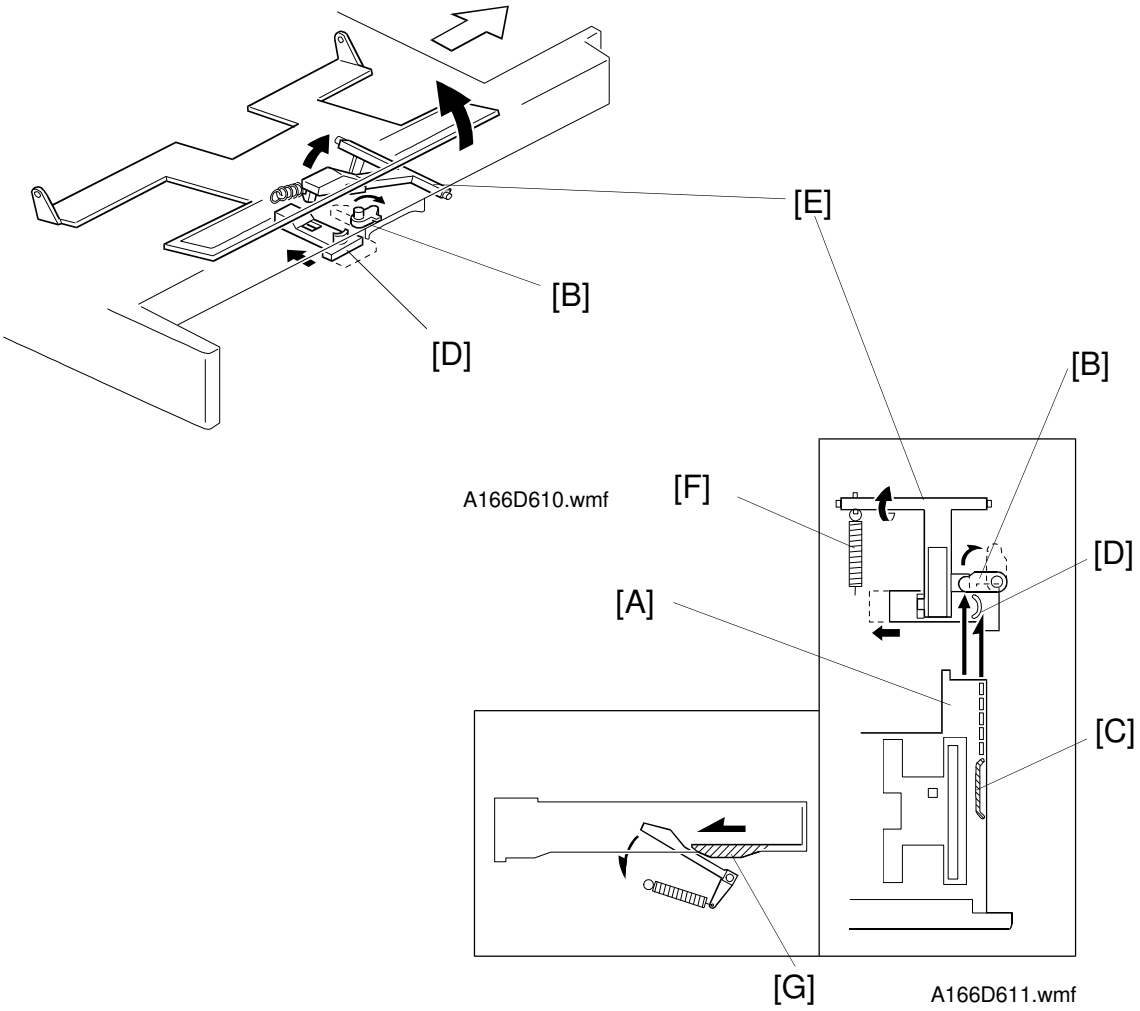


A166D609.wmf

The main motor [A] drives the paper feed rollers through the relay clutch gears, the timing belt [B], and the paper feed clutch [C].

After the Start key is pressed, the paper feed clutch turns on and the paper feed rollers start rotating to feed the paper. The paper feed clutch stays on for 150 ms to turn the paper feed rollers once only (the paper feed clutch is a one-turn clutch).

8.2.2 Paper Lift Mechanism

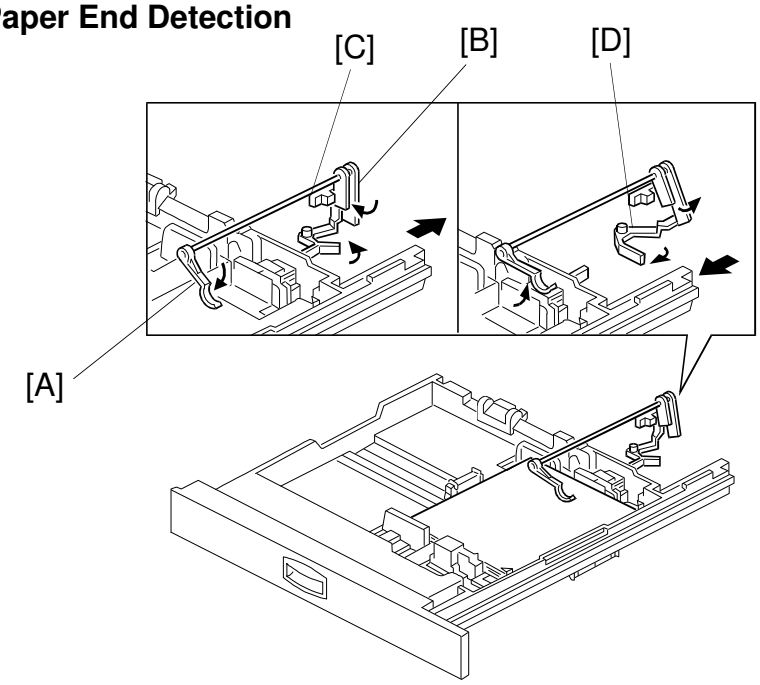


When the paper tray is closed, projection [A] on the tray pushes the release lever [B], and the other projection [C] pushes the release slider [D]. Then the release slider comes off the bottom plate lift arm [E].

Once the release slider comes off, the spring [F] raises the bottom plate lift arm and the bottom plate is lifted up. Then the top sheet of paper pushes up the corner separators. This keeps the stack of paper at the correct height.

When the tray is pulled out, the bottom part [G] of the tray pushes the bottom plate lift arm into the release slider.

8.2.3 Paper End Detection



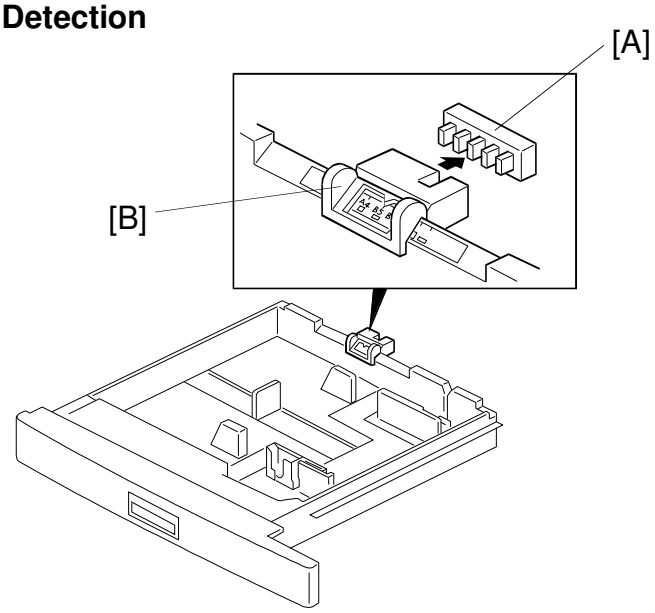
A166D612.wmf

The paper end feeler [A] is on the same shaft as the paper end actuator [B].

When the tray runs out of paper, the paper end feeler drops into the cutout in the tray bottom plate and the paper end actuator activates the paper end sensor [C].

The paper end actuator is in contact with the lever [D]. When the paper tray is drawn out of the copier, the lever turns as shown by the arrow in the diagram, and pushes up the actuator. As a result, the feeler rotates upwards. This mechanism is necessary to prevent the feeler from getting damaged by the paper tray body.

8.2.4 Paper Size Detection



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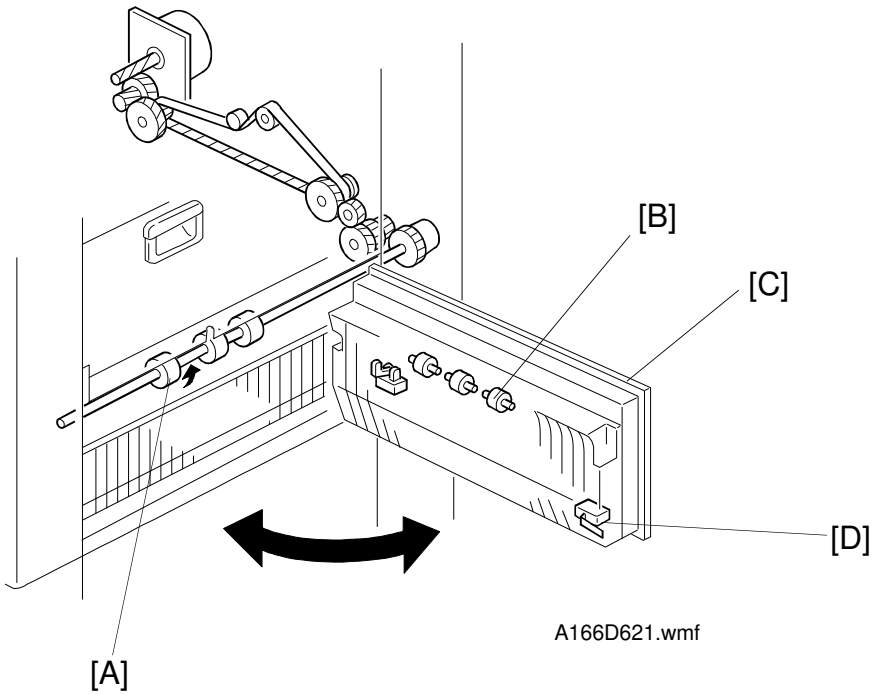
Actuated = 0 Deactuated = 1 1 2 3 4 5	**Paper size**	**L: Lengthwise** **S: Sideways**
	A4/A3 Version	**LT/DLT Version**
01111	A3-L	11" x 17"
00111	B4-L	8 1/2" x 14"
10011	A4-L	8 1/2" x 11"
01001	A4-S	11" x 8 1/2"
00100	B5-L	A4-L
00010	B5-S	A4-S
00001	A5-S	8 1/2" x 5 1/2"
10000	8 1/2" x 11"	11" x 15"
11000	11" x 8 1/2"	10" x 14"
11100	11" x 17"	8 1/2" x 13"
11110	F4-L	8" x 10"

The paper size switch [A] detects the paper size. The paper size switch has five microswitches inside. The paper size sensor is actuated by an actuator plate [B] on the rear of the tray. The actuator is slid across to match the paper size. Each paper size has its own unique combination of switch states, as shown in the table. The CPU determines the paper size by the signal combination from the sensor.

8.2.5 Vertical Transport Mechanism

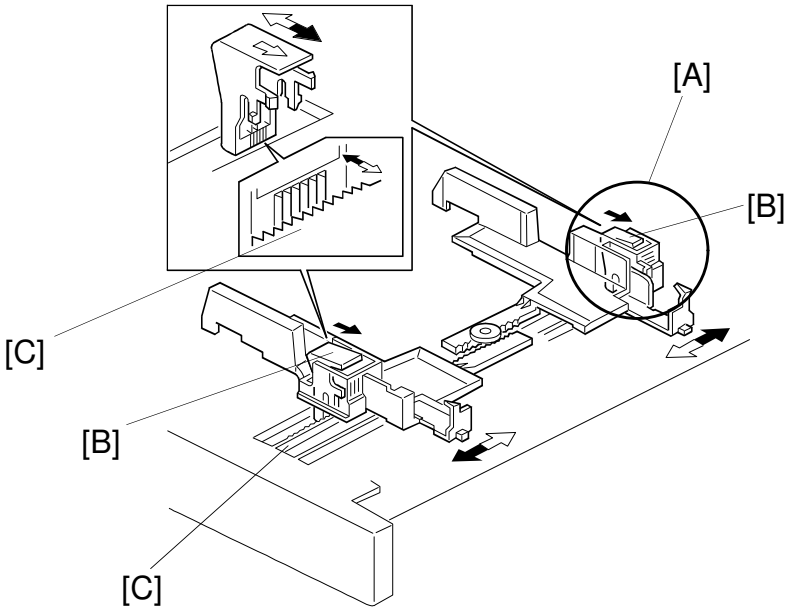


The vertical transport rollers [A] are driven by the main motor. The vertical transport rollers, and the driven vertical transport rollers [B] on the vertical transport door [C], transport the paper from the feed unit to the registration rollers.

The transport door can be opened to access jammed paper in the vertical transport area.

The vertical transport switch [D] detects whether the vertical transport door is opened or not.

8.2.6 Side Fence Double-stopper Mechanism



A166D622.wmf

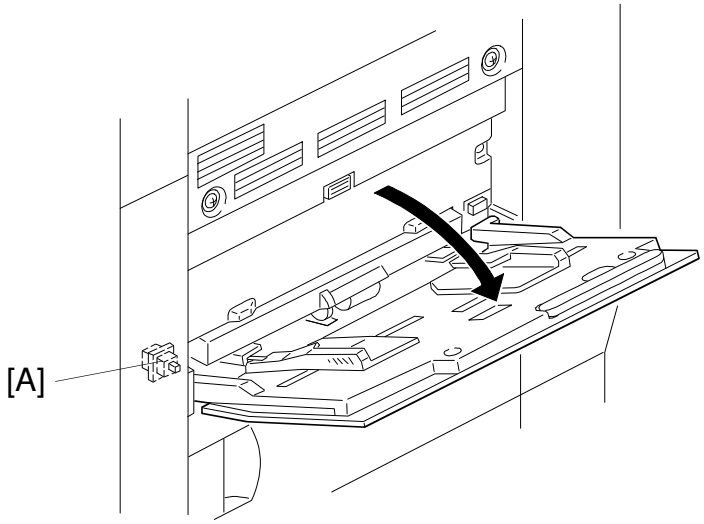
In this machine, there is a side fence stopper mechanism for both the front and rear side fences.

If the tray is closed with excessive force after loading paper, paper may come over the rear side fence because the fence is deformed by the weight of the paper leaning against it. As a result, skewing or paper jams may occur. To prevent this, a side fence stopper mechanism [A] has been added to the rear side fence also.

The release levers [B] have a stopper which contains teeth like those on a gear. The guide rails [C] also have teeth. When the release lever is pushed, the gear teeth release each other and the side fences can be moved.

8.3 BY-PASS FEED

8.3.1 By-pass Feed Table Mechanism

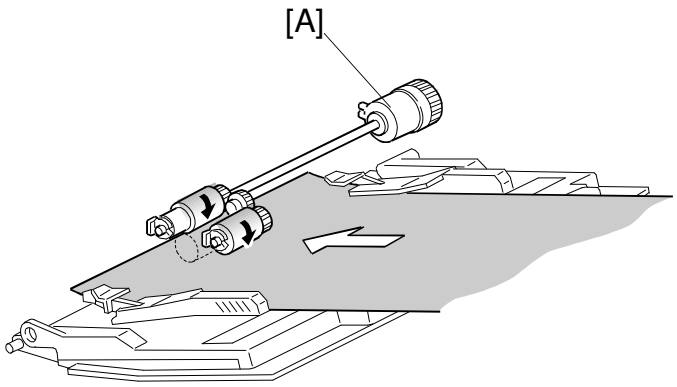


A166D629.wmf

The by-pass feed table switch [A] detects when the by-pass feed table is opened. Then the CPU turns on the by-pass feed indicator on the operation panel.

The by-pass feed table can hold up to 40 sheets of paper.

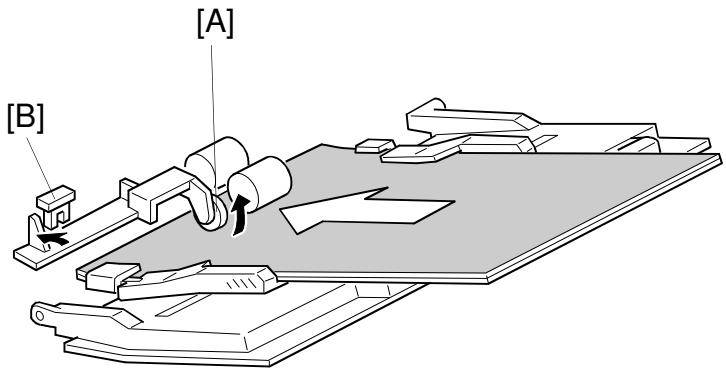
8.3.2 Paper Feed



A166D623.wmf

The by-pass feed table uses an FRR feed system. The feed and separation rollers are always in contact. They are driven by the main motor via the by-pass feed clutch [A].

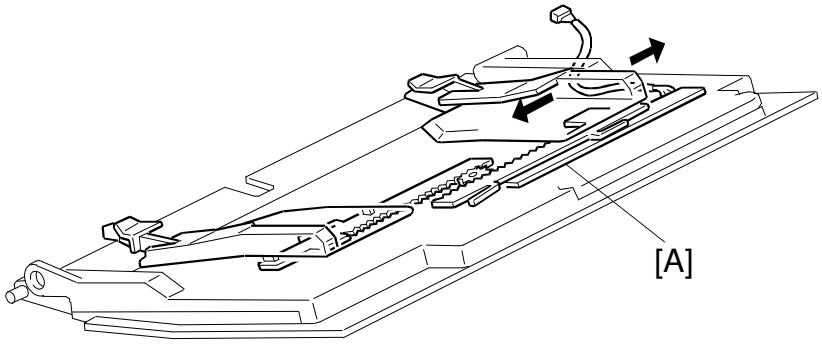
8.3.3 Paper End Detection



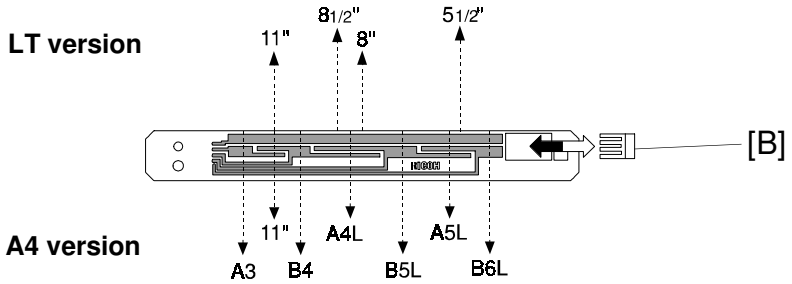
A166D624.wmf

If paper is loaded in the paper tray, the paper end feeler [A] is raised by the paper stack and the paper end sensor [B] is deactivated. When the paper tray runs out of paper, the paper end feeler drops into the cutout in the tray bottom plate and the paper end sensor is activated.

8.3.4 By-pass Feed Paper Width Detection



A166D625.wmf



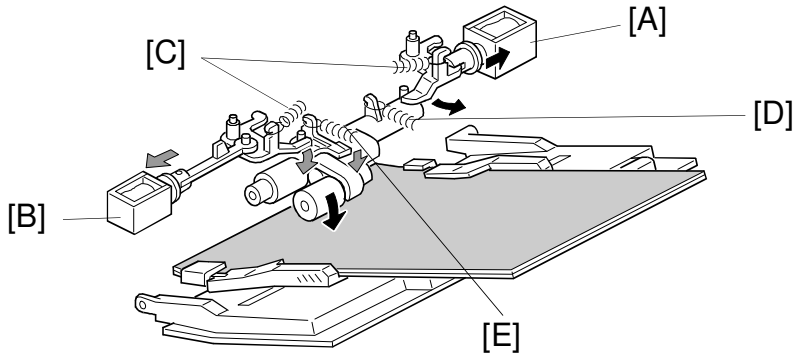
A166D626.wmf

The by-pass paper width detection board [A] monitors the paper width. The rear side fence is connected to the terminal plate [B]. When the side fences are positioned to match the paper width, the terminal plate slides along the wiring patterns on the detection board. The patterns for each paper width on the paper width detection board are unique. Therefore, the machine determines which paper width has been placed in the by-pass feed table by the signal output from the board.

This machine does not have a paper length sensor, so the paper length is selected by user operation when the by-pass feed table is opened. (The user also selects the lengthwise/sideways orientation.) The default of the orientation is defined by SP 5-19-15.

The user also can select a non-standard paper size which was previously set with a user tool (default: 432 x 297 mm).

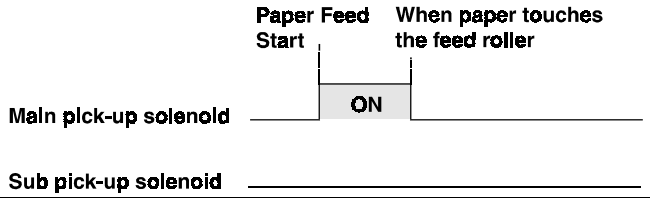
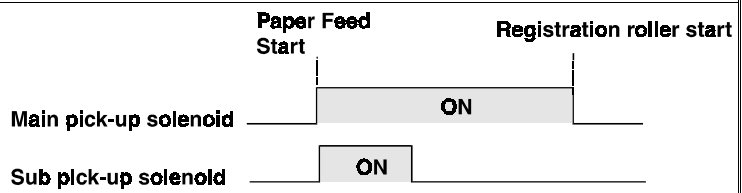
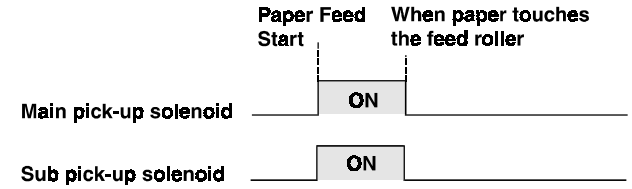
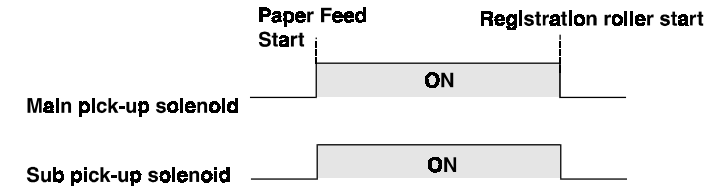
8.3.5 Pick-up Roller Pressure Mechanism



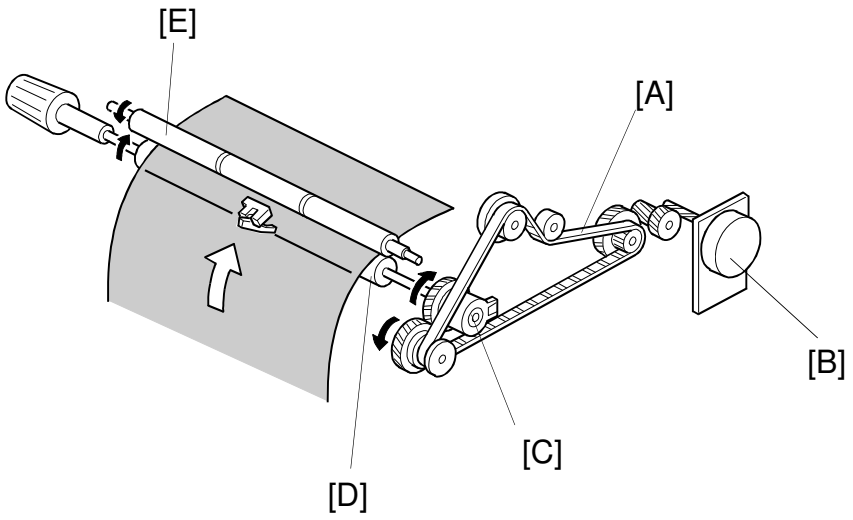
A166D627.wmf

This by-pass feed table uses a pick-up roller pressure mechanism, which has two pick-up solenoids. This system uses the main pick-up solenoid [A] and the sub pick-up solenoid [B] to change the pick-up roller pressure, to adapt to various paper types and copy modes.

The pick-up roller is lifted by springs [C] on the arm when the copier is not operated. When the copier is started, the pick-up roller is lowered onto the paper by the main pick-up solenoid spring [D]. The sub pick-up solenoid assists the main pick-up solenoid to increase the pressure with sub pick-up solenoid spring [E].

Mode	Timing Chart
Normal Paper (Normal speed)	
–Manual duplex machine only– Duplex Mode <reverse side> (Normal Speed)	
Thick Paper Mode (Half Speed)	
• OHP Mode (Half speed) • Thick Paper Mode (Half speed) <reverse side>	

8.4 REGISTRATION DRIVE MECHANISM



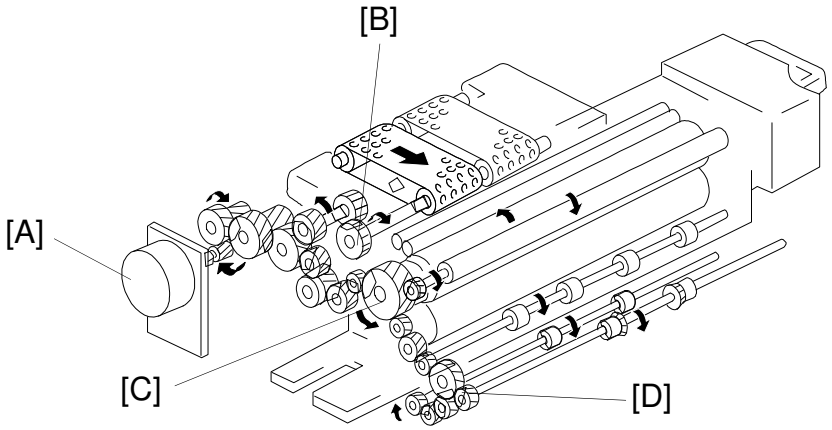
A166D628.wmf

Through the timing belt [A], rotation from the main motor [B] is transmitted to the registration clutch [C]. When the registration clutch activates, the main motor drive is transmitted to the lower registration roller [D], then to the upper registration roller [E].

9. PAPER TRANSPORT AND IMAGE FUSING

9.1 PAPER TRANSPORT UNIT

9.1.1 Drive Mechanism

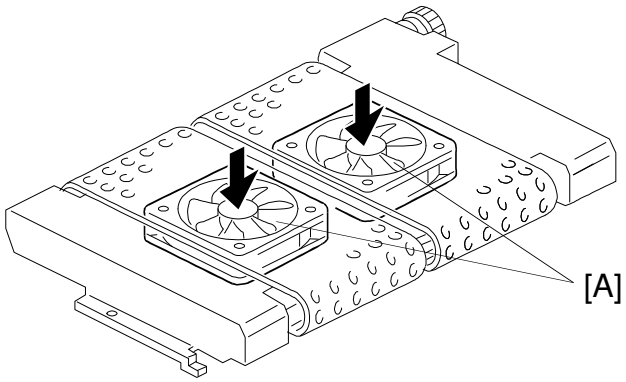


A166D632.wmf

The paper transport, fusing, and paper exit mechanisms are driven by the main motor [A].

Drive from the main motor is transmitted to the transport drive gear [B], the fusing roller drive gear [C], then to the paper exit drive gear [D] via idle gears.

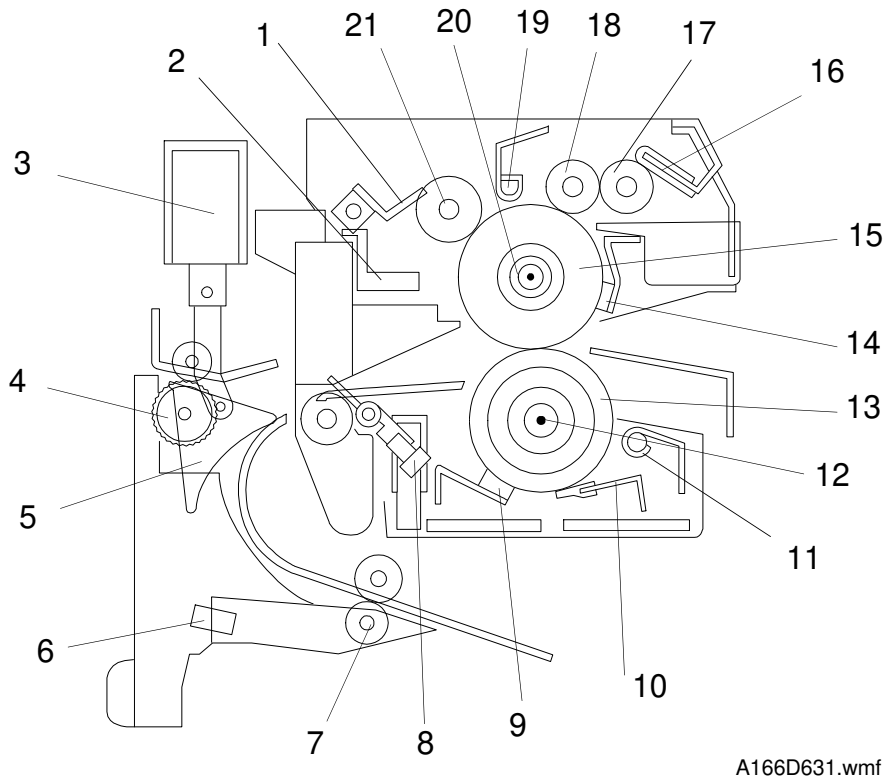
9.1.2 Transport Mechanism



A166D633.wmf

There are two vacuum fans [A] in the transfer unit. They hold the paper firmly against the transport belts so that there is enough friction between the paper and the transport belts for smooth transportation of the paper.

9.2 FUSING UNIT OVERVIEW

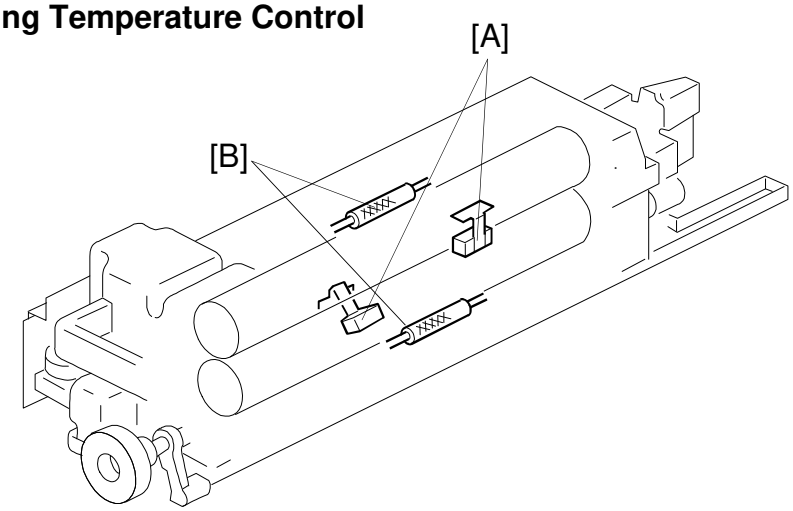


A166D631.wmf

1. Cleaning Blade
2. Cleaning Roller Oil Pan
3. Junction Gate Solenoid
4. Exit Roller
5. Junction Gate
6. Paper Exit Door Switch
7. Transport Roller
8. Exit Sensor
9. Pressure Roller Thermistor
10. Pressure Roller Cleaning Blade
11. Pressure Roller Thermofuse
12. Pressure Roller Lamp
13. Pressure Roller
14. Fusing Thermistor
15. Hot Roller
16. Oil Supply Pad
17. Oil Supply Sub-roller
18. Oil Supply Roller
19. Fusing Thermofuse
20. Fusing Lamp
21. Hot Roller Cleaning Roller

9.3 FUSING UNIT

9.3.1 Fusing Temperature Control



A166D634.wmf

There are fusing lamps in both hot and pressure rollers (the hot roller lamp is 670W, and the pressure roller lamp is 400W). To control fusing temperature, thermistors [A] detect the temperature at both rollers.

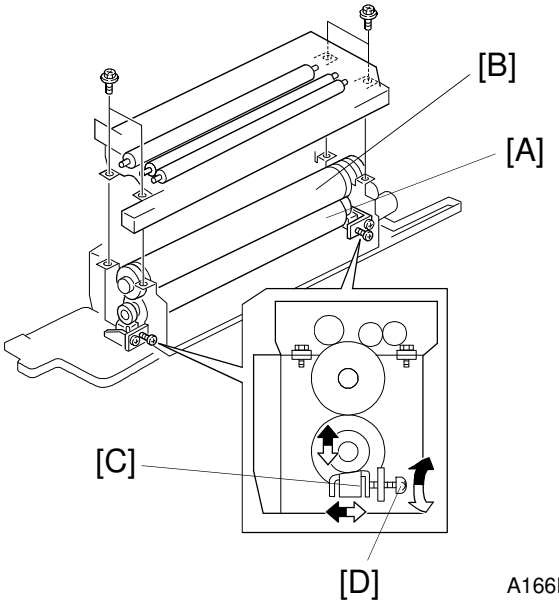
The fusing temperature depends on the selected mode, as shown in the following table. Color toner and some paper types such as OHP sheets require a higher fusing temperature. The temperature for various modes can be adjusted with SP 1-105-1 to -8.

	Standby Mode	While Copying		
		Normal Speed		OHP/Thick Paper Mode (Half Speed)
		Single Color	Full color	Single Color/Full Color
Hot Roller Temparature	150°	140°	150°	150°
Pressure Roller Temparature	150°			

There are two types of fusing temperature control: on/off control and phase control. The mode can be selected with SP1-104. Phase control mode should only be selected if the user has a problem with electrical noise or interference.

There are thermofuses [B] on the hot and pressure roller fusing lamp circuits. If the temperature of either thermofuse reaches 167°C, the thermofuse opens, protecting each roller from overheating.

9.3.2 Fusing Pressure Mechanism



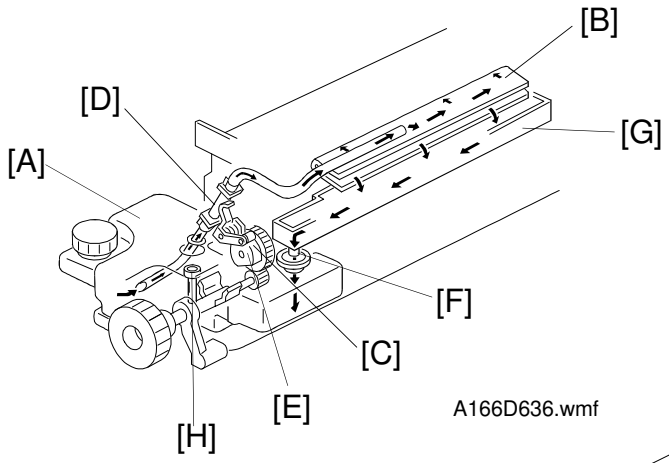
The pressure roller [A] is pressed up against the hot roller [B] by a pressure bracket [C].

The hot and pressure rollers are silicone rollers for improved paper separation.

The pressure screw [D] is paint-locked to prevent it from loosening during transportation and storage. Normally, this screw should not be used, except in some cases after replacing the hot and/or pressure rollers. This screw adjusts the nip band width.

When replacing the hot and pressure rollers, the hot roller pressure can be released by removing the upper fusing unit.

9.3.3 Oil Supply Mechanism



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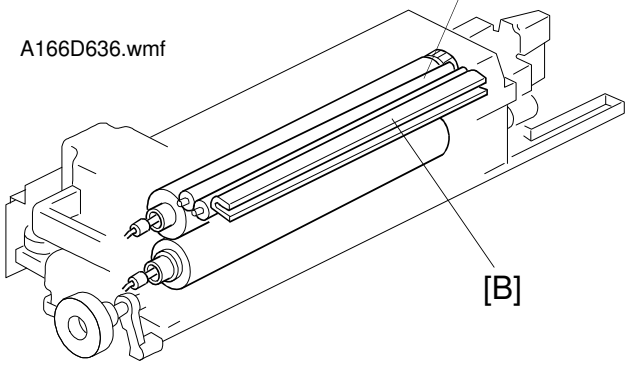


A166D637.wmf

Silicone oil is applied to the hot roller to help prevent toner and paper from sticking to the hot roller, to reduce paper curl, improve hot roller durability, and to help in roller cleaning.

A small pump with a one-way valve moves the oil from the oil tank [A] to the oil supply pad [B]. The oil pump lever [C] alternately presses and releases the rubber sleeve [D] between the valves as the oil cam [E] turns.

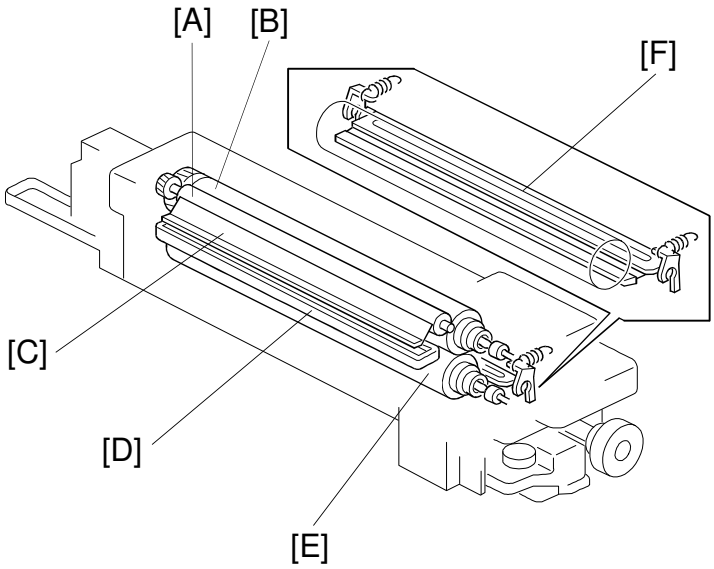
The oil supply pad then applies the oil to the hot roller as the roller turns via oil supply rollers [I]. The oil supply pad and oil supply rollers spread the oil. Oil flowing over these parts flows out through the hole [F] in the bottom of the oil sump [G] and returns to the oil tank. If there is not enough oil on the hot roller, friction between the oil supply and hot rollers increases, and the oil supply roller turns, and this supplies oil to the hot roller.

The oil supply roller distributes oil to the hot roller and the cleaning roller removes any toner remaining on the hot roller's surface.

The oil end sensor [H] detects the oil end condition. When an oil end condition is detected, copying is immediately disabled and a call service message is displayed on the LCD.

To keep oil use at a minimum, two oil supply rollers are used in this machine.

9.3.4 Cleaning Mechanism



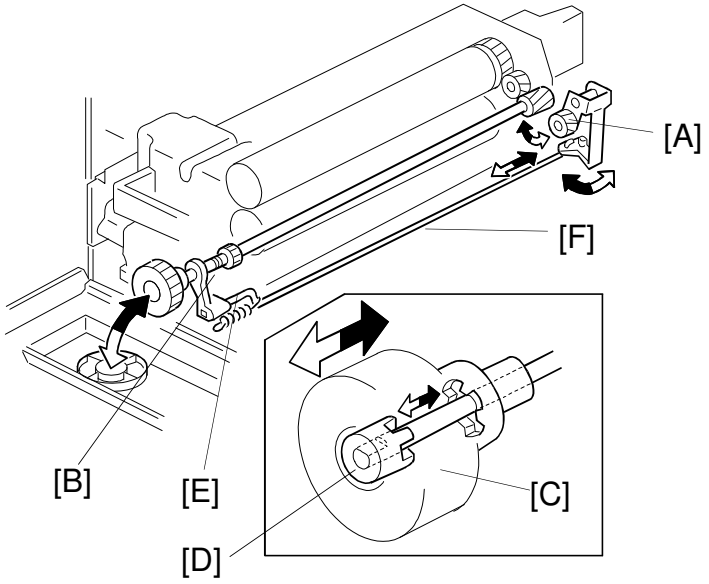
A166D638.wmf

The hot roller cleaning roller [A], which is always in contact with hot roller, collects toner and paper dust adhering to the surface of the hot roller [B]. The surface of the cleaning roller is coated with teflon.

The collected matter is scraped off by a stainless steel blade [C], and goes to the cleaning roller oil pan [D].

The pressure roller [E] has a cleaning blade [F] to clean the pressure roller.

9.3.5 Fusing Drive Release Mechanism



A166D639.wmf

The fusing unit drive release mechanism automatically disengages the fusing unit drive gear [A] when the front door is opened.

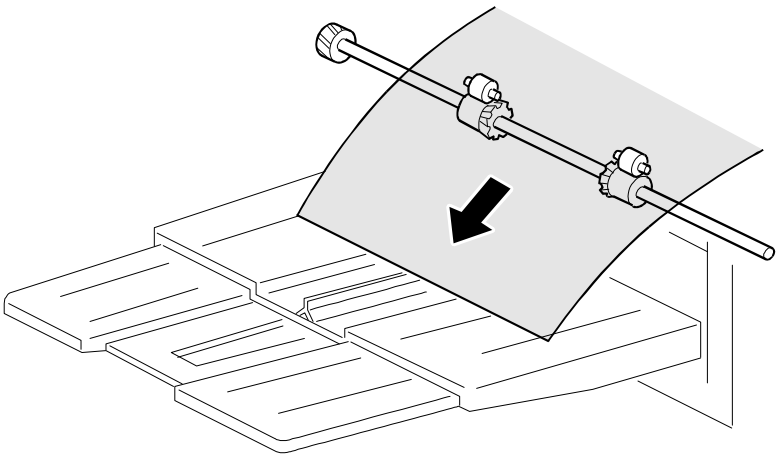
When the front door is opened, the fusing knob [C] is pushed out by the spring joints [B] in the fusing drive shaft. The pushed-out fusing knob [C] fits over the hub [D] at the end of the fusing drive shaft. This allows the user to turn the hot roller to remove jammed paper.

Also, when the door is opened, the release shaft [F] is shifted to the front side by the spring [E]. Then the fusing unit drive gear is released. This allows the fusing unit drive gear to rotate freely so that misfed paper can be easily removed.

9.4 JUNCTION GATE AND PAPER EXIT

9.4.1 Paper Exit

After fusing, the exit roller supports the paper going out. The exit roller improves paper stacking.



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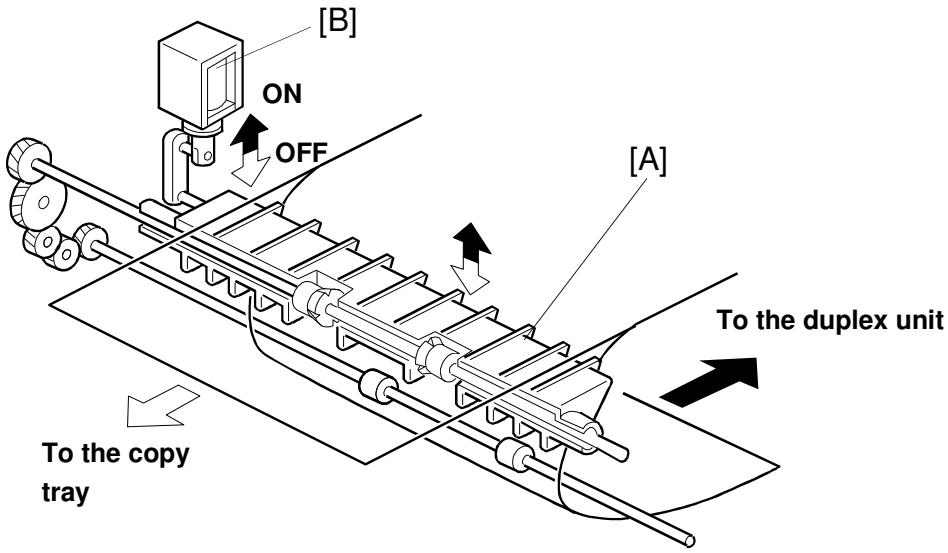
9.4.2 Junction Gate Mechanism (A187/A189 copiers only)



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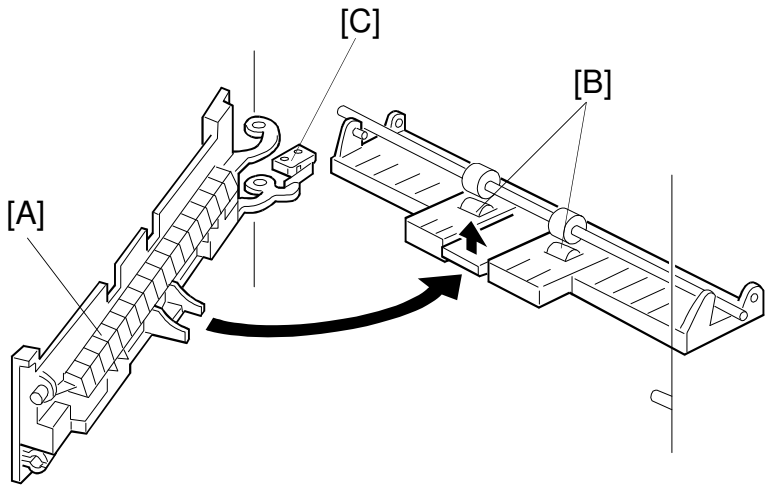
The junction gate [A] changes the direction of the paper coming out of the fusing unit to the copy tray or to the duplex unit. The junction gate is controled by switching the junction gate solenoid [B].

- To the copy tray: junction gate solenoid off
- To the duplex unit: junction gate solenoid on

9.4.3 Paper Exit Door (A187/A189 copiers only)



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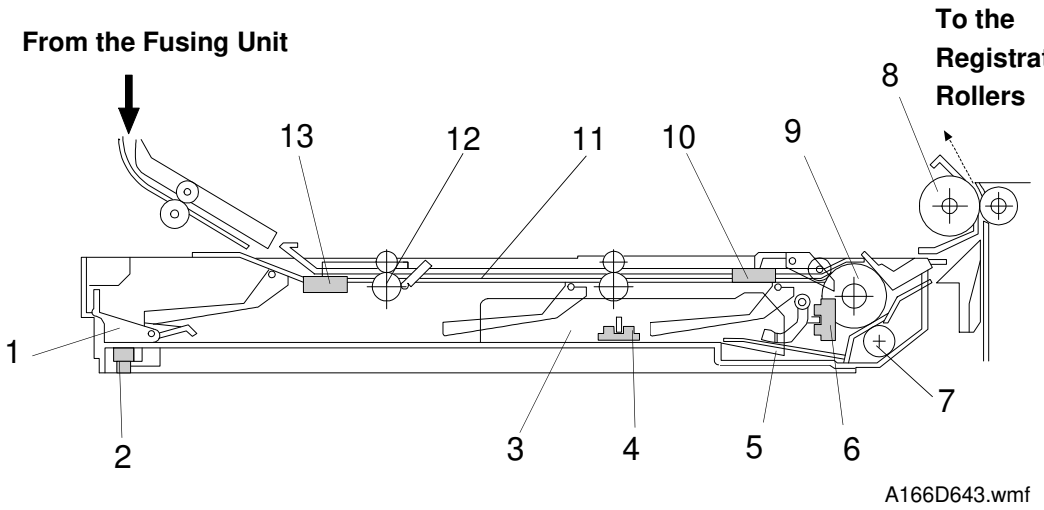
To remove jammed paper in the duplex unit easily, the paper exit door [A] of the duplex machine can be opened. When this door is opened, the duplex transport rollers [B] are released. The paper exit door switch [C] detects when the paper exit door is opened.

10. DUPLEX UNIT

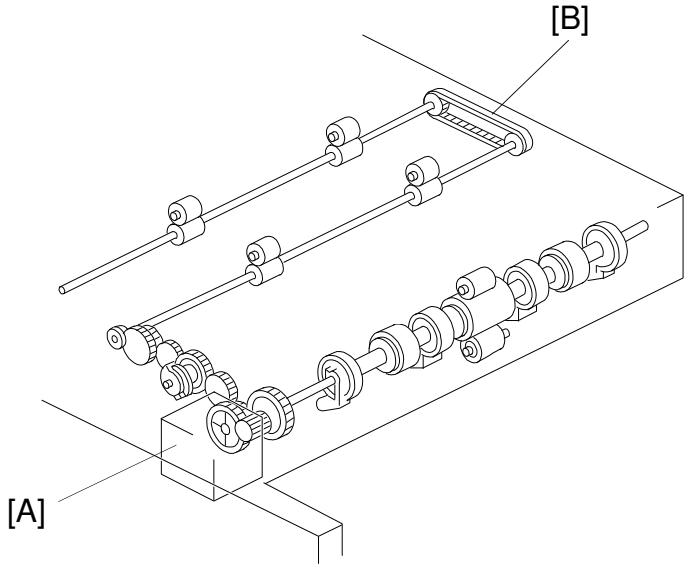
10.1 OVERVIEW



1. End Fence
2. End Fence Jogger H.P. Sensor
3. Side Fence Jogger
4. Side Fence Jogger H.P. Sensor
5. Bottom Plate
6. Paper End Sensor
7. Separation Roller
8. Vertical Transport Roller
9. Paper Feed Roller
10. Duplex Turn Sensor
11. Transport Path
12. Duplex Entrance Roller
13. Duplex Entrance Sensor

10.2 DUPLEX UNIT MECHANISMS (A187/A189 copiers only)

10.2.1 Drive Mechanism



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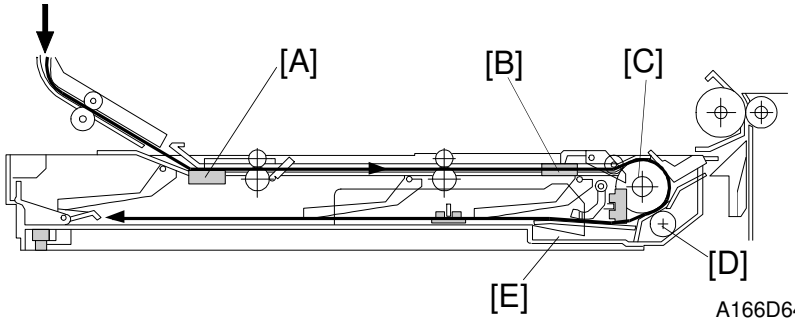
All rollers in the duplex tray are driven by the duplex feed motor [A] through a series of gears and a timing belt [B]. Helical gears are used to reduce noise. The duplex feed motor also drives the duplex bottom plate up and down.

10.2.2 Duplex Paper Path

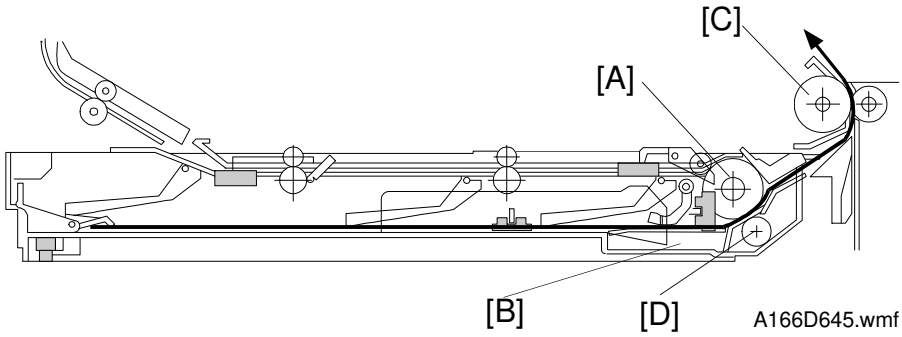
The duplex feed motor is a stepper motor. The direction that the motor turns depends on whether the duplex unit is stacking or feeding.

1. Duplex Stacking



Paper enters the duplex unit through the entrance sensor [A], the duplex turn sensor [B], the paper feed roller [C], and the separation roller [D]. Then, it is stacked while the bottom plate [E] is at the lower position.

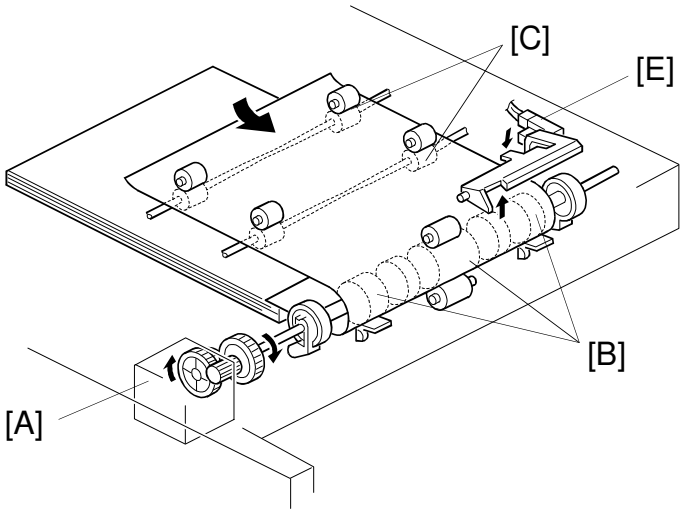
2. Paper Feed from the Duplex Tray



The paper stacked in the duplex unit contacts the paper feed roller [A] after the bottom plate [B] is lifted up. Then, the paper is fed by the paper feed roller and goes to the registration rollers via the vertical transport roller [C].

The separation roller [D] has a one-way clutch. During paper stacking, the separation roller turns with the paper feed roller. During paper feed, the separation roller does not turn, so that it can separate the sheets of paper.

10.2.3 Duplex Entrance To Duplex Tray



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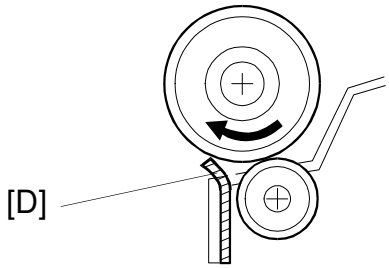
The duplex feed motor [A] starts turning after the leading edge of the paper activates the fusing exit sensor. This motor drives the duplex feed rollers [B] and the duplex entrance rollers [C]. The copy paper from the junction gate section is directed to the duplex tray through these rollers.

The tip of the flip mylar [D] moves to the left (front view) when the duplex feed rollers rotate to feed the copy into the duplex tray. The mylar presses the copy against the duplex feed rollers, ensuring that the trailing edge of the copy clears the guide plate.



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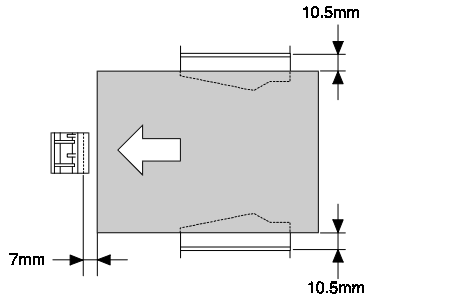
The duplex turn sensor [E] detects the trailing edge of the paper as it enters the tray.

10.2.4 Jogger Mechanism



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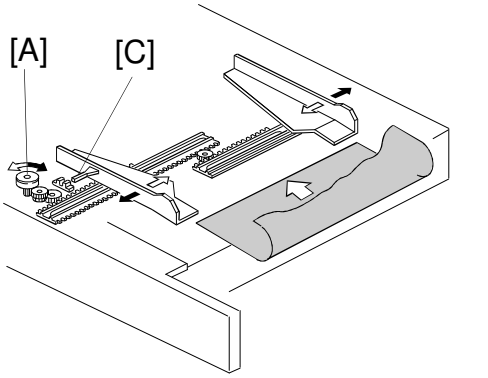

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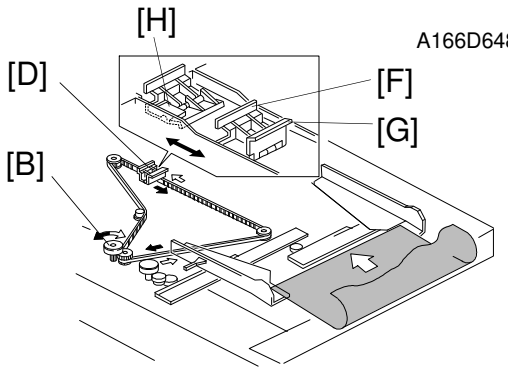

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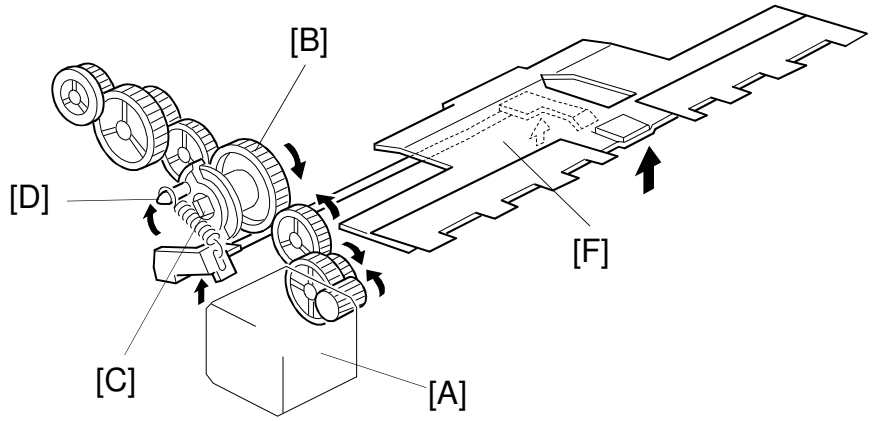
There are two motors for driving the fences. The side jogger fences are driven by the side fence jogger motor [A]. The end jogger fence is driven by the end fence jogger motor [B]. Using two separate motors for the side and end fence allows the duplex tray to handle all paper sizes from A3/11" x 17" to A5/ 8 1/2" x 5 1/2" sideways.

There are two home position sensors. One is for the side jogger fences [C], and the other is for the end fence [D]. When the main switch is turned on, the side fence jogger motor and the end fence jogger motor move the side jogger fences and the end fence to their home positions.

When the registration clutch turns on, the side fences move 10.5 mm, and the end fence moves 7 mm away from the selected paper size. Then when the copy paper is delivered to the duplex tray, the jogger fences move inward to square the paper. (This is done 690 ms after the duplex turn sensor detects the trailing edge of copy paper. The duplex turn sensor [E] is in the diagram on the previous page.) Shortly after this, the jogger fences move back to their previous positions. After the last copy of the first side copy run enters the duplex tray, the jogger fences remain against the paper stack.

There are two end fences. One [F] is for A3/ 11 x 17" size paper. The other [G] is for sizes smaller than B4. They are included as a unit. When A3/ 11 x 17" size paper is in the duplex tray, the end fence unit moves to the left and the B4 end fence rotates down as it is pressed against the end fence stopper [H].

10.2.5 Paper Feed from the Duplex Tray



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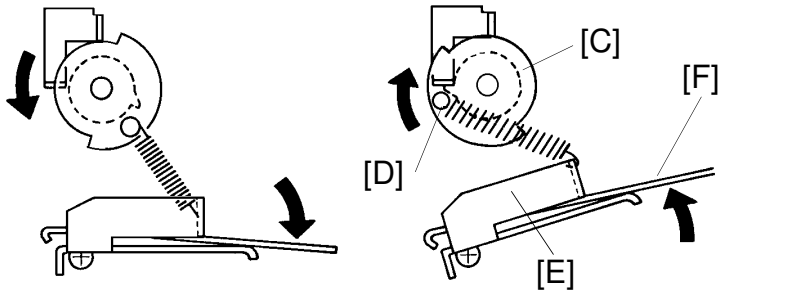

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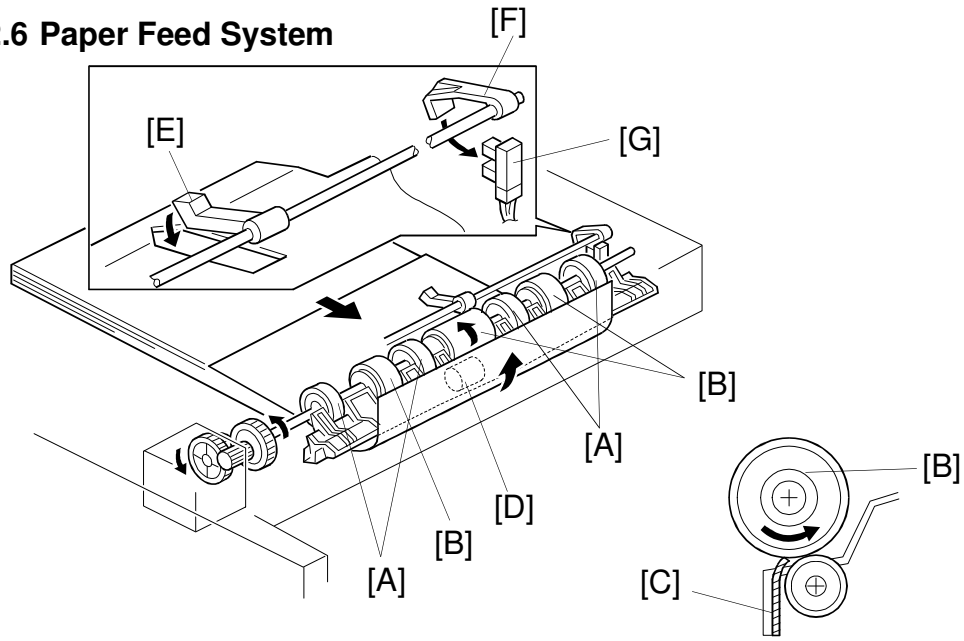
While the first side is being copied, the duplex feed motor [A] is rotating clockwise and the cam clutch gear [B] is rotating counter-clockwise (see the above drawing). Then all copies are stacked in the duplex tray unit.

After the first side copies have been made, the duplex feed motor [A] changes direction, and the cam clutch gear [B] rotates clockwise. The cam clutch [C] also rotates clockwise because of spring inside the clutch. The pin [D] on the clutch lifts up the duplex lever [E] through spring, raising the duplex bottom plate [F].

Then the stacked copies are fed by the duplex feed rollers to begin reverse side copying.

10.2.6 Paper Feed System



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While paper is being stacked in the duplex tray, the paper flatteners [A] correct curl at the leading edge of the paper.

After all the paper has been stacked in the duplex tray, the jogger fences square the paper stack and the duplex feed motor rotates counter-clockwise briefly to prepare to feed the paper from the duplex tray. At this time, the bottom plate rises and the duplex feed rollers [B] move the flip mylars [C] back to the right (front view).

The duplex paper feed system consists of three sets of duplex feed rollers and a separation roller [D]. As the separation roller has a one-way bearing inside, it rotates freely during paper stacking and locks during paper feeding. The duplex feed rollers can feed only the top sheet of the stack because the separation rollers function in the same way as a friction pad does.

After that, the second side copies follow the upper paper tray feed station paper path.

After the duplex tray runs out the final copy, the paper end feeler [E] drops through a slot in the duplex bottom plate. The duplex paper end actuator [F], which is on the same shaft as the duplex paper end feeler, pivots into the duplex paper end sensor [G]. Then the sensor signals the cpu to stop the next paper feed cycle.

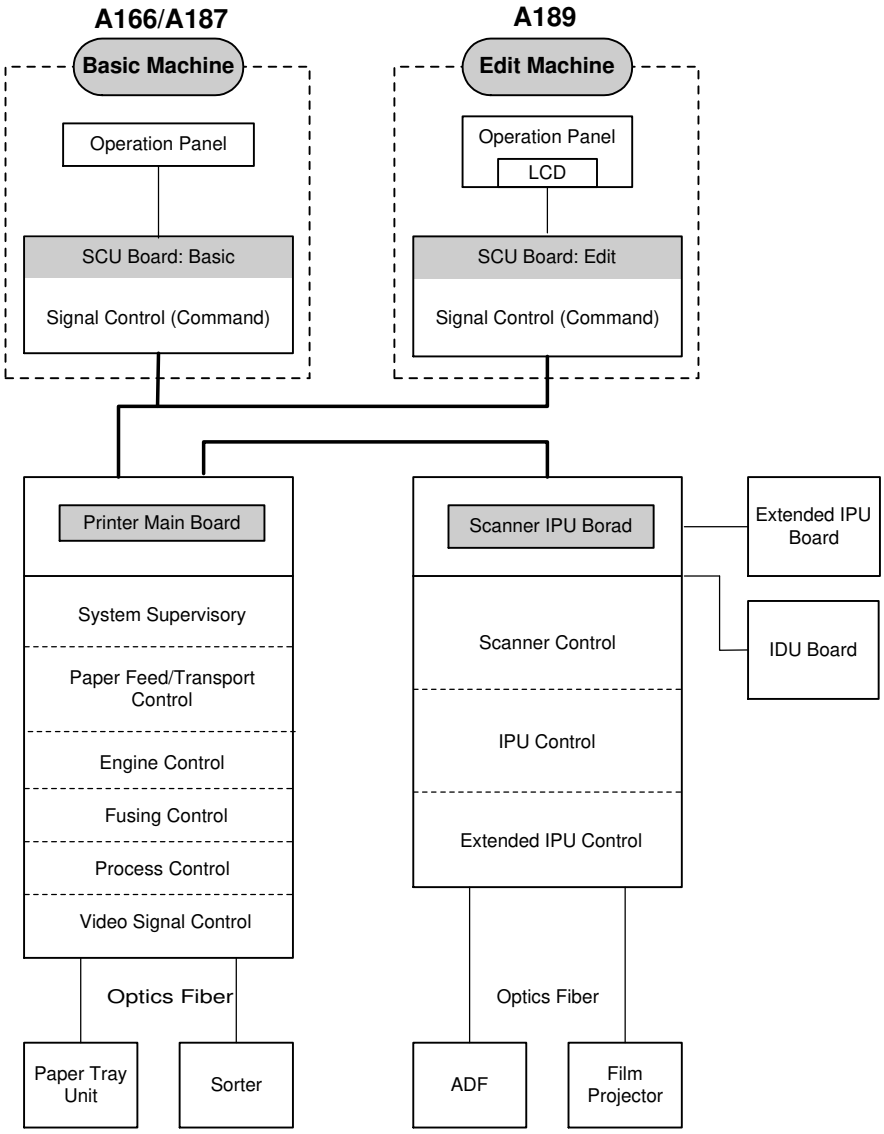
11. SYSTEM CONFIGURATION

11.1 BLOCK DIAGRAM

This machine has three independent modules:
Scanner Unit, Printer Unit, and System Control Unit.

The SCU board controls the scanner unit and printer unit to manage the whole machine system. The SCU for the edit machine is a different board from that of the basic machine.

The scanner unit contains the scanner IPU board, which controls the scanner unit. The printer unit contains the printer main board, which controls the printer unit.



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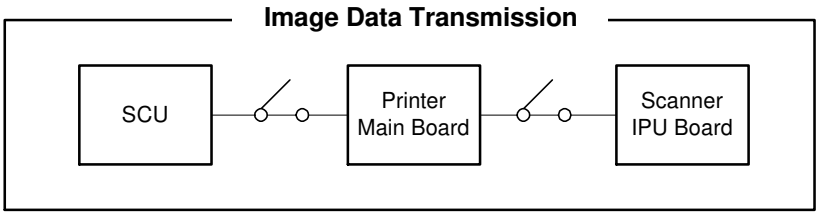
11.2 COMMAND SEQUENCE

The machine sends commands to control each module using an interface bus. Each unit is connected with a daisy chain connection.



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11.2.1 Normal Copy Mode

1. The SCU detects input from the operation panel and sends the print command to the printer unit.
   After the printer unit receives the print command, the printer unit requests the the scanner unit for the image data.
2. The scanner IPU receives the scan command and scans the original.
3. The scanner unit sends the scanned image data to the printer unit.
4. Then the machine prints the image.
5. After printing, the printer unit sends the end command to the SCU.
6. In multiple copy mode, this routine is performed in accordance with the number of copies.

11.2.2 Edit Mode

The process for copying is the same but the image data route for the display editor is different from normal copy mode.

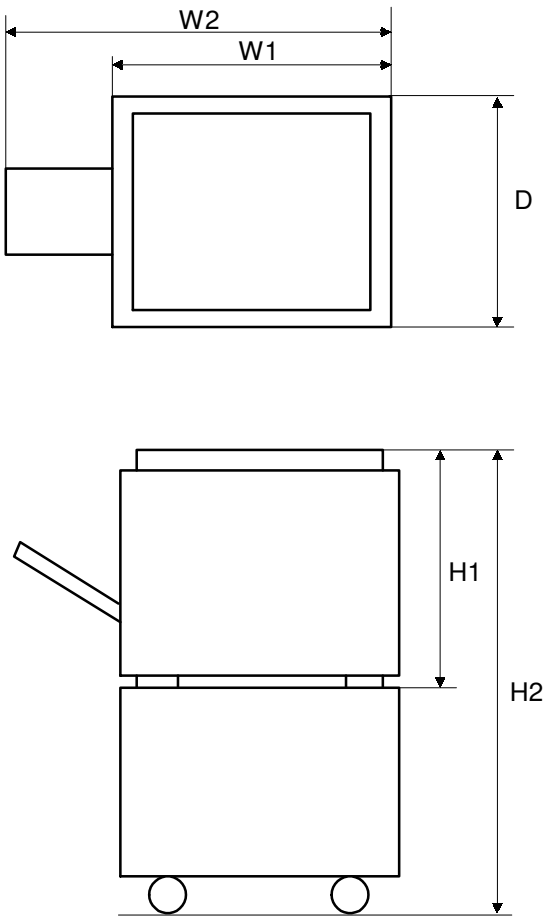
1. The SCU detects the edit command from the operation panel.
2. The SCU sends the scan command and requests the scanner unit for image data to display.
3. The scanner IPU sends the image data for display to the SCU through the printer unit. Then, image data is displayed on the LCD.
4. After the editing information has been entered at the LCD, this information is sent to the scanner IPU board and stored in the memory on the board.
5. After the Start key has been pressed, the machine performs its normal routine and the editing information is mixed with the current image data in the scanner IPU board. The mixed data is sent to the printer unit.

SECTION 3

INSTALLATION PROCEDURE

1. INSTALLATION REQUIREMENTS

1.1 DIMENSIONS



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(1) Copier + Platen Cover
Basic machine: 620 mm (W1) x 700 mm (D) x 632 mm (H1)
Edit machine: 620 mm (W1) x 750 mm (D) x 632 mm (H1)

(2) Copier + Platen Cover + Paper Feed Bank
Basic machine: 620 mm (W1) x 700 mm (D) x 1010 mm (H2)
Edit machine: 620 mm (W1) x 750 mm (D) x 1010 mm (H2)

(3) Copier + Platen Cover + Paper Feed Bank + Paper Exit Tray
Basic machine: 1000 mm (W2) x 700 mm (D) x 1010 mm (H2)
Edit machine: 1000 mm (W2) x 750 mm (D) x 1010 mm (H2)

1.2 ENVIRONMENT

To ensure the optimum copy quality, the following environmental requirements need to be observed. When installing this copier at the customer site, make sure that the location meets the following requirements.

1.2.1 Environmental Requirements

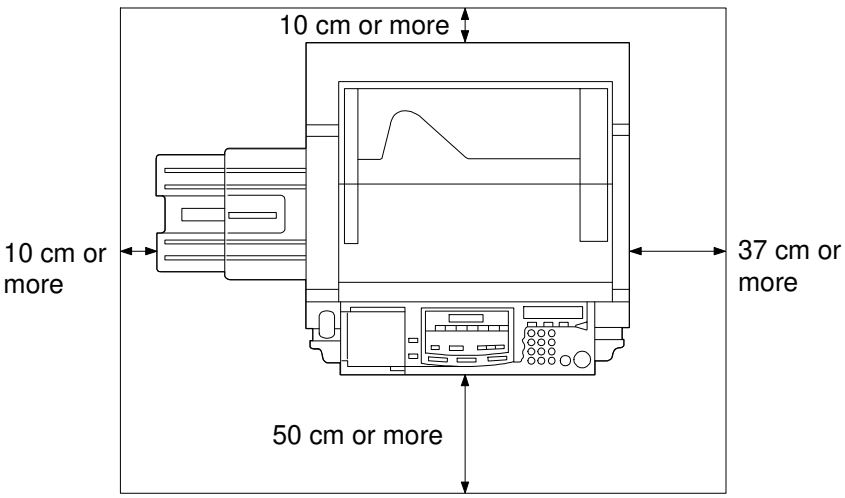
1. Avoid an area which is exposed to direct sunlight or is excessively illuminated (the illumination should not exceed 2000 lux).
2. Avoid an area which is too hot and humid or too cold and dry.
   Standard temperature range: 10°C to 32°C
   Standard humidity range: 15% to 90%
   Limit of high temperature and humidity: 30°C/90% or 32°C/80%
3. Avoid an area near fire or heat.
4. Avoid an area which is exposed to sudden temperature changes. This includes areas where the machine will not be directly exposed to:
   1) Cool air from an air conditioner
   2) Heat from a heater.
5. Avoid a dusty area (maximum allowable amount of dust: 0.15 mg/m^3).
6. Avoid a poor-ventilated area (required minimum ventilation: 30 m^3/hr/man
7. Do not place the machine where it will be exposed to corrosive gases.
8. Place the machine on a level floor (the inclination on any side should be no more than 5 mm).
9. Do not place the machine where it may be subjected to strong vibrations.
10. Do not install the machine at any location over 2,000 m (6,500 feet) above sea level.
11. If the machine is installed close to other electronic equipment, they may interfere with each other. To avoid this problem:
    1) Keep the machine as far away as possible from television sets or radios.
    2) Reorient the receiving antenna of television sets and radios as needed.
    3) Use a separate outlet for the machine.

⚠ CAUTION

1. **Do not install the machine in a very humid or dusty area.**
2. **Do not install the machine on a shaky or inclined floor.**
3. **Completely pull out and hold all four handles when moving the machine. If the handles are not fully pulled out, or if you hold other parts of the machine, your fingers may be caught in the machine and get seriously hurt. (Do not lift the A189 copier by grasping the operation panel; it may be damaged.)**
4. **When installing the paper feed bank, lock the caster wheels. If this is not done, the paper feed bank may fall and hurt someone.**
5. **When moving the machine after installing the paper feed bank, do not apply force to the upper part of the machine. The copier may drop off the paper bank unit.**

1.2.2 Minimum Space Requirements

Provide clearance for the copier, as shown below. If one or more options (such as the ADF or sorter stapler) are added to the copier, this clearance should be provided around the entire system.



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NOTE: A space of at least 10 cm (3.9") at the rear of the machine is important for machine ventilation.

1.2.3 Power Requirements

⚠ WARNING

1. Install the machine as close to the outlet as possible. Firmly plug in the machine after installation.
2. Avoid multi-wiring.
3. The power cord should be placed where it cannot be stepped on or flattened by the machine. When installing the machine, route the power cord out of the way of general traffic.
4. Be sure to connect the the power cord's grounding wire.

1. Input voltage level:
   120 V, 60 Hz: More than 20 A
   220 V to 240 V, 50/60 Hz: More than 10 A

2. Permissible voltage fluctuation: ±10%

3. Do not set anything on the power cord.

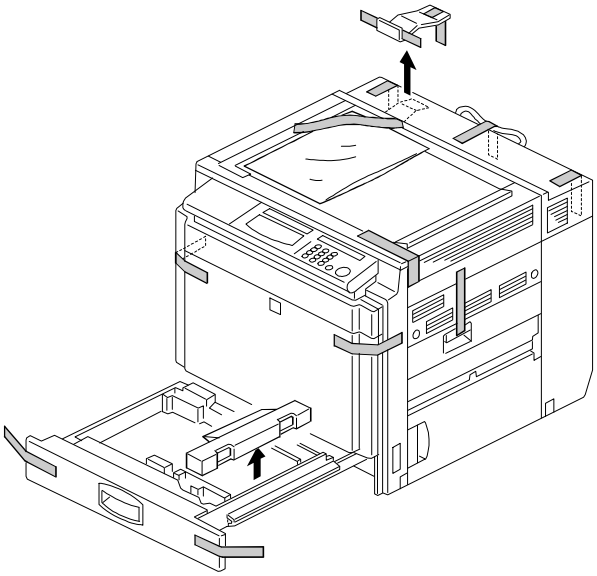
2. COPIER INSTALLATION

2.1 ACCESSORY CHECK

Check the quantity and condition of the accessories in the box with the following list:

Description	Q'ty
1. Paper Size Decal	1
2. Operating Instructions (not -27 machines)	1
3. New Equipment Condition Report (-17, -27, -29 machines only)	1
4. User Survey Card (-17 machines only)	1
5. Switch Actuator	1
6. Exit Tray	1
7. Holder for Operating Instructions	1
8. Logging Data Sheet	1
9. Anti-counterfeiting Manual	1

2.2 COPIER INSTALLATION PROCEDURE



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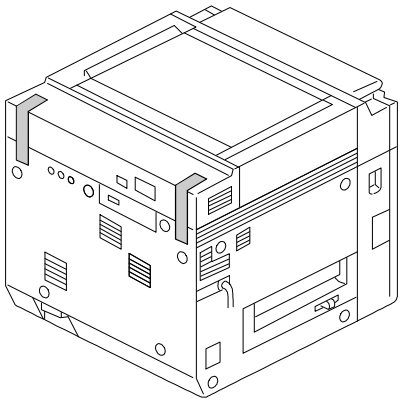

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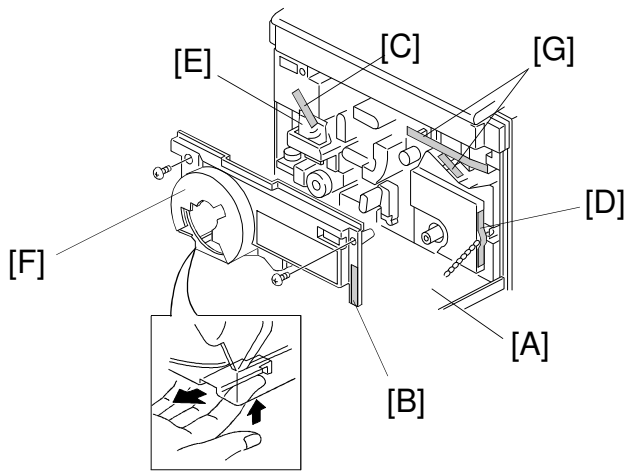

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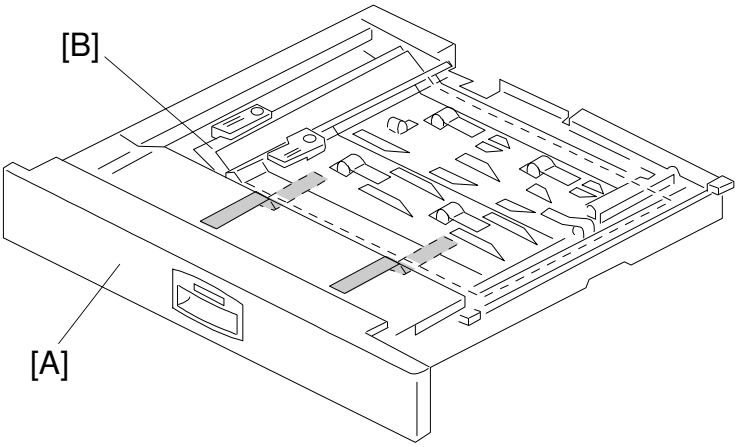
NOTE: Keep all shipping retainers after installing the machine. They must be re-used if the machine is moved to another location in the future.

1. Remove the strips of tape.
2. Open the front cover [A] then remove the following parts.
   - Strips of tape [B], [C], [D]
   - Desiccant [E]
3. Remove the inner cover [F] (2 screws, 1 hook) while lifting up the hook, then remove the following parts:
   - Strips of tape [G]



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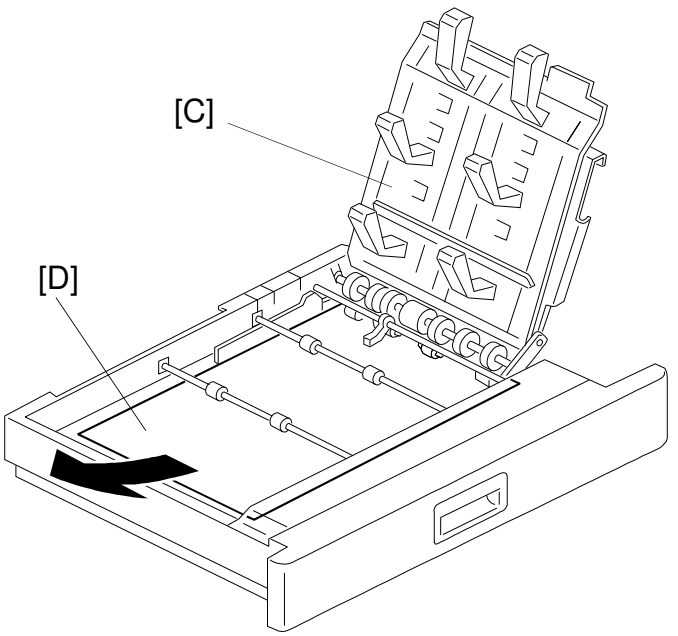

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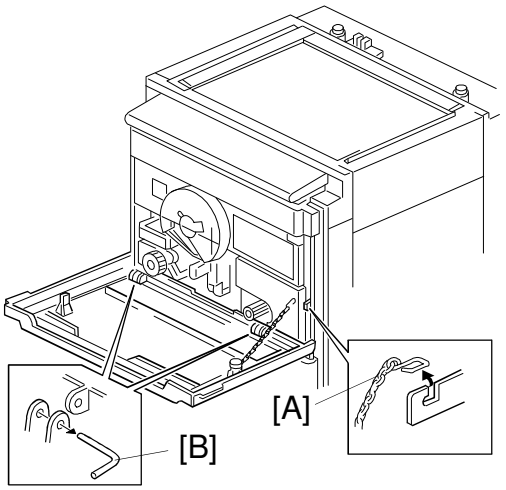
4. **A187 and A189 copiers only:**
   Pull out the duplex tray [A] and remove the strips of tape and the sheet of paper [B].

5. **A187 and A189 copiers only:**
   Open the lower duplex guide plate [C] and remove the sheet of paper [D].



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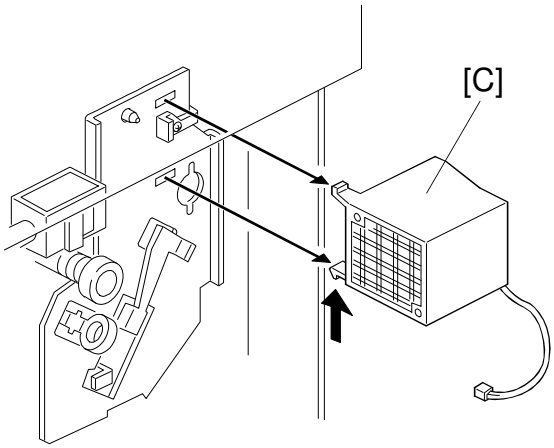

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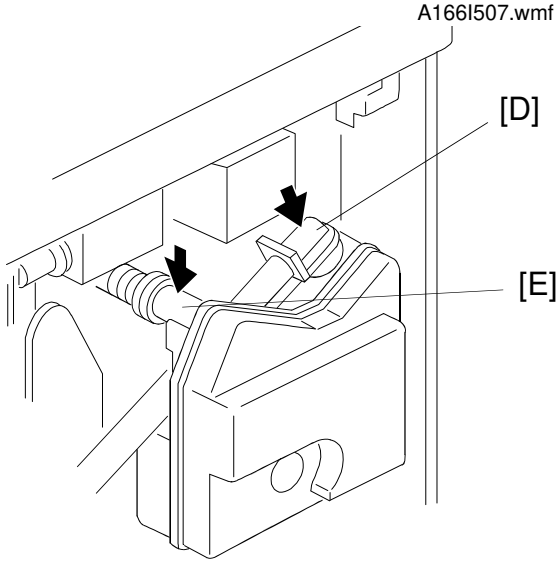

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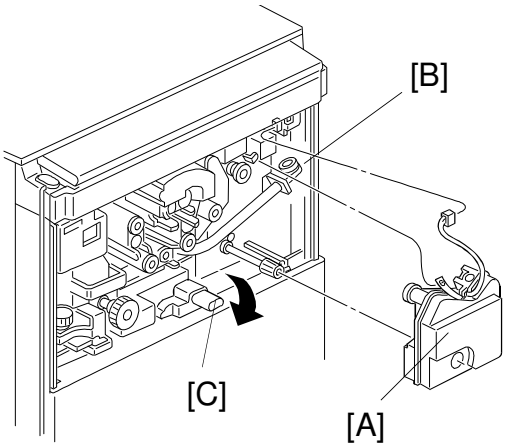
6. Remove the chain [A] and two pins [B]. Then remove the front cover.
7. Remove the transfer belt fan [C] (1 connector and 2 hooks).
8. Knock the toner collection duct joints [D] and [E] once or twice. This prevents toner from scattering when removing the used toner tank.



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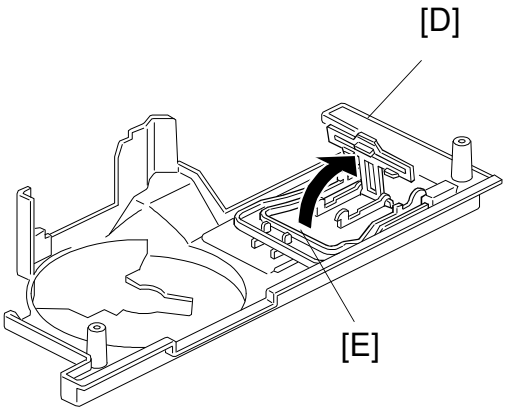

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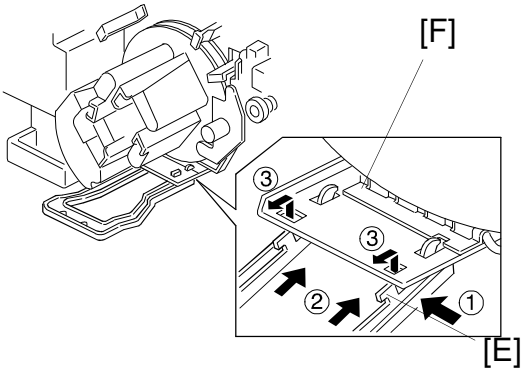

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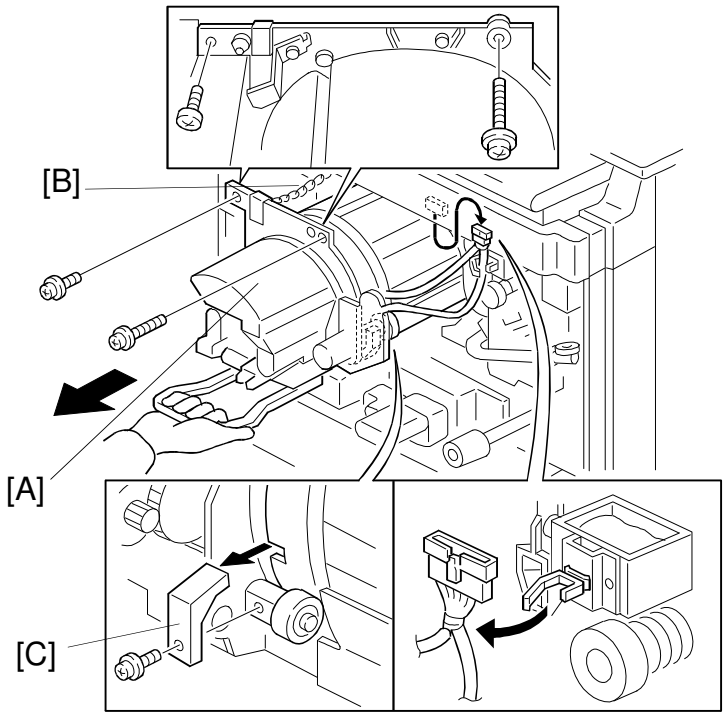
9. Remove the used toner tank [A] (1 connector and 1 clamp), while turning up the opening [B] of the duct to prevent the scattering of toner. Then turn down the transport release lever [C].
10. Raise the retainer [D], then remove the handle [E] from the back side of the inner cover.
11. Attach the handle [E] to the development unit [F] (follow the steps numbered ① through ③ above).

⚠ CAUTION:

When the handle is pulled (step ③), ensure it attaches to the development unit with a click. If the handle is not correctly installed, the development unit may fall when you attempt to remove it.



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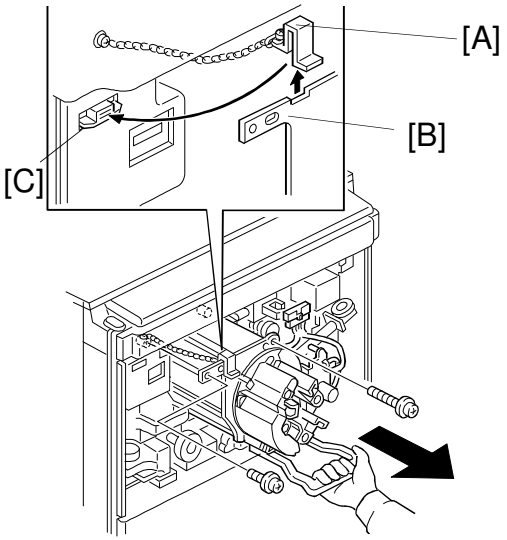
12. Slowly pull out the development unit [A] until it is stopped by the chain [B] (1 long screw, 1 screw, 1 clamp, and 1 connector).

13. Remove the revolver stopper [C] (1 screw).

NOTE: Keep the shipping retainer after removing it. It must be re-used if the machine is moved to another location in the future.



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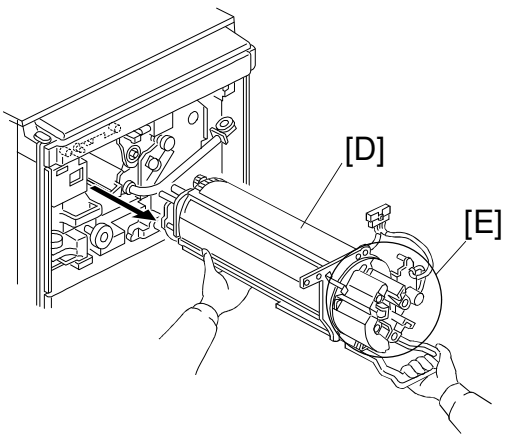

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14. Remove the chain hook [A] from the frame [B]. Then attach the chain hook to the magnet catch [C].

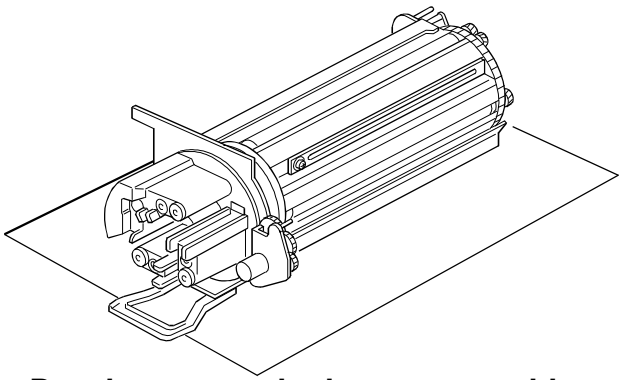
    NOTE: The aim of attaching the chain hook to the magnet catch is to avoid forgetting to reinstall the chain hook when the development unit is reinstalled.

15. Hold the development unit [D] as shown and remove it from the machine.

    NOTE: Never hold the hopper [E] when removing the unit. Otherwise the hopper could break or the doctor gap between the development rollers could become uneven.

⚠ CAUTION:

Be careful not to hurt your back when holding the development unit. Also, be careful not to drop the development unit. The development unit weighs about 12 kg (26 lb).



Development unit placement position

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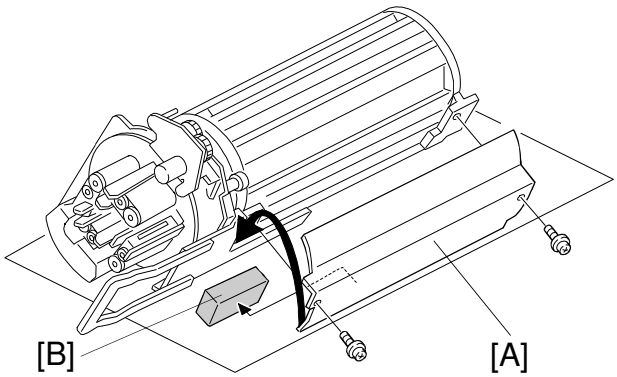

Developer installation position

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16. Place the development unit on a clean sheet of paper as shown above (**development unit placement position**).

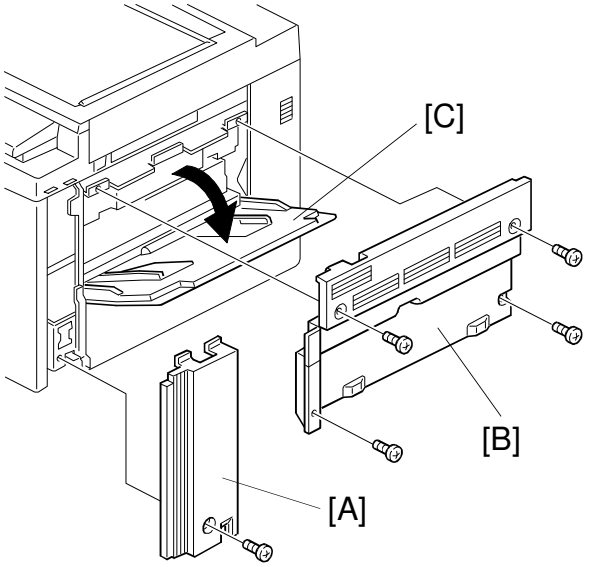
    NOTE: Be sure to use a clean sheet of paper or floor mat when placing the development unit on the floor. This prevents the floor from getting dirty.

17. Rotate the development unit into the **developer installation position** as shown, and remove the toner saucer [A] (2 screws). Then, remove the revolver retaining cushion [B].

    NOTE: Keep the cushion after installing the machine. It will be re-used if the machine is moved to another location in the future.

18. Reinstall the toner saucer [A] (2 screws).

19. Rotate the development unit into the **development unit placement position**. Turn the revolver counterclockwise until the locking lever secures the revolver unit.



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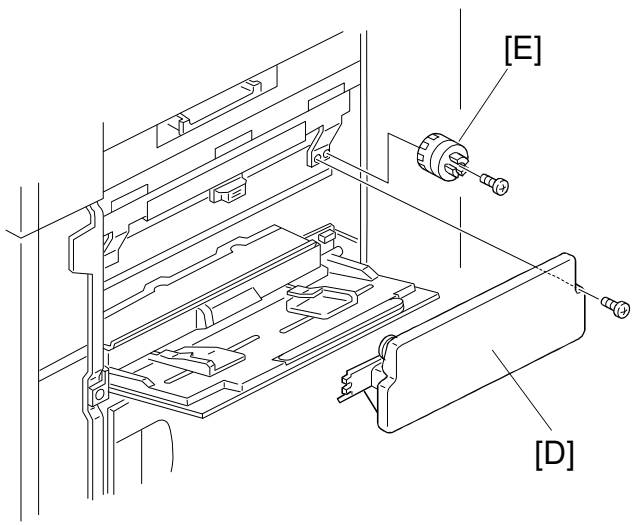

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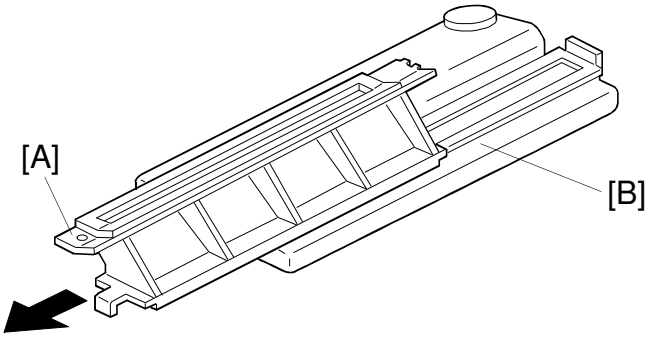
20. Remove the following outer covers.
    (1) Right front cover [A] (1 screw)
    (2) Right cover [B] (open the by-pass feed table [C], then remove 4 screws)
21. Remove the developer collection bottle/supply funnel ass'y [D] from its storage location (1 screw). Then remove the development roller rotation handle [E] from its storage location (1 screw).



