SERVICE MANUAL

(Machine Code: A195)

–Complete Version –

TS Dept. IPP Business Division
RICOH Co., LTD.

May 9th 1997

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.

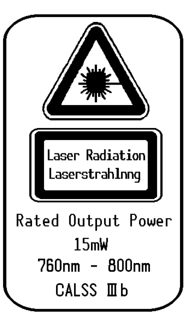
⚠ WARNING

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

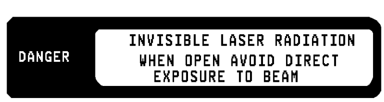
⚠ WARNING FOR LASER UNIT

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

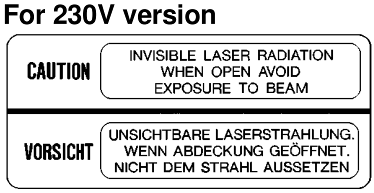
CAUTION MARKING:



For 115V version



For 230V version



SECTION 1

OVERALL MACHINE INFORMATION

1. SPECIFICATIONS

Configuration: Desktop

Copy Process: Dry electrostatic transfer system

Originals: Sheet/Book

Original Size: Maximum A3/11" x 17"

Copy Paper Size:
Maximum
A3/11" x 17" (Paper tray)
Minimum
A5/8 1/2" x 5 1/2" sideways (Paper tray)
A6/5 1/2" x 8 1/2" lengthwise (By-pass)
LCT
A4/11" x 8 1/2" sideways only

Duplex Copying:
Maximum
A3/11" x 17"
Minimum
A5/8 1/2" x 5 1/2" sideways

Copy Paper Weight:
Paper tray:
60 ~ 105 g/m^2, 16 ~ 24 lb
By-pass:
60 ~ 157 g/m^2, 16 ~ 42 lb
LCT:
60 ~ 128 g/m^2, 16 ~ 34 lb
Duplex copying:
64 ~ 105 g/m^2, 17 ~ 24 lb

Reproduction Ratios: 5 Enlargement and 7 Reduction

	A4/A3 Version	LT/DLT Version
Enlargement	400% 200% 141% 122% 115%	400% 200% 155% 129% 121%
Full size	100%	100%
Reduction	93% 87% 82% 71% 65% 50% 25%	93% 85% 77% 74% 65% 50% 25%

Zoom: 25% to 400% in 1% steps

Power Source:
120V/60Hz:
More than 12 A (for North America)
220V ~ 240V/50Hz:
More than 7 A (for Europe)
220V ~ 240V/60Hz:
More than 7 A (for Asia)

Power Consumption:

	Copier Only	Full System
Maximum	Less than 1.44 kW	Less than 1.44 kW
Copying	Less than 1.20 kW	Less than 1.20 kW
Warm-up	Less than 0.88 kW	Less than 0.90 kW
Stand-by	Less than 0.20 kW	Less than 0.22 kW

NOTE: 1) Full System: Copier + ADF + Paper Tray Unit + Finisher

Noise Emission:

	Copier Only	Full System
1. Sound Power Level		
Copying	66.0 dB(A)	69.0 dB(A)
Stand-by	40.0 dB(A)	40.0 dB(A)
2. Sound Pressure Level at the Operator Position		
Copying	54 dB(A)	59 dB(A)
Stand-by	25 dB(A)	25 dB(A)

NOTE: The above measurements are to be made in accordance with ISO 7779.
Full System: Copier + ADF + Paper Tray Unit + Finisher.

Dimensions (W x D x H): 880 x 655 x 602 mm (34.7" x 25.8" x 23.8")
Measurement Conditions
1) With by-pass feed table closed
2) With copy tray attached
3) With LCT cover closed
4) Without the 500-sheet copy tray

Weight: 95 kg (210 lb)

Copying Speed (copies/minute):

A4 sideways/ 11" x 8 1/2"	A3/11" x 17"	B4/8 1/2" x 14"
40	18	26

Warm-Up Time: Less than 140 seconds (20°C, 68°F)

First Copy Time: Less than 5.2 s (from LCT)

Copy Number Input: Ten-key pad, 1 to 999 (count up or count down)

Manual Image Density Selection: 7 steps

Automatic Reset: 30 s is the standard setting; it can be changed with a UP mode.

Copy Paper Capacity:

Paper Tray	By-pass Feed	LCT
About 500 sheets x1	About 40 sheets	About 1000 sheets

Hard Disk: 1.7 GB, Fast SCSI-2

Duplex Tray Capacity:
A4/11" x 81/2": 50 sheets
A3/11" x 17": 50 sheets (80 g/m^2, 20 lb paper)
30 sheets (81 ~ 105 g/m^2, 21.5 ~ 27.9 lb paper)

Toner Replenishment: Cartridge exchange (700 g/cartridge)

Toner Yield: 20K copies (A4, 6% full black, ID Level 4)

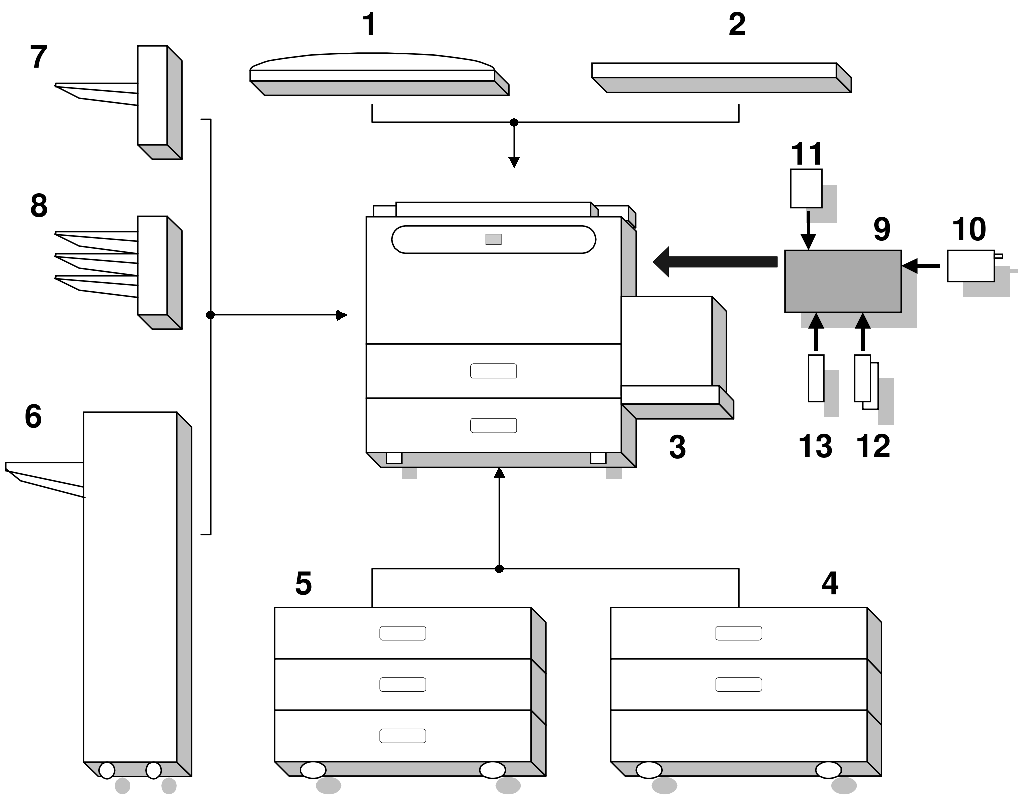
Optional Equipment:

- Platen cover
- Document feeder
- Paper tray unit with two paper trays
- Paper tray unit with three paper trays
- Finisher
- Key counter
- Tray heater
- Optical anti-condensation heater
- Drum heater
- 500-sheet receiving tray
- 3-bin Sorter
- Main Controller Board
- Network Interface Card
- Scanner Board
- PostScript ROM SIMM
- RAM SIMM

Copy Tray Capacity:

B4/81/2" x 14" ~ A4/81/2" x 11"	500 sheets
A3\11" x 17"	200 sheets
Less than B5/51/2" x 81/2":	200 sheets

2. MACHINE CONFIGURATION



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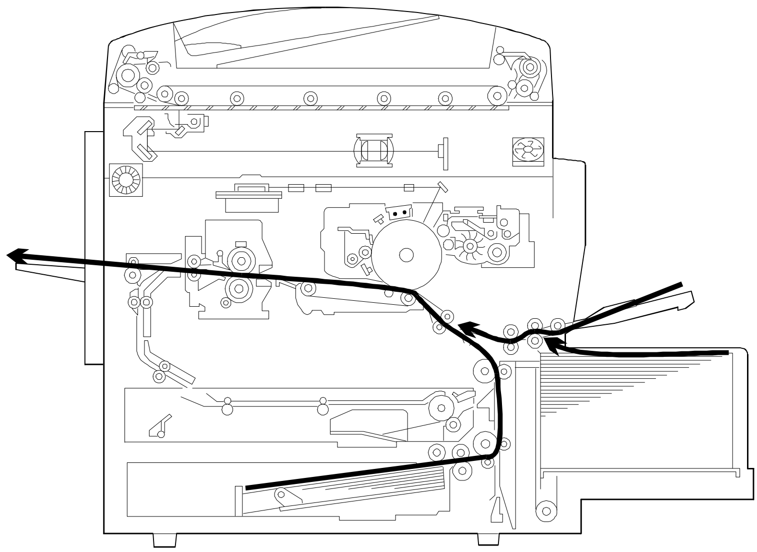
Item	Machine Code	No.
Copier	A195	3
ADF (Option)	A548	1
Paper Feed Unit (Option)	A549	5
	A550	4
Finisher (Option)	A612	6
500-sheet Receiving Tray (Option)	A615	7
Platen Cover (Option)	A381	2
3-bin Sorter (Option)	A566	8
Main Controller Board (Option)	A649	9
Network Interface Card (Option)	A732 (For Ethernet)	10
	A733 (For Token Ring)	
Scanner Board (Option)	A651	11
PostScript ROM SIMM (Option)	A650	12
RAM SIMM (Option)	—	13

3. PAPER PATH

3.1 NORMAL COPYING



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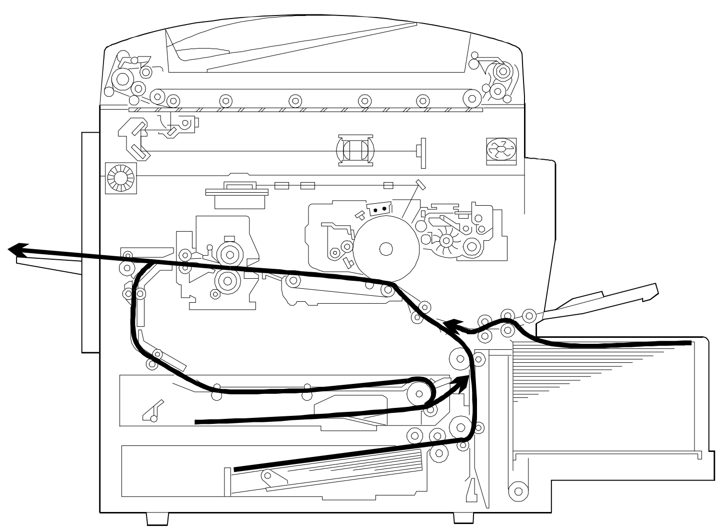
3.2 DUPLEX COPYING



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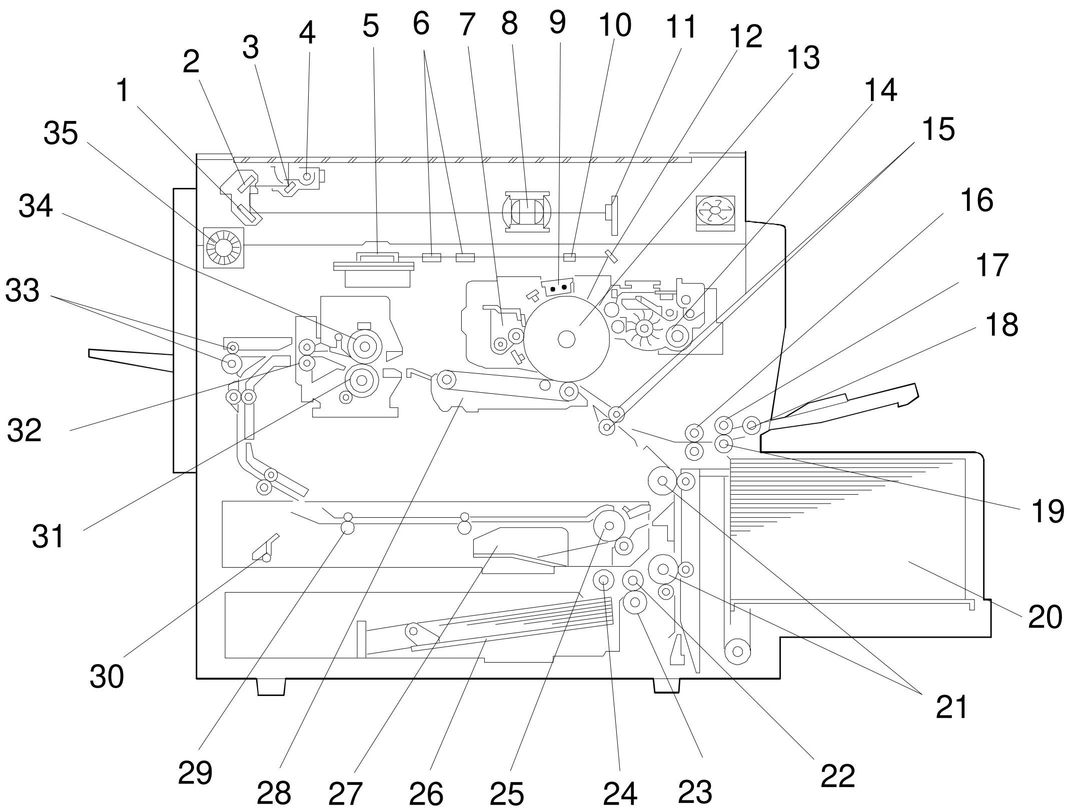
4. MECHANICAL COMPONENT LAYOUT



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1. 3rd. Mirror
2. 2nd. Mirror
3. 1st. Mirror
4. Exposure Lamp
5. Polygonal Mirror Motor
6. Fθ Lenses
7. Cleaning Unit
8. Lens
9. Charge Corona Unit
10. Barrel Toroidal Lens (BTL)
11. CCD
12. Mirror
13. Drum
14. Development Unit
15. Registration Rollers
16. By-pass Feed Relay Roller
17. By-pass Feed Roller
18. By-pass Pick-up Roller
19. By-pass Separation Roller
20. LCT
21. Relay Rollers
22. Feed Roller
23. Separation Roller
24. Pick-up Roller
25. Duplex Feed Roller
26. Bottom Plate
27. Side Jogger Fence
28. Transfer Belt Unit
29. Entrance Rollers
30. End Jogger Fence
31. Pressure Roller
32. Fusing Exit Roller
33. Exit Rollers
34. Hot Roller
35. Optics Exhaust Fan Motor

5. ELECTRICAL COMPONENT DESCRIPTIONS

Refer to the electrical component layout and the point-to-point diagram on the waterproof paper in the pocket for the locations of these components.

Symbol	Index No.	Description	Note
Printed Circuit Boards			
PCB1	90	SCU	Controls all copier functions both directly or through other control boards.
PCB2	89	AC Drive	Provides ac power to the exposure lamp and fusing lamps.
PCB3	92	DC Power Supply	Provides dc power.
PCB4	93	BCU	Controls the mechanical parts of the printer.
PCB5	80	Charge High Voltage Supply	Supplies high voltage to the charge corona unit.
PCB6	85	High Voltage Control	Controls the high voltage boards and the quenching lamp.
PCB7	87	Operation Panel	Controls the touch panel display and LED matrix, and monitors the key matrix.
PCB8	95	Scanner Drive	Drives the scanner motor.
PCB9	81	EX-IPU	Processes the video signal from the SBU and sends the video signal to the LD unit.
PCB10	84	SBU	Contains the CCD, and outputs a video signal to the EX-IPU board.
PCB11	94	Lamp Stabilizer	Provides dc power for the exposure lamp.
PCB12	86	Main Scan Synchronization Detector - 1	Detects the laser beam at the start of the main scan.
PCB13	83	Main Scan Synchronization Detector - 2	Detects the laser beam at the end of the main scan.
PCB14	31	Transfer High Voltage	Supplies high voltage to the transfer belt.
PCB15	33	Development Bias Power Pack	Supplies high voltage to the development roller.
PCB16	40	Duplex Control	Controls the operation of the duplex tray.
PCB17	N/A	Liquid Crystal Display	Controls the guidance display and displays guidance for machine operation.
PCB18	51	LCT Interface	Interfaces the LCT control signal between the main board and the LCT.
PCB19	91	Relay Board	Switches ac power to either the dc drive board (if the main switch is on) or to the heaters (if the main switch is off).
PCB20	7	Laser Diode Drive	Controls the laser diode.
PCB21	96	Extension Board	Transfers control signals between the SCU and the dummy board.

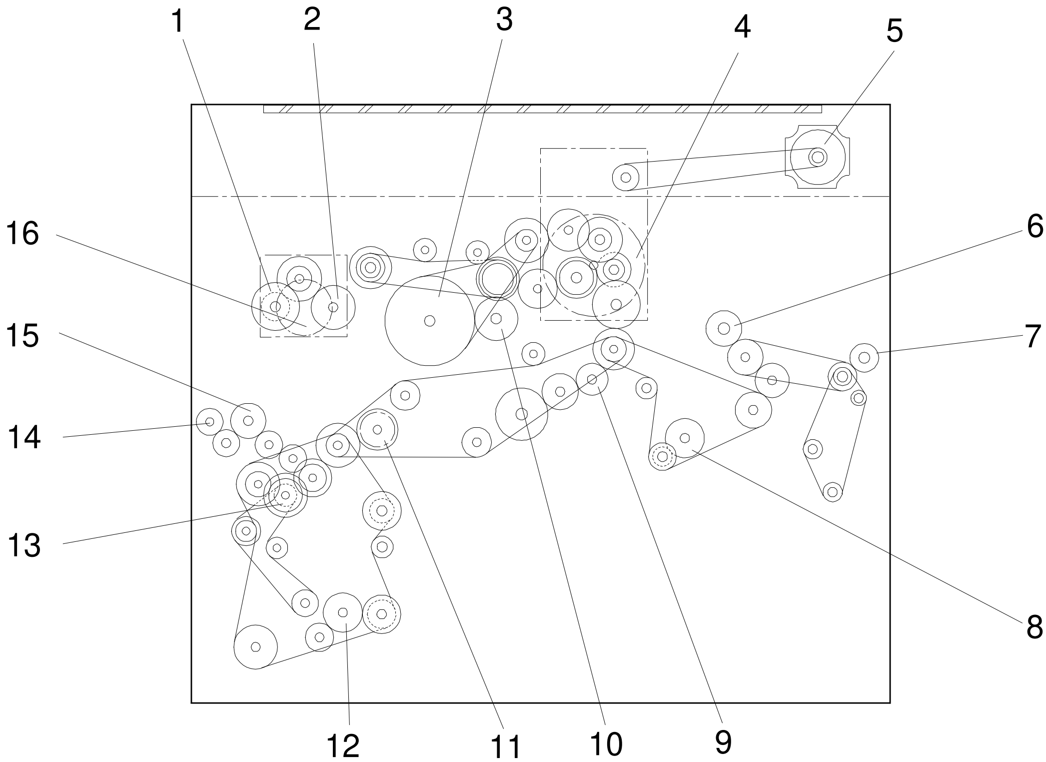
Symbol	Index No.	Description	Note
PCB22	79	Dummy Board	Installed to connect the SCU and EX-IPU and other cables when the main contoller board is not present.
Motors			
M1	57	Main	Drives the main body components.
M2	66	Toner Bottle Drive	Rotates the toner bottle to supply toner to the toner supply unit.
M3	73	Tray Lift	Raises the bottom plate in the paper tray.
M4	56	Polygonal Mirror	Turns the polygonal mirror.
M5	48	LCT Lift	Lifts up and lowers the LCT bottom plate.
M6	74	Optics Exhaust Fan	Removes heat from the optics unit.
M7	65	IPU Fan	Removes heat from the IPU board.
M8	78	Exhaust Fan	Removes heat from around the fusing unit.
M9	60	Ozone Fan	Removes ozone-laden air from inside the machine.
M10	55	Scanner Drive	Drives the 1st and 2nd scanners (dc stepper motor).
M11	36	Duplex Feed	Drives the feed roller and moves the bottom plate up and down.
M12	39	End Fence Jogger	Drives the end fence jogger to square the paper stack.
M13	38	Side Fence Jogger	Drives the side fence jogger to square the paper stack.
M14	75	DC Drive Board Fan	Removes heat from around the DC drive board.
M15	68	Charge Inlet Fan	Provides air flow around the charge corona unit section.
M16	59	Development Drive	Drives the development unit.
Sensors			
S1	13	By-pass Feed Paper Width	Informs the CPU what width paper is in the by-pass feed table.
S2	15	By-pass Feed Paper End	Informs the CPU that there is no paper in the by-pass tray.
S3	18	Tray Paper End	Informs the CPU when the paper tray runs out of paper.
S4	46	Upper Relay	Detects the leading edge of paper from the paper tray and duplex unit to determine the stop timing of the paper feed clutch and duplex feed motor. Also detects misfeeds.
S5	16	Tray Upper Limit	Detects the height of the paper stack in the paper tray to stop the upper tray lift motor.
S6	47	Lower Relay	Detects misfeeds.
S7	49	LCT Lower Limit	Sends a signal to the CPU to stop lowering the LCT bottom plate.
S8	50	LCT Paper End	Informs the CPU when the LCT runs out of paper.

Symbol	Index No.	Description	Note
S9	12	LCT Upper Limit	Signals the CPU to stop lifting the LCT bottom plate.
S10	19	Registration	Detects the leading edge of the copy paper to determine the stop timing of the paper feed clutch, and detects misfeeds.
S11	29	Image Density (ID)	Detects the density of various patterns on the drum during process control.
S12	30	Toner Density (TD)	Detects the amount of toner inside the development unit.
S13	1	Scanner HP	Informs the CPU when the 1st and 2nd scanners are at the home position.
S14	8	Original Length-1	Detects the length of the original. This is one of the APS (Auto Paper Select) sensors.
S15	9	Original Length-2	Detects the length of the original. This is one of the APS (Auto Paper Select) sensors.
S16	24	Fusing Exit	Detects misfeeds.
S17	6	Platen Cover	Informs the CPU whether the platen cover is up or down (related to APS/ARE functions). ARE: Auto Reduce and Enlarge
S18	32	Toner End	Instructs the CPU to add toner to the toner supply unit, and detects toner end conditions.
S19	28	Auto Response	Returns the operation panel display and exits from the energy saver mode.
S20	10	Transfer Belt Position	Informs the CPU of the current position of the transfer belt unit.
S21	2	Original Width	Detects the width of the original. This is one of the APS (Auto Paper Select) sensors.
S22	34	Duplex Paper End	Detects paper in the duplex tray.
S23	35	Duplex Turn	Detects the trailing edge of the copy paper to determine the jogging timing, and detects misfeeds.
S24	42	Duplex Entrance	Detects misfeeds.
S25	37	Side Fence Jogger HP	Detects the home position of the duplex side fence jogger.
S26	41	End Fence Jogger HP	Detects the home position of the duplex end fence jogger.
S27	23	Toner Overflow	Detects when the used toner collection bottle is full.
S28	14	By-pass Relay	Detects misfeeds.
Switches			
SW1	11	By-pass Feed Table	Detects whether the by-pass feed table is open or closed.
SW2	53	Tray Down	Sends a signal to the CPU to lower the LCT bottom plate.
SW3	20	Tray Paper Size	Determines what size of paper is in the paper tray.
SW4	54	LCT	Cuts the dc power line and detects whether the LCT is open or not.

Symbol	Index No.	Description	Note
SW5	52	LCT Cover	Cuts the dc power line of the LCT lift motor.
SW6	27	Main	Supplies power to the copier.
SW7	26	Front Cover Safety	Cuts the dc power line and detects whether the front cover is open or not.
Magnetic Clutches			
CL1	61	Toner Supply	Turns the toner supply roller to supply toner to the development unit.
CL2		Not used	
CL3	76	Transfer Belt Lift	Controls the touch and release movement of the transfer belt unit.
CL4	58	Registration	Drives the registration rollers.
CL5	63	By-pass Feed	Starts paper feed from the by-pass feed table or LCT.
CL6	71	Relay	Drives the relay rollers.
CL7	72	Paper Feed	Starts paper feed from the paper tray.
CL8	62	By-pass Relay	Drives the by-pass relay rollers.
Solenoids			
SOL1	67	By-pass Pick-up	Drops the pick-up roller to the by-pass paper feed position. When paper is fed from the LCT, this solenoid assists SOL3.
SOL2	77	Junction Gate	Moves the junction gate to direct copies to the duplex tray or to the paper exit.
SOL3	64	LCT Pick-up	Drops the pick-up roller all the way down to the LCT paper feed position from the by-pass paper feed position.
SOL4	69	Pick-up	Controls the up/down movement of the pick-up roller in the paper tray.
SOL5	70	Separation	Controls the up/down movement of the separation roller at the paper tray feed station.
Lamps			
L1	3	Exposure	Applies high intensity light to the original for exposure.
L2	43	Fusing	Provides heat to the hot roller.
L3	88	Quenching	Neutralizes any charge remaining on the drum surface after cleaning.
Heaters			
H1	21	Drum (option)	Turns on when the main switch is off to prevent moisture from forming around the drum.
H2	5	Optics Anti-condensation (option)	Turns on when the main switch is off to prevent moisture from forming on the optics.
H3	22	Tray (option)	Turns on when the main switch is off to keep paper dry in the paper tray.
Thermistors			

Symbol	Index No.	Description	Note
TH1	45	Fusing	Monitors the temperature at the central area of the hot roller.
Thermofuses			
TF1	44	Fusing	Provides back-up overheat protection in the fusing unit.
Thermoswitch			
TS1	4	Exposure Lamp	Opens the exposure lamp circuit if the 1st scanner overheats.
Counters			
CO1	25	Total	Keeps track of the total number of copies made.
CO2	N/A	Key (option)	Used for control of authorized use. The copier will not operate until it is installed.
Others			
CB1	17	Circuit Breaker (220 ~ 240V machines only)	Provides back-up high current protection for electrical components.
HDD	82	Hard Disk Drive	Scanned image data is compressed and held here temporarily during copying; also holds user stamp data.

6. DRIVE LAYOUT



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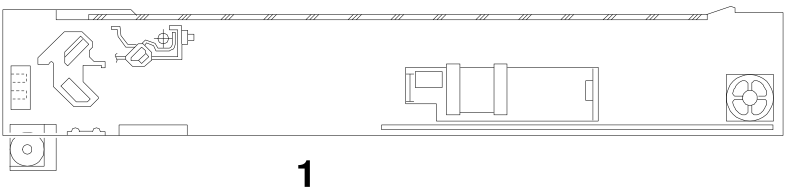
1. Toner Supply Clutch
2. Development Gear
3. Drum Drive Pulley
4. Main Motor
5. Scanner Drive Motor
6. Fusing Drive Gear
7. Exit Drive Gear
8. Toner Collection Bottle Drive Gear
9. Transfer Belt Drive Gear
10. Cleaning Blade Drive Gear
11. Registration Clutch
12. Paper Feed Clutch
13. Relay Clutch
14. By-pass Feed Clutch
15. By-pass Relay Clutch
16. Development Drive Motor

SECTION 2

DETAILED
SECTION DESCRIPTIONS

1. COPY PROCESS

1.1 OVERVIEW



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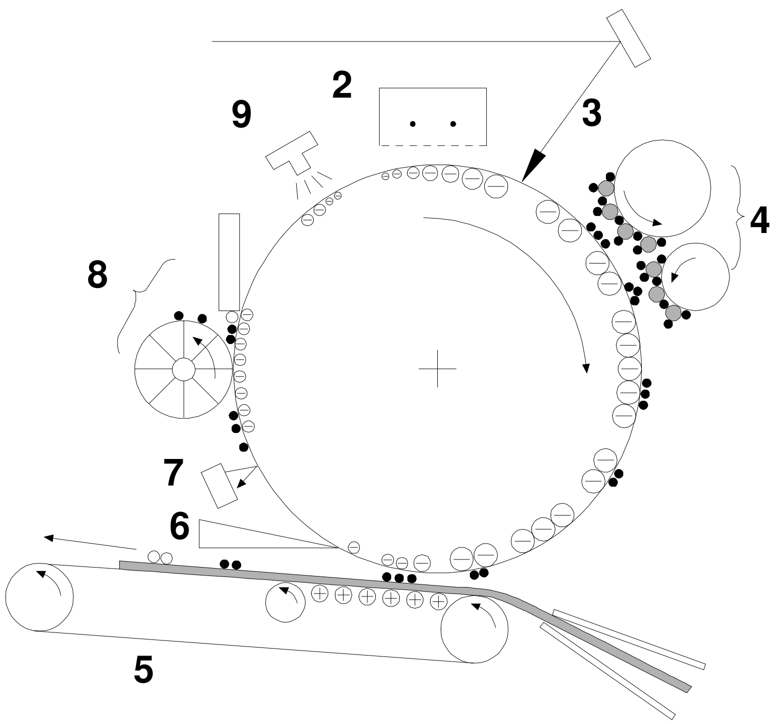

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1. EXPOSURE
A halogen lamp exposes the original. Light reflected from the original passes to the CCD, where it is converted into an analog data signal. This data is converted to a digital signal, processed, and stored on the hard disk. At the time of printing, the data is retrieved and sent to the laser diode. For multi-copy runs, the original is scanned once only and stored to the disk.

2. DRUM CHARGE
In the dark, the charge corona unit gives a negative charge to the organic photo-conductive (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.

3. LASER EXPOSURE
The processed data scanned from the original is retrieved from the disk and transferred to the drum by a laser beam, which 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, which is controlled by the EX-IPU board.

4. DEVELOPMENT
The magnetic developer brush on the development rollers comes in contact with the latent image on the drum surface. Toner particles are electrostatically attracted to the areas of the drum surface where the laser reduced the negative charge on the drum.

5. IMAGE TRANSFER
Paper is fed to the area between the drum surface and the transfer belt at the proper time so as to align the copy paper and the developed image on the drum surface. Then, the transfer bias roller applies a high positive charge to the reverse side of paper through the transfer belt. This positive charge produces an electrical force which pulls the toner particles from the drum surface on to the paper. At the same time, the paper is electrically attracted to the transfer belt.

6. PAPER SEPARATION
Paper separates from the drum as a result of the electrical attraction between the paper and the transfer belt. The pick-off pawls help separate the paper from the drum.

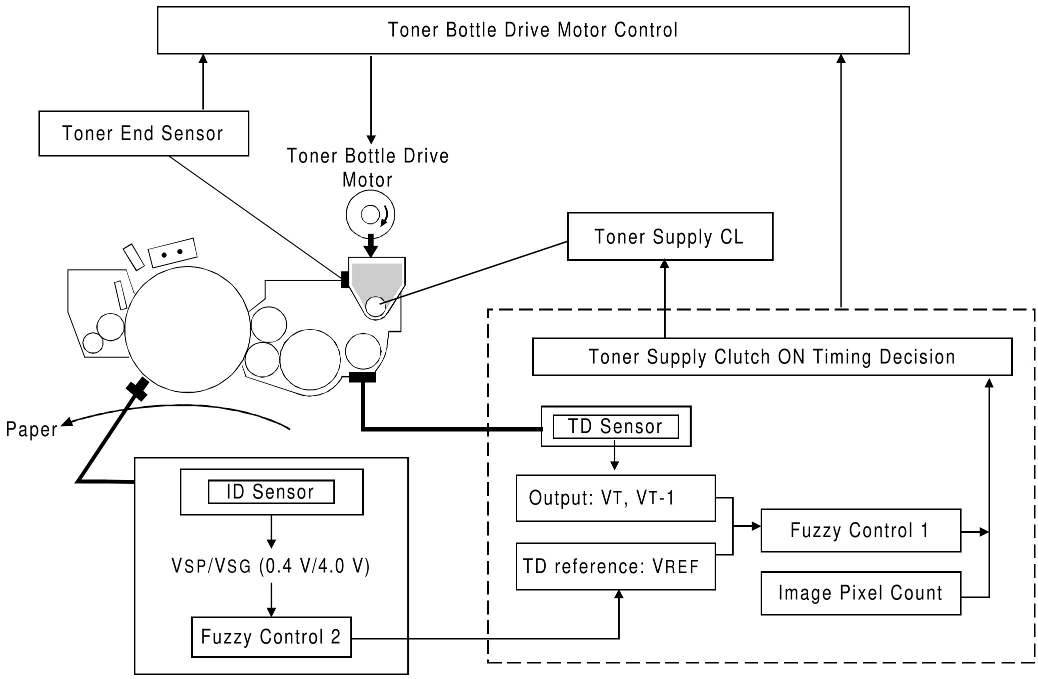
7. ID SENSOR
On every 200th copy cycle, the laser forms a sensor pattern on the drum surface. The ID sensor measures the reflectivity of the pattern. The output signal is one of the factors used for toner supply control.

8. CLEANING
The cleaning brush and cleaning blade remove any toner remaining on the drum surface after the image is transferred to the paper.

9. QUENCHING
The light from the quenching lamp electrically neutralizes the charge on the drum surface.

2. PROCESS CONTROL

2.1 OVERVIEW



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In this model, process control consists only of monitoring the toner density (with a correction from the ID sensor) in order to control the toner concentration and toner supply amount.

The machine controls the toner supply mechanism using readings from the toner density sensor (TD sensor) and image density sensor (ID sensor).

Readings from the TD sensor are used to keep the toner concentration in the developer at a constant level. However, the toner concentration on the image on the drum varies due to variations in toner chargeability, which is influenced by the environment and the status of the carrier, even if the toner concentration is constant. Because of this, readings from the ID sensor are used to change the toner concentration to keep the image density of the reference pattern on the drum constant.

2.2 TONER DENSITY CONTROL

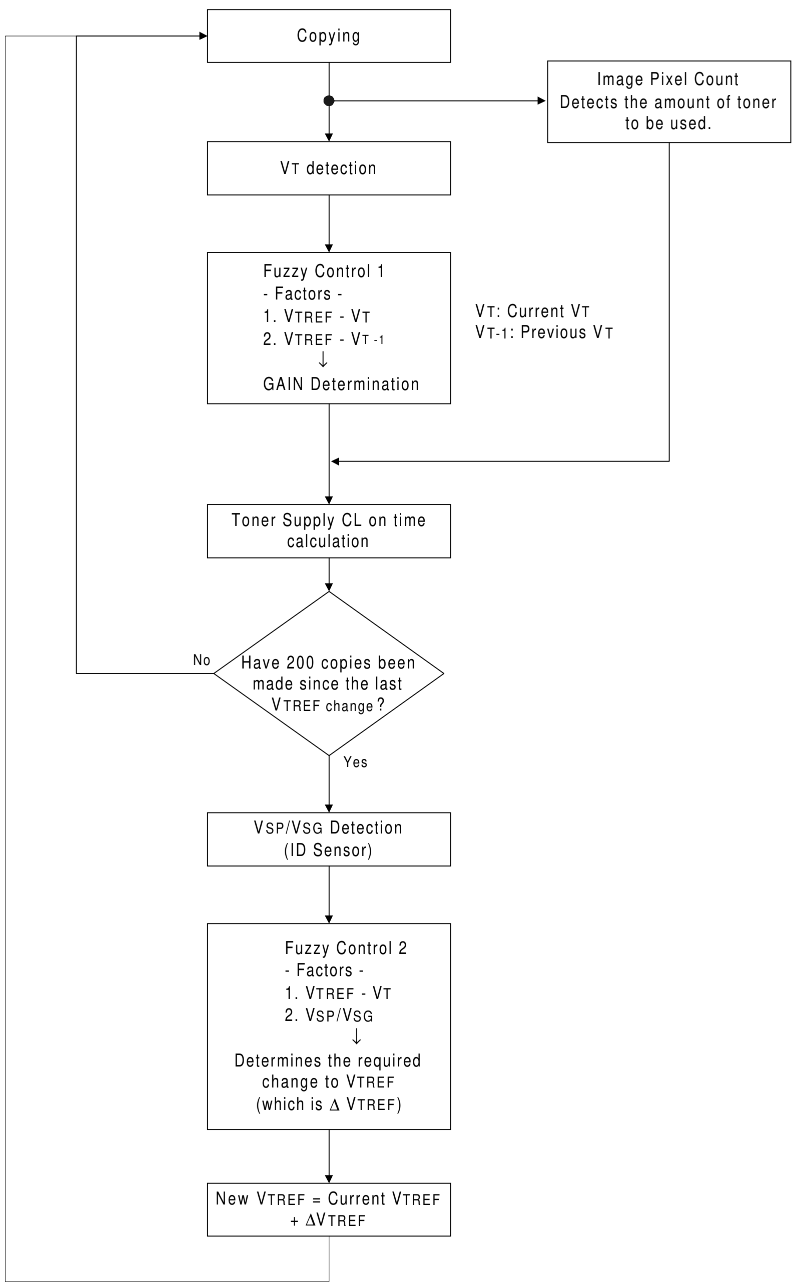
2.2.1 Overview

There are two modes for controlling toner supply: detect supply mode and fixed supply mode.

The mode can be changed with SP2208-1. The factory setting is detect supply mode.

2.2.2 Detect Supply Mode

Overview



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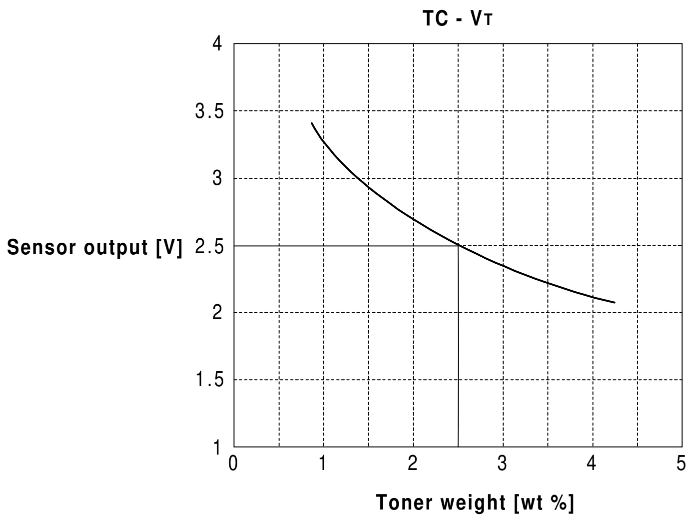
In detect supply mode, the machine varies toner supply for each copy based on the amount of toner required to print the page (based on a black pixel count for the page) and readings from the TD and ID sensors to maintain the correct proportion of toner in the developer and to account for changes in drum reflectivity over time.

The flow chart on the previous page outlines the detect supply mode. Each step is explained in more detail on the following pages.

Toner Density Sensor



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Developer consists of carrier particles (ferrite) and toner particles (resin and pigment). Inside the development unit, developer passes through a magnetic field created by coils inside the toner density sensor. When the toner concentration changes, the voltage output by the sensor changes accordingly.

The output from the sensor (V_T) is checked every copy. The machine tries to keep V_T constant by varying the toner supply using a fuzzy logic process, as shown in the flow chart on the previous page.

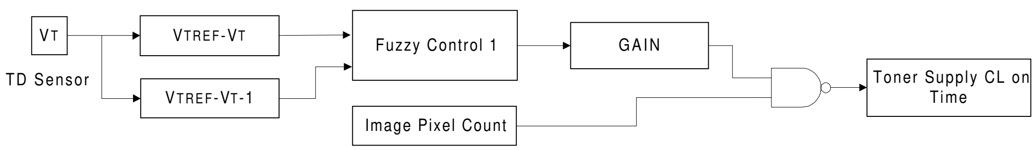
Toner Density Sensor Initial Setting

When new developer with the standard toner concentration (2.5% by weight, 21.25 g of toner in 850 g of developer) is installed, the TD sensor initial setting must be done using SP mode 2801. This sets the sensor output to 2.5 ± 0.1 V. This value will be used as the toner supply reference voltage (V_{TREF}) of the TD sensor.

Toner Density Measurement

Toner density in the developer is detected once every copy cycle. The sensor output voltage (VT) during the detection cycle is compared with the toner supply reference voltage (VTREF).

Toner Supply Clutch On Time Calculation



A195D540.wmf

- Fuzzy Control Process 1 -

To stabilize toner concentration, the toner supply amount (controlled by the toner supply clutch on time) is determined by referring to VTREF and VT.

The toner supply amount is calculated every copy using the following factors.

Factor 1: VTREF - VT

Factor 2: VTREF - VT-1

- VTREF: TD sensor output at the latest VSP detection corrected for ID sensor output (VSP/VSG); this is calculated every 200 copies (see VTREF calibration for more details). For new developer, the TD sensor initial setting is used.
- VT: Current TD sensor output data
- VT-1: Previous TD sensor output data

By referring to these factors, the machine recognizes the difference between the current toner concentration and the target toner concentration. It then determines the GAIN value for calculating the toner supply clutch on time.

- Image Pixel Count -

The CPU refers to the solid area ratio for the whole page informed from the EX-IPU to improve the precision of the toner density change prediction.
The CPU converts the image data value of each pixel to the toner supply amount. Therefore, the machine understands by how much the toner supply amount will probably change.

- Toner Supply Clutch On Time Calculation -

The toner supply clutch on time is decided using value of the gain which was calculated by the fuzzy control 1 procedure, the image pixel count value, the possible amount of toner on the drum, and the toner supply rate. The calculation is done using the following formula:

$$\text{Toner supply CL on time} = \frac{\text{GAIN x Image pixel count x } 0.7\ ^{mg}/_{cm^2}}{\text{Toner supply rate } (116\ ^{mg}/_{s})}$$

NOTE: The toner supply rate can be changed with SP2209. For example, if the user commonly makes copies with a lot of black areas, reduce the value stored in SP2209.

V_{TREF} Calibration

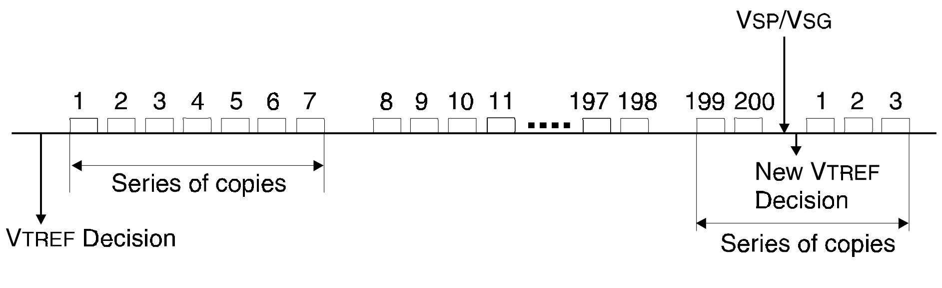
- V_{SP} and V_{SG} Detection -

The ID sensor (below the drum cleaning section) detects the following voltages.

- V_{SG}: The ID sensor output when checking the drum surface.
- V_{SP}: The ID sensor output when checking the V_{SP} pattern.

In this way, the reflectivity of both the drum surface and the pattern on the drum are checked. This compensates for any variations in the reflectivity of the pattern on the drum or the reflectivity of the drum surface.

The V_{SP} pattern is made on the drum by the charge corona unit and the laser diode.

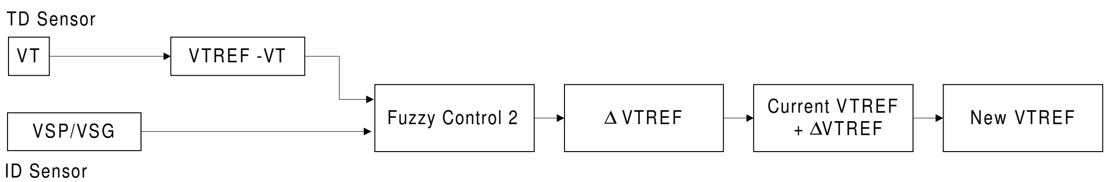


A195D541.wmf

V_{SP}/V_{SG} detection is performed every 200 copies to decide the new V_{TREF}. The value of the copy counter for the V_{SP}/V_{SG} detection is stored in the NVRAM (Non-volatile RAM) on the SCU board. So, even if the machine is switched off, the copy count starts from the number which was stored in the NVRAM. In addition, as the diagram shows, the new V_{TREF} will take effect even if the 200th copy occurs in the middle of a copy run; however, the overall cpm for this copy run will be lower because of the copy cycle required to make the ID sensor pattern.

- New V_{TREF} Determination -

Even if the toner concentration in the developer is kept constant by checking the TD sensor, the toner potential (chargeability) and the image density change with humidity and the amount of toner on the carrier.
Therefore, the ID sensor output is also used as one of the factors for deciding the new V_{TREF} which will be used for toner density control.



A195D542.wmf

First of all, the CPU decides the adjustment that is required to the current V_{TREF} (ΔV_{TREF}) with the fuzzy control 2 procedure using the following factors.

- V_{TREF} - V_T
- V_{SP}/V_{SG}

Then, the CPU determines the new V_{TREF} using the following formula.

New $V_{TREF} = V_{TREF} + \Delta V_{TREF}$

From this point, toner density control is done using the new V_{TREF}.

If V_{TREF} is either higher than 4.0 V or less than 0.5 V on more than 10 consecutive occasions, the GAIN value is fixed at 0.7 (see the equation at the end of the "Toner Supply Clutch On Time Calculation" section). Then, after finishing the copy job, SC390 will be generated.

2.2.3 Fixed Supply Mode

The machine supplies a fixed amount of toner every copy. The amount depends on the setting of SP2208-2 (for users who normally make copies with a lot of black areas, use a higher setting). Readings from the TD and ID sensors are ignored.

Fixed supply mode should only be used as a temporary measure while waiting for replacement parts, such as a TD sensor. The machine does not fall back to fixed supply mode when there are sensor errors.

2.2.4 Toner Supply in Abnormal Sensor Conditions

Overview

Under normal conditions, the machine uses detect supply mode, in which toner supply is varied based on readings from the TD and ID sensors.

The TD sensor is checked every copy. If the readings from the TD sensor become abnormal during a copy job, the machine holds the GAIN factor constant (GAIN is normally calculated from TD sensor readings) to allow toner supply to vary with only pixel count for the rest of the copy job. Then at the end of the copy job, an SC code is generated and the machine must be repaired. There is no fallback to fixed supply mode in this model.

The ID sensor is checked every 200 copies. If readings become abnormal, an SC code is generated and the machine must be repaired. If this happens during a copy job, V_{TREF} is not changed, the copy job is allowed to finish, and then the SC code is generated.

Details of abnormal sensor detection follow below.

Abnormal TD Sensor Output (during normal operation and V_{TREF} determination)

When V_T has been more than 4.0 V or less than 0.5 V on ten consecutive occasions, the CPU fixes the value of the GAIN factor in the toner supply clutch on time formula to 0.7. Then the toner is supplied in accordance with the value of the image pixel count data. After finishing the copy job, SC390 will be generated.

Also, SC390 is generated when the difference between V_T and V_{TREF} has been more than 0.6 V ten times.

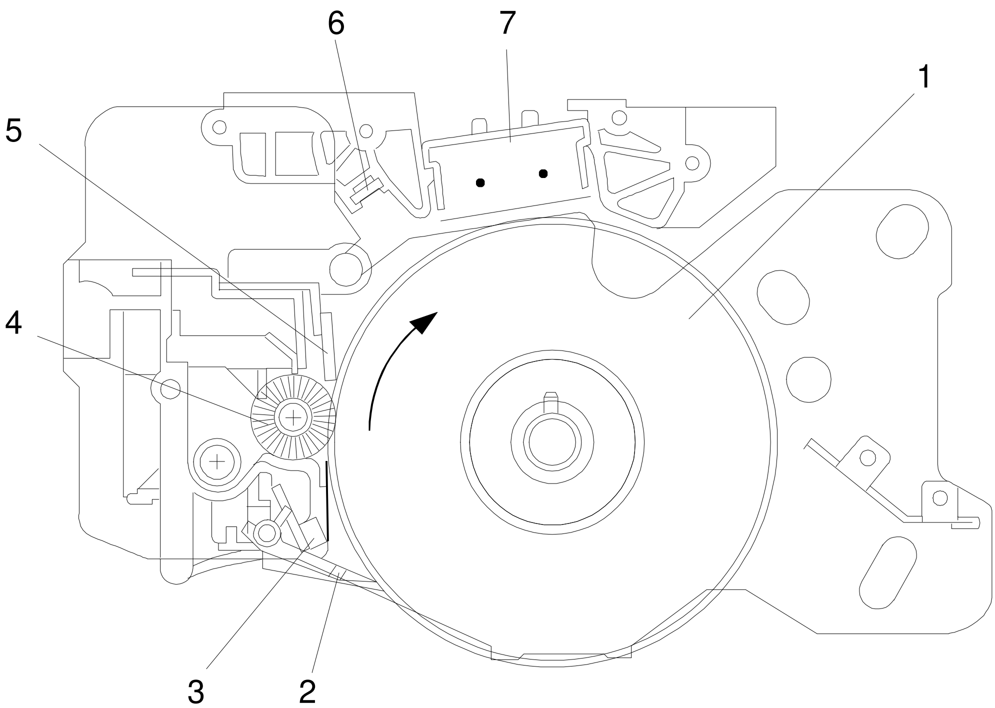
Abnormal ID Sensor Output (during V_{SP}/V_{SG} measurement)

When $V_{SP} \geq 2.5V$ or $V_{SG} \leq 2.5V$ twice consecutively, SC350 will be generated. At this time, V_{TREF} remains at the previous value.

Also, SC350 is generated if V_{SG} cannot be adjusted to $4 \pm 0.2V$ during ID sensor initialization (SP3001: this is done after installing a new drum or a new ID sensor, or after cleaning the ID sensor).

3. DRUM UNIT

3.1 OVERVIEW

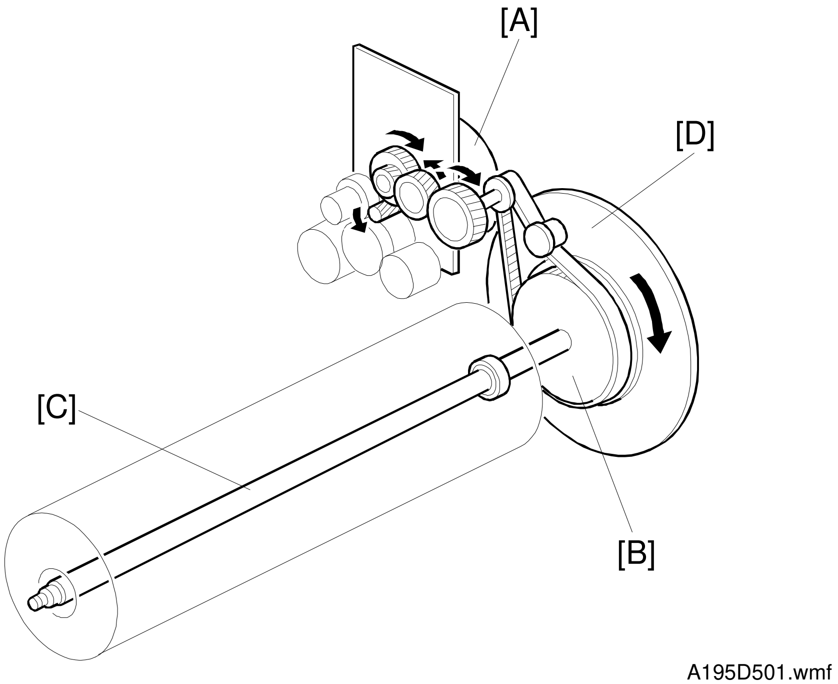


A195D500.wmf

The drum unit consists of the components shown in the above illustration. An organic photoconductor (OPC) drum (diameter: 100 mm) is used in this model.

1. OPC Drum
2. Pick-off Pawls
3. ID Sensor
4. Cleaning Brush
5. Cleaning Blade
6. Quenching Lamp
7. Charge Corona Unit

3.2 DRIVE MECHANISM



The drive from the main motor [A] is transmitted to the drum through a series of gears, a timing belt, the drum drive pulley [B], and the drum shaft [C]. The main motor has a drive controller, which outputs a motor lock signal when the rotation speed is out of the specified range.

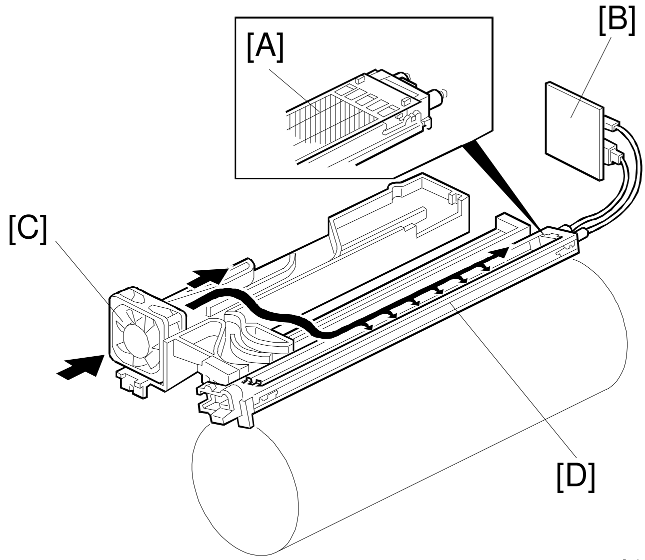
The fly-wheel [D] on the end of the drum shaft stabilizes the rotation speed (this prevents banding from appearing and jitter on copies).

The drum rotation speed is switched by the main motor as follows.

The drum rotation speed is 150 mm/s with 300/400 dpi resolution.

The drum rotation speed is 75 mm/s with 600 dpi resolution.

3.3 DRUM CHARGE



A195D502.wmf

This copier uses a double corona wire (single loop type) scorotron system for charging the drum.

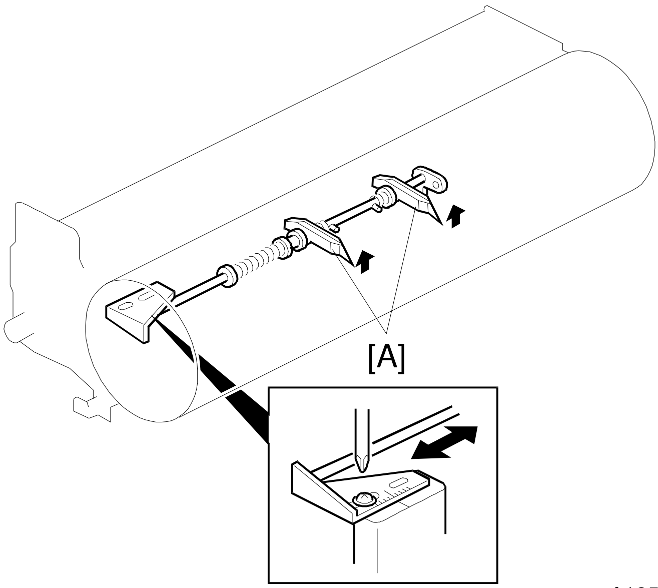
The two corona wires apply negative charge to the drum surface. The stainless steel grid plate [A] makes the corona charge uniform. The negative voltage on this grid controls the amount of negative charge on the drum.

The charge high voltage supply board [B] gives a constant corona current to the corona wires, and applies –890V to the grid plate. The grid plate voltage maintains a constant charge on the drum surface even when the wire current varies.

The ozone fan [C] provides a flow of air through the corona unit [D] in order to prevent an uneven build up of negative ions. This helps maintain an even image density.

A replacement charge corona unit with wire cleaner and motor is available as an optional service part for machines which produce a high copy volume.

3.4 PICK-OFF PAWLS



A195D504.wmf

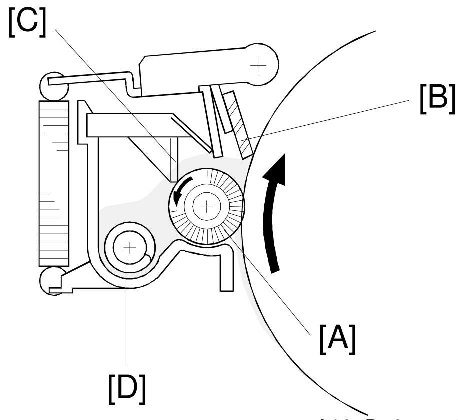
There are two pick-off pawls [A] under the cleaning unit.

The pick-off pawls help to separate the copy paper from the drum, and they are always in contact with the drum surface under a weak spring pressure.

The position of the pick-off pawls can be changed manually to prevent drum damage at an early stage caused by contact with the pick-off pawls. Change the position if lines are already beginning to appear on the drum at the pick-off pawl position at the first PM.

3.5 DRUM CLEANING

3.5.1 OVERVIEW



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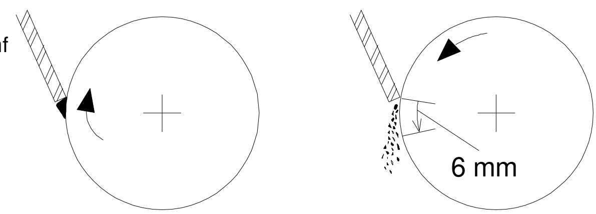


A195D513.wmf

The cleaning brush [A] and cleaning blade [B] remove any toner remaining on the drum after the image is transferred to the paper. This model uses a counter blade system.

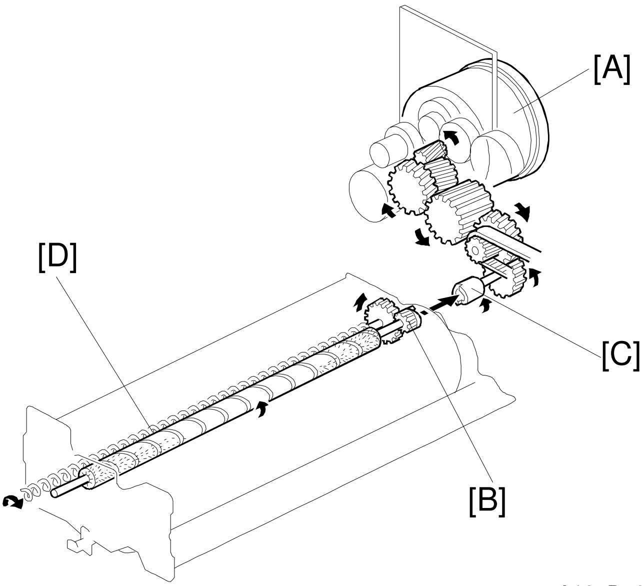
To reduce the wear on the drum, the cleaning brush and the drum move in the same direction at their point of contact, unlike previous models.

The main purpose of the cleaning brush is to improve the cleaning efficiency of the cleaning blade, by spreading out any leftover toner on the drum before it reaches the blade.

Toner scraped off by the cleaning blade will fall onto the cleaning brush, which will then be scraped off by the brush flicker [C] to be carried away by the toner collection coil [D].

To remove the toner and other particles that are accumulated at the edge of the cleaning blade, the drum turns in reverse for about 6 mm at the end of every copy job as shown in the illustration.

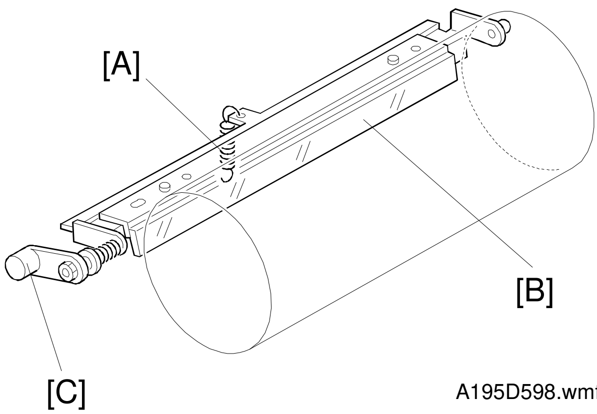
3.5.2 DRIVE MECHANISM



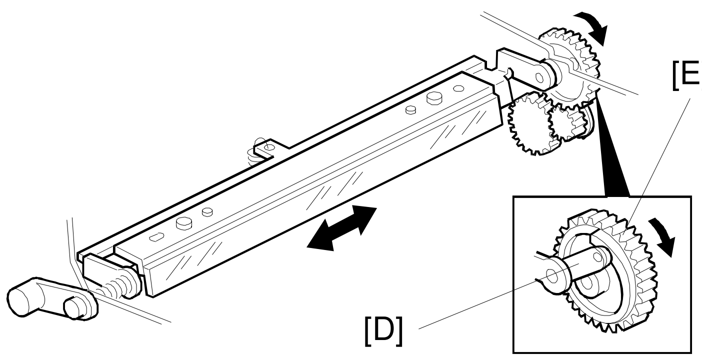
A195D507.wmf

Drive from the main motor [A] is transmitted to the cleaning brush gear [B] via a series of gears, a timing belt, and the joint gear [C]. The cleaning brush gear then transmits the drive to the toner collection coil [D].

3.5.3 CLEANING BLADE PRESSURE MECHANISM AND SIDE-TO-SIDE MOVEMENT



A195D598.wmf

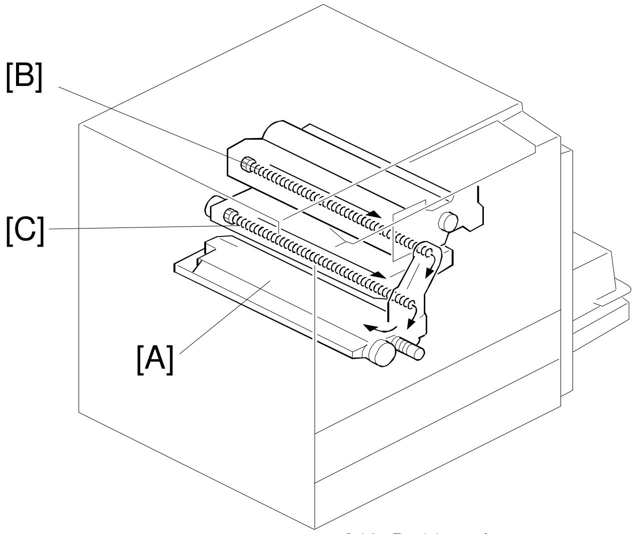


A195D509.wmf

The spring [A] always pushes the cleaning blade [B] against the drum. The cleaning blade pressure can be manually released by pushing up the release lever [C]. To prevent cleaning blade deformation during transportation, the release lever should be locked in the pressure release (upper) position with the retainer pins that were removed during installation.

The pin [D] at the rear end of the cleaning blade holder touches the inner rim of the sinusoidal cam gear [E] which gives a side-to-side movement to the blade. This movement helps to disperse accumulated toner to prevent early blade edge deterioration at any particular location.

3.5.4 TONER COLLECTION MECHANISM



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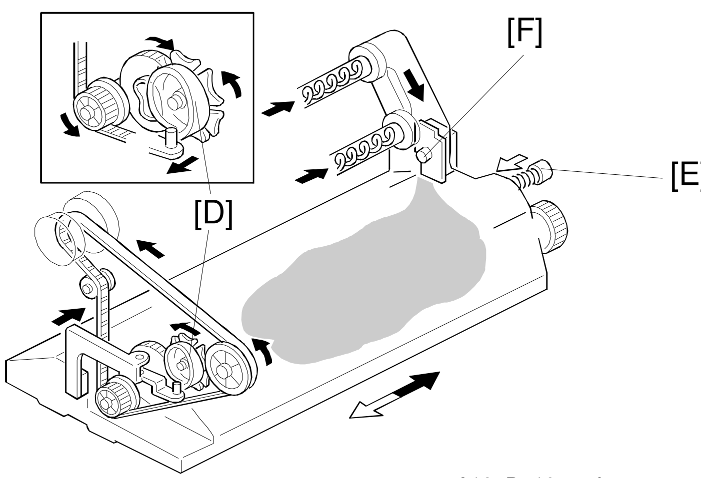


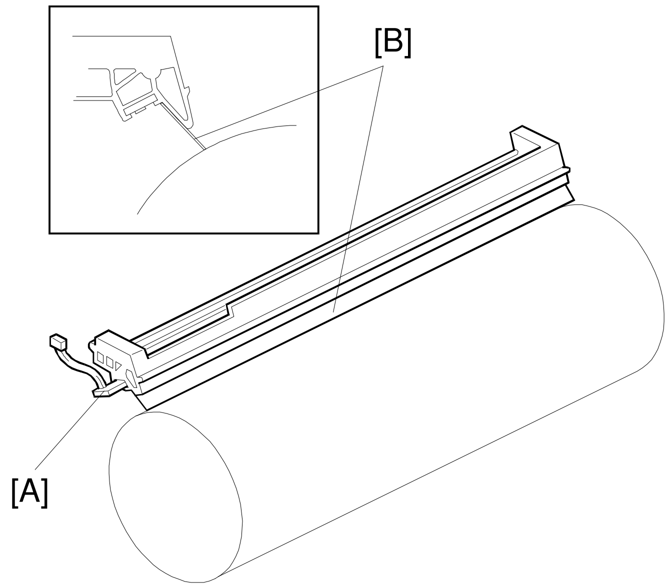
A195D510.wmf

The toner collected in the drum cleaning unit is carried into the toner collection bottle [A] by the drum toner collection coil [B]. The toner collected in the transfer belt unit is carried into the toner collection bottle by the transfer belt collection coil [C].

The toner collection bottle is pressed against the cam gear [D] by a spring [E] on the front side. The drive from the main motor drives the cam gear and shakes the toner collection bottle from front to rear to make the level of the collected toner even.

The toner overflow sensor [F] detects when the toner collection bottle is full. After the toner overflow sensor is activated, 250 copies are allowed, then copying is prohibited and a call service message appears on the LCD.

3.6 QUENCHING



A195D503.wmf

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

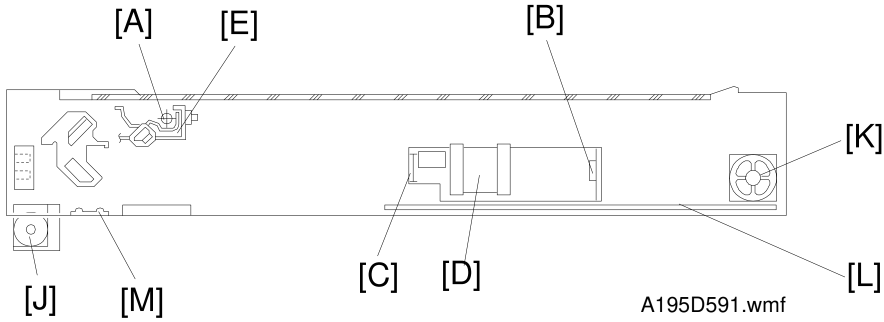
The quenching lamp turns on at the same time as the main motor activates.

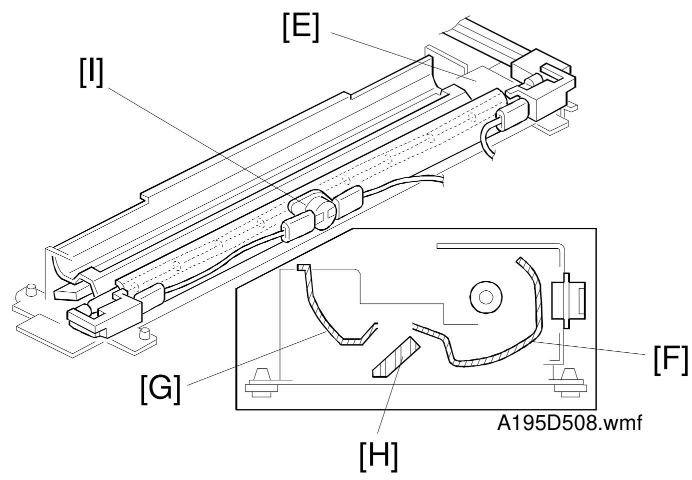
Red LEDs are used for the quenching lamp to reduce ultra-violet light that would cause light fatigue on the drum.

The mylar [B] on the side of the quenching lamp stops the flow of air from the cleaning unit to the charge corona unit, to prevent the charge corona unit from becoming dirty with toner.

4. SCANNING

4.1 OVERVIEW





An image of the original illuminated by the exposure lamp (a halogen lamp in this model) [A] is reflected onto a CCD (charge coupled device) [B] via the 1st, 2nd, 3rd mirrors, green filter [C], and lens [D].

The 1st scanner [E] consists of the exposure lamp, main and sub reflectors [F, G], and 1st mirror [H].

This model uses a halogen lamp for the exposure lamp, unlike the former black/white digital copiers which use fluorescent lamps. This is because a fairly fast cpm machine such as this one requires a greater light intensity than slower models. The exposure lamp is energized by a dc supply to avoid uneven light intensity as the 1st scanner moves in the sub scan direction. The entire exposure lamp surface is frosted to ensure even exposure in the main scan direction.

The green filter improves the reproduction of red areas in the original.

The light reflected by the main and sub reflectors is almost of equal intensity, to reduce shadows on pasted originals.

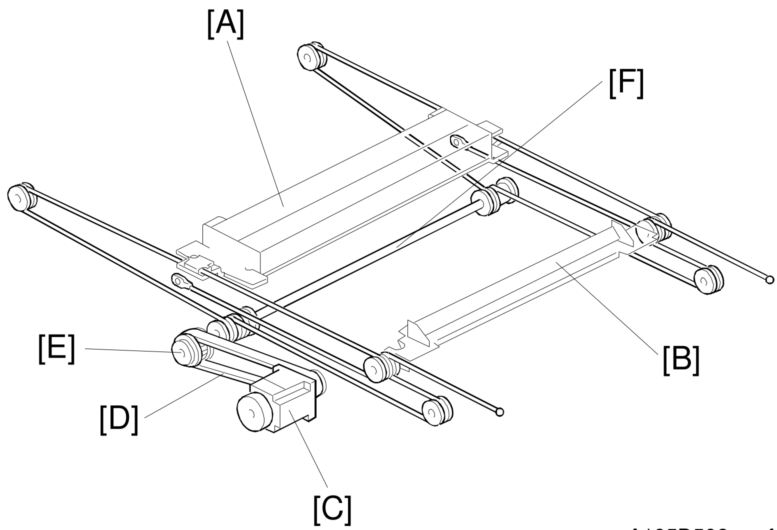
The thermoswitch [I] in the 1st scanner prevents overheating. It will turn off the exposure lamp at around 140°C.

The optics fan motor [J] is located under the home position of the scanner unit. It blows air into the optics cavity to prevent the exposure lamp and optics cavity from overheating during copying. The hot air exits through the vents in the upper cover.

The IPU fan motor [K] is located at the right side of the optics cavity under the lens housing cover. This fan blows air directly on the EX-IPU board [L] to prevent overheating.

An optics anticondensation heater [M] is available as optional equipment, which can be installed on the left side of the optical base plate. It turns on when the main switch is off.

4.2 SCANNER DRIVE



A195D592.wmf

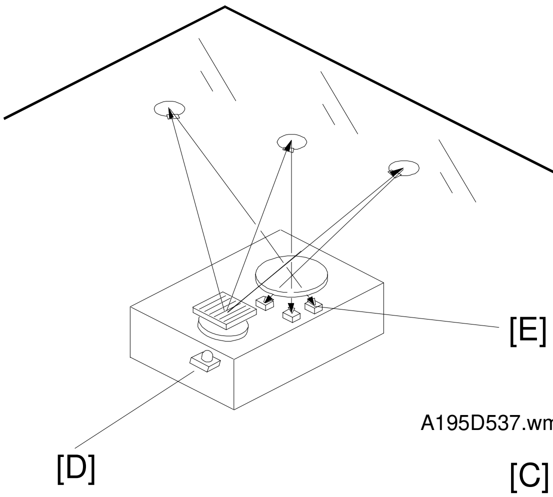
A five-phase stepper motor is used to drive the scanner. The 1st and 2nd scanners [A,B] are driven by this scanner drive motor [C] through the timing belt [D], scanner drive pulley [E], scanner drive shaft [F], and two scanner wires.

In full size mode, the 1st scanner speed is 200 mm/s during scanning. The 2nd scanner speed is half that of the 1st scanner.

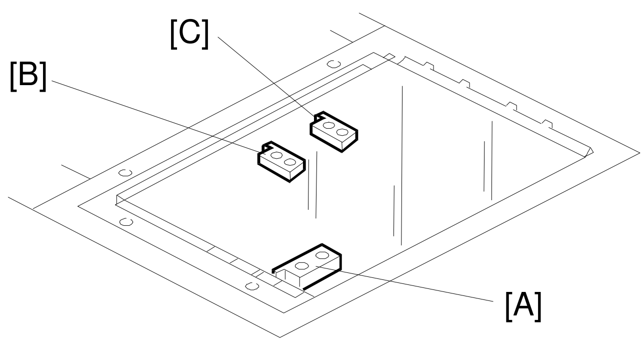
In reduction or enlargement mode, the scanning speed depends on the magnification ratio (M: 0.25 to 4.00) as follows: 200/M mm/s. The returning speed is always the same, whether in full size or magnification mode. The image length change in the sub scan direction is done by changing the scanner speed and in the main scan direction it is done by image processing on the EX-IPU board.

The scanner drive board controls and operates the scanner motor. Magnification in the sub-scan direction can be adjusted by changing the scanner drive motor speed using SP4008.

4.3 ORIGINAL SIZE DETECTION IN PLATEN MODE



A195D537.wmf

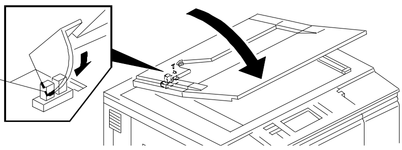


A195D539.wmf

There are three reflective sensors in the optics cavity for original size detection. The Original Width Sensor [A] detects the original width, and the Original Length Sensor-1 [B] and Original Length Sensor-2 [C] detect the original length. These are the APS (Auto Paper Select) sensors.

Inside each APS sensor, there is an LED [D] and either three photoelectric devices [E] (for the width sensor) or one photoelectric device (for each length sensor). In the width sensor, the light generated by the LED is broken up into three beams and each beam scans a different point of the exposure glass (in each length sensor, there is only one beam). If the original or platen cover is present over the scanning point, the beam is reflected and each reflected beam exposes a photoelectric device and activates it.

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.



A195D536.wmf

Original Size		Length Sensor		Width Sensor		
A4/A3 version	**LT/DLT version**	1	2	3	4	5
A3	11" x 17"	O	O	O	O	O
B4	10" x 14"	O	O	O	O	X
F4	81/2" x 14" (8" x 13")	O	O	O	X	X
A4–L	81/2" x 11"	X	O	O	X	X
B5–L	—	X	O	X	X	X
A5–L	51/2" x 81/2"	X	X	X	X	X
A4–S	11" x 81/2"	X	X	O	O	O
B5–S	—	X	X	O	O	X
A5–S	81/2" x 51/2"	X	X	O	X	X

Note: –L= Lengthwise, –S = Sideways, O = High (Paper Present), X = Low

The original size data is taken by the main CPU when the platen cover sensor [A] is activated. This is when the platen is positioned about 15 cm above the exposure glass. At this time, only the sensor(s) located underneath the original receive the reflected light and switch on. The other sensor(s) are off. The main CPU can recognize the original size from the on/off signals from the five sensors.

