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DOCUMENT FEEDER

SORTER

DUPLEX AND LCT UNIT

SECTION 1

OVERALL MACHINE INFORMATION

1. SPECIFICATIONS

Copy Process:	Laser electrostatic transfer system
Originals:	Book/sheet, fixed platen
Original Alignment:	Front-right corner
Maximum Original Size:	11" x 17"/A3
Copy Paper Size:	Maximum: 11" x 17"/A3 Minimum: 5½" x 8½"/A5
Copy Paper Weight:	Bypass feed: 17 to 42 lb/64 to 157 g/m^2 Side cassette: 17 to 42 lb/64 to 157 g/m^2 Front trays: 17 to 28 lb/64 to 104 g/m^2
Copying Speed:	30 copies per minute (8½" x 11" sideways) 31 copies per minute (A4 sideways) 18 copies per minute (11" x 17") 18 copies per minute (A3)
First Copy:	5.8 seconds (8½" x 11"/A4 sideways) from side cassette
Warm-up Time:	Within 5 minutes (Room temperature 23°C/73°F)
Copy Counters:	
Set counter:	1 to 999 (max. is adjustable by SP mode)
Copy counter:	1 to 999 (count-up or count-down, can be selected by SP mode)
Paper Capacity:	Cassette: 250 sheets Manual feed table: 30 sheets
Copy Tray Capacity:	250 sheets (8½" x 14"/B4 and smaller) 100 sheets (11" x 17"/A3)
Automatic Reset:	After 60 seconds (3 min. can be selected by SP mode) -- Reproduction Ratio: Full size -- Interrupt Mode: OFF -- 2 Single Copies: OFF -- Sort/Stack: OFF -- Duplex: OFF -- Set Counter: 1 -- Copy Counter: 0

* : It is possible to be changed by SP mode

-- Image Density: Auto ID *
-- User Program Mode: OFF
-- Total Area Editing: OFF
-- Letter/Photo mode: Letter mode
-- Designated Area Editing: OFF
-- Cassette: 1st or LCT *
-- Auto Reduce/Enlarge: OFF
-- Auto Paper Selection: ON *

Photoconductor: Organic photoconductor drum

Drum Charge: Dual-wire with grid plate (Negative Charge)

Fixed Reproduction Ratios: 6 enlargement ratios and 7 reduction ratios

	A4/A3 version	LT/LDG version
Enlargement	800%	800%
	400%	400%
	200%	200%
	141%	155%
	122%	129%
	115%	121%
Full Size	100%	100%
Reduction	93%	93%
	82%	85%
	75%	77%
	71%	74%
	65%	65%
	50%	50%
	25%	25%

Zoom: From 25% to 800% in 1% increments. Allows independent horizontal and vertical percentage.

Scanning System: CCD, one directional scanning with mirrors and lens

Picture Element Density: 400 dots per inch (15.7 lines/mm)

Scanner Light Source: Two fluorescent lamps (green light)

Exposure System: Semiconductor laser, one dimensional scanning

Development:
- Dual-component dry toner system
- Double roller development

Toner Replenishment: 300 gram cartridge

Toner Consumption:	5,500 copies/cartridge ($8\frac{1}{2}$" x 11"/A4, 6% Originals)
Development Bias:	Negative fixed bias
Toner Density Control:	Pattern density detection by photosensor
Image Transfer:	Single wire dc (positive charge)
Paper Separation:	Dual wire ac corona and pick-off pawls
Cleaning:	Cleaning blade, cleaning brush, and pre-cleaning corona
Quenching:	Photo quenching by LEDs
Paper Feed System:	Feed and reverse roller
Image Fusing:	Heat and pressure type, teflon (upper) and silicone rubber (lower) rollers
Fusing Lamp:	Halogen lamp (115 V, 750 W/230 V, 800 W)
Silicone Oil Consumption:	More than 80,000 copies/500 cc ($8\frac{1}{2}$" x 11"/A4 copies)

Printer Feature

Memory:	Instruction ROM:	4 Mbytes
	Font ROM:	2 Mbytes
	Base RAM:	8 Mbytes
PDL/Emulation:	Adobe PostScript Level 2 HP LaserJet III (PCL-5) Emulation and compatible with HP LaserJet IIIsi, IID	
Graphics:		
Compressed files:	Decompress raster graphic files (as per Adobe PS 2 and HP PCL 5 specifications)	
Conversion:	Automatically convert 300 dpi bit-mapped graphics for HP PCL 5 mode.	

Fonts:

Adobe type 1: Outline fonts: Zapf Chancery, Zapf Dingbats, Symbol plus four styles (normal, italic, bold, bold-italic) each of Avant Garde Bookman, Courier, Helvetica, Helvetica Narrow, New Century Schoolbook, Times Palatino

HP/Intellifonts: Outline fonts: Zapf Dingbats plus four styles (normal, italic, bold, bold-italic) each of Univers, Univers Condensed, CG Times

Soft font capability: Outline fonts downloadable to memory or optional hard disk

Printer Port:
RS232C serial
Bi-directional Centronics parallel
RS422 Appletalk

<u>Scanner Feature</u>

Scan Area: Max. 11" x 17"/A3

Scan Time: Max. 2 seconds (8½" x 11"/A4 at full size mode (400 dpi)

Document Type: Book/Sheet

Image Reduction: 25% (100 dpi) 50% (200 dpi) 75% (300 dpi)

Output Data:
Binary Digital Data
-- Black and White (fixed threshold)
-- Photo Mode (dither pattern)

Brightness: From 1 to 7

Host Interface: SCSI-II

Self-diagnostic Codes: 35 codes, indicated in the guidance display

Power Source: 115 V/60 Hz/15 A, 220 ~ 240 V/50 Hz/8 A

Power Consumption:

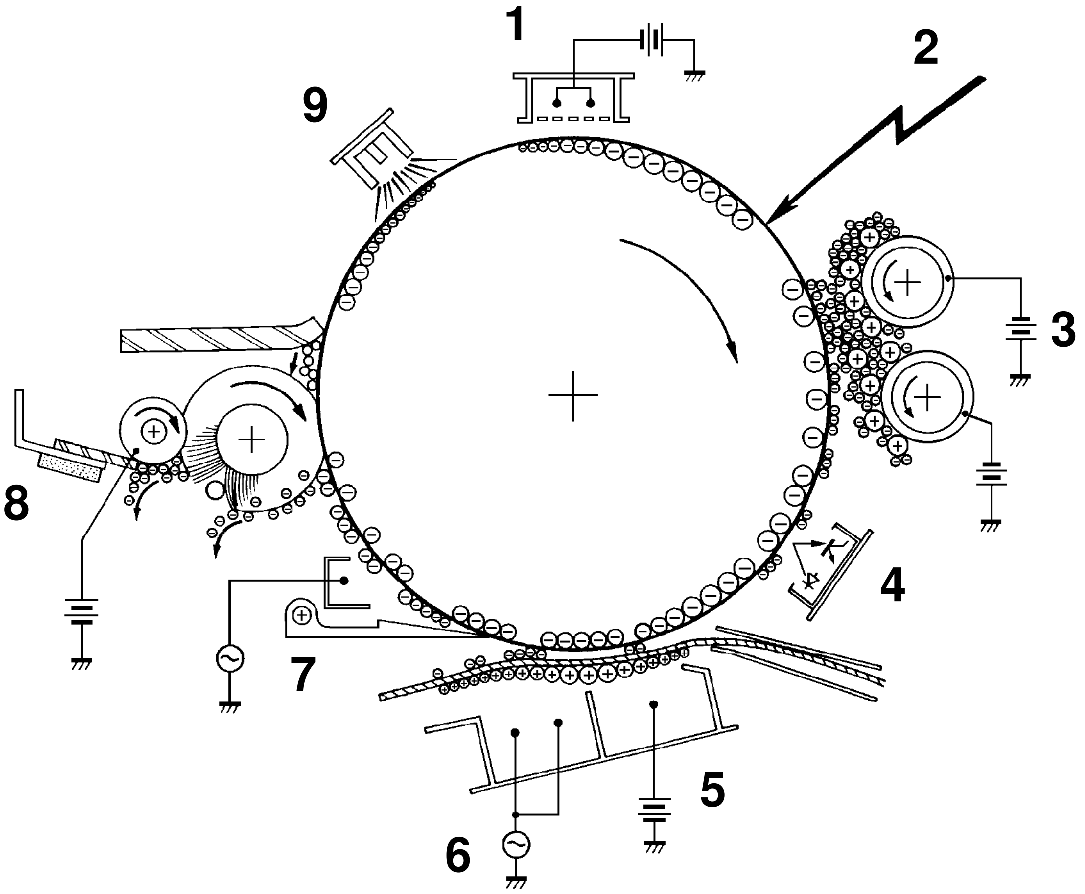
Maximum:	1.50 kW
Warm-up:	0.9 kW (average)
Copy cycle:	1.1 kW (average)
Stand-by:	0.15 kW

Dimensions (W x D x H):
Machine frame only: 27.6" x 28.8" x 23.8"
700 x 732 x 605 mm
Full system: 63.0" x 28.8" x 44.5"
1600 x 732 x 1130 mm

Weight:
Approximately 216.1 lb/112 kg (Main frame only)
Approximately 413.6 lb/188 kg (Full system)

Optional Equipment:
-- ARDF (automatic reverse document feeder)
-- 10 bin sorter
-- Auto duplex and LCT (1000 sheet) unit
-- LCT (1000 sheet) unit
-- Hard disk drive (40 MB)
-- Memory module unit (4 MB)
-- Scanner interface board
-- Key counter (locally procured)

2. DRUM PROCESSES



1. Charge
In the dark the charge corona unit applies a negative charge to the drum. The grid plate ensures that the charge is applied uniformly. The charge remains on the surface of the drum because the photoconductive drum has a high electrical resistance in the dark.

2. Laser Exposure
A laser beam exposes the drum, forming an electrical latent image on the drum surface.

3. 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.

4. Image Density Detection

On every 10th copy cycle, the laser forms a sensor pattern on the drum surface. The ID sensor measures the reflectivity of the pattern. When the image density of the pattern becomes too low, toner is supplied to the development unit.

5. Image Transfer

Copy paper is fed to the drum surface while a positive charge is applied to the back side of the paper. The positive charge pulls the toner particles from the drum surface onto the paper.

6. Paper Separation

A strong ac corona discharge is applied to the back side of the copy paper, reducing the charge on the paper and breaking the electrostatic attraction between the paper and the drum. Then, the stiffness of the copy paper causes it to separate from the drum. The pick-off pawls help to separate paper which has low stiffness.

7. Pre-cleaning Corona (PCC)

The PCC applies a strong ac corona discharge to the drum. This completely discharges the positive potential applied to the non-paper areas of the drum at the transfer section. The PCC has a negative bias which increases the negative charge on the toner remaining on the drum. This makes it easier for the cleaning brush to remove the toner from the drum surface.

8. Cleaning

The cleaning brush and cleaning blade remove any toner remaining on the drum surface. The cleaning brush is conductive and receives a positive charge from the bias roller (to which +150 Vdc is applied). This helps it to clean the negatively charged toner from the drum. The bias roller and a beater bar remove the toner from the cleaning brush.

9. Quenching

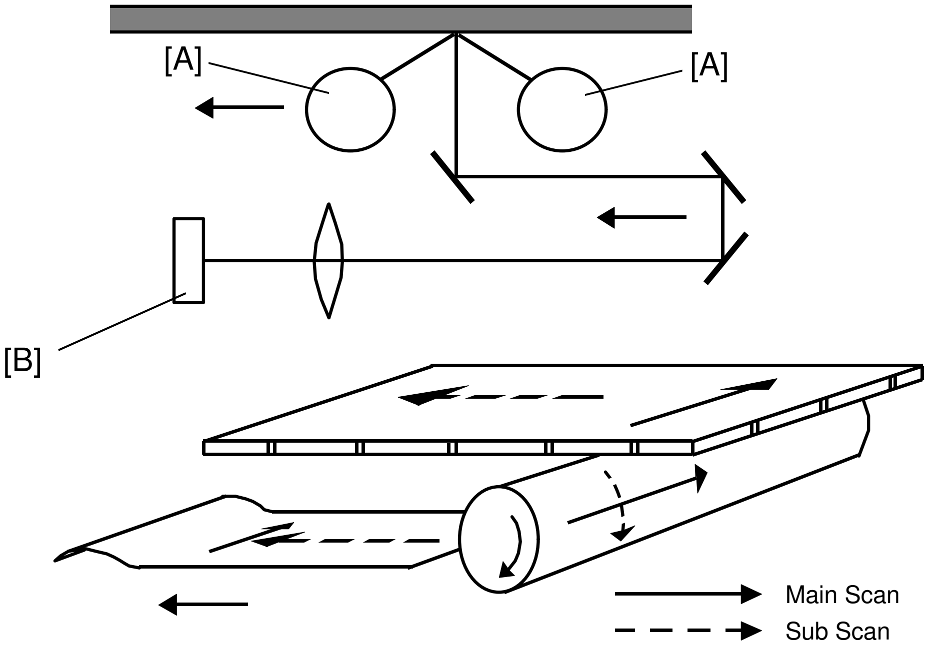
The light from the quenching lamp electrically neutralizes the surface of the drum.

3. COPY PROCESS

This section gives an overview of the copy process used in this machine. For more details, see the appropriate section description in the second chapter.

3.1 SCANNING AND IMAGE PROCESSING

3.1.1 Original Scanning



The scanner lamps [A] expose the original as in a normal copier. However, the optical system directs the light to the CCD [B] (charge coupled device) rather than a drum or OPC belt. The CCD converts the light intensity to electrical charges.

In this machine, the "main scan" direction refers to the direction perpendicular to scanner and paper travel. The "sub scan" direction is the direction of scanner movement, paper movement, and drum rotation.

3.1.2 Photoelectric Conversion

The CCD contains 5,000 picture elements (pixels) in a line (400 dots/inch, 15.7 dots/mm). It converts the original light intensity into an electrical signal (analog).

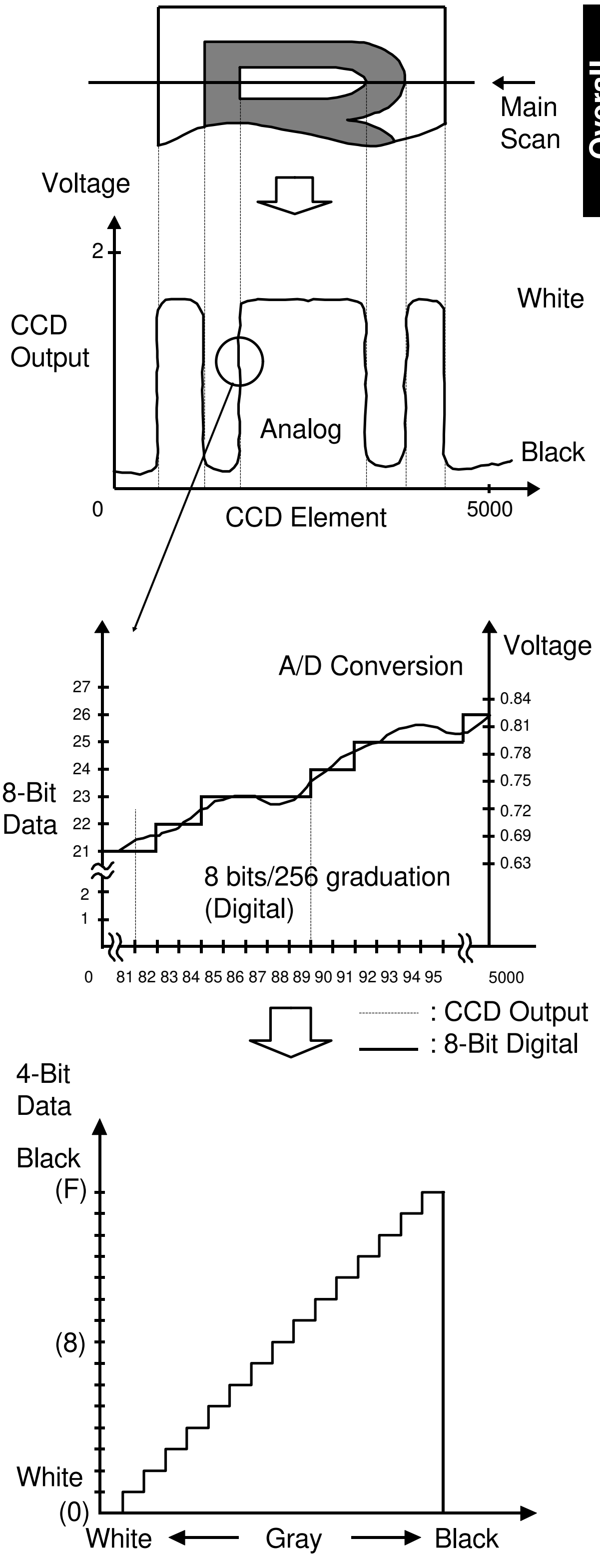
3.1.3 Analog to Digital Conversion

The analog signal output from the CCD is digitized. Eight bits are used for each pixel (picture element) which gives 256 gradation steps (256 level grayscale).

3.1.4 Image Processing

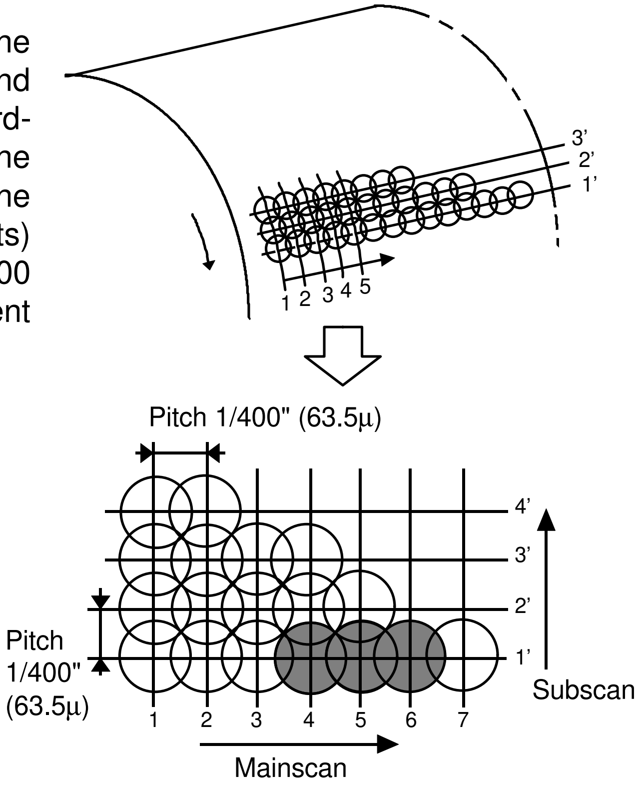
The digitized signal is then processed to convert the 8-bit grayscale image to 4-bit data which the laser unit can print (16 level grayscale). The image is processed in one or more of the following ways:

- Main scan magnification (sub scan magnification is changed by varying the scanner speed)
- Letter mode (line image) or photo mode processing
- Identification of designated areas
- Double copy image processing

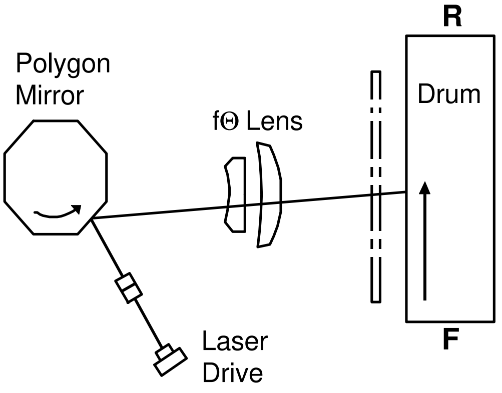


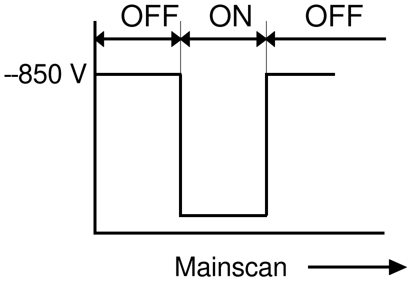
3.2 DRUM EXPOSURE

A semiconductor laser exposes the drum. The laser is switched on and off at a very high frequency according to the image signal. Where the laser beam strikes the drum, the negative charge (about --850 volts) on the drum drops (to about --100 volts), forming an electrical latent image on the drum surface.

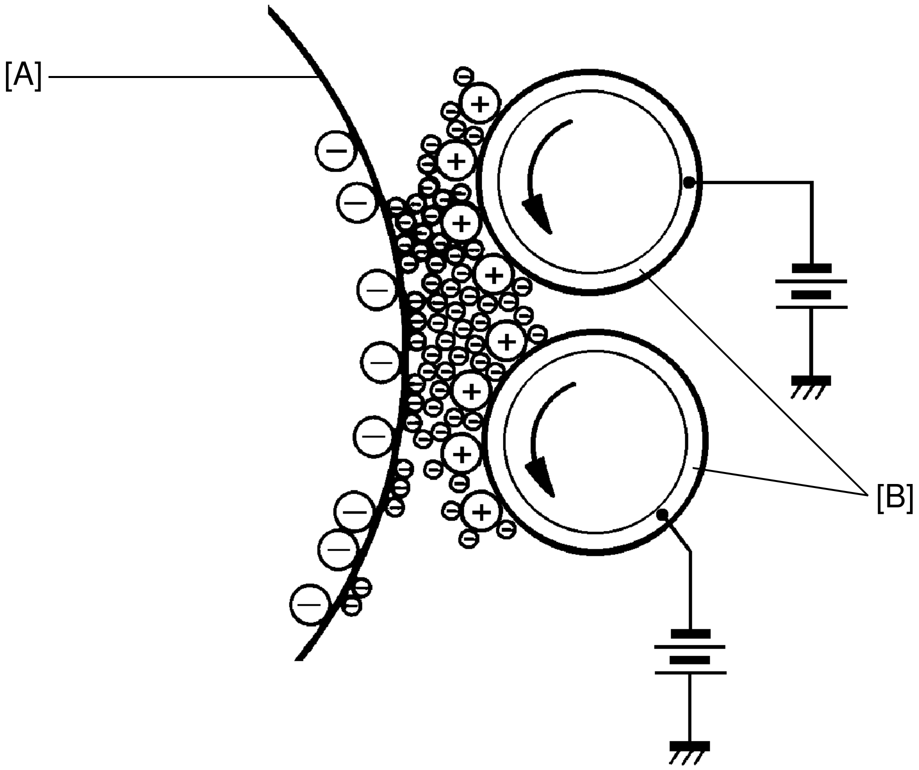


The laser beam is reflected by a turning polygon mirror. The light passes through a complex lens (called the fΘ lens) to the drum. Main scanning (or in this case writing) is from front to rear, and one surface of the polygon mirror is used for each line.





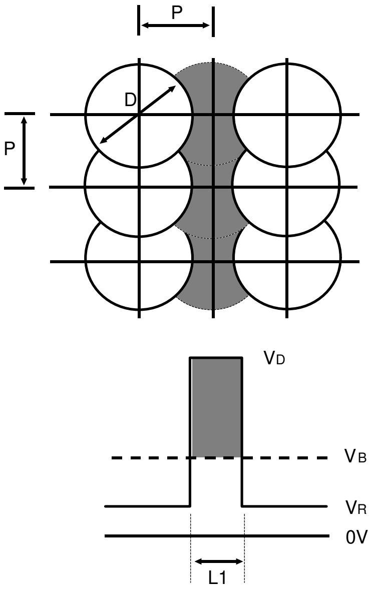
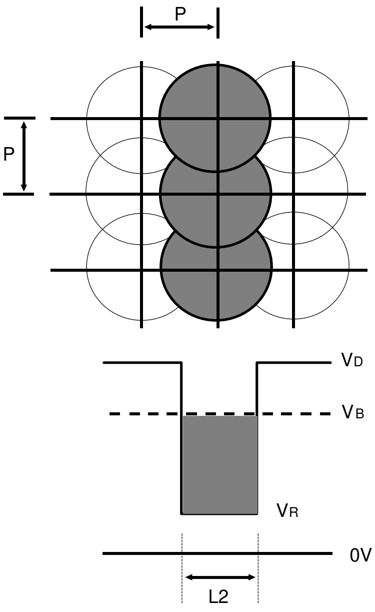
3.3 DEVELOPMENT PROCESS



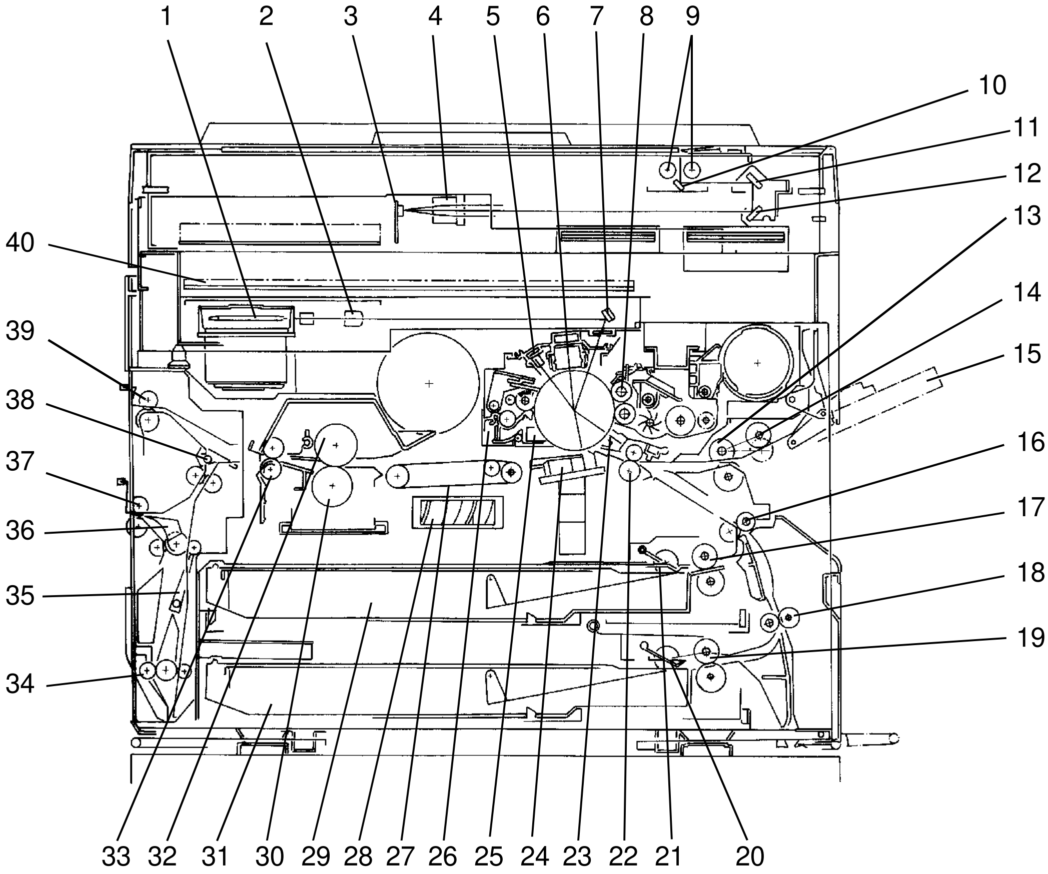
A: OPC Drum
B: Development Roller

Most copiers use either a positively charged photoconductor and negatively charged toner or a negatively charged photoconductor and positively charged toner. This is known of as positive/negative development. However, this machine uses a negative/negative process where both the drum surface charge and the toner charge are negative. The negative/negative process has certain advantages for laser printing, but some copy problems are exactly opposite from what many copier service people have intuitively come to expect. The table on the following page gives some of the differences between the positive/negative process and the negative/negative process.

Positive/Negative Development VS. Negative/Negative Development (2- component dry development process)

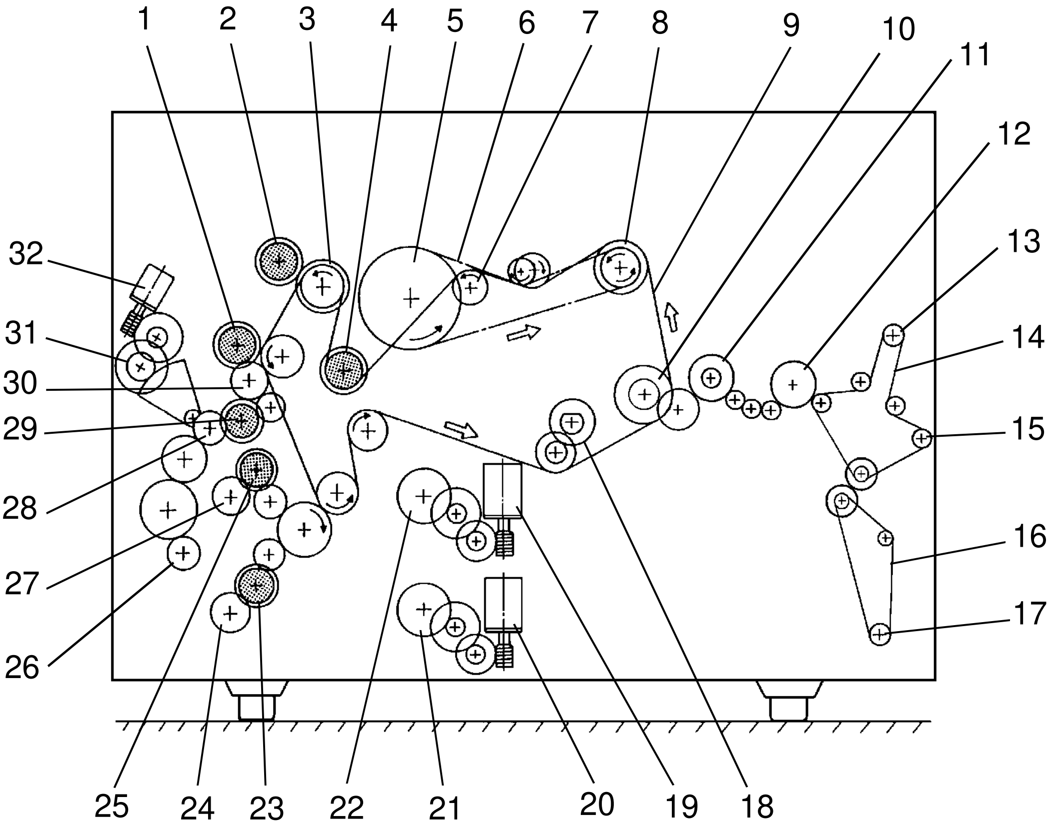
	Positive/Negative		Negative/Negative
Type of Laser	He-neon (gas, 630 nm)	He-neon or semiconductor	Semiconductor (780 nm)
Photoconductor	Se Drum	OPC	OPC
Charge Corona	Positive	Negative	Negative
Carrier Charge	Positive	Negative	Positive
Toner Charge	Negative	Positive	Negative
Photoconductor Exposure	Background exposure (write to white)		Image exposure (write to black)
P: Pitch (1/400" in this model) D: Laser beam diameter V_D: Drum voltage V_B: Bias voltage V_R: Residual voltage L1, L2: Line width (L1 < L2 for the same laser beam diameter)			
Copy Problems			
1. No photoconductor charge	White copy		Black solid copy
2. Low photoconductor charge	Low image density		Dirty background
3. High development bias	Low image density		Dirty background
4. Low development bias	Dirty background		Low image density
5. Stained toner shield glass	Black stripes		White stripes

4. MECHANICAL COMPONENT LAYOUT



1. Polygon Mirror Motor
2. Fθ Lens
3. Sensor Board Unit (SBU)
4. Lens
5. Quenching Lamp
6. Charge Corona Unit
7. Drum Mirror
8. Development Rollers
9. Exposure Lamps
10. First Mirror
11. Second Mirror
12. Third Mirror
13. Side Paper Feed Roller
14. Side Pick-up Roller
15. Multi By-pass Tray
16. First Relay Roller
17. First Paper Feed Roller
18. Second Relay Roller
19. Second Paper Feed Roller
20. Second Pick-up Roller
21. First Pick-up Roller
22. Registration Rollers
23. Image Density Sensor
24. Transfer/Separation Corona Unit
25. Pre-Cleaning Corona Unit
26. Cleaning Unit
27. Transport Belt
28. Vacuum Fan
29. First Cassette
30. Pressure Roller
31. Second Cassette
32. Hot Roller
33. Fusing Exit Roller
34. Return Pinch Roller
35. Return Gate
36. Inverter Entrance Gate
37. Lower Exit Rollers
38. Junction Gate
39. Upper Exit Rollers
40. Printer Control Board

5. DRIVE LAYOUT



1. Side Paper Feed Clutch
2. Toner Supply Clutch
3. Development Clutch
4. Registration Clutch
5. Drum Drive Gear

6. Drum Drive Belt
7. Cleaning Drive Gear
8. Main Motor Gear
9. Main Drive Chain
10. Fusing Drive Gear

11. Hot Roller Drive Gear
12. Inverter Unit Drive Gear
13. Upper Exit Roller Gear
14. Exit Roller Drive Belt
15. Lower Exit Roller Gear
16. Reverse Pinch Roller Drive Belt

17. Reverse Pinch Roller Gear
18. Used Toner Tank Drive Gear
19. First Paper Lift Motor
20. Second Paper Lift Motor
21. Second Paper Lift Gear

22. First Paper Lift Gear
23. Second Paper Lift Gear
24. Second Separation Roller Gear
25. First Paper Feed Clutch
26. Second Relay Roller gear

27. First Separation Roller Gear
28. First Relay Roller Gear
29. Relay Clutch
30. Side Separation Roller Gear
31. Side Paper Lift Gear
32. Side Paper Lift Motor

6. ELECTRICAL COMPONENT DESCRIPTIONS

SYMBOL	NAME	FUNCTION	INDEX NO.
Motors			
M1	Main Motor	Drives all the main unit components except for the optics unit and fans.	18
M2	Scanner Motor	Drives the scanner.	21
M3	Side Paper Lift Motor	Lifts the side cassette’s bottom plate.	15
M4	1st Paper Lift Motor	Lifts the 1st cassette’s bottom plate.	9
M5	2nd Paper Lift Motor	Lifts the 2nd cassette’s bottom plate.	8
M6	Polygon Mirror Motor	Turns the polygon mirror.	4
M7	Optics Cooling Fan Motor	Cools the optics cavity.	3
M8	Exhaust Fan Motor	Removes the air around the transport and the fusing unit.	1
M9	Printer Controller Fan Motor	Removes the air around the printer I/F board.	2
M10	Printer Controller Cooling Fan Motor	Cools the printer I/F board area.	19
M11	Charge Fan Motor	Provides a flow of air to the charge corona unit to prevent uneven charge.	16
M12	Vacuum Fan Motor	Provides suction so that paper is held firmly on the transport belt.	7
M13	LD Cooling Fan Motor	Cools the LD driver board area.	6
Magnetic Clutches			
MC1	Registration Clutch	Turns the registration rollers.	10
MC2	Side Paper Feed Clutch	Starts paper feed from the side feed station.	14
MC3	Relay Roller Clutch	Turns the relay rollers.	13
MC4	1st Paper Feed Clutch	Starts paper feed from the first feed station.	12
MC5	2nd Paper Feed Clutch	Starts paper feed from the second feed station.	11
MC6	Development Clutch	Transmits the main motor drive to the development drive gears.	17
Solenoids			
SOL1	Toner Supply Solenoid	Turns on to supply toner to the development unit.	99

SYMBOL	NAME	FUNCTION	INDEX NO.
SOL2	Cleaning Solenoid	Presses the cleaning blade against the drum.	98
SOL3	Side Pick-up Solenoid	Controls the up-down movement of the side pick-up roller.	97
SOL4	1st Tray Lock Solenoid	Locks the first tray during coping cycle.	96
SOL5	2nd Tray Lock Solenoid	Locks the second tray during coping cycle.	95
SOL6	2nd Pick-up Solenoid	Controls the up-down movement of the second pick-up roller.	94
SOL7	1st Pick-up Solenoid	Controls the up-down movement of the first pick-up roller.	93
SOL8	Return Pinch Roller Solenoid	Opens the return gate and presses the return pinch roller against the return roller.	64
SOL9	Junction Gate Solenoid	Opens the junction gate.	23
SOL10	Inverter Entrance Solenoid	Opens the inverter entrance gate.	24
Switches			
SW1	Main Switch	Provides the power to the copier.	35
SW2	Front Door Safety Switches	Cuts dc power and the +5 volts for the laser operation when the front cover is opened.	38
SW3	Anti-condensation Switch	Cuts the power to the tray and lamp heaters, drum heater, and the anti-condensation heater when the switch turns off.	32
SW4	Function Switch	Provides the power to the printer I/F board.	36
SW5	Right Upper Door Switch	Detects when the right upper door is opened.	54
SW6	Left Upper Door Switch	Detects when the left upper door is opened.	25
Sensors			
S1	Scanner H.P. Sensor	Notifies the CPU when the scanner is at the home position.	62
S2	Scanner Unit Lift Sensor	Notifies the CPU when the scanner unit is closed.	63
S3	Original Length Sensor	Detects the original length.	29
S4	Original Width Sensor 1	Detects the original width.	66
S5	Original Width Sensor 2	Detects the original width.	67
S6	Platen Cover Position Sensor	Gives the signal to perform original size detection with open platen cover condition.	65
S7	Manual Feed Width Sensor	Informs the CPU of the width of paper which is in the multi by-pass tray.	57

SYMBOL	NAME	FUNCTION	INDEX NO.
S8	Side Paper Lift Sensor	Detects the correct feed height of the side cassette.	59
S9	Side Paper Size Sensor	Informs the CPU what size paper is in the side cassette.	58
S10	1st Upper Limit Sensor	Detects the correct feed height of the first cassette.	56
S11	2nd Upper Limit Sensor	Detects the correct feed height of the second cassette.	55
S12	Manual Feed Sensor	Detects whether or not the manual feed table is in the down position.	60
S13	Oil End Sensor	Detects when it is time to add silicone oil.	37
S14	1st Paper Set Sensor	Detects whether or not the first paper tray is in the main frame.	53
S15	2nd Paper Set Sensor	Detects whether or not the second paper tray is in the main frame.	50
S16	1st Lower Limit Sensor	Detects the bottom plate of the first cassette is in the down position.	52
S17	2nd Lower Limit Sensor	Detects the bottom plate of the second cassette is in the down position.	51
S18	1st Relay Sensor	Detects misfeeds.	49
S19	2nd Relay Sensor	Detects misfeeds.	48
S20	Side Relay Sensor	Detects misfeeds.	47
S21	2nd Paper End Sensor	Informs the CPU when the second cassette runs out of paper.	46
S22	1st Paper End Sensor	Informs the CPU when the first cassette runs out of paper.	45
S23	2nd Paper Size Sensor	Informs the CPU what size paper is in the second cassette.	43
S24	1st Paper Size Sensor	Informs the CPU what size paper is in the first cassette.	42
S25	Registration Sensor	Detects misfeeds.	41
S26	ID Sensor	Detects the density of the image on the drum.	40
S27	Fusing Exit Sensor	Detects misfeeds.	34
S28	Platen Cover Sensor	Detects when the platen cover or the DF is closed, and gives the signal to perform original size detection with closed platen cover condition.	31
S29	Side Paper End Sensor	Informs the CPU when the side cassette runs out of paper.	44
S30	Toner Overflow Sensor	Detects when the used toner tank is full.	39
S31	Upper Exit Sensor	Detects misfeeds.	28

SYMBOL	NAME	FUNCTION	INDEX NO.
S32	Lower Exit Sensor	Detects misfeeds.	30
S33	Inverter Entrance Sensor	Detects misfeeds.	26
PCBs			
PCB1	Main PCB	Controls all copier functions both directly and through other PCBs.	78
PCB2	AC Drive PCB	Provides ac power to the fusing lamp.	76
PCB3	DC Drive PCB	Drives the dc components such as the solenoids and sensors.	77
PCB4	Operation Panel PCB Unit	The user controls the machine through this PCB.	73
PCB5	Sensor Board Unit (SBU) PCB	Digitizes the original image as it is scanned.	75
PCB6	Video Processing Unit (VPU) PCB	Processes video read in through the SBU.	70
PCB7	Main Motor Control PCB	Controls the main motor.	20
PCB8	Image Processing Unit (IPU) PCB	Processes image read in through the VPU.	69
PCB9	Laser Diode (LD) Drive PCB	Controls the laser diode.	71
PCB10	Pulse Width Modulation (PWM) Control PCB	Provides the pulse to the other PCBs and components.	72
PCB11	Printer Power Supply PCB	Provides the power for the printer I/F board.	68
PCB12	Printer Control PCB	Controls the printer functions.	81
PCB13	Printer I/F Board PCB	Connects the interface harnesses for the printer.	79
PCB14	Polygon Mirror Motor Drive PCB	Controls the polygon mirror motor.	5
PCB15	Scanner I/F Board PCB (Option)	Connects the interface harnesses for the scanner.	80
PCB16	DC Power Supply PCB	Provides dc power to the copier.	102
PCB17	Inverter Drive Board PCB	Controls the inverter unit.	27
Lamps			
L1	Exposure Lamp	Provides light to reflect the original's image onto the SBU.	104

SYMBOL	NAME	FUNCTION	INDEX NO.
L2	Quenching Lamp	Neutralizes any charge remaining on the drum surface after cleaning.	74
L3	Fusing Lamp	Provides heat to the hot roller.	86
Power Packs			
PP1	Transfer/ Separation Power Pack	Provides high voltage power for the transfer corona, pre-cleaning corona and the separation corona.	92
PP2	C/G/B/BR Power Pack	Provides high voltage power for the charge corona wire, development bias, grid bias and cleaning bias.	100
Heaters			
H1	Anticondensation Heater	Prevents moisture from condensing on the optics.	101
H2	Tray Heater	Prevents moisture from forming inside the copier.	89
H3	Lamp Heater	Warms the exposure lamp.	103
H4	Drum Heater	Keeps the drum warm to prevent condensation on the drum.	90
Counters			
CO1	Total Counter	Counts the number of pages in copy and print mode.	83
CO2	Print Counter	Counts the number of pages in print mode.	84
CO3	Key Counter (Option)	Used for control of authorized use. Copier will not operate until activated.	91
Others			
TH	Thermistor	Senses the temperature of the hot roller.	87
TF	Thermofuse	Opens the fusing lamp circuit if the fusing unit overheats.	85
NF	Noise Filter	Removes electrical noise from the AC input line.	88
CB	Circuit Breaker	Guards against voltage surges in the AC input line.	33
LS	Lamp Stabilizer	Powers the exposure lamps.	82
SMD	Scanner Motor Driver	Controls the scanner motor.	22
HDD	Hard Disk Unit (Option)	Stores the fonts for printer.	61

SECTION 2

DETAILED SECTION DESCRIPTIONS

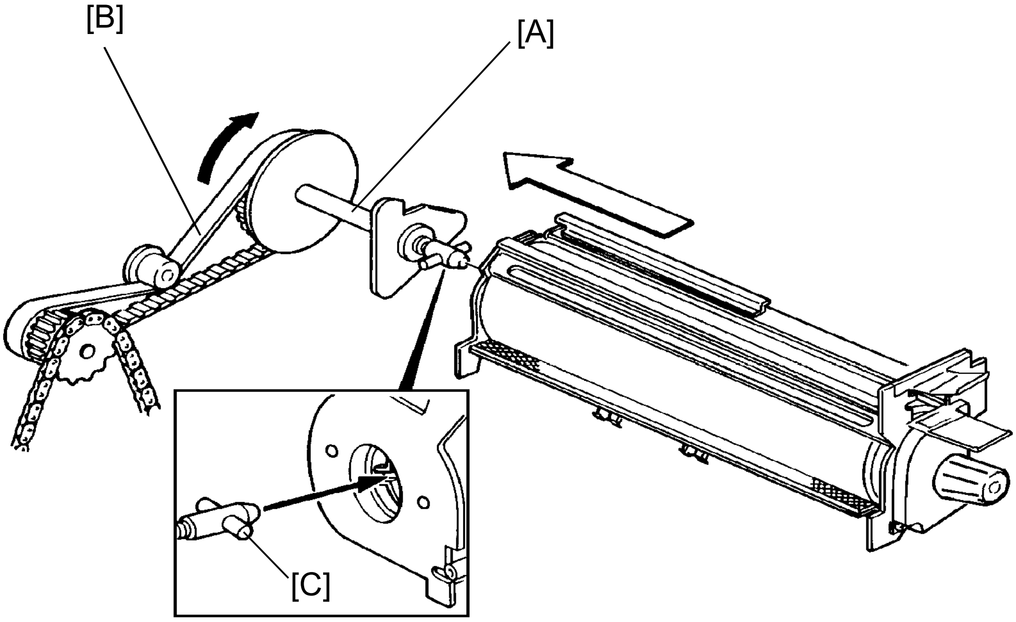
1. DRUM

1.1 DRUM CHARACTERISTICS

The organic photoconductor (OPC) drum has the following characteristics:

- It is able to accept a high negative electrical charge in the dark. (The electrical resistance of the OPC drum is high in the absence of light.)
- The electric charge on the drum surface dissipates when the drum is exposed to light. (The conductivity of the OPC drum is greatly enhanced by exposure to light.)
- The OPC drum used in this machine is specially made for use with diode lasers. It responds well to the 780 nm wavelength light of the laser used in this machine.