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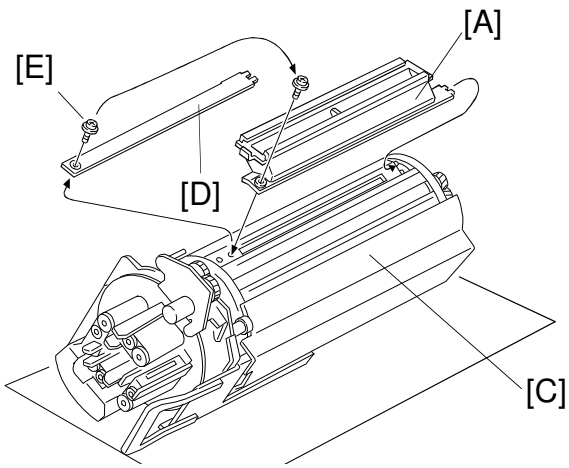

Developer installation position

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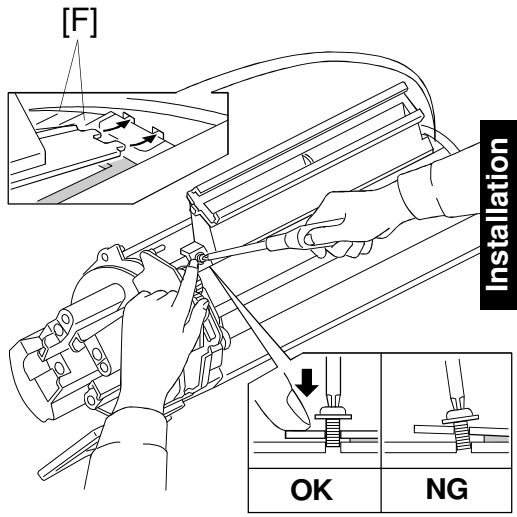

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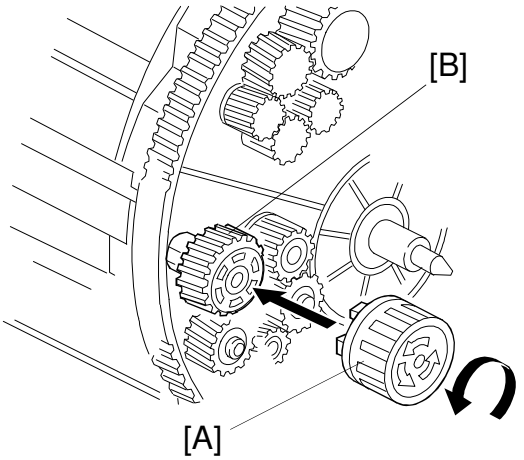
22. Remove the developer supply funnel [A] from the developer collection bottle [B].
23. Turn the development unit [C] to the **developer installation position** as shown.
24. Remove the developer cover [D] (1 screw [E]).
25. Attach the developer supply funnel [A] to the development unit using the screw [E] (M4 x 6).

NOTE: 1) Before tightening the screw [E], ensure that the two tabs [F] are completely inserted into the slots and the screw holes are aligned correctly.
2) Be sure to use the correct screw [E] (M4 x 6) to attach the developer supply funnel. If a screw longer than screw [E] is used, the development paddle will be damaged by the longer screw.
3) Hold the developer supply funnel in position when tightening the screw. This is to prevent the screw holes from misaligning.
4) **Never overtighten the screw** [E]. If the screw is overtightened, the development unit's screw hole (made of aluminum) may be damaged and the **entire development unit may need to be replaced**.



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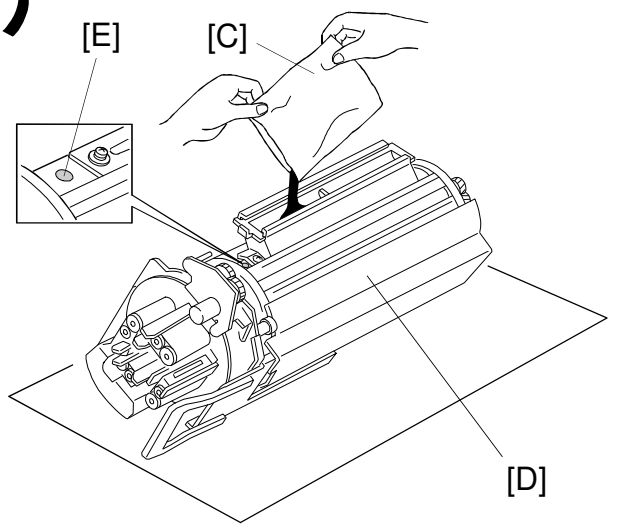

Developer installation position

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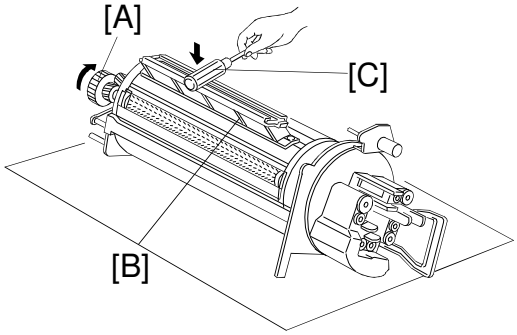
26. Attach the development roller rotation handle [A] to the development roller gear [B].

27. Pour one pack of developer [C] evenly (either black, cyan, magenta, or yellow developer) through the development supply funnel [D].

    NOTE: Before pouring the developer, be sure to check that the color of the developer matches the color of the decal [E] beside the opening for the developer.



Developer installation position

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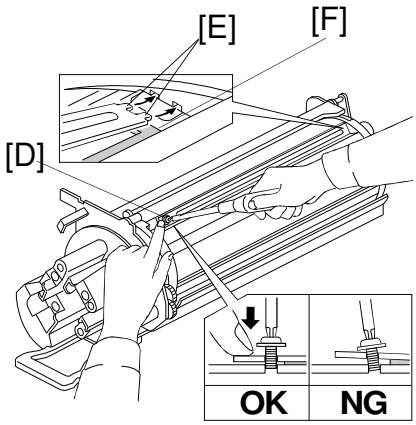

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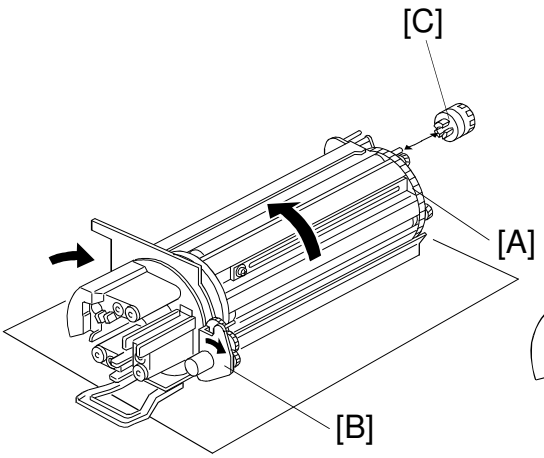
28. Rotate the development roller gear with the development roller rotation handle [A] until the developer is spread evenly on the development roller surface.

    NOTE: Rotate the development roller rotation handle only in the direction shown in the diagram.

29. Knock the development supply funnel [B] with the handle of a screwdriver [C] to drop the developer all the way into the unit.

30. Remove the funnel and reinstall the developer cover (1 screw).

    NOTE: 1) Before reinstalling the developer cover, clean any developer spills on the sponge seal around the opening with a vacuum cleaner. If any developer remains on the sponge seal, a gap may be eroded in the sponge by the spilt developer. Toner and developer may then leak through this gap.
    2) When installing the developer cover, take care not to misalign the sponge [F] or developer may spill out.
    3) Before tightening the screw [D], ensure the two tabs [E] are completely inserted into the slots and the screw holes are aligned correctly.
    4) Be sure to use the correct screw [D] (M4 x 6) to attach the developer cover. If a screw longer than screw [D] is used, the development paddle will be damaged by the longer screw.
    5) Hold the developer cover in position when tightening the screw. This is to prevent the screw holes from misaligning.
    6) **Never overtighten the screw** [D]. If the screw is overtightened, the development unit's screw hole (made of aluminum) may be damaged and the **entire development unit may need to be replaced.**



Development unit placement position

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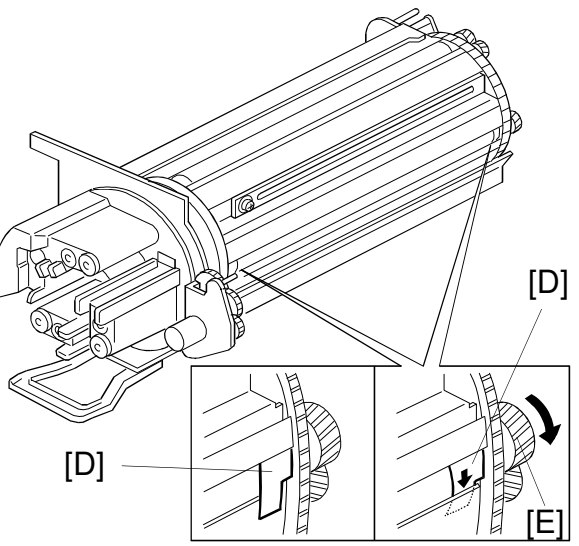

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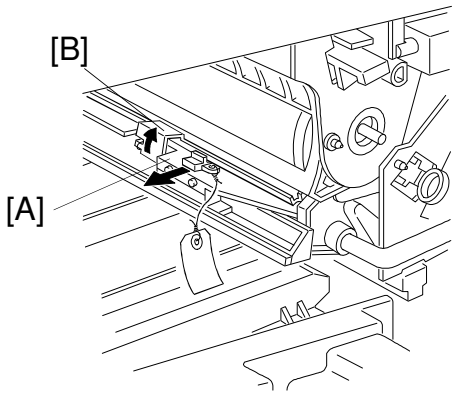
31. Raise the development unit to the **development unit placement position**.
32. Check that the entrance side seals [D] of the color's development roller are in the correct position as shown in the diagram. If they are not positioned correctly, put them in the correct position by rotating the development roller rotation handle [E] in the direction shown in the diagram.

    NOTE: Never rotate the development roller rotation handle in the opposite direction.
33. Rotate the revolver [A] while keeping the toner supply motor unit [B] away from the revolver until the next color's developer cover comes to the top.

    NOTE: Be sure to rotate the revolver only when the development unit is placed at the **development unit placement position**. Otherwise the center of the revolver or the development roller will be permanently misaligned.
34. Remove the development roller rotation handle [C].
35. Install the other color developers by performing steps 23 through 34 for each developer.



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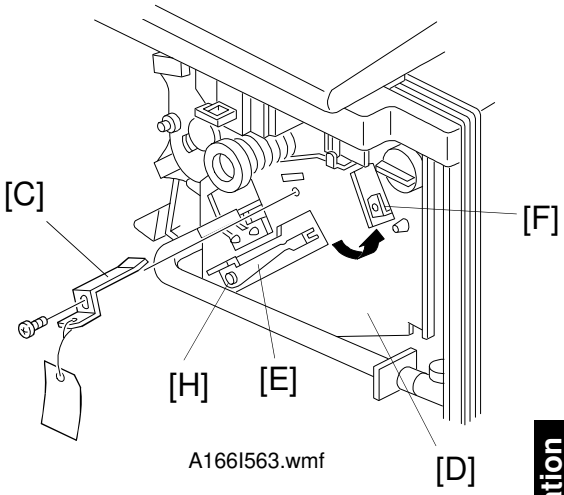

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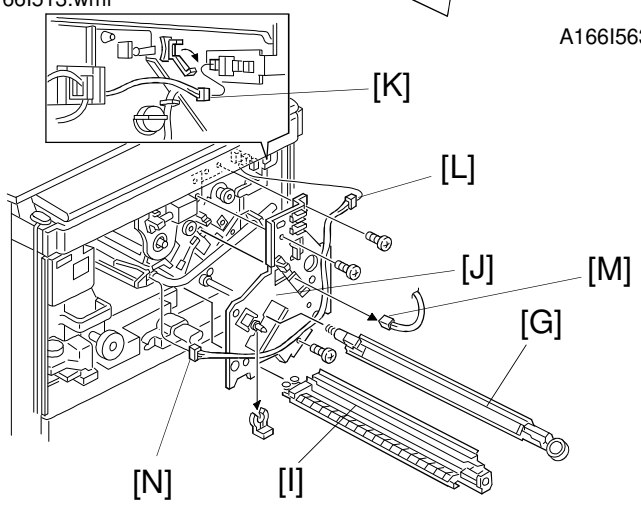

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36. Remove the cleaning blade release wedge [A] of the transfer belt unit while pushing up the pressure release lever [B].

37. Remove the transfer belt retainer [C] from the transfer belt stay [D].

    NOTE: Keep the cleaning blade release wedge and the transfer belt retainer (along with the retainer's securing screw) after installing the machine. These parts will be re-used if the machine is moved to another location in the future.

38. Move the belt tension release lever [E] anticlockwise to the upper position [F] (1 screw).

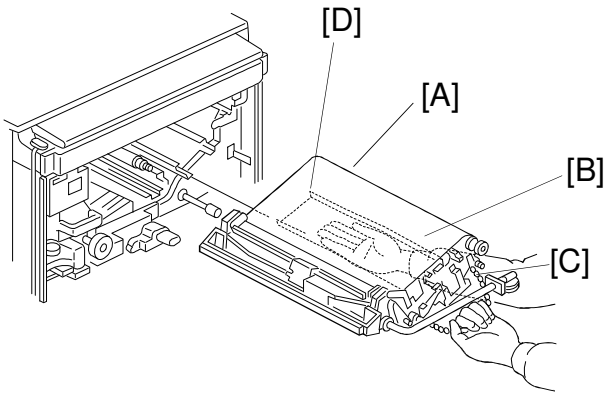
    NOTE: Failure to do this may damage the transfer belt in step 39.

39. Remove the belt transfer corona unit [G] (1 snap ring).

40. Move the belt tension release lever [E] back to the lower position [H] (1 screw).

41. Remove the paper transfer corona unit [I].

42. Remove the transfer belt stay [J] (3 screws, 4 connectors [K], [L], [M], [N] and 1 clamp).



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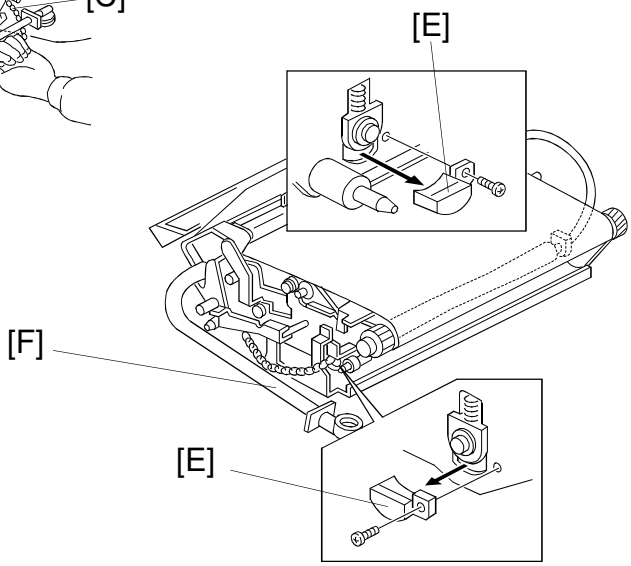

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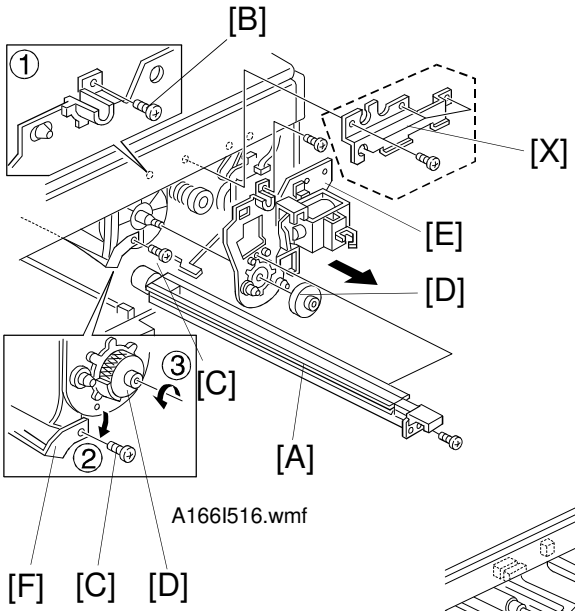
43. Remove the transfer belt unit [A]. Then remove the paper [B] attached to the transfer belt.

NOTE: 1) When removing the transfer belt unit, be sure to hold the chain [C] with your **left hand** and hold the bottom bracket [D] with your **right hand,** as shown. This prevents your fingers from touching the transfer belt surface. If the transfer belt surface is touched by bare hands, some copy quality problems may be caused by the oil stain.

2) While removing the transfer belt unit from the copier, do not turn the toner collection pipe counterclockwise [F] (as viewed from the front of the machine).

44. Remove the transfer belt release wedges [E] from the transfer belt unit (one M4 X 6 screw for each).

NOTE: Keep the transfer belt release wedges [E] and their securing screws after installing the machine. They will be re-used if the machine is moved to another location in the future. The wedges are also used as a tool in transfer belt replacement.



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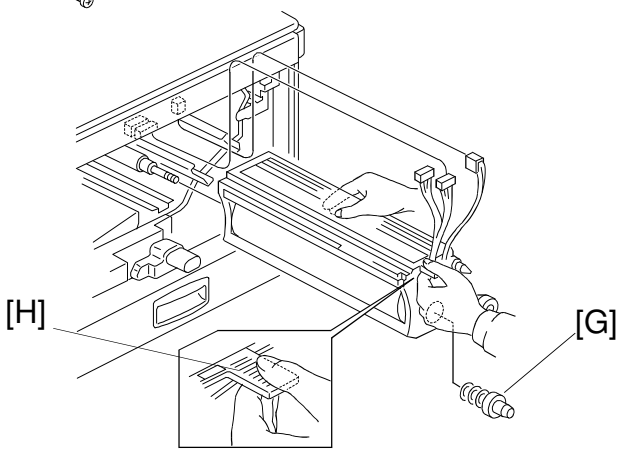

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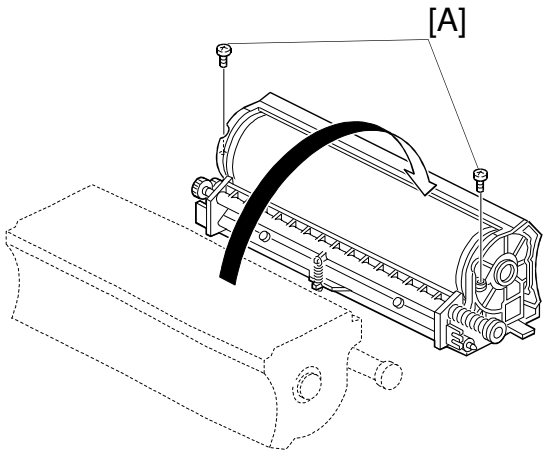
45. Remove the charge corona unit [A] (1 screw).

46. Remove the following parts in the following order:
    ① Drum stay screw [B]
    ② ID sensor shield plate screw [C].
    ③ Knob screw [D].

    NOTE: When removing the drum stay, be sure to remove the drum stay screw before the knob screw. If the knob screw is removed first, the drum stay may be bent by the pressure of the drum securing spring.

47. Remove the drum stay [E] while pushing the ID sensor shield plate [F] towards the outside.
    – For 220/240 V machine only –
    • Remove the LD shield plate [X] (3 screws).

48. Remove the drum securing spring [G]. Then remove the drum unit by pulling the grip [H] (3 connectors).



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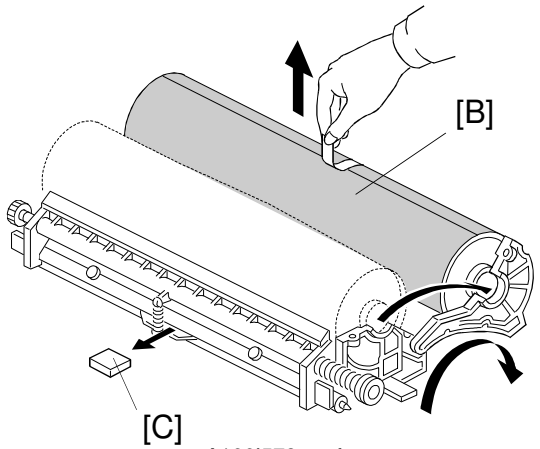

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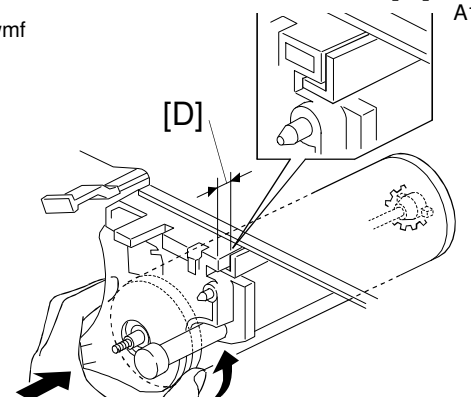

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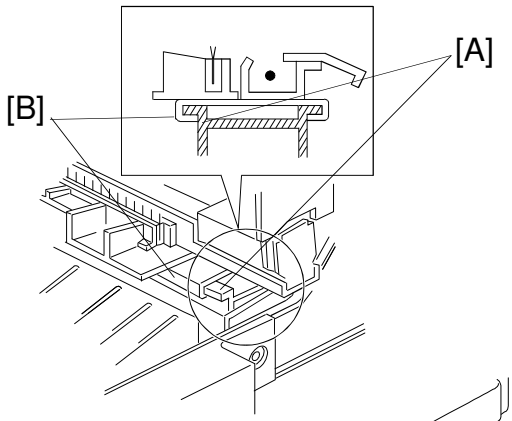
49. Place the drum unit on a clean sheet of paper or floor mat, as shown above. Turn it over in the direction shown. Then remove the two screws [A] and open the drum unit, as shown.

    NOTE: 1) Use a clean sheet of paper or floor mat when placing the drum unit on the floor. This stops the floor getting dirty.
    2) Turn over the drum unit in the direction shown above. If turned in the opposite direction, used toner from the drum may spill out.

50. Remove the drum protective sheet [B] and the cardboard cleaning blade release wedge [C]. Then reassemble the drum unit by reversing the previous step.

51. Reinstall the drum unit (3 connectors).

    NOTE: 1) When reinstalling the drum unit, ensure there is no gap at [D] (the ends should be flush). If there is a gap, turn the drum counterclockwise from the edge of the drum and reinsert the drum in the machine. This ensures that the gears mesh correctly.
    2) Ensure that all 3 connectors are securely connected before proceeding with the installation.
    3) Do not hold the drum at the hole at the rear. If the grounding plate in this hole is bent, the drum will not contact the drum shaft correctly.



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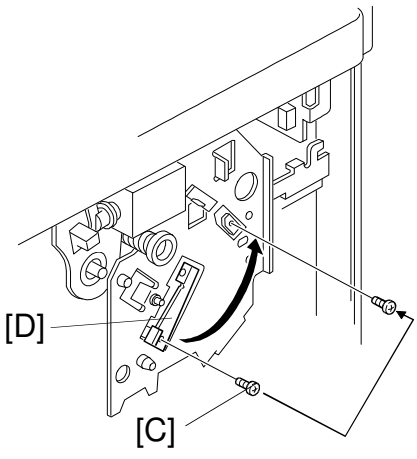

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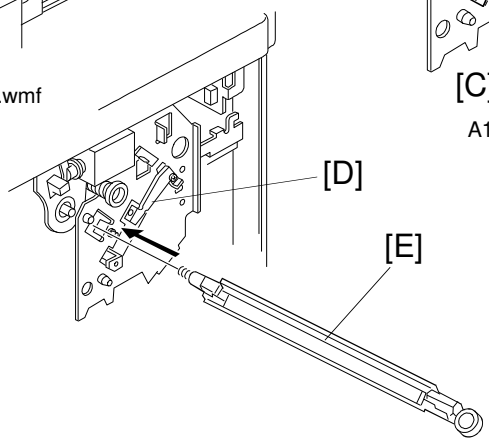

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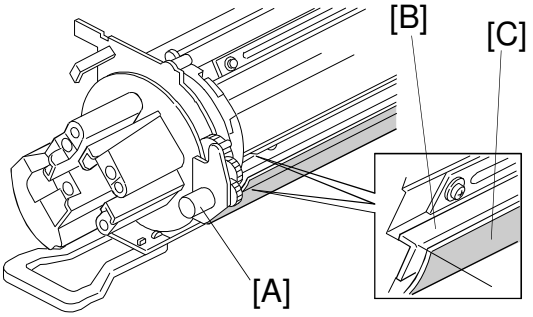
52. Reinstall the following parts by the opposite procedure of their removal:
    - Drum stay (Install in the following order, to avoid damaging the drum stay: 1 drum securing spring, <LD shield plate: 220/240 V machine only>, 1 knob screw, 1 ID sensor shield plate screw, 1 drum stay screw, and 1 connector).
    - Charge corona unit (1 screw).
53. Reinstall the following parts by the reverse procedure of their removal.
    - Transfer belt unit
    - Transfer belt stay (3 screws, 3 connectors and 1 clamp)
    - Paper transfer corona unit

    NOTE: When reinstalling the paper transfer corona unit [B], be sure that it fits securely onto the rail [A]. Also insure the belt tension release lever is placed in the upper position during reinstillation.
54. Remove the screw [C] and turn the belt tension release lever [D] counterclockwise as shown. Then tighten the belt tension release lever at the contact position with the same screw [C].
55. Reinstall the belt transfer corona unit [E] (1 snap ring).

    NOTE: Before reinstalling the belt transfer corona unit [E], be sure that you have fixed the belt tension release lever [D] at the contact position. Otherwise, the edge of the belt transfer corona unit may damage the transfer belt.



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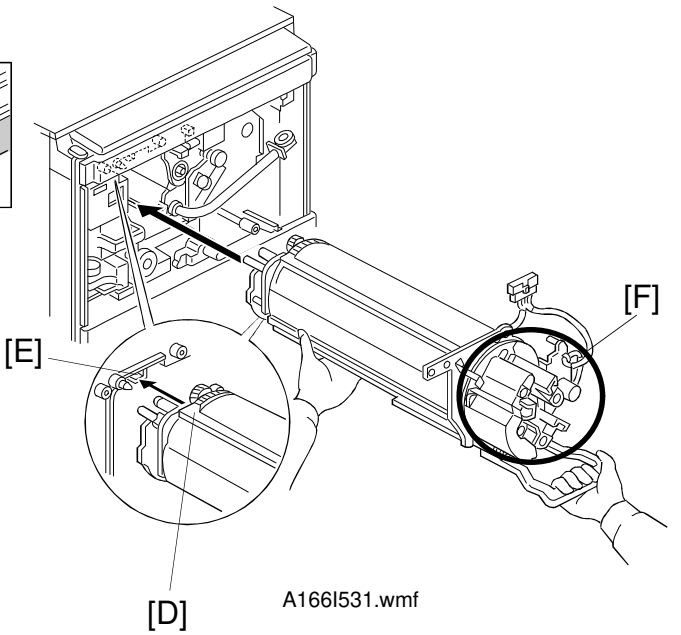

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56. Rotate the revolver, while moving the toner supply motor unit [A] slightly to the right, until the development unit bend plate [B] aligns with the toner saucer edge [C]. It does not matter which color is in position.

NOTE: The above step ensures the development unit is not misaligned during installation. This is important for the following reasons:

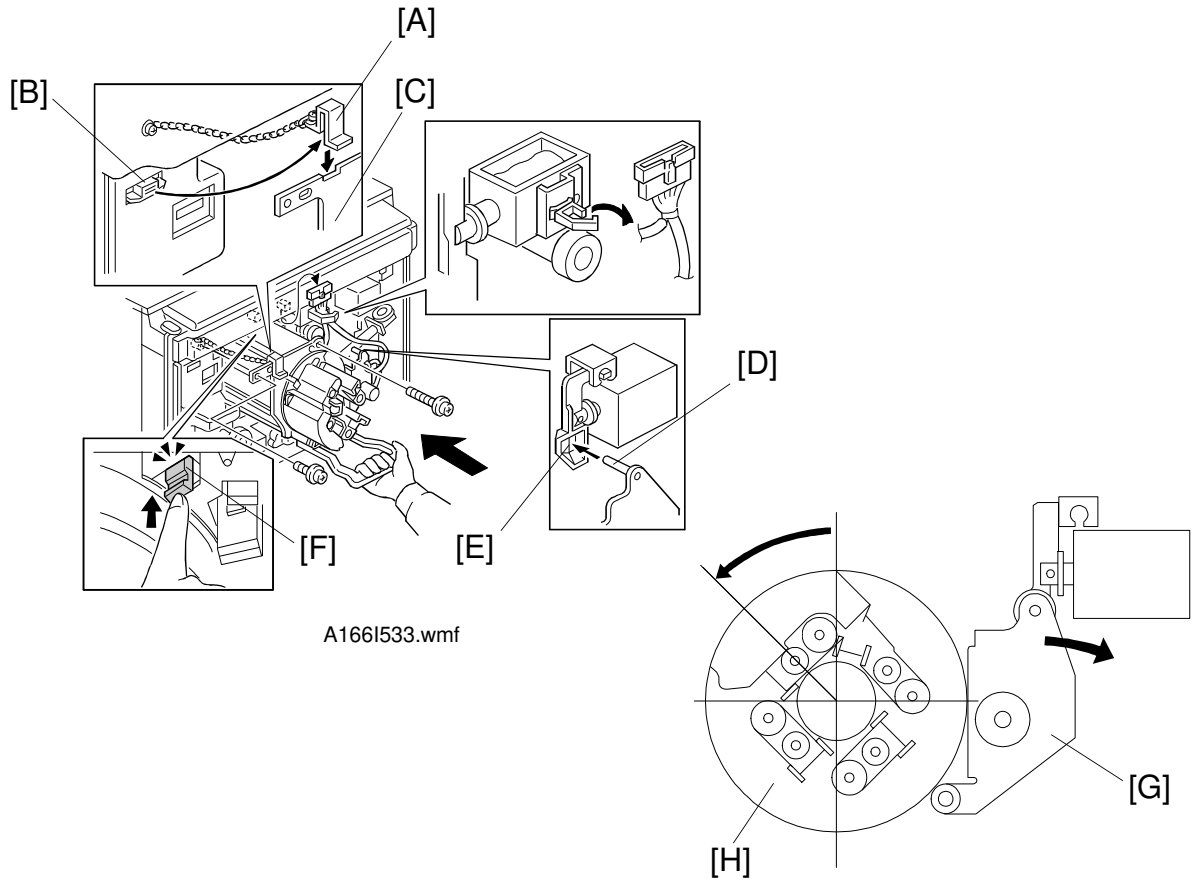
1) If misaligned, the development roller drive gear (located on the copier back side plate) could block the full insertion of the unit by coming in contact with the development roller gear.
2) If this occurs, the revolver drive gear and the development roller gear may accidentally mesh. The development roller gear may then be driven in reverse. This could lead to developer spilling inside the machine.

⚠ CAUTION:

Be careful not to hurt your back when holding the development unit. Also, be careful not to drop the development unit. The development unit weighs about 12 kg (26 lb).

57. Hold the development unit as shown above. Align the guide [D] with the guide rail [E]. Then insert the development unit halfway.

NOTE: Never hold the hopper part [F] of the development unit when installing the unit. Otherwise the hopper part will be broken or the doctor gap of the development rollers will become incorrect.



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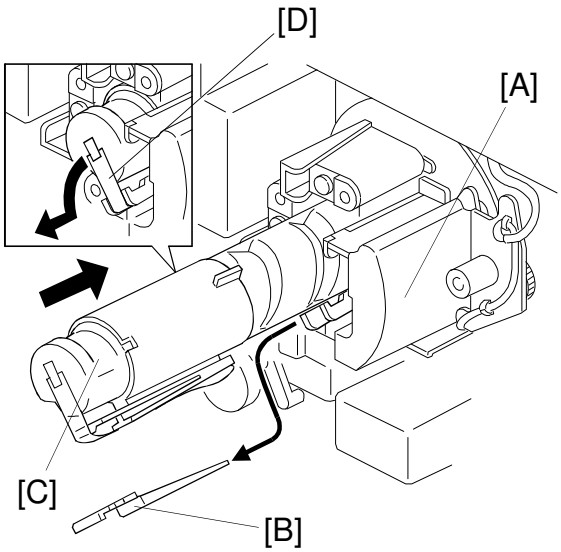
58. Remove the chain hook [A] from the magnet catch [B], and hook it on the frame [C] as shown.

59. Slowly insert the development unit completely into the copier while making sure that the chain is not caught by the development unit. Then secure the development unit to the copier front frame (1 connector, 1 harness clamp, 1 short screw, and 1 long screw).

    NOTE: When inserting the development unit into the copier, be sure to check that the toner supply motor pin [D] is aligned with the opening [E] in the toner supply solenoid plunger mechanism. Also ensure the shield glass plate [F] is inserted completely.

60. Remove the development unit handle from the development unit and replace it in the inner cover.

61. Rotate the revolver counterclockwise while keeping the toner supply motor unit [G] away from the revolver [H]. The revolver stopper should stop the revolver with a click at each development position. If not, the development roller drive gear and the development roller gear did not mesh properly. Reinsert the development unit.



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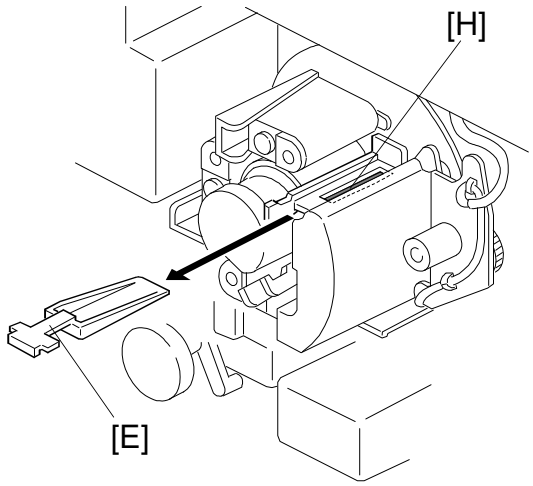

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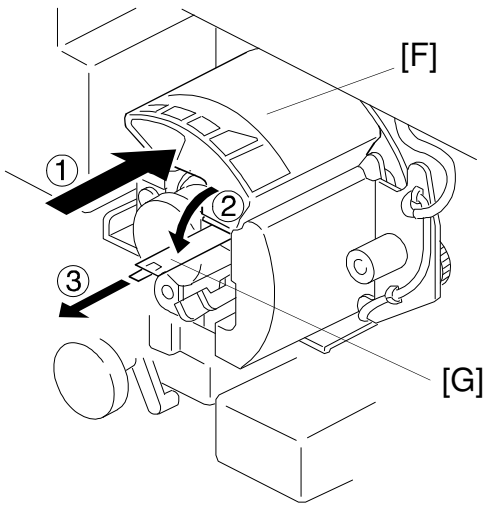


A166I536.wmf

62. Rotate the revolver until the Bk toner hopper [A] is positioned as shown. Remove the shutter [B] from the hopper. Install the Bk toner cartridge [C] completely into the development unit. Remove the Bk toner cartridge seal [D].

NOTE: 1) Be sure to rotate the revolver counterclockwise while keeping the toner supply motor unit away from the revolver.
2) When removing a shutter, be sure to rotate the revolver until the opening faces up. Do not remove a shutter if its opening is not facing up, or any remaining toner will spill out.

63. Remove the Y toner shutter [E] from the hopper. Install the Y toner cartridge [F] completely into the development unit. Remove the seal [G].

NOTE: The Y toner cartridge should be installed after the Bk cartridge. When the Bk toner cartridge is installed, the opening for the Y toner cartridge [H] faces up.

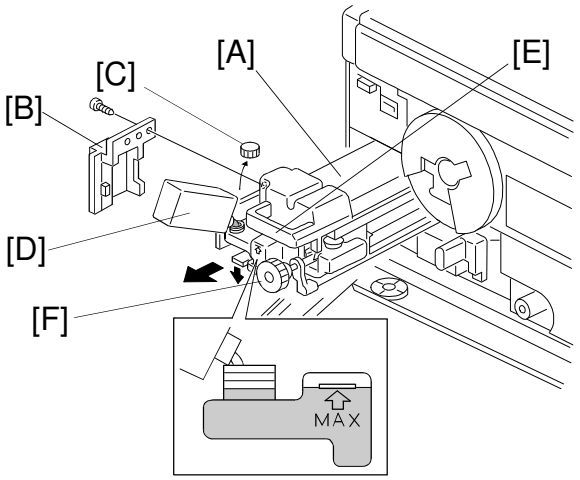
64. Rotate the revolver until the opening for the C toner cartridge faces up and repeat the preceding procedure. Do the same for the M toner cartridge.

NOTE: To avoid forcing a cartridge into the wrong position, check the circular color decal on the front face of the revolver.

65. Reinstall the used toner tank (1 connector and 1 clamp).

66. Reinstall the transfer belt fan (1 connector and 2 hooks).

67. Reinstall the following parts.
    (1) Developer collection bottle/supply funnel ass'y (put back in its storage location)
    (2) Development roller rotation handle (put back in its storage location)
    (3) Right cover
    (4) Right front cover
    (5) Inner cover
    (6) Front door



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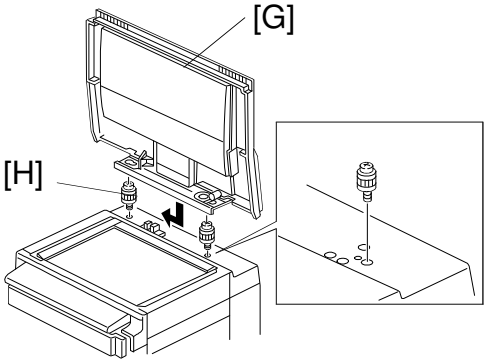

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68. Pull the fusing unit [A] halfway out. Remove the left fusing cover [B] and open the oil tank cap [C].

69. Pour in the silicone oil [D].

    NOTE: Never fill the silicone oil tank over the MAX line. Otherwise, the silicone oil may overflow.

70. Put back the oil tank cap and reinstall the fusing unit into the copier. Then close the front cover.

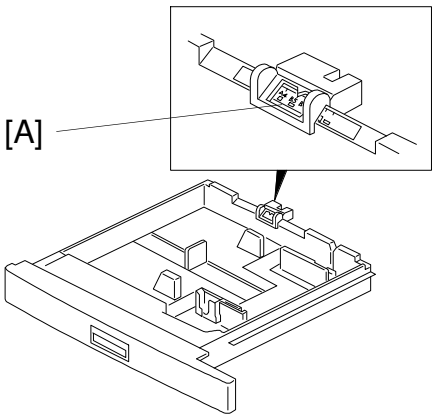
    NOTE: Be sure to push on the fusing unit handle [E] when reinstalling the fusing unit. Do not push the fusing knob [F]; the fusing unit may be damaged.

⚠ CAUTION :

Be careful that the silicone oil does not spill onto the floor. If the silicone oil spills onto the floor, be sure to wipe it away completely with a solvent. Spilled silicone oil presents a slip hazard.

71. **When the platen cover is to be installed:**
    Install the platen cover [G] as shown (2 stepped screws [H]).
    When the ARDF is to be installed:
    Install the ARDF by following the procedure shown in the installation procedure for the ARDF.

72. Plug in the power cord and turn on the main switch.



A166I540.wmf

73. **A166 copier only:**
Select the paper size for the 1st tray by sliding the paper size slider [A]. Load paper (A4/8 1/2" X11" sideways or A3/8 1/2" X11" lengthwise).

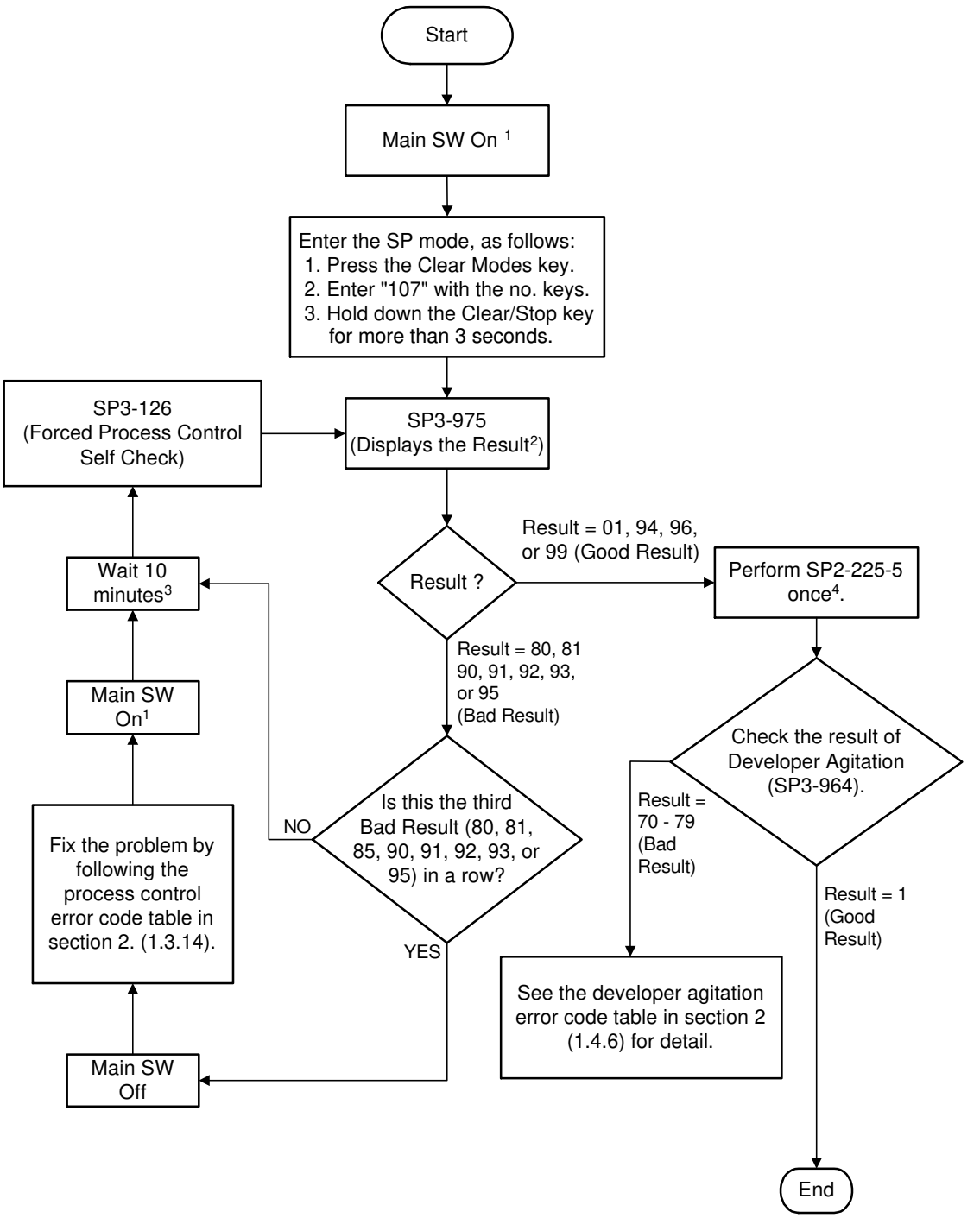
74. **When the paper tray unit is to be installed:**
(1) Install the paper tray unit as per the unit's installation procedure.
(2) Load paper (A4/8 1/2" X11" sideways or A3/8 1/2" X11" lengthwise; one of these paper sizes has to be used for the Auto Color Calibration procedure).
(3) Enter UP3-3 as follows.
[User Tools/Counter] → [C/Stop] → [3] → [#] → [3] → [#]

NOTE: Hold down the Clear/Stop key for more than 3 seconds.

(4) Select the tray (1 to 4).
(5) Select the paper direction (sideways or lengthwise).
(6) Select either the 1: "Common" or 2: "Special" groupings.
(7) Select the appropriate paper size.
(8) Set the paper size for each tray installed.

75. Perform the "**Developer Agitation for All Colors,"** as per the flow chart on the following page.

Developer Agitation for All Colors



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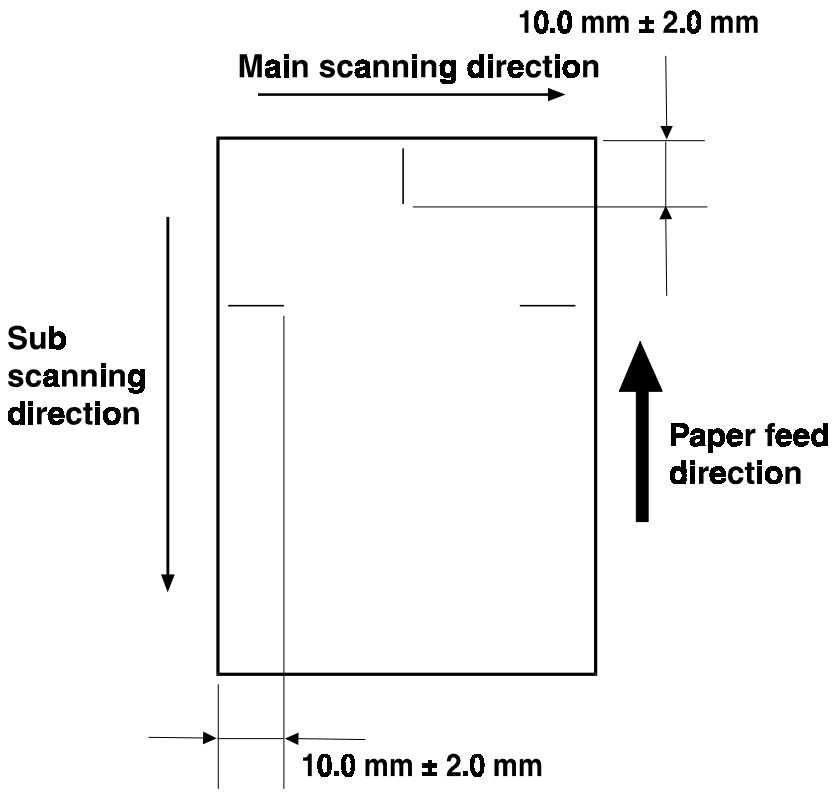
NOTE: 1. The covers must be closed before turning on the main switch because the initial process control self check must be performed (this takes about 5 minutes).

2. Displays the process control self check result by a code number.
3. This step removes the residual voltage on the drum left by the initial process control self check.
4. SP2-225-5 develops the pattern on the drum (Bk, C,M,Y) necessary for toner replacement. It replaces the old toner in the developer and then agitates the developer and toner. It also will correct a toner end or toner near end condition.
   This SP takes between 30 and 55 minutes.

   Check the amount of toner remaining before developer agitation. If there is not much, replace the toner cartridge to prevent an agitation error.



Copy image registration test pattern

A166I541.wmf

76. Check whether the copy image registration is within the specification or not as shown in the following procedure.
    (1) Enter SP5-955 and select pattern number 25.
    (2) Press the Interrupt key. Select the A3/11" x 17" or A4/8 1/2" x 11" (sideways) paper tray. Press the Start key. The copier prints out the test pattern as shown in the diagram.

(3) Check whether the copy image registration in the main scanning direction and the sub scanning direction are within the specifications shown below.

Main scanning direction: 10.0 ± 2.0 mm (0.393" ± 0.078")

Sub scanning direction: 10.0 ± 2.0 mm (0.393" ± 0.078")

If the copy image registration is out of specification, adjust it as shown in the procedure in section 6 of the service manual: "Copy image registration adjustment".

(4) Reset pattern number 25 to "0".

NOTE: After step 76, **be sure to input "0" as the setting for SP5-955.** Otherwise, the test chart will be output whenever the user tries to make copies.

77. Perform the ACC (Auto Color Calibration) procedure in section 6 of the service manual.

78. Input the current date and time with SP5-302-1.

EXAMPLE: Date Format: YYYYMMDDhhmmd
1996031200301
1996 = year
03 = month
12 = day of month
00 = hour (00 - 23)
30 = minute (00 - 59)
1 = day of week (Sun. - Sat. = 0-6)

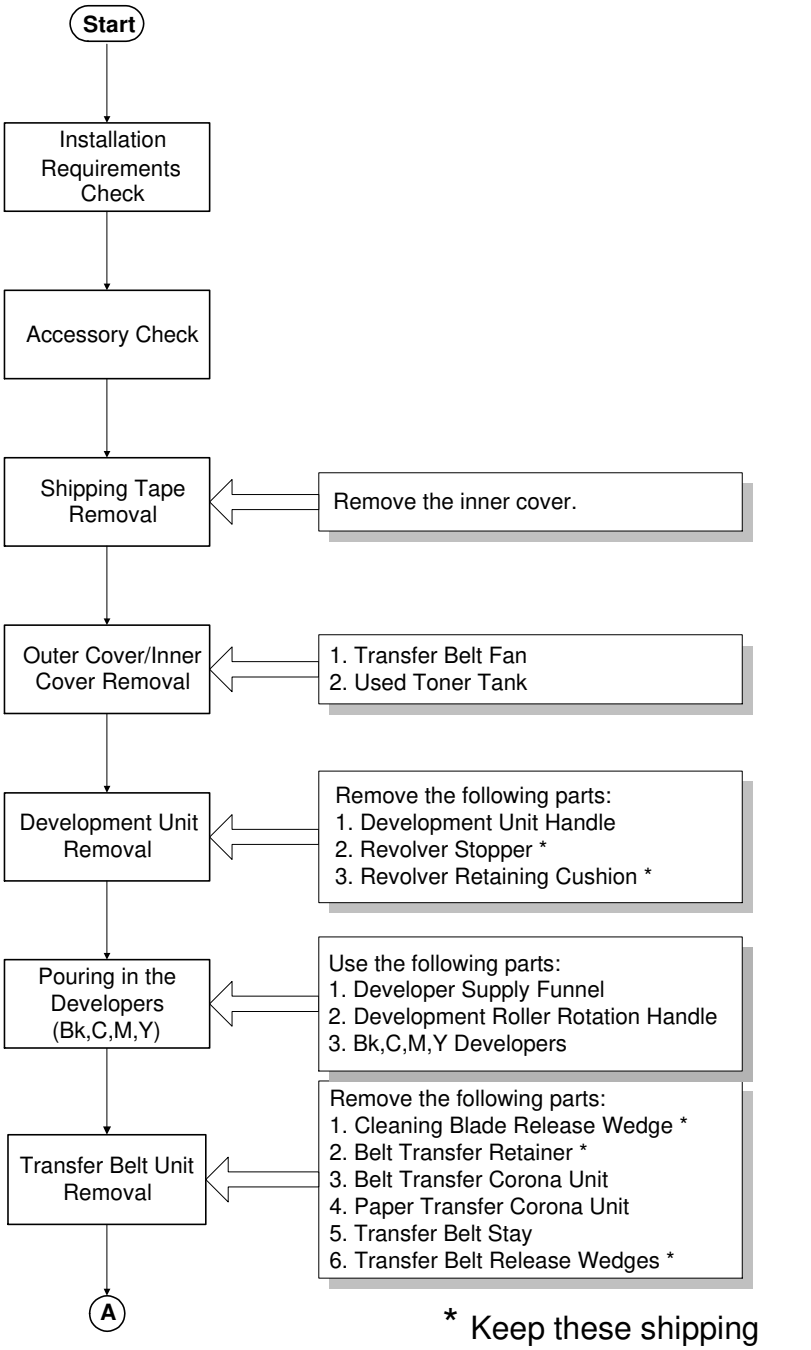
79. Reset the main counter and the backup counter with the following procedure.
(1) Enter SP mode.
(2) Enter SP7-914-1 and input the setting "1". Press the R/# key. This will reset the main counter, the back up counter and the CE counter.

NOTE: Resetting all three of these counters with SP7-914-1 can be done only at copier installation or at replacement of the RAM on the SCU board.

3. INSTALLATION PROCEDURE FLOWCHART

⚠ CAUTION:

Refer to the copier installation procedure when performing the steps shown below.



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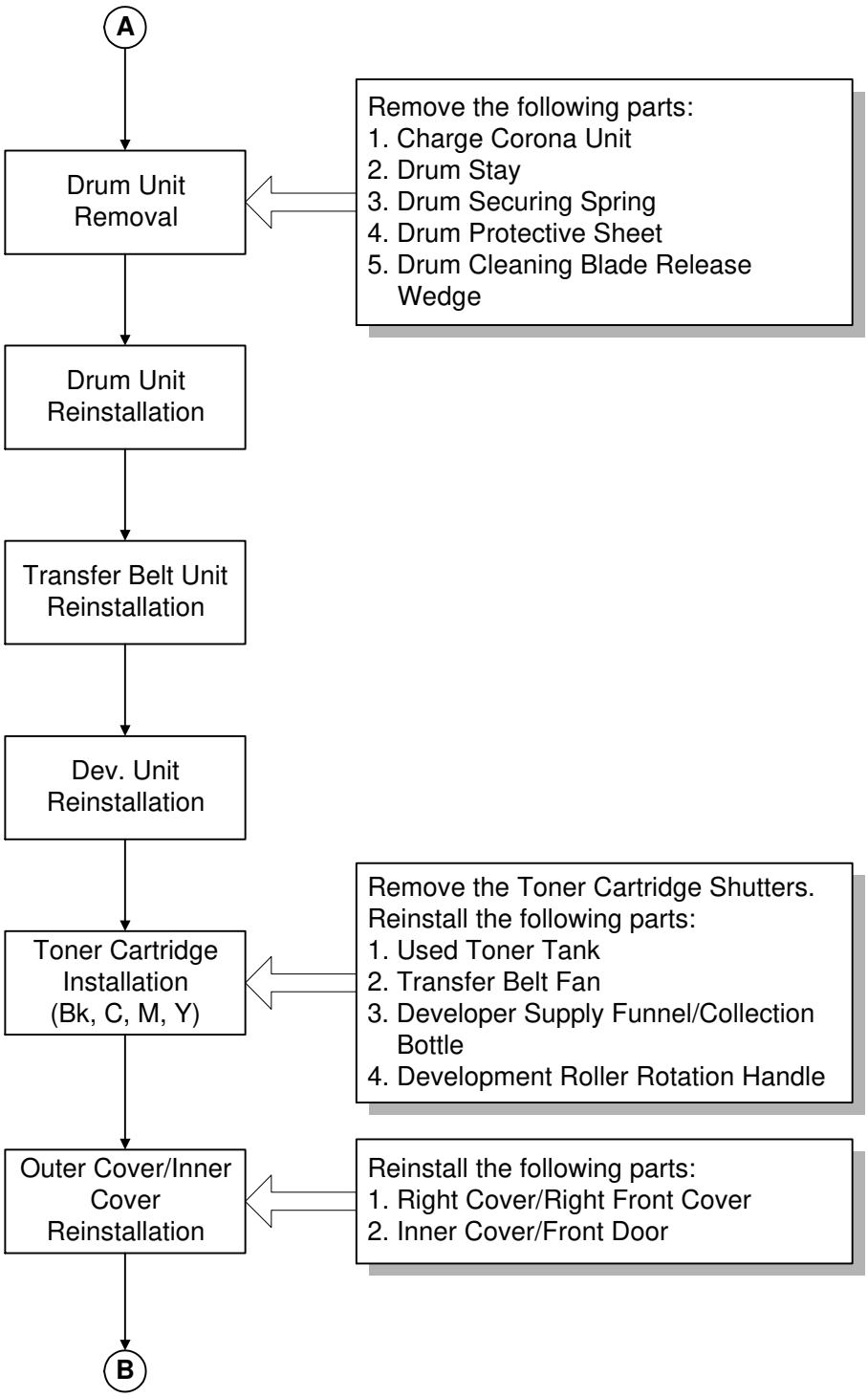
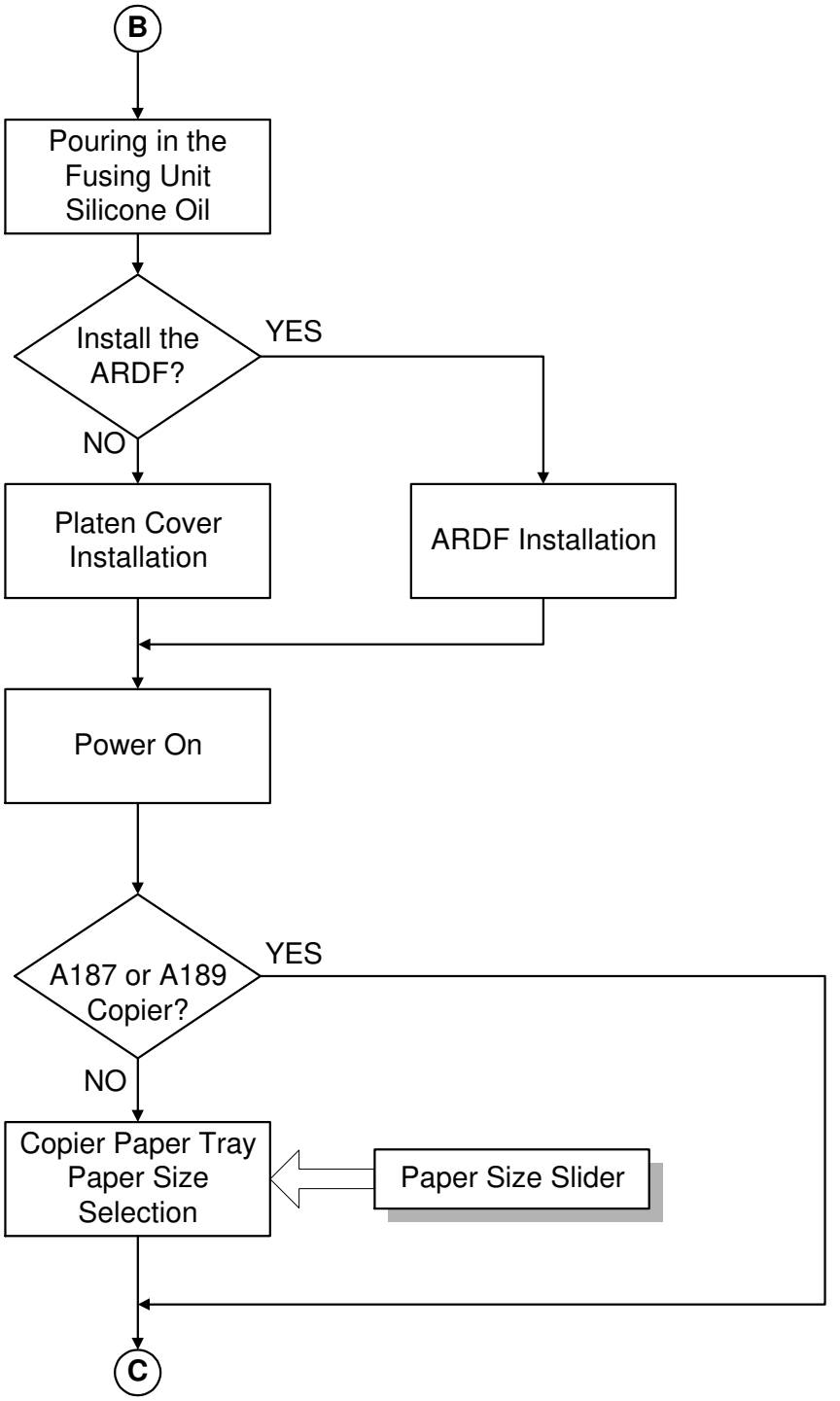


A166l545.wmf



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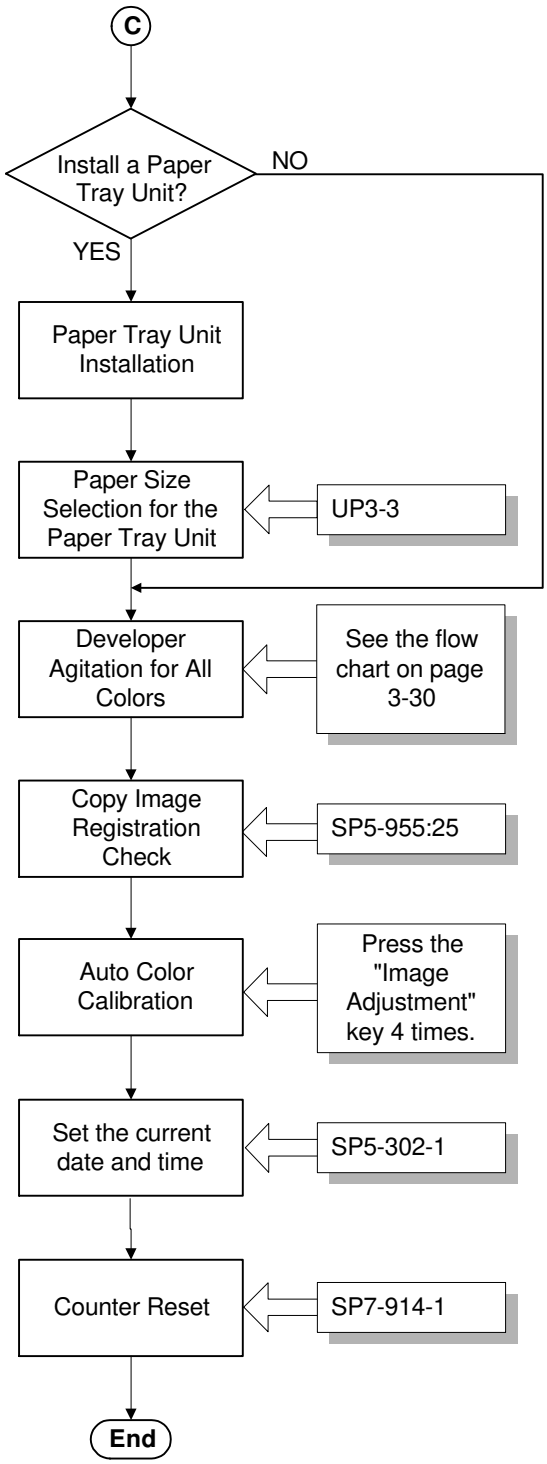

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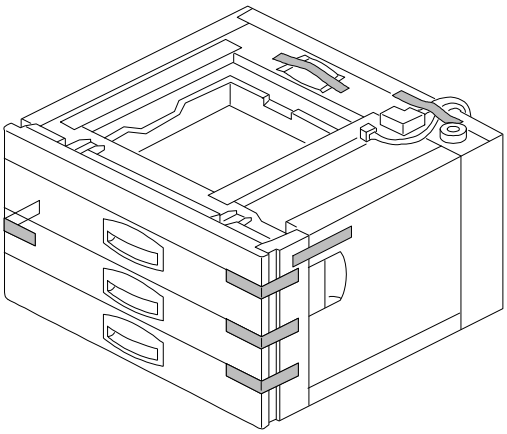
4. PAPER TRAY UNIT (A549/A550) INSTALLATION

4.1 ACCESSORY CHECK

Check the quantity and condition of the accessories in the box with the following list:

1. Right Support Bracket 1
2. Left Support Bracket 1
3. Joint Bracket 1
4. Shoulder Screw 1
5. Screw - M4 x 8 4
6. New Equipment Condition Report 1
7. Installation Procedure 1

4.2 INSTALLATION PROCEDURE



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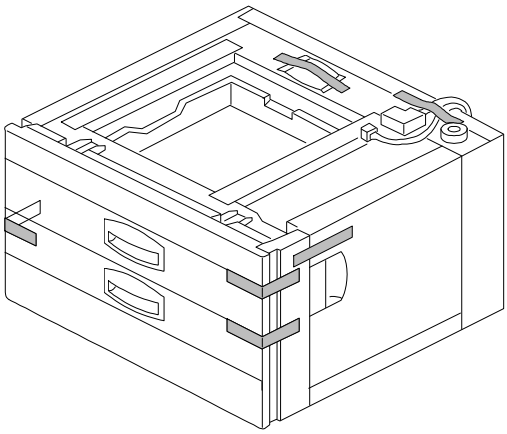

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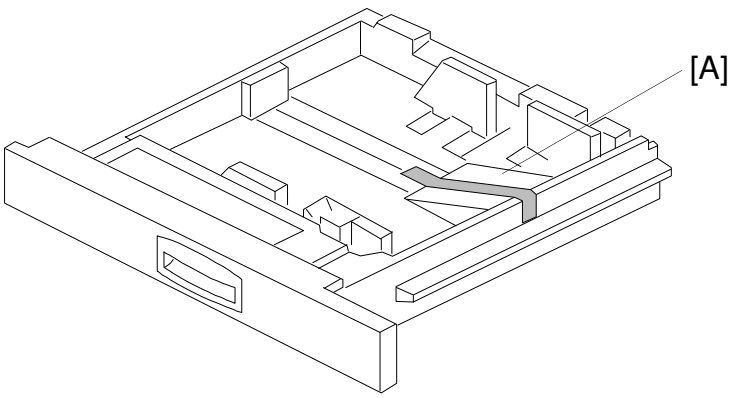


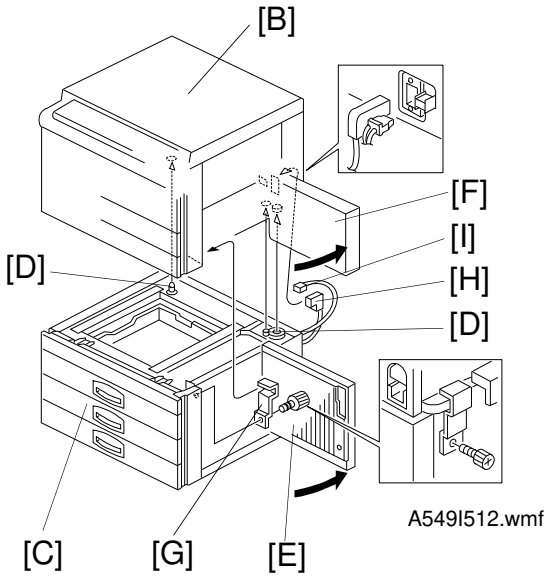
A549I511.wmf

⚠ CAUTION

Unplug the copier power cord before starting the following procedure.

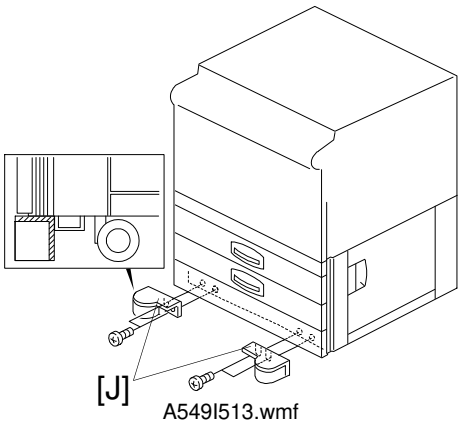
NOTE: Keep the shipping retainers after installing the machine. They will be reused if the machine is transported to another location. Proper reinstallation of the shipping retainers is required in order to avoid any transport damage.

1. Remove the strips of tape.
2. Remove the bottom plate stopper [A].



A549I512.wmf

For Copiers with an LCT: Do not lift the copier by holding the LCT unit.



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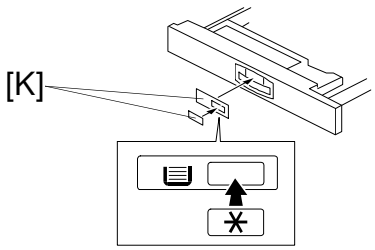

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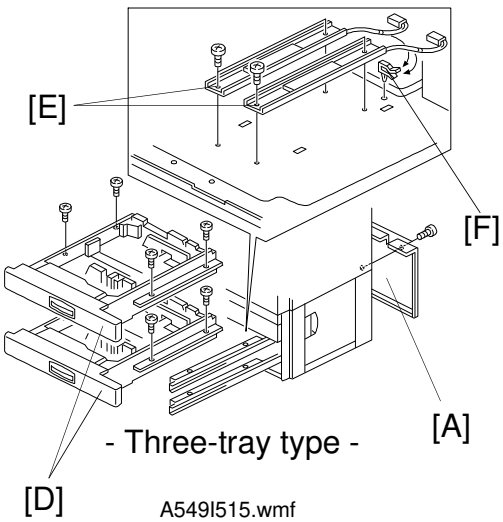
3. Set the copier [B] on the paper tray unit [C]. Align the 2 pins [D] on the paper tray unit with the holes in the base plate of the copier.
4. Open the lower door [E]. Also, open either the LCT [F] or the upper right door [F], (depending on the type of copier).
5. Secure the copier to the paper tray unit with the joint bracket [G].
6. Connect the cable [H] and optic fiber [I].
7. Attach the support brackets [J] to the bottom of the paper tray unit as shown (4 screws).

⚠ CAUTION

If you do not attach the support bracket, the machine may fall forwards when the paper trays are pulled open.

8. Pull out the paper tray and load paper into it. (The paper size and direction for each tray should be designated by a customer.) Position the side and rear fences properly.
9. Turn on the main switch.
10. Enter the proper paper size for each paper tray by following the procedure in the copier's manual.
11. Attach the appropriate tray decals [K] which are included in the accessory box with the main copier.
12. Check the machine's operation and copy quality.

4.3 TRAY HEATER (OPTION)



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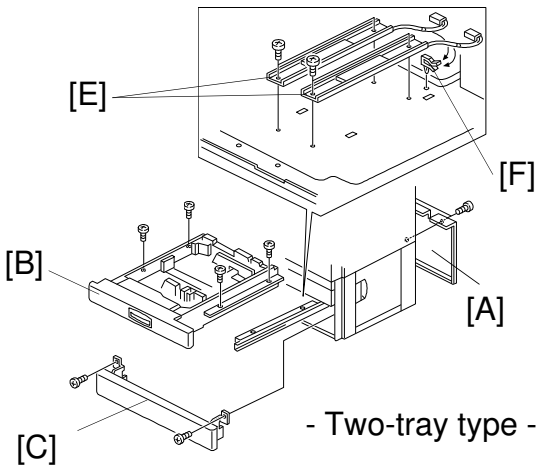

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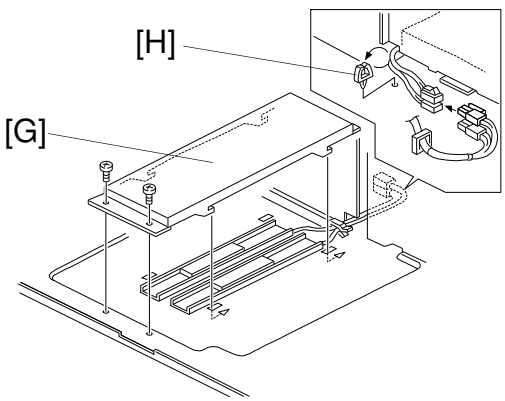

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1. Remove the rear cover [A].
2. **Two-tray type:** Remove the second paper tray [B] (4 screws) and the lower front cover [C] (2 screws).

   Three-tray type: Remove the second and third paper feed trays [D] (4 screws each).
3. Install the tray heaters [E] (2 screws each).
4. Install the clamper [F] and clamp the heater harnesses.
5. Install the heater bracket [G] (2 screws).
6. Connect the heater harnesses.
7. Install the clamper [H] and clamp the heater harnesses.

NOTE: After replacing the paper tray, perform the side-to-side registration adjustment (see section 6. Replacement and Adjustment).

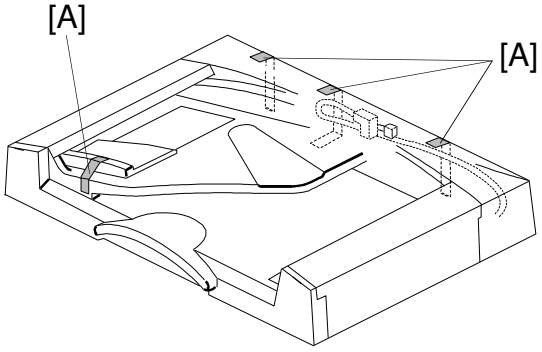
5. ARDF (A548) INSTALLTION

5.1 ACCESSORY CHECK

Check the quantity and condition of the accessories in the box with the following list:

1. New Equipment Condition Report 1
2. Installation Procedure 1
3. Stud Screw 2
4. Philips Screw with Flat Washer – M4 x 10 2
5. Sponge Retainer 1

5.2 INSTALLATION PROCEDURE



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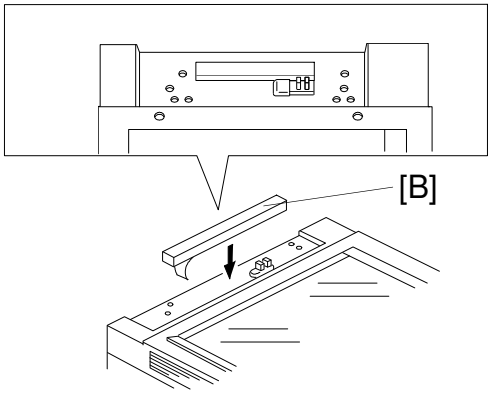

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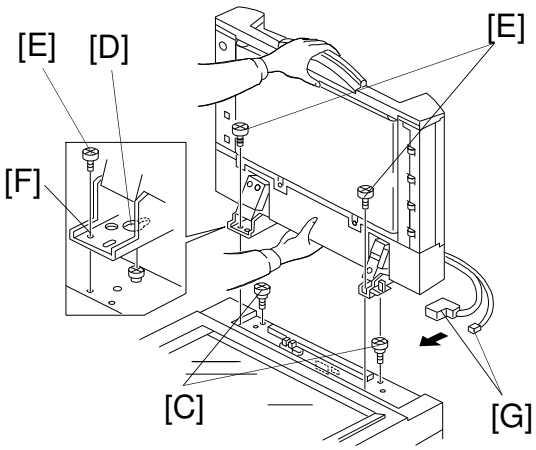

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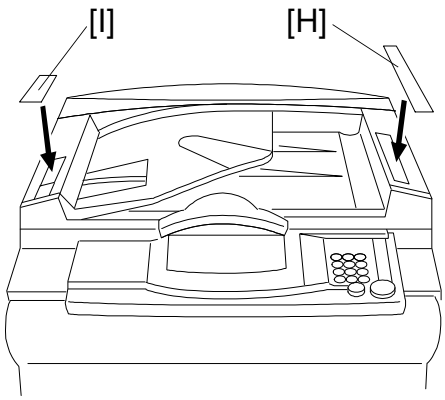


A548I507.wmf

⚠ CAUTION

Unplug the copier before starting the following procedure.

1. Remove the strips of tape [A].
2. Attach the sponge retainer [B] to the top cover of the copier as shown.
3. Tighten the two stud screws [C].
4. Mount the ARDF by aligning the holes [D] in the ARDF. Install the stud screws [C], then slide the ARDF to the front as shown.

   NOTE: When mounting the ARDF, hold it as shown in the illustration. Holding it in another way may damage the ARDF.
5. Screw the two M4 x 10 screws [E] into the holes [F] and tighten them.
6. Attach the connectors [G] into the socket on the rear of the copier.
7. Affix the symbol explanation decal [H] and the combine originals explanation decal [I] to the ARDF as shown.

6. 10-BIN SORTER (A555) INSTALLATION

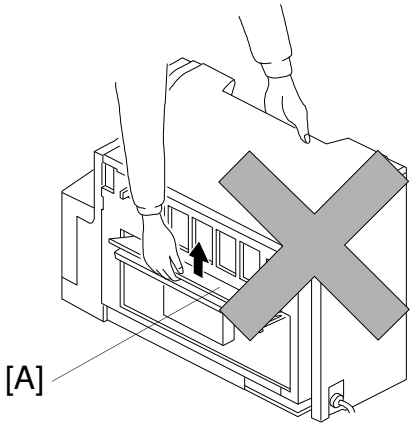
6.1 ACCESSORY CHECK

Check the quantity and condition of the accessories in the box with the following list:

1. Misfeed Removal Decal..... 1
2. Staple Position Decal 1
3. Chain 1
4. Cap Remover 1
5. Philips Pan Head Screw 4 x 8 1
6. Philips Pan Head Screw 4 x 14 4
7. New Equipment Condition Report 1
8. Installation Procedure..... 1

6.2 INSTALLATION PROCEDURE

Incorrect Lifting Method



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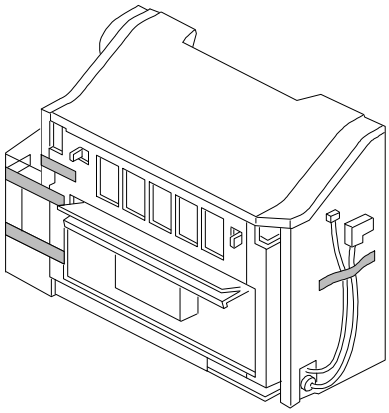

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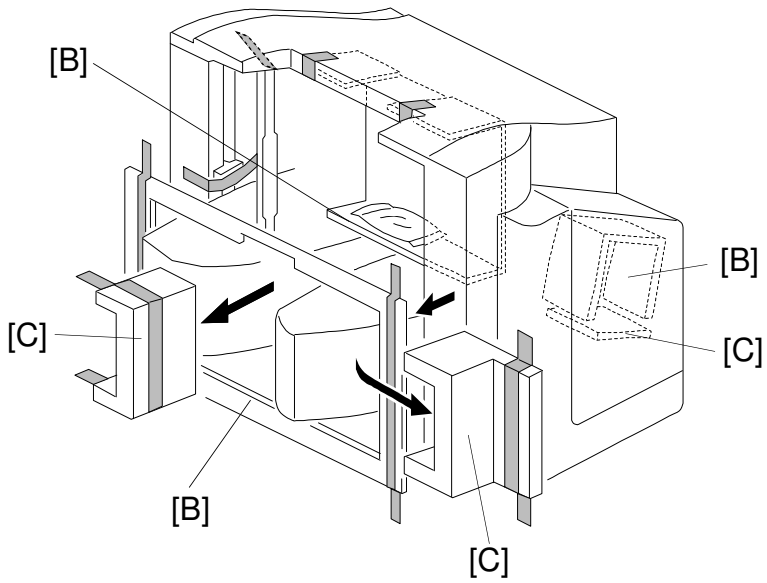
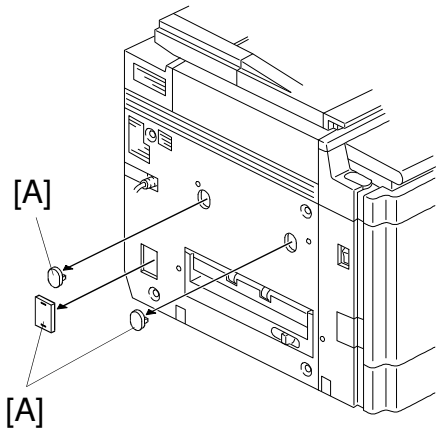


A555I517.wmf

⚠ CAUTION

Unplug the copier power cord before starting the following procedure.
Do not lift the sorter stapler by holding the entrance guide [A].
Otherwise, the resulting damage may cause paper jams to occur.

1. Remove the strips of tape.
2. Remove the cardboard pieces [B] and the foam blocks [C].



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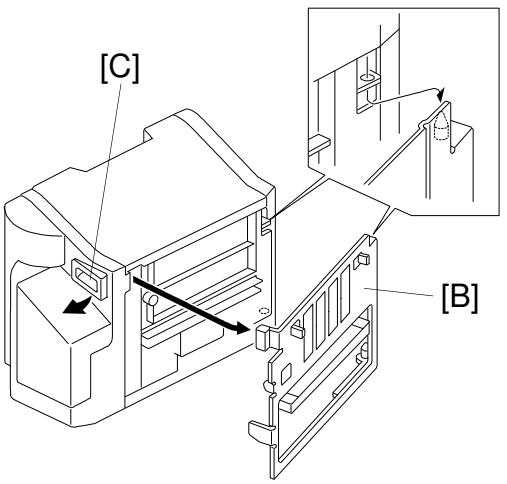
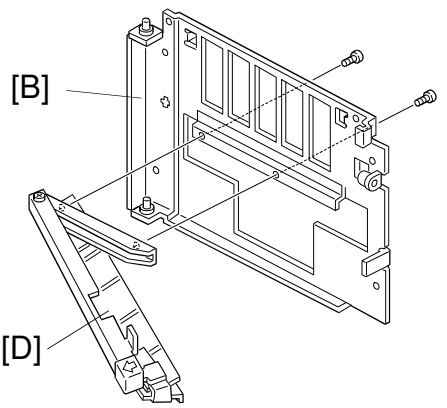


A555I504.wmf



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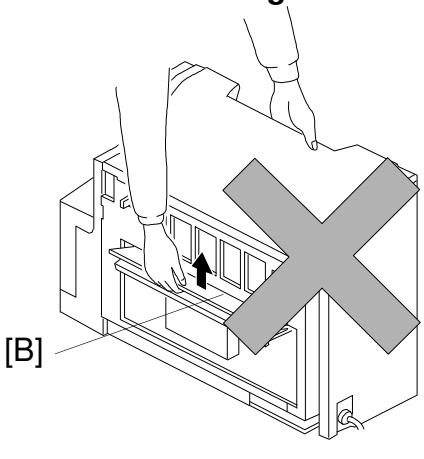
3. Remove the caps [A] with wire clippers.
4. Remove the mounting frame [B] from the sorter stapler by releasing the open lever [C].
5. Remove the exit paper guide [D] from the mounting frame [B].

Incorrect Lifting Method



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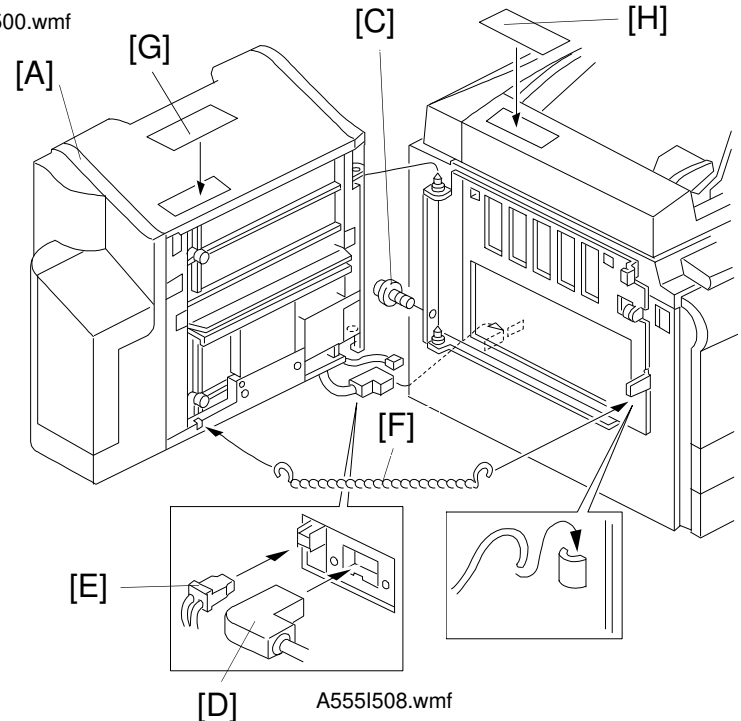

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6. Install the sorter stapler [A] on the frame [1 M4 x 8 screw].

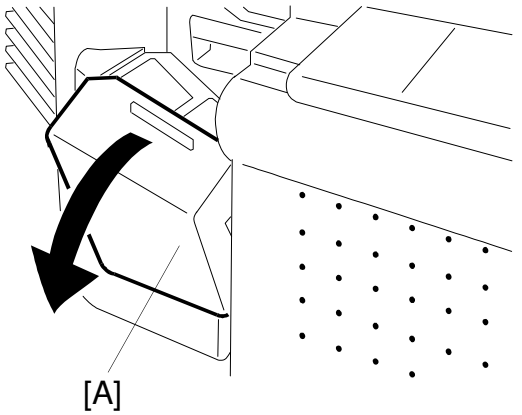
   NOTE: Do not lift the sorter stapler by holding the entrance guide [B] when installing it.

7. Tighten the M4 x 8 screw [C].

⚠ CAUTION

If you do not insert and tighten this screw, the sorter stapler may fall down.

8. Connect the cable [D] and the optic cable [E].
9. Install the chain [F] as shown.
10. Attach the misfeed removal decal [G] and the staple position decal [H] as shown above.



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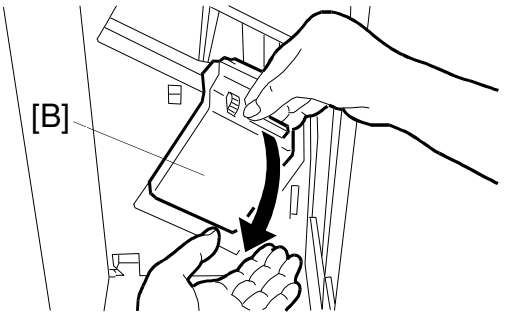

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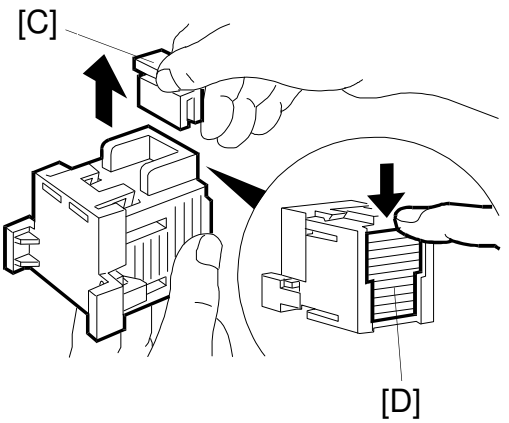
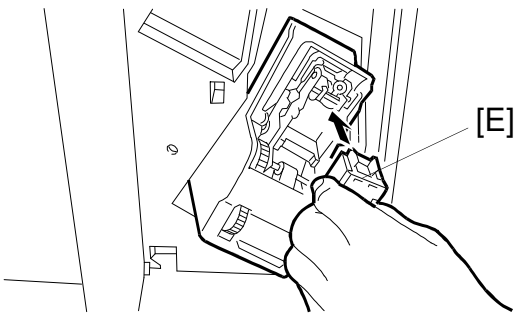


A555I520.wmf

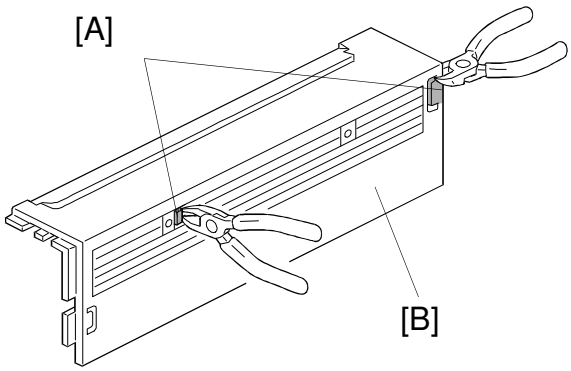


A555I521.wmf

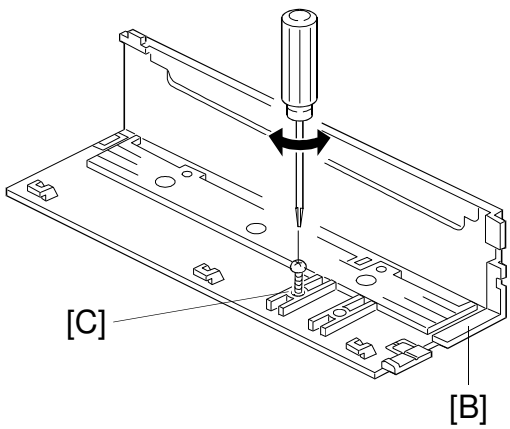
11. Open the front door [A] of the sorter stapler and swing the staple unit [B] up.
12. Remove the green plastic clip [C] from the staple cartridge and correct the position of the staple sheet [D]. Make it flush with the other sheets in the cartridge.
13. Install the cartridge [E] in the stapler while holding the staple unit.
14. Put the staple unit back in the original position, close the sorter stapler front door, and plug in the copier.
15. Turn on the main switch, and test the operation of the sorter stapler.

    NOTE: The stapler will not staple for the first few copies. The first staple will be set at the proper position after about 5 copies.

7. FILM PROJECTOR TABLE (A579) INSTALLATION



A166I551.wmf



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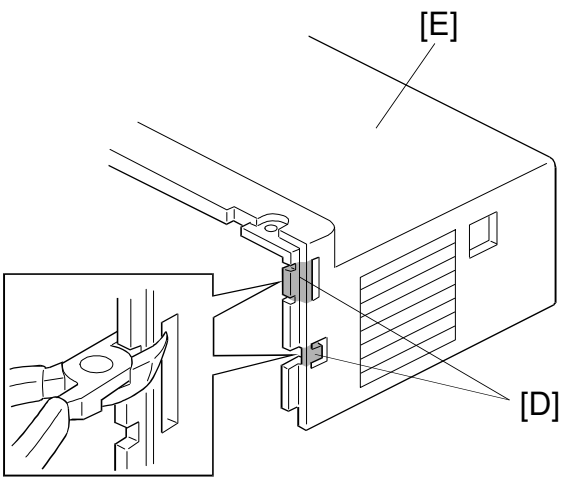


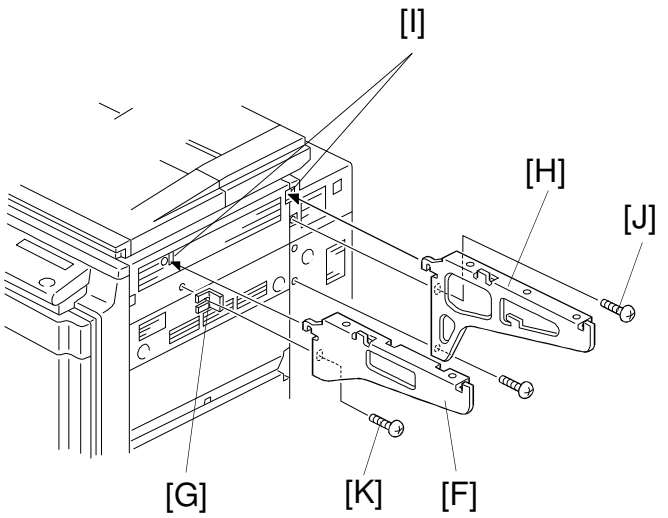
A166I553.wmf

1. Remove the following outer covers:
   (1) Upper right cover
   (2) Upper rear cover

2. Remove the two plastic caps [A] from the upper right cover [B] with wire cutters.

3. Bore a hole [C] with a screwdriver and a M5 x 10 tapping screw through the upper right cover [B].

4. Remove the two plastic caps [D] from the upper rear cover [E] with wire cutters.



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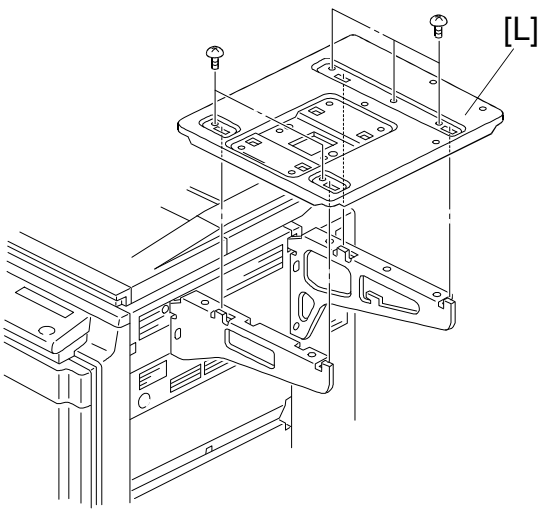


A166I555.wmf

5. Reinstall the following outer covers:
   (1) Upper right cover
   (2) Upper rear cover

6. Mount the two cantilevers [F] and [G] into the openings [I].

7. Fasten the cantilever [F] (1 M4 x 13 screw and 1 spacer [G]).

8. Fasten the cantilever [H] ([J]: M4 x 13 screw, [K]: M4 x 8 screw).

9. Place the table [L] on the cantilevers. Then fasten it with five M4 x 8 screws.

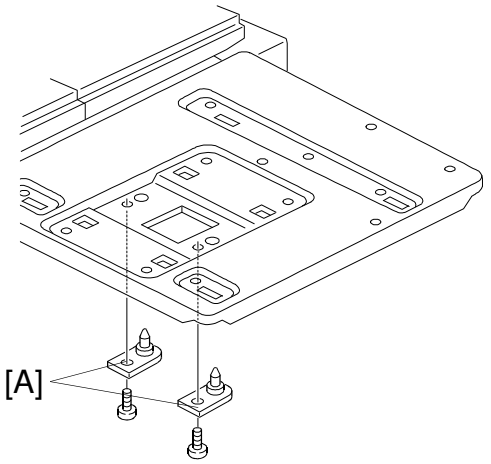
8. FILM PROJECTOR UNIT (A718) INSTALLATION

8.1 ACCESSORY CHECK

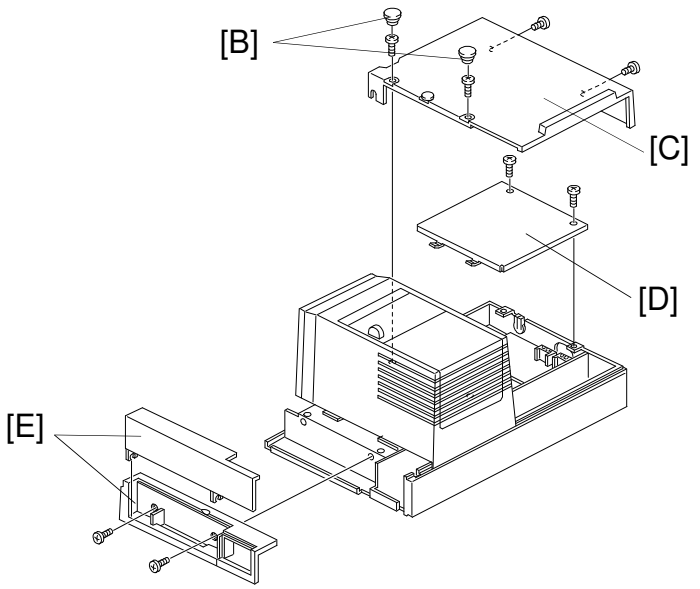
Make sure that each accessory listed in the following table is in the box. Also check the condition of each item.

1. Mirror Unit 1
2. Power Cord 1
3. Optical Fiber Cable 1
4. Film Strip Holder 1
5. Slide Holder 1
6. Glass Mount Holder 1
7. Base Film (FUJI, KODAK, AGFA) 3
8. Slide Mount 1
9. Correction Filter (P, N) 2
10. Blower Brush 1
11. Projection Lamp 1
12. Film Position Sheet 2
13. Positioning Pin 2
14. Spacer 4
15. Philips Pan Head Screw - M4 x 8 2
16. Philips Pan Head Screw - M4 x 12 4
17. Installation Procedure 1
18. New Equipment Condition Report 1 (-17/-27 only) 1

8.2 INSTALLATION PROCEDURE



A718I500.wmf



A718I502.wmf

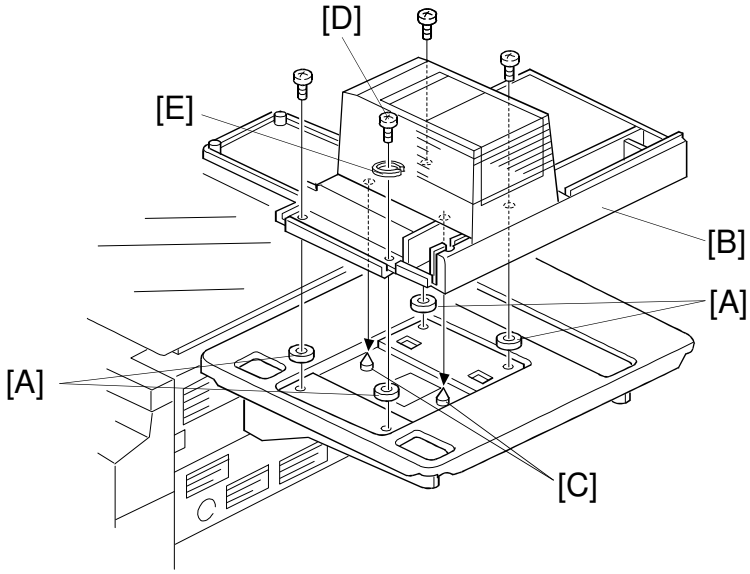
⚠ CAUTION

Unplug the copier power cord before starting the following procedure.