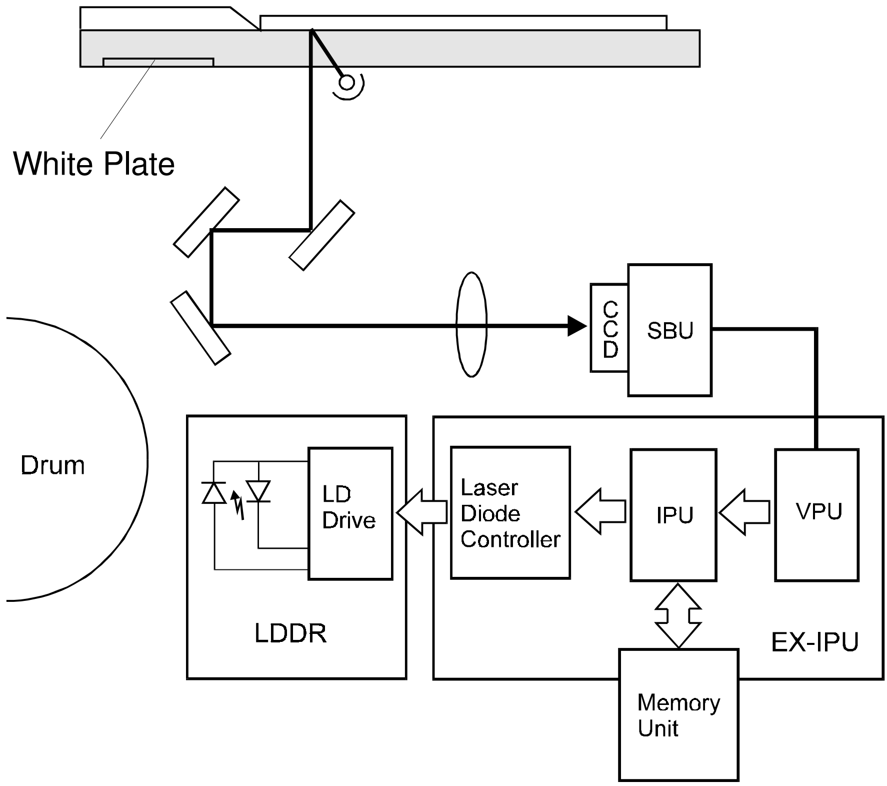
If the copy is made with the platen open, the main CPU decides the original size from the sensor outputs when the Start key is pressed.

The above table shows the outputs of the sensors for each original size. This original size detection method eliminates the necessity for a pre-scan and increases the machine's productivity. However, if the by-pass feeder is used, note that the machine assumes that the copy paper is lengthwise. For example, if A4 sideways paper is placed on the by-pass tray, the machine thinks it is A3 paper and scans the full A3 area, disregarding the original size sensors. This can cause excess toner to be transferred to the belt, so users should be instructed to always set the paper lengthwise on the by-pass tray.

Original size detection using the ARDF is described in the manual for the ARDF.

5. IMAGE PROCESSING

5.1 OVERVIEW



A195D543.wmf

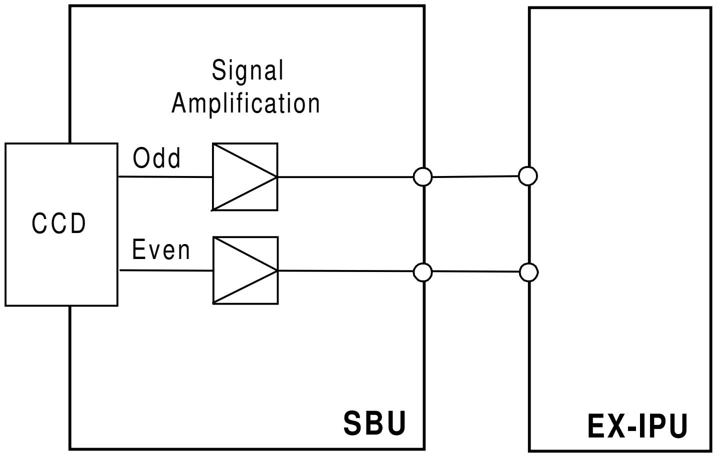
The CCD generates an analog video signal. The SBU (Sensor Board Unit) then sends the analog video signal to the EX-IPU (Extended Image Processing Unit) board.

The EX-IPU board can be divided into three image processing blocks: VPU, IPU, and laser diode controller.

- VPU: A/D conversion, signal composition, and auto shading.
- IPU: γ correction, auto text/photo separation, filtering, magnification adjustment, image creation, and dither processing.
- LD controller: Printer γ correction and the LD print timing control.

Finally, the EX-IPU board sends 8-bit video data to the LD drive board at the correct time.

5.2 SBU (Sensor Board Unit)



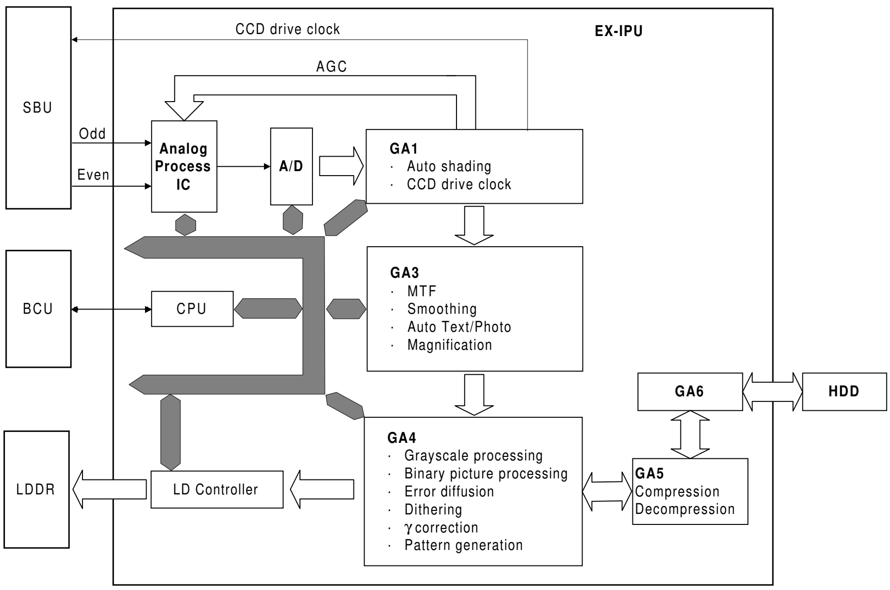
A195D544.wmf

The CCD converts the light reflected from the original into an analog signal. The CCD line has 5,000 pixels and the resolution is 400 dpi (15.7 lines/mm).

The CCD has two output lines, for odd and even pixels, to the EX-IPU board. Since the processing speed for one pixel is very fast, odd and even pixels are read from the CCD separately so that the signals can be amplified properly.

5.3 EX-IPU (Extended Image Processing Unit)

5.3.1 Overview

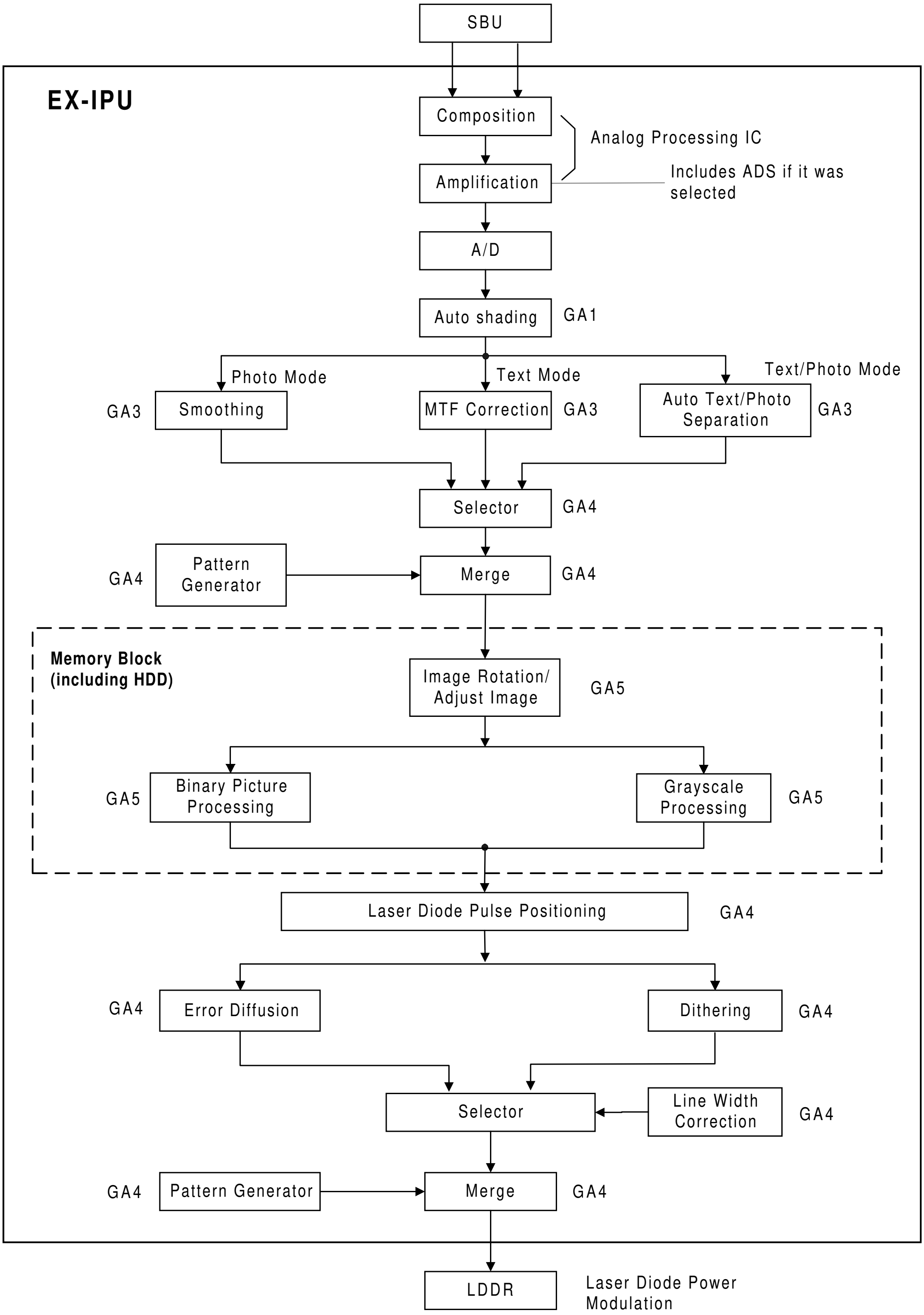


A195D545.wmf

The EX-IPU uses seven LSIs and a hard disk to process the video data. These LSIs have the following functions.

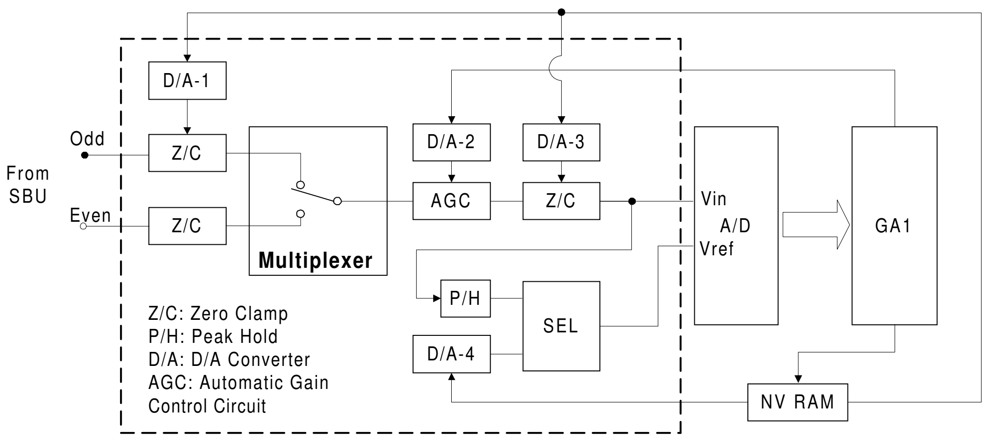
1. **Analog Process IC**
   Signal amplification and signal composition.
2. **A/D Converter**
   Converts analog video signals to 8-bit digital video signals.
3. **GA1 (Gate Array 1)**
   Generates the CCD drive clock and does auto shading
4. **GA3 (Gate Array 3)**
   MTF, smoothing, auto text/photo separation, and magnification
5. **GA4 (Also called the GASHITE IC)**
   Grayscale processing, binary picture processing, error diffusion, dithering, γ correction, and pattern generation.
6. **GA5 (Also called the GAFBTC IC)**
   Image data compression and decompression.
7. **GA6 (Also called the GAABS IC)**
   Image data interface between GA4 and HDD.
8. **Hard Disk Drive**
   Stores the compressed image data. Also holds user stamp data.

5.3.2 Image Processing Path



A195D546.wmf

5.3.3 Analog Processing



A195D547.wmf

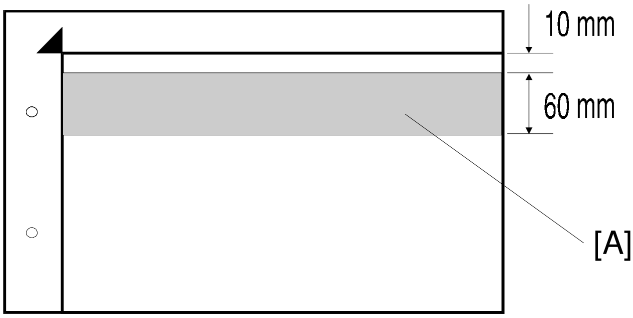
1) Signal Composition
   Analog signals for odd and even pixels from the SBU board are merged by a switching device.

2) Signal Amplification
   The analog signal is amplified by operational amplifiers in the AGC circuit. The maximum gains of the operational amplifiers are controlled by the CPU on the EX-IPU board by monitoring the feedback signals (Auto Gain Control signal) from GA1.

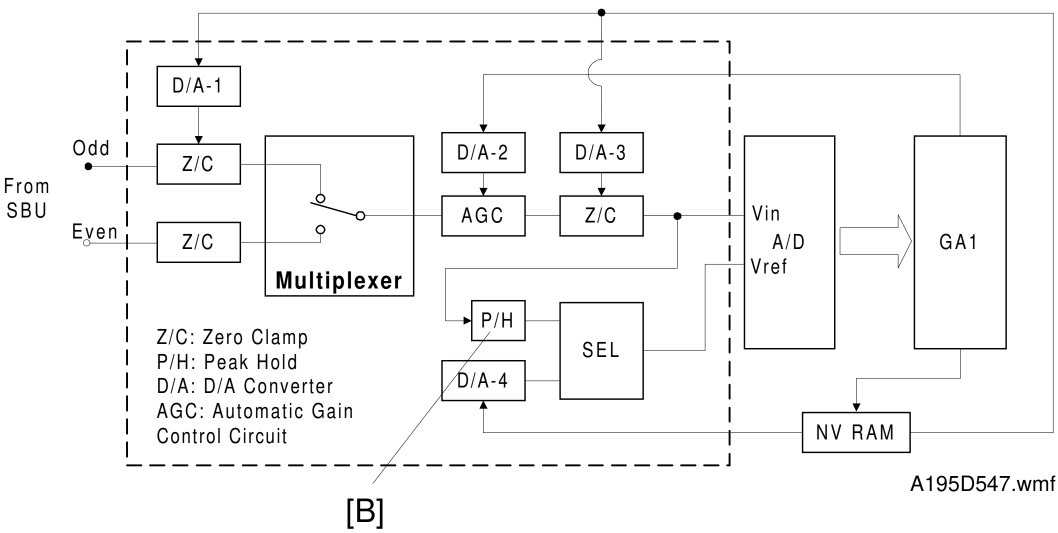
3) A/D Conversion
   The amplified analog signals are converted to 8-bit digital signals. This will give a value for each pixel on a scale of 256 grades.

4) Feedback - D/A Conversion
   The CPU monitors the feedback signals from the shading circuit in the GA1 and the NV RAM, then calculates correction factors. These digital values are converted to analog signals and fed back to each circuit.
   - D/A1: Adjusts the black level references for even pixels to match the even pixels.
   - D/A2: Adjusts the gain curve of the amplifier.
   - D/A3: Adjusts the absolute value of the black level.
   - D/A4: Adjusts the reference value of the white level when scanning the white plate.

5.3.4 Auto Image Density (ADS)



A195D506.wmf



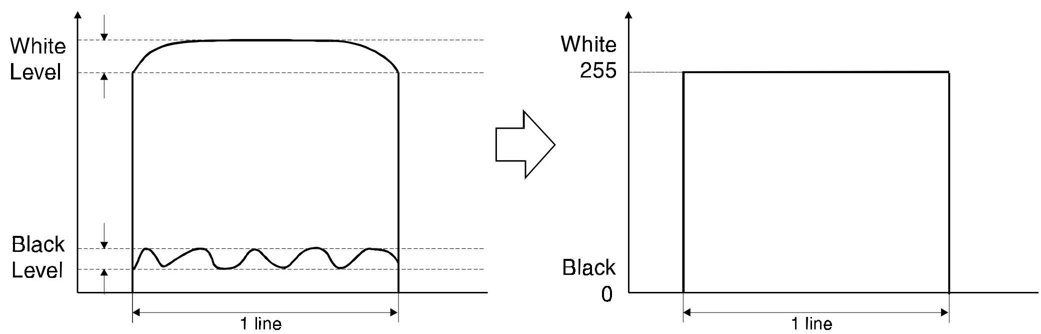
A195D547.wmf

This mode prevents the background of an original from appearing on copies.

The copier scans the auto image density detection area [A] as shown in the diagram. The CPU detects the peak white level every scan line in the area using the P/H (Peak Hold) circuit [B]. Then the peak white data is sent to the A/D converter to be the reference value. The video signal is converted to digital data using the peak white data. So, for example, when an original with a gray background is scanned, the density of the gray area is the peak white level density. So, the original background does not appear on copies.

Unlike with analog copiers, the user can select a manual image density when selecting auto image density mode, and the machine will use both settings when processing the original. This is useful when making copies of an original that has light image density with background; ADS removes the background, and if the user selected a dark manual image density setting, the image will be brought out more clearly in the copy.

5.3.5 Auto Shading



A195D548.wmf

There are two auto shading methods. One is black level correction and the the other is white level correction.

1) Black Level Correction

The CPU reads the black dummy data from one end of the CCD signal (about 64 pixels) and takes the average of the black dummy data. Then, the CPU deletes the black level value from each image pixel. The black level correction is performed every main scan line during scanning.

2) White Level Correction

Before scanning the original, the machine reads a reference waveform from the white plate (below the left scale; see the diagram accompanying section 5-1: Overview). The average of the white video level for each pixel is stored as the white shading data in the FIFO memory in the GA1 chip. This white level correction is performed every scan.

The video signal information for each pixel obtained during image scanning is corrected by GA1 as follows.

$$\text{Output} = \frac{(\text{Video data}) - (\text{Black shading data})}{(\text{White shading data}) - (\text{Black shading data})} \times 255$$

5.3.6 Original Modes

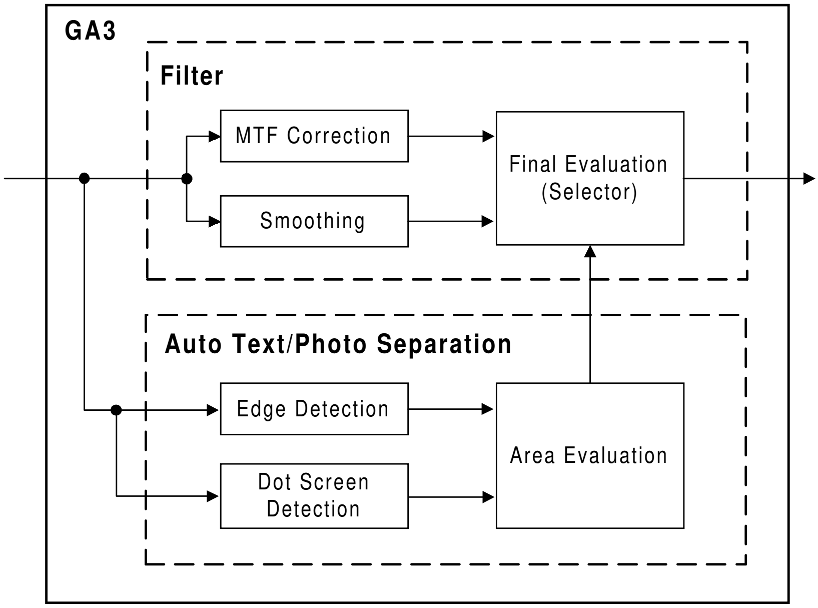
The user can select one of four original modes. These are:

- Letter: For originals that consist of line drawings and text
- Photo: For originals that consist of grayscale images such as photographs
- Letter/Photo: For originals that consist of both of the above
- Generation: When making a copy of a copy

The machine uses various filtering and processing techniques to enhance the data to suit the selected mode. These will be explained in the following sections:

- Filtering and Text/Photo Separation
- Gradation Processing
- Line Width Correction
- Summary of Image Processing Methods

5.3.7 Filtering and Text/Photo Separation



A195D549.wmf

1. Filtering

There are two software filters for enhancing the desired image qualities of the selected original mode: the MTF filter and the smoothing filter.

The MTF filter emphasizes sharpness and is used in Letter and Generation modes. The smoothing filter is used in Photo and Letter/Photo mode. (In Photo mode, this can be changed to MTF using SP 4904-3.)

The filter strengths for these modes can be adjusted with SP 4903-1.

2. Auto Text/Photo Separation

This is used only in Letter/Photo mode. In Letter/Photo mode, the original image is separated into text and photo areas (dot screen areas).

Generally, text areas have strong contrast between the image and the background. In photo areas (dot screen areas), mid-range gray areas are common. By using these characteristics and the following separation methods, the original image is separated into text and photo areas for area evaluation.

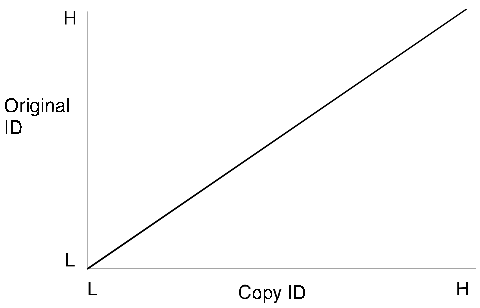
1. Edge detection
   The 8-bit digitized image data is filtered and converted into single-bit data. The edges of text areas are detected using a 3 x 3 matrix filter.

2. Photo area (dot screen) detection
   The image data is converted into single-bit data using the other MTF filter in the photo area detection block. Then it is compared with a 5 x 5 matrix table. The result of this filtering determines where the CPU detects photo areas.

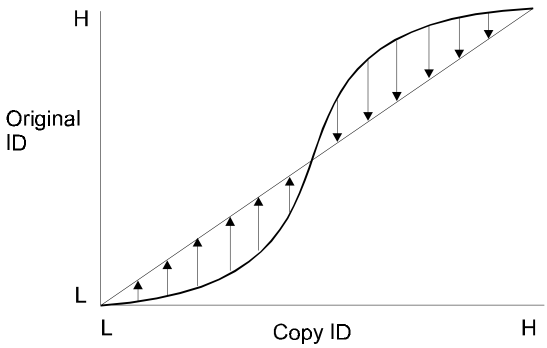
3. Area evaluation
   This circuit determines which areas of the original are text areas and which are photo areas.

4. Final evaluation
   This circuit receives inputs for each pixel from the MTF (text) and smoothing (photo) circuits and selects data from one of these inputs depending on the result of the area evaluation for that pixel.

5.3.8 Gamma (γ) Correction



A195D551.wmf

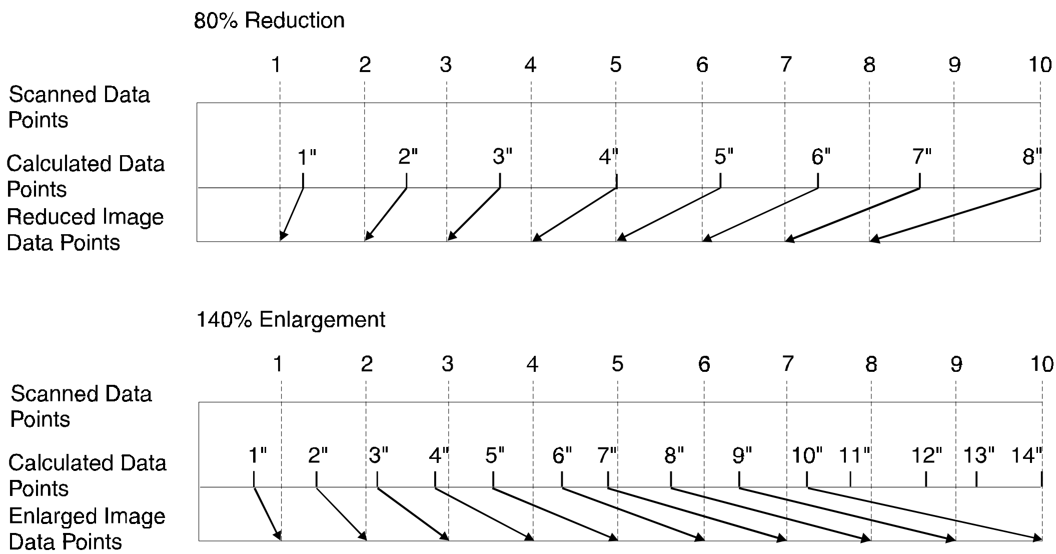


A195D552.wmf

This corrects the response of the CCD and the characteristics of the printer (i.e., the characteristics of the drum, laser diode, and lenses) to the various shades in the gray scale from black to white. The relationship between original ID and copy ID should be constant as shown in the diagram on the left. However, in reality, it is more like that shown in the diagram on the right. Gamma correction corrects the data for this deviation.

In this model, the data for the gamma correction is fixed and stored in the memory. The image data is corrected in accordance with the gamma data.

5.3.9 Main Scan Magnification



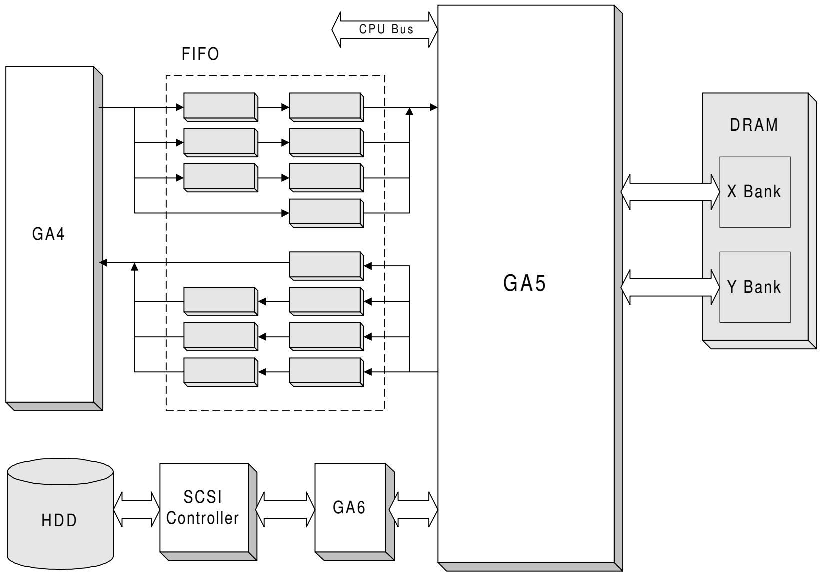
A195D629.wmf

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 the GA3 chip on the EX-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 of the nearest four true points. The calculated image data then becomes the new (reduced or enlarged) image data.

Main scan magnification can be disabled with SP 4903-5 to test the GA3 IC.

5.3.10 Memory Block



A195D596.wmf

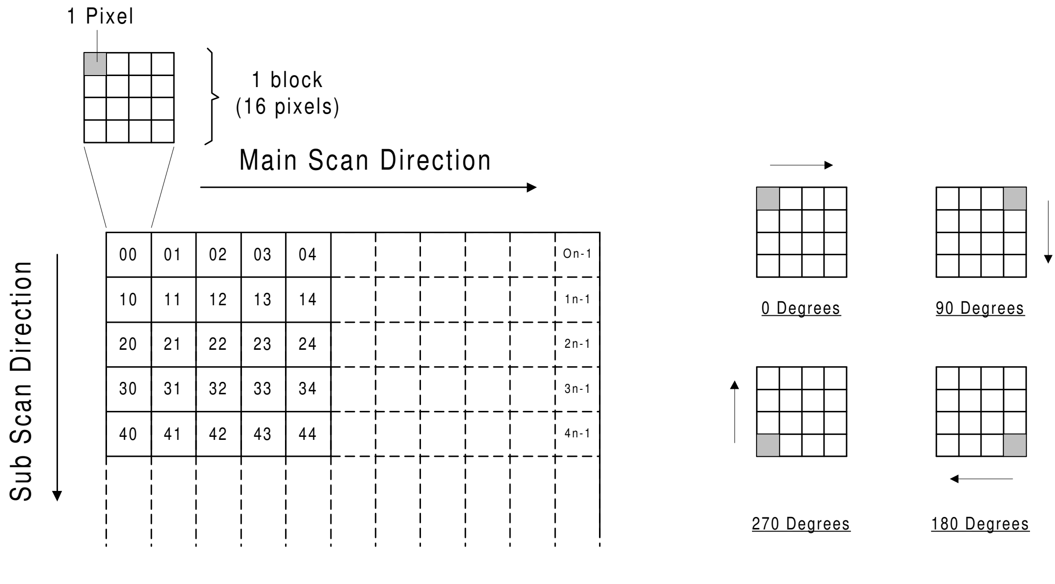
The memory block consists of the GA5 and GA6 ICs, the SCSI controller, and the hard disk drive. The functions of each device are as follows.

GA5:	Compressing the 8-bit image data Image rotation Image data transfer to the FIFO memory, DRAM, and the GA6
GA6:	Image data handling to/from the hard disk drive
FIFO memory:	Line buffer memory for image compression (5k x 8 bits total 14 pcs)
DRAM:	Page memory for image compression (12MB). This can store enough data for an A3 size page.
Hard Disk Drive	Stores the compressed image data (1 GB).

All scanned data goes through this memory block. This memory block functions like a page memory, in which the scanned image data is held before printing. As a result, many copies can be made with one scan, and various functions can be performed on the stored image data, including the following.

- Rotate Image
- Combine Mode
- Image Repeat
- Overlay/Merge
- Sort, Rotate Sort, and Stack

5.3.11 Image Compression and Decompression



– Image Data Memory Mapping – – Image Rotation –

A195D597.wmf

FIFO Memory

The image data from the GA4 IC first goes to the FIFO block. This block consists of total 14 FIFO memories (7 for the input data, the others for the output data) because the image compression is done using four scan lines at the same time to improve the image compression speed.

GA5

The image data then goes to the GA5 IC, where the image data for a whole page is divided into many blocks (the block size is 4 x 4 pixels) as shown above left. Then, each block is compressed (the compression ratio is 2/3) and sent to GA6 through the DRAM.
For printing, the compressed data block from the GA6 IC goes back to the GA5 IC through the DRAM. This IC assigns these blocks to the proper positions for printing, then the data blocks are decompressed.
In the image rotation mode, each compressed data block from the GA6 IC is rotated into the correct orientation and mapped into the proper position, then the blocks are decompressed.

When grayscale processing mode is selected (this is the default), the input and output image data are handled as 8-bit signals. When binary picture processing mode is selected (using SP4904-4), the input signal is handled as an 8-bit signal but the output signal is handled as a single-bit signal.

5.3.12 Gradation Processing

Gradation processing is done after the data is retrieved from the hard disk. There are two types of gradation processing:

- Grayscale processing: this has 256 output levels for each pixel, and is used to get the best reproduction of grayscales
- Binary picture processing: this has only two output levels (black and white)

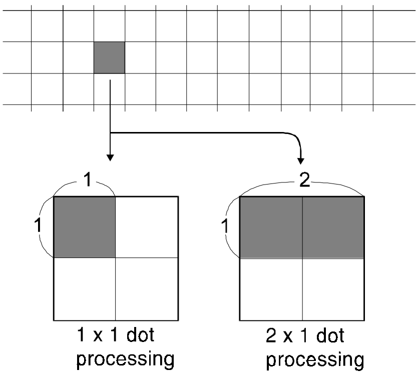
The default gradation processing mode is grayscale processing. This default can be changed using SP4904-4.

In some original modes, the gradation processing method in use can be enhanced with a matrix processing technique (error diffusion or dithering).

For a summary of the types of processing selected by the machine for each original mode, see section 5.3.14 "Summary of Image Processing Methods".

1. Grayscale Processing

- 1 x 1 and 2 x 1 dot processing -



Grayscale processing

A195D553.wmf

Each pixel has a video signal level between 0 and 255.

In this model, there two types of grayscale processing: 1 x 1 dot processing and 2 x 1 dot processing.

1 x 1 dot processing just takes the video signal level for each pixel as it comes.

In 2 x 1 dot processing, the levels of two adjacent dots are averaged, and the video signal levels for both pixels are changed to this average value.

Using the 1 x 1 dot mode, the image will be became more sharp in focus than using 2 x 1 dot mode.

The default modes for each original mode are as follows:

Letter Mode, Generation Mode: 1 x 1

Photo Mode: 1 x 1 with a 6 x 6 dither matrix (the dither matrix type can be changed with SP mode 4904-2)

Letter/Photo Mode:

- Text areas: 1 x 1 (this can be changed with SP mode 4904-7)
- Photo areas: 2 x 1 with error diffusion (this can be changed with SP mode 4904-8)

- Pulse Width Modulation -

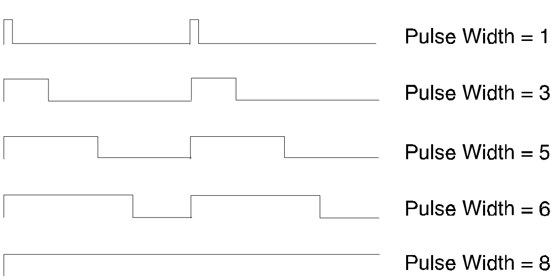
This machine uses a form of pulse width modulation to generate the grayscales and photo area reproduction effects.

In this machine, pulse width modulation consists of the following processes:

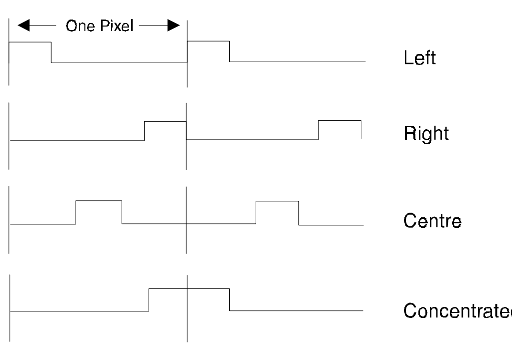
- Laser diode pulse positioning
- Laser diode power modulation

Laser diode power modulation is done by the laser diode drive board (LDDR), and will be explained in the Laser Exposure section. Briefly, the width of the laser pulse for a pixel will depend on the output level (from 0 to 255) required for the pixel.

This section of the manual explains how laser diode pulse positioning is done.



A195D588.wmf

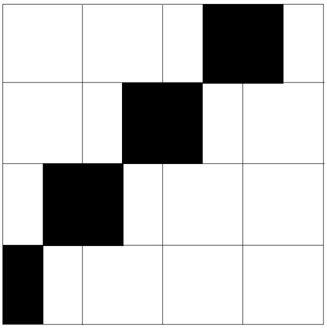


A195d589.wmf

The width of the laser pulse for each pixel has 8 settings (see the diagram on the left at the bottom of the previous page).

For each pixel, the location of the active (laser on) part can be either at the left side of the laser drive signal for the pixel, at the center, or at the right side. The diagram on the right (at the bottom of the previous page) shows this for two adjacent pixels with equal laser signal pulse widths.

There is also a mode known as "concentrated", in which the left hand pixel of an adjacent pair is printed with the active part on the right, and the right hand pixel has the active part on the left. The effects of this mode are shown below.



A195D590.wmf

In 1 x 1 dot processing, the machine determines which type of pulse positioning to use for adjacent pixels; the position of the active part of the laser signal depends on the values of the adjacent pixels. In the example shown above, the machine is printing a thin diagonal line. For the pixels in this thin line, "concentrated" mode is used; the active part for the pixel on the left is moved over to the right. Otherwise, the machine would print two thin diagonal lines on the paper.

In 2 x 1 dot mode, the center mode is used. In this mode, the dots are always a small distance apart, which leads to a better grayscale effect.

Pulse positioning can be switched on or off with SP4904-1.

- If pulse positioning is disabled, the active part of the laser signal is always at the center of the pixel.
- If pulse pulse positioning is enabled, the type that is used (left, center, right, concentrated) is determined automatically for each adjacent pair of pixels (if 1 x 1 mode is used), or center mode (if 2 x 1 mode is used).

- Error Diffusion -

This can only be used in Letter/Photo mode.

The error diffusion process reduces the difference in contrast between light and dark areas of a halftone image. Each pixel is corrected using the difference between it and the surrounding pixels. The corrected pixels are then compared with a error diffusion matrix table. This matrix table cannot be selected.

1) Grayscale processing mode

In 1 x 1 dot processing mode, the output image signal level has 9 levels (from white to black).
In 2 x 1 dot processing mode, the output image signal level has 17 levels.

2) Binary processing mode

The output image signal level has just 2 levels (white/black).

- Dither Processing -

This can only be used in Photo mode.

In dither processing, each pixel is compared with a pixel in a dither matrix table, and in this machine, the result is an 8-bit value (from 0 to 255). There are four dither matrixes that can be selected from to optimize image quality. The matrix that is used depends on the setting of SP 4904-2.

- If 6 x 6 is selected (suitable for most documents), the processing mode that is used (binary picture or gradation) depends on the setting of SP 4904-4.
- If 6 x 6 (new) is selected, the processing mode that is used also depends on the setting of SP 4904-4. However, the gamma curve is different from the one used in the above 6 x 6 mode, to improve reproduction of faint originals.
- 8 x 8 can only be used if 4904-4 is set to "binary". Also, if 4904-4 is set to "binary", the matrix is always 8 x 8, regardless of the setting of SP4904-2.
- 4 x 4 leads to a sharper image.

2. Binary Picture Processing

Each video signal level is converted from 8-bit to 1-bit (black and white image data) in accordance with a threshold level. The threshold level can be adjusted with SP4904-12.

If binary picture processing is enabled, pulse positioning (left, center, right, concentrated) depends on the setting of SP2905.

In addition, note the following.

- Photo Mode: A dither matrix will be used. The matrix is always 8 x 8 regardless of the setting of SP 4904-2.
- Letter/Photo Mode: Error diffusion will be used.

5.3.13 Line Width Correction

This function is effective only in the generation copy mode.

Usually, when making a copy of an original which was made on a copier, the line will bulge in the main scan direction as a result of the negative/positive development system that is used in this model. So, pixels on edges between black and white areas are compared with adjacent pixels, and if the pixel is on a line, the line thickness will be reduced.

Also, in this model, lines can be thickened using a similar process to the above.

The line width correction type can be selected with SP4904-6.

5.3.14 Types of Image Processing

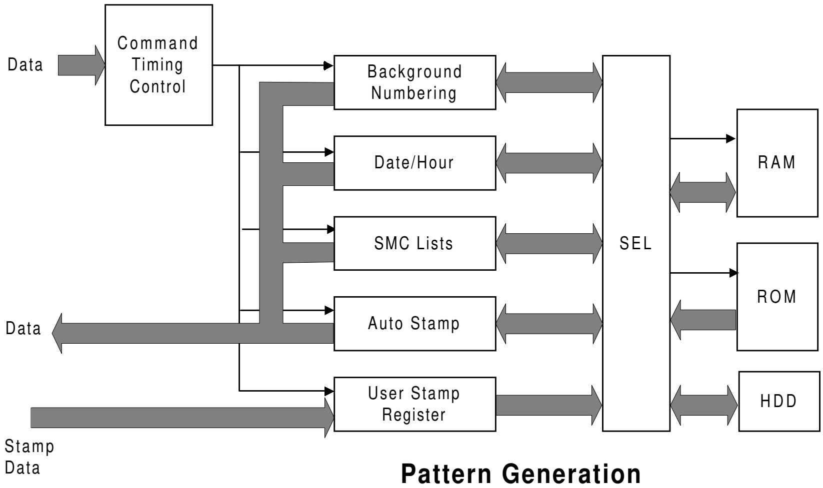
The following table shows which image processing is done for each selected mode. These are default settings; the table indicates which of these can be changed by SP mode.

Mode	Area Type	Filter Type (Filter Strengths: SP 4903-1)	Gradation Processing (See the Note below)	Line Width Correction	Image Processing Type
Letter/ Photo	Text Area	Smoothing	1 x 1dot (SP4904-7)	–	Grayscale Processing (SP4904-4)
	Photo Area		2 x 1dot, Error diffusion (SP4904-8)		
Photo		Smoothing (SP4904-3)	1 x 1 dot Dither (6 x 6 matrix) Matrix type: SP4904-2	–	
Letter		MTF	1 x 1 dot	–	
Generation		MTF	1 x 1 dot	Enabled (SP4904-6)	

NOTE: If SP4904 is set to Binary Picture Processing, the processes in the Gradation Processing column will be different. See the "Binary Picture Processing" section for details.

5.4 OTHERS

5.4.1 Pattern Printing



A195D555.wmf

The pattern generation circuit consists of the pattern generation circuit in the GA4 IC, RAM, ROM and Hard Disk. The pattern generation circuit has the following functions.

- Background Numbering
- Date and Hour
- SMC (Service and Machine Communication) lists
- Auto stamp
- User stamp
- Rotation of the stamp pattern

The selected function retrieves data from the RAM or ROM, then this data is merged with the image data.

The user stamp data is stored in the RAM and also in the hard disk drive for backup. This is because there is no battery back-up system for the RAM.

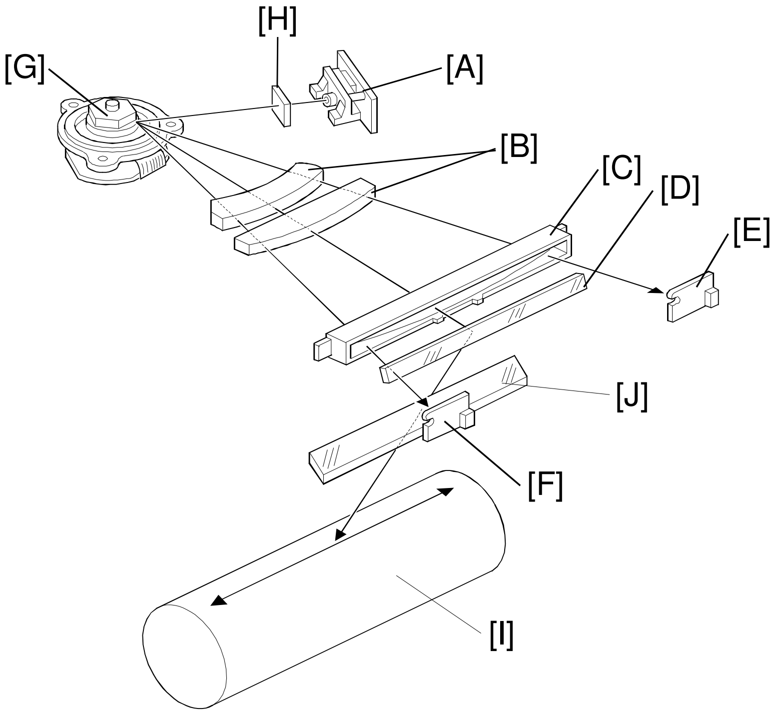
NOTE: Make sure that the user stamp data is stored again when the hard disk drive has been replaced.

5.4.2 Test Patterns

The GA3 and GA4 ICs have a test pattern generator and test pattern data. The gate array sends the test pattern data to the printer. These test patterns can be printed out using the SP modes. These test patterns help investigate defective EX-IPU boards and adjust the printing area (using the trim pattern).

6. LASER EXPOSURE

6.1 OVERVIEW



A: Laser Diode Unit	E: Laser Synchronization Detector Board-2
B: F-theta Lenses	F: Laser Synchronization Detector Board-1
C: BTL (Barrel Toroidal Lens)	G: Polygon Mirror Motor
D: Drum Mirror	H: Cylindrical Lens
I: OPC Drum	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 EX-IPU board into laser pulses, and the optical components direct these pulses to the OPC drum.

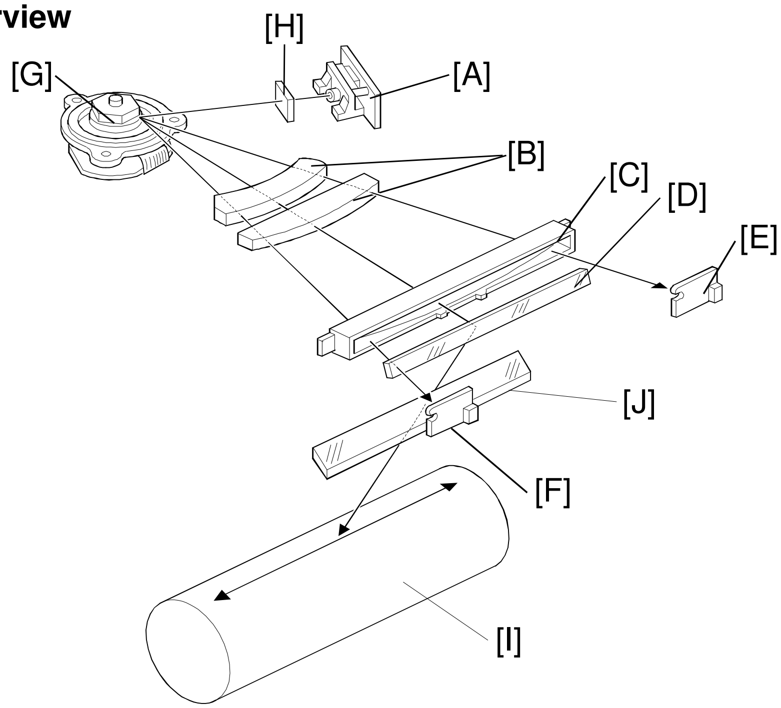
To produce a high quality copy image, there are 256 gradations for the laser pulses, controlled through power modulation and pulse width modulation.

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 1.3 mW on the drum surface at a wavelength of 780 nm.

6.2 OPTICAL PATH

6.2.1 Overview



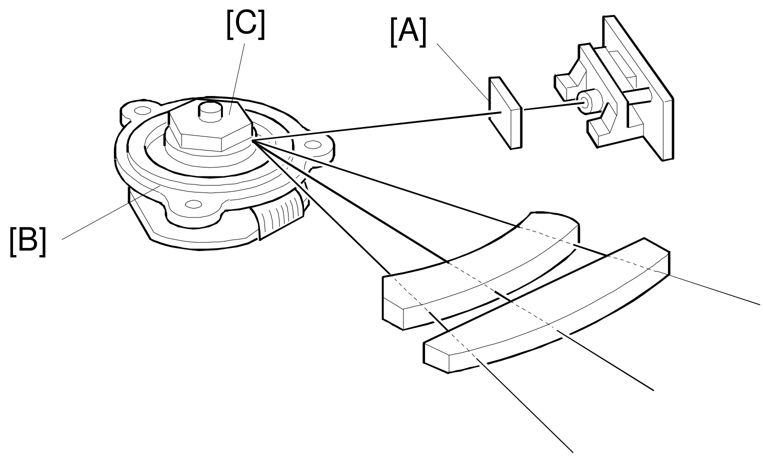
A195D613-2.wmf

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.



A195D614.wmf

6.2.2 Cylindrical Lens

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

6.2.3 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.

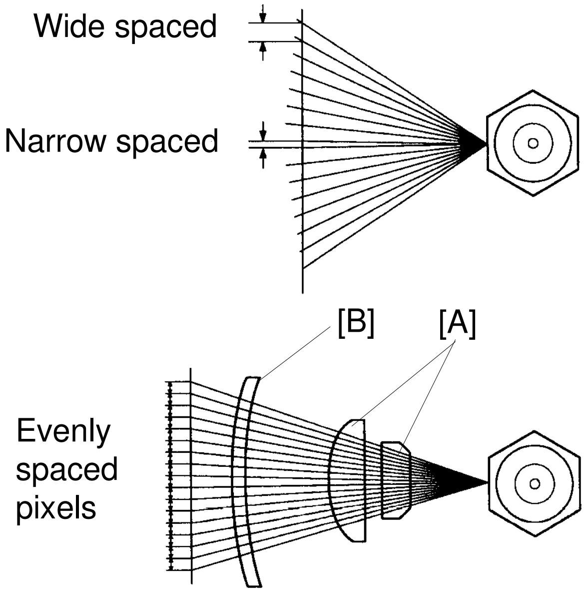
The mirror is precisely ground to enable high reflectivity and to prevent pixel misalignment on the drum in both the main scan and sub scan directions. One rotation corresponds to six main scans.

The polygon mirror rotation speed is switched as follows.

The polygon mirror motor rotates at 31,496 rpm with 400 dpi.

The polygon mirror motor rotates at 23,622 rpm with 300/600 dpi.

6.2.4 F-theta Lenses and the BTL

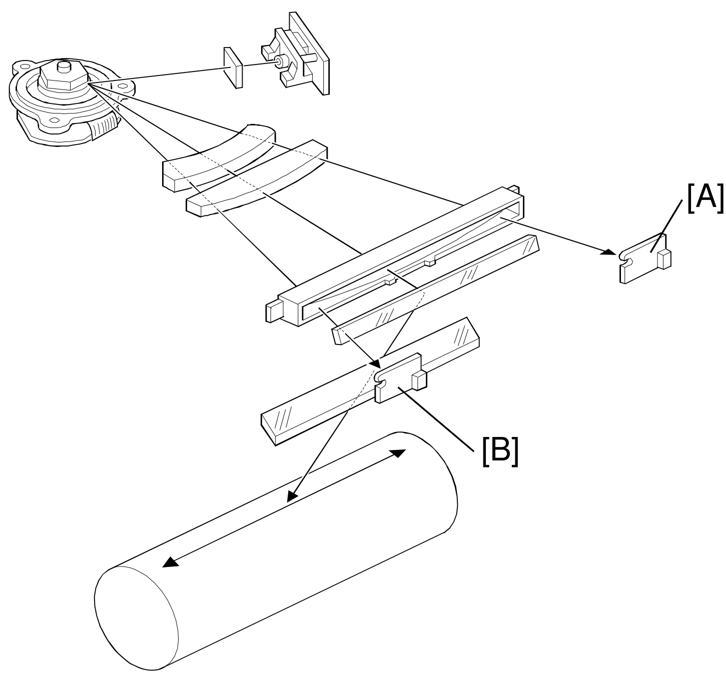


A195D615.img

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.

6.2.5 Laser Synchronizing Detector Boards



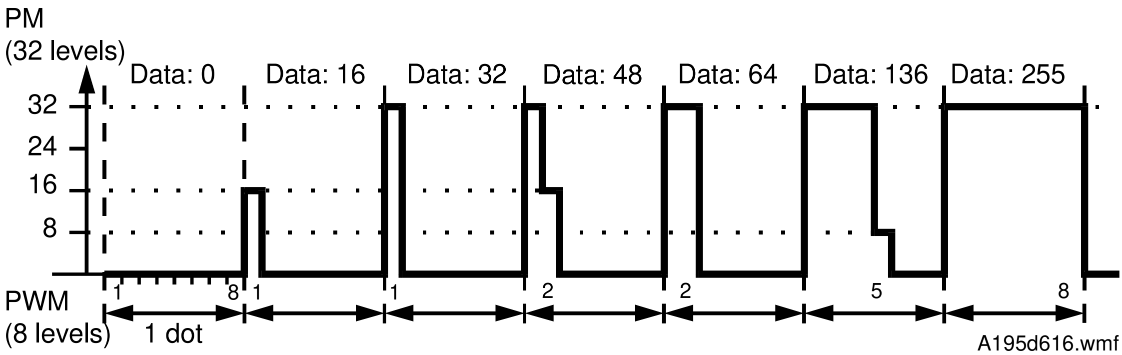
A195D613-3.wmf

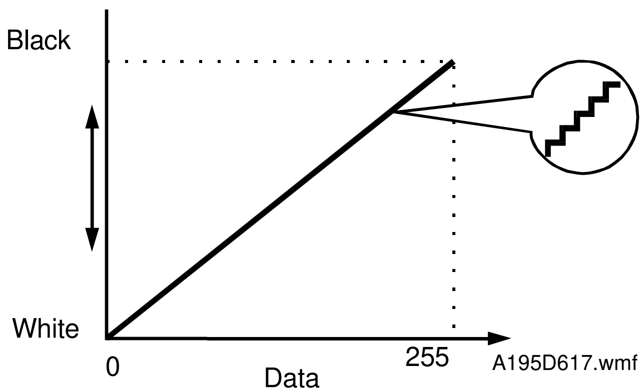
Some of the optical components are made of plastic, and may expand and contract with changes of temperature. If this happens, the number of pulses in the laser main scan across the drum will vary. To counteract the effects of this, the machine adjusts the frequency of the laser pulses to keep the number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

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

6.3 GRADATION CONTROL (LASER POWER MODULATION)





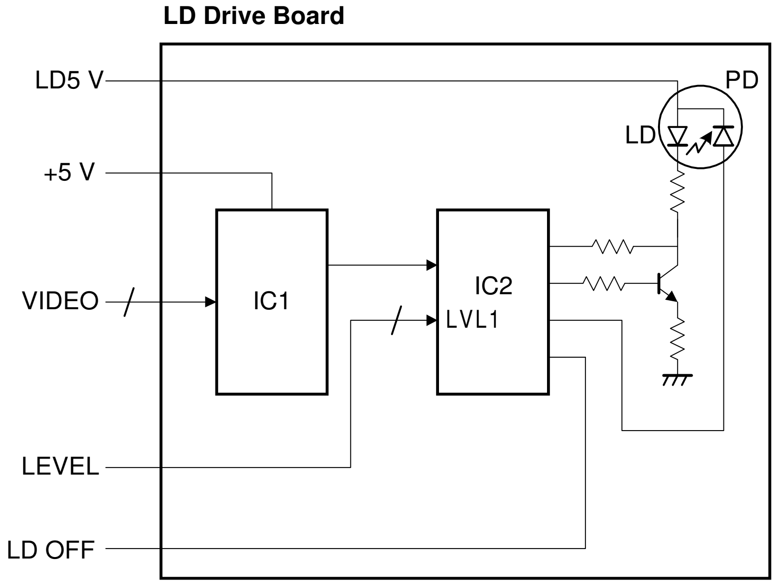
To make the latent image, the laser beam illuminates the image area of the drum surface. The longer the laser is on and the stronger its intensity is, the darker the developed pixel becomes. Modulating (changing) the width of the pulse makes the on time of the laser longer or shorter. There are eight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

The machine uses the 8 pulse width levels and 32 power levels to create the 256 possible grayscale values for each pixel.

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).

6.4 AUTO POWER CONTROL (APC)



A195D618.wmf

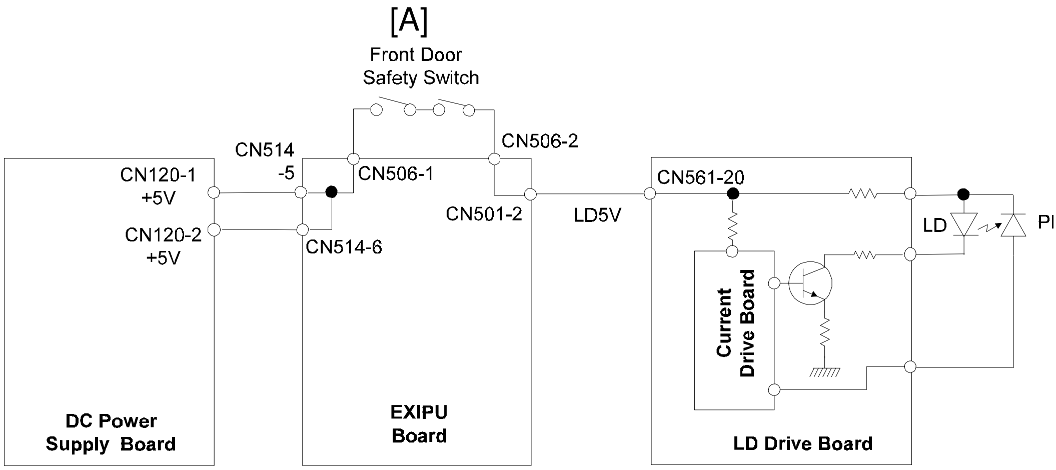
Even if a constant electric current is applied to the laser diode, the intensity of the output light changes with the temperature. The intensity of the output decreases as the temperature increases.

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, IC2 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 in IC2. IC2 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.

6.5 LD SAFETY SWITCHES



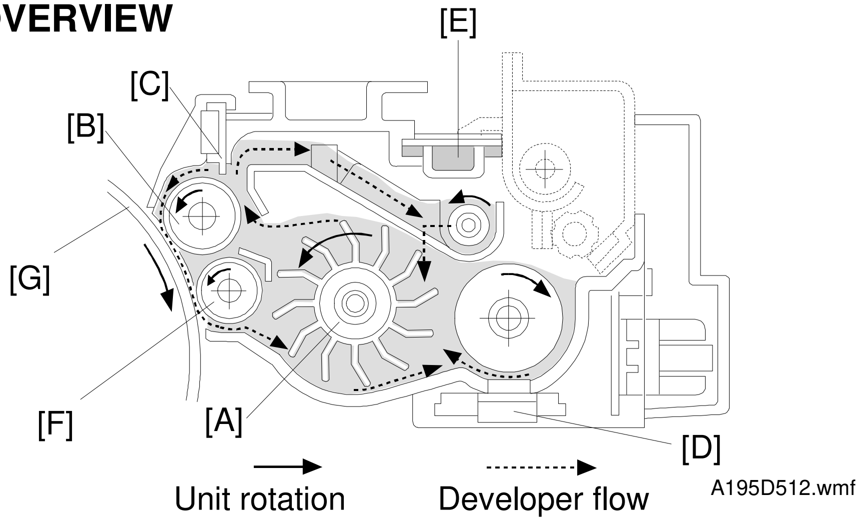
A195D620.wmf

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.

7. DEVELOPMENT

7.1 OVERVIEW



This copier uses a double roller development (DRD) system.

The diameters of the two development rollers are different from each other because the position where the development unit contacts the drum is located slightly higher than in other models.

The DRD system differs from the single roller development system in that (1) the diameter of each development roller is narrower (narrower development nip against the drum), (2) each develops the image (the image is developed twice), and (3) the relative speed of each development roller against the drum is reduced. As a result, the image quality of black cross points and the trailing edges of halftone areas are improved.

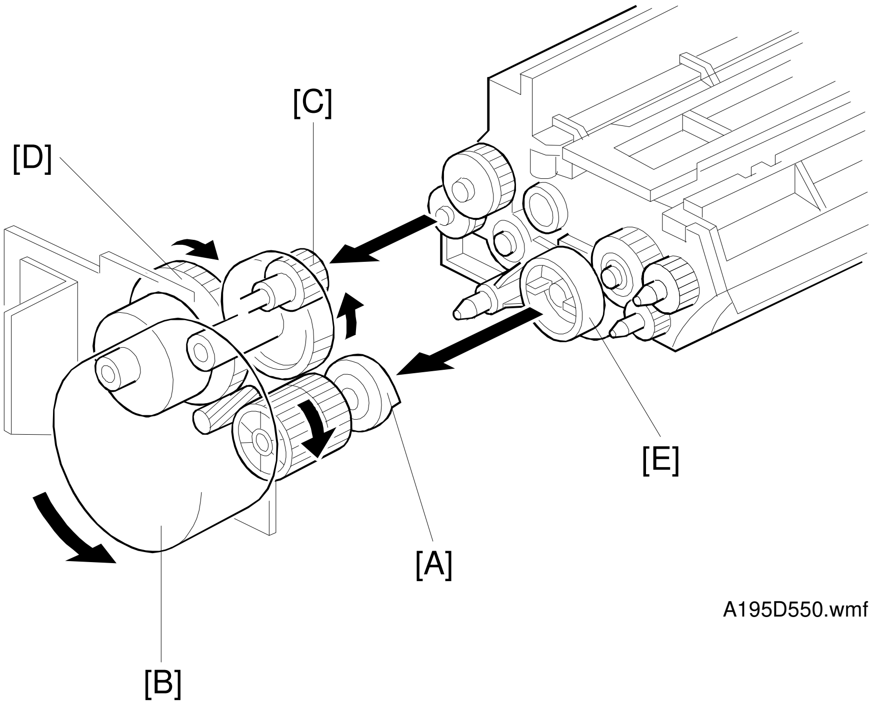
Also, the use of finer toner (approx. 7.5 µm) improves image quality, especially of thin horizontal lines and dot screen areas.

The paddle roller [A] picks up developer in its paddles and transports it to the upper development roller [B]. Internal permanent magnets in the development rollers attract the developer to the development roller sleeve. The upper development roller carries the developer past the doctor blade [C]. The doctor blade trims the developer on the upper development roller to the desired thickness and creates backspill to the cross mixing mechanism. The development rollers continue to turn, carrying the developer to the drum [G] where the latent image is developed. After turning another 100 degrees, the developer is released and returned to the paddle roller [A].

The toner density sensor [D] located under the unit measures the toner concentration in the developer. There is a hole, fitted with a filter [E], in the top of the unit to relieve air pressure and to minimize toner scattering.

7.2 DRIVE MECHANISM

7.2.1 Development Drive Mechanism [SP3]



A195D550.wmf

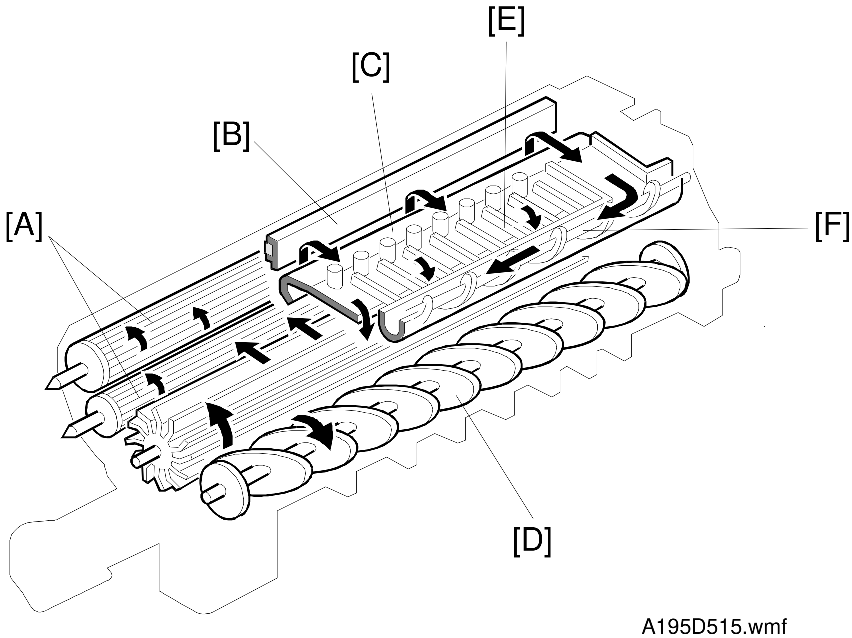
The development drive motor [B] rotates the development drive gear [A], which drives the gears in the development unit.

The gears in the toner supply unit are driven by the toner supply roller drive gear [C] when the toner supply clutch [D] activates.

All gears in the development unit are helical gears. These gears are quieter than normal gears. The teeth of the development drive gear are chamfered so they engage smoothly with the development roller gear [E] when the unit is installed.

The main motor speed at 600 dpi is half that at 300/400 dpi. However, the development motor speed is the same regardless of the resolution (300/400/600 dpi). The main motor changes speed to produce the different dpi resolutions, because this development unit mechanism is independent.

7.3 CROSSMIXING

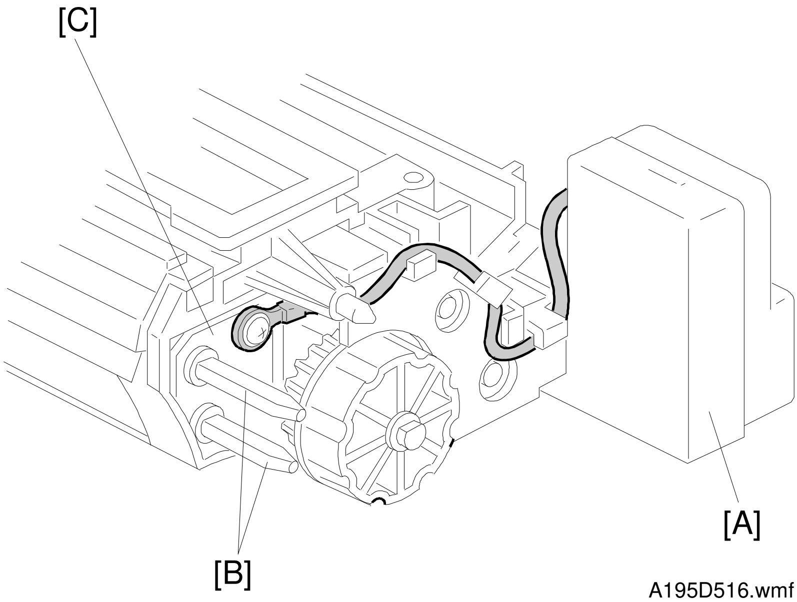


This copier uses a standard cross-mixing mechanism to keep the toner and developer evenly mixed. It also helps agitate the developer to prevent developer clumps from forming and helps create the triboelectric charge.

When the development rollers [A] turn, the developer on these rollers is split into two parts by the doctor blade [B]. The part that stays on the development rollers forms the magnetic brush and develops the latent image on the drum. The part that is trimmed off by the doctor blade goes to the backspill plate [C].

As the developer slides down the backspill plate to the agitator [D], the mixing vanes [E] move it slightly toward the rear of the unit. Part of the developer falls into the auger inlet and is transported to the front of the unit by the auger [F]. As the result of this mechanism, the developer stays level in the development unit.

7.4 DEVELOPMENT BIAS



This machine uses a negative-positive development system, in which black areas of the latent image are at a low negative charge (about -100 V) and white areas are at a high negative charge (about -850 V).

To attract negatively charged toner to the black areas of the latent image on the drum, the development bias power pack [A] applies a bias of –550 volts to the development rollers throughout the image development process. The bias is applied to both development roller shafts [B] through the development positioning plate [C].

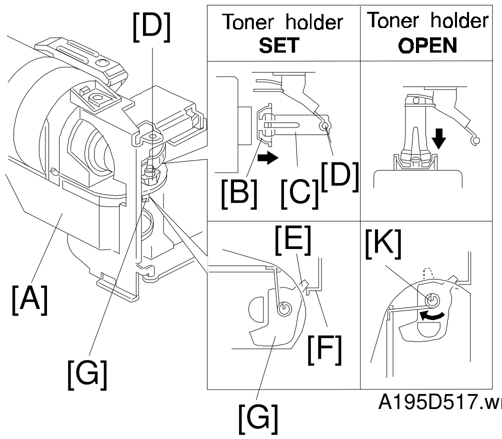
In stand-by mode, the development bias is 0V. When drum charging begins and the upper relay sensor detects the paper, the development bias is changed to +300 V. This is to prevent toner from transferring to the area of drum by the development roller, which has not yet been charged. After 70 ms, the development bias is then dropped to –550 V at the same time as the development clutch turns on.

The development bias voltage (-550 V) can be adjusted with SP2201-1.

The development bias for the ID sensor pattern is –310 V, which can be adjusted with SP2201-2.

7.5 TONER SUPPLY

7.5.1 Toner Bottle Replenishment Mechanism



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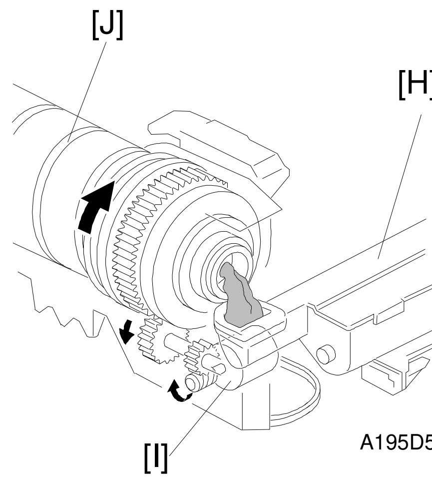


A195D531.wmf

When a toner cartridge is placed on the holder unit [A] and pushed back in completely, the following procedures are performed automatically to allow toner to be supplied to the toner supply unit.

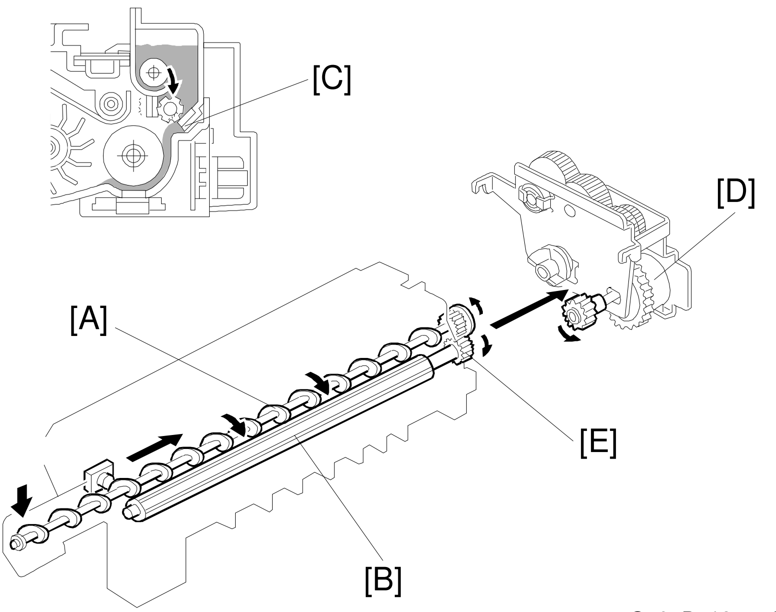
- The cap [B] remaining on the toner bottle is pulled away and kept by the chuck [C] away from the movement of the roller [D], which rides along the curved rail.
- The toner shutter lever [E] meets the bracket [F] on the copier frame and the toner shutter [G], which covers the hole above the toner supply unit opening, is opened.

The toner end detection system determines when to drive the toner bottle replenishment mechanism (see Toner End Detection). The bottle drive mechanism transports toner from the bottle to the toner supply unit [H]. A worm gear on the bottle drive motor [I] drives this mechanism. The toner bottle has a spiral groove [J] that helps move toner to the toner supply unit.

When the holder unit is pulled out to add new toner, the following procedures are performed automatically to prevent toner from scattering.

- The chuck releases the toner bottle cap into its proper position.
- The toner shutter shuts the opening as a result of the pressure from the torsion spring [K].

7.5.2 Toner Supply Mechanism

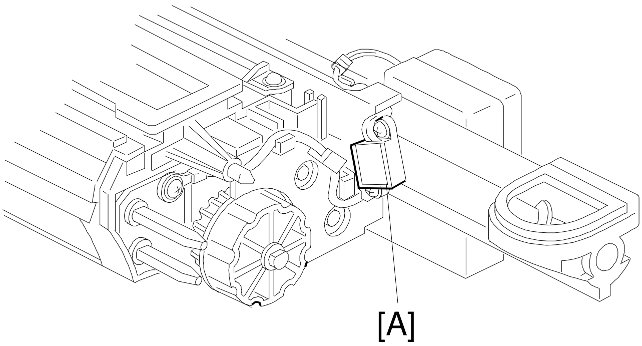


Inside the toner supply unit are the transport screw [A] and the toner supply roller [B]. As the grooves in the toner supply roller turn past the slit [C], toner falls into the development unit.

When the machine decides that it is time to add more toner to the developer (see Detect Supply Mode and Fixed Supply Mode in the Process Control section), the toner supply clutch [D] turns on. This clutch transfers rotation from the main motor to the toner supply roller gear [E], which drives the transport screw. In this way, toner is transported from the front to the rear.

For details on toner supply control, see the Process Control section.