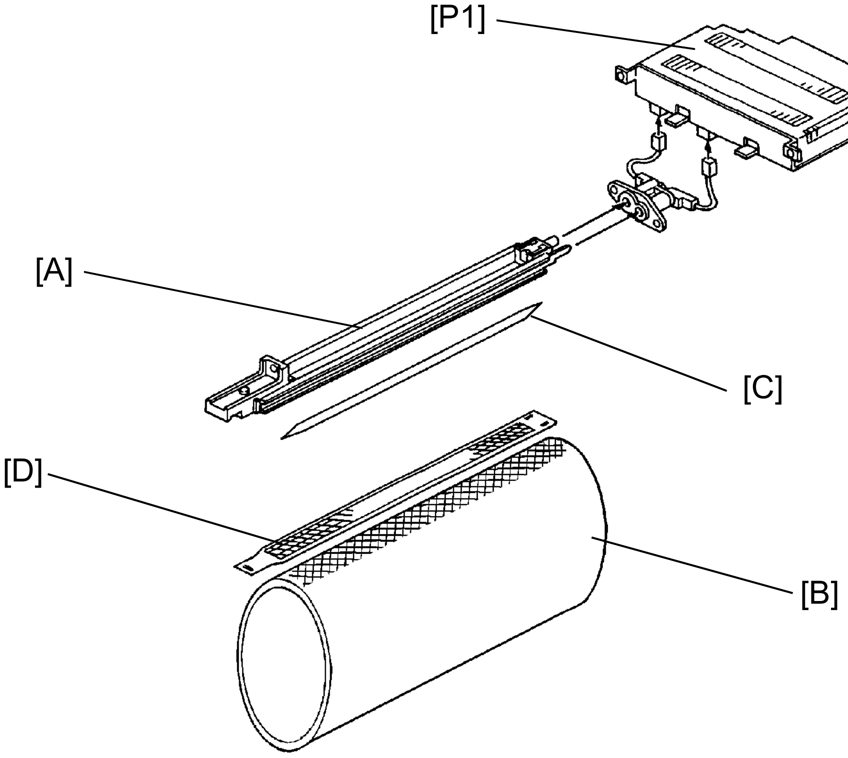
1.2 DRUM DRIVE

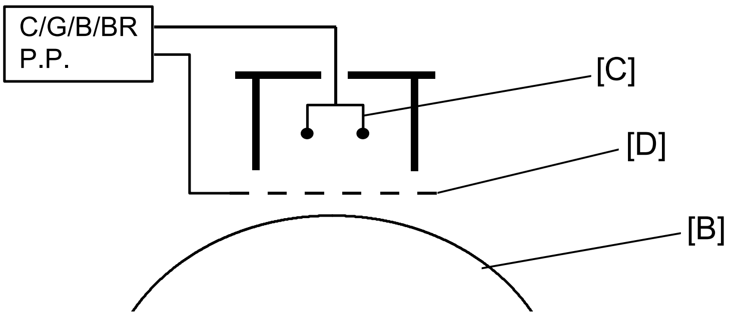


The main motor turns the drum drive shaft [A] through the timing belt [B]. A drive pin [C] on the end of the drum drive shaft fits into slots in the end of the drum. This pin turns the drum whenever the main motor is on.

2. CHARGE

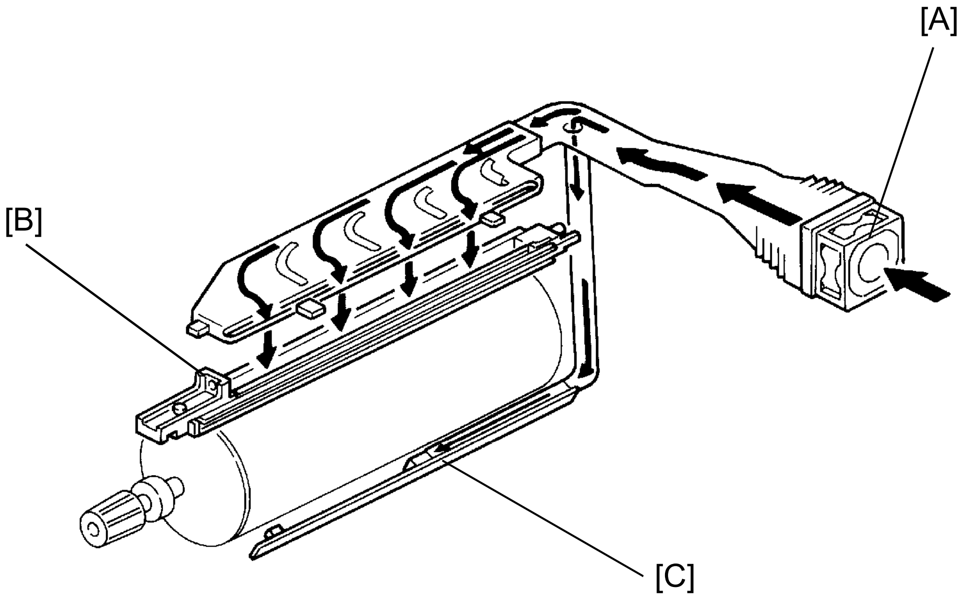
2.1 OVERVIEW





This model uses a dual wire corona unit [A] to charge the OPC (organic photoconductor) drum [B]. The corona wire [C] generates a corona of negative ions when a high negative voltage is applied to it by the charge/grid/bias/bias roller power pack. To make the negative corona uniform, a thin stainless steel grid [D] is installed on the charge corona unit. The drum receives a charge of approximately –850 volts.

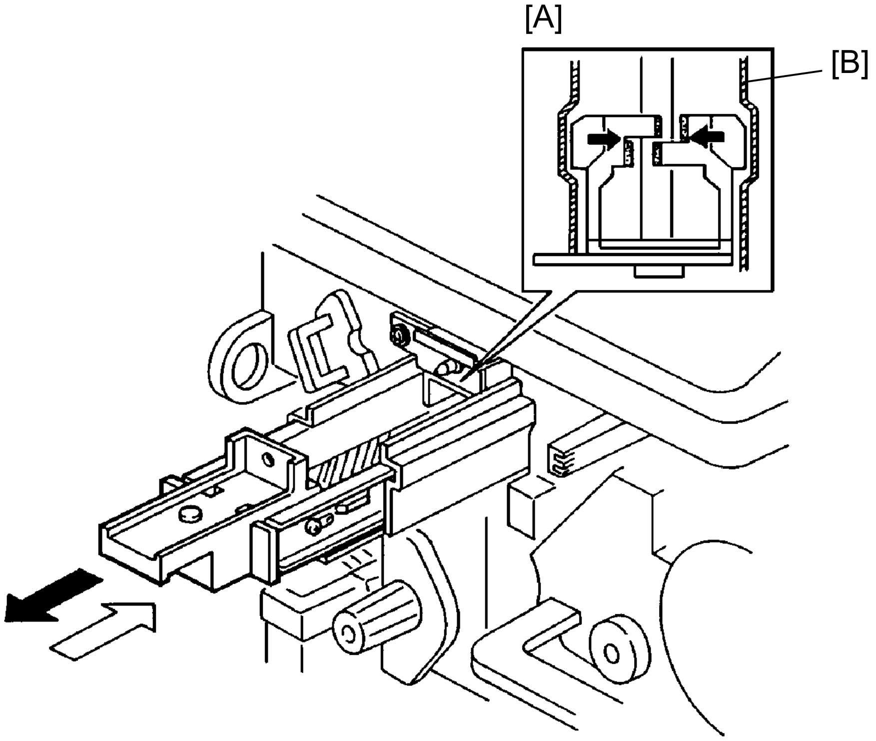
2.2 CHARGE VENTILATION



Ozone from the charge corona unit can oxidize the surface of the drum. This oxidization can cause dirty background. To prevent this, the charge fan [A] circulates air through the charge corona unit [B]. The airflow from this fan is also directed to the auto image density sensor [C]. This helps to prevent toner from settling on the auto ID sensor.

The charge fan turns on and off at the same time as the main motor.

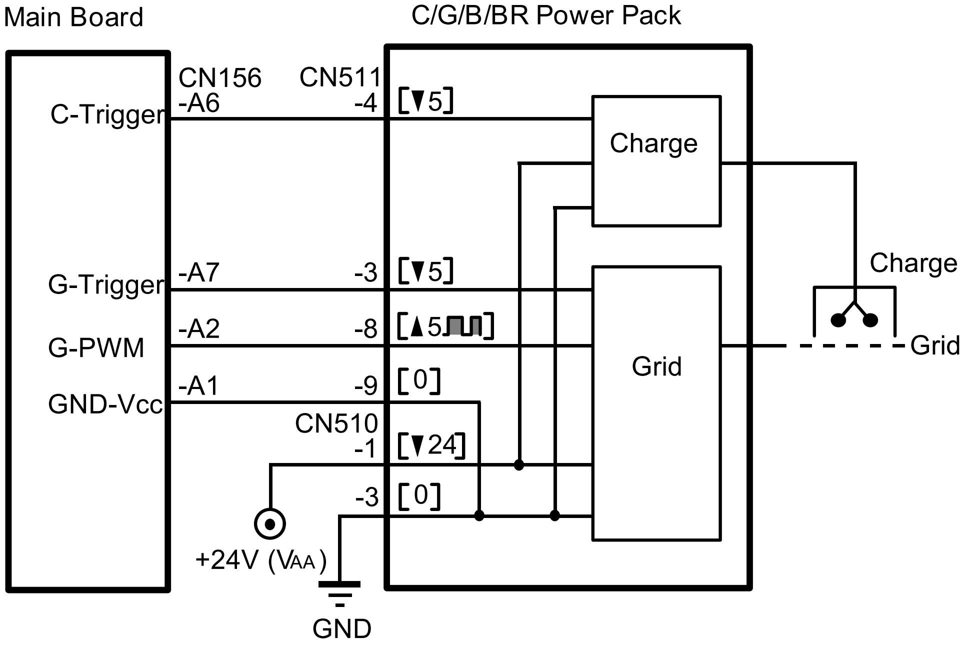
2.3 CORONA WIRE CLEANER

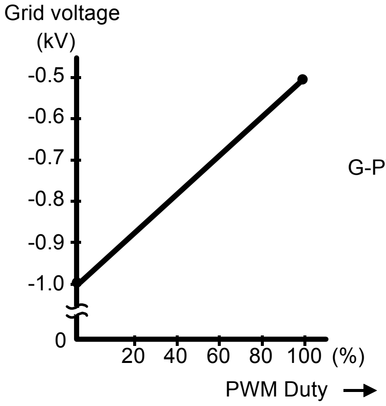


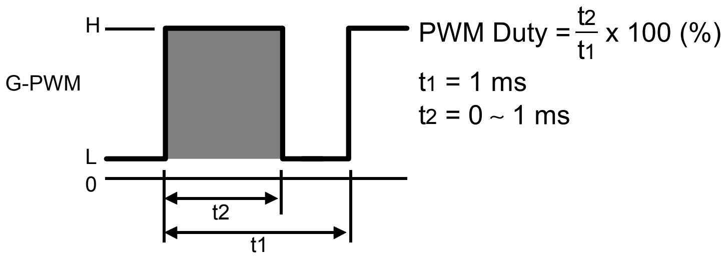
Toner particles or paper dust may be deposited on the corona wire by the air flow around the charge corona unit. Such particles may interfere with charging and cause dark lines on copies. The wire cleaner [A] allows the operator to correct this problem by pulling out and pushing in the charge corona unit.

When the corona unit is seated, the cleaning pads are held away from the corona wire as shown in the illustration. However, when the charge corona unit is pulled out, the wire casing [B] pushes the cleaning pads against the wire as shown in illustration.

2.4 CHARGE CORONA CIRCUIT







The dc power supply board provides +24 volts (VAA) to the C/G/B/BR power pack. The CPU drops CN156-A6 and -A7 from +5 volts to 0 volt. These are the trigger signals for the high voltage power to the charge corona wire (approx. –6.5 kV) and the grid wire (approx. –0.87 kV). The actual charge applied to the OPC drum is approximately –850 volts.

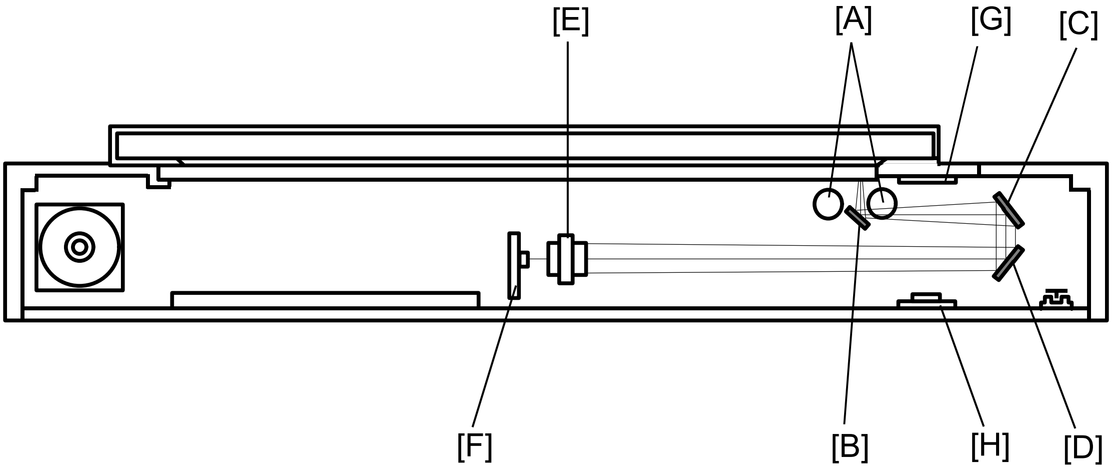
<PWM (Pulse Width Modulation) Control>

Instead of a variable resister, the PWM control is used for the grid voltage. The output level of the grid voltage increases as the duty of the G-PWM signal increases as shown above.

The grid bias can be set by the SP2-1-1 (Grid Bias Adjustment).

3. SCANNING

3.1 OVERVIEW



During scanning an image of the original is reflected on the CCD (charge coupled device) of the SBU (sensor board unit) via the optics assembly as follows:

> Scanner Lamp [A] ⇒ Original ⇒ First Mirror [B] ⇒ Second Mirror [C] ⇒ Third Mirror [D] ⇒ Lens [E] ⇒ CCD (on SBU) [F]

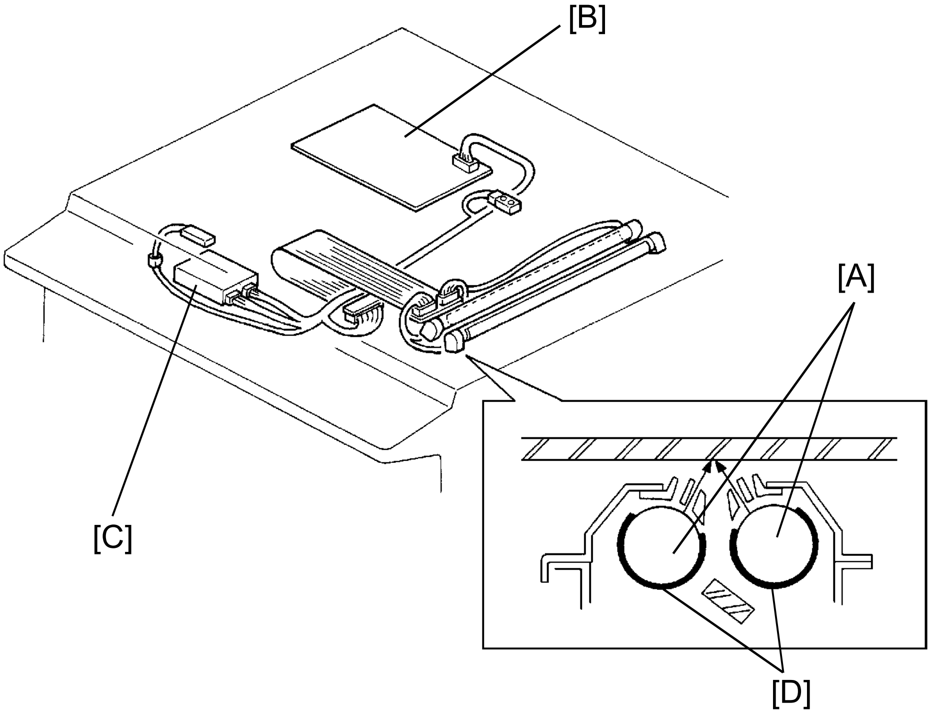
Light from a band across the entire width (main scanning direction) of the document is focused on the CCD by the lens (1 : 0.1102 ratio). The CCD has 5,000 picture elements which convert the light intensity into electric charges. The image reading plate on the VPU converts the CCD charges into a 8-bit (256 gradations) digital signal. 2835 lines are digitized per second.

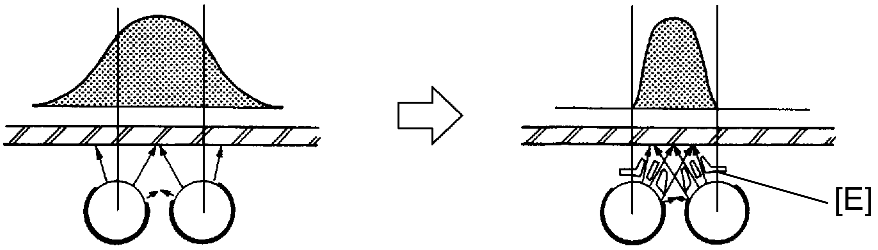
The scanning resolution is 400 dpi (15.7 dots/mm) in the main scanning direction. In full size mode it is also 400 dpi in the sub scanning direction. (The scanner speed is 180 mm/s when in full size mode.)

The white plate [G] is scanned prior to scanning the original. This gives a consistent white value which is used as a reference value to correct for variations in the fluorescent lamp or irregularities in the light striking the CCD.

The anti-condensation heater [H] keeps moisture from forming inside the scanner unit.

3.2 SCANNER LAMP





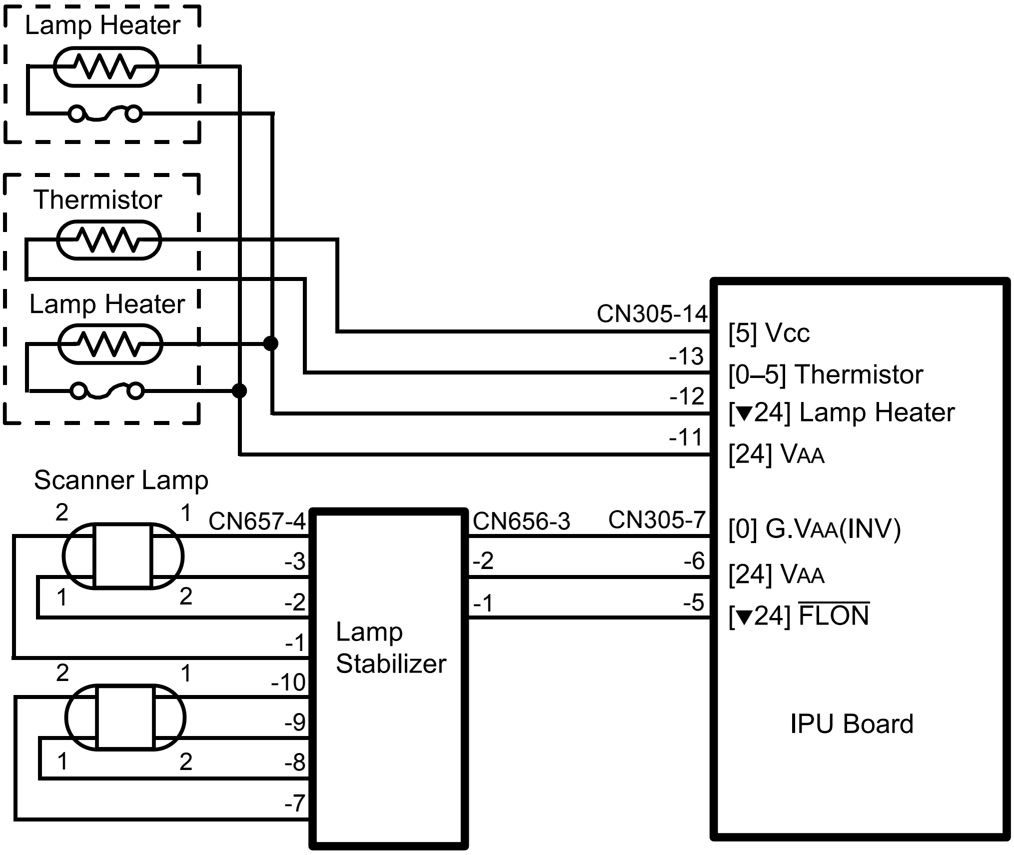
(without lamp grid) (with lamp grid)

The scanner lamps [A] are green fluorescent lamps with apertures so that most of the light is output in a single direction. They are controlled by the IPU board [B]. The scanner lamp stabilizer [C] drives the lamps with 15 W, 50 kHz power. The high frequency is necessary to achieve an even supply of light to the CCD, because the time for charging the CCD is 0.5 msec.

The scanner lamp heaters [D] keep the scanner lamp’s temperature at 40°C. This is necessary because the light intensity will be insufficient if the scanner lamp’s temperature is too low.

To prevent the light from being diffused, the lamp grid [E] is installed above the lamps. This grid can minimize the flare as shown the above illustration.

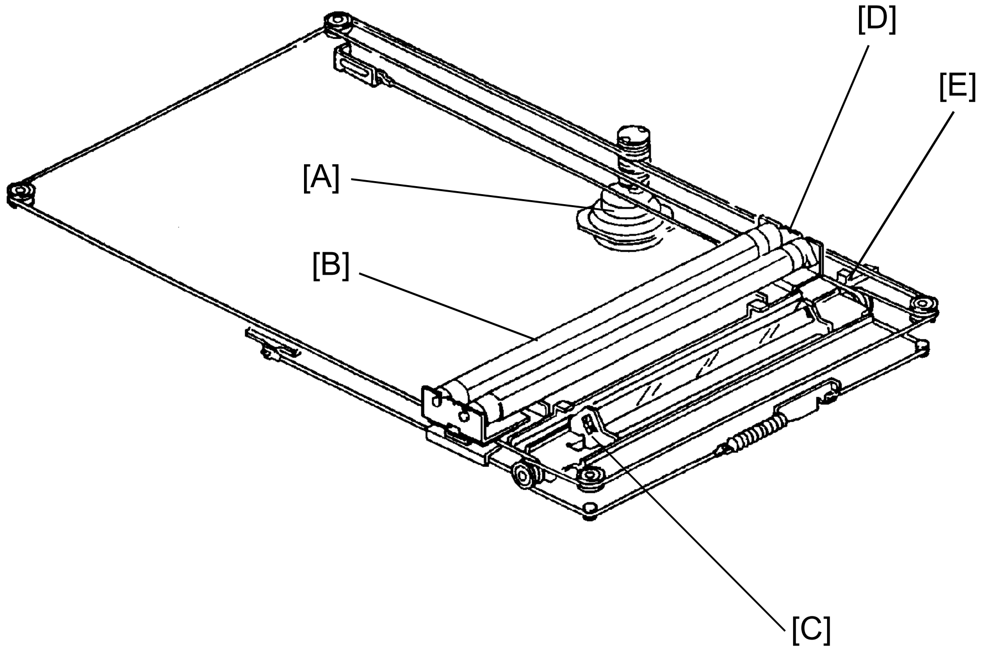
3.3 SCANNER LAMP CIRCUIT



The scanner lamp stabilizer is powered by +24 volts from CN305-6. To turn on the scanner lamp, the IPU board drops CN305-5 to Low. The scanner lamp stabilizer then provides high frequency power to the filaments of the scanner lamp.

The IPU board monitors the temperature of the scanner lamps through the lamp thermistor, and turns the scanner lamp heaters on and off to keep the scanner lamps at 40°C. It generally takes about 1 minute for the scanner lamps to reach 40°C after the main switch is turned on.

3.4 SCANNER DRIVE

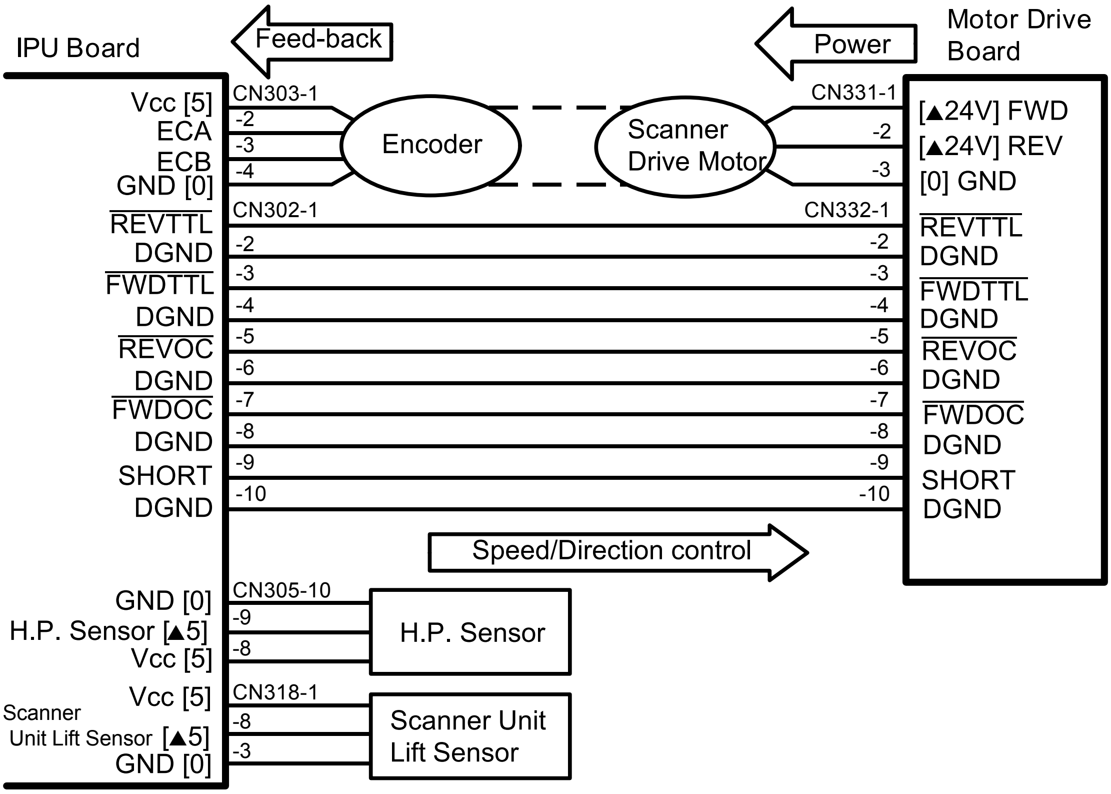


This model uses a dc servomotor [A] to drive the scanners.

The first scanner [B] consists of the scanner lamps and the first mirror, and the second scanner [C] consists of the second and third mirrors. Unlike most conventional copiers, four drive wires move these scanners. Four wires are used to keep scanner movement very smooth.

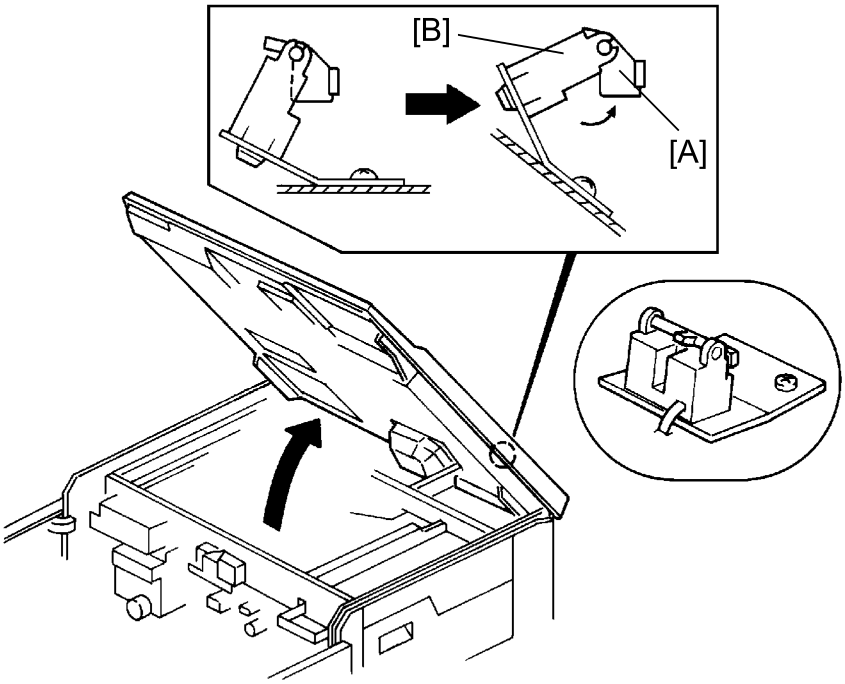
The rear wire clamp [D] of the first scanner also works as the actuator of the scanner home position sensor [E].

3.5 SCANNER DRIVE CIRCUIT



Unlike most conventional copiers, two PCBs are used to operate the scanner drive motor. The IPU board receives the feed-back data for the motor speed and the direction from the motor encoder and then, sends the control signal to the motor drive board. In accordance with these control signals, the motor drive board supplies the power, so that the scanner drive motor rotates at the proper speed and direction.

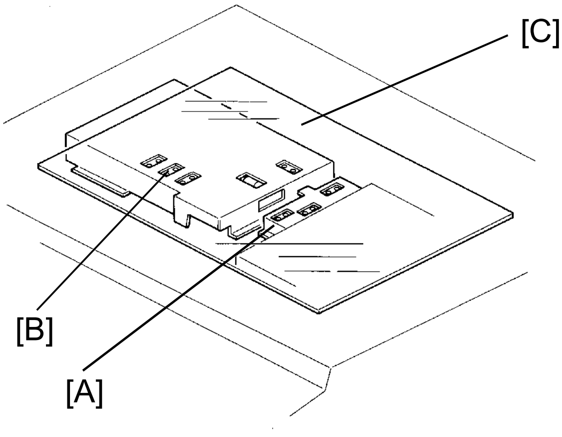
By keeping the control signal lines away from the power supply lines, the influence of any electrical noise is minimized.

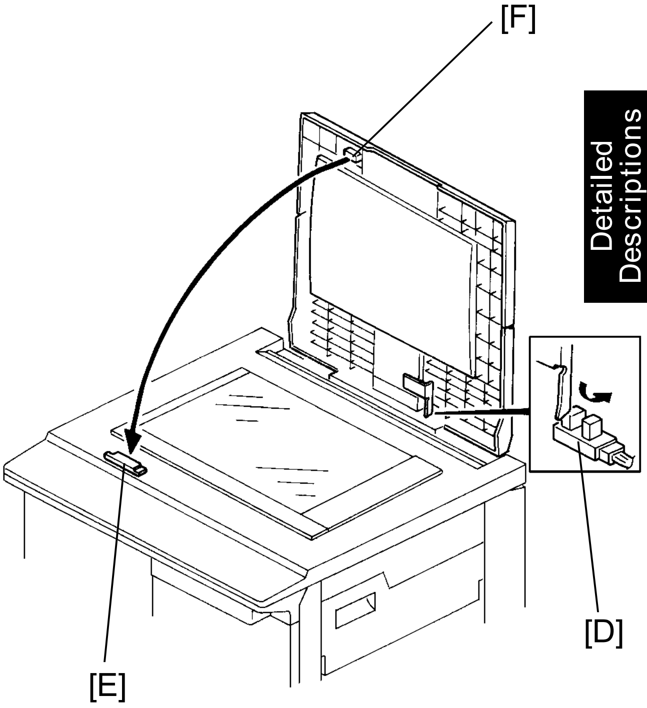


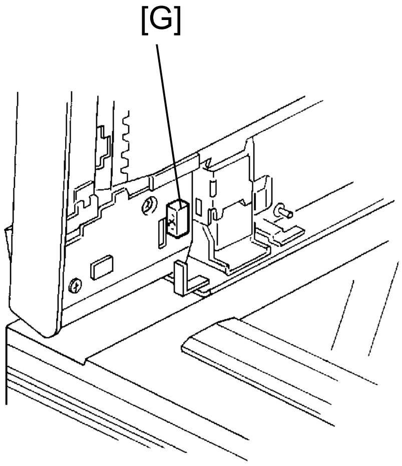
For field servicing, the scanner unit can be opened. When the scanner unit is lifted, the actuator [A] of the scanner unit lift sensor [B] moves out of the sensor (CN318-8 0 ⇒ 5 V).

Then, the CPU prohibits the scanner motor from rotating, for safety.

3.6 ORIGINAL SIZE DETECTION IN PLATEN MODE







An original width sensors [A] and an original length sensor [B] are under the exposure glass [C]. The original width sensor consists of four reflective photosensors. The original length sensor consists of three reflective photosensors.

While the main switch is on, these sensors are active and the IPU board receives their output signals. The IPU board checks the output signals twice as the platen cover (document feeder) is being closed.

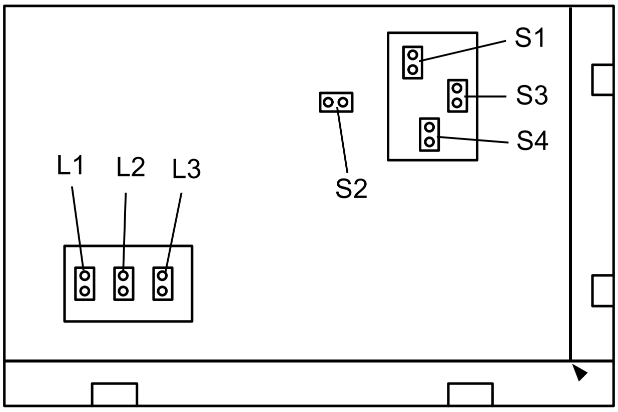
The first check is done when the platen cover position sensor [D] turns on. (When the document feeder is installed, the first check is done when the DF position sensor [G] on the document feeder turns on.) The platen cover position sensor is actuated when the platen cover (document feeder) is lowered to about 10 cm (4") above the exposure glass. At this time only the sensors located underneath the original receive the reflected light. These sensors output LOW signals.