NOTE: The film projector table (A579) must be installed before starting the following procedure. (See section 3. Film Projector Table Installation Procedure.)

1. Install the two positioning pins [A] on the table as shown (2 screws - M3 x 5); these are included in the A579 accessories.

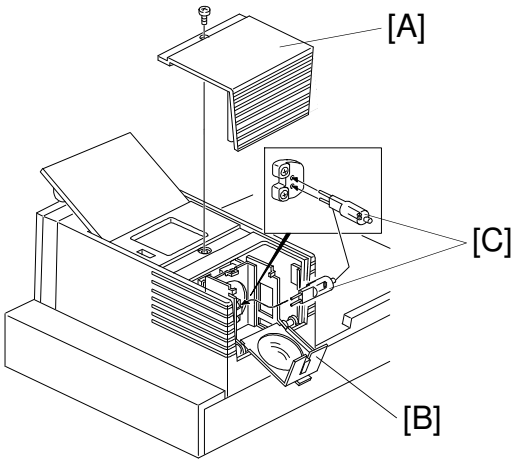
2. Remove the following parts.
   - Rubber caps [B]
   - Rear cover [C] (4 screws)
   - Shield plate [D] (2 screws)
   - Front covers [E] (2 screws)



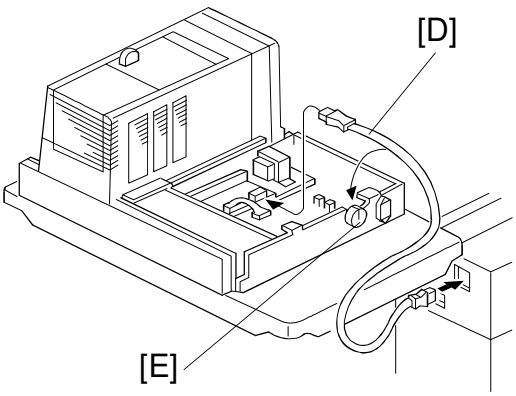
A718I501.wmf

3. Set the four spacers [A] at the four corners (in the indents provided).
4. Place the projector unit [B] on the table by aligning the holes in the projector base plate with the positioning pins [C]. Then secure the projector unit with four M4 x 12 screws.

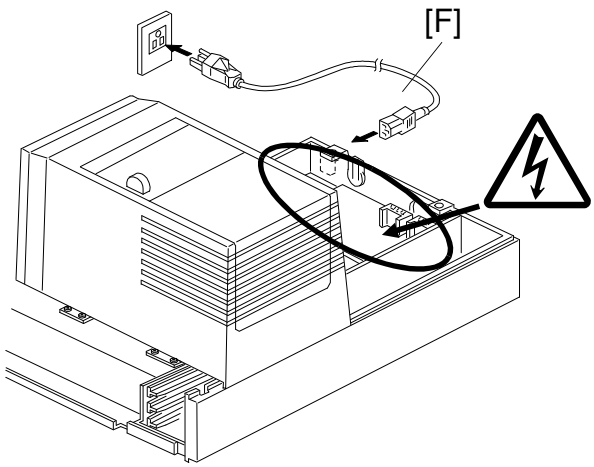
   NOTE: When securing the screw [D], insert the spring washer [E] between the screw and the projector unit. This spring washer grounds the projector unit frame.



A718I503.wmf



A718I506.wmf



A718I507.wmf

5. Remove the lamp cover [A] (1 screw) and open the reflector cover [B]. Then, plug the projection lamp [C] into the socket. Close the reflector cover.

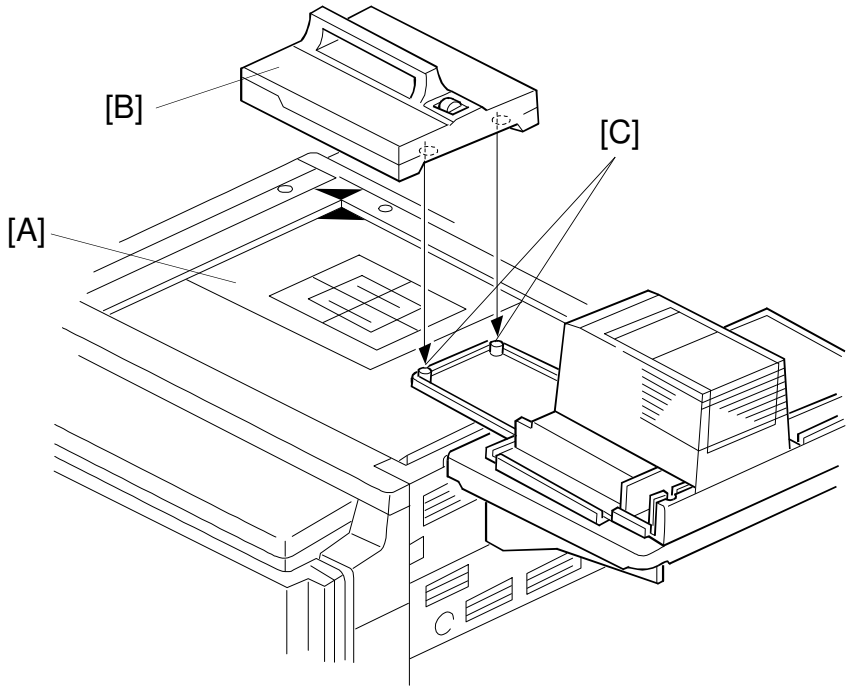
   NOTE: The projection lamp should be fully inserted.

6. Run the optical fiber cable [D] between the projector control board (CN6) and the copier through the rubber bushing [E], as shown.

7. Connect the power cord [F] to the power inlet and plug it into the wall outlet.

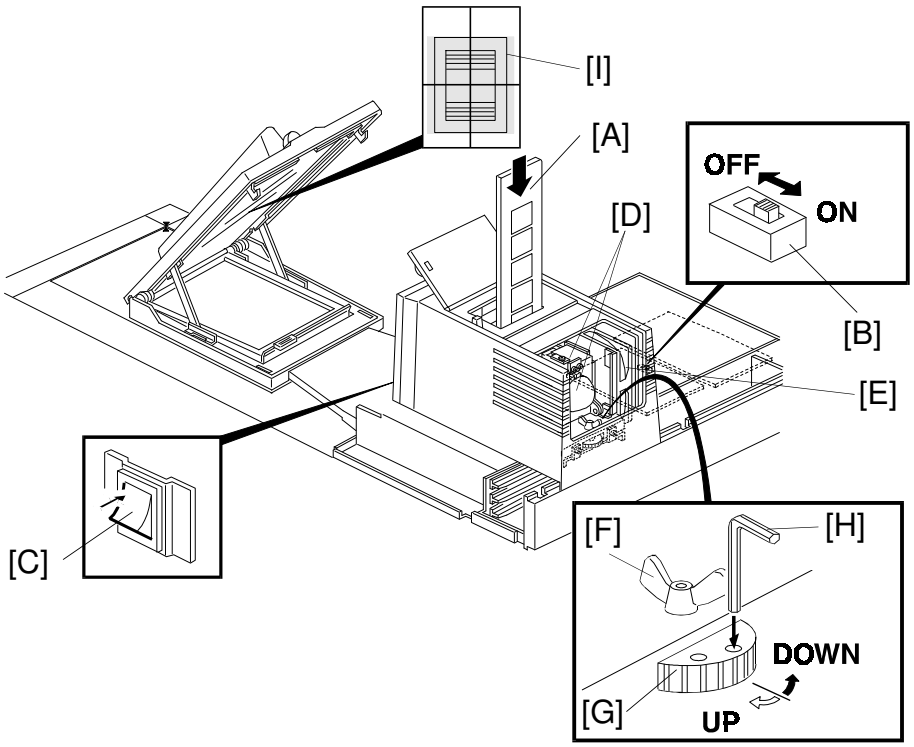
⚠ CAUTION

After plugging the power cord into the wall outlet, do not touch the electrical components inside the projector unit (other than the test switch used in steps 11 and 15). Otherwise, you might receive an electrical shock. ⚠



A718I509.wmf

8. Place the film position sheet [A] on the exposure glass, aligning it at the rear left corner.
9. Put the mirror unit [B] on the exposure glass by aligning the holes with the positioning pins [C] on the lens cover.



A718I511.wmf

10. Insert the film strip holder [A] into the film projector unit at the base film setting position.

    NOTE: Push the film strip holder gently to confirm that the film strip holder has been completely inserted.

11. Turn on the test switch [B] on the projector control board and turn on the projection unit main switch [C].

⚠ CAUTION

The lamp housing and reflector [D] will become very hot. The lamp cooling fan [E] will start turning suddenly when the lamp housing temperature becomes high. Keep hands away from these components to avoid any injury.

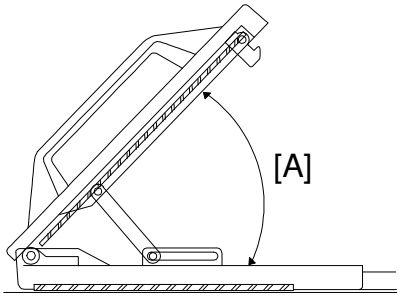
12. Loosen the wing nut [F].

13. Adjust the position of the projected light by turning the dial [G] with a hexagon wrench [H] until it is at the center of the 4" x 5" frame [I] reflected in the mirror unit.

14. Tighten the wing nut [F].

15. Turn off the projector main switch and the test switch.

16. Reinstall the lamp cover and other covers.



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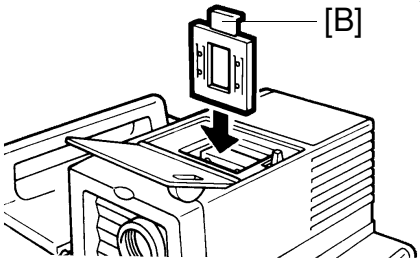
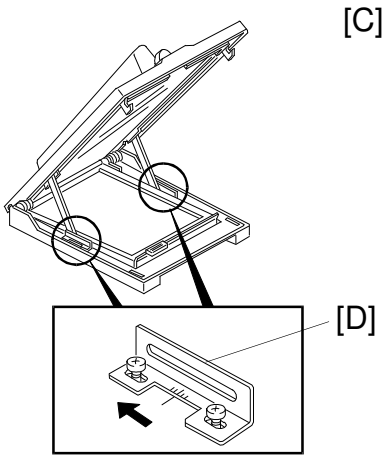
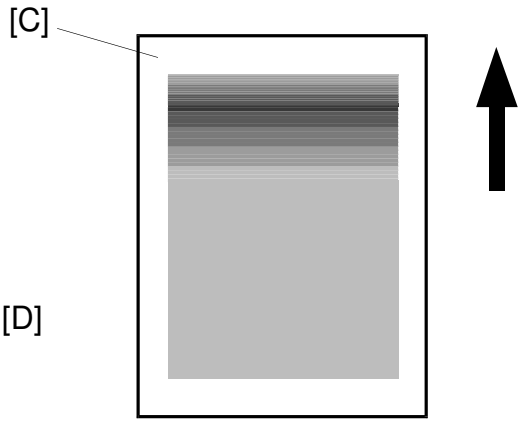


A718I513.img

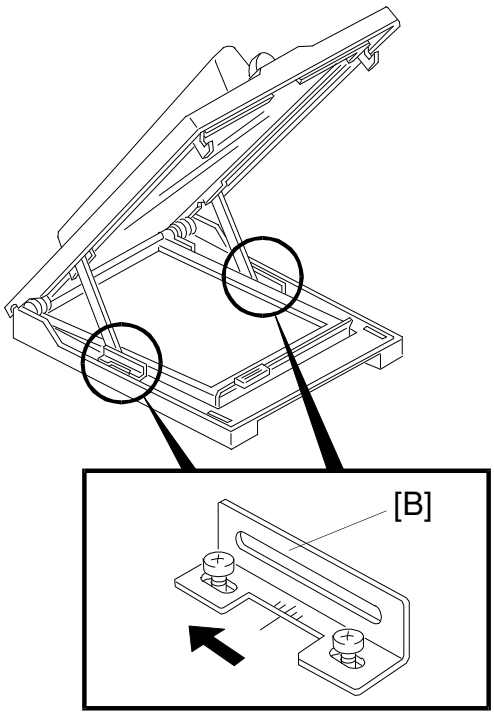


A718I514.wmf

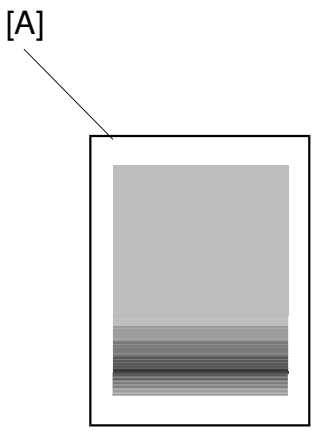


A718I515.wmf

17. Adjust the angle [A] of the mirror unit as follows:
    1) Turn on the copier main switch and wait for the ready condition.
    2) Open the lens cover and position the mirror unit on the exposure glass.
    3) Put the correction filter [B] (for positive film) in the filter slot.
    4) Turn on the projector main switch and press the option key.
    5) Perform shading using the positive 35 mm slides mode.
    6) Put one of the orange base films in the slide holder and position it in the projector unit.
    7) Make a copy of the orange film.
    8) Ensure that the orange image is even. If the image is uneven, adjust the mirror angle as follows:
        8-1) When the leading part of the image is dark (as shown in [C]).
            a) Move the front and rear arm guides [D] to the left so that the mirror angle is increased (2 screws each).
                NOTE: Position the arm guides in the same location at the front and rear, using the ruler decals. This prevents th mirror from being twisted.
            b) Make a copy of the orange film.
            c) Repeat steps a) and b) until the orange image is even.



A718I514-2.wmf



A718I516.wmf

8-2) When the trailing part of the image is dark (as shown in [A]).

a) Move the front and rear arm guides [B] to the right so that the mirror angle is reduced (2 screws each).

NOTE: Position the arm guides in the same location at the front and rear, using the ruler decals. This prevents the mirror from being twisted.

b) Make a copy of the orange film.

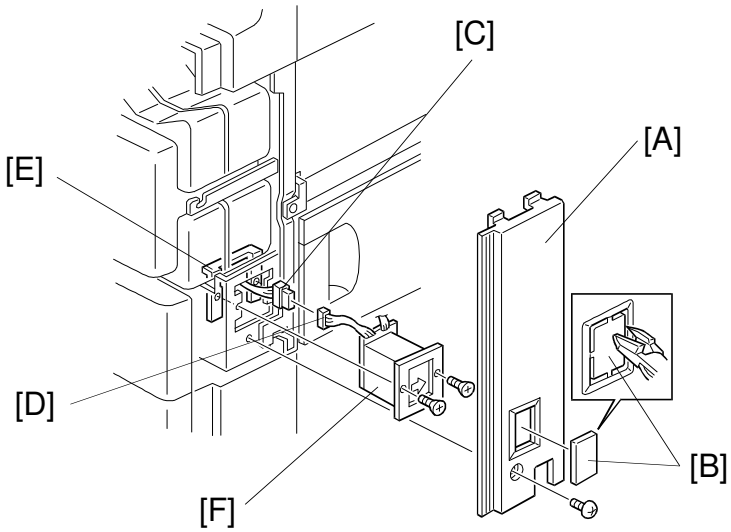
c) Repeat steps a) and b) until the orange image is even.

18. Check copy images from positive or negative films.

9. OTHERS

9.1 KEY COUNTER

9.1.1 Key Counter Installation



A166I584.wmf

1. Remove the right front cover [A] (1 screw).
2. Cut the key counter cover [B] out of the right front cover with wire cutters .
3. Couple the connector [C] with the key counter connector [D].
4. Remove the 2 screws which hold the securing plate [E] and install the key counter holder [F] to the fixing plate with the same screws.
5. Reinstall the right front cover [A] (1 screw).

9.1.2 Setting up the SP Modes for the Key Counter

SP5-113: Key Card/Coin Lock (Key Card /Key Counter/Coin Lock Selection)
This mode can be used to select the key counter mode.
0: None (Default), 1: Key card, **2: Key counter**, 3: Coin Lock

NOTE: After installing the key counter, this SP mode must be changed to 2.

SP5-104: Double Counting
A3\8 1/2" x 11" double counting can be selected with this mode, depending on customer contract.
0: Yes, **1: No (default)**

SP5-120: Clear Modes On/Off (Key Counter)
Clear modes when the key counter is removed
This mode can specify whether the machine clears the current mode when the key counter is removed.
0: Yes (default), 1: No

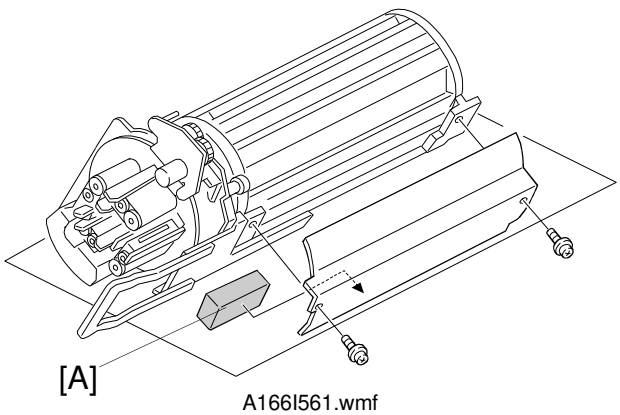
NOTE: The count-up timing for the key counter occurs when paper is fed in.

9.2 MOUNTING THE PACKING RETAINERS FOR MOVING THE COPIER

Before re-transporting the copier after installation, reinstall the following packing retainers which were removed at installation (see section 3. COPIER INSTALLATION PROCEDURE).

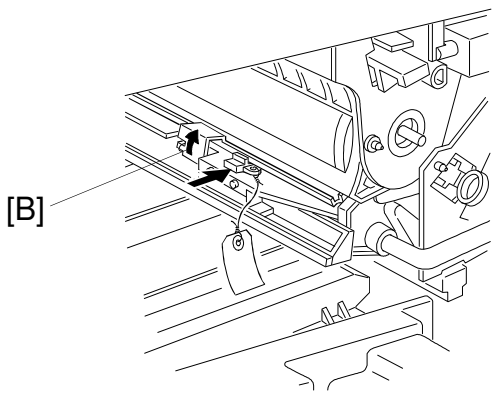
NOTE: When moving the machine after installation for only a short distance, it is only necessary to mount only the revolver stopper (step 5).

1. Install the revolver retainer [A].



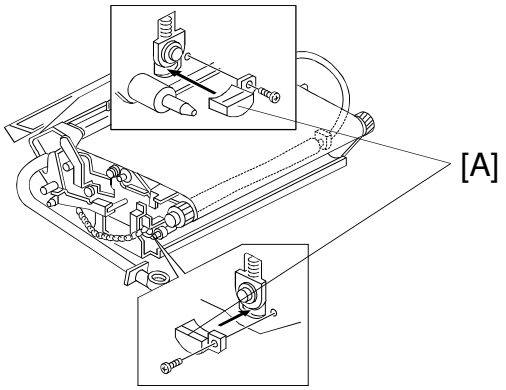
A166I561.wmf

2. Install the cleaning blade release wedge [B].



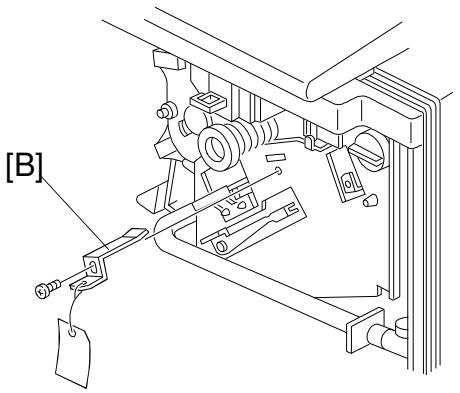
A166I562.wmf

3. Install the transfer belt release wedges [A] (1 screw for each).



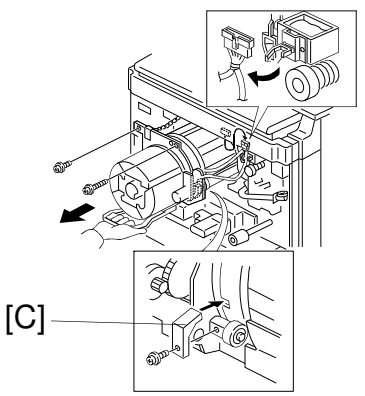
A166I587.wmf

4. Install the transfer belt retainer [B] (1 screw).



A166I588.wmf

5. Install the revolver stopper [C] (1 screw).



A166I589.wmf

SECTION 4

SERVICE TABLES

1. SERVICE PROGRAM MODES

1.1 SERVICE PROGRAM MODE OPERATION

The service program (SP) mode is used to check electrical data, change modes, and adjust values.

Service Program Access Procedure

[Clear Modes] → [1] → [0] → [7] → [C/Stop]

1. Press the clear modes key.
2. Enter "107".
3. Hold down the clear/stop key for more than 3 seconds until the service program SP mode menu appears on the display (LCD).

An SP No. is composed of the 1st, 2nd, and 3rd level numbers. Each level can be entered with the number keys and the enter key [R/#].

For example SP1-201-3

[1] → [R/#] → [2] → [0] → [1] → [R/#] → [3] → [R/#]

Each level can be changed with the [+] and [−] (Up/Down keys) on the operation panel.

NOTE: 1) When you wish to make a copy in SP mode, press the interrupt key to change to the initial copy mode screen. Then to go back to the SP mode screen, press the interrupt key again.
2) Press the clear modes key several times to go up one level or exit SP mode.

1.1.1 LCD Displays

Using the 20-digit LCD, there is a shortage of space for wording on the display.

For example

LCD Display	Meaning
K	Black
FC	Full Color
SC	Single Color

1.2 SP TABLE

See Appendix 2.

1.3 SP MODE ADDITIONAL NOTES

1.3.1 SP5-501 PM Counter

The PM counter counts up as follows:

	Bk	Full Color
In Full Color Mode	1	3
In Single Color Mode (2C: RGB)	0	2
In Single Color Mode (1C: CMY)	0	1
In Bk and White Mode	1	0

1.3.2 SP5-802-1 Printer Free Run

Running Condition

1. Wait for the fusing unit to warm up.
2. The printer free run can be done either
   Without paper in the selected tray and simulates printing with A4 sideways or letter sideways paper
   With A4 sideways, DLT, or Letter sideways paper

Process

1. The pattern for LD writing is the 1 dot/line grid pattern (No.5 for SP 5-955)
2. The free run simulates the normal copy process.
3. Paper jam detection is ignored.
4. The free run can be done in black and white mode, full color mode, or OHP/Thick paper mode.

1.3.3 SP5-802-4 System Free Run

Running Condition

1. Wait for the fusing unit to warm up.
2. The free run can be done either:
   Without paper in the selected tray and simulates copying with A4 sideways or letter sideways paper
   With A4 sideways, DLT, or Letter sideways

Process

1. The pattern for LD writing is the scanned image.
2. The free run simulates the normal copy process.
3. Paper jam detection is ignored.
4. The free run can be done in black and white mode, full color mode, or OHP/Thick paper mode.

1.3.4 SP5-803 Input Check

SP No.			Display	Sensor/Switch/Signal	Status	
1st	2nd	3rd			0	1
5	803	1	IN:Tray Paper End Sn	Tray Paper End Sensor	Paper present	Paper end
5	803	2	IN:Tray Paper Size SW	Tray Paper Size Switch (See the following table *)	0 ~ 255	
5	803	3	IN:Registration Sn	Registration Sensor	No paper	Paper present
5	803	4	IN:Vertical Transport SW	Vertical Transport Switch	Closed	Open
5	803	5	IN:By-ps Feed Table SW	By-pass Feed Table Switch	Closed	Open
5	803	6	IN:By-ps Fd Ppr End Sn	By-pass Paper End Sensor	Paper present	Paper end
5	803	7	IN:By-ps Fd Ppr Width Sn	By-pass Feed Paper Width Sensor (See the following table ☆)	0 ~ 255	
5	803	8	IN:Relay Sensor	Vertical Transport Sensor	No paper	Paper present
5	803	9	IN:Exit Sensor	Exit Sensor	No paper	Paper present
5	803	10	IN:Revolver HP Sn	Revolver Home Position Sensor	Not H.P.	H.P.
5	803	11	IN:Belt HP Sensor	Transfer Belt Home Position Sensor	Not H.P.	H.P.

SP No.			Display	Sensor/Switch/Signal	Status	
1st	2nd	3rd			0	1
5	803	12	IN:Main Mtr Lck Detect	Main Motor Syncronization Signal Detection	Detect (Motor Rotation)	Not Detect (No Rotation)
5	803	13	IN:Drum Mtr Lck Detect	Drum Motor Syncronization Signal Detection	Not Detect (No Rotation)	Detect (Motor Rotation
5	803	14	IN:Dev Dr Mtr Lck Detect	Development Drive Motor Syncronization Signal Detection	Not Detect (No Rotation)	Detect (Motor Rotation)
5	803	15	IN:Front Door SW	Front Door Switch	Closed	Open
5	803	16	IN:Oil End Sensor	Oil End Sensor	Not End	End
5	803	17	IN:Toner Overflow Sn	Toner Overflow Sensor	OFF	ON
5	803	18	IN:Duplex Unit Set Sn	Duplex Unit Set Sensor	Not Installed	Installed
5	803	19	IN:Jggr Side Fence HP Sn	Jogger Side Fence Home Position Sensor	Not H.P.	H.P.
5	803	20	IN:Jggr End Fence HP Sn	Jogger End Fence Home Position Sensor	Not H.P.	H.P.
5	803	21	IN:Dplx Paper End Sn	Duplex Paper End Sensor	Paper present	Paper end
5	803	22	IN:Dplx Entrance Sn	Duplex Entrance Sensor	No paper	Paper present
5	803	23	IN:Duplex Turn Sn	Duplex Turn Sensor	No paper	Paper present
5	803	24	IN:Scanner HP Sensor	Scanner Home Position Sensor	Not H.P.	H.P.
5	803	25	IN:Platen Position Sn	Platen Position Sensor	Cover open	Closed
5	803	26	IN:Exp. Lamp ON Signal	Lamp ON Signal	OFF	ON
5	803	27	IN:Toner Cartridge Sn: K	Bk Toner Cartridge Sensor	Not Detect	Detect
5	803	28	IN:Tnr Cartridge Sn:CMY	Color Toner Cartridge Sensor	Not Detect	Detect
5	803	29	IN:IDU Unit	IDU Unit	Not Installed	Installed
5	803	30	IN:Paper Exit Door SW	Paper Exit Door Switch	Closed	Open
5	803	31	IN:Poly. Mtr Lck Detect	Polygon Motor Synchronization Signal Detection	Not H.P.	H.P.
5	803	32	IN:AC Detection	AC Detection	Not H.P.	H.P.

* SP5-803-2

Displays a code indicating paper size as follows:

Code Displayed	Metric machine	Inch machine
1	A3	11" x 17"
3	B4	8.5" x 14"
6	A4L	8.5" x 11"
13	A4S	11" x 8.5"
15	A5S	8.5" x 5.5"
16	F4 (8.5" x 13")	8" x 10"
23	B5S	A4S
24	11" x 17"	8.5" x 13"
27	B5L	A4L
28	11" x 8.5"	10" x 14"
30	8.5" x 11"	11" x 15"

☆ SP5-803-7

Displays a code indicating paper size as follows:

Code Displayed	Metric machine	Inch machine
0	B6L	5.5" X 8.5"
1	B6L	5.5" X 8.5"
2	B5L	8" X 13"
3	A5L	5.5" X 8.5"
4	B4	8.5" X 11"
6	A4L	8.5" X 11"
8	A3	11" X 17"
12	11" X 17"	11" X 17"

1.3.5 SP5-804 Output Check

To activate the electrical component, press the start key. To stop the electrical component, press the clear modes key.

NOTE: After pressing the start key, the machine displays "Result =01 (#)". After that, press the # key, and the display goes back to the menu display. When the clear/stop key is pressed, the electrical component stops and the machine displays "Result=00 (#)". Then press the # key to go back to the menu display.

To check another component, use the + key or − key to change the display.

NOTE: The motors keep turning in this output mode regardless of inputs from sensors.
To prevent mechanical or electrical damage, do not keep the electrical component on for a long time.

SP No.			Display	Electrical Component/Mode
1st	2nd	3rd		
5	804	1	OUT:Paper Feed Clutch	Paper Feed Clutch
5	804	2	OUT:Relay Clutch	Relay Cluch
5	804	3	OUT:By-ps Feed Clutch	By-pass Feed Clutch
5	804	4	OUT:By-ps Pck-upSOL: Mn	By-pass Pick-up Solenoid: Main
5	804	5	OUT:Charge Corona/Grid 1	Charge Corona Grid 1
5	804	6	OUT:Charge Corona/Grid 2	Charge Corona Grid 2
5	804	7	OUT:Charge Corona/Grid 3	Charge Corona Grid 3
5	804	8	OUT:Development Bias:AC	Development Bias: AC
5	804	9	OUT:Development Bias:DC	Development Bias: DC
5	804	10	OUT:Dev Bias:AC+DC	Development Bias: AC+DC
5	804	11	OUT:Belt Trans Crnt	Belt Transfer Current
5	804	12	OUT:Paper Trans Crnt	Paper Transfer Current
5	804	13	OUT:Separation Crnt	Paper Separation Current
5	804	14	OUT:Toner Sply Motor	Toner Supply Motor
5	804	15	OUT:Charge Inlet Fan	Charge Inlet Fan
5	804	16	OUT:Quenching Lamp	Quenching Lamp
5	804	17	OUT:ID Sensor LED	ID Sensor LED
5	804	18	OUT:Belt Cleaning SOL	Belt Cleaning Solenoid
5	804	19	OUT:Lubricant Brush SOL	Lubricant Brush Solenoid
5	804	20	OUT:Main Motor: Normal	Main Motor: Normal Speed
5	804	21	OUT:Main Motor: Half	Main Motor: Half Speed
5	804	22	OUT:Drum Motor: Normal	Drum Motor: Normal Speed
5	804	23	OUT:Drum Motor: Half	Drum Motor: Half Speed
5	804	24	OUT:Dev Motor:Normal	Development Motor: Normal Speed
5	804	25	OUT:Dev Motor:Half	Development Motor: Half Speed
5	804	26	OUT:Toner Supply SOL	Toner Supply Solenoid
5	804	27	OUT:Revolver Drive Motor	Revolver Drive Motor: 1/4 Rotation
5	804	28	OUT:Transport Fan	Transport Fan

SP No.			Display	Electrical Component/Mode
1st	2nd	3rd		
5	804	29	OUT:Optics Cooling Fan 1	Optics Cooling Fan 1
5	804	30	OUT:Optics Cooling Fan 2	Optics Cooling Fan 2
5	804	32	OUT:Exposure Lamp	Exposure Lamp
5	804	33	OUT:Scanner Motor Crnt	Scanner Motor Current
5	804	34	OUT:Fusing Exhaust Fan 1	Fusing Exhaust Fan 1
5	804	35	OUT:Fusing Exhaust Fan 2	Fusing Exhaust Fan 2
5	804	36	OUT:Junction Gate SOL	Duplex Junction Gate Solenoid
5	804	37	OUT:Total Counter	Total Counter
5	804	38	OUT:Polygon Motor	Polygon Motor
5	804	39	OUT:Dplx Motor: Forward	Duplex Motor: Forward
5	804	40	OUT:Dplx Motor: Reverse	Duplex Motor: Reverse
5	804	41	OUT:Jggr Side Fence Mtr	Jogger Side Fence Motor
5	804	42	OUT:Jggr End Fence Mtr	Jogger End Fence Motor
5	804	43	OUT:Ptnl Sn Calib TRG	Drum Potential Sensor Calibration Trigger
5	804	44	OUT:Main Power Relay	Main Switch Relay
5	804	45	OUT:Fusing Lamp	Fusing Lamp
5	804	46	OUT:Pressure Roller Lamp	Pressure Roller Lamp
5	804	47	OUT:Scanner Fan 1,2	Optics Coding Fan 1, 2
5	804	48	OUT:Scanner Fan 3	Optics Exhaust Fan
5	804	49	OUT:Scanner Fan 4	Scanner Board Cooling Fan
5	804	50	OUT:Registration Clutch	Registration Clutch
5	804	51	OUT:Ppr Tr Rev Current	Paper Transfer Reverse Current
5	804	52	OUT:PTL	Pre-transfer Lamp
5	804	53	OUT:By-ps Pck-up SOL:Sub	By-pass Pick-up Solenoid: Sub
5	804	54	OUT:Reverse Crnt Relay	Reverse Current Relay for Paper Transfer Charge Unit

1.3.6 SP5-955 Printer Test Pattern

0	No Pattern (normal operating mode)
1	1 dot vertical line
2	2 dot vertical line
3	1 dot horizontal line
4	2 dot horizontal line
5	1 dot/line grid pattern
6	2 dot/line grid pattern
7	2 x 2 dot pattern
8	4 x 4 dot pattern
9	Full dot pattern
10	Print margin pattern
11 to 25	Print margin and 4 color independent dot (1/15 to15/15) patterns.
26	Print out all fonts
27	16-gradation steps
28	32-gradation steps
29	64-gradation steps
30	256-gradation steps
31	4 colors
32	ID sensor pattern (40 mm)

1.3.7 SP5-974 Auto Memory Call

0	Auto program recall OFF
1	Recall program 1 after the main switch is turned on.
2	Recall program 2 after the main switch is turned on.
3	Recall program 3 after the main switch is turned on.
4	Recall program 1 after pressing the Clear Modes key after the main switch is on.
5	Recall program 2 after pressing the Clear Modes key after the main switch is on.
6	Recall program 3 after pressing the Clear Modes key after the main switch is on.

1.3.8 SP6-102 Sort/Stack Limitation

The sort limitation for A555 is:

B4, LG: 25 sheets
A4, LT: 30 sheets

The stack limitation for A555 is:

B4, LG: 20 sheets
A4, LT: 25 sheets (using 80 g/m^2 paper)

1.3.9 SP6-107 Sorter Free Run

0	Stop
1	System free run 1 (2 sets for 2 bins and A4 sideways)
2	Endurance free run (for 2 bins and B5 lengthwise)
3	System free run 2 (2 sets for 10 bins and A4 sideways)
4	Sort free run
5	Stapler free run (without staple)

1.3.10 SP6-901 Input Check for the Optional Paper Bank Unit

SP No.			Display	Status
1st	2nd	3rd		
6	901	1	IN:Bank-1 Paper Size	1 to 19 *
6	901	2	IN:Bank-2 Paper Size	1 to 19 *
6	901	3	IN:Bank-3 Paper Size	1 to 19 *
6	901	4	IN:Bank-1 Paper End	0: Paper end 1: Paper present
6	901	5	IN:Bank-2 Paper End	
6	901	6	IN:Bank-3 Paper End	
6	901	7	IN:Bank Paper Feed Sn	0 to 7 **
6	901	8	IN:Bank-1 Condition Sens	0 to 15 ☆
6	901	9	IN:Bank-2 Condition Sens	0 to 15 ☆
6	901	10	IN:Bank-2 Condition Sens	0 to 15 ☆
6	901	11	IN:Bank Cover Sensor	0: Closed 2: Open

–* SP6-901-1 to 3–

	Metric version	Inch version
1	A3	A3
2	B4	B4
3	A4 sideways	A4 sideways
4	A4 lengthwise	A4 lengthwise
5	B5 sideways	–
6	B5 lengthwise	–
7	A5 sideways	A5 sideways
8	11" x 17"	11" x 17"
9	–	8 1/2" x 14"
10	8 1/2" x 11"	8 1/2" x 11"
11	11" x 8 1/2"	11" x 8 1/2"
12	8 1/2" x 5 1/2"	8 1/2" x 5 1/2"
13	8" x 13"	8" x 13"
14	8 1/2" x 13"	8 1/2" x 13"
15	8 1/4" x 13"	8 1/4" x 13"
16	–	11" x 15"
17	–	10" 14"
18	–	8" x 10 1/2"
19	8" x 10"	8" x 10"
20	8K (267 mm x 390 mm/ lengthwise)	–
21	16K (267 mm x 195 mm/ lengthwise)	–
22	16K (195 mm x 267 mm/ sideways)	–

– ** SP6-901-7–

Relay Sensor 1	Relay Sensor 2	Relay Sensor 3	Displayed Number
No Paper	No Paper	No Paper	0
Paper preset	No Paper	No Paper	1
No Paper	Paper Present	No Paper	2
Paper Present	Paper Present	No Paper	3
No Paper	No Paper	Paper Present	4
Paper Present	No Paper	Paper Present	5
No Paper	Paper Present	Paper Present	6
Paper Present	Paper Present	Paper Present	7

– ☆ SP6-901-8 to 10 –

Displayed Number	Tray Upper Limit Sensor	Tray Set Sensor
0	OFF	OFF (Not set)
4	OFF	ON (Set)
5	ON (Upper)	ON (Set)

1.3.11 SP6-902 Output Check for the Optional Paper Bank Unit

SP No.			Display	Electrical Component
1st	2nd	3rd		
6	902	1	OUT:Bank Drive Motor	Bank Main Motor
6	902	2	OUT:Bank Vert Trns CL	Bank Relay Clutch
6	902	3	OUT:Bank-1 P-Feed CL	Bank-1 Paper Feed Clutch
6	902	4	OUT:Bank-1 Pck-up SOL/no	Bank-1 Pick-up Solenoid
6	902	5	OUT:Bank-1 Sep SOL/no	Bank-1 Separation Solenoid
6	902	6	OUT:Bank-2 P-Feed CL	Bank-2 Paper Feed Clutch
6	902	7	OUT:Bank-2 Pck-up SOL/no	Bank-2 Pick-up Solenoid
6	902	8	OUT:Bank-2 Sep SOL/no	Bank-2 Separtaion Solenoid
6	902	9	OUT:Bank-3 P-Feed CL	Bank-3 Paper Feed Clutch
6	902	10	OUT:Bank-3 Pck-up SOL/no	Bank-3 Pick-up Solenoid
6	902	11	OUT:Bank-3 Sep SOL/no	Bank-3 Separtaion Solenoid
6	902	13	OUT:FPU Lamp On	Projector Lamp

1.3.12 SP6-903 Input Check for the Sorter

SP No.			Display	Sensor/Switch /Signal	Status	
1st	2nd	3rd			0	1
6	903	1	IN:No(10)/Entrance(3)	Not used	–	–
6	903	2	IN:No(10)/1st Bin(3)	Not used	–	–
6	903	3	IN:Entry(10)/2nd Bin(3)	Sorter Entrance Sensor	No Paper	Paper present
6	903	4	IN:Bin(10)/3rd Bin(3)	Bin Sensor	No Paper	Paper present
6	903	5	IN:Bin HP/Lift L-Limit	Bin H.P. Sensor	Not H.P.	H.P.
6	903	6	IN:Bin Pos.(10)/No(3)	Wheel Sensor	Not Detect	Detect
6	903	7	IN:Jggr HP/Shift Pos	Jogger H.P. Sensor	Not H.P.	H.P.
6	903	8	IN:Chuck HP(10)/No(3)	Grip H.P. Sensor	Not H.P.	H.P.
6	903	9	IN:Stapler HP(10)/No(3)	Stapler H.P. Sensor	Not H.P.	H.P.
6	903	10	IN:Staple End(10)/No(3)	Stapler End Sensor	Stapler Present	Stapler End
6	903	11	IN:Ppr Sen(10)/Ppr Sen 3	Stapler Paper Sensor	No Paper	Paper Present
6	903	12	IN:Door Safety Switch	Door Safty Switch	Closed	Open
6	903	13	IN:SS Encorder(10)/No(3)	Timing Sensor	OFF	ON
6	903	14	IN:No(10)/Turn:(3)	Not Used	–	–

1.3.13 SP6-904 Output Check for the Sorter

SP No.			Display	Electrical Component
1st	2nd	3rd		
6	904	1	OUT:SS Mn Mtr10/Mn Mtr 3	Transport Motor
6	904	2	OUT:No(10)/Exit Motor(3)	Not used
6	904	3	OUT:No(10)/Switch SOL(3)	Not used
6	904	4	OUT:Bin Lift M./Lift M.	Bin Drive Motor
6	904	5	OUT:Jggr Mtr(10)/No(3)	Jogger Motor
6	904	6	OUT:Chuck Mtr(10)/No(3)	Grip Motor
6	904	8	OUT:No(10)/Turn SOL(3)	Not used
6	904	9	OUT:No(10)/2nd Bin SOL 3	Not used
6	904	10	OUT:No(10)/3rd Bin SOL 3	Not used

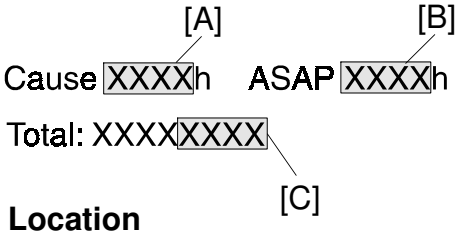
1.3.14 SP4-301 APS Data Confirmation

Code	Paper Size	Code	Paper size
0	No Original	133	A4 Lengthwise
1	A0 Sideways	134	A5 Lengthwise
2	A1 Sideways	135	A6 Lengthwise
3	A2 Sideways	136	A7 Lengthwise
4	A3 Sideways	137	B0 Lengthwise
5	A4 Sideways	138	B1 Lengthwise
6	A5 Sideways	139	B2 Lengthwise
7	A6 Sideways	140	B3 Lengthwise
8	A7 Sideways	141	B4 Lengthwise
9	B0 Sideways	142	B5 Lengthwise
10	B1 Sideways	143	B6 Lengthwise
11	B2 Sideways	144	B7 Lengthwise
12	B3 Sideways	145	148 mm x 200 mm
13	B4 Sideways	146	128 x 100 mm
14	B5 Sideways	147	170 mm x 210 mm
15	B6 Sideways	148	210 mm x 340 mm
16	B7 Sideways	149	225 mm x 276 mm
17	200mm x 148 mm	150	250 mm 300 mm
18	A6 Sideways	151~159	Not Used
19	210 mm x 170 mm	160	11" x 17"
20	340 mm x 210 mm	161	11" x 14"
21	276 mm x 225 mm	162	10" x 15"
22	300 mm x 250 mm	163	10" x 14"
23~31	Not Used	164	8 1/2" x 14"
32	17" x 11"	165	8 1/2" x 13"
33	14" x 11"	166	8 1/2" x 11"
34	15" x 10"	167	8 1/4" x 14"
35	14" x 10"	168	8 1/4" x13"
36	14" x 8 1/2"	169	8" x 13"
37	13" x 8 1/2"	170	8" x 10 1/2"
38	11" x 8 1/2"	171	8" x 10"
39	14" x 8 1/4"	172	5 1/2" x 8 1/2"
40	13" x 8 1/4"	173~191	Not Used
41	13" x 8"	192	FPU Maximum Size (145 mm x 217.2 mm)
42	10 1/2" x 8"	193	35 mm Film S
43	10" x 8"	194	35 mm Film M
44	8 1/2" x 5 1/2"	195	4" x 5"
45~127	Not Used	196	60 mm x 45 mm
128	Detection Error	197	60 mm x 60 mm
129	A0 Lengthwise	198	60 mm x 70 mm
130	A1 Lengthwise	199	60 mm x 80 mm
131	A2 Lengthwise	200	60 mm x 90 mm
132	A3 Lengthwise		

: Not used for this mahcine.

1.3.15 SP7-507-1 Paper Jam (Last 10)

SP7-507-1 displays information about the last paper jam. Pressing the "+" zoom key displays up to the last ten previous paper jams.



[A]: Jam Location

Code	Location	Cause	Indication
00h	No Jam	Recovery	–
01h	Jam	A jam is detected, but it can not be located.	–
02h	Registration sensor	Paper did not reach this sensor.	A
03h	Registration sensor	Paper passed this sensor.	B
04h	Vertical transport sensor	Paper did not reach this sensor.	A
05h	Vertical transport sensor	Paper passed this sensor.	A
06h	Relay sensor for bank 1	Paper did not reach this sensor.	Y
07h	Relay sensor for bank 1	Paper passed this sensor.	Y
08h	Relay sensor for bank 2	Paper did not reach this sensor.	Y
09h	Relay sensor for bank 2	Paper passed this sensor.	Y
0ah	Relay sensor for bank 3	Paper did not reach this sensor.	Y
0bh	Relay sensor for bank 3	Paper passed this sensor.	Y
0ch	Not used	-	–
0dh	Not used	-	–
0eh	By-pass feed end sensor	Paper did not reach this sensor.	B
0fh	By-pass feed end sensor	Paper passed this sensor.	B
10h	Not used	-	–
11h	Not used	-	–
12h	Exit sensor	Paper did not reach this sensor.	B
13h	Exit sensor	Paper passed this sensor.	C
14h	Duplex entrance sensor	Paper did not reach this sensor.	D
15h	Duplex entrance sensor	Paper passed this sensor.	Z
16h	Not used	-	–
17h	Not used	-	–
18h	Duplex turn sensor	Paper did not reach this sensor.	Z
19h	Duplex turn sensor	Paper passed this sensor.	Z
1ah	Not used	-	–
1bh	Not used	-	–
1ch	Not used	-	–
1dh	Not used	-	–
1eh	Sorter entrance sensor	Paper did not reach this sensor.	C
1fh	Sorter entrance sensor	Paper passed this sensor.	R
20h	Staple paper sensor	Paper passed this sensor.	R

[B]: Jam Paper Size

No.	Paper Size	No.	Paper Size
00h	No Paper	80h	Cannot recognize the paper size.
01h	A0 Sideways	81h	A0 Lengthwise
02h	A1 Sideways	82h	A1 Lengthwise
03h	A2 Sideways	83h	A2 Lengthwise
04h	A3 Sideways	84h	A3 Lengthwise
05h	A4 Sideways	85h	A4 Lengthwise
06h	A5 Sideways	86h	A5 Lengthwise
07h	A6 Sideways	87h	A6 Lengthwise
08h	A7 Sideways	88h	A7 Lengthwise
09h	B0 Sideways	89h	B0 Lengthwise
0ah	B1 Sideways	8ah	B1 Lengthwise
0bh	B2 Sideways	8bh	B2 Lengthwise
0ch	B3 Sideways	8ch	B3 Lengthwise
0dh	B4 Sideways	8dh	B4 Lengthwise
0eh	B5 Sideways	8eh	B5 Lengthwise
0fFh	B6 Sideways	8fh	B6 Lengthwise
10h	B7 Sideways	90h	B7 Lengthwise
12h	Post Card (A6) Sideways	92h	Post Card (A6)
20h	17" x 11" Sideways	a0h	17" x 11" Lengthwise
21h	14" x11" (DLT) Sideways	a1h	14" x11" (DLT) Lengthwise
22h	15" x 10" Sideways	a2h	15" x 10" Lengthwise
23h	14" x 10" Sideways	a3h	14" x 10" Lengthwise
24h	14" x 8 1/2" (LG) Sideways	a4h	14" x 8 1/2" (LG) Lengthwise
25h	13" x 8 1/2" (LT) Sideways	a5h	13" x 8 1/2" (LT) Lengthwise
26h	11" x 8 1/2" Sideways	a6h	11" x 8 1/2" Lengthwise
27h	14" x 8 1/4" Sideways	a7h	14" x 8 1/4" Lengthwise
28h	13" x 8 1/4" Sideways	a8h	13" x 8 1/4" Lengthwise
29h	13" x 8" (F) Sideways	a9h	13" x 8" (F) Lengthwise
2ah	10 1/2" x 8" (GT) Sideways	aah	10 1/2" x 8" (GT) Lengthwise
2bh	10" x 8" (UK) Sideways	abh	10" x 8" (UK) Lengthwise
2ch	8 1/2" x 5 1/2" (HLT) Sideways	ach	8 1/2" x 5 1/2" (HLT) Lengthwise
30h	14 1/2" x 12" Sideways	b0h	14 1/2" x 12" Lengthwise
31h	15" x 11" Sideways	b1h	15" x 11" Lengthwise
32h	11" x 9 1/2" Sideways	b2h	11" x 9 1/2" Lengthwise
33h	12" x 8 1/2" Sideways	b3h	12" x 8 1/2" Lengthwise

[C]: Last 4 digits

The last 4 digits come from the total value of the Bk counter and full color counter. This addition is done only to the last 4 digits of each counter.

Example:

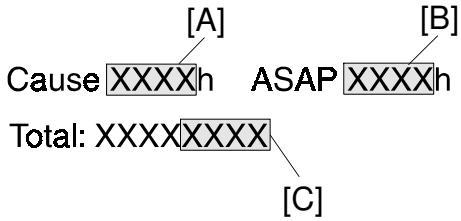
Bk: 9876

Full color: 1234

→ The last 4 digits of the display: 1110

1.3.16 SP7-507-2 Original Jam (Last 10)

SP7-507-2 displays information about the last original jam. Pressing the "+" zoom key displays up to the last ten previous paper jams.



[A]:

Code	Location	Cause
02h	Registration Sensor	The original passed this sensor.
04h	Feed-out Sensor	The original passed this sensor.
06h	Registration and Feed-out Sensors	The originals passed these sensors.

[B]: The same as SP7-507-1.

[C]: The same as SP7-507-1.

1.3.17 SP 3-973 Process Control Self Check Interval

1. Up to 5000 copies after replacing the developer, do not change the setting from the default (150).
2. If you input a number larger than 150, it might lead to low toner concentration in the development unit after copying an original with a high image ratio.

2. USER PROGRAM MODES

2.1 USER PROGRAM MODE OPERATION

The user program (UP) mode is used to change modes and adjust values.

User Program Access Procedure
[Clear Modes] → [C/Stop]

1. Press the clear modes key.
2. Hold down the clear/stop key for more than 3 seconds until the user program (UP) mode menu appears on the display (LCD).

An UP No. is composed of the 1st and 2nd level numbers. Each level can be entered with the number keys and the enter key [R/#].

For example UP1-2
[1] → [R/#] → [2] → [R/#]

Each level can be changed with the [+] and [−] (Up/Down keys) on the operation panel.

NOTE: Press the clear modes key several times to go up one level or exit UP mode.

2.2 UP MODE TABLE

UP-1 Default Image Settings

No.: Function name	Description	Choices (range) and specification method
1: Default photo type (Photo mode)	❑ Changes the default photo type.	1 Printed 2 Glossy 3 Copied
2: Default photo type (Auto mode)	❑ The "1: Default photo type (Photo mode)" is specified when the Photo mode is selected with the "Original Image Type Selection" function. The "2: Default photo type (Auto L/P mode)" is specified when the Auto (Letter/Photo) mode is selected.	
3: Auto Mode Sensitivity	When in the Auto (Letter/Photo) mode, you can select the level at which the copier identifies whether an original is "Letter" or "Photo." ❑ The setting should be closer to the "Letter" mode if letter areas are blurred or unclear, and closer to the "Photo" mode if the edges of a copy are blackish when copying a photograph in which there is a wide range of image density.	1 Photo 2 3 4 5 6 7 8 9 Letter
4: Auto Image Density	The "Auto Image Density" function sets the copier to make copies with an appropriate background density. There are 4 levels. ❑ The "Full Color Copy" and "Black Copy/Single Color" modes can be adjusted separately. ❑ Use this function to adjust the level of background color that is erased automatically. When you specify a darker value, dark background colors are not erased easily. When you specify a lighter value, dark colors are erased easily.	1 Full Color 2 B/W & Single Color 1 Light 2 3 4 Dark
5: U.C.R Adjustment (Black toner adjustment)	You can adjust the amount of black toner within 9 levels when making copies in full color. ❑ Specify a darker level when you want to copy letter parts clearly in black, and a lighter level if an entire image is blackish.	1 Weak 2 3 4 5 6 7 8 9 Strong

No.: Function name	Description	Choices (range) and specification method
6: Auto Color Select Sensitivity (Auto color selection)	When in Auto Color Select mode, you can specify the level at which the copier identifies whether an original is “Color” or “Black.” ❑ The copier easily identifies black originals when you specify a level close to “Black”, and color originals when you specify a level close to “Color.”	1 B/W 2 3 4 5 Color
7: Auto Color Select Mode Priority (Auto color selection)	When in Auto Color Select mode, you can set the copier to use either the “Black” or “Color” mode preferentially to make copies. ❑ Select the mode (Black or Color) used frequently to make copies in the Auto Color Select mode.	1 B/W 2 Full Color
8: Color Sensitivity (Color conversion)	You can adjust the width of colors before conversion within 5 levels. ❑ For example, when you specify yellow with the color width set to “Wide,” other colors close to yellow, such as orange and yellowish green, are also specified. When you set the color width to “Narrow,” only yellow is specified.	1 Narror 2 3 4 5 Wide

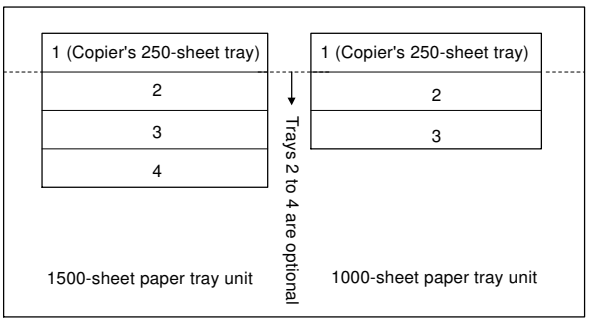
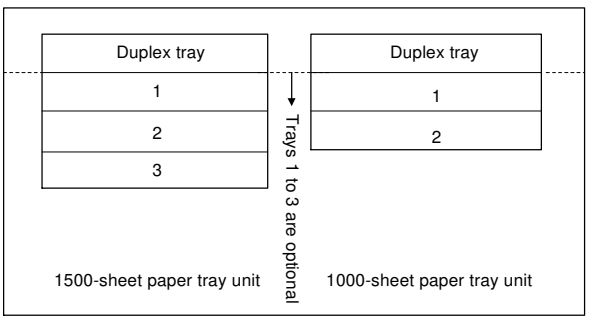
UP-2 Default Margin Settings

No.: Function name	Description	Choices (range) and specification method
1: Default Margin: Width	Changes the default margin direction and width.	Specify in the range of 1~20 mm, 0.1~0.8 inches (in 1 mm, 0.1 steps) 0mm
2: Side 2 Default Margin Width:	Changes the default side-2 margin direction and width.	Specify in the range of 1~20 mm, 0.1~0.8 inches (in 1 mm, 0.1 steps) 0mm
3: Auto Side 2 Margin Adjustment	When you make two-sided copies from one-sided originals, a right margin is put on the back side automatically if this is set to "ON". ❑ This function can be used only if your copier has a duplex tray.	1 On 2 Off

No.: Function name	Description	Choices (range) and specification method
4: Auto Empty Duplex Tray	With the default setting, the first page of copies will be delivered with one side blank when making two-sided copies from an odd number of one-sided originals using the optional document feeder. You can cancel this setting and the last copy will instead be stored in the duplex tray until you press the **Start** key. ❑ This function can be used only if the copier has a duplex tray and an optional document feeder.	1 On 2 Off

UP-3 Paper Tray Settings

No.: Function name	Description	Choices (range) and specification method
1: Auto tray shift	Specifies whether the machine selects another tray when paper runs out. ❑ This function can be used if you load paper of the same size and in the same direction in two or more paper trays. However, paper in the bypass feed tray is excluded. ❑ For a paper tray for which recycled paper is specified as “5: Remarked Paper”, auto tray shift is performed only when the paper tray is set in the same condition as the other trays. ❑ This function cannot be used if the copier has no optional paper tray unit.	1 On 2 Off

2: Paper Tray Priority	This function selects the default paper tray. This function also changes the paper tray which is selected preferentially when the Auto Paper Select mode is specified.   ❑ This function cannot be used if the copier has no optional paper tray unit.	Select from trays 1 to 4. 1 Tray 1 2 Tray 2 3 Tray 3 4 Tray 4

Service Tables

<table>
<tr><th>No.: Function name</th><th>Description</th><th>Choices (range) and specification method</th></tr>
<tr><td>3: Paper Size Selection</td><td>Specifies the size of paper set in the optional paper tray unit.
❑ When using the optional paper tray unit, you must specify the paper size.

❑ Important
If the specified paper size differs from the size of paper actually in the paper tray, a paper jam might occur.</td><td>① Select from trays 1 to 4.
For the optional paper tray unit

② Select the paper direction.
1 ⬓
2 ⬒

③ Select "Common" or "Special".
1 Common
2 Special

"Common" ⬓
1 A3
2 B4
3 A4
4 B5
5 11"x17"
8 1/2"x11"

"Special" ⬓
1 8"x13"
2 8 1/2"x13"
3 8 1/4"x13"
4 8"x10"

L
1 A4
2 B5
3 A5
4 8 1/2"x11"
5 8 1/2"x5 1/2"

"Common" ⬓
1 11"x17"
2 8 1/2"x14"
3 8 1/2"x11"
4 8"x13"
5 11"x15"
6 10"x14"
7 8"x10 1/2"
8 8"x10"

"Special" ⬓
1 A3
2 B4
3 A4
4 8 1/2"x13"
5 8 1/2"x13"

L
1 A4
2 A5
3 8 1/2"x11"
4 8 1/2"x5 1/2"</td></tr>
<tr><td>4: Bypass Odd Size Memory</td><td>Specifies the paper size which is displayed when selecting “Odd size” for copying from the bypass feed table.
• For the paper length and width direction, refer to the illustration at step 3 of “COPYING FROM THE BYPASS FEED TABLE” in the operation manual.</td><td>• Enter the paper size in the following ranges:
Width: 140 ~ 432 mm, 5.6" ~ 17.0"
Length: 100 ~ 297 mm, 4.0" ~ 11.7"</td></tr>
</table>

No.: Function name	Description	Choices (range) and specification method
5:Remarked paper	Sets the guidance display to display the paper type in each paper tray. ❑ When you specify a value for this function, follow the procedure shown below. ① Enter “1” and press the Recall/Enter key. ② Specify the paper tray (1 - 4) using the Number keys and press the Recall/Enter key. ❑ When you specify this function, the message “Remarked paper” is displayed on the operation panel.	① 1 On 2 Off ② Select from trays 1 to 4. See "Feed station priority selection."

UP-4 Basic User Settings

No.: Function name	Description	Choices (range) and specification method
1: Auto Paper Selection	Specifies whether Auto Paper Select mode is selected as a default .	1 On 2 Off
2: Color Mode Selection	Changes the default color mode.	1 Auto 2 Full Color 3 B/W
3: Default Copy Mode (Original image type for full color)	Changes the default original type.	1 Auto 2 Letter 3 Photo
4. Default Copy Mode (Original image type for black copy and single color)	Changes the default original type.	1 Auto 2 Letter 3 Photo
5. Default Copy Mode (Original image type for auto color selection)	Changes the default original type.	1 Auto 2 Letter 3 Photo

UP-5 Operation Mode Settings

No.: Function name	Description	Choices (range) and specification method
1: Auto Reset	Changes the time after which the copier resets itself. You can also turn off this function.	1 On 2 Off Enter a value in the range of 10 to 900 seconds. 60 seconds
2: Stand-by	Specifies whether the copier enters the Stand-by condition at the same time as the Auto Reset function is executed.	1 On 2 Off
3: Beeper	The beeper can be set to on or off.	1 On 2 Off
4: Set User R/E	You can store up to 2 frequently used magnifications other than the fixed magnifications. You can also change a stored magnification. If you enter “0,” this function remains undefined.	1 Ratio 1 2 Ratio 2 Enter a value in the range of 25 to 400% (in 1% steps). Default = 100%
5: Counter (count up/count down)	Specifies whether the copy counter shows the number of copies made so far or the number of copies remaining to be made. ❑ If you make copies at a specified magnification, use the **Enlarge** or **Reduce** key to select it.	1 Count up 2 Down
6: Max. Copy Quantity	Changes the maximum number of copies that can be made consecutively.	Enter a value in the range of 1 to 99. 99 sheets

Service Tables

UP-6 User Code Settings

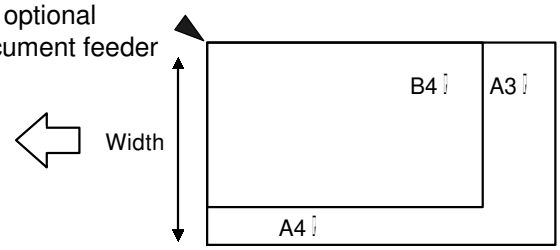
No.: Function name	Description	Choices (range) and specification method
1: User Code Mode (Set accounting mode)	Specifies whether to manage the copier with user codes. ❑ To enter the accounting mode, follow the procedure shown below. ① Enter "1" and press the **Recall**/**Enter** key. ② If you want to manage the copier with user codes when the color mode is set to "Full Color Copy," press the **Recall**/**Enter** key. If you do not wish to use user codes, enter "2" and press the **Recall**/**Enter** key. ③ Specify whether to manage the copier with user codes when the color mode is set to "Single Color. ④ Specify whether to manage the copier with user codes when the color mode is set to "Black Copy." ❑ If no user code is registered, the UP mode "3: User code number set" is displayed automatically.	① 1 On 2 Off ② 1 On 2 Off ③ 1 On 2 Off ④ 1 On 2 Off
2: Key Operator Access Code	Stores the key operator access code (6 digits or less) to operate the accounting mode. ❑ You can also register or change the key operator access code. ❑ When you have already registered the key operator access code, enter it then press the Recall/Enter key to set a new code number. ❑ When you specify "1: Set" for this function, you cannot use functions 1 to 8 in "6 Set Accounting Mode" unless you enter the key operator access code. ❑ If you cannot remember your access code, contact your service representative.	1 Set 2 No • Enter a code number in the range of 0 to 999999.

No.: Function name	Description	Choices (range) and specification method
3: Input User Code (User code set)	Registers user code numbers (6 digits or less). ❑ Enter your user code number (step 1.) and specify the color modes (steps 2. to 4.) in which your user code can be used. ❑ To register another code immediately after, enter the code number. To quit registering codes, press the **Recall**/**Enter** key.	① Enter a code number in the range of 0 to 999999. You can register up to 20 codes. ② Full Color Copy 1 On 2 Off ③ Single Color 1 On 2 Off ④ Black Copy 1 On 2 Off
4: Change User Code	Changes your present user code number (6 digits or less). ❑ Even if you change your user code number, the user code counter is not cleared.	• Enter your present user code number first. • Enter a new user code number in the range of 0 to 999999.
5: Delete User Code	Deletes your user code. ❑ If you delete your user code, the user code counter is cleared automatically.	1 All 2 Individual • Enter your user code number first.
6: User Code Counter	Shows the number of copies made using each user code. ❑ First, the counter for the Black Copy mode is displayed. When you press the **+ Up** key, the counters for the Single Color and Full Color Copy modes are displayed in that order. Then the counters for the next code are displayed. When you press the **– Down** key, the counters for the previous code are displayed. However, the counters are not displayed for color modes which do not need user codes.	• User the **+ Up** and **– Down** keys to display the counters.

Service Tables

No.: Function name	Description	Choices (range) and specification method
7: Print Counter	You can print the contents (number of copies made) of all user code counters. This data is printed on A4 ⊐ , 8 1/2" x 11" ⊐ paper. ❑ If the accounting mode is specified for the color mode set to Black Copy, you cannot print the user code counter unless you enter a user code that makes the Black Copy mode available.	• Press the **Start** key to print the counter data.
8: Reset User Code Counter	Resets each user code counter to "0".	1 All 2 Individual • Enter a user code number first.

UP-7 ADF/Sorter Settings

No.: Function name	Description	Choices (range) and specification method
1: Sorter: Full Color Sorting	You can set the copier to disable the Sort/Stack and Staple functions when you make copies in the Full Color Copy or Auto Color Select mode.	1 On 2 Off
2: ADF: Thin Paper Mode	Adjusts the optional document feeder so that thin originals (40 - 52 g/m^2, 10.7 - 13.8 lb) will not be damaged when they are set in the optional document feeder.	1 On 2 Off
3: SADF Auto Reset Time	When you set one original at a time in the optional document feeder, the next original is not fed automatically if you set it in the optional document feeder after a specified period of time. The SADF auto reset function changes this period of time.	• Enter a value in the range of 5 to 60 seconds (1 second steps). 20 seconds
4: ADF: Free Size Setting	The optional document feeder can be programmed to take a mixture of documents of varying sizes and orientations. • **Important** When using originals of different widths, put the wider original under the narrower one. If you put them in the wrong order, their sizes are not detected properly. Setting paper in the optional document feeder  • It takes more time to copy originals of different sizes and directions because the original size must be detected for each sheet. • Small originals might be copied at a skew because the guide cannot be adjusted to their sizes.	1 On 2 Off
5: ADF: APS Mode with ADF	Specifies whether the machine enters the Auto Paper Select mode automatically when originals are placed in the optional document feeder.	1 On 2 Off
6: ARDF Auto Sort Mode	Specifies whether to sort copies automatically when the number of originals and copies is two or more.	1 On 2 Off

Service Tables

3. TP/FUSE/LED/SW

3.1 TEST POINT

Main Control Board

No.	Signal	Description	Stand-by (V)	Note
TP201	GND	Ground		
TP202	SS_RXD	Received serial signal from the sorter stapler	0 to 5.0 V	
TP203	TV	Temparature sensor output	2.0 to 4.0 V	
TP204	RHV	Humidity sensor output	1.0 to4.0 V	
TP205	FB_TP	Feed back data from the high voltage supply board: Paper transfer	–4 ± 0.2 V	When the paper transfer current is applied with 800 μA, this value will be measured with the resistance 100 kΩ.
TP206	FB_TB	Feed back data from the high voltage supply board: Belt transfer	–4 ± 0.2 V	When the belt transfer current is applied with 600 μA, this value will be measured with the resistance 100 kΩ.
TP207	FB_B	Feed back data from the high voltage supply board: Developmet bias	–4.002 ± 0.08 V	When the development roller is applied with -800 V, this value will be measured with the resistance 100 kΩ.
TP208	FB_G	Feed back data from the high voltage supply board: Grid voltage	–3.993 ± 0.08 V	When the grid of the corona charge unit is applied with -900 V, this value will be measured with the resistance 100 kΩ.
TP209	FB_C	Feed back data from the high voltage supply board: Main corona charge voltage	4 ± 0.2 V	When the main corona charge is applied with –850 μA, this value will be measured with the resistance 100 kΩ.
TP210	TH_U	Fusing (Hot roller) thermistor output		
TP211	TH_L	Pressure roller thermistor output		
TP212	GND	Ground		
TP213	V_SEN	Drum potential sensor output	0 to 0.1 V	When the machine is in stand-by mode.
			0 to 4.5 V	When the drum potential sensor detects the sensor pattern for the toner supply control.

No.	Signal	Description	Stand-by (V)	Note
TP214	*INT_BLT	Belt H.P. sensor output	0 to 5.0 V	
TP215	FB_DAC	Not used		
TP216	FB_DDC	Feed back data from the high voltage supply board: DDC	2.381 ± 0.14 V	When the paper transfer charge unit (casing) is applied with –2.5 kV, this value will be measured with the resistance 100 kΩ.
TP217	P_SEN	ID sensor output	0 to 0.1 V	When the machine is in stand-by mode.
			0 to 4.5 V	When the ID sensor detects the sensor pattern for the toner supply control.
TP218	BNK_RXD	Recieved serial data from the paper tray unit	0 to 5.0 V	
TP219	BNK_TXD	Transmition serial data to the paper tray unit	0 to 5.0 V	
TP220	SS_TXD	Transmition serial data to the sorter stapler	0 to 5.0 V	
TP221	*RESET	Reset signal	0.2 to 4.8 V	Active Low
TP222	*WAIT	Wait signal	0 to 5.0 V	Active Low
TP223	*WR_FIF	Writing signal to FIFO	0 to 5.0 V	Active Low
TP224	*FULL	FIFO status signal: FULL	0 to 5.0 V	Active Low
TP225	*EMPTY	FIFO status signal: EMPTY	0 to 5.0 V	Active Low
TP226	SCU_TXD	Transmition serial siganl to the SCU	0 to 5.0 V	
TP227	LTRIM	Line trimming	0 to 5.0 V	
TP228	FGATE	Frame gate	0 to 5.0 V	
TP229	LGATE	Line gate	0 to 5.0 V	
TP230	LEVEL	LD output level	0 to 5.0 V	
TP231	PMCLK	Polygon motor syncronized clock signal	0 to 5.0 V	
TP232	LDCLK	LD drive synchronized signal	0 to 5.0 V	
TP233	DETP2	Laser syncronized detector board-2: Output	0 to 5.0 V	
TP234	FMRCLK	Feald memory read clock	0 to 5.0 V	
TP235	*DACKS	SCSI controller: DMA Acknowledge	0 to 5.0 V	Active Low
TP236	*ACK_SC	SCSI: *ACK	0 to 5.0 V	Active Low
TP237	*INT_SCSI	SCSI controller: Interrupt	0 to 5.0 V	Active Low
TP238	GND	Ground		
TP239	PM	Laser syncronized detector board-1: Main scan syncronized singal	0 to 5.0 V	
TP240	DETP1	Laser syncronized detector board-1: Output	0 to 5.0 V	

No.	Signal	Description	Stand-by (V)	Note
TP241	MCLK	Laser writing clock: Pixel	0 to 5.0 V	
TP242	DREQS	SCSI controller: DMA Request	0 to 5.0 V	
TP243	GND	Ground		
TP244	*DBRD	SCSI controller:	0 to 5.0 V	Active Low
TP245	REQ_SC	SCSI: *REQ	0 to 5.0 V	Active Low
TP246	GND	Ground		
TP247	SCU_RXD	Received serial signal from the SCU	0 to 5.0 V	
TP248	371_RXD	Received serial signal from the SCU	0 to 5.0 V	Not used
TP249	371_TXD	Transmition serial siganl to the SCU	0 to 5.0 V	Not used

Scanner IPU

No.	Signal	Description	Note
TP7	COM1	Ground for anolog signal	
TP8	VIN_R	Analog signal for Red	
TP10	COM1	Ground for anolog data	
TP11	VIN_G	Analog signal for Green	
TP13	COM1	Ground for anolog data	
TP14	VIN_B	Analog signal for Blue	
TP19	SLSYNCB	Line sincronized signal for scanning	0 to 5.0 V
TP26	GND	Ground for digital signal	

I/O Board 1

No.	Signal	Description	Stand-by (V)	Note
TP251	TH	Temperature sensor output	1.0 to 4.0	If keeping 0 V or 5 V: NG
TP252	RH	Humidity sensor output	1.0 to 4.0	
TP253	ANGND	Ground		
TP254	S_IN	Serial Data (for output)	0 to 5.0	If keeping 0 V or 5 V: NG
TP255	DE	Data enable signal (for output)	0 to 5.0	
TP256	LE	Latch enable signal (for Input)	0 to 5.0	If keeping 0 V or 5 V: NG
TP257	LOAD	Sift/Load signal (for Input)	0 to 5.0	
TP258	CLK1	Clock for output interface	0 to 5.0	
TP259	CLEAR	Clear signal (for input)	0 to 5.0	
TP260	DATA1	Input interface data 1	0 to 5.0	
TP261	DATA2	Input interface data 2	0 to 5.0	
TP262	GND	Ground		
TP263	GND	Ground		

I/O Board 2

No.	Signal	Description	Stand-by (V)	Note
TP301	GND	Ground		
TP302	A+		0 to 5.0	
TP303	A–		0 to 5.0	
TP304	B+		0 to 5.0	
TP305	B–		0 to 5.0	
TP306	CLK2	Clear signal (for input)	0 to 5.0	If not keeping 5 V: NG
TP307	DATA2	Input interface data 2	0 to 5.0	If keeping 0 V or 5 V: NG
TP308	DATA1	Input interface data 1	0 to 5.0	
TP309	LOAD	Sift/Load signal (for Input)	0 to 5.0	
TP310	CLK1	Clock for output interface	0 to 5.0	
TP311	LE	Latch enable signal (for output)	0 to 5.0	
TP312	DE	Data enable signal (for output)	0 to 5.0	
TP313	S_IN	Serial Data (for output)	0 to 5.0	If keeping 0 V or 5 V: NG
TP314	GND	Ground	0 to 5.0	

3.2 FUSE CONDITIONS

AC Drive/DC Power Supply Board

FUSE	Rating		Function	Condition
	220/240 V	115 V		
FU101	250 V, 6.3 A	125 V, 15 A	AC IN	If it is defective, does not supply the AC power.
FU102	250 V, 1.6 A	250 V, 3.15 A	AC STANBY	If it is defective, anti-condensation heater does not work.
FU200	250 V, 6.3 A	125 V, 8 A		

Main Control Board

FUSE	Rating	Function	Note
F201	250V, 1A	To prevent the toner supply motor from over current.	If defective, the power cannot be supplyed to the motor, then the machine will enter the toner end condition.

3.3 LED CONDITIONS

No.	Function	Note
Scanner IPU		
LED1	After the main switch is on, this LED is always blinking.	When LED1 is off and LED5 is on, a SCSI IC error might have occured.
LED5	When the scanner IPU board is connected with SCSI bus, this LED is on.	
Main Control Baord		
LED201	Lamp ON: Indicates the CPU in an abnormal condition.	Instruction error, Bus error, or Address error
LED202	Blinking: Indicates active	After the main switch is on and CPU starts, this LED is always blinking.
LED203	Lamp On: FGATE is ON.	

3.4 SWITCHES

Scanner IPU

Simbol	No.	Function	Note
SW1 (All switches should be always OFF.)	SW1-1	Scanner free run in normal speed	ON: Perform
	SW1-2	Scanner Motor	ON: Motor off, OFF: Motor on
	SW1-3	Exposure Lamp	ON: Lamp off, OFF: Lamp on
	SW1-4	OpticsCooling Fan 1 and 2	ON: Motor off, OFF: Motor on
	SW1-5	Optics Exhaust Fan	ON: Motor off, OFF: Motor on
	SW1-6	Scanner Board Cooling Fan	ON: Motor off, OFF: Motor on
	[SW1-6] - [SW1-7]	Image I/O signal selection	OFF-OFF: YMCK signal output
			ON-OFF: Image signal output from RGB connector (Factory use only)
			OFF-ON: Image signal input through the RGB connector(Factory use only)
			ON-ON: YMCK signal output
	SW1-8	Scanner free run in half-speed	ON: Perform

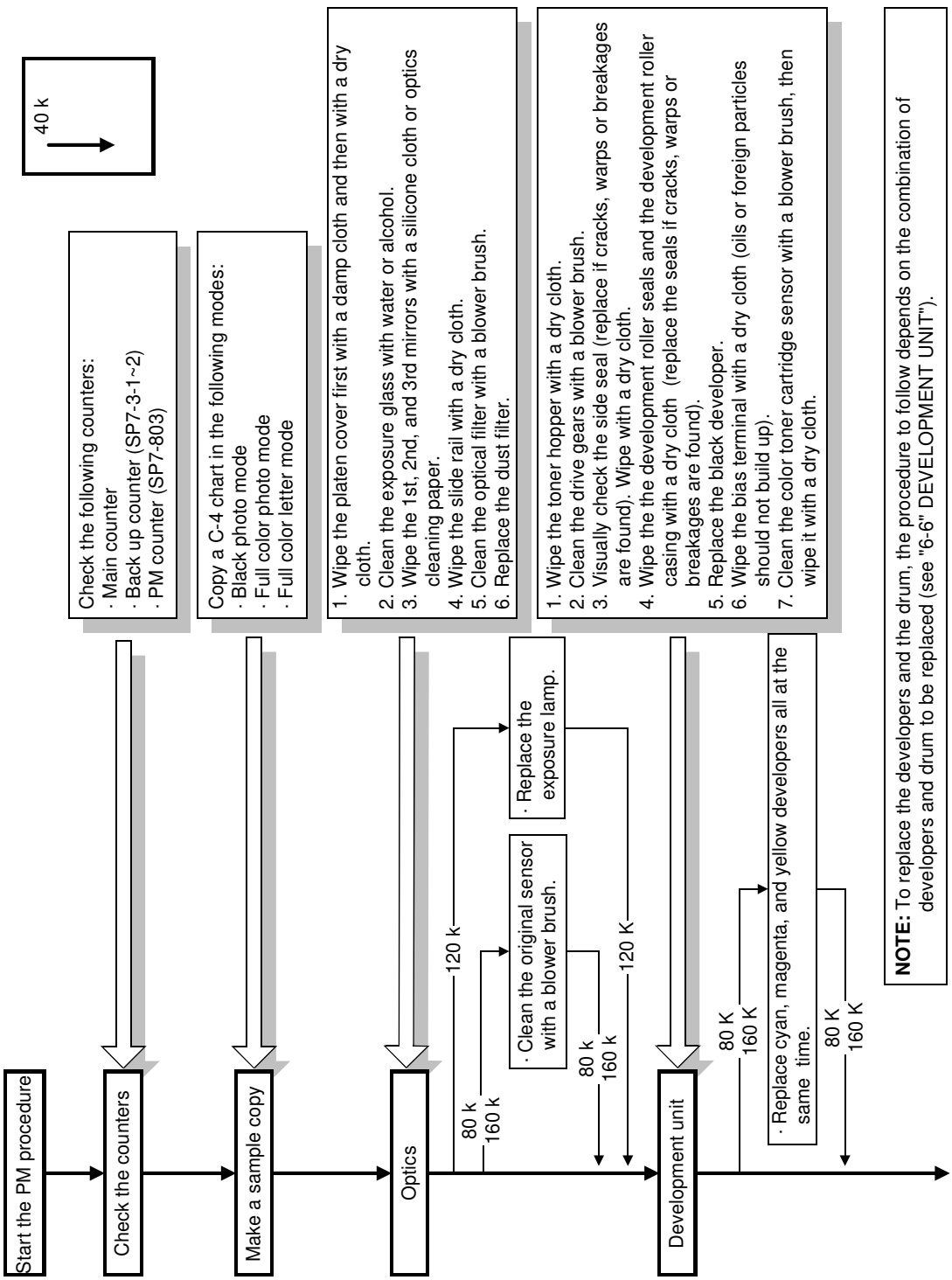
SCU

Simbol	Description
SW1	Reset switch
SW3	Do not change the default (Default: OFF)
SW4	ID number for CSS/RDS (Japan Only)
TB1	Loop for CSS/RDS (Japan Only)

SECTION 5

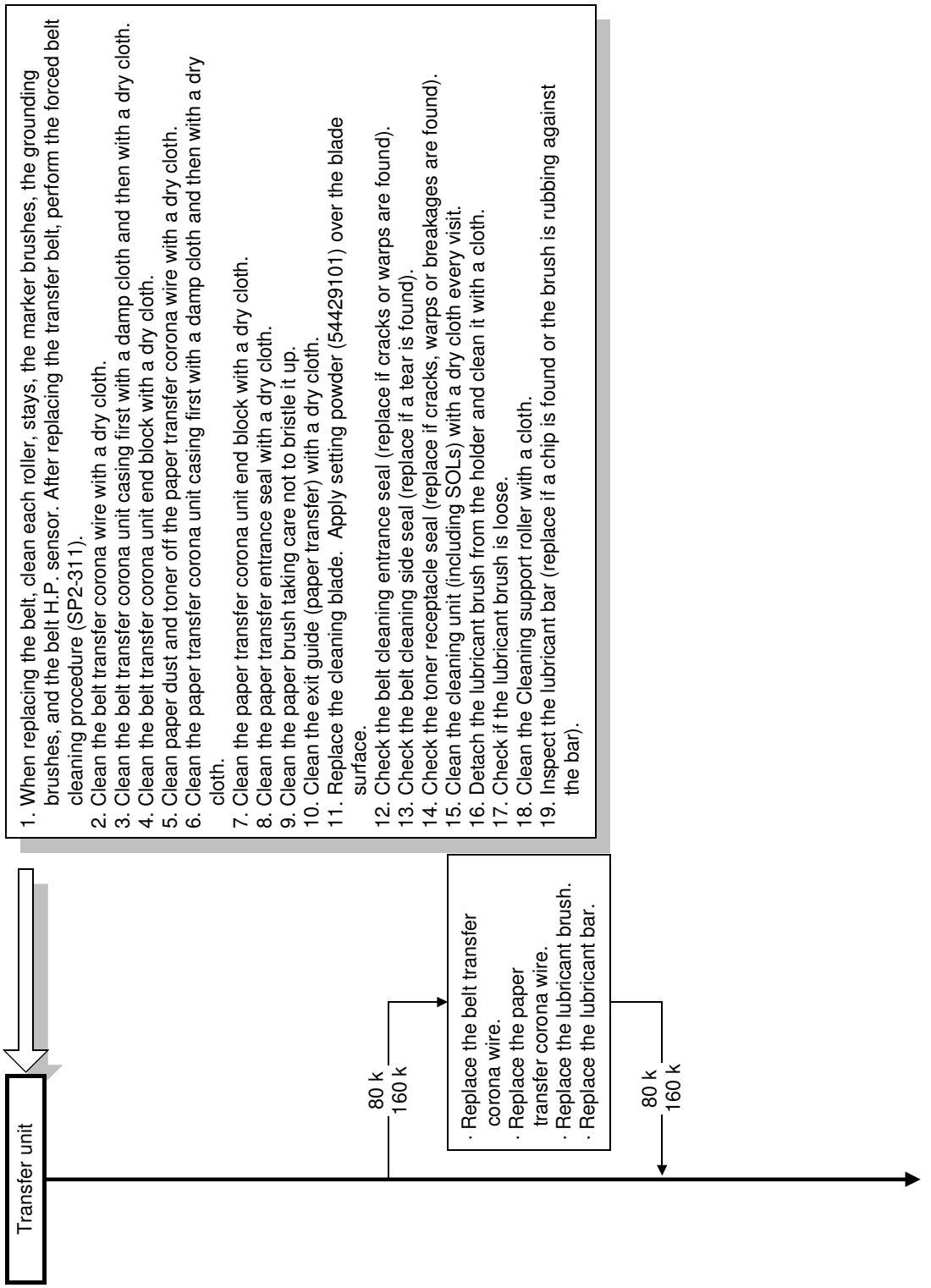
PREVENTIVE MAINTENANCE SCHEDULE

1. REGULAR PM PROCEDURE



A166P500.wmf

Preventive Maintenance



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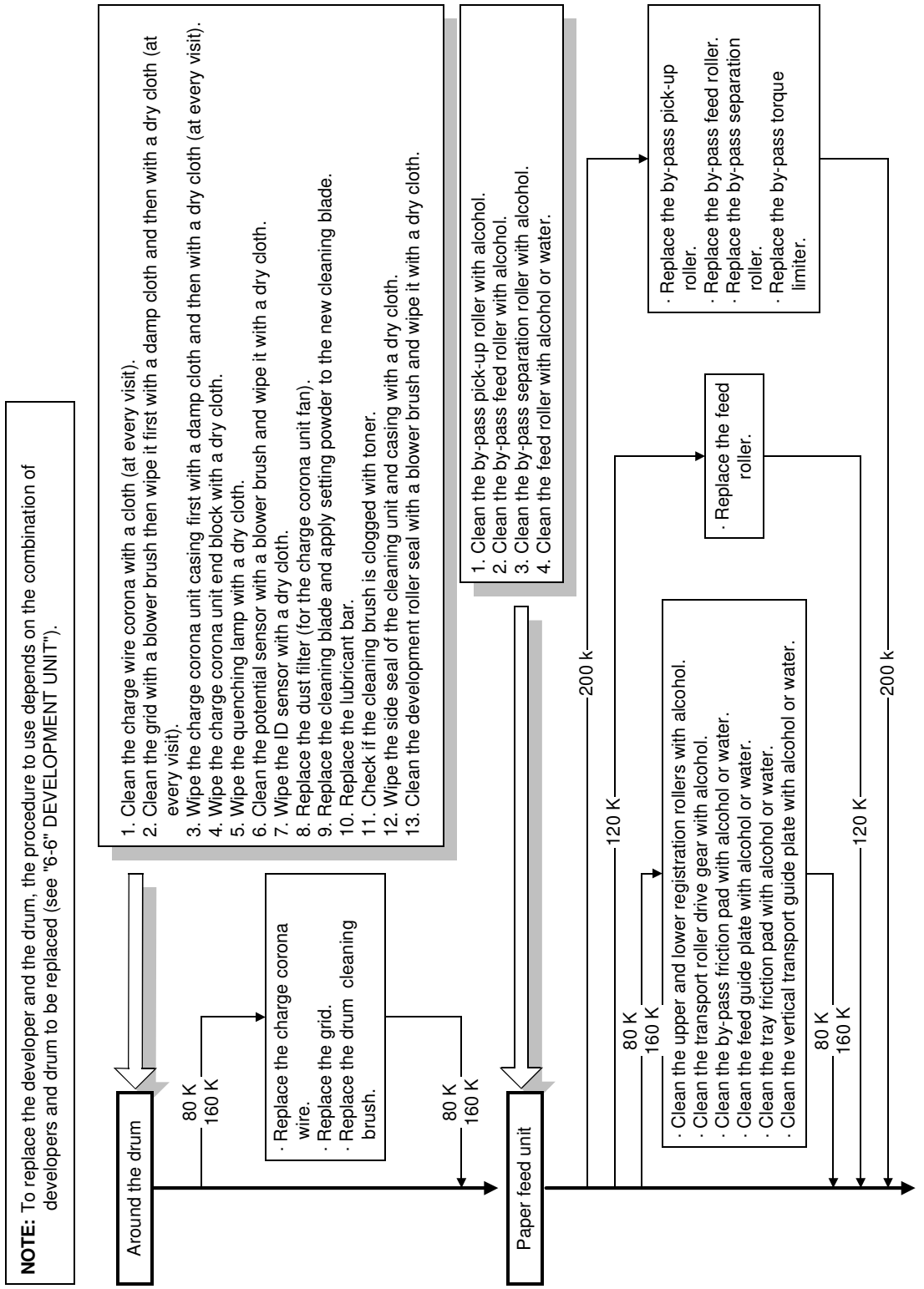

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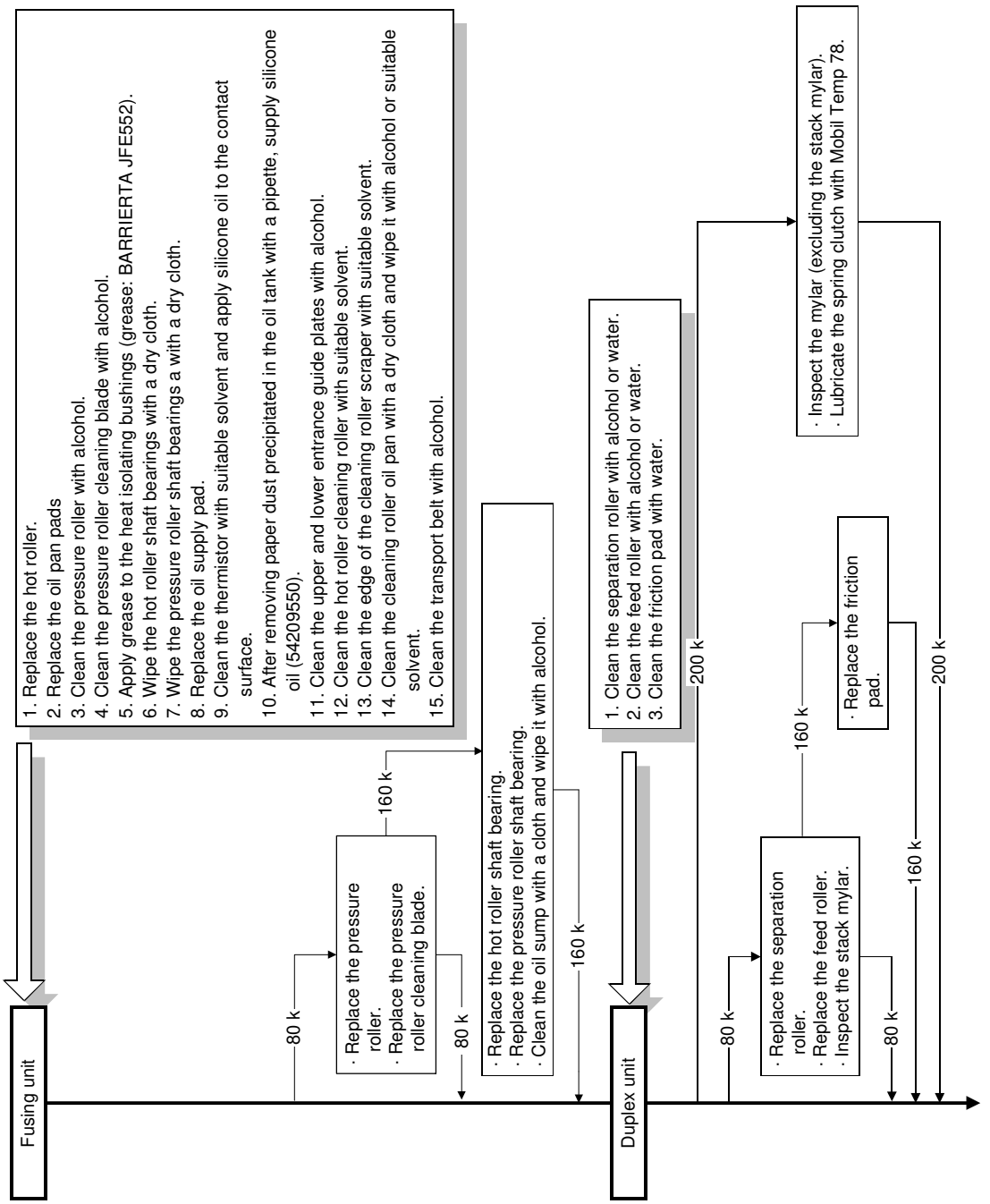
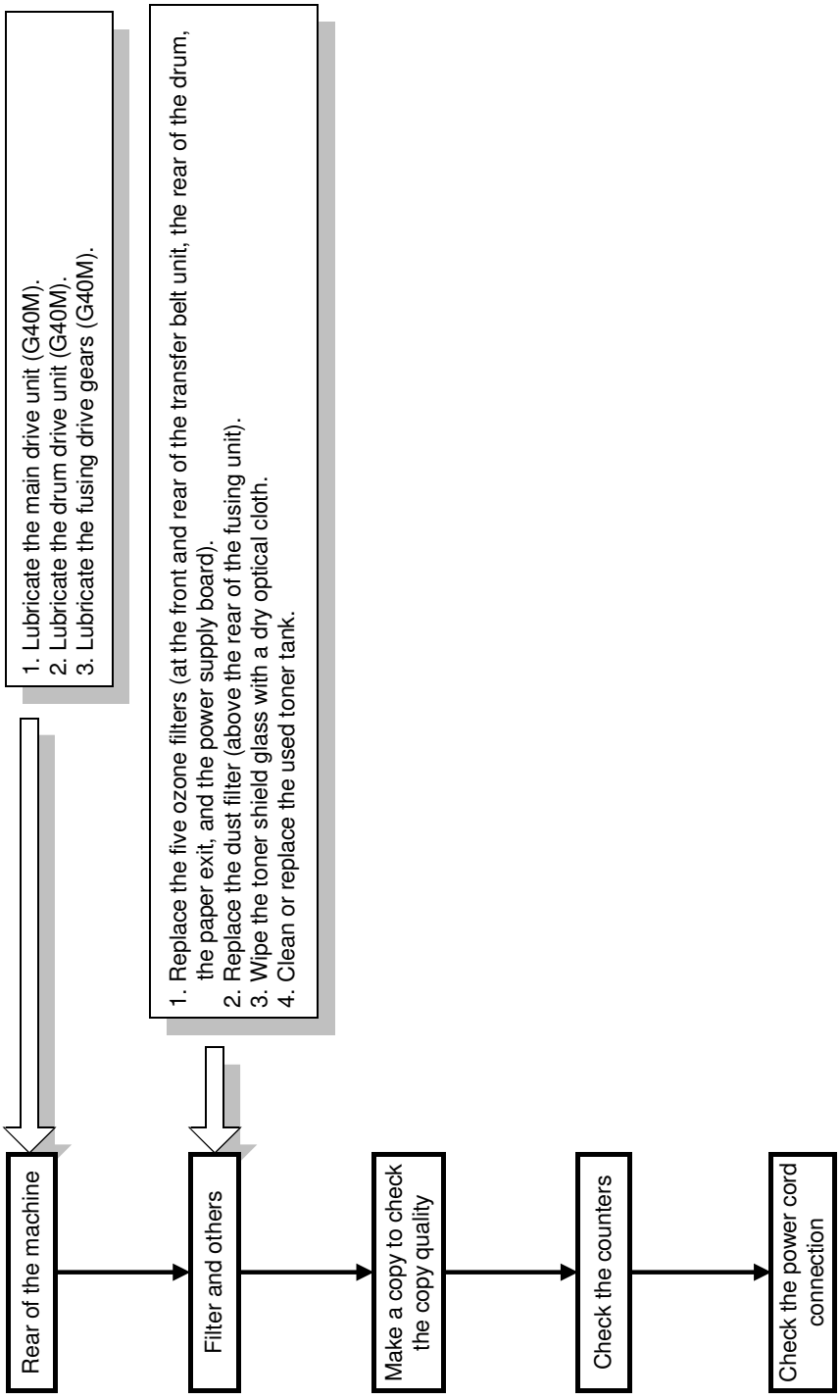


A166P503.wmf



A166p504.wmf

2. REGULAR PM TABLE

Regular PM items: To be performed every 40,000 scans in accordance with the following table.

NOTE: To wipe off toner, use a dry cloth. If toner is mixed with alcohol, it solidifies.

C: Clean R: Replace L: Lubricate I: Inspect and adjust

Cycle / Item	EM	Regular PM					Remarks
		40K	80K	120K	160K	200K	
SCANNER							
Platen cover	C	C					Wipe first with a damp cloth and then with a dry cloth.
Exposure glass	C	C					Clean with water or alcohol.
1st, 2nd, and 3rd mirrors		C					Wipe with a silicone cloth or an optical cleaning paper.
Halogen lamp				R			
Slide rail		C					Dry cloth
Optical filter		C					Blower brush
Dust filter		R					
Original sensor			C				Blower brush
COPIER PAPER FEED UNIT							
Upper and lower registration rollers			C				Clean with alcohol.
Transport roller drive gear			C				Clean with alcohol.
By-pass pick-up roller	C					R	Clean with alcohol.
By-pass feed roller	C					R	Clean with alcohol.
By-pass separation roller	C					R	Clean with alcohol.
By-pass friction pad			C				Clean with alcohol or water.
Feed guide plate			C				Clean with alcohol or water.
Feed roller	C			R			Clean with alcohol or water.
Tray friction pad			C	R			Clean with alcohol or water.
Vertical transport guide plate			C				Clean with alcohol or water.