7.5.3 Toner End Detection



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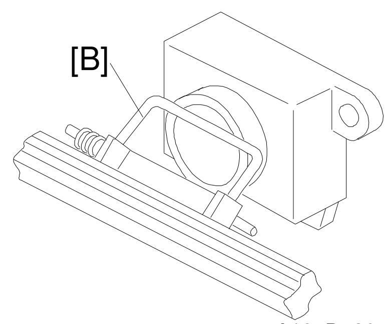

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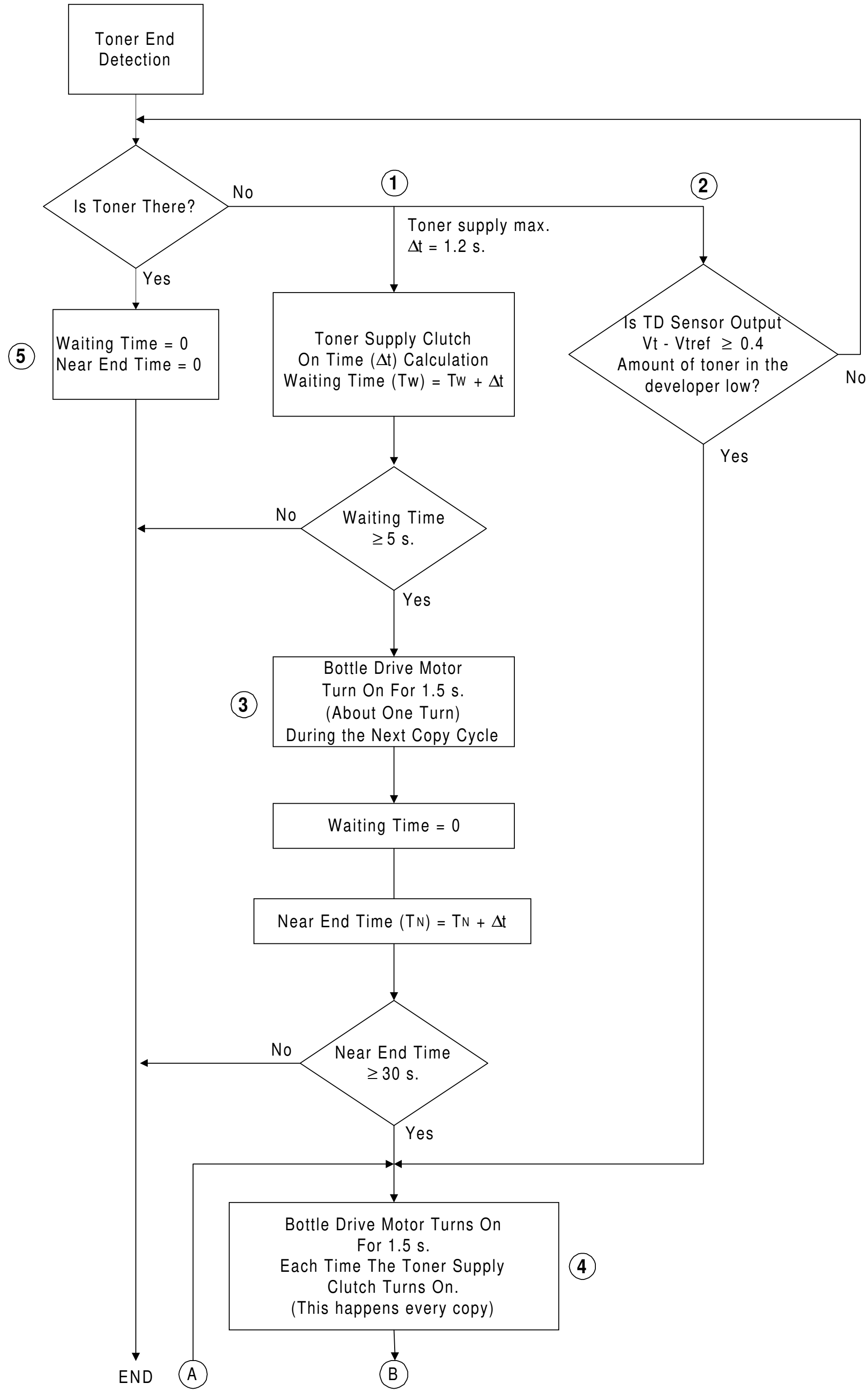
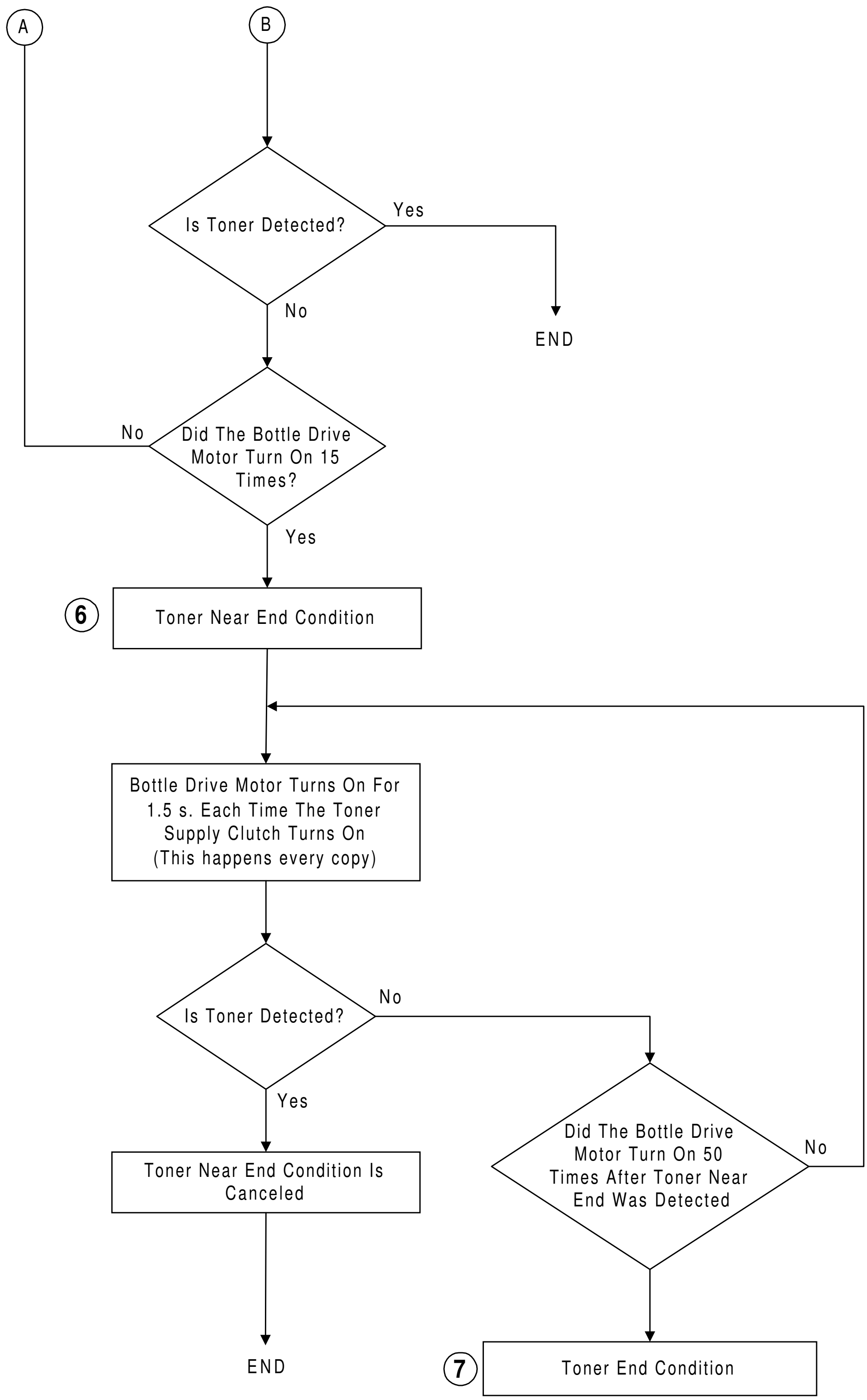
The toner end sensor [A] (which is a piezoelectric sensor) detects whether there is sufficient toner in the toner supply unit or not.

The toner end sensor surface is cleaned by the movement of the spring [B] attached to the transport screw in the toner supply unit.

Toner Near End/End Detection



A195D532.wmf



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If the toner end sensor informs the cpu that there is no toner, two things happen.

- TD Sensor Check ("2" on the flow chart) -

The cpu checks the TD sensor to determine whether the amount of toner in the developer is low or not. If the amount of toner is low, the near-end determination procedure starts ("4" on the flow chart).

- Toner Supply Clutch Activation ("1" on the flow chart) -

The toner supply clutch on time is calculated (as explained in "Process Control" - section 2.2.5), and the toner supply clutch turns on for the amount of time calculated (max 1.2 s).

The machine adds up the total amount of time that the toner supply clutch has been on since the first time the toner end sensor gave a negative response. When this reaches a multiple of 5 s, the toner supply bottle is rotated for 1.5 s the next time a copy is made ("3" on the flow chart). If the time reaches 30 s, the toner near end determination process begins ("4" on the flow chart).

Note: If the toner near-end sensor detects toner, all timers are reset to zero ("5" on the flow chart).

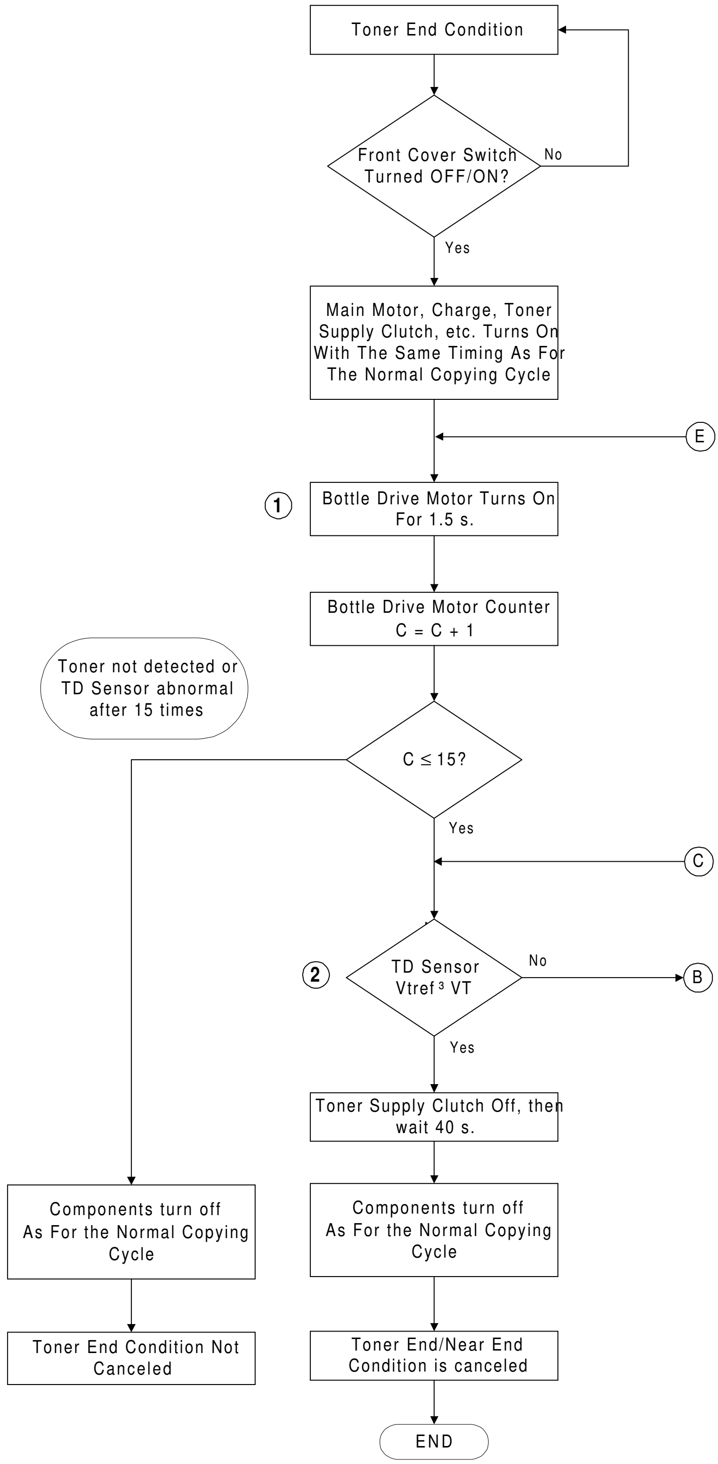
- Toner Near-end Determination -

Every copy, the toner supply clutch turns on for 1.5 s. If toner is still not detected after 15 copies, the machine detects a toner near-end condition ("6" on the flow chart).

- Toner End Determination -

If toner is still not detected 50 copies after toner near-end was determined, the machine detects a toner end condition ("7" on the flow chart).

Toner End Recovery



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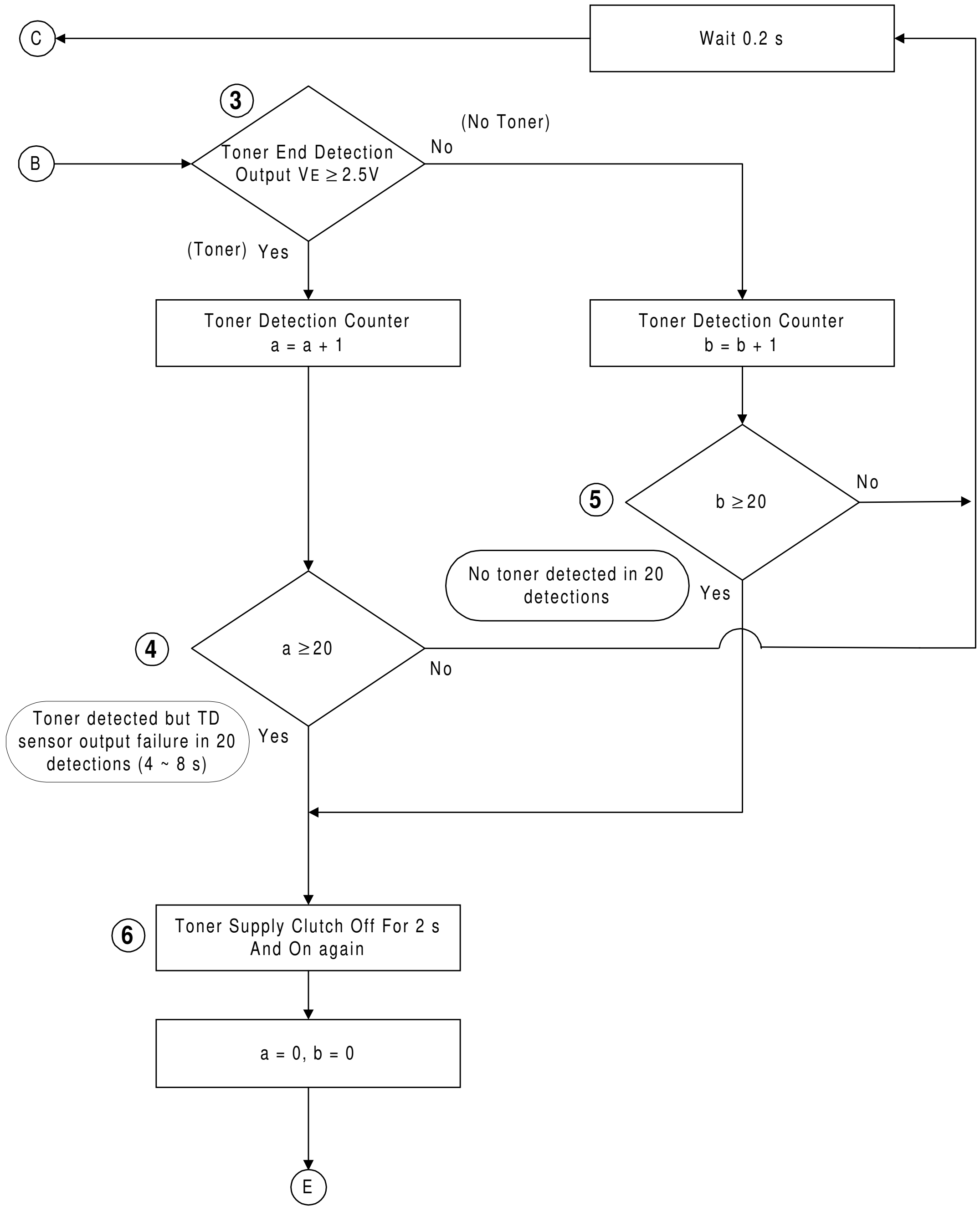

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If the power is turned off/on while a toner end condition exists, the machine will attempt to recover.

First, toner is supplied for 1.5 s and the bottle drive motor counter (C) is incremented, ("1" on the flow chart).

Then the TD sensor is checked ("2" on the flow chart). If the user added fresh toner and the TD sensor is in order, the toner end condition is canceled.

However, if the TD sensor detects that V_{TREF} is less than V_T, the amount of toner in the developer is still low (or the TD sensor is faulty). So the toner end sensor output is checked ("3" on the flow chart). The outputs from both the TD and the toner end sensor are checked until either a positive or negative result has been obtained from the toner end sensor 20 times.

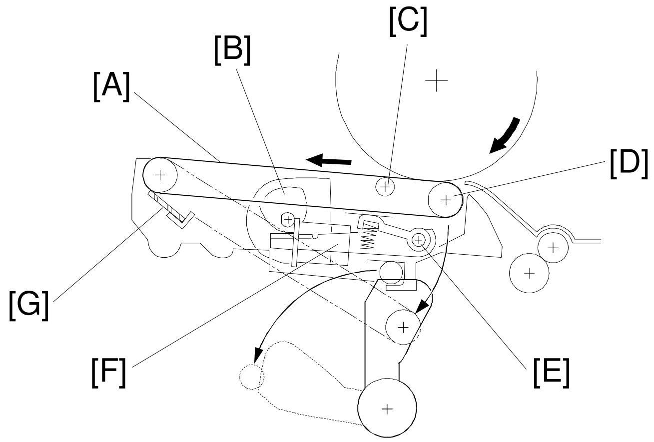
(If the toner end sensor detected toner at this point, either the TD sensor or the toner end sensor are defective ["4" on the flow chart]. However, SC codes are not generated during this procedure.)

Then, toner is supplied again ("6" on the flow chart), and the bottle drive motor counter (C) is incremented, ("1" on the flow chart).

If toner cannot be detected after this process has been done 15 times, the toner end condition is not cancelled.

8. IMAGE TRANSFER AND PAPER SEPARATION

8.1 OVERVIEW



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This model uses a transfer belt unit instead of a transfer and separation corona unit. The transfer belt unit consists of the following parts:

- Transfer belt [A]
- Transfer belt lift clutch [B]
- Transfer bias roller [C]
- Idle roller [D]
- Transfer belt lift lever [E]
- Transfer high voltage supply board [F]
- Transfer belt cleaning blade [G]

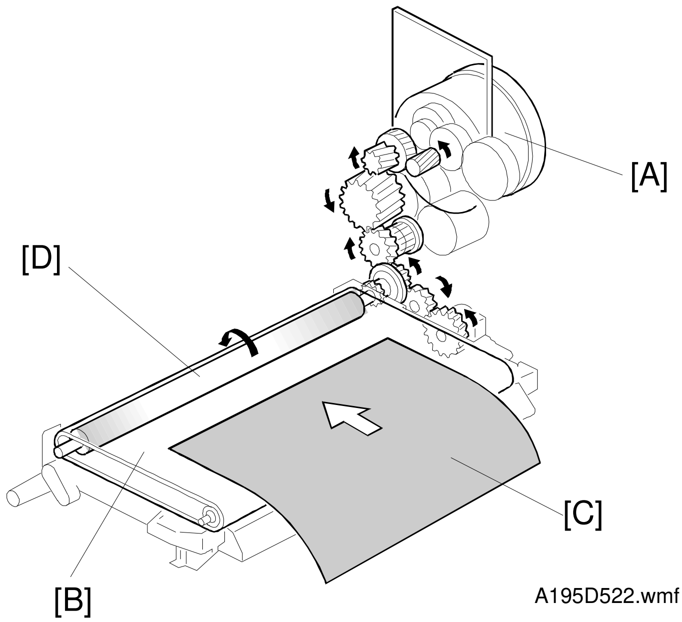
The belt (length: 334 mm) has a high electrical resistance, so it can hold a high positive electrical potential to attract toner from the drum onto the paper. Also, the electrical potential attracts the paper itself and helps to separate the paper from the drum.

The transfer belt cleaning blade removes toner from the transfer belt to prevent the back side of the paper from being stained.

The use of this system has the following advantages compared with the corona wire system.

- Contact with the full width of the drum to assure better transfer
- Stable paper separation and transportation
- Reduced ozone generation

8.2 PAPER TRANSPORTATION AND BELT DRIVE MECHANISM

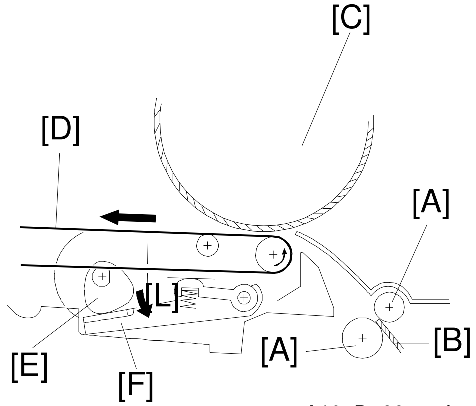


The main motor [A] drives the transfer belt [B] through a series of gears. Since the transfer belt attracts the paper [C] electrostatically, a transport fan is not required.

As a result of its own stiffness and the curvature of the belt, the paper separates from the transfer belt above the transfer belt drive roller [D] as the belt turns sharply around the transfer belt drive roller.

8.3 IMAGE TRANSFER AND PAPER SEPARATION MECHANISM

(1) The registration rollers [A] start feeding the paper [B] to the gap between the drum [C] and the transfer belt [D] at the proper time. The transfer belt does not contact the drum at this moment (the transfer belt lift clutch with cam [E] is pushing down the transfer belt lift lever [F]).



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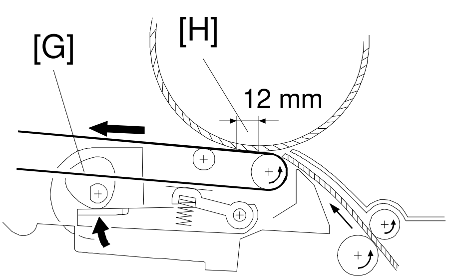
(2) Before the leading edge of the paper reaches the gap between the transfer belt and the drum, the transfer belt lift clutch [G] rotates half of a complete rotation to release the lift lever. Then, the transfer belt is pushed up as a result of spring pressure. The contact width [H] is about 12 mm.



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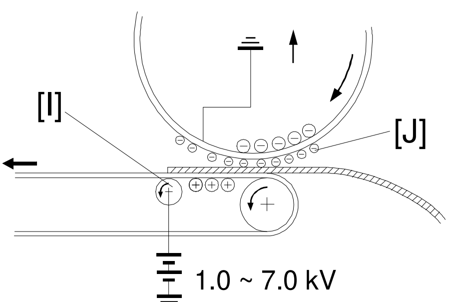
(3) Then a potential of 1.0 ~ 7.0 kV is applied to the transfer bias roller [I]. The positive charge attracts the negatively charged toner [J] from the drum. It also attracts the paper and separates the paper from the drum.



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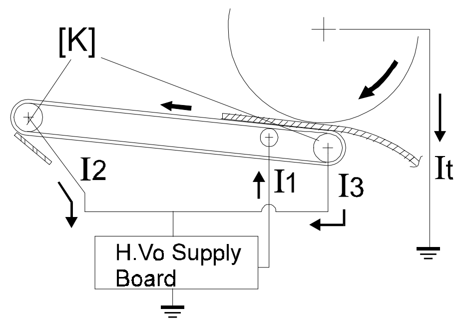
(4) After the image transfer is completed, the charge on the transfer belt holds the paper on the transfer belt. Excess charge on the paper and the transfer belt is discharged during rotation via the grounded rollers [K].



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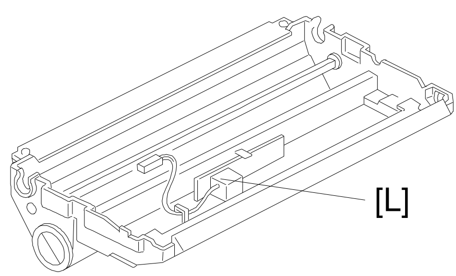
When the transfer high voltage supply board [L] inside the transfer belt unit provides high voltage to the transfer bias roller, a small current (I_t) flows to ground via the transfer belt, the paper, and the drum.



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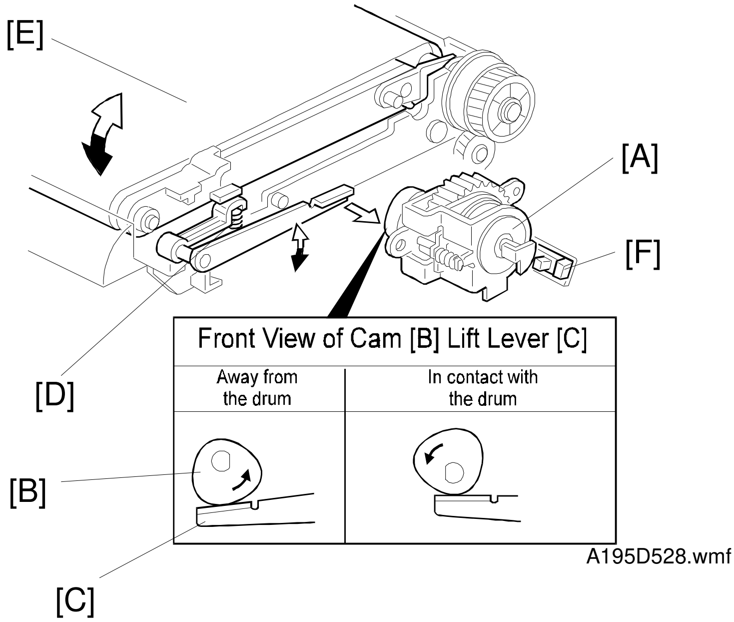
It is important that this current stays constant even if the paper thickness, type, environmental conditions, or the transfer belt surface resistance change. If it is not kept constant, efficiency of toner transfer and paper separation will vary with humidity and paper thickness.

$I_t = I_1 - (I_2 + I_3)$. The high voltage supply board measures I_2 and I_3, and varies I_1 (the current to the bias roller) to keep I_t constant.

8.4 TRANSFER BELT UNIT LIFT MECHANISM

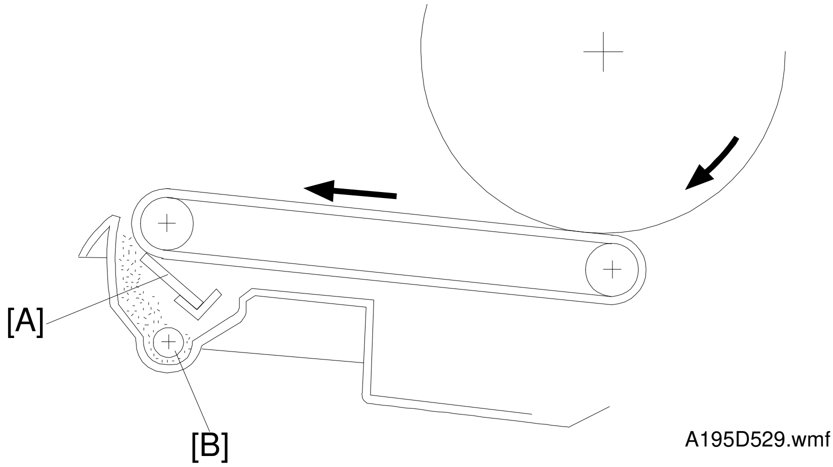


The transfer belt lift clutch [A] (a half turn clutch) located on the back of the copier turns on and the cam [B] rotates half of a complete rotation. The lift lever [C], riding on the cam is lifted up and the spring [D] pushes up the transfer belt [E] for it to contact the drum.

The transfer belt contact home position sensor [F] is used to detect the home position of the cam (this is when the transfer belt is away from the drum). The transfer belt must be released from the drum while it is not being used for image transfer. The reasons are as follows:

- To prevent sensor patterns on the drum from being rubbed off by the transfer belt, because the transfer belt is located between the development unit and the ID sensor
- To prevent a change in the drum's OPC characteristics because of the influence of additives inside the rubber belt
- To prevent the transfer belt cleaning mechanism from being overworked

8.5 TRANSFER BELT CLEANING MECHANISM



Some toner may adhere to the transfer belt under the following conditions:

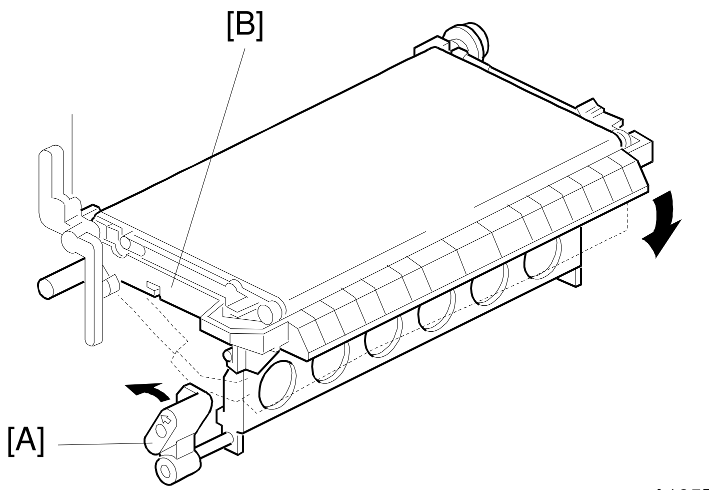
- When a paper jam occurs.
- When the size of the paper on the by-pass table is different from the one determined by the width sensor on the by-pass feed table. The machine always assumes that the paper on the by-pass table is lengthwise. For example, if the sensor detects A3 width, the machine scans the full A3 area of the exposure glass. However, if the paper was actually A4 sideways, the part of the platen cover after the original's trailing edge will be scanned and excess toner could be transferred.

The adhering toner must be removed to prevent the back side of later copies from being stained. The cleaning blade [A], which is always in contact with the transfer belt, scrapes off any toner remaining on the transfer belt. Paper dust on the transfer belt is also scraped off, and is disposed of with the waste toner from the transfer belt. A counter blade system is used to clean the transfer belt. The surface of the transfer belt is coated to make it smooth and to prevent the cleaning blade from being flipped by the transfer belt.

To remove toner and other particles that are accumulated at the edge of the cleaning blade, the transfer belt turns in reverse at the end of every copy job like for the drum cleaning blade mechanism.

The toner and paper dust that is scraped off fall into the toner collection coil [B] which then carries them to the toner collection bottle.

8.6 TRANSFER BELT UNIT RELEASE MECHANISM



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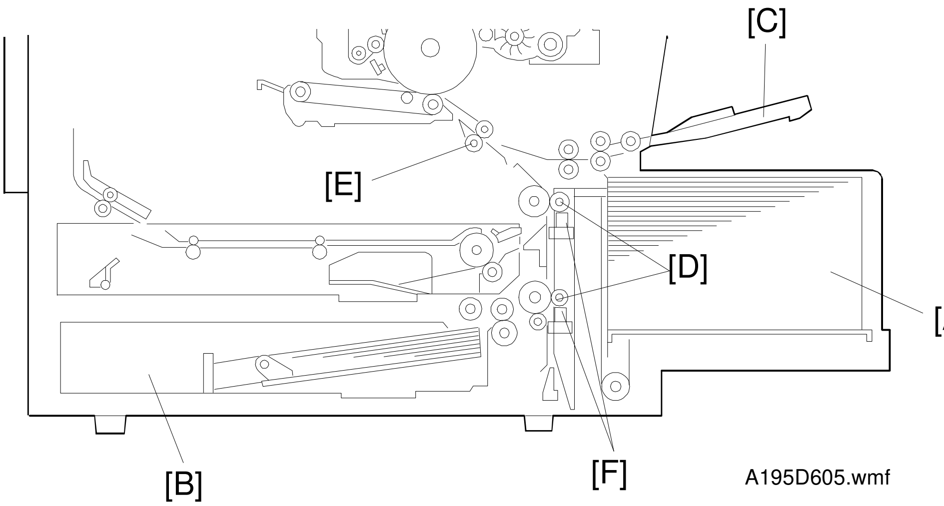
When the transfer belt unit release lever "A1" [A] is rotated counterclockwise, the transfer belt unit [B] is released, allowing it to drop. This mechanism allows easy paper jam recovery and easy maintenance of the transfer belt unit.

9. PAPER FEED AND REGISTRATION

9.1 OVERVIEW



This model has three paper feed stations: the large capacity tray feed station [A], the paper tray feed station [B], and the by-pass feed station [C].

The LCT holds 1000 sheets of paper. The paper tray is a drawer tray that holds 500 sheets of paper.

Paper can also be fed using the by-pass feed table, which uses the feed mechanism of the LCT feed station. The by-pass feed table can hold 40 sheets of paper.

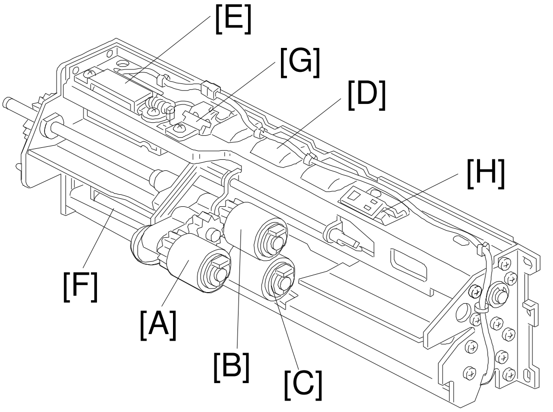
The paper tray feed station uses an FRR feed system.

The top sheet of paper separates from the stack and is fed to the relay rollers [D], then to the registration rollers [E].

There are two relay sensors [F], one located just under each set of relay rollers. These sensors are used for paper jam detection.

9.2 PAPER FEED MECHANISM - PAPER TRAY

9.2.1 Drive Mechanism



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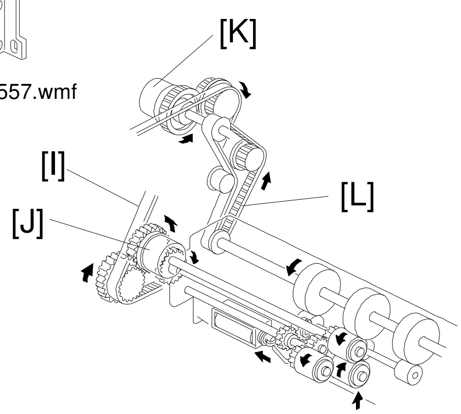

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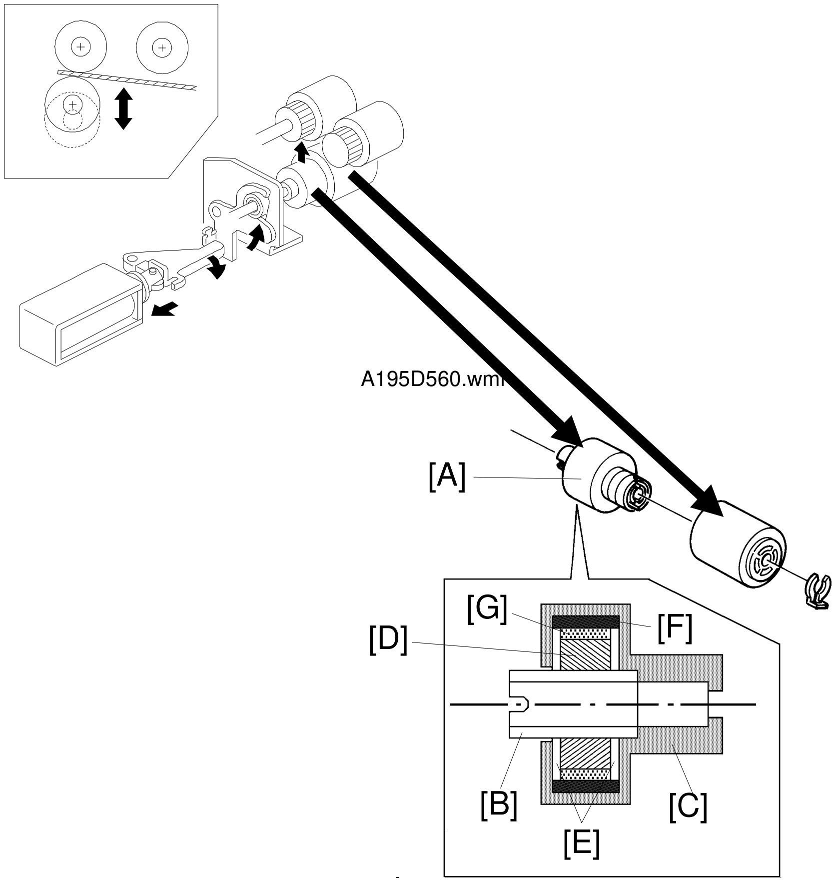
The paper feed unit consists of a pick-up roller [A], feed roller [B], separation roller [C], relay roller [D], pick-up solenoid [E], separation solenoid [F], paper upper limit sensor [G], and paper end sensor [H].

The pick-up, feed, and separation rollers are driven by the main motor via the timing belt [I] and the paper feed clutch [J]. The relay roller is also driven by the main motor. However, drive is transmitted to the relay roller via the relay clutch [K] and the timing belt [L].

In standby mode, the separation roller is away from the feed roller.
At 50 ms after the Start key was pressed, the main motor and the separation solenoid turn on. Then the separation roller contacts the feed roller.
At 100 ms after the main motor started to rotate, the pick-up solenoid turns on. The pick-up roller lowers to make contact with the top of the paper stack. The pick-up solenoid stays on for 550 ms.
At 200 ms after the main motor started to rotate, the paper feed clutch and the relay clutch turn on. The feed roller and relay rollers feed the top sheet of the paper stack to the registration rollers. When the leading edge of the paper passes through the upper relay sensor, the paper feed clutch is de-energized.

9.2.2 Slip Clutch Mechanism



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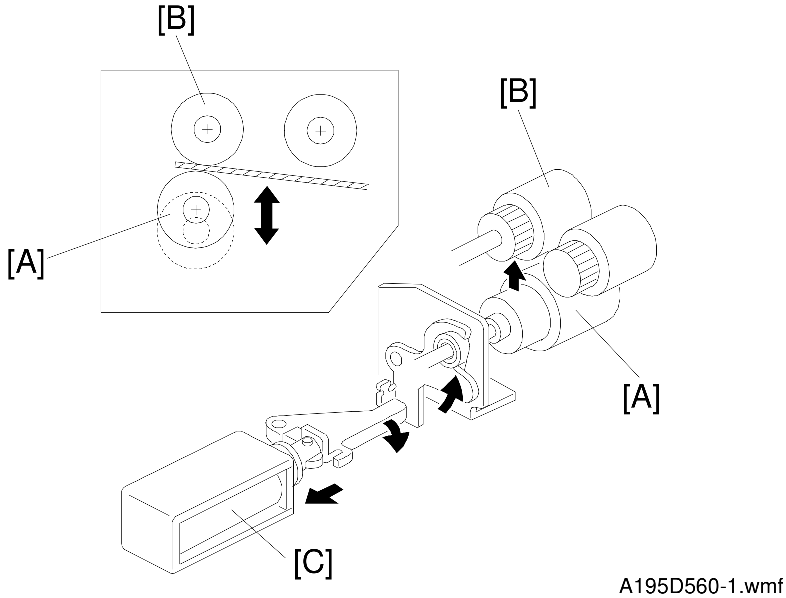
The separation roller is mounted on a slip clutch. The slip clutch [A] consists of an input hub [B] and an output hub [C], which also acts as the case of the clutch. A magnetic ring [D] and steel spacers [E] are fitted onto the input hub. A ferrite ring [F] is fitted into the output hub. Ferrite powder [G] packed between the magnetic ring and the ferrite ring generates a constant torque due to magnetic force. The input hub and the output hub slip when the rotational force exceeds this constant torque. The constant torque prevents double feeding, because it exceeds the coefficient of friction between sheets of paper.

This type of slip clutch does not require lubrication.

9.2.3 Separation Roller Release Mechanism

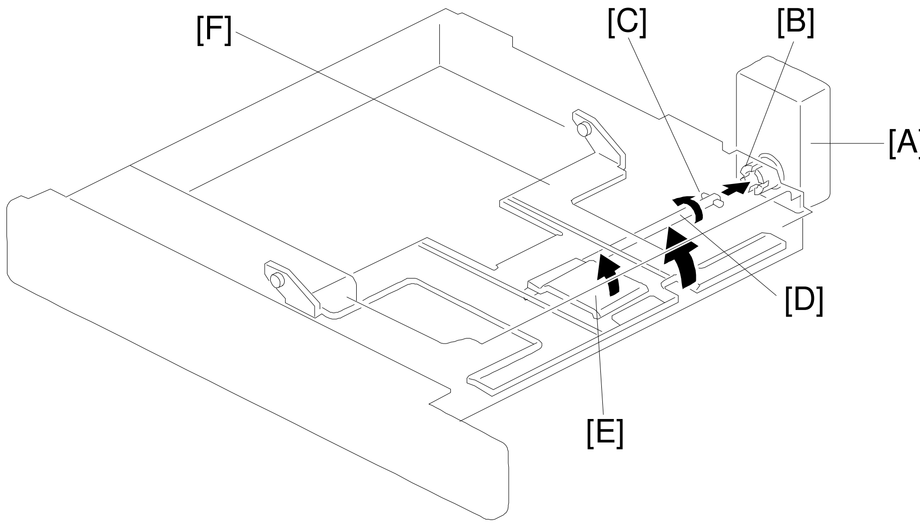


This FRR mechanism uses a separation roller release system. The separation roller [A] is normally away from the feed roller [B]. When the paper feed station has been selected and the Start key is pressed, the separation solenoid [C] moves the separation roller into contact with the feed roller.

This mechanism has the following three advantages:

- If the separation roller is normally away from the feed roller, it reduces the wear on the rubber surface of the separation roller that is caused by friction between the feed roller and the separation roller.
- With other types of mechanism, a sheet of paper sometimes remains between the feed roller and the separation roller after paper feeding is completed. If the feed tray is drawn out in this condition, it is possible for this sheet of paper to be torn. When the separation roller is away from the feed roller, the remaining sheet of paper is released from between the feed roller and the separation roller.
- When paper misfeeds occur in this area, users can easily pull out paper jammed between the feed roller and the separation roller because the separation roller is away from the feed roller.

9.3 PAPER LIFT MECHANISM - PAPER TRAY



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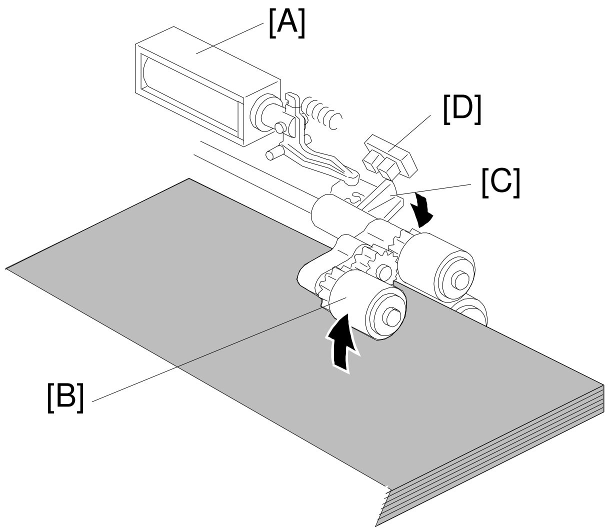
The tray switch detects when the tray is placed in the machine. When the machine detects that the paper tray is in the machine, the tray lift motor [A] rotates and the coupling gear [B] on the tray lift motor engages the pin [C] on the lift arm shaft [D]. Then the tray lift arm [E] lifts the tray bottom plate [F].



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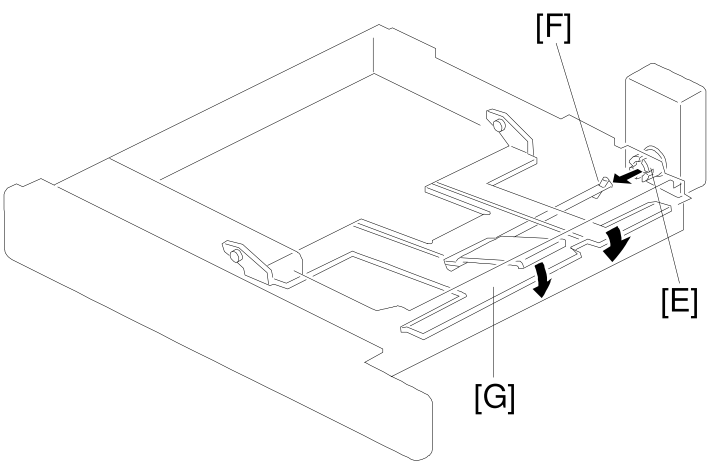


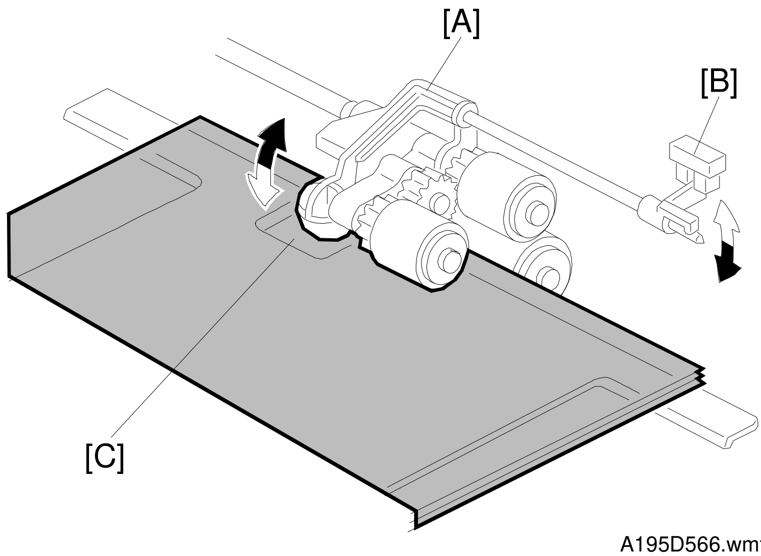
A195D565.wmf

When the tray lift motor turns on, the pick-up solenoid [A] activates to lower the pick-up roller [B]. When the top sheet of paper reaches the proper height for paper feed, the paper pushes up the pick-up roller, and the actuator [C] on the pick-up roller supporter activates the paper upper limit sensor [D] to stop the tray lift motor.

After several paper feed cycles, the paper level gradually lowers and the upper limit sensor is de-activated. The tray lift motor turns on again until this sensor is activated again.

When the tray is drawn out of the machine, the tray lift motor coupling gear [E] disengages the pin [F] on the lift arm shaft, and the tray bottom plate [G] then drops under its own weight.

9.4 PAPER END DETECTION - PAPER TRAY

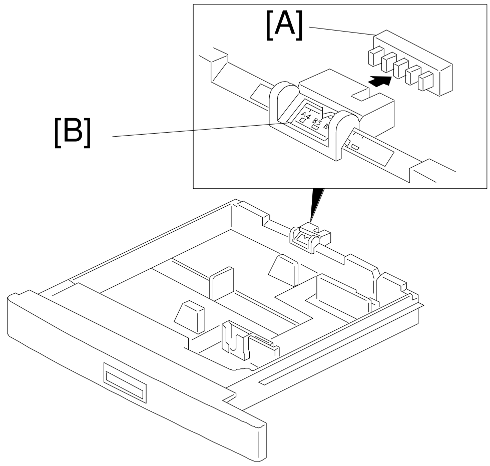


If there is some paper in the paper tray, the paper end feeler [A] is raised by the paper stack and the paper end sensor [B] is deactivated.

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

When a paper end condition occurs, the tray lift motor lowers the paper bottom plate and the pick-up solenoid turns off.

9.5 PAPER SIZE DETECTION - PAPER TRAY



A195D567.wmf

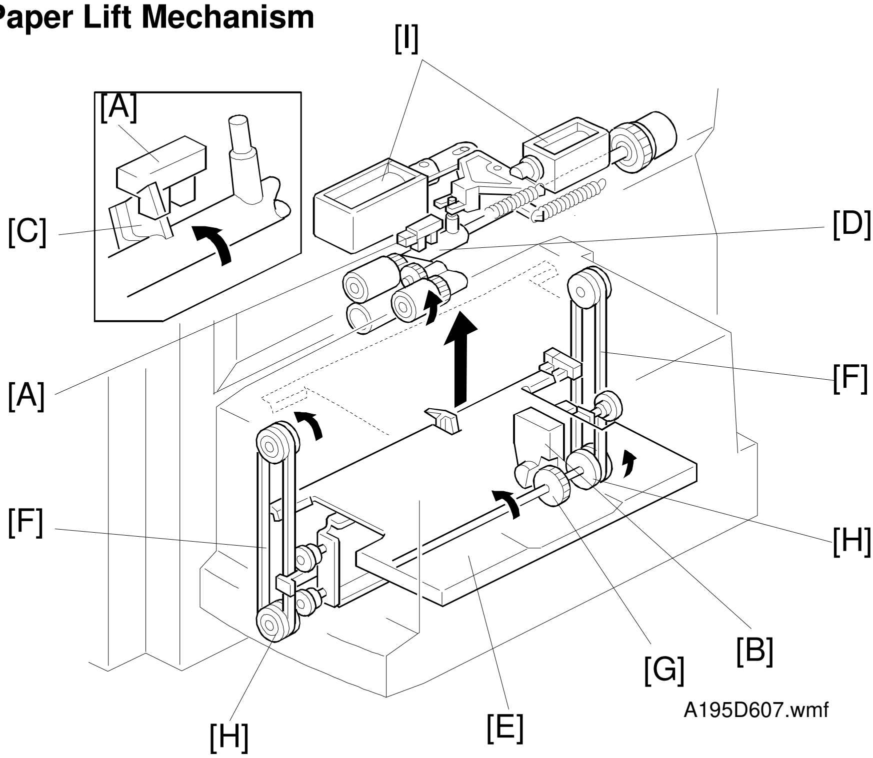
Actuated = 0 **Deactuated = 1**	**Paper size**	**L: Lengthwise** **S: Sideways**
1 2 3 4 5	**A4/A3 Version**	**LT/DLT Version**
01111	A3-L	11" x 17"
00111	B4-L	8 1/2" x 14"
10011	A4-L	8 1/2" x 11"
01001	A4-S	11" x 8 1/2"
00100	B5-L	8 1/2" x 5 1/2"
00010	B5-S	A3
00001	A5-S	A4-L
10000	8 1/2" x 11"	A4-S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

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] located 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.

Using a UP mode, the paper tray can be set up to accommodate one of a wider range of paper sizes. If this is done, the readings from the paper tray's sensor are ignored. If a different size of paper is used without changing the UP mode, paper jams will result.

9.6 LARGE CAPACITY TRAY

9.6.1 Paper Lift Mechanism



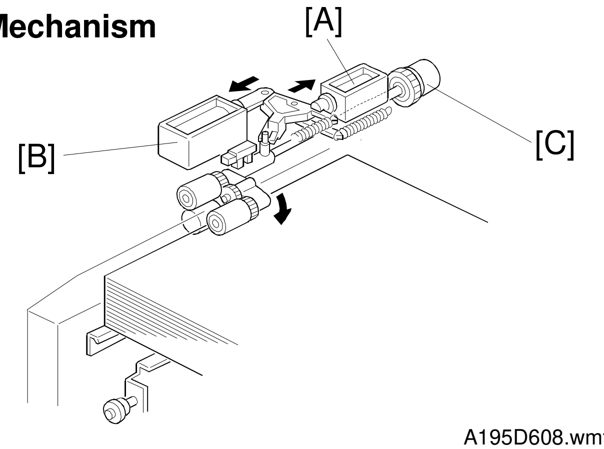
The LCT upper limit sensor [A] above the paper feed upper guide plate controls the LCT lift motor [B]. The actuator [C] for the sensor is on the pick-up roller shaft [D]. The LCT lift motor drives the LCT bottom plate [E] which is attached to the timing belts [F] through the helical gear [G] and drive pulleys [H].

When the LCT top cover is closed, the LCT cover switch actuates and both pick-up solenoids [I] are energized. The pick-up roller shaft then lowers and the LCT upper limit sensor is deactivated. At this time, the LCT lift motor starts rotating and the LCT bottom plate starts lifting.

When the top sheet of the paper stack raises the pick-up roller, the LCT upper limit sensor is activated and the LCT lift motor stops. Shortly after, the pick-up solenoids turn off and the pick-up roller goes back to the up position.

During the copy cycle, the pick-up roller is lowered to prepare for feeding the next sheet of paper. When the level of the paper stack has fallen past a certain point, the LCT upper limit sensor becomes deactivated and the LCT lift motor turns on to maintain the correct level for paper feed.

9.6.2 Paper Feed Mechanism



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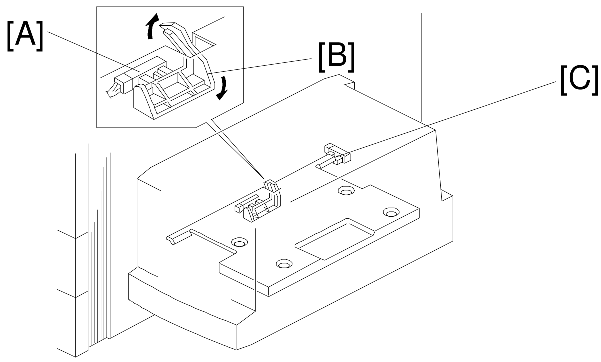
The LCT uses an FRR feed system. Unlike for the paper tray, the feed and separation rollers are always in contact. The LCT pick-up solenoid [A], by-pass pick-up solenoid [B], and by-pass feed clutch [C] control paper feed from the LCT. When the Start key is pressed, the by-pass pick-up solenoid [B] turns on, and stays on until the copy run has finished. The pick-up roller is now at the bypass feed level.

At 150 ms after the Start key is pressed, the LCT pick-up solenoid turns on to drop the pick-up roller all the way to the LCT feed level. Then, 100 ms after this, the by-pass feed clutch turns on to feed the top sheet of paper. Between sheets of paper, solenoid [A] turns off, but solenoid [B] stays on.

9.6.3 Paper End Detection



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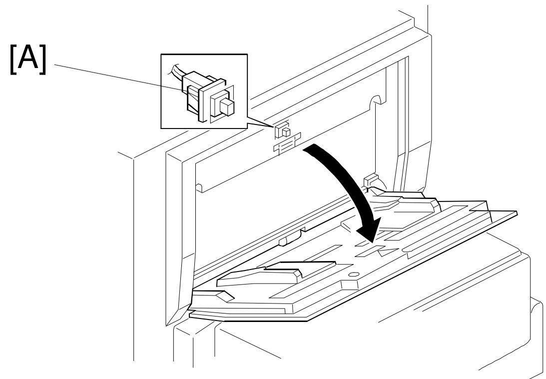
The LCT paper end sensor [A] is just under the LCT bottom plate.

When the LCT runs out of paper, the actuator [B] pivots into the LCT paper end sensor. Then the LCT lift motor starts to rotate in reverse to lower the LCT bottom plate. When the LCT lower limit sensor [C] is activated by the bottom plate, the LCT lift motor stops.

9.7 BY-PASS FEED TABLE

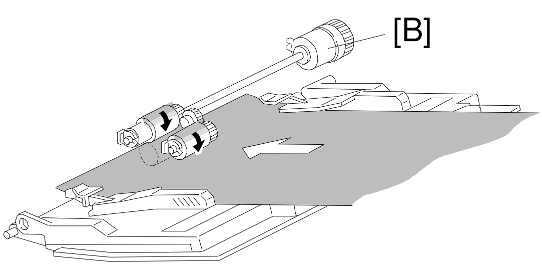
9.7.1 Table Open/Closed Detection



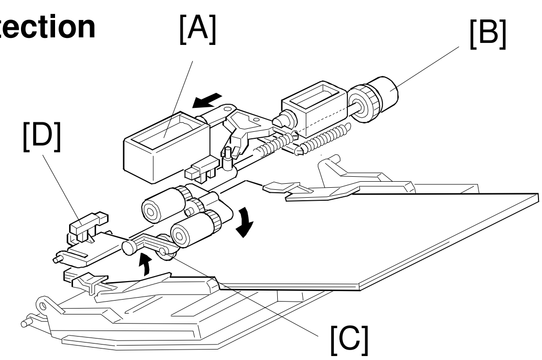
A195D602.wmf

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.

9.7.2 Feed Mechanism/Paper End Detection



A195D569.wmf



A195D604.wmf

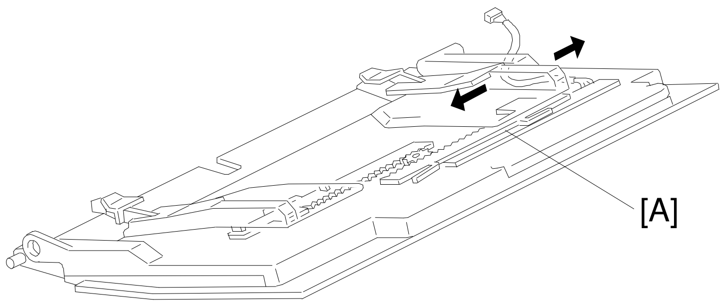
The by-pass feed table uses an FRR feed system, using the same rollers as the LCT, and one of the solenoids. Only the by-pass pick-up solenoid [A] is used, because the pick-up roller does not have to drop so far as it does when feeding from the LCT.

The user can put up to 40 sheets of paper on the by-pass feed table. Note that the paper can be pushed right into the machine, causing jams. The user must stop pushing the paper in when the by-pass feed indicator goes out.

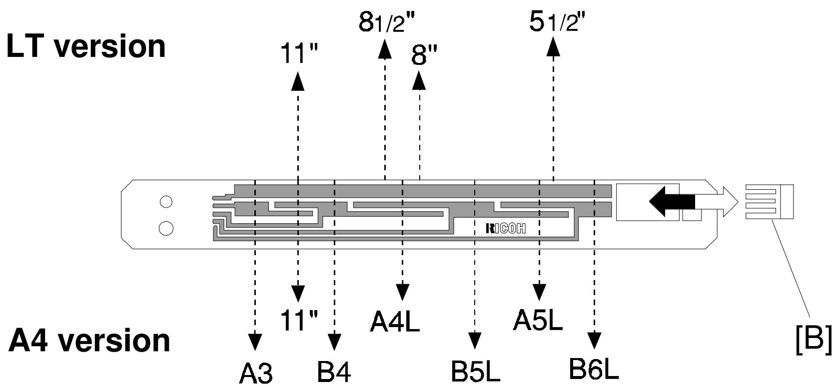
When the Start key is pressed, the by-pass feed clutch [B] and the pick-up solenoid turn on to feed the top sheet of paper.

When there is no paper on the by-pass feed table, the paper end feeler [C] drops into the cutout in the lower guide plate and the by-pass feed paper end sensor [D] is deactivated.

9.7.3 By-pass Feed Paper Width Detection



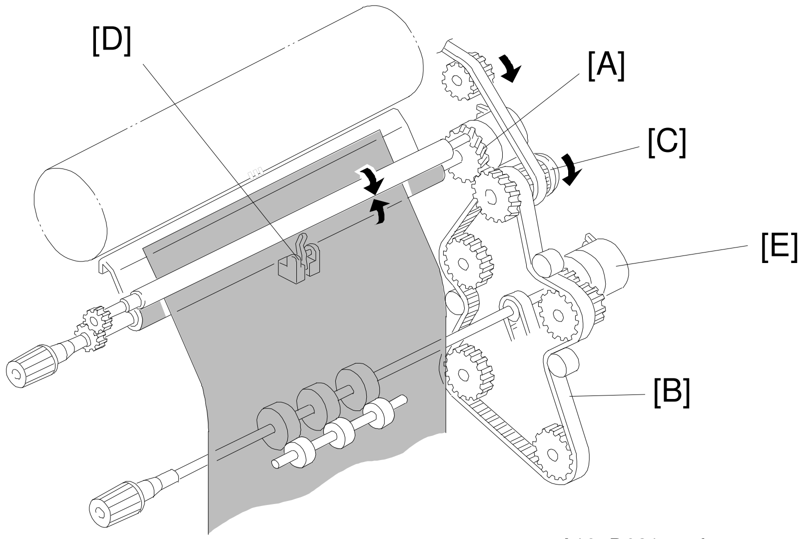
A195D570.wmf



A195D571.wmf

The by-pass feed paper width sensor board [A] monitors the paper width. The rear side fence is connected to the terminal plate [B]. When the side fences are moved 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. However, the machine will not determine the paper length. For example, A4 paper set sideways will be determined to be A3 paper.

9.8 PAPER REGISTRATION



A195D621.wmf

Main motor rotation is transmitted to the registration clutch gear [A] (located on the lower registration roller shaft) through the timing belt [B] and the relay gear [C].

The registration sensor [D] is positioned just before the registration rollers.

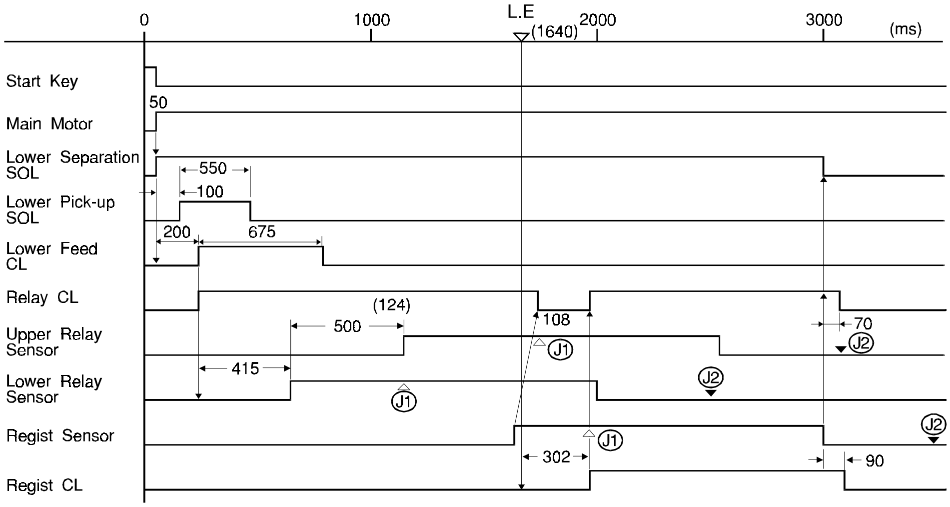
When the paper leading edge activates the registration sensor, the registration clutch is off and the registration rollers are not turning. However, the relay clutch [E] stays on for an extra 108 ms. This delay allows time for the paper to press against the registration rollers and buckle slightly to correct skew. Then, the registration clutch energizes and the relay clutch re-energizes at the proper time to align the paper with the image on the drum. The registration and relay rollers feed the paper to the image transfer section.

The registration sensor is also used for paper misfeed detection.

9.9 PAPER FEED AND MISFEED DETECTION TIMING

9.9.1 Paper Feed Tray

A4 sideways



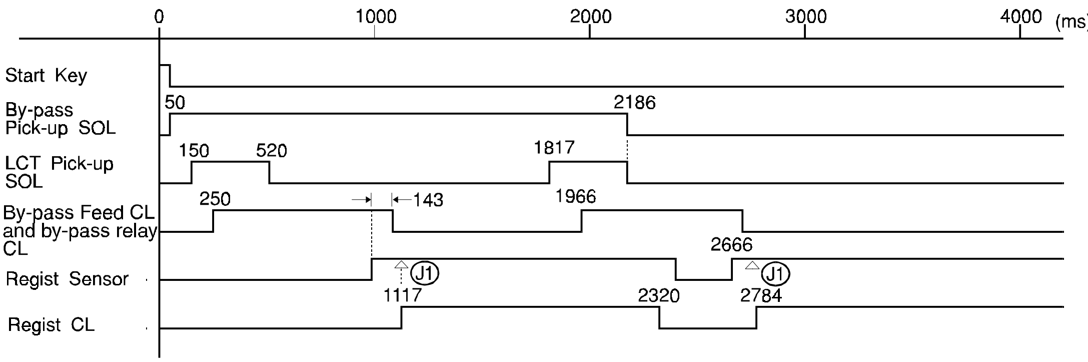
A195D622.wmf

L.E. (Leading Edge): Start Time for Scanning the Original

J1: Checks whether the sensors (relay sensors and registration sensor) are activated within 500 ms after the designated time for these sensors.

J2: Checks whether the sensors (relay sensors and registration sensor) are deactivated within 667 ms after the designated time for these sensors.

9.9.2 A4 sideways; two copies of a single-page original

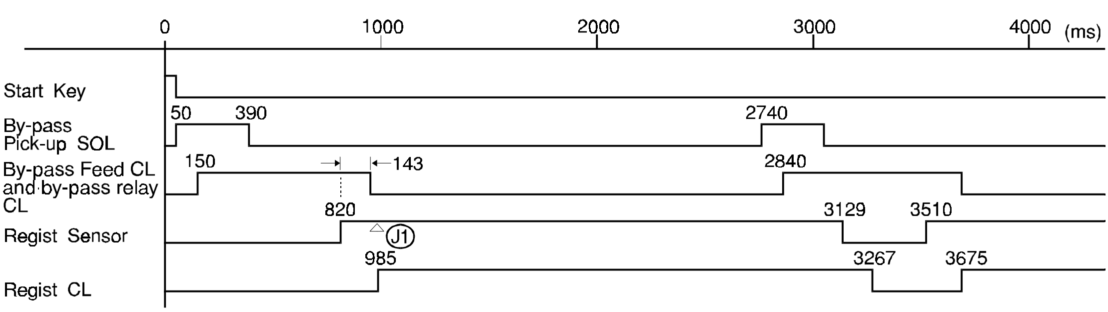


A195D623.wmf

J1: Checks whether the registration sensor is activated when the registration clutch is turned on.

9.9.3 By-pass Feed

A4 sideways

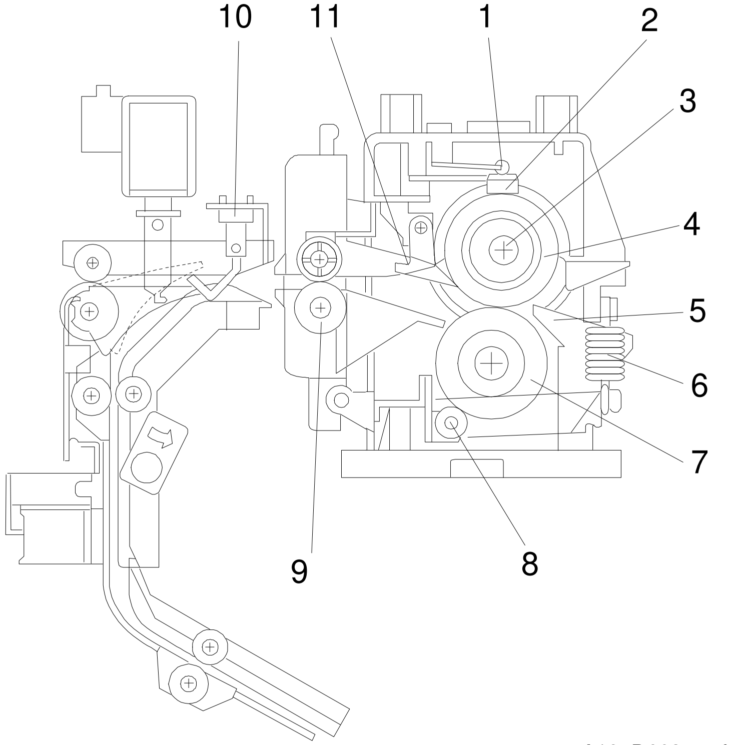


A195D624.wmf

J1: Checks whether the registration sensor is activated when the registration clutch is turned on.

10. IMAGE FUSING

10.1 OVERVIEW

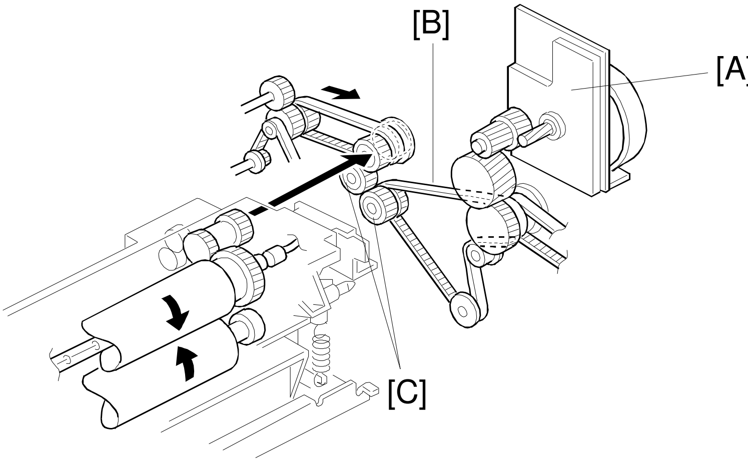


A195D603.wmf

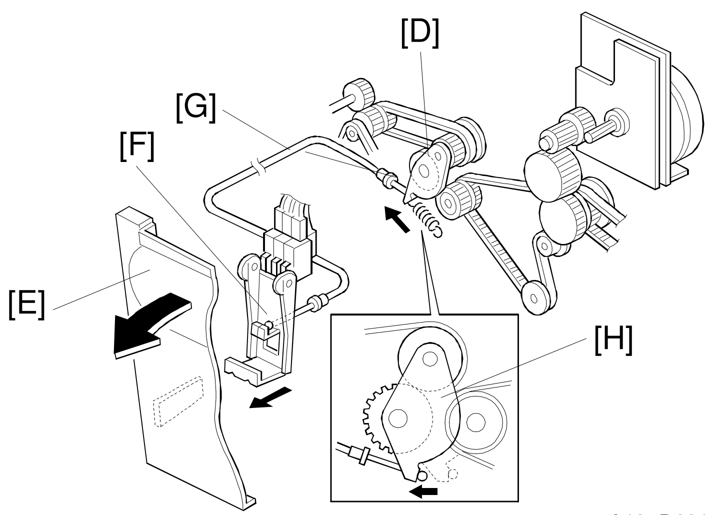
The fusing unit consists of the following parts:

1. Thermofuse
2. Thermistor
3. Fusing lamp
4. Hot roller
5. Lower entrance guide
6. Pressure springs
7. Pressure roller
8. Cleaning roller
9. Fusing exit roller
10. Fusing exit sensor
11. Hot roller strippers

10.2 FUSING DRIVE AND RELEASE MECHANISM



A195D609.wmf



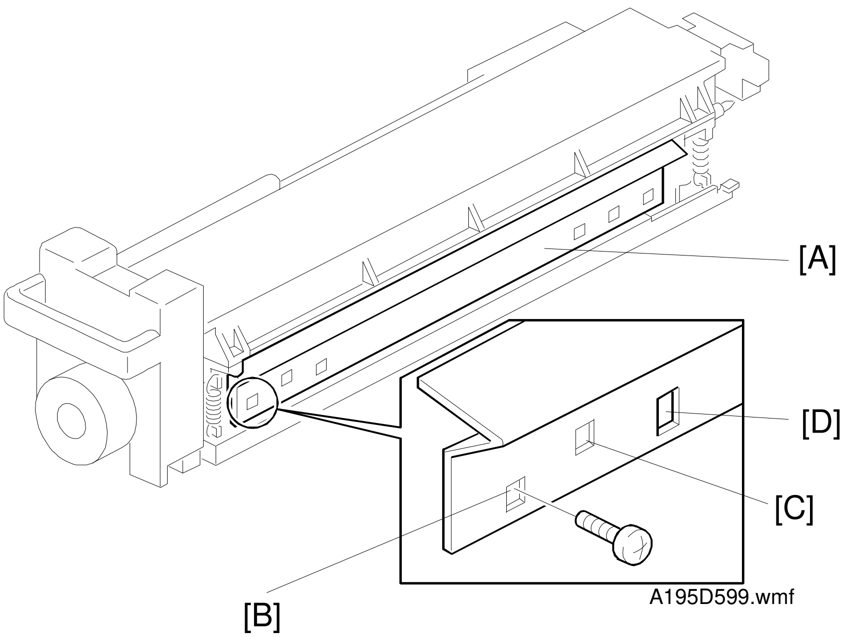
A195D601.wmf

The main motor [A] drives the fusing unit through a timing belt [B] and some gears [C].

The fusing unit drive release mechanism automatically disengages the fusing unit drive gear [D] when the front cover [E] is opened. This allows the fusing unit drive gear to rotate freely so that misfed paper can be easily removed.

When the front cover is opened, the actuator plate [F] pulls release wire [G]. The wire pulls the fusing unit gear bracket [H] and the fusing unit drive is disengaged.

10.3 FUSING ENTRANCE GUIDE SHIFT MECHANISM



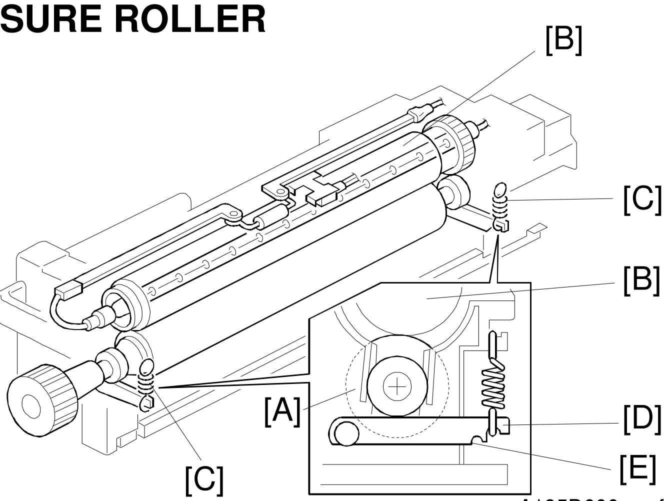
The entrance guide [A] for this machine has three holes on each side to adjust for thick or thin paper. Normally, the outer screw hole [B] on each side is used.

For thin paper, move the entrance guide up by securing it with screw holes [C]. This slightly lengthens the paper path which prevents the paper from creasing in the fusing unit.

For thick paper, move the entrance guide down (use the outer screw holes [B]). This is because the lower setting allows more direct access to the gap between the hot and pressure rollers. This prevents thick paper from buckling against the hot roller, which can cause blurring at the leading edge of the copy. Also, thick paper does not bend as easily, and is therefore less prone to creasing.

The inner screw holes [D] are spare in case the other screw holes get damaged.

10.4 PRESSURE ROLLER

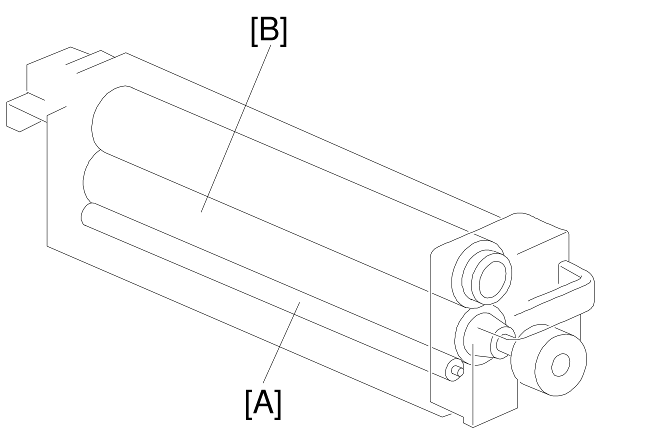


A195D600.wmf

The pressure roller [A] is made of silicone rubber with a teflon tube coating. The pressure springs [C] constantly apply pressure between the hot roller [B] and the pressure roller.

The pressure can be changed by adjusting the position of the pressure springs. The upper position [D] is the normal setting. The lower position [E] increases the pressure and this prevents insufficient fusing by the fusing unit.

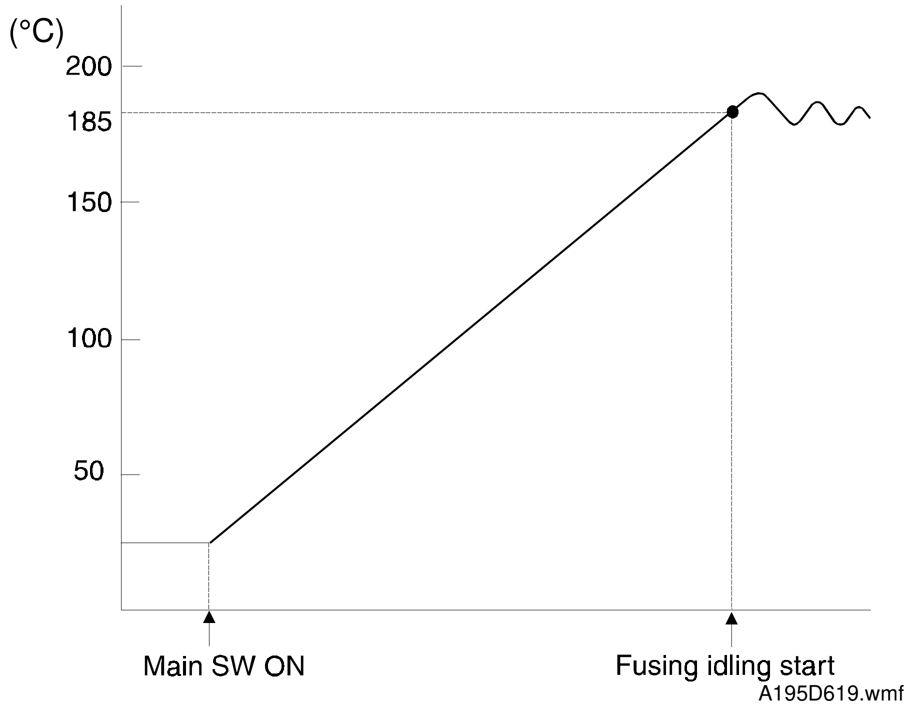
10.5 CLEANING MECHANISM



A195D575.wmf

The cleaning roller [A] is always in contact with the pressure roller [B]. It collects toner and paper dust adhering to the surface of the pressure roller. This is because the cleaning roller is made of metal and collects adhering matter more easily than the pressure roller (which has a teflon coating).