The second check is done when the platen cover closed switch [E] turns on. This is when the platen cover (document feeder) is completely closed. The platen cover closed switch is a reed switch. A magnet [F] mounted on the platen cover (document feeder) actuates the reed switch.

The second check is necessary to confirm that the original size detected at the first check is correct. This double check prevents original size detection errors that may occur if a black solid area on the original is positioned directly over a sensor.

When a copy is made with the platen cover (document feeder) open, the CPU checks the original size when the Start key is pressed.

The following illustration shows the location of the original width and length sensors. The table shows the sensor output (HIGH, LOW) for each original size.



Sensors / Original Size		Original Length Sensor			Original Width Sensor			
		L1	L2	L3	S1	S2	S3	S4
11" x 17"	A3	0	0	0	0	0	0	0
10" x 14"	B4	1	0	0	0	0	0	0
8½" x 14"	—	1	0	0	1	0	0	0
8½" x 11"	A4 (L)	1	1	1	1	0	0	0
8" x 10"	B5 (L)	1	1	1	1	1	0	0
11" x 8½"	A4 (S)	1	1	1	0	0	0	0
5½" x 8½"	A5 (L)	1	1	1	1	1	1	0
8½" x 5½"	A5 (S)	1	1	1	1	1	0	1
—	F	1	1	0	1	1	0	0

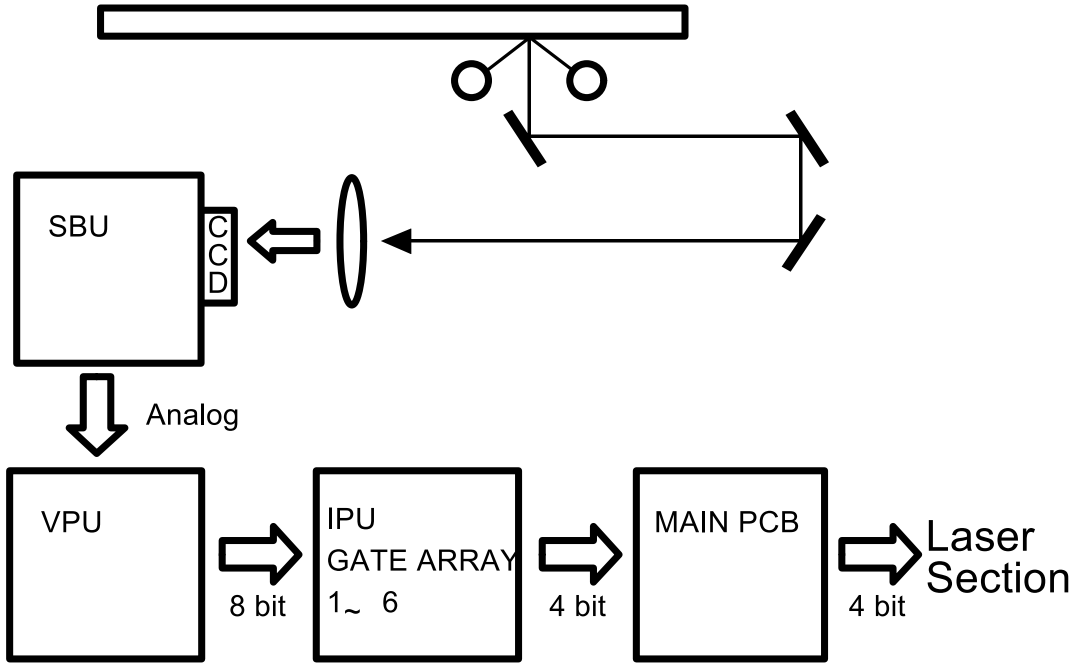
0: LOW
1: HIGH

NOTE: In case of other combinations, the "Original Size not sensed" will be indicated.

4. IMAGE PROCESSING

This section deals with the processing of scanner data from its generation by the CCD until its output to the laser unit as serial data.

4.1 OVERVIEW



The CCD generates an analog video signal. The SBU then sends the analog video signal to the VPU board.

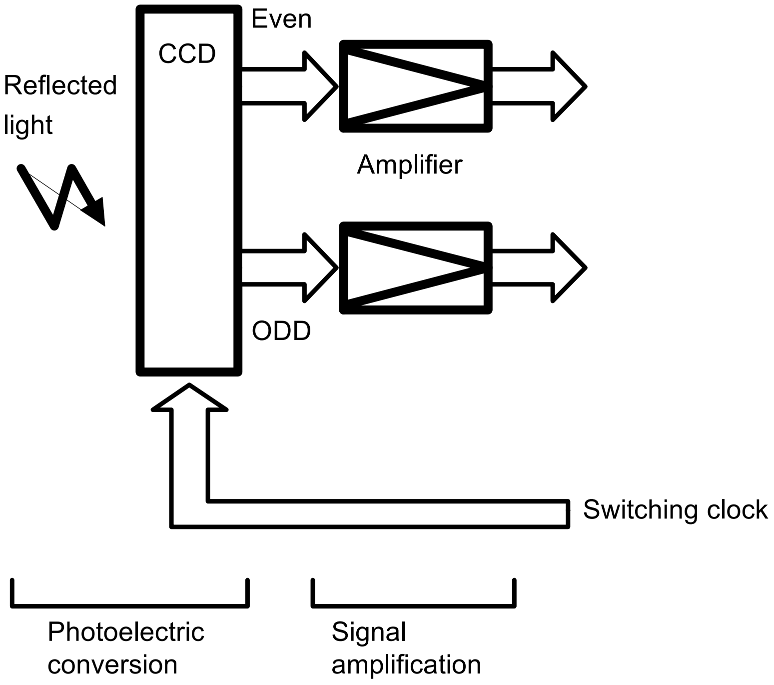
The processing of the VPU (Video Processing Unit) includes signal composition, variable amplification, and digitization.

The IPU (image processing unit) processes the 8-bit signal. This processing includes several functions, for example, halftone imaging, MTF (modulation transfer function) correction, and main scan magnification. The IPU generates a 4-bit signal which is sent to the laser section through the main PCB.

The main PCB sends the 4-bit signal to the laser section.

4.2 SENSOR BOARD UNIT

4.2.1 Basic Functions



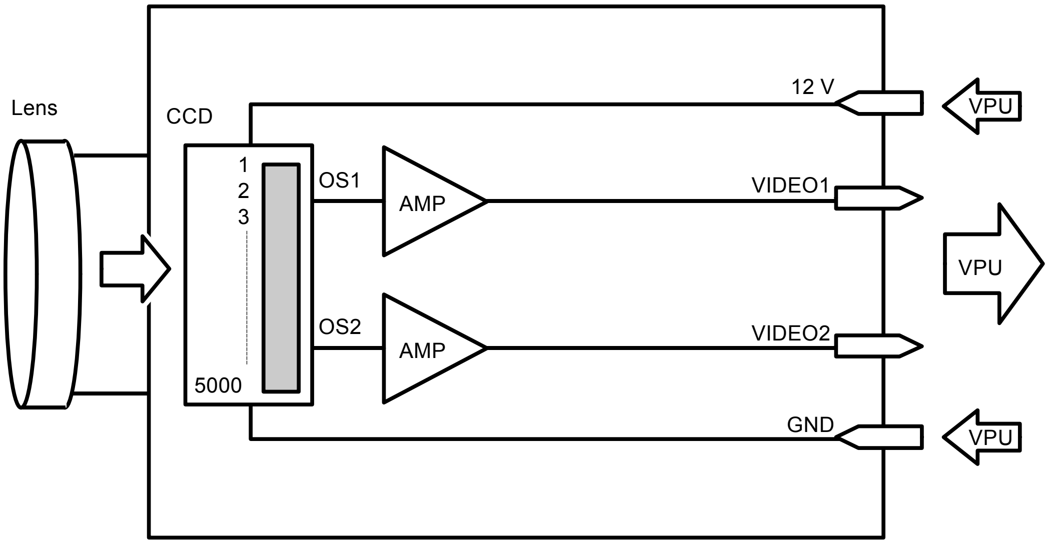
The illustration above shows the main elements of the SBU (sensor board unit) in block form. The SBU performs the following functions:

Photoelectric conversion: The light reflected from the original is converted to an analog signal. This is done by the CCD, which has 5,000 picture elements. The resolution is 400 dots per inch (15.7 lines/mm).

Signal amplification: To speed up processing, odd and even pixels are read from the CCD separately and then amplified.

4.2.2 SBU Circuit Operation

SBU: Sensor Board Unit

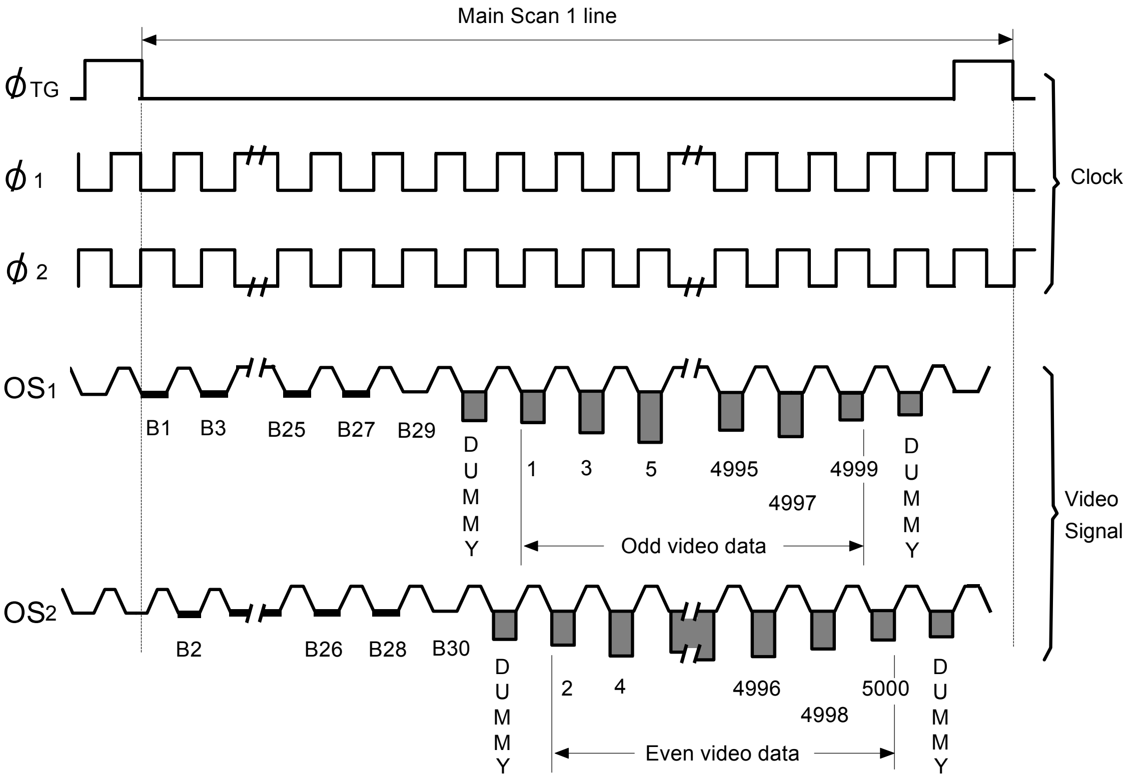


CCD: Charge Coupled Device

The SBU converts the light reflected from the document to two analog signals. The following covers how the video data is changed at each step of the process.

– Photoelectric Conversion –

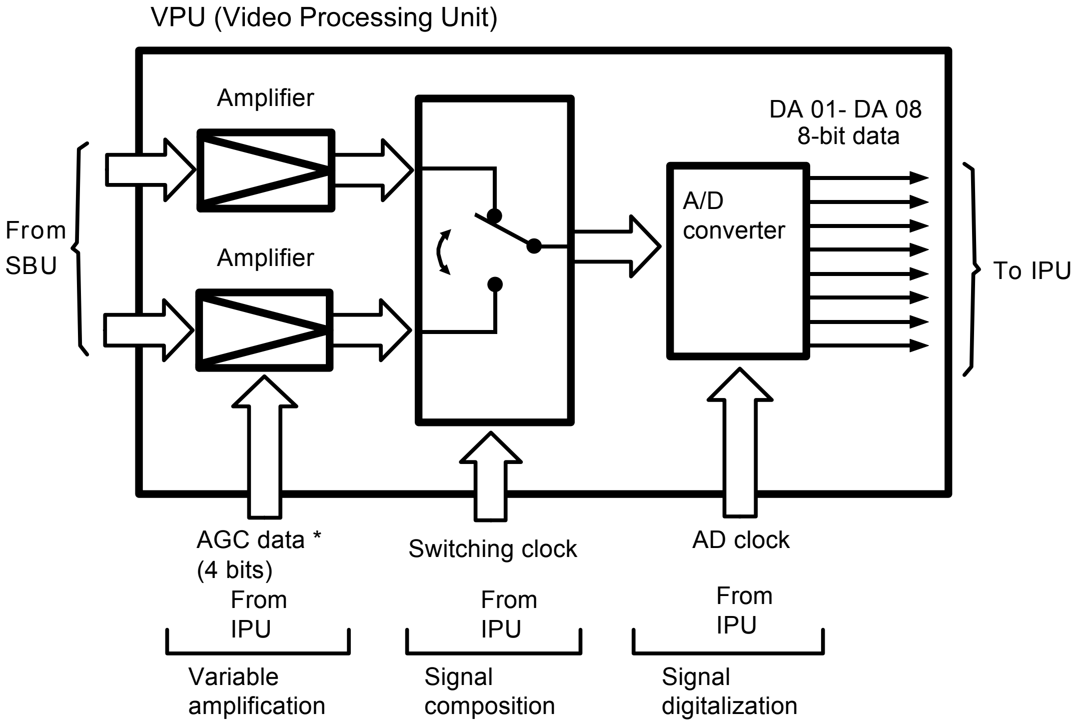
The CCD elements convert the light from the image to an analog signal. To increase the scanning speed, the CCD handles the odd pixel (picture element) data and even pixel data separately. Odd data is output from OS1 and even data is output from OS2. After amplification, the wave form of these signals is similar to the illustration on the next page. The timing of these signals is as follows:



∅TG:	Clock for main scan
∅1 and ∅2:	Clock pulses
OS1:	Odd video data
OS2:	Even video data

4.3 VIDEO PROCESSING UNIT

4.3.1 Basic Function



* AGC: Auto Gain Control

The illustration above shows the main elements of the VPU (video processing unit) in block form. The VPU performs the following functions:

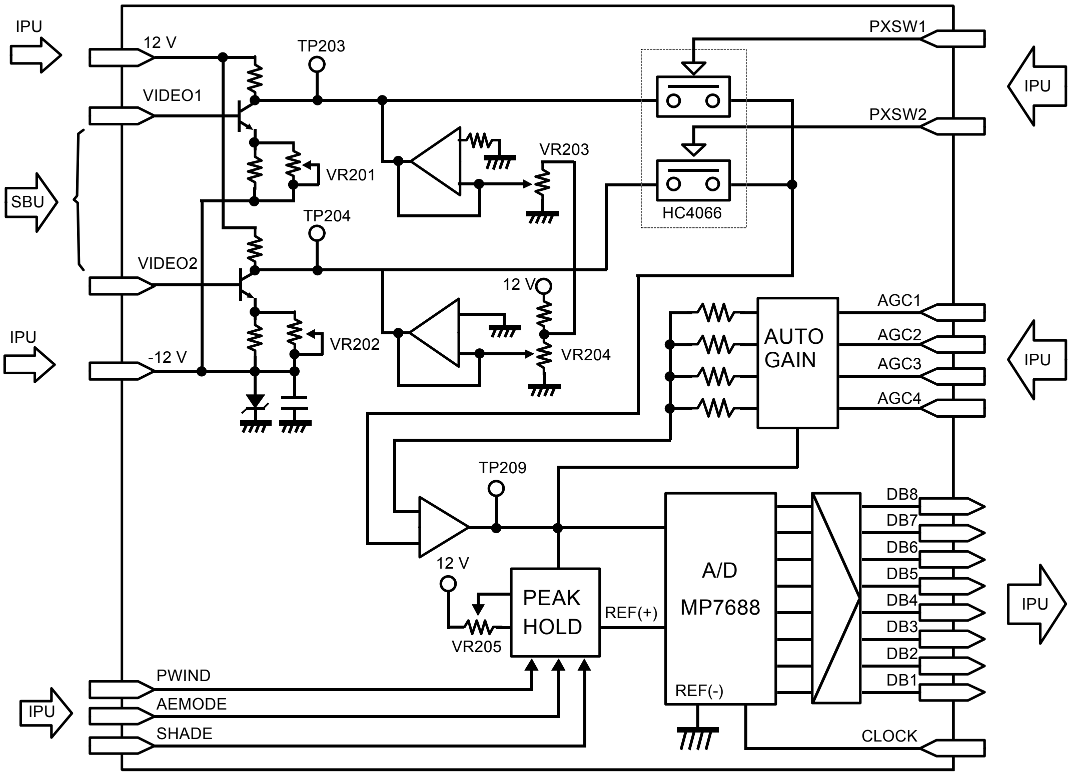
Variable amplification: The pixels of the signal are amplified using the AGC (auto gain control) signal. This is to compensate for variations in the light source.

Signal composition: The odd and even signals are merged into a single video signal.

Signal digitization: The analog signal is converted to an 8-bit digital signal and then sent to the IPU.

4.3.2 VPU Circuit Operation

VPU: Video Processing Unit

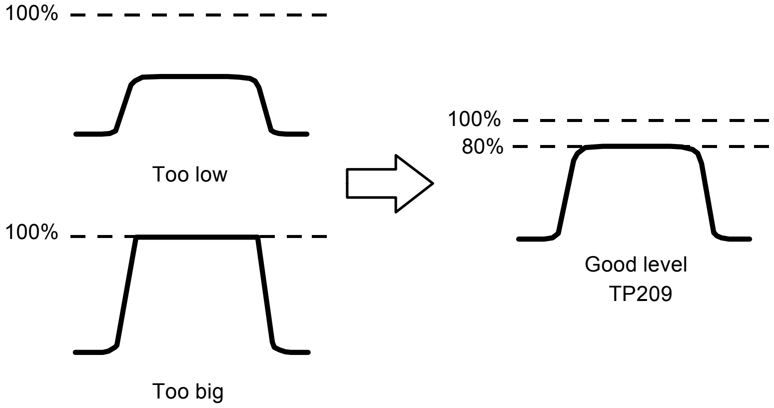


The VPU converts the analog video data from the SBU to an 8-bit digital video data signal. The following covers how the video data is changed in each step of the process.

– Variable Amplification –

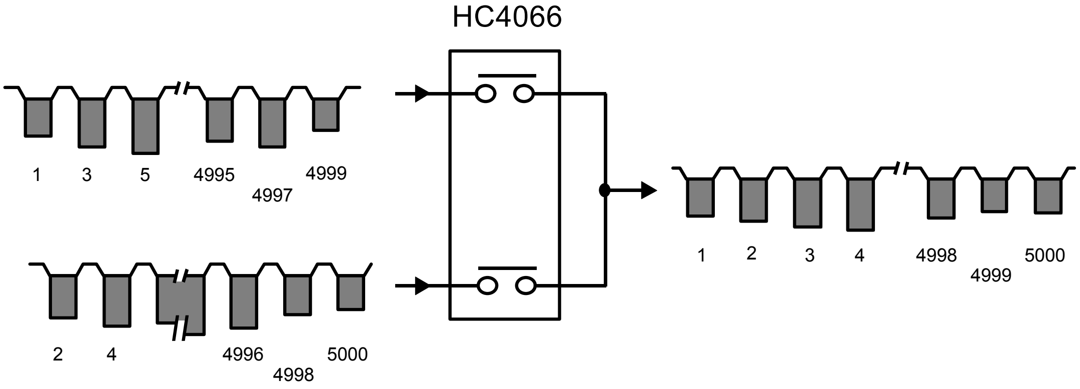
The video signals are adjusted by VR203 for odd pixel data and VR204 for even pixel data and the auto gain control.

NOTE: VR203 and VR204 are used to adjust the overall video signal level.



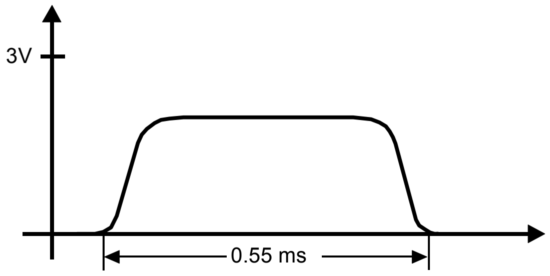
– Signal Composition –

The odd and even video signals are merged by IC HC4066.



– Auto Gain Control –

The video signal is modified by AGC1 – 4, supplied from the IPU. This compensates for fluctuations of the scanner lamp light level (due to temperature and time). The gain value is decided by scanning the white plate prior to scanning the original.

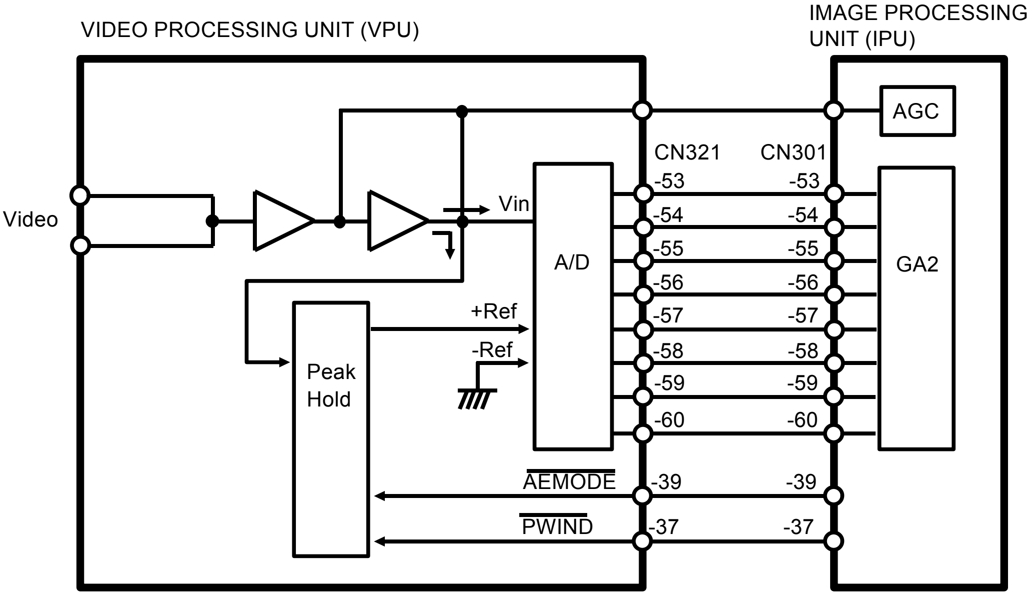


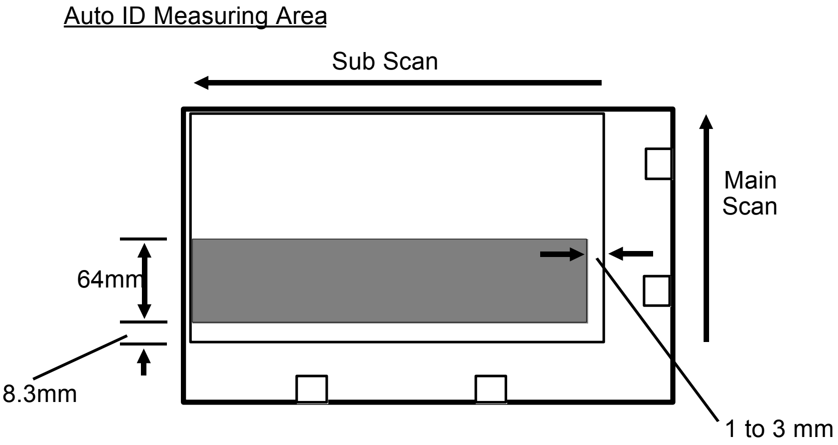
The wave form at TP209

– Signal Digitization –

The adjusted video data goes to the A/D converter (MP7684), which converts the serial video data to 8-bit digital data.

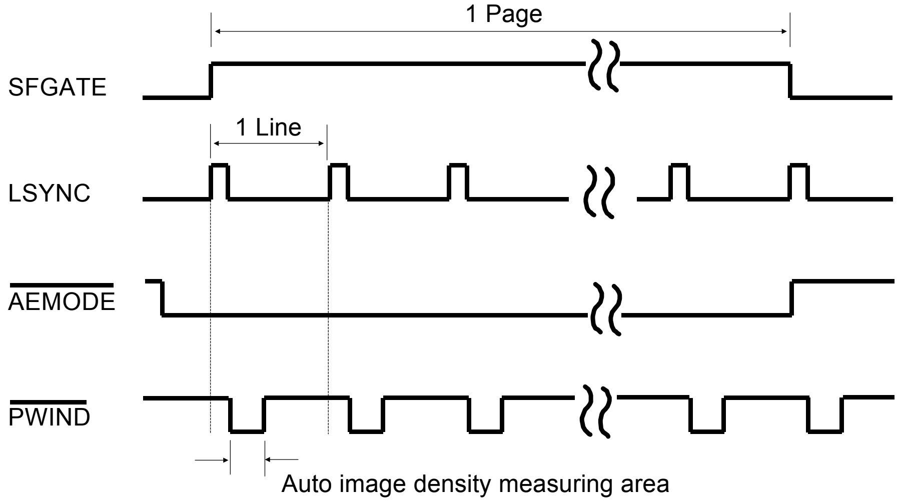
4.3.3 Auto Image Density Control





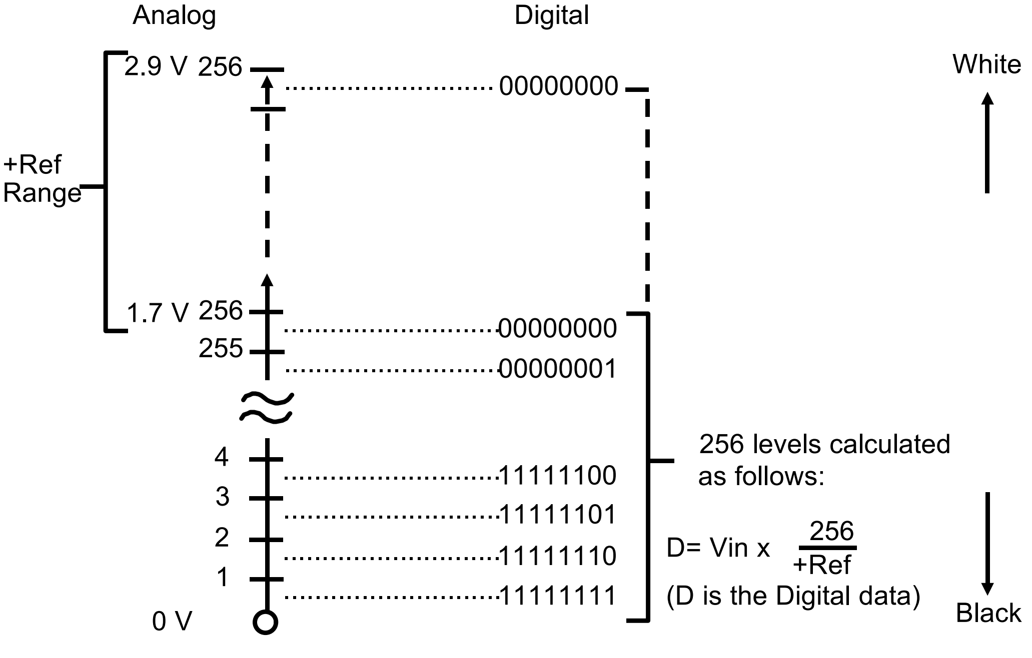
Unlike standard analog copiers, this machine does not prescan using an image sensor to determine original image density. Instead, this machine measures the background density of a 64 millimeter wide area of the document continuously while the original is scanned. Data from the CCD is used to check the background density, and the scanned data is made lighter or darker by the A/D (analog/digital) converter in the VPU.

The scanned video data goes from the CCD to both the A/D converter and the peak hold circuit. The peak hold circuit selects the peak voltage for each line scanned and sends it as "+Ref" to the A/D converter. The "–Ref" input is always 0 volts.

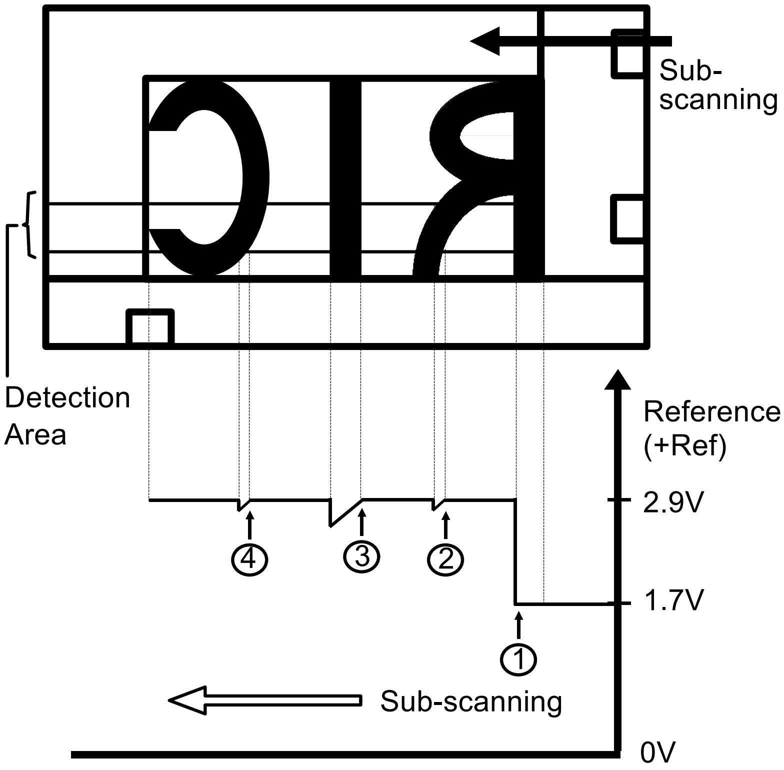


To enable "+Ref", GA1 on the IPU sends 2 signals. One is $\overline{\text{AEMODE}}$, which goes to Low when the machine starts scanning and then goes High again after scanning is complete. The other signal is $\overline{\text{PWIND}}$, which is a pulse signal which determines how wide the auto image density measuring area is. This means the peak hold circuit functions only while $\overline{\text{PWIND}}$ is Low.

The A/D converter decides the appropriate video data based on both signals, then digitizes the data signal.



+Ref can take values from +1.7 volts to +2.9 volts. The A/D converter divides +Ref into 256 levels and digitizes the data signal (Vin) based on these levels. The above chart shows how this is done.

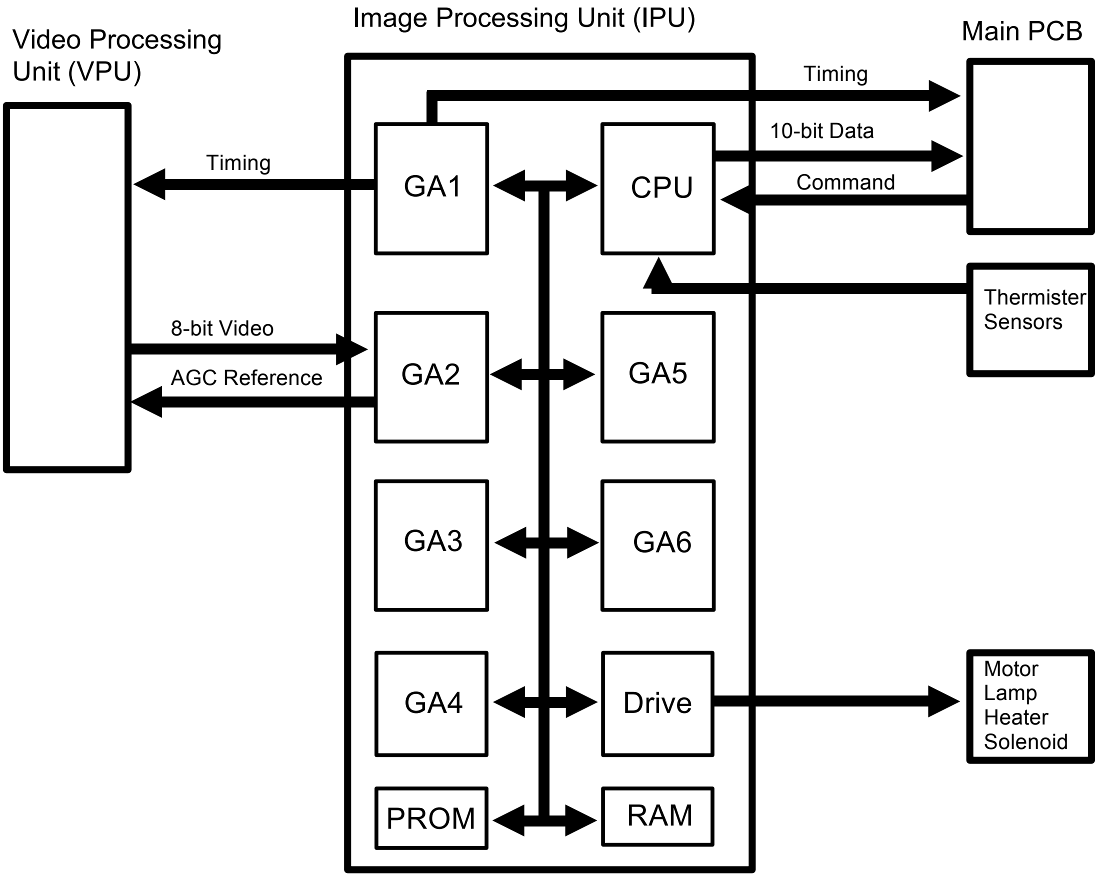


The reference value (+Ref) changes according to the image density in the area measured. However, to prevent dirty backgrounds due to sudden changes in the area sampled, the response to a light to dark change is slower than the response to a dark to light change.

This is illustrated above. At point (1) where the sampled image changes from black to white, +Ref changes to 2.9 volts immediately. At points (2), (3), and (4), +Ref starts decreasing slowly, but it returns to 2.9 volts immediately as soon as white is encountered in the detection area.

4.4 IMAGE PROCESSING UNIT

4.4.1 Basic Functions



The IPU uses six gate arrays (custom made LSIs) to process the video data. These gate arrays, which are labeled GA1 - GA6 in the above illustration, have the following functions.

– Gate Array 1 (GA1) –

Timing control and CCD drive clock

– Gate Array 2 (GA2) –

Auto shading and Auto gain control (AGC)

– Gate Array 3 (GA3) –

MTF (modulation transfer function) processing, Flare prevention and Smoothing

– Gate Array 4 (GA4) –

Main scanning magnification

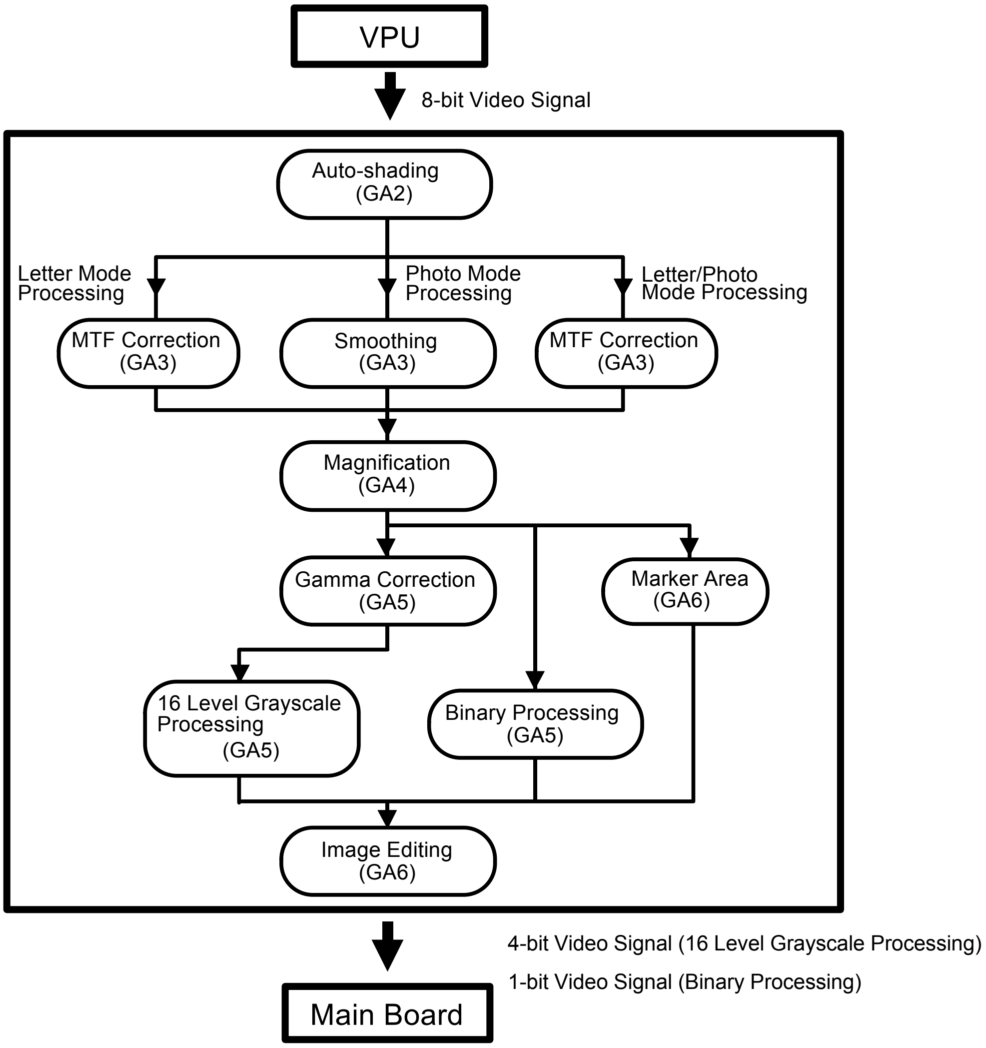
– Gate Array 5 (GA5) –

Gamma (γ) correction, Binary processing and 16 level grayscale processing

– Gate Array 6 (GA6) –

Marker area detection, Background Numbering, Binary and 16 level grayscale processing control

4.4.2 IPU Data Flow



The 8-bit video data from the VPU goes first to GA2 for auto-shading. The corrected data then goes to GA3.

At GA3 data processing splits into letter mode processing, photo mode, and letter/photo mode processing. For letter mode and letter/photo mode processing, GA3 applies the MTF correction. For photo mode processing, it applies a smoothing function.

Next the video data goes to GA4 where the magnification correction is applied (if necessary).

After magnification, the data goes to GA5, where it is subjected to a gamma correction. If the marker function is selected, the magnification processing data goes to GA6, where the image data for marker area recognition is produced. Then it goes to image editing.