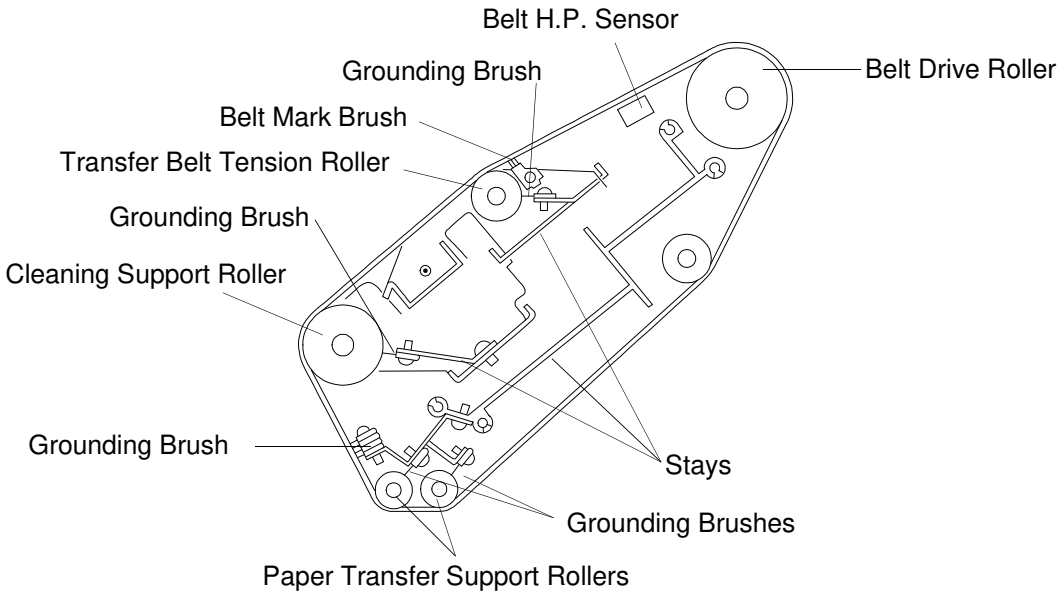
Cycle / Item	EM	Regular PM					Remarks
		40K	80K	120K	160K	200K	
Torque limiter						R	
DRIVE							
Main motor drive unit		L					Use G40M.
Drum motor drive unit			L				Use G40M.
AROUND THE DRUM							
Charge corona wire	C	C	R				Wipe with a dry cloth at every visit.
Grid	C	C	R				Clean with a blower brush, then wipe first with a damp cloth and then with a dry cloth (at every visit).
Charge corona unit casing	C	C					Wipe first with a damp cloth and then with a dry cloth (at every visit).
Charge corona unit end block	I	C					Wipe with a dry cloth.
Quenching Lamp	I	C					Wipe with a dry cloth.
Potential sensor	I	C					Clean with a blower brush and wipe with a dry cloth.
ID sensor	I	C					Wipe with a dry cloth.
Dust filter (for the charge corona unit fan)		R					
Cleaning blade		R					After replacement, apply setting powder.
Cleaning brush		I	R				Check if the cleaning brush is clogged with toner.
Side seal of the cleaning unit and casing		C					Wipe with a dry cloth.
Development roller seal	I	C					Clean with a blower brush and wipe with a dry cloth.
Lubricant bar		R					
DEVELOPMENT UNIT							
Toner hopper		C					Wipe with a dry cloth.
Drive gears		C					Clean with a blower brush.
Development roller side seal		C					Wipe with a dry cloth. Visually check. If cracks, warps or breakages are found, replace.

Cycle / Item	EM	Regular PM					Remarks
		40K	80K	120K	160K	200K	
Development roller seals, development roller casing		C					If cracks, warps or breakages are found, replace. Wipe with a dry cloth.
Black developer		R					Only black developer can be replaced independently.
Cyan, magenta, and yellow developers			R				Cyan, magenta, and yellow developers must be replaced at the same time.
Bias terminal		C					Wipe with dry cloth. Oil or foreign particles should not build up.
Color toner cartridge sensor	I	C					Clean with a blower brush, then wipe it with a dry cloth.
TRANSFER BELT UNIT							
Transfer belt		R					When replacing the belt, clean each roller, the marker brushes, the grounding brushes, and the belt H.P. sensor. **See Note 1.** After replacement, do the forced belt cleaning procedure (SP 2-311).
Belt transfer corona wire	C	C	R				Wipe with a dry cloth.
Belt transfer corona unit casing	C	C					Wipe first with a damp cloth and then with a dry cloth.
Belt transfer corona unit end block	I	C					Wipe with a dry cloth.
Paper transfer corona wire	C	C	R				Wipe off paper dust and toner with a dry cloth.
Paper transfer corona unit casing	C	C					Wipe first with a damp cloth and then with a dry cloth.
Paper transfer corona unit end block	I	C					Wipe with a dry cloth.
Paper transfer entrance seal		C					Wipe with a dry cloth.
Discharge brush	I	C					Clean taking care not to bristle up the brush.

Item \ Cycle	EM	Regular PM					Remarks
		40K	80K	120K	160K	200K	
Exit guide (Paper transfer)	I	C					Wipe with a dry cloth.
Cleaning blade		R					When replacing, apply setting powder (54429101).
Cleaning entrance seal	I	C					Clean with a dry cloth. Visually check. Replace if cracks or warps are found.
Cleaning side seal		C					Clean with a dry cloth. Visually check. Replace if a tear is found.
Toner receptacle seal		C					Clean with a dry cloth. Visually check. Replace if cracks, warps or breakages are found.
Cleaning unit (including SOLs)		C					Wipe with a dry cloth every visit.
Lubricant brush holder		C					Detach the lubricant brush and wipe it with a dry cloth.
Lubricant brush		I	R				Check if the lubricant brush is loose. Replace along with the lubricant bar.
Cleaning support roller		C					Wipe with a dry cloth.
Lubricant bar		I	R				Replace if a chip is found or the brush is not rubbing against the bar.
FUSING AND TRANSPORT UNITS							
Hot roller		R					
Heat-isolating bushings		L					When replacing the fusing roller, apply grease (BARRIERTA JFE552).
Hot roller shaft bearings					R		Wipe with a dry cloth.
Pressure roller		C	R				Clean with alcohol.
Pressure roller cleaning blade		C	R				Clean with alcohol.
Oil pan pads		R					See Section 6. Replacement and Adjustment (9.11).
Pressure roller shaft bearings		C			R		Wipe with a dry cloth.
Oil supply pad		R					
Oil sump					C		Clean with a cloth and wipe with alcohol.

Cycle / Item	EM	Regular PM					Remarks
		40K	80K	120K	160K	200K	
Thermistor		C					Clean with a suitable solvent and apply silicone oil over the contact surface.
Silicone oil		L					After removing paper dust precipitated in the oil tank with a pipette, supply silicone oil.
Upper and lower entrance guide plates	C	C					Clean with alcohol.
Hot roller cleaning roller		C					Clean with a suitable solvent.
Cleaning roller scraper		C					Clean the edge with a suitable solvent.
Cleaning roller oil pan		C					Clean with a dry cloth and wipe with alcohol or a suitable solvent.
Transport Belt		C					Clean with alcohol.
DUPLEX UNIT							
Separation roller	C		R				Clean with alcohol or water.
Feed roller	C		R				Clean with alcohol or water.
Friction pad	C				R		Clean with water.
Mylar			I		I	I	Inspect only the stack Mylar every 80K scans (under the guide plate).
Spring clutch **NOTE 2.**						L	Lubricate with Mobil Temp 78.
OTHERS							
Ozone filters (at five locations)		R					At the front and rear of the transfer belt unit, the rear of the drum, the paper exit, and the power supply board.
Dust filter		R					Above the rear of the fusing unit.
Fusing drive gears		L					G40M
Toner shield glass	C	C					Wipe with a dry optical cloth.
Used toner tank	C	C					Clean (dry cloth) or replace the used toner tank.
Power cord	C	I					Check the connection.

NOTE 1 When replacing the belt, clean each roller, the stays, and the belt H.P. sensor with alcohol. Also, clean the grounding brushes and the belt mark brush with a blower brush.



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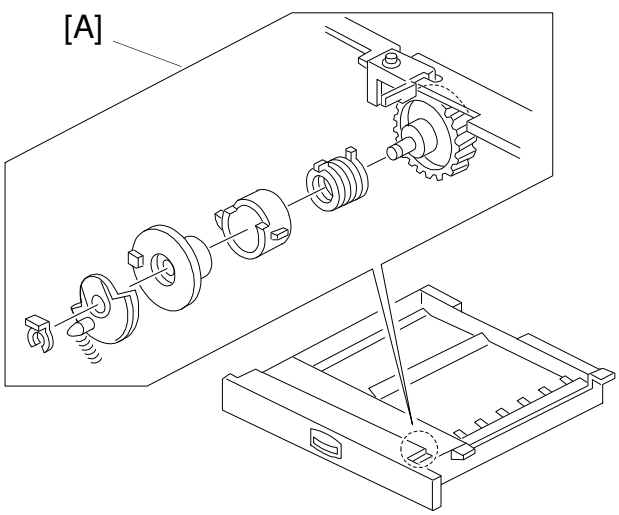
NOTE 2. Duplex Tray: Spring Clutch

Do the following every 200K.

Clean the clutch assembly [A]. Then lubricate the clutch spring with Mobil Temp 78.



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Cycle / Item	EM	Regular PM			Remarks
ARDF (A548)		**80k**	**160k**	**240k**	**(No. of originals)**
Transport belt	C	R	R	R	Belt cleaner
Friction belt	C	R	R	R	Water
Feed roller	C	R	R	R	Water
PAPER FEED BANK (A549/A550)		**120k**	**240k**	**360k**	**(No. of copies)**
Paper feed rollers	C	C	R	C	Clean with water. Replace these rollers as a set if necessary. <for each station>
Pick-up rollers	C	C	R	C	
Separation rollers	C	C	R	C	
Relay rollers		C	C	C	Alcohol or water
Bottom Plate Pad	C	R	R	R	Water
Relay clutch		I	I	I	Peplace every 1500 k copies
Paper feed clutch		I	I	I	Replace if necessary
Drive belts		I	I	I	Replace if necessary
SORTER (A555)					
Transport rollers	C				Clean with alcohol if stained.
Bins	C				Clean with alcohol if stained.
Bin and Paper Sensors	C				Blower brush
Bushings	L				Launa oil; if bushings generate noise.
Helicam wheels	L				Grease G501; if helicam wheels generate noise.

3. SP MODES AFTER REPLACEMENT AND CLEANING

The following table shows the necessary SP modes, procedures and priority order when the listed items are replaced or cleaned:

❍: Replacement Δ: Cleaning

Priority Order No.	SP mode	Description	Developer (NOTE1)	OPC Drum	ID Sensor	Drum Potential Sensor	Charge Corona •Wire •Grid •Casing	Transfer Belt
0 (NOTE2)	SP3-975	Confirmation of the result	❍	❍	Δ ❍	❍	Δ ❍	
1 (NOTE3)	SP2-225-5	Developer Agitation	❍					
2	SP3-964	Confirmation of the result	❍					
3	SP2-311	Belt cleaning mode		(❍)				❍
4 (NOTE4)	SP3-126	Forced process control		(❍)				
5	SP3-975	Confirmation of the result		(❍)				
6	Image Adjustment key (ACC Process) /SP4-910 to 918	Color adjustment • ACC • Manual	❍	❍	Δ ❍	❍	Δ ❍	❍

( ): When the developer also is replaced, this step can be skipped.

NOTE: 1) Only Bk developer can be replaced independently.

2) After the main switch is turned on, the machine must perform the initial process control self check. After the initial process control self check, this step is needed. If the machine does not do the initial process control self check, wait 10 minutes, then do the forced process control self check (SP3-126).

3) Check the amount of toner remaining before developer agitation. If there is not much, replace the toner cartridge to prevent an agitation error.
When you replace the Bk developer only, for the developer agitation procedure, use SP2-225-1 instead of SP2-225-5.
When you replace any color developer (except Bk), the C, M, Y developers should all be replaced at once. To do this, use SP2-225-6 (C, M, Y) instead of SP-225-5.

4) Make sure of the following items concerning the forced process control self check.
   - Check the settings of the following SP modes before performing the process control self check.
     SP2-203-9: 1
     SP2-208-9: 2
     SP3-125: 0
   - The forced process control self check must be performed when there is no residual voltage on the drum. (Wait at least 10 minutes after the last copy job.)

⚠ CAUTION

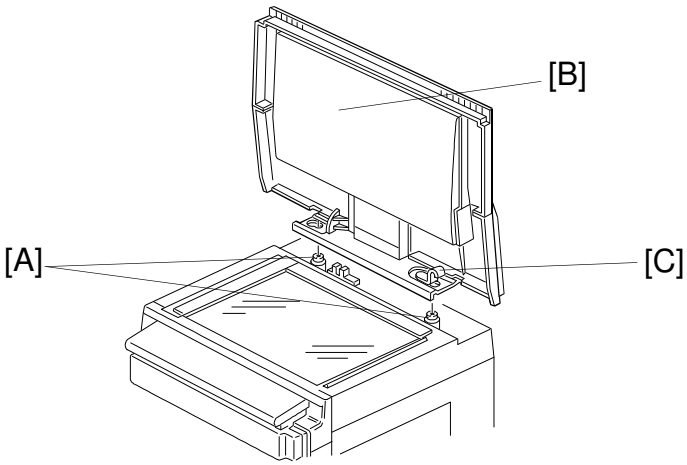
While performing the process control self-check, do not touch the drum shaft, knob screw, or flywheel. A high voltage of -800V is applied during potential sensor correction. Therefore, there is a risk of severe electric shock if these parts are touched.

SECTION 6

REPLACEMENT AND ADJUSTMENT

1. EXTERIOR

1.1 PLATEN COVER



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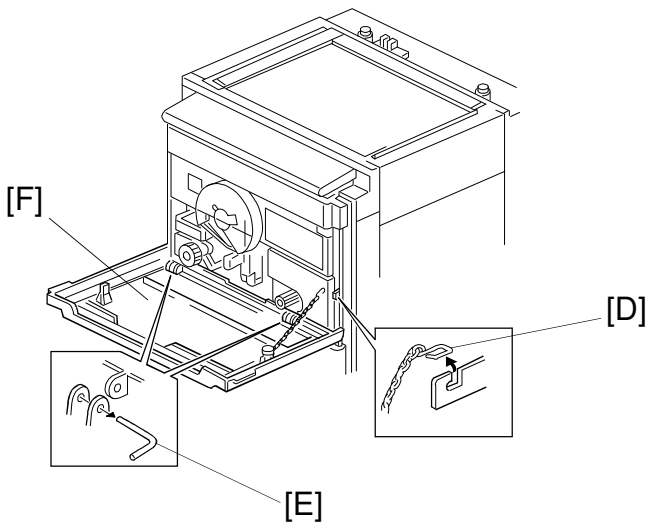
1. Remove the screws [A].
2. Slide the platen cover [B] to the right to unlock it. While lifting the hook [C] up, lift the cover up to remove it, as shown.

1.2 FRONT COVER



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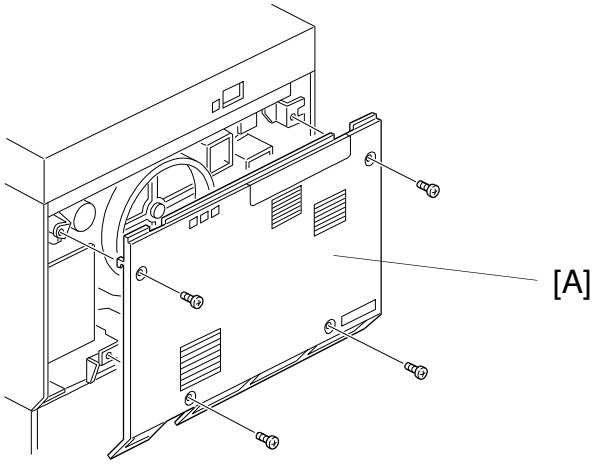
1. Remove the chain [D] from the hook.
2. Remove the pins [E].
3. Remove the front cover [F].

1.3 REAR COVER



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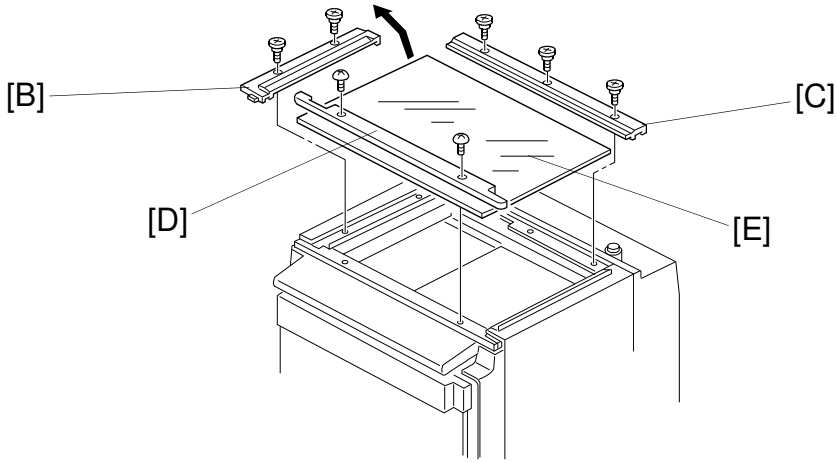
1. Remove the rear cover [A] (4 screws).

1.4 EXPOSURE GLASS



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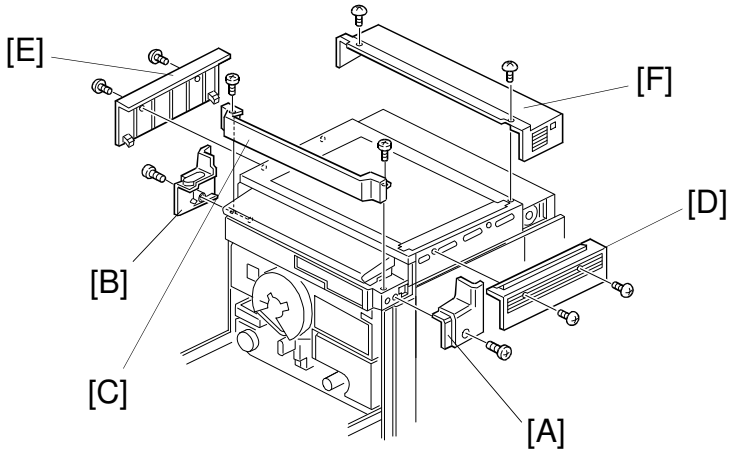
1. Remove the left scale [B] (2 screws).
2. Remove the rear scale [C] (3 screws).
3. Remove the upper front cover [D] (2 screws).
4. Remove the exposure glass [E].

NOTE: When reinstalling the exposure glass, ensure that the white plate faces down and to the left.

1.5 UPPER COVERS



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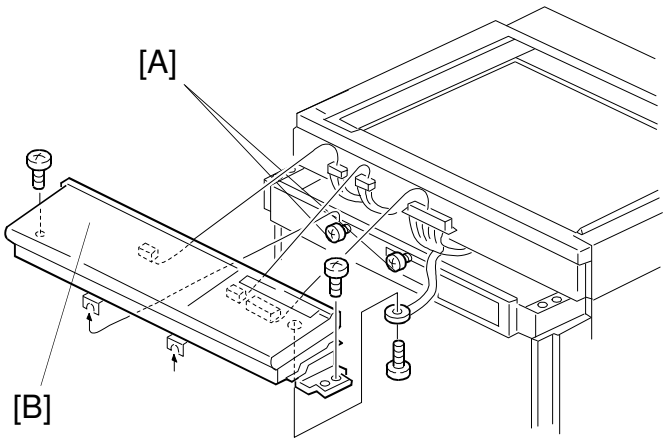
1. Remove the right upper bracket [A] (1 screw).
2. Remove the left upper bracket [B] (1 screw).
3. Remove the front upper cover [C] (2 screws).
4. Remove the upper right cover [D] (2 screws).
5. Remove the upper left cover [E] (2 screws).
6. Remove the upper rear cover [F] (2 screws).

1.6 OPERATION PANEL

First, remove the Upper Covers (see procedure 1.5, steps 1-3).

1.6.1 A166/A187 Copiers



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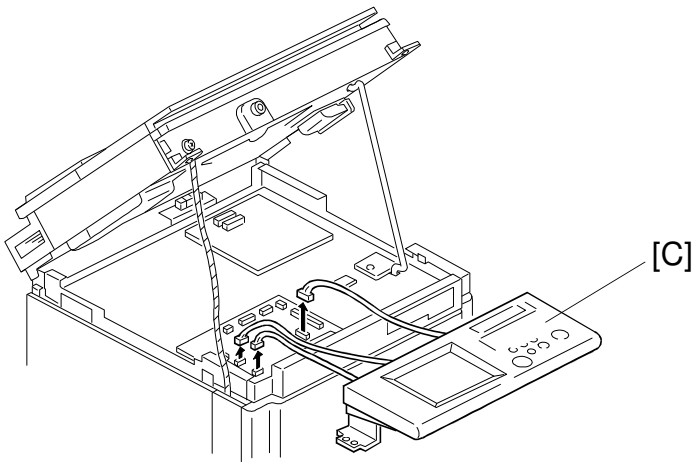
1. Loosen the screws [A].
2. Remove the Operation Panel [B] (2 screws, 3 connectors, and 1 screw with grounding wire).

1.6.2 A189 Copier

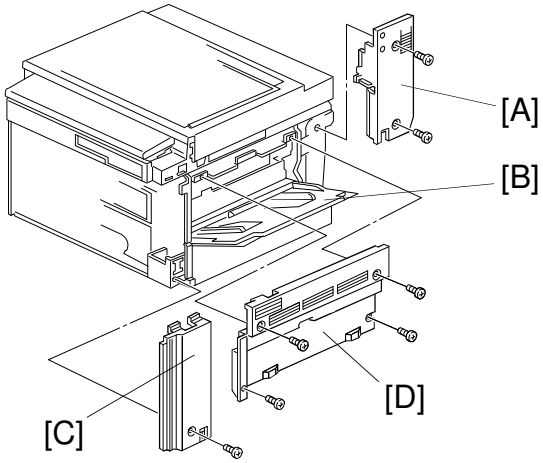


A166R510.wmf

1. Open the scanner unit (see procedure 1.11).
2. Remove the Operation Panel [C] (3 connectors).

NOTE: After the operation panel is replaced in the A189 copier, the touch panel calibration procedure must be performed (see procedure 12.4).

1.7 RIGHT COVERS



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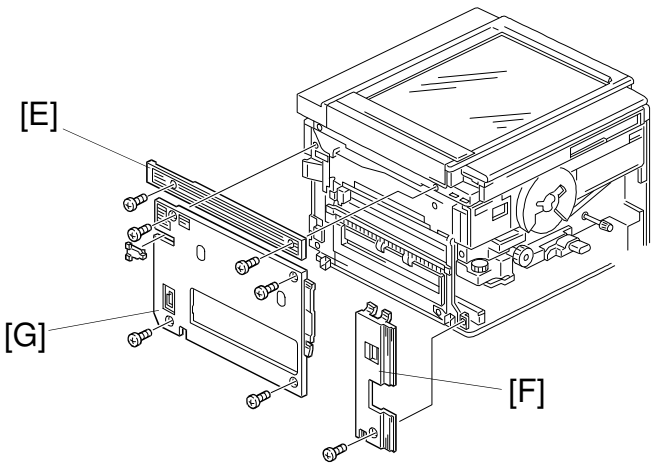
1. Remove the right rear cover [A] (2 screws).
2. Open the bypass tray [B].
3. Remove the right front cover [C] (1 screw and 2 hooks).
4. Remove the right cover [D] (4 screws).

1.8 LEFT COVERS



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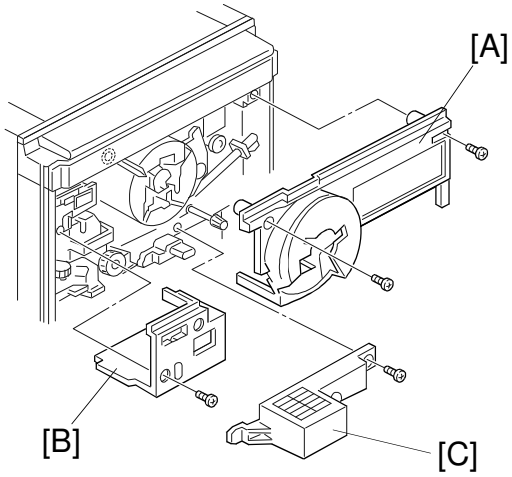
1. Remove the upper cover [E] (2 screws).
2. Remove the left front cover [F] (1 screw and 2 hooks).
3. Remove the left cover [G] (4 screws).

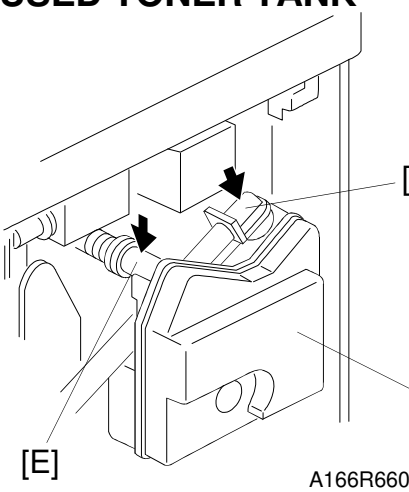
1.9 INNER COVERS



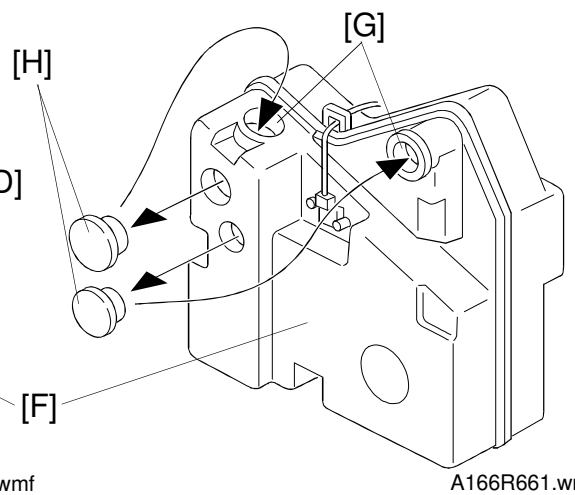
A166R659.wmf

1. While lifting up the hook, remove the inner cover [A] (2 screws, 1 hook).
2. Remove the counter cover [B] (2 screws).
3. Remove the inlet fan cover [C] (1 screw).

1.10 USED TONER TANK



A166R660.wmf



A166R661.wmf

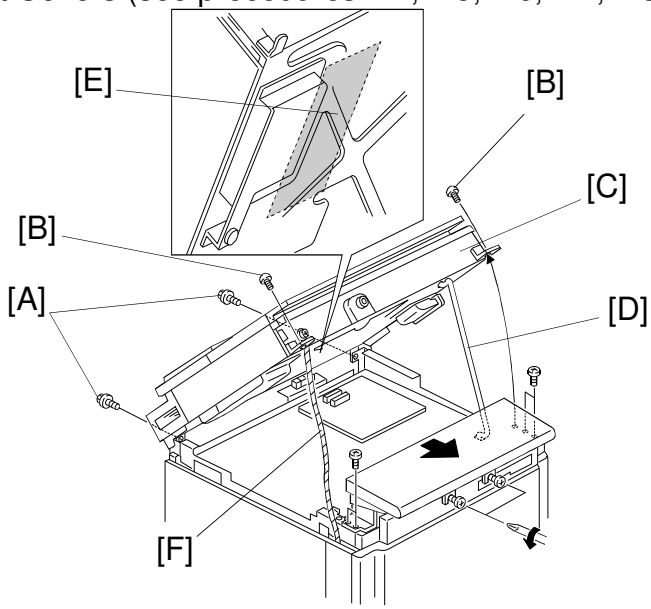
1. Knock the toner collection duct joints [D] and [E] once or twice. This prevents toner from scattering when removing the used toner tank.
2. Remove the used toner tank [F] (1 connector and 1 clamp), while turning up the opening [D] of the duct to prevent the scattering of toner.
3. After removing the used toner tank, seal the toner inlet holes [G] with the used toner caps [H].

1.11 SCANNER UNIT

⚠ CAUTION

Before beginning this installation procedure, be sure to remove the ARDF. If the scanner unit is opened with the ARDF installed, the machine may fall over.

First, remove the Exposure Glass Upper Covers, Operation Panel, Right Covers, and Left Covers (see procedures 1.4, 1.5, 1.6, 1.7, 1.8).



A166R513.wmf

1. Remove 4 screws [A and B].
2. Open the Scanner Unit [C] and set the Stopper Bar [D], as shown.

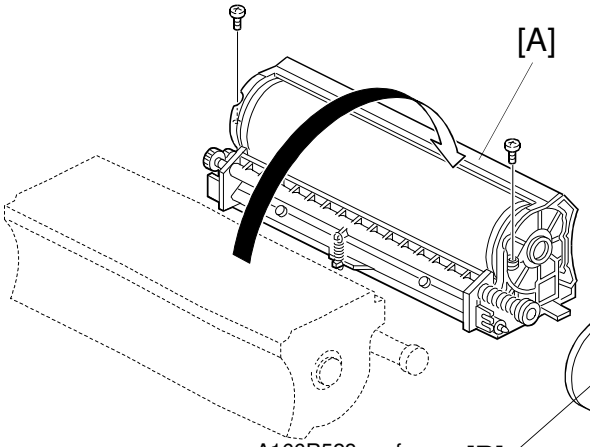
⚠ CAUTION

1. Part [E] of the scanner unit is very hot.

2. When opening the scanner unit do not apply a large force. The stopper wire [F] may pull the machine and cause it to fall over.

3. While removing the scanner unit take care not to jar the stopper bar.

2. DRUM UNIT



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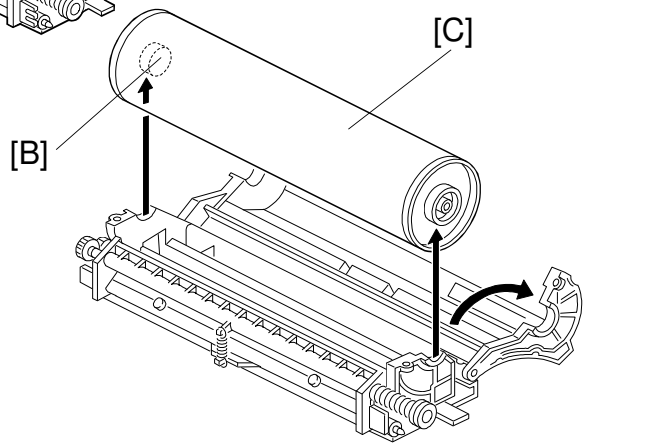


A166R529.wmf

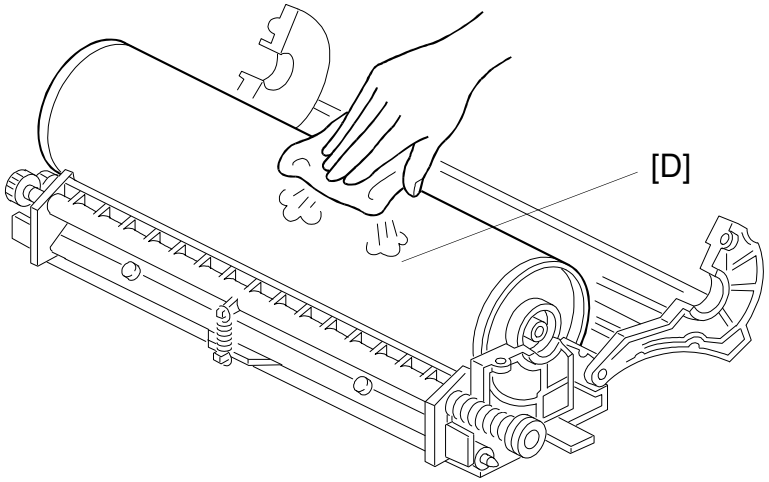
NOTE: Place a mat on the floor to keep the floor clean before performing this procedure.

2.1 DRUM REPLACEMENT

1. Remove the drum unit [A] (see chapter 3. COPIER INSTALLATION PROCEDURE).
2. In the work area, rotate the drum unit into the position as shown. Then remove the 2 screws.

   NOTE: 1) When placing the drum unit in the work area, it is important to turn it in the direction shown. This prevents toner spillage.
   2) Do not hold the drum at hole [B]. Hole [B] contains a conductive plate spring. If this spring is bent, the drum will not contact the drum shaft correctly.

3. Open the drum unit and remove the drum [C].
4. Install the new drum [C].



A166R530.wmf

5. Apply setting powder to the entire drum surface [D].

   NOTE: Be sure to apply the setting powder over the entire drum. This prevents the cleaning blade from catching on the drum surface.

6. Rotate the drum forward two or three times to settle the setting powder between the drum surface and cleaning blade.

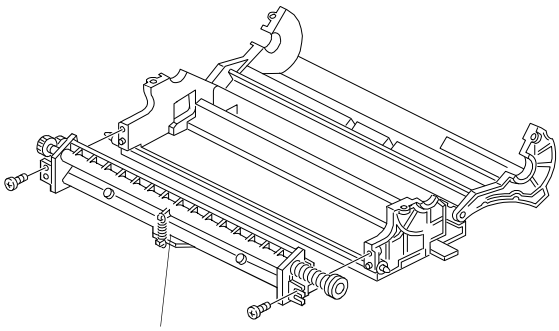
   NOTE: Do not the touch the drum beyond 10 mm from the edge.

7. Install the drum unit by the reverse procedure of its removal.

8. After replacing the drum only, perform the process control self-check for the new drum using following procedure.
   1). Turn the main switch on. Then wait 10 minutes to remove the residual voltage on the drum left by the initial process control self-check.
   2). Perform SP2-311 (Belt cleaning mode).
   This is to apply a small amount of lubricant on the drum.
   3). Perform SP3-126 (Forced process control).
   This SP takes about 5 minutes.
   4). Check the value of SP3-975 (Confirmation of the result).
   Good result=01
   Bad result = 80 to 99
   If the value is a bad result, see section 2. (1.3.14).

NOTE: When replacing the drum and developer (or the development unit, containing new black, cyan, magenta, and yellow developers), do the SP modes listed in the SP Modes After Replacing and Cleaning table in section 5, Maintenance.

2.2 CLEANING BLADE REPLACEMENT



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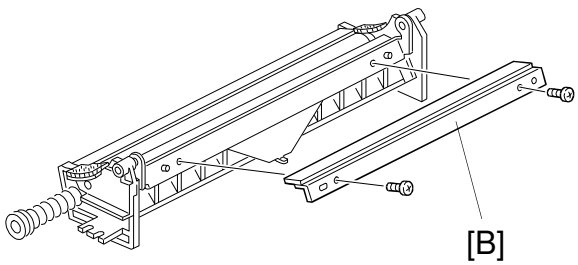

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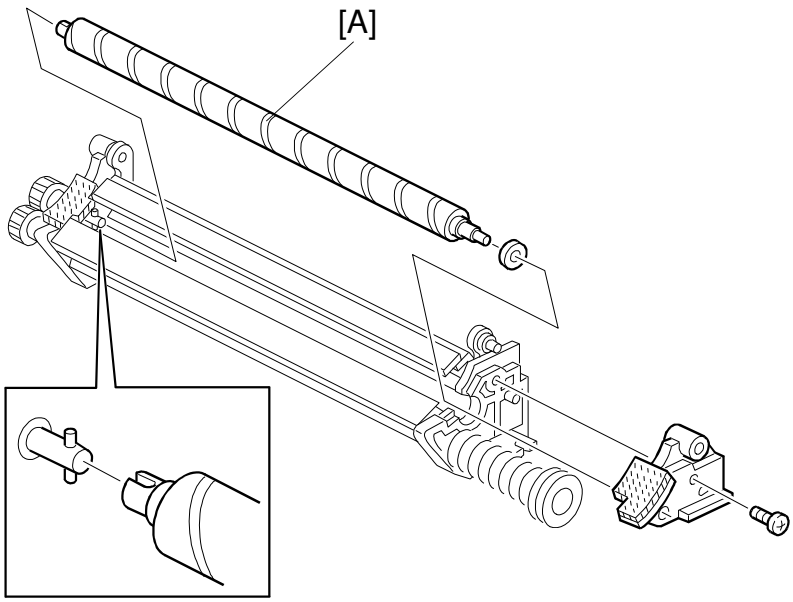
1. Remove the drum unit and place it in the work area (see procedure 2.1).
2. Remove the cleaning unit [A] (2 screws).
3. Remove the cleaning blade [B] (2 screws).
4. Install the new cleaning blade on the cleaning unit.
5. Install the cleaning unit on the drum unit.
5. Apply setting powder to the drum surface.

   NOTE: Be sure to apply the setting powder over the entire drum. This prevents the cleaning blade from catching on the drum surface.
6. Turn the drum forward two or three times to settle the setting powder between the drum surface and cleaning blade.
7. Reinstall the drum unit by the reverse procedure of its removal.

2.3 CLEANING BRUSH REPLACEMENT



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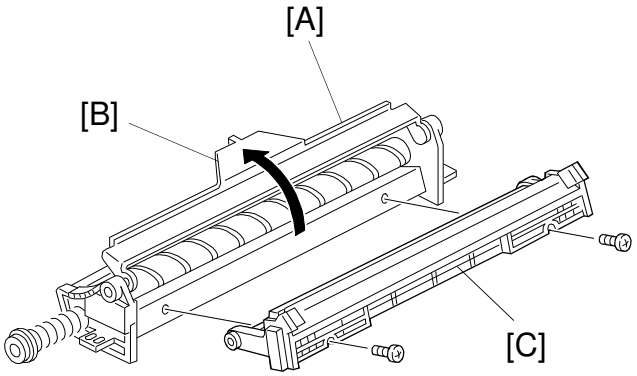
1. Remove the drum unit and place it in the work area (see procedure 2.1).
2. Remove the cleaning unit (see procedure 2.2).
3. Remove and replace the cleaning brush [A] (1 screw).

   NOTE: When installing the new cleaning brush, be sure to place its notch over the pin on the cleaning unit, as shown.
4. Reinstall the drum unit by the reverse procedure of its removal.

2.4 LUBRICANT BAR REPLACEMENT



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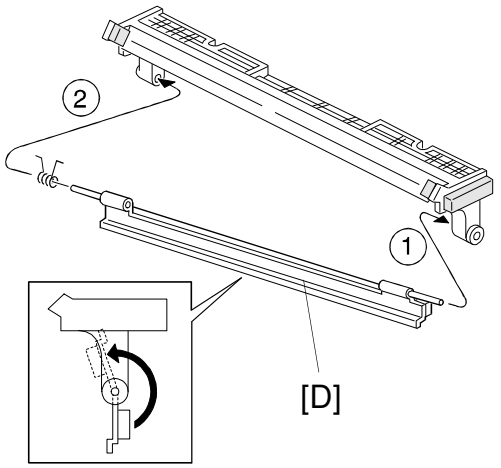

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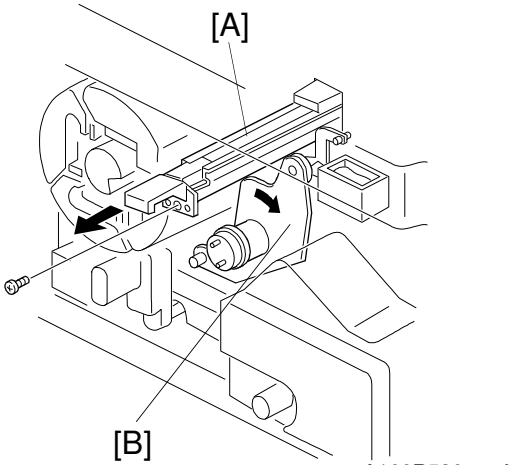
1. Remove the drum and cleaning units (see procedures 2.1 and 2.2).
2. Remove the cleaning blade from the cleaning unit [A] (see procedure 2.2).
3. Turn the pressure release lever up [B] and remove the cleaning unit top cover [C] (2 screws).
4. Replace the lubricant bar [D]. To install a new lubricant bar, first insert the bar end at ① and then the end at ②, as shown.

   NOTE: After installing the lubricant bar, turn it upward as shown. Ensure the cleaning brush can rotate smoothly. Do not turn the lubricant bar in the opposite direction; this force may break the the cleaning brush.

2.5 CHARGE GRID AND CORONA WIRE REPLACEMENT



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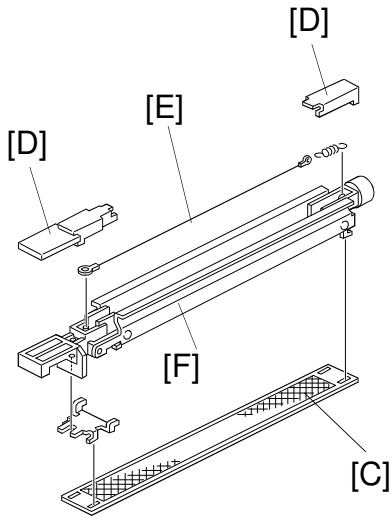

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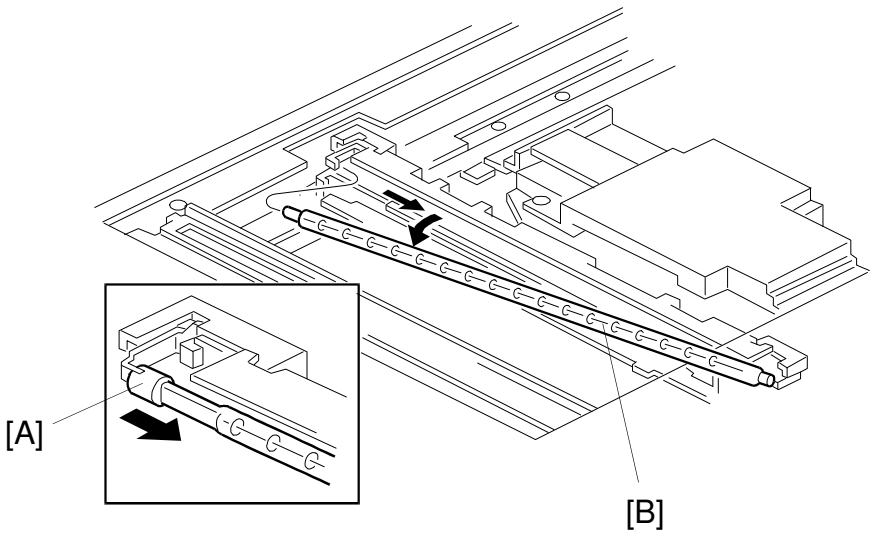
1. Remove the front and inner covers, (see procedures 1.2 and 1.9).
2. Remove the charge corona unit [A] (1 screw). Hold the toner supply motor bracket [B] away while removing the charge corona unit.
3. To replace the grid:
   Remove and replace the grid [C] (1 screw).
4. To replace the charge wire:
   1) Release the hooks of the front and rear end block covers [D] and then remove the covers from the charge corona unit.
   2) Replace the corona wire [E].

NOTE: 1) Do not touch the corona wire directly. Skin oils can deteriorate the corona wire over time, causing uneven charging.
2) Do not bend the corona wire. If the wire is bent, it will not discharge uniformly. This causes uneven charging.
3) Put both ends of the corona wire in the end block slots.
4) Replace the front end block cover first. If the rear end block cover is replaced before the front cover, the corona wire may catch on the corona wire case slot [F]. This may damage the wire.

3. SCANNER UNIT

3.1 HALOGEN LAMP REPLACEMENT



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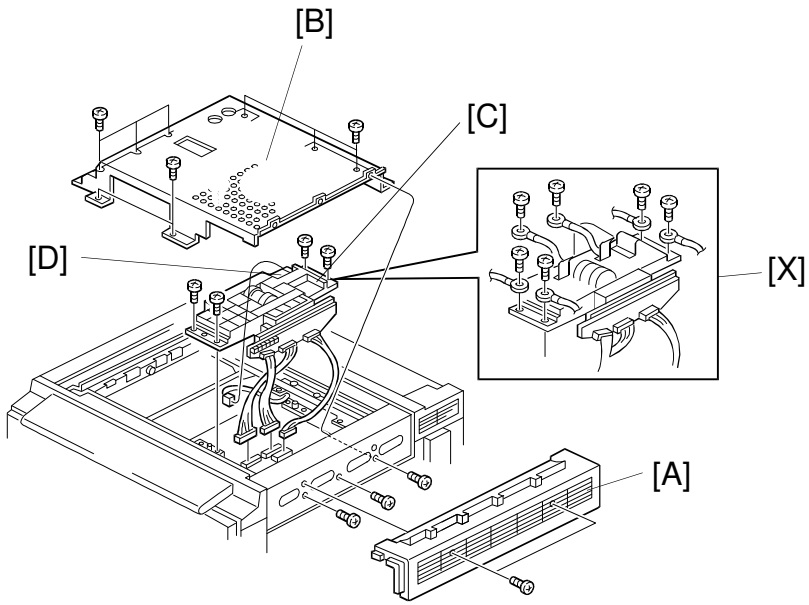
1. Remove the exposure glass (see procedure 1.4).
2. Position the 1st scanner into the slot on the frame.
3. Push the halogen lamp terminal [A] in the direction shown. This allows the removal of the halogen lamp [B].
4. Install a new halogen lamp in the scanner unit by the reverse procedure of its removal.

   NOTE: Do not touch the glass surface of the halogen lamp.
5. Perform the white level adjustment (SP4-435).

3.2 SCANNER INNER COVER REMOVAL



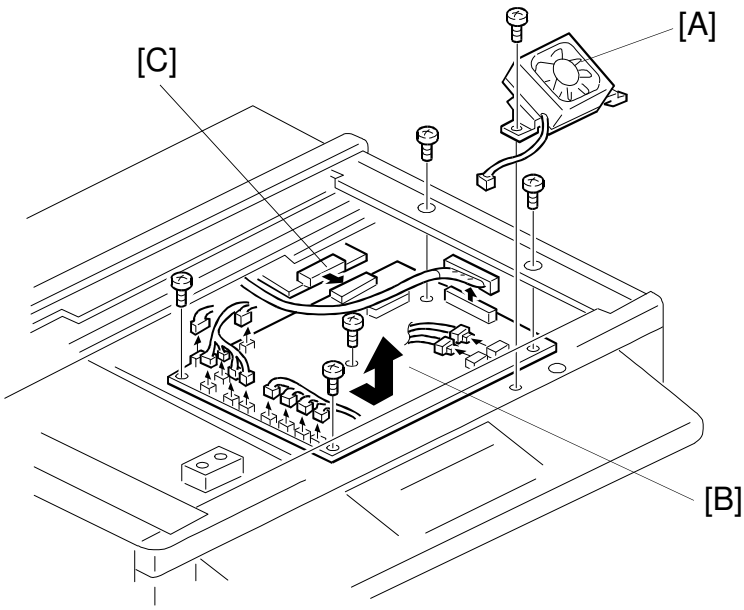
A166r539.wmf

1. Remove the exposure glass (see procedure 1.4).
2. Remove the front cover and the upper right cover [A] (see procedures 1.2 and 1.5)
3. Remove the scanner inner cover [B] (11 screws).

3.3 SBU REPLACEMENT

1. Remove the exposure glass (see procedure 1.4)
2. Remove the scanner inner cover (see procedure 3.2).
3. Disconnect the connectors of the SBU [C] and APS sensor [D].
4. Remove the SBU assembly [C] (4 screws).
   (220/240 V machine: 6 screws [X])
5. Remove the APS sensor from the old SBU and mount it on the new SBU.
6. Reinstall the SBU by the reverse procedure of its removal.

3.4 SCANNER IPU BOARD REPLACEMENT

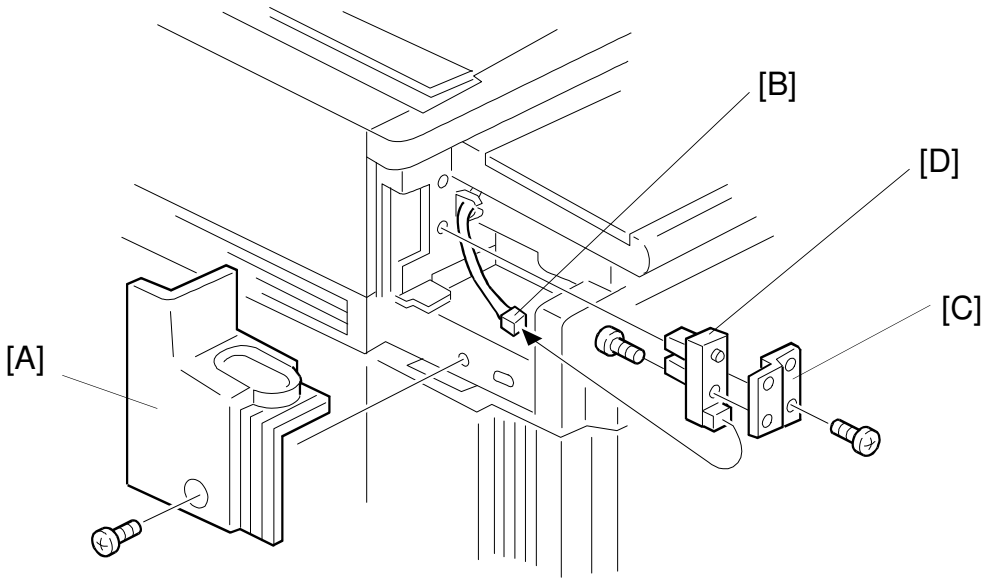


A166R540.wmf

1. Remove the exposure glass (see procedure 1.4).
2. Remove the scanner inner cover (see procedure 3.2).
3. Remove the SBU (see procedure 3.3).
4. Remove the scanner board cooling fan [A] (1 screw).
5. Remove the IPU board [B] (13 connectors, 5 screws).

NOTE: When removing the IPU board, pull the board towards the front of the copier to disconnect it from the IDU connector [C].

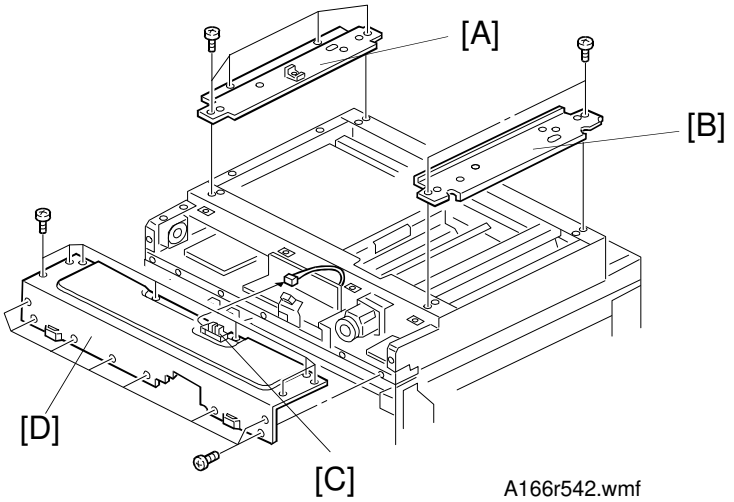
3.5 SCANNER HOME POSITION SENSOR REPLACEMENT



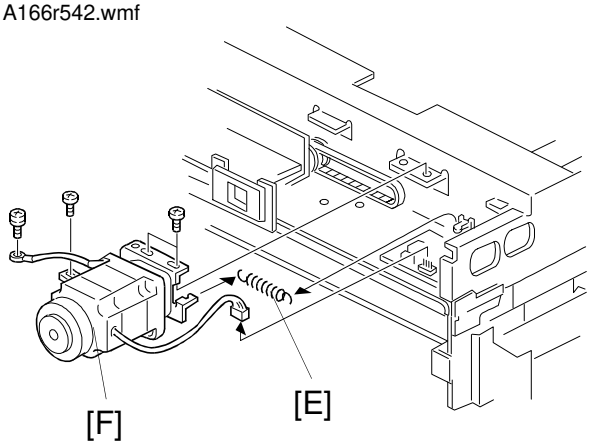
A166R541.wmf

1. Remove the left upper bracket [A] on the left of the operation panel (1 screw).
2. Disconnect the HP sensor connector [B].
3. Remove the HP sensor bracket [C] (1 screw).
4. Remove and replace the HP sensor [D] (1 screw).

3.6 SCANNER WIRE REPLACEMENT



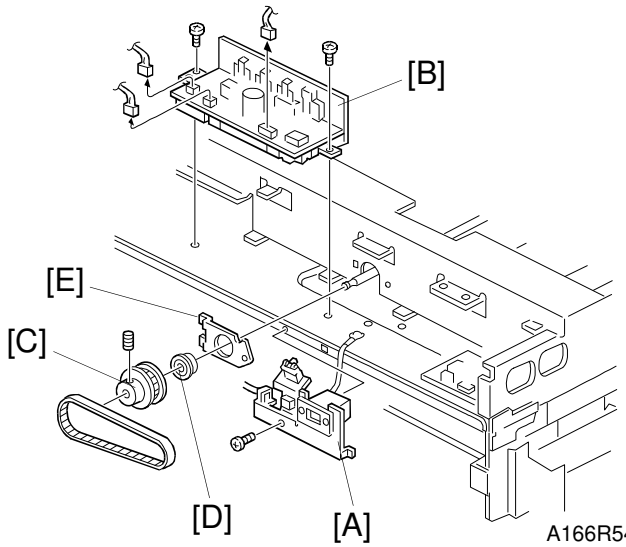
A166r542.wmf



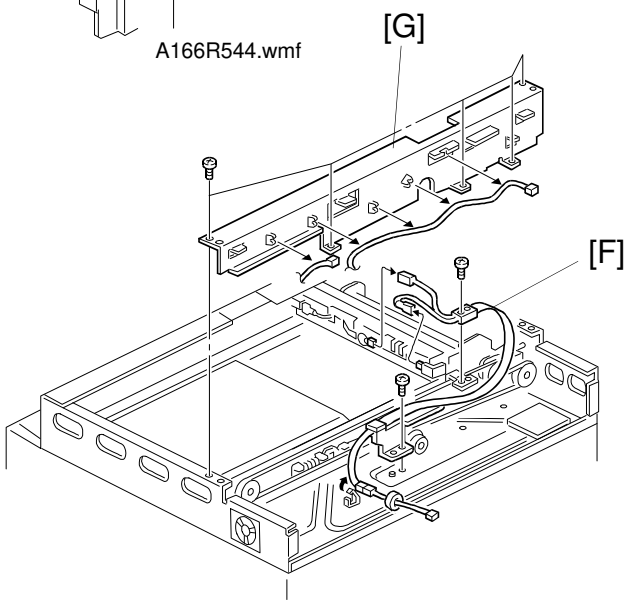
A166R543.wmf

1. Remove the exposure glass and exterior covers (see procedures 1.1 through 1.9).
2. Remove the upper right stay [A] (4 screws) and the upper left stay [B] (2 screws) from the scanner unit.
3. Remove the two scanner frames, as shown:
   1) Front wire: Remove the platen cover frame [D] (1 connector, 16 screws).
   2) Rear wire: Remove the scanner bar frame (12 screws).
4. Remove the scanner motor [F] (2 connectors, 4 screws, 1 spring [E], timing belt).

   NOTE: When reinstalling the scanner motor, pull the timing belt taut with the tension spring [E].

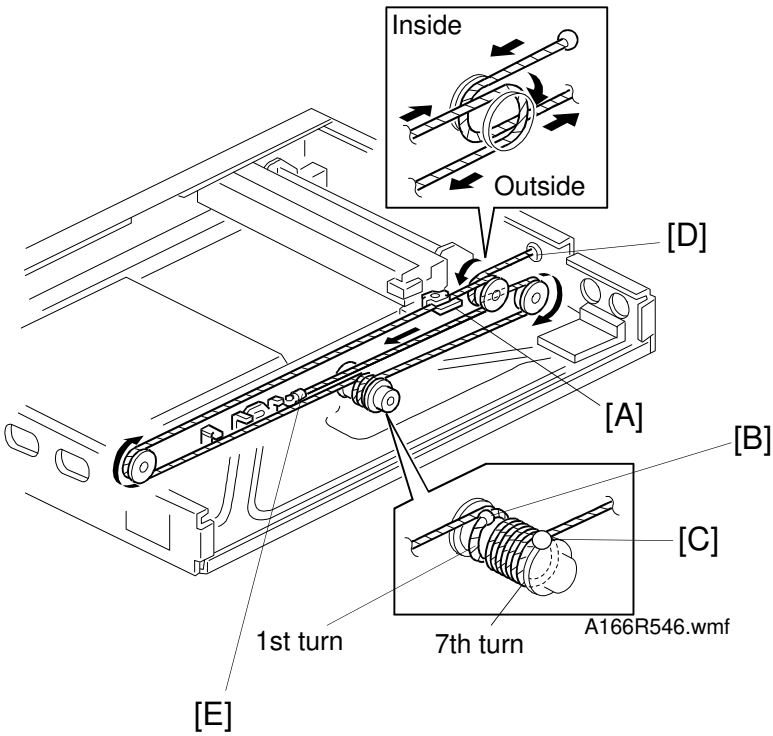


A166R544.wmf



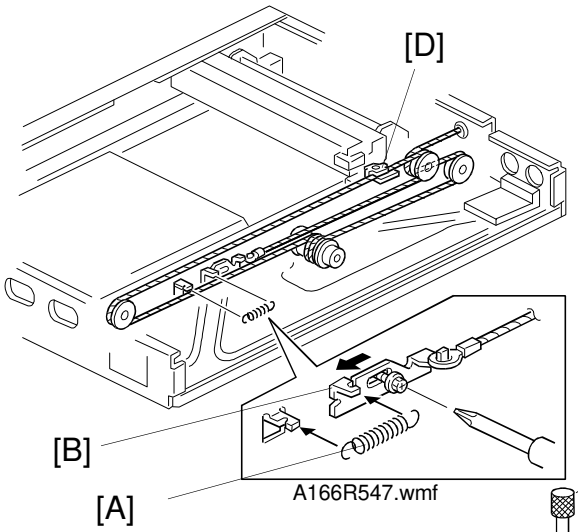
A166R545.lwmf

5. Remove the scanner unit lift sensor bracket [A] (1 screw, 1 connector).
6. Remove the lamp regulator [B] (2 screws, 3 connectors).
7. Remove the drive pulley [C].
8. Remove the pulley shaft bearing [D] and bearing retainer [E].
9. Remove the lamp relay cable [F] (2 screws).
10. Remove the rear frame [G] (5 screws).

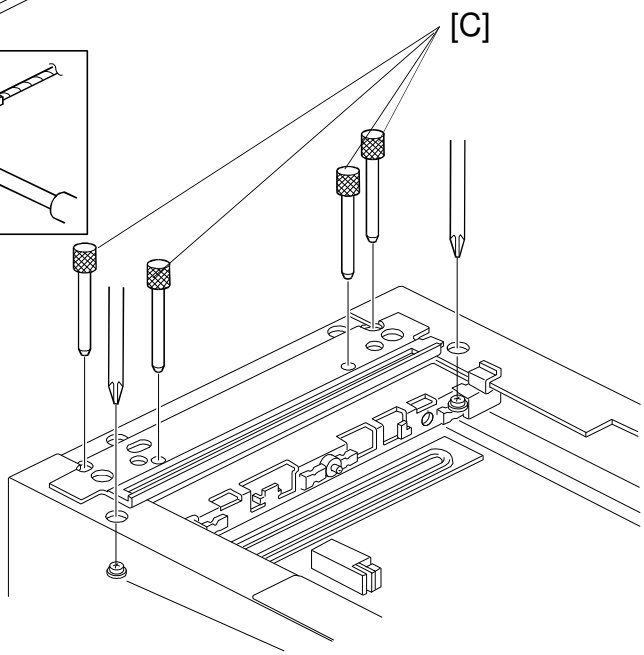


11. In the 1st scanner, loosen the screw [A] of both wire clamps. (Only the front scanner wire is shown above.)

12. Route the new scanner wire:
    The scanner wire has a ball attached to one end and a ring attached to the other. These ends are used to route the wire properly. The wire also has a ball attached to its middle.
    1) Put the middle ball in the groove on the pulley [B] and wind the wire eight times, as shown. Make sure that the red reference mark [C] on the wire is positioned as shown.
    2) Route the ball end of the wire along the pulley, as shown. Place the ball into the hole in the frame [D].
    3) Route the ring end of the wire along the pulley, as shown. Hook the ring onto the wire tension bracket [E].



A166R547.wmf

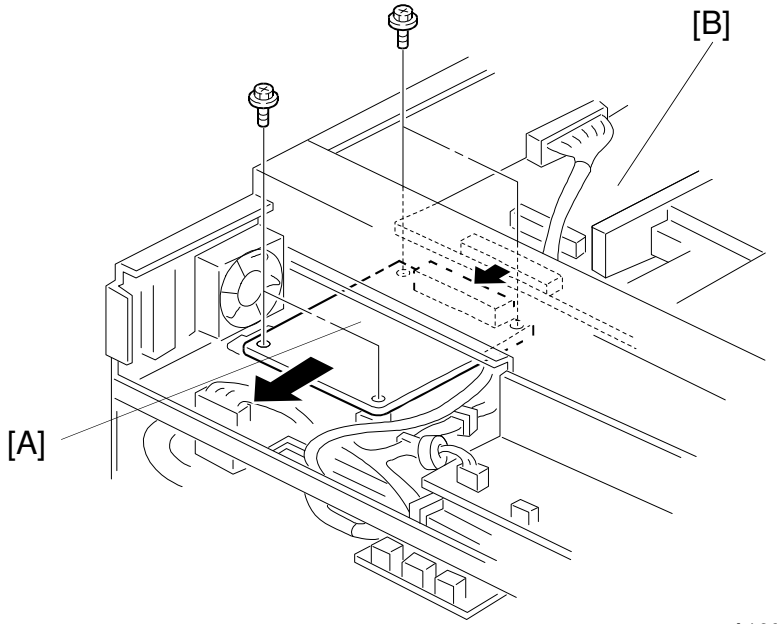


A166R548.wmf

13. Pull the wire taut with the wire tension spring [A] and attach the wire tension bracket [B] (1 screw).
14. Reinstall the frames and upper stays by the reverse procedure of their removal.
15. Secure the 1st scanner at the front and rear with the scanner locking pins [C] as shown. Set and tighten the scanner wire clamp [D].

    NOTE: Make sure to place the pins in the correct holes; the pins should slide in and out easily.
    Part number: A0069104 (4pcs/set)
16. Remove the scanner locking pins [C]. Tension the scanner wire by executing a scanner free run (SP mode 4-13-2).
17. Re-secure the 1st scanner with the locking pins [C]. Then loosen and reset the scanner wire clamp [D].
18. Remove the scanner locking pins.
19. Reassemble the scanner unit by the reverse procedure of its disassembly.

3.7 IDU (IMAGE DISCRIMINATE UNIT) REPLACEMENT



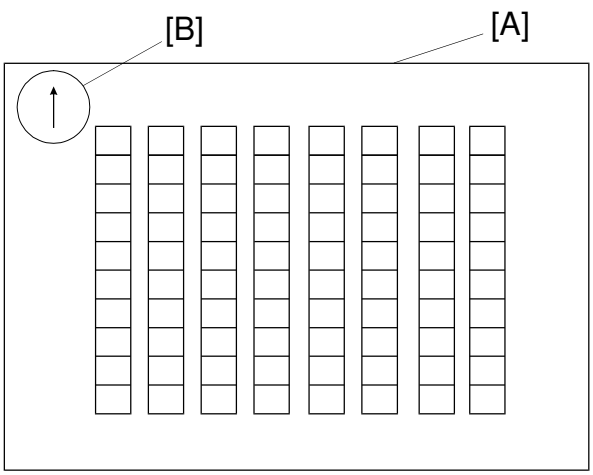
A166R549.wmf

1. Remove the exposure glass (see procedure 1.4).
2. Remove the scanner inner cover (see procedure 3.2).
3. Remove the platen cover frame (see item [D] in step 3 of Scanner Wire Replacement).
4. Remove the IDU [A] (4 screws). Carefully separate the IDU from the IPU [B] while removing.

4. COPY IMAGE ADJUSTMENT

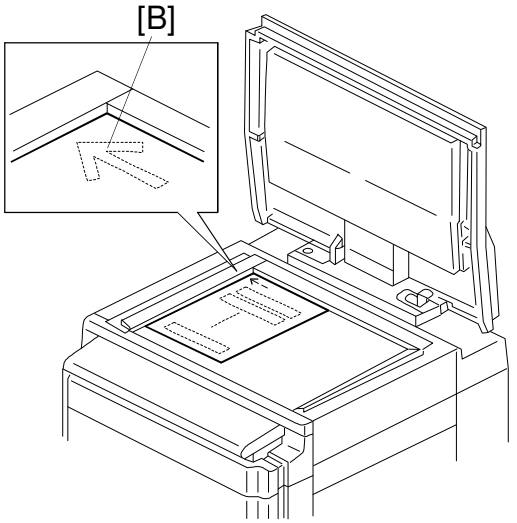
4.1 PRINTER γ ADJUSTMENT

4.1.1 Auto Color Calibration (ACC)



ACC test pattern

A166R662.wmf



A166R663.wmf

NOTE: When performing the ACC procedure, one of the following sizes of copy paper must be placed in the copier paper tray or paper tray unit: A4-sideways, 11" x 8 1/2", B4-lengthwise, A3-lengthwise or 11" x 17". If none of the above sizes are available in any paper tray, feed one those sizes into the by-pass feed table.

1. Press the Image Adjustment key on the operation panel four times.
2. When "1 (Calibrate)" blinks on the operation panel, press the "R/#" key.
3. "Select bypass tray (1-2#)" is displayed on the LCD. If the paper to be used is in a paper tray, press the "2: No" key; if the paper is in the by-pass feed table, press the "1: Enter" key.
4. Press the Start key when the message "Print Test Pattern/Press Start Key" appears on the LCD. The ACC test pattern [A] will be printed out.
5. Position the ACC test pattern [A] on the exposure glass (printed side down), aligning the arrow mark [B] with the rear left corner of the exposure glass. Then close the platen cover or ARDF.

   NOTE: The ACC test pattern should not be fed from the ARDF. The ARDF will not align the ACC test pattern properly.
6. Press the Start key. The machine scans the ACC test pattern 8 times and ACC is performed.

7. "Auto Color Calibrator/Completed" is displayed on the LCD if the ACC was completed successfully.

NOTE: 1. If the ACC was not completed successfully for any reason, retry the ACC as follows:

(1) Select "2: Reset to previous calibration" at step 2.
(2) This deletes the unwanted ACC data and restores the previous data.
(3) Perform steps 3 through 6 again.

2. If you want to return the ACC data to the factory settings, perform SP5-610-4.

4.1.2 BkCMY Color Balance Adjustment

The printer γ curve created during the auto color calibration can be modified using SP mode. The adjustment uses only offset values.

Low ID	Level 2 through 5 in the C4 chart 10-level scale
Middle ID	Level 3 through 7 in the C4 chart 10-level scale
High ID	Level 6 through 9 in the C4 chart 10-level scale
ID max	Level 10 in the C4 chart 10-level scale (affects the entire image density)
Offset	The higher the number in the range associated with the low ID, middle ID, high ID, and ID max, the greater the density.

*: SP4-905 (printer γ printout) can be used to print the current values.

There are four adjustable modes:

- Letter mode
- Photo mode
- Monochrome letter mode
- Glossy photo mode

		K(Bk)	C	M	Y
Letter mode	Low ID	4-910-1	4-911-1	4-912-1	4-913-1
	Middle ID	4-910-2	4-911-2	4-912-2	4-913-2
	High ID	4-910-3	4-911-3	4-912-3	4-913-3
	ID Max	4-910-4	4-911-4	4-912-4	4-913-4
Photo mode	Low ID	4-915-1	4-916-1	4-917-1	4-918-1
	Middle ID	4-915-2	4-916-2	4-917-2	4-918-2
	High ID	4-915-3	4-916-3	4-917-3	4-918-3
	ID Max	4-915-4	4-916-4	4-917-4	4-918-4
Black and White letter mode (K, SC)	Low ID	4-914-1			
	Middle ID	4-914-2			
	High ID	4-914-3			
	ID Max	4-914-4			

		K(Bk)	C	M	Y
Glossy photo mode (GP)	Low ID	4-919-1	4-920-1	4-921-1	4-922-1
	Middle ID	4-919-2	4-920-2	4-921-2	4-922-2
	High ID	4-919-3	4-920-3	4-921-3	4-922-3
	ID Max	4-919-4	4-920-4	4-921-4	4-922-4

Adjustment Procedure

NOTE: Do not change the order of these steps.

1. For Image Adjustment, set the Sharp/Soft value to 4. Then copy the C-4 chart in letter mode.

   NOTE: 1) For letter mode adjustment, set the Sharp/Soft value to 4. If you set it to the standard value (3), the filter intensifies the image contrast, making it difficult to evaluate image quality.
   2) When re-copying the image after the SP mode adjustment, be sure to reset the Sharp/Soft value to 4. (The Sharp/Soft setting is cleared when entering SP mode.)

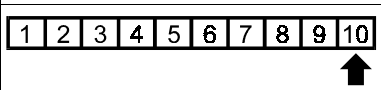
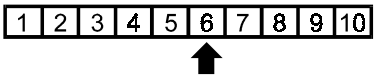
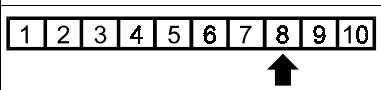
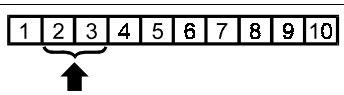
2. Enter SP mode.

3. Open the required SP 4-XX-X screen (see the following table).‘

		Bk	C	M	Y	Value
Letter mode (T)	Low ID	4-910-1	4-911-1	4-912-1	4-913-1	0~31
	Middle ID	4-910-2	4-911-2	4-912-2	4-913-2	
	High ID	4-910-3	4-911-3	4-912-3	4-913-3	
	ID max	4-910-4	4-911-4	4-912-4	4-913-4	

4. Adjust the offset values until the copy quality conforms to standard (see the following table). If the copy is too dark, lower the appropriate value.

Standard Copy Quality in Letter Mode

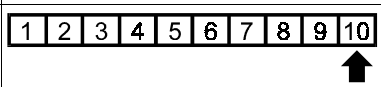
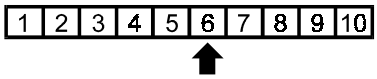
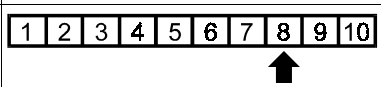
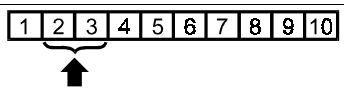
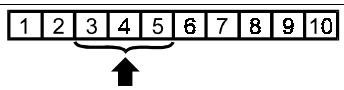
Step	Item to Adjust	Level on the C-4 chart	Adjustment Standard
1	ID max: (Bk, C, M, and Y)		Adjust the offset value so that the density of level 10 matches that of level 10 on the C-4 chart.
2	Middle ID: (Bk, C, M, and Y)		Adjust the offset value so that the density of level 6 matches that of level 6 on the C-4 chart.
3	High ID: (Bk, C, M, and Y)		Adjust the offset value so that the density of level 8 matches that of level 8 on the C-4 chart.
4	Low ID: (Bk, C, M, and Y)		Adjust the offset value so that level 2 is not visible on the copy and the density of level 3 matches that of level 10 on the C-4 chart.

5. Copy the C-4 chart in photo mode (with Bk and white mode for Bk adjustment and full color mode for C, M and Y adjustment).

6. Open the appropriate SP 4-XX-X screen (see the following table).

		Bk	C	M	Y	**Y Value**
Photo mode	Low ID	4-915-1	4-916-1	4-917-1	4-918-1	0~31
	Middle ID	4-915-2	4-916-2	4-917-2	4-918-2	
	High ID	4-915-3	4-916-3	4-917-3	4-918-3	
	ID max	4-915-4	4-916-4	4-917-4	4-918-4	

7. Adjust the offset values until the copy quality conforms to standard (see the following table). If the copy is too dark, lower the appropriate value. For Bk adjustment, compare the black and white copy with the C-4 chart. For C, M and Y adjustment, use the full color copy.

Standard Copy Quality in Photo Mode			
Step	**Item to Adjust**	**Level on the C-4 chart**	**Adjustment Standard**
1	ID max: (Bk, C, M, and Y)		Adjust the offset value so that the density of level 10 matches that of level 10 on the C-4 chart.
2	Middle ID: (Bk, C, M, and Y)		Adjust the offset value so that the density of level 6 matches that of level 6 on the C-4 chart.
3	High ID: (Bk, C, M, and Y)		Adjust the offset value so that the density of level 8 matches that of level 8 on the C-4 chart.
4	Low ID: (Bk, C, M, and Y)		Adjust the offset value so that level 2 is just visible in the copy image and the density of level 3 matches that of level 10 on the C-4 chart.
5	Bk Low ID: (C, M, and Y) <on the full color copy>		Adjust the offset value so that the color balance of black scale levels 3 through 5 in the copy is seen as gray.

4.2 MAIN SCAN POSITION DOT CORRECTION

NOTE: Before adjusting the scanner, perform the printer registration adjustment (see procedure 8.11).

1. Enter the SP mode and open SP4-10 and SP4-11.
2. Check that each value corresponds to the factory-set value.
3. Press the Interrupt key and copy the C-4 chart in the full-color photo mode.

   NOTE: It is necessary to copy the C-4 chart in photo mode. In letter mode, color displacement cannot be checked properly.

   Be sure to perform the following procedure for both the left and right edges of the C-4 chart.
4. Check the yellow and cyan vertical lines. (Use a Magnification Scope to do this.) If they overlap the black line at the edges of the copy, exit the SP mode to end the adjustment. If the yellow and cyan lines significantly extend beyond the black line, proceed to the next step.
5. Press the interrupt key to return to the SP mode and open SP4-932. The following table shows the location of the current values.

4-932-1	Dot correction R left edge
4-932-2	Dot correction R right edge
4-932-3	Dot correction B left edge
4-932-4	Dot correction B right edge

6. Change the values in accordance with the following tables.

Condition	Sub condition	Location of new value
The yellow line is to the left of the black line, and the cyan line is to the right of the black line.	The edges of the yellow and cyan lines deviate evenly from the black line.	The new value is in the middle row, to the left of the current value's column.
	The cyan line's edge is the most distant edge from the black line.	The new value is in the upper row, to the left of the current value's column.
	The yellow line's edge is the most distant edge from the black line.	The new value is in the lower row, to the left of the current value's column.
The cyan line is to the left of the black line, and the yellow line is to the right of the black line.	The edges of the yellow and cyan lines deviate evenly from the black line.	The new value is in the middle row, to the right of the current value's column.
	The cyan line's edge is the most distant edge from the black line.	The new value is in the upper row, to the right of the current value's column.
	The yellow line's edge is the most distant edge from the black line.	The new value is in the lower row, to the right of the current value's column.

Top Row		18		27		36		45		65		74		83		92	
Middle Row	19		28		37		46		55		64		73		82		91
Bottom Row		29		38		47		56		54		63		72		81	

NOTE: In the above table:
The first digit represents the value of the red correction
(4-932-1: R left, 4-932-2: R right)
The second digit represents the value of the blue correction
(4-932-3: B left, 4-932-4: B right)

Example:

1. The C-4 chart's vertical lines do not overlap properly. On the right side of the chart, the yellow line is to the left of the black line and the cyan line is to the right of the black line. The yellow line's edge is the most distant edge from the black line. These conditions are used to determine what the new values should be. The new value is located in the bottom row, to the left of the current value's column.
   For the right side of the chart, the machine's current red correction value is 6 (4-932-2), and the blue correction value is 5 (4-932-4). Therefore, the current value in the chart is 65. The new value (bottom row to the left) is 56.
2. On the left side of the chart, the cyan line is to the left of the black line and the yellow line is to the right of the black line. The edges of the yellow and cyan lines deviate evenly from the black line. These conditions are used to determine what the new values should be. The new value is located in the middle row, to the right of the current value's column.
   For the left side of the chart, the machine's current red correction value is 6 (4-932-1), and the blue correction value is 4 (4-932-3). Therefore, the current value in the chart is 64. The new value (middle row to the right) is 73.

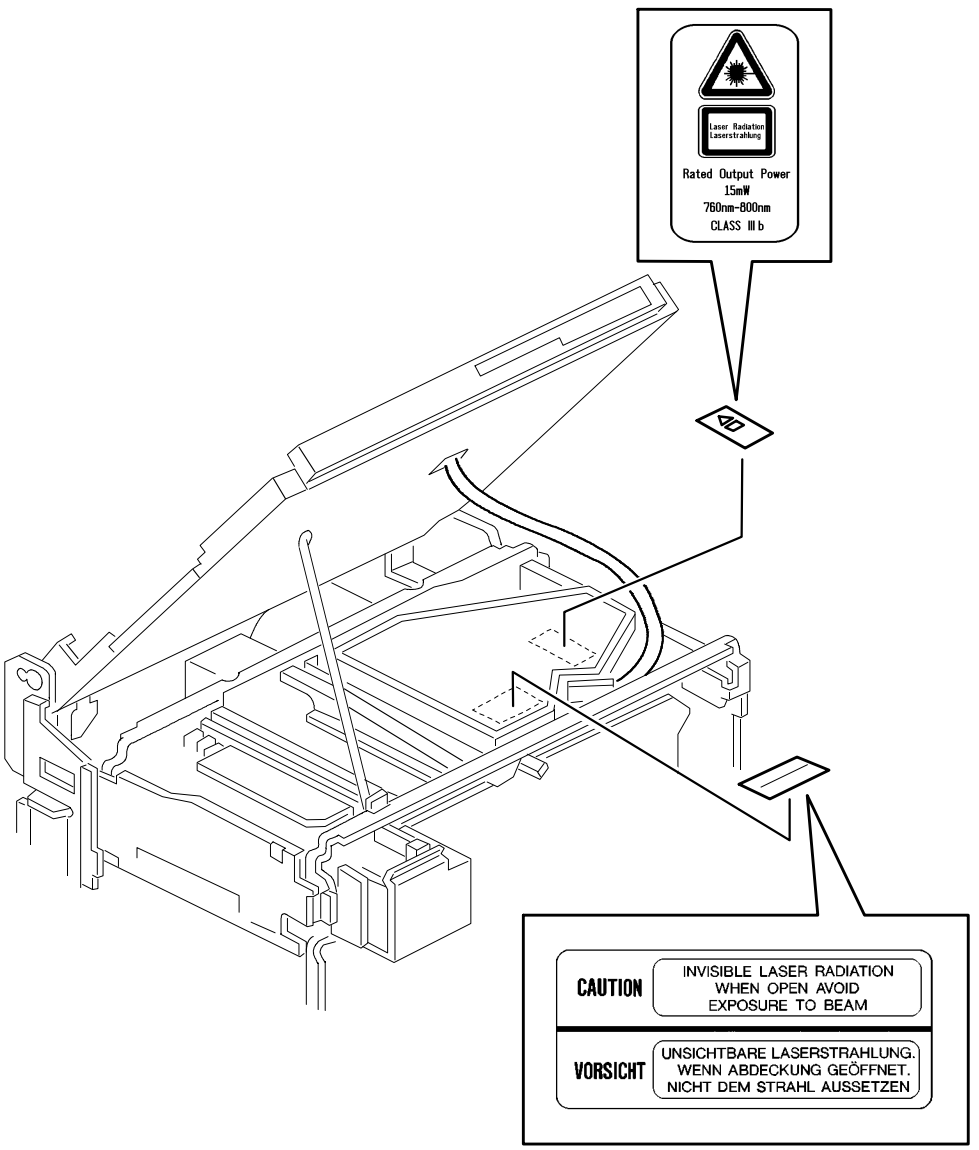
5. LASER UNIT

⚠ DANGER

Turn off the main switch and unplug the machine before attempting any of the procedures in this section. Laser beams can seriously damage your eyes.

- CAUTION DECALS -

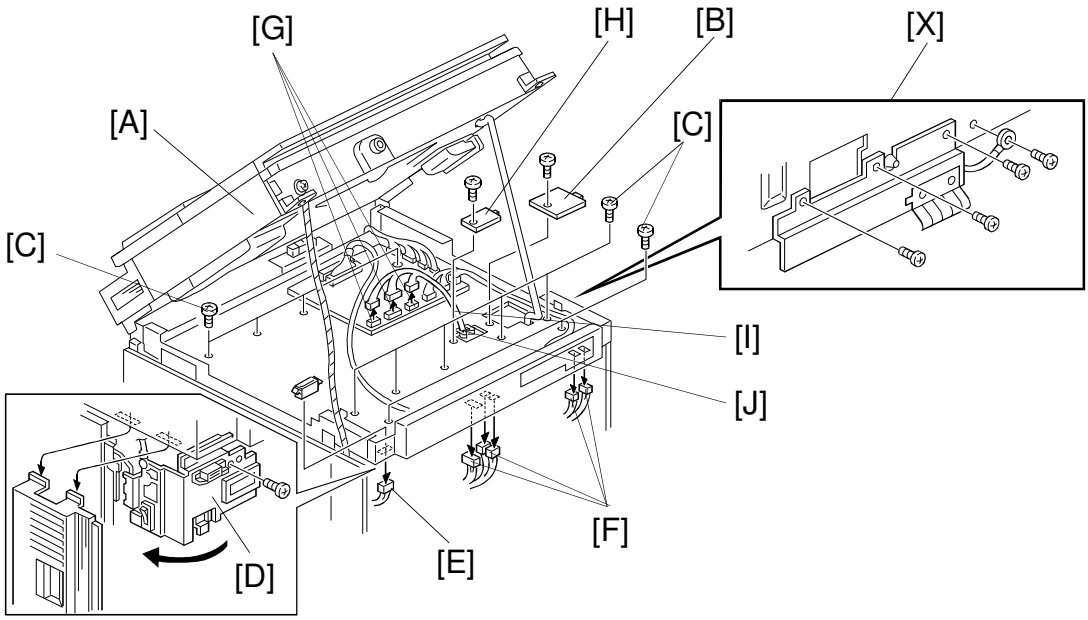
Two caution decals are located in the laser section as follows.



⚠ DANGER

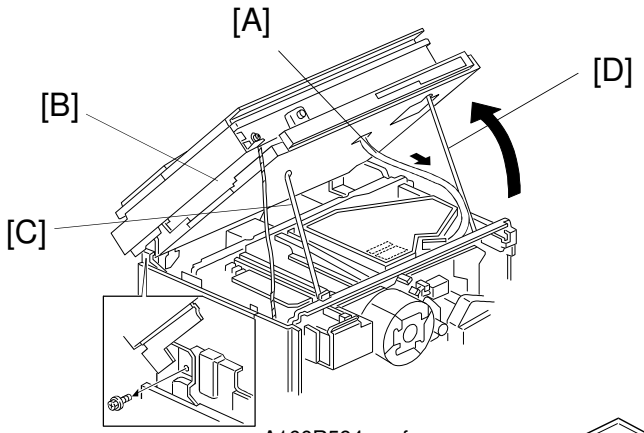
Be sure to turn the main switch off and disconnect the power plug before any disassembly or adjustment of the laser unit. This copier uses a class 3B laser beam with wavelength of 780 nm and an output of 10 mW. The laser can cause blindness if the eye is exposed.

5.1 POLYGON MOTOR REPLACEMENT

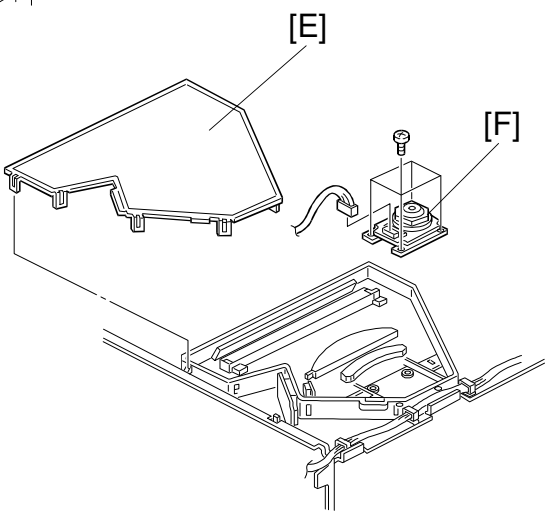


A166R593.wmf

1. Lift up the scanner unit [A] (see procedure 1.11).
2. Remove the frame cover [B] (1 screw).
3. Remove all 11 screws [C].
   – For 220/240 V machine only –
   - Remove 4 screws [X] for the LD shield plate and the grounding wire.
4. Swing out the counter bracket [D].
5. Disconnect the 9 connectors [E], [F], [G].
6. Remove the harness exit cover [H] (1 screw).
7. Open the three clamps securing harness [I] (2 white clamps, one black clamp [J]).



A166R594.wmf



A166R595.wmf

8. Carefully pull the harness [A] to take up the slack while opening the printer control box [B] as shown (1 screw). Set the printer control box support bar [C].

⚠ CAUTION

Take care not to knock the support bars (C and D) while the scanner unit and printer control box are open. If the support bars are disengaged, the scanner unit and printer control box may suddenly fall into the closed position.

9. Remove the optical housing cover [E] (10 hooks).

10. Remove the polygon motor [F] (4 screws and 1 connector).

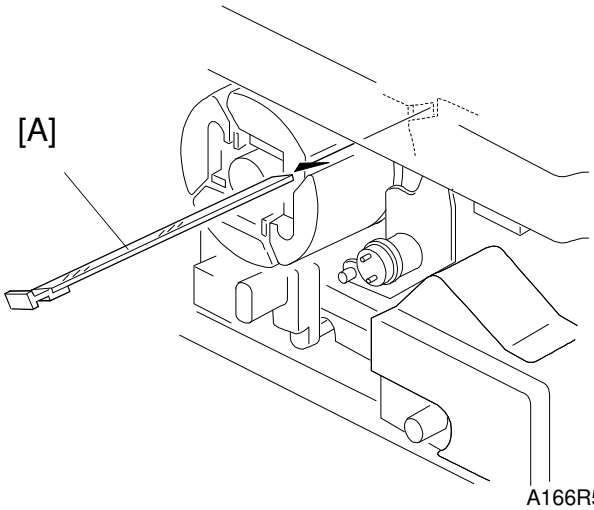
11. Install the new polygon motor by the reverse procedure of its removal.

⚠ DANGER

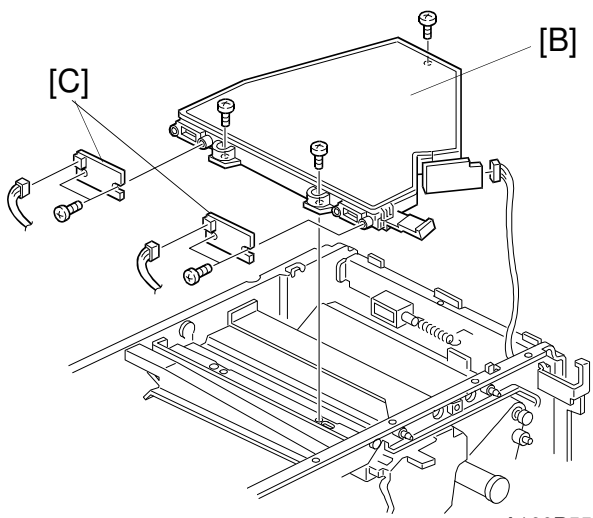
1. Do not attempt to trigger the LD with the optical housing cover open.

2. After reassembly, make sure that the optical housing cover is completely closed.

5.2 LASER SYNCHRONIZING DETECTOR BOARD REPLACEMENT



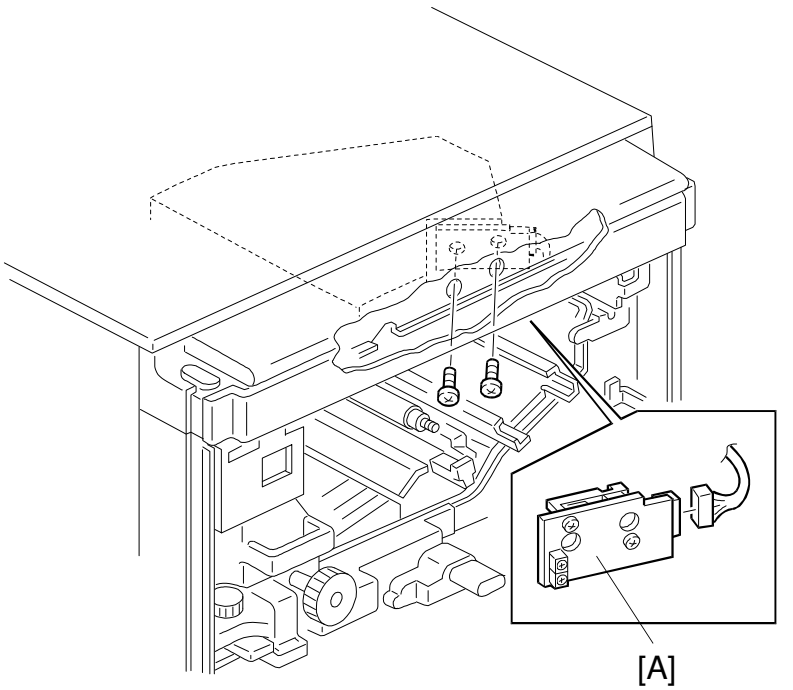
A166R596.wmf



A166R554.wmf

1. Open the front cover and remove the inner cover (see procedure 1.9).
2. Remove the toner shield glass [A].
3. Open the printer control box (see procedure 5.1).
4. Remove the optical housing unit [B] (3 screws and 3 connectors).
5. Remove and replace the laser synchronizing detector boards [C] (2 screws each).

5.3 LD UNIT REPLACEMENT



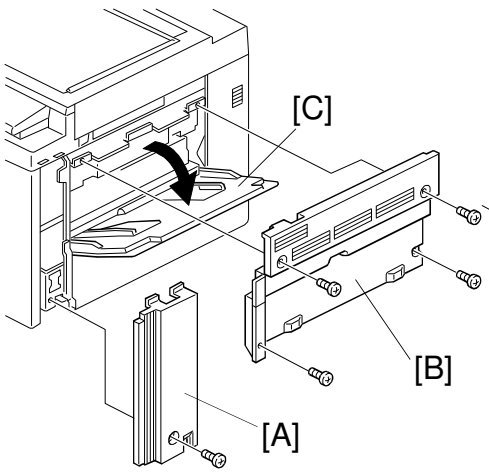
A166D555.wmf

1. Remove the inner cover (see procedure 1.9)
2. Remove the used toner tank (see procedure 1.10)
3. Remove the development unit (see procedure 6.1).
4. Remove the transfer belt unit (see procedure 7.1.1).
5. Remove the drum unit (see procedure 2.1).
6. Remove the LD unit [A] (2 screws and 1 connector).
7. Install the new LD unit by the reverse procedure of its removal.

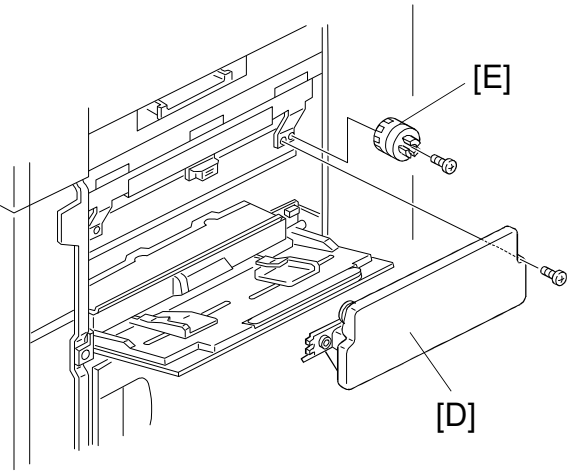
6. DEVELOPMENT UNIT

6.1 DEVELOPER

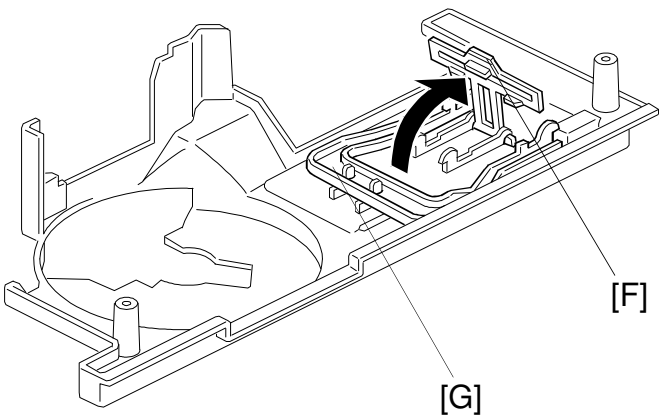
6.1.1 Developer Collection



A166R658.wmf



A166R556.wmf

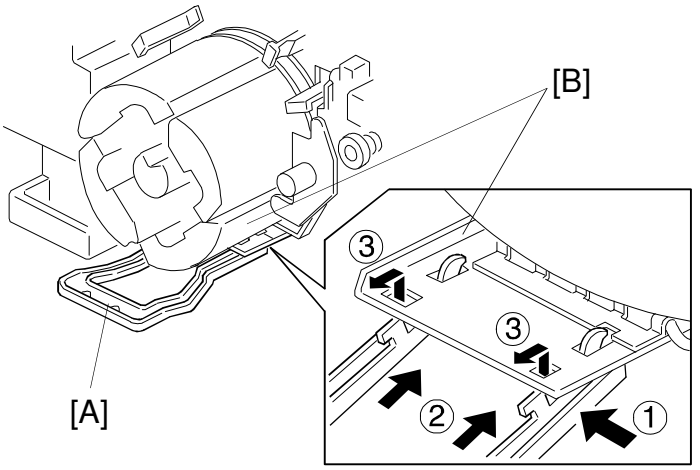


A166R557.wmf

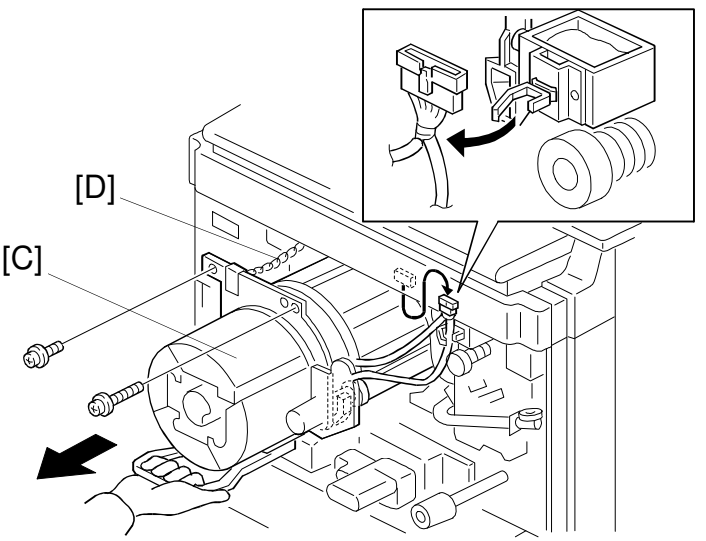
1. Remove the following outer covers.
   (1) Right front cover [A] (1 screw)
   (2) Right cover [B] (open the by-pass feed table [C], then remove 4 screws)

2. Remove the developer collection bottle/supply funnel ass'y [D] (1 screw). Then remove the development roller rotation handle [E] (1 screw).

3. Raise the retainer [F] to remove handle [G] from the rear of the upper inner cover.



A166R558.wmf



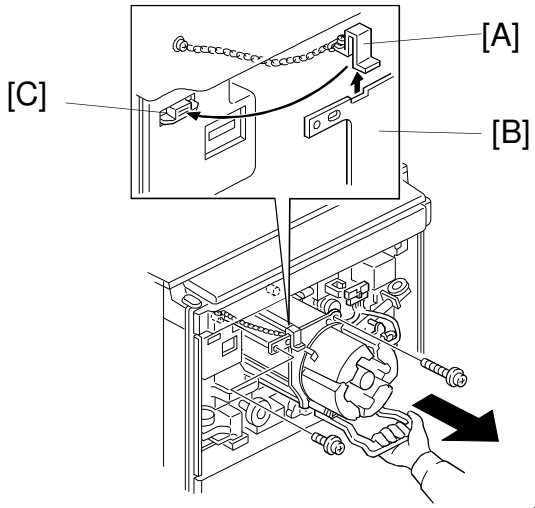
A166R559.wmf

4. Attach the handle [A] to the development unit [B] (follow the steps numbered ① through ③ above).

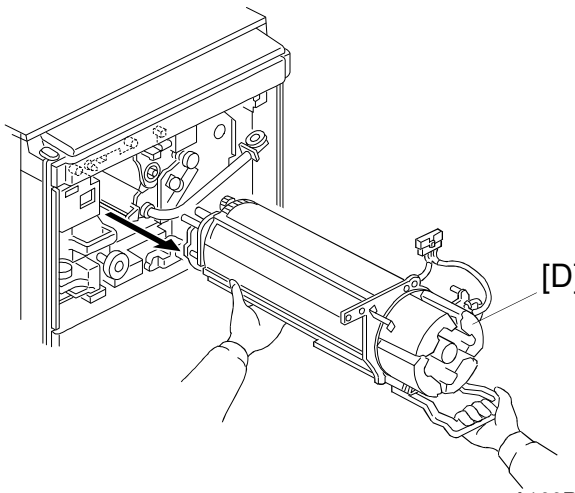
⚠ CAUTION

When the handle is pulled (step ③), ensure that it attaches to the development unit with a click. If the handle is not correctly installed, the development unit may fall when you attempt to remove it.

5. Slowly pull out the development unit [C] until it is stopped by the chain [D] (1 long screw, 1 screw, 1 clamp, and 1 connector).