10.6 FUSING TEMPERATURE CONTROL



When the main switch turns on, the CPU checks the mains frequency for 500 ms; this is done in case phase control mode is selected later. Then the CPU turns on the fusing lamp.

After the main switch has been turned on, the copier starts fusing idling for about 30s when the thermistor detects the operating fusing temperature (185°C). When fusing idling mode is disabled, fusing idling is not done, regardless of the fusing temperature when the main switch is turned on.

NOTE: Fusing idling can be enabled or disabled with SP 1103. In this machine, it is normally disabled because the copy speed is not high enough to require it.

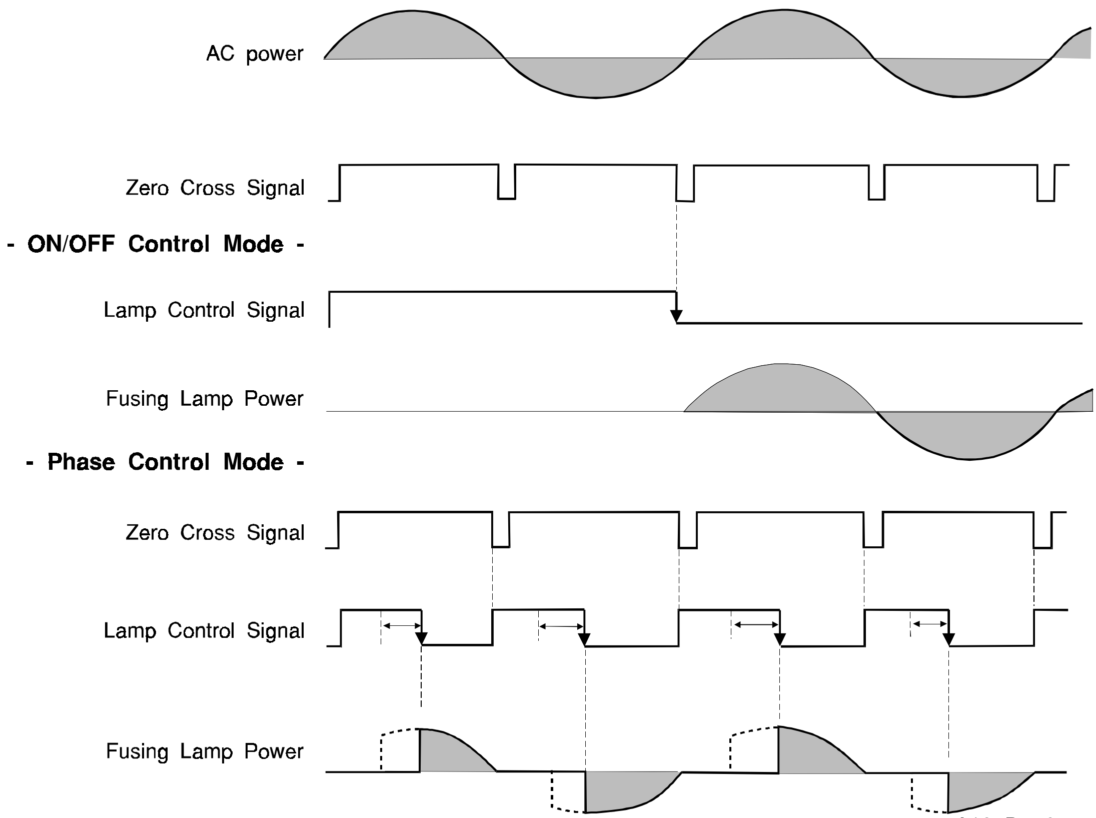
If the fusing lamp is turned on while the exposure lamp is on, the power supplied to the exposure lamp may fluctuate, possibly degrading the copy quality. To prevent this, in this machine, the fusing lamp can either stay off or change from on to off while the exposure lamp is on.

There are two types of fusing unit control: on/off control, and phase control. The mode can be selected with SP1104.

- On/Off Control -

When the thermistor detects the operation temperature, the fusing lamp is turned off. After that, the CPU keeps the operation temperature constant by turning the lamp on and off. This is the default setting.

- Phase Control Mode -



A195D576.wmf

In on/off control mode, the ac drive board supplies full ac power to the fusing lamp.

In phase control mode, the fusing controller on the BCU board controls the lamp control signal duty cycle which in turn affects the duty cycle of the fusing lamp supply.

When the main switch is turned on, the BCU board starts to output the lamp control signal, which is generated from the zero cross signal.

The duty cycle of the lamp control signal depends on the temperature of the hot roller. When the hot roller temperature is low, the lamp control signal pulse will be wider to increase the temperature. Conversely, if the roller temperature is high, the duty cycles will be smaller to reduce the temperature.

Phase control mode should be selected only if the user has a problem with electrical noise on the same circuit or interference.

10.7 OVERHEAT PROTECTION

If the hot roller temperature reaches higher than 230°C, the CPU cuts off the power to the fusing lamp. At the same time, SC543 will be generated.

Even if the thermistor overheat protection fails, there is a thermofuse in series with the common ground line of the fusing lamp. If the temperature of the thermofuse reaches 169°C, the thermofuse opens, removing power from the fusing lamp. At the same time, the copier stops operating.

10.8 ENERGY SAVER FUNCTIONS

Note: This explanation is for the 230V machine. The energy saver function for the 115V machine is explained in section 12-2 (Energy Star) in more detail.

When the copier is not in use, the energy saver function reduces power consumption by decreasing the fusing temperature.

If the low power timer (UP mode) runs out, the copier automatically enters low power mode. The fusing lamp switches off until the lamp reaches the temperature selected with SP5920. The lower this temperature is, the longer the waiting time until the copier returns to the ready condition.

Also, when the Clear Modes/Low Power Mode key is held down for over 1 s, the copier goes into the low power mode. The Low Power indicator turns on and all the other indicators turn off.

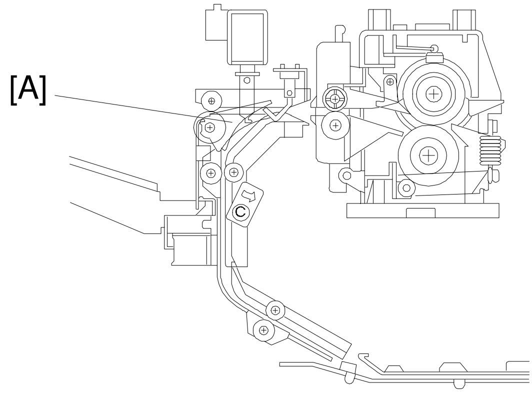
In low power mode, the copier returns to the ready condition if someone stands at the front of the copier (in other words, when the Auto Response sensor is activated).

The programming modes for this function are shown in the following table.

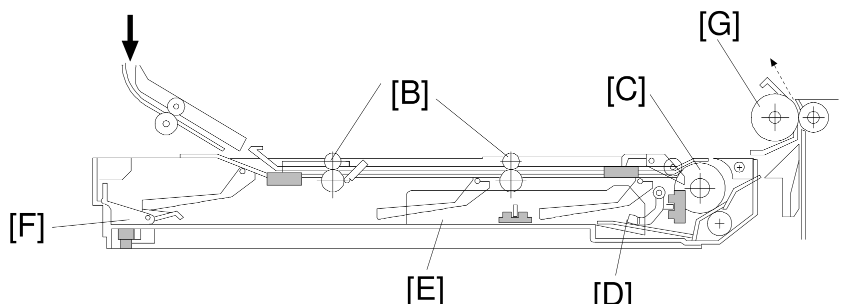
Mode	Method	Selectable values	Default	Unit/Step
Auto OFF Timer	This function only works in 115V models.			
Low Power Timer	UP mode	0 ~ 180 s	60 s	10 s
Fusing temp. in the low power mode	SP 5920	170 °C 155 °C 125 °C 100 °C	170 °C	
Duplex Mode Priority	UP mode	1 sided to 1 sided 1 sided to 2 sided 2 sided to 2 sided	1 sided to 1 sided	
Auto OFF Mode	SP 5303	This function only works in 115V models.		

11. DUPLEX

11.1 OVERVIEW



A195D577.wmf



A195D578.wmf

The duplex tray is used for multiple two-sided and single two-sided copying.

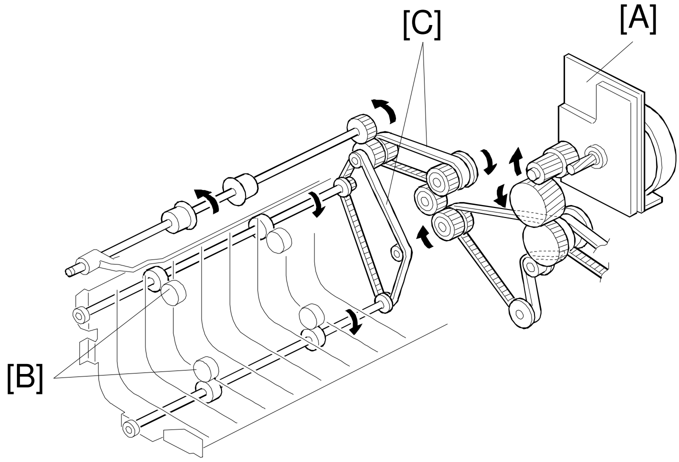
The junction gate [A] rotates up 1.1 seconds after the registration clutch turns on, and the copy passes to the duplex tray. Shortly after the fusing exit sensor detects the leading edge of the paper, the entrance rollers [B] and duplex feed roller [C] start to rotate. At the same time, the duplex bottom plate [D] lowers.

The copy feeds over the duplex feed roller and into the tray. The jogger fences [E] and end fence [F] move inward to square the copy stack, then they move back 10.5 mm from the paper stack. After the final copy is delivered to the stack area, the jogger and end fences remain against the paper stack.

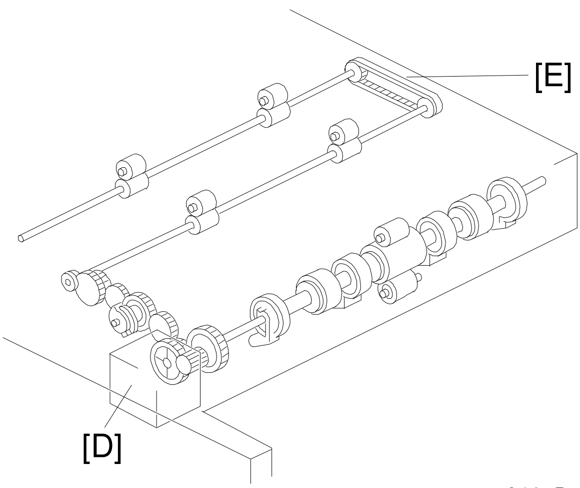
Soon after the final copy is squared, the duplex bottom plate lifts to the paper feed position and the duplex feed roller starts rotating counterclockwise to feed the top copy to the relay rollers [G]. The second side is then copied with the copy following the paper tray feed station paper path.

For a diagram of the paper feed path, see "Paper Path - Duplex Copying" in the Overall Machine Information section.

11.2 DRIVE MECHANISM



A195D611.wmf

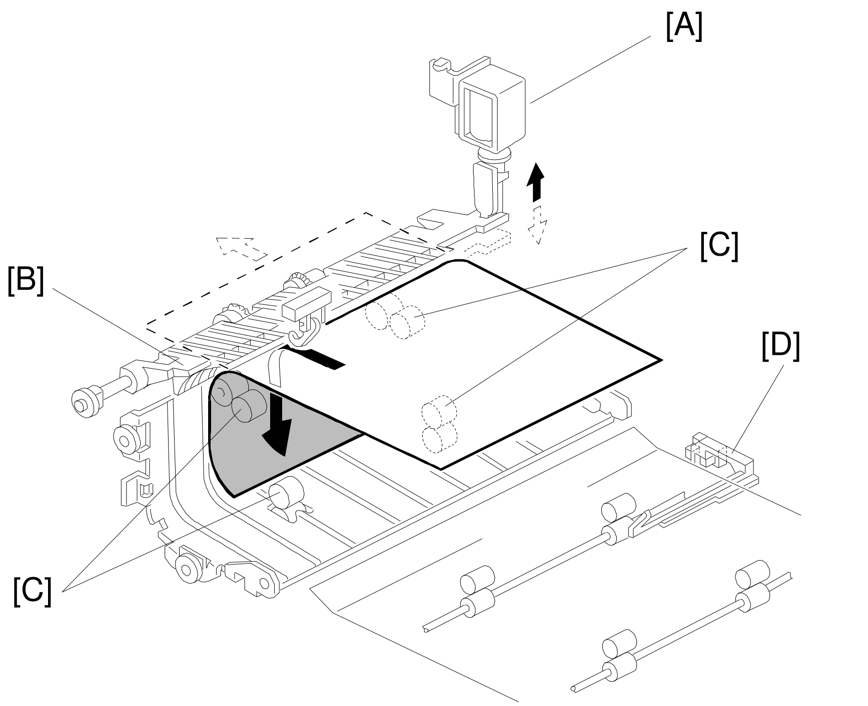


A195D579.wmf

The main motor [A] drives the transport rollers [B] through the timing belts [C]. All rollers in the duplex tray are driven by the duplex feed motor [D] through a series of gears and a timing belt [E]. Helical gears are used to reduce noise.

The duplex feed motor also drives the duplex bottom plate up and down.

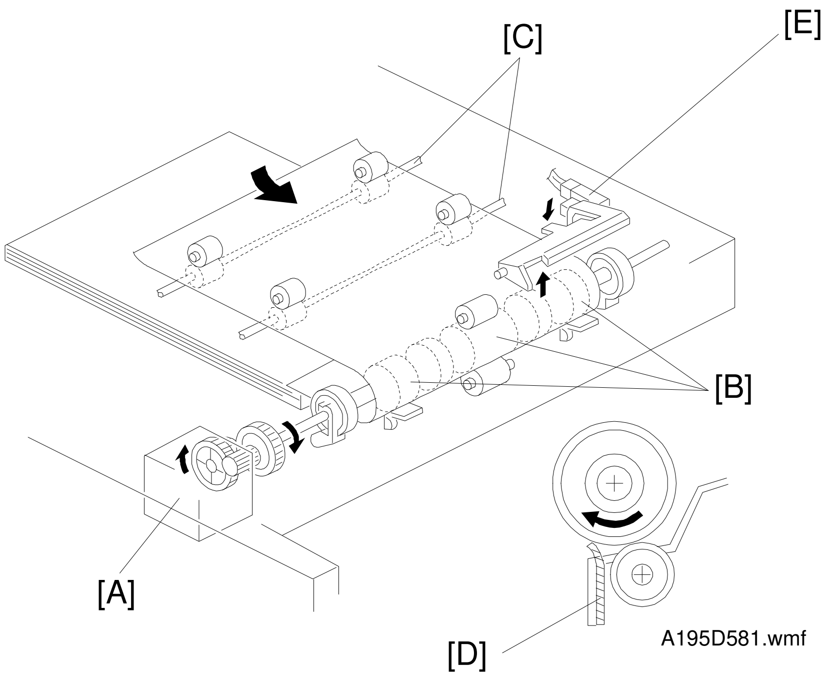
11.3 TURN GUIDE



The junction gate solenoid [A] is energized 1.1 seconds after the registration clutch has been turned on. Then, the junction gate [B] rotates upwards to direct the copy paper to the duplex turn guide. The junction gate solenoid stays on until the first side copies are stacked in the duplex tray.

The copy is then directed out of the duplex tray back into the copier by the transport rollers [C] to start the second side copying. There is a duplex entrance sensor [D] for paper misfeed detection.

11.4 DUPLEX ENTRANCE TO DUPLEX TRAY

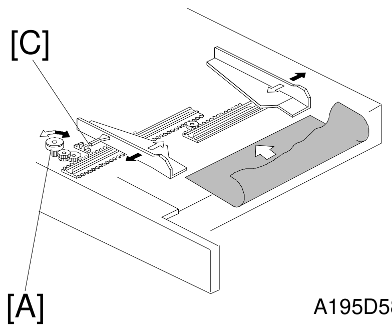


The duplex feed motor [A] starts turning 500 ms after the leading edge of the paper activates the fusing exit sensor. This motor drives the duplex feed rollers [B] and the duplex transport rollers [C]. The copy paper from the turn guide is directed to the duplex tray through these rollers.

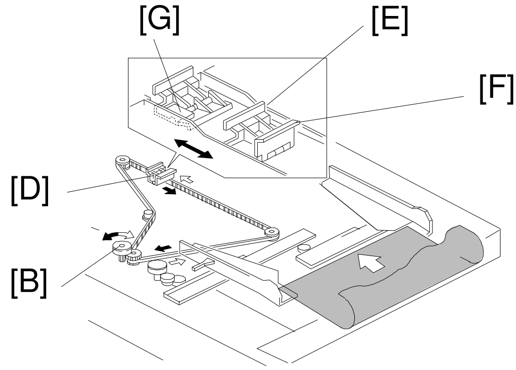
The tip of the flip mylar [D] moves to the left (front view) when the duplex feed rollers rotate to feed the copy into the duplex tray. The mylar presses the copy against the duplex feed rollers, ensuring that the trailing edge of the copy clears the guide plate.

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

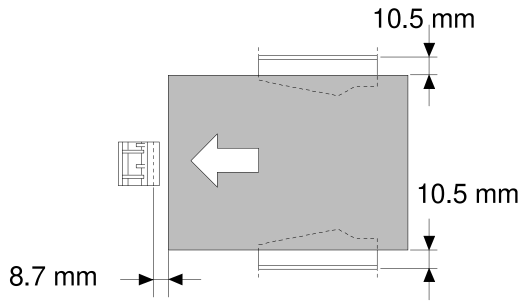
11.5 DUPLEX STACKING



A195D582.wmf



A195D583.wmf



A195D584.wmf

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 fences allows the duplex tray to handle all paper sizes from A3/11" x 17" to A5/ 81/2" x 51/2" sideways.

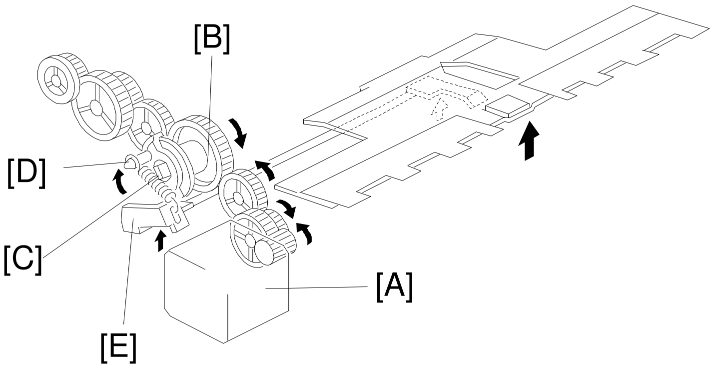
There are two home position sensors. One is for the jogger fences [C], and the other is for the end fence [D]. When the main switch turns on, the side fence jogger motor and the end fence jogger motor rotate to place the jogger fences and the end fence at their home positions.

When the registration clutch turns on, the side fences move 10.5 mm, and the end fence moves 8.7 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 after the duplex turn sensor detects the trailing edge of the copy paper. (The duplex turn sensor is [E] 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 [E] is for A3/11 x 17" size paper. The other [F] 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 (as seen from the operation side of the machine) and the B4 end fence rotates down as it is pressed against the end fence stopper [G].

11.6 PAPER FEED FROM THE DUPLEX TRAY

11.6.1 Tray Lift Mechanism



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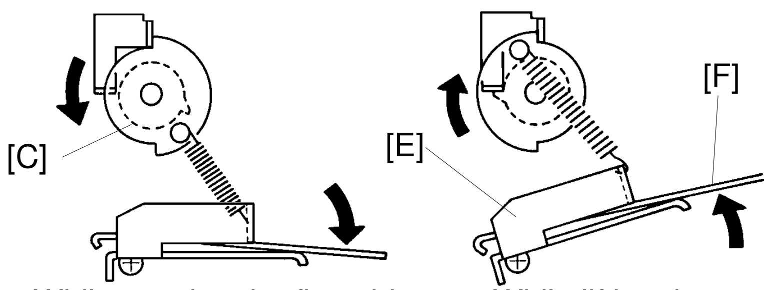


A195D586.img

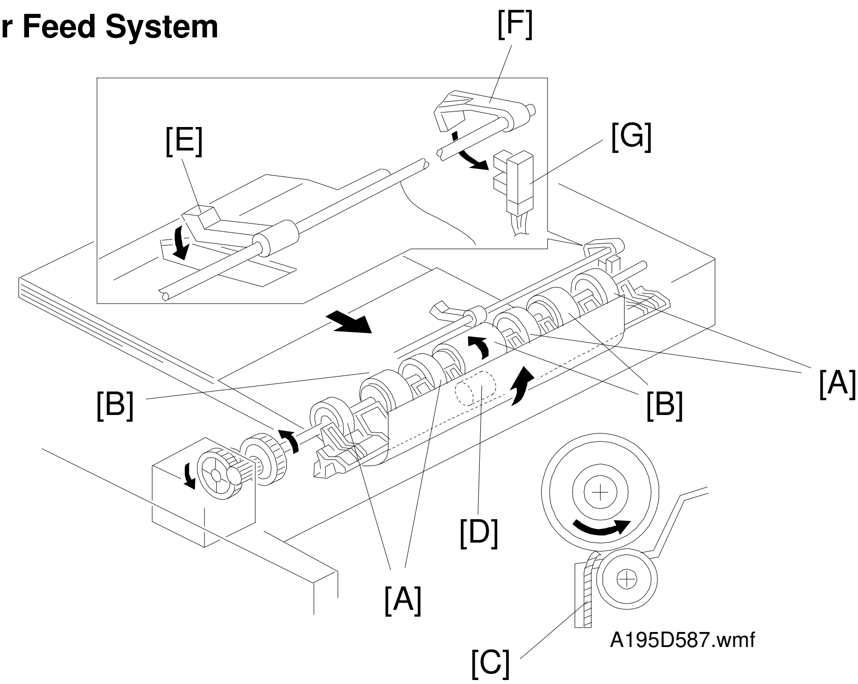
After the first side copies have been made, the duplex feed motor [A] changes direction, and the cam clutch gear [B] lifts up the duplex bottom plate through a series of gears.

While the first side is being copied, the duplex feed motor is rotating clockwise and the cam clutch gear is rotating counter clockwise (see the above drawing).

When all copies have been stacked in the duplex tray, the duplex feed motor rotates counterclockwise, and the cam clutch gear rotates clockwise. The cam clutch [C] also rotates clockwise because of the spring inside the clutch. The pin [D] on the clutch lifts up the duplex lift lever [E] through a spring, raising the duplex bottom plate [F].

When the duplex feed motor rotates clockwise again, the cam clutch rotates counterclockwise, and the bottom plate lowers.

11.6.2 Paper Feed System



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 counterclockwise 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 friction roller [D]. As the friction 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 friction roller functions in the same way as a friction pad does.

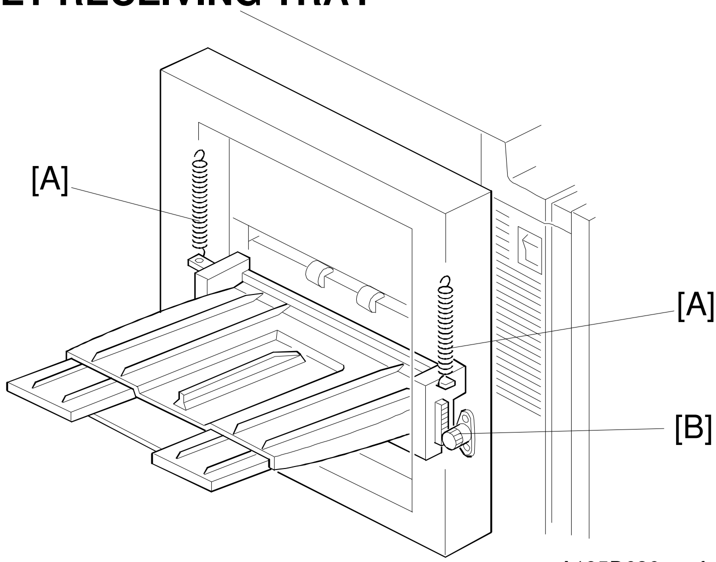
After that, the paper leaving the duplex tray for copying the second side follows the paper tray feed station paper path.

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]. The sensor sends the signal to the cpu to stop the next paper feed cycle.

For a diagram of the paper feed path, see "Paper Path - Duplex Copying" in the Overall Machine Information section.

12. OTHERS

12.1 500-SHEET RECEIVING TRAY



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The 500-sheet receiving tray is available as an option.

The tray holder is suspended by springs [A]. After about 200 copies (A4/LT) have been stacked on the tray, the copy tray starts to move down because of the paper weight.

The tray holder has a rack gear that contacts the damper gear [B]. When copies are taken from the tray, the springs pull the tray back up. However, the damper gear resists the upward pull of the springs and the tray rises slowly.

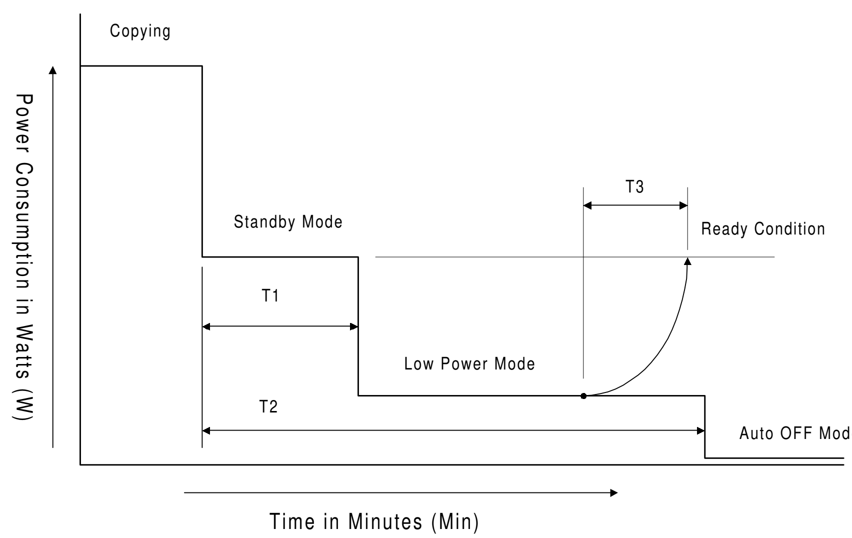
12.2 ENERGY STAR

12.2.1 Overview

This Energy Star specifications set by the USA Environmental Protection Agency (EPA - Tier 2) are effected only for the 115V machine. This machine has the following three modes: Low Power Mode, Auto OFF mode, and Duplex Default Mode. Details are as follows.

12.2.2 Low Power Mode

When the copier is not in use, the energy saver function reduces power consumption by decreasing the fusing temperature. If the low power timer (set using UP mode) runs out, the copier automatically enters the low power mode. The fusing lamp switches off until the fusing unit reaches the temperature selected with SP5920. The lower this temperature is, the longer the waiting time until the copier returns to the ready condition.



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T1: Low Power Mode Timer (UP mode)
Default = 15 minutes
Adjustment range = 1 ~ 120 minutes

T2: Auto OFF Timer (UP mode)
Default = 60 minutes
Adjustment range = 10 ~ 120 minutes

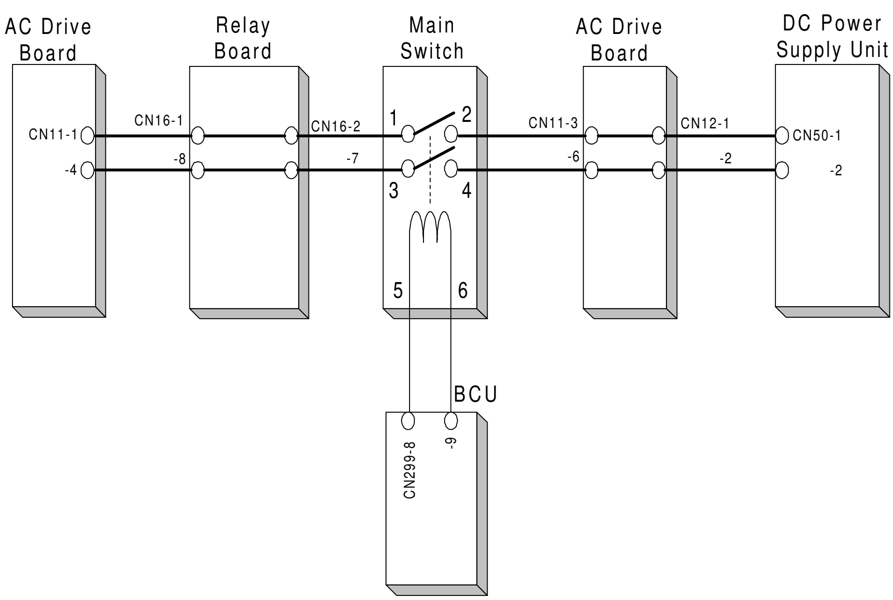
T3: Recovery Time: 30 s or less

12.2.3 Auto OFF Mode

When the main controller board is not installed

When the Auto OFF timer expires (the default is 60 minutes), the machine cuts all power to the copier. The Auto OFF timer can be programmed with UP mode. The power is re-supplied when the main switch is turned back on. The longer the machine has been off, the longer it will take to return to a ready condition.

To automatically turn off the machine, a new type of main switch with an incorporated coil is used. When the CPU drops CN299-9 from +24 to 0, the main switch contacts are opened. The wiring diagram and connector layout are shown below.



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When the main controller board is installed

If the main controller board is installed, the Auto OFF mode is disabled by the main controller board. This is because with the main board installed, the machine can work as a network printer, and Auto Off Mode must be disabled in a network printer.

12.2.4 Programming Modes

The following table shows the programming modes for the energy star function.

Mode	Method	Selectable values	Default	Unit/Step
Auto OFF Timer	UP mode	10 ~ 120 min	60 min	10 min
Low Power Timer	UP mode	1 ~ 120 min	15 min	1 min
Fusing temp. in the low power mode	SP 5920	125 °C 100 °C	125 °C	
Duplex Mode Priority	UP mode	1 sided to 1 sided 1 sided to 2 sided 2 sided to 2 sided	1 sided to 2 sided	
Auto OFF Mode (see Note)	SP 5303	Enabled Disabled	Enabled	

NOTE: The auto off mode should be disabled for all countries except for the USA. This is because the Enegy Star specifications are required only for the USA. If this mode is disabled, the selectable values for the auto off timer will be changed to "0 ~ 120 min". The auto off function is disabled if "0 min" is selected.

12.3 PRODUCT NAME AND DEVICE NAME

12.3.1 Overview

The product name is used as a response when the host machine inquires using PostScript for Macintosh.

The device name is used for the SCSI device name on the SCSI bus.

Also, the product name will be used for the demo page from the this machine.

This information is stored in the SCU.

The product name or device name is forwarded to the host PC through the main controller, depending on the type of data requested from the host PC.

12.3.2 Programming Mode

The following table shows the programming mode for the production name and device name.

Mode	Method	Entry	Brand Name	Product Name	Device Name	
					Vender ID	Product ID
OEM Code Setting	SP 5818	0	Ricoh	Ricoh Aficio 401	Ricoh	Aficio 401
		1	NRG	NRG D440/2840/3240	NRG	D440/2840/3240
		2	Not used			
		3	Savin	Savin 9940DPC	Savin	9940DPC
		4	Not used			
		5	Infotec	infotec 5402 MF	infotec	5402MF
		6	Lanier	Lanier 5040 MFD	Lanier	5040MFD

NOTE: This only needs to be registered if the NVRAM on the SCU is defective.

SECTION 3

INSTALLATION

1. INSTALLATION REQUIREMENTS

1.1 ENVIRONMENT

1. Temperature Range: 10°C ~ 30°C
2. Humidity Range: 15% ~ 90%
3. Ambient Illumination: Less than 1,500 lux (Do not expose to direct sunlight.)
4. Ventilation: 30 m^3/hr/person
5. Ambient Dust: Less than 0.10 mg/m^3 (2.7 x 10^{-6} oz/yd^3)
6. If the place of installation is air-conditioned or heated, place the machine:
   a) where it will not be subjected to sudden temperature changes.
   b) where it will not be directly exposed to cool air from an air conditioner.
   c) where it will not be directly exposed to heat from a heater.
7. Do not place the machine where it will be exposed to corrosive gases.
8. Do not install the machine at any location over 2,000 m (6,500 feet) above sea level.
9. Place the copier on a strong and level base.
10. Do not place the machine where it may be subjected to strong vibration.

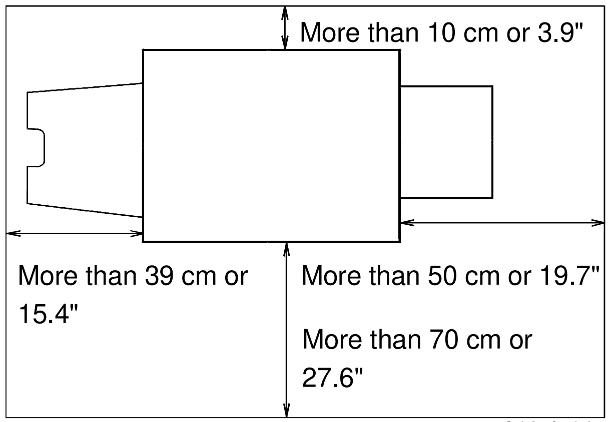
1.2 MACHINE LEVEL

1. Front to back: Within 5 mm (0.2") of level
2. Right to Left: Within 5 mm (0.2") of level

1.3 MINIMUM SPACE REQUIREMENTS

Place the copier near a power source, providing clearance as shown.

– Copier –



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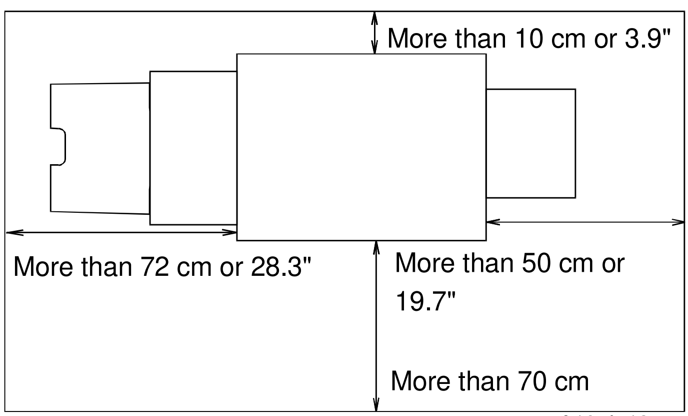
– Copier with the optional finisher–



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1.4 POWER REQUIRMENTS

⚠ CAUTION
A. Be sure to ground the machine.
B. Make sure the plug is firmly inserted in the outlet.
C. Avoid multi-wiring.

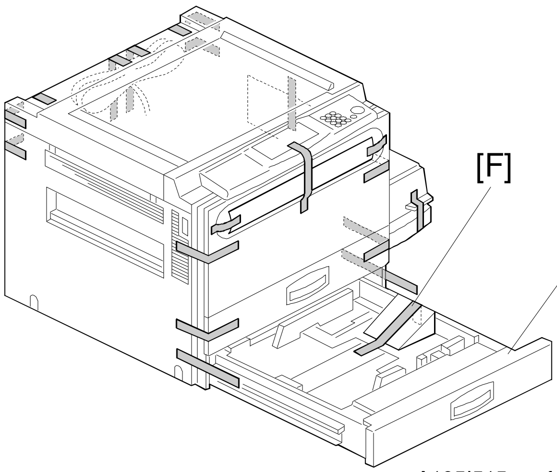
1. Input voltage level:
   120V, 60Hz: More than 12A
   220V ~ 240V, 50 Hz/60Hz: More than 7A
2. Permissible voltage fluctuation: ±10%
3. Do not set anything on the power cord.

2. COPIER INSTALLATION

2.1 ACCESSORY CHECK

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

Description	Qt'y
1. Paper Size Decal	1
2. Operating Instructions (except for -27 machines)	1
3. New Equipment Condition Report	1
4. User Survey Card (-17 machines only)	1



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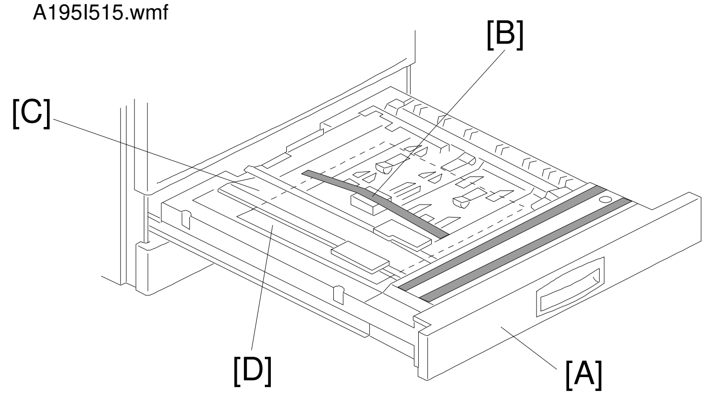

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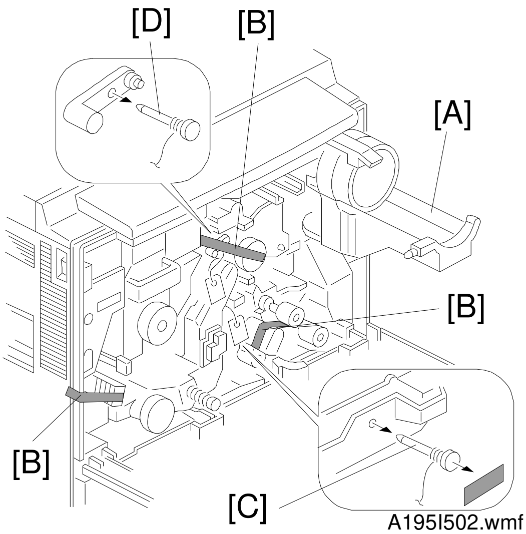
NOTE: 1) Keep the shipping retainers after installing the machine. They will be reused if the machine is moved to another location in the future.
2) Never lift the machine by holding the LCT, or the LCT will break.

1. Remove the strips of tape.
2. Pull out the duplex tray [A] and remove the strips of tape.
3. Remove the guide roller stopper [B].
4. Open the lower duplex guide plate [C] and remove the sheet of paper [D].
5. Install the duplex tray in the machine.
6. Pull out the paper tray [E], and remove the strips of tape and the bottom plate stopper [F]. Then install the paper tray in the machine.



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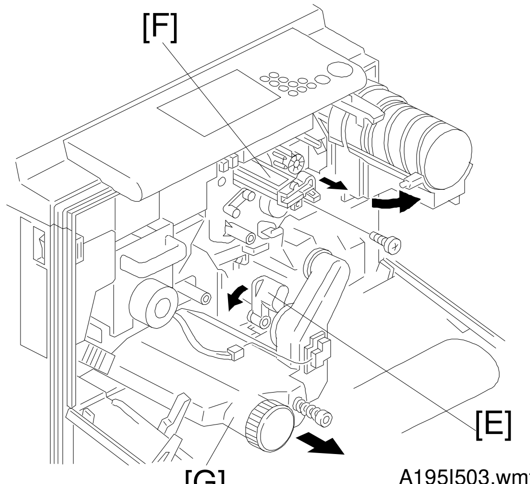

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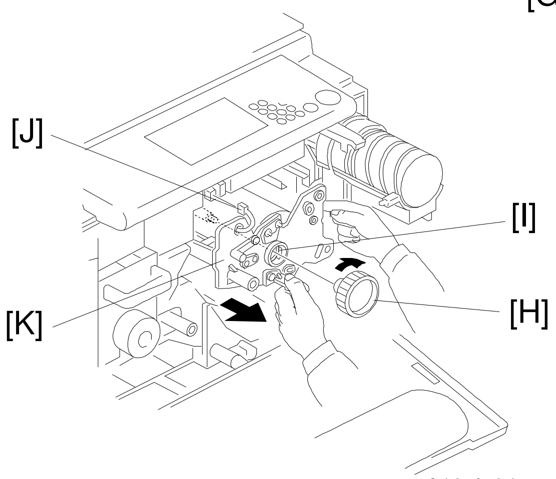

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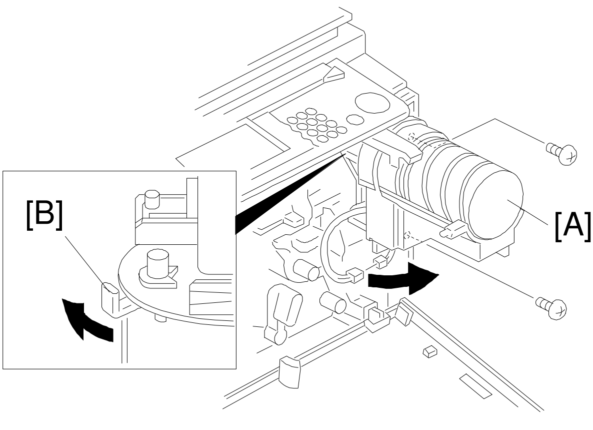
7. Open the front cover and swing out the toner bottle holder [A].
8. Remove the strips of tape [B].
9. Remove transfer belt release pin [C] and cleaning blade release pin [D].

   NOTE: Put back pins [C] and [D] before transporting the machine to a new location.

10. Turn the "A1" lever [E] counterclockwise to lower the transfer belt unit.
11. Remove the charge corona unit [F] (1 screw).
12. Remove the toner collection bottle [G] (1 connector).
13. Remove the drum knob [H] and drum bushing [I].
14. Disconnect the ID sensor harness [J] and carefully slide out the drum unit [K] until the front guide plate releases from the positioning pins.
15. Move the development unit to the right so that the development unit is away from the drum, then slide out the drum unit completely.



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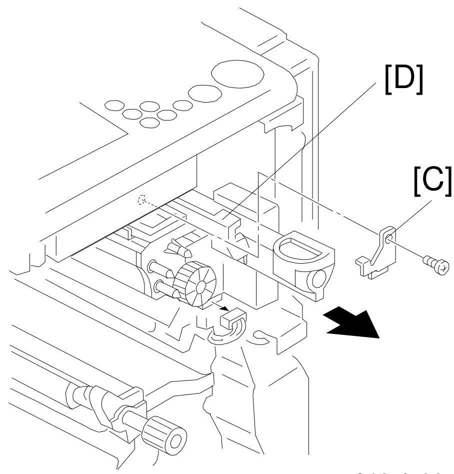

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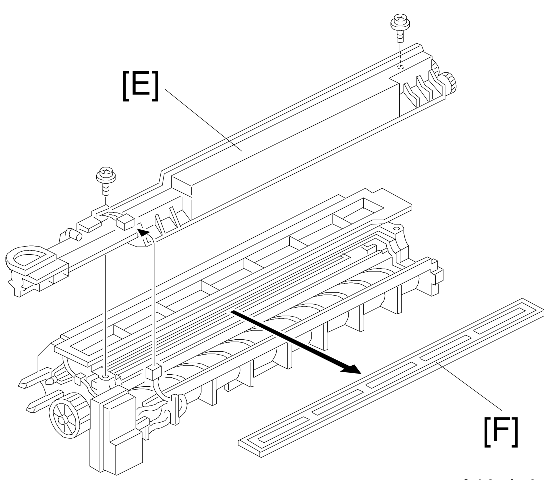
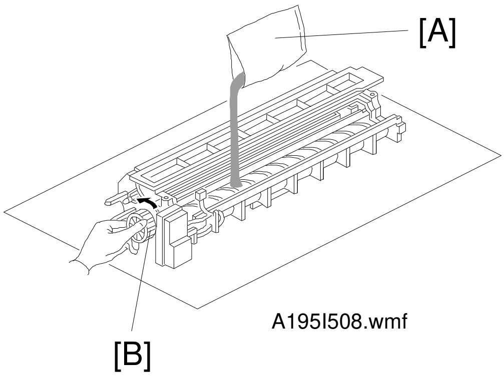
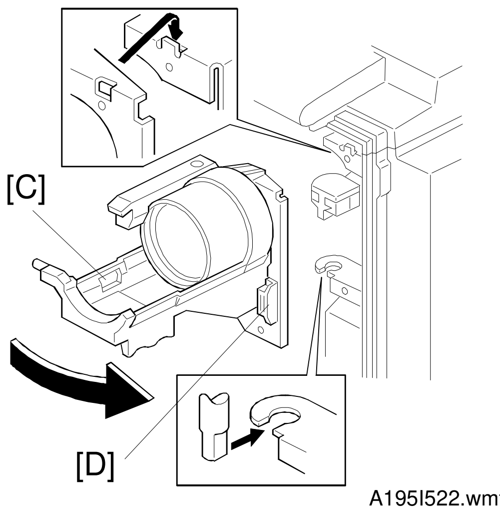


A195I507.wmf

16. Remove the toner bottle holder [A] (2 screws, 1 connector).
17. Turn the shutter lever [B] of the toner bottle holder as shown.
18. Remove the development unit stopper [C] (1 screw).
19. Pull out the development unit [D] (1 connector). Then place it on a clean sheet of paper.
20. Remove the toner supply unit [E] (2 screws, 1 connector).
21. Remove the development filter [F].





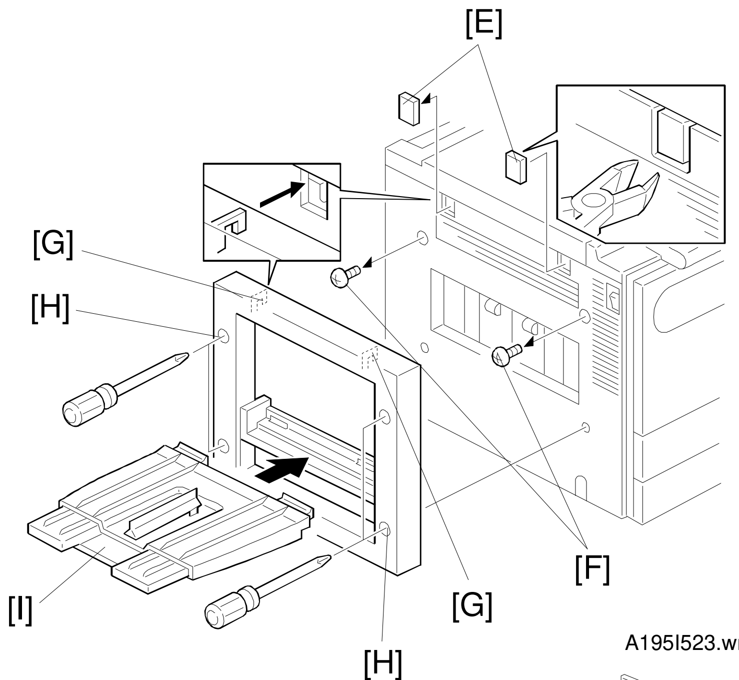
22. Pour about half a pack of developer [A] into the development unit. Then rotate the knob [B] as shown to distribute the developer evenly. Then pour in all the remaining developer and rotate the knob again.

    NOTE: To prevent the developer from spilling, do not rotate the knob in the other direction.

23. Attach the toner supply unit to the development unit.
24. Install the development unit in the copier and put back the stopper ([C] that was removed in step 18).

    NOTE: Be careful not to damage the bias wire.

25. Move the development unit to the right so that the development unit is away from the drum. Then install the drum unit.
26. Make sure that the toner bottle holder [C] and the toner bottle holder bracket [D] are at right angles as shown above. If not, swing the toner bottle holder out in the direction of the big arrow in the diagram.
27. Install the toner bottle holder.
28. Install the charge corona unit.
29. Install the toner collection bottle.
30. Install the toner bottle by following the instructions on the reverse side of the front cover.
31. Swing the toner bottle holder into its original position and close the front cover.



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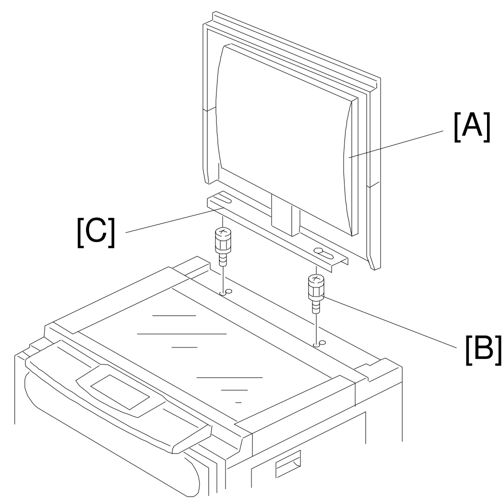

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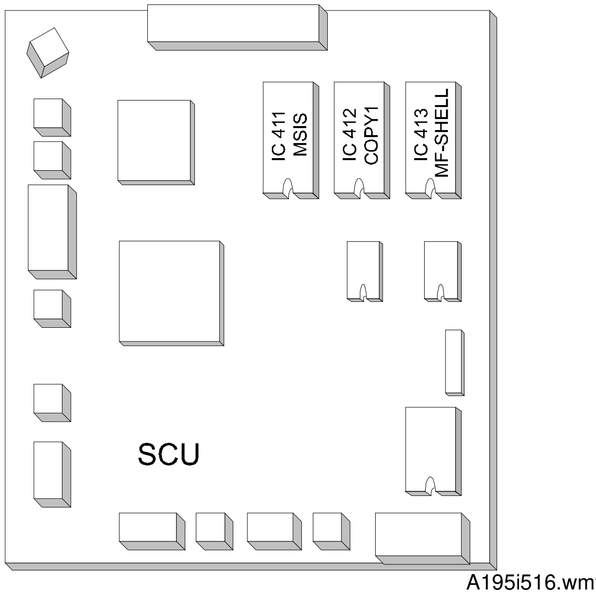
32. Install the 500-sheet copy tray if required:
    1) Remove caps [E] with nippers.
    2) First, remove the screws [F], and fit the hooks [G] on the copy tray unit into the openings. Then tighten the screws [H] that are built into the copy tray unit.
    3) Install the copy tray [I].
33. Install the optional platen cover [A] as shown if required:
    1) Install two stud screws [B] on the top cover.
    2) Position the platen cover bracket [C] on the stud screws and slide it to the left.



Steps 34 through 36 are for the 220 ~ 240 V machine only.

34. Remove the rear cover.

35. Install the three ROMs which contain the language kit in the IC411, IC412, and IC413 sockets on the SCU board (the lower left PCB as viewed from the rear of the machine).
    The "IC411" ROM should be put in the IC411 socket.
    The "IC412" ROM should be put in the IC412 socket.
    The "IC413" ROM should be put in the IC413 socket.

    NOTE: Do not bend the pins of the ROMs.
    Do not install the ROMs the wrong way round.

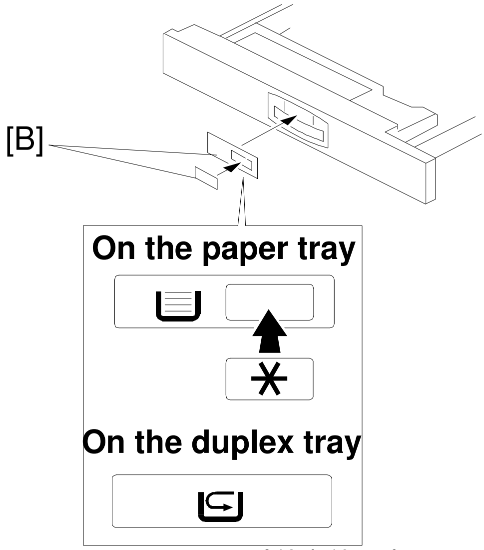
36. Put the rear cover back on the machine.

37. Plug in the copier and turn on the main switch.

38. After finishing warming up (after the main motor stops), enter SP mode as follows:
    1) Press the "Clear Modes" key.
    2) Enter "107" using the numeric keys.
    3) Hold down the "Clear/Stop" key for more than 3 seconds.

39. Perform the TD sensor initial setting as follows:
    1) Enter "2801" and press the "Enter" key.
    2) Touch "Start" on the LCD.

    NOTE: The machine will automatically stop when TD sensor initial setting is completed.



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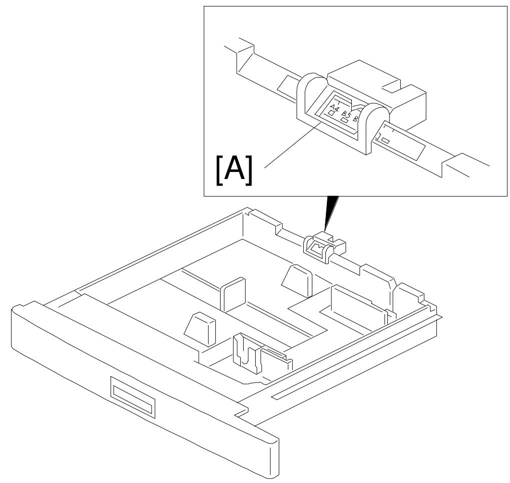

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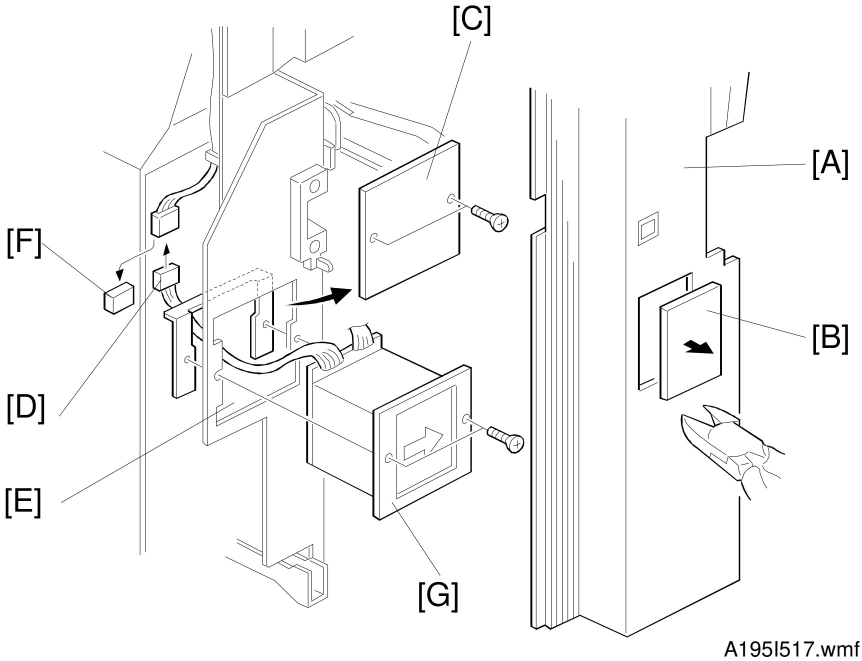
40. Perform the free run procedure as follows:
    1) Enter "5802" and press the "Enter" key.
    2) Touch "ON" on the LCD then touch "Copy Mode" on the LCD.
    3) Set the number of copies at 50.
    4) Close the platen cover or the ADF then press the "Start" key.
    5) After finishing the free run, touch "SP Mode" on the LCD.
    6) Touch "Quit" on the LCD to leave SP mode.
41. Pull out the paper tray and load paper into it (the paper size and orientation should be as specified by the customer).

    NOTE: The side and rear fences should be properly positioned.
42. Select the appropriate paper size for the paper tray by sliding the paper size slider [A] into the correct position.

    NOTE: A non-standard paper size can be selected with a UP mode (See the Paper Size Selection section).
43. **When the optional Paper Feed Unit is installed:** Enter the proper paper size for each paper tray using a UP mode. (See the Paper Size Selection section.)
44. Attach the appropriate paper size decals [B] to the paper trays. Also, attach the duplex decal to the duplex tray.

    NOTE: Paper size decals are also used for the optional paper feed unit. Keep any remaining decals for use with the paper feed unit.
45. Check the copy quality and machine operation.

2.2 KEY COUNTER (OPTION)

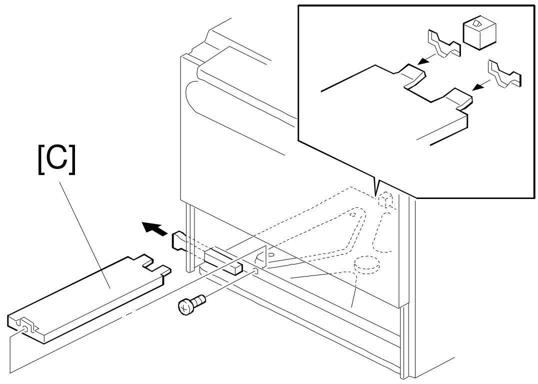


⚠ CAUTION

Unplug the copier power cord before starting the following procedure.

1. Remove the right cover [A]. (See "Replacement and Adjustment - Outer Cover Removal".)
2. Remove the cap [B] with nippers.
3. Remove the key counter cover [C] (2 screws)
4. Pass the key counter holder connector [D] through the opening [E].
5. Disconnect the connector [F] and connect the key counter holder connector.
6. Mount the key counter holder [G] (2 screws).
7. Reassemble the machine and check the key counter's operation.

2.3 TRAY HEATER (OPTION)



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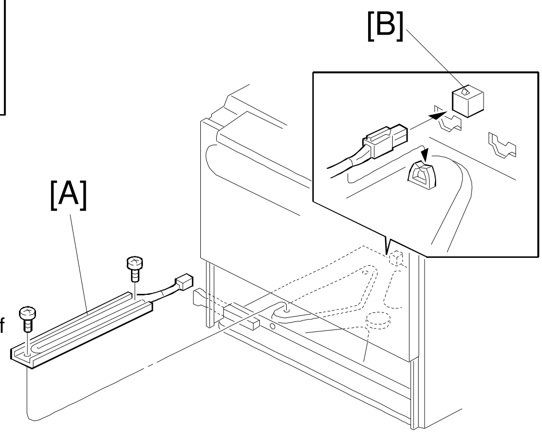


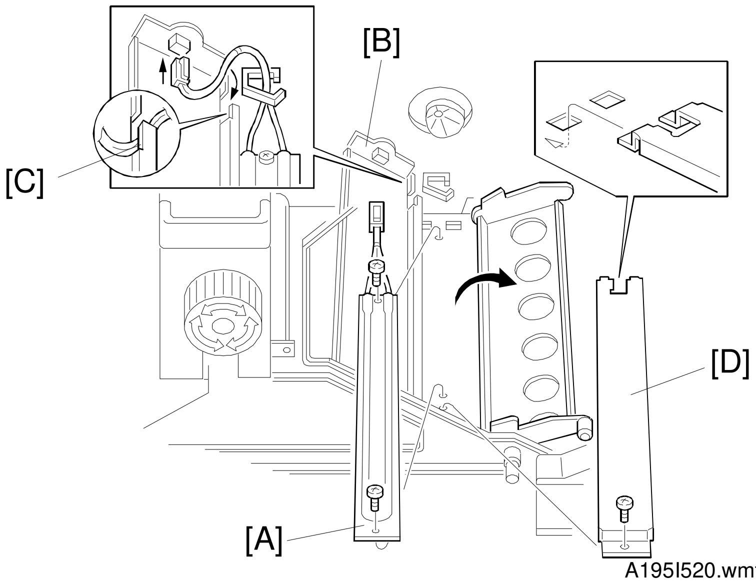
A195I519.wmf

⚠ CAUTION
Unplug the copier power cord before starting the following procedure.

1. Remove the duplex unit. (See "Replacement and Adjustment - Duplex Unit Removal".)
2. Remove the paper feed tray. (See "Replacement and Adjustment - Paper Feed Tray Removal".)
3. Install the tray heater [A] (2 screws).
4. Connect the connector of the heater to the copier’s connector [B] which is mounted on the rear frame.
5. Fit the heater harness into the clamper.
6. Install the heater cover [C] (1 screw).
7. Reassemble the machine.
8. Check the printer side-to-side registration for the 1st paper feed station (SP1002-2) and the duplex unit (SP1002-1).

   NOTE: Tell the customer that even when the copier’s main switch is turned off, the copier power cord should be plugged in. Otherwise, the tray heater will not function.

2.4 DRUM HEATER (OPTION)



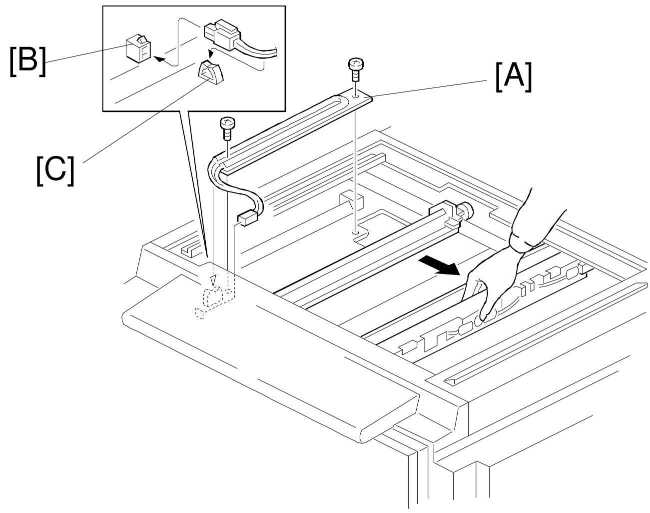
⚠ CAUTION
Unplug the copier power cord before starting the following procedure.

1. Remove the transfer the belt unit. (See "Replacement and Adjustment - Transfer Belt Unit Removal".)
2. Move the "A1" lever clockwise.
3. Install the drum heater [A] (2 screws).
4. Connect the connector of the heater to the copier’s connector [B] which is mounted on the rear frame.
5. Fit the heater harness into the clamper.

   NOTE: Route the heater harness under the hook [C].
6. Install the heater cover [D] (1 screw).
7. Reassemble the machine.

   NOTE: Tell the customer that even when the copier’s main switch is turned off, the copier power cord should be plugged in. Otherwise, the drum heater will not function.

2.5 OPTICS ANTI-CONDENSATION HEATER (OPTION)



A195I521.wmf

⚠ CAUTION
Unplug the copier power cord before starting the following procedure.

1. Remove the exposure glass. (See "Replacement and Adjustment - Exposure Glass Removal".)
2. Move the 1st scanner to the center of the scanner unit.
3. Install the optics anti-condensation heater [A] (2 screws).
4. Connect the connector of the heater to the copier’s connector [B] which is mounted on the front frame of the scanner unit.
5. Fit the harness into the clamper [C].
6. Reassemble the machine.

   NOTE: Tell the customer that even when the copier’s main switch is turned off, the copier power cord should be plugged in. Otherwise, the optics anti-condensation heater will not function.

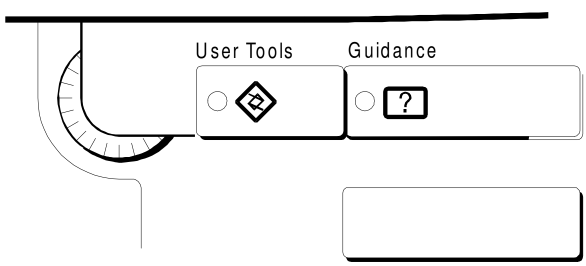
3. PAPER SIZE SELECTION

3.1 OPTIONAL PAPER FEED UNIT

The paper size for the paper feed unit can be selected with User Program mode.

You can select paper of the following sizes:

Metric version	Inch version
A3, B4, A4, B5 11" x 17", 81/2" x 14", 81/2" x 11", 8" x 10", 8" x 13", 81/2" x 13", 81/4" x 13"	11" x 17", 81/2" x 14", 81/2" x 11", 11" x 15", 10" x 14", 8" x 101/2", 8" x 10", A3, B4, A4, 8" x 13", 81/2" x 13", 81/4" x 13"



A195I512.wmf

1. Press the User Tools key.
2. Touch the Basic Settings key.
3. Touch the Next key three times to reach the paper size setting menu.
4. Find the paper tray (2, 3, or 4) and touch the Change key. Select the new paper size by touching a key. Then touch the Exit key.
5. Press the User Tools key.

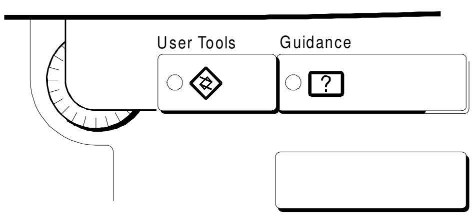
3.2 1ST TRAY - NON-STANDARD PAPER SIZE SELECTION

For the 1st tray, a wider range of paper sizes can be selected with User Program mode.

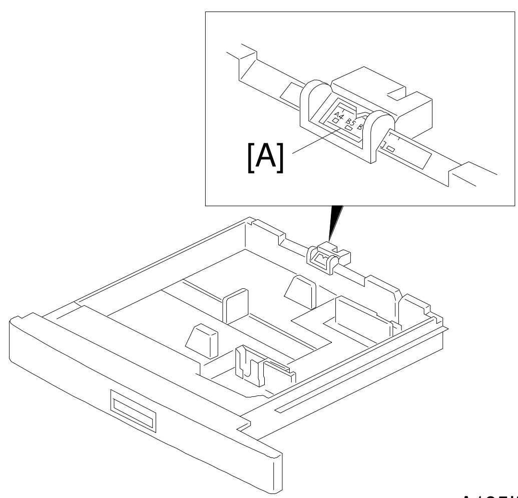
If a non-standard paper size is selected, the machine ignores the paper size set with the paper size slider.

You can select paper of the following sizes:

Metric version	Inch version
11" x 17", 81/2" x 14", 51/2" x 81/2", 8" x 10"	11" x 15", 10" x 14", 8" x 101/2", 8" x 10", B4



A195I512-2.wmf



A195I511-2.wmf

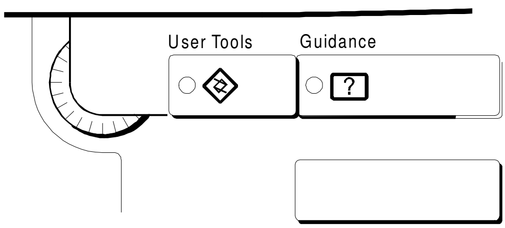
1. Slide the paper size slider [A] on the paper tray into the "*" position.
2. Press the User Tools key.
3. Touch the Basic Setting key.
4. Touch the Next key three times to reach the paper setting menu.
5. In the Tray <*> Paper Size Setting menu, the present size setting is displayed. Touch the Change key. Select the new paper size by touching a key. Then, touch the Exit key.
6. Press the User Tools key.

3.3 1ST TRAY - F/F4 SIZE PAPER SELECTION

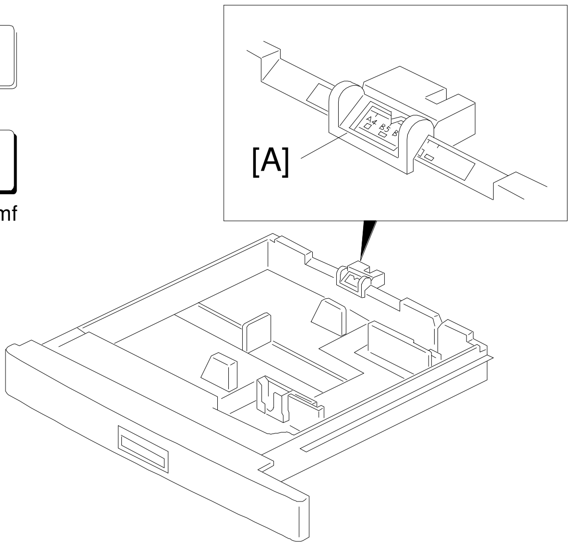
For the 1st tray, a wider range of F and F4 paper sizes can be selected with User Program mode.

You can select paper of the following sizes:

8" x 13"
8 1/4" x 13"
8 1/2" x 13"



A195I512-3.wmf



A195I511-3.wmf

1. Slide the paper size slider [A] on the paper tray into the "F/F4" position.
2. Press the User Tools key.
3. Touch the Basic Setting key.
4. Touch the Next key three times to reach the paper setting menu.
5. In the Tray <F/F4> Paper Size Setting menu, the present size setting is displayed. Touch the Change key. Select the new paper size by touching a key. Then, touch the Exit key.
6. Press the User Tools key.

SECTION 4

SERVICE TABLES

1. SERVICE REMARKS

1.1 GENERAL CAUTION

Do not turn off the main switch while any of the electrical components are active. Doing so might cause damage to units such as the transfer belt, drum, and development unit when they are pulled out of or put back into the copier.

1.2 DRUM

The organic photoconductor (OPC) drum is more sensitive to light and ammonia gas than a selenium drum. Follow the cautions below when handling an OPC drum.

1. Never expose the drum to direct sunlight.
2. Never expose the drum to direct light of more than 1,000 Lux for more than a minute.
3. Never touch the drum surface with bare hands. When the drum surface is touched with a finger or becomes dirty, wipe it with a dry cloth or clean it with wet cotton. Wipe with a dry cloth after cleaning with wet cotton.
4. Never use alcohol to clean the drum; alcohol dissolves the drum surface.
5. Store the drum in a cool, dry place away from heat.
6. Take care not to scratch the drum as the drum layer is thin and is easily damaged.
7. Never expose the drum to corrosive gases such as ammonia gas.
8. Always keep the drum in the protective sheet when keeping the drum unit, or the drum itself, out of the copier. Doing so avoids exposing it to bright light or direct sunlight. This will protect the drum from light fatigue.
9. Before pulling out the drum unit, place a sheet of paper under the drum to catch any spilt toner.
10. Dispose of used drums in accordance with local regulations.

11. When installing a **new** drum in the drum unit, the following must be done.
    a) Remove the protective sheet after securing the new drum to the drum unit.
    b) Do the ID Sensor Initial Setting procedure (SP Test Mode 3001).

12. When installing the drum unit, the following steps must be performed in the order written.
    1) Secure the drum unit to the shaft with the knob screw.
    2) Set the drum stay in position.

1.3 TRANSFER BELT UNIT

1. Replace the transfer belt every two PM cycles (240K copies) to avoid bad effects on the drum.
2. Never touch the transfer belt surface with bare hands.
3. Take care not to scratch the transfer belt as the surface is easily damaged.
4. Before installing the new transfer belt, clean all the rollers with a dry cloth to prevent the belt from slipping.

1.4 SCANNER UNIT

1. When installing the exposure glass, make sure that the white reference plate is facing down.
2. Clean the exposure glass with alcohol or glass cleaner to reduce the amount of static electricity on the glass surface.
3. Use a cotton pad with water or a blower brush to clean the mirrors and lens.
4. Do not bend or crease the exposure lamp flat cable.
5. Do not disassemble the lens unit. Doing so will throw the lens and the copy image out of focus.
6. Do not turn any of the CCD positioning screws. Doing so will throw the CCD out of position.

1.5 LASER UNIT

1. Do not loosen the screws that secure the LD drive board to the laser diode casing. Doing so would throw the LD unit out of adjustment.
2. Do not adjust the variable resistors on the LD unit, as they are adjusted in the factory.
3. The polygon mirror and F-theta lenses are very sensitive to dust. Never open the optical housing unit or remove the polygon mirror motor cover.
4. Do not touch the glass surface of the polygon mirror motor unit with bare hands.

1.6 CHARGE CORONA UNIT

1. Clean the charge corona wire with a dry cloth. Do not use sandpaper or a solvent.
2. Clean the charge corona casing with wet cotton and a dry cloth.
3. Clean the end blocks with a blower brush first to remove toner and paper dust. Then clean it with a dry cloth if any toner still remains on it.
4. Do not touch the corona wires with bare hands. Oil stains from fingers may cause uneven image density on copies.
5. Make sure that there is no foreign material (iron filings, etc.) on the casing.
6. To avoid uneven charge, do not bend or scratch the wire surface when installing new corona wires. Also be sure that the corona wires are correctly positioned in the grooves of the end blocks.
7. Clean the charge grid plate with a blower brush, water, then with a dry cloth. When doing so, be careful not to damage the grids by letting fibers attach to them.
8. Do not touch the charge grid plate with bare hands. Also, do not bend the charge grid plate or make any dent in it. Doing so may cause uneven charge.

1.7 DEVELOPMENT

1. Be careful not to nick or scratch the development rollers.
2. Place the development unit on a sheet of paper after removing it from the copier.

3. Never disassemble the development roller assembly. The position of the doctor plate is set with special tools and instruments at the factory to ensure the proper gap between the doctor blade and the development roller.
4. Clean the drive gears after removing used developer.
5. Dispose of used developer in accordance with local regulations.
6. When removing or installing the development unit, be careful not to damage the drum surface with the entrance seal on the development unit.
7. Never load different types of developer and toner into the development unit. Doing so will cause poor copy quality and toner scattering.
8. Immediately after installing new developer, the TD sensor initial setting procedure should be performed to avoid damage to the copier. Do not perform the TD sensor initial setting with used developer. Do not make any copies before doing the TD sensor initial setting.
9. When using a vacuum cleaner to clean the development unit casing, always ground the casing with your fingers to avoid damaging the toner density sensor with static electricity.
10. After replacing the TD sensor, do the TD sensor initial setting procedure (SP 2801).

1.8 DRUM CLEANING

1. Do not touch the cleaning brush with bare hands.
2. When servicing the cleaning section, be careful not to damage the edge of the cleaning blade.

1.9 FUSING UNIT

1. After installing the fusing thermistor, make sure that it is in contact with the hot roller and that it is movable.
2. Be careful not to damage the edges of the hot roller strippers or their tension springs.
3. Do not touch the fusing lamp and rollers with bare hands.
4. Make sure that the fusing lamp is positioned correctly and that it does not touch the inner surface of the hot roller.

1.10 PAPER FEED

1. Do not touch the surface of the pick-up, feed, and separation rollers.
2. The side fences and end fence of the paper tray must be positioned correctly to align with the actual paper size to avoid paper misfeeds.

1.11 USED TONER

1. The used toner tank should be emptied at every PM cycle, but we recommend checking the amount of used toner in the tank at every EM.
2. When reinstalling the used toner tank, make sure that the toner overflow sensor connector is inserted firmly.
3. Dispose of used toner in accordance with local regulations. Never throw toner into an open flame, for toner dust may ignite when exposed to open flame.

1.12 OTHERS

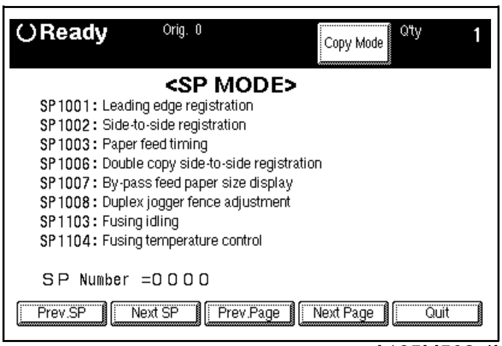
1. When carrying the copier, never lift it up by holding the LCT. Otherwise, the LCT will be broken. Hold the copier by the carrier handles in the bottom corners.
2. Do not move the copier while the main switch is on. The hard disk will be damaged. Stop the hard disk from spinning with SP 4911-4 before moving the machine.

2. SERVICE PROGRAM MODE

2.1 SERVICE PROGRAM MODE OPERATION

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

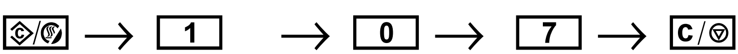
2.1.1 Service Program Access Procedure



A195M502.tif

1) How to enter the SP mode

Press the following keys in sequence.



Hold the C/◎ key for more than 3 seconds.
A menu of SP modes is displayed on the screen.

2) How to use an SP mode

Input the required SP mode number at the ten-key pad, then press Enter (#).

Also, you can scroll through the modes on the screen by pressing the "Prev. SP" or "Next SP" button.