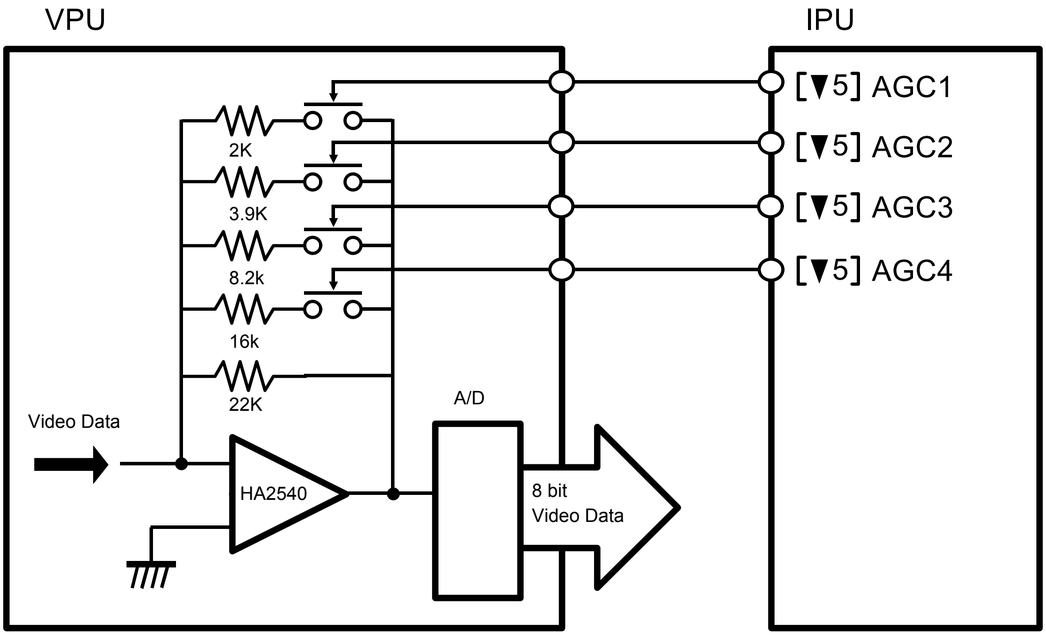
If binary processing is selected, the magnification processing data goes to the binary processing mode in GA5, where it is converted to a black and white signal bit image.

If 16 level grayscale processing is selected, the gamma correction data goes to the 16 level grayscale processing mode in GA5, where it is distributed over 16 levels.

16 level grayscale processing and binary processing can be chosen for each original mode (letter, photo and letter/photo) through the SP4-403.

Finally, the output data from GA5 goes to the image editing section in GA6, where background numbering and marker image data are processed. Then the appropriate video data is ready for output to the main board.

4.4.3 Auto Gain Control (GA2)



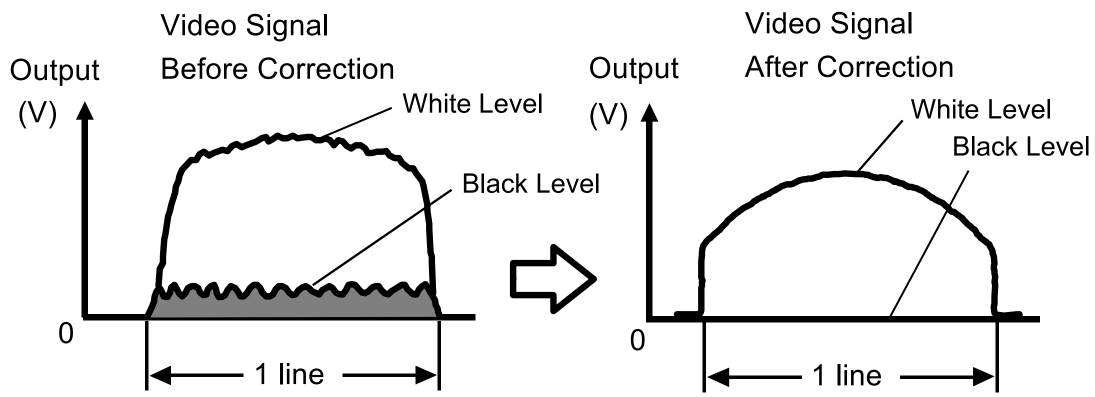
GA2 applies a 4-bit auto gain control (AGC) signal to the VPU (Video Processing Unit) during document scanning. The AGC is based on the peak white level detected when the white plate is read prior to document scanning. It corrects for variations in the output of the scanning lamp. (The scanner lamps are fluorescent lamps, so output will vary depending on temperature and age.)

As shown in the above schematic, the 4-bit AGC information changes the amplification factor of the amplifier (HA2540) on the VPU.

4.4.4 Auto Shading (GA2)

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

– Black Level Correction –

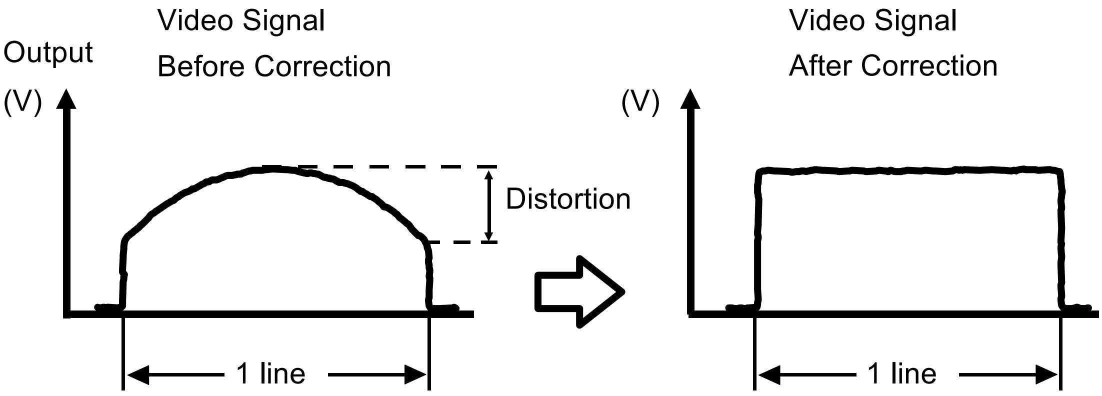


Black level correction works similarly to white shading, but sets the black base rather than the white one.

The video data is scanned by the CCD with the scanner lamps turned OFF. Each CCD element should therefore send identical almost near 0 V output, but this is not the case. This is because of variations in sensitivity between elements of the CCD. So, this function is necessary to improve copy quality in black areas.

Before scanning the document, the CCD scans the black level for each pixels. Then this data is stored in RAM. The video signal information obtained during white platen scanning is then modified by the black level data just described: for each element, the black level result is subtracted from the white level result. After this correction, the black level of each element will be even.

– White Shading –



When scanning the white plate.

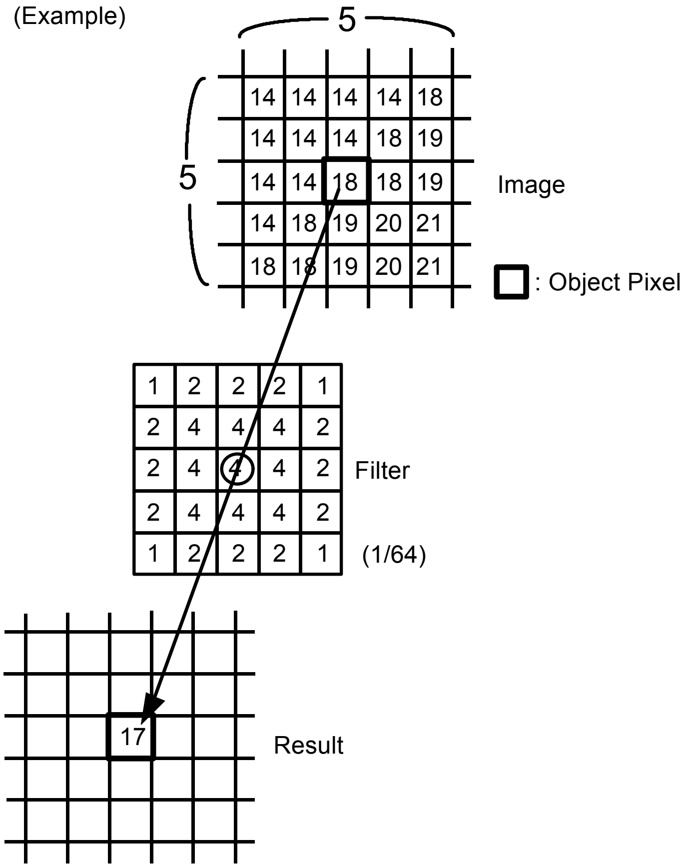
Like auto gain control, auto shading is based on image data read from the white plate. However, auto shading differs from auto gain control in that it is a bit by bit correction rather than an overall correction. Auto shading is necessary for the following reasons:

- Variations in sensitivity between bits of the CCD. (This arises from production processes.)
- Variations in characteristics of the lens and mirror reflectivity.
- Loss of brightness toward the ends of the fluorescent lamps.

Before scanning the document, the machine reads a reference waveform from the white plate (which has a uniform color and reflectivity). The white plate video level for the each pixel is written to RAM. After black level correction, the video signal information obtained during image scanning is then input and corrected in accordance with the white waveform data which is read out from RAM. In this way distortion is eliminated and a signal containing only image data is achieved.

4.4.5 Smoothing Function (GA3)

After auto-shading the next step in photo mode processing is the smoothing step. Basically, this step improves the image by smoothing the gradient of photo originals.



14	14	14	14	18
14	14	14	18	19
14	14	18	18	19
14	18	19	20	21
18	18	19	20	21

1	2	2	2	1
2	4	4	4	2
2	4	4	4	2
2	4	4	4	2
1	2	2	2	1

The smoothing algorithm is: the values of the 24 pixels surrounding the object pixel and the object pixel are multiplied by the data in accordance with the filter. Then they are added together. The result is then divided by 64 and rounded off to yield the new value of the pixel. If this procedure is applied to the example, the value of the pixel shown in the figure changes from 18 to 17.

This algorithm is applied to all pixels. If the pixel is on the edge of the image area, the missing data is assumed to be "0".

There are other filters for this process. Normally, the filter used is the filter above but these filters can be selected by SP4-407-2 depending on the original. The type of filter for each SP4-407-2 setting are as follows.

0:

1	2	2	2	1
1	4	4	4	1
2	4	8	4	2
1	4	4	4	1
1	2	2	2	1

(High contrast)

(1/64)

1:

1	2	2	2	1
2	4	4	4	2
2	4	4	4	2
2	4	4	4	2
1	2	2	2	1

(Standard)

(1/64)

2:

1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1

(Low contrast)

(1/25)

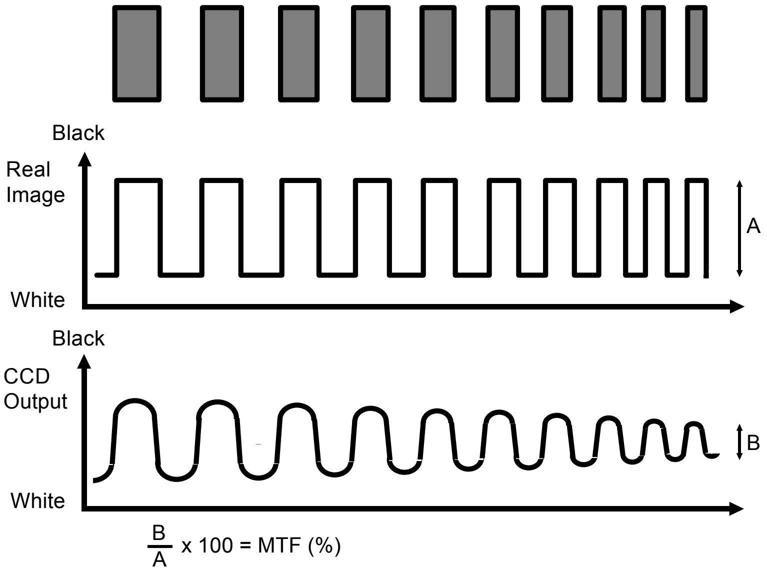
SP4-407-2 is normally set at 1. Set it at 2 to improve the reproduction of low contrast originals.

4.4.6 Flare Prevention (GA3)

When the CCD scans across the edge of a black solid image, the reflected light from both the white and black areas go to CCD elements. This will cause the edge of the image on the copy to be blurred when 16 level grayscale processing is used. To prevent this, there are two methods. One is optical, the other is electrical.

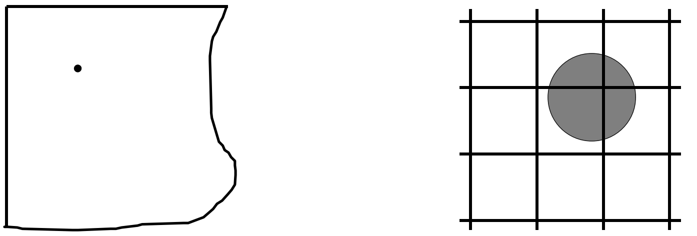
The optical one is simply to place a lamp grid above the lamps to minimize the width of exposure light. The electrical one is to use smoothing filters.

4.4.7 Modulation Transfer Function Correction (GA3)



When a letter mode or letter/photo mode image is converted to an electrical signal (for example by a CCD), the signal deteriorates (contrast becomes less) as the width and spacing of the black and white areas becomes narrower. The ratio of the difference between the black and white levels of the signal and the difference between the black and white levels of the original is called the modulation transfer function or MTF. The MTF is usually expressed as a percentage.

If the MTF is too low, some parts of the image may be lost. To prevent this, the image data is enhanced by applying an MTF correction.



(a) Section of document

(b) Enlarged view of dot

0	0	0	0
0	42	11	0
0	105	42	0
0	11	11	0
0	0	0	0

(c) Image data after A/D conversion

(d) Copy without MTF correction (Threshold level; 127)

Consider a small black point on a document as shown in the previous illustration. The 8-bit image data (range 0 to 255) for this section of the original is shown in (c). If the threshold level is 127, then all the pixels in this area will become white and the dot will not be reproduced (d).

Such image loss is prevented by providing MTF correction as follows:

		-1		
	-2	-3	-2	
-1	-3	35	-3	-1
	-2	-3	-2	
		-1		

1/11

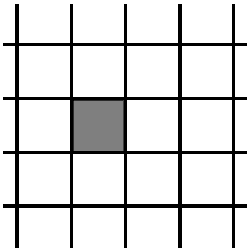
The value of the pixel is multiplied by 35. Then the new value of the pixel is reduced by 3 times the value of the pixels to the left, right, above and below, the values of the pixels two steps to the left, right, above and below, the values of the pixels to the opposite angles. Then the new value of the pixel is divided by 11. If the new number is greater than 256, it is reduced to 256.

The MFT algorithm is as follows.

C = {A x (24 x N + 11) + B x N} / 11
A = Value of the object pixel
B = Value of the calculated surrounding the object pixel
N = The strength of the filter
C = Calculated value

0	0	0	0
0	93	0	0
0	255	89	0
0	0	0.5	0
0	0	0	0

(e) Image data after MTF correction



(f) Copy after MTF correction

After MTF correction is applied the image data of our example becomes as shown in (e) above. The copy after correction (f) has the dot that was on the original.

The MTF algorithm and filter differ by magnification and original type (letter and letter/photo mode) and they are selected by the CPU. The algorithms and filters are as follows.

- Letter Mode

Magnification	Type of filter	Strength of filter
25 ~ 54%	A	1/2
55 ~ 79%	A	1
80 ~ 179%	B	1
180 ~ 379%	C	1/2
380 ~ 800%	C	1/4

- Letter/Photo Mode

Magnification	Type of filter	Strength of filter
25 ~ 800%	A	1/8

Type of filter

A

		-4		
-1	-3	24	-3	-1
		-4		

1/8

C = {Ax(16xN+8)+BxN}/8

B

		-1		
	-2	-3	-2	
-1	-3	35	-3	-1
	-2	-3	-2	
		-1		

1/11

C = {Ax(24xN+11)+BxN}/11

C

		-4		
	-2	0	-2	
-1	-3	35	-3	-1
	-2	0	-2	
		-4		

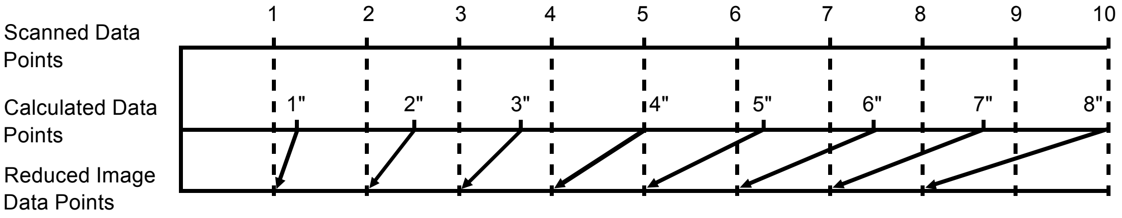
1/11

C = {Ax(24xN+11)+BxN}/11

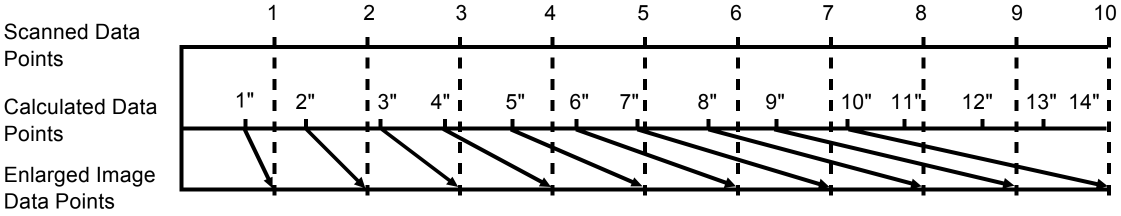
The strength of the filter can be changed using SP4-407-1 and SP4-407-3. Normally the value of the SP modes is set at "1", the value of the filter strength is set according to the above table. If set at "0", each filter strength value of the above table changes to 1/2 of what it was. If set at "2", the strength filter value is doubled.

4.4.8 Main Scan Magnification (GA4)

80% Reduction



140% Enlargement

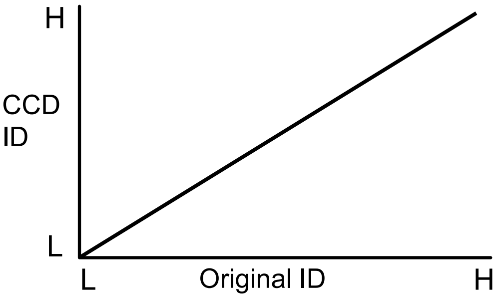


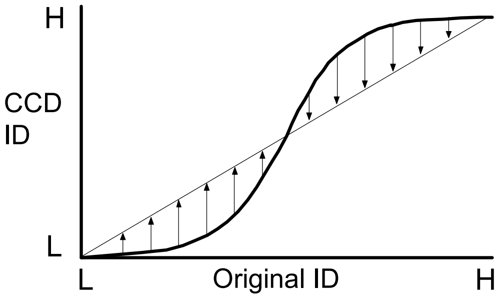
Reduction and enlargement in the sub scan direction is done by changing the scanner speed. However, reduction and enlargement in the main scan direction is handled by the IPU.

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, GA4 calculates imaginary points that would correspond to a physical enlargement or reduction of the image. It then calculates the correct image density 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.

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

4.4.9 Gamma Correction (GA5)



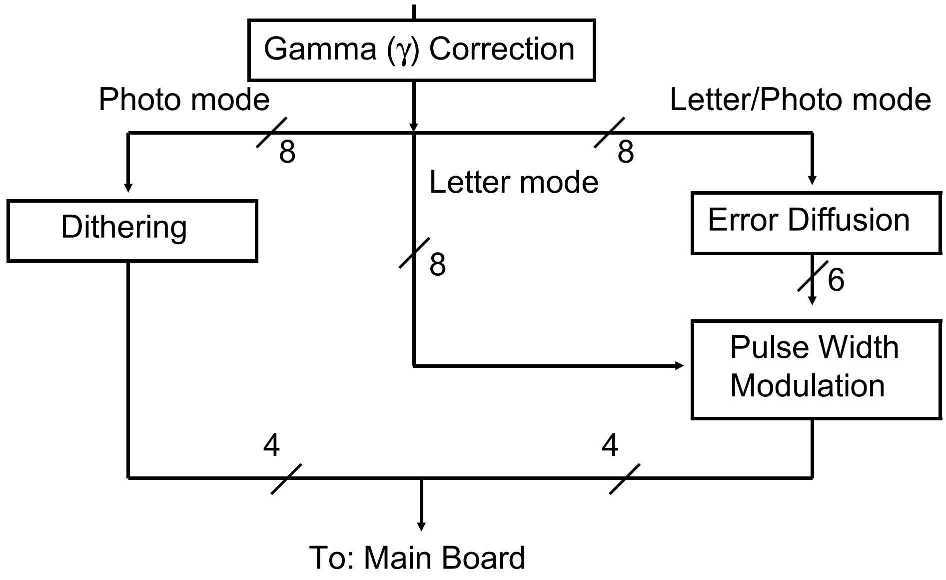


This corrects the response of the CCD to the various shades in the gray scale from black to white. For digital processing techniques to be most effective, the relationship between original ID and CCD output voltage should be constant, as shown in the diagram on the left. However, in reality, the response is more like that shown in the diagram on the right. Gamma correction corrects this deviation in CCD response.

4.4.10 Grayscale to Black and White Conversion (GA5)

After gamma correction, the image data goes to the functions for 16 level grayscale. Prior to this each pixel is represented by 8 bits, yielding a 256 level grayscale. The laser uses 4 bits, yielding a 16 level grayscale per pixel. The 16 level grayscale processing steps convert 8-bit image data to 4-bit image data suitable for printing. The binary processing steps convert the 8-bit image data to single-bit image data.

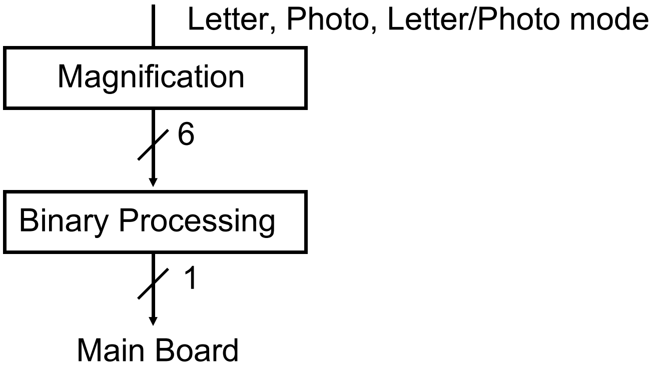
– 16 Level Grayscale Processing –



There are three 16 level grayscale processing methods, depending on the document mode, as shown in the above illustration.

- Letter Mode
  After γ correction, the video data is transformed from an 8 bit data signal to a 4 bit data signal by the pulse width modulation function.
- Photo Mode
  After γ correction, the video data is transformed from an 8 bit data signal to a 4 bit data signal in accordance with the dither matrix in the ROM (IC 123) on the IPU board.
- Letter/Photo Mode
  After γ correction, the video data goes to the error diffusion function where it reduces the difference in contrast between light and dark areas of the photo image. The corrected data then goes to the pulse width modulation function where it is converted to a 4 bit video signal.

- Binary Processing -



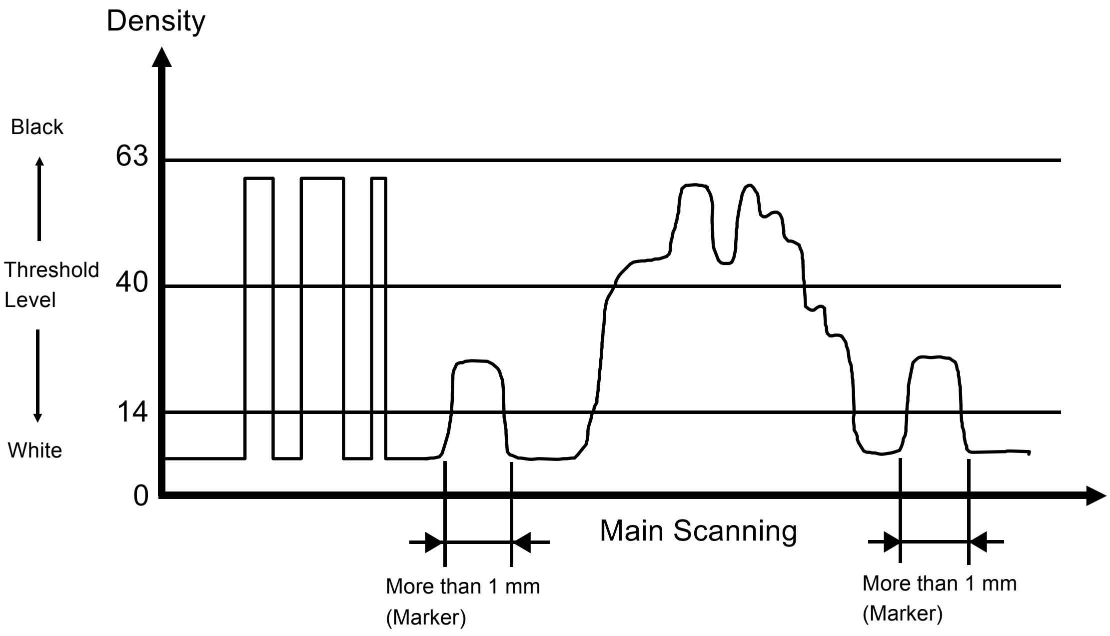
Binary processing, which is used for character or line originals, is simpler than dithering. Binary processing is performed using the first 6 bits of the 8 bit data from the magnification function. In binary processing all image data pixels are compared to a single threshold level. A pixel is set to black if its value is above the threshold level or it is set to white if it is equal to or below the threshold level.

The binary processing threshold level for each manually selectable ID level is shown in the following table.

ID Level	1	2	3	4	5	6	7
Threshold Level	16	24	28	32	40	44	48

← Darker Lighter →

4.4.11 Marker Area Detection (GA6)



The marker area detection function determines what parts of the image have been designated for special processing. The area is designated on the original using a marker.

Marker area detection is based on the fact that the image density of the marker ink is between the "black" of the original image and the "white" of the background areas. As shown in the above illustration, the IPU assumes that the image element is made by a marker if it has a value above 14 but less than the threshold level and is wider than 1 millimeter.

When the marker area designation function is used, letter mode is automatically selected. The default threshold level is 40 (manual ID level 5), but it can be changed to any other manual ID level using SP4-406.

SP4-406: Marker Density	
Adjustable range = 0 to 3	Standard = 0

4.4.12 Background Numbering (GA6)

Copies have a number appear in the background of the copy. This function can help the customer keep track of confidential documents.

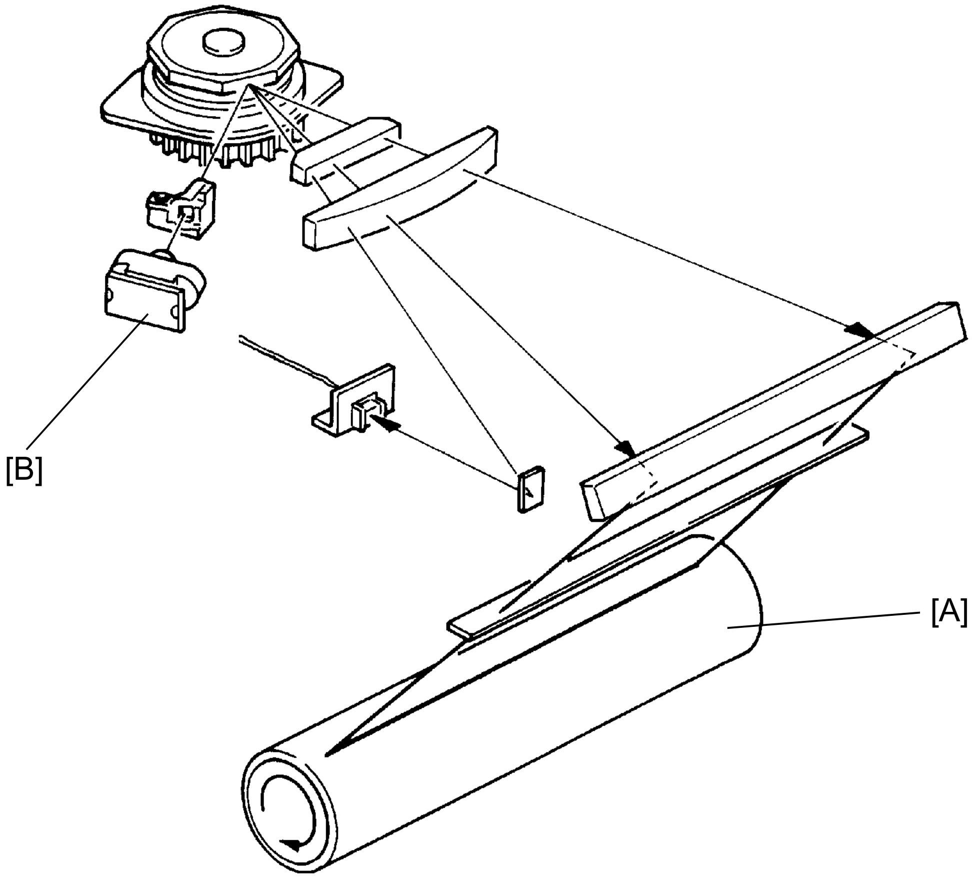
The patterns for background numbering are stored in a ROM (IC126) on the IPU. When the background numbering function is selected, the patterns are sent from the ROM. Then the data will be sent to the laser section.

Image density for the background numbering can be changed using SP4-405.

SP4-405: Background Numbering Density	
Adjustable range = 0 or 1	Standard = 1

5. LASER EXPOSURE

5.1 OVERVIEW

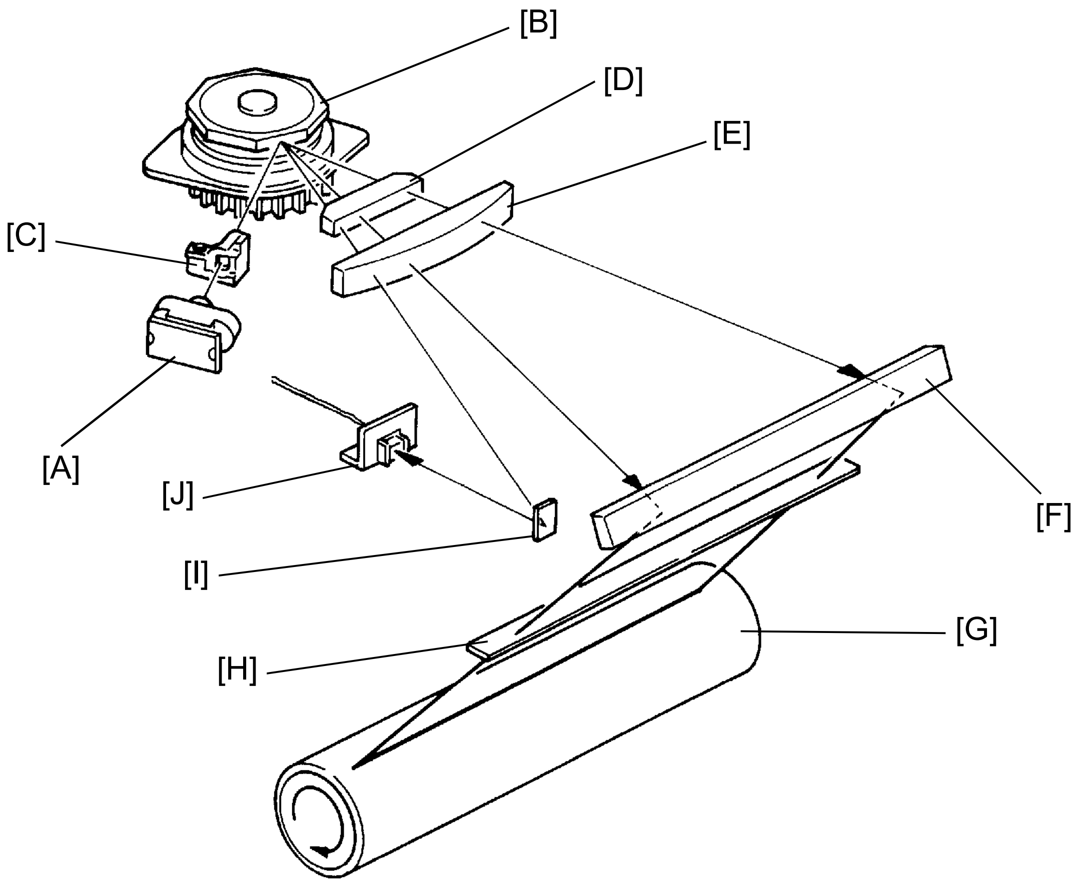


This machine uses a laser diode to produce electrostatic images on an OPC (organic photoconductor) drum [A]. This gives high picture quality and enables high-speed writing. The laser diode unit [B] converts image data from the main PCB into laser pulses through the PWM board, and the optical components direct these pulses to the OPC drum.

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 drum is charged to about –850 volts. The charge on the areas hit by the laser beam drops to about –100 volts.

5.2 OPTICAL PATH



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

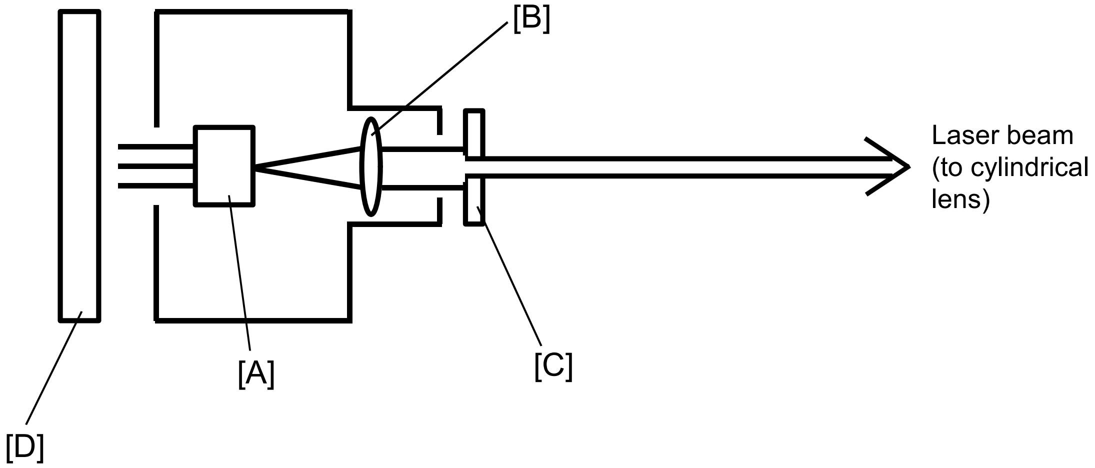
The LD unit [A] outputs the laser beam to the polygon mirror [B] through the cylindrical lens [C].

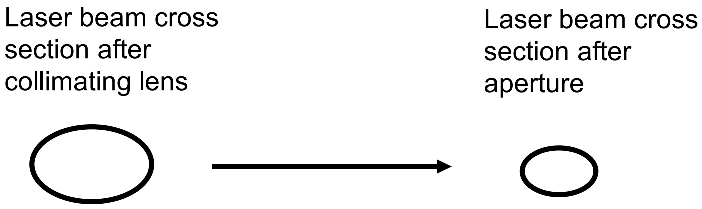
The polygon mirror reflects a full main scan line with a single surface of the mirror. The laser beam goes through the 1st fΘ lens [D] and, 2nd fΘ lens [E]. The drum mirror [F] reflects the laser beam to the drum [G] through the toner shield glass [H].

To determine the main scan starting position, the laser beam is reflected from the the synchronizing mirror [I] to the laser synchronizing detector [J].

The other end of this cable connects to the synchronization detection circuit on the main board.

5.2.1 Laser Diode Unit



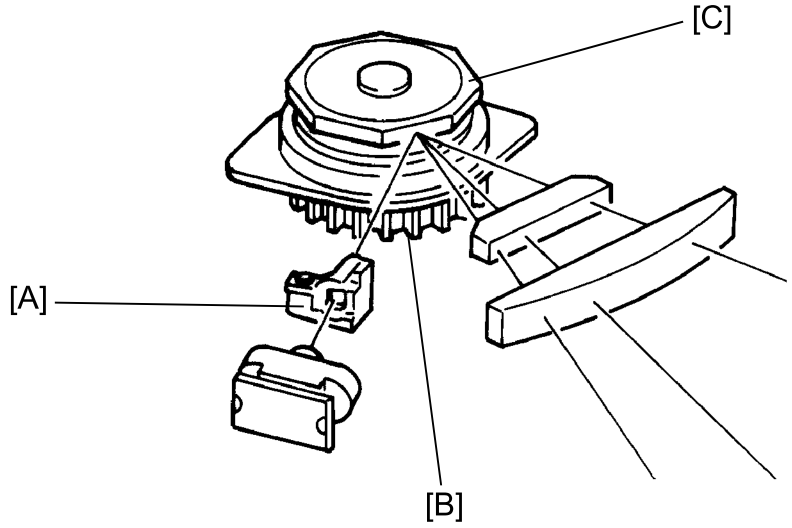


The laser diode unit consists of the laser diode [A], the collimating lens [B], aperture [C], and the LD driver PCB [D].

The LD driver PCB excites the laser diode, causing it to radiate coherent light at 780 nm with about 15 mW power.

The collimating lens forms the radiating beams into a parallel beam.

After the collimating lens, the aperture alters the beam, giving it a smaller cross-section, as shown above.



5.2.2 Cylindrical Lens

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

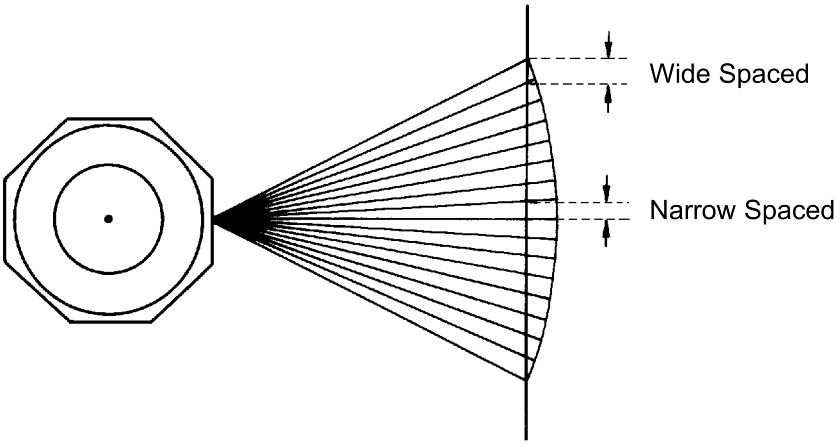
5.2.3 Polygon Mirror

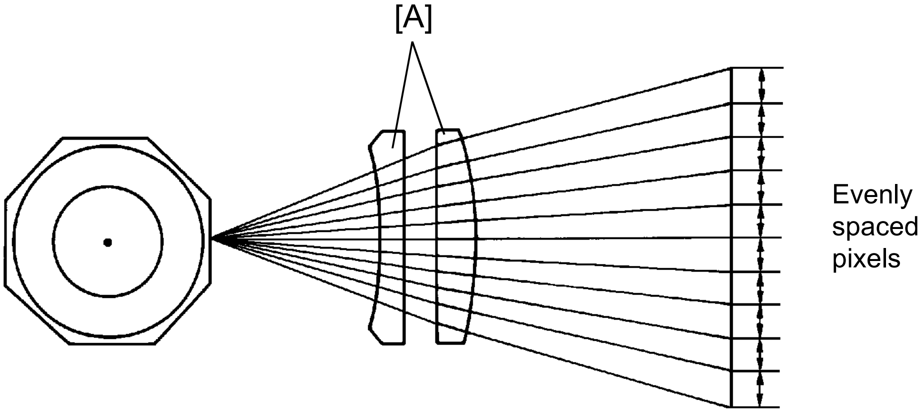
The polygon mirror assembly consists of the polygon mirror motor [B] and the polygon mirror itself [C].

As the mirror rotates, it reflects the laser beam across the OPC drum, via the fΘ lens and the 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 (picture element) misalignment on the drum in both the main scan and sub scan directions.