A166R560.wmf



A166R561.wmf

6. Remove the chain hook [A] from the frame [B]. Then attach the chain hook to the magnet catch [C].

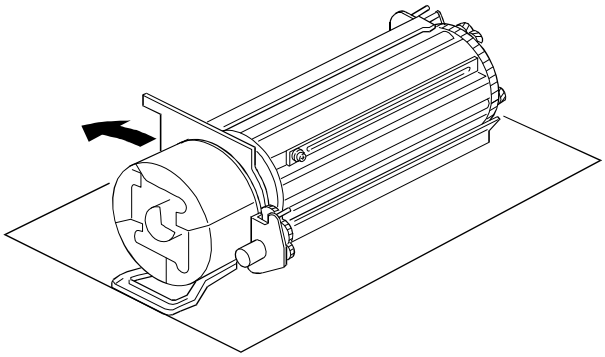
   NOTE: The aim of attaching the chain hook to the magnet catch is to avoid forgetting to reinstall the chain hook when the development unit is reinstalled.

7. Hold the development unit as shown and remove it from the copier.

⚠ CAUTION

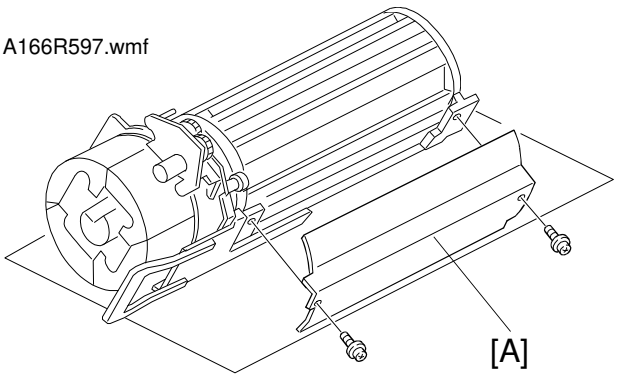
Be careful not to hurt your back when holding the development unit. Also, be careful not to drop the development unit. The development unit weighs about 12 kg (26 lb).

NOTE: Never hold the hopper [D] when removing the unit. Otherwise the hopper could break or the doctor gap between the development rollers could become uneven.



Development unit placement position

A166R597.wmf



Developer installation position

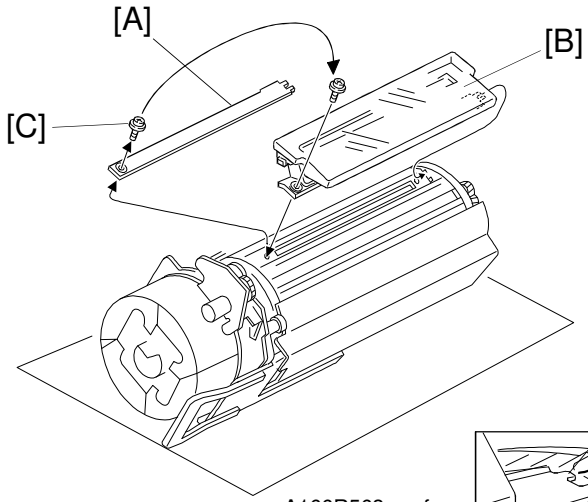
A166R562.wmf

8. Place the development unit on a clean sheet of paper as shown above (**development unit placement position**)

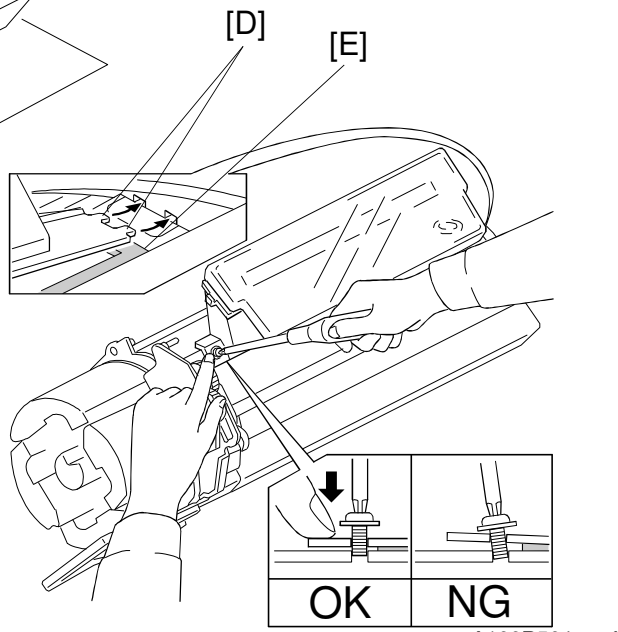
   NOTE: Be sure to use a clean sheet of paper or floor mat when placing the development unit on the floor. This prevents the floor from getting dirty.

9. Rotate the development unit into the **developer installation position** as shown.

10. Remove the toner saucer [A] (2 screws).



A166R563.wmf

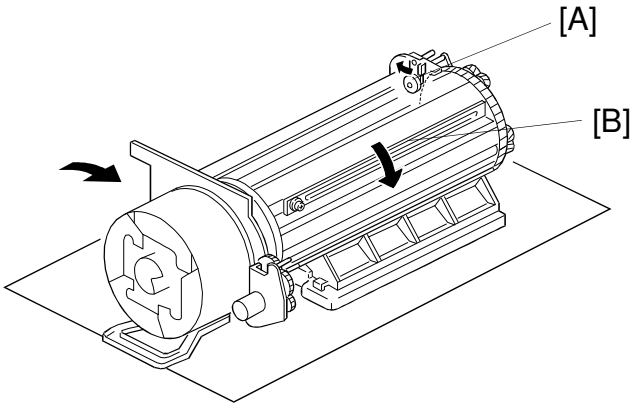


A166R564.wmf

11. Remove the developer cover [A].
12. Attach the developer collection bottle/supply funnel ass'y [B] to the development unit using the screw [C] (M4 x 6).

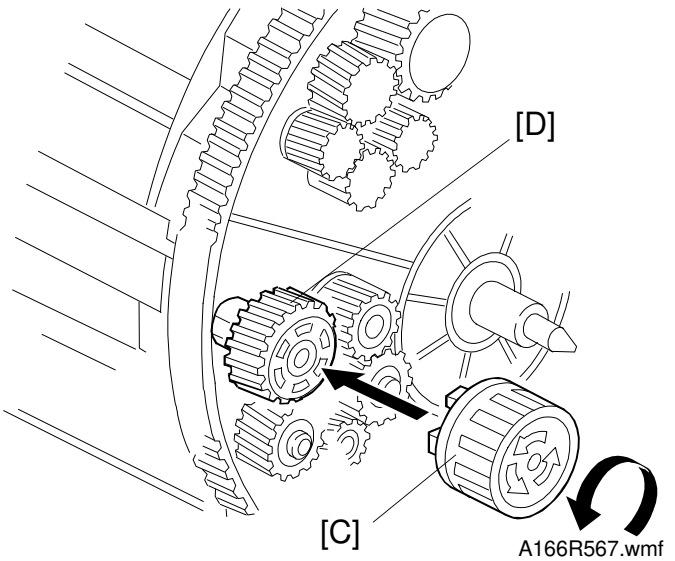
NOTE: 1. Before tightening the screw [C], ensure the two tabs [D] are completely inserted into the slots and the screw holes are aligned correctly.

2. Be sure to use the correct screw [C] (M4 x 6) to attach the developer supply funnel. If a screw longer than screw [C] is used, the development paddle will be damaged by the longer screw.
3. When installing the developer supply funnel, take care not to misalign the sponge [E] or developer may spill out.
4. Hold the developer supply funnel in position when tightening the screw. This is to prevent the screw holes from misaligning.
5. **Never overtighten the screw** [C]. If the screw is overtightened, the development unit's screw hole (made of aluminum) may be damaged and the **entire development unit may need to be replaced**.



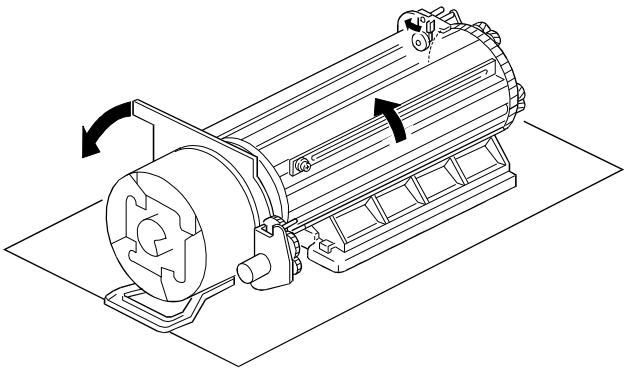
Development unit placement position

A166R565.wmf



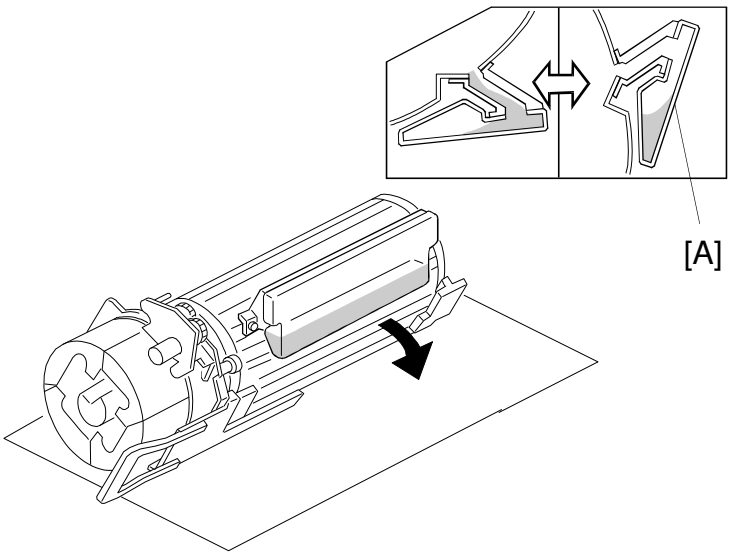
A166R567.wmf

13. Place the development unit in the **development unit placement position**, as shown.
14. Release the development revolver stay [A] and turn the revolver [B] 90 degrees, as shown.
15. Attach the development roller rotation handle [C] to the development roller gear [D]



Development unit placement position

A166R568.wmf

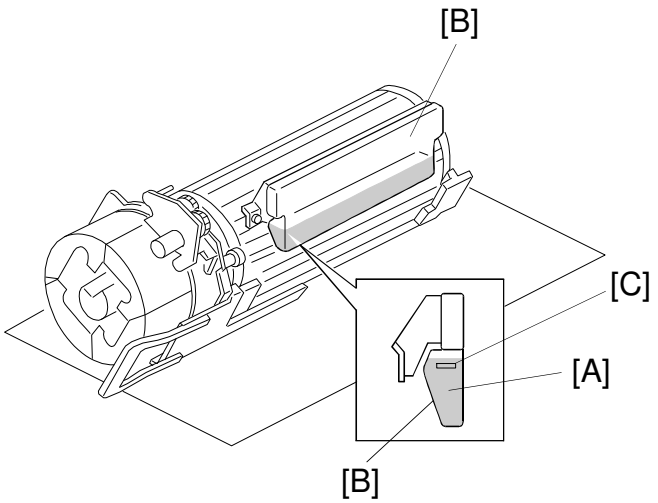


Developer installation position

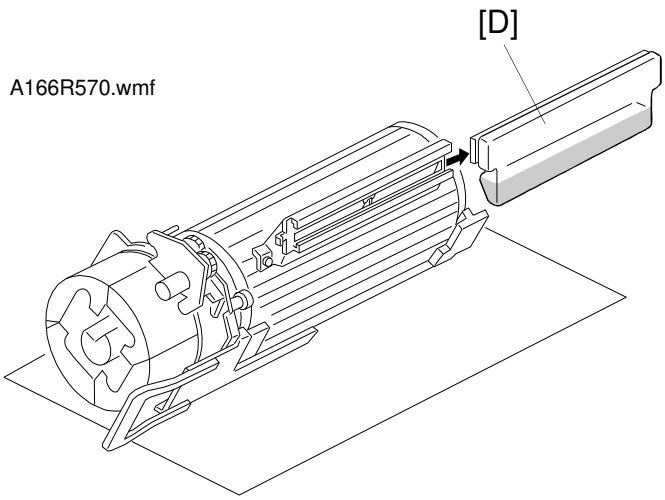
A166R569.lwmf

16. Do the following a few times to get the developer out of the unit.

    Rotate the development roller gear with the development roller rotation handle. Then rotate the revolver into the developer installation position, as shown. The developer will settle in the developer collection bottle/supply funnel ass'y [A]. Then return it to the development unit placement position.

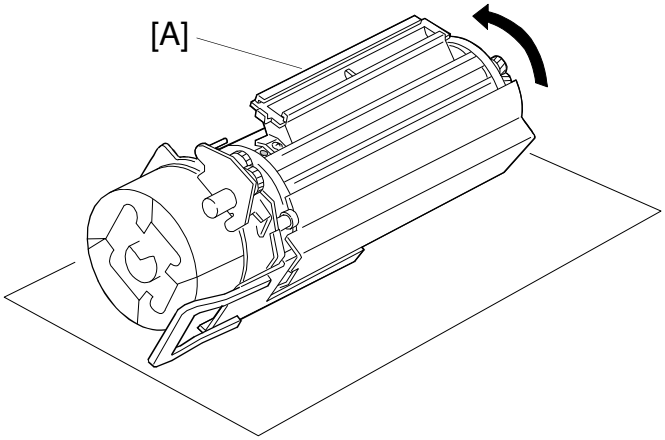


A166R570.wmf

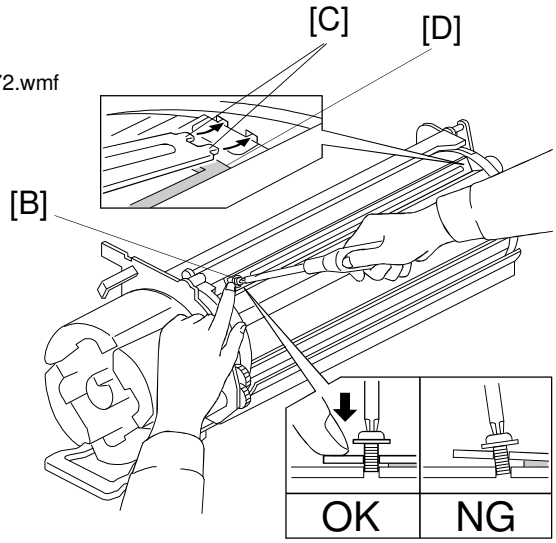


A166R571.wmf

17. Place the development unit in the **development unit installation position** and check the amount of used developer [A] in the developer collection bottle/supply funnel ass'y [B].
18. If the used developer has reached the fill line [C] the developer must be emptied. If the developer has not reached the fill line, return the development unit to the **development unit placement position** and continue to collect the developer.
19. Place the development unit in the **development unit installation position**. Remove the developer collection bottle/supply funnel ass'y [D], and put it in a developer collection bag.
20. With the development unit in the **development unit installation position**, turn the revolver counterclockwise (as viewed from the hopper) and supply new developer of the same color as the collected developer (see chapter 3. COPIER INSTALLATION PROCEDURE).



A166R572.wmf



A166R573.wmf

21. Remove the developer supply funnel [A] and mount the developer cover (1 screw).

NOTE: 1. Before reinstalling the developer cover, clean any developer spills on the sponge seal around the opening with a vacuum cleaner. If any developer remains on the sponge seal, a gap may be eroded in the sponge by the spilt developer. Toner and developer may then leak through this gap.

2. When installing the developer cover, take care not to misalign the sponge [D] or developer may spill out.

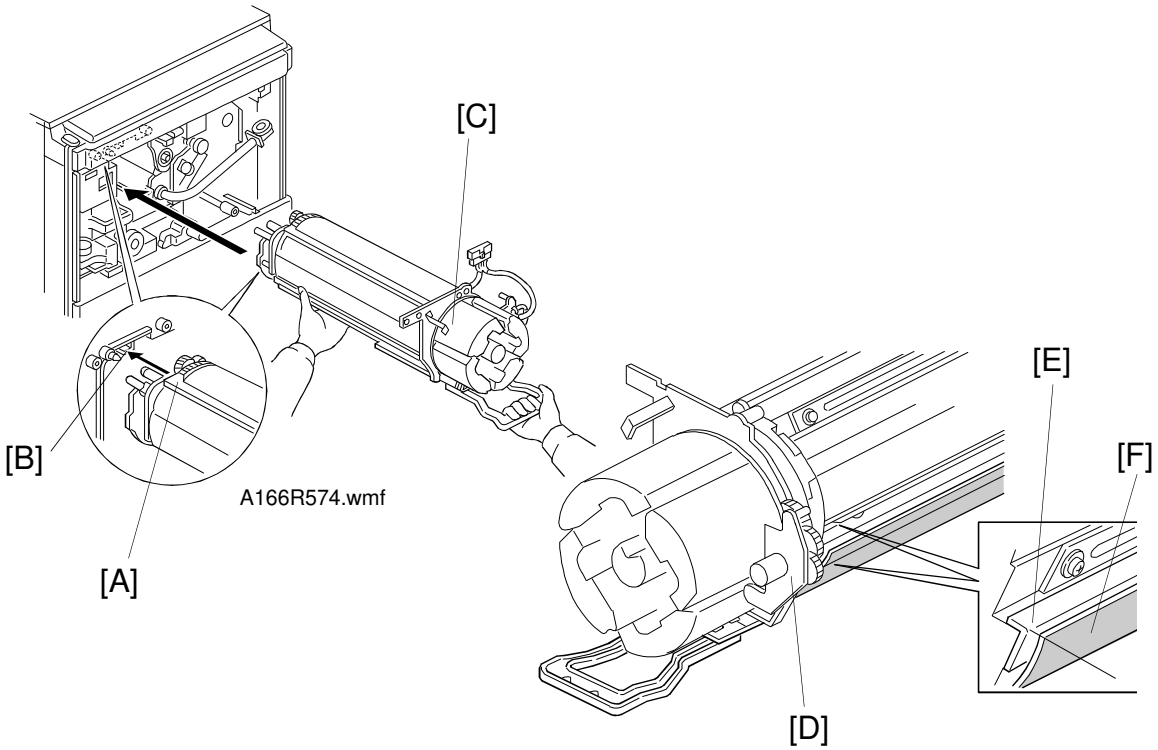
3. Before tightening the screw [B], ensure the two tabs [C] are completely inserted into the slots and the screw holes are aligned correctly.

4. Be sure to use the correct screw [B] (M4 x 6) to attach the developer cover. If a screw longer than screw [B] is used, the development paddle will be damaged by the longer screw.

4. Hold the developer cover in position when tightening the screw. This is to prevent the screw holes from misaligning.
5. **Never overtighten the screw** [B]. If the screw is overtightened, the development unit's screw hole (made of aluminum) may be damaged and the **entire development unit may need to be replaced**.

22. Return the development unit to the **development unit placement position** and turn the revolver to the next color.

23. For each remaining color, repeat steps (11) through (22).



A166R574.wmf

A166R575.wmf

24. Hold the development unit as shown above. Align the guide [A] with the guide rail [B]. Then insert the development unit halfway.

    NOTE: Never hold the hopper part [C] of the development unit when installing the unit. Otherwise the hopper part will be broken or the doctor gap of the development rollers will become uneven.

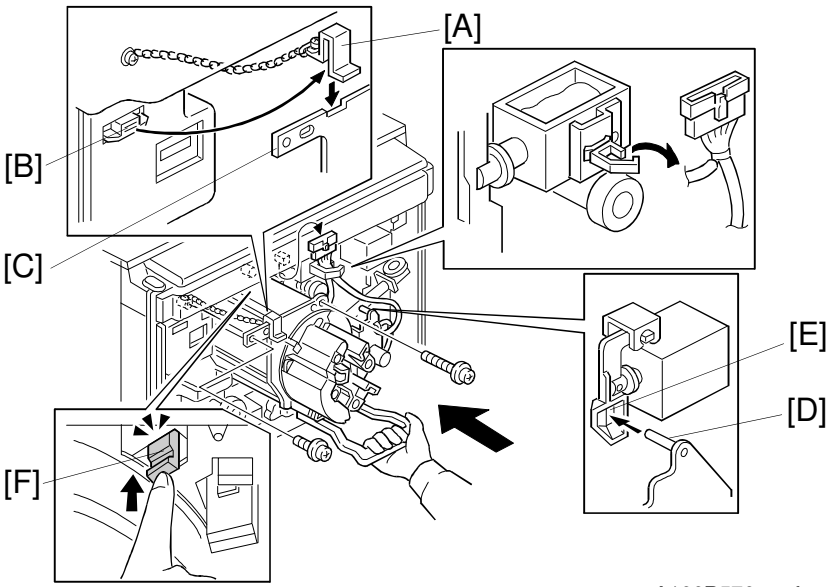
⚠ CAUTION:

Be careful not to hurt your back when holding the development unit. Also, be careful not to drop the development unit. The development unit weighs about 12 kg (26 lb).

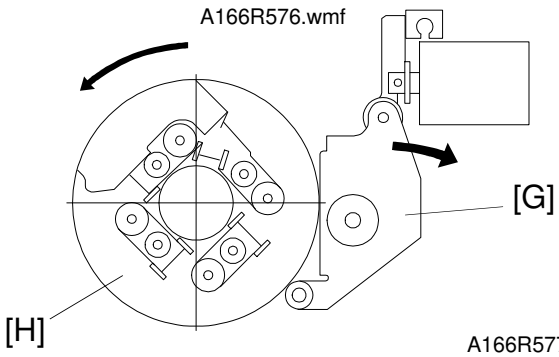
25. Rotate the revolver while releasing the toner supply motor unit [D] until the the development unit bend plate [E] aligns with the toner saucer edge [F].

    NOTE: The above step ensures the development unit is not misaligned during installation. If misaligned, the development roller drive gear (located on the copier back side plate) could block the full insertion of the unit by coming in contact with the development roller gear.

    If this occurs, the revolver drive gear and the development roller gear may accidentally mesh. The development roller gear may then be driven in reverse. This could lead to toner spilling inside the machine.



A166R576.wmf



A166R577.wmf

26. Remove the chain hook [A] from the magnet catch [B], and hook it on the frame [C], as shown.

27. Slowly insert the development unit completely into the copier while making sure that the chain is not caught by the development unit. Then secure the development unit to the copier front frame (1 connector, 1 harness clamp, 1 short screw, and 1 long screw).

    NOTE: When inserting the development unit into the copier, be sure to check that the toner supply motor pin [D] is aligned with the opening [E] in the toner supply solenoid plunger mechanism. Also ensure the shield glass plate [F] is inserted completely.

28. Remove the development unit handle from the development unit.

29. Rotate the revolver counterclockwise while keeping the toner supply motor unit [G] away from the revolver [H]. The revolver stopper should stop the revolver with a click at each development position. If not, the development roller drive gear and the development roller gear did not mesh properly. Reinsert the development unit.

    NOTE: After replacing the developer, be sure to perform the "Process Control Self Check" procedure on the following page.

6.2 PROCESS CONTROL SELF-CHECK

After replacing developer, the development unit (containing new black, cyan, magenta and yellow developers) or the photoconductor drum, do the SP modes listed in the SP Modes After Replacing and Cleaning table in section 5, Maintenance.

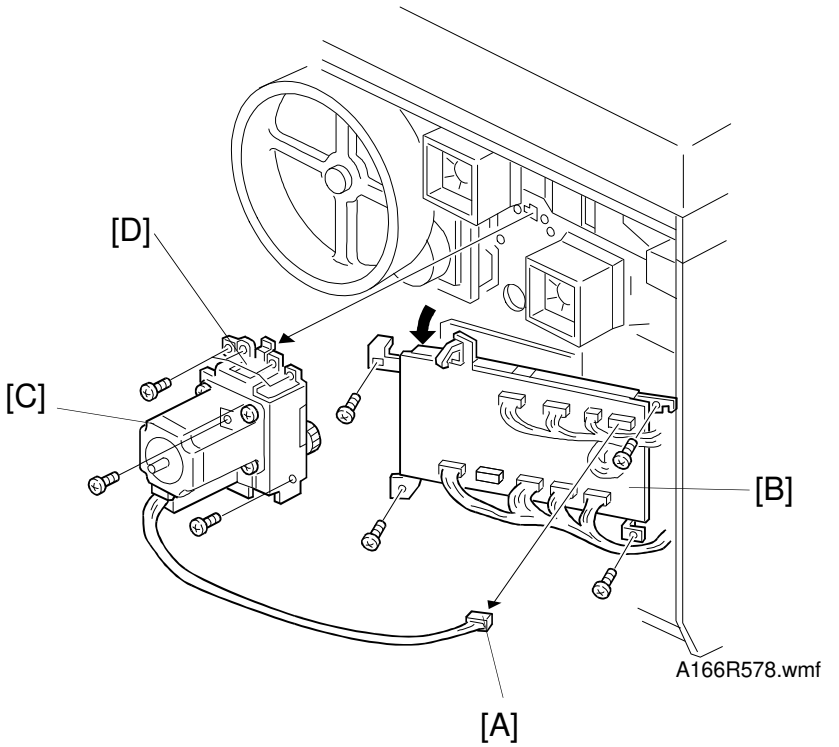
⚠ CAUTION

While performing the process control self-check, do not touch the drum shaft, knob screw, or flywheel. A high voltage of -800V is applied during potential sensor correction. Therefore, there is a risk of severe electric shock if these parts are touched.

NOTE: When agitating the developers, use the SP mode that suits on the color of the developers that were replaced, as follows:

1) When all developers (black, cyan, magenta, and yellow) were replaced:
   SP2-225-5 (Developer Aging: All Colors)
2) When only black developer was replaced:
   SP2-225-1 (Developer Aging: Bk)
3) When cyan, magenta, and yellow developers were replaced:
   SP2-225-6 (Developer Aging: C, M, Y)
4) When only cyan developer was replaced:
   SP2-225-2 (Developer Aging: C)
5) When only magenta developer was replaced:
   SP2-225-3 (Developer Aging: M)
6) When only yellow developer was replaced:
   SP2-225-4 (Developer Aging: Y)

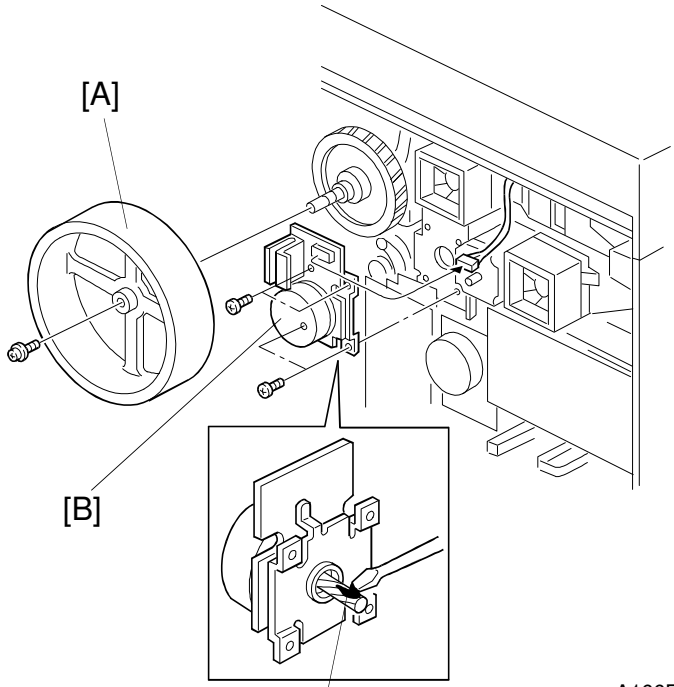
6.3 REVOLVER MOTOR REPLACEMENT



1. Remove the rear cover.
2. Disconnect the connector No. 307 [A] from I/O control board 2 [B].
3. Remove I/O control board 2 [B] (4 screws).
4. Remove the revolver motor [C] and the revolver motor bracket [D] as a unit (6 screws).

   NOTE: Do not remove the revolver motor from the revolver motor bracket.
5. Install a new revolver motor by the reverse procedure of its removal.

6.4 DEVELOPMENT MOTOR REPLACEMENT



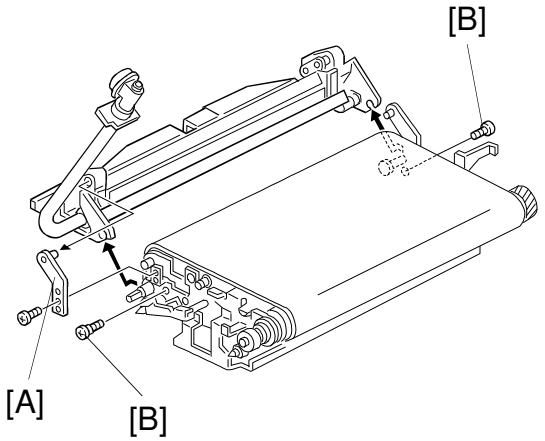
1. Remove the rear cover.
2. Remove the flywheel [A] (1 screw).
3. Disconnect the connector from the development motor control board.
4. Remove the development motor [B] (4 screws).

   NOTE: After replacing the development motor, apply silicone grease G-40M (A0089502) to the development motor shaft gear.
5. Install a new development motor by the reverse procedure of its removal.

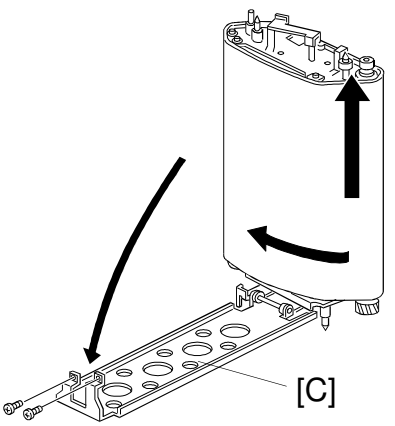
7. TRANSFER BELT UNIT

7.1 TRANSFER BELT SECTION

7.1.1 Transfer Belt



A166R580.wmf



A166R581.wmf

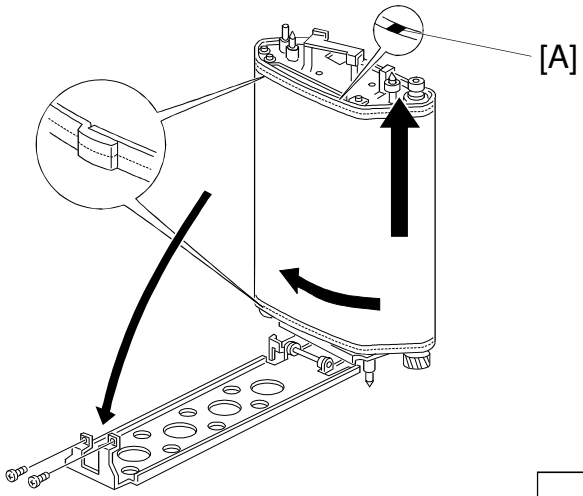
1. Remove the transfer belt unit (see section 3. INSTALLATION PROCEDURE).
2. Remove the cleaning unit bracket [A] (1 screw).
3. Remove the cleaning unit.

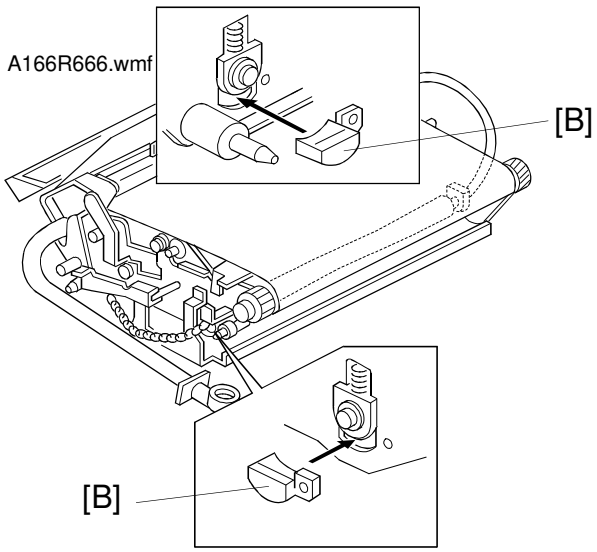
   NOTE: Keep the cleaning unit level to prevent toner spillage.

3. Remove the belt tension screws [B].
4. Lift up the transfer belt unit by the chain. Detach the upper part of the transfer belt bracket [C] (2 screws). Lower the bracket, as shown.
5. Pull and turn the belt to remove it, as shown.

   NOTE: 1) During transfer belt removal, hold the belt by the edge. Do not touch the belt surface or the belt may become stained causing poor copy quality.

   2) After removing the transfer belt, clean each roller with water or alcohol. When using alcohol, set the rollers aside for about 10 minutes to dry. If alcohol remains on the rollers when the belt is replaced, the rollers may adhere to the belt.





A166R583.wmf

6. Replace the transfer belt and reset the transfer belt bracket.

   NOTE: 1) When installing a new transfer belt, make sure that white mark [A] on the edge of the belt is at the upper side.
   2) When installing a new transfer belt, make sure that both belt lips are placed over each roller edge.

7. Place the transfer belt release wedges [A] between the belt tension roller and the transfer belt unit, as shown.

   NOTE: These wedges should have been retained at copier installation.

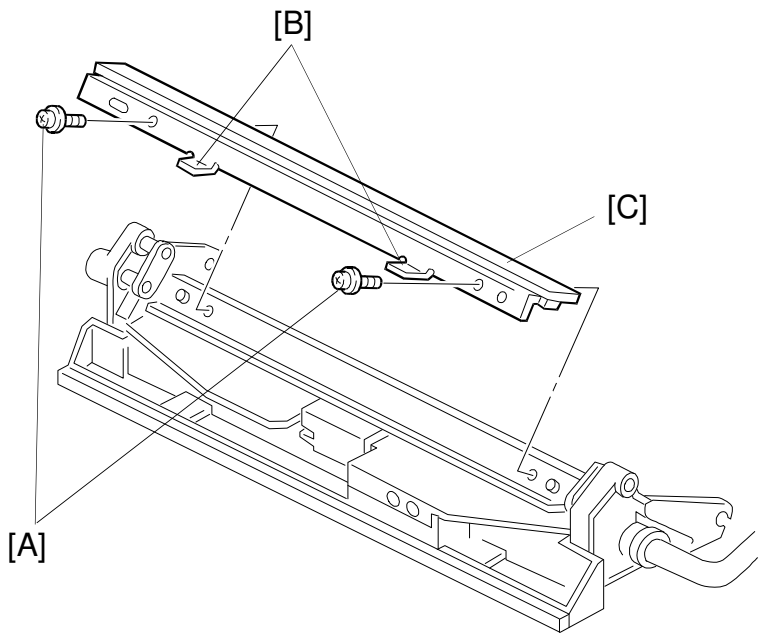
8. Then reinstall the belt tension screws and remove the transfer belt release wedges.

9. After the reinstallation, enter the SP mode and execute SP2-311, Forced Belt Cleaning.

7.2 CLEANING UNIT

NOTE: Take care not to dirty the customer site. Lay a floor mat before removing the cleaning unit.

7.2.1 Cleaning Blade Replacement

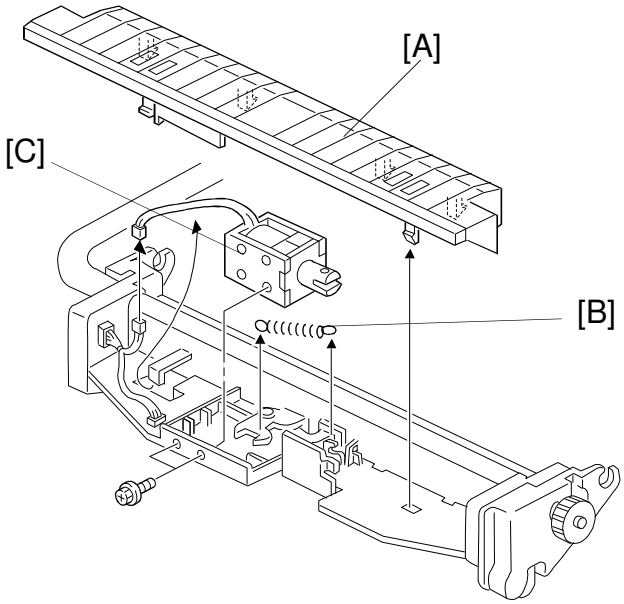


A166R584.wmf

1. Remove the 2 screws [A].
2. Pull the handles [B] to remove the cleaning blade.

NOTE: Do not touch the rubber area [C].

7.2.2 Belt Cleaning Solenoid Replacement

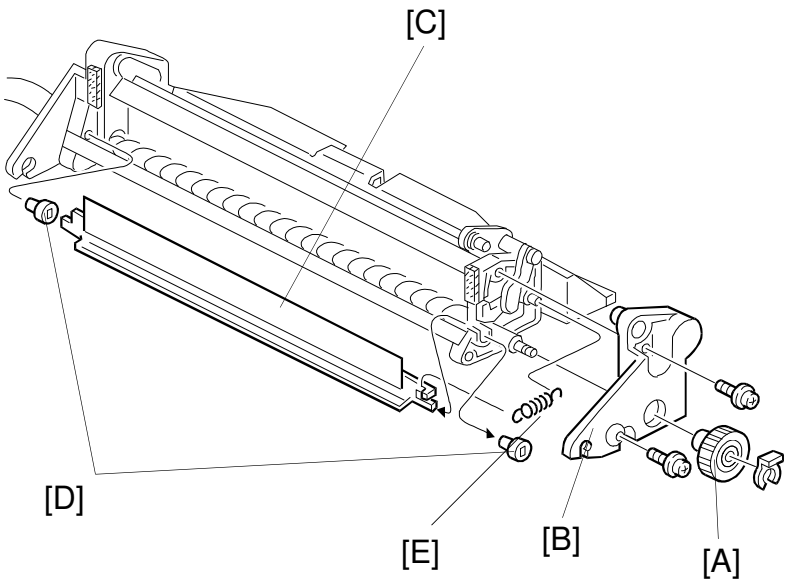


A166R585.wmf

1. Remove the cleaning unit bottom cover [A] (6 latches).
2. Remove the spring [B] (1 spring).
3. Remove the belt cleaning solenoid [C] (2 screws and 1 connector).

NOTE: When turning the cleaning unit upside-down, be careful of the toner that will spill out.

7.2.3 Entrance Seal Replacement

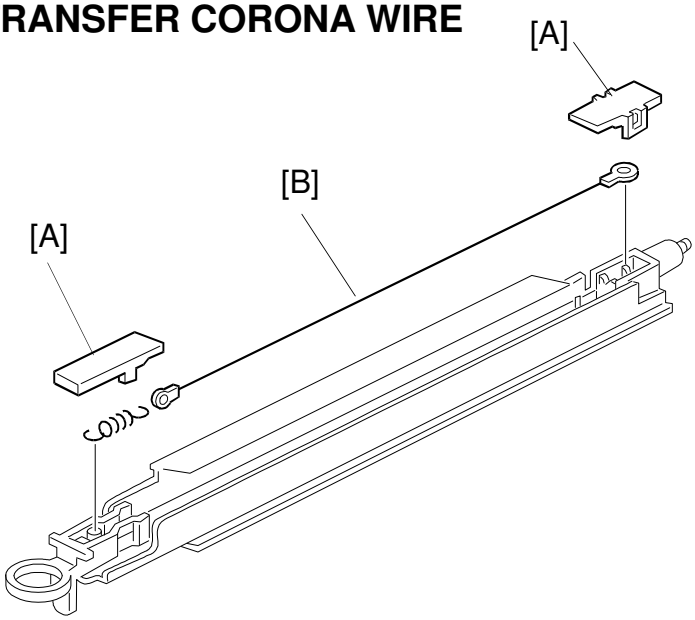


A166R586.wmf

1. Remove the rear gear from the cleaning unit [A] (1 snap-ring).
2. Remove the rear plastic side plate [B] (2 screws).
3. Remove the cleaning entrance seal unit [C] and spring [E].
4. Remove the cleaning entrance seal bearings [D] at the both ends of the unit (2 bearings).

NOTE: When installing a new cleaning entrance seal, make sure that it has not been deformed.

7.3 BELT TRANSFER CORONA WIRE



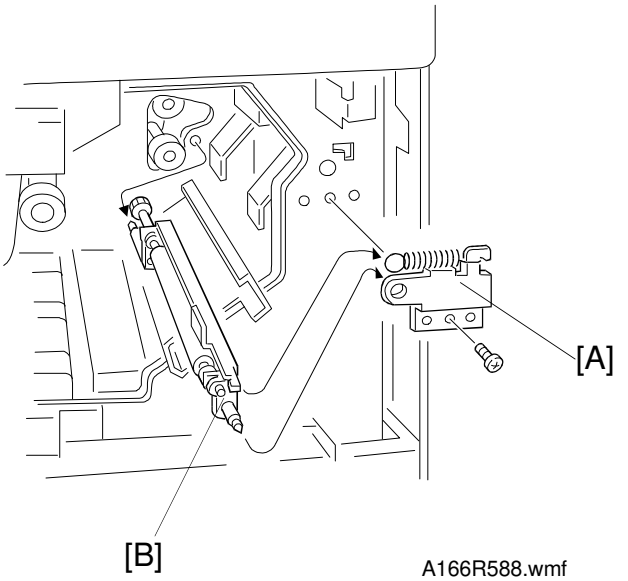
A166R587.wmf

1. Remove the corona unit from the transfer belt unit (see section 3. COPIER INSTALLATION PROCEDURE).
2. Remove the front and rear end block caps [A].
3. Remove the corona wire [B] (1 spring).

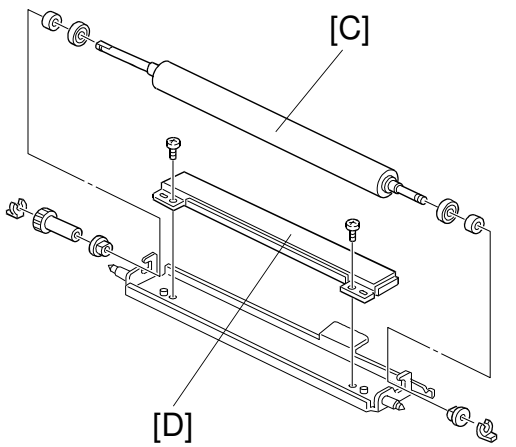
NOTE: 1. When cleaning or replacing the corona wire, take care not to deform the mylar on the corona unit.
2. Make sure the corona wire is properly set in the V-gutter of both blocks.

7.4 LUBRICANT UNIT

7.4.1 Lubricant Brush and Bar Replacement



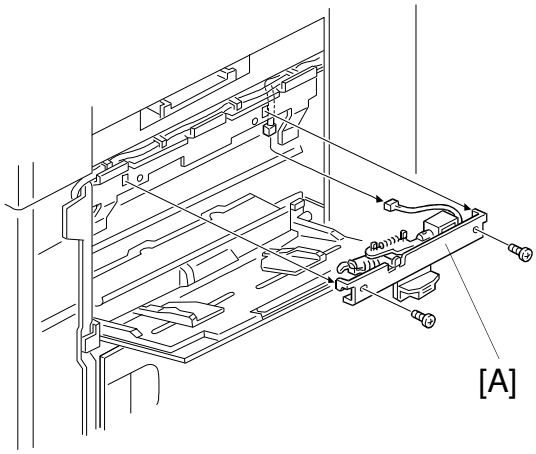
A166R588.wmf

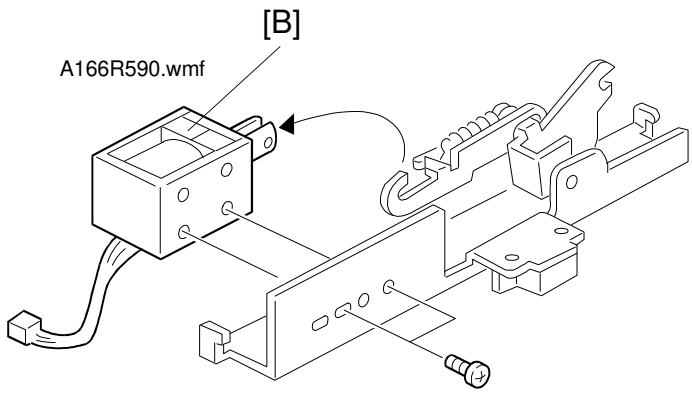


A166R589.wmf

1. Remove the bracket [A] (1 spring and 1 screw).
2. Remove the lubricant unit [B].
3. Remove the lubricant brush [C] (2 snap-rings).
4. Remove the lubricant bar [D] (2 screws).

7.4.2 Lubricant Solenoid Replacement

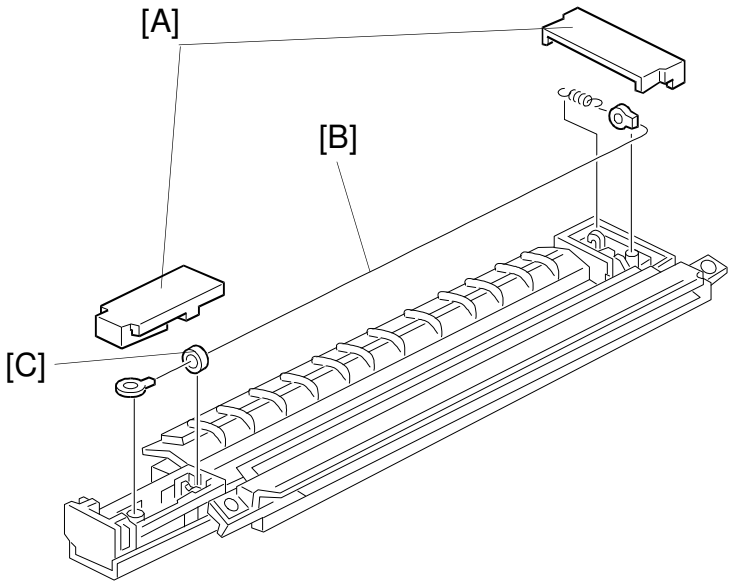




A166R591.wmf

1. Remove the right front cover and the right cover (see procedure 1.7).
2. Remove the lubricant solenoid bracket [A] (2 screws and 1 connector).
3. Remove the lubricant solenoid [B] (2 screws).

7.5 PAPER TRANSFER CORONA WIRE



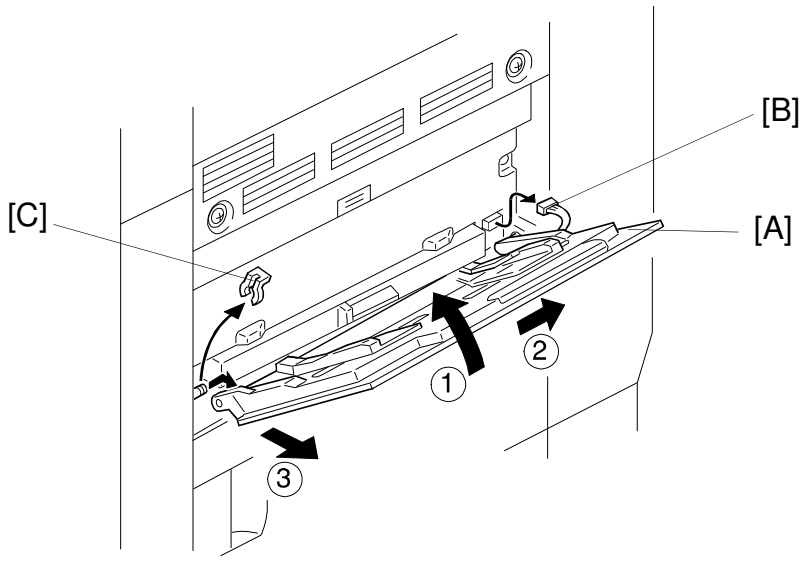
A166R592.wmf

1. Remove the paper transfer corona unit (see section 3. COPIER INSTALLATION PROCEDURE).
2. Remove the end blocks [A].
3. Remove the corona wire [B].

NOTE: 1) During replacement, ensure the corona wire is threaded correctly in the rear slot.
2) When replacing the corona wire, be sure to put the vibration-isolating ring [C] between the slot and the end block, as shown.

8. PAPER FEED AND REGISTRATION

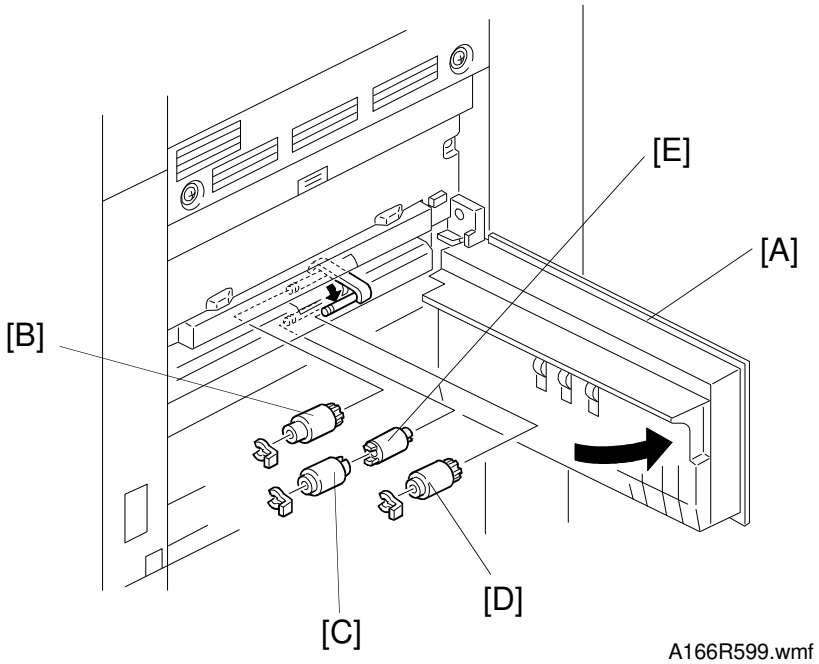
8.1 BY-PASS FEED TABLE REMOVAL



A166r598.wmf

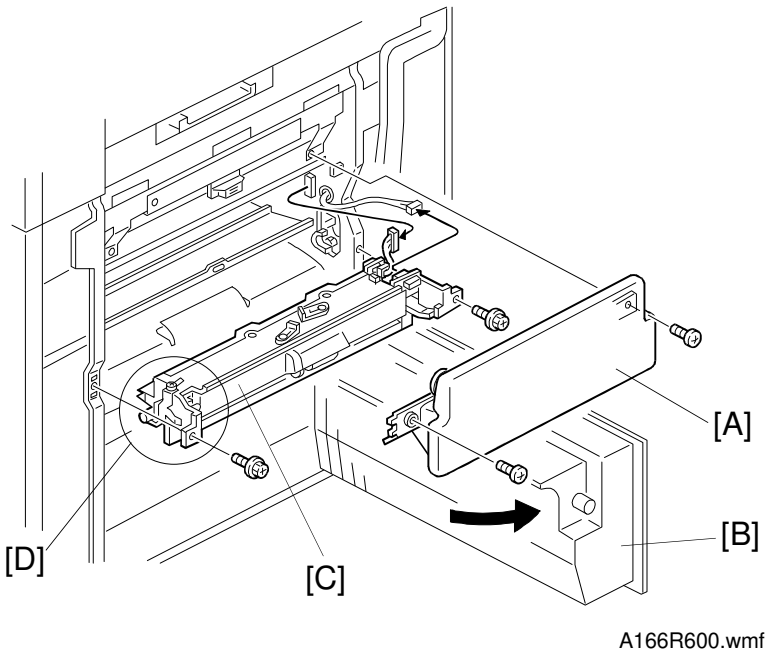
1. Open the by-pass feed table [A].
2. Disconnect the connector [B].
3. Remove the snap ring [C].
4. Raise the by-pass feed table almost vertically ① and push it toward the rear of the copier ② to remove it ③, as shown.

8.2 BY-PASS FEED ROLLER, PICK-UP ROLLER, AND SEPARATION ROLLER REPLACEMENT



1. Remove the by-pass feed table (see procedure 8.1).
2. Open the vertical transport door [A].
3. Remove the snap-rings from the feed roller [B], separation roller [C] and pick-up roller [D]. Replace the rollers and the torque limiter [E].

8.3 BY-PASS FEED UNIT REPLACEMENT

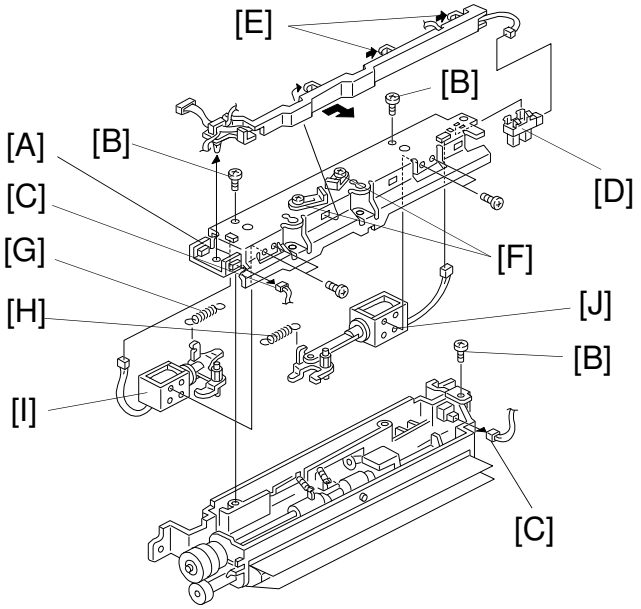


A166R600.wmf

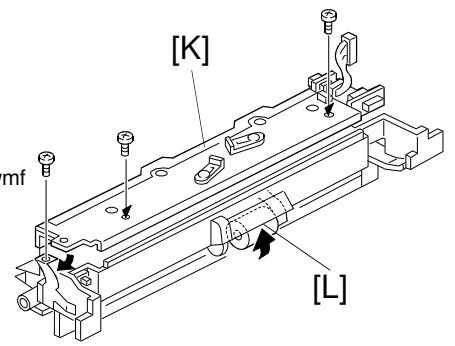
1. Remove the right cover, the right rear cover, and the right front cover (see procedure 1.7).
2. Remove the by-pass feed table (see procedure 8.1).
3. Remove the developer collection bottle/supply funnel ass'y [A] from its storage position (1 screw).
4. Open the vertical transport door [B].
5. To remove the by-pass feed unit [C]
   1) Remove the 2 connectors and 2 screws.
   2) Carefully remove the front end [D] of the by-pass feed unit and slowly pull it free.
   3) Gently twist the by-pass feed unit and completely remove it.

NOTE: While removing the by-pass feed unit, take care not to damage the gears at the rear end of the unit.

8.4 BY-PASS FEED PICK-UP SOLENOIDS AND END SENSOR REPLACEMENT



A166R601.wmf



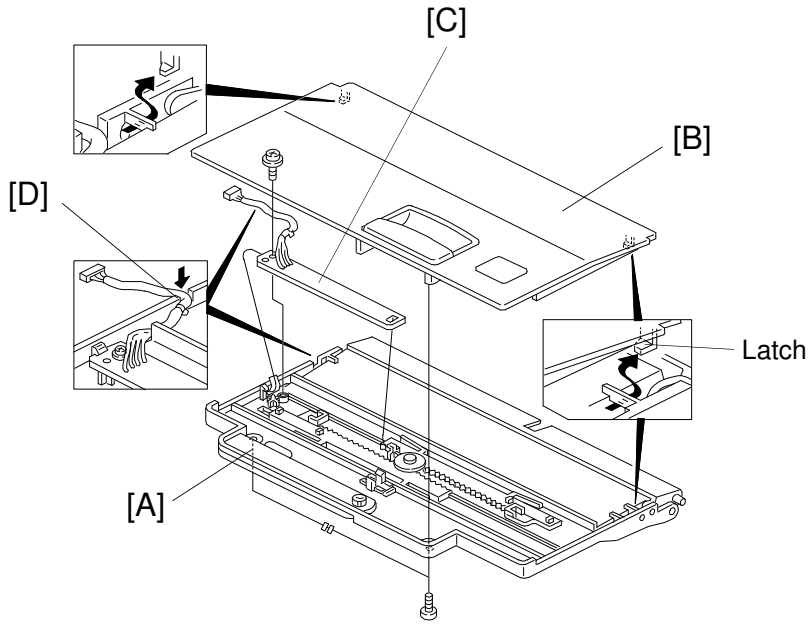
A166R656.wmf

1. Remove the by-pass feed unit. (see procedure 8.3.)
2. Remove the upper part of the by-pass feed unit [A] (3 screws [B] and 2 connectors [C]).
3. Replace the paper end sensor [D] (1 connector).
4. Remove the harness guide [E].
5. Loosen the screws [F], remove the bracket from the hook, and remove the springs [G] and [H].

   NOTE: Take care not to confuse the main and sub pick-up solenoid springs, which have different tensions. Spring [G] has a stronger tension than spring [H].
6. Remove and replace the main pick-up solenoid [I] and sub pick-up solenoid [J] (4 screws, 2 springs, and 2 connectors).

   NOTE: When installing the upper part [K] of the by-pass feed unit, lift the pick-up roller [L].

8.5 BY-PASS FEED PAPER SIZE SENSOR REPLACEMENT

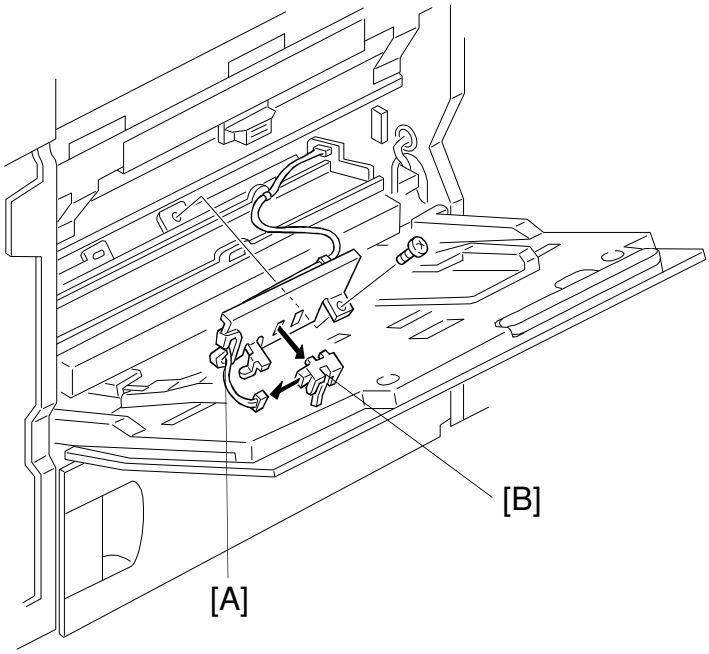


A166R602.wmf

1. Remove the by-pass feed table (see procedure 8.1).
2. Remove the by-pass feed table base [A] (2 screws).
3. Move the by-pass feed table cover [B] to the right (this releases the latch) Remove it from the by-pass feed table base.
4. Replace the by-pass paper width detection board [C] (1 screw).

NOTE: 1) When installing the by-pass paper width detection board, take care not to bend the terminal plate.
2) When routing the sensor harness, ensure that it is not caught between the screw and the by-pass feed table cover. Run the harness through the notch [D] in the by-pass feed table base.

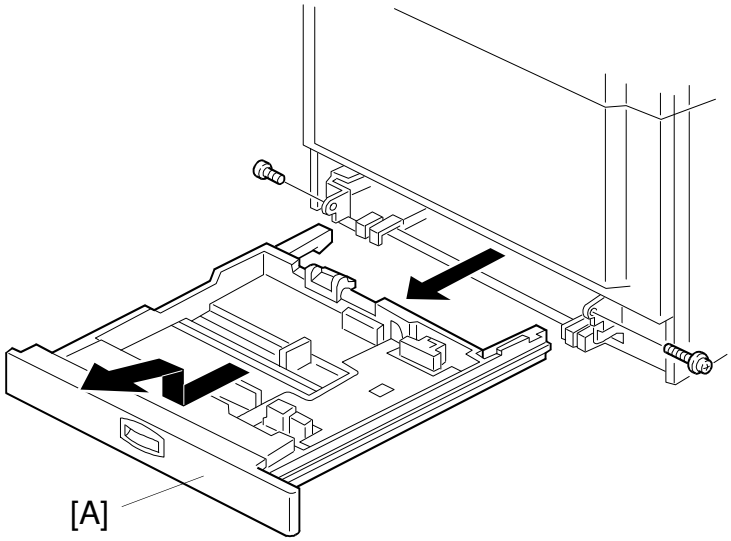
8.6 REGISTRATION SENSOR REPLACEMENT



A166R603.wmf

1. Remove the right front cover and the right cover (see procedure 1.7).
2. Remove the developer collection bottle (see procedure 6.6.1).
3. Remove the registration sensor bracket [A] (1 screw).
4. Replace the registration sensor [B] (1 connector).

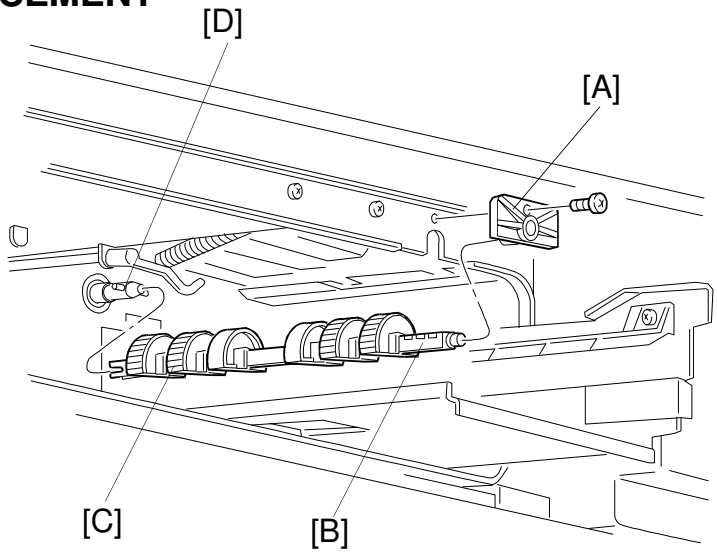
8.7 PAPER FEED TRAY REMOVAL



A166R604.wmf

1. Open the paper feed tray [A]
2. Lift and remove the paper feed tray (2 screws).

8.8 PAPER FEED ROLLER (SEMICIRCULAR ROLLER) REPLACEMENT

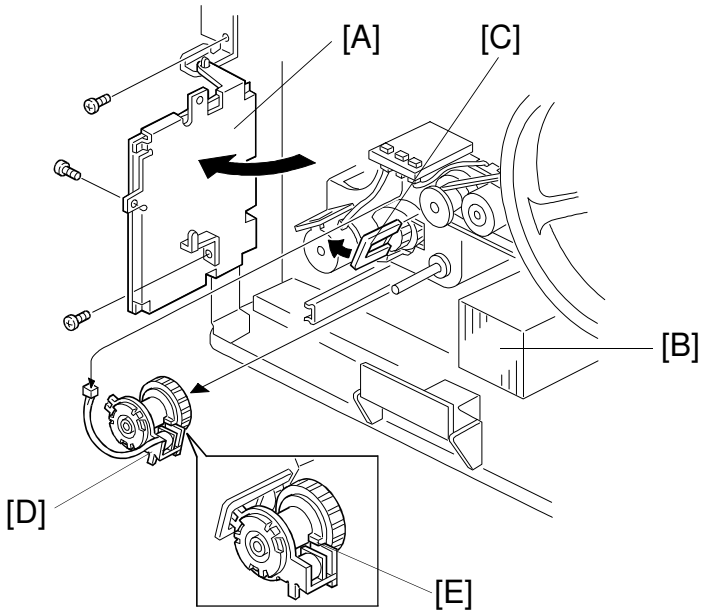


A166R605.wmf

1. Remove the front cover, the inner cover, and the used toner tank (see procedures 1.2, 1.9 and 1.10).
2. Remove the paper feed tray (see procedure 8.7).
3. Remove the paper feed roller shaft holder [A] (1 screw).
4. Pull out the paper feed roller shaft [B].
5. Replace the 4 paper feed rollers [C].

NOTE: 1) Do not touch the paper feed rollers directly. This is to avoid staining the roller's surface with skin oils.
2) Be sure to orient the paper feed rollers correctly. Otherwise the rollers will not align with the holes on the shaft.
3) The middle two rollers are made of plastic. Handle them with care.
4) Ensure the pin [D] fits properly into the notch at the end of the paper feed roller shaft. Install the paper feed roller shaft with the flat side of the rollers facing down.
5) The paper feed roller shaft has three paper feed roller mounting holes for each roller. The middle mounting hole is the normal (factory) setting; the first for A size paper, and the third for B size paper. The holes for A and B sizes can be used as alternate holes when a paper jam occurs.
For example, the B size hole is used for DLT Jams.

8.9 PAPER FEED CLUTCH REPLACEMENT

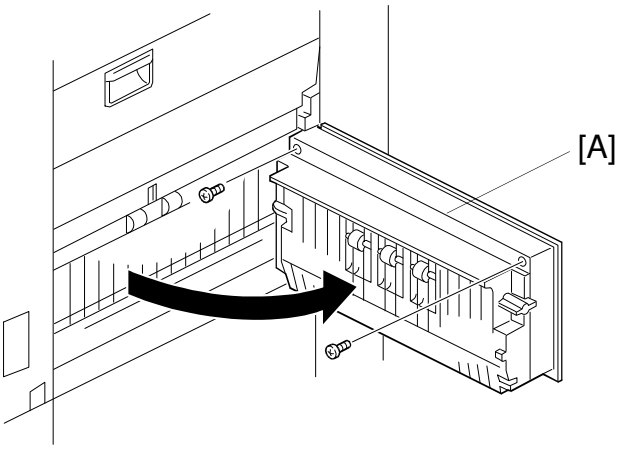


A166R607.wmf

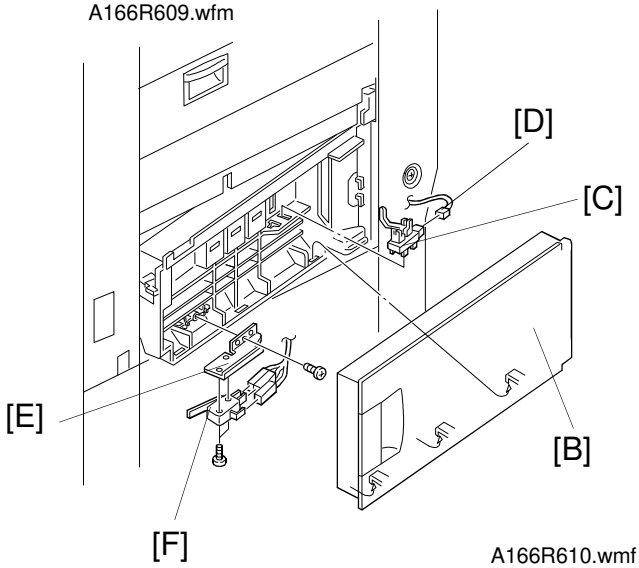
1. Remove the rear cover (see procedure 1.3).
2. Swing out the I/O control board [A] (3 screws).
3. Remove the rear transfer fan [B] (1 screw).
4. Remove the connector and the rotation stopper [C] and replace the paper feed clutch [D].

   NOTE: Install the paper feed clutch so that the lug [E] on the clutch is positioned as shown. Pull out the paper feed tray and ensure the flat side of the feed roller faces down.

8.10 VERTICAL TRANSPORT SWITCH AND SENSOR REPLACEMENT



A166R609.wfm



A166R610.wmf

1. Open the vertical transport door [A].
2. Remove the vertical transport cover [B] (2 screws).
3. Replace the vertical transport sensor [C] (1 connector [D]).
4. Remove the vertical transport switch bracket [E] (1 screw).
5. Replace the vertical transport switch [F] (1 connector and 2 screws).

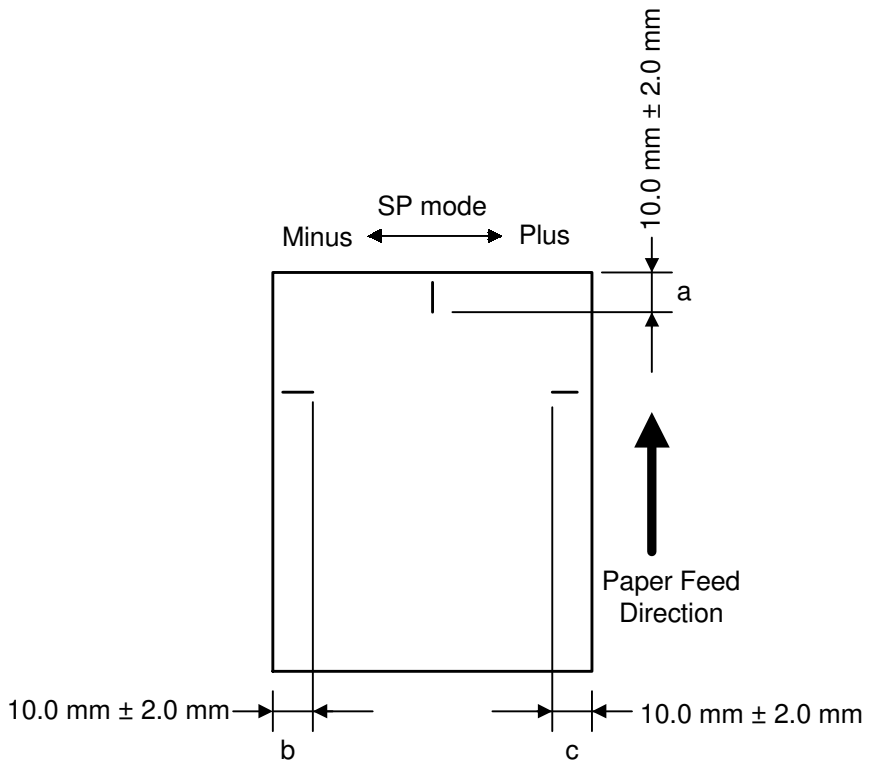
8.11 COPY IMAGE AREA ADJUSTMENT

The leading edge margin can be adjusted for both normal paper and OHP/thick paper. This can be done in the SP mode for both paper types.

The right and left edge margins can also be adjusted for both paper types. This can be done with the side to side registration adjustment SP mode for each paper feed station.

To get within the required adjustment range of 10 ±2 mm , the leading edge margin should be adjusted to 5±2 mm and the right and left edge margins should be adjusted to 2±2 mm each (for a total margin of 4 mm or less). The adjustment procedure is described below.

1. Place the type paper for which you want to perform the registration adjustment on the paper feed tray.
2. Enter the SP mode and ensure that the value of SP2-101-1 is 4.0.
3. Select the registration test pattern (SP5-955-25).
4. Press the Interrupt key to it the SP mode screen. Select the monochrome mode and the copier paper feed tray and press the Start key to output the registration test pattern. Press the Interrupt key again to return to the SP mode screen.
5. Select the leading edge registration adjustment for normal paper (SP1-1-1) or for OHP/thick paper (SP1-1-2) to adjust the width of the leading edge margin. To specify a negative value, press the program key to display the minus sign (–). Adjust distance "a" (as shown on the following page) from the paper leading edge to 10 mm ±2 mm.
6. Perform the side to side registration adjustment.
   1) Enter the side to side registration adjustment SP mode.
      - Side to Side Registration: By-Pass Feed Table (SP1-2-1)
      - Side to Side Registration: Copier Paper Feed Tray (SP1-2-2)
      - Side to Side Registration: 1st Bank Tray (SP1-2-3)
      - Side to Side Registration: 2nd Bank Tray (SP1-2-4)
      - Side to Side Registration: 3rd Bank Tray (SP1-2-5)
   2) Press the Interrupt key to it the SP mode screen. Select the monochrome mode and the paper feed tray for which you want to perform the registration adjustment. Press the Start key to output the registration test pattern. Press the Interrupt key again to return to the SP mode screen.
   3) Adjust distance "b" from the paper left edge to 10 mm ±2 mm (as shown on the following page).



A166R611.wmf

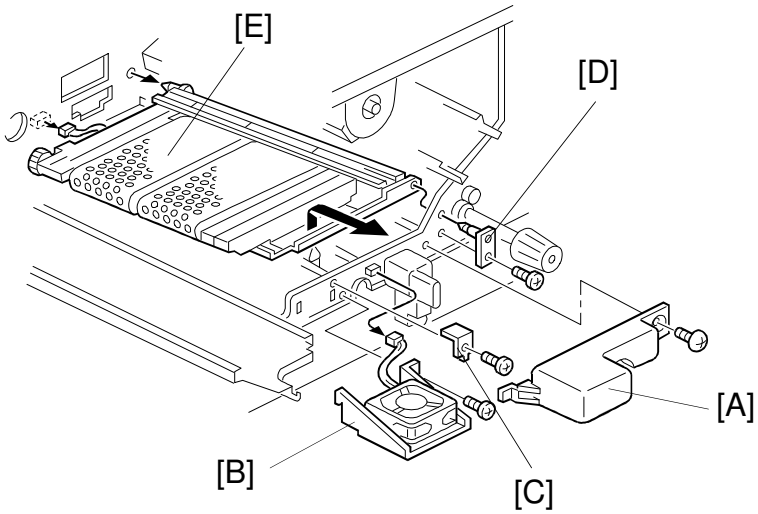
	Standard margins	Required registration pattern adjustment range
Leading edge margin	5 ± 2 mm	a must be 10 ± 2 mm
Right and left edge margins	2 ± 2 mm (Total margin: 4 mm or less)	b must be 10 ± 2 mm c must be 10 ± 2 mm

7. Copy a two-sided original and check that distance "c" from the paper's right edge is 10 mm ±2 mm (as shown above).
   - Side to Side Registration: Dupl (SP1-2-6)

   NOTE: After the registration adjustment, reset the value of SP5-955 to "0" to resume normal copy operation.

9. PAPER TRANSPORT AND FUSING

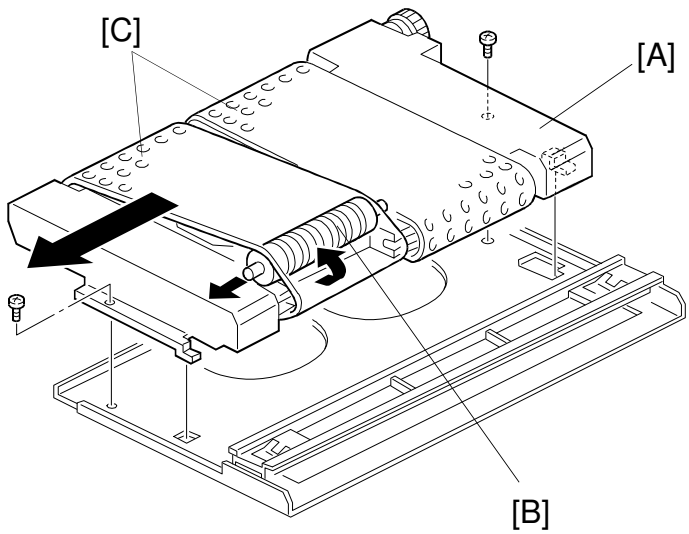
9.1 TRANSPORT UNIT REMOVAL



A166R612.wmf

1. Remove the transfer belt unit (see procedure 7.1).
2. Remove the fusing unit (see procedure 9.3).
3. Remove the inlet fan cover [A] (1 screw).
4. Remove the development inlet fan [B] (1 connector and 1 screw).
5. Remove the transport tank positioning plate [C] (1 screw).
6. Remove the support plate [D] (1 screw).
7. Remove the transport unit [E] (1 connector).

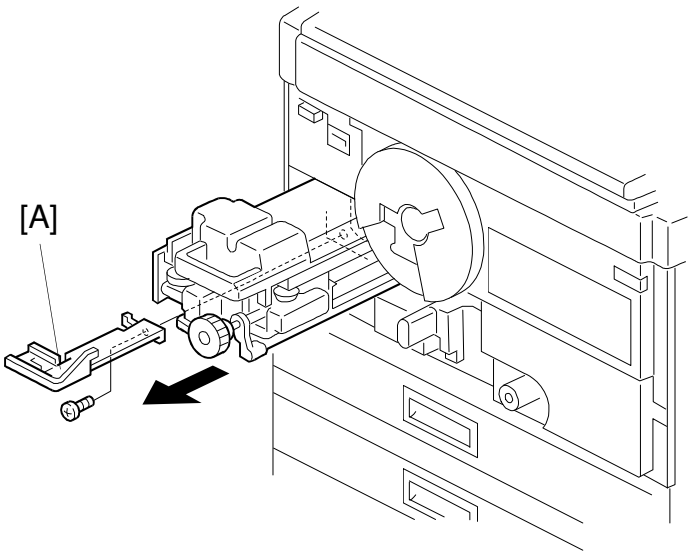
9.2 TRANSPORT BELT REMOVAL



A166R613.wmf

1. Remove the transport unit (see procedure 9.1).
2. Remove the transport assembly [A] (2 screws).
3. Remove the transport belt roller [B].
4. Replace the transport belt [C].

9.3 FUSING UNIT REMOVAL



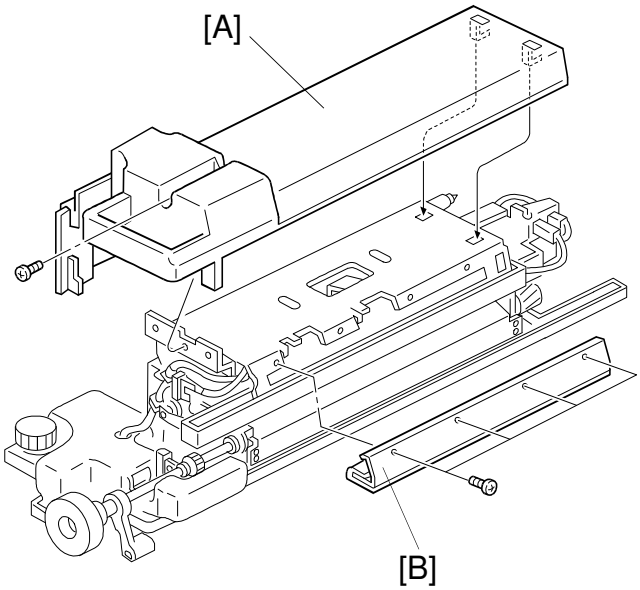
A166R614.wmf

⚠ CAUTION

1. **Be careful when handling the fusing unit. It is hot.**
2. **Take care not to spill silicone oil on the floor. If silicone oil spills on the floor, immediately clean it off with a silicone oil remover. Silicone oil is very slippery and can cause someone to fall.**

1. Remove the front cover (see procedure 1.2).
2. Remove the fusing unit stopper [A] (1 screw).
3. Hold the bottom of the fusing unit and pull it out.

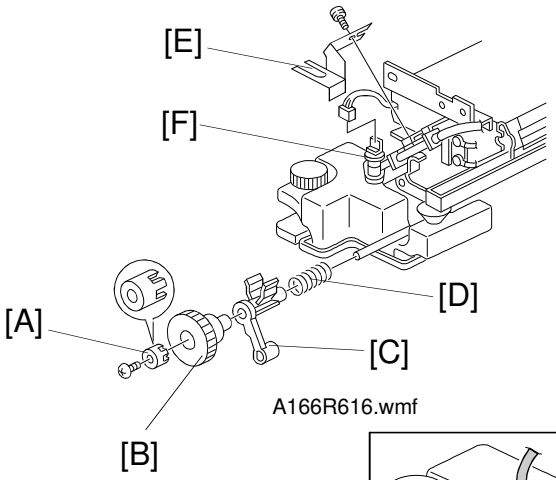
9.4 OIL SUPPLY PAD REPLACEMENT



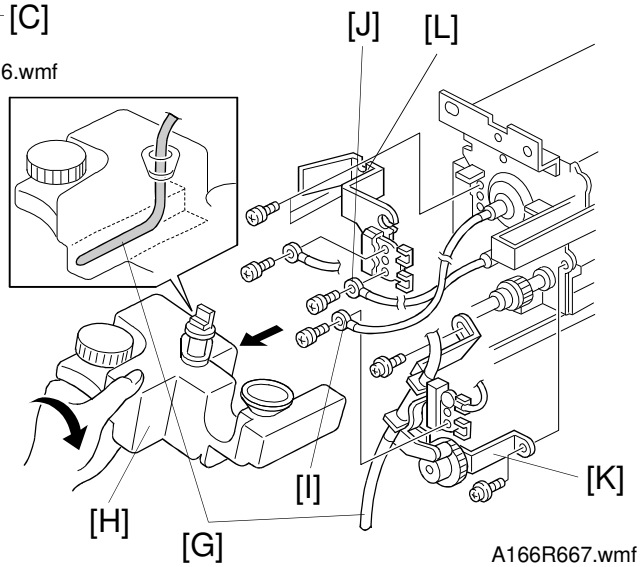
A166R615.wmf

1. Remove the fusing unit (see procedure 9.3)
2. Remove the fusing unit top cover [A] (1 screw).
3. Remove and replace the oil supply pad [B] (4 screws).

9.5 HOT ROLLER, PRESSURE ROLLER, AND FUSING LAMP REPLACEMENT



A166R616.wmf

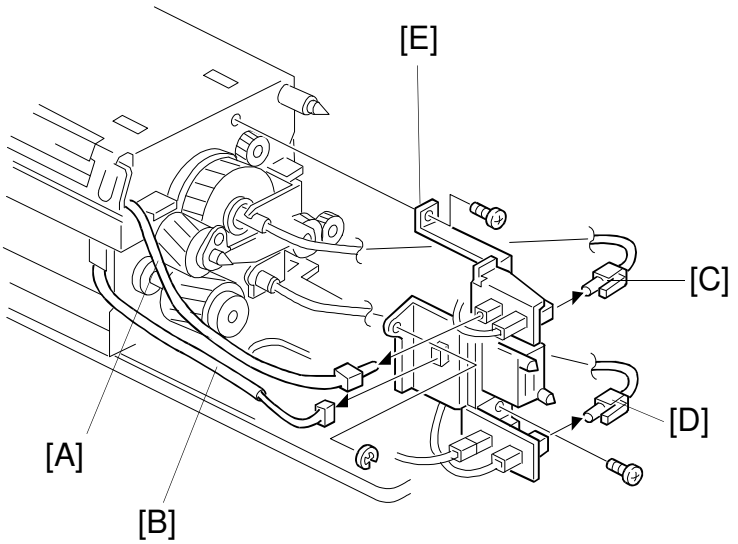


A166R667.wmf

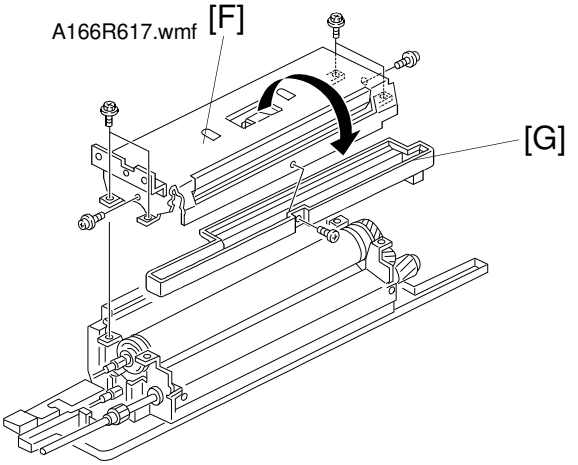
1. Remove the fusing unit (see procedure 9.3.).
2. Remove the fusing unit top cover (see procedure 9.4).
3. Remove the fusing knob hub [A] (1 screw).

Remove the fusing knob [B], the release slider [C], and the spring [D].

5. Remove the oil sensor bracket [E] and the oil end sensor [F] (1 screw).
6. Disconnect the oil tube [G] and remove the oil tank [H].
7. Remove the terminal [I] on the front side of the fusing lamp (1 screw).
8. Remove the terminal [J] on the front side of the pressure roller lamp (1 screw).
9. Remove the oil supply unit assembly [K] (2 screws).
10. Remove the front heater bracket [L] (1 screw).



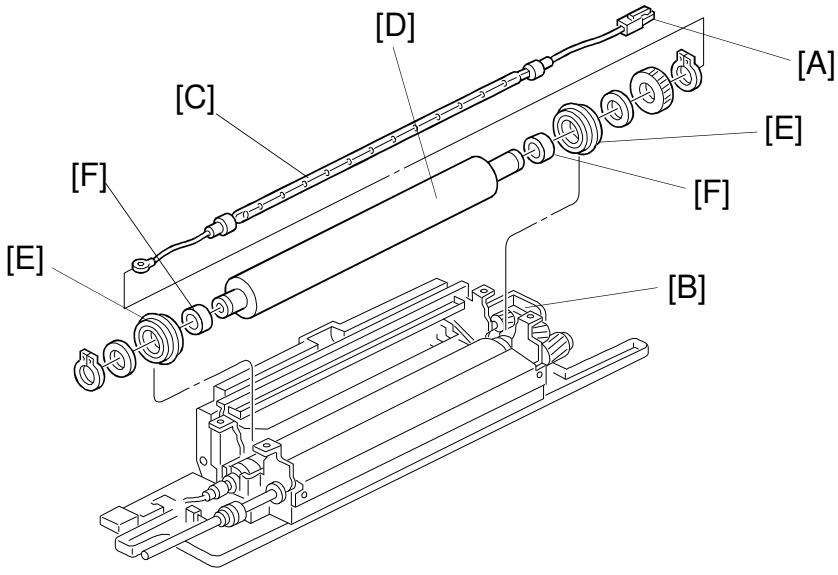
A166R617.wmf



A166R618.wmf

11. Disconnect the fusing thermofuse connector [A].
12. Disconnect the fusing thermistor connector [B].
13. Disconnect the connector [C] at the rear of the fusing lamp.
14. Disconnect the connector [D] at the rear of the pressure roller lamp.
15. Remove the fusing unit connector bracket [E] (2 screws and 1 E-ring).
16. Remove the fusing unit upper assembly [F] and the oil sump [G] (7 screws).

NOTE: Ensure that the fusing lamp harness is not caught when removing the fusing unit upper assembly. A strong force erted on the harness may damage the fusing lamp.



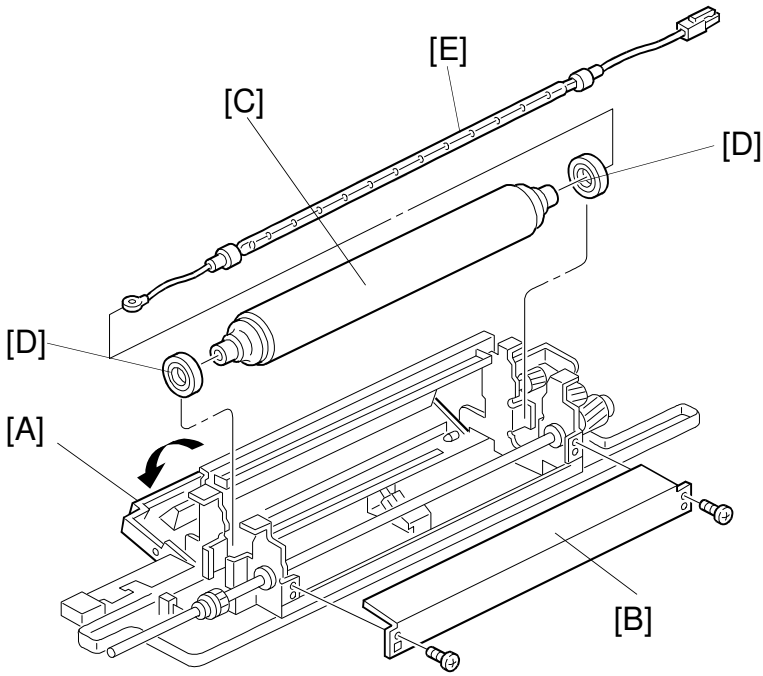
A166R619.wmf

17. Disconnect the fusing lamp connector [A] from the rear lamp holder [B] and remove the fusing lamp [C] from the rear.

18. Replace the hot roller [D] and the hot roller shaft bearings [E] (2 C-rings, 1 gear, 2 spacers, and 2 bushings).
    - Apply grease to the inner and outer surfaces of the bushings every 40K scans.

⚠ CAUTION

Be sure to apply the grease to the bushings [F] only after they have cooled. The grease vaporizes when heated. The resulting gas is harmful if inhaled.



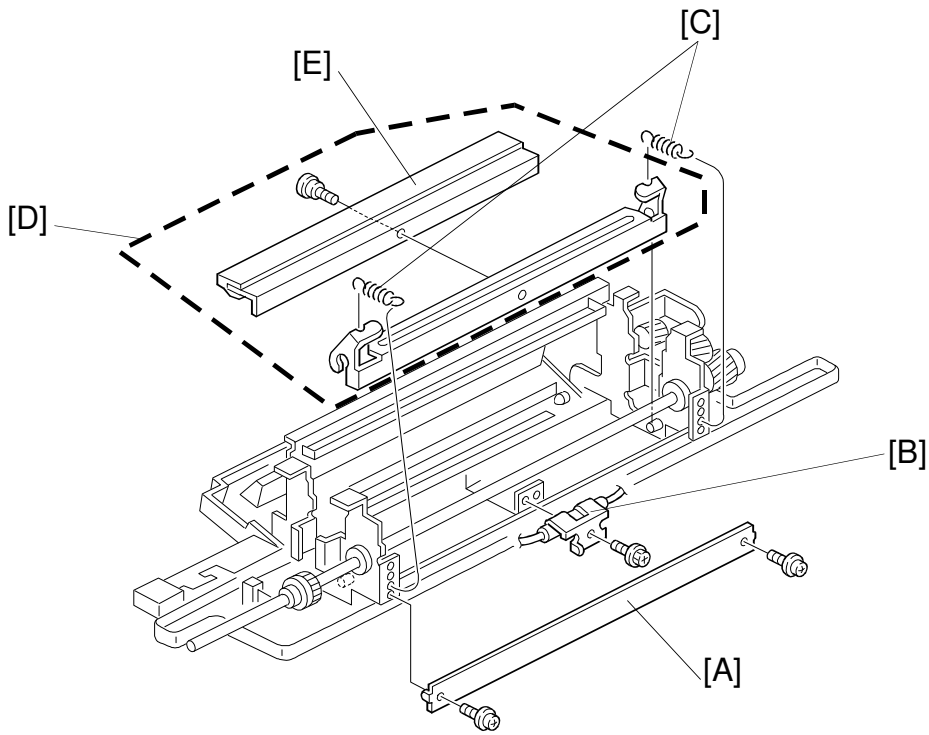
A166R621.wmf

19. Open the paper it door [A].

20. Remove the fusing entrance guide plate [B] (2 screws).

NOTE: Be sure to use the upper screw holes when reinstalling the fusing entrance guide plate. The lower screw holes are used to adjust the paper feed path (see procedure 9.12).

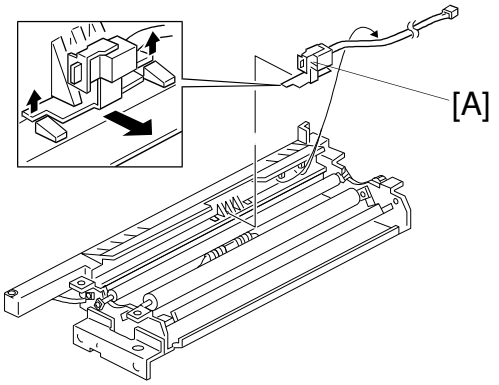
21. Replace the pressure roller [C] and the pressure roller shaft bearings [D].
    1) Remove the pressure roller lamp [E] by pulling it forward and disconnecting the connector from the rear lamp holder.
    2) Remove the pressure roller.



A166R668.wmf

22. Remove the lower plate [A] (2 screws).
23. Remove the pressure roller thermofuse [B] (1 screw).
24. Remove the two pressure blade springs [C].
25. Remove the pressure roller cleaning blade assembly [D].
26. Remove the pressure roller cleaning blade [E] (1 stepping screw).

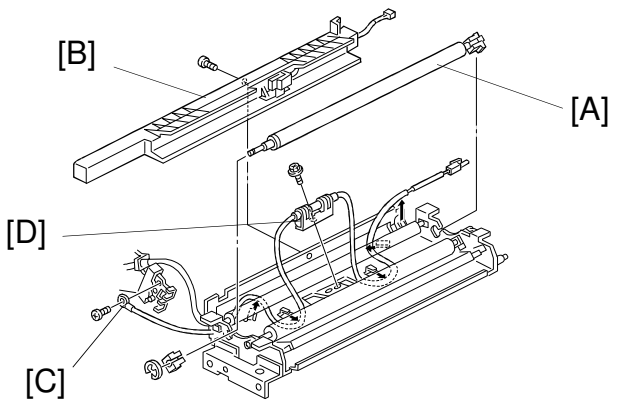
9.6 HOT ROLLER THERMISTOR REPLACEMENT



A166R622.wmf

1. Remove the fusing unit upper assembly (see procedure 9.5).
2. Remove and replace the thermistor [A] as shown.

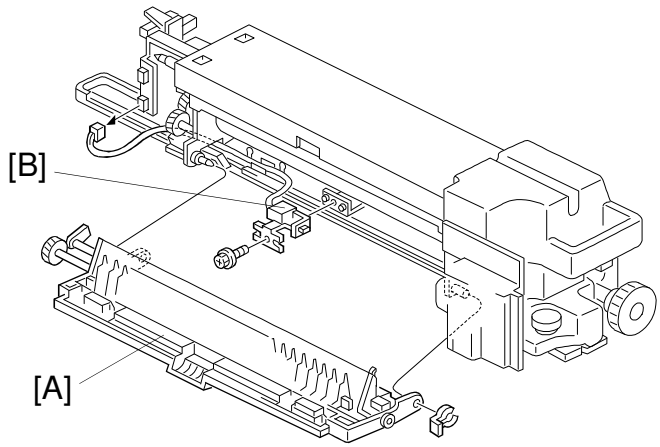
9.7 HOT ROLLER THERMOFUSE REPLACEMENT



A166R623.wmf

1. Remove the oil supply pad (see procedure 9.4).
2. Remove the fusing unit upper assembly (see procedure 9.5).
3. Remove the oil supply roller [A] (2 E-rings and 2 bearings).
4. Remove the oil pan [B] (1 screw).
5. Remove the hot roller thermofuse terminal [C] (1 screw).
6. Replace the hot roller thermofuse [D].

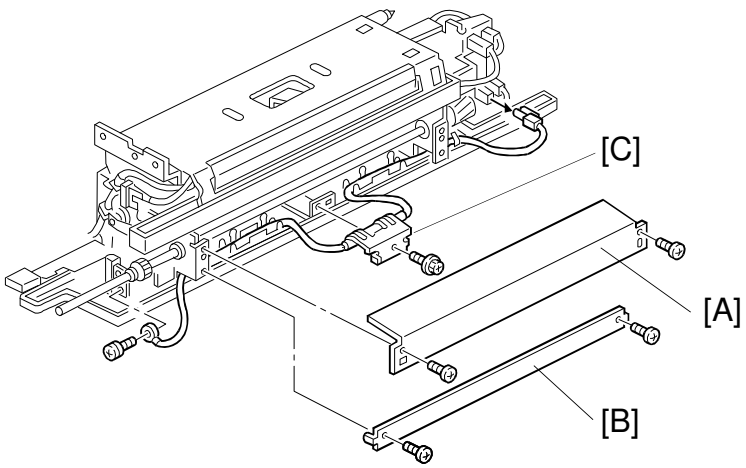
9.8 PRESSURE ROLLER THERMISTOR REPLACEMENT



A166R624.wmf

1. Remove the fusing unit (see procedure 9.3).
2. Remove the paper it door [A] (1 snap-ring).
3. Replace the pressure roller thermistor [B] (1 connector and 1 screw).