To get to a Class 2 level, press the Enter key again. Then scroll through the Class 2 modes with "Prev. SP" or "Next SP".

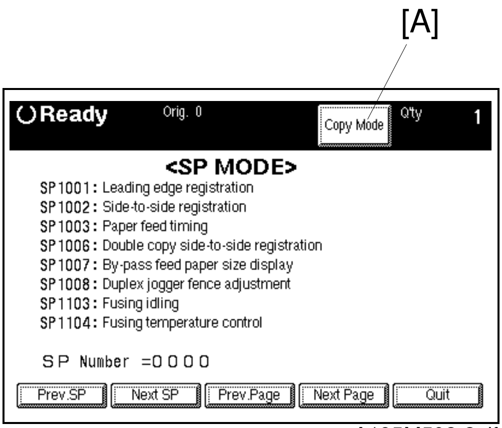
3) How to return to the main menu from within an SP mode

Press the key.

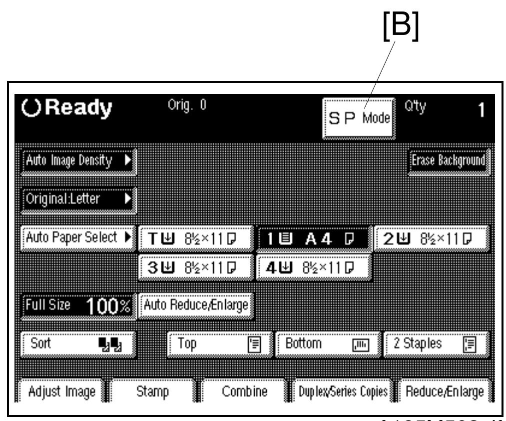
4) How to leave SP mode

Touch the "Quit" button on the display.

2.1.2 Accessing Copy Mode from within an SP Mode



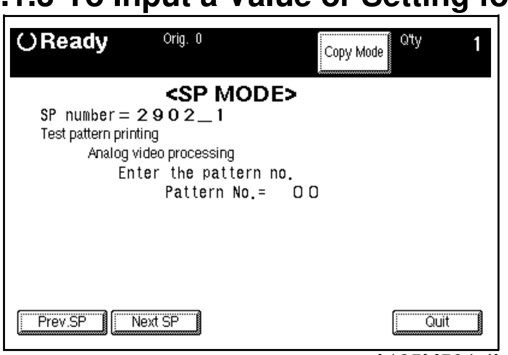
A195M502-2.tif



A195M503.tif

1. Touch "Copy Mode" [A] on the display. (This now changes to "SP Mode".)
2. Select the appropriate copy modes and make trial copies.
3. To return to the SP mode, touch "SP Mode" [B] on the display.

2.1.3 To Input a Value or Setting for an SP Mode



A195M504.tif

1. Input the value using the number keys, or for some SP modes, press the appropriate setting button on the screen.
2. If you used the number keys, now press the "Enter" key.

   NOTE: If you forget to press the "Enter" key, the previous value remains.

Service Tables

2.2 SERVICE PROGRAM MODE TABLES

2.2.1 MAIN SP MODE TABLE

NOTE: 1. In the Function column, comments are in italics.
2. In the Settings column, the default value is in bold letters.
3. An asterisk " * " after the mode number means that this mode is stored in the NVRAM. If you do a RAM reset, all these SP modes will be reset to their factory settings.

Mode No.			Function	Settings
Class 1	Class 2			
1001 *		Leading Edge Registration	Adjusts the printing leading edge registration using Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 3±2 mm. See "Replacement and Adjustment - Copy Image Adjustments" for details.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
1002 *	1 *	Side-to-Side Registration (Duplex)	Adjusts the printing side-to-side registration from the duplex tray using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm. See "Replacement and Adjustment - Copy Image Adjustments" for details on SP1002*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
	2 *	Side-to-Side Registration (1st paper feed)	Adjusts the printing side-to-side registration from the 1st paper feed station using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
	3 *	Side-to-Side Registration (2nd paper feed: Option PFU tray 1)	Adjusts the printing side-to-side registration from the 2nd paper feed station using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
	4 *	Side-to-Side Registration (3rd paper feed: Option PFU tray 2)	Adjusts the printing side-to-side registration from the 3rd paper feed station using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
	5 *	Side-to-Side Registration (4th paper feed: Option PFU tray 3 if present)	Adjusts the printing side-to-side registration from the 4th paper feed station using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**

Mode No.			Function	Settings
Class 1	Class 2			
1002 *	6 *	Side-to-Side Registration (By-pass feed)	Adjusts the printing side-to-side registration from the by-pass feed table using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
	7 *	Side-to-Side Registration (LCT)	Adjusts the printing side-to-side registration from the LCT using the Trimming Area Pattern (SP2902-3, No.10). *Use the •/∗ key to toggle between + and -. The specification is 2±1.5 mm.*	+9 ~ -9 0.1 mm/step **+ 0.0 mm**
1003 *	1 *	Paper Feed Timing (Paper Feed Trays)	Adjusts the relay clutch timing at registration. The relay clutch timing determines the amount of paper buckle at registration. (A +ve setting leads to more buckling.)	+9 ~ -9 1 mm/step **+ 0 mm**
	2 *	Paper Feed Timing (By-pass, LCT)		
1006 *		Double copy side-to-side registration	Adjusts the image position from the center line in double copy mode. *Use the •/∗ key to toggle between + and -. See "Replacement and Adjustment - Copy Image Adjustments" for details.*	+9 ~ -9 1 mm/step **+ 0 mm**
1007 *		By-pass Feed Paper Size Display	Displays the paper width sensor data for the by-pass feed table.	
1008 *	1 *	Duplex Jogger Fence Adjustment (Side Fence)	Adjusts the stop position of the side jogger fence span of the duplex unit. *Use the •/∗ key to toggle between + and -.*	*+4 ~ -4* *0.5 mm/step* **+ 0.0 mm**
	2 *	Duplex Jogger Fence Adjustment (End Fence)	Adjusts the stop position of the end jogger fence span of the duplex unit. *Use the •/∗ key to toggle between + and -.*	*+4 ~ -4* *0.5 mm/step* **+ 0.0 mm**
1103 *		Fusing Idling	Selects whether fusing idling is done or not. *Normally disabled in this machine. However, if fusing is incomplete on the 1st and 2nd copies, switch it on. This may occur if the room is cold.*	On **Off**
1104 *		Fusing Temperature Control	Selects the fusing temperature control mode.	**On/Off** Phase
1105 *		Fusing Temperature Adjustment	Adjusts the fusing temperature.	170 ~ 200 *1°C/step* **185°C**

Mode No. Class 1	Mode No. Class 2		Function	Settings
1106		Fusing Temperature Display	Displays the fusing temperature.	
2001 *	1 *	Grid Voltage Adjustment (For copying)	Adjusts the voltage applied to the grid plate during copying.	600 ~ 1000 1 V/step **890 V**
			Do not adjust.	
	2 *	Grid Voltage Adjustment (For ID sensor pattern)	Adjusts the voltage applied to the grid plate when making the ID sensor pattern.	600 ~ 1000 1 V/step **650 V**
			Do not adjust.	
	5 *	Charge Corona Current Adjustment	Adjusts the current applied to the charge corona wire.	900 ~ 1300 1 µA/step **1100 µA**
			Do not adjust.	
2101 *	1 *	Leading Edge Erase Margin (Printing)	Adjusts the leading edge erase margin. *The specification is 3±2 mm. See "Replacement and Adjustment - Copy Image Adjustments" for details on SP2101.*	0.0 ~ 9.0 0.1 mm/step **3.0 mm**
	2 *	Trailing Edge Erase Margin (Printing)	Adjusts the trailing edge erase margin. *The specification is 2±2 mm.*	0.0 ~ 9.0 0.1 mm/step **2.0 mm**
	3 *	Left Side Edge Erase Margin (Printing)	Adjusts the left side erase margin. *The specification is 2±1.5 mm.*	0.0 ~ 9.0 0.1 mm/step **2.0 mm**
	4 *	Right Side Edge Erase Margin (Printing)	Adjusts the right side erase margin. *The specification is $2^{+2.5}_{-1.5}$ mm.*	0.0 ~ 9.0 0.1 mm/step **1.0 mm**
2103 *		LD Power Adjustment	Adjusts the LD power. ***Do not change the value.***	-127 ~ +127 2.1 µW/step **+0**
2201 *	1 *	Development Bias Adjustment (for copying)	Adjusts the development bias during copying.	200 ~ 700 1 V/step **550 V**
			This can be adjusted as a temporary measure if faint copies appear due to an aging drum.	
	2 *	Development Bias Adjustment (for ID sensor pattern)	Adjusts the development bias when making the ID sensor pattern.	200 ~ 700 1 V/step **310 V**
			This can be adjusted as a temporary measure if faint copies appear due to an ageing drum.	

Mode No.			Function	Settings
Class 1	Class 2			
2207		Forced Toner Supply	Forces the toner bottle to supply toner to the toner supply unit for 30 seconds. *Toner supply finishes automatically after 30 seconds. This process is not normally needed in the field for this model. At installation, doing the 50-page free run also supplies toner to the development unit.*	
2208 *	1 *	Toner Supply Mode	Selects the toner supply mode. *Use fixed supply mode only as a temporary measure if process control is not working.*	**Detect** Fixed
	2 *	Toner Supply Ratio (Fixed Supply Mode)	Selects the toner supply ratio for Fixed Supply Mode. *Use a higher value if the user tends to make lots of copies that have a high proportion of black.*	**6%** 15% 30%
2209 *		Toner Supply Rate (Detect Supply Mode)	Adjusts the toner supply rate for Detect Supply Mode. *Increasing this value reduces the toner supply clutch on time. Use a lower value if the user tends to make lots of copies that have a high proportion of black.*	50 ~ 200 1 mg/s / step **116 mg/s**
2210 *		ID Detection Interval	Changes the interval for making the ID sensor pattern (VSP/VSG detection). *Reducing the interval will also reduce the CPM.* *Do not adjust this.*	10 ~ 200 1 copy/step **200 copies**
2220 *		VTREF Manual Setting	Adjust the VTREF of the TD sensor. *Change this value after replacing the development unit with another one that already contains toner.* *For example, when using a development unit from another machine for test purposes, do the following:* *1. Check the value of SP2220 in both the machine containing the test unit and the machine that you are going to move it to.* *2. Install the test development unit, then input the VTREF for this unit into SP2220.* *3. After the test, put back the old development unit, and change SP2220 back to the original value.*	1.50 ~ 3.00 0.01V/step **2.52V**
2223 *		VT Display	Displays the TD sensor output voltage.	

Mode No.			Function	Settings
Class 1	Class 2			
2301 *	1 *	Transfer Current Adjustment (1st side of the paper)	Adjusts the current applied to the transfer belt during copying on the 1st side of the paper.	10 ~ 60 1 µA/step **32 µA**
			If the user uses thicker paper, the current may have to be increased to ensure sufficient transfer of toner.	
	2 *	Transfer Current Adjustment (2nd side of the paper)	Adjusts the current applied to the transfer belt during copying on the 2nd side of the paper.	10 ~ 60 1 µA/step **32 µA**
			See above.	
	6 *	Transfer Current Adjustment (By-pass Feed)	Adjusts the current applied to the transfer belt during copying from the by-pass feed table.	10 ~ 60 1 µA/step **48 µA**
			See above; note that thicker paper can be fed from the bypass feed tray, so the factory setting is higher.	
2801		TD Sensor Initial Setting	Performs the TD sensor initial setting. This SP mode controls the voltage applied to the TD sensor to make the TD sensor output about 2.5 V.	
			Use this mode only after installing the machine, changing the TD sensor, or the adding new developer.	
2803		Forced Charge Corona Wire Cleaning	Forces the charge corona wire cleaning motor to start cleaning.	
			This only works if the optional wire cleaning motor is installed.	
2804 *	1 *	Charge Corona Wire Cleaning Enable/Disable	Determines whether to clean the charge corona wire every time interval set with SP 2804-2.	
			This only works if the optional wire cleaning motor is installed.	
	2 *	Charge Corona Wire Cleaning Interval	Changes the interval for charge corona wire cleaning.	100 ~ 10000 100 copies/step **2500 copies**
			This only works if the optional wire cleaning motor is installed.	

Mode No.			Function	Settings
Class 1	Class 2			
2902	1	Test Pattern Printing (Analog Video Processing)	Prints the test patterns for analog video processing. See section 2.2.2 for how to print test patterns. 0. Not used 1. 16 gradations 2. 128-dot intervals 3. 64-dot intervals *This SP mode is useful for finding whether the SBU or EX-IPU failed. If the printout is OK, the SBU is defective. If the printout is not OK, the EX-IPU is defective.*	
	2	Test Pattern Printing (Digital Video Processing)	Prints the test patterns for digital video processing. See section 2.2.2 for how to print test patterns. 0. Not used 1. Vertical Stripes 2. Grayscales 3. Cross Pattern 4. Black Bands 5. 300 dpi 6. 600 dpi *This SP mode is useful for finding whether the printer or the EX-IPU failed. If the printout is OK, the EX-IPU is defective. If the printout is not OK, the printer is defective.*	
	3	Test Pattern Printing (Printing)	Prints the printer test patterns. See section 2.2.2 for how to print test patterns. Example: 10. Trimming Area For the other test patterns, refer to section 2.2.2. *This SP mode is useful for finding the part that failed. If the printout is OK, the EX-IPU is defective. If the printout is not OK, the printer is defective.*	
	7	Test Pattern Printing (GA5)	Prints the test pattern for the GA5 (IC for image compression) 0: Not used 1: Print out	
2905 *		LD PWM Laser Pulse Positioning	Selects the laser pulse positioning type that is used for test printouts and when in binary picture processing mode. *If SP 4904-1 is set to NO, this SP mode is ignored. The "center" setting will be used.*	**2: Center** 3. Left 4. Right 5. Concentrated
2906 *		TD Sensor Input Voltage	Use to input the TD sensor control voltage. ***Factory use only***	4 ~ 10 0.1 V/step **8.0 V**
2909 *		Main Scan Magnification	Adjusts the magnification in the main scan direction for the printer. *Use the •/∗ key to toggle between + and -. See "Replacement and Adjustment - Copy Image Adjustments" for details.*	- 2.54 ~ + 2.54 0.02 %/step **+ 0.00 %**
2950 *		Side-to-Side Registration (Base)	Changes the printing start position. ***Factory use only***	- 12.7 ~ + 12.7 0.1 mm/step **+ 0.0 mm**
3001		ID Sensor Initial Setting	Performs the ID sensor initial setting. The ID sensor output for the bare area of the drum (V_{SG}) is adjusted to 4.0 ± 0.2V. *This SP mode should be performed after replacing or cleaning the ID sensor or replacing the drum.*	

Service Tables

Mode No.			Function	Settings
Class 1	Class 2			
3103 *		ID Sensor Output Display	Displays the current V_{SG} and V_{SP} output. *If the ID sensor does not detect the ID pattern, "V_{SP}=5.0v/V_{SG}=5.0v" is displayed. If the ID sensor does not detect the bare area of the drum, "V_{SP}=0.0v/V_{SG}=0.0v" is displayed.*	V_{SP}=■.■■V V_{SG}=■.■■V
4008 *		Sub Scan Magnification (Scanning)	Adjusts the magnification in the sub scan direction for scanning. If this value is changed, the scanner motor speed is changed. *Use the •/∗ key to toggle between + and -. See "Replacement and Adjustment - Copy Image Adjustments" for details.*	- 9.0 ~ + 9.0 0.1 %/step **+ 0.0 %**
4010 *		Leading Edge Registration (Scanning)	Adjusts the leading edge registration for scanning. *(-): the image moves in the direction of the leading edge* *Use the •/∗ key to toggle between + and -. See "Replacement and Adjustment - Copy Image Adjustments" for details.*	- 9.0 ~ + 9.0 0.1 mm/step **+ 0.0 mm**
4011 *		Side-to Side Registration (Scanning)	Adjusts the side-to-side registration for scanning. *(-): the image disappears at the left side.* *(+): The image appears.* *Use the •/∗ key to toggle between + and -. See "Replacement and Adjustment - Copy Image Adjustments" for details.*	- 9.0 ~ + 9.0 0.1 mm/step **+ 0.0 mm**
4012 *	1 *	Leading Edge Erase Margin (Scanning)	Adjusts the leading edge margin for scanning. *Do not adjust this unless the user wishes to have a scanner margin that is greater than the printer margin.*	0.0 ~ 0.9 0.1 mm/step **1.0 mm**
	2 *	Trailing Edge Erase Margin (Scanning)	Adjusts the trailing edge margin for scanning. *See the comment for SP 4012-1.*	0.0 ~ 0.9 0.1 mm/step **0.5 mm**
	3 *	Left Side Erase Margin (Scanning)	Adjusts the left side margin for scanning. *See the comment for SP 4012-1.*	0.0 ~ 0.9 0.1 mm/step **1.0 mm**
	4 *	Right Side Erase Margin (Scanning)	Adjusts the right side margin for scanning. *See the comment for SP 4012-1.*	0.0 ~ 0.9 0.1 mm/step **0.5 mm**
4013		Scanner Free Run	Performs a scanner free run with the exposure lamp off.	

Mode No.			Function	Settings
Class 1	Class 2			
4301		APS Sensor Output Display	Displays the size of an original placed on the exposure glass. *If A5 or 51/2" x 81/2" is displayed, check the current setting of SP 4303; depending on that SP mode setting, A5 or 51/2" x 81/2" may be displayed if the APS sensors cannot detect the paper size.*	
4303 *		APS Small Size Original Detection	Selects whether or not the copier determines that the original is A5/HLT size when the APS sensor does not detect the size. *If "A5 length / 51/2" x 81/2"" is selected, paper sizes that cannot be detected by the APS sensors are regarded as A5 lengthwise or 51/2" x 81/2".* *If "Not detected" is selected, "Cannot detect original size" will be displayed.*	**Not detected** A5 length / 51/2"X81/2
4428		Standard White Level Adjustment	Corrects the standard white level of the white plate. ***This SP mode is for factory use only. Do not change the value.***	
4901 *	2 *	GA 1 Setting (GAIN 0)	The coefficient of the D/A converter for the standard AGC gain curve. ***This SP mode is for factory use only. Do not change the value.***	0 ~ 255 1 /step **100**
	5 *	GA 1 Setting (GAIN 1)	The coefficient of the D/A converter for the AGC gain curve at power on. ***This SP mode is for factory use only. Do not change the value.***	0 ~ 255 1 /step **100**
	8 *	GA 1 Setting (REF)	The coefficient of the D/A converter for the AGC gain curve for scanning the white plate. ***This SP mode is for factory use only. Do not change the value.***	0 ~ 255 1 /step **100**
	11 *	GA 1 Setting (Video Data Path)	Selects one of the following video data outputs, which will be used for printing. **0. After GA1 functions** 1. Before auto shading processing 2. After black auto shading processing 3. After all auto shading processing (black and white) ***Do not change the value.***	

Service Tables

<table>
<tr><th colspan="3">Mode No.</th><th rowspan="2">Function</th><th rowspan="2">Settings</th></tr>
<tr><th>Class 1</th><th>Class 2</th><th></th></tr>
<tr><td rowspan="6">4903 *</td><td>1 *</td><td>GA 3 Setting
(Filter Level)</td><td>Selects the strengths of the MTF and smoothing filters.

bit 7, 6: Letter Mode (MTF)
00: Normal 01: Weak 10: Weaker
11: Weakest
bit 5, 4: Generation Mode (MTF)
00: Normal 01: Weak 10: Weaker
11: Weakest
bit 3: Not used
Keep at "0"
bit 2: Letter/Photo Mode (Smoothing)
0: Sharp 1: Smooth
bit 1: Photo Mode (MTF)
0: Weak 1: Strong
bit 0: Photo Mode (Smoothing)
0: Smooth 1: Sharp
Input the setting for all 8 bits at once as a decimal value.
(e.g. To set the MTF filter strength of the the generation mode to ’weak’, the input value should be 16 as shown below, assuming all other parameters are at the ’zero’ setting.
00010000 → 16

The type of filter used in Photo mode depends on the setting of SP4904-3.</td><td>0 ~ 255
0</td></tr>
<tr><td>2 *</td><td>GA 3 Setting
(Filter Mode)</td><td>Selects the coefficients and strengths of the MTF filter and smoothing filter.
Do not change the value.</td><td>0 ~ 16
1 /step
3</td></tr>
<tr><td>3</td><td>Not used</td><td></td><td></td></tr>
<tr><td>4 *</td><td>GA 3 Setting
(White Threshold)</td><td>Changes the threshold level for dot screen detection processing.
Do not change the value.</td><td>0 ~ 255
1 /step
80</td></tr>
<tr><td>5</td><td>GA3 Setting
(Full Size)</td><td>Selects whether the copy image is always in the full size mode even if the magnification ratio has been changed.
This SP mode is used for checking the magnification function in the main scan direction, which is performed by the GA3 chip.</td><td>0: Normal Operation
1: Always full size mode</td></tr>
<tr><td>6</td><td>GA 3 Setting
(Test Pattern Output)</td><td colspan="2">Prints the test pattern for the GA3 or selects one of the following video data outputs for printing.
0. Normal
1. Test pattern print out
2. Skips the magnification processing.
3. Skips the filter processing
4. Skips the GA3 functions
This SP mode is used for checking the GA3 functions.</td></tr>
</table>

Mode No.			Function	Settings
Class 1	Class 2			
4903	7 *	GA 3 Setting (Main Shift High)	Changes the image shift amount for the main scan direction in magnification mode.	0 ~ 255 1 /step **0**
	8 *	GA 3 Setting (Main Shift Low)	***Do not change the values of 4903-7 and 4903-8.***	
	9 *	GA 3 Setting (Switch Separation)	Changes the threshold ratio for auto text/photo separation processing. *This is used only in the Japanese model.*	25 ~ 255 1 %/step **170 %**
4904 *	1 *	GA4 Setting (Laser Pulse Positioning)	Selects whether LD PWM laser pulse positioning feature is performed or not. *If "No" is selected, the copier always uses the "center" setting (pixels will always have a small separation).*	0: OFF **1: ON**
	2 *	GA4 Setting (Photo Matrix)	Selects the matrix size for photo mode. *• 8 x 8 is only used if 4904-4 is set to "binary". Also, if 4904-4 is set to binary, 4904-2 will be ignored if the setting is other than 8 x 8.* *• 6 x 6 (New) should be selected when a light original is used.* *• 4 x 4 leads to a sharper image*	0: 4 x 4 **1: 6 x 6** 2: 8 x 8 3: 6 x 6 (New)
	3 *	GA4 Setting (Filter Select in Photo Mode)	Selects either the MTF filter or the smoothing filter in Photo mode. *The strength of the MTF filter can be selected with SP4903-1, bit 1.* *The strength of the Smoothing filter can be selected with SP4903-1, bit 0.* *If you select the MTF filter, the image resolution is improved. However, the dot screen areas will be faint.*	0: MTF filter **1: Smoothing filter**
	4 *	GA4 Setting (Binary Process Mode)	Selects whether binary picture processing mode is performed or not. *If YES is selected, all image processing modes are handled using binary picture processing mode.*	**0: NO** 1: YES
	6	GA4 Setting (Generation Mode)	Selects the line width correction type in the generation mode. *In generation mode, lines may bulge in the main scan direction. Adjust this SP mode until the result is satisfactory.*	0: Not corrected 1: Thin line-1 **2: Thin line-2** 3: Thick line
	7	GA4 Setting (Image Process mode in Letter/ Photo mode: Letter areas)	Selects the image processing mode used for Letter areas in Letter/Photo mode. **0: 1 x 1 dot processing** 1: Error diffusion with 1 x 1 dot processing 2: 2 x 1 dot processing 3: Error diffusion with 2 x 1 dot processing *A larger value cases the image to became lighter. Only works if 4904-4 is at 0.*	

Service Tables

Mode No.			Function	Settings
Class 1	Class 2			
4904	8	GA4 Setting (Image Process mode in Letter/Photo mode: Photo Areas)	Selects the image processing mode used for photo areas in the Letter/Photo mode. 0: 1 x 1 dot processing 1: Error diffusion with 1 x 1 dot processing 2: 2 x 1 dot processing **3: Error diffusion with 2 x 1 dot processing** *A smaller value causes the image to become more sharp in focus.* *Only works if 4904-4 is at 0.*	
	10	GA4 Setting (GA4 Test Data)	Prints the test pattern for the GA4 IC, to test the GA4 chip on the EX-IPU. **0: No Print** 1: Gradation 2: Cross 3: Black bands	
	12 *	GA4 Setting (BK Thresh Level)	Changes the threshold level for binary picture processing mode. *A larger value causes the image to become lighter.*	0 ~ 255 1 /step **40**
	13 *	GA4 Setting (Top point Level)	The value for pixels at an edge in binary picture processing mode. ***Do not change the value.***	0 ~ 255 1 /step **128**
	14 *	GA4 Setting (All Black Level)	The value for black areas in binary picture processing mode. ***Do not change the value.***	0 ~ 255 1 /step **255**
	16 *	GA4 Setting (Print Top Point Level)	The value for pixels at an edge in stamp mode. ***Do not change the value.***	0 ~ 255 1 /step **128**
	17 *	GA4 Setting (Print All Black Level)	The value for black areas in stamp mode. ***Do not change the value.***	0 ~ 255 1 /step **255**
	18 *	GA4 Setting (Dither Pattern)	Selects the dither pattern used in binary picture processing mode. ***Do not change the value.***	**0: 70-line** 1: 95-line 2: 140-line 3: 180-line
4905	1	Path setting (MSU video in)	Do not change the value	0
	2	Path Setting (ASAP Video In)	Use to check the external ASAP video interface with the dummy board. See the "External ASAP Video I/F Test" section for details. Before this test is performed, the main controller should be replaced with the dummy board	0: Normal 1: Test
4907		GA4 Setting (Auto letter/photo separation)	Selects whether the auto letter/photo separation is performed in the Letter/Photo mode or not. *Test purposes only*	Disabled **Enabled**

Mode No.			Function	Settings
Class 1	Class 2			
4909	1	GA4 Setting (Pulse Width Modulation)	Decides the threshold level for selecting the type of pulse width modulation that is used. ***Do not change the value.***	0 ~ 255 1 /step **32**
	2	GA4 Setting (Line Width Correction 1 : White	Decides the threshold value for a pixel to be white when line width correction type 1 is performed. ***Do not change the value.***	0 ~ 255 1 /step **48**
	3	GA4 Setting (Line Width Correction 1 : Black	Decides the threshold value for a pixel to be black when line width correction type 1 is performed. ***Do not change the value.***	0 ~ 255 1 /step **208**
	4	GA4 Setting (Line Width Correction 2 : White	Decides the threshold value for a pixel to be white when line width correction type 2 is performed. ***Do not change the value.***	0 ~ 255 1 /step **60**
	5	GA4 Setting (Line Width Correction 2 : Black	Decides the threshold value for a pixel to be black when line width correction type 2 is performed. ***Do not change the value.***	0 ~ 255 1 /step **192**
	6	GA4 Setting (Error Diffusion Gamma)	Selects the gamma type for error diffusion. ***Do not change the value.***	0 ~ 7 1 /step **0**
	7	GA4 Setting (Edge Detection 1)	Decides the threshold value to calculate the difference value between the object pixel and the surrounding pixels. ***Do not change the value.***	0 ~ 255 1 /step **16**
	8	GA4 Setting (Edge Detection 2)	Decides the threshold value for detecting the edge area. ***Do not change the value.***	0 ~ 255 1 /step **128**
	17	GA4 Setting (Background Pattern Merge Method)	Selects whether an image which overlaps a background numbering pattern is converted from positive to negative or not. *This SP mode is used when a background numbering pattern is overlapping a solid black area.*	**0: Not converted** 1: Converted

Service Tables

Mode No.			Function	Settings
Class 1	Class 2			
4909	18	GA4 Setting (Stamp Pattern Merge Method)	Selects whether an image which overlaps a stamp pattern is converted from positive to negative or not. The settings 0 and 1 are the same as for 4909-17 above. The setting 2 means that the black level of the stamp (SP4904-17) is inverted (e.g. when the black level of the stamp is 200, the stamp pattern is printed at black level 55.) *This SP mode is used when a stamp pattern is overlapping a solid black area.*	**0: Not converted** 1: Converted 2: Inverted
	19	GA4 Setting (Data Path Selection 1)	***These SP modes are used for design purposes only.*** ***Do not change the settings.***	**0**
	20	GA4 Setting (Data Path Selection 2)	***These SP modes are used for design purposes only.*** ***Do not change the settings.***	**0**
4911	1	HDD Setting (Media Test)	Checks for bad sectors on the hard disk that develop during machine use. This takes 4 minutes. *This SP mode should be done when an abnormal image is printed. There is no need to do this at installation as the hard disk firmware already contains bad sector information, and damage is not likely during transportation.* *Bad sectors detected with this SP mode will be stored in the E^2PROM on the EX-IPU board with the bad sector data copied across from the firmware.*	
	2	HDD Setting (Formatting)	Formats the hard disk. This takes 8 minutes. **Do not turn off the main switch during this process.**	
	3	HDD Setting (Spindle Control)	Decides the disk drive motor (spindle motor) stop timing. Yes: The hard disk stops in low power mode. The first copy after returning to standby will take longer. No: The hard disk keeps going in low power mode	
	4	HDD Setting (Head Retraction)	Press Enter to move the head of the hard disk away from the disk while the disk is turning. The head automatically moves back when a copy is made. *This SP should be performed when the machine will be moved without turning the main switch off.*	

Mode No.			Function	Settings
Class 1	Class 2			
4911	5	HDD Setting (Total Storage Capacity)	Input the total storage capacity of the hard disk at replacement. *In future, hard disks of various sizes may be available. In this case, use this SP mode when installing a new disk.*	
	6	HDD Setting (Bad Sector Information Reset)	Resets the bad sector information which is stored in the E^2PROM on the EX-IPU board. *This SP should be performed when the hard disk is replaced.*	
	7	HDD Setting (Bad Sector Display)	Displays the number of bad sectors there are on the hard disk.	
5019		LCT Paper Size Setting	Selects the paper size for the LCT. *When changing the setting, the position of the side fences for the LCT should be changed.*	A4 (230V machines) 8 1/2" X 11" (115V machines)
5104 *		A3/11"x17" Double Count	Specifies whether the counter is doubled for A3/11"x17" paper. *If "YES" is selected, the total counter and the current user code counter counts up twice when A3/11"x17" paper is used.*	**No** Yes
5106 *		ADS Level Selection	Selects the image density level that is used in ADS mode.	1 ~ 7 1 notch /step **4**
5118 *		Disable Copying	Selects whether the copy function is disabled or not.	**No** Yes
5220 *		Auto Stamp Function	Selects whether the auto stamp function is enabled or not.	On (115V machine) Off (230V machine)
5305		Auto Off Mode	**This SP mode is used only for 115V machines (Energy Star standardization).** Selects whether the auto off timer setting is enabled or disabled *When "disabled" is selected, the auto off timer range will be wider than the default timer range. (In UP mode, the user will be able to select a time between 0 and 120 minutes.) If "0" is selected, the auto off timer function is disabled.*	**Enabled** Disabled
5501 *	1	PM Alarm	Selects whether the PM alarm is enabled or not.	**Enabled** Disabled
5501	2	PM Alarm Interval	Sets the PM interval, with an alarm. *When the setting is "0", this function is disabled.*	0 ~ 255 1k copies/step **120 k copies**

Mode No.			Function	Settings
Class 1	Class 2			
5801		Memory All Clear	Resets all correction data for process control and all software counters. Also, returns all modes and adjustments to the default settings. See the "MEMORY ALL CLEAR" section for how to use this SP mode correctly. ***Normally, this SP mode should not be used.*** *It is used only after replacing the NVRAM, or when the copier malfunctions due to a damaged NVRAM.*	
5802		Free Run	Performs a free run. The scanner scans once and the printer prints for the number of copies requested.	
5803	1 ~ 9	Input Check	Displays the signals received from sensors and switches. See the "INPUT CHECK" section for details.	
5804		Output Check	Turns on the electrical components individually for test purposes. See the "OUTPUT CHECK" section for details.	
5807		Option Connection Check	Checks the connectors to the options.	
5811 *		Machine Serial Number	Use to input the machine serial number. *This serial number will be printed on the system parameter list.*	
5812 *		Service Telephone Number	Use this to input the telephone number of the service representative (this is displayed when a service call condition occurs.) *Press the "•/#" key to input a pause (—).* *Press the "Clear modes" key to delete the telephone number.*	
5818 *		OEM Code Setting	Select the production name and the device name for Windows95 Plug and Play, PostScript for Macintosh, or the SCSI Device name. The production name and device name is registered in the NV RAM on the SCU in the factory. If the NV RAM is defective, these names should be registered using this SP mode.	0: Ricoh Aficio 401 1: NRG D440/ 2840/3240 2: Not Used 3: Savin 9940DPC 4: Not Used 5: Infotec 5402MF 6: Lanier 5040MFD

Mode No.			Function	Settings
Class 1	Class 2			
5902		Duplex Tray Capacity Limit for A3 Copies	Selects the total capacity of the duplex tray for A3 paper. *If there are frequent jams at the duplex unit when using A3 paper, try setting this to 30.*	**50 sheets** 30 sheets
5920 *		Fusing Temp. Setting - Low Power Mode	Selects the fusing temperature that will be used in low power mode. *If a low temperature is selected, it takes more time to reach the ready condition.*	**(115V ver.)** **125 °C** 100 °C **(230V ver.)** 170 °C **155 °C** 125 °C 100 °C
5945		Option Bus Interface Check	Check the optional bus interface with the dummy board from the SCU through the extension board. Before this test is performed, the main controller should be replaced with the dummy board. See the "OPTIONAL BUS INTERFACE CHECK" section for details.	
5946		Printer Controller Disk Error Log Clear	To clear the error log of the controller disk. See the "PRINTER CONTROLLER ERROR LOG" section for details.	
5990	1	SP Mode Data Printing (All Data)	Prints all the system parameter lists. See the "SYSTEM PARAMETER AND DATA LISTS" section for how to print the lists. *Printing takes 6 minutes.*	
	2	SP Mode Data Printing (SP Mode Data)	Prints the SP mode data list. See the "SYSTEM PARAMETER AND DATA LISTS" section for how to print the lists. *Printing takes 2 minutes.*	
	3	SP Mode Data Printing (UP Mode Data)	Prints the UP mode data list. See the "SYSTEM PARAMETER AND DATA LISTS" section for how to print the lists. *Printing takes 2 minutes.*	
	4	SP Mode Data Printing (Machine Status Data)	Prints the machine status history data list. See the "SYSTEM PARAMETER AND DATA LISTS" section for how to print the lists. *Printing takes 2 minutes.*	

Service Tables

Mode No. Class 1	Class 2		Function	Settings
6006 *	1 *	ADF Side-to Side Registration	Adjusts the printing side-to-side registration in the ADF mode. *Use the •/∗ key to toggle between + and -.*	-3 ~ +3 0.1 mm/step **+ 0.0 mm**
	2 *	ADF Leading Edge Registration (Simplex)	Adjusts the original stop position. *Use the •/∗ key to toggle between + and -.*	-3 ~ +3 0.1 mm/step **+ 0.0 mm**
	3 *	ADF Leading Edge Registration (Duplex-front)	Adjusts the original stop position against the original left scale in one-sided original mode. *Use the •/∗ key to toggle between + and -.*	-3 ~ +3 0.1 mm/step **+ 0.0 mm**
	4 *	ADF Leading Edge Registration (Duplex-rear)	Adjusts the original stop position against the original left scale in two-sided original mode. *Use the •/∗ key to toggle between + and -.*	-3 ~ +3 0.1 mm/step **+ 0.0 mm**
	For details on the correct way to use SP 6006, see the ADF service manual.			
6009		ADF Free Run	Performs an ADF free run. *This is a general free run controlled from the copier. For more detailed free run modes, see the DF manual.*	
6105 *		Finisher Staple Position Adjustment	Adjusts the staple position when using the finisher. *Use the •/∗ key to toggle between + and -.* ***One staple position:** A larger value causes the staple position to shift inward.* ***Two staple position:** A larger value causes both staple positions to shift to the rear side of the machine.*	- 1~ +3.5 0.5 mm/step **+0.0 mm**
6107		Finisher Free Run	Performs a finisher free run (without stapler). *This is a general free run controlled from the copier. For more detailed free run modes, see the finisher manual.*	
7004		Total Copy Counter Reset	**Japanese version only.** **Do not change this value.**	
7804		PM Counter Reset	Resets the PM counter.	To see the current counter values, print the SP mode data lists (SP 5990).
7807		SC/Jam Counter Reset	Resets the SC and jam counters.	
7808		Resets Counters (except for the total counter)	Resets the following counters: On the data list, between "Total No of Org from ADF" and "Number of SCs: Others", and between "Counter from ADF" and "Staple Mode".	
7810		User Code Number Reset	Resets the user code numbers.	

Mode No.			Function	Settings
Class 1	Class 2			
7901	1	ROM/CPU Version (Operation Panel)	Displays the operation panel board ROM version.	
	2	ROM/CPU Version (MSIS)	Displays the ROM version for the MSIS on the SCU board.	
	3	ROM/CPU Version (Copy App.)	Displays the ROM version for the copy application on the SCU board.	
	4	ROM/CPU Version (BCU:68340)	Displays the CPU version for the fusing controller on the BCU board.	
	5	ROM/CPU Version (AC Power Control)	Displays the ROM version for AC power control on the AC drive board.	
	6	ROM/CPU Version (High Voltage)	Displays the ROM version for the high voltage control board.	
	7	ROM/CPU Version (EX-IPU)	Displays the ROM version for the EX-IPU board.	
	8	ROM/CPU Version (ADF)	Displays the ROM version for the ADF.	
	9	ROM/CPU Version (Paper Feed Unit)	Displays the ROM version for the paper feed unit.	
7901	10	ROM/CPU Version (Sorter/ Finisher)	Displays the ROM version for the sorter/finisher.	
	11	ROM/CPU Version (MSU)	Displays the ROM version for the memory unit on the EX-IPU board.	

2.2.2 TEST PATTERN PRINTING (SP 2902)

1. Access the SP mode which holds the test pattern that you need.
2. Touch the "Copy Mode" button on the display to access the copy mode display.
3. Select the required copy features such as paper size, image density, reduction.
4. Press the "Start" key on the operation panel.
5. After checking the test pattern, leave copy mode by touching the "SP Mode" button on the display.
6. Touch the "Quit" button to leave the SP mode.

⚠ CAUTION

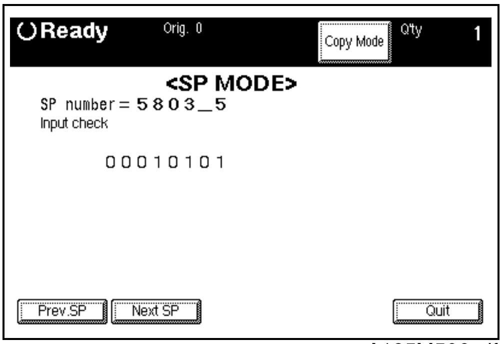
Before leaving the SP mode, return the setting of the SP mode to 0 (No Print). Otherwise, the user will get a test pattern whenever taking a copy.

NOTE: The 600 dpi printed pattern (2902-2-6) will have a black area and a white area. This is normal for the 600 dpi test pattern.

Test Pattern Table for SP2902-3

No.	Test Pattern	No.	Test Pattern
0	No Print	16	32 Grayscales (Horizontal)
1	Vertical Lines (1 dot)	17	32 Grayscales (Vertical)
2	Horizontal Lines (1 dot)	18	32 Grayscales (Vert./Hor.)
3	Vertical Lines (2 dots)	19	32 Grayscales (V/H Overlay)
4	Horizontal Lines (2 dots)	20	64 Grayscales (Horizontal)
5	Grid Pattern (single dot)	21	64 Grayscales (Vertical)
6	Grid Pattern (double dots)	22	64 Grayscales (Vert./Hor.)
7	Alternating Dot Pattern	23	64 Grayscales (V/H Overlay)
8	Full Dot Pattern	24	128 Grayscales (Horizontal)
9	Black Band	25	128 Grayscales (Vertical)
10	Trimming Area	26	128 Grayscales (Vert./Hor.)
11	Argyle Pattern	27	128 Grayscales (Vert./Hor. Overlay)
12	16 Grayscales (Horizontal)	28	256 Grayscales (Horizontal)
13	16 Grayscales (Vertical)	29	256 Grayscales (Vertical)
14	16 Grayscales (Vert./Hor.)	30	256 Grayscales (Vert./Hor.)
15	16 Grayscales (Vert./Hor. Overlay)	31	256 Grayscales (Vert./Hor. Overlay)

2.2.3 INPUT CHECK (SP5803)



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1. Access SP mode 5803.
2. Select the class 2 SP number which will access the switch or sensor you wish to check (see the table that follows this procedure).
3. Check the status of the sensor or switch.

   NOTE: If you wish to change to another class 2 level, touch "Next SP" or "Prev. SP" on the display.
4. If you wish to check the signal during a copy cycle, enter copy mode from the SP mode, select the required copy modes, then press the Start key. After that, go back to the SP mode to check the signal.
5. The reading ("0" or "1") will be displayed. The meaning of the display is as follows.

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0	0	0	0	0

Class 2 no.	bit no.	Description	Reading	
			0	1
1	7	Not used		
	6	LCT Paper End Sensor	Paper not detected	Paper detected
	5	Not used		
	4			
	3			
	2			
	1	Registration Sensor	Paper detected	Paper not detected
	0	Not used		

Class 2 no.	bit no.	Description	Reading 0	Reading 1
2	7	Not used		
	6	LCT Switch	LCT unit closed	LCT unit open
	5	Front Cover Safety Switch	Front cover closed	Front cover open
	4	Relay Sensor 3 (Option PFU)	Paper not detected	Paper detected
	3	Relay Sensor 2 (Option PFU)	Paper not detected	Paper detected
	2	Relay Sensor 1 (Option PFU)	Paper not detected	Paper detected
	1	By-pass Feed Paper End Sensor	Paper detected	Paper not detected
	0	By-pass Feed Table Switch	By-pass feed table closed	By-pass feed table open
3	7	Thermistor	Normal	Overheat
	6	Not used		
	5	Toner End Sensor	No toner	Toner present
	4	Toner Overflow Sensor	Bottle not full	Bottle full
	3	Not used		
	2	Transfer Belt Position Sensor	Transfer belt down	Transfer belt up
	1	Not used		
	0			
4	7	Not used		
	6			
	5	LCT Tray Down Switch	Switch not pressed	Switch pressed
	4	LCT Lower Limit Sensor	Bottom plate not at lower position	Bottom plate at lower position
	3	LCT Upper Limit Sensor	Paper not at high position	Paper at high position
	2	LCT Set Signal	Not connected	Connected
	1	LCT Cover Sensor	LCT cover closed	LCT cover open
	0	LCT/By-pass Relay Sensor	Paper not detected	Paper detected
5	7	DIP Switch 8 (BCU)	Not used	
	6	DIP Switch 7 (BCU)	Not used	
	5	DIP Switch 6 (BCU)	Version Setting (see Table 1)	
	4	DIP Switch 5 (BCU)	Version Setting (see Table 1)	
	3	DIP Switch 4 (BCU)	SC is enabled	SC is disabled
	2	DIP Switch 3 (BCU)	No duplex	Duplex
	1	DIP Switch 2 (BCU)	Black	Twin Color
	0	DIP Switch 1 (BCU)	25 CPM	40 CPM

Class 2 no.	bit no.	Description	Reading 0	Reading 1
6	7	Print start signal	Not activated	Activated
	6	Main Motor Lock signal	Not detected	Detected
	5	Ozone Fan Motor Lock signal	Not detected	Detected
	4	Exhaust Fan Motor Lock signal	Not detected	Detected
	3	By-pass Feed Table Paper Width Data	See Table 2	
	2			
	1			
	0			
7	7	Not Used		
	6	Upper Relay Sensor	Paper not detected	Paper detected
	5	Not Used		
	4			
	3			
	2			
	1			
	0			
8	7	Paper End Sensor	Paper detected	Paper not detected
	6	Lower Relay Sensor	Paper not detected	Paper detected
	5	Tray Upper Limit Sensor	Paper not at high position	Paper at high position
	4	Tray Paper Size Sensor - 5	Switch not pressed	Switch pressed
	3	Tray Paper Size Sensor - 4	Switch not pressed	Switch pressed
	2	Tray Paper Size Sensor - 3	Switch not pressed	Switch pressed
	1	Tray Paper Size Sensor - 2	Switch not pressed	Switch pressed
	0	Tray Paper Size Sensor - 1	Switch not pressed	Switch pressed

Class 2 no.	bit no.	Description	Reading	
			0	1
9	7	Duplex Unit Set Signal	Not detected	Detected
	6	Fusing Unit Set Signal	Not detected	Detected
	5	Fusing Exit Sensor	Paper not detected	Paper detected
	4	Duplex End Fence H.P Sensor	End fence not at home position	End fence at home position
	3	Duplex Side Fence H.P Sensor	Side fence not at home position	Side fence at home position
	2	Duplex Turn Sensor	Paper not detected	Paper detected
	1	Duplex Entrance Sensor	Paper not detected	Paper detected
	0	Duplex Paper End Sensor	Paper not detected	Paper detected

Table 1: Version Setting

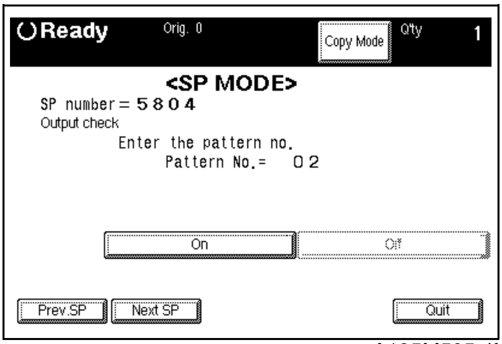
Class 2 no.	Bit 4	Bit 5	Version
5	0	0	Japanese version
	1	0	120V version
	0	1	230V version
	1	1	Not used

Table 2: By-pass Feed Table Paper Size Data

Class 2 no.	Bit 3	Bit 2	Bit 1	Bit 0	Paper Width
6	0	0	0	0	Post Card
	0	0	0	1	B6 Lengthwise
	0	0	1	0	B5 Lengthwise
	0	0	1	1	A5 Lengthwise / 51/2"
	0	1	0	0	B4 Lengthwise
	0	1	1	0	A4 Lengthwise / 81/2" / 8"
	1	0	0	0	A3 Lengthwise
	1	1	0	0	11" x 17"

1: Contact closed

2.2.4 OUTPUT CHECK (SP5804)



A195M505.tif

> **⚠ CAUTION**
>
> **Motors keep turning in this mode regardless of upper or lower limit sensor signals. To prevent mechanical or electrical damage, do not keep an electrical component on for a long time.**

1. Access SP mode 5804.
2. Selects the SP number that corresponds to the component you wish to check (see the table following this procedure), then press # .
3. Touch "ON" on the display to check the function.
4. Touch "OFF" on the display to interrupt the function.
5. If you wish to check another component, do the following procedure.
   1) Press C/⊗
   2) Enter the new SP number for the component you wish to check next.
   3) Press #

- Output check table -

No.	Description	No.	Description
1	Not used	51	Transport Drive Motor (Optional Finisher)
2	Not used	52	Junction Gate Solenoid (Optional Finisher)
3	Not used	53	Shift Tray Lift Motor (Optional Finisher)
4	Relay Clutch	54	Jogger Motor (Optional Finisher)
5	Registration Clutch	55	Not used
6	Paper Feed Clutch	56	Staple Motor (Optional Finisher)
7	Pick-up Solenoid		
8	Separation Solenoid	60	Duplex Motor (Forward)
9	Main Motor	61	Duplex Motor (Reverse)
10	Quenching Lamp	62	Side Jogger Motor (Duplex Tray)
11	Charge Corona & Grid Bias	63	End Jogger Motor (Duplex Tray)
12	Development Bias	64	Main Switch (Tests Auto Off Mode)
13	Transfer Belt Bias	65	Not used
14	Not used	66	Ozone Fan Motor
15	Not used	67	Cooling Fan Motor
16	Development Clutch	68	Exhaust Fan Motor
17	Toner Supply Motor	69	Not used
18	Toner Bottle Drive Motor	70	Not used
19	Not used	71	Not used
20	Not used	72	Not used
21	ID Sensor	73	Not used
22	Transfer Belt Lift Clutch (Up)	74	Not used
23	Transfer Belt Lift Clutch (Down)	75	Corona Wire Cleaner
24	Junction Gate Solenoid	76	Charge Corona Bias
25	Not used	77	Grid Bias
26	1st Paper Feed Cl (Optional PFU)	78	Not used
27	1st Pick-up Sol (Optional PFU)	79	Not used
28	1st Separation Sol (Optional PFU)	80	Not used
29	2nd Paper Feed Cl (Optional PFU)	81	DF Feed Motor (Forward)
30	2nd Pick-up Sol (Optional PFU)	82	DF Feed Motor (Reverse)
31	2nd Separation Sol (Optional PFU)	83	DF Belt Motor (Forward)
32	Main Motor (Optional PFU)	84	DF Belt Motor (Reverse)
33	3rd Paper Feed Cl (Optional PFU)	85	DF Feed Motor (Forward)
34	3rd Pick-up Sol (Optional PFU)	86	DF Solenoids (All solenoids)
35	3rd Separation Sol (Optional PFU)	87	DF LEDs
36	Relay Clutch (Optional PFU)	88	Not used
37	By-pass Feed Clutch	89	Not used
38	Not used	90	Not used
39	LCT Pick-up Solenoid	91	Not used
40	LCT/By-pass Pick-up Solenoid	92	Not used
41	LCT/By-pass Relay Clutch	93	Not used

2.2.5 SYSTEM PARAMETER AND DATA LISTS (SP5990)

1. Access SP mode 5990 and select the class 2 SP mode number corresponding to the list that you wish to print.
2. Touch the "Copy Mode" button on the display to access the copy mode display.
3. Select the paper size.

   NOTE: A paper size larger than A4 or 81/2" x 11" should be selected.

4. Touch the "SP Mode" button then the "Print" button on the display.
5. Touch the "Copy Mode" button on the display.
6. Press the "Start" key on the operation panel to print the list.
7. After printing the list, leave copy mode by touching the "SP Mode" button on the display.
8. Touch the "Quit" button to leave the SP mode.

2.2.6 External ASAP Video I/F Test (SP4905-2)

This tests the video data interface between the dummy board and the IPU board. If the printout from the test is no good, the interface between the IPU and the dummy board is defective.

1. Replace the main controller with the dummy board.

⚠ CAUTION
Do not perform this test with the main controller board.

2. Access SP mode and select the SP number 4905, item number 2.
3. Enter the path setting number 1.
4. Touch the "Copy Mode" button on the display to access the copy mode display.
5. Place the test chart on the exposure glass and make a copy.
6. Check the printout. If it is no good, the IPU - dummy board interface is defective.
7. After checking, leave copy mode by touching the "SP Mode" button on the display.
8. Change the path setting number back to zero.
9. Touch the "Quit" button to leave the SP mode.

⚠ CAUTION
Before leaving the SP mode, return the setting of the SP mode to 0 (normal).

2.2.7 Option Bus Interface Check (SP5945)

1. Replace the main controller with the dummy board.

⚠ CAUTION
Do not perform this test with the main controller board in the machine.

2. Access SP mode and select SP mode 5945.
3. Touch the "Start" button on the display.
4. The status of the test result will be shown on the display.
5. Touch the "Quit" button to leave the SP mode.

- Test result display -

1	No Error	
2	Err2	/ XBS16 Assert Error
3	Err3	+12 V Power Source Error
4	Err4	/ XBE2 Assert Error
5	Err5	/ XBE1 Assert Error
6	Err6	/ XBE0 Assert Error
7	Err7	Upper Address Error
8	Err8	Low Address Error
9	Err9	Data Write Error

2.2.8 Printer Controller Disk Error Log (SP5990 to Print, SP5946 to Clear)

The Printer Controller Disk Error Log is used to determine whether a disk error is fatal or not.

Use this for reference when deciding whether HDD replacement is needed.

To print to the printer controller disk error log:

1. Print the log data (SP5990-1/4).
   Refer to the "SYSTEM PARAMETER AND DATA LIST" section for the printing procedure.
2. Check the PRINTER DISK ERROR log section on the last page of the printed System Parameter Report as shown in PRINTER DISK ERROR below.
3. After printing this list, leave copy mode by touching the "SP Mode" button on the display.
4. Touch the "Quit" button to leave SP mode.

PRINTER DISK ERROR

Reset Date............DDMMYY

Total Counter....... xxx

1st.........................DDMMYY

2nd........................DDMMYY

3rd.........................DDMMYY

4th.........................DDMMYY

5th.........................DDMMYY

This error log records the dates of the last five errors. If errors with the same symptom occur frequently, change the hard disk.

The number of the total counter shows the total page number after the error log was last reset.

To clear the error log.

1. Access SP mode 5946.
2. Touch "Yes" on the display to clear the error log.
   The last five error logs will be cleared, and the total counter will be reset to 0.
   The Reset Date will be set to the current date.

2.3 SP MODE AFTER REPLACEMENT AND CLEANING

The following table shows the necessary SP modes and their order of execution when the listed items are replaced or cleaned.

●: After replacement ❍: After cleaning

No.	SP Mode No.	Item Description	Developer	TD Sensor	Drum	ID Sensor	Test Development Unit (with toner already in it)
1	2801	TD sensor initial setting **(See the note below.)**	●	●			
2	2220	VTREF manual setting					●
3	3001	ID sensor initial setting			●	● ❍	

NOTE: TD sensor initial setting can only be performed after warming up the machine completely.

2.4 MEMORY ALL CLEAR (SP5801)

⚠ CAUTION

Memory All Clear mode resets all the settings that are stored in the NVRAM to the default settings. These settings are the correction data for process control and all the software counters.
Normally, this SP mode should not be performed, This procedure is required only after replacing the NVRAM or when the copier malfunctions due to a damaged NVRAM.

1. Print out all System Parameter Lists (SP mode 5990).
2. Enter SP mode 5801.
3. Hold the C/⊛ key for more than 3 seconds.
4. Turn the main switch off and back on.
5. Perform the Touch Screen Adjustment procedure (see the "Touch Screen Adjustment" chapter in the Replacement and Adjustment section).
6. Do the printer and scanner registration and magnification adjustments (see section 12 of "Replacement and Adjustment").
7. Enter the values which had been changed from the factory settings, referring to the system parameter list (the values which have an "✻" mark next to them had been changed). In particular, the values for SP2220, SP3001, SP4901-2, SP4901-5, and SP4901-8 must be input.
8. Enter the setting of the OEM code (the value is set using SP5818).

   NOTE: This step is not necessary for the Ricoh Aficio 401, only for OEM machines.
9. Check the copy quality and the paper path, and do any necessary adjustments.

2.5 USER CODE FEATURE

If the user wishes to use the User Code Feature, the key counter connector must be disconnected. Refer to Installation - Key Counter for how to do this.

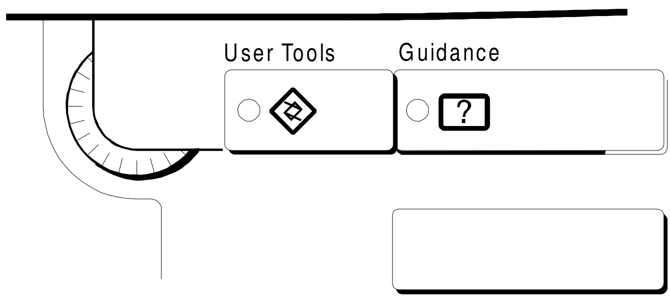
For how to store User Codes, refer to the operating instructions.

3. USER PROGRAM MODE

The user program (UP) mode is accesed by the key operators, and sales and service staff. This mode is used to input the copier’s default settings.

3.1 How to Enter and Leave UP Mode

Press the User Tools button



A195M508.wmf

3.2 UP Mode Table

Menu	
Basic Settings	Auto Response (Human) Sensor
	Operation Panel Beeper
	Copy Counter Display
	Set Date
	Set Time
	Auto Reset
	Low Power Timer
	Auto Off Timer
	Paper Type Display (for each tray)
	Tray 1 <*> Paper Size Setting
	Tray 1 <F/F4> Paper Size Setting
	Paper Size Setting (for tray 2,3, and 4 (Optional))
	Paper Tray Priority
	Original <F/F4> Size Setting
	ADF: Thin Paper Mode
	Auto Tray Switching
	Set User Code(s)

Menu			
Copy Features	Copy Modes	Auto Paper Select Priority	
		Auto Image Density Priority	
		Original Mode Priority	
		Full Main Menu Display	
		Duplex Mode Priority	
		User Reproduction Ratio 1, 2	
		Maximum Copy Quantity	
		Original Beeper	
	Adjust Image	Margin Adjust Front	
		Margin Adjust Back	
		Erase Border	
		Erase Center	
		Double Copies Separation Line	
		Combine Originals Booklet Format	
		Image Repeat Separation Line	
	Stamp	Page Numbering Format	
		P1,P2 1/5,2/5.... Format Position	
		-1-,-2- Format Position	
		Auto Stamping	
		Stamp Layout	Size
			Density
			Position
		User Stamp	
		User Stamp Layout	Size
			Density
			Position
		Date Position/Format	Date Format
			Orientation
			Position Top Left
			Position Bottom Right
		Background Numbering Size	
		Background Numbering Density	
	Input/ Output	Duplex Remaining Copy Exit	
		Combine Remaining Copy Exit	
		SADF Auto Reset Timer	
		Mixed Original Sizes	
		ADF Auto Sort Mode	
		Memory Full Auto Scan Restart	
		Rotate Sort Auto Paper Continue	

4. TEST POINTS/DIP SWITCHES/LEDS

4.1 DIP SWITCHES

BCU (Base Engine Control Unit): DIP SW201

No.	Function	ON	OFF
1	Copy Speed	**200 mm/s**	150 mm/s
2	Development Unit Type	Twin color	**Mono color**
3	Duplex Unit	**Installed**	Not installed
4	SC Generation	Disabled	**Enabled**
5	Destination	Off) Japan On) N.America Off) Europe On) Not used	
6		Off Off On On	
7	Not used		
8	Not used		

Do not change the settings of switches 1 to 4. They should be kept at the settings indicated in bold type in the above table.

SCU (System Control Unit): DIP SW401

No.	Function	ON	OFF
1,2	Not used		
3	Ricoh/OEM setting	OEM	Ricoh
4~8	Not used		

Service Tables

4.2 TEST POINTS

BCU (Base Engine Control Unit)

Number	Label	Monitored Signal
TP 208	**(GND)**	Ground

SCU (System Control Unit)

Number	Label	Monitored Signal
TP 402	**(GND)**	Ground

EX-IPU (Expanded - Image Processing Unit)

Number	Label	Monitored Signal
TP 1	**(GND)**	Ground
TP 2	**(GND)**	Ground
TP 5	**(GND)**	Ground
TP 25	**(+ 5V)**	+ 5V
TP 26	**(GND)**	Ground
TP 27	**(- 12V)**	- 12V
TP 28	**(+ 24V)**	+ 24V
TP 29	**(+ 12V)**	+ 12V
TP 40	**(GND)**	Ground
TP 43	**(GND)**	Ground

4.3 LEDS

BCU (Base Engine Control Unit)

Number	Monitored Signal
LED 201	Monitors the CPU (IC401). Usually, this LED is blinking.
LED 202	Monitors the sub CPU (IC213), fusing lamp control, and the +24V line condition. Usually, this LED is blinking. When the IC is not working properly, both LED201 and 202 are turned off. When there is an abnormal fusing lamp control condition or the +24V line is cut, this LED blinks faster than normal.

SCU (System Control Unit)

Number	Monitored Signal
LED 401	Monitors the MPU (IC401). Usually, this LED is blinking. If this LED is either always lit or always off, the MPU is not working properly.

Lamp Stabilizer

Number	Monitored Signal
LED 1	Lights when the exposure lamp turns on.

4.4 VARIABLE RESISTORS

EX-IPU (Expanded Image Processing Unit)

Number	Function
VR 1	Adjusts the differences between the odd white level and the even white level
	Do not adjust.
VR 2	Adjusts the original background erase level.
	Do not adjust.

5. PREVENTIVE MAINTENANCE SCHEDULE

5.1 PM TABLE

NOTE: The amounts mentioned as the PM interval indicate the number of copies.

Symbol key: C: Clean, R: Replace, L: Lubricate, I: Inspect

A195	EM	120K	240K	360K	NOTE
SCANNER/OPTICS					
Mirrors, Lens, Reflectors		C	C	C	Optics cloth or blower brush
Exposure Glass	C	C	C	C	Alcohol or glass cleaner
Exposure Lamp	I	I	I	I	Replace if necessary
Green Filter		C	C	C	Dry cloth
Scanner Guide Rails		C	C	C	Dry cloth
APS sensors		C	C	C	Blower brush
Lens Block Guide Rail		C	C	C	Dry cloth
Toner Shield Glass	C	C	C	C	Dry cloth
Dust Filter			R		
AROUND THE DRUM					
Corona Wires	C	R	R	R	Dry cloth
End Blocks and Casing	C	C	C	C	Water
Charge Grid	C	R	R	R	Water
ID Sensor	C	C	C	C	Blower brush or dry cloth After cleaning, do SP3001.
Quenching Lamp			C		Dry cloth
Pick-off Pawls		C	R	C	Dry cloth
DEVELOPMENT UNIT					
Development Drive Gears	I	I	I	I	Replace if necessary. Anyway, replace the drive gears every 480K.
Mold Gear		I	I	I	
Side Seal		I	I	I	
Development Filter		C	C	R	Vacuum cleaner
Entrance Seal	C	I	I	I	Dry cloth. Replace if necessary
Toner Supply Unit	C	C	C	C	Blower brush
Developer				R	Replace if necessary
Rear Sleeve		C	C	C	Dry cloth. See Note 2.
PAPER FEED (for each paper feed station)					
Pick-up, Feed, Separation Rollers (Paper tray)	C	C	R	C	Clean with water. Replace these rollers as a set.
Pick-up, Feed, Separation Rollers (LCT,By-pass feed)	C	C	R	C	Clean with water. Replace these rollers as a set.
Paper Dust			C		Dry cloth
Paper Feed Guide Plate		C	C	C	Alcohol
Relay rollers		C	C	C	Alcohol or water
Registration roller		C	C	C	Alcohol or water

A195	EM	120K	240K	360K	NOTE
Bottom Plate Pad (Paper tray, By-pass feed, LCT)	C	R	R	R	Water. Replace if necessary.
Registration Sensor		I	I	I	
CLEANING UNIT					
Drum Cleaning Blade		R	R	R	Spread setting powder. See "Drum Cleaning Blade Replacement".
Brush Roller			R		
Side Seal		C	C	C	Blower brush. Replace if necessary
Cleaning Entrance Seal		C	C	C	
Inside of the Cleaning Unit		C	C	C	Blower brush or vacuum cleaner
TRANSFER BELT UNIT					
Transfer Belt	C	I	R	I	Dry cloth. Replace if necessary
Transfer Belt Cleaning Blade	C	R	R	R	Dry cloth. Apply setting powder or toner after cleaning.
Rollers		I	C	I	Dry cloth. Replace if necessary
Transfer Entrance Guide Plate	C	C	C	C	Dry cloth
Transfer Guide Plate	C	C	C	C	Dry cloth
Used Toner Tank	I	C	C	C	Empty the tank.
FUSING UNIT					
Fusing Entrance and Exit Guide Plates		C	C	C	Suitable solvent - do not use water
Fusing Lamp		I	I	I	Replace if necessary
Hot Roller		R	R	R	
Pressure Roller		R	R	R	
Fusing Thermistor	C	I	I	I	Clean if necessary with a suitable solvent (not water)
Hot Roller Bushings		R	R	R	
Fusing Antistatic Brush		I	I	I	Replace if necessary
Cleaning Roller		C	C	C	Suitable solvent - not water
Cleaning Roller Bushings		C	C	C	Suitable solvent - not water. Replace if necessary
Hot Roller Strippers		C	R	C	Dry cloth
DUPLEX TRAY					
Clutch Spring		L	L	L	Mobil Temp 78. See Note 1.
Feed Roller		R	R	R	
Bottom Plate Pad		R	R	R	
Mylars		I	I	I	Replace if necessary
OTHERS					
Drive Belts			I		Replace if necessary

	EM	80K	160K	240K	NOTE
AUTO DOCUMENT FEEDER		(for originals)			
Transport Belt	C	R	R	R	Belt cleaner
Friction Belt	C	R	R	R	Water
Feed Roller	C	R	R	R	Water

	EM	120K	240K	360K	NOTE
PAPER TRAY UNIT (A549/550)					
Pick-up, Feed, Separation Rollers	C	C	R	C	Water, Replace these rollers as a set.
Relay Rollers		C	C	C	Alcohol or water
Bottom Plate Pad	C	R	R	R	Water
Relay Clutch		I	I	I	Replace every 1500K copies.
Feed Clutch		I	I	I	Replace if necessary
Drive Belts		I	I	I	Replace if necessary

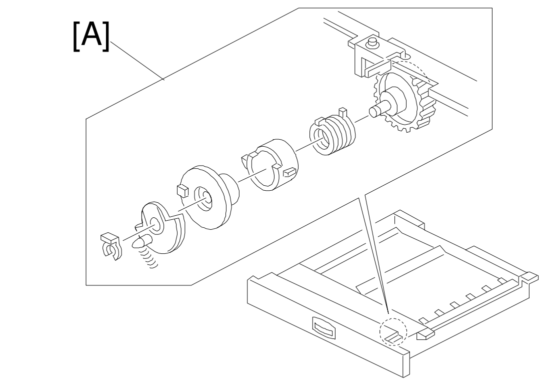
	EM	120K	240K	360K	NOTE
FINISHER (A612)					
Rollers	C	C	C	C	Water.
Bushings	I	I	I	I	Use Launa oil or equivalent.
Gears	I	I	I	I	Use Grease-501

Service Tables

NOTE 1.
Duplex Tray: Clutch Spring

Do the following every 120K.

Clean the clutch assembly [A]. Then lubricate the clutch spring with Mobil Temp 78.



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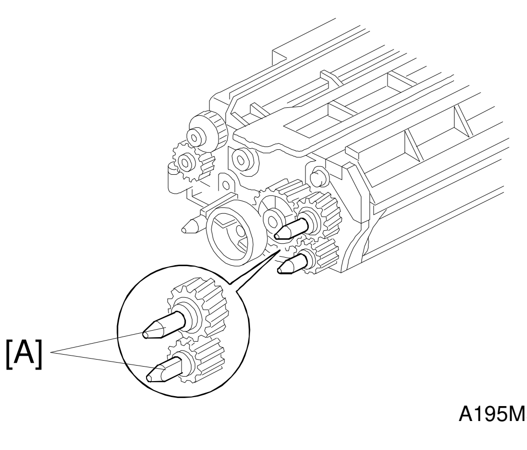
NOTE: 2.
Development Unit: Rear Sleeve
Do the following every 120K.
Clean the rear sleeve [A] with a dry cloth.



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5.2 REGULAR PM PROCEDURE

Every 120k

Every 240k

Every 360k/480k

1. Make a Copy

Make a copy of an OS-A3 test chart at manual image density level 4. Check the copy quality.

2. Optics (every 120 k)

Replace the dust filter (every 240 k).

1. Clean the mirrors, lens, and reflectors with a optics cloth or a blower brush.
2. Clean the exposure glass with alcohol or glass cleaner.
3. Clean the green filter with a dry cloth.
4. Clean the scanner guide rail with a dry cloth.
5. Clean the lens block guide rail with a dry cloth.
6. Clean the APS sensors with a blower brush.
7. Inspect the exposure lamp.
8. Clean the toner shield glass and the dust filter.

3. Around the Drum (every 120 k)

Replace the pick-off pawls (every 240 k).

1. Remove the drum and clean the ID sensor with a blower brush or dry cloth.
2. Clean the pick-off pawls with a dry cloth. Move them if they are scratching the drum.
3. Clean the inside of the cleaning unit and seals.
4. Replace the drum cleaning blade.
5. Clean the quenching lamp with a dry cloth.
6. Put back the drum.

Replace the brush roller (every 240 k).

7. Replace the charge grid and corona wires.
8. Clean the end blocks and casing.

5. Development Unit (every 120 k)

Replace the developer and development filter. (every 360 k).

Replace the drive gears (every 480 k).

1. Remove the toner supply unit.
2. Clean the development filter.
3. Inspect the seals
4. Clean around the openings of the toner supply unit with a blower brush.
5. Put back the development filter and toner supply unit.
6. Inspect the mold gear and development drive gears.
7. Clean the rear sleeve with a dry cloth.

6. Paper Feed (every 120 k for each paper feed station)

Replace the pick-up, feed, and separation rollers for each paper feed tray, the by-pass feed station, and the LCT (every 240k).

Clean the paper dust (every 240k).

1. Clean the paper guide plate.
2. Clean the paper feed, pick-up, separation, and relay rollers for each paper feed tray, the by-pass feed station, and the LCT.
3. Replace the bottom plate pad for each paper feed tray, the by-pass feed station, and the LCT.
4. Clean the registration rollers.
5. Inspect the registration sensor.

Service Tables

7. Transfer Belt Unit (every 120 k)

1. Remove the transfer belt.
2. Empty the used toner tank.
3. Replace the transfer belt cleaning blade.
4. Inspect the transfer belt and rollers.
5. Clean the transfer entrance guide plate and transfer guide plate.

Replace the transfer belt and clean the rollers (every 240 k).

8. Fusing Unit (every 120 k)

1. Clean the entrance and exit guide plates
2. Inspect the thermistor, fusing lamp, hot and pressure roller bearings, antistatic brush, and cleaning roller bushings.
3. Clean the cleaning roller and cleaning roller bushings.
4. Replace the pressure roller, hot roller, and hot roller bushings.
5. Replace the hot roller strippers.

Replace the hot roller strippers (every 240 k).

9. Duplex Tray (every 120 k)

1. Inspect the mylars.
2. Replace the feed roller and the bottom plate pad.
3. Lubricate the clutch spring with Mobil Temp 78.

10. Rear of the machine (every 120 k)

1. Inspect the timing belts.

11. Exterior (every 120 k)

1. Clean the covers.

12. Copy Process SP Mode Settings (every 120k)

Perform the ID Sensor Initial Setting (SP3001).

Perform the TD sensor initial setting SP 2801 (every 360 k)

13. Make a Copy

Make a copy of an OS-A3 test chart at manual image density level 4. Check the copy quality.

6. SPECIAL TOOLS AND LUBRICANTS

6.1 SPECIAL TOOLS AND LUBRICANTS

Part Number	Description	Q'ty
A006 9104	Scanner Positioning Pin (4 pcs/set)	1
5420 9516	Test Chart - OS-A3 (10 pcs/set)	1
5447 9078	Heat Resistant Grease - MT-78	1
5203 9501	Silicone Grease G-501	1
5420 9507	Digital Multimeter	1

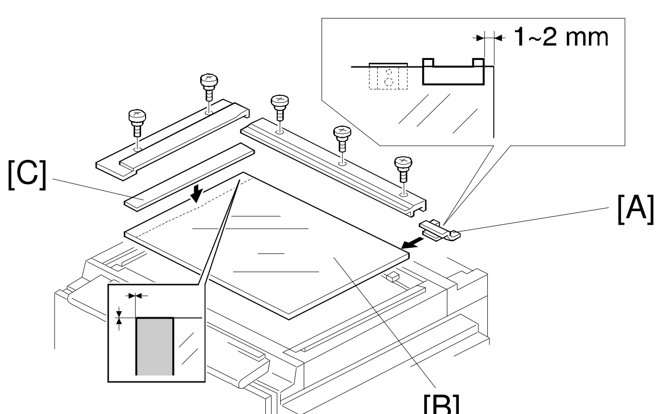
6.2 SPECIAL PARTS

Part Number	Description	Q'ty
A1349011 (Note 1)	Charge Corona Unit with Cleaner	1
A1309005 (Note 2)	Exposure Glass with Electric Conductor Coating	1
A1309006 (Note 2)	Grounding Plate - Exposure Glass	1
AC060002 (Note 2)	White Plate	1

NOTE 1: This special part is used for machines which produce a high copy volume.

NOTE 2: These special parts are used when many original jams occur on the exposure glass using the ADF in low humidity conditions.

The installation procedure is as follows.
1. Remove the exposure glass.
2. Install the grounding plate [A] as shown.
3. Install the new exposure glass [B].
   Note: The red mark should be placed at the rear left corner.
4. Stick the white plate [C] on the exposure glass as shown.
5. Reinstall the scales.



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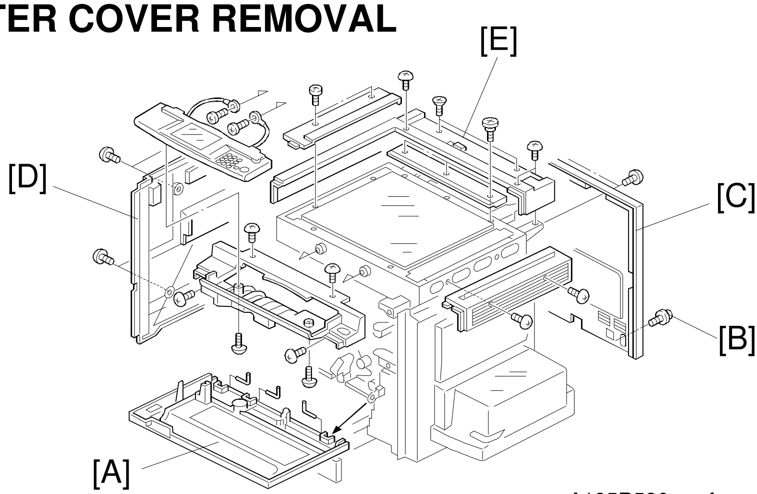
SECTION 5

REPLACEMENT AND ADJUSTMENT

1. INNER AND OUTER COVERS

1.1 OUTER COVER REMOVAL



A195R530.wmf

1.1.1 Front Cover

1. Open the front cover.
2. Remove the front cover [A] (3 pins).

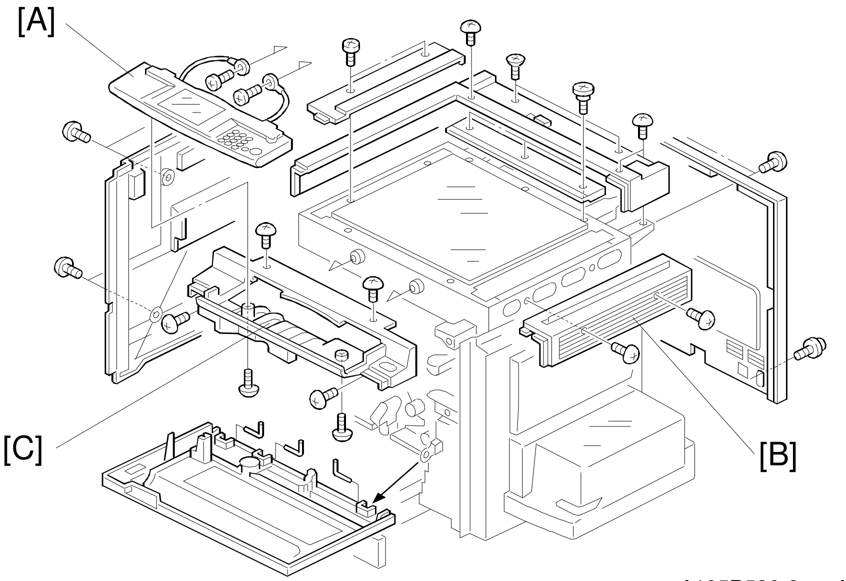
1.1.2 Left Cover

1. Remove the optional 500-sheet tray or finisher.
2. Open the front cover.
3. Slide out the duplex and paper feed trays.
4. Remove the left cover [D] (4 screws).