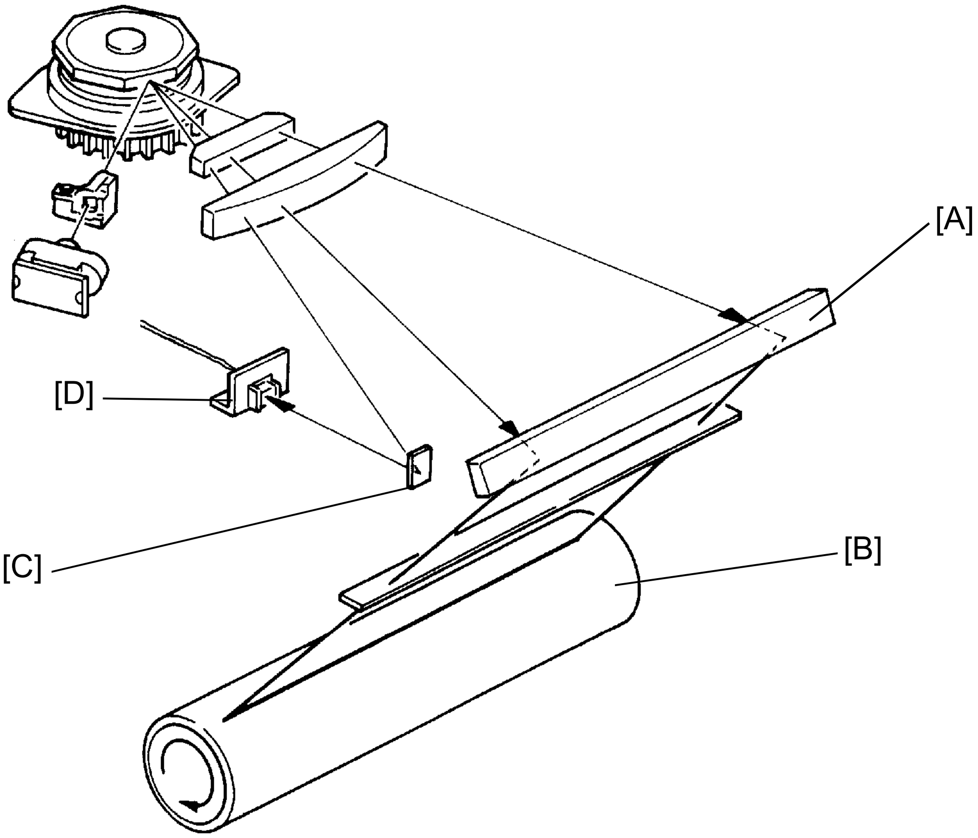
5.2.4 F-Theta Lenses





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 according to the angle of the beam. The pixels near the end of the drum would be further appart 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 fΘ lenses [A] correct for this by deflecting the beam slightly inward to insure uniform picture element spacing and diameter. The fΘ lenses also correct for irregularities in the polygon mirror face, focusing irregular beams onto the correct part of the drum.



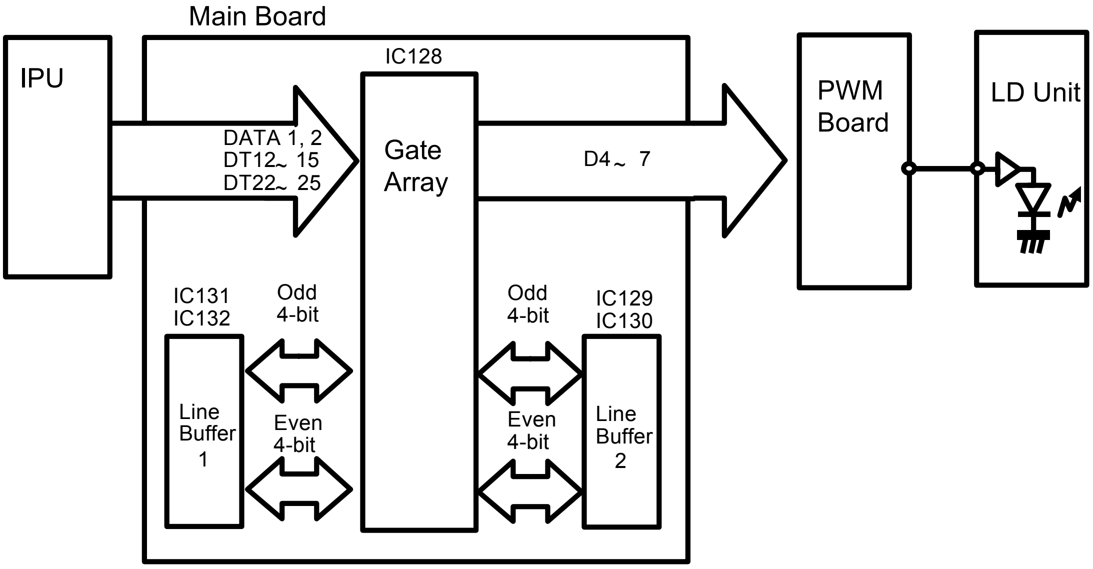
5.2.5 Drum Mirror

The drum mirror [A] reflects the corrected laser beam to the drum [B].

5.2.6 Laser Synchronizing Mirror and Detector

At the start of each scan line, the synchronizing mirror [C] reflects the laser beam to the laser synchronizing detector [D] as shown above. Activation of this detector signals the start of main scan writing by the laser beam.

5.3 LASER EXPOSURE CONTROL



The IPU sends a total of 10 bits of video data to the main PCB (DATA1, 2, DT12 ~ 15 and DT22 ~ 25).

The gate array combines the input data signals into a 8 bit video data signal (4-bit odd data and 4-bit even data) and then stores the combined data in one of two line buffers (line buffer 1 or line buffer 2). The two line buffers are used alternately and hold one scan line of video data each.

When it is time for the data to be written to the drum, the data in the line buffer returns to the gate array. The gate array combines the read data signals into 4-bit video data to be written to the drum. The gate array then sends it to the PWM board.

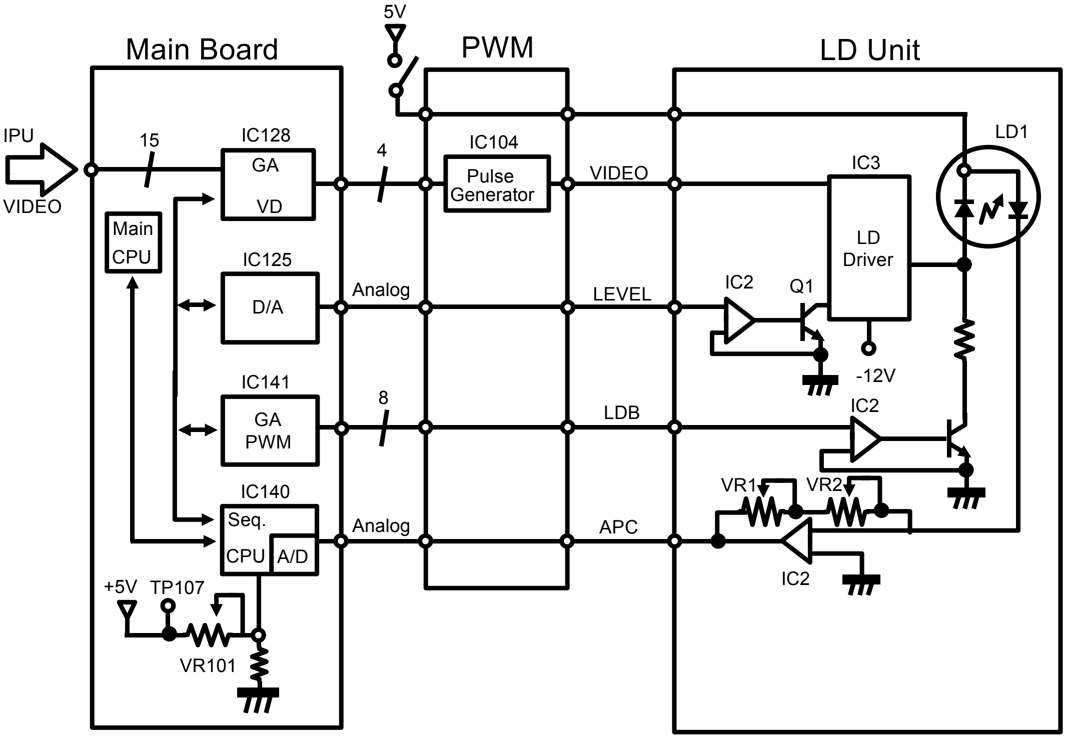
5.4 PULSE WIDTH MODULATION (PWM)

Video data	Pulse width (ns)	
	Letter mode	Letter/Photo mode
0	0	0
1	4	4
2	6	6
3	8	8
4	10	10
5	12	14
6	14	18
7	16	22
8	18	26
9	20	30
A	22	34
B	26	38
C	30	42
D	38	46
E	46	50
F	54	54

To make the latent image, the laser beam exposes the image area of the drum surface. The longer the laser beam exposes the drum, the darker the image is developed. The laser on-time for one pulse is controlled using a pulse width modulation (PWM) circuit.

The video data is sent from the main board to the PWM board through the 4 bit data. In accordance with this 4 bit data, the pulse width for each pixel can be changed over 16 levels as shown in the table.

5.5 AUTO POWER CONTROL (APC)

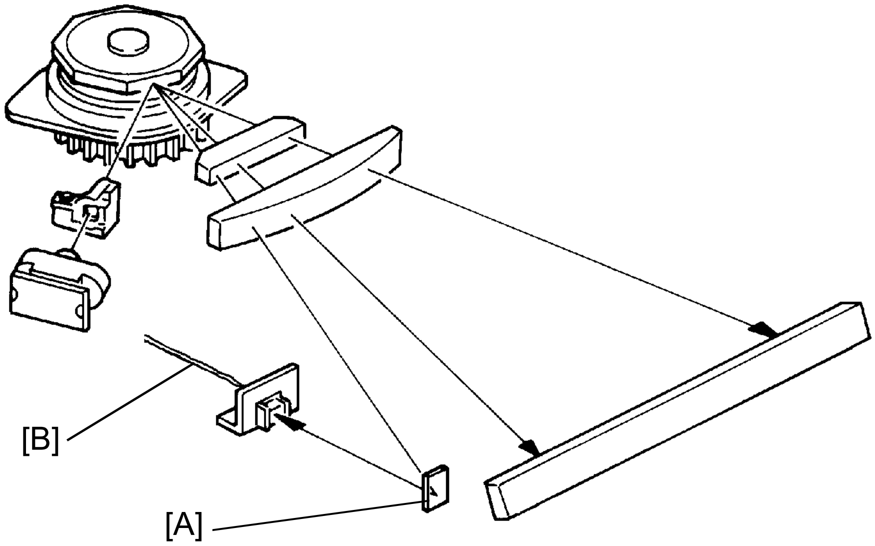


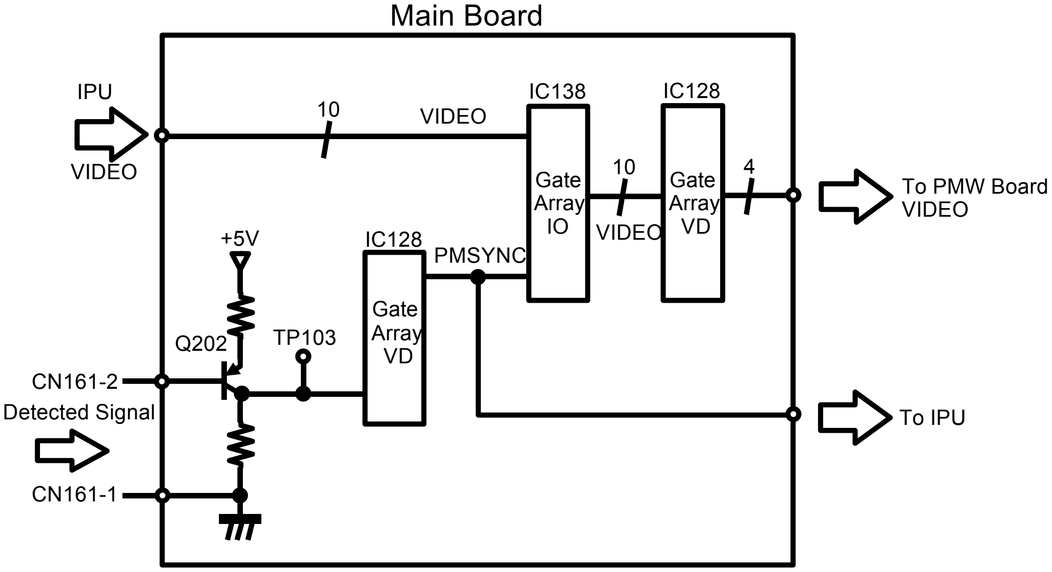
Even if a constant electric current is applied to the laser diode, the intensity of the output light changes with the temperature. The intensity of the output decreases as the temperature increases. In order to keep the output level constant, the output light intensity is monitored through a photodiode and the current to the laser diode is increased or decreased as necessary. The main PCB checks the output of the laser diode at the beginning of the first copy cycle and after every 10 copies. The procedure for checking and controlling the laser power is as follows:

- The main PCB sends an all black data signal to the LD unit (VIDEO), which causes the laser diode to turn on.
- The sequence CPU on the main PCB monitors the feedback signal (APC) from the photodiode in the LD unit.
- If the APC is less than 3 volts, the sequence CPU increases the voltage of the power control signal (LEVEL) through the D/A converter, and the other power control signal (LDB) through the gate array PWM. If the APC is more than 3 volts, the CPU decreases LDB.

The sequence CPU does not control the laser power during printing. This is because the laser output is not constant during printing, so power control would be inaccurate. The reference voltage is adjusted by VR101 in the factory, so that the proper laser power is applied to the drum surface when APC is 3.0 V.

5.6 LASER SYNCHRONIZING DETECTOR

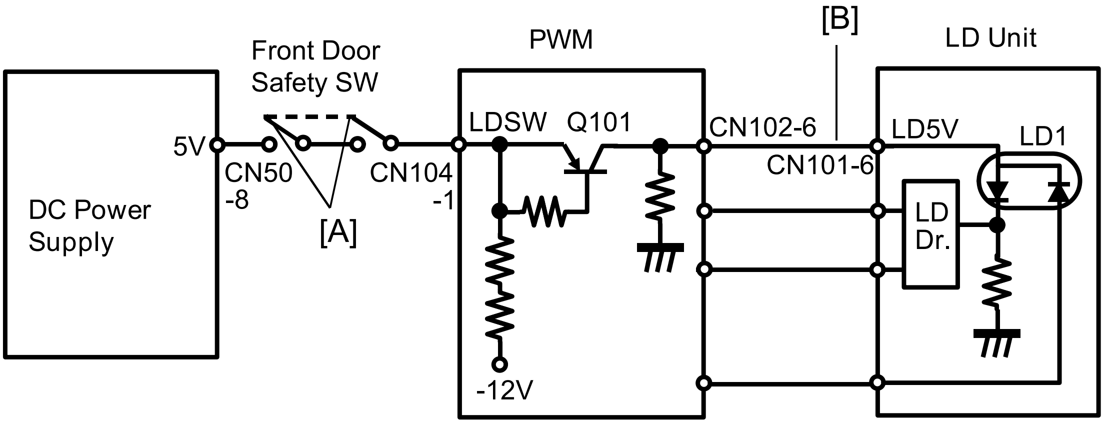




At the start of each scan line, the synchronizing mirror [A] reflect the laser beam to the main PCB through the laser synchronizing detector cable [B]. Activation of this detector signals the start of main scan writing by the laser beam.

The laser beam is received by the gate array VD (IC128) on the main PCB. After receiving the beam, the gate array generates a signal (PMSYNC) and then sends it to the gate array IO (IC138). IC138 controls the timing for the video data printing, in accordance with the signal. The (PMSYNC) is also used to control the timing of IPU operation.

5.7 LD SWITCH

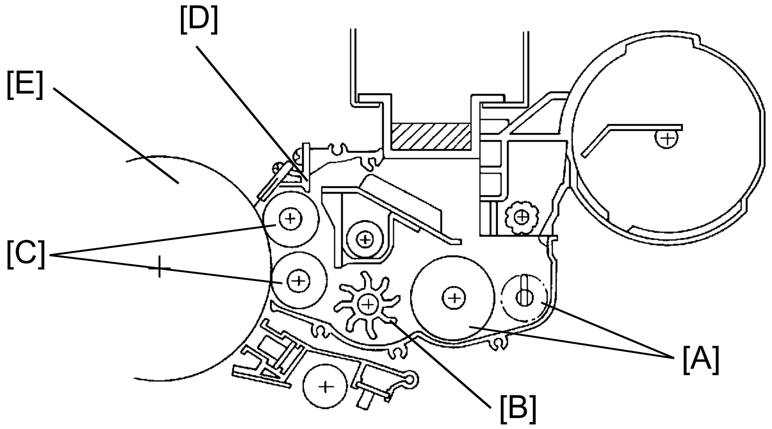


To ensure that the laser beam does not inadvertently expose the drum at servicing, there are two LD switches located at the front door. These two switches [A] are installed in series on the LDSW line coming from the dc power supply board.

When a front door is opened, the switches cut the power to CN104-1 (LDSW) of the PWM board. Then, dc 5 volts (LD+5V) for LD power [B] cannot be supplied to the LD drive board.

6. DEVELOPMENT

6.1 OVERVIEW



This copier uses a double roller development (DRD) system. This system differs from single roller development system in that (1) it develops the image in a narrower area, (2) it develops the image twice, and (3) the relative speed of each development roller against the drum is reduced. Also, finer toner and developer (smaller particle size) are used. Both DRD system and new supplies improve the image, especially of thin horizontal lines, the trailing edges of the half-tone areas, and black cross points.

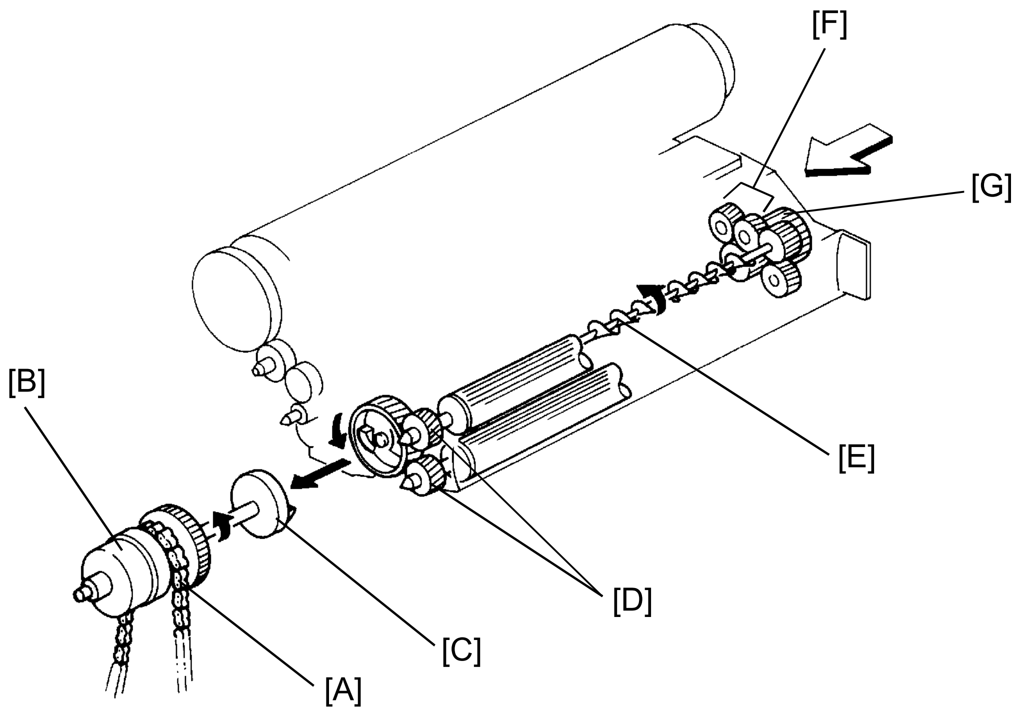
When the development clutch is turned on while the main motor is rotating, the agitators [A], paddle roller [B] and two development rollers [C] start turning. The paddle roller picks up developer in its paddles and transports it to the lower development roller. Internal permanent magnets in the development rollers attract the developer to the development roller sleeve. The turning sleeve of the lower development roller carries the developer to the upper development roller. The upper development roller carries the developer past the doctor blade [D]. The doctor blade trims the developer to the desired thickness and creates backspill to the cross mixing mechanism.

The development rollers continues to turn, carrying the developer to the OPC drum [E]. When the developer brush contacts the drum surface, the areas of the drum surface that have a low negative charge attract and hold the negatively charged toner. In this way, the latent image is developed.

The development rollers are given a strong negative bias in order to create an electrical potential between the development rollers and the areas of the drum where the laser has dissipated the negative charge.

After turning another 100 degrees, the developer is released to the development unit.

6.2 DRIVE MECHANISM



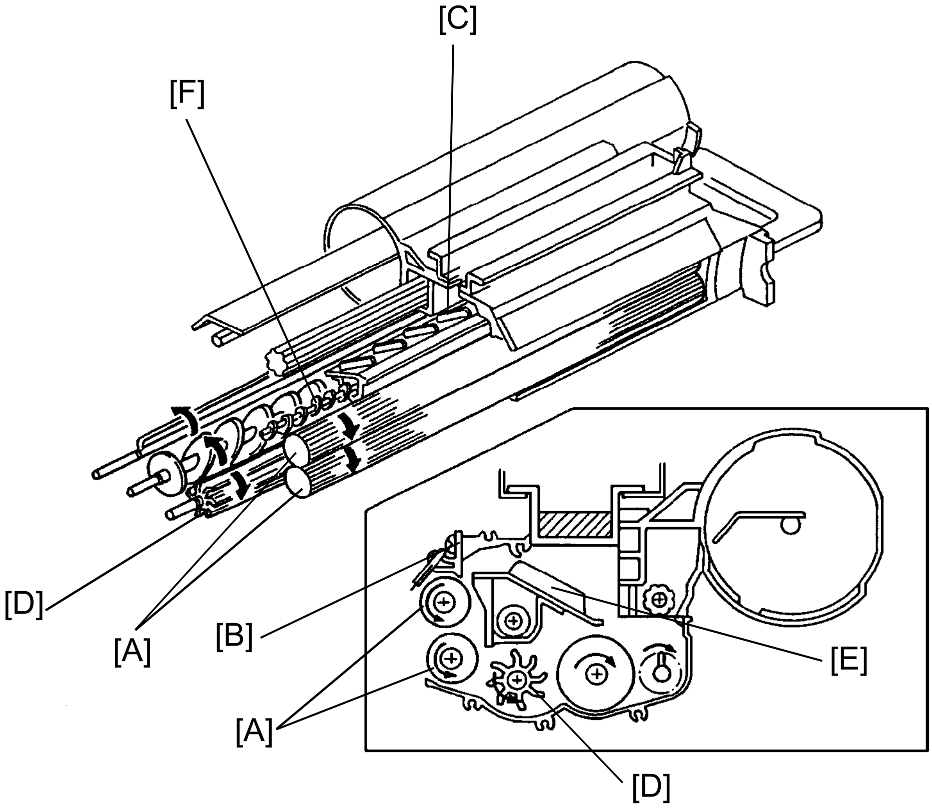
The development clutch gear [A] turns when the main motor is on. The development clutch [B] controls transmission of this rotation to the development drive gear [C].

The development drive gear turns both the upper and the lower development rollers via their drive gears [D].

This rotation is also transmitted to the front side through the mixing auger [E] and then turns the paddle rollers and the agitators via gears [F].

The paddle roller shaft has a knob [G] on its front end to facilitate gear engagement and to turn the rollers for developer exchange. The paddle roller knob has a one-way clutch inside. The one-way clutch prevents the development roller from turning in the opposite direction, which would cause the developer brush to damage the upper brush seal.

6.3 CROSS-MIXING

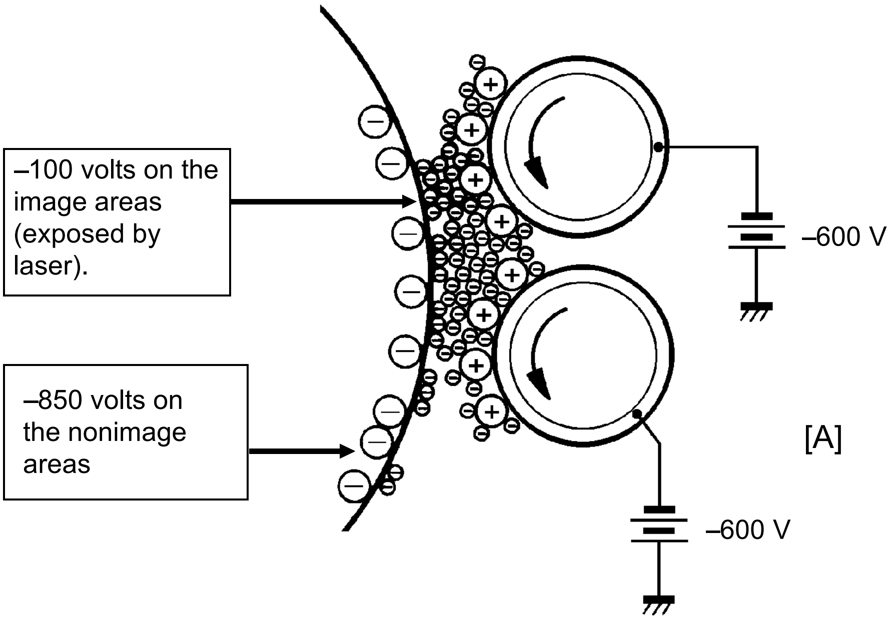


This copier uses a standard cross-mixing mechanism to keep the toner and developer evenly mixed. It also helps agitate the developer to prevent clumping and help create the triboelectric charge.

The developer on the turning development rollers [A] is split into two parts by the doctor blade [B]. The part that stays on the development roller 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 paddle roller [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 mixing auger [F].

6.4 DEVELOPMENT PROCESS



Several forces interact in the development process to produce a visible image on the OPC drum. These forces are the charge pattern of the latent image, the development bias, the magnetic field of the development roller, the positive triboelectric charge of the carrier, and the negative triboelectric charge of the toner.

One of the most important of these forces is the charge pattern of the latent image on the drum. To make the latent image, the laser exposes an area of the drum surface corresponding to the dark parts of the original image. The laser reduces the charge on the drum surface in these areas from about –850 volts to about –100 volts. The latent image is thus formed as a pattern of –100 volts and –850 volts.

The C/G/B/BR power pack applies a bias of –600 volts to the development rollers. Also, a magnetic field between the drum and the development sleeve is created by strong magnets [A], which are placed inside the development rollers close to the sleeve.

The developer consists of carrier and toner. The carrier particles are made of ferrite with a surface coating and are about 70 µm in diameter. The toner particles are made of resin and carbon black and are approximately 9 µm in diameter. The toner is negatively charged and the carrier is positively charged by rubbing action within the development unit.

In the development area, the following forces act on the toner particles:

F_C: The attractive force between toner (–) and carrier (+)
F_D: The repelling force between toner (–) and the drum charge (–)
F_B: The repelling force between the toner (–) and the development roller bias (–)

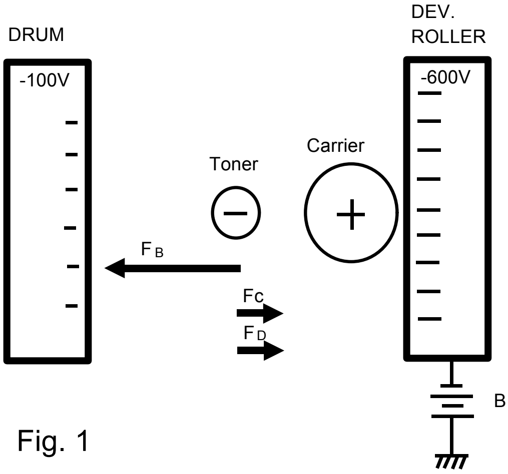


Fig. 1

The exposed areas of the drum have the relationship of:

$F_B > F_C + F_D$ (Fig.1)

Which causes toner to be repelled from the carrier to the drum. (F_D is very small.)

The non-exposed areas of the drum have the relationship of:

$F_B < F_C + F_D$ (Fig. 2)

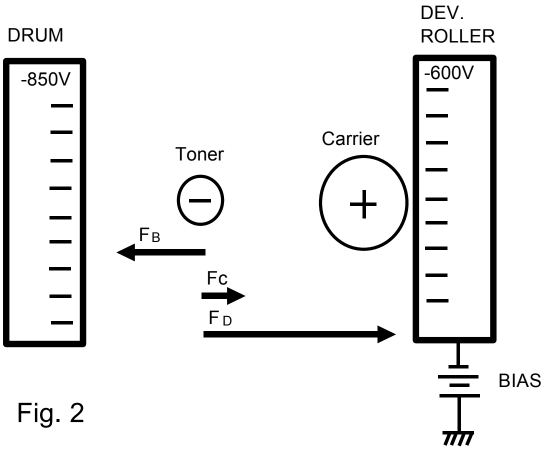


Fig. 2

Here F_D is very large and repels toner from the non image areas.

You might expect that the positively charged carrier would be attracted to the negatively charged non-image areas of the drum. However, this does not happen. In the development area, the following forces act on the carrier particles:

F_{MC}: The attractive force of the magnet on the carrier
F_{BC}: The attractive force between the carrier and development bias
F_{DC}: The attractive force between the carrier (+) and the non-exposed areas of the drum (–)

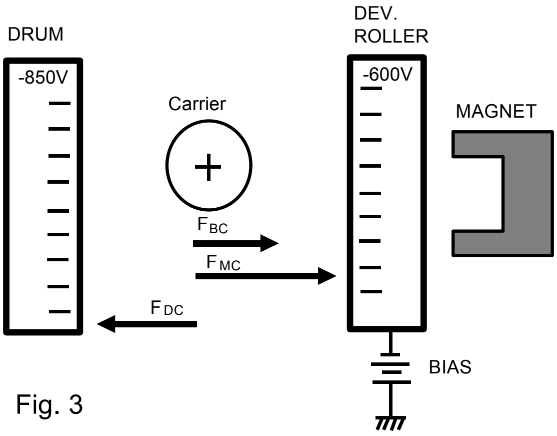
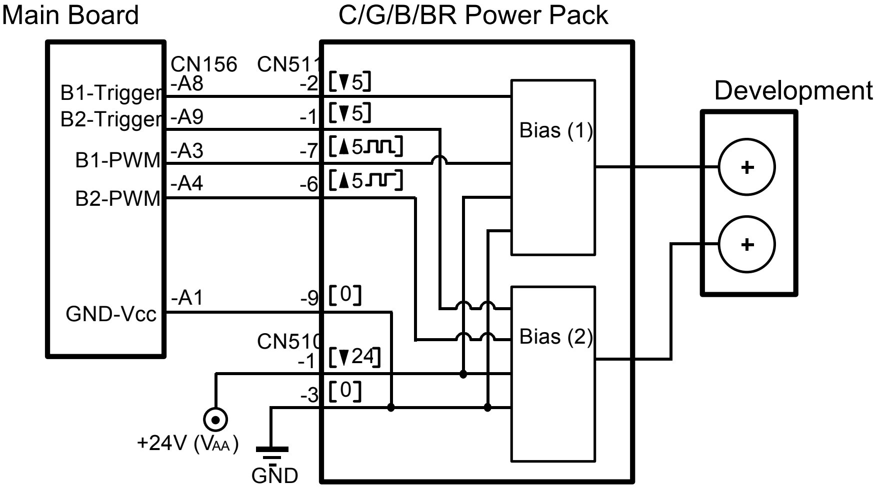


Fig. 3

Since $F_{DC} < F_{MC} + F_{BC}$ (Fig. 3), the carrier remains on the development roller's sleeve.

6.5 BIAS CONTROL



The development biases are controlled by the PWM signals (CN156-A3 and -A4).

	Status
1	Stand by: 0V
2	Ready: +250 V
3	Charged area start: +250 V→ –430 V → –600 V
4	Image area: –600 V
5	ID sensor area: –430 V
6	Charged area finish: –600 V → –430 V → +250 V

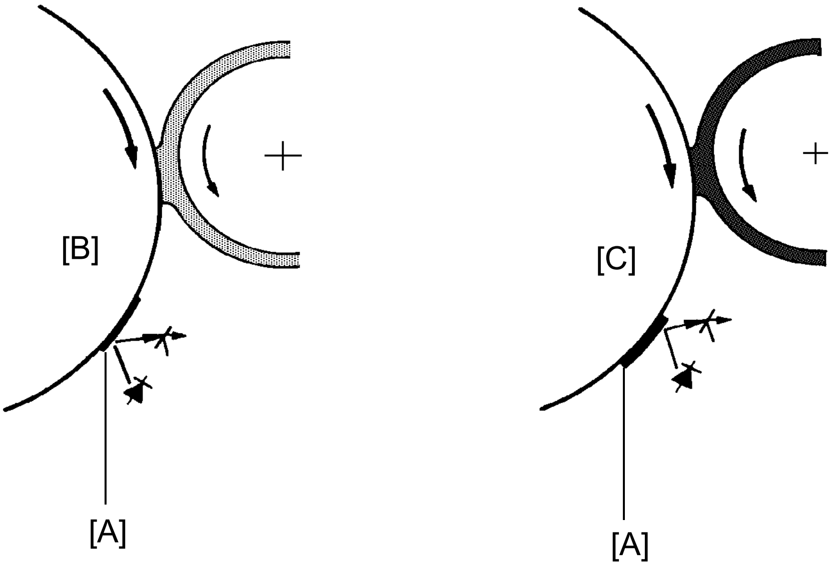
In the stand-by mode, the development bias is 0V. When the development roller starts rotating, the development bias is changed to +250 V. When the drum charging process begins, the development bias is changed to –430 V. If the development bias were to remain at +250 V during charging, the positive carrier would be attracted to the negatively charged drum, and the negative toner would stay on the development roller. The bias is set to –430 V during the initial charging period to prevent this toner-carrier break down. The toner must be kept on the development roller until the image area of the drum reaches the development roller.

The development bias is then dropped to –600 V and remains at this voltage through out the image development process. If the development bias were changed to –600 V before the image development begins, toner would be attracted to the drum before the image area. This would cause toner to be wasted and toner scattering.

After the image is developed, this three-step voltage change sequence is reversed.

These development bias changes are controlled by the PWM circuit as shown on the table.

6.6 TONER DENSITY DETECTION



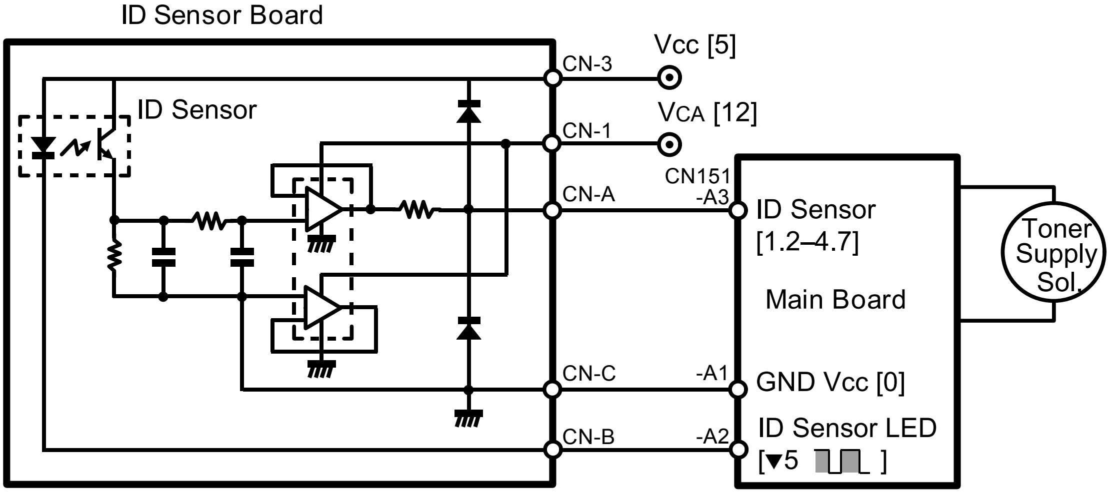
A: Developed sensor pattern
B: Low toner
C: Enough toner

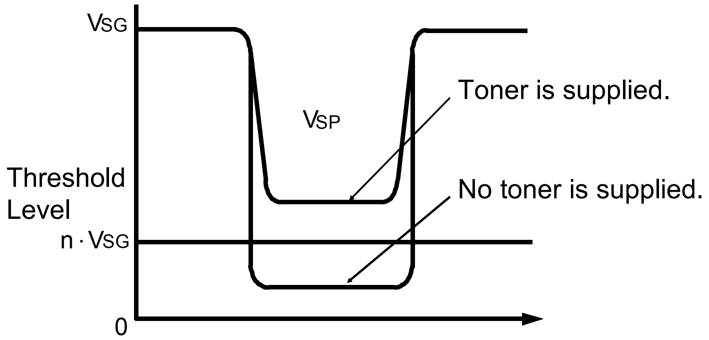
The main board checks toner density by directly sensing the image density at the end of the first copy cycle after the main switch is turned on, and at every 10th copy after that. (The machine can be set to check toner density every 5 cycles using SP2-209.)

On check cycles, the CPU sends the laser on signal to make the pattern image (20 x 20 mm) on the drum surface. After the sensor pattern is developed, its reflectivity is checked by the image density sensor. The CPU notes the strength of reflectivity. If the reflected light is too strong, indicating the toner density condition is too low, it adds toner to the development unit.

The toner is not added all at once. The CPU energizes the toner supply solenoid and adds a selected amount of toner over the next 10 cycles.

6.7 TONER DENSITY CONTROL





The CPU receives two voltage values (Vsg and Vsp) directly from the image density (ID) sensor through CN151-A3. Vsg is the value for the bare drum and Vsp is the value for the sensor pattern. The CPU compares these two values to determine if more toner should be added.

NOTE: Vsg is 4.0 volts when adjusted properly.

– Toner Supply Condition –

$Vsp \geq n \cdot Vsg \Rightarrow$ Low image density (toner added)
$Vsp < n \cdot Vsg \Rightarrow$ High image density (no toner added)
("n" is the toner add coefficient)

When the density of the developed pattern becomes low, the light reflected to the phototransistor from the sensor pattern increases. This causes Vsp to increase. When Vsp becomes greater than the toner add level (n · Vsg) the CPU activates the toner supply solenoid to add a selected amount of toner over the next 10 copy cycles.

– Add Toner Level –

The coefficient "n", which determines the add toner level, is adjustable using SP2-211.
Never change this SP setting to increase or decrease toner setting. Use SP2-201-4.

SP2-211: Toner Add				
Display	N	LL	L	H
Coefficient "n"	1/13	1/9	1/11	1/15
Toner add detected level	Standard 0.31 V	Lowest 0.44 V	Low 0.36 V	High 0.27 V

Default: N

– ID Sensor Bias –

The bias voltage used for the development of the ID sensor pattern is not the same as for the image development. The ID sensor bias is adjustable using SP2-201-4.