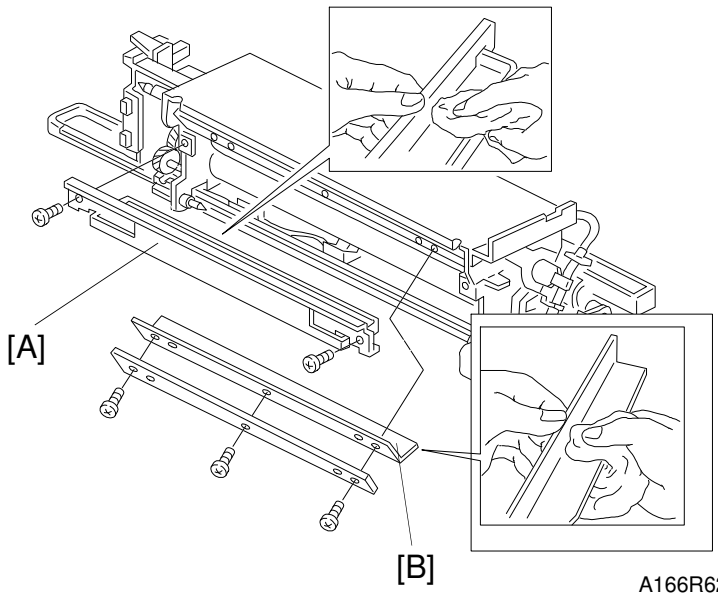
9.9 PRESSURE ROLLER THERMOFUSE REPLACEMENT



A166R625.wmf

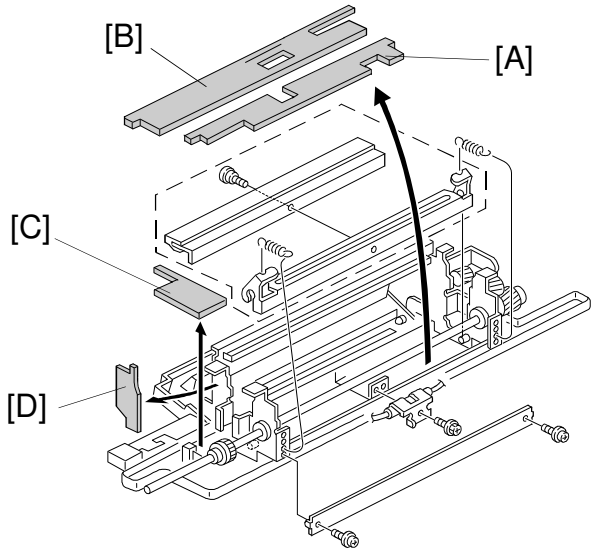
1. Remove the oil tank (see procedure 9.4).
2. Remove the fusing entrance guide plate [A] (2 screws).
3. Remove the heat shield [B] (2 screws).
4. Remove the pressure roller thermofuse [C] (1 connector and 2 screws) and install a new thermofuse.

9.10 CLEANING ROLLER OIL PAN AND SCRAPER

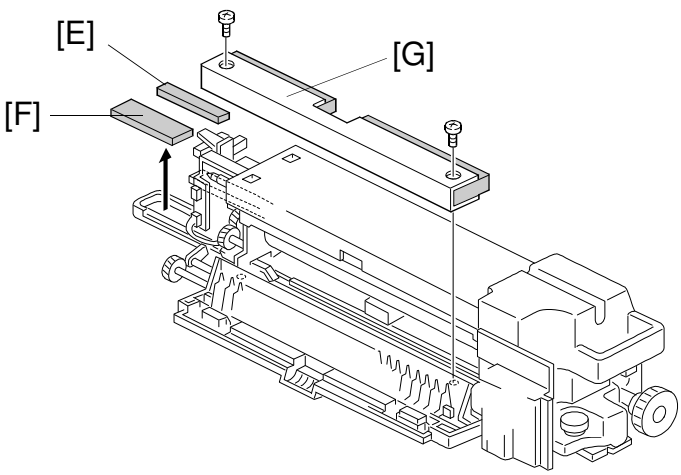


1. Remove the fusing unit (see procedure 9.3).
2. Remove the paper it door (see procedure 9.8).
3. Remove the cleaning roller oil pan [A] (2 screws).
4. Clean the cleaning roller oil pan and wipe it with a suitable solvent.
5. Remove the cleaning roller scraper [B] (3 screws).
6. Wipe the cleaning roller scraper with a suitable solvent.

9.11 OIL PAN PADS



A166R671.wmf

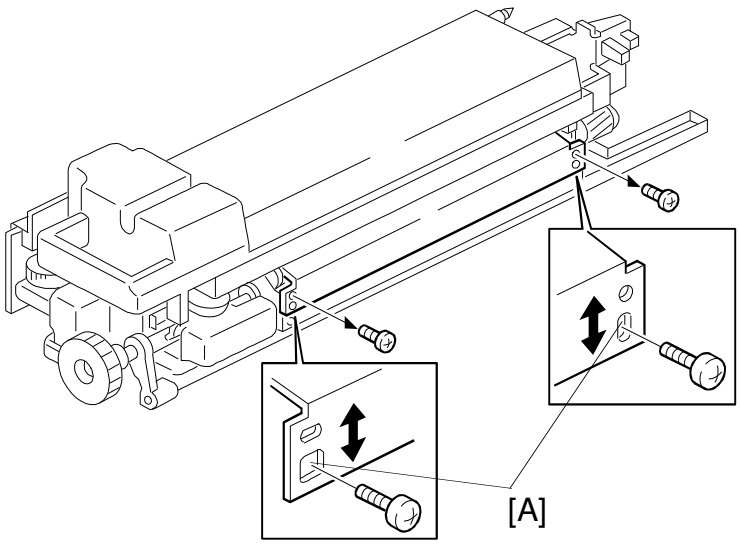


A166R627.wmf

1. Remove the hot roller, the pressure roller, and the pressure roller cleaning blade assembly. (see procedure 9.5.)

2. Replace the following oil pan pads.
   - Right oil pan pad [A]
   - Left oil pan pad [B]
   - Bottom front oil pan pad [C]
   - Front oil pan pad [D]
   - Rear right oil pan pad [E]
   - Rear left oil pan pad [F]
   - it door oil pan pad assembly [G]

9.12 FUSING ENTRANCE GUIDE ADJUSTMENT



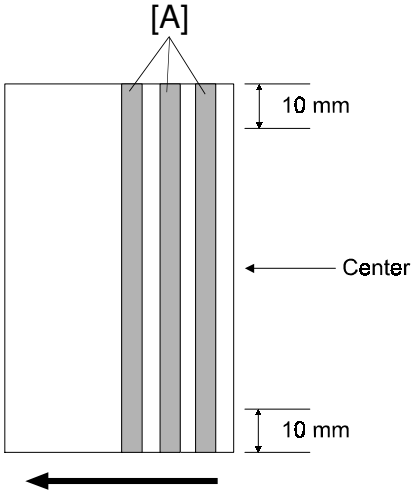
A166R629.wmf

- The height of the fusing entrance can be adjusted to correct for wrinkling on special paper types or jams when using postcards.

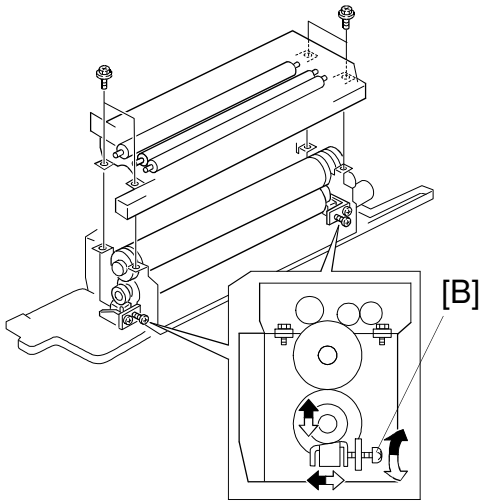
1. Remove the screws from the standard positions (as set at the factory).
2. Mount the screws in the service holes [A] in a position which will correct the particular problem.
   - When a special paper type wrinkles, set the screws to a higher position in the service holes.
   - When a postcard jam occurs, set the screws to a lower position.

9.13 NIP BAND WIDTH ADJUSTMENT

9.13.1 Procedure



A166R663.wmf



A166R630.wmf

NOTE: 1) Check and adjust the nip band width only after the copier has warmed up.
2) Place an OHP sheet on the by-pass feed table before starting this procedure.
3) Use only A4/LT sideways (if you use an OHP of other sizes, a paper jam will occur).
4) If the copier is connected with the sorter, disconnect the sorter connector and remove the sorter, otherwise a paper jam will occur after ejecting the OHP sheet.

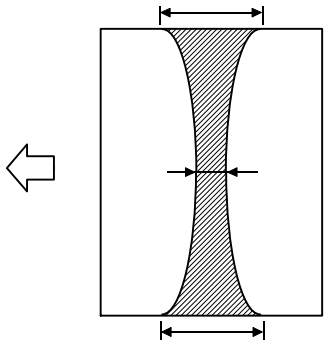
1. Enter the SP mode and measure the fusing nip band width (SP1-109).
2. When the OHP sheet is ejected, measure the nip width of the bands.
   1) On the sheet locate the nip bands [A].
   2) Use a rule to measure the width of the slightly opaque area on the OHP sheet.
   3) If the slightly opaque area has notched boundaries, measure the narrower width.
   4) For both edges of the OHP sheet, measure the width 10 mm away from the edge.
3. Calculate an average of the width of the three bands at the front, rear and center on the OHP sheet. The center average should be 6.5 ± 0.5 mm and the deviation between the edges should be no more than 0.5 mm.
4. If the measured nip width does not correspond to the standard value, adjust the nip width by using the pressure roller screw [B].
   Then repeat steps 1 to 4 until the width is correct.

9.13.2 Troubleshooting

1. When the paper is wrinkled

Adjust the pressure roller screw to set the nip band width close to the upper limit of the standard value (since the standard value is 6.5 ±0.5 mm, adjust the pressure roller screw to obtain a nip width of about 7 mm).

Widening the nip width creates an hourglass effect (the nip band is slightly wider at the ends due to the higher roller pressure). This helps eliminate copy paper wrinkles.



Hourglass Effect

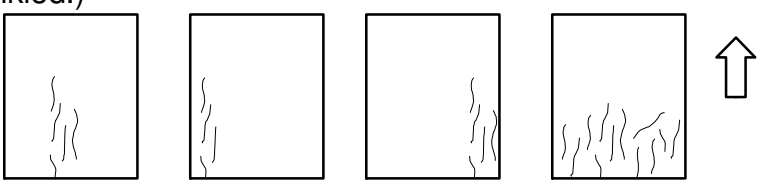
NOTE: Check that a Mimizu image is not printed on thin paper (see below).

2. Mimizu image

Adjust the pressure roller screw to set the nip band's width close to the lower limit of the standard value (since the standard value is 6.5 ±0.5 mm, adjust the pressure roller screw to obtain the nip width of about 6 mm).

A Mimizu image appears when the paper is strained due to an cessive hourglass-shape effect. (This is in contrast with the situation where the copy paper is wrinkled.)

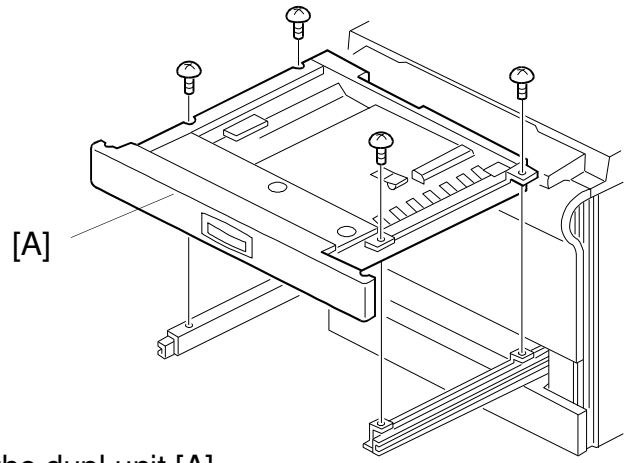
Mimizu images



NOTE: Do not narrow the nip width too much. Otherwise, the copy paper may wrinkle.

10. DUPL UNIT

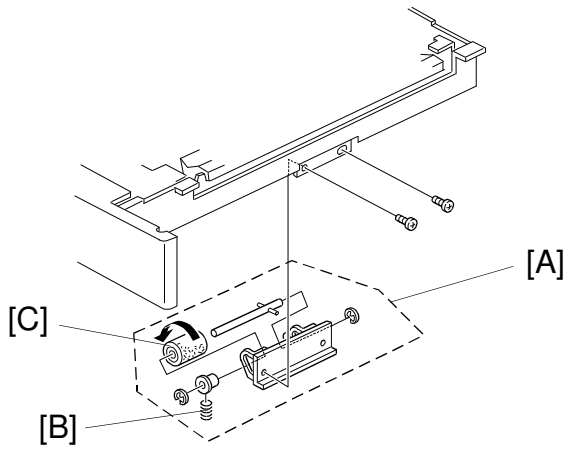
10.1 DUPL UNIT REMOVAL



A166R631.wmf

1. Open the dupl unit [A].
2. Remove the dupl unit (4 screws).

10.2 SEPARATION ROLLER REPLACEMENT

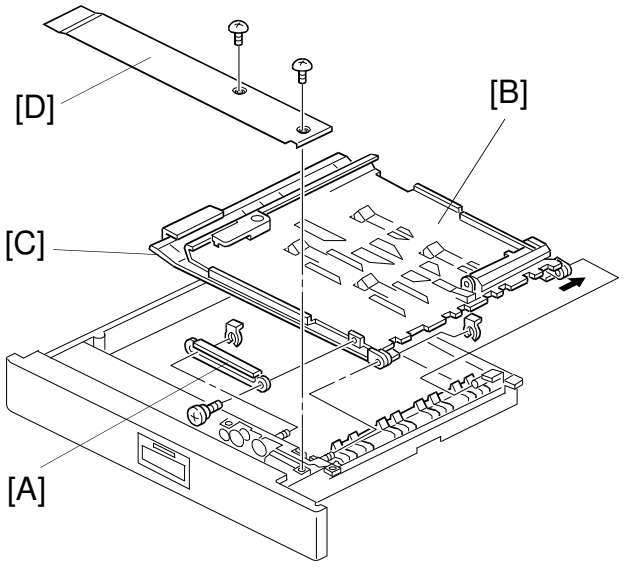


A166R632.wmf

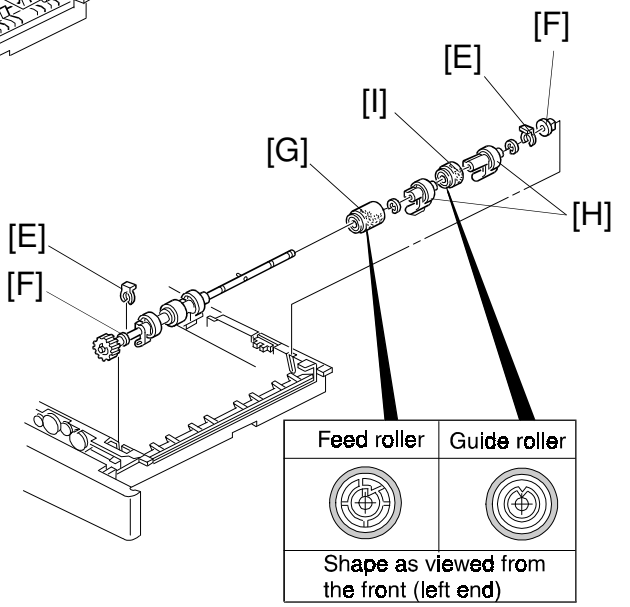
1. Remove the dupl unit (see procedure 10.1).
2. Remove the separation roller assembly [A] (2 screws).
3. Remove the spring [B].
4. Replace the separation roller [C] (2 E-rings and 2 bearings).

NOTE: Be sure to install the separation roller (one-way clutch) so that the clutch is visible.

10.3 FEED ROLLER REPLACEMENT



A166R633.wmf

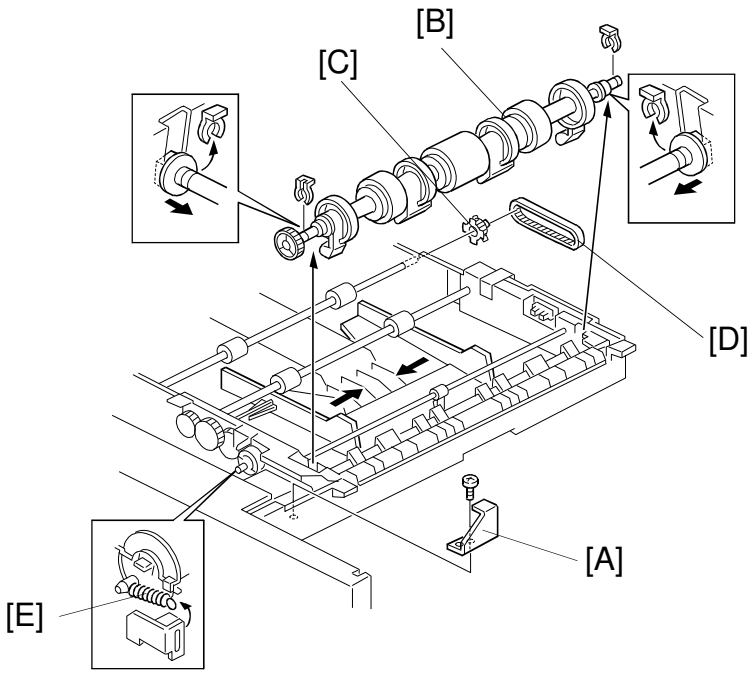


A166R634.wmf

1. Open the dupl unit.
2. Remove the guide rail [A] (1 screw and 1 snap-ring).
3. Remove the upper guide plate [B] and lower guide plate [C] (1 snap-ring).
4. Remove the inner cover [D] (2 screws).
5. Remove the 2 snap-rings [E] from the both ends of the feed roller shaft.
6. Slide the bearings [F] inward.
7. Replace the feed roller [G] (2 E-rings, 2 paper flatteners [H], and 1 guide roller [I]).

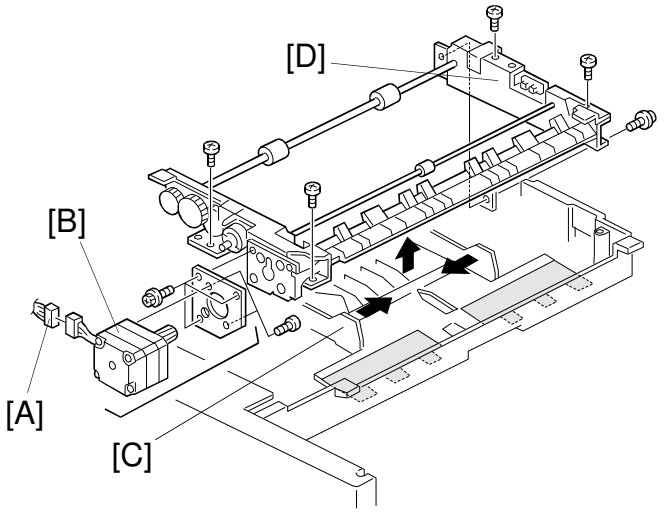
   NOTE: 1) Be sure to install the feed and guide rollers correctly.
   2) The feed roller is made of silicone rubber and is not compatible with the non-silicone rubber feed rollers used in some previous models.

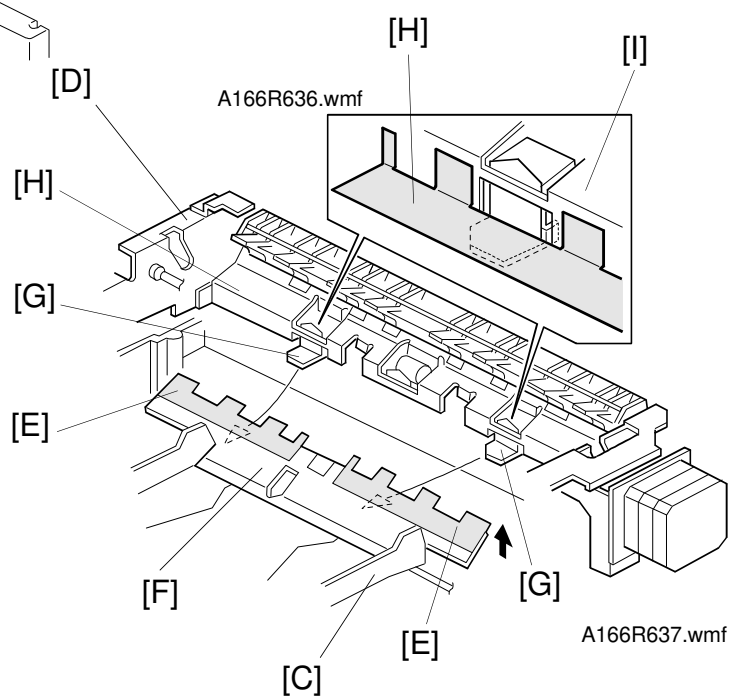
10.4 DUPL FEED MOTOR REPLACEMENT



A166R635.wmf

1. Perform steps 1 through 4 in procedure 10.3.
2. Remove the bracket [A] (1 screw).
3. Remove the feed roller shaft assembly [B] (2 snap-rings).
4. Remove the pulley [C] and the timing belt [D].
5. Remove the pressure spring [E].



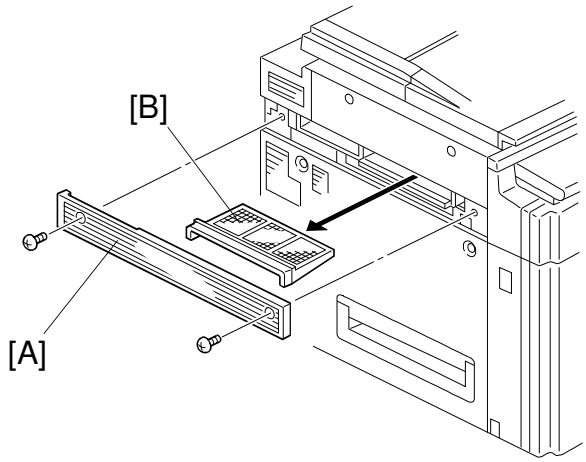


6. Disconnect the connector [A] of the dupl feed motor [B].
7. Close the side fences [C] and remove the dupl feed assembly [D] (5 screws).
8. Remove the dupl feed motor assembly (3 screws).
9. Replace the dupl feed motor (2 screws).

NOTE: 1. When installing the dupl feed assembly [D] on the base unit, place the bottom plate [F], with the mylar strip [E], above the bracket tabs [G].
2. Ensure the base unit's mylar strip [H] is placed on the guide plate [I], as shown.

11. FILTERS

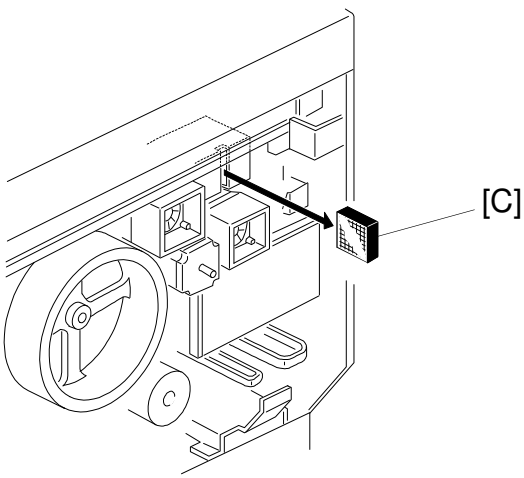
11.1 OPTICS FAN FILTER REPLACEMENT



A166R638.wmf

1. Remove the filter cover [A] on the left side of the copier (2 screws).
2. Remove and replace the dust filter [B].

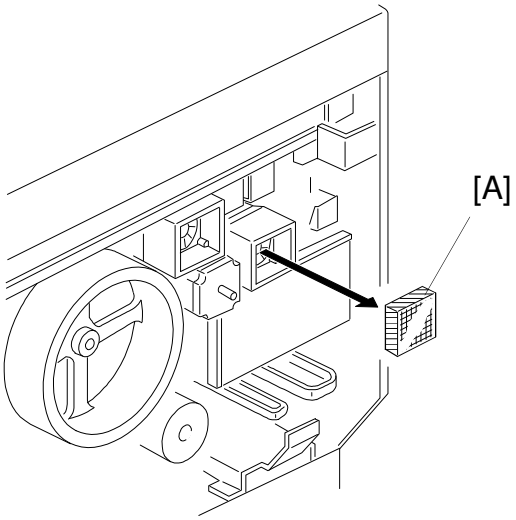
11.2 HAUST OZONE FILTER REPLACEMENT



A166R639.wmf

1. Remove the rear cover (see procedure 1.3).
2. Remove the ozone filter [C] from the duct slit and replace it.

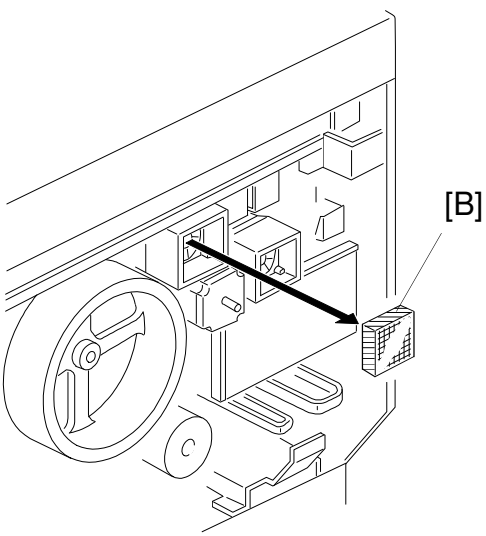
11.3 FUSING FILTER REPLACEMENT



A166R640.wmf

1. Remove the rear cover (see procedure 1.3).
2. Replace the dust filter [A].

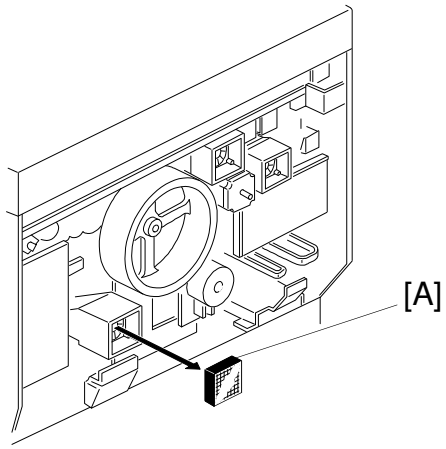
11.4 CHARGE INLET FILTER REPLACEMENT



A166R641.wmf

1. Remove the rear cover (see procedure 1.3).
2. Replace the dust filter [B].

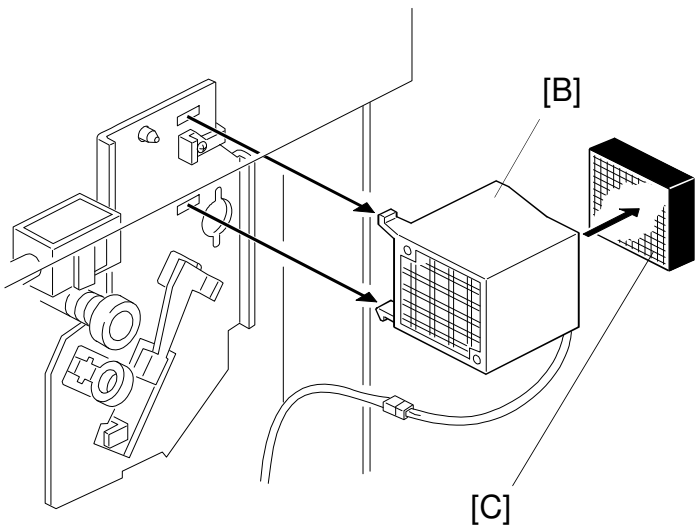
11.5 REAR OZONE FILTER REPLACEMENT



A166R642.wmf

1. Remove the rear cover (see procedure 1.3).
2. Replace the ozone filter [A].

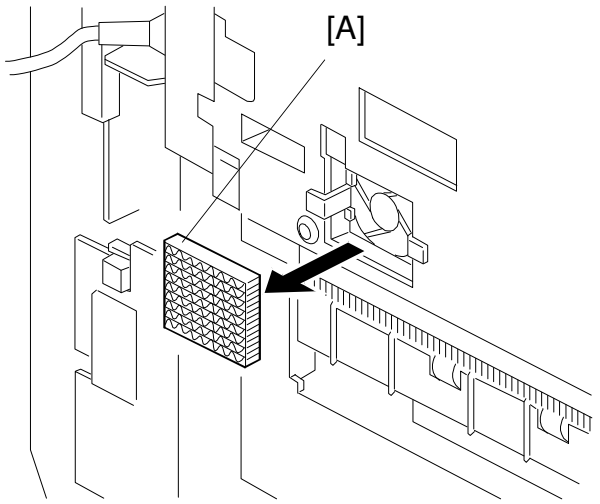
11.6 FRONT OZONE FILTER REPLACEMENT



A166R643.wmf

1. Remove the front cover (see procedure 1.3).
2. Remove the inner cover (see procedure 1.9).
3. Remove the front transfer fan [B] and replace the ozone filter [C].

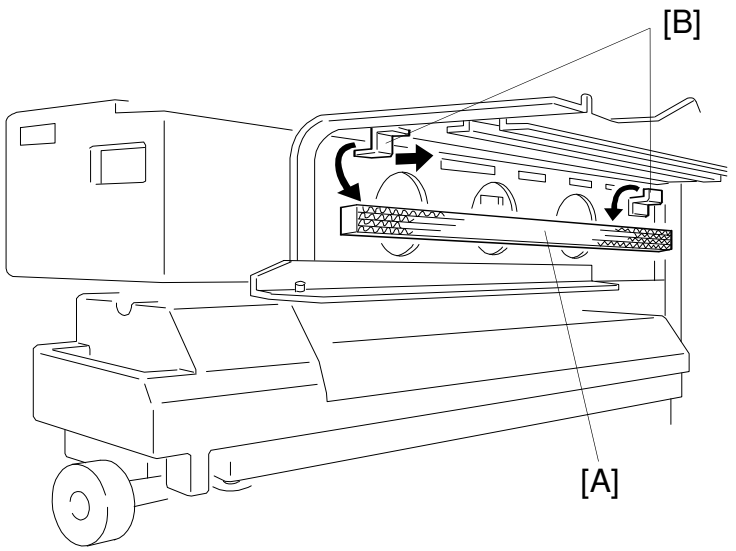
11.7 PAPER IT OZONE FILTER REPLACEMENT



A166R649.wmf

1. Remove the left front cover (see procedure 1.8).
2. Replace the ozone filter [A].

11.8 POWER SUPPLY OZONE FILTER REPLACEMENT



A166R644.wmf

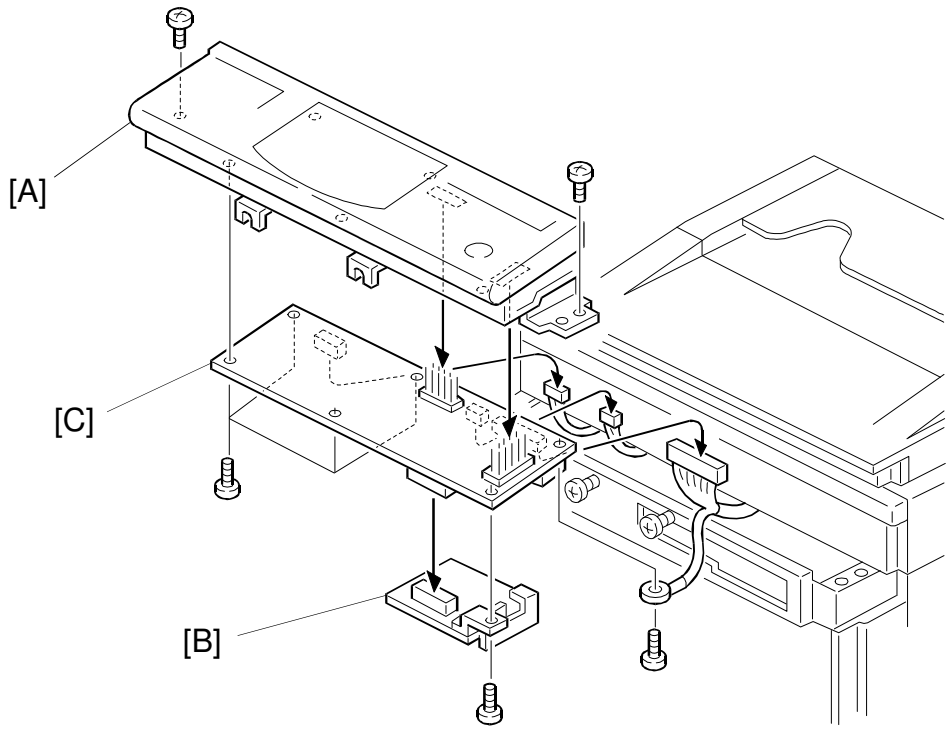
1. Remove the development unit (see procedure 6.1.1, steps 1 through 8).
2. Replace the ozone filter [A] while holding the plate springs [B], as shown.

12. OTHERS

12.1 SCU

12.1.1 SCU Replacement

1. A166/A187 Copiers Only



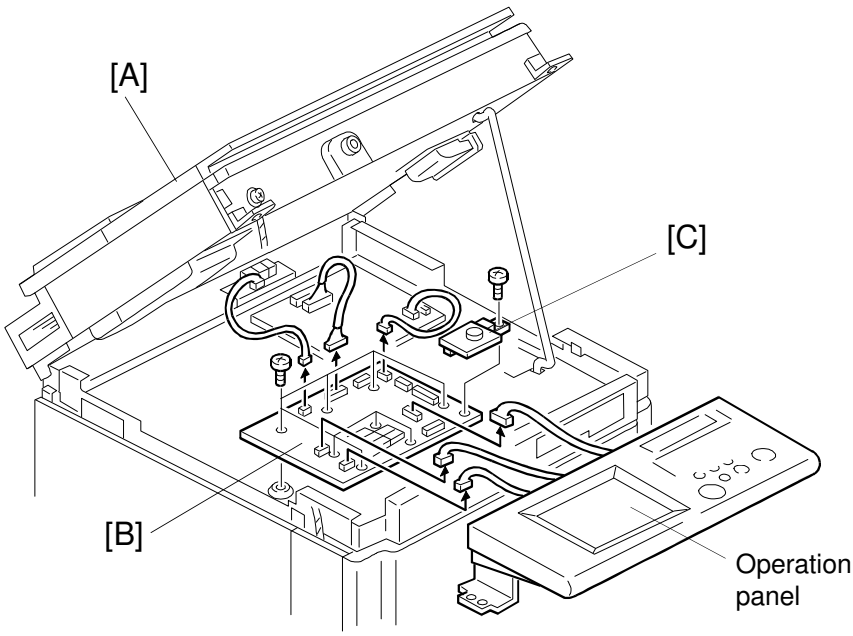
A166R662.wmf

1. Remove the operation panel [A] (see procedure 1.6).
2. Remove the RAM board [B] from the SCU board [C].
3. Remove the SCU board (6 screws).

   NOTE: When removing the SCU from the operation panel, take care not to bend the connector pins of the SCU.
4. Install the isting RAM board on the new SCU and reinstall the SCU on the operation panel by using the reverse procedure of its removal.

   NOTE: 1) When replacing the SCU, you must retain and reinstall the isting RAM board on the new SCU.
   2) When reinstalling the new SCU on the operation panel, carefully align the connector pins with the connectors of the operation panel. Take care not to bend the connector pins.

2. A189 Copier Only



A166R646.wmf

1. Open the scanner unit [A] (see procedure 1.11).
2. Remove the RAM board [C] from the SCU [B] (1 screw).
3. Remove the SCU (9 screws).
4. Install the isting RAM board on the new SCU and reinstall it.

   NOTE: When replacing the SCU, you must retain and reinstall the isting RAM board on the new SCU.

12.2 RAM CLEAR

12.2.1 RAM (Memory Board) Clear Procedure

1. Before clearing the RAM, ecute SP7-902 to output the current SP mode values.

   NOTE: Clearing the RAM resets all SP and UP values, cept the serial number and main counter value, to the defaults. It is, therefore, important to perform this step.

2. Perform SP5-801 to clear the RAM.

3. Perform SP7-914-3 to upload the main counter value into RAM. This data will become the back-up counter value.

   NOTE: If you do not ecute SP7-914-3, SC901 will be displayed indicating a counter problem.

4. Input the previous value in the following SP modes. They are needed for the ACC procedure. (Look at the SP7-902 printout.)
   SP4-8, SP4-10, SP4-11, SP4-426, SP4-427
   SP4-431, SP2-303-1, SP2-303-2, SP2-915-1, SP2-915-2

5. Perform the forced process control self check (SP3-126), then check the result (SP3-975).

NOTE: Wait 10 minutes before the forced process control self check.

6. Perform the auto color calibration procedure (see procedure 4.1.1).

7. Input the other SP mode values from the SP 7-902 output of step 1 above.

NOTE: To clear the counter log data, other than the main counter and backup counter values, ecute SP7-808 (Clear All Counters).

12.3 MAIN COUNTER

12.3.1 Main Counter Replacement

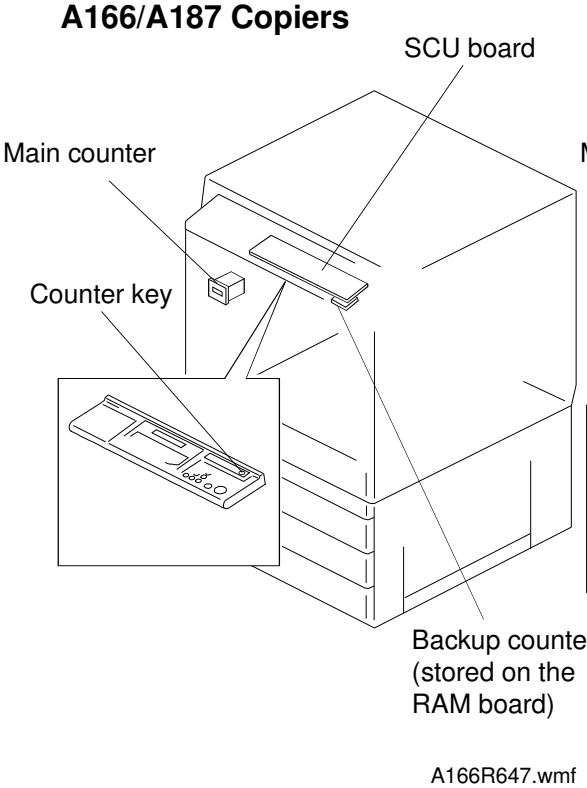
1. Replace the main counter.

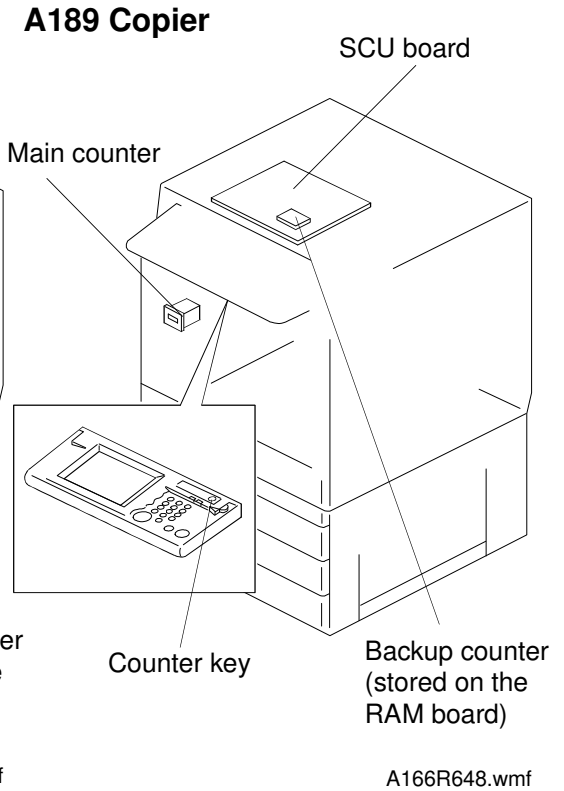
2. Perform SP7-914-3 to overwrite the back-up counter value with the main counter value.

3. Display the backup counter value by ecuting SP7-3-1 and SP7-3-2. Ensure the backup counter value is the same as the main counter value.

   NOTE: To display the main counter value, open the front cover. Defeat the door switch interlock with the switch actuator. Press the Counter key on the operation panel. This will display the main counter value on the LCD (1: Bk scan 2: Full Color Scan).

1. Relationship between Main and Backup Counters





The following describe the main and backup counters:

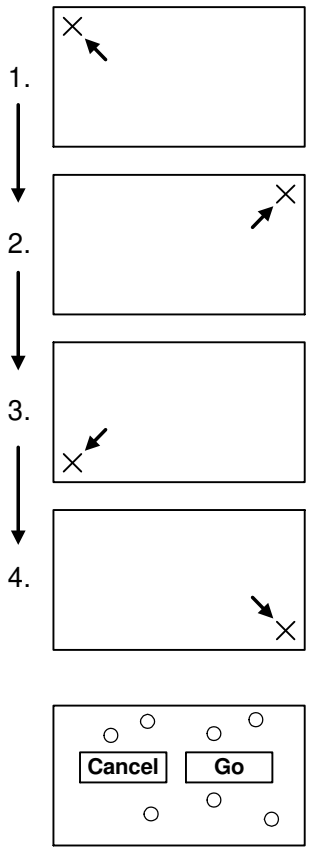
1. The main counter is the LCD counter. It can be seen when the front cover is opened.
2. To display the main counter value on the main counter LCD, open the front cover and defeat the interlock with the switch actuator. Pressing the Counter key alternates the display with the values of the Bk and full color counters.
3. Pressing the Counter key on the operation panel also displays the main counter value on the main (operation panel) LCD.
4. The backup counter is stored in the RAM board installed on the SCU board.
5. To check the backup counter value, use SP7-3-1 and SP7-3-2.

6. When SC900 is displayed it indicates a problem with the main counter. If this occurs, do the following:
   - Check the connection of the main counter connector.
   - If you determine that the main counter is faulty, replace it.
7. The main counter value is compared with the backup counter value when:
   - The copier main switch is turned ON.
   - The Counter key on the operation panel is pressed.
   - If you determine that the main counter is faulty, see 6. above.
   - If you determine that the backup counter is faulty, ecute SP7-914-3 to overwrite the backup counter with the main counter value.
8. The SP modes for the counters are summarized below:
   SP7-914-1 (Reset Counters to 0):
   During the installation process, use this SP to reset the main and backup counters to 0. This SP can be used only once, at installation.
   SP7-914-3 (Backup Counter Recovery):
   This SP overwrites the backup counter with the main counter value. This SP can be used any number of times.
   SP7-3-1 and SP7-3-2 (Backup Counter #1-2):
   This SP displays the backup counter values.

9. In addition to the main and backup counters, this copier is also equipped with a CE counter (SP7-4-1 and 7-4-2). This counter is independent of the main and backup counters and is provided for the CEs. A service person can use the CE counters for any purpose. The technician can input any value and reset the counter at any time. It is updated at the same rate as the main counter, so it is useful for determining the number of copies counted in a particular period of time. The CE counter is also stored in the RAM board.

12.4 TOUCH PANEL CALIBRATION

A189 Copier Only



A166R657.wmf

After replacing the operation panel, the touch panel must be calibrated as follows:

1. Enter SP5-901 "Touch Panel Calibration" and select "0" (reset). This step cancels the isting touch panel calibration and allows the panel to be re-calibrated.
2. The operation panel displays four screens in sequence, as shown. Gently touch the center of the "X" on each screen with the tip of a pen.

   NOTE: Do not use too sharp a tip in this step. The touch panel may be damaged.
3. The operation panel displays the final screen shown. Point at any place on this screen and make sure that a "O" mark appears at that point. If the mark appears properly, press [Go].
4. it the SP mode.

SECTION 7

TROUBLESHOOTING

1. SERVICE CALL CONDITIONS

This copier provides the following five types of service call (SC) conditions that help minimize the possibility of system down time.

TYPE 1: Safety Action	Immediately stops the copier and displays an SC. Turning the power off and on cannot recover the copier.
TYPE 2: Immediate Stop	Immediately stops the copier and displays an SC. Turning the power off and on can recover the copier.
TYPE 3: Stop	Displays an SC after any necessary machine operation is completed. Turning the power off and on can recover the copier.
TYPE 4: Unit Failure	Displays an SC only when a faulty function is selected. Turning the power off and on can recover the copier.
TYPE 5: Logging Only	Neither displays an SC nor stops the copier. Only logs these SCs. Logged SCs can be displayed in the SP mode.

Type 1 SCs (Safety Action) can be reset by taking the following action:

- SCs for fusing unit failure:
  Enter SP5-810-1 (Fusing SC Reset), select "1" (Reset), and turn the power off and on.
- Other Type 1 SCs:
  Enter SP5-810-2 (SC Reset), select "1" (Reset), and turn the power off and on.

All SCs are logged.

SC101: Lamp failure (broken or persistently on)

Type: 3

- Description -

When the lamp regulator detects that the exposure lamp is not turned on or is not turned off, the scanner IPU informs the SCU of this.

- Detection Timing -

Failure to go on (break) is detected when the lamp is turned on.
Failure to go off (persistently on) is detected when the lamp is turned off.

- Possible Causes -

- Lamp regulator defective
- Exposure lamp open
- Optics thermoswitch open

SP-Log: 7-402-1

SC120: Scanner HP sensor abnormal - Stays off

Type: 3

- Description -

The scanner IPU board notifies the SCU when the home position sensor does not go on even though the scanner carriage has been returned to the home position during the scanner carriage homing process of the power-on sequence.

- Detection Timing -

When the power switch is turned on and the scanner homing operation starts

- Possible Causes -

- Scanner HP sensor defective

SP-Log: 7-402-1

SC121: Scanner HP sensor abnormal - Stays on

Type: 3

- Description -
  The scanner IPU board notifies the SCU when the home sensor does not go on even though the scanner carriage has been retracted from the home position during the scanner carriage homing process of the power-on sequence.
- Detection Timing -
  When the power switch is turned on and the scanner homing operation starts
- Possible Causes -
  - Scanner HP sensor defective
  - Scanner motor defective

SP-Log: 7-402-1

SC130: Scanner start abnormal

Type: 3

- Description -
  The scanner IPU board notifies the SCU when the next scan start signal is received before the scanner carriage has returned to the home position.
- Detection Timing -
  During scanning
- Possible Causes -
  - Scanner IPU board

SP-Log: 7-402-1

SC170: VPU abnormal 1

Type: 3

- Description -
  The scanner IPU board notifies the SCU when the feedback data for the black level (mask area at the front end of the CCD) E/O is not in the proper range at power-on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Scanner IPU board

SP-Log: 7-402-1

SC171: VPU abnormal 2

Type: 3

- Description -
  The scanner IPU board notifies the SCU when feedback data for the white level is not in the proper range at power-on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Scanner IPU board

SP-Log: 7-402-1

SC172: VPU abnormal 3

Type: 3

- Description -
  The scanner IPU board notifies the SCU when the white shading data is not in the proper range after the white level has been adjusted (SP4-435).
- Detection Timing -
  When the above SP mode is performed
- Possible Causes -
  - Scanner IPU board

SP-Log: 7-402-1

SC191: Bar code scanning error

Type: 2

- Description -
  The bar code on the scanner guide plate is scanned by the CCD and stored in the SCSI buffer memory. The scanner IPU board reads the data and performs a pattern analysis on the data. If the scanner IPU board determines that the image pattern is not an appropriate bar code pattern, it notifies the SCU of a bar code scanning error.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Non-standard bar code label

SP-Log: 7-402-1

SC192: Bar code number mismatch

Type: 2

- Description -
  The SCU compares the bar code data read by the CCD and analyzed by the scanner IPU board with the machine identification number stored in the machine. If they do not match, the SCU determines that there is a bar code number mismatch.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - SCU (System Control Unit)

SP-Log: 7-402-1

SC193: IDU failure

Type: 2

- Description -
  The IDU board diagnostics notify the scanner IPU board that it is faulty at power-on. Then the scanner IPU board notifies the SCU of this.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - IDU

SP-Log: 7-402-1

SC196: Extended IPU abnormal

Type: 4

- Description -
  The extended IPU board diagnostics notify the scanner IPU board when its image processing ASIC on the extended IPU board is faulty at power-on. Then the scanner IPU board notifies the SCU of this. This check is not made if the extended IPU board is not installed.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Extended IPU

SP-Log: 7-402-1

SC197: Extended IPU connection abnormal (A189 machine only)

Type: 4

- Description -
  The SCU detects when the extended IPU is not connected.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Extended IPU
  - SCU (System Control Unit)

SP-Log: 7-402-1

SC301: Charge current leak

Type: 2

- Description -
  The main control board notifies the SCU that the charge current from the high-voltage power pack does not reach the target due to such causes as a leak or power pack failure.
- Detection Timing -
  When the charge current is applied
- Possible Causes -
  - High voltage power supply
  - Leak locations

SP-Log: 7-402-3

SC320: Polygon motor abnormal

Type: 2

- Description -
  The main control board notifies the SCU when the polygon motor driver does not reach a defined number of rotations within a predetermined period of time.
- Detection Timing -
  When starting the preparation for writing
- Possible Causes -
  - Polygon motor

SP-Log: 7-402-3

SC322: Laser synchronizing signal error

Type: 5

- Description -
  The main control board notifies the SCU when image transfer is aborted and the image transfer buffer (FIFO) on the printer main board is full or in an error condition.
- Detection Timing -
  During the image transfer process
- Possible Causes -
  - Laser synchronizing detector board
  - Main control board
  - LD control board

SP-Log: 7-402-3

SC323: LD drive current over (LD error)

Type: 2

- Description -
  The main control board notifies the SCU of LD overcurrent.
- Detection Timing -
  During LD writing
- Possible Causes -
  - LD control board

SP-Log: 7-402-3

SC325: Magnification correction error

Type: 5

- Description -
  When the polygon motor is activated, a laser synchronizing detection output cannot be detected within a certain time between the laser synchronizing detector boards 1 and 2. The main control board notifies the SCU when the detection fails three times.
- Detection Timing -
  At the activation of the polygon motor
- Possible Causes -
  - Laser synchronizing detector board
  - Main control board
  - LD control board

SP-Log: 7-402-3

SC341: Development motor abnormal

Type: 2

- Description -
  The main control board notifies the SCU when the development motor does not start up within a predetermined period of time or does not output the LOCK signal for more than a predetermined period of time during the rotation.
- Detection Timing -
  During the rotation of the development motor
- Possible Causes -
  - Development motor
  - Main control board

SP-Log: 7-402-3

SC360: Development bias abnormal

Type: 2

- Description -
  The main control board notifies the SCU that the development bias output from the high-voltage power pack does not reach the target due to such causes as a leak or power pack failure.
- Detection Timing -
  During output of the development bias
- Possible Causes -
  - High voltage power supply
  - Leak locations

SP-Log: 7-402-3

SC361: Revolver HP sensor abnormal - Stays off

Type: 2

- Description -
  The main control board notifies the SCU when the revolver home position sensor does not go on even though the revolver was sent to the home position during the revolver homing process.
- Detection Timing -
  During the development revolver homing process
- Possible Causes -
  - Revolver unit
  - Revolver HP sensor

SP-Log: 7-402-3

SC362: Revolver HP sensor abnormal - Stays on

Type: 2

- Description -
  The main control board notifies the SCU when the revolver home sensor does not go off even though the revolver was moved from the home position to an appropriate color.
- Detection Timing -
  During copying
- Possible Causes -
  - Revolver unit
  - Revolver HP sensor

SP-Log: 7-402-3

SC363: Revolver setting error

Type: 2

- Description -
  The cartridge detector detects that there is no cartridge when the revolver stops rotating.
- Detection Timing -
  When the revolver stops rotating at the black development position
- Possible Causes -
  - Revolver unit
  - Cartridge sensor
  - Toner cartridge

SP-Log: 7-402-3

SC380: Drum potential sensor calibration error

Type: 5

- Description -
  During calibration, the drum is floated (disconnected from ground) and biases of dc -200 V and dc -800 V are applied. The main control board notifies the SCU when the potential sensor output value for either bias is not within a predetermined tolerance.
- Detection Timing -
  During the forced process control self check or the initial process control self check
- Possible Causes -
  - Drum potential sensor
  - Main control board

SP-Log: 7-402-3

SC382: VD adjustment error (charging failure - the target is not reached within 40 trials)

Type: 5

- Description -

The main control board notifies the SCU when VD does not come within ±5 V of the target after 40 trials in the VD check mode during the potential control process.

- Detection Timing -

During the process control self check

- Possible Causes -

- High voltage power supply
- Main control board

SP-Log: 7-402-3

SC383: Vpl adjustment error (exposure potential does not reach the target within 40 trials)

Type: 5

- Description -

The main control board notifies the SCU when Vpl does not come within ±5 V of the target after 40 trials in the Vpl check mode during the potential control process.

- Detection Timing -

During the process control self check

- Possible Causes -

- LD control board
- Main control board

SP-Log: 7-402-3

Vpl is the voltage on areas of the drum exposed by the laser at the testing intensity. This is done during the process control self check.

SC384: LD writing error (the response from the 12th grade of the pattern is out of range)

Type: 5

- Description -

The main control board notifies the SCU when the potential is out of tolerance ($0 \leq V12 \leq 300$) at the creation of the potential control pattern (12th grade).

- Detection Timing -

During the process control self check

- Possible Causes -

- LD control board
- Main control board

SP-Log: 7-402-3

SC385: ID sensor initial adjustment error (Vsg adjustment error)

Type: 3

- Description -

The main control board notifies the SCU when the Vsg adjustment is repeated three times and the Vsg value read by the ID sensor is out of the specified range (4.0 ± 0.1 V).

- Detection Timing -

During the process control self check

- Possible Causes -

- ID sensor
- Main control board

SP-Log: 7-402-3

SC386: Vmin abnormal

Type: 5

- Description -
  The main control board notifies the SCU when Vmin for black is out of range (between 0.01 V and 0.20 V) and Vmin for color is out of range (between 1.5 V and 2.2 V) at the creation of the 12-grade patterns during process control.
- Detection Timing -
  During the process control self check
- Possible Causes -
  - LD control board
  - Main control board

SP-Log: 7-402-3

SC387: Potential control Vsg (Vsg_ave) abnormal

Type: 5

- Description -
  The main control board notifies the SCU when the average of the Vsg readings (Vsg for potential control) taken by the ID sensor in one drum rotation is out of the specified range (4.0 ±0.3 V).
- Detection Timing -
  During the process control self check
- Possible Causes -
  - LD control board
  - Main control board

SP-Log: 7-402-3

SC388: Toner control Vsg (Vsg_ptn) abnormal

Type: 5

- Description -
  The main control board notifies the SCU when the average of the Vsg readings (Vsg for toner supply control) taken by the ID sensor at the three points on the drum is out of the specified range (between Vsg_ave –0.2 V and Vsg_ave +0.4 V).
- Detection Timing -
  During the process control self check
- Possible Causes -
  - ID sensor
  - Main control board

SP-Log: 7-402-3

SC400: Belt transfer charge abnormal

Type: 2

- Description -
  The main control board notifies the SCU that the belt transfer charge output from the high voltage power pack does not reach the target due to such causes as a leak or power pack failure.
- Detection Timing -
  When the belt transfer charge is active
- Possible Causes -
  - High voltage power supply
  - Leak locations

SP-Log: 7-402-4

SC440: Main motor abnormal

Type: 2

- Description -
  The main control board notifies the SCU when the main motor does not start up within a predetermined period of time or does not output the LOCK signal for more than a predetermined period of time during the rotation.
- Detection Timing -
  During the rotation of the main motor
- Possible Causes -
  - Main motor
  - Main control board

SP-Log: 7-402-4

SC441: Drum motor abnormal

Type: 2

- Description -
  The main control board notifies the SCU when the drum motor does not start up within a predetermined period of time or does not output the LOCK signal for more than a predetermined period of time during the rotation.
- Detection Timing -
  During the rotation of the drum motor
- Possible Causes -
  - Drum motor
  - Main control board

SP-Log: 7-402-4

SC450: Paper transfer charge abnormal

Type: 2

- Description -
  The main control board notifies the SCU that the paper transfer charge output value from the high voltage power pack does not reach the target due to such causes as a leak or power pack failure.
- Detection Timing -
  When the paper transfer charge is active
- Possible Causes -
  - High voltage power supply
  - Leak locations

SP-Log: 7-402-4

SC452: Transfer belt H.P. not detected

Type: 2

- Description -
  The main control board notifies the SCU that the belt H.P. sensor does not detect the belt mark (does not go on) while the transfer belt is moving at normal speed.
- Detection Timing -
  During normal-speed rotation of the transfer belt
- Possible Causes -
  - Transfer belt H.P. sensor
  - Main control board

SP-Log: 7-402-4

SC453: Transfer belt H.P. sensor abnormal - Stays on

Type: 2

- Description -
  The main control board notifies the SCU that the belt H.P. sensor does not go off while the transfer belt is moving at normal speed.
- Detection Timing -
  During normal-speed rotation of the transfer belt
- Possible Causes -
  - Transfer belt H.P. sensor
  - Main control board

SP-Log: 7-402-4

SC495: Thermo sensor abnormal

Type: 5

- Description -
  The voltage read by the thermosensor on I/O control board 1 is out of the specified range (between 0.2 V and 3.5 V) for a successive 30 times.
- Detection Timing -
  When the power switch is turned on
  When the front cover is closed
- Possible Causes -
  - Thermosensor
  - Main control board

SP-Log: 7-402-4

SC496: Humidity sensor abnormal

Type: 5

- Description -
  The voltage read by the humidity sensor on I/O control board is out of the specified range (between 0.2 V and 3.5 V) for a successive 30 times.
- Detection Timing -
  When the power switch is turned on
  When the front cover is closed
- Possible Causes -
  - Humidity sensor
  - Main control board

SP-Log: 7-402-4

SC501: Tray upper limit sensor disabled (1st bank)

Type: 4

- Description -
  The paper tray unit diagnostics notify the main control board when the 1st bank upper limit sensor does not operate.
- Detection Timing -
  When the power switch is turned on
  When the paper tray unit operates
- Possible Causes -
  - Paper tray unit
  - Main control board

SP-Log: 7-402-5

SC502: Tray upper limit sensor disabled (2nd bank)

Type: 4

- Description -
  The paper tray unit diagnostics notify the main control board when the 2nd bank upper limit sensor does not operate.
- Detection Timing -
  When the power switch is turned on
  When the paper tray unit operates
- Possible Causes -
  - Paper tray unit
  - Main control board

SP-Log: 7-402-5

SC503: Tray upper limit sensor disabled (3rd bank)

Type: 4

- Description -
  The paper tray unit diagnostics notify the main control board when the 3rd bank upper limit sensor does not operate.
- Detection Timing -
  When the power switch is turned on
  When the paper tray unit operates
- Possible Causes -
  - Paper tray unit
  - Main control board

SP-Log: 7-402-5

SC522: Side fence jogger H.P. sensor abnormal - Stays off

Type: 4

- Description -
  The main control board notifies the SCU when the jogger H.P. sensor does not go on even though the jogger was returned to the home position during the duplex tray side fence jogger homing process of the power-on sequence.
- Detection Timing -
  During the duplex tray side fence jogger homing process of the power-on sequence
- Possible Causes -
  - Side fence jogger H.P. sensor

SP-Log: 7-402-5

SC523: Side fence jogger H.P. abnormal - Stays on

Type: 4

- Description -
  The main control board notifies the SCU when the jogger H.P. sensor does not go off even though the jogger was moved from the home position during the duplex tray side fence homing process.
- Detection Timing -
  During the duplex tray side fence jogger homing process
- Possible Causes -
  - Side fence jogger H.P. sensor

SP-Log: 7-402-5

SC524: End fence jogger H.P. sensor abnormal - Stays off

Type: 4

- Description -
  The main control board notifies the SCU when the jogger H.P. sensor does not go on even though the jogger was returned to the home position during the duplex tray end fence jogger homing process of the power-on sequence.
- Detection Timing -
  During the duplex tray end fence jogger homing process of the power-on sequence
- Possible Causes -
  - End fence jogger H.P. sensor

SP-Log: 7-402-5

SC525: End fence jogger H.P. sensor abnormal - Stays on

Type: 4

- Description -
  The main control board notifies the SCU when the jogger H.P. sensor does not go off even though the jogger was moved from the home position during the duplex tray end fence jogger homing process.
- Detection Timing -
  During the duplex tray end fence jogger homing process
- Possible Causes -
  - End fence jogger H.P. sensor

SP-Log: 7-402-5

SC541: Fusing (hot roller) thermistor open

Type: 1

- Description -
  When the fusing (hot roller) thermistor outputs an analog value corresponding to 0°C, the main control board determines that the fusing thermistor is broken and notifies the SCU of this.
- Detection Timing -
  Always
- Possible Causes -
  - Fusing (hot roller) thermistor
  - Main control board

SP-Log: 7-402-5

SC542: Fusing (hot roller) warm-up error

Type: 1

- Description -
  The main control board notifies the SCU when the fusing (hot roller) thermistor does not output an analog value corresponding to the ready temperature within 12 minutes after the power switch is turned on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Fusing (hot roller) thermistor
  - Main control board

SP-Log: 7-402-5

SC543: Fusing (hot roller) overheat

Type: 1

- Description -
  When the fusing (hot roller) thermistor outputs an analog value corresponding to 200°C, the main control board detects an overheat and notifies the SCU of it.
- Detection Timing -
  At all times
- Possible Causes -
  - Fusing (hot roller) thermistor
  - Main control board

SP-Log: 7-402-5

SC544: Fusing (hot roller) low temperature

Type: 1

- Description -
  The main control board notifies the SCU when the fusing (hot roller) thermistor outputs an analog value corresponding to 90°C after it had previously reached the ready temperature.
- Detection Timing -
  Always
- Possible Causes -
  - Fusing (hot roller) thermistor
  - Main control board

SP-Log: 7-402-5

SC545: Fusing (hot roller) ready temperature abnormal

Type: 1

- Description -
  The main control board notifies the SCU when the fusing (hot roller) thermistor outputs an analog value corresponding to a temperature lower than the ready temperature for 6 minutes or more after it had previously reached the ready temperature.
- Detection Timing -
  Always
- Possible Causes -
  - Fusing (hot roller) thermistor
  - Main control board

SP-Log: 7-402-5

SC547: Fusing (hot roller) temperature does not increase

Type: 1

- Description -
  The main control board notifies the SCU when the output of the fusing (hot roller) thermistor increases by no more than 3°C for a minute during warming up after the power switch is turned on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Fusing (hot roller) thermistor
  - Main control board

SP-Log: 7-402-5

SC551: Pressure roller thermistor open

Type: 1

- Description -
  When the pressure roller thermistor outputs an analog value corresponding to 0°C, the main control board determines that the pressure roller thermistor is broken and notifies the SCU of it.
- Detection Timing -
  Always
- Possible Causes -
  - Pressure roller thermistor
  - Main control board

SP-Log: 7-402-5

SC552: Pressure roller warm-up error

Type: 1

- Description -
  The main control board notifies the SCU when the pressure roller thermistor does not output an analog value corresponding to the ready temperature within 12 minutes after the power switch is turned on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Pressure roller thermistor
  - Main control board

SP-Log: 7-402-5

SC553: Pressure roller overheat

Type: 1

- Description -
  When the pressure roller thermistor outputs an analog value corresponding to 200°C, the main control board judges an overheat and notifies the SCU of this.
- Detection Timing -
  Always
- Possible Causes -
  - Pressure roller thermistor
  - Main control board

SP-Log: 7-402-5

SC554: Pressure roller low temperature

Type: 1

- Description -
  The main control board notifies the SCU when the pressure roller thermistor outputs an analog value corresponding to 70°C after it had already reached the ready temperature.
- Detection Timing -
  At all times
- Possible Causes -
  - Pressure roller thermistor
  - Main control board

SP-Log: 7-402-5

SC555: Pressure roller ready temperature abnormal

Type: 1

- Description -
  The main control board notifies the SCU when the pressure roller thermistor outputs an analog value corresponding to a temperature lower than the ready temperature for 6 minutes or more after it had already reached the ready temperature.
- Detection Timing -
  At all times
- Possible Causes -
  - Pressure roller thermistor
  - Main control board

SP-Log: 7-402-5

SC557: Pressure roller temperature does not increase

Type: 1

- Description -
  The main control board notifies the SCU when the output of the pressure roller thermistor increases by no more than 3°C for a minute during warming up after the power switch is turned on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - Pressure roller thermistor
  - Main control board

SP-Log: 7-402-5

SC558: Zero cross signal abnormal

Type: 1

- Description -
  The main control board notifies the SCU when the number of zero cross signals generated within a certain period of time does not reach a predetermined number.
- Detection Timing -
  At all times
- Possible Causes -
  - Main control board

SP-Log: 7-402-5

SC600: Communication error between the SCU and operation panel boards

Type: 3

- Description -
  The input value used by the SCU to send the test signal to the operation panel does not match the expected value.
- Detection Timing -
  When the power switch is turned on
  When the operation panel is used
- Possible Causes -
  - SCU (System Control Unit)

SP-Log: 7-402-6

SC601: Communication error between SCU and scanner IPU boards

Type: 3

- Description -
  The SCU detects a communication error in the scanner module during communication with the scanner IPU board based on the SCSI connection protocol.
- Detection Timing -
  At all times
- Possible Causes -
  - Scanner IPU
  - SCU (System Control Unit)
  - SCSI cable

SP-Log: 7-402-6

SC603: Communication error between SCU and printer main control board

Type: 3

- Description -
  The SCU detects a communication error in the printer module during communication with the main control board based on the SCSI connection protocol.
- Detection Timing -
  Always
- Possible Causes -
  - Main control board
  - SCU (System Control Unit)
  - SCSI cable

SP-Log: 7-402-6

SC604: Communication error between scanner and IDU

Type: 2

- Description -
  The scanner IPU board detects a communication error in the IDU during communication with the IDU based on the IDU connection protocol.
- Detection Timing -
  When the power switch is turned on
  When the IDU is active
- Possible Causes -
  - Scanner IPU
  - IDU

SP-Log: 7-402-6

SC605: Printer internal communication error

Type: 2

- Description -
  (1) When the Fgate signal (LD on/off control) is not sent.
  (2) When the sequence reaches an impossible value.
  (3) When the Fgate OFF command is received for a process that has not started
- Detection Timing -
  Always
- Possible Causes -
  - Main control board

SP-Log: 7-402-6

SC606: Printer SCSI communication error

Type: 2

- Description -
  The main control board detects an error or hardware-related noise during communication between the SCU or SCN and the main control board.
- Detection Timing -
  Always
- Possible Causes -
  - Main control board
  - SCU (System Control Unit)
  - Scanner IPU
  - SCSI cable

SP-Log: 7-402-6

SC607: Serial communication error between SCU and printer

Type: 2

- Description -
  A hardware-related communication error occurs for a successive three times or a communication time-out occurs during optical-fiber serial communication between the SCU and the main control board.
- Detection Timing -
  When the power switch is turned on
  When the main counter is active
- Possible Causes -
  - Main control board
  - SCU (System Control Unit)
  - Fiber cable

SP-Log: 7-402-6

SC620: Communication error between scanner and ADF

Type: 4

- Description -

When the scanner IPU board detects a communication error in the ADF during communication with the ADF based on the ASAP optical-fiber connection protocol, it notifies the SCU of this.

- Detection Timing -

When the power switch is turned on
When the ADF prepares for operation

- Possible Causes -

- Scanner IPU
- ADF main board

SP-Log: 7-402-6

SC621: Communication error between printer and sorter

Type: 2

- Description -

When the main control board detects a communication error in the sorter during communication with the sorter based on the ASAP optical-fiber connection protocol, it notifies the SCU of this.

- Detection Timing -

When the power switch is turned on
When the sorter is active

- Possible Causes -

- Main control board
- Sorter main board
- Fiber cable

SP-Log: 7-402-6

SC625: Communication error between scanner and projector

Type: 4

- Description -

When the scanner IPU board detects a communication error in the projector during communication with the projector based on the projector optical-fiber connection protocol, it notifies the SCU of this.

- Detection Timing -

When the power switch is turned on
When the projector prepares for operation

- Possible Causes -

- Scanner IPU
- Projector control board
- Fiber cable

SP-Log: 7-402-6

SC626: Communication error between printer and bank

Type: 4

- Description -

When the main control board detects a communication error in the paper bank unit during communication with the paper bank unit based on the ASAP optical-fiber connection protocol, it notifies the SCU of this.

- Detection Timing -

When the power switch is turned on
When the paper bank unit is active

- Possible Causes -

- Main control board
- Bank interface board
- Fiber cable

SP-Log: 7-402-6

SC630: RDS communication error

Type: 3

– Japan only –

SC720: Sorter transport motor abnormal

Type: 2

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter transport motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Sorter transport motor

SP-Log: 7-402-7

SC721: Bin drive motor abnormal

Type: 2

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter bin drive motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Bin drive motor

SP-Log: 7-402-1

SC722: Sorter jogger motor abnormal

Type: 2

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter jogger motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Sorter jogger motor

SP-Log: 7-402-7

SC724: Sorter grip motor abnormal

Type: 2

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter grip motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Sorter grip motor

SP-Log: 7-402-7

SC725: Stapler motor abnormal

Type: 4

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter stapler motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Stapler motor

SP-Log: 7-402-7

SC731: Shift motor abnormal

Type: 2

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter shift motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Shift motor

SP-Log: 7-402-7

SC732: Lift motor abnormal

Type: 2

- Description -
  The sorter diagnostics notify the main control board of an anomaly with the sorter lift motor. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the sorter is active
- Possible Causes -
  - Lift motor

SP-Log: 7-402-7

SC741: Paper bank unit abnormal

Type: 4

- Description -
  The paper bank unit diagnostics notify the main control board of an anomaly with the paper bank unit. Then the main control board notifies the SCU of it.
- Detection Timing -
  When the power switch is turned on
  When the paper bank unit is active
- Possible Causes -
  - Bank interface board

SP-Log: 7-402-7

SC790: Projector lamp does not go on

Type: 4

- Description -
  The projector diagnostics notify the scanner IPU board when the projector lamp does not go on although the ON command is issued. Then the scanner IPU board notifies the SCU of it.
- Detection Timing -
  When the projector is started up
- Possible Causes -
  - Projector control board

SP-Log: 7-402-7

SC791: Projector lamp does not go off

Type: 4

- Description -
  The projector diagnostics notify the scanner IPU board when the projector lamp does not go off although the OFF command is issued. Then the scanner IPU board notifies the SCU of it.
- Detection Timing -
  When the projector is stopped
- Possible Causes -
  - Projector control board

SP-Log: 7-402-7

SC792: Projector lamp overheat

Type: 4

- Description -
  The projector diagnostics notify the scanner IPU board that the projector lamp has overheated. Then the scanner IPU board notifies the SCU of it.
- Detection Timing -
  When the projector is active
- Possible Causes -
  - Projector control board

SP-Log: 7-402-7

SC900: Main counter disabled

Type: 2

- Description -
  Communication error between the main counter and main control board
- Detection Timing -
  When counter information is uploaded or downloaded
- Possible Causes -
  - Main counter
  - Main control board
  - SCU harness

SP-Log: 7-402-9

SC901: Inconsistent main counter and backup counter

Type: 2

- Description -
  This SC is displayed when the difference between the main and backup counter values is more than ±5.
- Detection Timing -
  When the power switch is turned on
  When the Counter key is pressed
- Possible Causes -
  - Main counter (See "6-12. OTHERS" in "6. REPLACEMENT AND ADJUSTMENT".)

SP-Log: 7-402-9

SC902: SCU-SCSI communication error

Type:1

- Description -
  This SC occurs when the power switch is turned on and neither the scanner IPU board nor main control board is recognized or when an initial error occurs in the SCSI driver.
- Detection Timing -
  Always
- Possible Causes-
  - SCU
  - SCSI cable

SP-Log: 7-402-6

SC903: Serial communication error

Type: 1

- Description -
  This SC is displayed when a counter serial I/O error is detected on the optics fiber cable between the SCU and the main control board for a successive five times.
- Detection Timing -
  Always
- Possible Causes -
  - SCU
  - Main control board
  - Fiber cable

SP-Log: 7-402-6

SC920: SCU/RAM board abnormal

Type: 2

- Description -
  The SCU executes the read/write test for the RAM board on the SCU and the read/write operation is not successfully done. This SC is not displayed just after the read/write test because the CPU enters the hold state. It is displayed after the power switch is turned off and on.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - RAM board

SP-Log: 7-402-9

SC931: Printer NV-RAM abnormal

Type: 1

- Description -
  When the main control board detects that illegal NV-RAM data has been loaded from the SCU, it notifies the SCU of an anomaly.
- Detection Timing -
  When the power switch is turned on
- Possible Causes -
  - RAM board (Battery)
  - Main control board

SP-Log: 7-402-9

SC990: I/O control board 1 abnormal

Type: 2

- Description -

This SC is displayed when a serial/parallel I/O error is detected in the I/O control board 1 for a successive five times.

- Detection Timing -

Always

- Possible Causes -

- I/O control board 1
- Corona unit setting error
- Connector/harness
- Main control board

SP-Log: 7-402-9

SC991: I/O control board 2 abnormal

Type: 2

- Description -

This SC is displayed when a serial/parallel I/O error is detected in the I/O control board 2 for a successive five times.

- Detection Timing -

Always

- Possible Causes -

- I/O control board 2
- Corona unit setting error
- Connector/harness
- Main control board

SP-Log: 7-402-9

2. HOW TO FIND A DEFECTIVE POTENTIAL SENSOR OR ID SENSOR

Purpose

When an image problem occurs, it is difficult to recognize whether there is a problem with these sensors with only the SP data print out.
Measuring the signal coming into the main control board can help you to recognize the defective part.

Overview

- Ensure the resistance of the drum surface and the grounding wire.
- Check the potential sensor and ID sensor output.

Condition

1. Image density is slightly high, but there are no other image problems.
2. The following SP values are out of the normal range for each color by about the same amount.

SP No.	Normal condition*
3-121	K: 2.7 ~ 3.3 Color: 2.5 ~ 3.0
3-902	10 ~ 5

3. The Vmin display (SP3-910) value for each color is similar.
   The value for Bk should be different from the color value.
   (Normal condition*: Bk ≅ 0.03, Color ≅ 1.80)

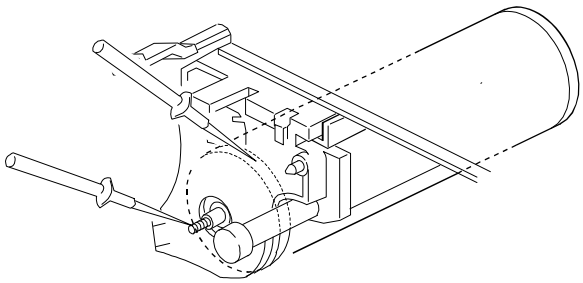
* : These values come from a test machine, therefore the values are just reference data and might not suit your machine.

Procedure

⚠ CAUTION

Before chekcing the resistance or potential of the sensors, make sure to unplug the power cord.

1-1. Measure the resistance between the drum surface and drum shaft.



Normal resistance*: 0.3Ω ~ 0.5Ω

A166T501.wmf

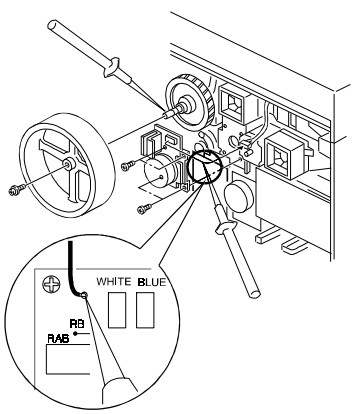
Remove the charge corona unit. Then, contact the edge of the drum surface through the space where the charge corona unit was.

1-2. Check the resistance between the drum shaft and the grounding wire terminal.

- Remove the fly wheel securing screw and the fly wheel.
- Measure the resistance between the shaft and the grounding wire terminal.

  Normal condition*: 4Ω ~ 5Ω.

  (This value includes the bearing resistance)



A166T504.wmf

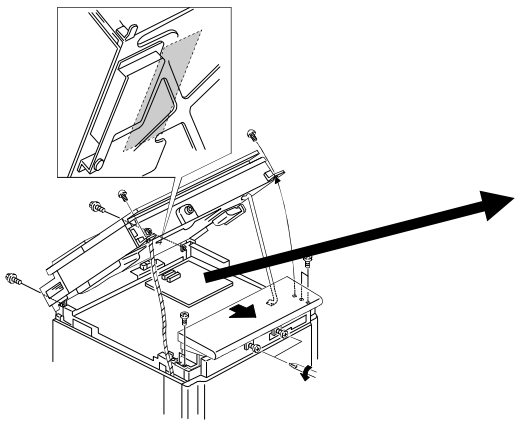
* : These values come from a test machine, therefore the values are just reference data and might not suit your machine.

2-1. Potential sensor/ID sensor check

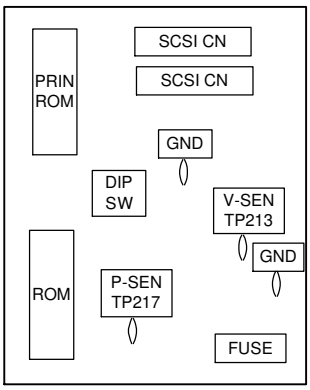
Using a digital oscilloscope, check the waveforms at the following terminals.

If the waveforms are flat, the sensor is broken.

- Potential sensor (V-SEN)
  TP213 on the main control board and GND (Ground)
- ID Sensor (P-SEN)
  TP217 on the main control board and GND (Ground)



A166T502.wmf



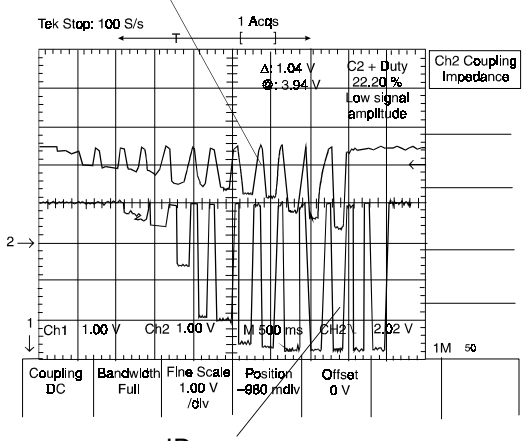
Front A166T500.wmf

After connecting the digital oscilloscope, reassemble the machine, perform the forced process control self check (SP3-126), and check the waveforms while the self check is running.

If the shapes are similar to those shown in the diagram, there is no problem. (The exact shapes and amplitudes of the peaks depends on the machine's condition and environmental circumstances.)

Potential sensor

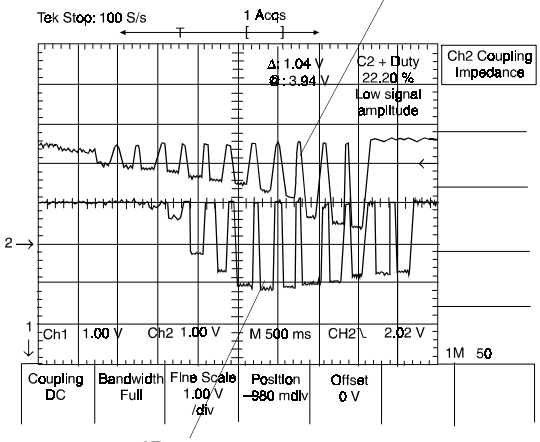
for Bk



ID sensor A166T506.wmf

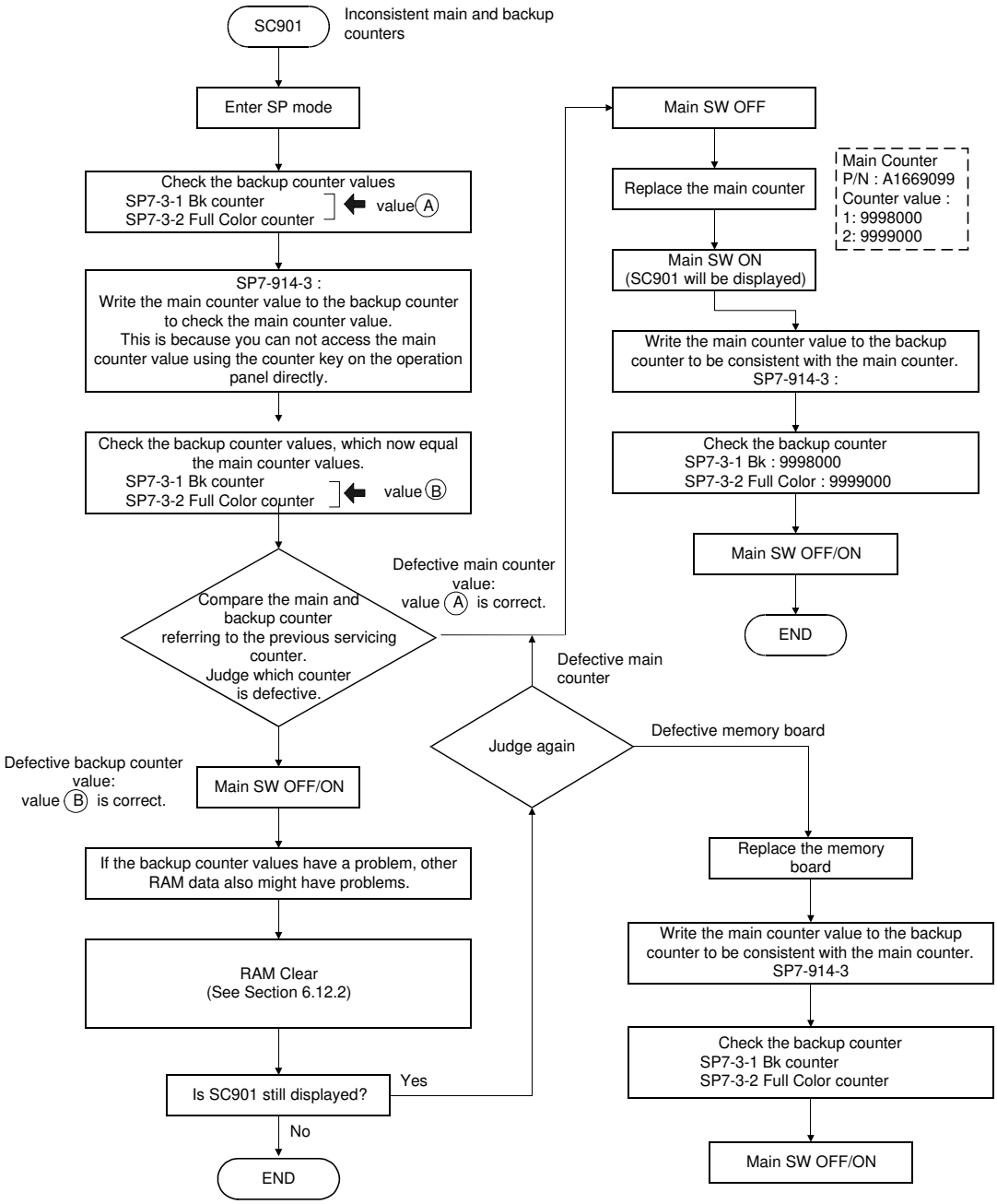
for YMC

Potential sensor



ID sensor A166T503.wmf

3. TROUBLESHOOTING FOR COUNTERS



A166T505.wmf

SECTION 8

OPTIONS

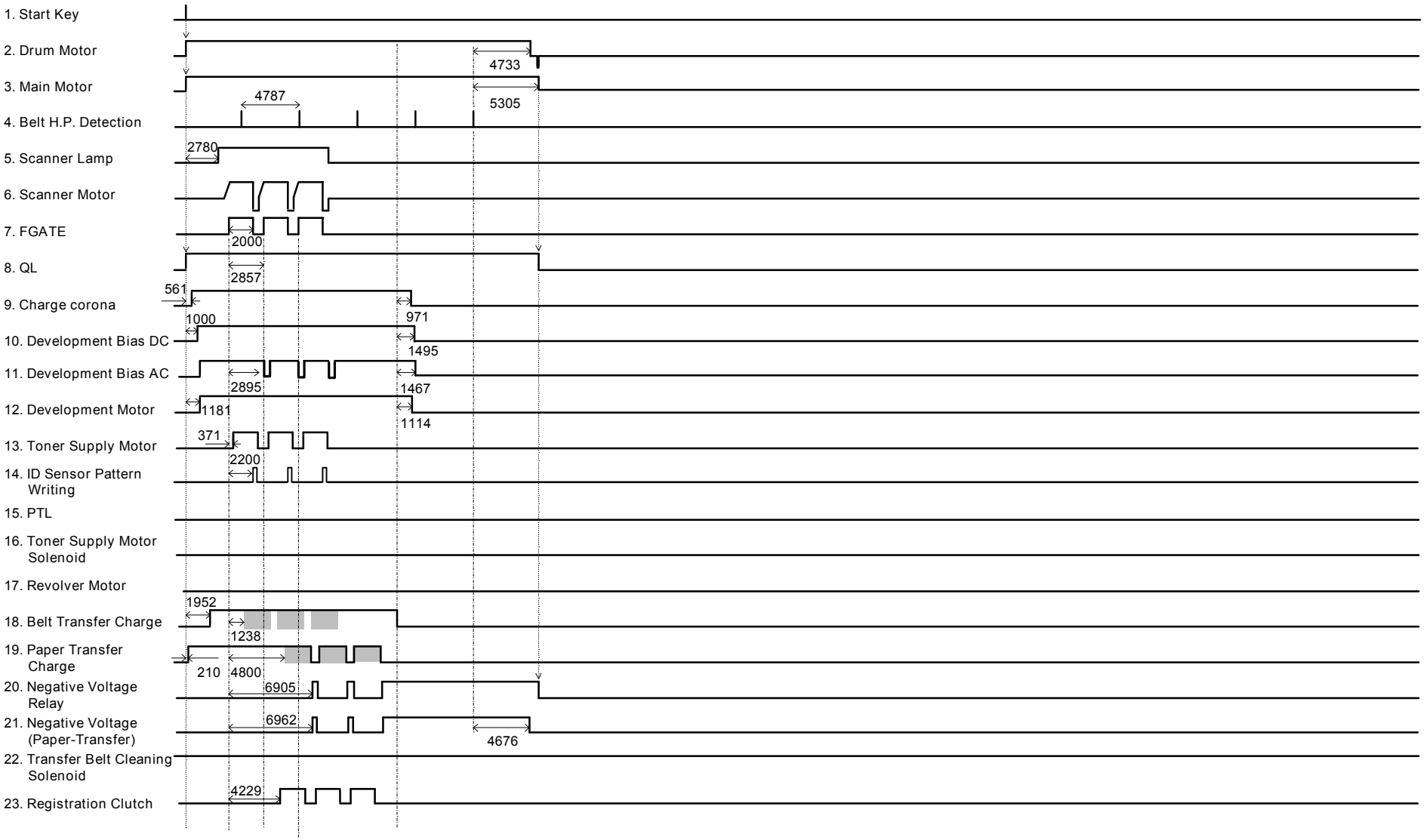
SECTION 9

APPENDIX

APPENDIX 1

TIMING CHARTS

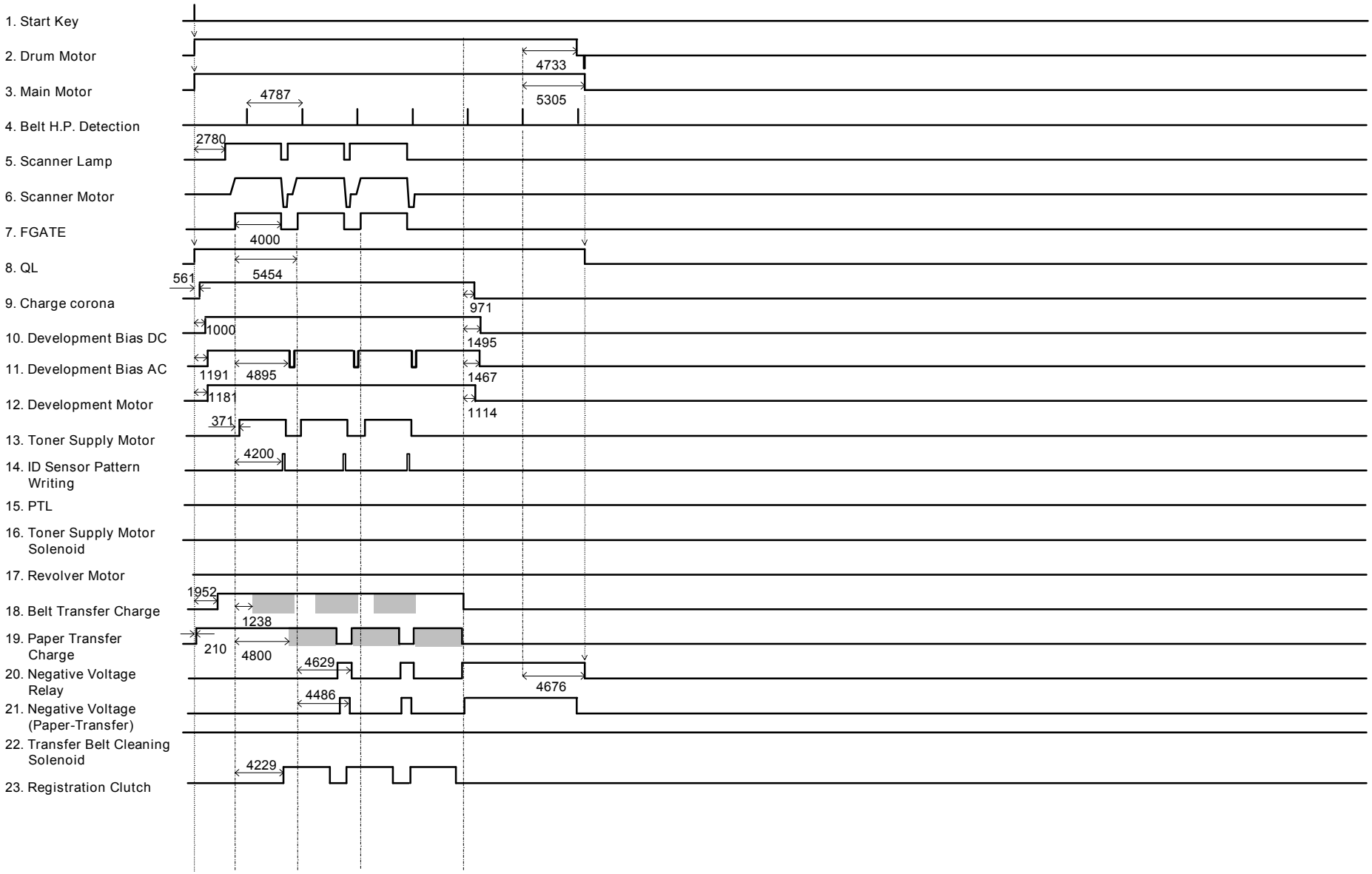
TIMING CHART 1 [Normal speed/Bk/A4]



Copy Mode: Normal Speed
Color Mode: 1C (Black)
Size: A4 Sideways
Copy Volume: 3 Sheets
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The copy is 21 CPM with these conditions.
4. FGATE: When high, the laser diode can write image data to the drum. It corresponds to the image length in the subscan direction.

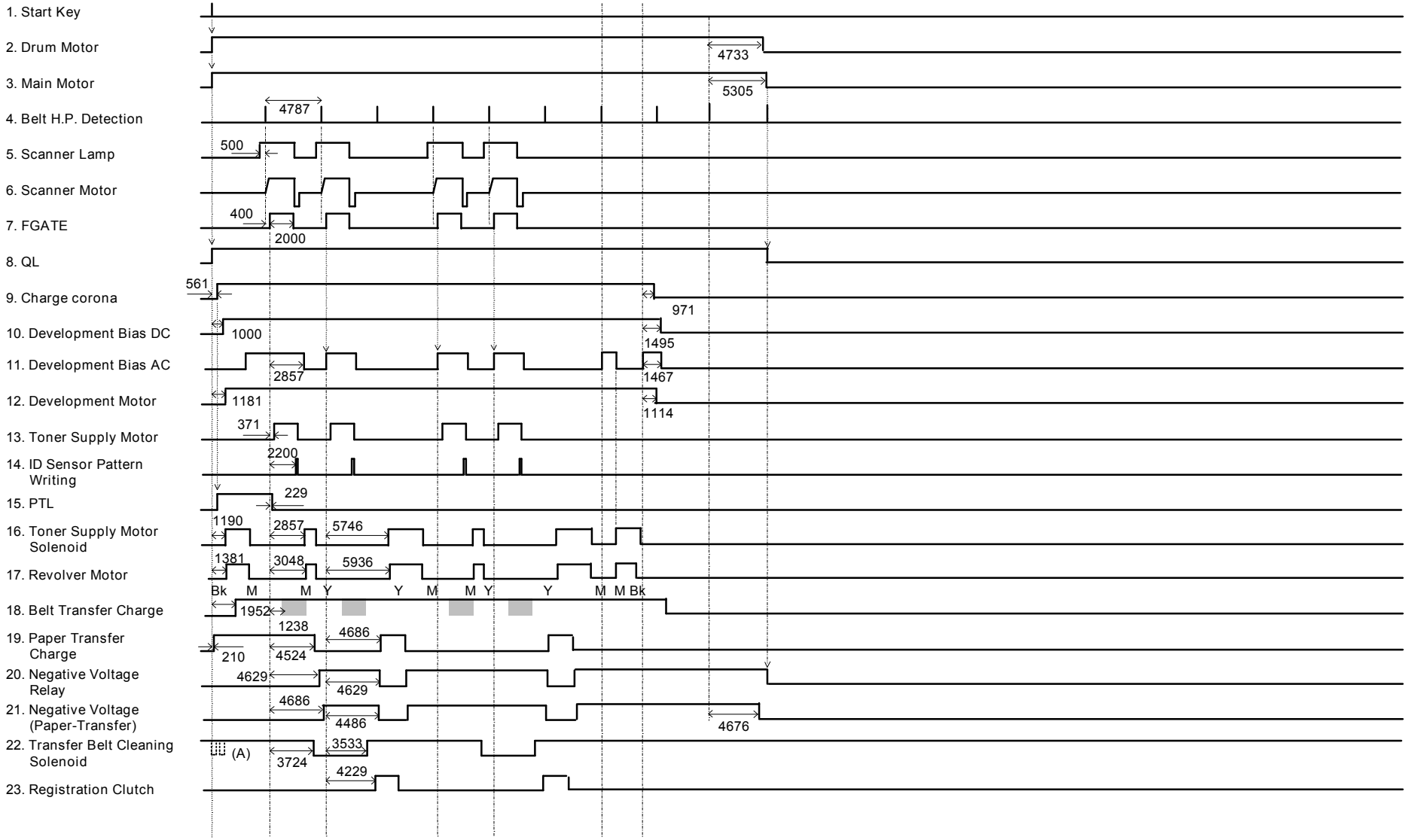
TIMING CHART 2 [Normal speed/Bk/A3]



Copy Mode: Normal Speed
Color Mode: Black
Size: A3
Copy Volume: 3 Sheets
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The copy is 11 CPM with these conditions.