1.1.3 Top Cover

1. Remove the platen cover (see the Installation procedure) or DF (see the manual for the DF).
2. Remove the exposure glass. (See Exposure Glass Removal.)
3. Remove the top cover [E] (5 screws).

1.1.4 Operation Panel



A195R530-2.wmf

1. Turn off the main switch and unplug the machine.
2. Open the front cover.
3. Swing out the toner bottle holder assembly.
4. Remove the operation panel [A] (4 screws, 3 connectors).

1.1.5 Right Upper Cover

1. Remove the right upper cover [B] (2 screws).

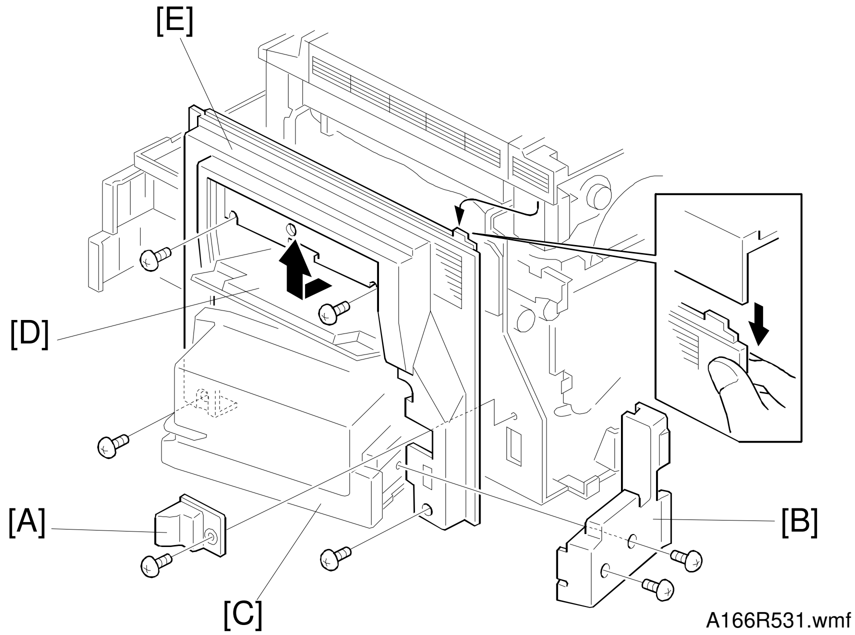
1.1.6 Front Upper Cover

1. Open the front cover.
2. Remove the toner bottle holder assembly. (See Development Unit Removal.)
3. Remove the operation panel [A] (6 screws, 3 connectors).

4 Remove the left inner cover. (See Inner Cover Removal.)

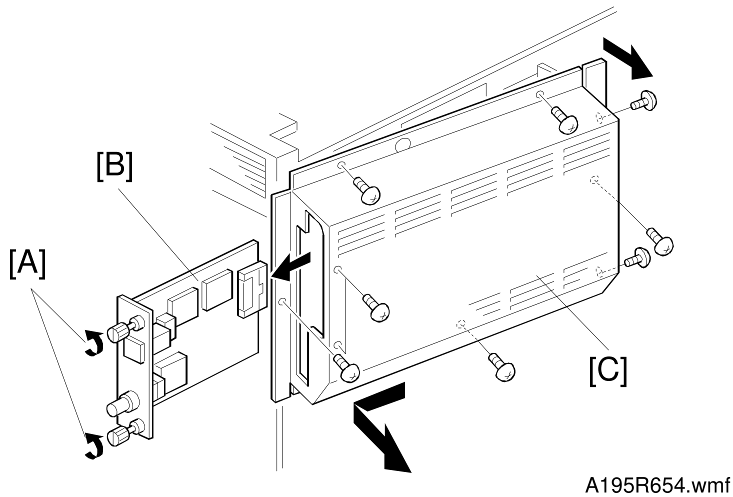
5. Remove the front upper cover [C] (2 screws).

1.1.7 Right Cover



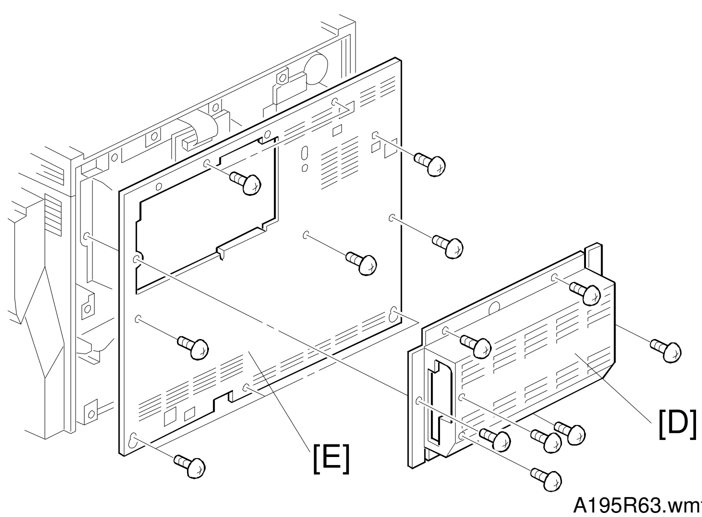
1. Open the front cover and pull out the paper tray and duplex.
2. Remove the LCT harness cover [A] (1 screw).
3. Remove the LCT rear cover [B] (2 screws).
4. Swing open the LCT [C] and open the by-pass feed table [D].
5. Remove the right cover [E] (4 screws).

1.1.8 Controller Board Cover



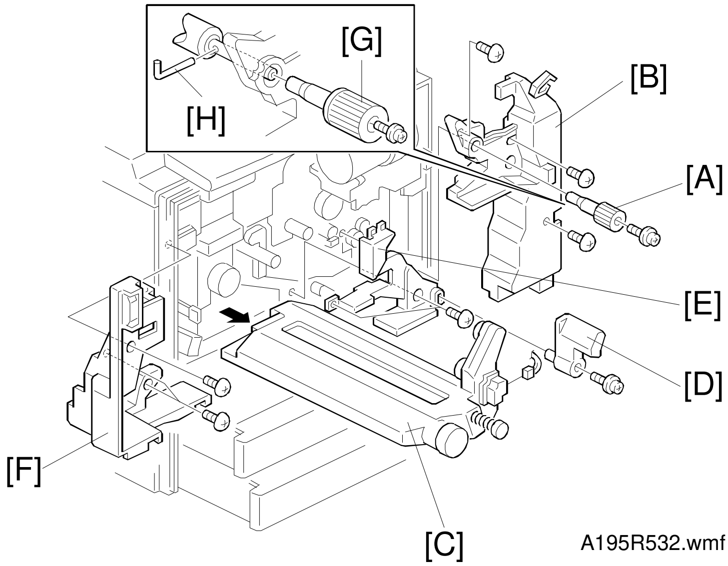
1. Loosen the 2 screws [A] of the optional NIC.
2. Remove the optional NIC [B].
3. Remove the controller board cover [C] (9 screws).

1.1.9 Rear Cover



1. Remove the controller board cover [D]. (See Controller Board Cover Removal.)
2. Remove the optional scanner board (See Scanner Board Removal).
3. Remove the rear cover [E] (9 screws).

1.2 INNER COVER REMOVAL



1.2.1 Right Inner Cover

1. Remove the front cover. (See Outer Cover Removal.)
2. Pull out the paper trays.
3. Remove the "A2" knob [A] (1 screw).
4. Remove the right inner cover [B] (3 screws).

   NOTE: When removing the knob [G], insert an allen key [H] into the hole in the registration roller shaft as shown in the illustration.

1.2.2 Middle Inner Cover

1. Open the front cover and pull out the paper trays.
2. Remove the toner collection bottle [C] (1 connector).
3. Remove the "A1" lever [D] (1 screw).
4. Remove the middle inner cover [E] (2 screws).

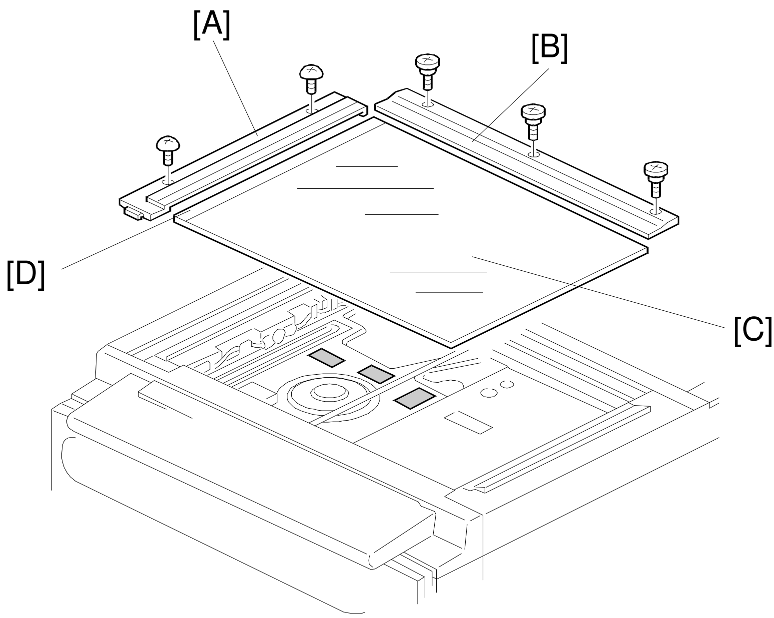
1.2.3 Left Inner Cover

1. Remove the front cover. (See Outer Cover Removal.)
2. Remove the toner collection bottle [C] (1 connector).
3. Remove the left inner cover [F] (3 screws).

Replacement Adjustment

2. SCANNER

2.1 EXPOSURE GLASS REMOVAL

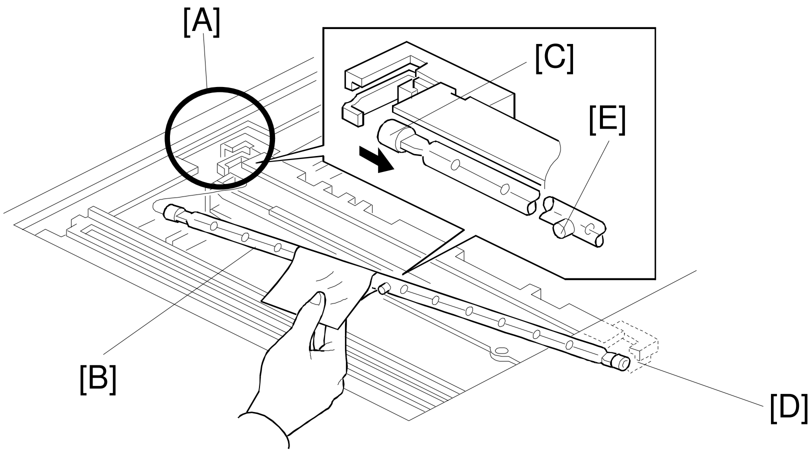


A195R627.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the left scale [A] (2 shoulder screws).
3. Remove the rear scale [B] (3 shoulder screws).
4. Remove the exposure glass [C].

NOTE: 1) Do not touch the exposure glass with dirty bare hands.
2) When installing the exposure glass, make sure that the white reference plate [D] is facing down.

2.2 EXPOSURE LAMP REPLACEMENT



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NOTE: Do not touch the reflector or the new exposure lamp with your bare hands. Use a strip of paper as shown. (Oil marks on the edges of the lamps or reflectors will be affected by heat from the lamp and will cause discoloration.)

1. Turn off the main switch and unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal.)
3. Move the 1st scanner to the rear cutout position [A].
4. Place a strip of paper around the exposure lamp [B].
4. Release the exposure lamp by holding the lamp tab [C] and pushing it towards the front.

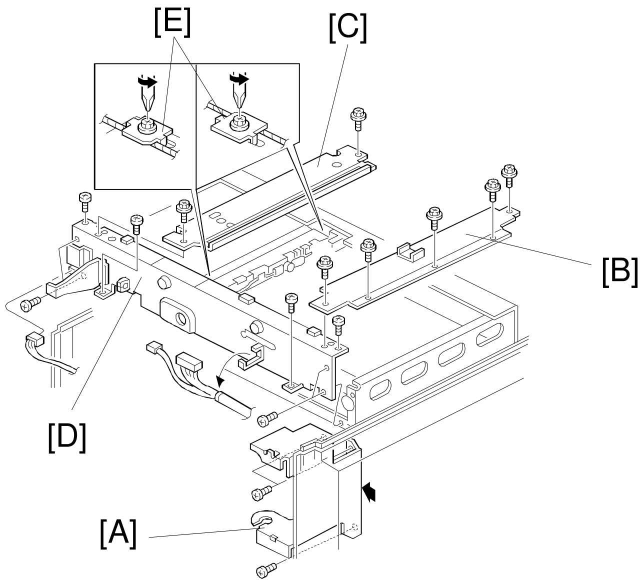
   NOTE: Push the lamp tab very gently or the front terminal will be damaged.
5. Remove the exposure lamp.
6. Install a new lamp. Use a strip of paper to hold the lamp. Set the front terminal [D] first.

NOTE: 1) Make sure that the exposure lamp is properly positioned at the front and rear terminals.
2) Make sure that the glass bump [E] on the exposure lamp is away from the reflector.

Replacement Adjustment

2.3 SCANNER WIRE REPLACEMENT

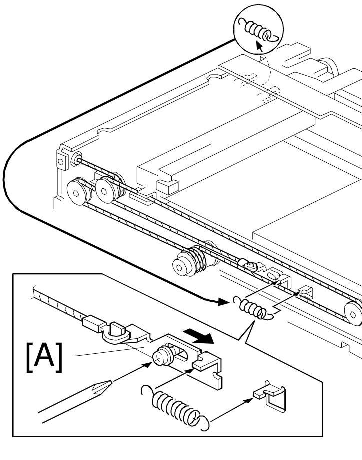
2.3.1 Front Scanner Wire Replacement



A195R534.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal.)
3. Remove the top, right upper, and front covers. (See Outer Cover Removal.)
4. Remove the right and left inner covers. (See Inner Cover Removal.)
5. Remove the toner bottle holder assembly. (See Development Unit Removal.)

   NOTE: Close the shutter of the toner bottle unit.
6. Remove the operation panel assembly. (See Outer Cover Removal.)
7. Remove the front upper cover. (See Outer Cover Removal.)
8. Remove the toner bottle holder bracket [A].
9. Remove the upper right stay [B] (5 screws) and the upper left stay [C] (2 screws).
10. Remove the scanner home position sensor. (See Scanner Home Position Sensor Replacement.)
11. Remove the front frame of the scanner unit [D] (9 screws).
12. Release the front and rear wire clamps [E] of the 1st scanner (1 screw each).



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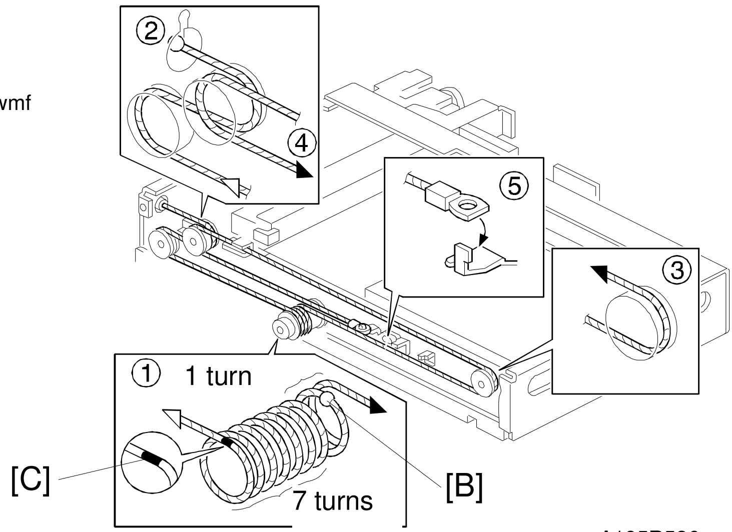


A195R536.wmf

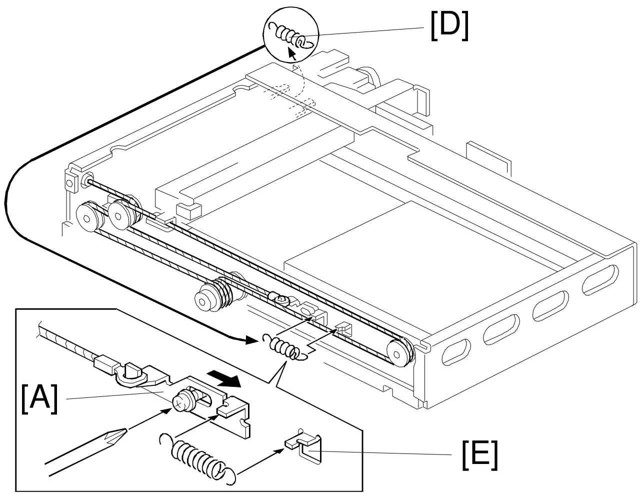
13. Loosen the tension bracket [A].
14. Remove the old scanner wire.
15. Move the 1st scanner to the home position.
16. Put the center ball of the scanner wire [B] into the hole in the scanner drive pulley.

    NOTE: The orientation of the scanner wire must be as follows:
    Left end of the scanner wire → ball.
    Right end of the scanner wire → hook.

17. Wind the right side of the wire counterclockwise towards the rear side (1 turn) and the left side of the wire counterclockwise towards the front (7 turns) as shown.

    NOTE: The mark [C] on the wire will come to the position shown.

18. Run the scanner wire as shown.



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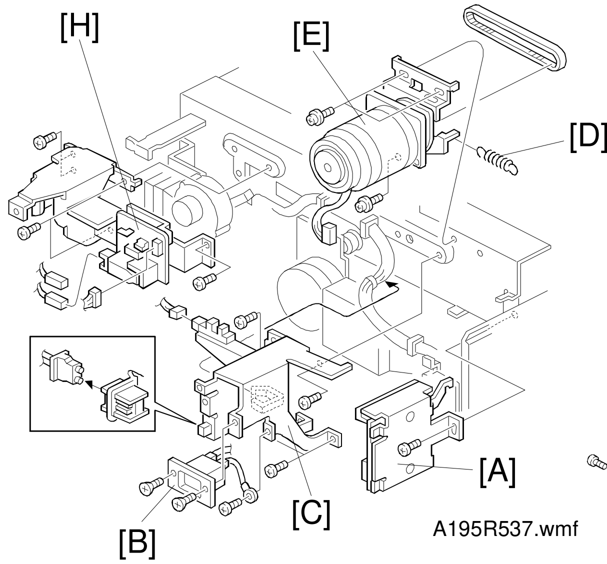
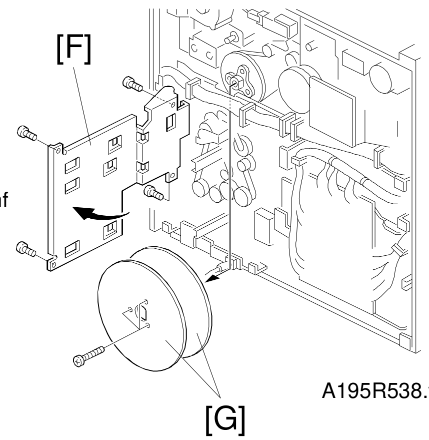
19. Secure the tension bracket [A] temporarily.
20. Remove the tension spring [D] of the scanner motor.
21. Hook the spring onto the tension bracket and spring hook [E].
22. Loosen the screw of the tension bracket and tighten it again.
23. Put the tension spring back on the scanner motor.
24. Adjust the scanner position. (See Scanner Position Adjustment.)
25. Do the copy image adjustments in section 12. (Check the printer settings first, then adjust the scanner registration and the sub-scan magnification.)

2.3.2 Rear Scanner Wire Replacement

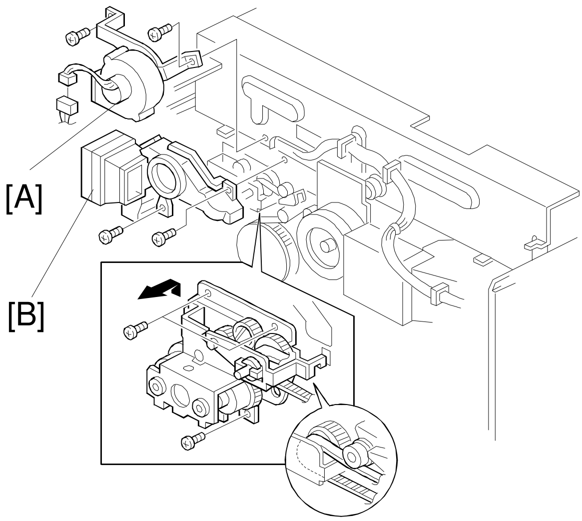


A195R537.wmf



A195R538.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal.)
3. Remove the top, right upper, and rear covers. (See Outer Cover Removal.)
4. Remove the scanner drive board [A] (3 connectors, 1 screw).
5. Remove the DF connector [B] (2 screws, 1 grounding wire).
6. Remove the left DF bracket [C] (4 screws, 1 connector).
7. Remove the tension spring [D].
8. Remove the scanner motor [E] (3 screws) and its grounding wire (1 screw).
9. Remove the HDD unit. (See HDD Unit Replacement.)
10. Swing out the SCU board plate [F] (4 screws).
11. Remove the fly wheels [G] (3 screws).
12. Remove the right DF bracket and the charge high voltage supply board assembly [H] (5 screws, 2 connectors).



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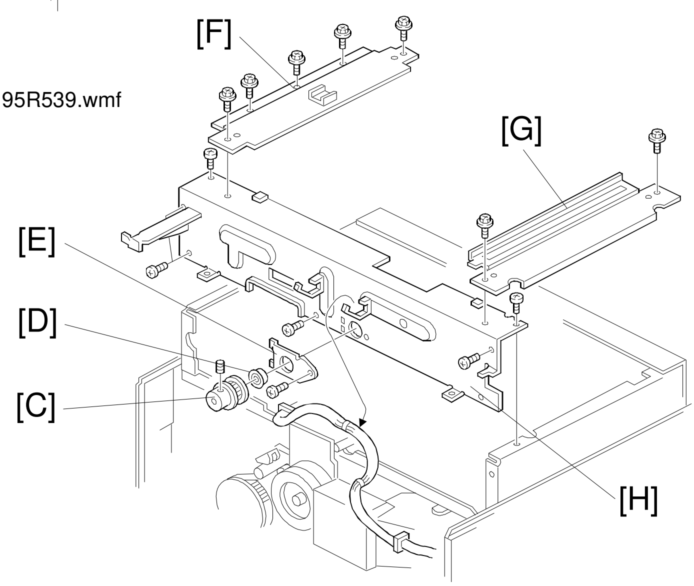

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13. Remove the development drive clutch holder and the development drive clutch assembly. (See Development Drive Clutch and Toner Supply Clutch Replacement.)

14. Remove the ozone fan motor [A] (1 connector, 2 screws).

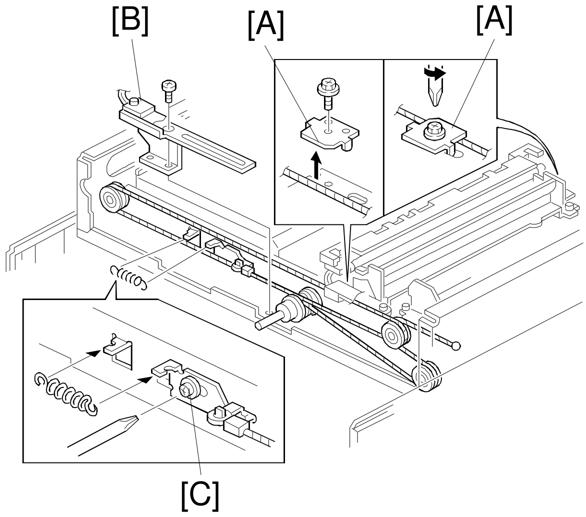
15. Remove the ozone fan motor duct [B] (2 screws).

16. Remove the scanner drive gear [C] (1 allen screw).

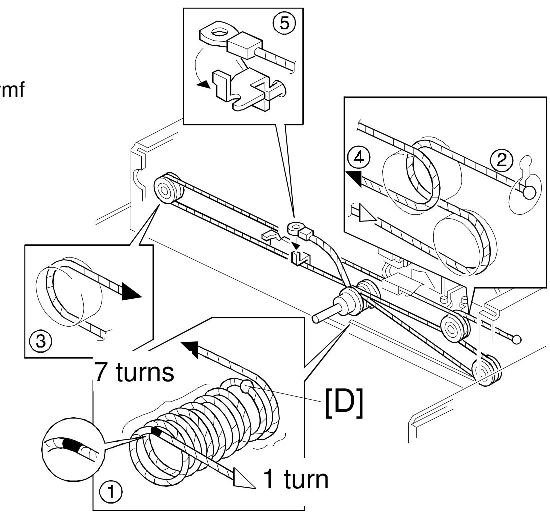
17. Remove the bushing [D] and holding bracket [E] (1 screw).

18. Remove the upper right stay [F] (5 screws) and the upper left stay [G] (2 screws).

19. Remove the rear frame of the scanner unit [H] (9 screws).



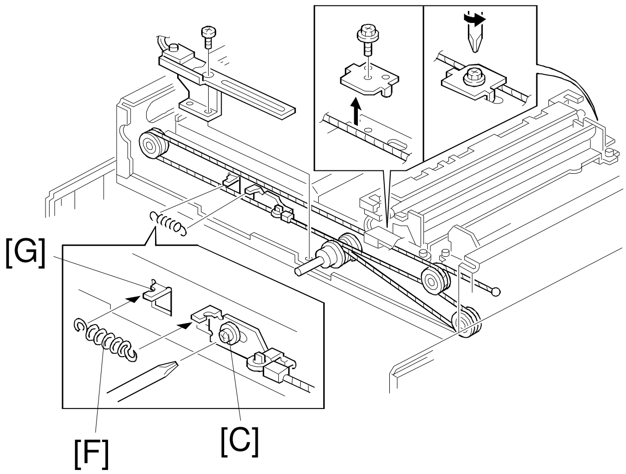
A195R541.wmf



A195R542.wmf

20. Release the rear and front wire clamps [A] of the 1st scanner (1 screw each).
21. Remove the terminal [B] of the flat cable (1 screw).
22. Loosen the tension bracket [C] and remove the old scanner wire.
23. Remove the old scanner wire.
24. Move the 1st scanner to the home position.
25. Put the center ball of the scanner wire [D] into the hole in the scanner drive pulley.

    NOTE: The orientation of the scanner wire must be as follows:
    Right end of the scanner wire → ball.
    Left end of the scanner wire → hook.



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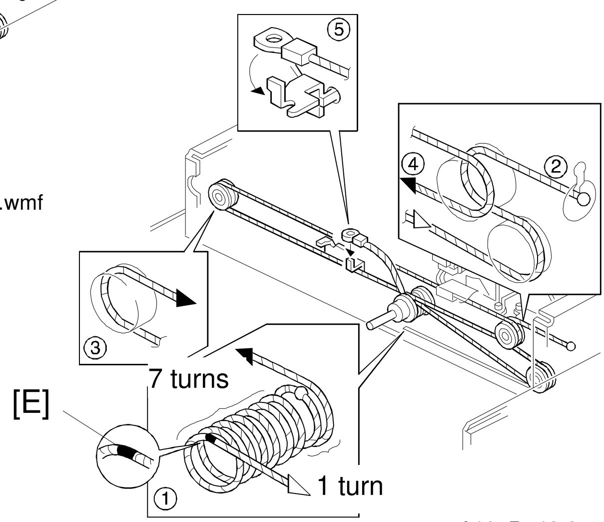


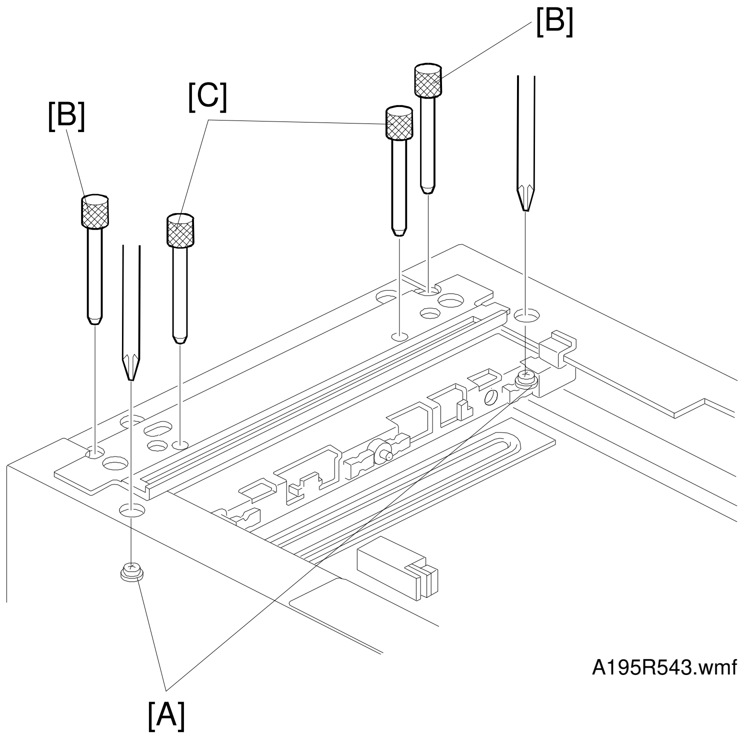
A195R542-2.wmf

26. Wind the left side of the wire counterclockwise towards the front side (1 turn) and the right side of the wire counterclockwise towards the rear (7 turns) as shown.

    NOTE: The mark [E] on the wire will come to the position shown.

27. Run the scanner wire as shown.
28. Secure the tension bracket [C] temporarily.
29. Remove the tension spring [F] of the scanner motor.
30. Hook the spring onto the tension bracket and spring hook [G].
31. Loosen the screw of the tension bracket [C] and tighten it again.
32. Put the tension spring back on the scanner motor.
33. Adjust the scanner position. (See Scanner Position Adjustment.)
34. Do the copy image adjustments in section 12. (Check the printer settings first, then adjust the scanner registration and the sub-scan magnification.)

2.3.3 Scanner Position Adjustment

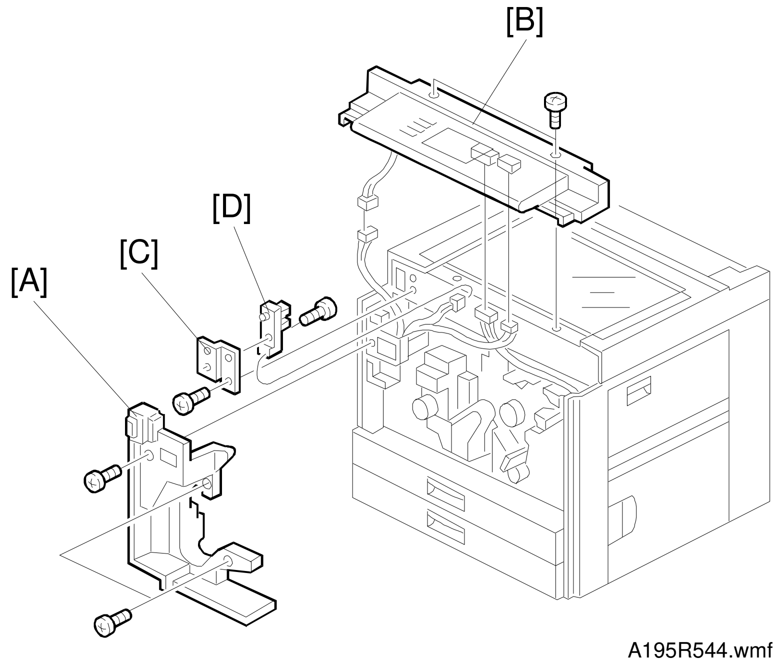


1. Move the 1st scanner to the home position.
2. If the scanner wire clamp screws [A] are not loose already, loosen them now.
3. Secure the 1st scanner with two pins [B] and the 2nd scanner with two pins [C].

   NOTE: The four pins should drop in smoothly.
4. Secure the 1st scanner wire clamps [C] (1 screw each).
5. Take out the 4 pins.
6. Run the scanner with the scanner free run mode (SP4013) and check the scanner position using the 4 pins (repeat steps 1 and 2).

Replacement Adjustment

2.4 SCANNER HOME POSITION SENSOR REPLACEMENT



1. Turn off the main switch and unplug the machine.
2. Remove the toner bottle holder assembly. (See Development Unit Removal.)

   NOTE : Close the shutter of the toner collection bottle holder.
3. Remove the left inner cover [A] (3 screws).
4. Remove the operation panel assembly [B]. (See Outer Cover Removal.)
5. Remove the home position sensor bracket [C] (1 connector, 1 screw).
6. Replace the home position sensor [D] (1 screw).

2.5 SCANNER DRIVE MOTOR

See steps 1 to 8 of Rear Scanner Wire Replacement.

After replacing the motor, do the copy image adjustments in section 12. (Check the printer settings first, then adjust the scanner registration and the sub-scan magnification.)

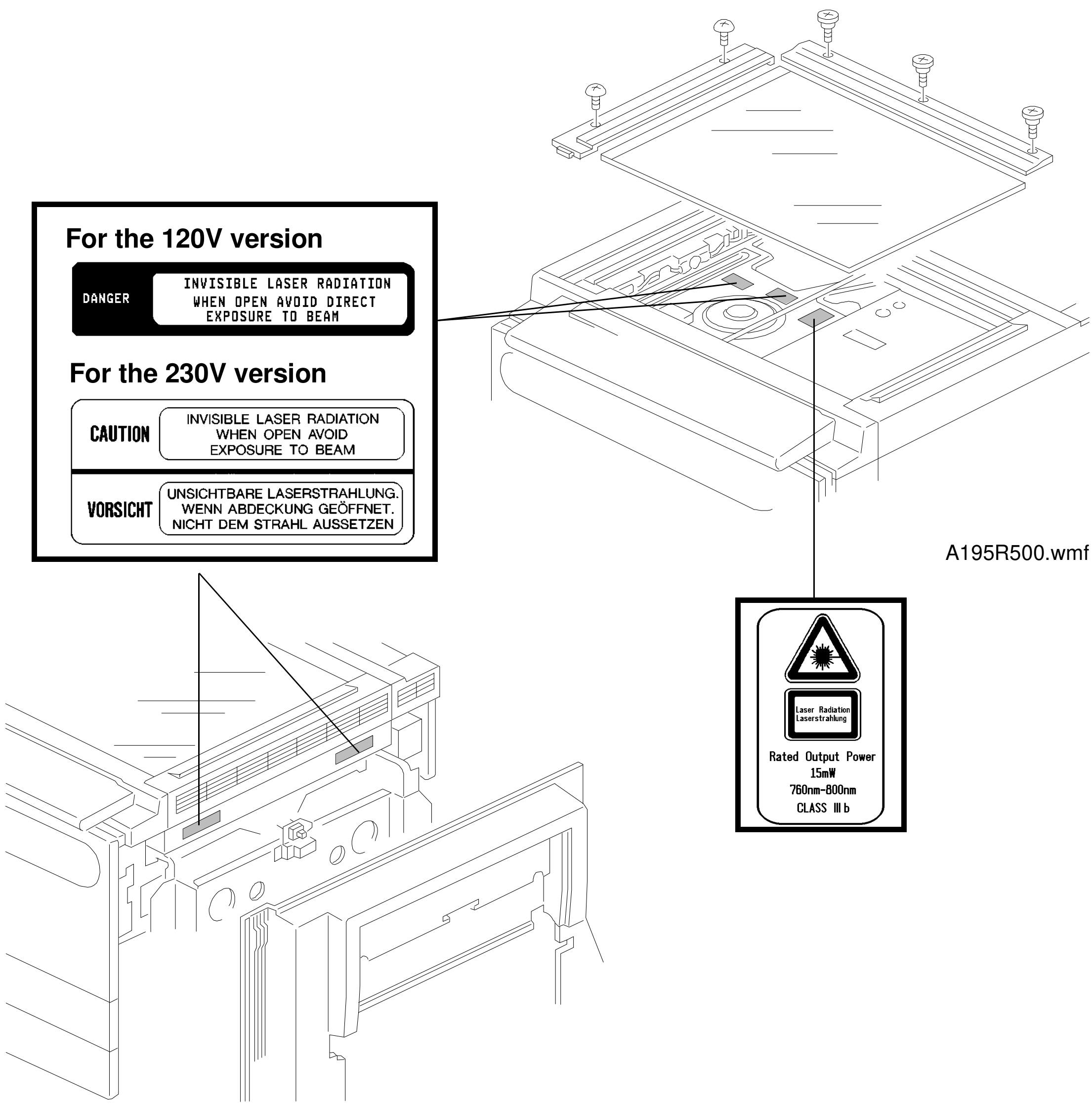
3. LASER EXPOSURE

⚠ WARNING

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 -

Five caution decals are located in the laser section, as shown.



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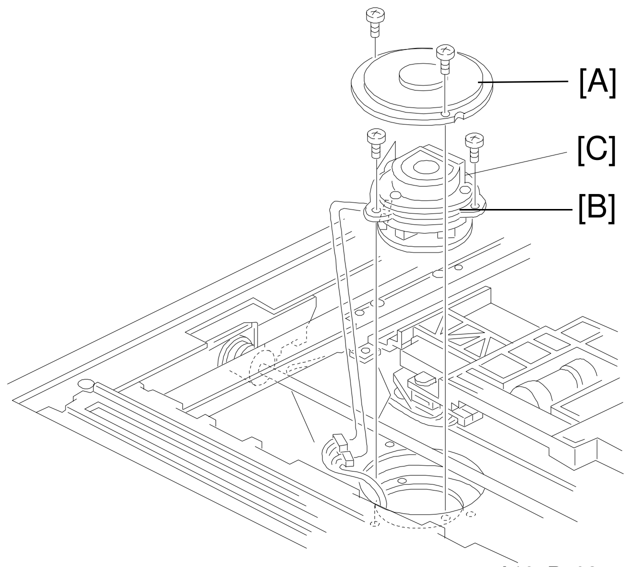
A195R501.wmf

3.1 POLYGON MIRROR MOTOR REPLACEMENT

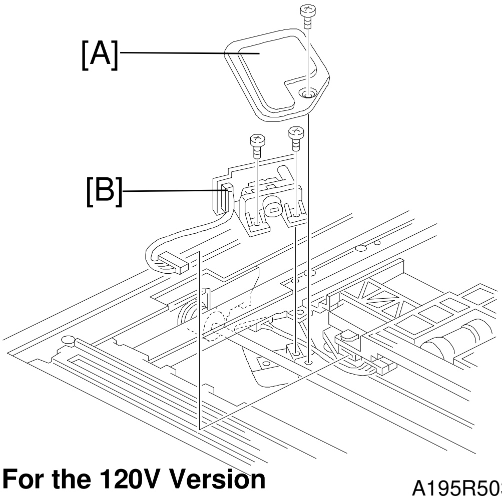


A195R502.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal.)
3. Remove the polygon mirror motor cover [A] (2 screws).
4. Remove the polygon mirror motor [B] (3 screws, 2 connectors).

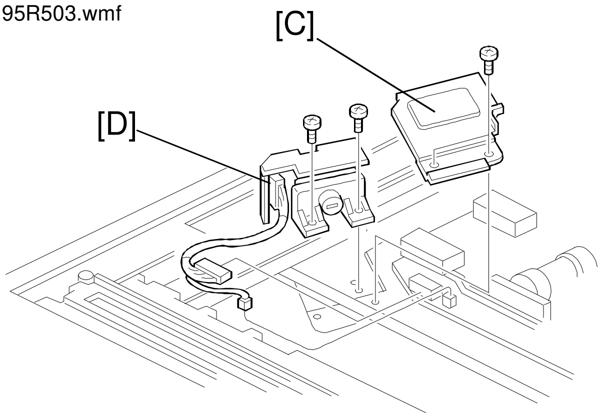
NOTE: 1) Do not touch the shield glass surface [C] on the polygon mirror motor.
2) Do not remove the cover of the polygon mirror. The polygon mirror is very sensitive to dust.
3) After putting back the motor, do the printer and main scan adjustments in section 12.

3.2 LD UNIT REPLACEMENT



For the 120V Version

A195R503.wmf



For the 230 V Version

A195R604.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal.)
3. Remove the SBU cover. (See EX-IPU Replacement.)

– 115 V machine –

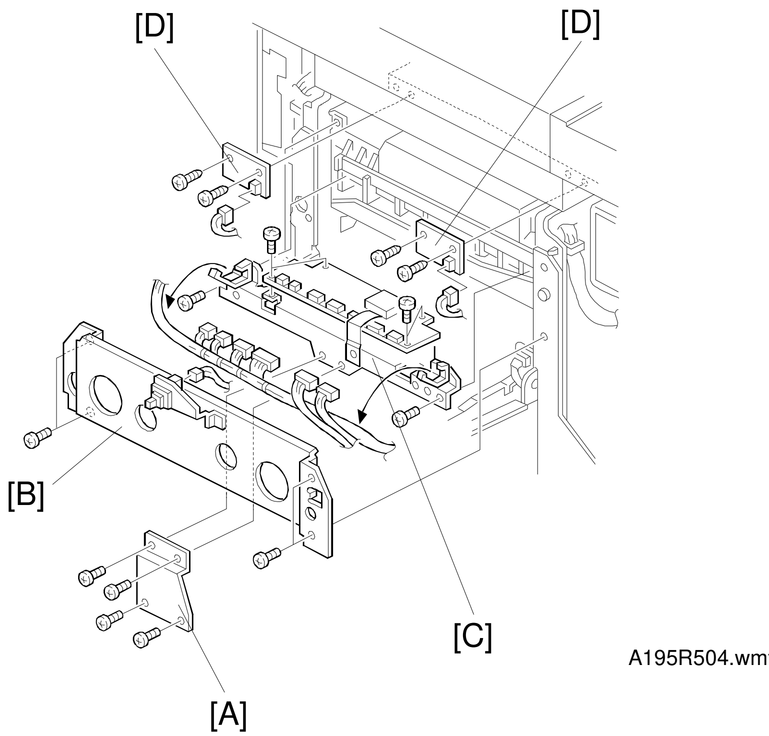
4. Remove the LD unit cover(s) [A] (1 screw).
5. Remove the LD unit [B] (2 screws, 1 connector).

– 230 V machine –

4. Remove the LD unit cover [C] (2 screws).
5. Remove the LD unit [D] (2 screws, 2 connectors)

NOTE: Do not adjust the variable resistors on the LD unit, as they are adjusted in the factory.

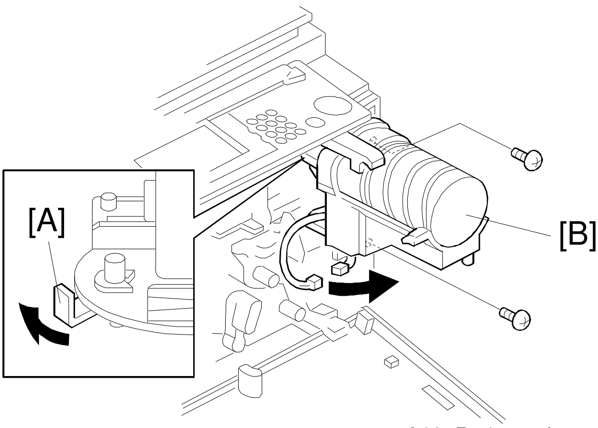
3.3 MAIN SCAN SYNCHRONIZATION DETECTOR BOARD REPLACEMENT



1. Turn off the main switch and unplug the machine.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Remove the right cover. (See Outer Cover Removal.)
4. Remove the lower grounding plated [A] (4 screws).
5. Remove the right stay [B] (4 screws, 1 connector).
6. Disconnect all connectors from the power pack.
7. Slide out the high voltage control board [C] (2 screws).
8. Remove the main scan synchronization detector boards [D] (2 screws each).

4. DEVELOPMENT AND TONER SUPPLY

4.1 DEVELOPMENT UNIT REMOVAL



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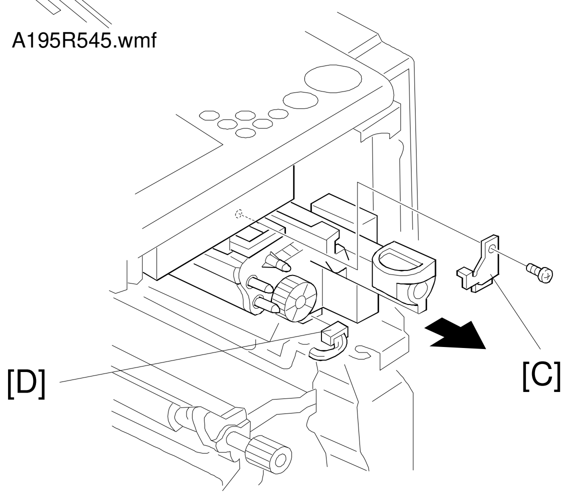

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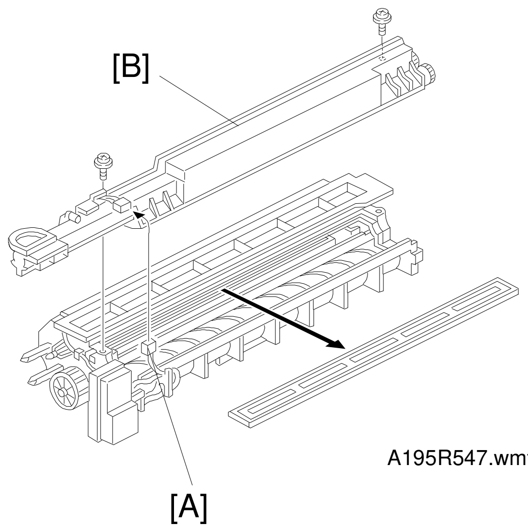
1. Turn off the main switch and unplug the machine.
2. Remove the drum unit. (See Drum Unit Removal.)
3. Push the shutter lever [A] of the toner bottle holder as shown.
4. Remove the toner bottle holder [B] (2 screws, 1 connector).
5. Remove the development unit stopper [C] (1 screw).
6. Disconnect the development unit connector [D].
7. Pull out the development unit.

NOTE: Be careful not to nick or scratch the development roller.

If you are temporarily installing a used development unit for test purposes, do SP2220 after installation (see SP 2220 in the SP mode table for how to use this SP mode).

4.2 DEVELOPER REPLACEMENT



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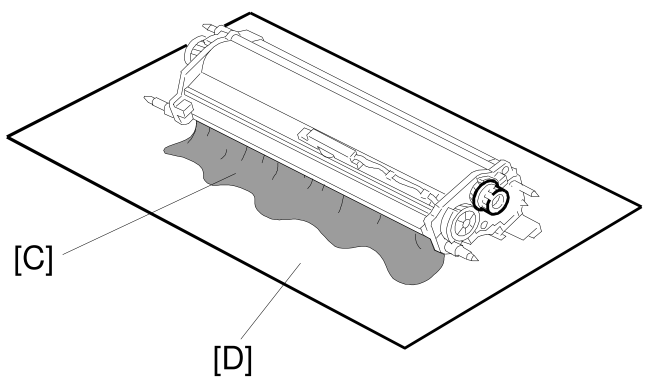

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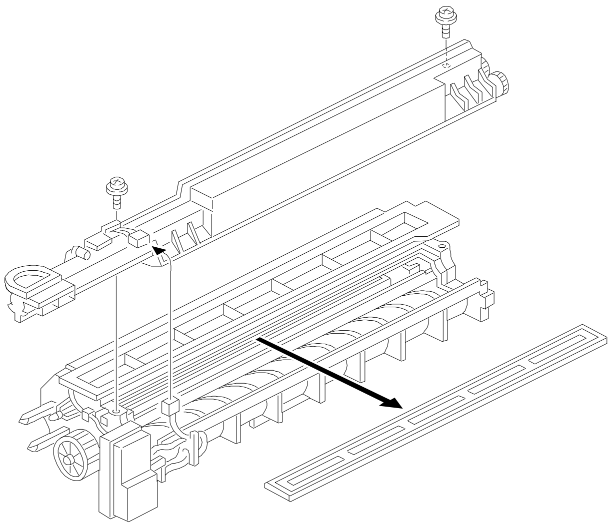
1. Take out the development unit and place it on a clean sheet (see Development Unit Removal).
2. Disconnect the connector [A] and separate the toner supply unit [B] from the development unit (2 screws).
3. Turn over the development unit and empty all the developer [C] onto the paper [D]. Make sure that no developer remains on the development roller or in the unit.

NOTE : 1) Dispose of the used developer in accordance with local regulations.
2) Be careful not to nick or scratch the development roller.



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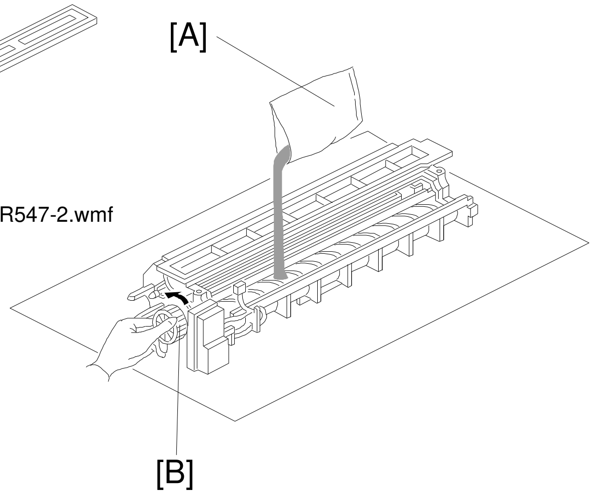


A195R548.wmf

4. Pour about half a pack of developer [A] into the development unit. Then rotate counterclockwise the outer knob [B] as shown to distribute the developer evenly. Then pour in all the remaining developer and rotate the gears again.

   NOTE : Do not rotate the gears in the other direction, or developer will spill out.

5. Remount the toner supply unit on the development unit (2 screws) and reconnect the connector.

6. Install the development unit in the copier (1 stopper and 1 connector).

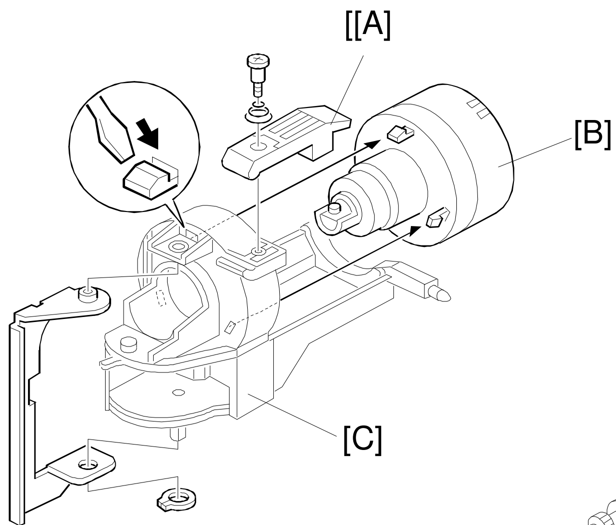
7. Turn on the main switch, make sure that the machine has warmed up, then do the TD sensor initial setting for new developer using SP2801.

   NOTE : Do not perform the TD sensor initial setting before the machine is in the ready condition.

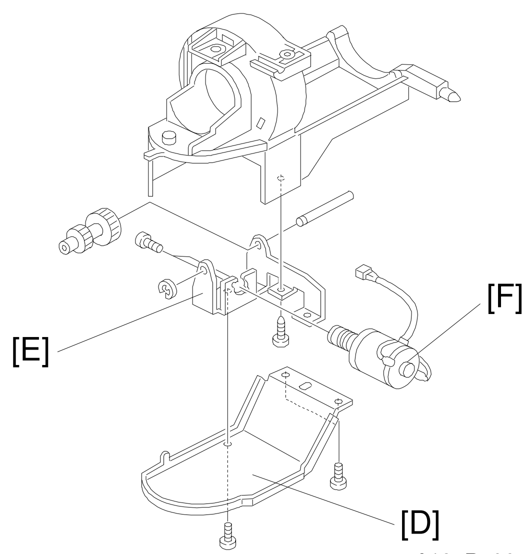
⚠ CAUTION

Never make a copy with the new developer before completing the TD sensor initial setting (SP2801). Otherwise toner density control will be abnormal.

4.3 TONER SUPPLY MOTOR REPLACEMENT



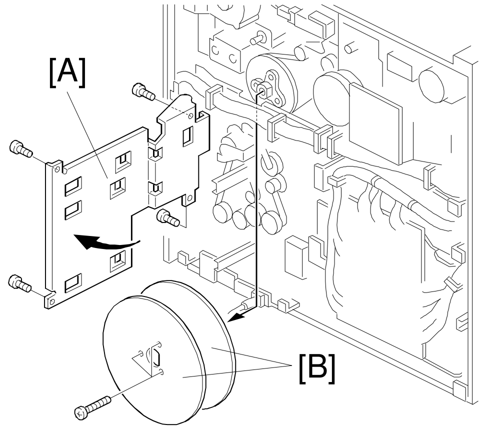
A195R505.wmf



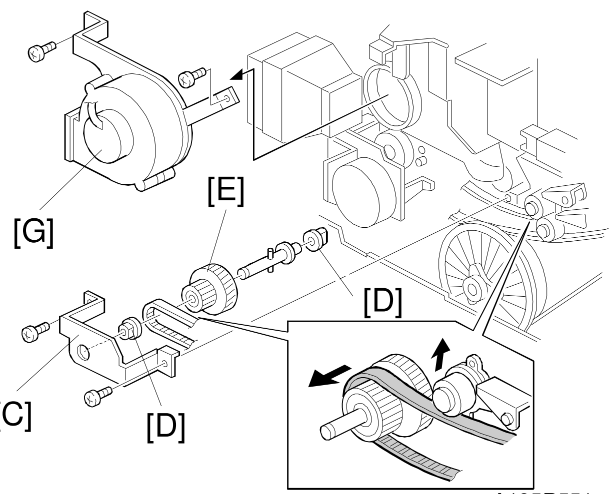
A195R506.wmf

1. Turn off the main switch and unplug the machine.
2. Open the front cover.
3. Swing out the bottle holder and remove the toner bottle.
4. Remove the bottle holder from the copier (2 screws and 1 connector).
5. Remove the bottle locking lever [A] (1 shoulder screw and 1 spring).
6. Remove the bottle rotating cover [B] by releasing the three hooks.
7. Remove the hinge bracket [C] from the bottle holder (1 C-ring).
8. Remove the bottom cover [D] (3 screws).
9. Remove the toner supply motor bracket [E] (1 screw) and replace the toner supply motor [F] (1 E-ring and 1 gear shaft).

4.4 DEVELOPMENT DRIVE MOTOR AND TONER SUPPLY CLUTCH REPLACEMENT



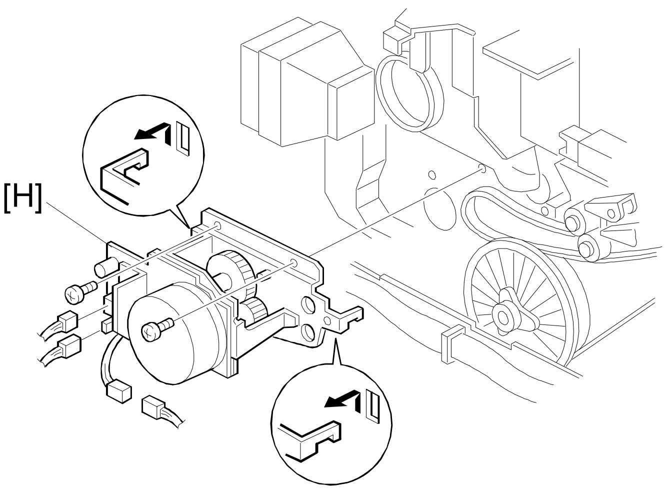
A195R538.wmf



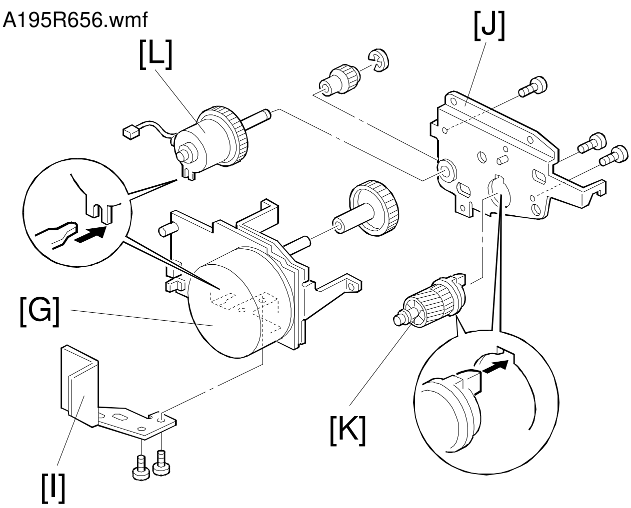
A195R551.wmf

1. Turn off the main switch.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Remove the controller board bracket (See Controller Board Bracket Replacement)
4. Remove the SCSI HDD Unit (See HDD unit Replacement)
5. Swing out the SCU board plate [A] (4 screws).
6. Remove the fly wheels [B] (3 screws).
7. Remove the drive gear holder [C] (2 screws).
8. Remove 2 bushings [D], 1 gear [E], and 1 shaft [F].

   NOTE : The bushings drop easily.



A195R656.wmf



A195R657.wmf

9. Remove the fan motor [G]. (2 screw, 1 connector.)
10. Remove the development drive motor assembly [H] (3 connectors, 3 screws).
11. Remove the gear cover [I] (2 screws).
12. Remove the development drive holder [J] (1 E-rings, 3 screws).
13. Replace the development drive gear [K] or the toner supply clutch [L] (2 Allen screws).

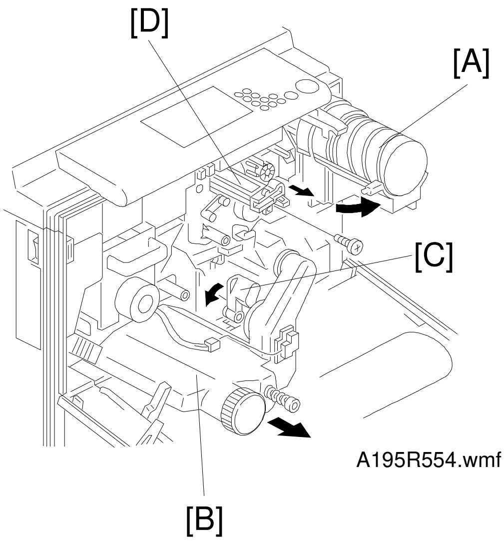
4.5 TD SENSOR REPLACEMENT

After replacing the TD sensor, do the TD sensor initial setting for new developer using SP2801.

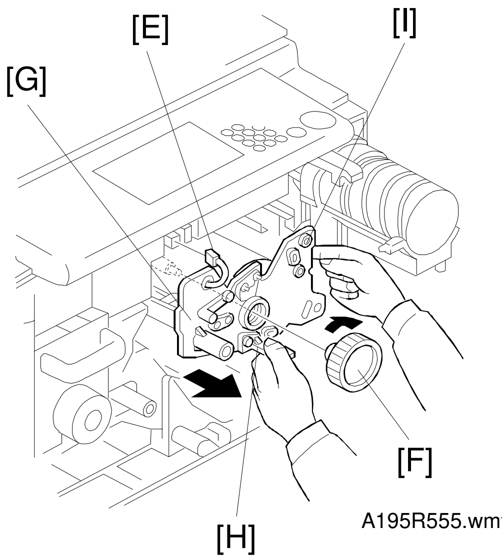
See Developer Replacement for details.

5. AROUND THE DRUM

5.1 DRUM UNIT REMOVAL



A195R554.wmf



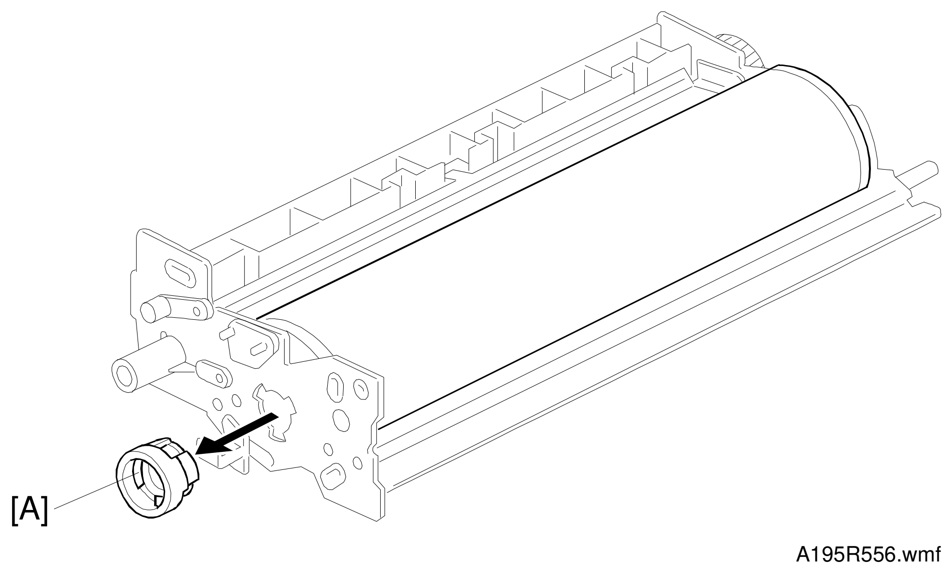
A195R555.wmf

1. Turn off the main switch and unplug the machine.
2. Open the front cover.
3. Swing out the toner bottle holder [A].
4. Remove the toner collection bottle [B] (1 connector).
5. Turn the "A1" lever [C] counterclockwise to lower the transfer belt unit.
6. Pull out the charge corona unit [D] (1 screw).
7. Disconnect the connector [E] of the image density sensor.
8. Turn the drum unit knob [F] clockwise and remove the knob.
9. Pull out the drum unit [G] part of the way out while holding the knob [H] and the upper right corner [I] of the front side plate of the drum unit.
10. Push the development unit to the right after the front side plate of the drum unit is released from the development roller shaft.
11. Pull the drum unit all the way out.

NOTE: 1) Place the drum unit on a clean sheet of paper.
2) Do not touch the drum surface with bare hands.
3) Make sure that the image density sensor connector is connected when you put back the drum.

Replacement Adjustment

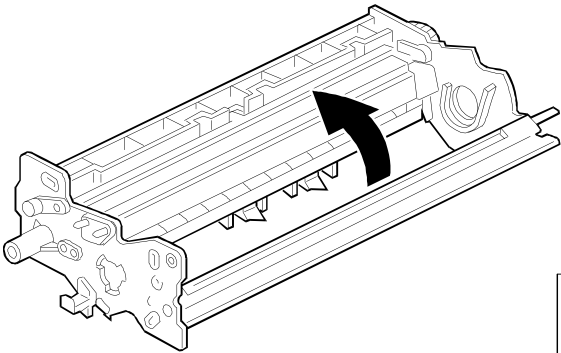
5.2 DRUM REPLACEMENT



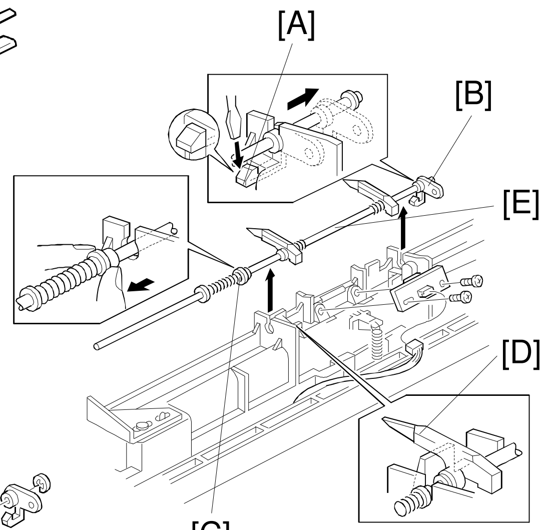
1. Remove the drum unit. (See Drum Unit Removal.)
2. Put the drum unit on a clean sheet of paper. Cover it with another sheet to avoid light fatigue.
3. Remove the front bearing [A].
4. Remove the old drum.
5. Install the new drum.
6. Install the front bearing and remove the protective sheet.
7. Reassemble the machine.
8. Perform the ID sensor initial setting (SP3001).

NOTE: Do not touch the drum surface with bare hands.

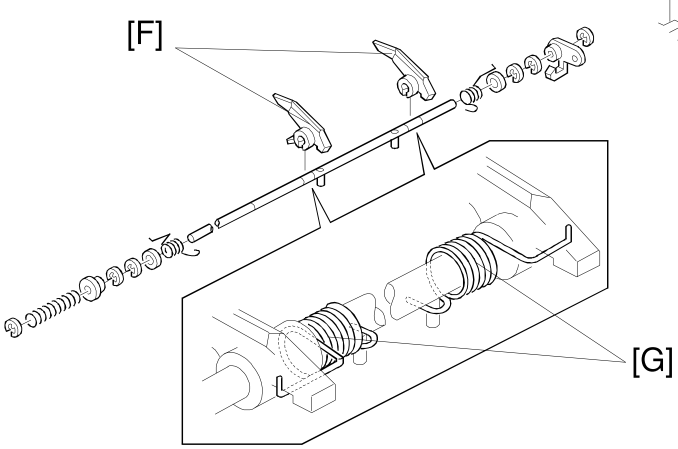
5.3 PICK-OFF PAWL REPLACEMENT



A195R557.wmf



A195R558.wmf



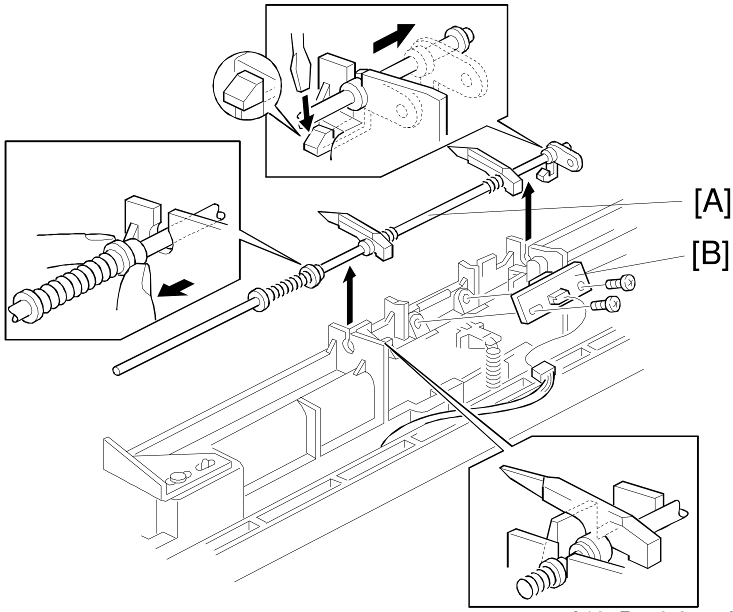
A195R559.wmf

1. Remove the drum. (See Drum Replacement.)
2. Turn the drum unit upside-down.
3. Release the hook [A] and slide the rear bushing [B] to the rear.
4. Slide the front bushing [C] to the front and release it from the bracket.

   NOTE: Be sure that the pawls [D] are positioned as shown when you put them back. Check that they move smoothly.
5. Lift the front side of the pick-off pawl shaft assembly [E] and replace the pick-off pawls [F].

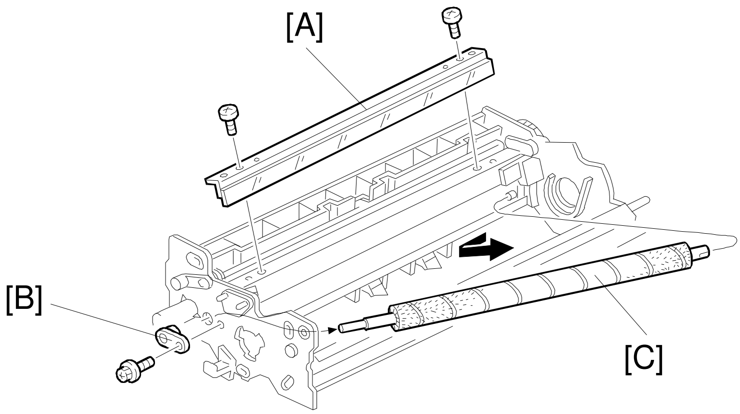
   NOTE: Be sure that the pressure spring [G] is positioned as shown.

5.4 ID SENSOR BOARD REPLACEMENT



A195R558-2.wmf

1. Remove the pick-off pawls. (See Pick-off Pawl Replacement.)
2. Remove the pick-off pawl shaft assembly [E].
4. Replace the ID sensor board [H] (2 screws, 1 connector).
5. Reassemble the machine.
6. Do the ID sensor initial setting procedure (SP3001).



A195R560.wmf

5.5 DRUM CLEANING BLADE REPLACEMENT

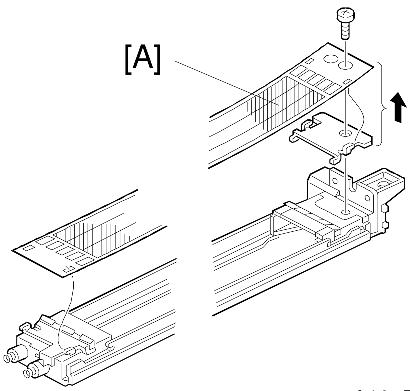
1. Remove the drum. (See Drum Replacement.)
2. Remove the old cleaning blade [A] (2 screws).
3. Install the new cleaning blade.

NOTE: 1) Check that there is no dust on the edge of the new cleaning blade.
2) When installing the new cleaning blade, be sure not to deform the sponge seals at both sides of the cleaning blade holder.

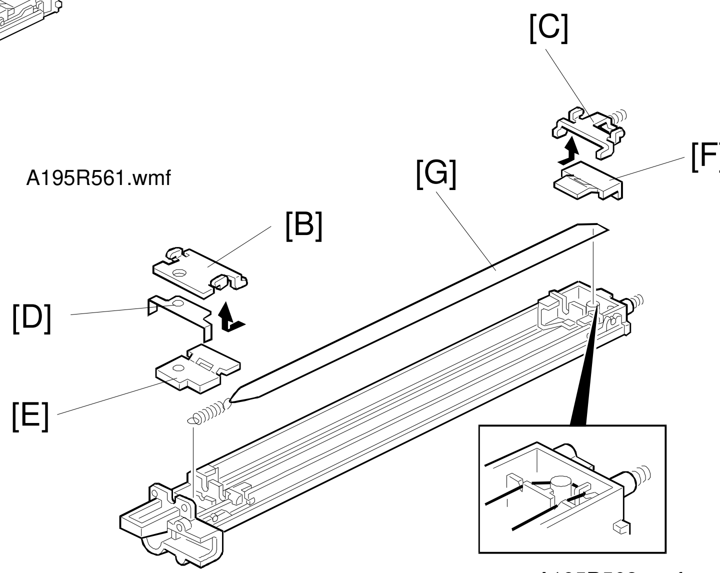
5.6 CLEANING BRUSH REPLACEMENT

1. Remove the drum. (See Drum Replacement.)
2. Remove the cleaning blade [A] (2 screws).
3. Remove the front bushing [B] of the cleaning brush (1 screw).
4. Move the cleaning brush [C] towards the front and release the rear shaft of the cleaning brush from the rear side plate.
5. Remove the old cleaning brush.
6. Install the new cleaning brush.

NOTE: 1) Clean the ID sensor after replacing the cleaning brush if necessary. If you clean the ID sensor, do the ID sensor initial setting procedure afterwards (SP3001).
2) Do not scratch or fold the entrance seal.
3) Do not touch the surface of the cleaning brush with your bare hands.



A195R561.wmf



A195R562.wmf

5.7 CHARGE CORONA GRID PLATE REPLACEMENT

1. Open the front cover.
2. Swing out the bottle holder.
3. Remove the charge corona unit. (See Drum Unit Removal.)
4. Replace the grid plate [A] (1 screw).

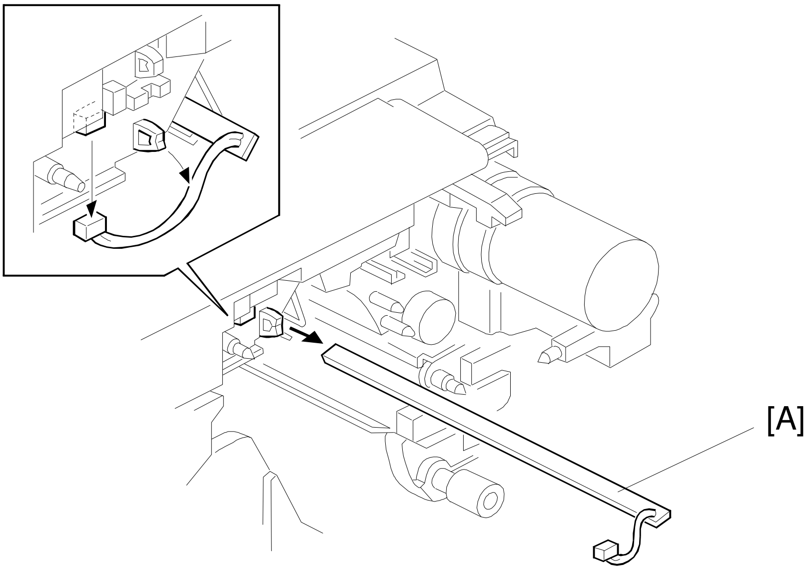
NOTE: Do not touch the grid plate with bare hands. Also, do not bend the grid plate or make any dent in it.

5.8 CORONA WIRE REPLACEMENT

1. Remove the grid plate. (See Grid Plate Replacement.)
2. Remove the front and rear grid plate holders [B, C].
3. Remove the connecting plate [D].
4. Remove the front and rear end block covers [E, F].
5. Replace the corona wire [G].

NOTE: Do not touch the corona wire with bare hands.