SP2-201-4: ID Sensor Bias					
Display	0	1	2	3	4
ID sensor bias	–490 V	–460 V	–430 V	–400 V	–370 V

Default: 2

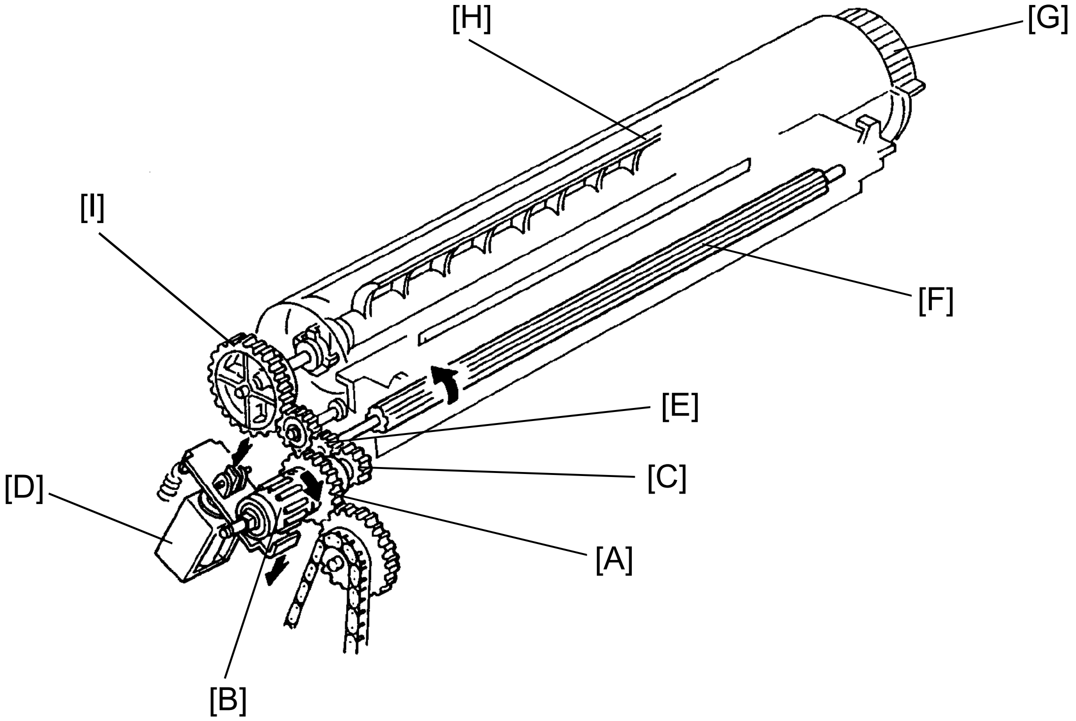
As an example of the function of the ID sensor bias, consider what happens when SP2-201-4 is set to 0 (ID sensor bias = –490 V). The change in bias causes the potential between the pattern area of the drum and the development bias to become stronger. As a result, the pattern is developed with a higher image density, which causes the toner concentration in the developer to be reduced.

– ID Sensor Abnormal –

If one of the following conditions is detected three times in succession, the CPU automatically shifts from the detect supply mode to the fixed supply mode and displays "Clean ID Sensor" in the message display.

- Vsp higher than 2.5 volts
- Vsg lower than 2.5 volts

6.8 TONER SUPPLY



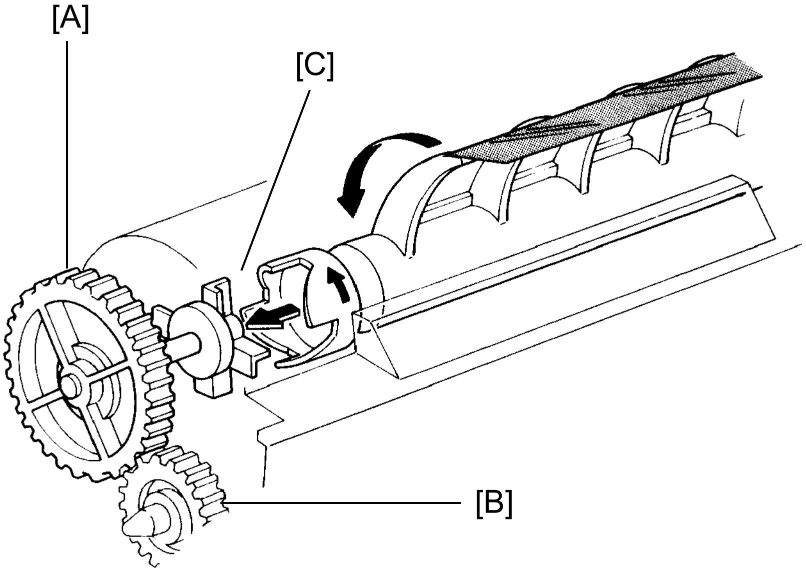
G: Toner Cartridge
H: Toner Agitator
I: Toner Agitator Gear

6.8.1 Roller Drive Mechanism

The toner supply clutch gear [A] turns when the main motor is on. The toner supply clutch [B] controls transmission of this rotation to the toner supply drive gear [C].

When the toner supply solenoid [D] energizes, the toner supply clutch engages and starts turning the toner supply drive gear. The toner supply drive gear turns the toner supply roller gear [E]. Toner catches in the grooves in the toner supply roller [F]. Then, as the grooves turn past the opening, the toner drops into the development unit.

6.8.2 Toner Agitator Drive Mechanism



The toner agitator mechanism, which is in the toner cartridge, prevents toner from blocking.

The toner agitator gear [A] engages with the toner supply roller gear through an idle gear [B]. Therefore, the toner agitator gear turns when the toner supply clutch engages.

Rotation passes through the toner cartridge casing to the agitator junction [C].

6.9 TONER SUPPLY MODE AND AMOUNT

This copier has four different ways of controlling the amount of toner supplied. Normally, the detect supply system controls toner supply. However, other supply systems can also be selected, depending on the type of original, by SP2-208-1.

SP2-208-1: Toner Supply Mode				
Display	0: D	1: F	2: DF	3: A
Mode	Detect	Fixed	Detect + Fixed	Auto

Default: 0

6.9.1 Detect Supply Mode

When SP2-208-1 is set to 0, the detect supply mode is selected. If Vsp becomes greater than n · Vsg, a small amount of toner is added by the toner supply solenoid on each of the next 10 copy cycles. (The machine can be set to check ID and add toner in 5 cycle increments by SP2-209.)

SP2-209: I.D.S. Check Interval		
Display	0: 10	1: 5
Check interval	10 copies	5 copies

Default: 0

When toner supply amount is increased, 5 cycle increments is better than 10 cycle to keep good toner concentration control in the developer.

Toner supply starts 90 pulses after the exposure lamp turns off. (Toner is supplied at this time to prevent toner scattering on the copies.) The actual amount of toner added is determined by controlling the length of time that the clutch is on. Toner supply amount is adjustable by SP2-208-2.

6.9.2 Fixed Supply Mode

If SP2-208-1 is 1 or ID sensing is abnormal, the CPU selects the fixed supply mode. In this case, a fixed amount of toner is added every copy cycle.

SP2-208-2: Toner Supply Amount				
Display	0: N	1: L	2: H	3: HH
Detect supply	30%	15%	45%	60%
Fixed supply	7%	4%	11%	14%

Default: 0

6.9.3 Detect + Fixed Supply Mode

When SP2-208-1 is set to 2, the detect + fix supply mode is selected.

In the condition that Vsp is greater than n · Vsg, the toner supply is controlled by the detect supply mode.

Even if Vsp becomes lower than n · Vsg, a small amount of toner (2%) is supplied every copy cycle. If Vsp becomes lower than $\frac{1}{2}$ n · Vsg, no toner is supplied.

6.9.4 Auto Supply Mode

When SP2-208-1 is set to 3, the auto supply mode is selected. In this mode, the detect supply mode is also used for the overall toner density control.

In addition, the CPU counts the time the laser is on for every original. Through this data, the CPU estimates how much toner should be added to compensate and adds this amount of toner during next copy cycle.

For the customer who makes copies from high-coverage originals, this mode should be selected to minimize the fluctuation of the image density.

6.10 TONER END DETECTION

6.10.1 Toner Near End Detection

The toner near end level is reached when Vsp has increased a certain amount over the level at which toner is added. This level is determined as follows:

$$\text{Vsp(toner near end)} = n \cdot \text{Vsg(add toner level)} + \text{V(increase)}$$

The amount that Vsp must increase before the toner near end condition is reached depends on the setting of SP2-212.

SP2-212: Toner Near End			
Display	0: N (+0.20 V)	1: L (+0.25 V)	2: H (+0.15 V)

Default: 0

The normal setting of SP2-212 is 0. If the toner end setting and add toner setting are both at the normal setting and the image density sensor is adjusted properly (Vsg = 4.0 V), then the toner near end level is reached when Vsp = 0.51 volt (($\frac{1}{13}$ x 4.0) + 0.20).

If the CPU detects the toner near end level three times in succession, the Add Toner indicator starts blinking. This is Toner Near End condition.

6.10.2 Toner End

After Toner Near End condition occurs, up to 50 copies can be made (toner end copy run). If a new toner cartridge is not added within that interval, the Add Toner indicator stays on. Copying is then inhibited until a new toner cartridge is added.

The toner end copy run can be set to 20 copies rather than 50 using SP2-213.

SP2-213: Toner End Copy Run		
Display	0: 50	1: 20

Default: 0

6.10.3 Toner End Run Additional Toner Supply

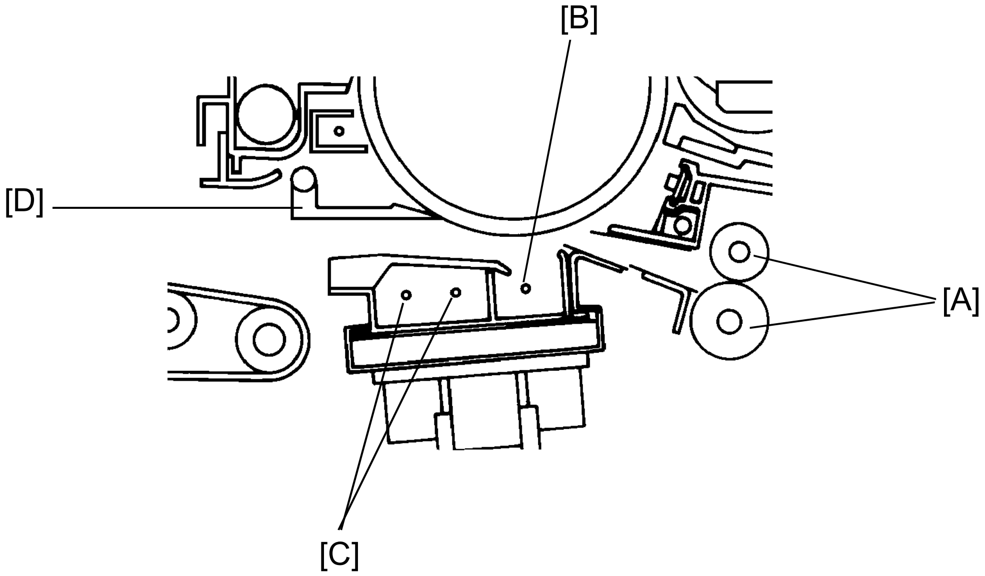
During the toner end indicator blinking, the toner supply solenoid and the main motor stay on for an additional period after the copy job is finished.

This adds extra toner in order to recover the image density level. This is necessary because it is possible for Vsp to exceed the toner near end level even though there is sufficient toner in the cartridge if originals with large dark image areas are copied. Once Vsp drops below the toner near end level, the copier is reset to normal. The time period for the additional toner supply is set by SP2-210.

SP2-210: Toner Add Time	
Adjustable range = 4 to 9	Default = 8

With SP2-210, the toner add time increases as the number (n) entered gets larger.
The actual time of toner supply solenoid activity can be calculated with the following formula: 1.4 sec x n (n = 4 to 9)

7. TRANSFER AND SEPARATION



7.1 IMAGE TRANSFER

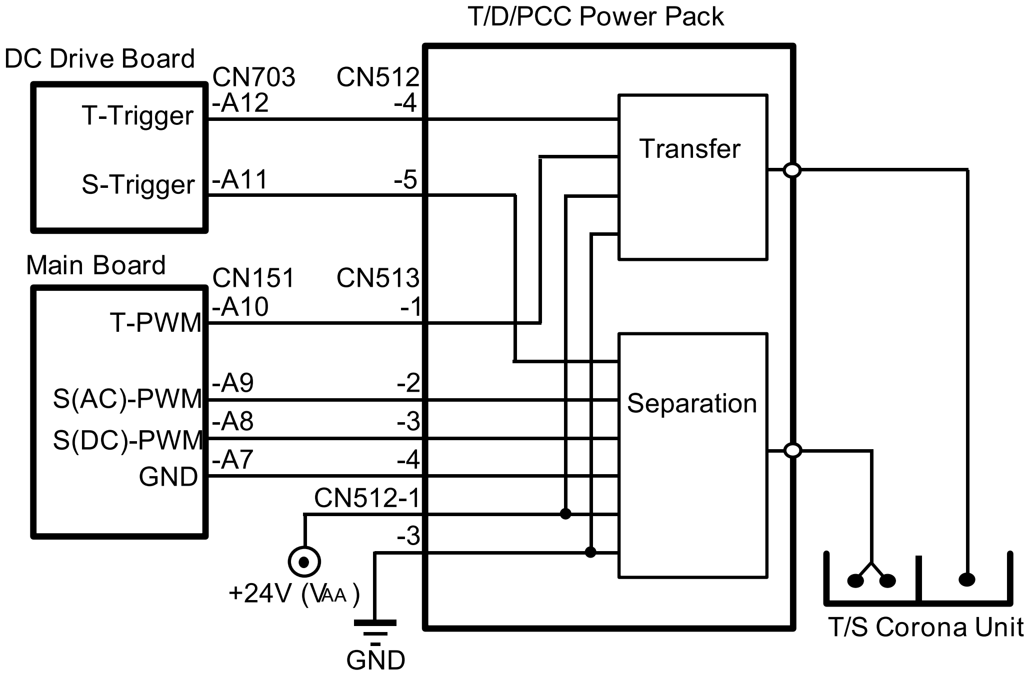
The registration rollers [A] feed the copy paper through the transfer entrance guides to the transfer section. A high positive voltage (+6.0 kilovolts) is applied to the transfer corona wire [B], and the corona wire generates positive ions. These positive ions are applied to the copy paper, and the positive charge attracts the negatively charged toner away from the drum and onto the paper. In addition, the paper is held against the drum by the negative countercharge on the drum.

7.2 PAPER SEPARATION

After image transfer, the paper must be separated from the drum. The separation corona wires [C] generate an ac corona which breaks the attraction between the paper and the drum. The pick-off pawls [D] aid in separating light weight paper and paper that has low stiffness.

The separation corona has both ac and dc components. The ac component is constant (5.3 ± 0.2 kV), but the dc component is not. For the first 10 mm of the copy, the dc component is –90 µA, but for the rest of the copy the dc component shifts to –25 µA. This helps the leading edge of the paper to separate from the drum. (If –90 µA were applied to the entire sheet, image transfer would be adversely affected.)

7.3 TRANSFER/SEPARATION CORONA CIRCUIT



The above diagram shows the transfer/separation corona circuit. The dc power supply board supplies +24 volts (VAA) to CN512-1 of the T/D/Pcc power pack.

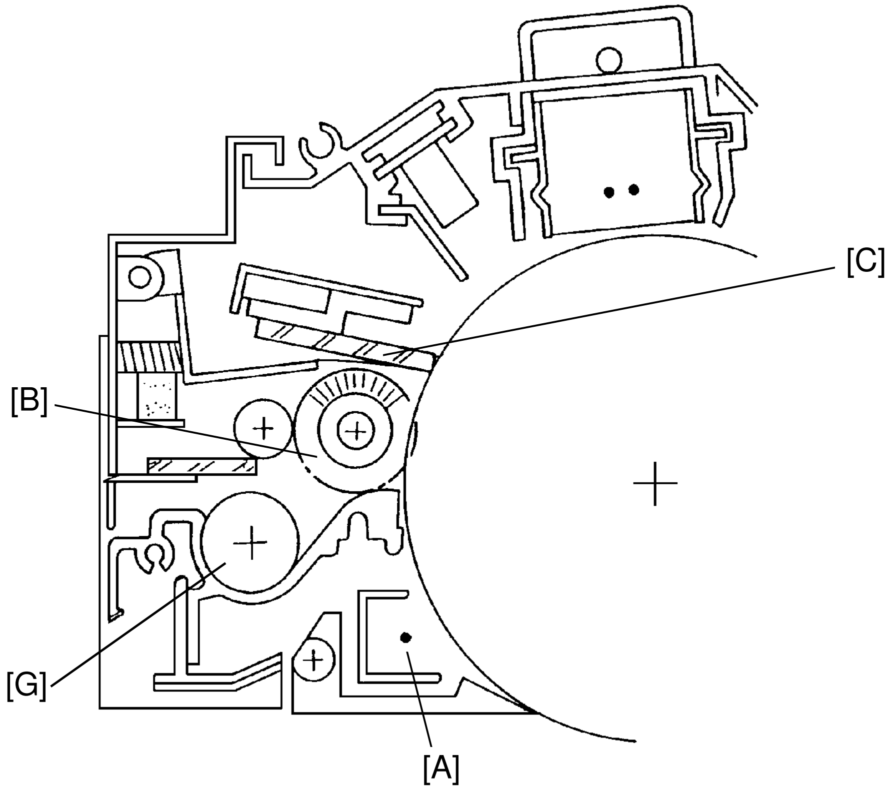
The dc drive board sends the transfer and the separation trigger signals (active LOW) from CN703-A12 and -A11.

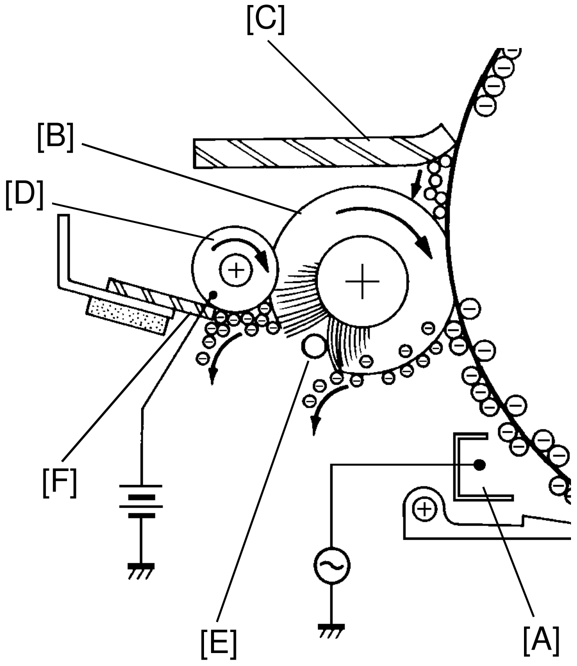
CN151-A8, -A9, and -A10 are used for the PWM control for the transfer and separation corona. Depending upon the duty of PWM applied, the output can be changed. The duty of the S(DC)-PWM is changed at the first 10 mm of the copy, so that the paper can be easily separated from the drum.

	Output	PWM Duty
Transfer	+350 ± 15 µA	50%
Separation (AC)	+5.3 ± 0.2 kV	50%
Separation (DC-Edge)	–90 ± 5 µA	37%
Separation (DC)	–25 ± 5 µA	80%

8. DRUM CLEANING

8.1 OVERVIEW





Drum cleaning is accomplished by the pre-cleaning corona (PCC) [A], cleaning brush [B], and cleaning blade [C].

As the toner enters the cleaning unit, the PCC unit applies an ac corona with a negative bias. The ac component of the PCC removes any positive charge remaining on the drum from the transfer corona. The negative dc component of the PCC gives the toner a uniform negative charge, which makes it easier for the cleaning brush to remove the toner.

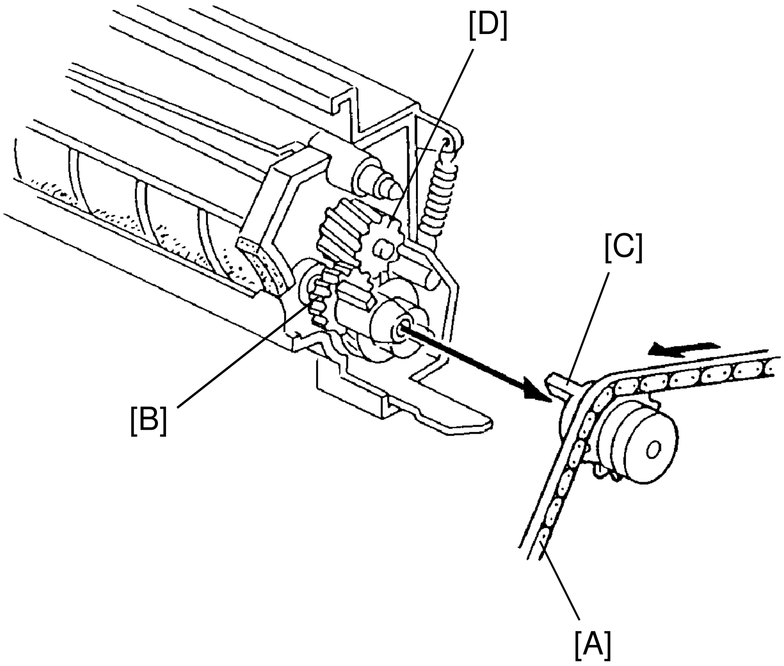
In this model the cleaning brush removes more of the toner than the cleaning blade. This is because it uses electrical as well as mechanical action to remove the toner. The cleaning brush has a positive charge, which it receives from the bias roller [D], and electrically attracts the negatively charged toner.

After picking up the toner, the cleaning brush turns inside the cleaning unit. Just inside the unit, it brushes against a beater bar [E]. The beater bar dislodges paper dust and some of the toner.

Next the cleaning brush brushes against the bias roller. The bias roller, which has a charge of +150 volts, attracts the toner from the cleaning brush. The bias roller blade [F] scrapes the toner from the bias roller and the toner drops on the toner collection coil [G]. The cleaning blade removes the remaining toner.

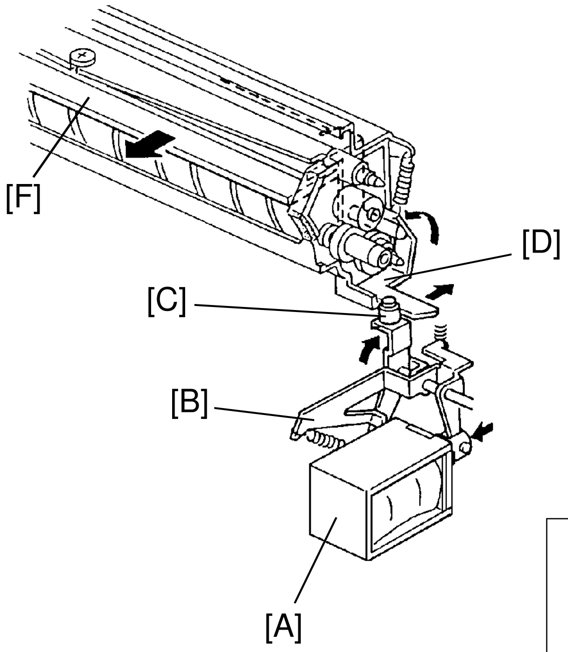
The toner collection coil transports the used toner to the front of the machine where it falls into the used toner bottle.

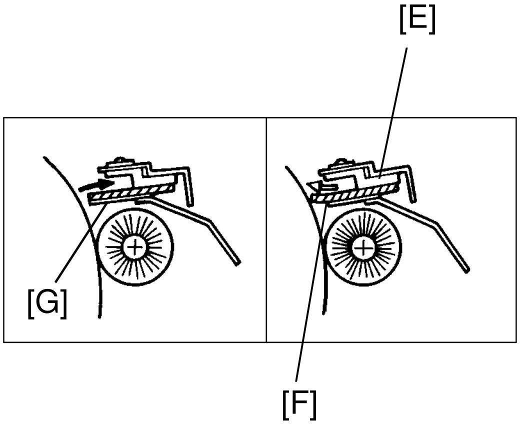
8.2 DRIVE MECHANISM



The main chain [A] drives the cleaning unit when the main motor is on. The brush gear [B] fits into the cleaning drive sprocket. A pin [C] on the inside of the sprocket turns the brush gear by pushing on the tab. The brush gear drives the bias roller gear [D] and the collection coil gear.

8.3 CLEANING BLADE PRESSURE MECHANISM





When the cleaning solenoid [A] turns on, it turns the cleaning solenoid lever [B] clockwise (rear view). The pressure arm [C] turns clockwise and presses the cleaning blade lever [D] as shown above. The cleaning blade holder [E] then rotates and presses the cleaning blade [F] against the drum.

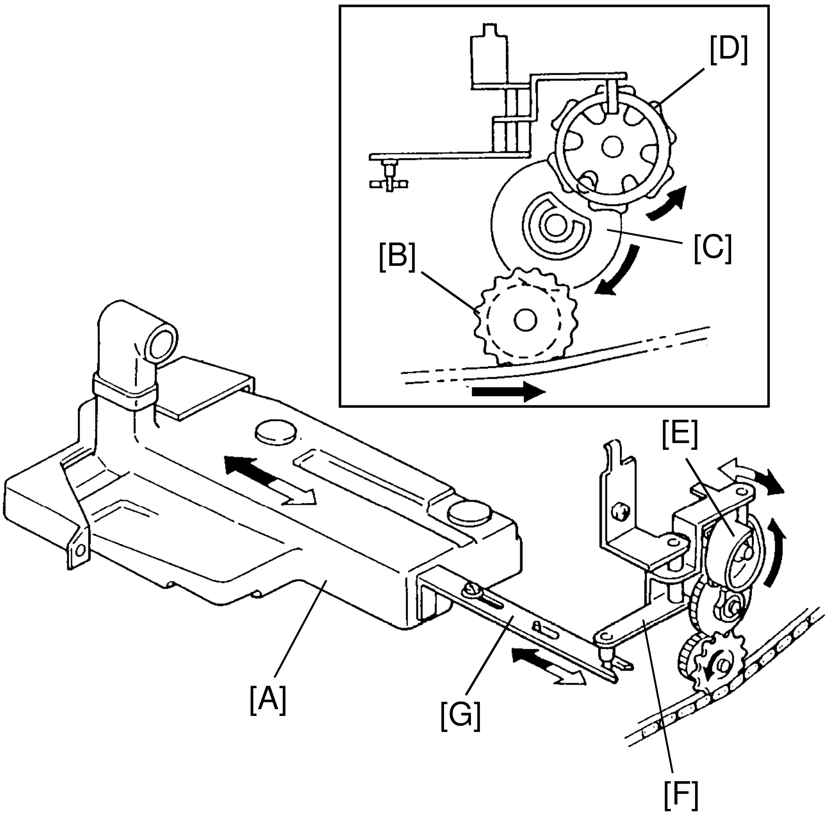
The cleaning blade is mounted by a single swivel screw at its exact center of mass. With this type of mounting the blade sets parallel and applies even pressure automatically. Also since pressure is transmitted in the center, a single pressure spring is used.

The blade scraper [G] contacts the bottom of the cleaning blade. When pressure is applied to the cleaning blade, the blade presses against the drum and bends at its outer edge. When pressure is released from the blade, it snaps back to its original shape. The mylar of the blade scraper then scrapes off the excess toner and paper dust from the edge of the blade.

The cleaning solenoid is deactivated at the following times:

- when the main switch is off
- after every 100 copies
- when the front doors are opened
- after 20 minutes without copy operation

8.4 TONER COLLECTION BOTTLE VIBRATION

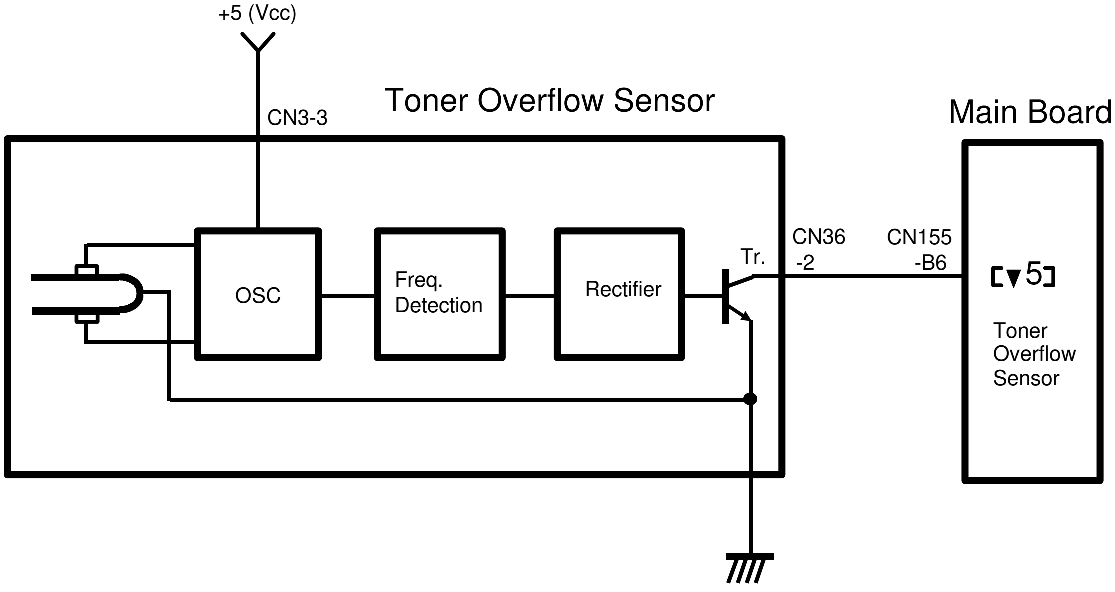


The toner collection bottle [A] is vibrated to prevent toner from building up in one place and activating the toner overflow sensor too early.

The main drive chain turns the drive sprocket [B]. The drive sprocket has a gear on the reverse side which turns the cam drive gear [C]. A pin on the cam drive gear rotates the cam wheel [D]. This wheel has six slots in which the pin catches; so, the cam wheel turns 1/6 of a revolution for each full turn of the cam drive gear.

The cam [E] of the cam wheel pushes the cam lever [F] out as it turns. The pin on the other end of the cam lever pushes the vibration link [G] toward the front of the copier. This link pushes the toner collection bottle against a spring installed inside the bottle cover. When the cam wheel completes one turn, the cam lever is released and the spring pushes the toner collection bottle quickly toward the rear of the copier. This action keeps the toner level inside the toner collection bottle.

8.5 TONER OVERFLOW SENSOR CIRCUIT



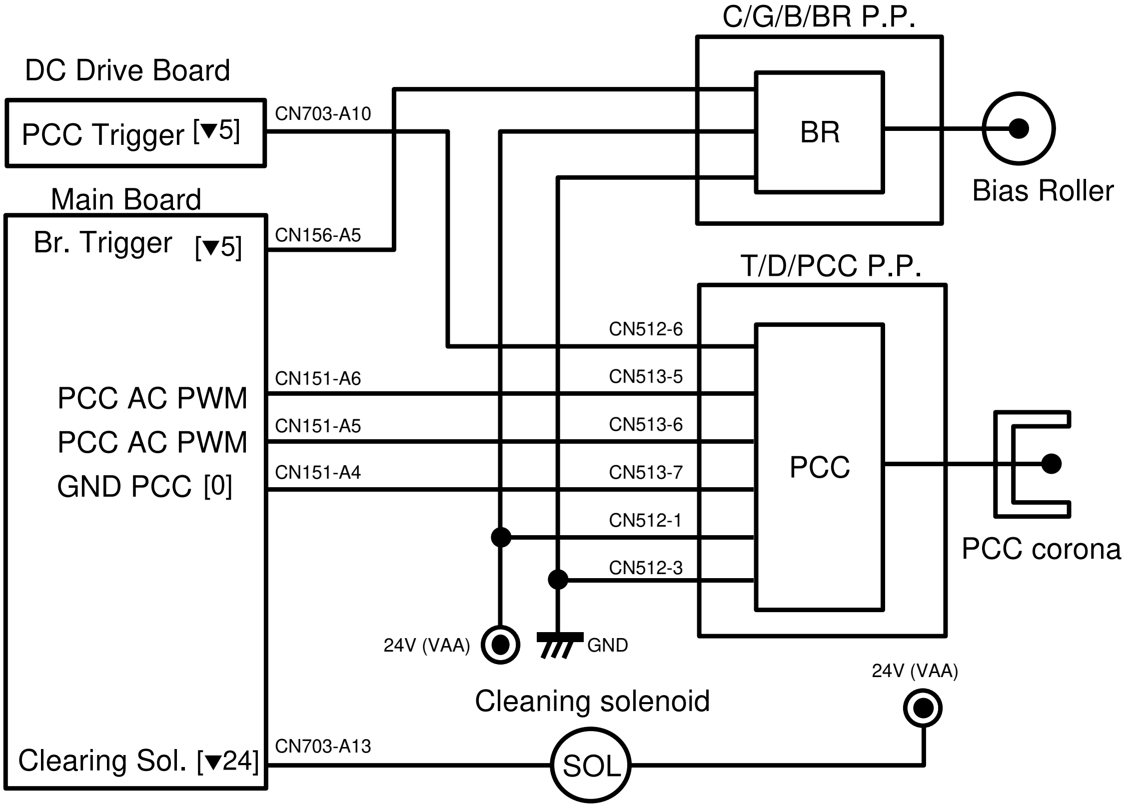
The toner overflow sensor signals the CPU when the toner collection bottle is full.

A tiny tuning fork is used as the sensing element of the toner overflow sensor. This tuning fork is a damping element in a multivibrator circuit. As long as there is nothing in contact with the tuning fork, the vibrating frequency of the circuit stays low and the transistor stays off.

When toner presses against the tuning fork, the resistance of the piezoelectric elements that are in contact with the tuning fork changes and the vibrating frequency increases. The frequency detection circuit passes the higher frequency signal to the rectifier which activates the switching transistor. The transistor sends a LOW signal to CN155-B6.

When the CPU detects this LOW signal, the Used Toner Bottle indicator starts blinking. This is Used Toner Bottle Near Full condition. 2,000 copies (8½" x 11"/A4 size) after the Near Full condition occurs, the Used Toner Bottle indicator stays on and copying is then inhibited. To clear this condition, empty the used toner bottle and set SP7-806 (Used Toner Counter Clear).

8.6 PCC, BIAS ROLLER, AND CLEANING SOLENOID CIRCUITS



8.6.1 PCC and Cleaning Bias

The dc power supply board supplies +24 volts (VAA) to pins 1 and 3 respectively of both the C/G/B/BR power pack and the T/D/PCC power pack. To turn on the cleaning bias, the main board drops CN156-A5 to LOW. The cleaning bias turns on at the same time as the main motor, and it turns off 20 pulses after the trailing edge of the copy paper passes the exit sensor.

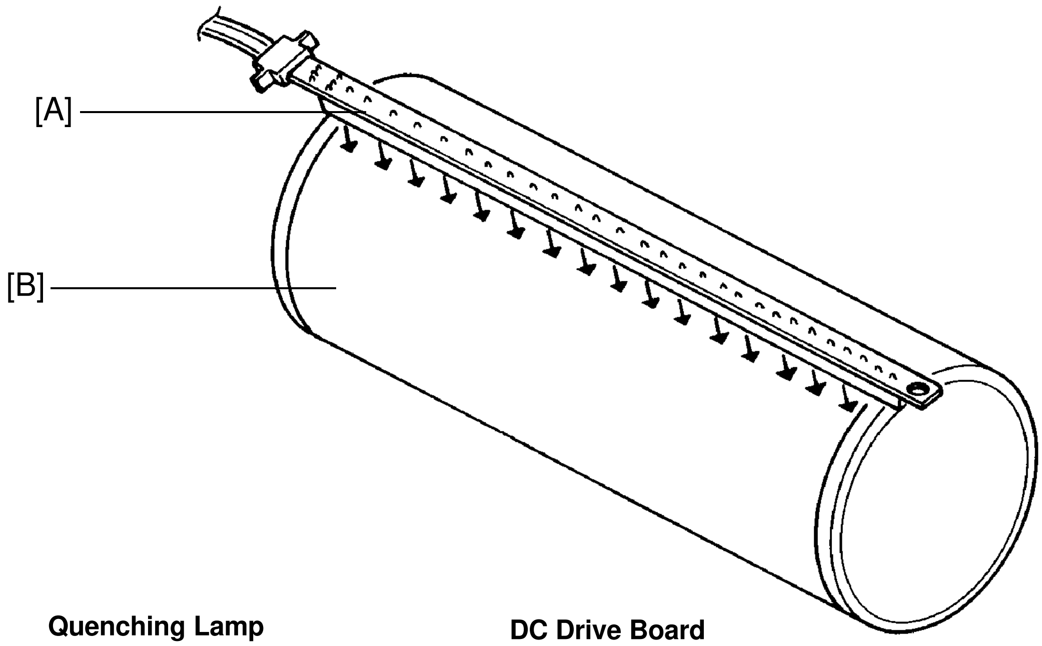
To turn on the pre-cleaning corona, the dc drive board drops CN703-A10 to LOW. CN151-A6 and CN151-A5 on the main board are used for the PWM control for the PCC.
Depending up on the duty of PWM applied, the output can be changed.
(Default AC: 50% duty, 4.0 kV, DC: 40% duty, --90 V)

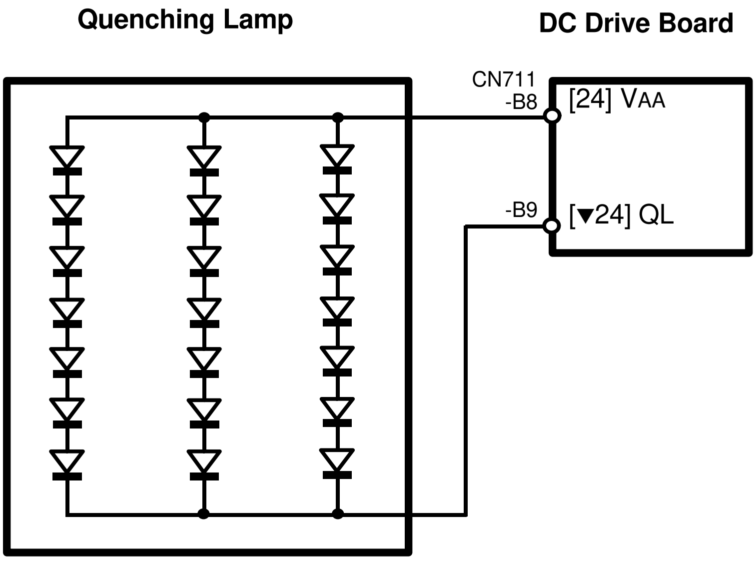
The PCC turns on and off at the same time as the main motor.

8.6.2 Cleaning Solenoid

When the main switch is turned on, the main board drops CN703-A13 to LOW to energize the cleaning solenoid. Twenty minntes after the main motor turns off, this signal becomes HIGH again, turning off the solenoid.

9. DRUM QUENCHING



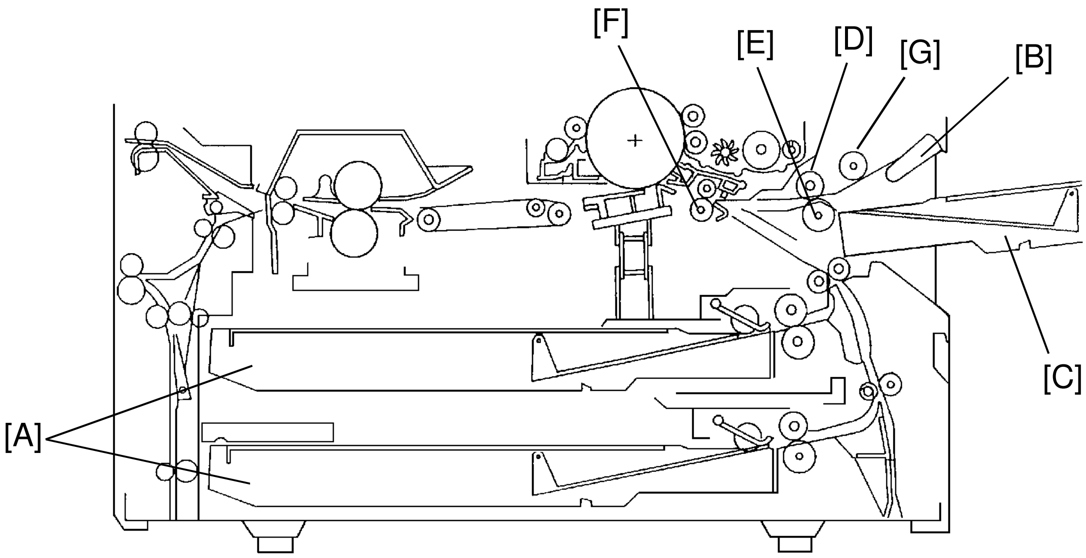


Light from the quenching lamp [A] neutralizes any charge remaining on the drum [B] after drum cleaning.