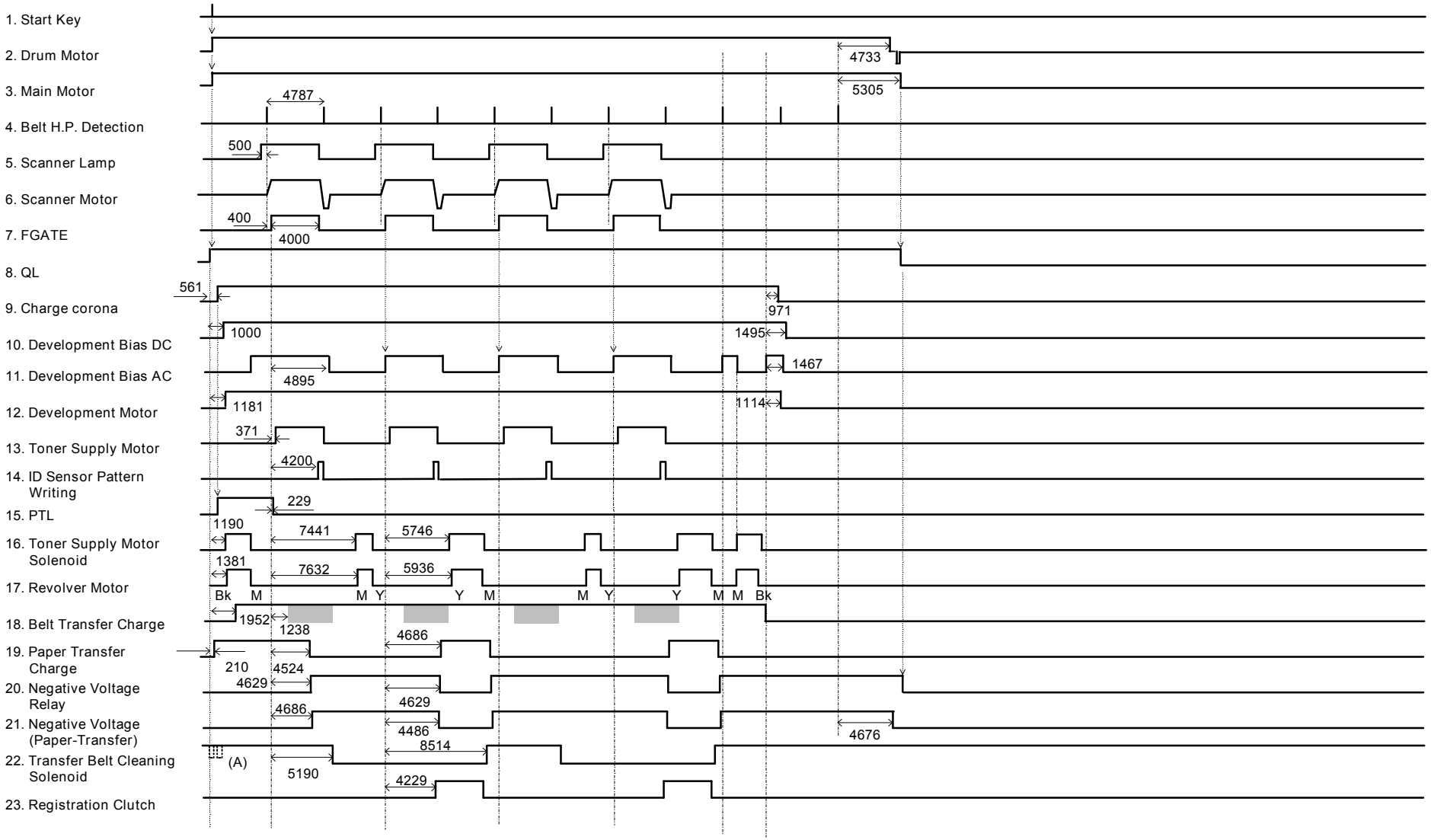
TIMING CHART 3 [Normal speed/Red/A4]



Copy Mode: Normal Speed
Color Mode: Red (M + Y)
Size: A4 Sideways
Copy Volume: 2 Sheets
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).

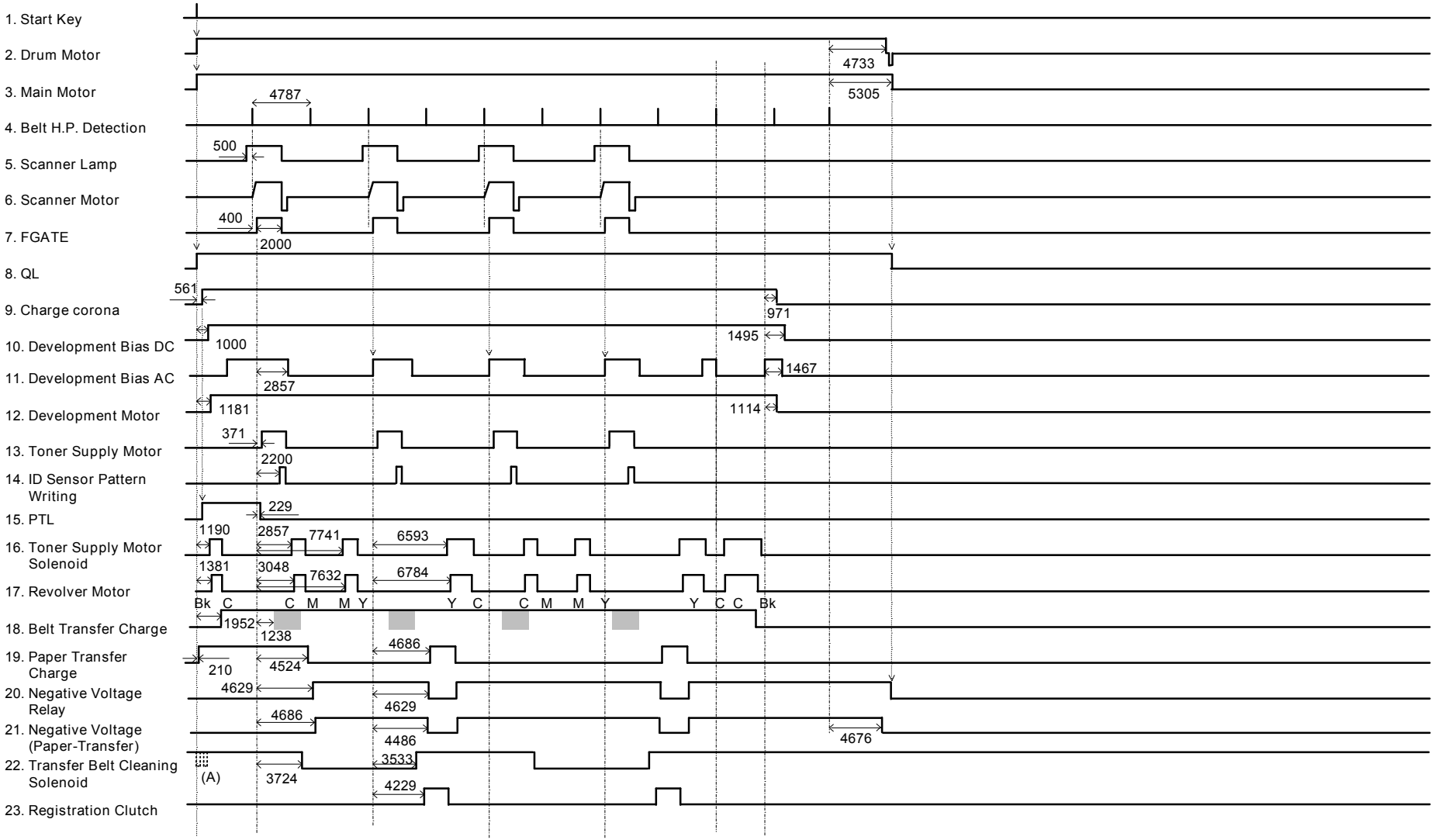
TIMING CHART 4 [Normal speed/Red/A3]



Copy Mode: Normal Speed
Color Mode: Red (M + Y)
Size: A3
Copy Volume: 2 Sheets
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).
4. The time between the belt H.P. detection and FGATE (400 [ms]) depends on the scanner registration adjustment.

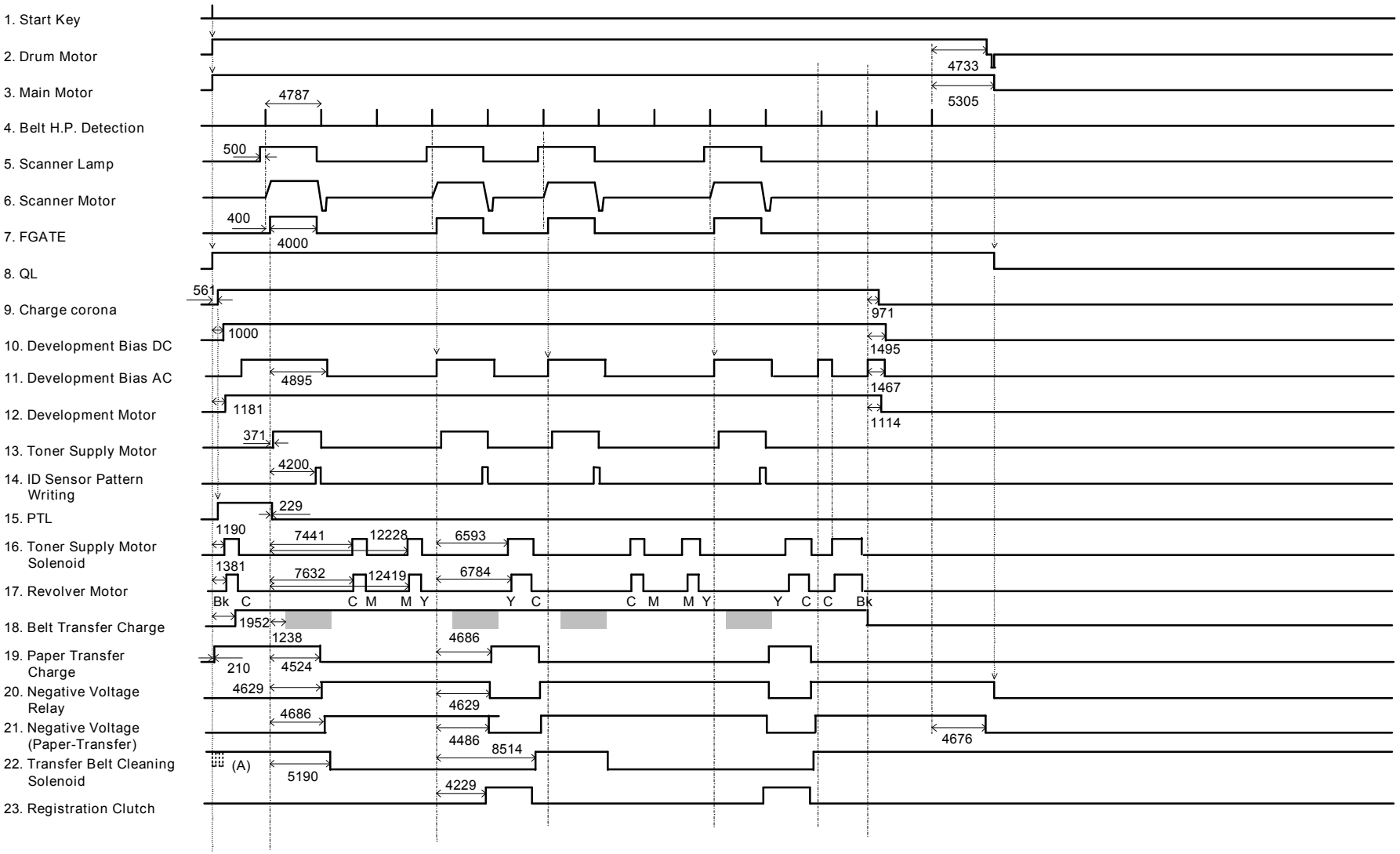
TIMING CHART 5 [Normal speed/Green/A4]



Copy Mode: Normal Speed
Color Mode: Green (C+Y)
Size: A4 Sideways
Copy Volume: 2 Sheets
Magnification: 100%

Note: 1. Time units are in msec.
2. Timing is accurate within 20 msec.
3. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).
4. The time between the belt mark detection and FGATE (400 msec) depends on the scanner registration adjustment.

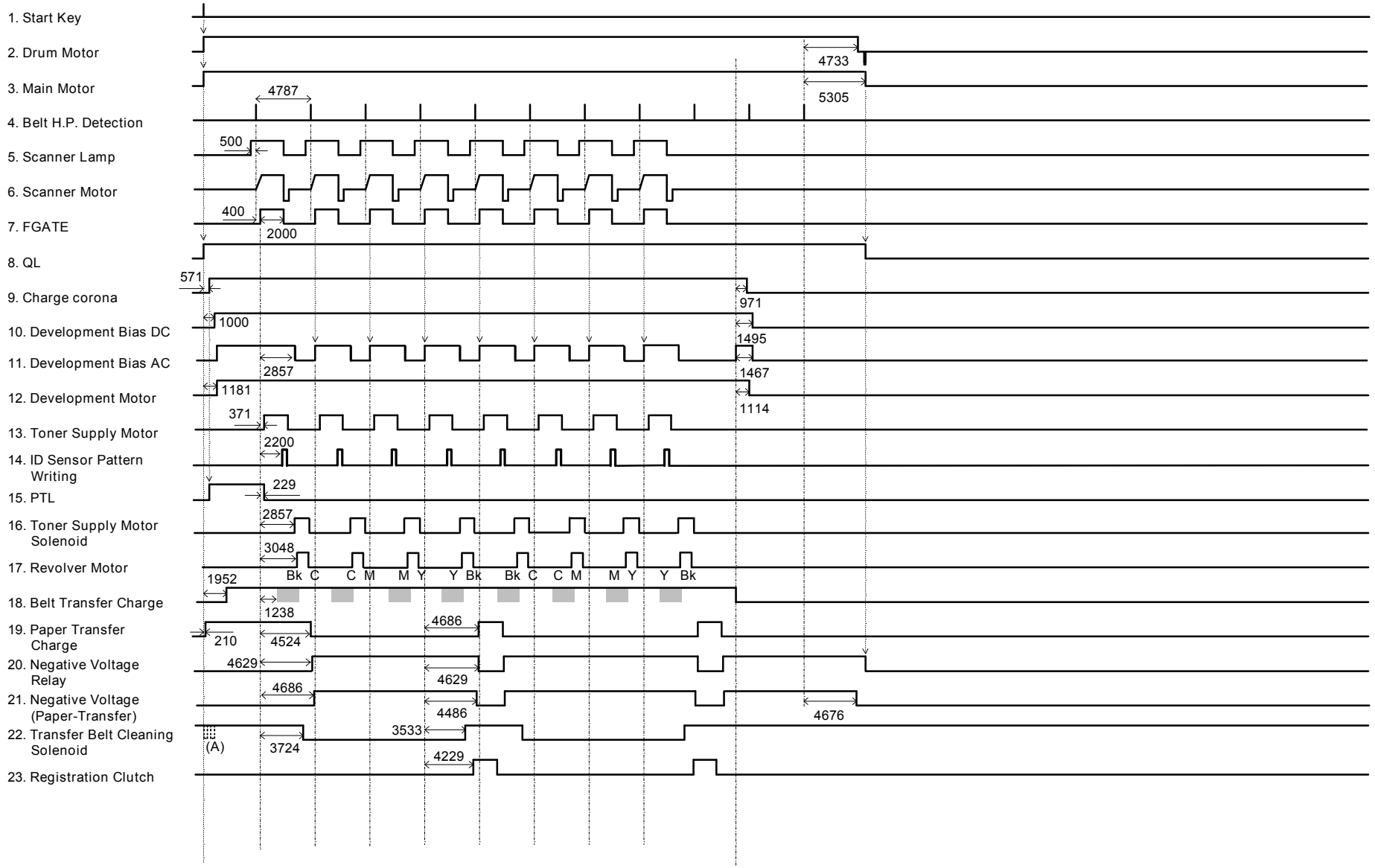
TIMING CHART 6 [Normal speed/Green/A3]



Copy Mode: Normal Speed
Color Mode: Green (C+Y)
Size: A3
Copy Volume: 2 Sheets
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).
4. The time between the belt H.P. detection and FGATE (400 [ms]) depends on the scanner registration adjustment.

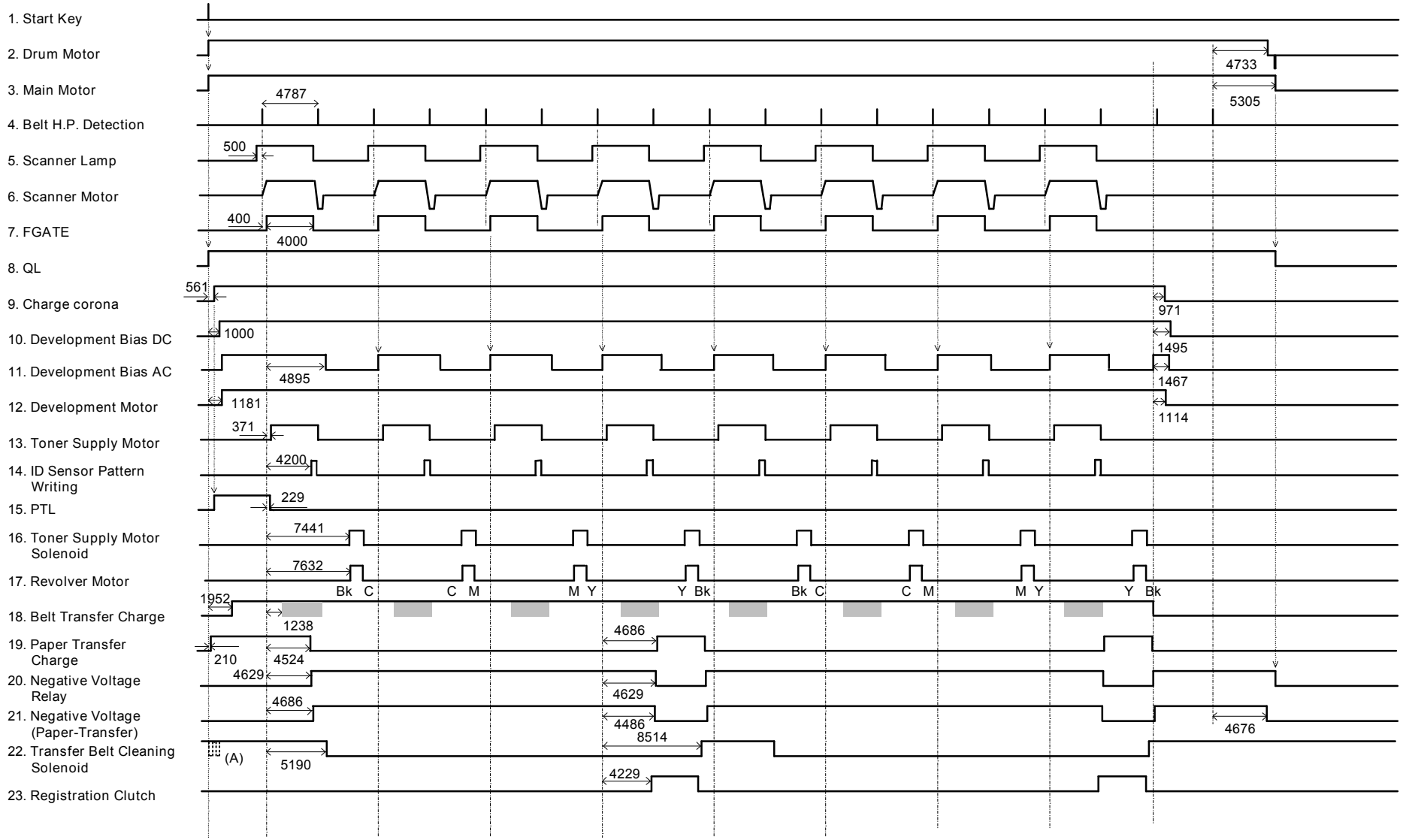
TIMING CHART 7 [Normal speed/Full Color/A4]



Copy Mode: Normal Speed
Color Mode: Full Color
Size: A4 Sideways
Copy Volume: 2 Sheets
Magnification:100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).

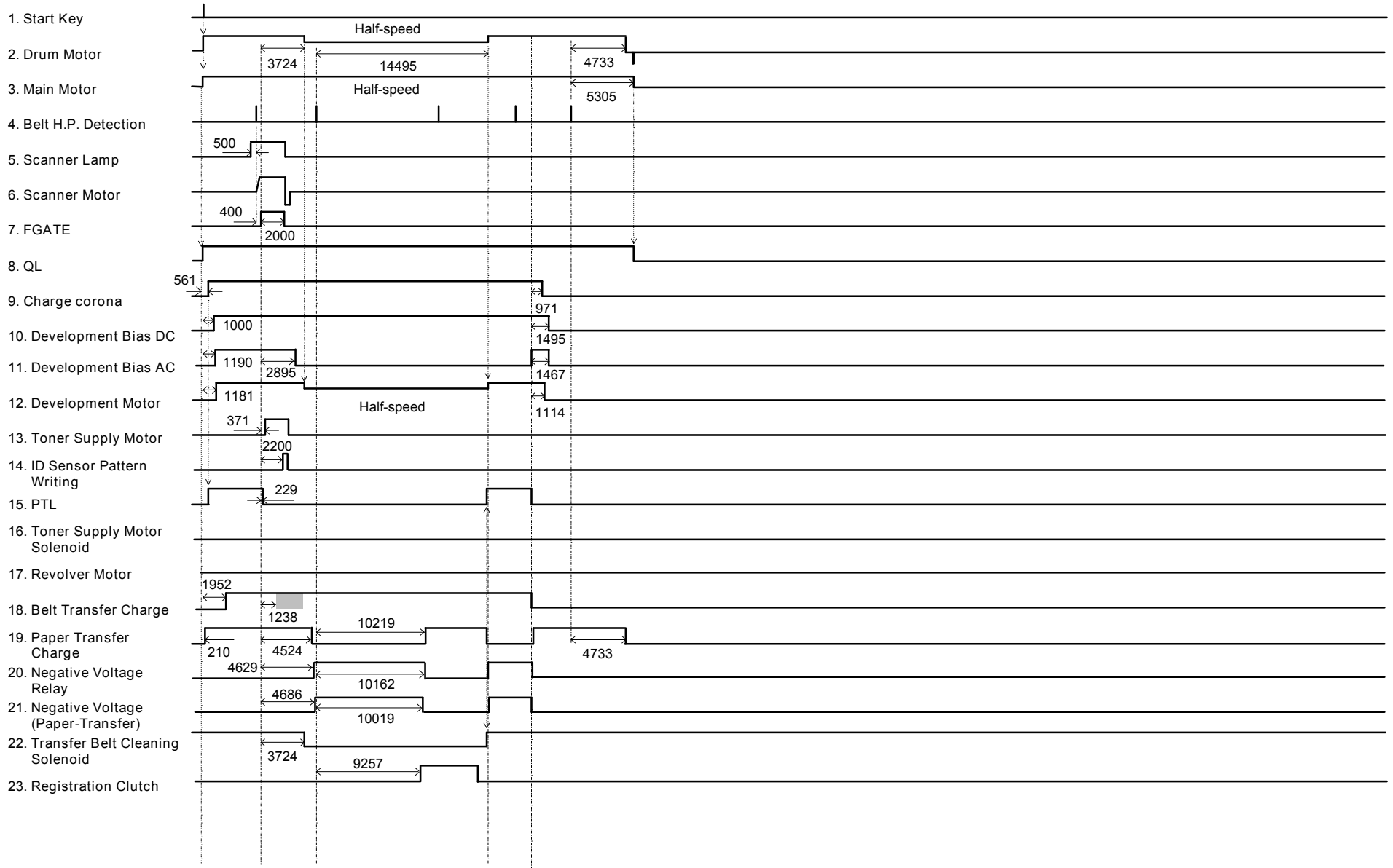
TIMING CHART 8 [Normal speed/Full Color/A3]



Copy Mode: Normal Speed
Color Mode: Full Color
Size: A3
Copy Volume: 2 Sheets
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).
4. The time between the belt H.P. detection and FGATE (400 [ms]) depends on the scanner registration adjustment.

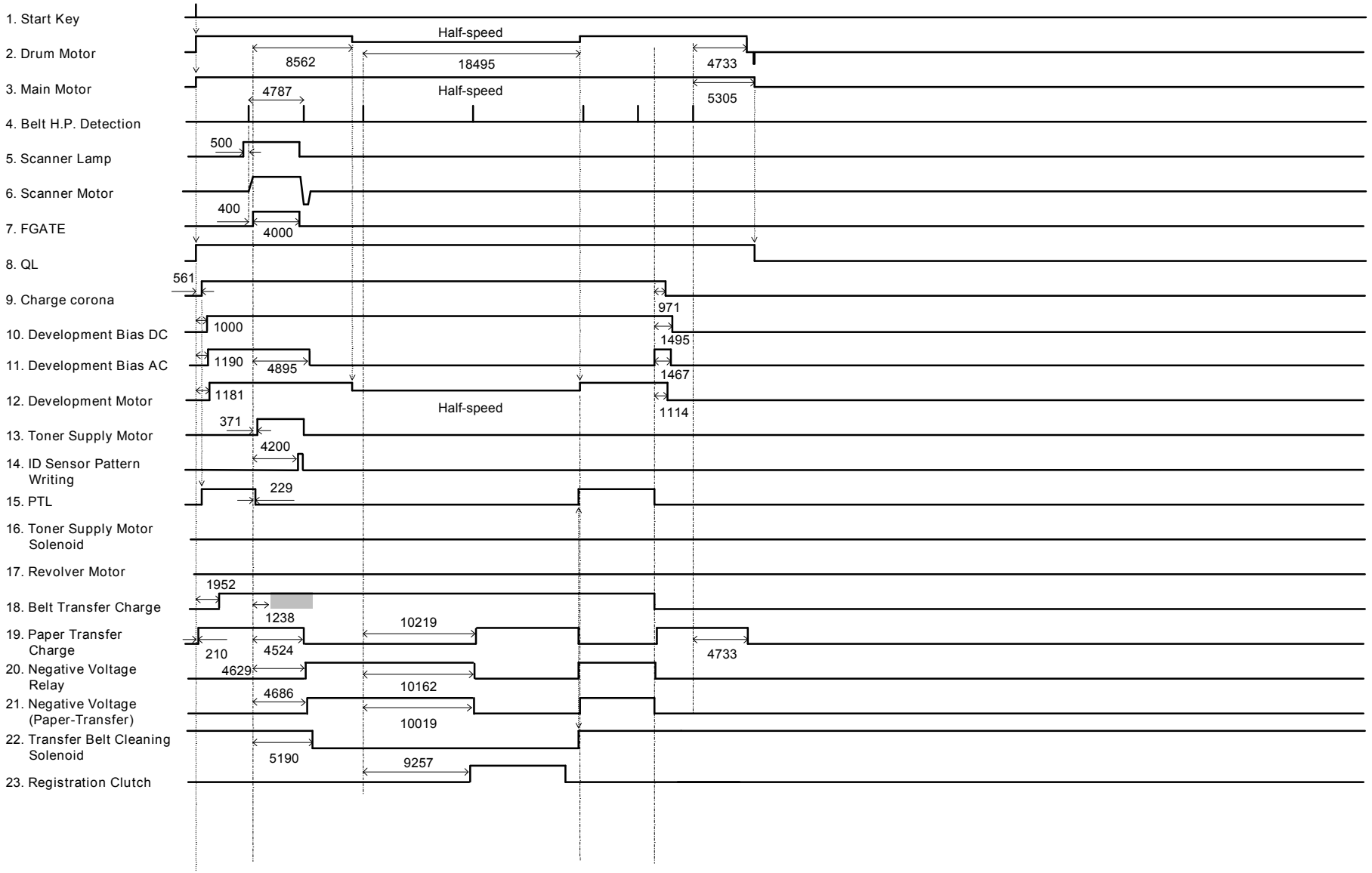
TIMING CHART 9 [Half-speed/Bk/A4]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Black
Size: A4 Sideways
Copy Volume: 1 Sheet
Magnification:100%

2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.

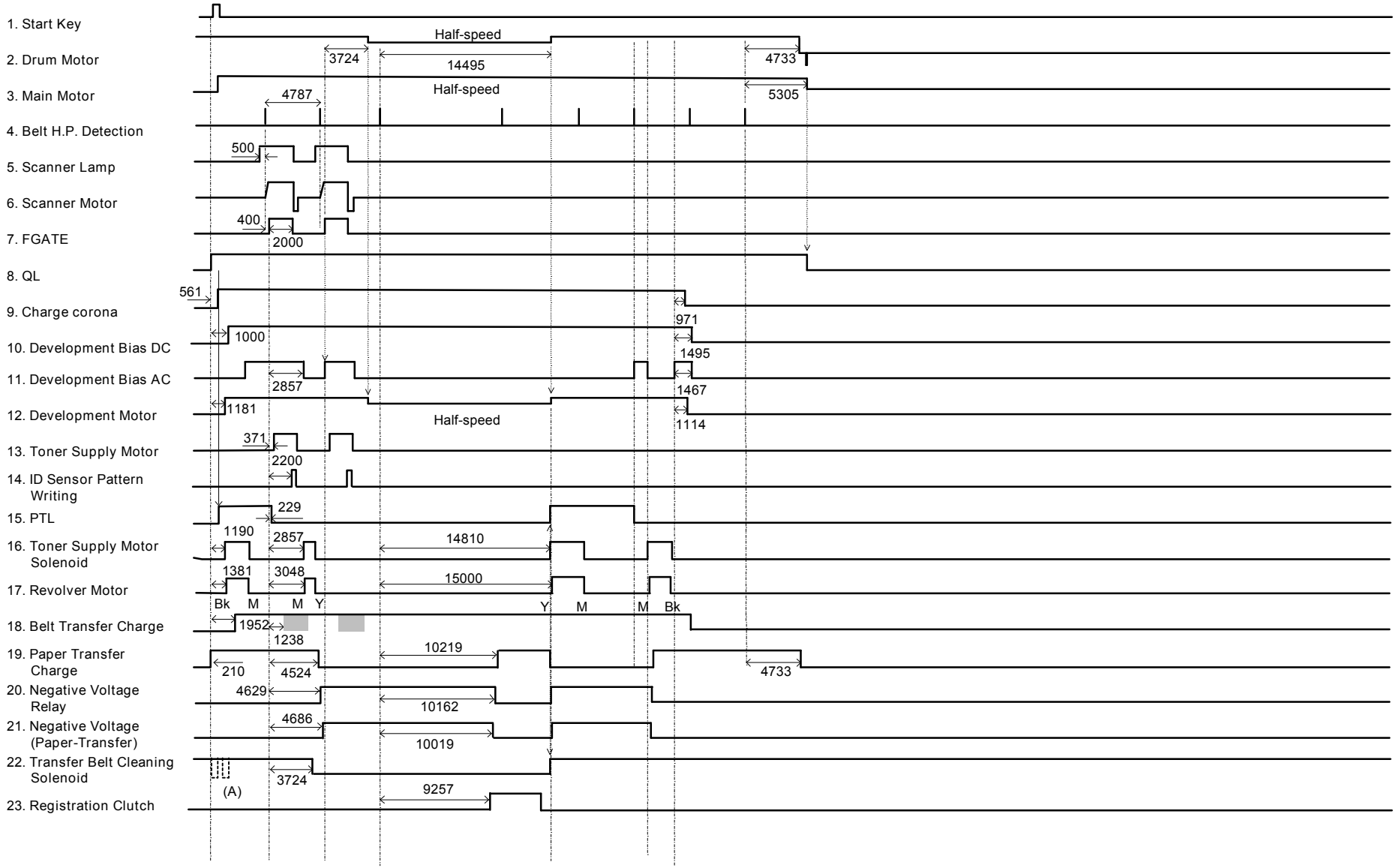
TIMING CHART 10 [Half-speed/Bk/A3]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Black
Size: A3
Copy Volume: 1 sheet
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.

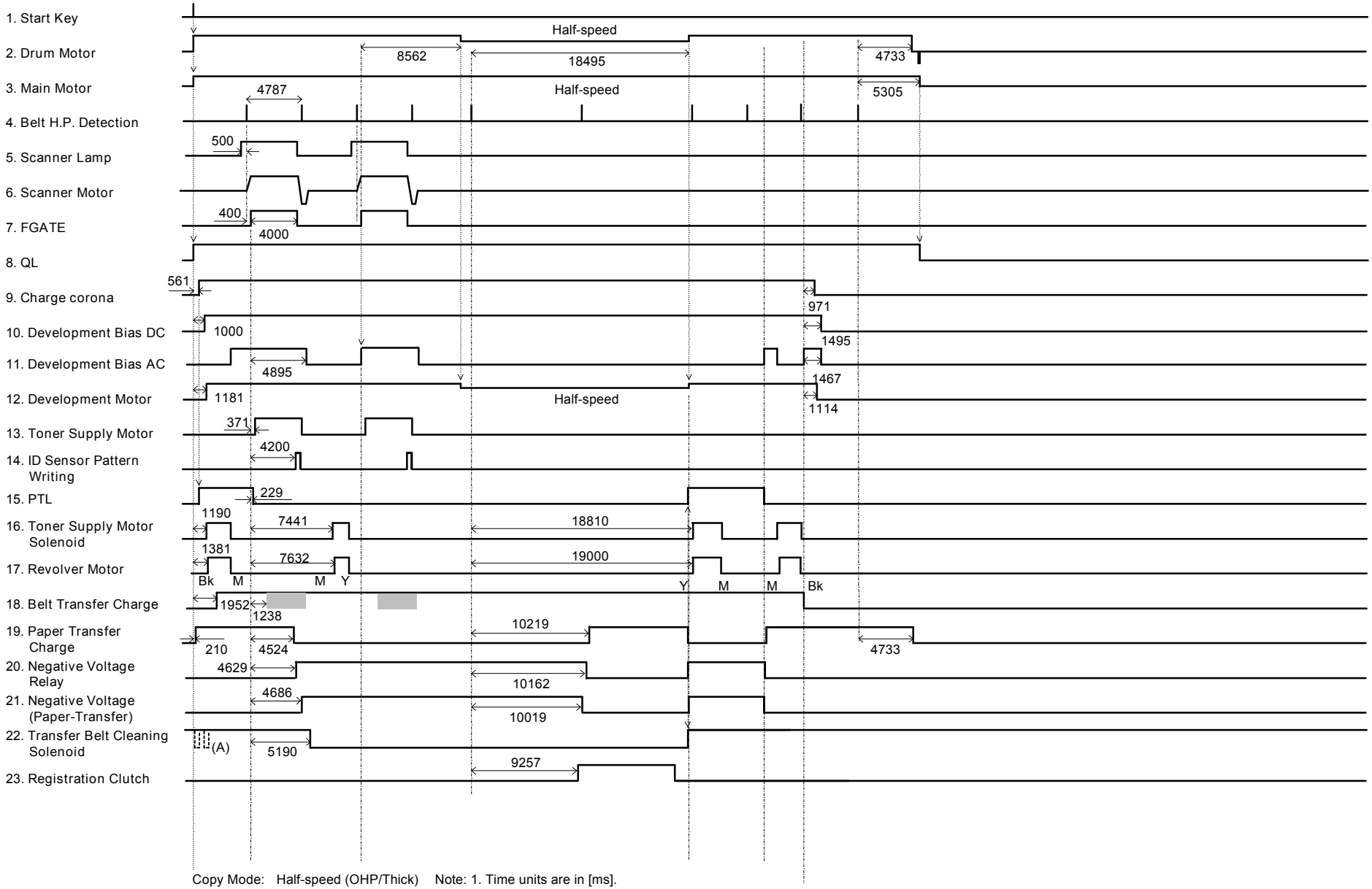
TIMING CHART 11 [Half-speed/Red/A4]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Red (M + Y)
Size: A4 Sideways
Copy Volume: 1 Sheet
Magnification: 100%

2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.
4. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).

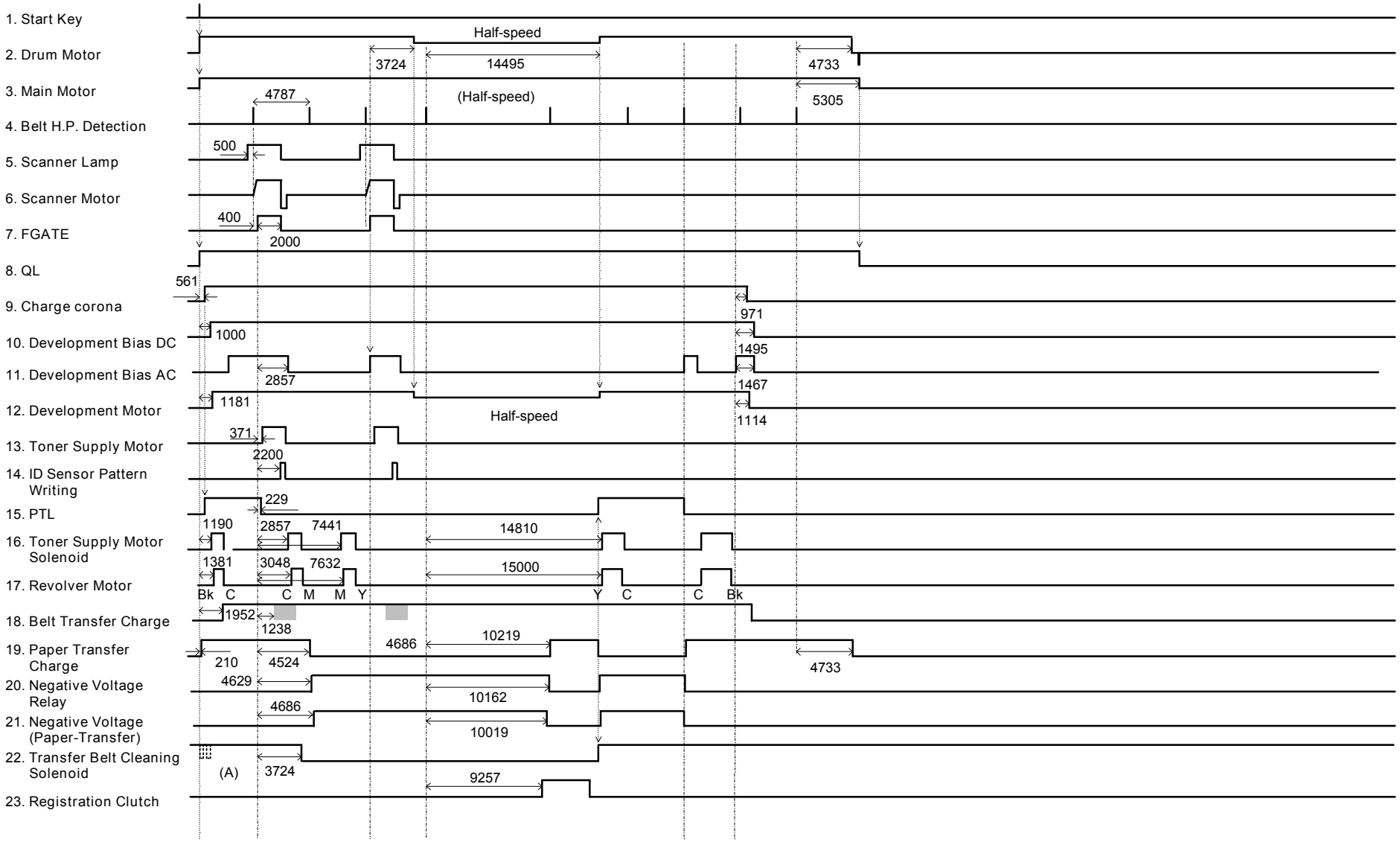
TIMING CHART 12 [Half-speed/Red/A3]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Red (M + Y)
Size: A3
Copy Volume: 1 Sheet
Magnification: 100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.
4. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).

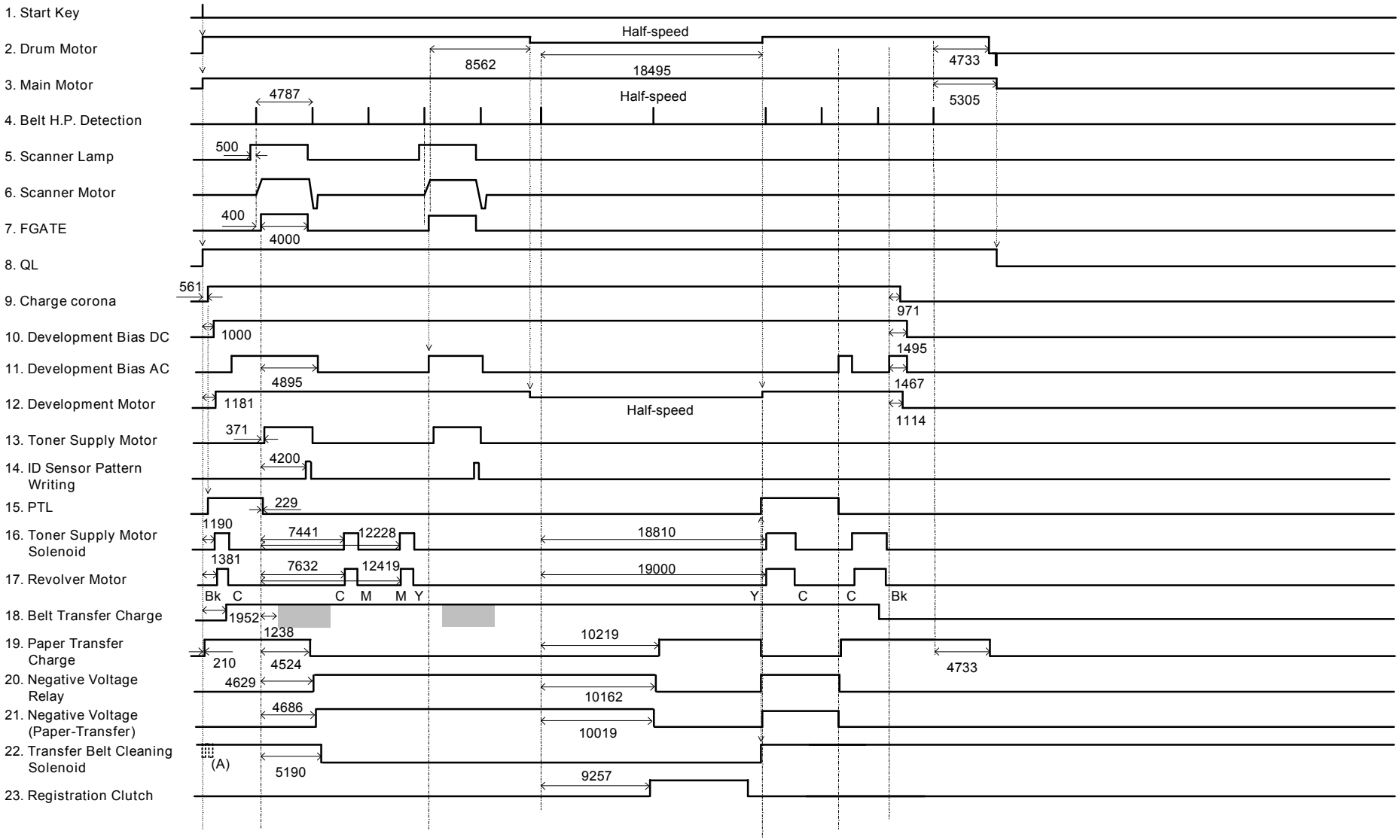
TIMING CHART 13 [Half-speed/Green/A4]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Green (C +Y)
Size: A4 Sideways
Copy Volume: 1 Sheet
Magnification:100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.
4. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).
5. The time between the belt H.P. detection and FGATE (400 [ms]) depends on the scanner registration adjustment.
6. Revolver Motor: Bk → C: 90°; C → M: 90°; M → Y: 90°; Y → C: 180°; C → Bk: 270°

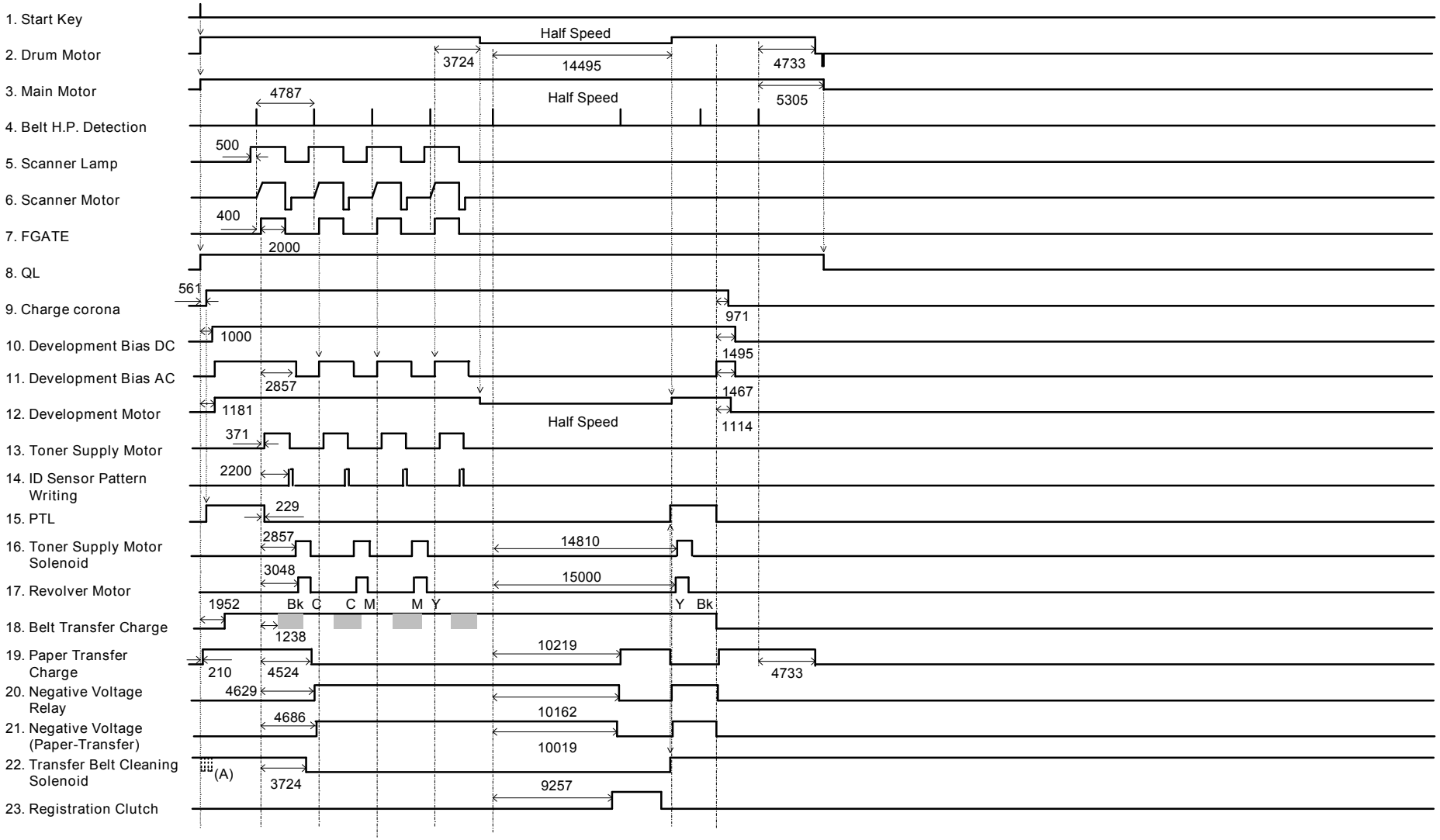
TIMING CHART 14 [Half-speed/Green/A3]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Green (C + Y)
Size: A3
Copy Volume: 1 Sheet
Magnification: 100%

Note:
1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.
4. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).
5. The time between the belt H.P. detection and FGATE (400 [ms]) depends on the scanner registration adjustment.
6. Revolver Motor: Bk → C: 90°; C → M: 90°; M → Y: 90°; Y → C: 180°; C → Bk: 270°

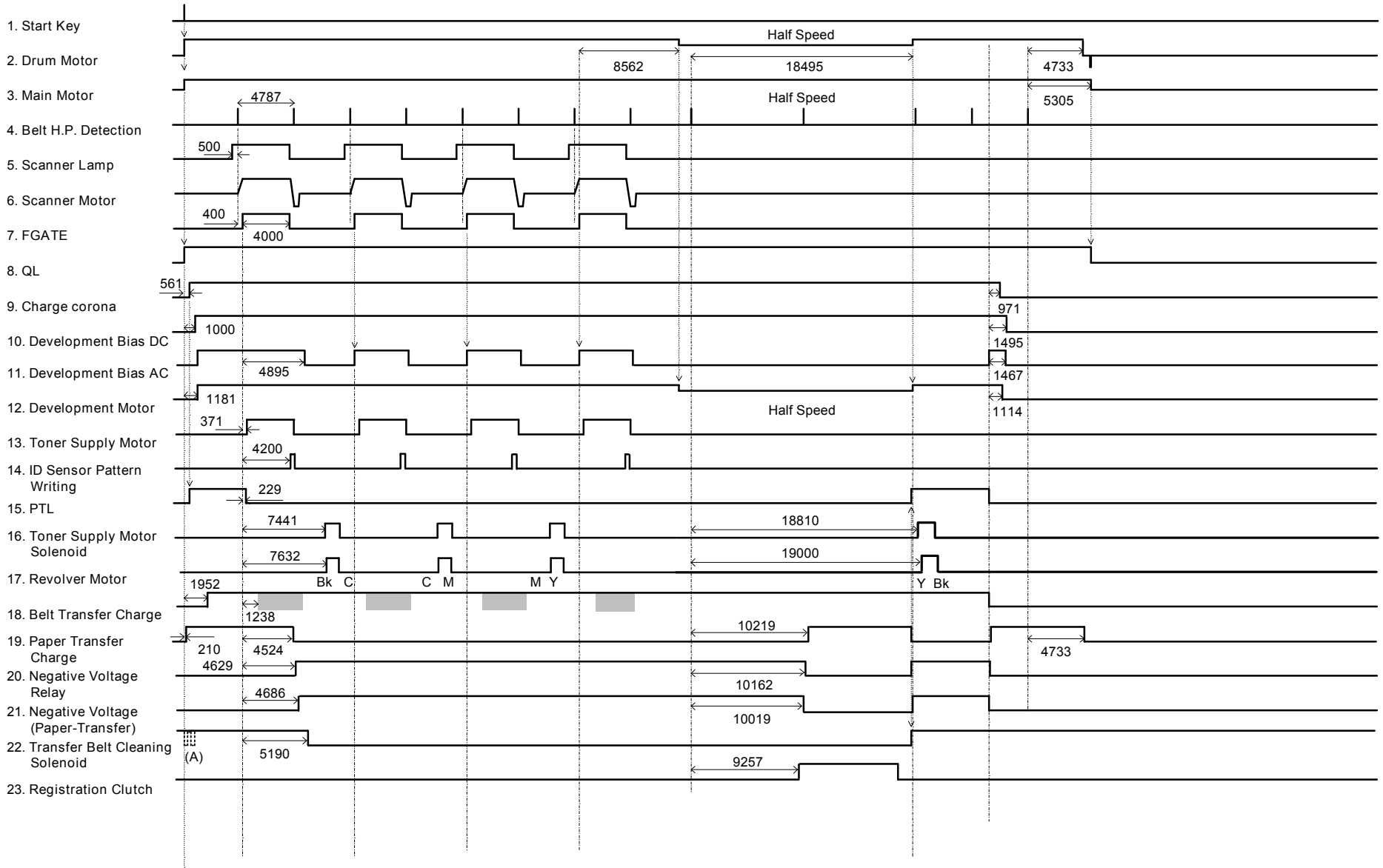
TIMING CHART 15 [Half-speed/Full Color/A4]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Full Color
Size: A4 Sideways
Copy Volume: 1 Sheet
Magnification:100%

Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.
4. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT (sideways)/larger than B4 size).

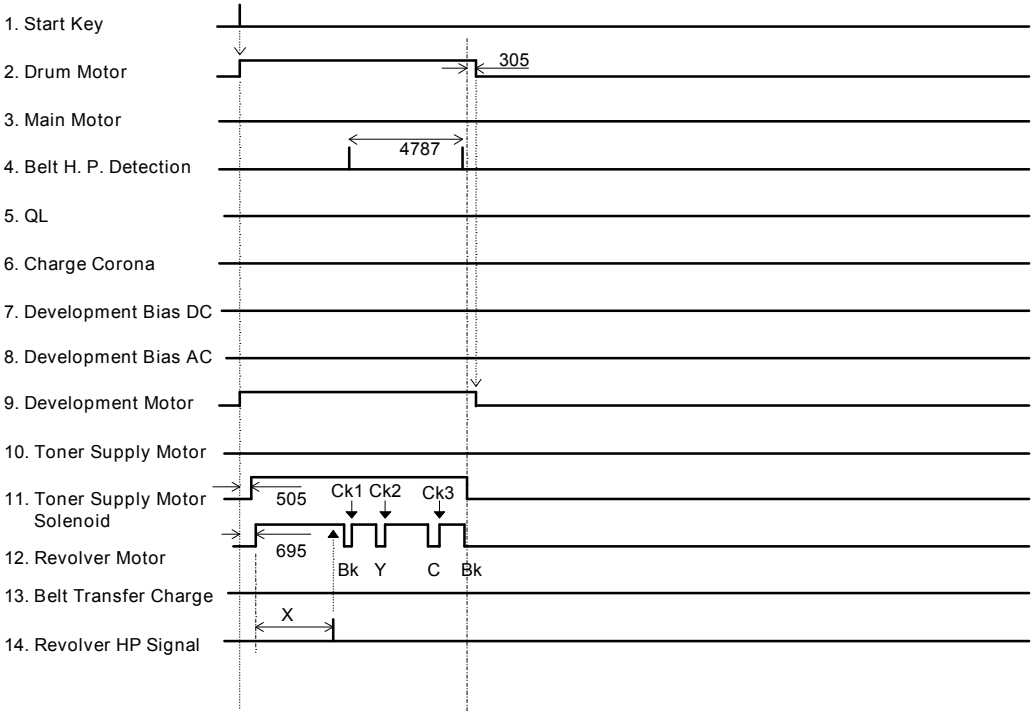
TIMING CHART 16 [Half-speed/Full Color/A3]



Copy Mode: Half-speed (OHP/Thick)
Color Mode: Full Color
Size: A3
Copy Volume: 1 Sheet
Magnification: 100%

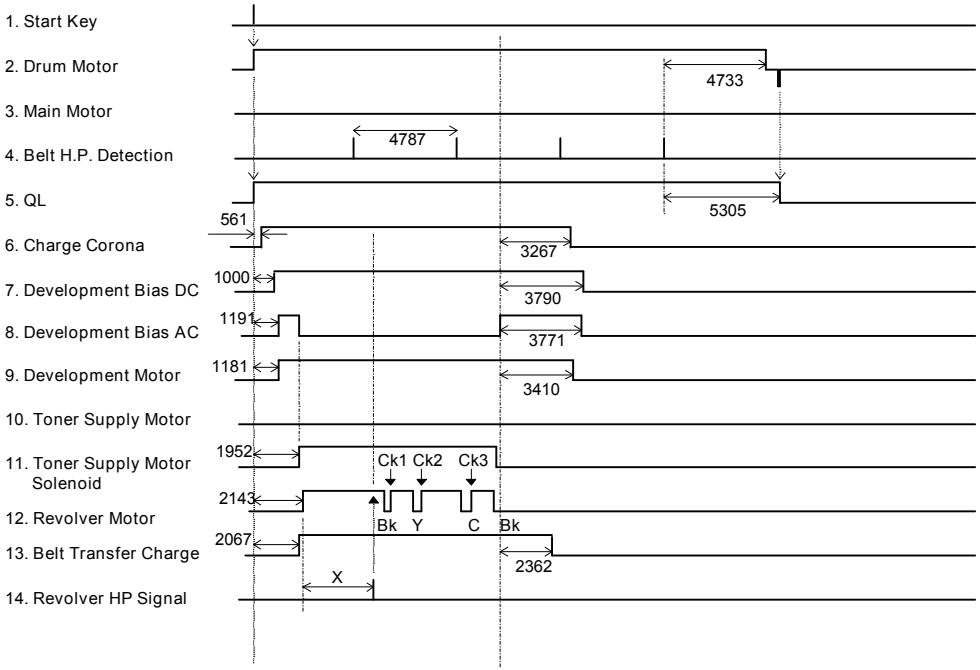
Note:
1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The revolver unit does not rotate while the drum motor or the development roller rotate at half speed.
4. The belt cleaning OFF/ON procedure [part (A)] is performed only after copying in 1C mode (LT or smaller than LT/ larger than B4 size).

TIMING CHART 17 [Cartridge check sequence]



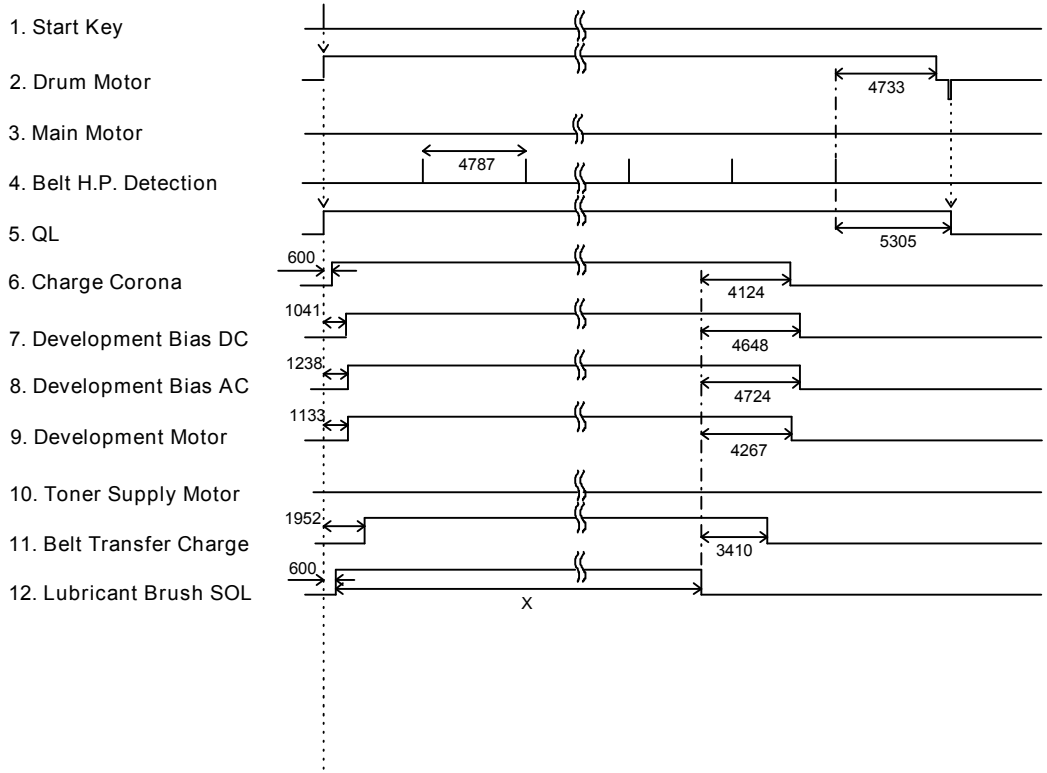
Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. Ck1: Checks whether the Bk and M cartridge are present.
Ck2: Checks whether the Y cartridge is present.
Ck3: Checks whether the C cartridge is present.
4. The amount of time "X" depends on the position of the revolver unit.
5. This sequence will stop if the cartridge sensor detects no cartridge.
6. The drum motor and the development motor rotate at half speed.
7. The drum motor stop timing does not depend on belt H.P. detection.
This is because toner replenishment is performed after this sequence.
8. This sequence is performed after a cartridge which is in the toner end or near-end condition is replaced.
This sequence describes what happens when Bk toner is replaced, therefore the revolver stopes at the Bk development position.

TIMING CHART 18 [Sequence for the Revolver H.P. Process]



Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. Ck1: Checks whether the Bk and M cartriege are present.
Ck2: Checks whether the Y cartridge is present.
Ck3: Checks whether the C cartridge is present
4. The amount of time "X" depends on the position of the revolver unit.
5. This sequence will stop if the cartridge sensor detects no cartridge.

TIMING CHART 19 [Sequence for Lubrication] (Forced Belt Cleaning)



Note: 1. Time units are in [ms].
2. Timing is accurate within 20 [ms].
3. The lubricant time "X" depends on SP mode 2-310-4 (default: 80 seconds)

APPENDIX 2

SP TABLE

Groups of SP Modes

SP mode has 8 groups as follows:

(1) Paper Feed/Transport/Fusing
(2) Around the Drum/Belt Units
(3) Process Control
(4) Scanner
(5) Operation and System
(6) Peripherals
(7) Logged Data
(8) Others

Do not change the data in the field:
Default/Unit Column: Divide the displayed value by the unit to get the actual setting. If the unit is x 10 and the display is 5, the value is 0.5.
Report Column: ❍: Printed with SP7-902 (if changed from the default) and 7-903
☆: Printed with SP7-809

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
PAPER FEED/TRANSPORT/FUSING								
1	1	1	Lead Edge Regist.:Nrml	Shifts the vertical image position by changing the ON timing of the registration clutch for each paper type.	0, x 10	-5.0 to +5.0 (mm)	See "Replacement and Adjustment: Copy Image Adjustments" for how to use these SP modes.	❍
1	1	2	Lead Edge Regist:OHP/Thk		0, x 10	-5.0 to +5.0 (mm)		❍
1	2	1	Side to Side Reg: By-ps	Adjusts the horizontal image position by changing the main scanning start position for each paper feed station.	0, x 10	-5.0 to +5.0 (mm)	Bank 1: Top tray of the optional paper feed unit Bank 2: 2nd tray of the optional paper feed unit Bank 3: 3rd tray of the optional paper feed unit (three-tray types only)	❍
1	2	2	Side to Side Reg: Tray		0, x 10	-5.0 to +5.0 (mm)		❍
1	2	3	Side to Side Reg: Bank-1		0, x 10	-5.0 to +5.0 (mm)		❍
1	2	4	Side to Side Reg: Bank-2		0, x 10	-5.0 to +5.0 (mm)		❍
1	2	5	Side to Side Reg: Bank-3		0, x 10	-5.0 to +5.0 (mm)		❍
1	2	6	Side to Side Reg: Dplx		0, x 10	-5.0 to +5.0 (mm)		❍
1	3	1	P.Feed Tmg: Nrml/By-ps	Changes the paper feed clutch on period at each feed station to adjust the paper buckle at the registration roller for each paper type.	0, x 10	-5.0 to +5.0 (mm)		❍
1	3	2	P.Feed Tmg: Nrml/Tray		0, x 10	-5.0 to +5.0 (mm)		❍
1	3	3	P.Fd.Tmg: OHP/Thk/By-ps		0, x 10	-5.0 to +5.0 (mm)		❍
1	3	4	P.Feed Tmg:Dplx	Changes the paper feed clutch on period at the duplex tray to adjust the paper buckle at the registration roller.	0, x 10	-5.0 to +5.0 (mm)		❍
1	8		Jam Detection OFF	Specifies whether the jam sensors work or not.	0	0: ON, 1: OFF	Use for testing only.	❍
1	101		Oil End Sensor	Specifies whether the oil end sensor is installed or not.	1	0: No, 1: Yes	Do not change the setting.	❍
1	104		Fusing Control	Selects the fusing temperature control mode	0	0: ON/OFF, 1: Phase	Phase control mode should only be selected if the user has a problem with electrical noise or interference.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
1	105	1	Set Hot Rllr.Tmp.Idling	Sets the target temperature of the hot roller during idling. After the setting is changed, the main switch must be turned off/on.	135 , x 1	130 to 170 (°C)	Do not input a value higher than 167°C. The thermofuse opens at 167°C.	❍
1	105	2	Set Hot Rllr.Tmp.Std by	Sets the target temperature of the hot roller during stand-by.	150 , x 1	130 to 170 (°C)		❍
1	105	3	Set Hot Rllr.Tmp.Nrml:FC	Sets the target temperature of the hot roller during copying with normal paper in full color mode.	150 , x 1	130 to 170 (°C)	Do not input a value higher than 167°C. The thermofuse opens at 167 °C.	❍
1	105	4	Set Hot Rllr.Tmp.OHP:FC	Sets the target temperature of the hot roller during copying with OHP/thick paper in full color mode.	150 , x 1	130 to 170 (°C)		❍
1	105	5	Set Hot Rllr.Tmp.Thin:FC	Sets the target temperature of the hot roller during copying with thin paper in full color mode.	150 , x 1	130 to 170 (°C)		❍
1	105	6	Set Hot Rllr.Tmp.Nrml:SC	Sets the target temperature of the hot roller during copying with normal paper in single color mode.	140 , x 1	130 to 170 (°C)		❍
1	105	7	Set Hot Rllr.Tmp.OHP:SC	Sets the target temperature of the hot roller during copying with OHP/thick paper in single color mode.	140 , x 1	130 to 170 (°C)		❍
1	105	8	Set Hot Rllr.Tmp.Thin:SC	Sets the target temperature of the hot roller during copying with thin paper in single color mode.	140 , x 1	130 to 170 (°C)		❍
1	105	9	Set Pressure Roller Temp	Sets the target temperature of the pressure roller.	150 , x 1	130 to 170 (°C)	If the first side of a duplex copy is sticking to the pressure roller, lower the temperature. Do not input a value higher than 167°C. The thermofuse opens at 167 °C.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
1	106	1	Pressure Roller Temp	Displays the temperature on the surface of the central area of the pressure roller.	x 1	0 to 200 (°C)	Normal range in stand-by mode: 150 to 157°C	❍
1	106	2	Hot Roller Temp	Displays the temperature on the surface of the central area of the hot roller.	x 1	0 to 200 (°C)	Normal range in stand-by mode: 150 to 162°C	❍
1	108		Fusing Unit Set	Selects whether the fusing unit is set in the machine.	1	0: No, 1: Yes	Do not adjust.	❍
1	109		Fusing Nip Band Wdth	Measures the nip band width of the fusing unit.	-	1: Start	See "Replacement and Adjustment: Nip Band Width Adjustment" for how to use this SP mode.	
1	801	1	Main Motor Speed	Adjusts the sub-scan magnification (printer section) by adjusting the main motor speed.	0, x 10	-1.0 to +1.0 (%)		❍
1	801	2	Main Motor Speed: By-ps	Adjusts the sub-scan magnification (printer section) by adjusting the main motor speed when printing from the by-pass table.	0.3, x 10	0 to 1.0 (%)		❍
1	901		Dplx Side Fence Position	Adjusts the position of the duplex side fences.	0, x 10	-5.0 to +5.0 (mm)		❍
1	902		Dplx End Fence Position	Adjusts the position of the duplex end fence.	0, x 10	-5.0 to +5.0 (mm)		❍
AROUND THE DRUM/BELT UNITS								
2	101	1	Lead Edge Blnk Mrgn	Adjusts the blank margin at the leading edge.	4, x 10	0 to 8.0 (mm)		❍
2	101	2	Trail Mrgn (Nrml)	Adjusts the blank margin at the trailing edge in normal paper mode.	2.5, x 10	0 to 10.0 (mm)		❍
2	101	3	Trail Mrgn (Nrml/Back)	Adjusts the blank margin at the trailing edge for the reverse side in normal paper mode.	5.0, x 10	0 to 10.0 (mm)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	101	4	Trail Mrgn (OHP/Thk)	Adjusts the blank margin at the trailing edge in OHP/thick paper mode.	2.5, x 10	0 to 10.0 (mm)		❍
2	101	5	Trail Mrgn (Thk/Back)	Adjusts the blank margin at the trailing edge for the reverse side in thick paper mode.	5.0, x 10	0 to 10.0 (mm)		❍
2	301	1	Belt Trans Current	Adjusts the belt transfer current to compensate for various high voltage supply boards (using the drum current as a reference).	100, x 1	50 to 200 (μA)	Do not change the factory setting.	❍
2	301	3	Belt Trans Crnt (1/4C)	Sets the first belt transfer current for 2C and 4C mode.	50, x 1	10 to 600 (μA)	Do not change the factory settings.	❍
2	301	4	Belt Trans Crnt (2/4C)	Sets the second belt transfer current for 2C and 4C mode.	100, x 1	10 to 600 (μA)		❍
2	301	5	Belt Trans Crnt (3/4C)	Sets the third belt transfer current for 4C mode.	100, x 1	10 to 600 (μA)		❍
2	301	6	Belt Trans Crnt (4/4C)	Sets the fourth belt transfer current for 4C mode.	100, x 1	10 to 600 (μA)		❍
2	301	7	B.T.C. (1/2C)	Sets the first belt transfer current for 2C mode when the belt is at half speed.	100, x 1	10 to 600 (μA)	Do not change the factory settings.	❍
2	301	8	B.T.C. (2/2C)	Sets the second belt transfer current for 2C mode when the belt is at half speed.	100, x 1	10 to 600 (μA)		❍
2	301	9	B.T.C. (1/2 Spd:3/4C)	Sets the third belt transfer current for 4C mode when the belt is at half speed.	180, x 1	10 to 600 (μA)		❍
2	301	10	B.T.C. (1/2 Spd:4/4C)	Sets the fourth belt transfer current for 4C mode when the belt is at half speed.	180, x 1	10 to 600 (μA)		❍
2	301	11	B.T.C. (1/1C):K	Sets the belt transfer current for 1C mode for Bk.	70, x 1	10 to 600 (μA)	Do not change the factory settings.	❍
2	301	12	B.T.C. (1/1C):CMY	Sets the belt transfer current for 1C mode for CMY.	100, x 1	10 to 600 (μA)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	301	21	Paper Trans Current	Adjusts the paper transfer current to compensate for various high voltage supply boards (using the transfer belt roller current as a reference).	200, x 1	100 to 400 (μA)	Do not change the factory setting.	❍
2	301	23	P.T.C.(Nrml:1C)	Sets the paper transfer current for 1C mode with normal paper.	100, x 1	30 to 800 (μA)	Do not change the factory settings.	❍
2	301	24	P.T.C.(Nrml:2C)	Sets the paper transfer current for 2C mode with normal paper.	200, x 1	30 to 800 (μA)		❍
2	301	25	P.T.C.(Nrml:4C)	Sets the paper transfer current for 4C mode with normal paper.	250, x 1	30 to 800 (μA)		❍
2	301	26	Paper Trans Crnt (PC:1C)	Sets the paper transfer current for 1C mode with post cards.	300, x 1	30 to 800 (μA)	Do not change the factory settings.	❍
2	301	27	Paper Trans Crnt (PC:2C)	Sets the paper transfer current for 2C mode with post cards.	400, x 1	30 to 800 (μA)		❍
2	301	28	Paper Trans Crnt (PC:4C)	Sets the paper transfer current for 4C mode with post cards.	400, x 1	30 to 800 (μA)		❍
2	301	29	P.T.C.(Thk:1C)	Sets the paper transfer current for 1C mode with thick paper.	100, x 1	30 to 800 (μA)	Do not change the factory settings.	❍
2	301	30	P.T.C.(Thk:2C)	Sets the paper transfer current for 2C mode with thick paper.	200, x 1	30 to 800 (μA)		❍
2	301	31	P.T.C.(Thk:4C)	Sets the paper transfer current for 4C mode with thick paper.	200, x 1	30 to 800 (μA)		❍
2	301	32	P.T.C.(OHP:1C)	Sets the paper transfer current for 1C mode with OHP sheets.	150, x 1	30 to 800 (μA)	Do not change the factory settings.	❍
2	301	33	P.T.C.(OHP:2C)	Sets the paper transfer current for 2C mode with OHP sheets.	400, x 1	30 to 800 (μA)		❍
2	301	34	P.T.C.(OHP:4C)	Sets the paper transfer current for 4C mode with OHP sheets.	400, x 1	30 to 800 (μA)		❍
2	301	35	P.T.C.(Special:1C)	Sets the paper transfer current for 1C mode with special paper.	100, x 1	30 to 800 (μA)	Do not change the factory settings.	❍
2	301	36	P.T.C.(Special:2C)	Sets the paper transfer current for 2C mode with special paper.	150, x 1	30 to 800 (μA)		❍
2	301	37	P.T.C.(Special:4C)	Sets the paper transfer current for 4C mode with special paper.	300, x 1	30 to 800 (μA)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	301	38	P.T.C.Sp:1/2Spd:1C	Sets the paper transfer current for 1C mode with special paper, when the belt is at half speed.	150, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	39	P.T.C.Special:1/2Spd:2C	Sets the paper transfer current for 2C mode with special paper, when the belt is at half speed.	250, x 1	30 to 800 (µA)		❍
2	301	40	P.T.C.Special:1/2Spd:4C	Sets the paper transfer current for 4C mode with special paper, when the belt is at half speed.	250, x 1	30 to 800 (µA)		❍
2	301	41	P.T.C.(Bk/Nrml:1C)	Sets the paper transfer current for 1C mode with normal paper (for the back side).	150, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	42	P.T.C.(Bk/Nrml:2C)	Sets the paper transfer current for 2C mode with normal paper (for the back side).	250, x 1	30 to 800 (µA)		❍
2	301	43	P.T.C.(Bk/Nrml:4C)	Sets the paper transfer current for 4C mode with normal paper (for the back side).	300, x 1	30 to 800 (µA)		❍
2	301	44	P.T.C.(Bk/Thk:1C)	Sets the paper transfer current for 1C mode with thick paper (for the back side).	150, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	45	P.T.C.(Bk/Thk:2C)	Sets the paper transfer current for 2C mode with thick paper (for the back side).	200, x 1	30 to 800 (µA)		❍
2	301	46	P.T.C.(Bk/Thk:4C)	Sets the paper transfer current for 4C mode with thick paper (for the back side).	300, x 1	30 to 800 (µA)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	301	47	P.T.C.(Nrml/Lead Edge)	Sets the paper transfer current for 2C and 4C mode at the leading edge of normal paper.	300, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	48	P.T.C.(Thin/Lead Edge)	Sets the paper transfer current for 2C and 4C mode at the leading edge of thin paper.	400, x 1	30 to 800 (µA)		❍
2	301	49	P.T.C.(Thk/Lead Edge)	Sets the paper transfer current for 2C and 4C mode at the leading edge of thick paper.	400, x 1	30 to 800 (µA)		❍
2	301	50	P.T.C.(OHP/Lead Edge)	Sets the paper transfer current for 2C and 4C mode at the leading edge of OHP sheets.	400, x 1	30 to 800 (µA)		❍
2	301	51	P.T.C.(Nrml/Trail Edge)	Sets the paper transfer current for 2C and 4C mode at the trailing edge of normal paper.	120, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	52	P.T.C.(Thin/Trail Edge)	Sets the paper transfer current for 2C and 4C mode at the trailing edge of thin paper.	200, x 1	30 to 800 (µA)		❍
2	301	53	P.T.C.(Thk/Trail Edge)	Sets the paper transfer current for 2C and 4C mode at the trailing edge of thick paper.	130, x 1	30 to 800 (µA)		❍
2	301	54	P.T.C.(OHP/Trail Edge)	Sets the paper transfer current for 2C and 4C mode at the trailing edge of OHP sheets.	200, x 1	30 to 800 (µA)		❍
2	301	55	P.T.C.(Nrml-Bk/Lead)	Sets the paper transfer current for 2C and 4C mode at the leading edge of the back side of normal paper.	500, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	56	P.T.C.(Thk-Bk/Lead)	Sets the paper transfer current for 2C and 4C mode at the leading edge of the back side of thick paper.	300, x 1	30 to 800 (µA)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	301	57	P.T.C.(Nrml-Bk/Trail)	Sets the paper transfer current for 2C and 4C mode at the leading edge of the back side of thick paper.	150, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	58	P.T.C.(Thk-Bk/Trail)	Sets the paper transfer current for 2C and 4C mode at the trailing edge of the back side of thick paper.	100, x 1	30 to 800 (µA)		❍
2	301	59	P.T.C.(1C/Nrml/Lead)	Sets the paper transfer current for 1C mode at the leading edge of normal paper.	200, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	60	P.T.C.(1C/Thin/Lead)	Sets the paper transfer current for 1C mode at the leading edge of thin paper.	300, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	61	P.T.C.(1C/Thk/Lead)	Sets the paper transfer current for 1C mode at the leading edge of thick paper.	300, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	62	P.T.C.(1C/OHP/Lead)	Sets the paper transfer current for 1C mode at the leading edge of OHP sheets.	300, x 1	30 to 800 (µA)		❍
2	301	64	P.T.C.(1C/Thin/Trail)	Sets the paper transfer current for 1C mode at the trailing edge of thin paper.	100, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	65	P.T.C.(1C/Thk/Trail)	Sets the paper transfer current for 1C mode at the trailing edge of thick paper.	100, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	66	P.T.C.(1C/OHP/Trail)	Sets the paper transfer current for 1C mode at the trailing edge of OHP sheets.	100, x 1	30 to 800 (µA)		❍
2	301	67	P.T.C.(1C/Nrml-Bk/Lead)	Sets the paper transfer current for 1C mode at the leading edge of the back side of normal paper.	400, x 1	30 to 800 (µA)	Do not change the factory settings.	❍
2	301	68	P.T.C.(1C/Thk-Bk/Lead)	Sets the paper transfer current for 1C mode at the leading edge of the back side of thick paper.	350, x 1	30 to 800 (µA)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	301	69	P.T.C.(1C/Nrml-Bk/Trail)	Sets the paper transfer current for 1C mode at the trailing edge of the back side of normal paper.	100, x 1	30 to 800 (μA)	Do not change the factory settings.	❍
2	301	70	P.T.C.(1C/Thk-Bk/Trail)	Sets the paper transfer current for 1C mode at the trailing edge of the back side of thick paper.	100, x 1	30 to 800 (μA)		❍
2	302	1	Trans Crnt Shift On	Switches the paper transfer current shift on or off. If it is switched on, the paper transfer current is shifted depending on the temperature and humidity detected by the sensors on I/O control board 1 at the rear of the machine.	1	0: OFF, 1: ON	Do not change the factory setting.	❍
2	303	1	Belt Trans Current Coef	Displays the belt transfer current coefficient	100, x 1	0 to 65535 (%)	Do not use in the field.	❍
2	303	2	Paper Trans Current Coef	Displays the paper transfer current coefficient	124, x 1	0 to 65535 (%)	Do not use in the field.	❍
2	310	1	Belt Cleaning Time	Sets the duration (seconds) for belt cleaning.	15, x 1	0 to 999 (s)	Do not change the factory setting.	
2	310	2	Belt Cleaning Interval	Sets the interval (number of copies) between belt cleaning jobs. The belt is cleaned at the first end of copy job after the number of copies exceeded the set interval. The counter will not be reset until the belt cleaning is done.	50, x 1	0 to 999 (copies)	Do not change the factory setting.	
2	310	3	Blt Cleaning Int:ARDF	Sets the interval (accumulated number of copies) between belt cleaning jobs. The belt is cleaned even during a copy job when the accumulated number of copies exceeds the set interval. The counter will not be reset until the belt cleaning is done.	150, x 1	0 to 999 (copies)	Do not change the factory setting.	

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	310	4	Forced Blt Cleaning Time	Sets the duration for the forced belt cleaning (2-311).	80, x 1	0 to 999 (s)	Do not change the factory setting.	❍
2	311		Forced Belt Cleaning	Cleans the belt.	-	1: Start	Do this after replacing the transfer belt.	
2	503		Blt Cleaning Timing Shft	If the belt cleaning blade releases the blade earlier (40mm), this prevents the toner scattering from the blade onto the belt at the leading edge.	1 (0)	0: OFF (Normal) 1: ON (40mm)	This timing shift has a side effect: Bk images might be shifted.	❍
2	602		PTL ON/OFF	Selects whether PTL works or not for the printer model.	0	0: No, 1:Yes	Used only for the printer version.	❍
2	912	1	Temp. Display	Displays the current temperature sensor output.	-, x 10	0 to 6553.5 (°C)	This shows the output from the thermosensor on I/O control board 1 at the rear of the machine.	❍
2	912	2	Humidity Display	Displays the current humidity sensor output (relative humidity).	-, x 10	0 to 6553.5 (%)	This shows the output from the humidity sensor on I/O control board 1 at the rear of the machine.	❍
2	913		Toner Overflow Sn	Selects whether the used toner sensor is used or not.	1	0: ON, 1: Yes	Do not change the factory setting.	❍
2	914	1	Revolution Interval:K	Sets the revolution interval (number of copies) of the development unit during single color copying for Bk.	50, x 1	0 to 99 (copies)	Do not change the factory setting.	❍
2	914	2	Revolution Interval:CMY	Sets the revolution interval (number of copies) of the development unit during single color copying for C, M, Y	50, x 1	0 to 99 (copies)		❍
2	915	1	Belt Trans Crnt Ratio	Changes the belt transfer current.	100, x 1	0 to 200 (%)	Do not change the factory setting.	❍
2	915	2	Paper Trans Crnt Ratio	Changes the paper transfer current.	100, x 1	0 to 200 (%)	Do not change the factory setting.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	917		Paper Trans Reverse Crnt	Sets the negative voltage applied to the paper transfer corona unit. This is applied at all times, except during toner transfer to the paper.	1700, x 1	1000 to 2500 V	Do not change the factory setting.	❍
2	918	0	P.T.C.(Pre-rotation)	Sets the current for the paper transfer corona unit, which is used to make the residual voltage on the transfer belt even.	100, x 1	50 to 500 (μA)		❍
2	950	1	Main Scn Mag:Copier	Adjusts the magnification of the main scanning direction for copier mode.	0, x 10	-2.0 to +2.0 %	Do not change the factory setting.	❍
2	950	2	Main Scn Mag:Printer	Adjusts the magnification of the main scanning direction for printer mode.	0, x 10	-2.0 to +2.0 %	Do not change the factory setting.	❍
3	972	1	LD Writing ON/OFF: K	Selects whether the LD works or not for each color image. Whichever it is, the sensor pattern for each color is made to control the toner concentration.	-	0: No, 1: Yes	Do not change the factory settings.	
3	972	2	LD Writing ON/OFF: C		-	0: No, 1: Yes		
3	972	3	LD Writing ON/OFF: M		-	0: No, 1: Yes		
3	972	4	LD Writing ON/OFF: Y		-	0: No, 1: Yes		
PROCESS CONTROL								
2	1	1	Set VG: K	Sets VG in fixed potential control mode for each color.	700, x 1	300 to 900 (V)		
2	1	2	Set VG: C		700, x 1	300 to 900 (V)		
2	1	3	Set VG: M		700, x 1	300 to 900 (V)		
2	1	4	Set VG: Y		700, x 1	300 to 900 (V)		
2	201	1	Set VB: K	Sets VB (development bias) in fixed potential control mode for each color	500, x 1	200 to 800 (V)	Do not change the factory settings.	
2	201	2	Set VB: C		500, x 1	200 to 800 (V)		
2	201	3	Set VB: M		500, x 1	200 to 800 (V)		
2	201	4	Set VB: Y		500, x 1	200 to 800 (V)		
2	201	5	VB at Rev. Rotation: K	Sets VB for each color during revolver rotation.	120, x 1	0 to 500 (V)	Do not change the factory settings.	❍
2	201	6	VB at Rev. Rotation: C		120, x 1	0 to 500 (V)		❍
2	201	7	VB at Rev. Rotation: M		120, x 1	0 to 500 (V)		❍
2	201	8	VB at Rev. Rotation: Y		120, x 1	0 to 500 (V)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	203	1	Dev Ptnl ID Sn Ptrn:K	Sets the development potential for the ID sensor pattern for each color (VB - VL at the ID sensor pattern). Also see SP 2-954.	140, x 1	0 to 300 (V)	Do not change the factory settings.	❍
2	203	2	Dev Ptnl ID Sn Ptrn:C		140, x 1	0 to 300 (V)		❍
2	203	3	Dev Ptnl ID Sn Ptrn:M		140, x 1	0 to 300 (V)		❍
2	203	4	Dev Ptnl ID Sn Ptrn:Y		140, x 1	0 to 300 (V)		❍
2	203	5	Dev Ptnl Ad ID Sn Ptrn:K	Adjusts the development potential for the ID sensor pattern for each color (VB - VL at the ID sensor pattern). Only effective if SP 2-203-9 is at 1.	3	1:+20V 2:+10V 3:0V 4:-10V 5:-20V	Do not change the factory settings.	❍
2	203	6	Dev Ptnl Ad ID Sn Ptrn:C	Adjusts the development potential for the ID sensor pattern for each color (VB - VL at the ID sensor pattern). Only effective if SP 2-203-9 is at 1.	3	1:+20V 2:+10V 3:0V 4:-10V 5:-20V	Do not change the factory settings.	❍
2	203	7	Dev Ptnl Ad ID Sn Ptrn:M					❍
2	203	8	Dev Ptnl Ad ID Sn Ptrn:Y					❍
2	203	9	Dev Ptnl Compensation	Effects the adjustment of SP203-5 to SP203-8 for the development potential. If this is set to 0, any adjustment by SP2-203-5 to 8 is ignored.	1	0: OFF, 1:ON	Do not change the factory settings.	❍
2	206	1	Target VB: K	Displays the target VB calculated by the process control self check for each color.	0, x 1	0 to 65535 (V)		❍
2	206	2	Target VB: C		0, x 1	0 to 65535 (V)		❍
2	206	3	Target VB: M		0, x 1	0 to 65535 (V)		❍
2	206	4	Target VB: Y		0, x 1	0 to 65535 (V)		❍
2	207	1	Forced Toner Spply:K	Performs the forced toner supply mode operation for each color.	-	ON: Start, OFF: C/S		
2	207	2	Forced Toner Spply:C		-	ON: Start, OFF: C/S		
2	207	3	Forced Toner Spply:M		-	ON: Start, OFF: C/S		
2	207	4	Forced Toner Spply:Y		-	ON: Start, OFF: C/S		
2	208	1	Forced Tnr Spply Times:K	Sets the number of forced toner supply operations for each color.	10, x 1	0 to 20 (times)		
2	208	2	Forced Tnr Spply Times:C		10, x 1	0 to 20 (times)		
2	208	3	Forced Tnr Spply Times:M		10, x 1	0 to 20 (times)		
2	208	4	Forced Tnr Spply Times:Y		10, x 1	0 to 20 (times)		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	208	5	Toner Supply Coef:K	Sets the toner supply coefficient in fixed supply mode for each color.	5, x 1	0 to 100 (%)	Do not change the factory settings.	
2	208	6	Toner Supply Coef:C		5, x 1	0 to 100 (%)		
2	208	7	Toner Supply Coef:M		5, x 1	0 to 100 (%)		
2	208	8	Toner Supply Coef:Y		5, x 1	0 to 100 (%)		
2	208	9	Toner Supply Mode	Selects the toner supply mode.	2	0: Fixed, 1: PS, 2: Fuzzy	Do not change the factory setting.	❍
2	212	1	Toner Near End Thd:K	Displays the toner near end threshold for K (M/A (mg/cm^2) x1000)	325, x 1	100 to 1000	Do not change the factory settings.	❍
2	212	2	Toner Near End Thd:CMY	Displays the toner near end threshold for C, M, Y (M/A (mg/cm^2) x1000)	243, x 1	100 to 1000	Do not change the factory settings.	❍
2	213	1	Copies bfr Near End:K	Sets the number of copies that can be made between toner near-end and toner end for Bk toner.	10, x 1	1 to 10	Do not change the factory settings.	❍
2	213	2	Copies bfr Near End:CMY	Sets the number of copies that can be made between toner near-end and toner end for color toner.	10, x 1	1 to 10		❍
2	225	1	Dev. Agitation: K	Agitates the developer for each color.	-	ON: Start	Do this at installation and after changing the developer. <See installation procedure in section 3.>	
2	225	2	Dev. Agitation: C		-			
2	225	3	Dev. Agitation: M		-			
2	225	4	Dev. Agitation: Y		-			
2	225	5	Dev. Agitation: All	Agitates the developer for all colors.	-			
2	225	6	Dev. Agitation: CMY	Agitates the developer for C, M, and Y toners.	-			
2	951		Toner End Detection:K	Selects whether toner end detection for Bk toner is on or off.	0, x 1	0: OFF, 1: ON	Do not change the factory setting.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	952	1	Tnr End Rec Coef:K	Sets the coefficient used to calculate the toner supply ratio for toner end recovery for Bk. The greater this coefficient is, the smaller the toner supply is.	8, x 1	0 to 1000	Do not change the factory setting.	❍
2	952	2	Tnr End Rec Coef:CMY	Sets the coefficient used to calculate the toner supply ratio for toner end recovery for C, M, Y. The greater this coefficient is, the smaller the toner supply is.	6, x 1	0 to 1000		❍
2	953	1	Max Tnr Rec Ratio:K	Sets the maximum toner supply ratio for Bk. This ratio is the percentage of the toner supply motor on time at the maximum duty of the toner supply motor.	60, x 1	0 to 100 %	Do not change the factory setting.	❍
2	953	2	Max Tnr Rec Ratio:CMY	Sets the maximum toner supply ratio for C, M, Y. This ratio is the percentage of the toner supply motor on time at the maximum duty of the toner supply motor.	60, x 1	30 to 100 %		❍
2	954	1	Comp Dev Ptnl Sn Ptrn:K	Displays the development potential for the ID sensor pattern for Bk.	-, x1	-32767 to 32767	The value displayed is the value of SP2-203-1, plus/minus all correction factors.	
2	954	2	Comp Dev Ptnl Sn Ptrn:C	Displays the development potential for the ID sensor pattern for C.	-, x1	-32767 to 32767	The value displayed is the value of SP2-203-2, plus/minus all correction factors.	
2	954	3	Comp Dev Ptnl Sn Ptrn:M	Displays the development potential for the ID sensor pattern for M.	-, x1	-32767 to 32767	The value displayed is the value of SP2-203-3, plus/minus all correction factors.	
2	954	4	Comp Dev Ptnl Sn Ptrn:Y	Displays the development potential for the ID sensor pattern for Y.	-, x1	-32767 to 32767	The value displayed is the value of SP2-203-4, plus/minus all correction factors.	

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
2	954	5	Dev Ptnl Comp Cpy Cnt:K	Displays the Copy Count Correction for the development potential for the ID sesnor pattern for each color.	0, x 1	-32767 to 32767	This is one of the correction factors mentioned above. It is done in the Confirmation Procedure of the process control self check.	❍
2	954	6	Dev Ptnl Comp Cpy Cnt:C		0, x 1	-32767 to 32767		❍
2	954	7	Dev Ptnl Comp Cpy Cnt:M		0, x 1	-32767 to 32767		❍
2	954	8	Dev Ptnl Comp Cpy Cnt:Y		0, x 1	-32767 to 32767		❍
2	954	9	Image Area Int Data:K	Displays the image area integration data for Bk x 1/1000.	0, x 1	-32767 to 32767	This is a running total of the image area ratios for Bk for consecutive copies. It is reset when the revolver rotates.	❍
2	954	10	Vmax: C	Displays the Vmax value used for the VP correction for C.	0, x 1	-32767 to 32767	VP correction is one of the correction factors mentioned in SP 2-954.	❍
2	954	11	Vmax: M	Displays the Vmax value used for the VP correction for M.	0, x 1	-32767 to 32767		❍
2	954	12	Vmax: Y	Displays the Vmax value used for the VP correction for Y.	0, x 1	-32767 to 32767		❍
3	2		VSG Display	Displays the Vsg value that was calculated for toner supply control during the process control self check.	-, x 100	0 to 5.00 V		❍
3	4	1	Potential Sensor:Coef	Displays the gradient of the potential sensor response line.	-, x 10	0 to 6553.5	The gradient and intercept are calculated from the response of the sensor to -200 and -800 V during calibration.	❍
3	4	2	Ptnl Sensor:Intercept	Displays the intercept of the potential sensor response line.	-, x 10	-3276.8 to 3276.7 (V)		❍
3	103	1	VSP Display: K	Displays the Vsp value from the most recent ID sensor pattern detection for toner supply control for each color.	-, x 100	0 to 655.35 (V)		
3	103	2	VSP Display: C		-, x 100	0 to 655.35 (V)		
3	103	3	VSP Display: M		-, x 100	0 to 655.35 (V)		
3	103	4	VSP Display: Y		-, x 100	0 to 655.35 (V)		
3	111		Residual Voltage	Displays the residual voltage on the surface of the drum detected at the most recent process control self check.	-, x 1	0 to 65535 (V)		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
3	114	1	Actual VD: K	Displays the actual VD after the process control for each color. If this value is not within +/- 5V of the target VD calculated by the process control self check, this SP mode displays the VD from the previous process control, and this is used by the machine.	0, x 1	0 to 65535 (V)		❍
3	114	2	Actual VD: C		0, x 1	0 to 65535 (V)		❍
3	114	3	Actual VD: M		0, x 1	0 to 65535 (V)		❍
3	114	4	Actual VD: Y		0, x 1	0 to 65535 (V)		❍
3	115	1	Actual VL: K	Displays the actual VL after process control for each color.	0, x 1	0 to 65535 (V)		❍
3	115	2	Actual VL: C		0, x 1	0 to 65535 (V)		❍
3	115	3	Actual VL: M		0, x 1	0 to 65535 (V)		❍
3	115	4	Actual VL: Y		0, x 1	0 to 65535 (V)		❍
3	119	1	Target VD: K	Displays the target VD for each color that was calculated by the most recent process control self check.	0, x 1	0 to 65535 (V)		❍
3	119	2	Target VD: C		0, x 1	0 to 65535 (V)		❍
3	119	3	Target VD: M		0, x 1	0 to 65535 (V)		❍
3	119	4	Target VD: Y		0, x 1	0 to 65535 (V)		❍
3	120	1	Target VL: K	Displays the target VL for each color that was calculated by the most recent process control self check.	0, x 1	0 to 65535 (V)		❍
3	120	2	Target VL: C		0, x 1	0 to 65535 (V)		❍
3	120	3	Target VL: M		0, x 1	0 to 65535 (V)		❍
3	120	4	Target VL: Y		0, x 1	0 to 65535 (V)		❍
3	121	1	Development Gamma: K	Displays the gradient of the closest straight line to the development gamma curve for each color.	0, x 100	0 to 655.35	These are calculated during the development potential calculation process (see Detailed Descriptions - Process Control)	❍
3	121	2	Development Gamma: C		0, x 100	0 to 655.35		❍
3	121	3	Development Gamma: M		0, x 100	0 to 655.35		❍
3	121	4	Development Gamma: Y		0, x 100	0 to 655.35		❍
3	122	1	VK: K	Displays Vk for each color.	0, x 10	-3276.8 to 3276.7		❍
3	122	2	VK: C		0, x 10	-3276.8 to 3276.7		❍
3	122	3	VK: M		0, x 10	-3276.8 to 3276.7		❍
3	122	4	VK: Y		0, x 10	-3276.8 to 3276.7		❍
3	125		Potential Control	Selects the potential control mode.	0	0: Auto, 1: Fixed	Do not change the factory setting.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
3	126		Forced P-Ctrl Self Chk	Performs the forced process control self check.	-	1: Start	Do this after replacing the drum, unless the developer was replaced at the same time, in which case it can be omitted.	
3	902	1	Pointer Table No: K	Displays the current pointer table number for each color.	0, x 1	0 to 65535		❍
3	902	2	Pointer Table No: C		0, x 1	0 to 65535		❍
3	902	3	Pointer Table No: M		0, x 1	0 to 65535		❍
3	902	4	Pointer Table No: Y		0, x 1	0 to 65535		❍
3	907	1	Sensor Pattern M/A:K	Displays the current sensor pattern M/A for each color (calculated during toner supply control).	-, x 1000	0 to 65.535		
3	907	2	Sensor Pattern M/A:C		-, x 1000	0 to 65.535		
3	907	3	Sensor Pattern M/A:M		-, x 1000	0 to 65.535		
3	907	4	Sensor Pattern M/A:Y		-, x 1000	0 to 65.535		
3	910	1	Vmin: K	Displays the current Vmin for each color.	0, x 100	0 to 655.35 (V)		❍
3	910	2	Vmin: C		0, x 100	0 to 655.35 (V)		❍
3	910	3	Vmin: M		0, x 100	0 to 655.35 (V)		❍
3	910	4	Vmin: Y		0, x 100	0 to 655.35 (V)		❍
3	932	1	Actual LD Data: K	Display the actual LD control data for each color.	0, x 1	0 to 65535	This is based on the target VL calculated during process control. VL is controlled by adjusting the LD current.	❍
3	932	2	Actual LD Data: C		0, x 1	0 to 65535		❍
3	932	3	Actual LD Data: M		0, x 1	0 to 65535		❍
3	932	4	Actual LD Data: Y		0, x 1	0 to 65535		❍
3	954	1	Image Area Ratio: K	Displays the image area ratio (a measure of the total amount of toner on the page) for each color. This ratio is processed in the Printer ASIC.	-, x 1	0 to 65535 (%)		
3	954	2	Image Area Ratio: C		-, x 1	0 to 65535 (%)		
3	954	3	Image Area Ratio: M		-, x 1	0 to 65535 (%)		
3	954	4	Image Area Ratio: Y		-, x 1	0 to 65535 (%)		
3	956	1	Act Tnr Sppy Ratio:K	Displays the toner supply ratio for each color. This ratio is updated after every time the ID sensor pattern is made (after every development for each color).	-, x 1	0 to 65535 (%)		
3	956	2	Act Tnr Sppy Ratio:C		-, x 1	0 to 65535 (%)		
3	956	3	Act Tnr Sppy Ratio:M		-, x 1	0 to 65535 (%)		
3	956	4	Act Tnr Sppy Ratio:Y		-, x 1	0 to 65535 (%)		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
3	957		P-Ctrl Data Tx	Sends the data concerning process control through the serial port (the optics fiber) to the P/C.	0, x 1	0 to 5	Do not change the factory setting.	
3	964		Dev. Agitation Result	Displays the result of the most recent developer agitation.	- , x 1	01: Success Others: Error	See the developer agitation error code table in section 2. (1. 4. 6.)	❍
3	973		P-Ctrl Self Chk Interval	Sets the interval for process control.	150, x 1	0 to 200 (copies)	Do not change the factory setting.	❍
3	974		Toner Max M/A Target	Sets the target maximum M/A	1100, x 1	800 to 1300	Do not change the factory setting.	❍
3	975		P-Ctrl Self Chk Result	Displays the result of the most recent process control self check.	- , x 1	01: Success Others: Error	See Detailed Section Descriptions - Process Control for details of the various error codes that are displayed. This should be checked every time after switching the machine on after doing the following: Replacing the developer, drum, ID sensor, drum potential sensor, or charge corona unit Cleaning the ID sensor or charge corona unit	❍
SCANNER								
4	8		Subscan Magnification	Adjusts the scanner motor speed.	0, x 10	-0.9 to +0.9 (%)	Do not change the factory settings.	❍
4	10		Lead Edge Regist:Scanng	Adjusts the vertical registration for the scanned image by adjusting the laser exposure start timing.	0, x 10	-9.0 to +9.0 (mm)	Do not change the factory settings.	❍
4	11		Sd to Sd Regist:Scanng	Adjusts the horizontal registration for the scanned image by adjusting the laser exposure start timing.	0, x 10	-6.0 to +6.0 (mm)	Do not change the factory settings.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	12	1	Scanning Blnk Mrgn:Rear	Sets the blank margin for the rear side (as viewed form the operation side of the machine).	0.0, x 10	0.0 to 3.0 (mm)	Do not change the factory settings.	
4	12	2	Scanning Blnk Mrgn:Front	Sets the blank margin for the front side (as viewed form the operation side of the machine).	0.0, x 10	0.0 to 3.0 (mm)	Do not change the factory settings.	
4	12	3	Scanning Blnk Mrgn:Left	Sets the blank margin for the left side (as viewed form the operation side of the machine).	0.0, x 10	0.0 to 3.0 (mm)	Do not change the factory settings.	
4	12	4	Scanning Blnk Mrgn:Right	Sets the blank margin for the right side (as viewed form the operation side of the machine).	0.0, x 10	0.0 to 3.0 (mm)	Do not change the factory settings.	
4	13	1	Scnr Free Run (Lamp:ON)	Starts a scanner free run with the exposure lamp on.	-	ON: Start, OFF: C/S		
4	13	2	Scnr Free Run (Lamp:OFF)	Starts a scanner free run with the exposure lamp off.	-	ON: Start, OFF: C/S		
4	301		APS Data Confirmation	Displays the size detected with the APS sensors as 8-bit data.	-	0 to 255	See the Service Tables section for how to read the displayed data.	
4	417		IPU Test Ptrn Selection	Selects the IPU test pattern.	0	0: Scanned Original 1: Grid and Registration Mark 2: RGB Scale and Registration Mark 3: KCMY Scale 1 and Registration Mark 4: KCMY Scale 2 and Registration Mark 5: KCMY Scale 3 and Registration Mark 6: KCMY Scale 4 and Registration Mark		
4	418	1	White Conversion Thd	Sets the threshold for converting a color to white.	30, x 1	0 to 255	If this value is increased, the proportion of white on the copy will increase.	
4	418	2	User/Single Color Thd	Sets the threshold for converting a color to a single color.	100, x 1	0 to 255	If this value is increased, the proportion of single color on the copy will increase.	