5.9 QUENCHING LAMP REPLACEMENT

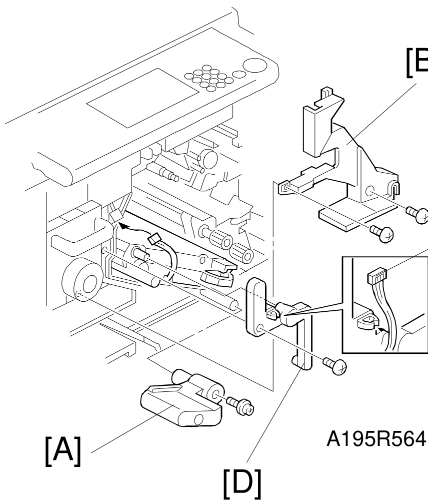


A195R563.wmf

1. Remove the drum unit. (See Drum Unit Removal.)
2. Replace the quenching lamp [A] (1 connector).

6. TRANSFER BELT UNIT

6.1 TRANSFER BELT UNIT REPLACEMENT



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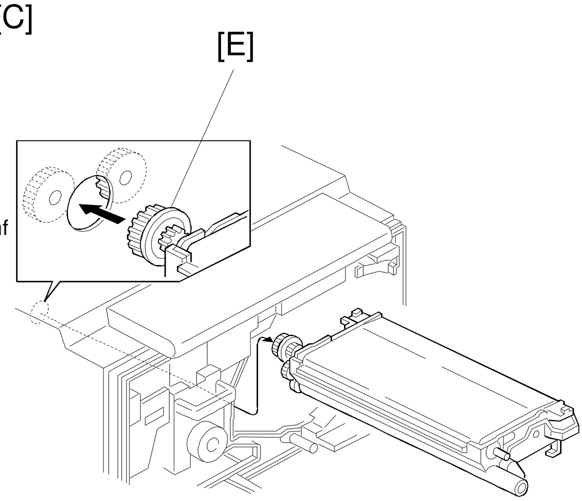
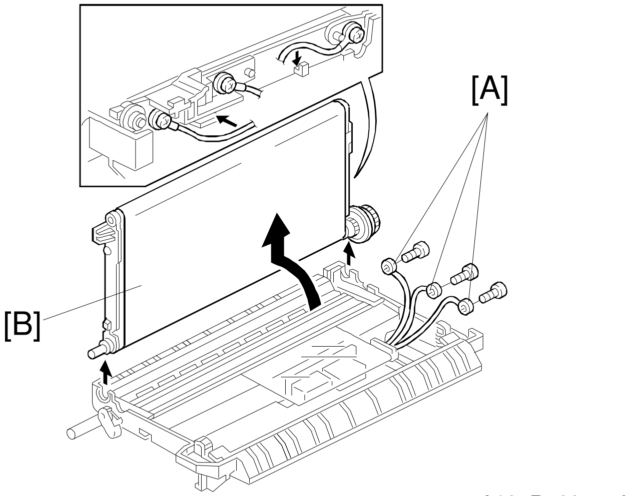


A195R565.wmf

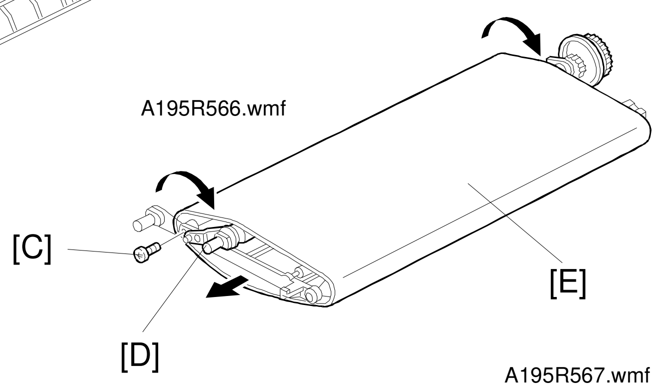
1. Turn off the main switch and unplug the machine.
2. Remove the front cover. (See Outer Cover Removal.)
3. Swing out the toner bottle holder.
4. Turn the "A1" lever counterclockwise to lower the transfer belt unit.
5. Remove the drum unit. (See Drum Unit Removal.)
6. Remove the "A1" lever [A] (1 screw).
7. Remove the middle inner cover [B] (2 screws).
8. Disconnect the four-pin connector [C] and release the harness from the clamp.
9. Remove the transfer belt positioning plate [D] (1 screw).
10. Remove the transfer belt unit.

    NOTE: Never touch the surface of the transfer belt.
11. When reinstalling the transfer belt unit, align gear [E] with the opening.

6.2 TRANSFER BELT REMOVAL



A195R566.wmf



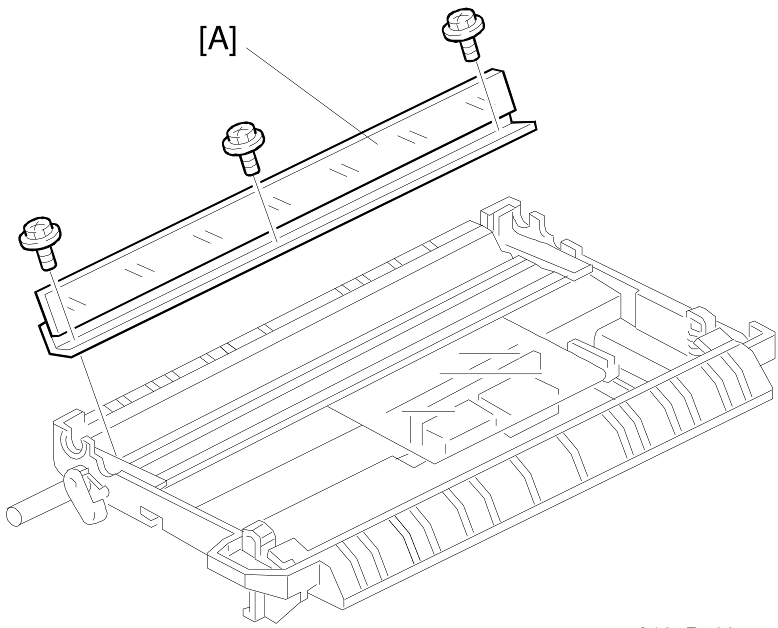
A195R567.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the transfer belt unit. (See Transfer Belt Unit Removal.)
3. Remove the three terminals [A] from the rear side plate of the transfer belt unit (3 screws).
4. Swing the transfer belt assembly [B] up by 90 degrees, then remove it.

   NOTE: Never touch the transfer belt surface.
5. Remove a screw [C] at the front and turn the belt drive holder [D].
6. Replace the transfer belt [E].

NOTE: 1) Before installing the new transfer belt, clean all the rollers and shafts (dry cloth) to prevent the belt from slipping.
2) When reinstalling, to avoid damage to the transfer belt, manually turn the rollers and check that the new transfer belt is not running over the edge of any of the rollers.

6.3 TRANSFER BELT CLEANING BLADE REPLACEMENT

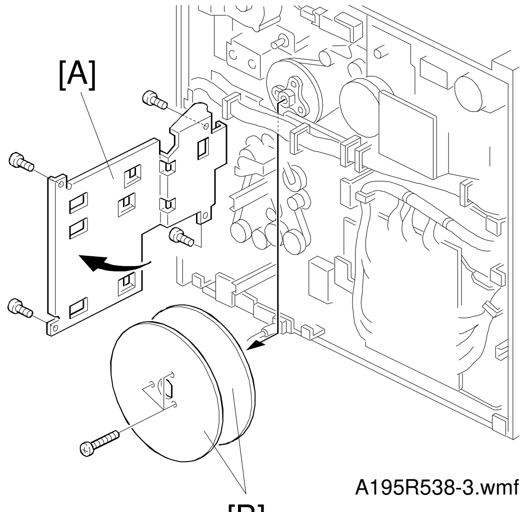


A195R568.wmf

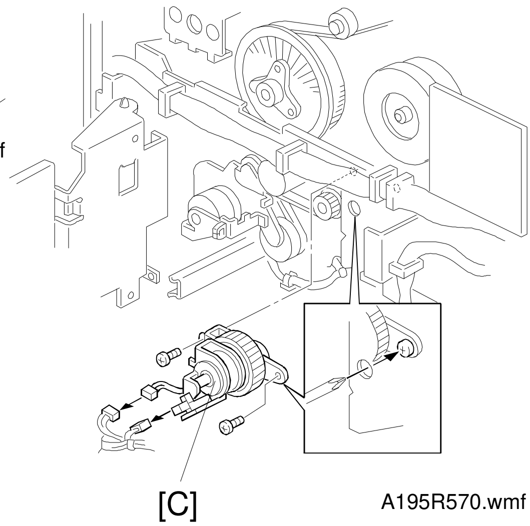
1. Remove the transfer belt unit. (See Transfer Belt Unit Removal.)
2. Remove the transfer belt assembly. (See Transfer Belt Replacement.)
3. Put the transfer belt assembly on a clean sheet of paper.
4. Remove the cleaning blade [A] (3 screws).

NOTE: 1) Do not touch the edge of the new blade.
2) Check that there is no dust/no damage on the edge of the new cleaning blade.

6.4 TRANSFER BELT LIFT CLUTCH



A195R538-3.wmf

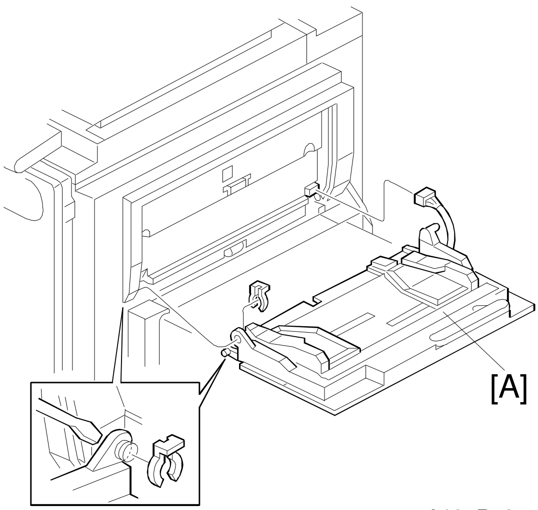


A195R570.wmf

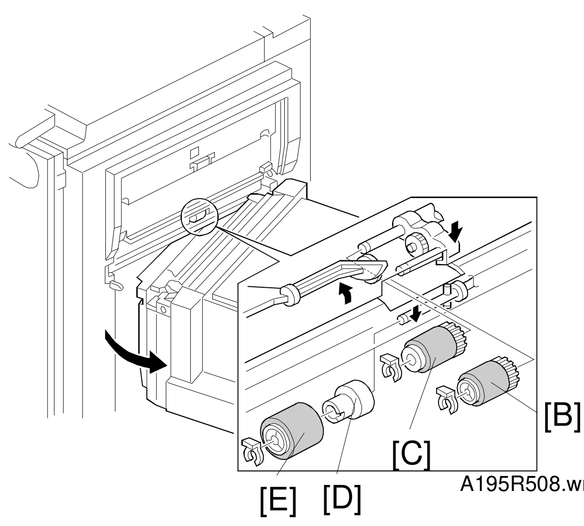
1. Turn off the main switch and unplug the machine.
2. Open the front cover.
3. Turn the lever "A1" clockwise.
4. Remove the rear cover. (See Outer Cover Removal.)
5. Swing out the SCU board plate [A] (4 screws).
6. Remove the fly wheels [B] (3 screws).
7. Replace the transfer belt lift clutch assembly [C] (2 connectors, 2 screws).

7. PAPER FEED

7.1 LCT PICK-UP, SEPARATION, AND FEED ROLLER REPLACEMENT



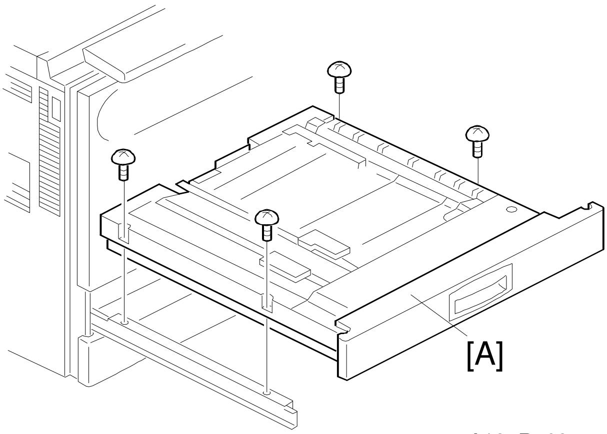
A195R507.wmf



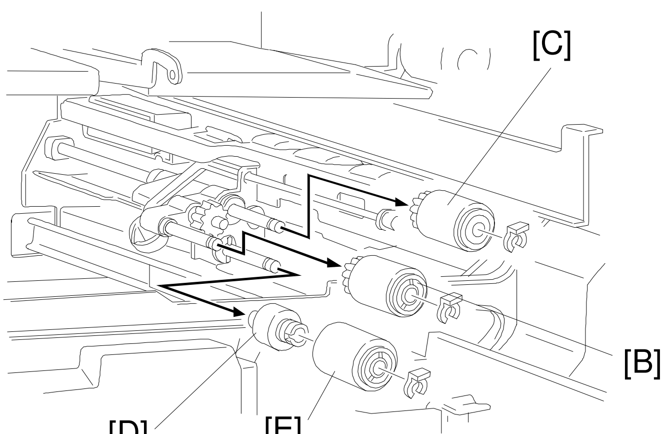
A195R508.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the by-pass feed table [A] (1 clip, 1 connector).
3. Open the LCT unit.
4. Remove the pick-up roller [B], feed roller [C], torque limiter [D], and the separation roller [E] (1 clip each).

7.2 TRAY PICK-UP, SEPARATION, AND FEED ROLLER REPLACEMENT



A195R509.wmf

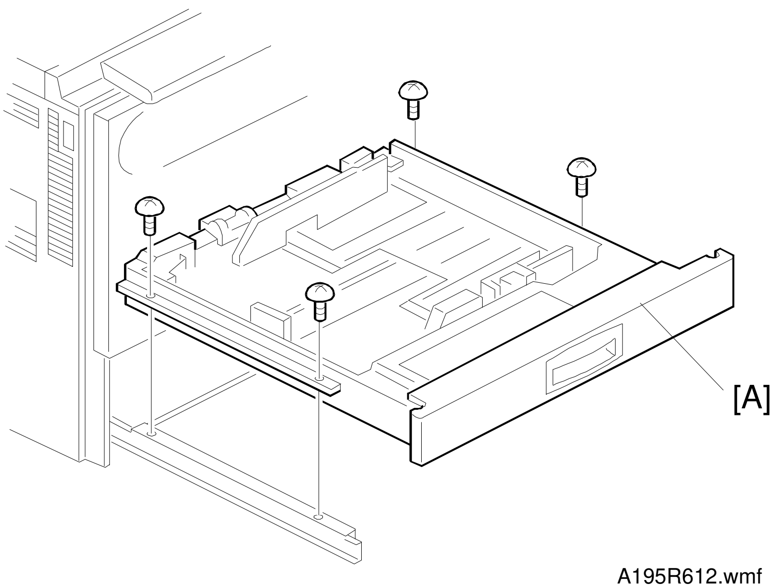


A195R510.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the duplex tray [A] (4 screws).
3. Remove the pick-up [B] and feed [C] rollers, torque limiter [D], and the separation roller [E] (1 clip each).

NOTE: After reinstalling the duplex tray, perform the printer side-to-side registration adjustment and the main scan magnification adjustment (see section 12).

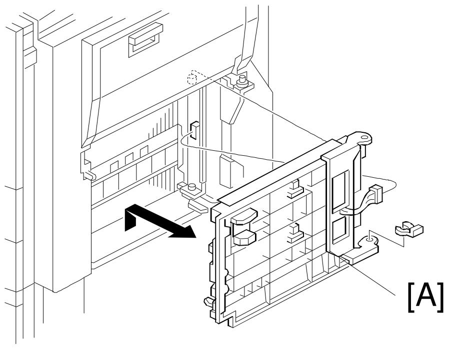
7.3 PAPER FEED TRAY REPLACEMENT



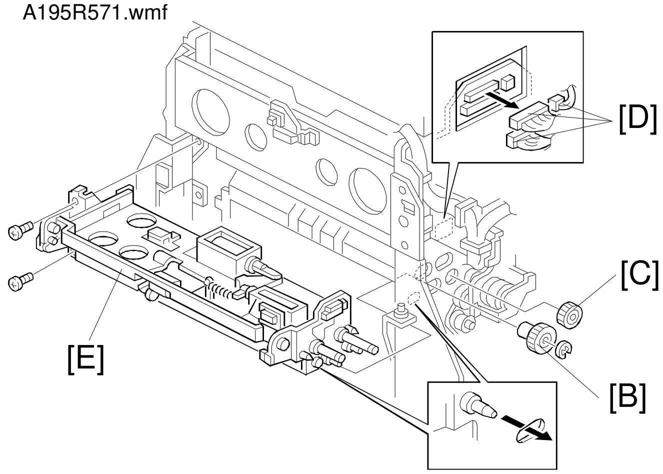
1. Turn off the main switch and unplug the machine.
2. Remove the paper feed tray [A] (4 screws).

NOTE: After reinstalling the paper feed tray, perform the side-to-side registration adjustment and the main scan magnification adjustment (see section 12).

7.4 BYPASS PAPER FEED UNIT REMOVAL



A195R571.wmf

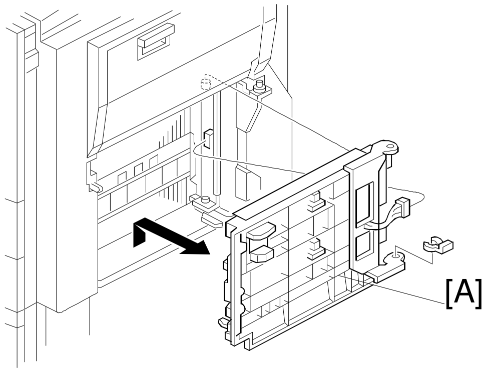


A195R572.wmf

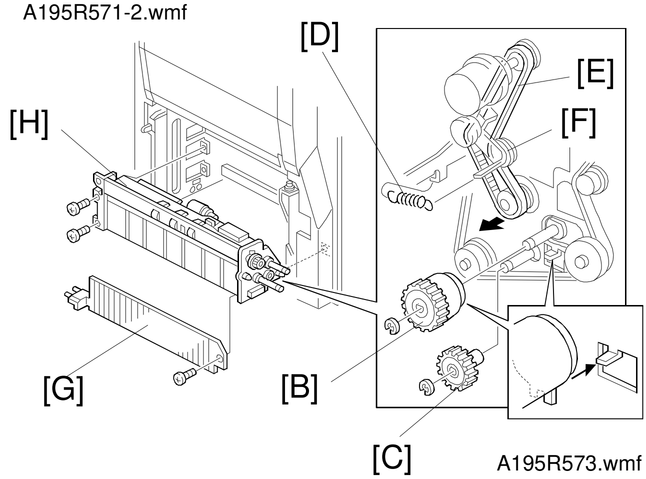
1. Turn off the main switch and unplug the machine.
2. Remove the LCT. (See LCT Unit Removal.)
3. Remove the vertical transport guide [A] (1 clip, 1 connector).
4. Remove the by-pass table. (See LCT Pick-up, Separation, and Feed Roller Replacement.)
5. Remove the right cover. (See Outer Cover Removal.)
6. Remove the SCU board, by-pass feed clutch, and by-pass relay clutch. (See By-pass Feed and By-pass Relay Clutch Replacement.)
7. Remove the separation roller drive gear [B] (1 E-ring).
8. Remove the relay gear [C].
9. Disconnect the connectors [D] (3 connectors).
10. Remove the by-pass paper feed unit [E] (2 screws).

Replacement Adjustment

7.5 TRAY PAPER FEED UNIT REMOVAL



A195R571-2.wmf

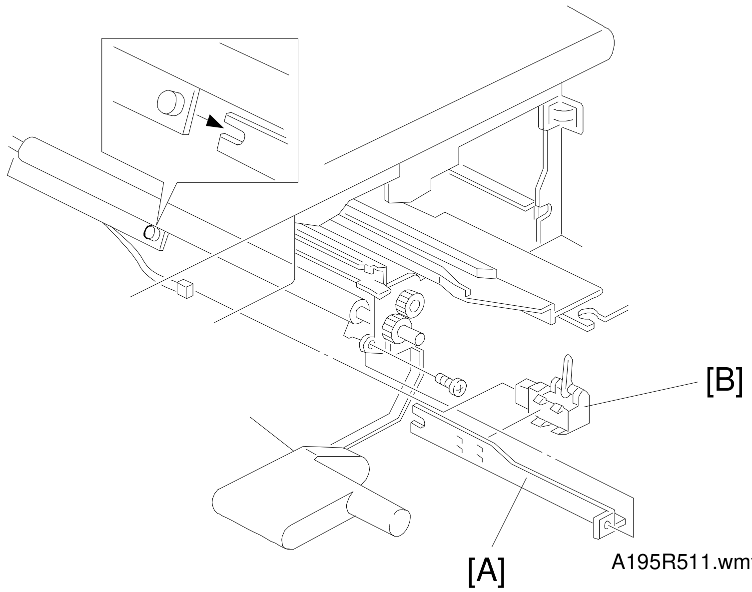


A195R573.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Remove the LCT unit. (See LCT Unit Removal.)
4. Remove the vertical transport guide [A] (1 snap ring and 1 connector).
5. Remove the paper feed clutch [B]. (See Paper Feed Clutch Replacement.)
6. Remove the separation roller gear [C] (1 E-ring).
7. Remove the spring [D] and remove the timing belt [E] from the relay roller pulley [F].
8. Remove the small vertical transport guide plate [G] (1 screw).

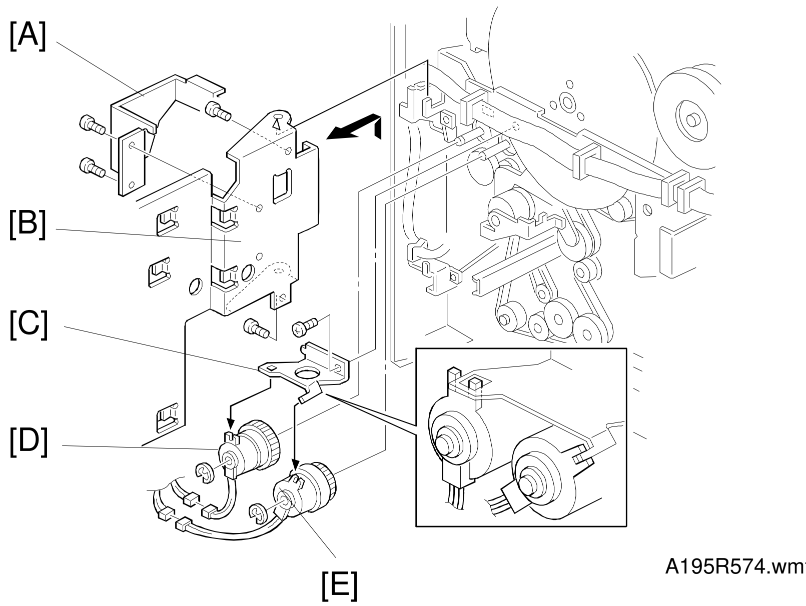
10. Remove the paper feed unit [H] (2 screws, 1 connector).

7.6 REGISTRATION SENSOR REPLACEMENT



1. Turn off the main switch and unplug the machine.
2. Remove the front cover. (See Outer Cover Removal.)
3. Remove the right inner cover. (See Inner Cover Removal.)
4. Remove the transfer belt assembly. (See Transfer Belt Unit Removal.)
5. Remove the registration sensor bracket [A] (1 screw, 1 connector).
6. Remove the registration sensor [B].

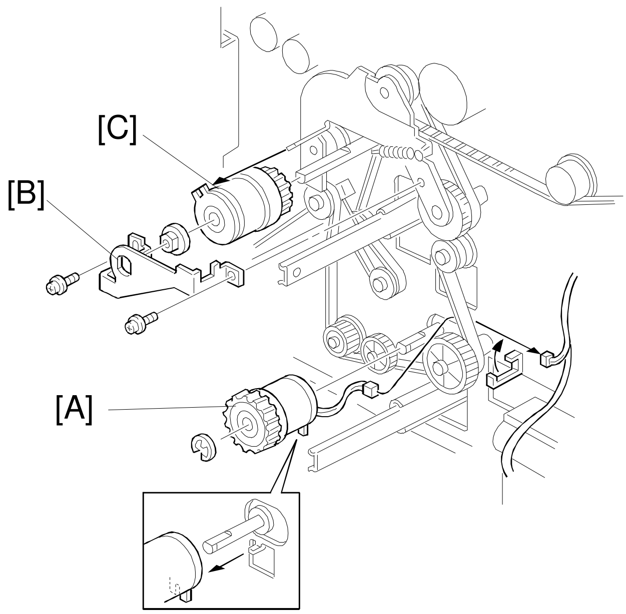
7.7 BY-PASS FEED AND BY-PASS RELAY CLUTCH REPLACEMENT



1. Turn off the main switch and unplug the machine.
2. Remove the rear cover. (See Outer Cover Removal.)

– 230 V machine only for step 3 –

3. Remove the grounding plate bracket [A] (2 screws).
4. Remove the SCU board plate [B] (4 screws, all connectors).
5. Remove the clutch stopper [C] (1 screw).
6. Replace the by-pass feed [D] and by-pass relay clutches [E] (1 connector each, 1 E-ring each).



A195R575.wmf

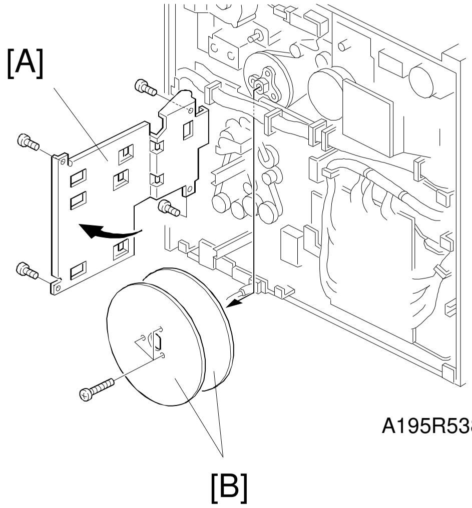
7.8 PAPER FEED CLUTCH REPLACEMENT

1. Turn off the main switch and unplug the machine.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Swing out the SCU board (4 screws).
4. Replace the paper feed clutch [A] (1 connector, 1 E-ring).

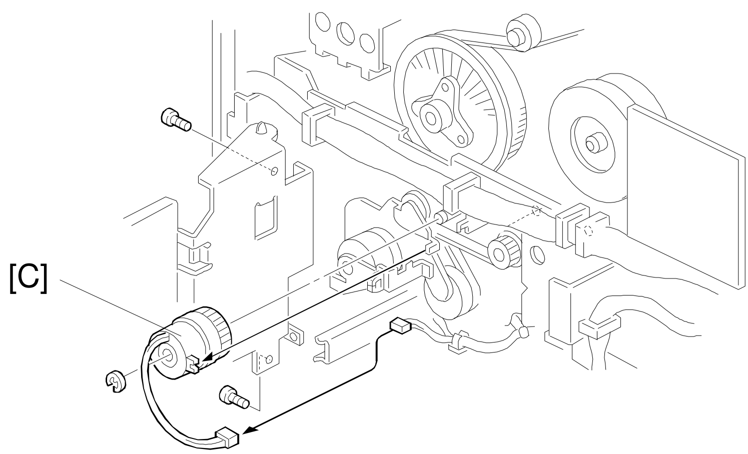
7.9 RELAY CLUTCH REPLACEMENT

1. Turn off the main switch and unplug the machine.
2. Remove the rear cover.
3. Swing out the SCU board (4 screws).
4. Remove the clutch holder [B] (2 screws).
5. Replace the relay clutch [C] (1 bushing, 1 connector).

7.10 REGISTRATION CLUTCH REPLACEMENT



A195R538-3.wmf

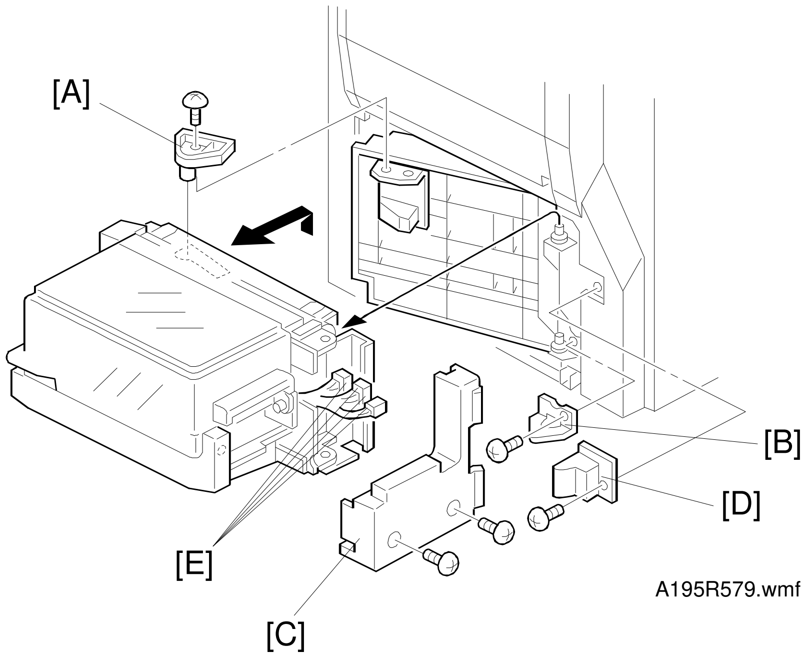


A195R576.wmf

1. Turn off the main switch and unplug the machine.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Swing out the SCU board [A] (4 screws).
4. Remove the fly wheels [B] (3 screws).
5. Remove the registration clutch [C] (1 connector, 1 E-ring).

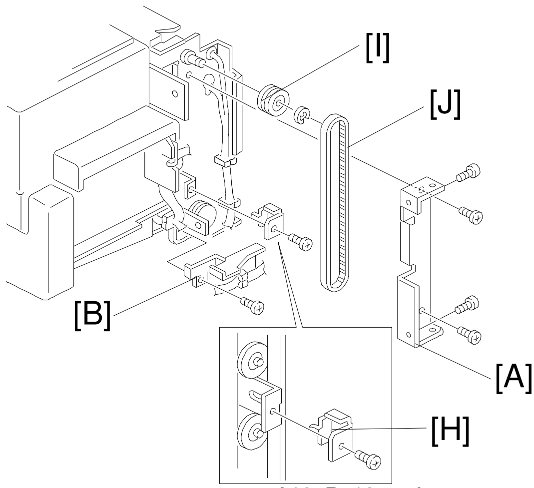
8. LCT UNIT

8.1 LCT UNIT REMOVAL

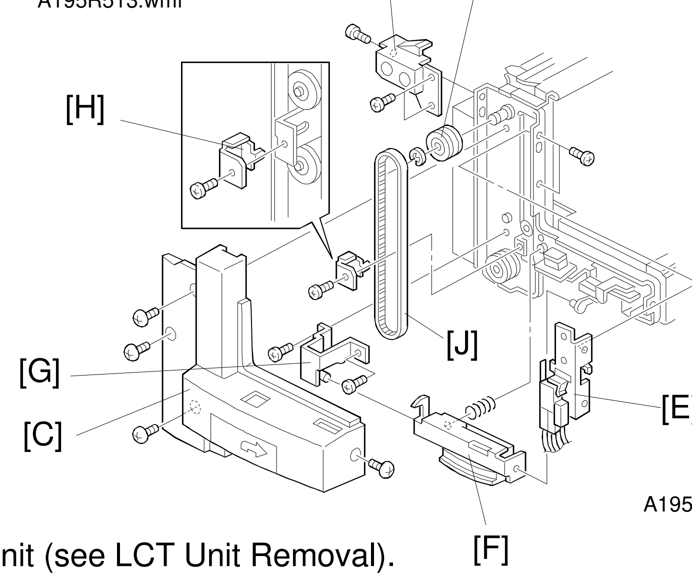


1. Turn off the main switch and unplug the machine.
2. Remove the rear cover (see Outer Cover Removal).
3. Open the LCT unit.
4. Remove the support guide [A] (1 screw).
5. Remove the harness cover [B] (1 screw).
6. Remove the LCT's rear cover [C] (2 screws).
7. Remove the stopper bracket [D] (1 screw).
8. Disconnect four connectors [E].
9. Remove the LCT.

8.2 LCT DRIVE BELT REPLACEMENT



A195R513.wmf

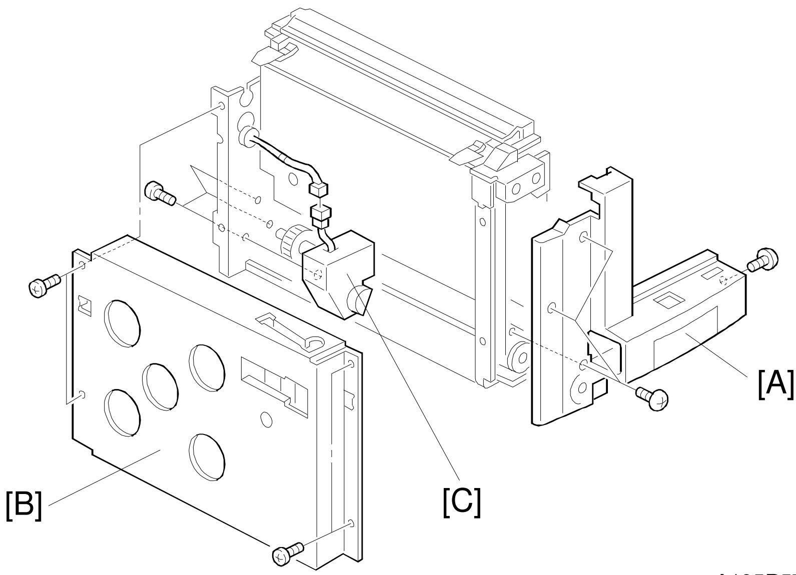


A195R578.wmf

1. Remove the LCT unit (see LCT Unit Removal).
2. Remove the upper belt cover [A] (4 screws).
3. Remove the lower belt cover [B] (1 screw).
4. Remove the front cover [C] (4 screws).
5. Remove the front upper bracket with cover [D] (3 screws).
6. Remove the LCT switch [E] (2 screws, 1 connector)
7. Remove the grip holding bracket [F] and grip bracket [G] (2 screws).
8. Remove the belt stoppers [H] (1 screw each).
9. Remove the upper pulley [I] and LCT drive belt [J] (1 E-ring each).

NOTE: When reinstalling the belt stoppers, make sure that the LCT bottom plate is at the bottom.

8.3 LCT MOTOR REPLACEMENT



A195R577.wmf

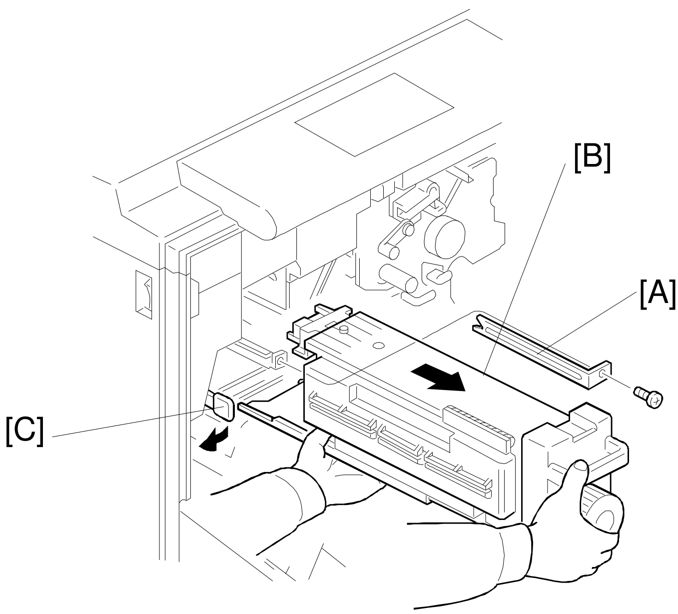
1. Remove the LCT. (See LCT Unit Removal.)
2. Remove the front cover [A] (4 screws).
3. Remove the left plate [B] (4 screws).
4. Remove the LCT motor [C] (3 screws, 1 connector).

9. FUSING

9.1 FUSING UNIT REMOVAL

⚠ CAUTION

Allow time for the unit to cool before doing the following procedure.

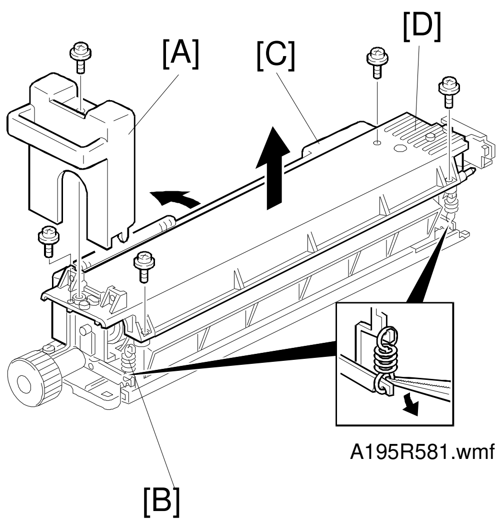


A195R580.wmf

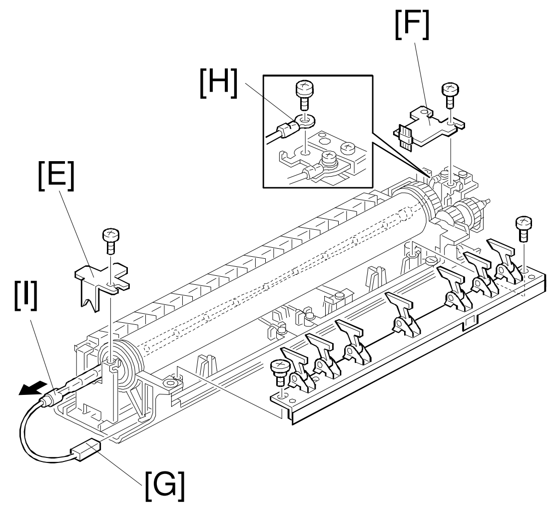
1. Turn off the main switch and unplug the machine.
2. Open the front cover.
3. Remove the stopper bracket [A] (1 screw).
4. Hold the fusing unit cover [B] while pushing the release lever [C] to the left, and pull out the fusing unit until it stops.
5. Push the release lever again, and remove the fusing unit completely.

NOTE: Before completely removing the fusing unit, support the bottom of the fusing unit.

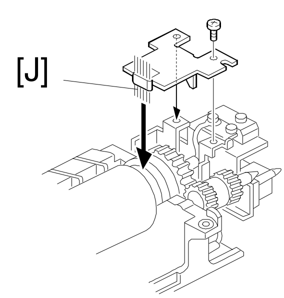
9.2 FUSING LAMP REPLACEMENT



A195R581.wmf



A195R582.wmf

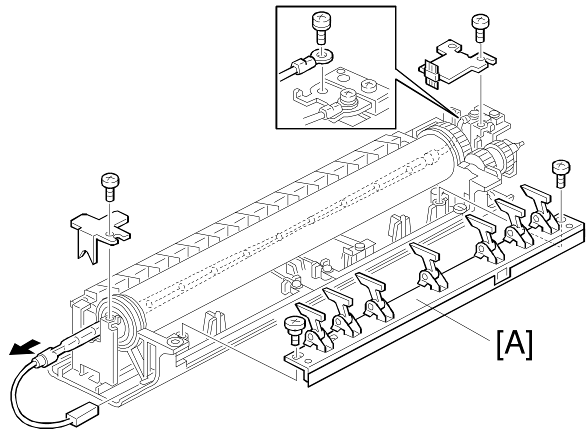


A195R583.wmf

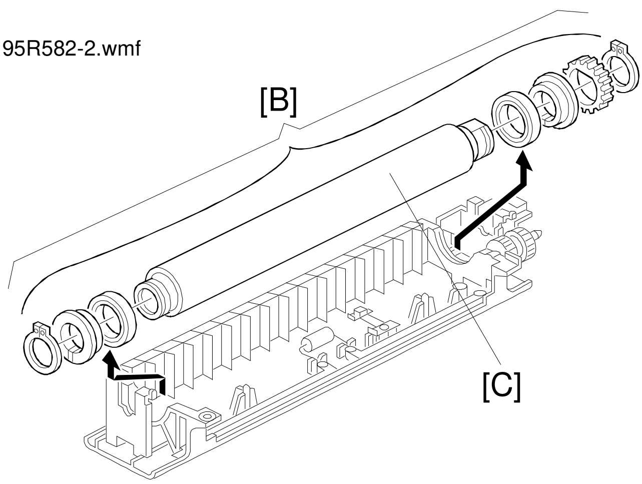
1. Remove the fusing unit (see Fusing Unit Removal).
2. Remove the fusing unit cover [A] (1 screw).
3. Remove the pressure springs [B].
4. Open the fusing exit cover [C] and remove the fusing upper unit [D] (4 screws).
5. Remove the front lamp holder [E] (1 screw).
6. Remove the rear lamp holder [F] (1 screw).
7. Disconnect the front lamp connector [G] and the rear lamp terminal [H] (1 screw).
8. Remove the lamp [I].
9. Install the new lamp.

NOTE: 1) Do not touch the glass part of the fusing lamp with bare hands.
2) When reinstalling the rear lamp holder, make sure that the antistatic brush [J] contacts the hot roller and the pressure roller as shown.
3) The standard pressure spring position is at the upper position.

9.3 HOT ROLLER REPLACEMENT



A195R582-2.wmf

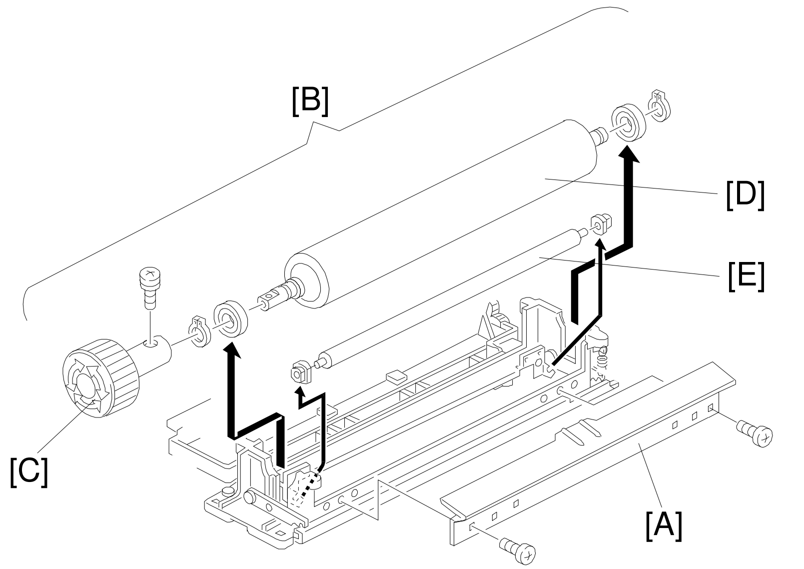


A195R613.wmf

1. Remove the fusing lamp (see Fusing Lamp Replacement).
2. Remove the hot roller stripper pawl assembly [A] (1 screw, 1 step screw).
3. Remove the hot roller assembly [B].
4. Replace the hot roller [C] (2 C-rings, 1 gear, 2 bearings, 2 bushings).

NOTE: 1) Before installing the hot roller, peel off 3 cm (1 inch) from both ends of the protective sheet on the new one.
2) The standard pressure spring position is at the upper position.
3) Do not touch the surface of the rollers.
4) Be careful not to damage the surface of the hot roller.

9.4 PRESSURE ROLLER AND CLEANING ROLLER REPLACEMENT

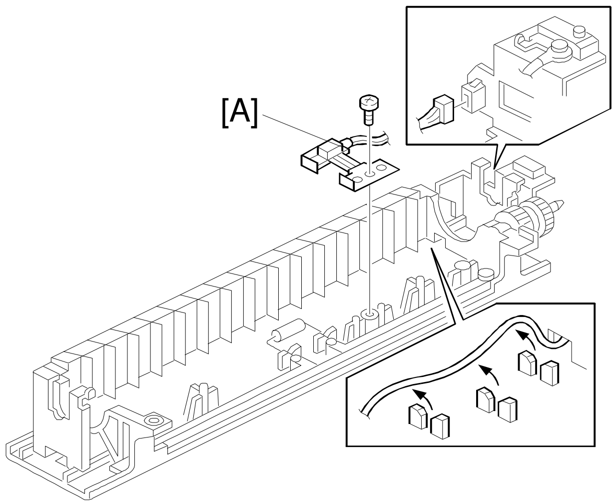


A195R584.wmf

1. Remove the fusing unit (see Fusing Unit Removal).
2. Remove the pressure springs and remove the lower fusing unit (4 screws).
3. Remove the lower fusing entrance guide [A] (2 screws).
4. Remove the pressure roller assembly [B].
5. Remove the fusing knob [C].
6. Replace the pressure roller [D] (2 C-rings, 2 bearings).
7. Replace the cleaning roller [E] (2 bushings).

NOTE: 1) When reinstalling the fusing entrance guide, tighten the screws while pushing the guide plate up to the upper position (for standard or thin paper). For thick paper, let the entrance guide plate drop to the lowest position.
2) There are three screw holes on each side for securing the entrance guide. Normally, the outer screw hole on each side is used.
3) The standard pressure spring position is at the upper position.

9.5 THERMISTOR REPLACEMENT

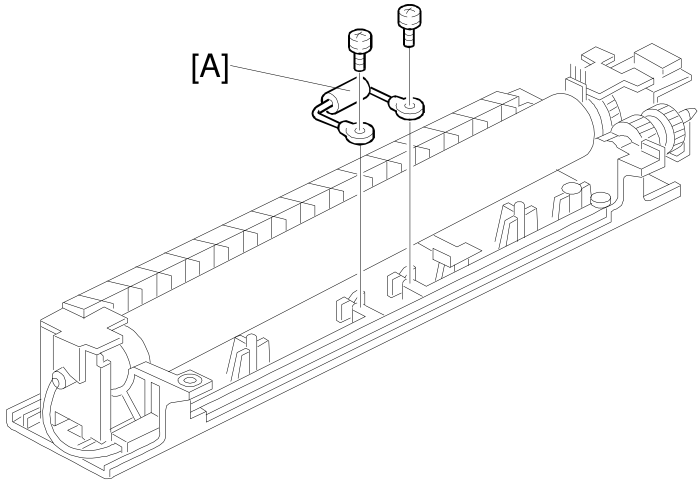


A195R585.wmf

1. Remove the fusing unit (see Fusing Unit Removal).
2. Remove the hot roller assembly (see Hot Roller Replacement).
3. Remove the thermistor [A] (1 screw, 1 connector).

NOTE: 1) Do not touch the surface of the hot roller.
2) Be careful not to damage the surface of the hot roller.
3) The standard pressure spring position is at the upper position.

9.6 THERMOFUSE REPLACEMENT

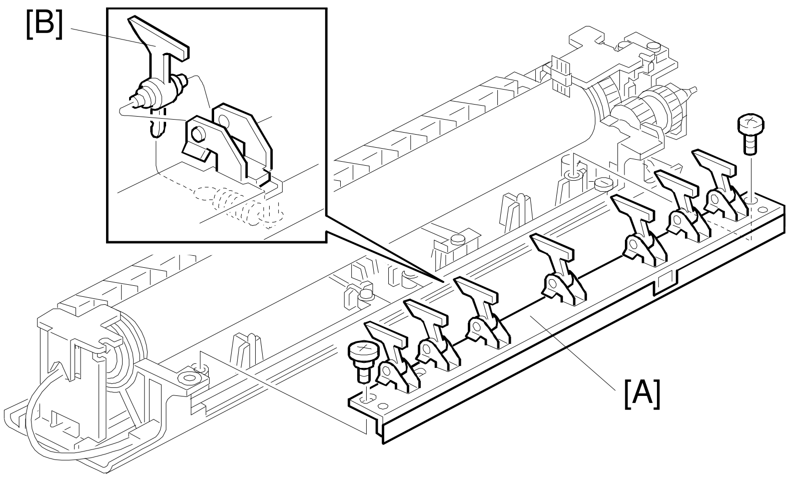


A195R586.wmf

1. Remove the fusing unit. (See Fusing Unit Removal.)
2. Remove the pressure springs and remove the upper fusing unit. (See Fusing Lamp Replacement.)
3. Remove the stripper pawl assembly. (See Hot Roller Replacement.)
4. Remove the thermofuse [A] (2 screws).

NOTE: 1) Do not touch the surface of the hot roller.
2) When replacing the thermofuse, make sure that you do not damage the hot roller.
3) The standard pressure spring position is at the upper position.

9.7 HOT ROLLER STRIPPER PAWL REPLACEMENT

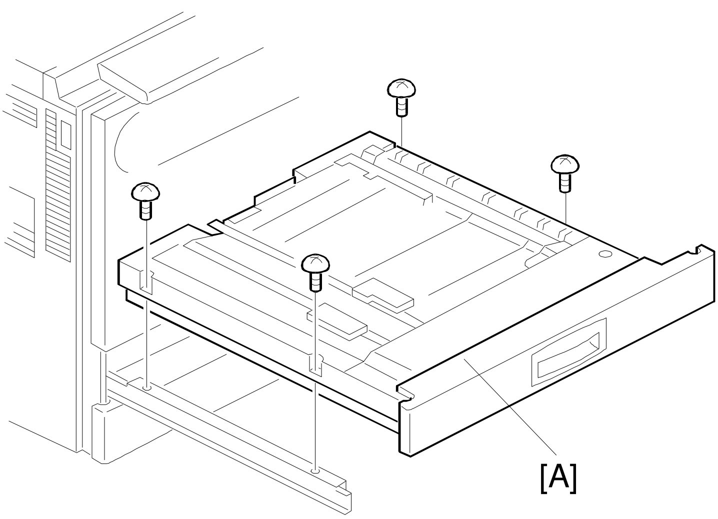


A195R614.wmf

1. Remove the fusing unit. (See Fusing Unit Removal.)
2. Remove the fusing unit cover and pressure springs. (See Fusing Lamp Replacement.)
3. Remove the fusing upper unit. (See Fusing Lamp Replacement.)
4. Remove the hot roller stripper pawl assembly [A] (1 screw, 1 step screw).
5. Replace the hot roller stripper pawls [B] (1 spring each).

10. DUPLEX UNIT

10.1 DUPLEX UNIT REMOVAL

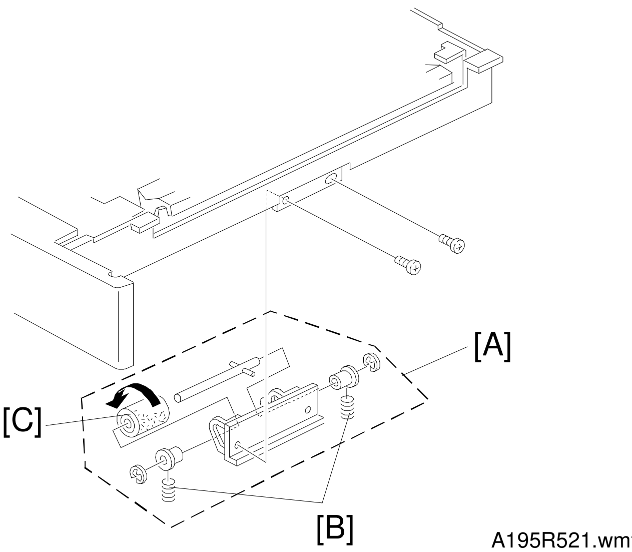


A195R509-2.wmf

1. Pull the duplex unit out.
2. Remove the duplex unit [A] (4 screws).

NOTE: After reinstalling the duplex unit, perform the side-to-side registration and main scan magnification adjustments (see section 12.)

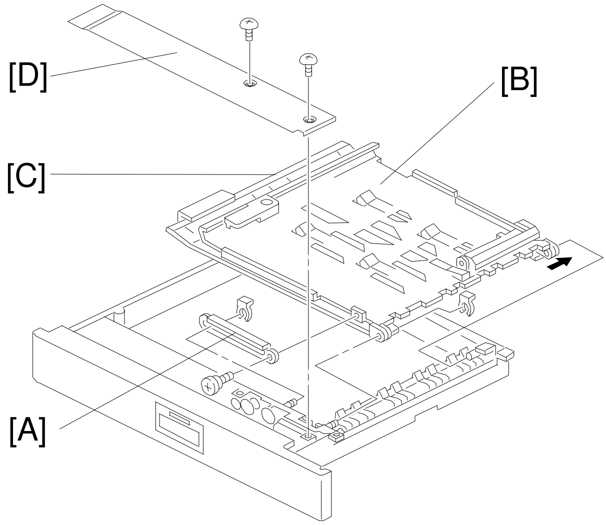
10.2 FRICTION ROLLER REPLACEMENT



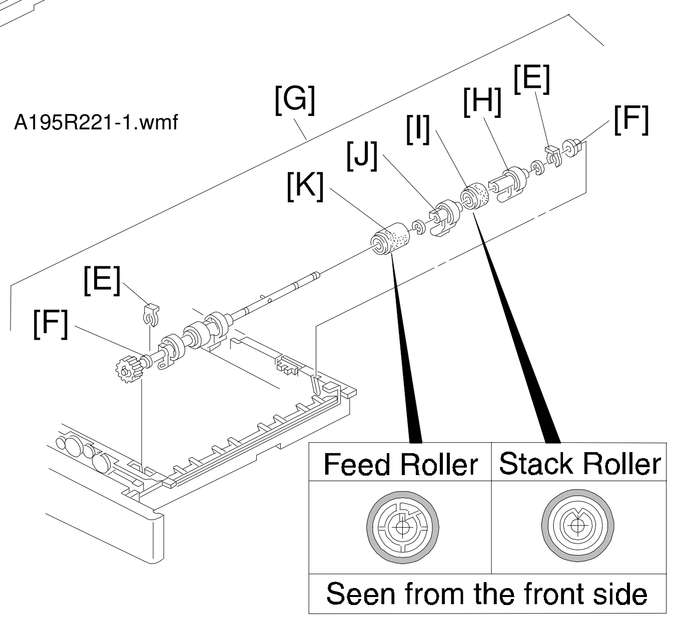
1. Remove the duplex unit. (See Duplex Unit Removal.)
2. Remove the separation roller assembly [A] (2 screws).
3. Remove the springs [B].
4. Remove the friction roller [C] (2 E-rings, 2 bushings).

NOTE: This friction roller has a one-way clutch. Be sure to install the roller so that it rotates in the direction of the arrow (see the illustration).

10.3 DUPLEX FEED ROLLER REPLACEMENT



A195R221-1.wmf

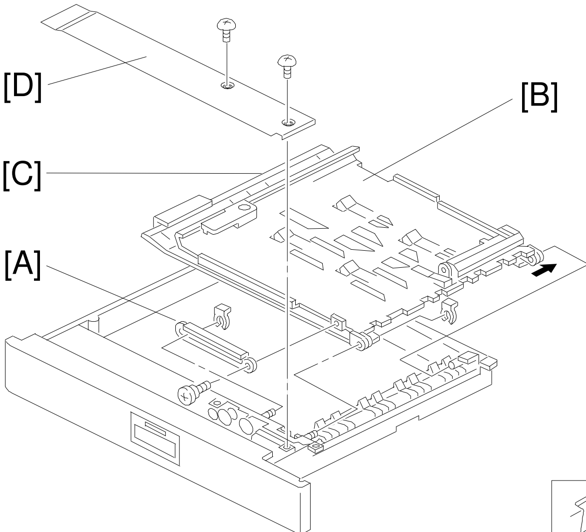


A195R523.wmf

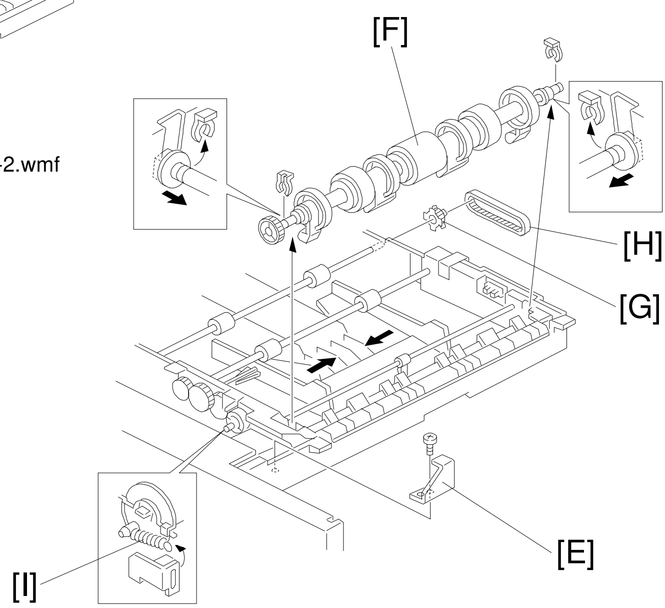
1. Pull out the duplex unit.
2. Remove the link bracket [A] (1 screw, 1 clip).
3. Remove the upper guide plate [B] and the lower guide plate [C] (1 clip).
4. Remove the inner cover [D] (2 screws).
5. Remove two snap rings [E].
6. Move the bushings [F] inward and remove the duplex feed roller assembly [G].
7. Remove the bushing [F], the paper flattener [H] (1 E-ring), the stack roller [I], the paper flattener [J], and the duplex feed roller [K].

NOTE: When installing the stack roller and the duplex feed roller, make sure that they are inserted in the correct orientation as shown.

10.4 DUPLEX FEED MOTOR REPLACEMENT

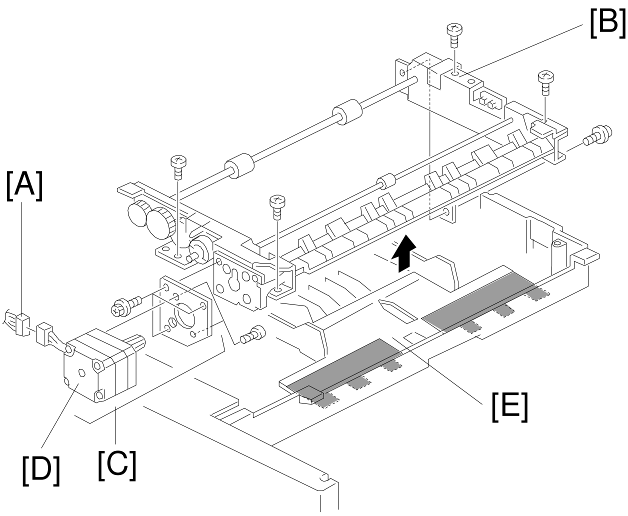


A195R522-2.wmf

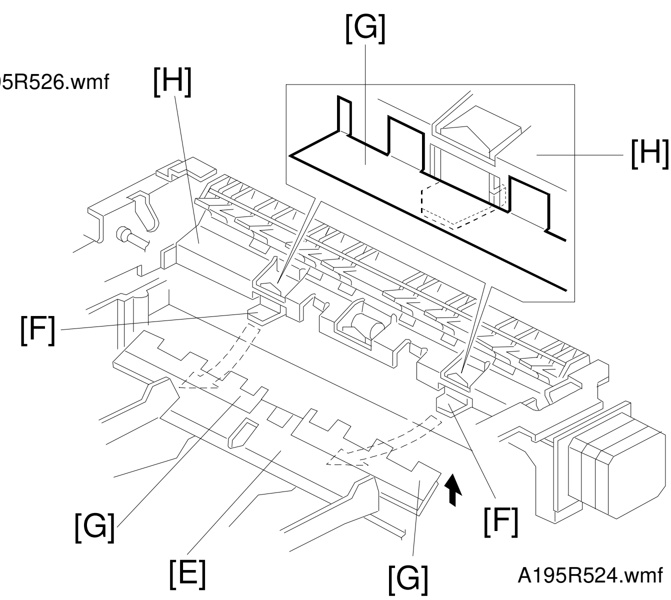


A195R525.wmf

1. Remove the duplex unit (4 screws).
2. Remove the link bracket [A] (1 screw, 1 snap ring).
3. Remove the upper guide plate [B] and the lower guide plate [C] (1 snap ring).
4. Remove the inner cover [D] (1 screw).
5. Remove the inner cover bracket [E] (1 screw).
6. Remove the duplex feed roller assembly [F] (2 snap rings).
7. Remove the timing belt pulley [G] and remove the timing belt [H].
8. Remove the spring [I].



A195R526.wmf



A195R524.wmf

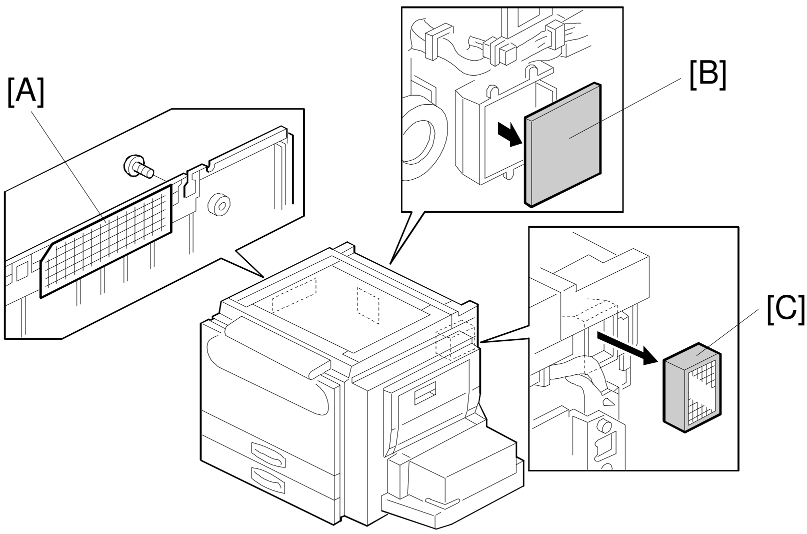
9. Disconnect the motor harness [A].
10. Move the jogger fence inward and remove the paper feed assembly [B] (5 screws).
11. Remove the duplex feed motor assembly [C] (3 screws).
12. Replace the duplex feed motor [D] (2 screws).

NOTE: 1) When installing the paper feed assembly, make sure that the bottom plate [E] is on top of the bracket [F] as shown.
2) When installing the paper feed assembly, make sure that the mylars [G] on the bottom plate are on top of the guide plate [H] as shown.

Replacement Adjustment

11. OTHERS

11.1 FILTERS



A195R609.wmf

11.1.1 Optics Dust Filter

1. Remove the left cover (see Outer Cover Removal).
2. Replace the optics dust filter [A].

11.1.2 Fusing Exhaust Fan Filter

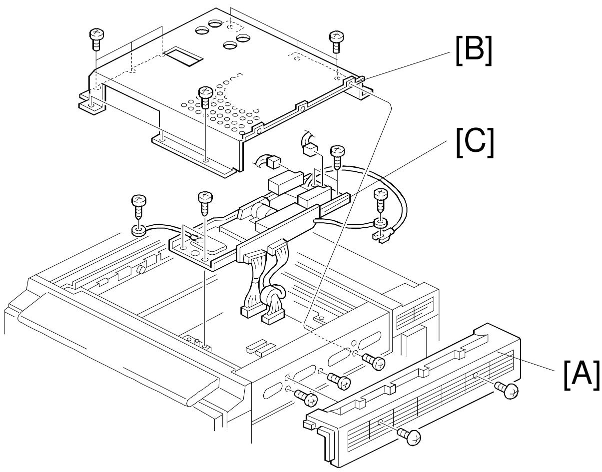
1. Remove the rear cover (see Outer Cover Removal).
2. Replace the fusing exhaust fan filter [B].

11.1.3 Ozone Filter

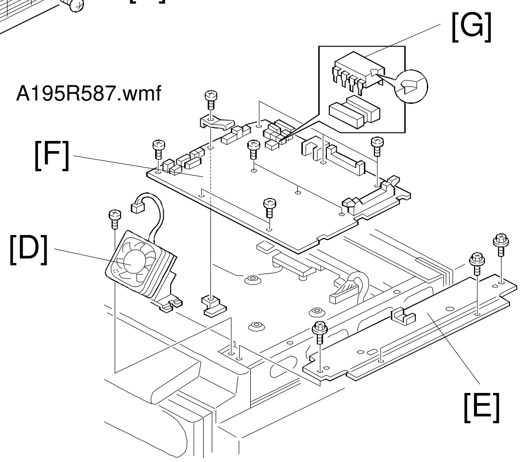
1. Remove the right cover (see Outer Cover Removal).
2. Replace the ozone filter [C].

11.2 PCB REPLACEMENT

11.2.1 SBU Assembly/EX-IPU Replacement



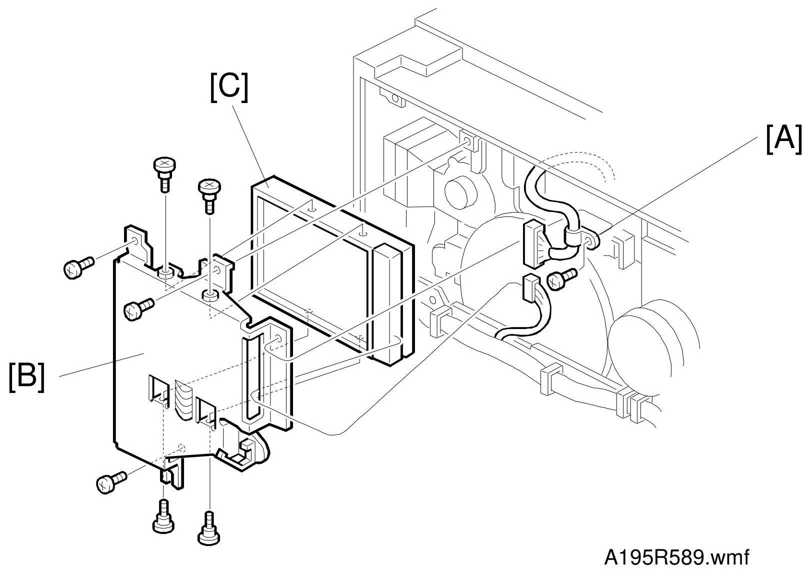
A195R587.wmf



A195R588.wmf

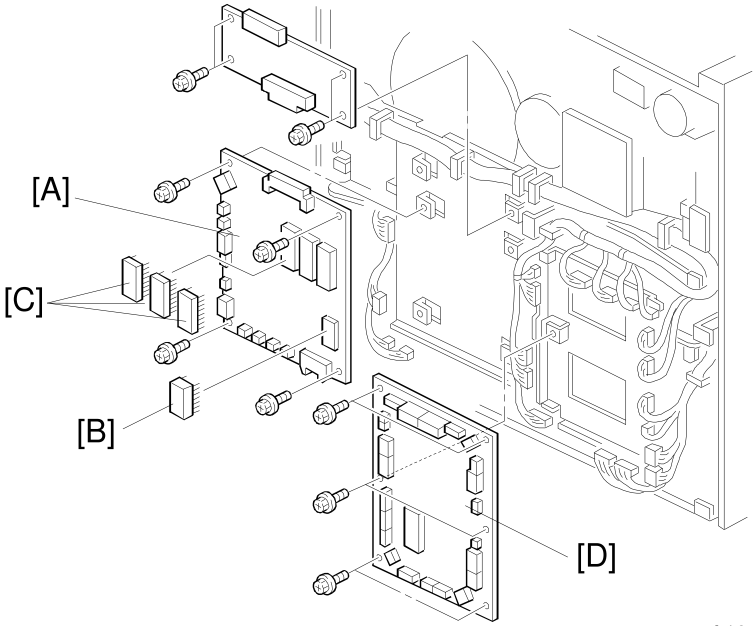
1. Turn off the main switch and unplug the machine.
2. Remove the exposure glass (see Exposure Glass Removal).
3. Remove the right upper cover [A] (2 screws).
4. Remove the SBU cover [B] (11 screws).
5. Remove the lens block/SBU assembly [C] (6 screws, 4 connectors).
6. Remove the IPU fan motor [D] (1 screw).
7. Remove the upper right stay [E] (4 screws).
8. Remove the EX-IPU [F] (all connectors, 9 screws, 1 grounding plate)
9. Remove the E^2 PROM (IC52) [G] from the old EX-IPU and install it on the new board. This contains the hard disk bad sector data.
10. After reassembly, do the scanner registration and sub scan magnification adjustments in section 12 (check the printer registration settings first).

11.2.2 HDD Unit Replacement



1. Turn off the main switch and unplug the machine.
2. Remove the main controller board bracket. (See Main Controller Board Bracket Removal.)
3. Remove the wire clamp [A] (1 screw).
4. Remove the HDD unit assembly [B] (3 screws, 2 connectors).
5. Replace the HDD unit [C] (4 screws).

   NOTE: 1) Reset the bad sector information (SP4911-6).
   2) If the user has registered user stamps in the previous HDD unit, advise the user that they may need to register them again.



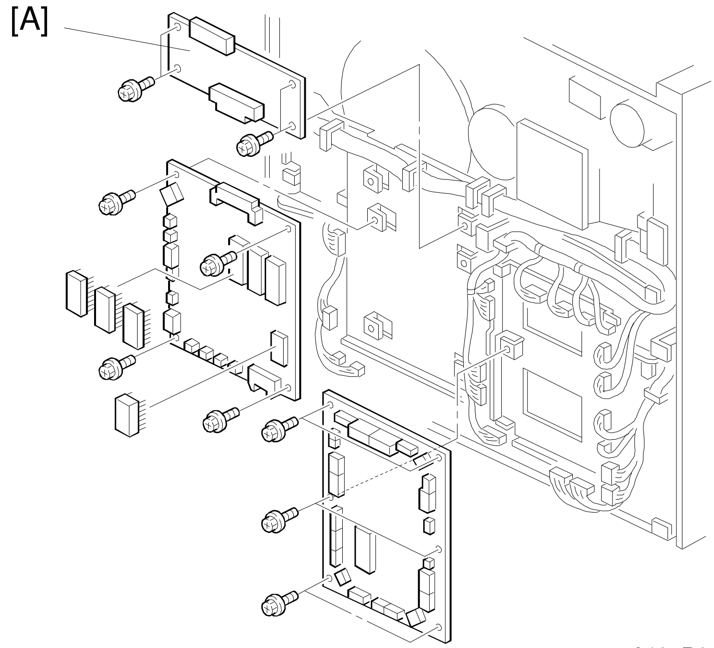
11.2.3 SCU Board Replacement

1. Turn off the main switch and unplug the machine.
2. Remove the rear cover (See Outer Cover Removal).
3. Replace the SCU board [A] (4 screws, all connectors).
4. Remove the NV RAM [B] from the old SCU board and install it on the new board.
5. Remove the ROMs [C] from the old SCU board and install them on the new board.
6. Make sure that the DIP switch settings on the new board are the same as those on the old board.

11.2.4 BCU Board Replacement

1. Turn off the main switch and unplug the machine.
2. Remove the rear cover (See Outer Cover Removal).
3. Replace the BCU board [D] (6 screws and all connectors).
4. Make sure that the DIP switch settings on the new board are the same as those on the old board.

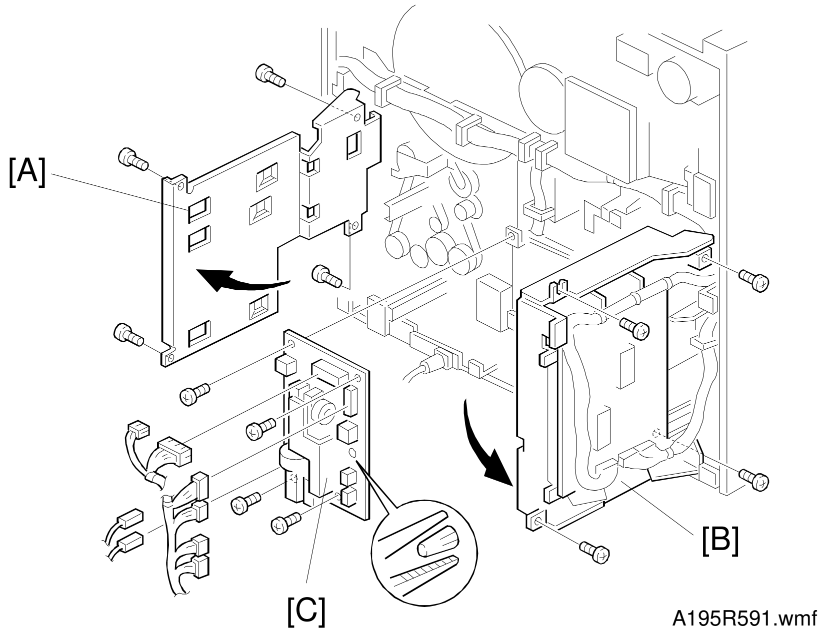
11.2.5 Extension Board Replacement



A195R658-2.wmf

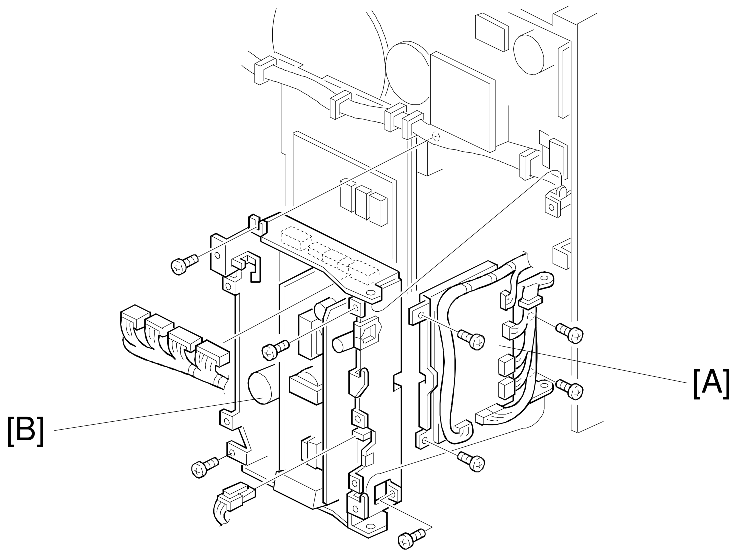
1. Trun off the main switch and unplug the machine.
2. Remove the rear cover (See Outer Cover Removal).
3. Remove the extension board [A] (2 connector, 4 screws).

11.2.6 AC Drive Board



1. Turn off the main switch and unplug the machine.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Swing out the SCU board [A] (4 screws).
4. Swing out the dc power supply unit/BCU board [B] (4 screws).
5. Replace the ac drive board [C] (all connectors, 4 screws).

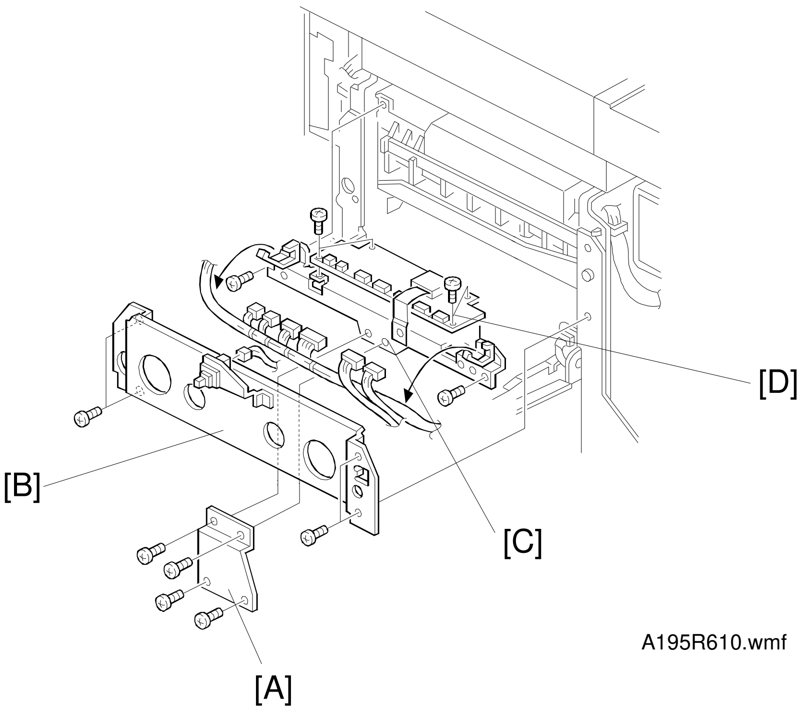
11.2.7 DC Power Supply Unit



A195R592.wmf

1. Turn off the main switch and unplug the power cable.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Remove the BCU board assembly [A] (all connectors, 4 screws).
4. Replace the dc power supply unit [B] (all connectors, 4 screws).