The CPU turns on the quenching lamp by dropping CN711-B9 to LOW. The quenching lamp turns on and off at the same time as the main motor.

10. PAPER FEED AND REGISTRATION

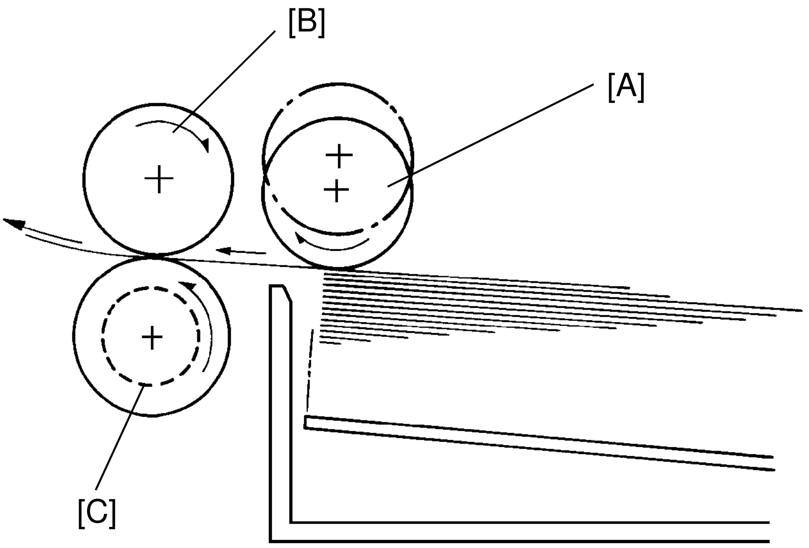
10.1 OVERVIEW



Paper is fed from two paper trays (cassettes [A]), from the manual feed table [B], or the side cassette [C]. The cassettes each hold 250 sheets.

This machine uses a F.R.R. (feed roller [D] and reverse roller [E]) feed mechanism. During paper feed, the top sheet of paper is separated from the stack and fed to the registration rollers [F]. If more than one sheet is fed by the pick-up roller [G], the reverse roller rotates in the opposite direction and prevents all but the top sheet from passing through to the registration rollers.

10.2 FRR FEED SYSTEM



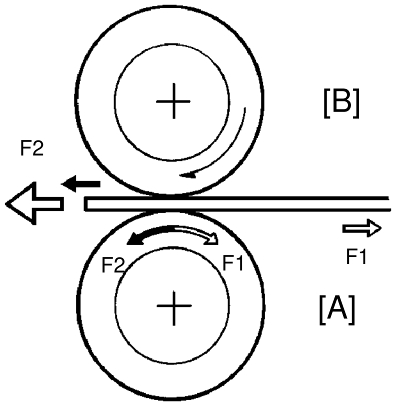
This copier uses an FRR paper feed system which utilizes three rollers.

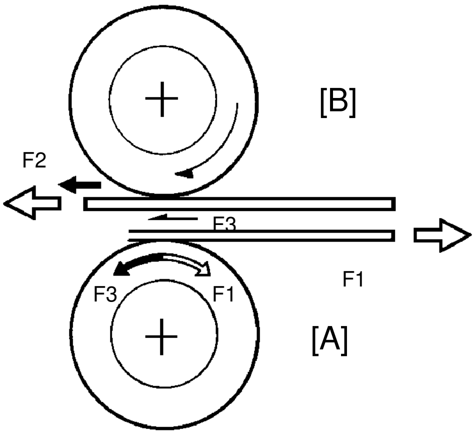
10.2.1 Pick-up Roller

The pick-up roller [A] is not in contact with the paper stack before it starts feeding paper. Shortly after the Start key is pressed, the pick-up roller drops down and feeds the top sheet between the feed [B] and the separation rollers [C]. At almost the same time that the paper's leading edge arrives at the feed roller, the pick-up roller lifts off the paper stack so that it does not interfere with the operation of the feed and separation rollers. The feed and separation rollers then take over the paper feed process.

10.2.2 Feed and Separation Rollers

There is a one-way bearing inside the feed roller so it can turn only in one direction. The separation roller is driven in the opposite direction to the feed roller. The separation roller, however, is driven through a slip clutch (torque limiter clutch) which allows it to turn in either direction depending on the friction between the rollers. A spring keeps the separation roller in contact with the feed roller.



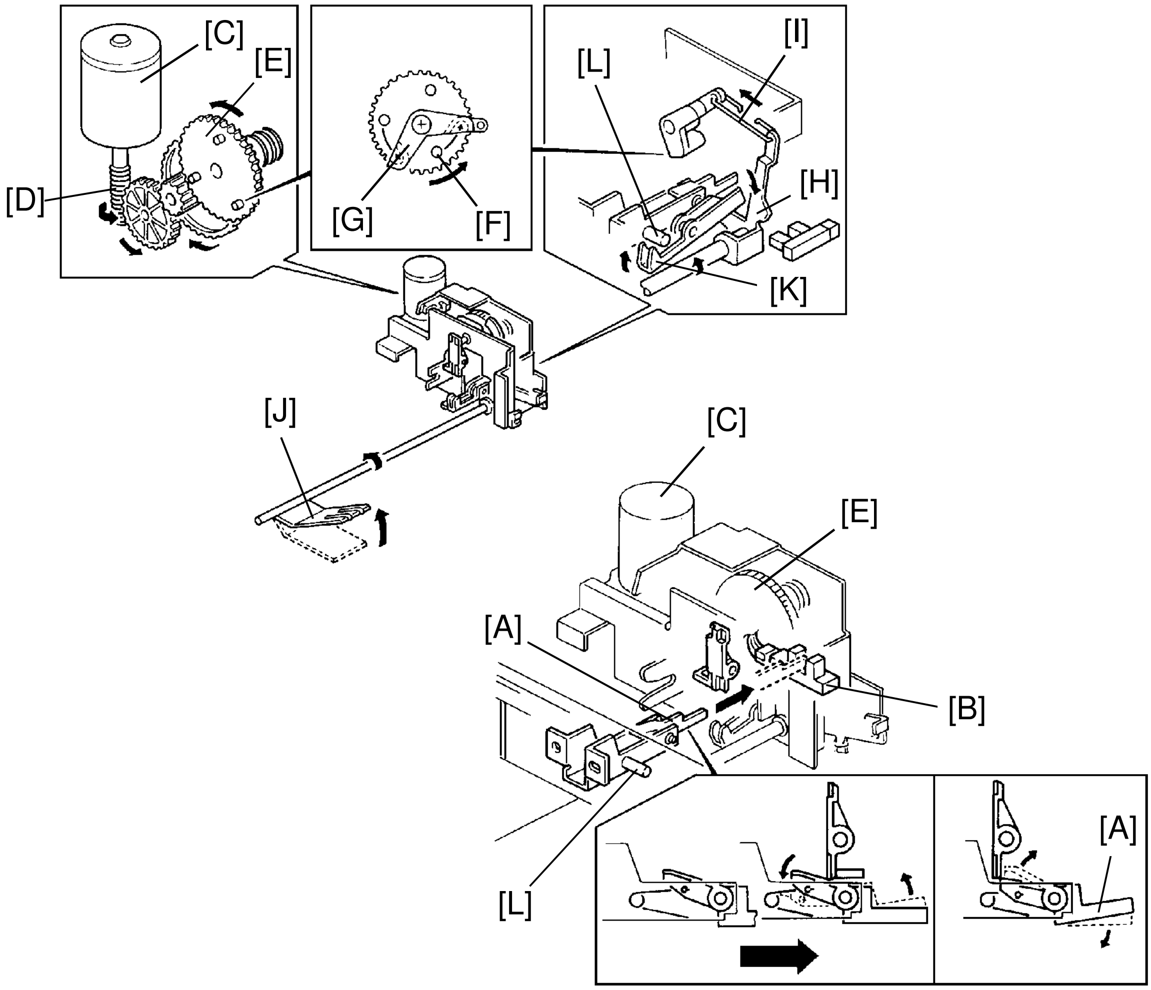


The direction in which the separation roller [A] turns depends on the frictional forces acting on it. The slip clutch applies a constant clockwise force (F1). When there is a single sheet of paper being driven between the rollers, the force of friction between the feed roller [B] and the paper (F2) is greater then F1. So, the separation roller turns counterclockwise.

If two or more sheets are fed between the rollers, the forward force on the second sheet (F3), becomes less than F1 because the friction between the two sheets is small. So, the separation roller starts turning clockwise and drives the second sheet back to the tray.

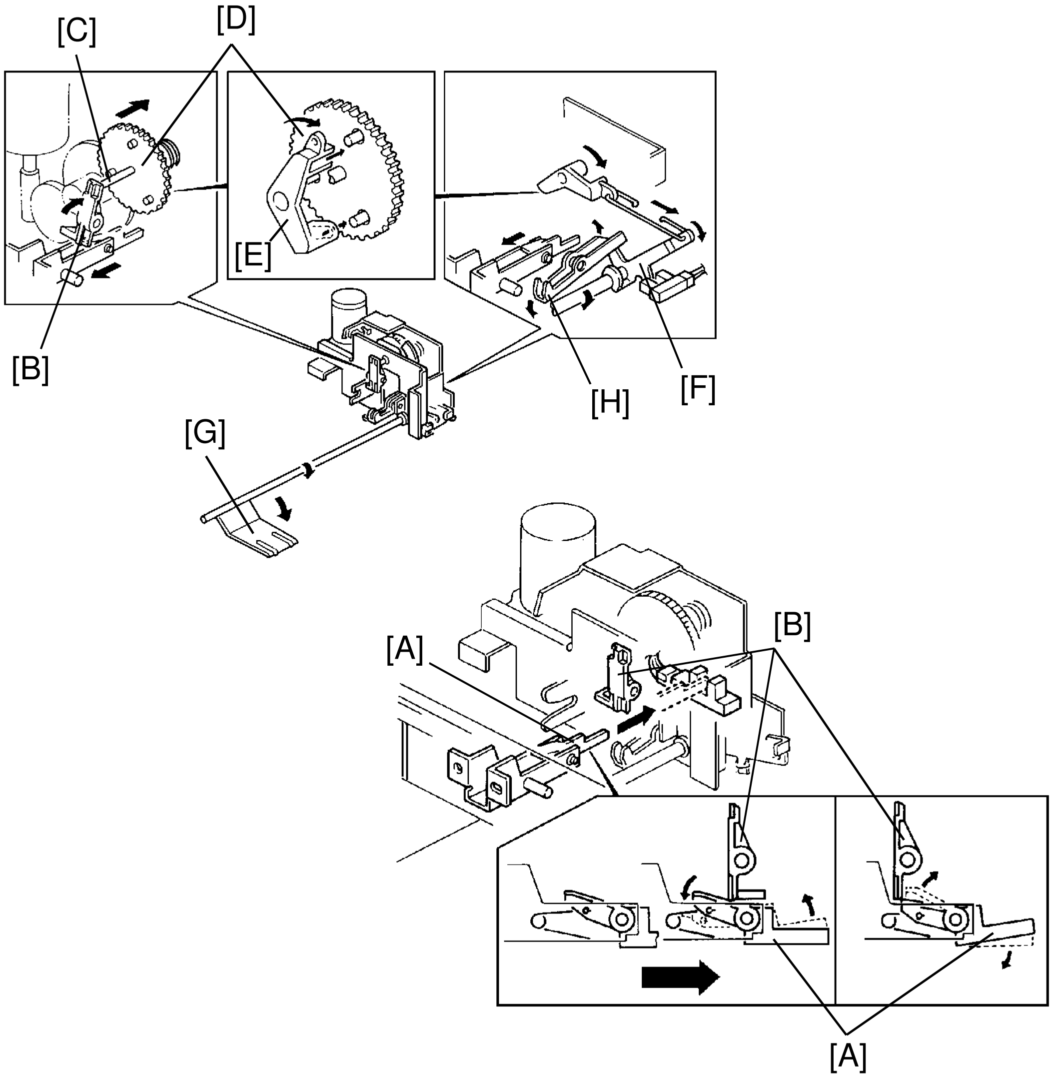
10.3 PAPER LIFT MECHANISM

10.3.1 Paper Tray



-- Up operation --

When the paper tray is set in the copier, the tray set feeler [A] activates the tray set sensor [B] and the tray lift motor [C] starts turning the worm gear[D]. The rotation is transmitted to the tray lift gear [E] via 2 coupled idle gears. The tray lift gear has 3 projections on its disc surface. As the tray lift gear rotates, 2 of the 3 projections are caught by the coupling hooks [F] of the tray lift arm [G]. Then the tray lift arm rotates counterclockwise to pull the tray lift lever [H] via the bottom plate pressure link [I]. The tray lift arm [J] rotates counterclockwise to lift up the tray bottom plate. At the same time, as the tray lift lever rotates, the tray lock lever [K] rotates up by its own weight and is located at the safety lock position against the tray lock pin [L]. When the actuator on the pick-up roller shaft activates the upper limit sensor, the tray lift motor stops.

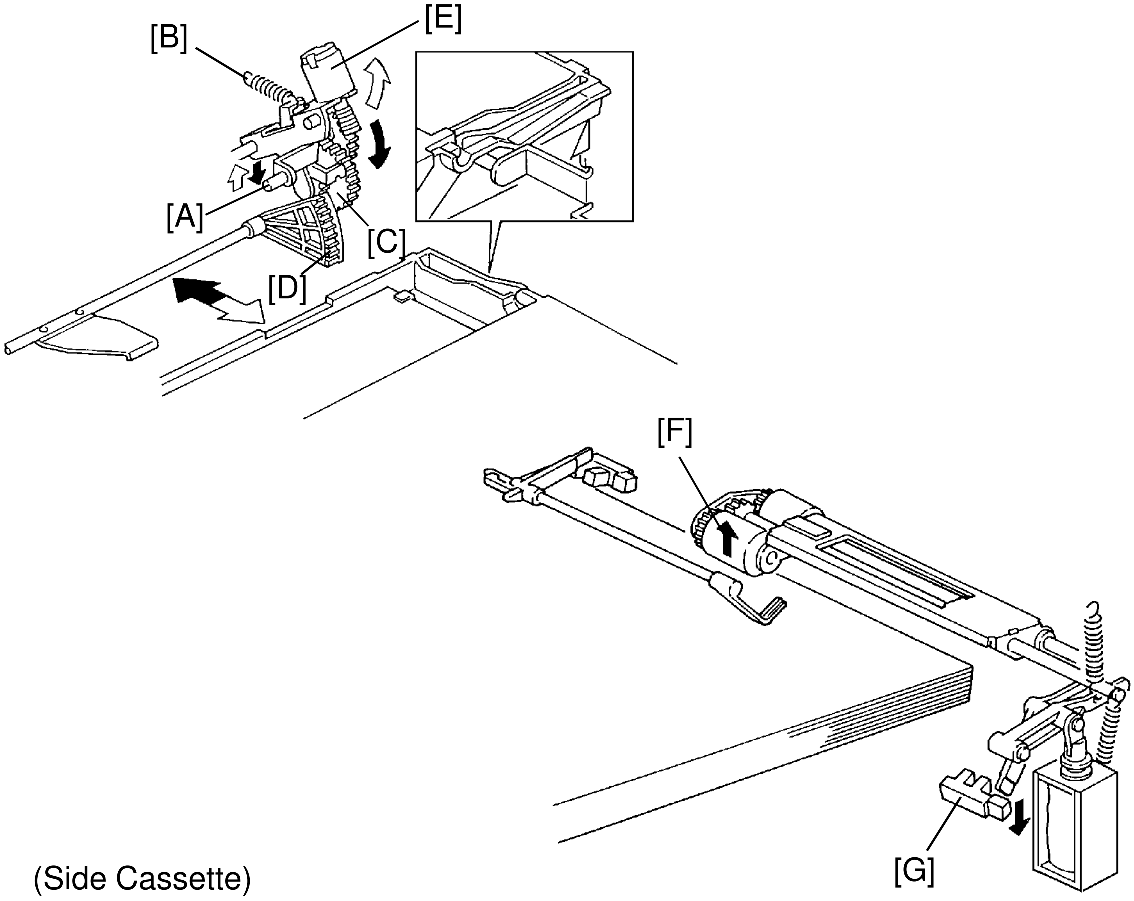


-- Down operation --

While the paper tray is being set in position, the operator side of the tray set feeler [A] is pushed down by the tray release lever [B]. When the tray is completely set in position, the operator side of the tray set feeler rotates up and is positioned behind the tray release lever.

When the paper tray is pulled out, the operator side of the tray set feeler pulls the bottom end of the tray release lever. The tray release lever rotates and its upper end pushes back the tray lift gear shaft [C] which is pressed towards the front by the spring. As the coupling between the tray lift gear [D] and the tray lift arm [E] is released, the tray lift lever [F] rotates back to its lower position by the lever return spring and the weight loaded to the tray lift arm [G]. As the tray lift lever rotates back, it lifts the rear end of the tray lock lever [H] to move it away from the safety lock position.

10.3.2 Side Cassette



(Side Cassette)

-- Up operation --

When the side cassette is inserted into the copier, the cassette actuator pin [A] is pushed down by the cassette. The lift motor unit then mechanically pivots clockwise at point [B] so that the lift gear [C] engages with the sector gear [D].

Simultaneously, the paper size actuator plate actuates the paper size sensor. The CPU then detects that a cassette has been inserted and turns on the lift motor. The lift motor [E] raises the bottom plate until the top sheet pushes up the pick-up roller [F].

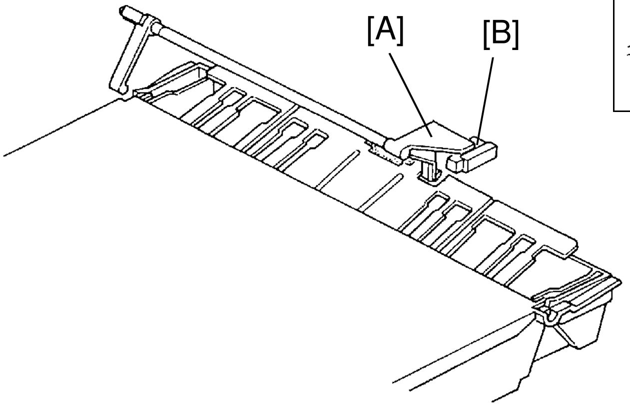
When the paper pushes up the pick-up roller, the lift sensor [G] is de-actuated and the CPU turns off the lift motor.

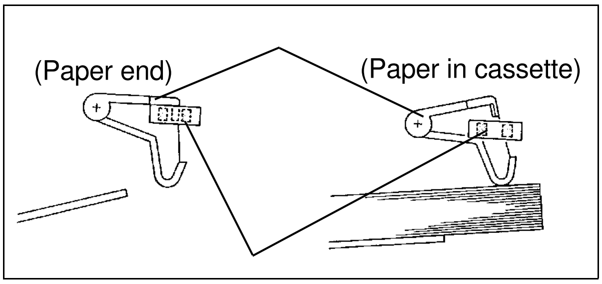
-- Down operation --

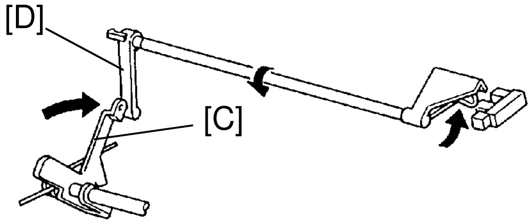
When the side cassette is pulled out, the actuator pin is released and then the lift motor unit is dis-engaged from the sector gear. The cassette arm is lowered by its own weight.

10.4 PAPER END DETECTION

10.4.1 Paper Tray



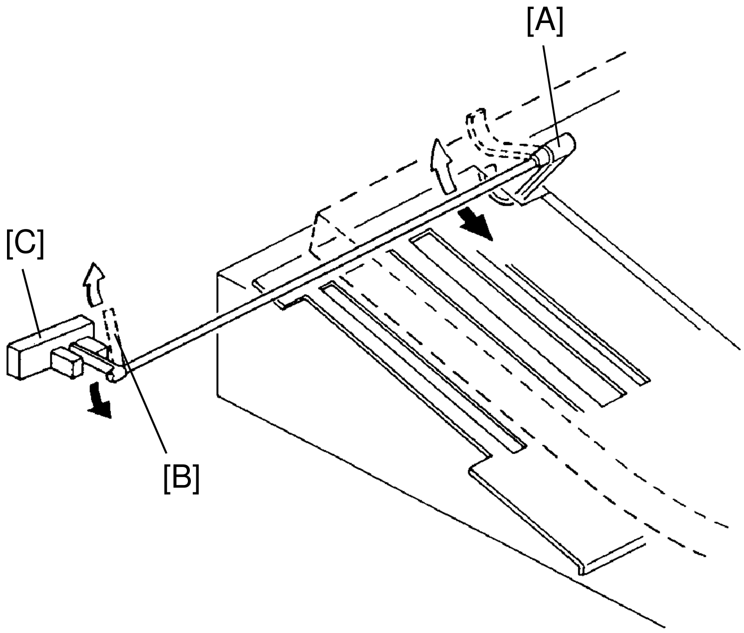




When a cassette runs out of paper, the paper end feeler [A] drops through a slot in the bottom plate and pivots into the sensor [B] (photointerrupter). The sensor then provides a LOW signal to the dc drive board, informing it that the cassette is empty. The Add Paper indicator then turns on, the Start key turns red, and the machine stops after the copy is finished.

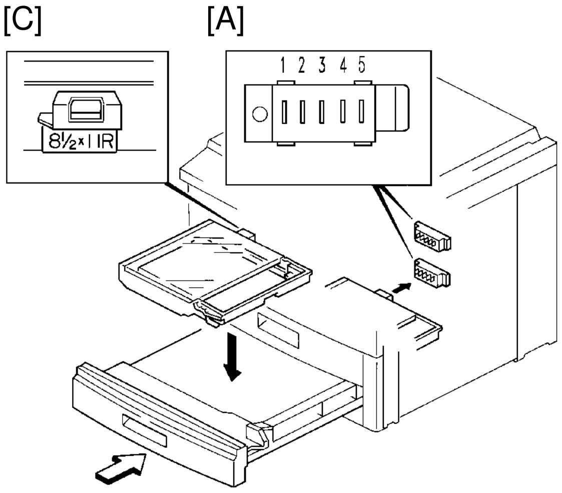
When the tray is pulled out, the paper end feeler may hit the tray cassette. To prevent this, the tray lift lever [C] pushes the paper end release lever [D] down, so that the paper end feeler is hidden (lifted up) into the copier.

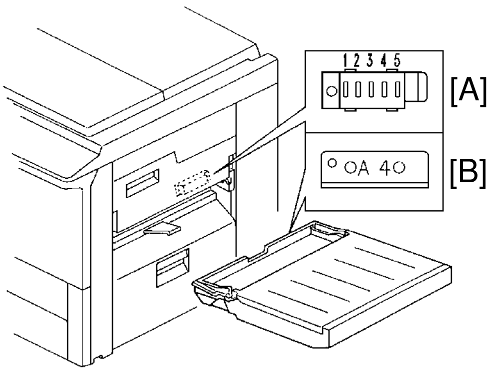
10.4.2 Side Cassette



When a side cassette runs out of paper, the paper end feeler [A] drops through a slot in the bottom plate, the paper end actuator [B], which is on the same shaft with the paper end feeler, pivots into the sensor [C] (photo interrupter).

10.5 PAPER SIZE DETECTION





Paper Size Detection Table

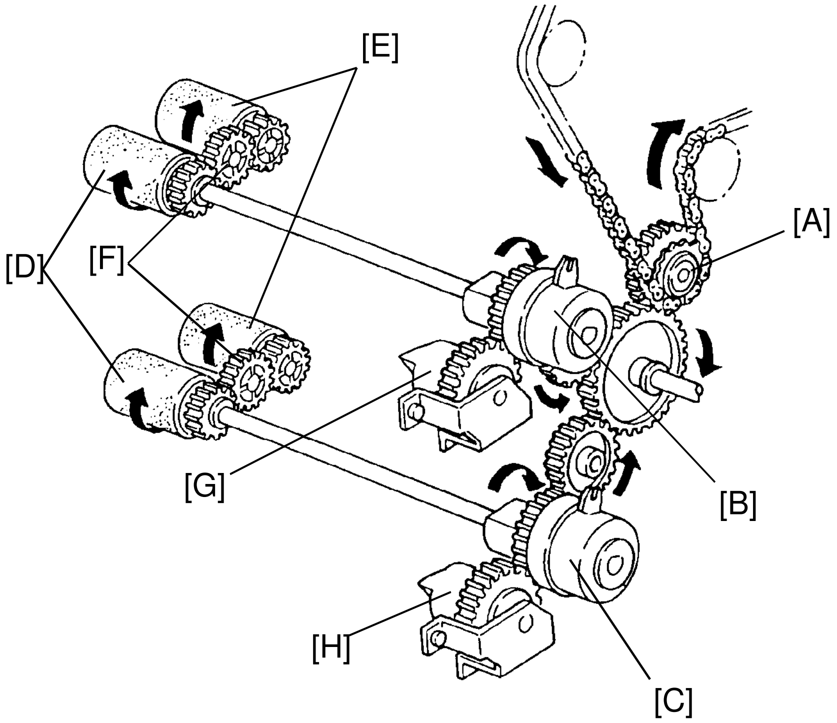
Paper Size	Sensor No.					Operation Panel Indicator	
	1	2	3	4	5	220V	115V
A3	1	0	0	0	0	A3	*
B4	1	1	0	0	0	B4	*
A4 sideways	0	0	1	0	0	A4 ▯	*
A4 lengthwise	1	0	1	0	0	A4 ▭	*
A5 sideways	0	1	1	0	0	A5 ▯	*
A5 lengthwise	1	0	0	1	0	A5 ▭	*
11"x17"	0	0	0	0	1	*	11x17 ▭
11"x8½"	1	0	0	0	1	*	8½x11 ▯
8½"x14"	0	0	1	0	1	*	8½x14 ▭
8½"x11"	0	1	1	0	1	*	8½x11 ▭
8½"x5½"	1	1	1	0	1	*	5½x8½ ▯
5½"x8½"	0	0	1	1	1	*	5½x8½ ▭
F	1	0	0	1	1	*	F ▭
F4	1	0	1	0	1	*	F4 ▭
No cassette	1	1	1	1	1		

1: Not actuated/Low (0V) 0: Actuated/High (5V)

The paper size sensor [A] in the cassette entrance detects the paper size. The paper size sensor has five microswitches inside. The paper size sensor is actuated by a paper size actuator [B] (side cassette) and a paper size plate [C] (paper tray). Each paper size has its own unique combination of notches in the plate. The dc drive board receives a LOW signal from the microswitches activated by the actuator and determines which cassette was inserted.

10.6 PAPER FEED DRIVE (1st and 2nd Feed Station)

10.6.1 Paper Feed and Pick-up Rollers



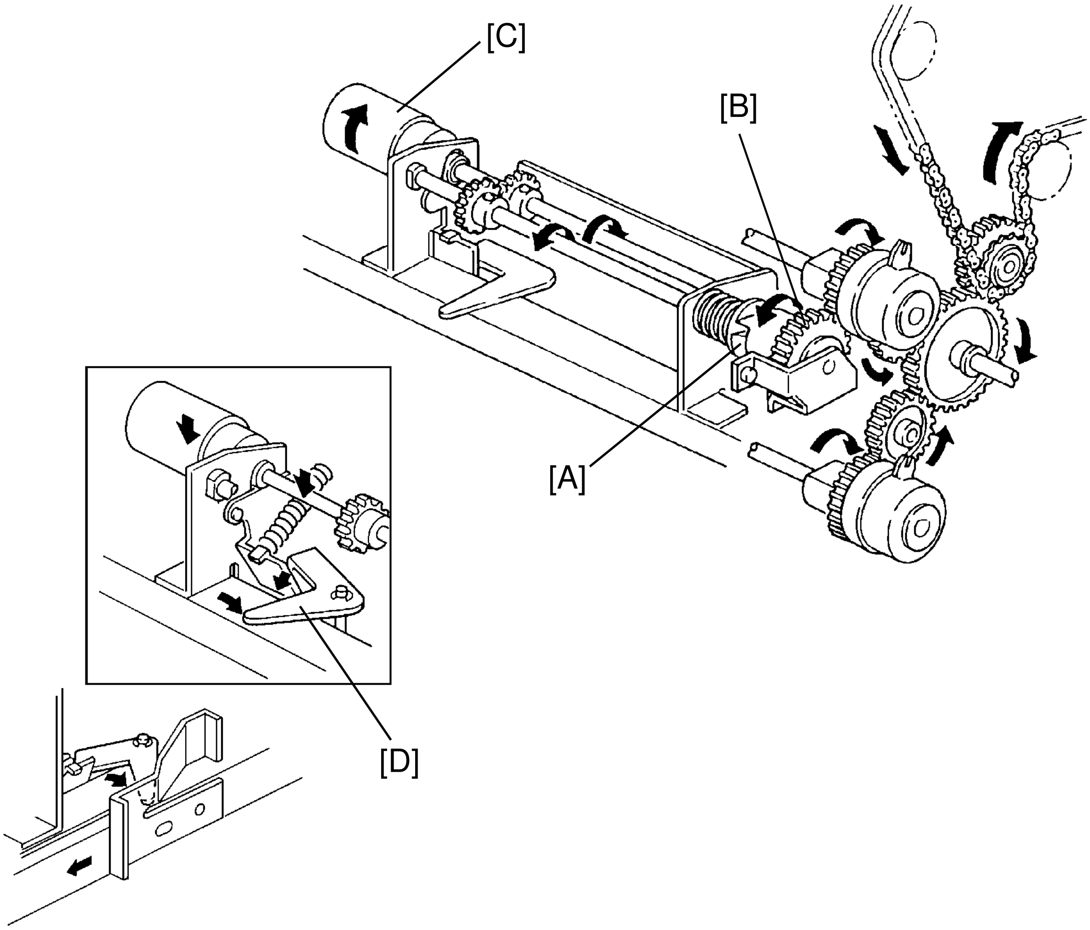
The main drive chain turns the paper feed drive sprocket [A]. A gear on the inside of the sprocket turns three idle gears, which turn the first [B] and second [C] paper feed clutch gears.

The dc drive board starts paper feed by energizing the appropriate paper feed clutch (magnetic clutch). Drive then passes through the clutch to the feed roller shaft, and the paper feed roller [D] starts turning.

The pick-up roller [E] rotates in the same direction as the paper feed roller through the idle gear [F].

This drive is also transmitted to the first [G] and the second [H] reverse roller drive gears.

10.6.2 Reverse Roller



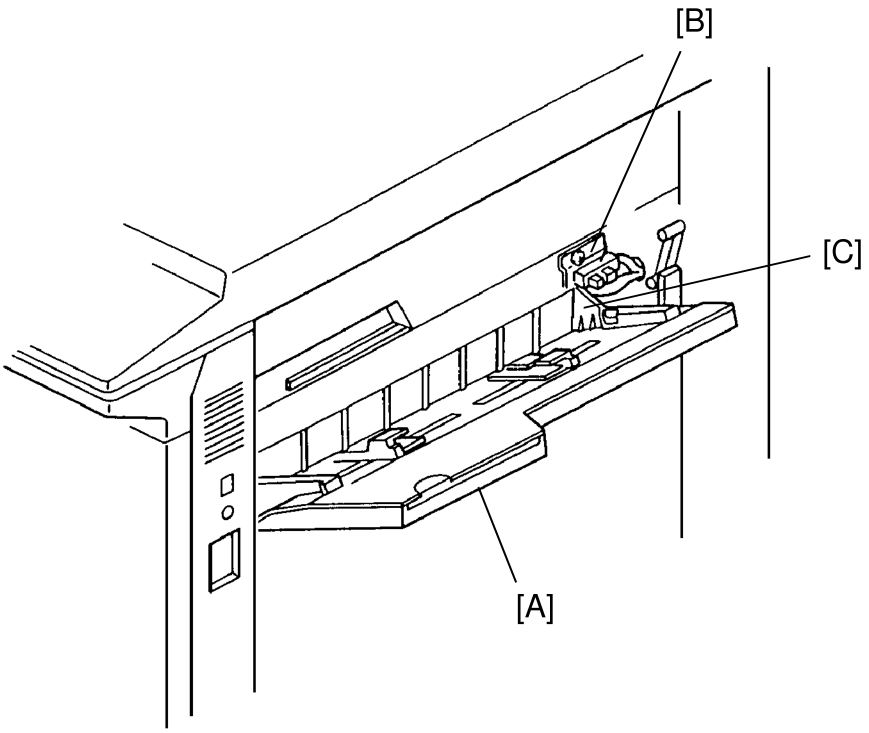
(Reverse Roller)

The reverse roller assembly is assembled in the paper tray. When the paper tray is set in the copier, the gear [A] on the reverse roller drive shaft couples with the reverse roller drive gear [B]. The drive is then transmitted to the reverse roller [C].

When the paper tray is pulled out, the reverse roller release lever [D] rotates back to the original position. The reverse roller is lowered. This prevents the reverse roller from being damaged.

10.7 MANUAL FEED TABLE

10.7.1 Manual Feed Table Mechanism

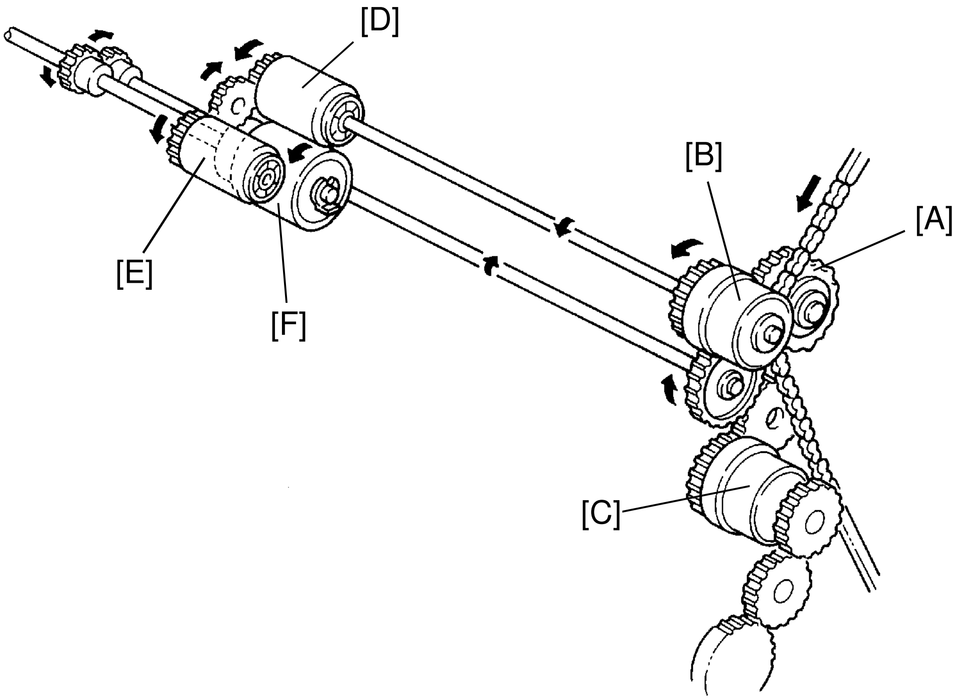


The manual feed table [A] uses the FRR feed system for feeding non-standard sized paper, thick paper, and application paper such as OHP sheet, translucent paper, etc.

When the manual feed table is opened, the manual feed table sensor [B] is activated by the manual feed side plate [C]. Then the CPU lights the manual feed indicator on the operation panel.

On this model, opening the manual feed table does not shift the mode into the interrupt mode. The selected modes and input data from before opening the manual feed table remain. Also other paper trays can be selected while the manual feed table is open.

10.7.2 Feed Drive Mechanism (Side Cassette and Manual Feed Table)

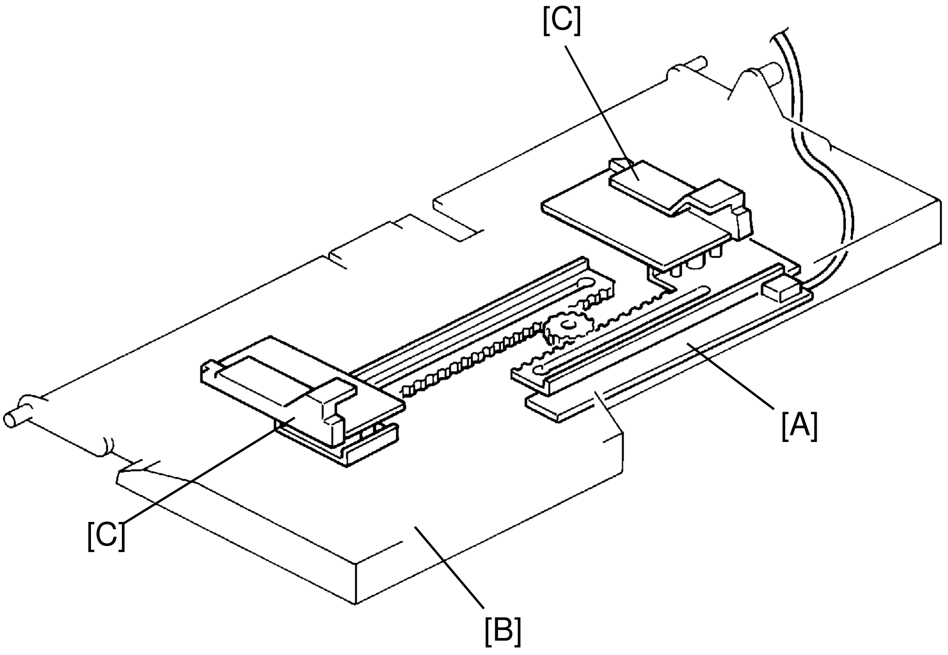


The main drive chain turns the side (cassette) paper feed drive sprocket [A]. A gear on the inside of the sprocket turns the idle gears, which turn the side paper feed clutch [B] and the first relay clutch gear [C].

When the dc drive board starts paper feed by energizing the side paper feed clutch, the drive passes through the clutch to the feed roller shaft, and the paper feed [D] and pick-up roller [E] start turning.

The reverse roller [F] is rotating whenever the main motor is turning.