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	426	1	R_GAIN 0	Sets or displays the gain value of the amplifiers on the scanner IPU (for each RGB color).	111, x 1	0 to 255	Keep all these at the factory settings.	❍
4	426	2	G_GAIN 0		111, x 1			❍
4	426	3	B_GAIN 0		111, x 1			❍
4	426	4	R_GAIN 1		111, x 1			❍
4	426	5	G_GAIN 1		111, x 1			❍
4	426	6	B_GAIN 1		111, x 1			❍
4	427	1	R_REF. 0	Sets or displays the reference voltage for the A/D converters on the scanner IPU for each RGB color.	132, x 1	0 to 255	Keep all these at the factory settings.	❍
4	427	2	G_REF. 0		132, x 1			❍
4	427	3	B_REF. 0		132, x 1			❍
4	427	4	R_REF. 1		173, x 1			❍
4	427	5	G_REF. 1		173, x 1			❍
4	427	6	B_REF. 1		173, x 1			❍
4	431	1	Trgt R_Gray Balance	Sets or displays the target gray balance value for the scanner for each RGB color.	180, x 1	180 ± 10	Keep all these at the factory settings.	❍
4	431	2	Trgt G_Gray Balance		180, x 1			❍
4	431	3	Trgt B_Gray Balance		180, x 1			❍
4	435		White Level Adj.	Performs the white level adjustment.	-	ON: Start, OFF: C/S	Do this after replacing the exposure lamp.	
4	901	1	Scan with Shading	Scans, moving the carriage one time and using shading correction.	-	ON: Start, OFF: C/S	The output signal can be obtained from CN401 on the scanner IPU board.	
4	901	2	Scan without Shading	Scans, moving the carriage one time and without shading correction.	-	ON: Start, OFF: C/S		
4	903		Create Gamma Table	Creates all printer gamma tables.	0, x 1	0 to 511	Do not change the factory settings.	

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	904	1	IPU Board Test 1	Performs IPU board test 1. The test 1 program diagnoses problems with register Write/Read of the LSIs on the IPU board (except the picture element correction LSI and SCSI FIFO). It will take about 1 second.	0	ON: Start, OFF: C/S	Use this to test the scanner IPU board if there are image problems. If one of these three tests gives a bad result, change the board. 00: NG, 01: OK	
4	904	2	IPU Board Test 2	Performs IPU board test 2. The test 2 program diagnoses problems with the connections between the LSIs. It will take about 15 seconds.	0	ON: Start, OFF: C/S		
4	904	3	IPU Board Test 3	Performs IPU board test 3. The test 3 program diagnoses problems with DRAM Write/Read of the Extended IPU. It will take about 13 seconds.	0	ON: Start, OFF: C/S		
4	905		Printer Gamma Printing	Prints the printer gamma settings on A4/Letter paper.	1	1: Print		
4	907		VPU Test Ptrn Selection	Selects the VPU test pattern.	0	0: Scanned Original 1: White Plate Pattern 2: 16-steps Gradation Pattern 3: 4-dot/line Pattern 4: 2-dot/line Pattern		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	910	1	K:Letter/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Bk in Letter mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	910	2	K:Letter/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Bk in Letter mode.	15, x 1	0 to 31		
4	910	3	K:Letter/Offset:H	Adjusts the offset data of the printer gamma (higher range) for Bk in Letter mode.	15, x 1	0 to 31		
4	910	4	K:Letter/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for Bk in Letter mode.	15, x 1	0 to 31		
4	910	5	K:Letter/Step:L	Selects another gamma curve for Bk in letter mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	910	6	K:Letter/Step:M		15, x 1	0 to 31		
4	910	7	K:Letter/Step:H		15, x 1	0 to 31		
4	910	8	K:Letter/Step:IDmax	Selects another gamma curve for Bk in letter mode.	15, x 1	0 to 31		
4	911	1	C:Letter/Offset:L	Adjusts the offset data of the printer gamma (lower range) for C in Letter mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	911	2	C:Letter/Offset:M	Adjusts the offset data of the printer gamma (medium range) for C in Letter mode.	15, x 1	0 to 31		
4	911	3	C:Letter/Offset:H	Adjusts the offset data of the printer gamma (higher range) for C in Letter mode.	15, x 1	0 to 31		
4	911	4	C:Letter/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for C in Letter mode.	15, x 1	0 to 31		
4	911	5	C:Letter/Step:L	Selects another gamma curve for C in letter mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	911	6	C:Letter/Step:M		15, x 1	0 to 31		
4	911	7	C:Letter/Step:H		15, x 1	0 to 31		
4	911	8	C:Letter/Step:IDmax		15, x 1	0 to 31		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	912	1	M:Letter/Offset:L	Adjusts the offset data of the printer gamma (lower range) for M in Letter mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	912	2	M:Letter/Offset:M	Adjusts the offset data of the printer gamma (medium range) for M in Letter mode.	15, x 1	0 to 31		
4	912	3	M:Letter/Offset:H	Adjusts the offset data of the printer gamma (higher range) for M in Letter mode.	15, x 1	0 to 31		
4	912	4	M:Letter/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for M in Letter mode.	15, x 1	0 to 31		
4	912	5	M:Letter/Step:L	Selects another gamma curve for M in letter mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	912	6	M:Letter/Step:M		15, x 1	0 to 31		
4	912	7	M:Letter/Step:H		15, x 1	0 to 31		
4	912	8	M:Letter/Step:IDmax		15, x 1	0 to 31		
4	913	1	Y:Letter/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Y in Letter mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	913	2	Y:Letter/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Y in Letter mode.	15, x 1	0 to 31		
4	913	3	Y:Letter/Offset:H	Adjusts the offset data of the printer gamma (higher range) for Y in Letter mode.	15, x 1	0 to 31		
4	913	4	Y:Letter/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for Y in Letter mode.	15, x 1	0 to 31		
4	913	5	Y:Letter/Step:L	Selects another gamma curve for Y in letter mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	913	6	Y:Letter/Step:M		15, x 1	0 to 31		
4	913	7	Y:Letter/Step:H		15, x 1	0 to 31		
4	913	8	Y:Letter/Step:IDmax		15, x 1	0 to 31		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	914	1	K(SC):Letter/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Bk (single color mode) in Letter mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	914	2	K(SC):Letter/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Bk (single color mode) in Letter mode.	15, x 1	0 to 31		
4	914	3	K(SC):Letter/Offset:H	Adjusts the offset data of the printer gamma (high range) for Bk (sngle color mode) in Letter mode.	15, x 1	0 to 31		
4	914	4	K(SC):Lttr/Offset:ID max	Adjusts the offset data of the printer gamma (ID max) for Bk (single color mode) in Letter mode.	15, x 1	0 to 31		
4	914	5	K(SC):Letter/Step:L	Selects another gamma curve for Bk (single color mode) in letter mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	914	6	K(SC):Letter/Step:M		15, x 1	0 to 31		
4	914	7	K(SC):Letter/Step:H		15, x 1	0 to 31		
4	914	8	K(SC):Letter/Step:IDmax		15, x 1	0 to 31		
4	915	1	K:Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Bk in Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	915	2	K:Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Bk in Photo mode.	15, x 1	0 to 31		
4	915	3	K:Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for Bk in Photo mode.	15, x 1	0 to 31		
4	915	4	K:Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for Bk in Photo mode.	15, x 1	0 to 31		
4	915	5	K:Photo/Step:L	Selects another gamma curve for Bk in Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	915	6	K:Photo/Step:M		15, x 1	0 to 31		
4	915	7	K:Photo/Step:H		15, x 1	0 to 31		
4	915	8	K:Photo/Step:IDmax		15, x 1	0 to 31		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	916	1	C:Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for C in Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	916	2	C:Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for C in Photo mode.	15, x 1	0 to 31		
4	916	3	C:Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for C in Photo mode.	15, x 1	0 to 31		
4	916	4	C:Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for C in Photo mode.	15, x 1	0 to 31		
4	916	5	C:Photo/Step:L	Selects another gamma curve for C in Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	916	6	C:Photo/Step:M		15, x 1	0 to 31		
4	916	7	C:Photo/Step:H		15, x 1	0 to 31		
4	916	8	C:Photo/Step:IDmax		15, x 1	0 to 31		
4	917	1	M:Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for M in Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	917	2	M:Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for M in Photo mode.	15, x 1	0 to 31		
4	917	3	M:Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for M in Photo mode.	15, x 1	0 to 31		
4	917	4	M:Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for M in Photo mode.	15, x 1	0 to 31		
4	917	5	M:Photo/Step:L	Selects another gamma curve for M in Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	917	6	M:Photo/Step:M		15, x 1	0 to 31		
4	917	7	M:Photo/Step:H		15, x 1	0 to 31		
4	917	8	M:Photo/Step:IDmax		15, x 1	0 to 31		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	918	1	Y:Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Y in Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	918	2	Y:Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Y in Photo mode.	15, x 1	0 to 31		
4	918	3	Y:Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for Y in Photo mode.	15, x 1	0 to 31		
4	918	4	Y:Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for Y in Photo mode.	15, x 1	0 to 31		
4	918	5	Y:Photo/Step:L	Selects another gamma curve for Y in Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	918	6	Y:Photo/Step:M		15, x 1	0 to 31		
4	918	7	Y:Photo/Step:H		15, x 1	0 to 31		
4	918	8	Y:Photo/Step:IDmax		15, x 1	0 to 31		
4	919	1	K:G-Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Bk in Glossy Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	919	2	K:G-Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Bk in Glossy Photo mode.	15, x 1	0 to 31		
4	919	3	K:G-Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for Bk in Glossy Photo mode.	15, x 1	0 to 31		
4	919	4	K:G-Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for Bk in Glossy Photo mode.	15, x 1	0 to 31		
4	919	5	K:G-Photo/Step:L	Selects another gamma curve for Bk in Glossy Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	919	6	K:G-Photo/Step:M		15, x 1	0 to 31		
4	919	7	K:G-Photo/Step:H		15, x 1	0 to 31		
4	919	8	K:G-Photo/Step:IDmax		15, x 1	0 to 31		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	920	1	C:G-Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for C in Glossy Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	920	2	C:G-Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for C in Glossy Photo mode.	15, x 1	0 to 31		
4	920	3	C:G-Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for C in Glossy Photo mode.	15, x 1	0 to 31		
4	920	4	C:G-Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for C in Glossy Photo mode.	15, x 1	0 to 31		
4	920	5	C:G-Photo/Step:L	Selects another gamma curve for C in Glossy Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	920	6	C:G-Photo/Step:M		15, x 1	0 to 31		
4	920	7	C:G-Photo/Step:H		15, x 1	0 to 31		
4	920	8	C:G-Photo/Step:IDmax		15, x 1	0 to 31		
4	921	1	M:G-Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for M in Glossy Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	921	2	M:G-Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for M in Glossy Photo mode.	15, x 1	0 to 31		
4	921	3	M:G-Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for M in Glossy Photo mode.	15, x 1	0 to 31		
4	921	4	M:G-Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for M in Glossy Photo mode.	15, x 1	0 to 31		
4	921	5	M:G-Photo/Step:L	Selects another gamma curve for M in Glossy Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	921	6	M:G-Photo/Step:M		15, x 1	0 to 31		
4	921	7	M:G-Photo/Step:H		15, x 1	0 to 31		
4	921	8	M:G-Photo/Step:IDmax		15, x 1	0 to 31		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	922	1	Y:G-Photo/Offset:L	Adjusts the offset data of the printer gamma (lower range) for Y in Glossy Photo mode.	15, x 1	0 to 31	If the user does not like the color output after doing the ACC procedure, adjust the offsets as explained in Replacement and Adjustment: Copy Image Adjustments.	
4	922	2	Y:G-Photo/Offset:M	Adjusts the offset data of the printer gamma (medium range) for Y in Glossy Photo mode.	15, x 1	0 to 31		
4	922	3	Y:G-Photo/Offset:H	Adjusts the offset data of the printer gamma (higher range) for Y in Glossy Photo mode.	15, x 1	0 to 31		
4	922	4	Y:G-Photo/Offset:IDmax	Adjusts the offset data of the printer gamma (ID max) for Y in Glossy Photo mode.	15, x 1	0 to 31		
4	922	5	Y:G-Photo/Step:L	Selects another gamma curve for Y in Glossy Photo mode.	15, x 1	0 to 31	Do not change the factory settings.	
4	922	6	Y:G-Photo/Step:M		15, x 1	0 to 31		
4	922	7	Y:G-Photo/Step:H		15, x 1	0 to 31		
4	922	8	Y:G-Photo/Step:IDmax		15, x 1	0 to 31		
4	932	1	Pic Elmnt Corr:R-Left	Adjusts the left side alignment of the red filter line on the CCD.	5, x 1	0 to 9	See "Replacement and Adjustment: Copy Image Adjustment" for how to use these adjustments.	❍
4	932	2	Pic Elmnt Corr:R-Right	Adjusts the right side alignment of the red filter line on the CCD.	5, x 1	0 to 9		❍
4	932	3	Pic Elmnt Corr:B-Left	Adjusts the left side alignment of the blue filter line on the CCD.	5, x 1	0 to 9		❍
4	932	4	Pic Elmnt Corr:B-Right	Adjusts the right side alignment of the blue filter line on the CCD.	5, x 1	0 to 9		❍
4	940	1 to 34	K: Letter	Each SP mode displays one of the parameters for the printer gamma curve in each mode.	0, x 1	0 to 1024	Do not use any of these settings.	
4	941		C: Letter					
4	942		M: Letter					
4	943		Y: Letter					
4	944		K: Photo					
4	945		C: Photo					
4	946		M: Photo					
4	947		Y: Photo					

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
4	950	1	Color Background: R1	Programs the density level of each color for the color background.	10, x 1	1 to 10	Used only for the edit machine	
4	950	2	Color Background: G1					
4	950	3	Color Background: B1					
4	950	4	Color Background: C1					
4	950	5	Color Background: M1					
4	950	6	Color Background: Y1					
4	950	7	Color Background: K1					
4	951	1	Color Background: R2	Do not adjust.	5, x 1	1 to 10	Not used	
4	951	2	Color Background: G2					
4	951	3	Color Background: B2					
4	951	4	Color Background: C2					
4	951	5	Color Background: M2					
4	951	6	Color Background: Y2					
4	951	7	Color Background: K2					
4	952	1	Paint Area: R1	Do not adjust.	10, x 1	1 to 10	Not used	
4	952	2	Paint Area: G1					
4	952	3	Paint Area: B1					
4	952	4	Paint Area: C1					
4	952	5	Paint Area: M1					
4	952	6	Paint Area: Y1					
4	952	7	Paint Area: K1					
4	953	1	Paint Area: R2	Programs the density level of each color for the paint area.	5, x 1	1 to 10	Used only for the edit machine	
4	953	2	Paint Area: G2					
4	953	3	Paint Area: B2					
4	953	4	Paint Area: C2					
4	953	5	Paint Area: M2					
4	953	6	Paint Area: Y2					
4	954	1	User Color Data: Y	Sets the amount of each toner for the user color.	0, x 1	0 to 100 (%)	Used only for the edit machine	
4	954	2	User Color Data: M					
4	954	3	User Color Data: C					
4	954	4	User Color Data: K					

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
OPERATION AND SYSTEM								
4	303		APS Smallest Size	Selects whether the copier determines that the original is A5 lengthwise (HLT for inch version machines) when the APS sensors cannot detect the original size.	0	0: No, 1:Yes (A5 lengthwise/HLT)	If Yes is selected, paper sizes that cannot be detected by the APS sensors are regarded as A5 lengthwise/HLT. If No is selected, "Cannot detect original size" will be displayed.	❍
5	1		All Indicators On	Turns on all indicators on the operation panel.	0	ON: Start, OFF: C/S		
5	4	1	ADS Priority: FC-Letter	Specifies whether the copier defaults to ADS or manual mode when the main switch is turned on, an auto reset is done, the Clear Modes key is pressed, or when this original type or color mode is selected.	1	0: Manual, 1: ADS	For Letter mode with full color	❍
5	4	2	ADS Pri.:FC-Photo/Auto		1	0: Manual, 1: ADS	For Photo or Auto mode with full color	❍
5	4	3	ADS Priority: SC-Letter		0	0: Manual, 1: ADS	For Letter mode with single color	❍
5	4	4	ADS Pri.:SC-Photo/Auto		0	0: Manual, 1: ADS	For Photo or Auto mode with single color	❍
5	4	5	ADS Priority: ACS-Letter		0	0: Manual, 1: ADS	For Letter mode with Auto Color Selection	❍
5	4	6	ADS Pri.:ACS-Photo/Auto		0	0: Manual, 1: ADS	For Photo or Auto Mode with Auto Color Selection	❍
5	7		Copier/Printer Priority	Specifies whether the machine defaults to copier or printer mode (if available) when the main switch is turned on, an auto reset is done, or the Clear Modes key is pressed.	0	0: Copier, 1: Printer, 2: Other Option	Do not select 2. For the printer version only.	❍
5	9	1	Language Setting	Selects either Japanese or English for the LCD.	0	0 to 13	Not Used.	❍
5	13		Count Up/Down	Selects whether the main counter counts up or down.	1	0: Down, 1: Up		❍
5	19	4	* Size Setting: Tray	Sets the paper size when selecting * size for the tray.	9	0 to 9	For use in Japan only.	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	19	15	Odd Paper Size: Default	Selects the default of the by-pass feed station when the by-pass feed table is opened. It can be sideways, lengthwise, or a non-standard paper size.	0	0: Lengthwise 1: Sideways 2: Non-standard		❍
5	104		A3/DLT Double Count	Specifies whether the main counter is doubled for A3/DLT paper.	0	0: Single, 1: Double		❍
5	111		A6/Post Card Sellection	Selects the default size when the machine detects A6 or a smaller paper size on the by-pass table.	0	0: Post Card, 1: A6	For used in Japan only.	❍
5	113		Key Card / Coin Lock	Specifies whether the key card, key counter, or coin lock is installed or not.	0	0: No, 1: Key Card, 2: Key Counter, 3: Coin Lock	Do not select Key Card or Coin Lock, These are for Japan only.	❍
5	114		Key Card Mode	Selects the mode for the key card.	7, x 1	0 to 7	For use in Japan only.	❍
5	120		Clear Md On/Off Key Cntr	Specifies whether the current mode is cleared or not when the key counter is removed.	0	0: Cleared, 1: Kept		❍
5	121		Cntr Updt Tmg Key Cnter	Selects the update timing for the key card.	0	0: Paper Feed-in 1: Paper Feed-out	For use in Japan only.	❍
5	126		F Size Original Setting	Selects which original paper size the machine selects when the APS sensors detect F size.	0	0: 8 1/2 x 13, 1: 8 x 13, 2: 8 1/4 x 13		
5	127	1	APS On/Off(Coin Lock)	Selects whether APS is on or not when the machine is equipped with a coin lock.	0	0: OFF, 1: ON	For use in Japan only.	❍
5	127	2	ACS On/Off(Coin Lock)	Selects whether ACS is on or not when the machine is equipped with a coin lock.	0	0: OFF, 1: ON	For use in Japan only.	❍
5	128		User Code+Coin Lock	Selects whether User Code and Coin Lock can both be used.	0	0: Both, 1: One of them	For use in Japan only.	
5	129		F Size Paper Setting	Selects which copy paper size the machine selects when the paper size sensor or switch detects F size.	0	0: 8 1/2 x 13, 1: 8 x 13, 2: 8 1/4 x 13		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	130		ACC On/Off:Pay Cpy Md	Selects whether ACC can be done or not when using the key card, the key counter, or the coin lock. (When SP5-113 setting is not "0".)	0	0: Possible 1: Impossible		
5	302	1	Set Date and Time	Use to input the year, month, date, hour, minute, and day in "YYYYMMDDhhmmd" format.	1990010100001	YYYY:1990 to 2089, MM: 01 to 12, DD: 01 to 31, hh: 00 to 23, mm: 00 to 59, d: 0 to 6 (Sun to Sat)		
5	302	2	Set Date: Year	Sets the year of the date.	94	1994 to 2010 (Year)	These SP modes allow you to change individual components of the date and time stored with SP 5-302-1.	
5	302	3	Set Date: Month	Sets the month of the date.	1	1 to 12 (Month)		
5	302	4	Set Date: Day	Sets the day of the date.	1	1 to 31 (Date)		
5	302	5	Set Time: Hour	Sets the hour of the time.	0	0 to 23 (Hour)		
5	302	6	Set Time: Minute	Sets the minute of the time.	0	0 to 59 (Minute)		
5	302	7	Set Time: Second	Sets the second of the time.	0	0 to 59 (Second)		
5	402	1	User Code Counter: All	Displays all user codes with their counters.	-	0 to 999999	For use in Japan only.	
5	410		Reset Password	Resets the key operator access code to 000000.	0	Start: Reset		
5	501	1	Set PM Counter	Sets the PM interval.	10, x 1	1 to 100 (k copies)	For use in Japan only.	❍
5	501	2	PM Counter ON/OFF	Selects whether the machine calls the service station when the PM interval has expired.	1	0: OFF, 1: ON	For use in Japan only.	❍
5	504		Jam Alarm Level	Sets the jam alarm level.	3, x 1		For use in Japan only	❍
5	505		SC Alarm Level	Sets the SC alarm level.	3, x 1		For use in Japan only	❍
5	507	1	Sppy Alarm On/Off Ppr Sz	Selects whether the supply alarm for each paper size is on or off.	0, x 1		For use in Japan only	❍
5	507	2	Sppy Alarm On/Off Staple	Selects whether the supply alarm for staples is on or off.	0, x 1		For use in Japan only	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	507	3	Sppy Alarm On/Off(Tnr)	Selects whether the supply alarm for toner end is on or off.	0, x 1		For use in Japan only	❍
5	508		EM Auto Call On/Off	Selects whether the EM auto call is on or off.	1, x 1		For use in Japan only	❍
5	602	2	UCA Adjustment	Adjusts the UCA level. UCA: Under Color Addition This adjustment is only effective for Letter mode.	3, x 1	1 (weak) to 5 (strong)	UCR is 100% in Letter mode. However, in this condition, dark colors (such as dark brown) may be black on the copy. If so, increase the UCA setting. Conversely, use a lower UCA setting if pure black on the original is not pure black on the copy.	❍
5	610	4	ACC Factory Data Loading	Loads the factory gamma settings for ACC (Auto Color Calibration).	-	Start: Load	See "Replacement and Adjustment: Copy Image Adjustment" for details on how to use this SP mode.	
5	611	1	C Ratio in Blue	Sets the toner amount ratio of cyan in blue.	90, x 1	0 to 100 (%)		❍
5	611	2	M Ratio in Blue	Sets the toner amount ratio of magenta in blue.	90, x 1	0 to 100 (%)		❍
5	611	3	C Ratio in Green	Sets the toner amount ratio of cyan in green.	90, x 1	0 to 100 (%)		❍
5	611	4	Y Ratio in Green	Sets the toner amount ratio of yellow in green.	90, x 1	0 to 100 (%)		❍
5	611	5	M Ratio in Red	Sets the toner amount ratio of magenta in red.	90, x 1	0 to 100 (%)		❍
5	611	6	Y Ratio In Red	Sets the toner amount ratio of yellow in red.	75, x 1	0 to 100 (%)		❍
5	801		RAM Clear	Resets the NV-RAM to the factory settings except for the machine serial No. and the main counter values.	1: Clear (See section 6-12)			

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	802	1	Printer Free Run	In the printer free run mode, paper is not fed and following are not activated: paper transfer, paper feed clutch, the by-pass feed clutch, and all of the scanner functions.	-	0: Stop, 1: Start		
5	802	4	System Free Run	In the system free run mode, paper is not fed and the following are not activated: paper transfer, paper feed clutches, and all of the scanner functions.	-	0: Stop, 1: Start		
5	803	1 to 32	IN:XXXXXX (INPUT CHECK)	Displays the data received from sensors and switches.	-	0, 1	See the Service Tables section for details. <section 4. (1.3.4)>	
5	804	1 to 54	OUT:XXXXXX (OUTPUT CHECK)	Turns on the electrical components individually for test purposes.	-	ON: Start, OFF: C/S	See the Service Tables section for details. <section 4. (1.3.5)>	
5	810	1	Fusing SC Reset	Resets a type 1 service call condition that was caused by the fusing unit. After doing SP5-810-1, turn the copier main switch off and on.	-	1: Reset	See section 7, "Troubleshooting" for details.	
5	810	2	SC Reset	Resets a type 1 service call condition that was caused by an error other than a fusing unit error. After doing SP5-810-2, turn the copier main switch off and on.	-	1: Reset	See section 7, "Troubleshooting" for details.	
5	812		Service Tel.No.	Use this to input the telephone number of the service representative (this is displayed when a service call condition occurs.) Maximum 15 digits. Press the . key to input a pause (-). Press the Clear Modes key to delete the input telephone number.	-	15 digits		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	816		RDS On/Off	For use in Japan only.	0	0: OFF, 1: ON	Do not change the factory settings.	
5	817		Repair Time Tx		-	ON: Start, OFF: C/S		
5	818	6	IPU Diagnostic Tx		-	1: Start		
5	818	7	Ext-IPU Diagnostic Tx		-	1: Start		
5	818	8	IDU Diagnostic Tx		-	1: Start		
5	818	9	Printer Diagnostic Tx		-	1: Start		
5	901		Touch Panel Calibration	Selects the touch panel calibration conditions.	0	0: OFF, 1: ON	For details, see the Replacements and Adjustments section.	
5	955		Select Printer Test Ptrn	Selects the printer test pattern.	0	0 to 32	For details, see the Service Tables section. <Section 4 (1.3.6)>	
5	963		Polygon Motor Power Off	Adjusts the time from after making image on the drum until the polygon motor current turns off. To prolong the lifetime of the polygon motor, you should set a value of 30 or less.	30, x 1	0 to 60 (s)	When the polygon motor current is off and start key is pressed, the copy process time is longer than when the motor is on. This is because it takes more time to stabilize the motor speed.	❍
5	970	1	Special Ppr Select:Tray	Selects whether special paper or standard paper is used for each paper feed station. When you select special, the paper transfer corona unit is shifted to the condition for special paper.	0	0: Normal, 1: Special	This is for the built-in paper tray. (A166 only)	❍
5	970	2	Type of Paper Bank-1		0	0: Normal, 1: Special	Bank 1 refers to the top tray of the optional paper feed unit.	❍
5	970	3	Type of Paper Bank-2		0	0: Normal, 1: Special	Bank 2 refers to the second tray of the optional paper feed unit.	❍
5	970	4	Type of Paper Bank-3		0	0: Normal, 1: Special	Bank 3 refers to the third tray of the optional paper feed unit (three-tray models only).	❍
5	974		Auto Memory Call	Selects the combination for the auto memory call.	0, x 1	0 to 6	For details, see the Service Tables section. <Section 4 (1.3.7)>	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	975		3C Mode (UCR=0)	Selects whether 3C mode is used or not. When you select 3C mode, the image is made under the following conditions; UCR=0, Bk=0	0	0: 4C, 1: 3C (UCR=0)	If there is a problem with the Bk developer, this SP mode can be set to 3C as a temporary measure while waiting for new Bk developer. Bk developer will not be used in 3C mode.	
5	982	0	Oil Bnd Warn On/Off(OHP)	Determines whether the oil band warning is displayed when the user selects OHP mode after more than 5 sheets smaller than A4 size were fed in multi-copy mode.	1	0: OFF, 1: ON		
PERIPHERALS								
4	802		FPU Free Run	Starts the FPU free run with the following conditions: FPU lamp on, Scanner lamp off	-	ON: Start, OFF: C/S	FPU: Film Projector Unit	
4	908		Shading : FPU	Starts the shading for the film projector unit.	-	ON: Start, OFF: C/S	Do this to test the shading operation of the FPU.	
4	909		Shading Data : FPU	Displays the FPU shading status.	-	0: Fault, 1: Processing, 2: Success	This is the result of SP 4-908.	
6	6	1	ADF Regist: Horizontal	Adjusts the registration of the document feeder for each original in the horizontal direction (main scan).	0, x 10	-3.0 to +3.0 (mm)	Refer to the ARDF manual for details on how to use these SP modes.	❍
6	6	2	ADF Regist: Thin	Adjusts the registration of the document feeder for each type of original.	0, x 10	-4.5 to +4.5 (mm)	Refer to the ARDF manual for details on how to use these SP modes.	❍
6	6	3	ADF Regist: Thick		0, x 10	-4.5 to +4.5 (mm)		❍
6	6	4	ADF Regist: 2 Sided		0, x 10	-4.5 to +4.5 (mm)		❍
6	13	1	Tray Select.:Cpy O/P	Selects which tray is used for output in copy mode.	1	1: 1st Tray, 2: 2nd Tray, 3: 3rd Tray	Not used	❍
6	13	2	Fce Up Prntout:Cpy O/P	Specifies whether the fed-out paper is face up or face down on the sorter in copier mode.	1	0: Face down, 1:Face up	Not used	❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
6	13	3	Tray Select.:Printer O/P	Selects which tray is used for output in printer mode.	2	1: 1st Tray, 2: 2nd Tray, 3: 3rd Tray	Not used	❍
6	13	4	Fce Up Prntout:Prntr O/P	Specifies whether the fed-out paper is face up or face down on the sorter in printer mode.	0	0: Face down, 1:Face up	Not used	❍
6	13	5	Tray Selection:FAX O/P	Selects which tray is used for output in fax mode.	3	1: 1st Tray, 2: 2nd Tray, 3: 3rd Tray	Not used	❍
6	13	6	Fce Up Prntout:FAX O/P	Specifies whether the fed-out paper is face up or face down on the sorter in fax mode.	0	0: Face down, 1:Face up	Not used	❍
6	102		Sort/Stack Limit	Selects whether to use a sorter stack limit.	1	0: No Limitation, 1: Limitation	For more detail, see the Service Tables section. <Section 4 (1.3.8)>	❍
6	104		Staple Sheet Limit	Selects whether there is a stapling limit for the sorter stapler. On: Copies of up to 20 pages can be stapled for all paper sizes. Off: Copies of up to 25 pages can be stapled for all paper sizes.	1	0: OFF, 1: ON		❍
6	107		Sorter Free Run	Start a sorter free run by pressing the Start key. Stop it by pressing the Clear/Stop key. This is a general free run controlled from the copier.	-	0 to 5	For more detail, see the Service Tables section. <Section 4 (1.3.9)>	
6	901		Input check (Paper Tray Unit)				For more detail, see the Service Tables section. <Section 4 (1.3.10 to13)>	
6	902		Output check (PTU and FPU)					
6	903		Input check (Sorter)					
6	904		Output check (Sorter)					
LOGGED DATA								
7	2	1	Nmbr of Originals: Total	Displays the total number of scanned originals (all modes).	0	0 to 9999999 (scans)		☆
7	2	2	Number of Originals: FC	Displays the total number of scanned originals in full color mode.	0	0 to 9999999 (scans)		☆

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
7	2	3	Number of Originals: SC	Displays the total number of scanned originals in single color mode.	0	0 to 9999999 (scans)		☆
7	2	4	Number of Originals: Bk	Displays the total number of scanned originals in black and white mode.	0	0 to 9999999 (scans)		☆
7	3	1	Display Counter: B/W	Display the total black counter.	0	0 to 9999999 (copies)	Back-up counter	☆
7	3	2	Display Counter: FC	Display the total full color counter.	0	0 to 9999999 (copies)	Back-up counter	☆
7	3	3	Display Counter: #3	Display the total #3 counter.	0	0 to 9999999 (copies)	Not used	☆
7	3	4	Display Counter: #4	Display the total #4 counter.	0	0 to 9999999 (copies)	Not used	☆
7	4	1	CE Counter: B/W	These counters can be used by the technician for any purpose. They increment at the same time as the main counter.	0	0 to 9999999 (copies)		
7	4	2	CE Counter: FC		0	0 to 9999999 (copies)		
7	4	3	CE Counter: #3		0	0 to 9999999 (copies)	Not used	
7	4	4	CE Counter: #4		0	0 to 9999999 (copies)		
7	101	1	A3 Counter	Displays the total number of copies by paper size.	0	0 to 9999999 (copies)		☆
7	101	2	B4 Counter		0	0 to 9999999 (copies)		☆
7	101	3	A4L Counter		0	0 to 9999999 (copies)		☆
7	101	4	B5L Counter		0	0 to 9999999 (copies)		☆
7	101	5	A4 Counter		0	0 to 9999999 (copies)		☆
7	101	6	B5 Counter		0	0 to 9999999 (copies)		☆
7	101	7	A5L Counter		0	0 to 9999999 (copies)		☆
7	101	8	B6L Counter		0	0 to 9999999 (copies)		☆
7	101	9	A6L Counter			0 to 9999999 (copies)		☆
7	202	1	Development Counter:K	Displays the total number of cycles for each color development. These counters count up after each toner transfer to the drum.	0	0 to 9999999		☆
7	202	2	Development Counter:C		0	0 to 9999999		☆
7	202	3	Development Counter:M		0	0 to 9999999		☆
7	202	4	Development Counter:Y		0	0 to 9999999		☆

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
7	204	1	By-pass Feed Counter	Displays the total number of copies fed from each paper feed station.	0	0 to 9999999		☆
7	204	2	Feed Counter: Tray		0	0 to 9999999	This is for the standard paper tray.	☆
7	204	3	Feed Counter: Bank-1		0	0 to 9999999	Bank 1 refers to the top tray of the optional paper feed unit.	☆
7	204	4	Feed Counter: Bank-2		0	0 to 9999999	Bank 2 refers to the second tray of the optional PFU.	☆
7	204	5	Feed Counter: Bank-3		0	0 to 9999999	Bank 3 refers to the third tray of the optional paper feed unit (three-tray models only).	☆
7	209	1	Counter: Normal	Displays the total number of copies in each mode.	0	0 to 9999999		☆
7	209	2	Counter: OHP/Thick		0	0 to 9999999		☆
7	209	3	Counter: Thin		0	0 to 9999999		☆
7	209	4	Counter: Odd Paper		0	0 to 9999999	For non-standard sized paper on the by-pass tray.	☆
7	301	1	Counter: 100%	Displays the total number of copies by reproduction ratio.	0	0 to 9999999		☆
7	301	2	Counter: 25-49%		0	0 to 9999999		☆
7	301	3	Counter: 50-99%		0	0 to 9999999		☆
7	301	4	Counter: 101-150%		0	0 to 9999999		☆
7	301	5	Counter: 151-200%		0	0 to 9999999		☆
7	301	6	Counter: 201-400%		0	0 to 9999999		☆
7	302	1	Copy Data: FC	Displays the total number of copies by color mode. FC: Full Color, SC: Single Color, Area: When an area is selected with an Edit machine.	0	0 to 9999999		☆
7	302	2	Copy Data: C		0	0 to 9999999		☆
7	302	3	Copy Data: M		0	0 to 9999999		☆
7	302	4	Copy Data: Y		0	0 to 9999999		☆
7	302	5	Copy Data: R		0	0 to 9999999		☆
7	302	6	Copy Data: G		0	0 to 9999999		☆
7	302	7	Copy Data: B		0	0 to 9999999		☆
7	302	8	Copy Data: K		0	0 to 9999999		☆
7	302	9	Copy Data: FC (Area)		0	0 to 9999999		☆
7	302	10	Copy Data: SC (Area)		0	0 to 9999999		☆
7	302	11	Cpy Data:Bkgrnd/Pnt.Area		0	0 to 9999999		☆
7	302	12	Copy Data:K (Area)		0	0 to 9999999		☆

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
7	302	13	Copy Data: P-Mode1	Displays the number of copies made using the printer controller (Bk only)	0	0 to 9999999	Used only for the printer version	☆
7	302	14	Copy Data: P-Mode2	Displays the number of copies made using the printer controller (full color)	0	0 to 9999999	Used only for the printer version	☆
7	302	15	Copy Data: P-Mode3	Not used	0	0 to 9999999		☆
7	302	16	Copy Data: P-Mode4		0	0 to 9999999		☆
7	302	17	Copy Data: AP1/1	Not used	0	0 to 9999999	Not used	☆
7	302	18	Copy Data: AP1/2		0	0 to 9999999		☆
7	302	19	Copy Data: AP1/3		0	0 to 9999999		☆
7	302	20	Copy Data: AP1/4		0	0 to 9999999		☆
7	302	21	Copy Data: AP2/1		0	0 to 9999999		☆
7	302	22	Copy Data: AP2/2		0	0 to 9999999		☆
7	302	23	Copy Data: AP2/3		0	0 to 9999999		☆
7	302	24	Copy Data: AP2/4		0	0 to 9999999		☆
7	302	25	Counter: Color Balance	Displays the total number of copies by function.	0	0 to 9999999		☆
7	302	26	Counter: Image Adj.		0	0 to 9999999		☆
7	302	27	Cnter:Clr Conversion		0	0 to 9999999		☆
7	302	28	Counter: Color Erase		0	0 to 9999999		☆
7	302	29	Counter: Color Bkgrnd		0	0 to 9999999		☆
7	302	30	Counter: Paint		0	0 to 9999999		☆
7	302	31	Counter: ACS		0	0 to 9999999		☆
7	303	2	Counter: Series Copying		0	0 to 9999999		☆
7	303	3	Counter: Rectangle		0	0 to 9999999		☆
7	303	4	Counter: Right Angle		0	0 to 9999999		☆
7	303	5	Counter: Polygon		0	0 to 9999999		☆
7	303	6	Counter: Closed Loop		0	0 to 9999999		☆
7	304	1	Counter: APS		0	0 to 9999999		☆
7	304	2	Counter: AMS		0	0 to 9999999		☆
7	304	3	Counter: Auto L/P		0	0 to 9999999		☆
7	304	4	Counter: Photo		0	0 to 9999999		☆
7	304	5	Counter: Letter		0	0 to 9999999		☆

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
7	401		Total SC	Displays the total number of service calls that have occurred.	0	0 to 10000		
7	402	1	SC Counter: Scan	Displays the service call counters for each service call code. By pressing the "+" and "-" keys, another service call number and its counter can be displeyed.	0	0 to 10000		
7	402	3	SC Cntr:Charge/LD/Dev.		0	0 to 10000		
7	402	4	SC Cntr:T&S/Clean/QL/Drm		0	0 to 10000		
7	402	5	SC Counter: Paper Feed		0	0 to 10000		
7	402	6	SC Cnter:Communication		0	0 to 10000		
7	402	7	SC Counter: Peripherals		0	0 to 10000		
7	402	9	SC Counter: Others		0	0 to 10000		
7	502		Total Paper Jam	Displays the total number of copy jams.	0	0 to 10000		
7	503		Total Original Jam	Displays the total number of original jams (ARDF).	0	0 to 10000		
7	504	1	Jam : Tray	Displays the total copy paper jam counts by location.	0	0 to 10000	This is for the standard paper tray.	
7	504	2	Jam : Bank-1		0	0 to 10000	Bank 1 refers to the top tray of the optional paper feed unit.	
7	504	3	Jam : Bank-2		0	0 to 10000	Bank 2 refers to the second tray of the optional paper feed unit.	
7	504	4	Jam : Bank-3		0	0 to 10000	Bank 3 refers to the third tray of the optional paper feed unit (three-tray models only).	
7	504	5	Jam: Duplex Entrance		0	0 to 10000		
7	504	6	Jam: Duplex Exit		0	0 to 10000		
7	504	7	Jam: Relay Roller		0	0 to 10000		
7	504	8	Jam: Registration		0	0 to 10000		
7	504	9	Jam: Transfer		0	0 to 10000		
7	504	10	Jam : Fusing		0	0 to 10000		
7	504	11	Jam: Paper Exit		0	0 to 10000		
7	504	12	Jam : Sorter		0	0 to 10000		
7	504	13	Jam : Stapler		0	0 to 10000		
7	504	14	Jam : Proof		0	0 to 10000		

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
7	505	1	Original Jam : Feed	Displays the total original jam counts by location.	0	0 to 10000		
7	505	2	Original Jam : Exit		0	0 to 10000		
7	507	1	Paper Jam (Last10)	Displays data for the latest 10 paper jams.	0, x 1	80 digits	See section 4. (1.3.15)	
7	507	2	Original Jam (Last10)	Displays data for the latest 10 original jams.	0, x 1	80 digits	See sectoin 4. (1.3. 16)	
7	801	1	SCU ROM Version	Displays each ROM version.	-, x 1	20 digits		
7	801	3	Scanner CPU ROM Ver		-, x 1	20 digits		
7	801	4	Scanner Main ROM Ver		-, x 1	20 digits		
7	801	5	Printer CPU ROM Ver		-, x 1	20 digits		
7	801	6	Printer Main ROM Ver		-, x 1	20 digits		
7	801	7	IDU ROM Version		-, x 1	20 digits		
7	801	8	ADF-ROM Version		-, x 1	20 digits		
7	801	9	FPU-ROM Version		-, x 1	20 digits		
7	801	10	SS-ROM Version		-, x 1	20 digits		
7	801	11	Bank-ROM Version		-, x 1	20 digits		
7	803		PM Counter	Displays the number of copies made since the last PM.	0	0 to 9999999		
7	804		PM Counter Clear	Resets the PM counter.	0	1: Clear		
7	805		Counter: Test Mode	Displays the number of copies made in SP mode.	0	0 to 9999999		
7	806		Counter Clear: Test Mode	Resets the counter for the number of copies made in SP mode.	-	1: Clear		
7	807		Jam/SC All Clear	Resets the counters that are displayed with SP modes 7-401, 402, 502, 503, 504, 505, and 507.	-	1: Clear		
7	808		All Counter Clear	Clears all at once every counter that can be cleared with SP7-807 and 7-810.	-	1: Clear		
7	809		Print Logging Data	Prints the operation counters. A4 or LT size paper must be used.	-	1: Print		
7	810		All Copy Counter Clear	Resets all the copy counters (these are displayed with SP modes 7-101, 202, 204, and 209).	-	1: Clear		

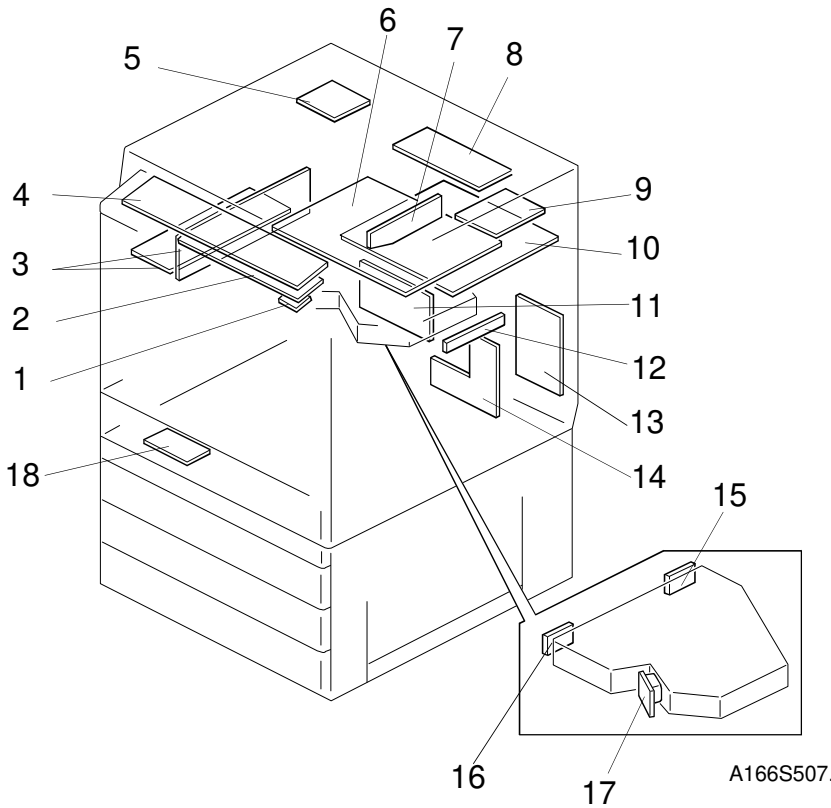
1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
7	816		Op Cntr Clear:Tr	Clears the paper feed station copy counters (displayed with SP7-204).	-	1: Clear		
7	818	1	Dev.Counter Clear:K	Resets the development counter for each color.	-	1: Clear		
7	818	2	Dev.Counter Clear:C		-	1: Clear		
7	818	3	Dev.Counter Clear:M		-	1: Clear		
7	818	4	Dev.Counter Clear:Y		-	1: Clear		
7	819		Op Cntr Clear:Ppr Sz	Clears the paper size copy counters (displayed with SP7-101).	-	1: Clear		
7	902		Print Non-Default Data	Prints all settings that have been modified from the default.	-	1: Print	This includes settings that were adjusted at the factory. These will all have to be re-input after a RAM Clear.	
7	903		Print All Data	Prints all the settings.	-	1: Print		
7	912	1	Total ACC Counter	Displays the total ACC counter.	-	0 to 9999999		
7	912	2	ACC Failure Counter	Displays the number of failures for ACC.	-	0 to 9999999		
7	913	1	Total ACC Counter Clear	Resets the total ACC counter.	-	1: Clear		
7	913	2	ACC Failure Cnter Clear	Resets the ACC failure counter.	-	1: Clear		
7	914	1	Main/Bk-up Counter Reset	Resets the main counter and the back up counter (to 0).	-	1: Clear	Refer to section 3. Installation.	
7	914	2	Main Counter Recovery	Loads the back-up counter data and writes them to the main counter.	-	Not used		
7	914	3	Back-up Counter Recovery	Loads the main counter data and writes them to the back-up counter.	-	1: Clear	Refer to "Replacement and Adjustment: Others" for how to use these SP modes.	

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
OTHERS								
4	422	0	Auto L/P Sensitivity	See UP1-3 in section 4 (2.2)	5, x 1	1 to 9	These SP modes can not be accessed from the SP mode, only from UP mode. These SP No. can be printed out by SP7-902 and 7-903.	❍
5	2	0	Feedstation Priority	See UP3-2 in section 4 (2.2)	0, x 1	0 to 3		❍
5	3	0	APS Priority	See UP4-1 in section 4 (2.2)	1, x 1	0, 1		❍
5	5	1	Original Type: FC	See UP4-3 in section 4 (2.2)	1, x 1	0 to 2		❍
5	5	2	Original Type: Bk/SC	See UP4-2 in section 4 (2.2)	0, x 1	0 to 2		❍
5	5	3	Original Type: ACS	See UP4-3 in section 4 (2.2)	0, x 1	0 to 2		❍
5	6	0	Color Mode Selection	See UP4-2 in section 4 (2.2)	2, x 1	0 to 2		❍
5	8	0	Beeper	See UP5-3 in section 4 (2.2)	1, x 1	0, 1		❍
5	10	1	Set User R/E-1	See UP5-4 in section 4 (2.2)	0, x 1	0, 25 to 400 (%)		❍
5	10	2	Set User R/E-2	See UP5-4 in section 4 (2.2)	0, x 1	0, 25 to 400 (%)		❍
5	15	1	Rcycl Ppr Setting:Tray	See UP3-5 in section 4 (2.2)	0, x 1	0, 1		❍
5	15	2	Rcycl Ppr Setting:Bank-1	See UP3-5 in section 4 (2.2)	0, x 1	0, 1		❍
5	15	3	Rcycl Ppr Setting:Bank-2	See UP3-5 in section 4 (2.2)	0, x 1	0, 1		❍
5	15	4	Rcycl Ppr Setting:Bank-3	See UP3-5 in section 4 (2.2)	0, x 1	0, 1		❍
5	17	0	Max. Copy Quantity	See UP5-6 in section 4 (2.2)	99, x 1	1 to 99		❍
5	19	1	Bank-1 Ppr Sz Selection	See UP3-3 in section 4 (2.2)	1, x 1	1 to 99		❍
5	19	2	Bank-2 Ppr Sz Selection	See UP3-3 in section 4 (2.2)	1, x 1	1 to 99		❍
5	19	3	Bank-3 Ppr Sz Selection	See UP3-3 in section 4 (2.2)	1, x 1	1 to 99		❍
5	19	5	Odd Paper 1 Size: H	See UP3-4 in section 4 (2.2)	297, x 1	100 to 297 (mm)		❍
5	19	6	Odd Paper 1 Size: V	See UP3-4 in section 4 (2.2)	432, x 1	140 to 432 (mm)		❍
5	19	7	Odd Paper 2 Size: H	See UP3-4 in section 4 (2.2)	297, x 1	100 to 297 (mm)		❍
5	19	8	Odd Paper 2 Size: V	See UP3-4 in section 4 (2.2)	432, x 1	140 to 432 (mm)		❍
5	19	9	Odd Paper 3 Size: H	See UP3-4 in section 4 (2.2)	297, x 1	100 to 297 (mm)		❍
5	19	10	Odd Paper 3 Size: V	See UP3-4 in section 4 (2.2)	432, x 1	140 to 432 (mm)		❍
5	19	11	Odd Paper 4 Size: H	See UP3-4 in section 4 (2.2)	297, x 1	100 to 297 (mm)		❍
5	19	12	Odd Paper 4 Size: V	See UP3-4 in section 4 (2.2)	432, x 1	140 to 432 (mm)		❍
5	19	13	Odd Paper 5 Size: H	See UP3-4 in section 4 (2.2)	297, x 1	100 to 297 (mm)		❍
5	19	14	Odd Paper 5 Size: V	See UP3-4 in section 4 (2.2)	432, x 1	140 to 432 (mm)		❍
5	101	0	Auto Reset Time	See UP5-1 in section 4 (2.2)	60, x 1	0, 10 to 900 (s)		❍
5	102	0	Screen Saver	See UP5-2 in section 4 (2.2)	1, x 1	0, 1		❍
5	103	0	Auto Tray Shift	See UP3-1 in section 4 (2.2)	1, x 1	0,1		❍

1st	2nd	3rd	Display	Function	Default, x Unit ( ): For Europe	Settings/Range	Comments	Report
5	106	1	ADS Lev <Clr> (1:L-4:H)	See UP1-4 in section 4 (2.2)	2, x 1	1 to 4	These SP modes can not be accessed from the SP mode, only from UP mode. These SP No. can be printed out by SP7-902 and 7-903.	❍
5	106	2	ADS Lev <Bk SC> (1:L-4:H)	See UP1-4 in section 4 (2.2)	2, x 1	1 to 4		❍
5	107	1	Lead Edge Margin (Sngl)	See UP2-1 in section 4 (2.2)	0, x 1	–20 to +20 (mm)		❍
5	107	2	Lead Edge Margin (Rev)	See UP2-2 in section 4 (2.2)	0, x 1	–20 to +20 (mm)		❍
5	115	0	Duplex Auto Margin	See UP2-3 in section 4 (2.2)	0, x 1	0, 1		❍
5	602	1	UCR Adjustment	See UP1-5 in section 4 (2.2)	5, x 1	0 to 9		❍
5	606	0	ACS Sensitivity	See UP1-6 in section 4 (2.2)	3, x 1	1 to 5		❍
5	607	0	ACS Color Priority	See UP1-7 in section 4 (2.2)	0, x 1	0, 1		❍
5	608	0	Color Sensitivity Adj.	See UP1-8 in section 4 (2.2)	3, x 1	1 to 5		❍
6	1	0	SADF Auto Reset	See UP7-3 in section 4 (2.2)	20, x 1	5 to 60 (s)		❍
6	2	0	ADF Free Size	See UP7-4 in section 4 (2.2)	0, x 1	0, 1		❍
6	3	0	Auto Sort Selection	See UP7-6 in section 4 (2.2)	1, x 1	0, 1		❍
6	5	0	Auto Feed Out(ADF+Dplx)	See UP2-4 in section 4 (2.2)	1, x 1	0, 1		❍
6	10	0	ADF Auto APS Select	See UP7-5 in section 4 (2.2)	1, x 1	0, 1		❍
6	11	0	ADF Thin Paper Mode	See UP7-2 in section 4 (2.2)	0, x 1	0, 1		❍
6	103	0	FC Sort Prohibition	See UP7-1 in section 4 (2.2)	0, x 1	0, 1		❍

ELECTRICAL COMPONENT LAYOUT

PCB (A166/A187 Copiers)



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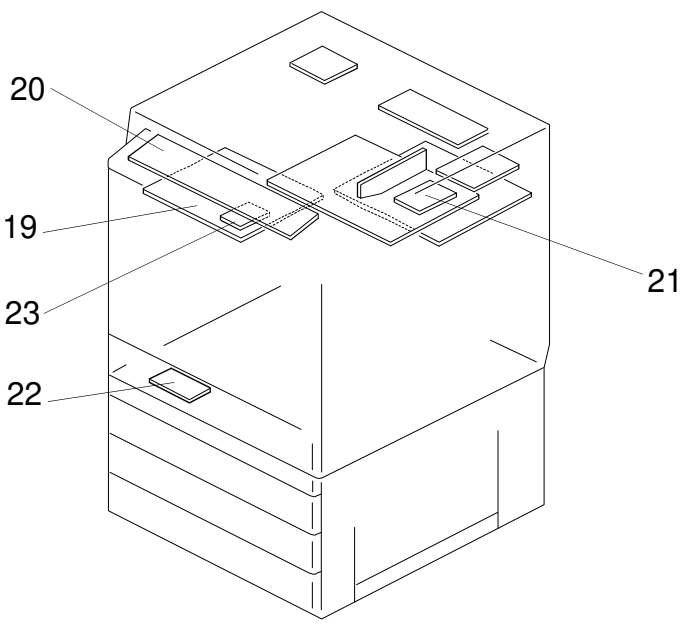
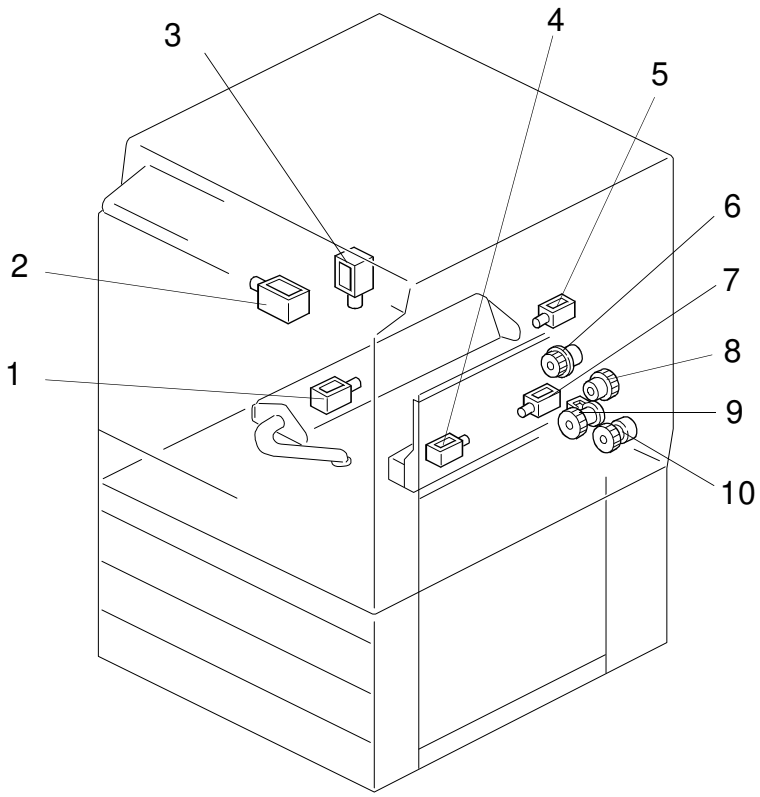
PCB (A189 Copiers)



A166S508.wmf

Index. No.	Description	Symbol	P to P
1, 23	RAM Board	PCB16	J21, M21
2, 19	SCU Board	PCB15	I18, M18
3	AC Drive/DC Power Supply Board	PCB4	D6
4, 20	Operation Panel	PCB17	L21, O21
5	Scanner Motor Drive Board	PCB2	D15
6	Scanner IPU Board	PCB5	F16
7	CCD Board	PCB3	C18
8	Lamp Regulator	PCB1	B15
9	IDU Board	PCB12	G21
10	Main Control Board	PCB6	I8
11	I/O Control Baord 2	PCB8	I5
12	By-pass Paper Width Detection Board	PCB13	L15
13	I/O control Board 1	PCB7	K12
14	High Voltage Supply Board	PCB14	O8
15	Laser Synchronizing Detector Board 2	PCB11	H12
16	Laser Synchronizing Detector Board 1	PCB10	H12
17	LD Drive Board	PCB9	G12
18, 22	Duplex Control Board **(A187/A189 only)**	PCB19	L5
21	Extended IPU Board	PCB18	D21

SOLENOIDS AND CLUTCHES



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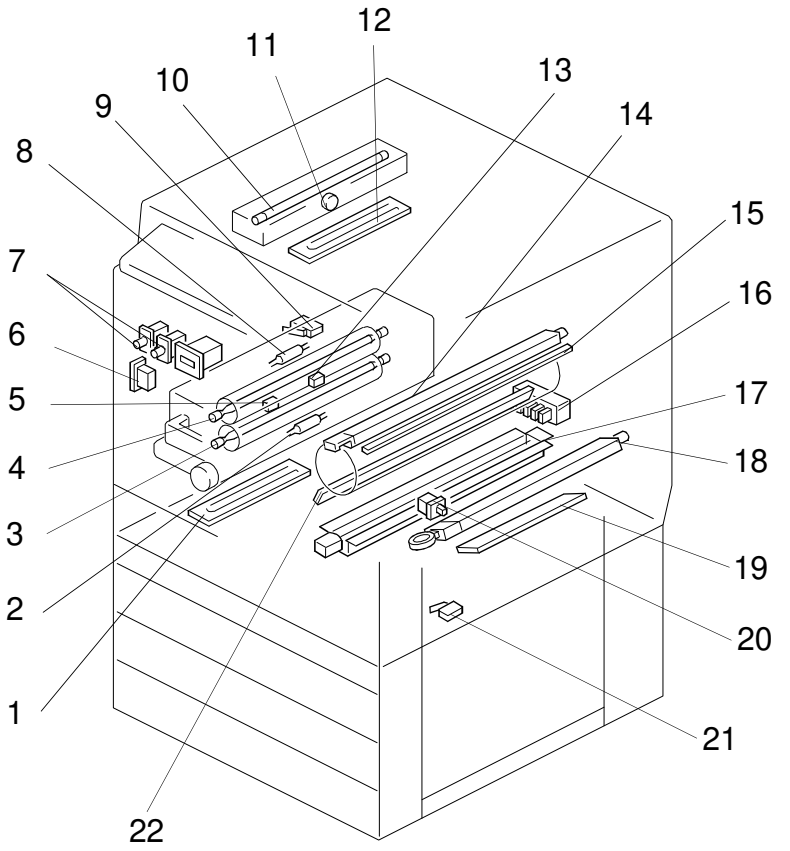
Index. No.	Description	Symbol	P-to-P
1	Transfer Belt Cleaning SOL	SOL4	P15
2	Toner Supply Release SOL	SOL3	O15
3	Junction Gate SOL **(A187/A189 only)**	SOL6	K5
4	Sub By-pass Feed Pick-up SOL	SOL1	P10
5	Transfer Belt Lubricant SOL	SOL5	P15
6	Registration CL	CL2	M15
7	Main By-pass Feed Pick-up SOL	SOL2	P10
8	By-pass Feed CL	CL1	P10
9	Paper Feed CL **(A166 only)**	CL4	O15
10	Vertical Transport CL	CL3	N15

SWITCHES AND HEATERS



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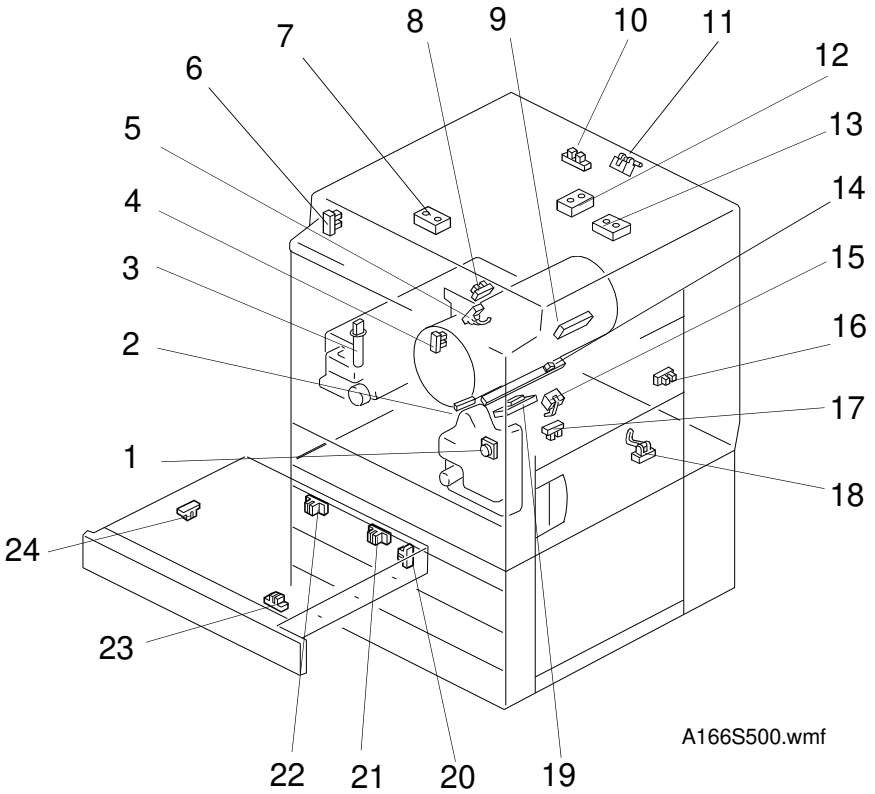
Index No.	Description	Symbol	P-to-P
1	Lower Tray Heater	H3	D10
2	Pressure Roller Thermofuse	TF2	B11
3	Pressure Roller Lamp	L2	B12
4	Fusing Lamp	L1	A10
5	Pressure Roller Thermistor	TH2	I1
6	Main Switch	SW1	C3
7	Front Door Switch	SW2, 3, 4, 5	F5, F6, F7, G4
8	Fusing Thermofuse	TF1	A11
9	Paper Exit Door Switch **(A187/A189 only)**	SW9	J2
10	Exposure Lamp	L3	B19
11	Thermostat	TS1	B18
12	Optics Anticondensation Heater	H1	A15
13	Fusing Thermistor	TH1	H1
14	Charge Corona Unit	–	–
15	Quenching Lamp	L4	L15
16	Tray Paper Size SW **(A166 only)**	SW8	N1
17	Paper Transfer Charge Unit	–	–
18	Belt Transfer Charge Unit	–	–
19	Drum Heater	H2	C10
20	By-pass Feed Table SW	SW7	O10
21	Vertical Transport SW	SW6	N15
22	Pre-transfer Lamp	L5	P16

SENSORS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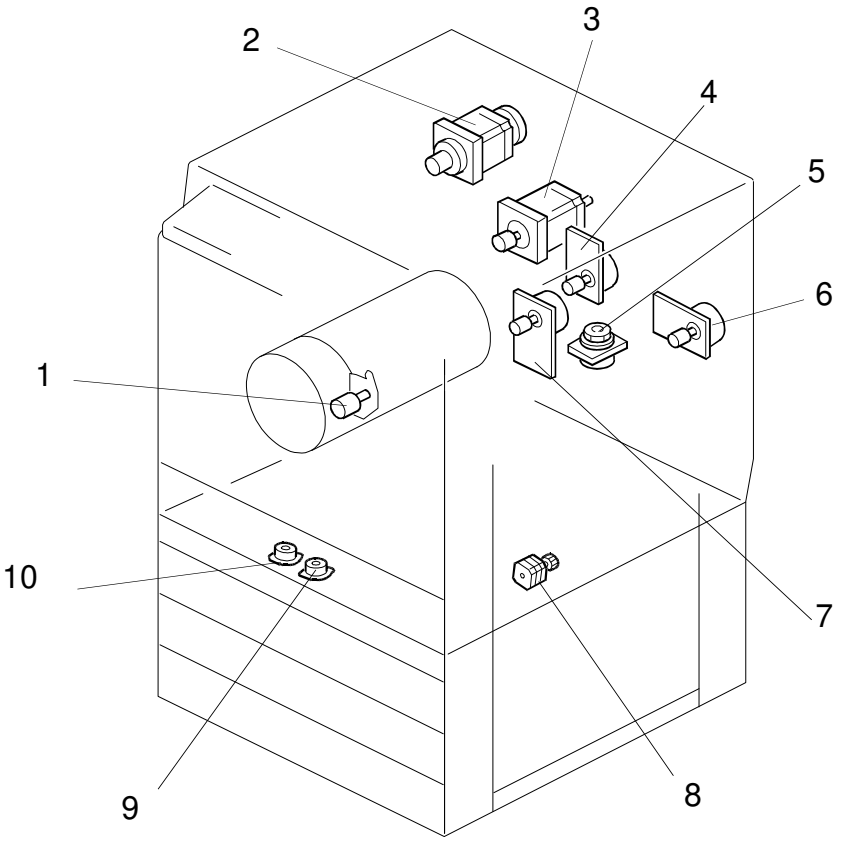
A166S500.wmf

Index No.	Description	Symbol	P-to-P
1	Used Toner Sensor	S13	N11
2	Color Toner Cartridge Sensor	S6	K12
3	Oil End Sensor	S24	I1
4	Revolver H.P. Sensor	S9	J12
5	Bk Toner Cartridge Sensor	S10	K12
6	Scanner H.P. Sensor	S3	H19
7	Original Width Sensor	S21	H19
8	Paper Exit Sensor	S5	I1
9	Drum Potential Sensor	S7	K12
10	Platen Cover Position Sensor	S1	H18
11	Scanner Unit Lift Sensor	S2	H18
12	Original Length Sensor 1	S22	H17
13	Original Length Sensor 2	S23	H15
14	ID Sensor	S8	L12
15	Registration Sensor	S11	K15
16	Tray Paper End Sensor **(A166 only)**	S15	N11
17	By-pass Feed Paper End Sensor	S14	O10
18	Vertical Transport Sensor	S12	K15
19	Transfer Belt H.P. Sensor	S4	H6
20	Duplex Paper End Sensor **(A187/A189 only)**	S18	N4
21	Duplex Entrance Sensor **(A187/A189 only)**	S19	N4
22	Duplex Turn Sensor **(A187/A189 only)**	S20	O4
23	Side Fence Jogger HP Sensor **(A187/A189 only)**	S16	M4
24	End Fence Jogger HP Sensor **(A187/A189 only)**	S17	M4

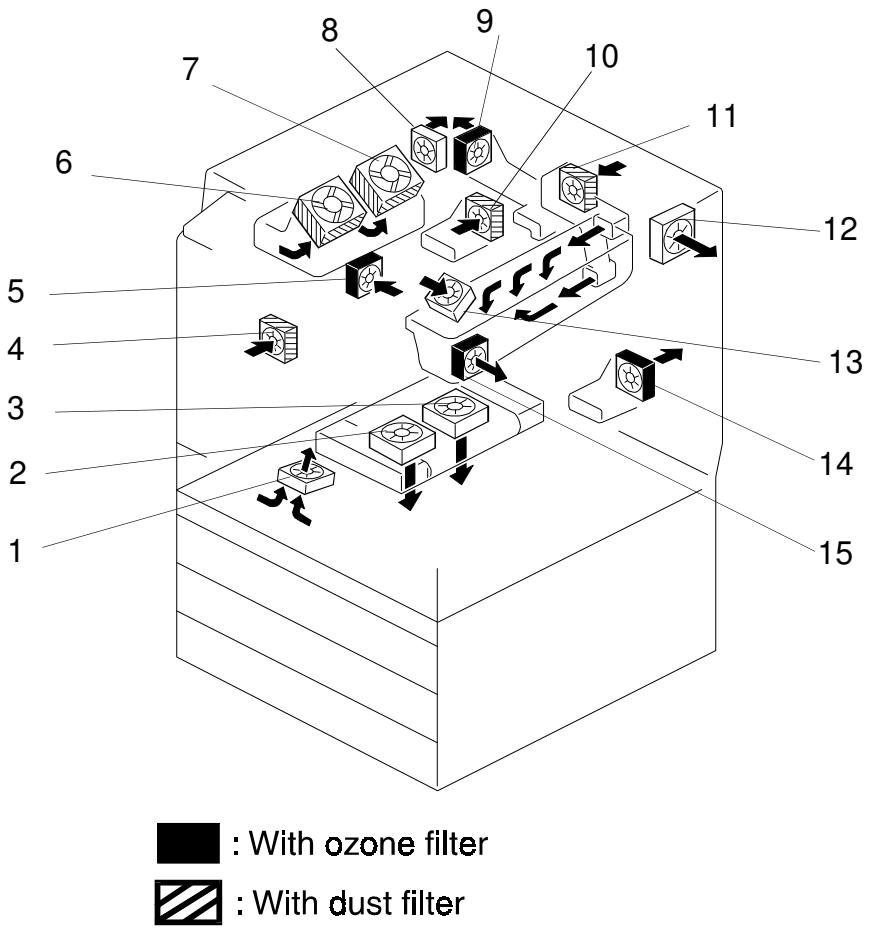
MOTORS



A166S511.wmf

Index No.	Description	Symbol	P-to-P
1	Toner Supply Motor	M5	J11
2	Scanner Motor	M1	C13
3	Revolver Drive Motor	M7	M1
4	Development Drive Motor	M6	L1
5	Polygon Motor	M2	G12
6	Drum Motor	M4	J15
7	Main Motor	M3	K1
8	Duplex Feed Motor **(A187/A189 only)**	M10	M4
9	Side Fence Jogger Motor **(A187/A189 only)**	M8	K4
10	End Fence Jogger Motor **(A187/A189 only)**	M9	L4

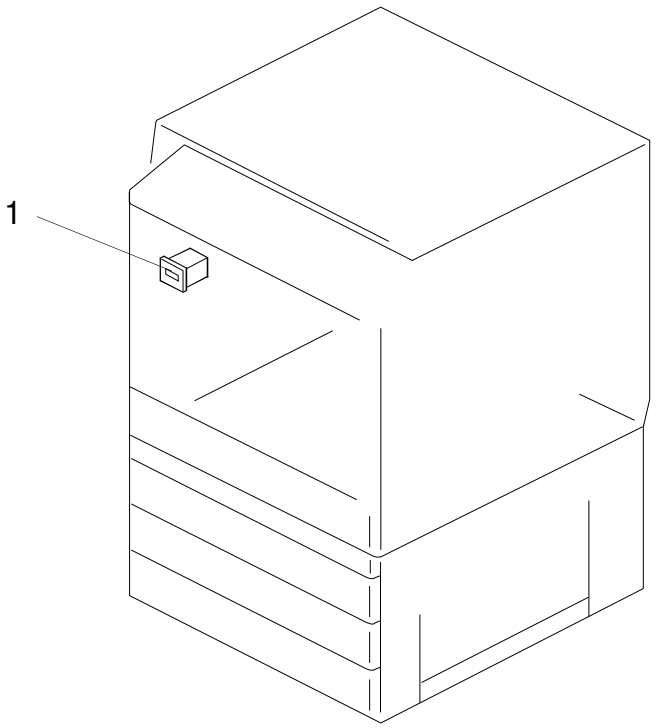
FANS



A166S513.wmf

Index No.	Description	Symbol	P-to-P
1	Development Inlet Fan	FM5	L15
2	Transport Fan 1	FM7	N15
3	Transprot Fan 2	FM8	O15
4	Front Power Supply Board Fan	FM15	P1
5	Paper Exit Fan	FM14	O1
6	Optics Cooling Fan 1	FM2	H16
7	Optics Cooling Fan 2	FM3	H16
8	Rear Power Supply Board Fan	FM13	F3
9	Exhaust Fan	FM11	N1
10	Fusing Fan	FM10	P1
11	Charge Inlet Fan	FM9	O1
12	Optics Exhaust Fan	FM1	C17
13	Scanner Board Cooling Fan	FM4	H17
14	Rear Transfer Fan	FM6	M15
15	Front Transfer Fan	FM12	O1

COUNTERS



A166S515.wmf

Index No.	Description	Symbol	P-to-P
1	Main Counter	CO1	G5

POINT TO POINT DIAGRAM
AZALEA (A166)

Symbol Table

- AC Line
- DC Line
- Pulse Signal
- Signal Direction
- Active High
- Active Low
- ( ) Voltage

AC INPUT

H
N

FU101

Noise Filter

Power Relay (RA)

Fusing Lamp Control Circuit

SW1 Main Switch

T3 T4 T5 T6 T7 T8

FU102

AC Drive/DC Power Supply Board

CN1 CN2 CN3 CN4 CN5 CN6 CN7 CN8 CN9

TF1 Fusing Thermofuse T102 T101

L1 Fusing Lamp 670W

L2 Pressure Roller Lamp 400W

TF2 Pressure Roller Thermofuse T104 T103

Drum Heater H2

Lower Tray Heater H3

Optics Anticondensation Heater H1

CN460 CN461 CN462 CN463

Lamp Regulator PCB1

FPU (Option)

Thermostat TS1

Exposure Lamp L3

VAA4 24V
A4GND

ARDF (Option)

CN465 CN466

T1

Paper Tray Unit (Option)

CN704

Scanner Motor M1

PCB2 Scanner Motor Drive Board

CN461 CN462 CN463

Optics Exhaust Fan FM1

CN457

CCD Board PCB3

CN550 CN551 CN552

PCB18 Extended IPU Board (A189 Only)

1	+5V	41	MG3(A5=0/5)	B1	EA4(A5=0/5)
2	+5V	42	MG1(A5=0/5)	B2	EA2(A5=0/5)
3	+5V	43	SRTY(A5=0/5)	B3	EA0(A5=0/5)
4	+5V	44	SR7(A5=0/5)	B4	GND
5	+5V	45	SR5(A5=0/5)	B5	GND
6	NC	46	SR3(A5=0/5)	B6	SB6(A5=0/5)
7	ED7(A5=0/5)	47	SR1(A5=0/5)	B7	SB4(A5=0/5)
8	ED5(A5=0/5)	48	MG2(A5=0/5)	B8	SB2(A5=0/5)
9	ED3(A5=0/5)	49	MG5(A5=0/5)	B9	SB0(A5=0/5)
10	ED1(A5=0/5)	50	MG3(A5=0/5)	B0	MG6(A5=0/5)
11	/ERR(T5=0/5)	51	MG1(A5=0/5)	B1	MG4(A5=0/5)
12	/CSS0(T5=0/5)	52	SBLACK(A5=0/5)	B2	MB2(A5=0/5)
13	EA21(A5=0/5)	53	/ELSTRG(A5=0/5)	B3	MB0(A5=0/5)
14	EA19(A5=0/5)	54	/ERESET(T5)	B4	MCHRA(A5=0/5)
15	EA17(A5=0/5)	55	/EXIEN(T5)	B5	SG6(A5=0/5)
16	EA15(A5=0/5)	56	+5V	B6	SG4(A5=0/5)
17	EA13(A5=0/5)	57	+5V	B7	SG2(A5=0/5)
18	EA11(A5=0/5)	58	+5V	B8	SG0(A5=0/5)
19	EA9(A5=0/5)	59	+5V	B9	MG6(A5=0/5)
20	EA7(A5=0/5)	60	+5V	B0	MG4(A5=0/5)
21	EA5(A5=0/5)	61	GND	B1	MG2(A5=0/5)
22	EA3(A5=0/5)	62	GND	B2	MG0(A5=0/5)
23	EA1(A5=0/5)	63	GND	B3	MHT(A5=0/5)
24	GND	64	GND	B4	SR6(A5=0/5)
25	GND	65	GND	B5	SR4(A5=0/5)
26	/SR7(A5=0/5)	66	/DBY2(A5=0/5)	B6	SR2(A5=0/5)
27	SR5(A5=0/5)	67	ED6(A5=0/5)	B7	SR0(A5=0/5)
28	SR3(A5=0/5)	68	ED4(A5=0/5)	B8	MB6(A5=0/5)
29	SR1(A5=0/5)	69	ED2(A5=0/5)	B9	MB4(A5=0/5)
30	MB7(A5=0/5)	70	ED0(A5=0/5)	B0	MB2(A5=0/5)
31	MB5(A5=0/5)	71	/ERD(T5=0/5)	B1	MB0(A5=0/5)
32	MB3(A5=0/5)	72	/ECSS(T5=0/5)	B2	MBLACK(A5=0/5)
33	MB1(A5=0/5)	73	EA20(A5=0/5)	B3	/ESTART(T5)
34	SCHARA(A5=0/5)	74	EA18(A5=0/5)	B4	GND
35	SG7(A5=0/5)	75	EA16(A5=0/5)	B5	ECLK(A5=0/5)
36	SG5(A5=0/5)	76	EA14(A5=0/5)	B6	GND
37	SG3(A5=0/5)	77	EA12(A5=0/5)	B7	GND
38	SG1(A5=0/5)	78	EA10(A5=0/5)	B8	GND
39	MG7(A5=0/5)	79	EA8(A5=0/5)	B9	GND
40	MG5(A5=0/5)	80	EA6(A5=0/5)	B0	GND

PCB5 ◁▷ PCB18

Test Points

TP1	GND
TP2	GND
TP3	
TP4	COM2
TP5	+5V
TP6	/FFWRI
TP7	COM1
TP8	VIN_R
TP9	VREF_R
TP10	COM1
TP11	VIN_G
TP12	VREF_G
TP13	COM1
TP14	VIN_B
TP15	VREF_B
TP16	BLACK2
TP17	BT2
TP18	CHAR2
TP19	SLSYNCB
TP20	
TP21	TXD403
TP22	RXD403
TP23	TXADF
TP24	TXPPU
TP25	GND
TP26	GND
TP27	RXADF
TP28	RXPPU

PCB4

CN50 CN51 CN52 CN53 CN54 CN55 CN56 CN57 CN58 CN59 CN60 CN61 CN62 CN63 CN64 CN65 CN66 CN67 CN68 CN69 CN70 CN71 CN72 CN73 CN74 CN75 CN76 CN77 CN78 CN79 CN80 CN81 CN82 CN83 CN84 CN85 CN86 CN87

Scanner IPU Board PCB5

CN440 CN441 CN442 CN550 CN551 CN552

PCB12 IDU Board

CN403

PCB17 Operation Panel (A166, A187 Only)

CN354

PCB16 RAM Board

CN360, CN370~CN381

1	/RESET(T5)	2	FLD0(A5=0/5)		
3	/RTCINT(T5)	4	FLD1(A5=0/5)		
5	RTCAS(A5)	6	FLD2(A5=0/5)		
7	RTCRW(A5)	8	FLD3(A5=0/5)		
9	RTCDS(A5)	10	FLD4(A5=0/5)		
11	/NVRDH(T5=0/5)	12	FLD5(A5=0/5)		
13	/NVRDL(T5=0/5)	14	FLD6(A5=0/5)		
15	/NVRWH(T5=0/5)	16	FLD7(A5=0/5)		
17	/NVRWL(T5=0/5)	18	SA14(A5=0/5)		
19	/SARI(A5=0/5)	20	SA13(A5=0/5)		
21	SA11(A5=0/5)	22	SA9 (A5=0/5)		
23	SA17(A5=0/5)	24	SA15(A5=0/5)		
25	XD7(A5=0/5)	26	XD6 (A5=0/5)		
27	XD5(A5=0/5)	28	XD4 (A5=0/5)		
29	XD3(A5=0/5)	30	XD2 (A5=0/5)		
31	XD1(A5=0/5)	32	XD0 (A5=0/5)		
33	/CLOG2(A5=0/5)	34			
35	VCC1(5)	36	SA0 (A5=0/5)		
37	VCC1(5)	38	SA1 (A5=0/5)		
39	VCC1(5)	40	SA2 (A5=0/5)		
41		42	SA3 (A5=0/5)		
43	C1GND	44	SA4 (A5=0/5)		
45	C1GND	46	SA5 (A5=0/5)		
47	C1GND	48	SA6 (A5=0/5)		
49	C1GND	50	SA7 (A5=0/5)		

PCB15

CN351 CN352 CN353 CN354

SCU Board (A166, A187 Only)

CN202~CN352, CN375

CN219 ◁▷ CN355, CN373

1	C1GND	2	/SCSID0		
3	C1GND	4	/SCSID1		
5	C1GND	6	/SCSID2		
7	C1GND	8	/SCSID3		
9	C1GND	10	/SCSID4		
11	C1GND	12	/SCSID5		
13	C1GND	14	/SCSID6		
15	C1GND	16	/SCSID7		
17	C1GND	18	/SCSIDP		
19	C1GND	20	C1GND		
21	C1GND	22	C1GND		
23	C1GND	24	C1GND		
25	C1GND	26	TRMPWR		
27	C1GND	28	C1GND		
29	C1GND	30	C1GND		
31	C1GND	32	/SCATN		
33	C1GND	34	C1GND		
35	C1GND	36	/SCBSY		
37	C1GND	38	/SCACK		
39	C1GND	40	/SCRST		
41	C1GND	42	/SCMSG		
43	C1GND	44	/SCSEL		
45	C1GND	46	/SCCD		
47	C1GND	48	/SCREQ		
49	C1GND	50	/SCIO		

CN353(PCB15◁▷PCB17)

1		2	CLCOD1(A5=0/5)
3		4	CLCOEN(A5=0/5)
5		6	CLCOS1(A5=0/5)
7		8	CLCOS2(A5=0/5)
9		10	CLFLD1(A5=0/5)
11		12	VCC1(5)
13		14	CLCOD7(A5=0/5)
15		16	VCC1(5)
17		18	CLCOD6(A5=0/5)
19		20	VCC1(5)
21		22	CLCOD5(A5=0/5)
23		24	CLCOD4(A5=0/5)
25		26	CLCOD3(A5=0/5)
27		28	CLCOD2(A5=0/5)
29		30	CLCOD1(A5=0/5)
31		32	CLCOD0(A5=0/5)
33		34	
35		36	
37		38	
39		40	
41		42	
43		44	
45		46	
47		48	
49		50	

CN358(PCB15◁▷PCB17)

1	LED08(A5=0/5)	2	LED01(A5=0/5)
3	LED02(A5=0/5)	4	LED03(A5=0/5)
5	LED04(A5=0/5)	6	LED05(A5=0/5)
7	LED07(A5=0/5)	8	LED06(A5=0/5)
9	LED09(A5=0/5)	10	LED00(A5=0/5)
11	LED10(A5=0/5)	12	LED11(A5=0/5)
13		14	CNFG_DRY(A5)
15	DRY3(A5=0/5)	16	DRY2(A5=0/5)
17	DRY1(A5=0/5)	18	DRY0(A5=0/5)
19	KEYD7(A5=0/5)	20	KEYD6(A5=0/5)
21	KEYD5(A5=0/5)	22	KEYD4(A5=0/5)
23	KEYD3(A5=0/5)	24	KEYD2(A5=0/5)
25	KEYD1(A5=0/5)	26	KEYD0(A5=0/5)
27	SPEAKER(A5)	28	
29	C1GND	30	VCC1(5)

SCU Board (A189 Only)

CN351, CN366(GP Interface)

1	VCA1(12)	2	VCA1(12)	61	IRQ1(A5)	62	SA1 (A5=0/5)
3	C1GND	4	/LOCKOK(T5)	63	TC(A5)	64	SA0 (A5=0/5)
5	C1GND	6	SD7(A5=0/5)	65	BALE(A5=0/5)	66	/SBHE(T5)
7	C1GND	8	SD6(A5=0/5)	67	C1GND	68	LA23(A5=0/5)
9	C1GND	10	SD5(A5=0/5)	69	C1GND	70	LA22(A5=0/5)
11	LCOPGOOD(A5)	12	SD4(A5=0/5)	71	C1GND	72	LA21(A5=0/5)
13	LCOVOFF(A5)	14	SD3(A5=0/5)	73	/MEMCS16(T5=0/5)	74	LA20(A5=0/5)
15	LCDEN(A5)	16	SD2(A5=0/5)	75	/IOCS16(T5=0/5)	76	LA19(A5=0/5)
17	GFLEN(A5)	18	SD1(A5=0/5)	77	IRQ15(A5)	78	LA18(A5=0/5)
19	LISP(A5)	20	SD0(A5=0/5)	79	IRQ14(A5)	80	LA17(A5=0/5)
21	RSTDRV(A5)	22	IOCRDY(A5)	81	/DACK6(T5)	82	/MEMR(T5=0/5)
23	/DACK2(T5)	24	AEN(A5=0/5)	83	VCC1(5)	84	/MEMW(T5=0/5)
25	IOCS(A5)	26	SA19(A5=0/5)	85	VCC1(5)	86	SD8 (A5=0/5)
27	DRQ2(A5)	28	SA18(A5=0/5)	87	VCC1(5)	88	SD9 (A5=0/5)
29	VCB1(-12)	30	SA17(A5=0/5)	89	VCC1(5)	90	SD10(A5=0/5)
31	/ZWS(T5)	32	SA16(A5=0/5)	91	VCC1(5)	92	SD11(A5=0/5)
33	C1GND	34	SA15(A5=0/5)	93		94	SD12(A5=0/5)
35	C1GND	36	SA14(A5=0/5)	95	/DBIR(A5=0/5)	96	SD13(A5=0/5)
37	/SMEMW(T5=0/5)	38	SA13(A5=0/5)	97	/CSRD(T5=0/5)	98	SD14(A5=0/5)
39	/SMEMR(T5=0/5)	40	SA12(A5=0/5)	99	/INROMEN(T5)	100	SD15(A5=0/5)
41	/IORW(T5=0/5)	42	SA11(A5=0/5)				
43	/IORD(T5=0/5)	44	SA10(A5=0/5)				
45	/DACK0(T5)	46	SA9 (A5=0/5)				
47	DRQ0(A5)	48	SA8 (A5=0/5)				
49	/REFRESH(T5=0/5)	50	SA7 (A5=0/5)				
51	SYSCLK(A5=0/5)	52	SA6 (A5=0/5)				
53	IRQ7(A5)	54	SA5 (A5=0/5)				
55	IRQ6(A5)	56	SA4 (A5=0/5)				
57		58	SA3 (A5=0/5)				
59	IRQ4(A5)	60	SA2 (A5=0/5)				

NOTE:11, 13, 15, 17, 19 are not used for CN366

CN369(PCB15◁▷PCB17)

1	CNCFLEN(A5)	10	TPAGND
2	C1GND	11	TPAGND
3	X_ANALOG(G-5)	12	TPAGND
4	Y_ANALOG(G-5)	13	VCA1(12)
5	TP_INT(A5)	14	VCB1(-12)
6	ASW_CTL1(A5)	15	TPAGND
7	ASW_CTL2(A5)	16	TPAGND
8	C1GND	17	CNLOGEN(A5)
9	ADVREF(5)	18	LCOVEE(-13~22)

CN368(PCB15◁▷PCB17)

1	CNFLM(A5)	9	CNUD1(A5=0/5)
2	CNLP(A5)	10	CNUD2(A5=0/5)
3	CNSRFCLK(A5=0/5)	11	CNUD3(A5=0/5)
4	CNUIF(A5)	12	CNUD4(A5=0/5)
5	LCOVCC(5)	13	CNLD1(A5=0/5)
6	C1GND	14	CNLD2(A5=0/5)
7	LCOVEE(2)	15	CNLD3(A5=0/5)
8	CNUDD(A5=0/5)		

PCB17 Operation Panel (A189 Only)

PCB6 Main Control Board

CN201 CN705 CN202 CN705

1		17	WD6(T5=0/5)	2		20	WD7(T5=0/5)
3		15	WD4(T5=0/5)	4		18	WD5(T5=0/5)
5		13	WD2(T5=0/5)	6		16	WD3(T5=0/5)
7		11	WD0(T5=0/5)	8		14	WD1(T5=0/5)
9		11	PD0(A5=0/5)	10		12	PD1(A5=0/5)
11		9	LDOWD(A5)	12		10	LOCKA(A5=0/5)
13		7	LOOPI(A5)	14		8	LDERR(A5=0/5)
15		5	LEVEL(A5=0/5)	16		6	VCC1
17		3	LDGND	18		4	C1GND
19		1	VCCLD	20		2	VCC1

Dip Switch(Factory Use Only)

	Default	ON
1	OFF	Not Used
2	OFF	Duplex Set

チップピン

TP221	RESET	TP202	SS_RXD
TP222	WAIT	TP208	SS_TXD
TP223	WR_FIF	TP218	BNK_RXD
TP224	RPULL	TP219	BNK_TXD
TP225	EMPTY	TP247	SCU_RXD
TP236	ACK_SC	TP226	SCU_TXD
TP237	INT_SCSI	TP246	371_RXD
TP245	XREQ_SC	TP249	371_TXD
TP235	RDACS	TP205	FB_TP
TP234	DREQS	TP206	FB_TB
TP244	IDDRD	TP207	FB_B
TP227	LTRIM	TP208	FB_C
TP228	FGATE	TP209	FB_D
TP229	LGATE	TP215	
TP230	LEVEL	TP216	FB_DDC(TPC)
TP231	FMCLK	TP203	TV
TP232	LDCLK	TP204	RHV
TP233	DETP2	TP210	TB_U
TP234	FWRCLK	TP211	TB_L
TP239	PW	TP213	V_SEN
TP240	DETP1	TP214	INT_BLT
TP241	WCLK	TP217	P_SEN
TP201	GND		
TP212	GND		
TP238	GND		
TP243	GND		
TP242	GND		

PCB7 I/O Control Board 1

Test Points

TP251	RX
TP252	C1GND
TP253	TH
TP254	IN_DATA11
TP255	OE1
TP256	LE1
TP257	OUT_CLOCK1
TP258	IN_DATA12
TP259	C2GND
TP260	LOAD1
TP261	IN_CLOCK1
TP262	SO_DATA1

PCB8 I/O Control Board 2

Test Points

TP301	OE2
TP302	C2GND
TP303	IN_CLOCK2
TP304	LOAD2
TP305	LE2
TP306	OUT_CLOCK2
TP307	SO_DATA2
TP308	IN_DATA22
TP309	IN_DATA21
TP310	X8
TP311	B
TP312	XA
TP313	A

PCB9 LD Drive Board

LD

Polygon Motor M2

PCB10 Laser Synchronizing Detector Board 1

PCB11 Laser Synchronizing Detector Board 2

PCB14 High Voltage Supply Board

PCB19 Duplex Control Board

Sortor Stapler (Option)

T2

Main Counter CO1

Transfer Belt H,P Sensor S4

Fusing Thermistor TH1

Oil End Sensor S24

Pressure Roller Thermistor TH2

Paper Exit Sensor S5

Paper Exit Door SW SW9

(A187, A189 Only)

Junction Gate SOL SOL6 (A187, A189 Only)

Side Fence Jogger Motor M8

End Fence Jogger Motor M9

Duplex Feed Motor M10

Side Fence Jogger HP Sensor S16

End Fence Jogger HP Sensor S17

Duplex Paper End Sensor S18

Duplex Entrance Sensor S19

Duplex Turn Sensor S20

Key Counter(Option)

Main Motor M3

Development Drive Motor M6

Revolver Drive Motor M7

(A166 Only) Tray Paper Size SW SW8

Exhaust Fan Motor FM11

Front Transfer Fan Motor FM12

Paper Exit Fan Motor FM14

Charge Inlet Fan Motor FM9

Fusing Fan Motor FM10

Front Power Supply Board Fan Motor FM15

Rear Power Supply Board Fan Motor FM13

Front Door Switch SW2

Front Door SW SW3

Front Door SW SW4

Revolver HP Sensor S9

Toner Supply Motor M5

Bk Toner Cartridge Sensor S10

Color Toner Cartridge Sensor S6

Drum Potential Sensor S7

ID Sensor S8

Used Toner Sensor S13

SW7 By-pass Feed Table SW CN728-1 CN728-2

By-pass Feed Paper End Sensor S14

By-pass Feed CL CL1

Sub By-pass Feed Pick-up SOL SOL1

Main By-pass Feed Pick-up SOL SOL2

Tray Paper End Sensor S15

Drum Motor M4

Registration Sensor S11

Vertical Transport Sensor S12

By-pass Paper Width Detection Board PCB13

Development Inlet Fan Motor FM5

Registration CL CL2

Rear Transfer Fan Motor FM6

Vertical Transport SW SW6

Vertical Transport CL CL3

Transport Fan Motor 1 FM7

Transport Fan Motor 2 FM8

Paper Feed CL CL4 (A166 Only)

Toner Supply Release SOL SOL3

Toner Supply Release SOL SOL4

Transfer Belt Cleaning SOL SOL5

Transfer Belt Lubricant SOL

PCB1 Lamp Regulator

PCB2 Scanner Motor Drive Board

PCB3 CCD Board

PCB5 Scanner IPU Board

PCB12 IDU Board

PCB16 RAM Board

PCB17 Operation Panel (A189 Only)

PCB18 Extended IPU Board (A189 Only)

Aficio Color 2003/2103/2203 (Azalea, A166/A187/A189) Service Manual

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