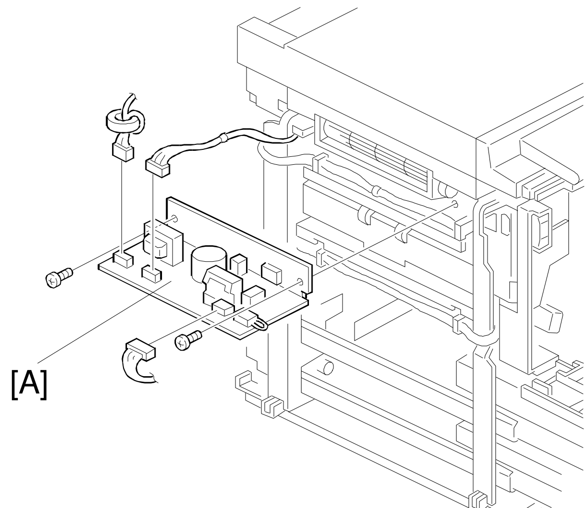
11.2.8 High Voltage Control Board



A195R610.wmf

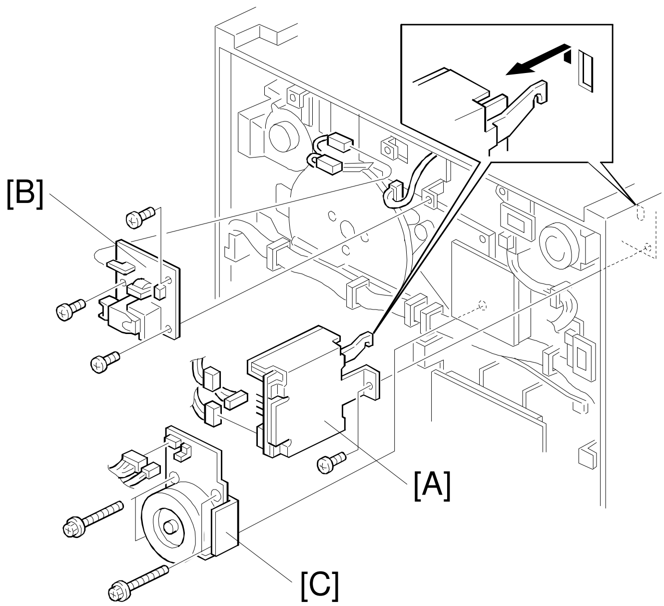
1. Turn off the main switch and unplug the machine.
2. Remove the right cover (See Outer Cover Removal).
3. Remove the lower grounding plate [A] (4 screws).
4. Remove the right stay [B] (1 connector, 4 screws).
5. Slide out the high voltage control board assembly [C] (all connectors, 2 screws).
6. Replace the high voltage control board [D] (4 screws).

11.2.9 Lamp Stabilizer



A195R593.wmf

1. Turn off the main switch and unplug the power cable.
2. Remove the left cover (see Outer Cover Removal).
3. Replace the lamp stabilizer [A] (3 connectors, 2 screws).



A195R594.wmf

11.2.10 Scanner Drive Board

1. Turn off the main switch and unplug the power cable.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Replace the scanner drive board [A] (all connectors, 1 screw).

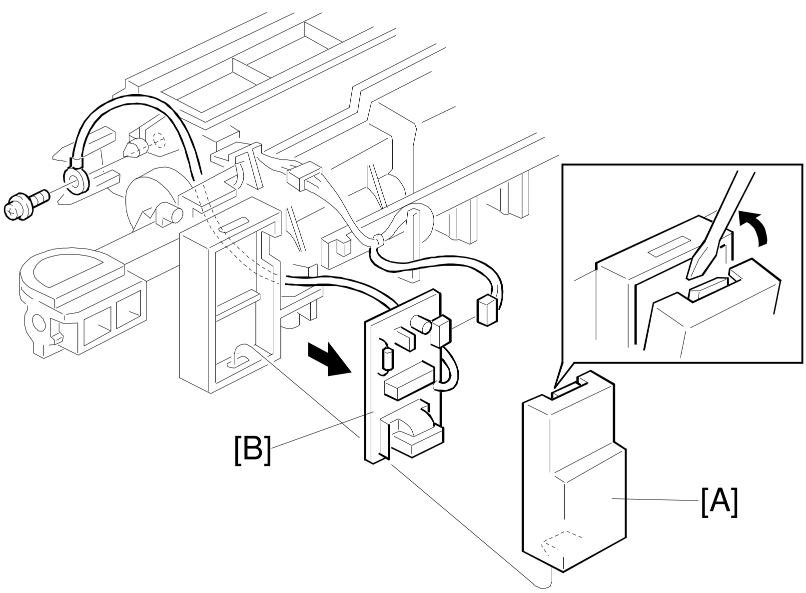
11.2.11 Charge High Voltage Supply Board

1. Turn off the main switch and unplug the power cable.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Replace the charge high voltage supply board [B] (3 connectors, 3 screws).

11.2.12 Main Motor

1. Turn off the main switch and unplug the power cable.
2. Remove the rear cover. (See Outer Cover Removal.)
3. Replace the main motor [C] (2 connectors, 4 screws).

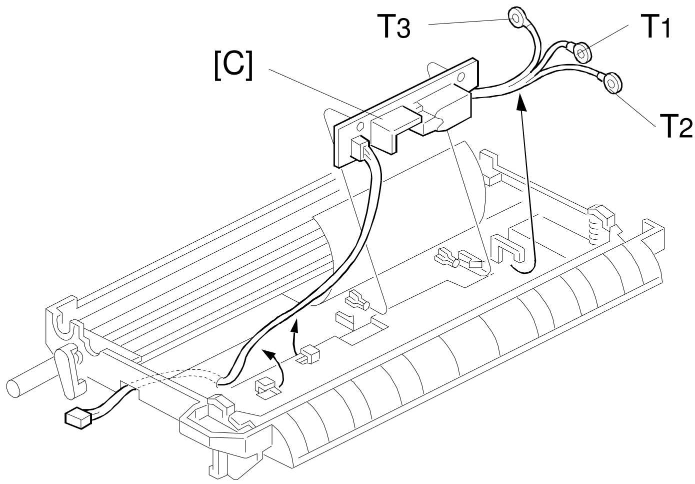
11.2.13 Development Bias Power Pack



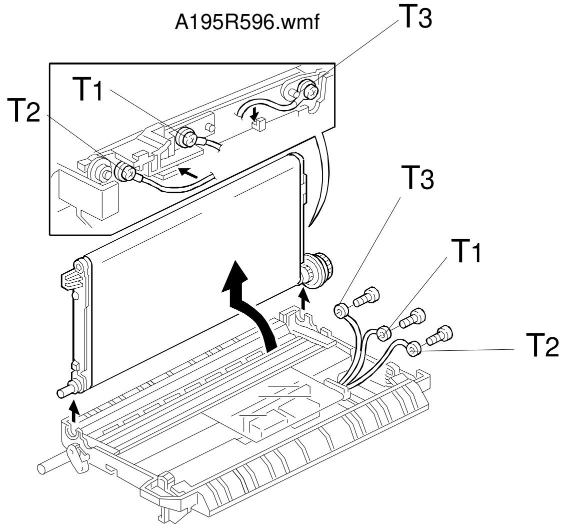
A195R595.wmf

1. Turn off the main switch and unplug the power cable.
2. Remove the development unit (see Development Unit Removal).
3. Remove the cover [A] of the development bias power pack.
4. Replace the development bias power pack [B] (1 screw, 1 connector).

11.2.14 Transfer High Voltage Supply Board



A195R596.wmf

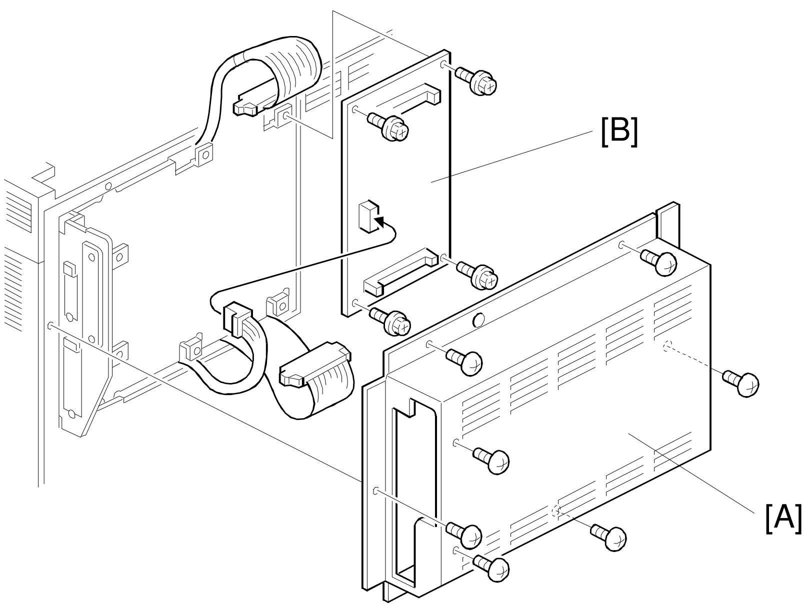


A195R566.wmf

1. Turn off the main switch and unplug the power cable.
2. Remove the transfer belt unit (see Transfer Belt Unit Replacement).
3. Remove the transfer belt assembly (see Transfer Belt Removal).
4. Replace the transfer high voltage board [C] (1 connector).

   NOTE: Be sure that each wire [T1, T2, T3] is placed as shown.

11.2.15 Dummy Board Replacement

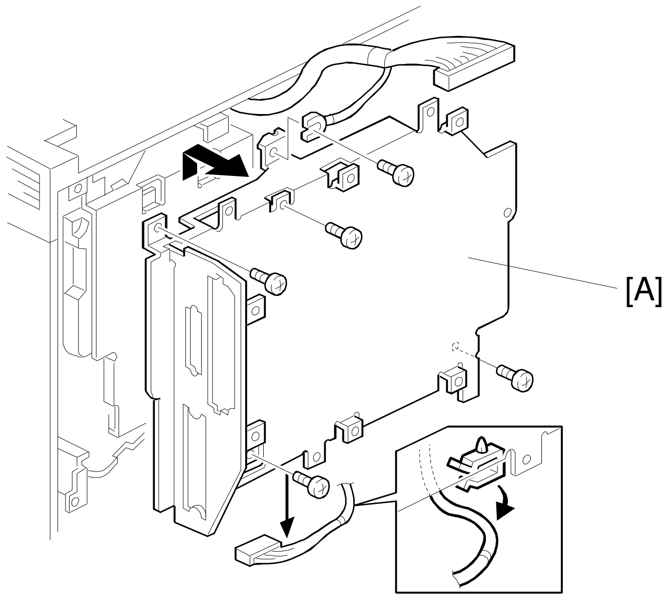


A195R652.wmf

1. Remove the controller board cover [A] (See Outer cover Removal).
2. Remove the dummy board [B] (3 connectors, 4 screws)

   NOTE: If the main controller has been installed, the dummy board is not there.

11.2.16 Controller Board Bracket Replacement



1. Remove the controller board cover (See Outer Cover Removal).
2. Remove the main controller board and optional boards (See the SP3 controller manual), or remove the dummy board (See Dummy Board Removal).
3. Remove the rear cover (See Outer Cover Removal).
4. Remove the main controller board bracket [A] (1 clamp, 5 screws)

12. COPY IMAGE ADJUSTMENT- PRINTING/SCANNING

NOTE: 1) You need to perform these adjustment(s) after replacing any of the following parts:

Scanner Wire
Lens Block/SBU Assembly
Scanner Drive Motor
Polygon Mirror Motor
Paper Trays
Duplex Tray
Paper Side Fence
Memory All Clear

2) For more details about accessing SP modes, refer to section 4.

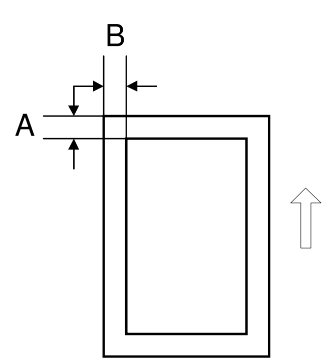
12.1 Printing

NOTE: 1) Make sure the paper is installed correctly in each paper tray before you start these adjustments.
2) Use the Trimming Area Pattern (SP2902-3, No.10) to print the test pattern for the following procedures.
3) Set SP 2901-3 to 0 again after completing these printing adjustments.

12.1.1 Registration - Leading Edge/Side-to-Side

1. Check the leading edge registration, and adjust it using SP1001.
   The specification is: 3 ± 2mm
2. Check the side-to-side registration for each paper feed station, and adjust them using the following SP modes.

	SP mode	Specification
1st paper feed	SP1002-2	2 ± 1.5 mm
Duplex	SP1002-1	2 ± 1.5 mm
2nd paper feed (Optional PFU tray 1)	SP1002-3	2 ± 1.5 mm
3rd paper feed (Optional PFU tray 2)	SP1002-4	2 ± 1.5 mm
4th paper feed (Optional PFU tray 3)	SP1002-5	2 ± 1.5 mm
By-pass feed	SP1002-6	2 ± 1.5 mm
LCT	SP1002-7	2 ± 1.5 mm



A195R597.wmf

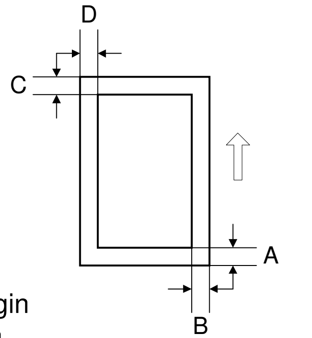
A: Leading Edge Registration
B: Side-to-side Registration

12.1.2 Blank Margins

NOTE: If the leading edge/side-to-side registration can not be adjusted within the specifications, adjust the leading/left side edge blank margin.

1. Check the trailing edge and right side edge blank margins, and adjust them using the following SP modes.

	SP mode	Specification
Trailing edge	SP2101-2	2±2 mm
Right side edge	SP2101-4	$2^{+2.5mm}_{-1.5mm}$
Leading edge	SP2101-1	3±2 mm
Left side edge	SP2101-3	2±1.5 mm

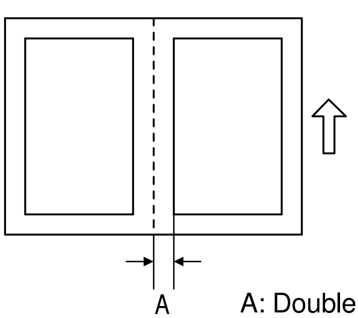


A: Trailing Edge Blank Margin
B: Right Side Edge Blank Margin
C: Leading Edge Blank Margin
D: Left Side Edge Blank Margin

A195R598.wmf

12.1.3 Double Copy Side-to-side Registration

NOTE: 1) Perform this adjustment after completing the registration adjustment and the blank margin adjustment for single copies.
2) Select the double copies mode in the Adjust Image menu using the copy mode to print the test pattern.



A: Double Copy Side-to-side Registration

A195R599.wmf

1. If you need to adjust the double copy side-to-side registration, use SP1006.

Replacement Adjustment

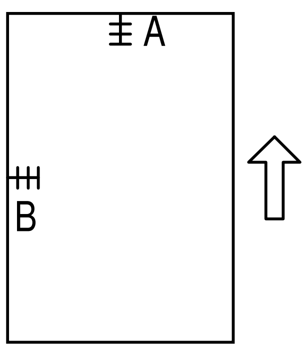
12.2 Scanning

NOTE: 1) Perform or check the printing registration/side-to-side adjustment and the blank margin adjustment, before doing the following scanner adjustment.
2) Use an OS-A3 test chart to perform the following adjustments.

12.2.1 Registration: Platen Mode

1. Place the test chart on the exposure glass and make a copy from one of the feed stations.
2. Check the leading edge and side-to-side registration, and adjust them using the following SP modes if necessary.

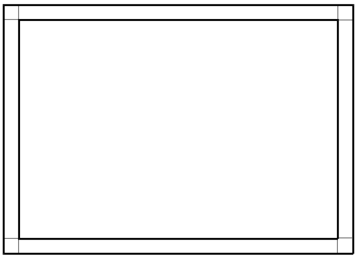
	SP mode
Leading edge	SP4010
Side-to-side	SP4011



A: Leading Edge Registration
B: Side-to-side Registration

A195R600.wmf

12.2.2 Registration: ADF

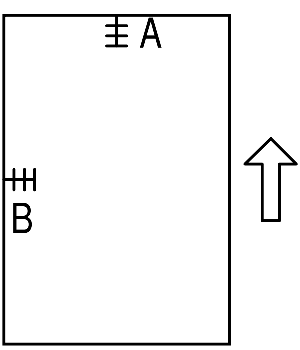


A195R611.wmf

NOTE: Make a temporary test chart as shown above using A3/DLT paper.

1. Place the temporary test chart on the ADF and make a copy from one of the feed stations.
2. Check the registration, and adjust using the following SP modes if necessary. See the ADF manual for details on how to use these SP modes.

	SP mode
Side-to-side Registration	SP6006-1
Leading Edge Registration (Simplex)	SP6006-2
Leading Edge Registration (Duplex: front)	SP6006-3
Leading Edge Registration (Duplex: rear)	SP6006-4

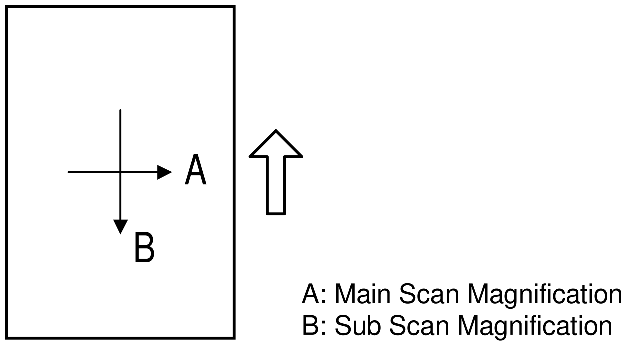


A: Leading Edge Registration
B: Side-to-side Registration

A195R600-2.wmf

12.3 Magnification

NOTE: Use an OS-A3 test chart to perform the following adjustment.



A195R602.wmf

12.3.1 Main Scan Magnification

1. Place the test chart on the exposure glass and make a copy from one of the feed stations.
2. Check the magnification ratio, and adjust it using the following SP mode if necessary.

SP mode	
Main Scan Magnification	SP2909

12.3.2 Sub Scan Magnification

1. Place the test chart on the exposure glass and make a copy from one of the feed stations.
2. Check the magnification ratio, and adjust it using the following SP mode if necessary.

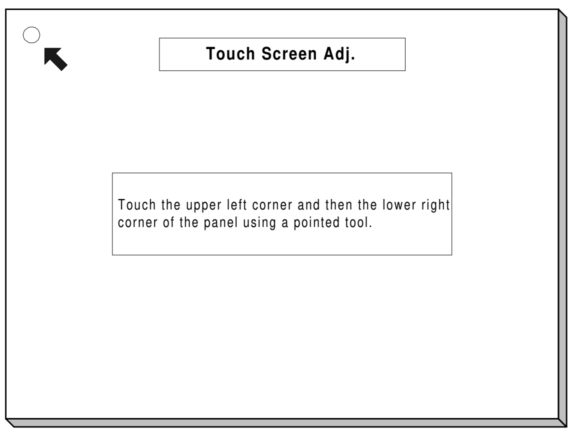
SP mode	
Sub Scan Magnification	SP4008

13. TOUCH SCREEN ADJUSTMENT

After doing a Memory All Clear or when the touch panel sensing mechanism is not working properly, adjust it as follows.

1. Press the following keys in sequence to enter the touch screen adjustment mode.

   [1] [9] [9] [3] [C/] x 5 [#]



A195R603.wmf

2. The graphic sensing adjustment screen will appear. Touch the upper left corner then the lower right corner of the panel using a pointed tool.
3. Touch a few spots on the LCD touch panel, and confirm that the marker (a small circle) appears on the screen at exactly the same location as the pointed tip. If it does not, touch "Clear" on the adjustment screen, and press the [#] key. Then repeat this procedure.
4. Touch "Enter" on the adjustment screen.
5. Turn the main switch off and back on to store the settings.

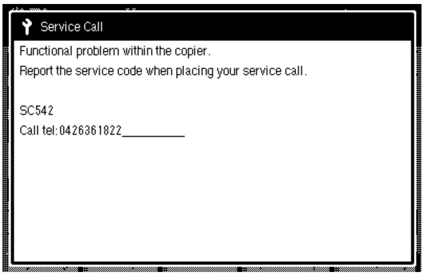
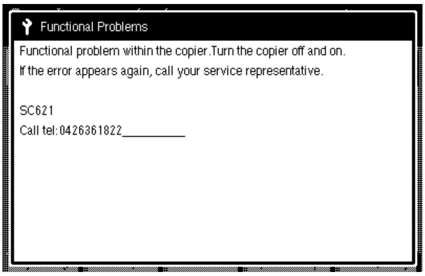
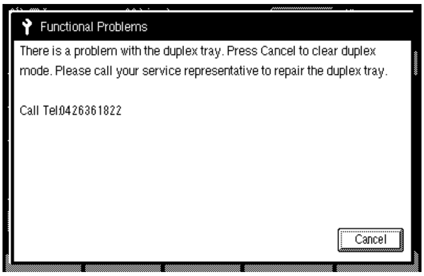
SECTION 6

TROUBLESHOOTING

1. SERVICE CALL CONDITIONS

1.1 SUMMARY

There are 4 levels of service call conditions.

Level	Definition	Display
A	To prevent the machine from being damaged, the SC can only be reset by a service representative (see the note on the next page). The copier cannot be operated at all.	The SC display will not be canceled.  A195T500.tif
B	The SC can be reset by turning the main switch off and on if the SC was caused by a sensor error.	 A195T501.tif
C	The copier can be operated as usual except for the unit related to the service call.	If the user selects a related function, this display appears.  A195T502.tif
D	The SC counter is incremented. The copier can be operated as usual.	The SC will not be displayed.

Trouble-shooting

NOTE: 1) If the problem is related to electrical circuit boards, first disconnect then reconnect the connectors before replacing the PCBs.
2) If the problem is related to motor lock, first check the mechanical load before replacing motors or sensors.
3) To reset a Level A SC, enter SP mode then turn the main switch off and on.
4) When a Level A or B SC occurs while in SP mode, the display does not indicate the SC number. You can recognize that there is an SC condition because no key input is possible.
If this occurs, check the SC number by turning the main switch off and on.

2. SC CODE DESCRIPTIONS

SC101: Lamp regulator error

-Definition- [A]

Detects lamp regulator malfunctions by monitoring the signal for both the exposure lamp on and off signals.

- Possible causes -

- Lamp regulator board defective
- Exposure lamp open
- Optics thermoswitch open
- EX-IPU board defective
- FU1 on the lamp stabilizer board is blown

SC120: Scanner home position error 1

-Definition- [B]

The scanner home position sensor does not detect the on condition during initialization or copying.

- Possible causes -

- Scanner home position sensor defective
- Scanner drive motor defective
- EX-IPU board defective

SC121: Scanner home position error 2

-Definition- [B]

The scanner home position sensor does not detect the off condition during initialization or copying.

- Possible causes -

- Scanner home position sensor defective
- Scanner drive motor defective
- EX-IPU board defective

SC190: EX-IPU board error 1

-Definition- [B]
An error is detected during the ASIC register check.

- Possible cause -
• EX-IPU board defective

SC191: EX-IPU board error 2

-Definition- [B]
The SRAM in the EX-IPU board is defective.

- Possible causes -
• EX-IPU board defective

SC302: Charge current leak

-Definition- [B]
A charge current leak signal is detected.

- Possible causes -
• Charge corona end block damaged
• Charge corona receptacle damaged
• Charge high voltage supply board defective

SC303: Time out error (printer)

- Definition -
The BCU cannot receive the printer ready signal from the EX-IPU

- Possible cause -
• BCU defective
• EX-IPU defective
• SCU defective

SC305: Time out error (memory)

- Definition -
The BCU cannot receive the memory access ready signal from the EX-IPU

- Possible cause -
• BCU defective
• EX-IPU defective
• SCU defective

SC320: Polygon motor error

-Definition- [B]

The polygon motor does not reach its operating speed within 20 seconds after sending the polygon motor ON signal, or the motor speed does not decrease within 20 seconds after sending the polygon motor OFF signal.

- Possible causes -

- 24V line abnormal (blown fuse condition)
- Polygon motor defective
- Polygon motor driver defective
- Poor connection of the interface harness which connects the polygon motor driver and the EX-IPU board
- EX-IPU board defective
- FU103 on the DC power supply board is blown

SC321: No laser start signal (F-GATE error)

- Definition- [B]

The laser start signal (F-GATE) is not sent within 20 seconds after the copy paper reaches the registration sensor.

- Possible causes -

- BCU board defective
- EX-IPU board defective
- Poor connection of the interface harness which connects the BCU board and the EX-IPU board.

SC322: Laser synchronization error 1

-Definition- [B]

The laser synchronization signal can not be detected by the main scan synchroniziation detector board -1 just after the LD is turned on while the polygon mirror is rotating at operating speed.

- Possible causes -

- Poor connection of the interface harness which connects the laser synchronization detector board -1 and the EX-IPU board
- Laser synchronization detector board -1 out of position
- Laser synchronization detector board -1 defective
- EX-IPU board defective
- LD unit defective

SC323: LD drive current over

-Definition- [B]

The LD drive board applies more than 100 mA to the LD.

- Possible causes -

- LD unit defective (not enough power, due to aging)
- Poor connection of the interface harness which connects the LD unit and the EX-IPU board
- Temperature around the LD unit is too high

SC325: Laser synchronizing signal error 2

-Definition- [D]

The interval of the laser synchronizing signal detected by the main scan synchronization detector board -2 becomes outside the correctable range.

- Possible causes -

- Main scan synchronization detector board -2 defective
- Poor connection of the interface harness which connects the main scan synchronization detector board -2 and the EX-IPU board
- Main scan synchronization detector board -2 out of position
- EX-IPU board defective
- Polygon motor defective

SC350: ID sensor error

-Definition- [B]

1. Vsg falls out of the adjustment target (4 ± 0.2 V) during Vsg checking
2. Vsp>2.5V or Vsg<2.5V is detected twice consecutively during copying.

- Possible causes -

- ID sensor board defective
- Dirty ID sensor board
- BCU board defective
- High voltage control board defective

SC360: Hard disk drive error 1

-Definition- [B]
The EX-IPU board does not receive the response signal from the HDD.

- Possible causes -
- Poor connection of the interface harness which connects the EX-IPU board and the HDD.
- HDD power cord not connected properly.
- HDD defective
- SCSI controller on the EX-IPU defective.

SC361: Hard disk drive error 2

-Definition- [B]
The image data stored in the HDD cannot be output properly.

- Possible causes -
- EX-IPU board defective

SC390: TD sensor error

-Definition- [B]
1. TD sensor output voltage falls out of the adjustment target (2.5 ± 0.1 V) during the Vt check.
2. Vt-Vtref>0.6V is detected 10 consecutive times even though toner is detected by the toner end sensor.
3. Vt<0.5 or Vt>4.0 is detected.

- Possible causes -
- TD sensor abnormal
- BCU board defective

SC391: Development bias leak

-Definition- [B]
A development bias leak signal is detected.

- Possible causes -
- Sleeve roller receptacle damage
- Development bias power pack defective

SC392: Image storage address error

- Definition -

The EX-IPU receives the image data output request signal for data that is not stored in memory

- Possible cause -

- SCU defective
- EX-IPU defective

SC401: Transfer belt error

-Definition- [B]

A transfer belt current leak signal is detected.

- Possible causes -

- Transfer high voltage supply board defective
- Transfer belt position sensor defective

SC405: Time out error (scanner)

-Definition -

The BCU does not receive the scanner access ready signal from the EX-IPU

- Possible cause -

- BCU defective
- EX-IPU defective
- SCU defective

SC440: Main motor lock

-Definition- [B]

A main motor lock signal is detected for more than 2 seconds.

- Possible causes -

- Too much load on the drive mechanism
- Main motor defective

SC490: Ozone fan motor lock/Exhaust fan motor lock

-Definition- [B]

A fan motor lock signal is detected for more than 0.5 second from either fan.

- Possible causes -

- Ozone fan motor defective
- Exaust fan motor defective
- Poor connection of the fan motor connector
- Something is stuck in the fan motor

SC501: Main body tray lift motor malfunction

SC502: Paper tray unit 1st tray lift motor malfunction

SC503: Paper tray unit 2nd tray lift motor malfunction

SC504: Paper tray unit 3rd tray lift motor malfunction

-Definition- [C]

- The paper upper limit sensor is not actuated after the tray lift motor has been on for 10 seconds.
- The pick-up roller solenoid does not contact the top sheet of paper.

- Possible causes -

- Upper limit sensor defective
- Tray lift motor defective
- Pick-up roller solenoid defective

SC506: Paper tray unit main motor lock (A549 optional paper tray unit only)

-Definition- [C]

- A paper tray unit motor lock signal is detected.
- A synchronization error is detected for 20 ms during rotation.

- Possible causes -

- Paper tray unit main motor defective
- Interface board defective
- Pick-up roller solenoid defective

SC507: LCT lift motor malfunction

-Definition- [C]

1. The LCT upper limit sensor is not actuated after the LCT lift motor has been on for 15.0 seconds.
2. The LCT lower limit sensor is not actuated after the LCT lift motor has been on for 15.0 seconds.
3. The LCT upper limit sensor is not actuated after the LCT lift motor has been on for 1.5 seconds to lift up paper during copying.
4. The LCT upper limit sensor stays actuated after the LCT lift motor has been on for 1.5 seconds to lower the LCT tray.
5. Both the LCT upper and lower limit sensors are actuated when the LCT lift motor starts to lift the LCT tray.
6. The LCT upper limit sensor is outputting an OFF signal when the LCT pick-up solenoid is OFF.

- Possible causes -

- LCT upper limit sensor defective
- LCT lower limit sensor defective
- LCT lift motor defective
- LCT interface board defective
- BCU board defective
- LCT cover switch defective

SC521: Duplex side fence drive motor error

-Definition- [C]

- The side fence jogger home position sensor remains de-actuated for 5.0 seconds when the jogger home position initialization procedure is performed.
- The side fence jogger home position sensor remains actuated for 0.5 second when moving away from home position.

- Possible causes -

- Side fence jogger home position sensor defective
- Side fence jogger motor defective
- Duplex control board defective

SC524: Duplex end fence drive motor error

-Definition- [C]
- The end fence jogger home position sensor remains de-actuated for 8.0 seconds when the jogger home position initialization procedure is performed.
- The end fence jogger home position sensor remains actuated for 0.5 second when moving away from home position.

- Possible causes -
- End fence jogger home position sensor defective
- End fence jogger motor defective
- Duplex control board defective

SC541: Fusing thermistor open

-Definition- [A]
The fusing temperature detected by the thermistor was below 7°C for 10 seconds.

- Possible cause -
- Fusing thermistor open
- Fusing lamp open
- Poor thermistor connection

SC542: Fusing temperature warm-up error

-Definition- [A]
The fusing temperature does not reach the fusing standby temperature within 135.0 seconds after the main switch is turned on.

- Possible causes -
- Fusing thermistor defective or out of position
- Fusing lamp open
- Fusing thermofuse open
- BCU board defective
- AC drive board defective

SC543: Fusing overheat error 1

-Definition- [A]
A fusing temperature of over 231°C is detected for 5 seconds by the fusing thermistor.

- Possible causes -
- Fusing thermistor defective
- BCU board defective
- AC drive board defective

SC545: Fusing overheat error 2

-Definition- [A]
The fusing lamp stays on at full power for 30.0 seconds while in the stand-by condition after warm-up is completed.

- Possible causes -
- Fusing thermistor out of position

SC546: Fusing ready temperature malfunction

-Definition- [A]
The fusing temperature goes 20 °C below or 20 °C over the stand-by temperature after warm-up is completed.

- Possible causes -
- Poor thermistor connection
- Poor connection of the sliding connector between the fusing unit and the rear of the machine

SC547: Zero cross signal malfunction

-Definition- [A]
Zero cross signals are not detected within a certain period.

- Possible causes -
- AC drive board defective
- BCU board defective

SC600: Communication error between SCU and operation panel

-Definition- [B]
The SCU board cannot communicate with the operation panel CPU properly.

- Possible causes -
- Poor connection
- SCU board defective
- Operation panel board defective

SC601: Communication error between BCU and EX-IPU

-Definition- [B]
The BCU board cannot communicate with the EX-IPU board properly.

- Possible causes -
- Poor connection of the interface harness which connects the BCU board and the EX-IPU board

SC602: Communication error between BCU and fusing control unit

-Definition- [B]
The BCU board cannot communicate with the fusing control unit properly.

- Possible causes -
- BCU board defective

SC604: Communication error between BCU and high voltage control board

-Definition- [B]
The BCU board cannot communicate with the high voltage control board properly.

- Possible causes -
- Poor connection of the interface harness which connects the BCU baord and the high voltage control baord.
- High voltage control board defective

SC605: Communication error between SCU and BCU

-Definition- [B]
The SCU board cannot communicate with the BCU board properly.

- Possible causes -
- Poor connection
- SCU board defective
- BCU board defective

SC620: Communication error between BCU and ARDF

-Definition- [B]
The BCU board cannot start communication with the ARDF properly.

- Possible causes -
- Poor connection
- BCU board defective
- DF main board defective

SC621: Communication error between BCU and finisher

-Definition- [B]
The BCU board cannot start communication with the finisher properly.

- Possible causes -
- Poor connection
- BCU board defective
- Finisher main control board defective

SC623: Communication error between BCU and paper tray unit

-Definition- [B]
The BCU board cannot start communication with the paper tray unit properly.

- Possible causes -
- Poor connection
- BCU board defective
- Paper tray unit defective

SC625: GA5 (GAFBTC) Error

- Definition -
The GA5 did not finish the data transfer to the memory in 20 seconds.

- Possible cause -
- EX-IPU defective
- Software problem

SC720: Finisher transport drive motor error

-Definition- [B]
An abnormal motor condition is detected from the finisher transport drive motor.

- Possible causes -
- Finisher transport drive motor defective
- Finisher main control board defective

SC721: Finisher tray lift/shift motor error

-Definition- [B]
An abnormal motor condition is detected from either the finisher tray lift or shift motor.

- Possible causes -
- Finisher tray lift motor defective
- Finisher tray shift motor defective
- Finisher main control board defective

SC722: Finisher jogger motor error

-Definition- [B]
- The finisher jogger home position sensor remains de-actuated for 800 ms when returning to home position.
- The finisher jogger home position sensor remains actuated for 100 ms when moving away from home position.

- Possible causes -
- Finisher jogger motor defective
- Finisher main control board defective

SC723: Finisher stack feed-out motor error

-Definition- [B]
An abnormal motor condition is detected from the finisher stack feed-out motor.

- Possible causes -
- Finisher stack feed-out motor defective
- Finisher main control board defective

SC724: Finisher staple drive/stable motor error

-Definition- [B]
An abnormal motor condition is detected from either the finisher staple drive or staple motor.

- Possible causes -
- Finisher staple drive motor defective
- Finisher staple motor defective
- Finisher main control board defective

SC900: Total counter error

-Definition- [B]
The total counter is not working properly.

- Possible causes -
- Total counter defective
- CN403 on the SCU board not connected properly

3. ELECTRICAL COMPONENT DEFECTS

3.1 SENSORS

Component (Symbol)	CN	Condition	Symptom
By-pass Feed Paper Width (S1)	209-9~12 (BCU)	Open	The copier does not turn on.
		Shorted	The CPU cannot detect the proper paper size.
By-pass Feed Paper End (S2)	209-7 (BCU)	Open	The Paper End indicator lights even if paper is placed on the by-pass feed table.
		Shorted	The Paper End indicator does not light even if there is no paper on the by-pass feed table.
Tray Paper End (S3)	213-A2 (BCU)	Open	The Paper End indicator lights even if paper is placed on the by-pass feed table.
		Shorted	The Paper End indicator does not light even if there is no paper on the by-pass feed table.
Upper Relay (S4)	214-B12 (BCU)	Open	The Check Paper Path indicator will light whenever a copy is made.
		Shorted	The Check Paper Path indicator lights even if there is no paper.
Tray Upper Limit (S5)	213-A8 (BCU)	Open	A related SC code will be displayed before the pick-up solenoid activates.
		Shorted	The tray bottom plate does not rise, and a related SC code will be displayed.
Lower Relay (S6)	214-B9 (BCU)	Open	The Check Paper Path indicator will light whenever a copy is made.
		Shorted	The Check Paper Path indicator lights even if there is no paper.
LCT Lower Limit (S7)	218-10 (BCU)	Open	The LCT bottom plate does not lower.
		Shorted	When the bottom plate is lowered, it locks at the lowest position.
LCT Paper End (S8)	223-2 (BCU)	Open	The Paper End indicator lights even if there is paper in the LCT.
		Shorted	The Paper End indicator does not light even if there is no paper.
LCT Upper Limit (S9)	217-5 (BCU)	Open	The bottom plate does not rise even if paper is placed in the LCT.
		Shorted	The bottom plate rises and locks at the upper position.
Registration (S10)	214-A2 (BCU)	Open	The Check Paper Path indicator will light whenever a copy is made.
		Shorted	The Check Paper Path indicator lights even if there is no paper.
Image Density (ID) (S11)	210-A8 (BCU)	Open	SC350 is displayed.
		Shorted	SC350 is displayed.
Toner Density (TD) (S12)	210-B3 (BCU)	Open	SC390 is displayed.
		Shorted	SC390 is displayed.

Trouble-shooting

Component (Symbol)	CN	Condition	Symptom
Scanner HP (S13)	505-1 (EX-IPU)	Open	SC121 is displayed.
		Shorted	SC120 is displayed.
Original Length (S14)	516-6 (EX-IPU)	Open	The CPU cannot detect the original size properly. APS and ARE do not function correctly.
		Shorted	
Original Length-2 (S15)	516-3 (EX-IPU)	Open	The CPU cannot detect the original size properly. APS and ARE do not function correctly.
		Shorted	
Fusing Exit(S16)	210-B9 (BCU)	Open	The Check Paper Path indicator will light whenever a copy is made.
		Shorted	The Check Paper Path indicator lights even if there is no paper.
Platen Cover (S17)	516-2 (EX-IPU)	Open	APS and ARE do not function properly.
		Shorted	No symptom
Toner End (S18)	210-B6 (BCU)	Open	Toner is added even if there is a sufficient amount of toner inside the toner supply unit.
		Shorted	Toner is not supplied even if there is no toner inside the toner supply unit.
Auto Response (S19)	414-2 (SCU)	Open	The copier does not exit the "Energy Saver" mode even if an operator approaches the machine.
		Shorted	"Energy Saver" mode does not work.
Transfer Belt Position (S20)	211-A8 (BCU)	Open	No symptom
		Shorted	SC401 is displayed.
Original Width (S21)	505-6~8 (EX-IPU)	Open	The CPU cannot detect the original size properly. APS and ARE do not function correctly.
		Shorted	
Duplex Paper End (S22)	215-4 (BCU)	Open	"Copies Left In The Duplex Tray" is displayed or the Paper Jam Z indicator lights even if there is no paper in the duplex tray.
		Shorted	Only one rear side copy is made regardless of the quantity of copies required.
Duplex Turn (S23)	215-6 (BCU)	Open	The machine indicates that originals should be reset.
		Shorted	"Copies Left In The Duplex Tray" is displayed or the Paper Jam Z indicator lights even if there is no paper in the duplex tray.
Duplex Entrance (S24)	215-5 (BCU)	Open	"Copies Left In The Duplex Tray" is displayed or the Paper Jam Z indicator lights even if there is no paper in the duplex tray.
		Shorted	The Check Paper Path indicator lights even if there is no paper.
Side Fence Jogger HP (S25)	215-2 (BCU)	Open	SC521 is displayed.
		Shorted	SC521 is displayed.
End Fence Jogger HP (S26)	215-3 (BCU)	Open	SC524 is displayed.
		Shorted	SC524 is displayed.

Component (Symbol)	CN	Condition	Symptom
Toner Overflow (S27)	210-A4 (BCU)	Open	"Used Toner Bottle Nearly Full" is indicated, even if the bottle is not full.
		Shorted	Toner overflow cannot be detected even if the bottle is full.
By-pass Relay (S28)	217-8 (BCU)	Open	The Check Paper Path indicator will light whenever a copy is made.
		Shorted	The Check Paper Path indicator lights even if there is no paper.

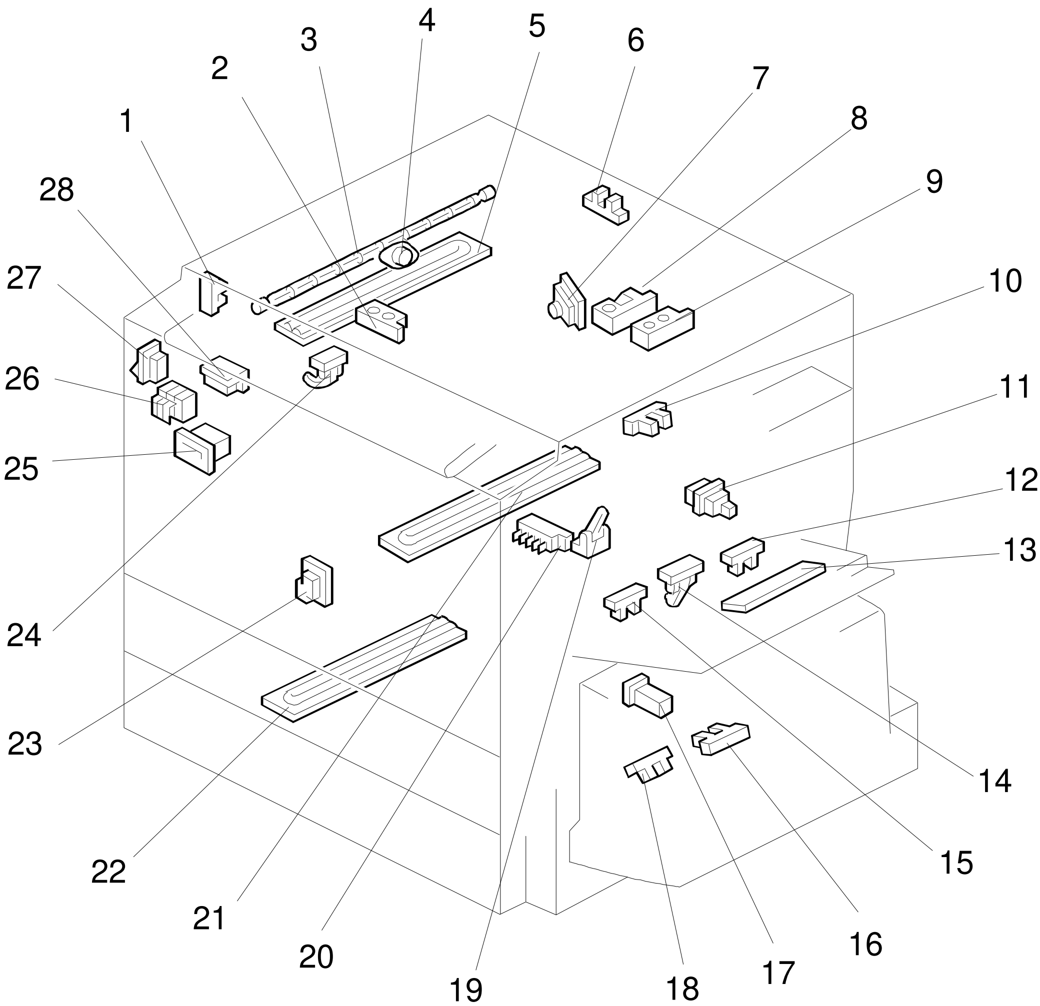
3.2 SWITCHES

Component (Symbol)	CN	Condition	Symptom
By-pass Feed Table (SW1)	209-4 (BCU)	Open	By-pass feed cannot be selected.
		Shorted	The by-pass feed indicator is lit even if the by-pass feed table is closed.
Tray Down (SW2)	218-6 (BCU)	Open	The LCT bottom plate does not lower.
		Shorted	The LCT bottom plate lowers even if there is paper in the LCT.
Tray Paper Size (SW3)	213-B2~6 (BCU)	Open	The CPU cannot detect the proper paper size, and misfeeds may occur when a copy is made.
		Shorted	
LCT (SW4)	218-3 (BCU)	Open	The LCT bottom plate lowers even if there is paper in the LCT.
		Shorted	The LCT bottom plate does not rise even if the cover is closed.
LCT Cover (SW5)	218-12 (BCU)	Open	SC507 is displayed or the LCT bottom plate does not rise or lower.
		Shorted	
Main (SW6)	–	Open	The copier does not turn on.
		Shorted	The copier does not turn off.
Front Cover Safety (SW7)	–	Open	"Doors/Covers Open" is not displayed even if the front cover is opened.
		Shorted	"Doors/Covers Open" is displayed even if the front cover is closed.

4. BLOWN FUSE CONDITIONS

Fuse	Rating		Symptom when turning on the main switch
	115 V	220 ~ 240 V	
DC Power Supply Board			
FU101	8 A/125 V	6.3 A/250 V	No response.
FU102	8 A/125 V	8 A/125 V	"Close the indicated doors/covers" is displayed on the LCD.
FU103	6.3 A/125 V	6.3 A/125 V	SC320 is displayed.
FU104	6.3 A/125 V	6.3 A/125 V	"Close the indicated doors/covers" is displayed on the LCD.
Lamp Stabilizer Board			
FU1	5 A/125 V	3.15 A/250 V	SC101 is displayed.

COPIER (A195) ELECTRICAL COMPONENTS



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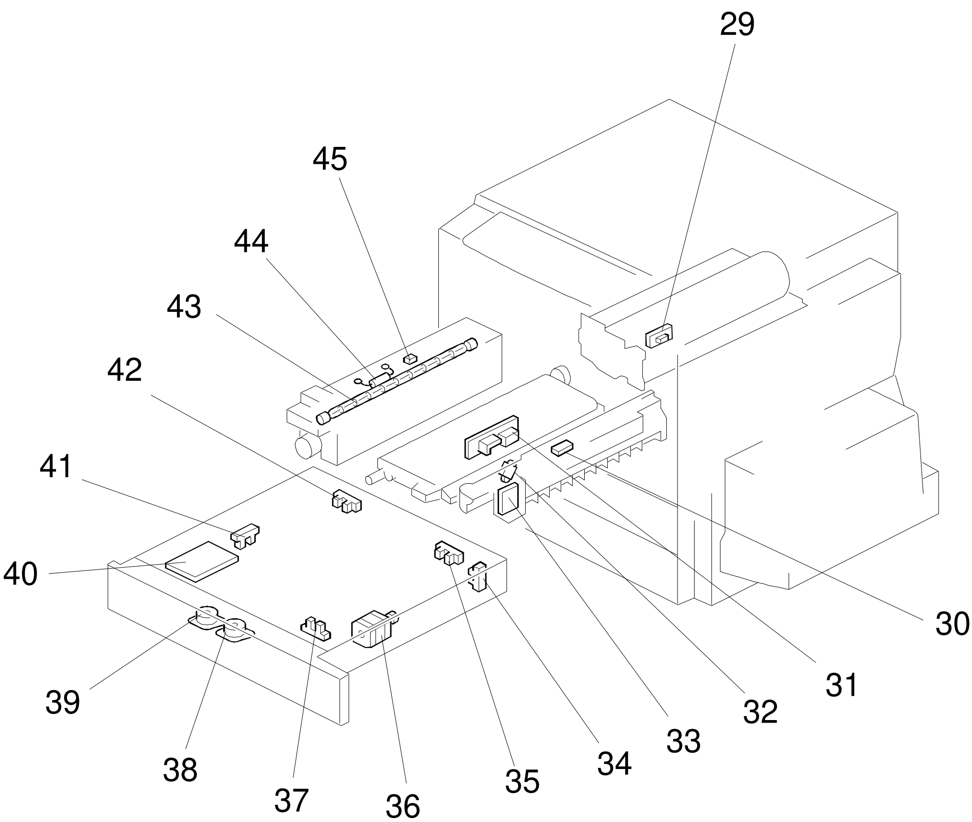

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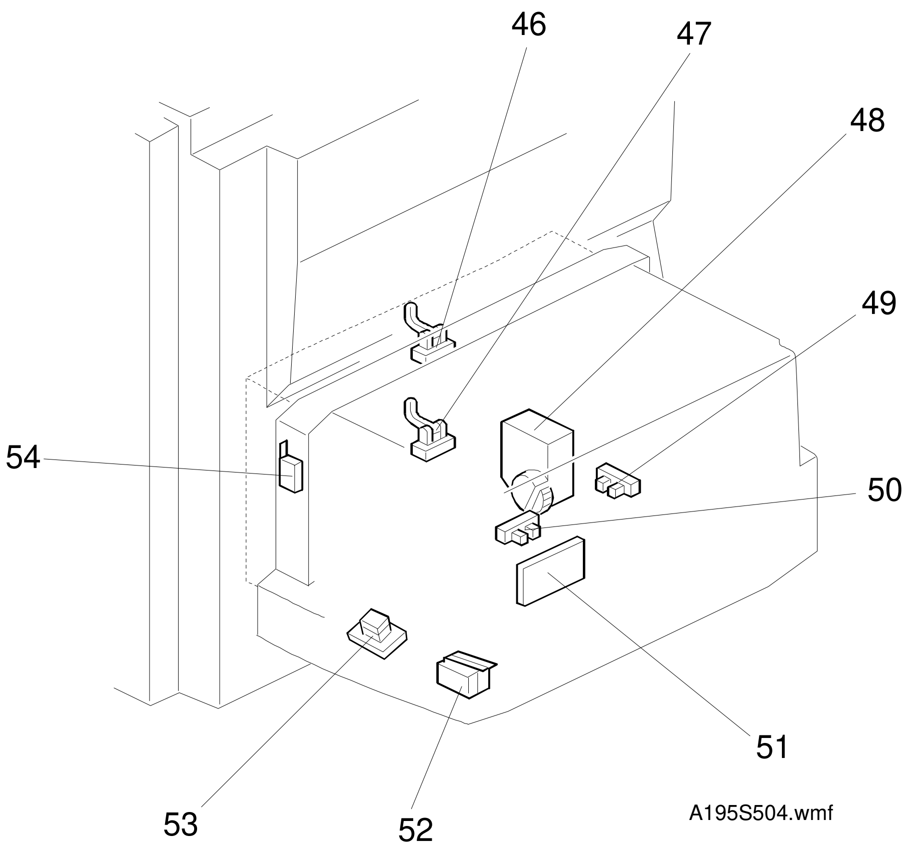

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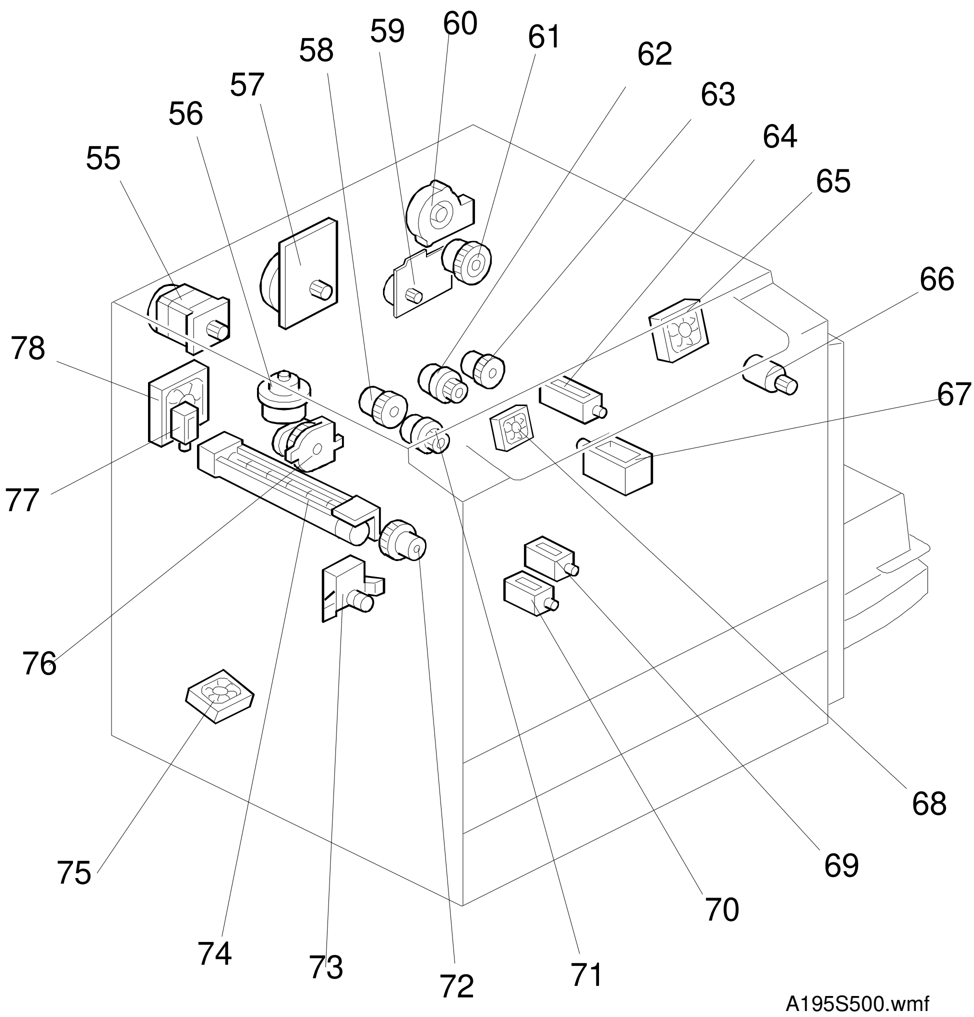
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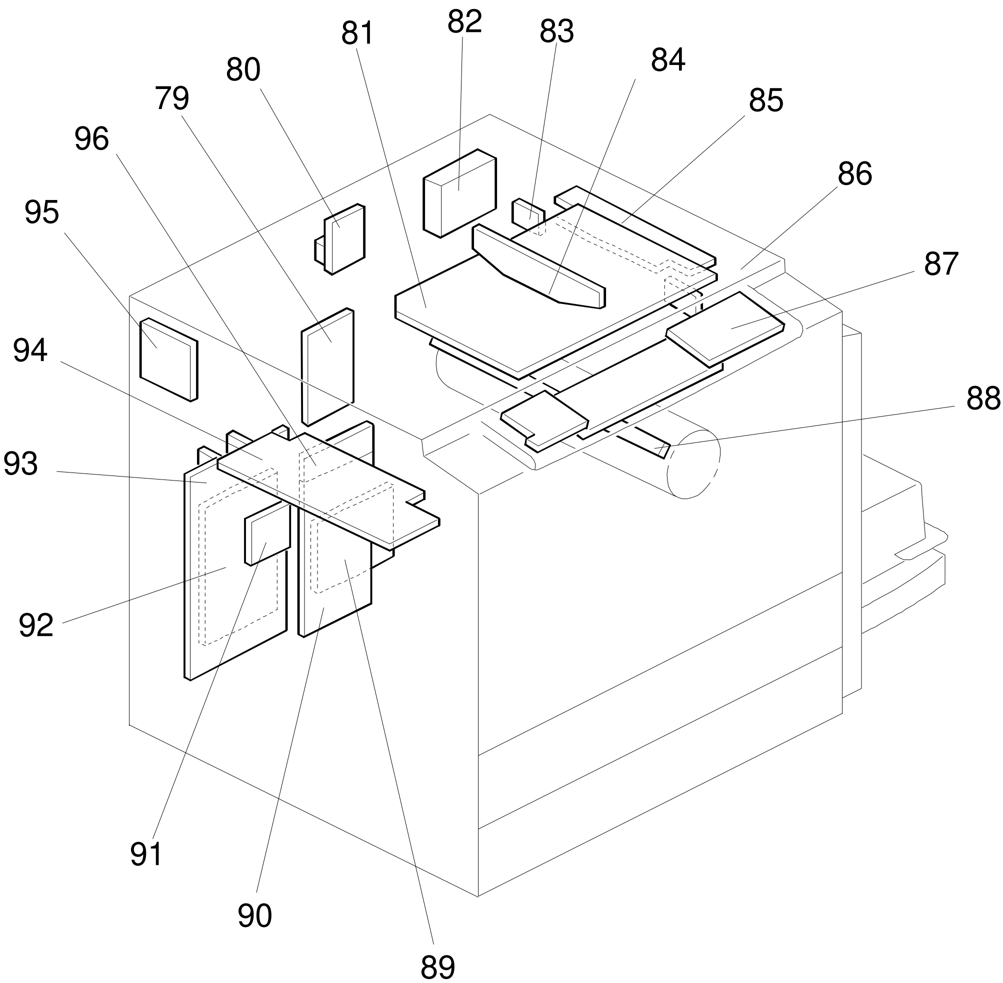

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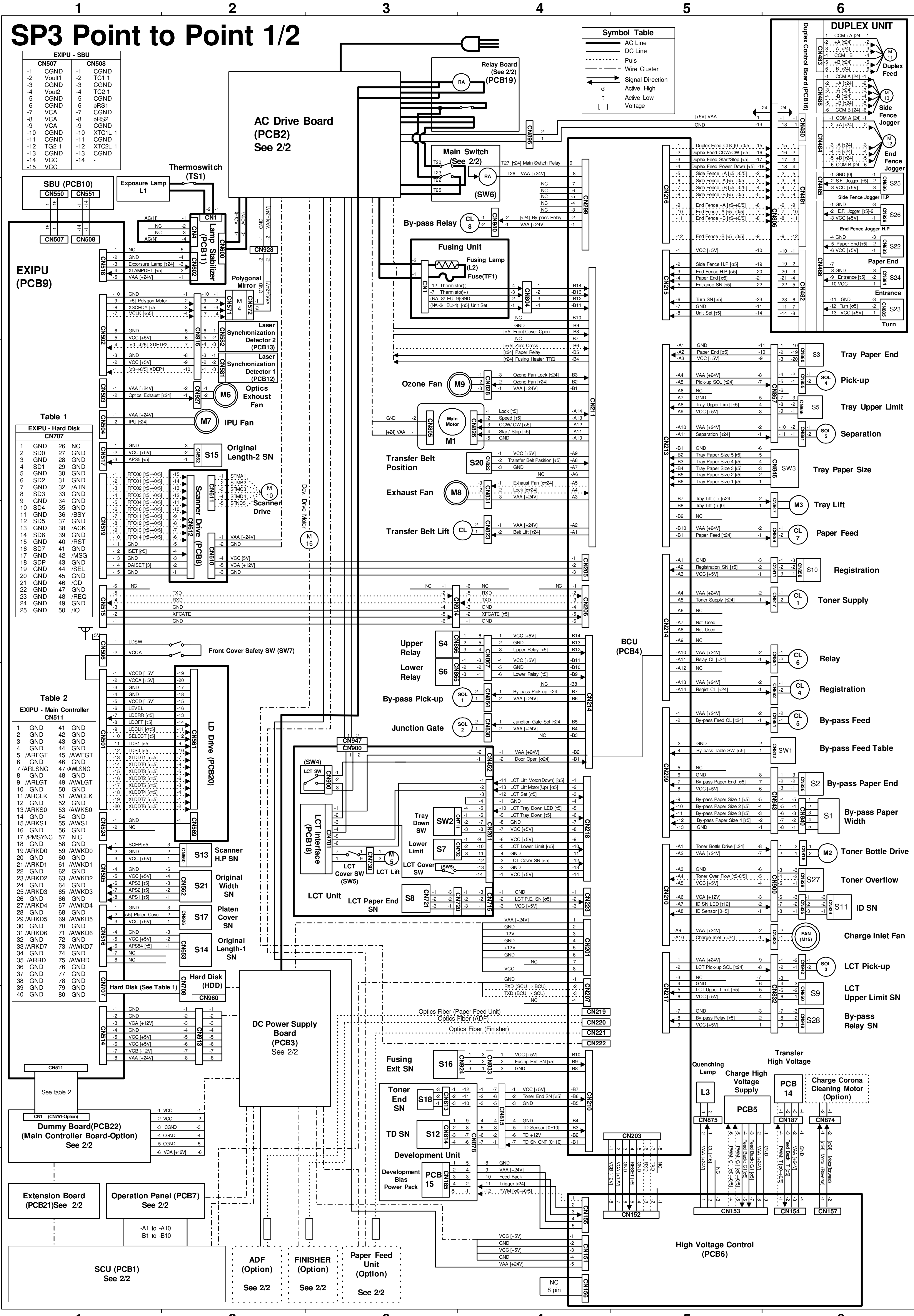
Symbol	Index No.	Description	P-to P
Printed Circuit Boards			
PCB1	90	SCU	H1 (1/2), G2 (2/2)
PCB2	89	AC Drive	A2 (1/2), A3 (2/2)
PCB3	92	DC Power Supply	G2 (1/2), E1 (2/2)
PCB4	93	BCU	D5 (1/2), D6 (2/2)
PCB5	80	Charge High Voltage Supply	G5 (1/2)
PCB6	85	High Voltage Control	H5 (1/2), F6 (2/2)
PCB7	87	Operation Panel	H1 (1/2), G1 (2/2)
PCB8	95	Scanner Drive	D2 (1/2), C2(2/2)
PCB9	81	EX-IPU	D2 (1/2), C1 (2/2)
PCB10	84	SBU	B1 (1/2)
PCB11	94	Lamp Stabilizer	B2 (1/2), C2 (2/2)
PCB12	86	Main Scan Synchronization Detector - 1	C2 (1/2)
PCB13	83	Main Scan Synchronization Detector - 2	B2 (1/2)
PCB14	31	Transfer High Voltage	G6 (1/2)
PCB15	33	Development Bias Power Pack	H3 (1/2)
PCB16	40	Duplex Control	A6 (1/2)
PCB17	N/A	Liquid Crystal Display	N/A
PCB18	51	LCT Interface	F2 (1/2)
PCB19	91	Relay Board	A4 (1/2) B5 (2/2)
PCB20	7	Laser Diode Drive	E2 (1/2)
PCB21	96	Extention Board	H1(1/2), G3 (2/2)
PCB22	79	Dummy Board	G1(1/2), G3 (2/2)
Motors			
M1	57	Main	C3 (1/2), C5 (2/2)
M2	66	Toner Bottle Drive	F6 (1/2)
M3	73	Tray Lift	D6 (1/2)
M4	56	Polygonal Mirror	B2 (1/2), C2 (2/2)
M5	48	LCT Lift	F3 (1/2)
M6	74	Optics Exhaust Fan	C2 (1/2)
M7	65	IPU Fan	C2 (1/2)
M8	78	Exhaust Fan	C3 (1/2)
M9	60	Ozone Fan	C3 (1/2)
M10	55	Scanner Drive	C2 (1/2)
M11	36	Duplex Feed	A6 (1/2)
M12	39	End Fence Jogger	A6 (1/2)
M13	38	Side Fence Jogger	A6 (1/2)
M14	75	DC Drive Board Fan	F1 (2/2)
M15	68	Charge Inlet Fan	F6 (1/2)
M16	59	Development Drive	D3 (1/2), D4 (2/2)
Sensors			
S1	13	By-pass Feed Paper Width	E6 (1/2)
S2	15	By-pass Feed Paper End	E6 (1/2)
S3	18	Tray Paper End	C6 (1/2)

Symbol	Index No.	Description	P-to P
S4	46	Upper Relay	D3 (1/2)
S5	16	Tray Upper Limit	C6 (1/2)
S6	47	Lower Relay	E3 (1/2)
S7	49	LCT Lower Limit	F3 (1/2)
S8	50	LCT Paper End	F3 (1/2)
S9	12	LCT Upper Limit	G6 (1/2)
S10	19	Registration	D6 (1/2)
S11	29	Image Density (ID)	F6 (1/2)
S12	30	Toner Density (TD)	G3 (1/2)
S13	1	Scanner HP	F2 (1/2)
S14	8	Original Length-1	F2 (1/2)
S15	9	Original Length-2	C2 (1/2)
S16	24	Fusing Exit	G4 (1/2)
S17	6	Platen Cover	F2 (1/2)
S18	32	Toner End	G3 (1/2)
S19	28	Auto Response	H2 (2/2)
S20	10	Transfer Belt Position	C4 (1/2)
S21	2	Original Width	F2 (1/2)
S22	34	Duplex Paper End	B6 (1/2)
S23	35	Duplex Turn	B6 (1/2)
S24	42	Duplex Entrance	B6 (1/2)
S25	37	Side Fence Jogger HP	B6 (1/2)
S26	41	End Fence Jogger HP	B6 (1/2)
S27	23	Toner Overflow	F6 (1/2)
S28	14	By-pass Relay	G6 (1/2)
Switches			
SW1	11	By-pass Feed Table	E6 (1/2)
SW2	53	Tray Down	F3 (1/2)
SW3	20	Tray Paper Size	C6 (1/2)
SW4	54	LCT	E3 (1/2)
SW5	52	LCT Cover	F3 (1/2)
SW6	27	Main	A4 (1/2), B4 (2/2)
SW7	26	Front Cover Safety	D2 (1/2)
Magnetic Clutches			
CL1	61	Toner Supply	D6 (1/2)
CL2		Not used	
CL3	76	Transfer Belt Lift	D3 (1/2)
CL4	58	Registration	E6 (1/2)
CL5	63	By-pass Feed	E6 (1/2)
CL6	71	Relay	D6 (1/2)
CL7	72	Paper Feed	D6 (1/2)
CL8	62	By-pass Relay	B4 (1/2)

Symbol	Index No.	Description	P-to P
Solenoids			
SOL1	67	By-pass Pick-up	E3 (1/2)
SOL2	77	Junction Gate	E3 (1/2)
SOL3	64	LCT Pick-up	F6 (1/2)
SOL4	69	Pick-up	C6 (1/2)
SOL5	70	Separation	C6 (1/2)
Lamps			
L1	3	Exposure	B1 (1/2)
L2	43	Fusing	B3 (1/2)
L3	88	Quenching	G5 (1/2)
Heaters			
H1	21	Drum (option)	B1 (2/2)
H2	5	Optics Anti-condensation (option)	B1 (2/2)
H3	22	Tray (option)	A1 (2/2)
Thermistors			
TH1	45	Fusing	A6 (2/2)
Thermofuses			
TF1	44	Fusing	B3 (1/2), A5 (2/2)
Thermoswitch			
TS1	4	Exposure Lamp	B2 (1/2)
Counters			
CO1	25	Total	H3 (2/2)
CO2	N/A	Key (option)	H2 (2/2)
Others			
CB1	17	Circuit Breaker (220 ~ 240V machines only)	A4 (2/2)
HDD	82	Hard Disk Drive	F2 (1/2), C2 (2/2)

SP3 Point to Point 1/2



EXIPU - SBU

CN507		CN508	
-1	CGND	-1	CGND
-2	Voult1	-2	TC1 1
-3	CGND	-3	CGND
-4	Vout2	-4	TC2 1
-5	CGND	-5	CGND
-6	CGND	-6	φRS1
-7	VCA	-7	CGND
-8	VCA	-8	φRS2
-9	VCA	-9	CGND
-10	CGND	-10	XTC1L 1
-11	CGND	-11	CGND
-12	TG2 1	-12	XTC2L 1
-13	CGND	-13	CGND
-14	VCC	-14	-
-15	VCC		

Table 1

EXIPU - Hard Disk CN707

1	GND	26	NC
2	SD0	27	GND
3	GND	28	GND
4	SD1	29	GND
5	GND	30	GND
6	SD2	31	GND
7	GND	32	/ATN
8	SD3	33	GND
9	GND	34	GND
10	SD4	35	GND
11	GND	36	/BSY
12	SD5	37	GND
13	GND	38	/ACK
14	SD6	39	GND
15	GND	40	/RST
16	SD7	41	GND
17	GND	42	/MSG
18	SDP	43	GND
19	GND	44	/SEL
20	GND	45	GND
21	GND	46	/CD
22	GND	47	GND
23	GND	48	/REQ
24	GND	49	GND
25	GND	50	/IO

Table 2

EXIPU - Main Controller CN511

1	GND	41	GND
2	GND	42	GND
3	GND	43	GND
4	GND	44	GND
5	/ARFGT	45	/AWFGT
6	GND	46	GND
7	/ARLSNC	47	/AWLSNC
8	GND	48	GND
9	/ARLGT	49	/AWLGT
10	GND	50	GND
11	/ARCLK	51	/AWCLK
12	GND	52	GND
13	/ARKS0	53	/AWKS0
14	GND	54	GND
15	/ARKS1	55	/AWS1
16	GND	56	GND
17	/PMSYNC	57	N.C.
18	GND	58	GND
19	/ARKD0	59	/AWKD0
20	GND	60	GND
21	/ARKD1	61	/AWKD1
22	GND	62	GND
23	/ARKD2	63	/AWKD2
24	GND	64	GND
25	/ARKD3	65	/AWKD3
26	GND	66	GND
27	/ARKD4	67	/AWKD4
28	GND	68	GND
29	/ARKD5	69	/AWKD5
30	GND	70	GND
31	/ARKD6	71	/AWKD6
32	GND	72	GND
33	/ARKD7	73	/AWKD7
34	GND	74	GND
35	/ARRD	75	/AWRD
36	GND	76	GND
37	GND	77	GND
38	GND	78	GND
39	GND	79	GND
40	GND	80	GND

SP3 Point to Point 2/2

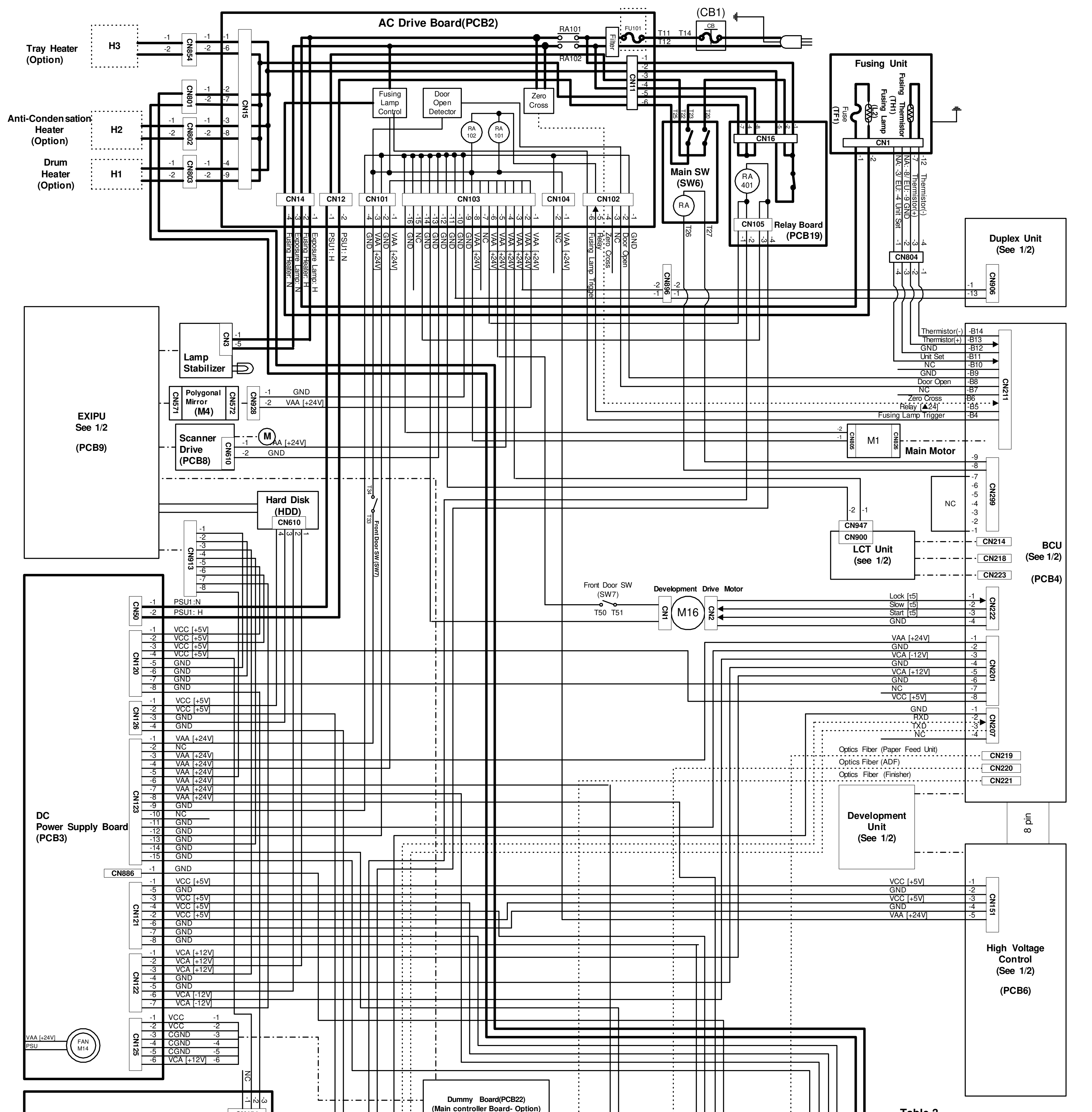


Table 3

Main Controller Board - Extension Board							
CN752							
1	XA28	21	XA13	41	-XBE0	61	XD12
2	XA27	22	XA12	42	-X0E	62	XD11
3	XA26	23	XA11	43	NC	63	XD10
4	GND	24	GND	44	GND	64	GND
5	XA25	25	XA10	45	-XACK	65	XD09
6	XA24	26	XA09	46	-XWE	66	XD08
7	NC	27	XA08	47	-XCS1	67	XD07
8	GND	28	GND	48	GND	68	GND
9	NC	29	XA07	49	-XINT1	69	XD06
10	NC	30	XA06	50	NC	70	XD05
11	NC	31	XA05	51	-XRES	71	XD04
12	GND	32	GND	52	GND	72	GND
13	NC	33	XA04	53	NC	73	XD03
14	XA18	34	XA03	54	NC	74	XD02
15	NC	35	XA02	55	NC	75	XD01
16	GND	36	GND	56	GND	76	GND
17	NC	37	-XBE3	57	XD15	77	XD00
18	XA15	38	-XBE2	58	XD14	78	NC
19	XA14	39	-XBE1	59	XD13	79	NC
20	GND	40	GND	60	GND	80	GND

Table 4

SCU - Extension Board							
CN407							
1	VCC	16	A12	31	SYSCLK	46	D10
2	VCC	17	A11	32	R/-W	47	D9
3	VCC	18	A10	33	-AIACK	48	D8
4	VCC	19	A9	34	-CS AI	49	D7
5	A23	20	A8	35	-AI INT	50	D6
6	A22	21	A7	36	-AI_DREQ	51	D5
7	A21	22	A6	37	-AI_DACK	52	D4
8	A20	23	A5	38	-AI RESET	53	D3
9	A19	24	A4	39	NC	54	D2
10	A18	25	A3	40	NC	55	D1
11	A17	26	A2	41	D15	56	D0
12	A16	27	A1	42	D14	57	GND
13	A15	28	A0	43	D13	58	GND
14	A14	29	SIZ1	44	D12	59	GND
15	A13	30	SIZ0	45	D11	60	GND