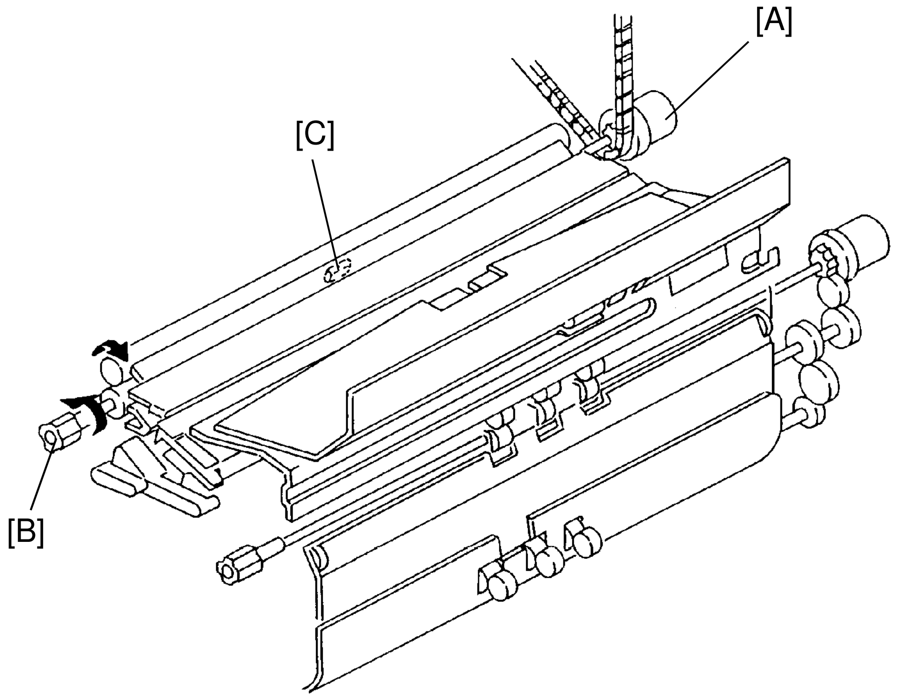
10.7.3 Manual Feed Paper Width Detection



In manual feed mode, the CPU needs paper width data in order to decide the drum exposure area on the main scan direction.

The paper width switch [A] is a slide switch, that is located inside the manual feed table [B]. It measures the width of paper fed manually. This switch has four contacts which are connected to ground by a slide. The slide moves when the user positions the manual feed guides [C] against the paper, and the CPU determines the paper width based on the information from the dc drive board which of the contacts is grounded. By switching SP5-112-2 (Non-standard Size Manual Feed Copy) to 1: yes, the customer can inform the CPU of any paper width data through the operation panel.

10.8 REGISTRATION

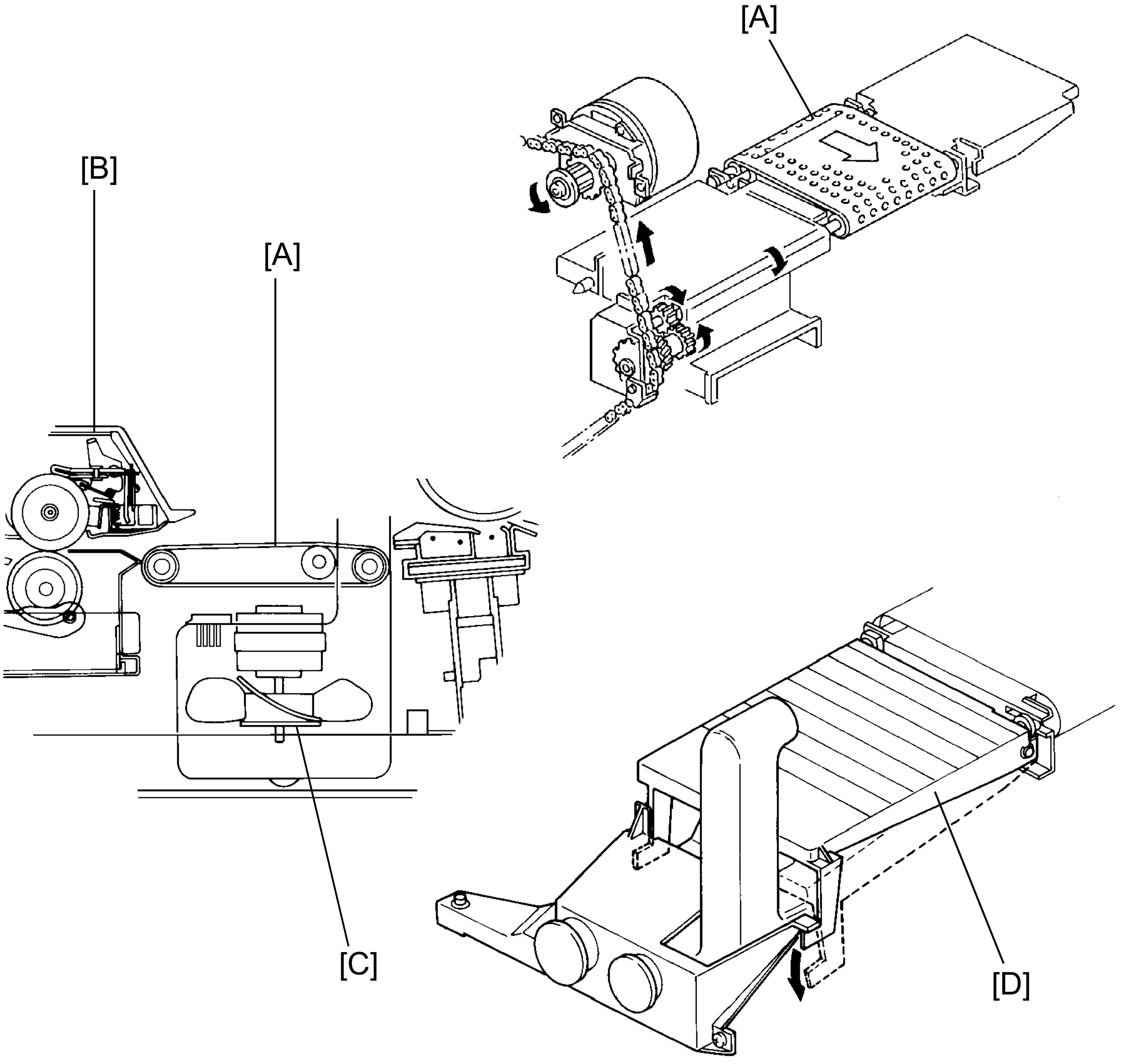


The registration clutch [A] is located on the lower registration roller shaft. When the dc drive board energizes the registration clutch, the rotation is then transmitted to the lower registration roller [B].

The registration sensor [C] is positioned just before the registration rollers. The dc drive board turns off the side paper feed clutch 8 pulses after and the 1st relay clutch 13 pulses after the registration sensor detects the leading edge of the copy paper.

This delay allows time for the paper to press against the registration rollers and buckle slightly to correct skew.

11. PAPER TRANSPORT



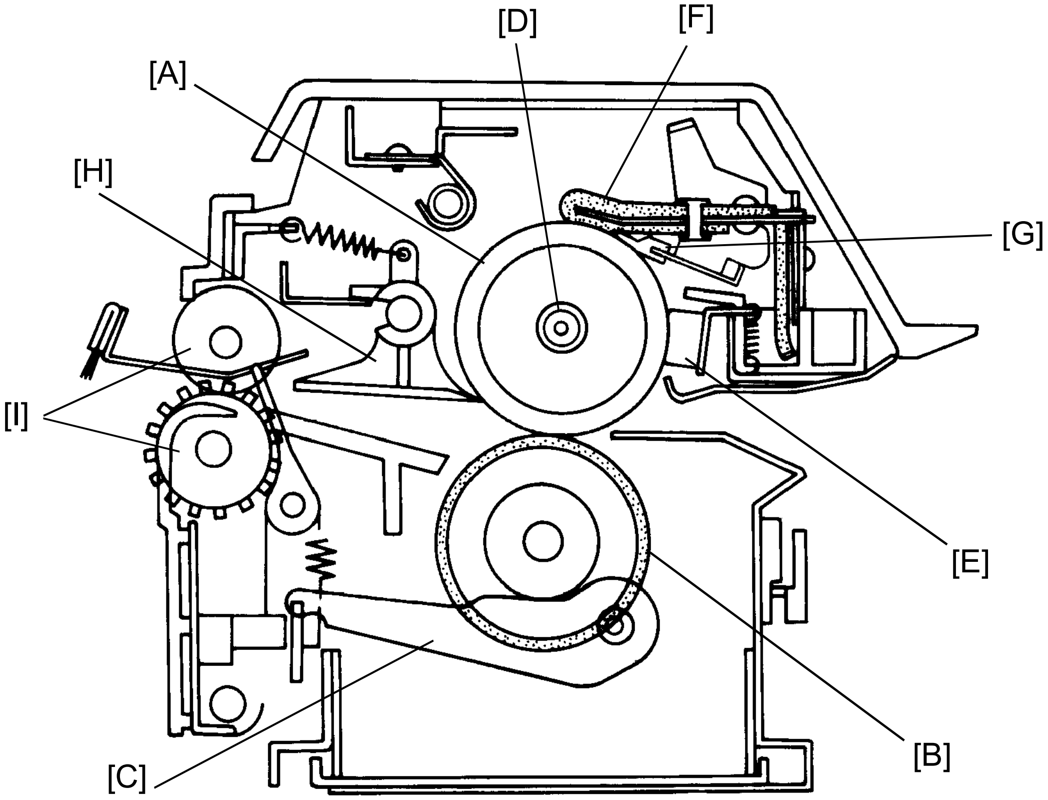
After the copy paper separates from the drum, the transport belt [A] advances it to the fusing unit [B].

A vacuum fan [C] holds the paper firmly against the belt so there is enough friction between the paper and the belt for smooth transport. The transport belt is directly gear driven (no clutch); so, it turns constantly when the main motor is on.

The front part of the transport unit [D] is hinged and can be pressed down for easy jam removal.

12. IMAGE FUSING

12.1 OVERVIEW



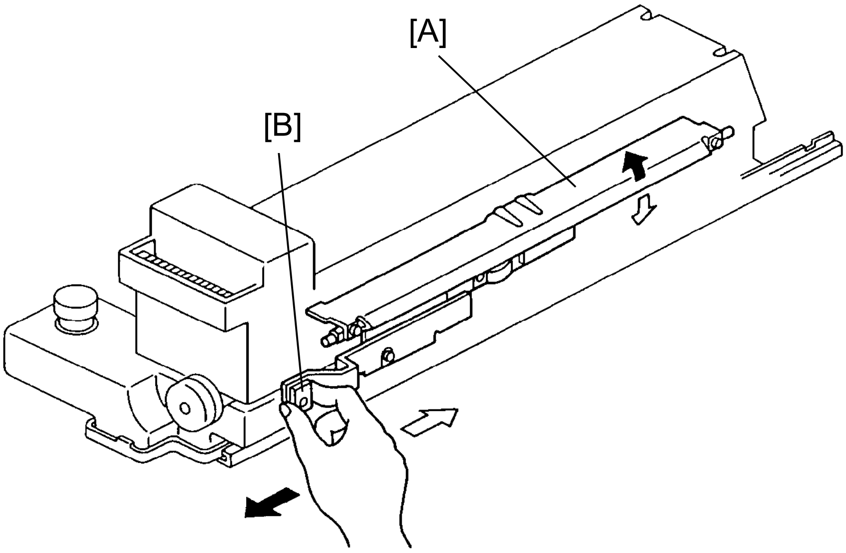
Two rollers fuse the image to the copy paper by applying heat and pressure. The hot roller [A] is made of carbon-teflon and the pressure roller [B] is made of silicone rubber. Pressure is constantly applied by the pressure lever [C]. There is no pressure release mechanism. Pressure is adjustable to correct for creasing or incomplete fusing.

The fusing lamp [D], which is located at the hot roller axis, is turned on and off to maintain the operating temperature. The temperature control circuit (on the main board) monitors the hot roller surface temperature through a contact type thermistor [E].

The oil supply pad [F] applies silicone oil to the hot roller. The oil blade [G] then spreads the oil evenly across the hot roller. The oil reduces the adhesion between paper and the hot roller (reducing misfeeds), reduces paper curl, and helps to keep the roller clean by reducing the amount of toner transferred to the hot roller surface. The oil supply pad also cleans the hot roller.

The hot roller strippers [H] separate the copy from the hot roller and direct it to the fusing exit rollers [I].

12.2 ENTRANCE GUIDE

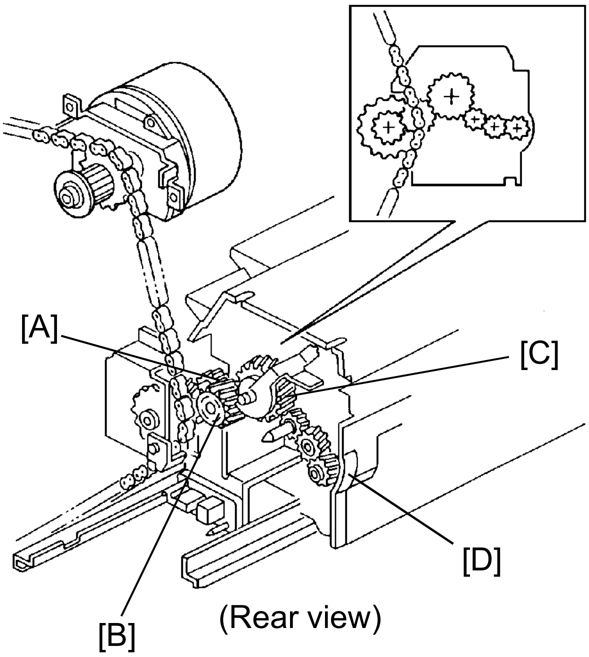


The lower entrance guide [A] is normally set in down position. In this position, the paper will be in contact with the lower area of hot roller, resulting in smooth paper path with less paper buckling.

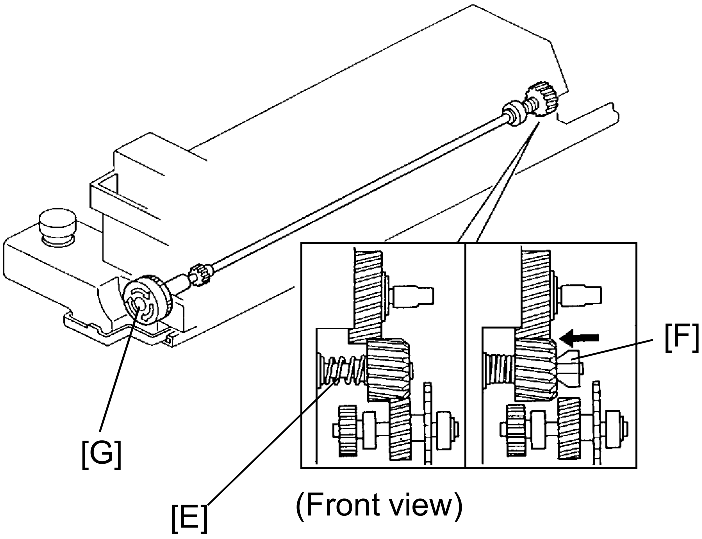
When the knob [B] is set in the front position, the guide goes down as shown in white arrows. In this optional position, contact point of paper against the hot roller goes up, give more paper buckling to correct paper skew. Therefore, this position is effective when:

1. Paper creasing occurs especially with thin paper.
2. Toner image on thin paper is rubbed by the upper guide ribs on the fusing unit cover, resulting in black line on the latter half of paper.

12.3 FUSING DRIVE MECHANISM



(Rear view)



(Front view)

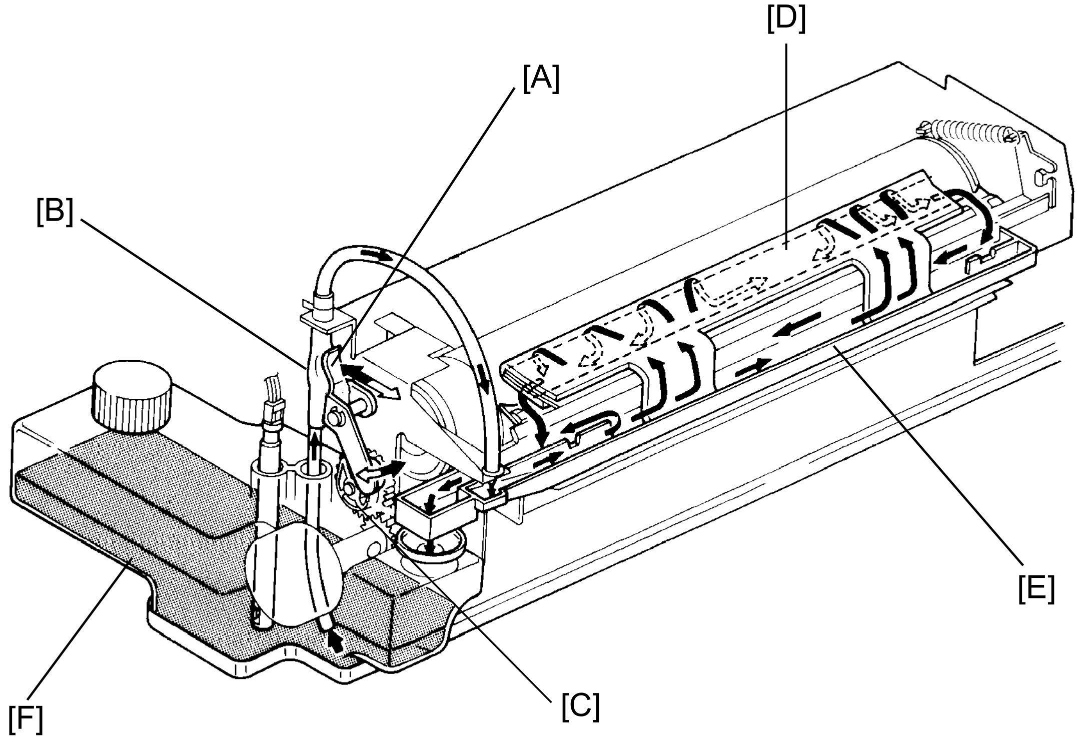
The fusing drive gear [A] turns the release gear [B] which drives the hot roller gear [C]. Rotation passes from the hot roller gear through two idle gears to the exit roller gear [D]. The pressure roller is driven by the hot roller.

The release gear spring [E] allows the release gear to move in and out. This prevents the gears from being damaged if they should not engage correctly when the fusing unit is set.

Release cam [F] fits in the release gear, which has a matching cam surface inside. When the fusing knob [G] is turned, the release cam rotates and forces the release gear inward.

This disengages the release gear from the fusing drive gear [A] so that the fusing rollers turn easily.

12.4 OIL SUPPLY AND CLEANING



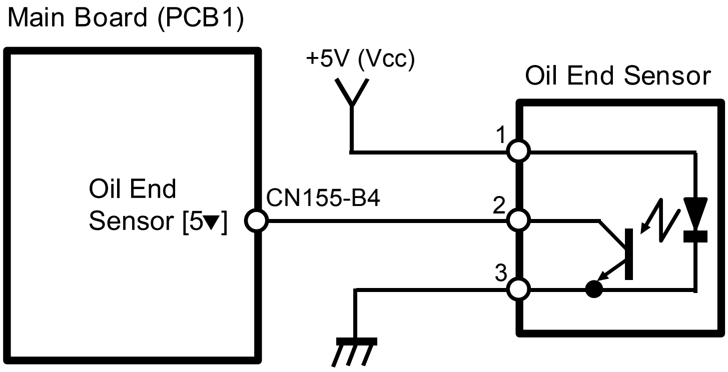
Silicone oil is applied to the hot roller to help prevent toner and paper from sticking to the hot roller, to reduce paper curl, and to help in roller cleaning.

A small one-way valve pump moves the oil from the oil tank (capacity 580 cc) to the oil sump. The oil pump lever [A] alternately presses and releases the rubber sleeve [B] between the valves as the oil cam [C] turns.

The oil supply pad [D] then applies the oil to the hot roller as it turns. The oil blade spreads and levels the oil on the hot roller. Excess oil flows along the blade toward the ends of the roller. At the ends, oil skimmers scrape off the excess oil and return it to the oil sump [E]. Oil flows out through a hole in the bottom of the oil sump and returns to the oil tank [F].

The oil supply pad both distributes oil to the hot roller and removes toner and foreign matter from the hot roller surface.

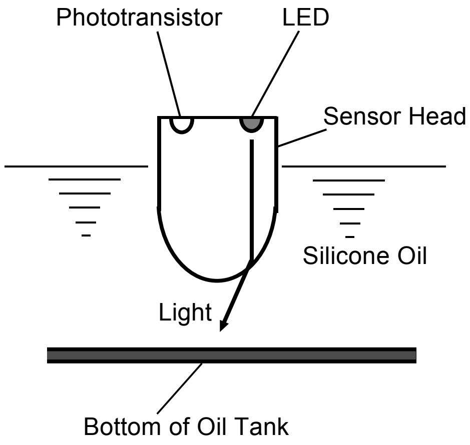
12.5 OIL END SENSOR

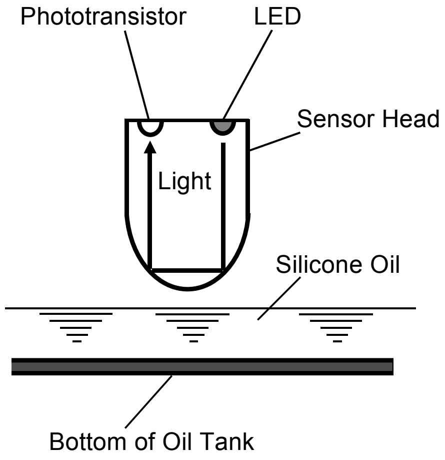


Oil end detection is based on the difference between the index of refraction of air and that of silicone oil. The index of refraction of silicone oil is very near that of the sensor casing. So, when oil covers the sensor, light from the LED is only refracted slightly at the boundary between the casing and the oil, and the phototransistor stays off.

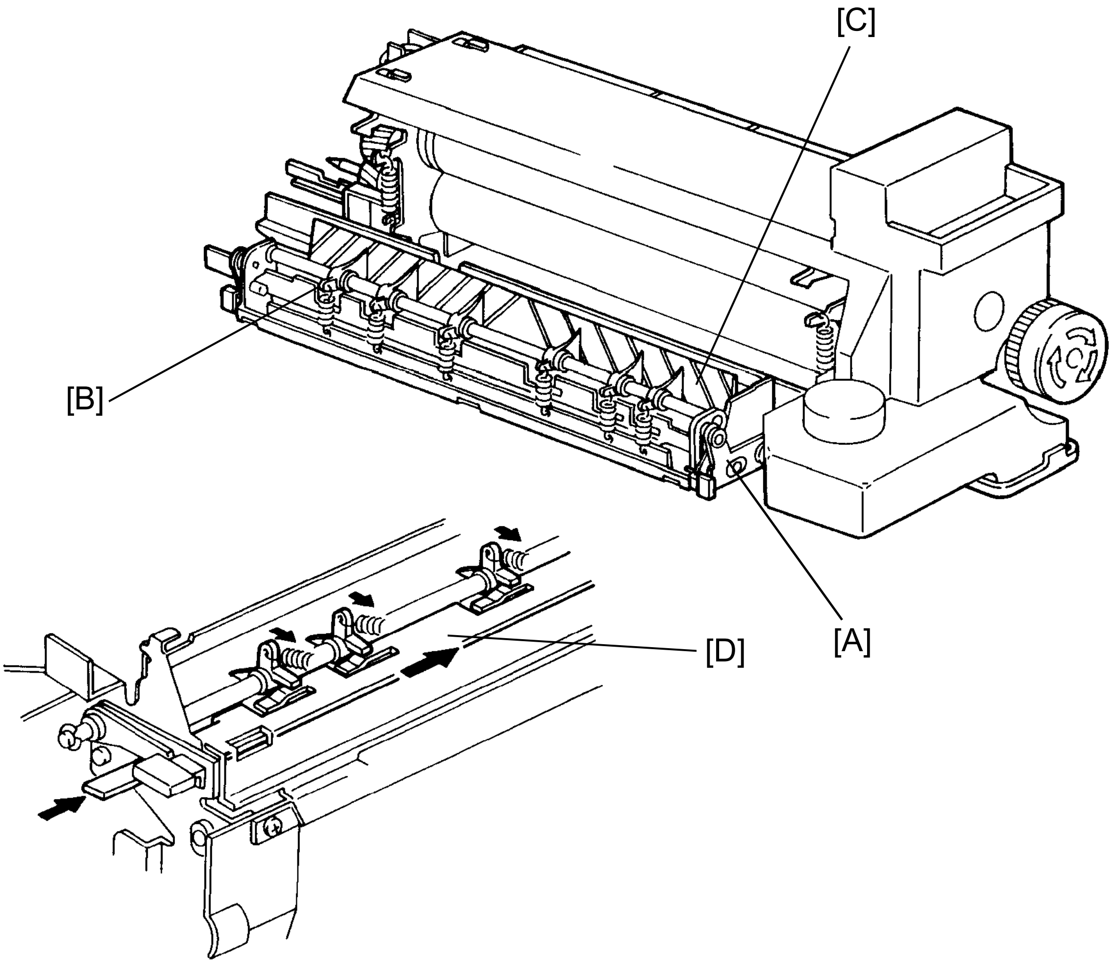
However, the index of refraction of air is much lower than that of oil. As a result, light from the LED reflects instead of refracting when it strikes the air–casing interface. The reflected light turns on the phototransistor.

When the phototransistor turns on, CN155-B4 of the main board changes from a 5-volt pulse to 0 volt. This informs the CPU that silicone oil needs to be replenished. The start key will turn red, the add oil icon will light and the display will read "add oil".





12.6 FUSING EXIT ASSEMBLY



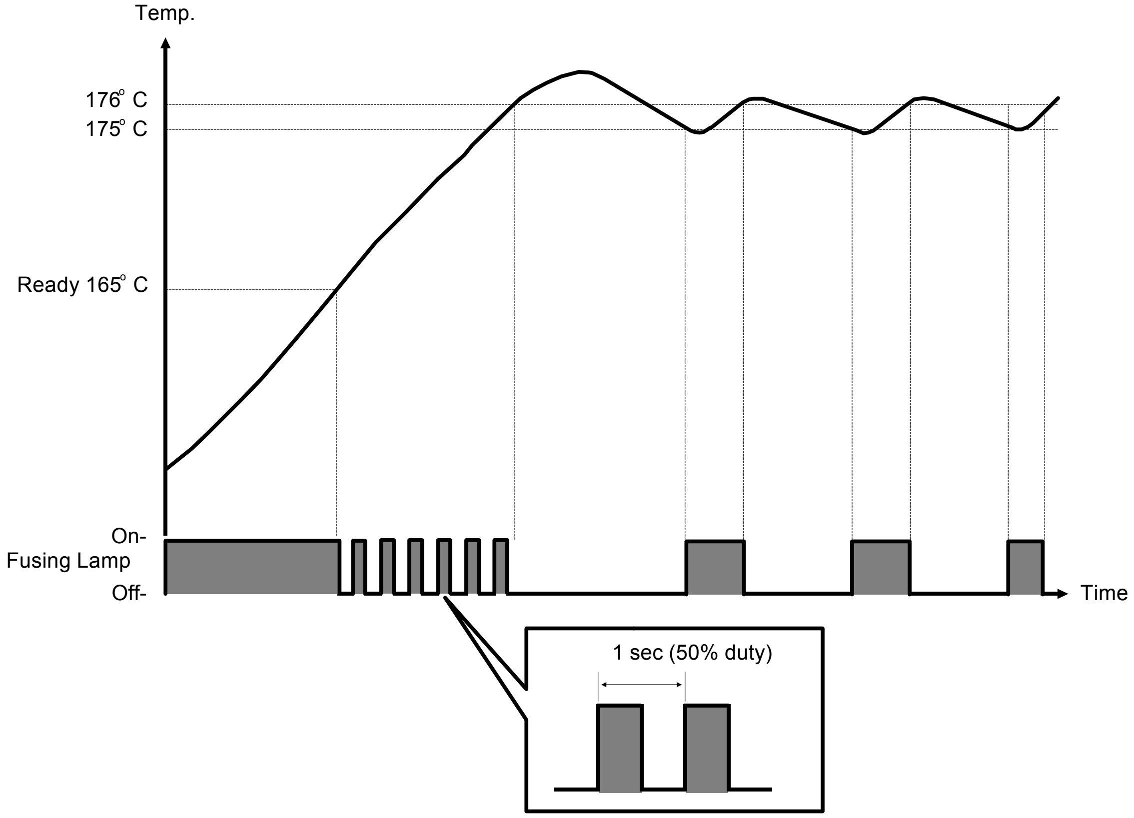
The fusing exit assembly [A] includes the fusing roller strippers [B], the lower fusing exit guide [C], the exit sensor, and the antistatic brush.

The hot roller strippers prevent copy paper from wrapping around the hot roller. They slide between the paper and the roller and then direct the paper to the fusing exit rollers.

The stripper release plate [D] forces the strippers away from the hot roller when the fusing unit is pulled out. Therefore, when the exit assembly is opened and closed, the strippers will not hit against the roller, thus preventing the possibility of hot roller damage.

The lower fusing exit guide prevents the copy paper from wrapping around the pressure roller. Although the lower fusing exit guide is not touching the pressure roller, it will catch the leading edge of copy paper due to the face curl of the paper. (The face curl is caused by the pressure between the teflon hot roller and silicone rubber pressure roller.)

12.7 FUSING CONTROL



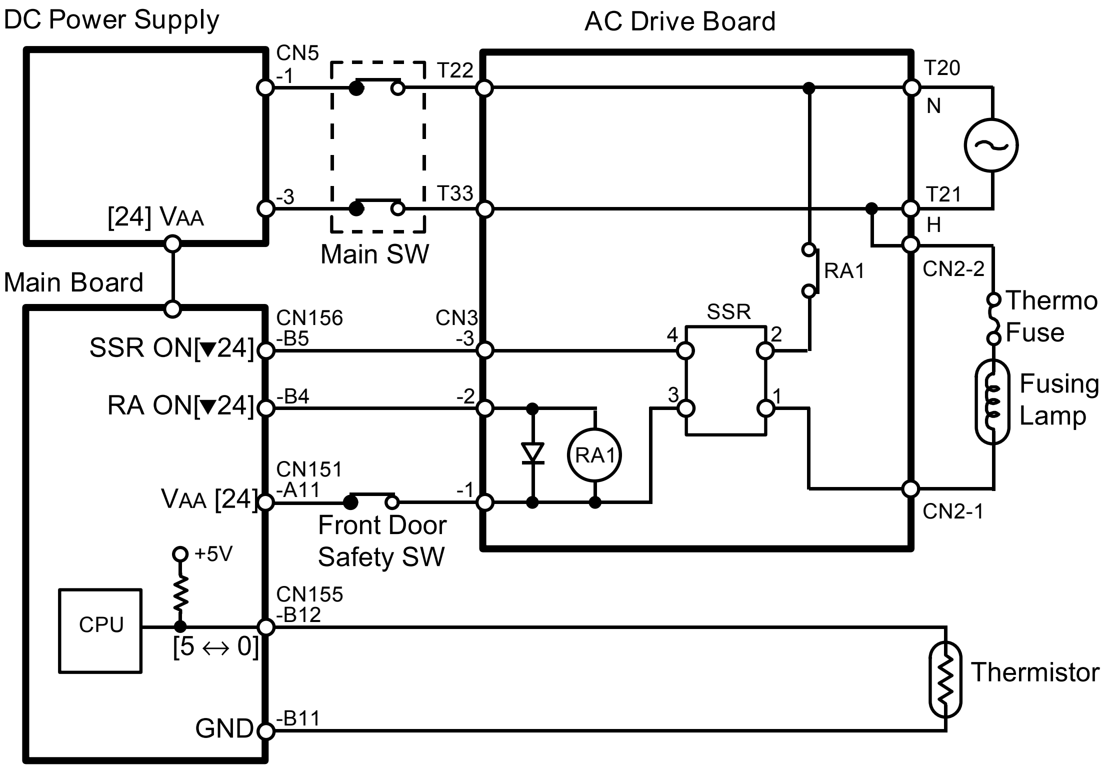
When the main switch is turned on, full power is applied to the fusing lamp. Full power is applied until the fusing temperature reaches 165°C.

After the thermistor senses a hot roller temperature of 165°C, the fusing enable signal changes to a switching signal. The switching signal applies 50% power until the hot roller reaches the fusing temperature (175°C). During this period the fusing lamp alternately switches on for 500 ms and off for 500 ms.

After the hot roller reaches the operating temperature, the fusing enable signal is turned on constantly when the thermistor detects a temperature less than 175°C, and is turned off when the 176°C is detected.

SP1-104 Fusing Temperature Control Method
When the room light is flickering due to too low wall power, shift the switching control to phase control "1".

12.8 FUSING CIRCUIT



The main board CPU controls the fusing lamp. To do so, it monitors the resistance of the fusing thermistor at CN155-B12.

To turn on the fusing lamp, the CPU drops CN156-B5 from 24 volts to 0 volt. The SSR then provides the ac power to the fusing lamp.

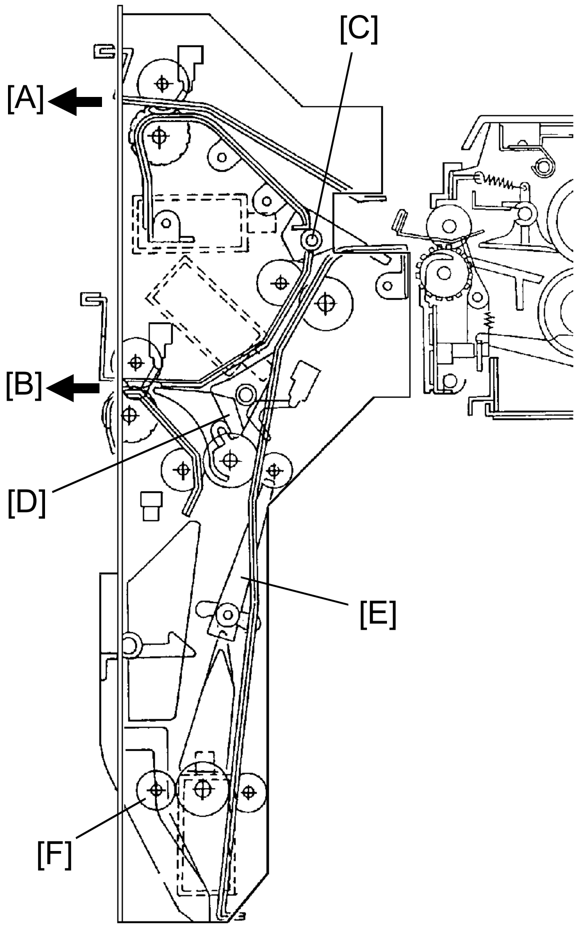
The 24 volts line for driving the SSR is opened by the front door safety switch, whenever the front doors are opened.

Fusing lamp operation is also impossible if RA1 is not energized.

The thermofuse provides back-up protection against overheating. It will open if the temperature of the fuse rises to 182°C. The fusing lamp then turns off.

13. INVERTER AND PAPER EXIT

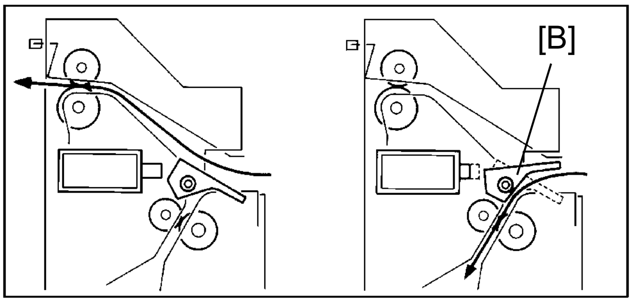
13.1 OVERVIEW

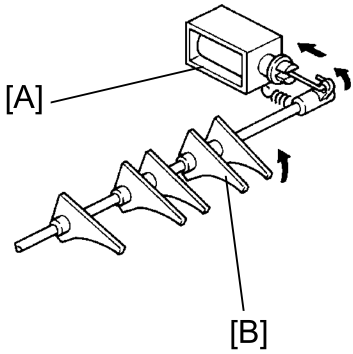


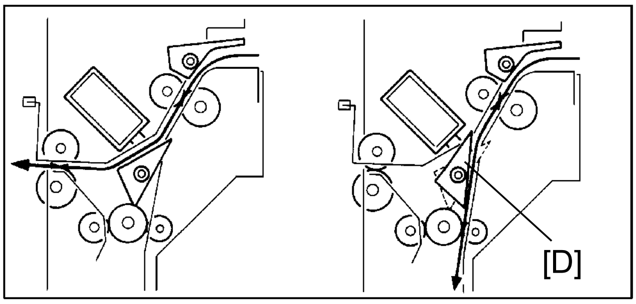
Paper reaches the inverter unit after it passes through the fusing unit. The inverter unit has two paper outlets. The upper outlet [A] is used in the normal mode and the lower one [B] is used in the sort/stack and or the printer mode.

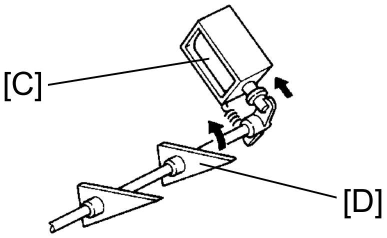
The junction gate [C] directs the paper to the upper outlet or to lower destinations. In the latter case, the inverter entrance gate [D] then directs this paper to lower outlet or lower still. By the return gate [E] and the return pinch roller [F], the paper is switch-backed (inverted) and fed out to the lower outlet. In the duplex mode, the paper passes through the inverter unit and goes to the duplex unit.

13.2 PAPER TRANSPORT MECHANISM







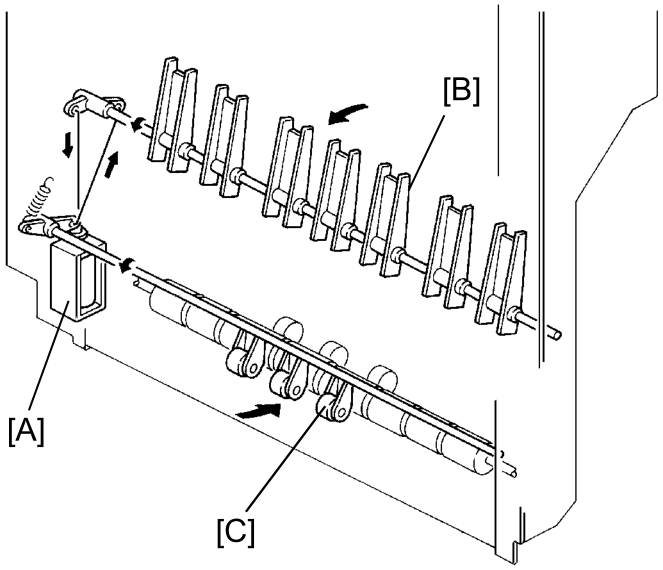


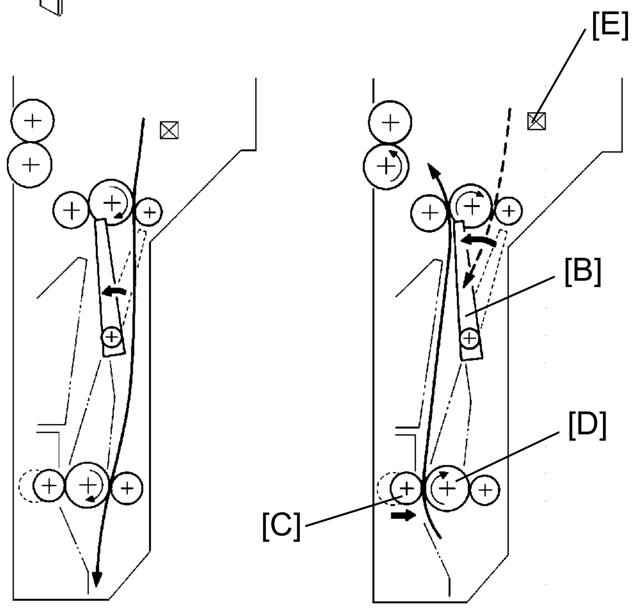
– Junction gate solenoid –

In the normal mode, the junction gate solenoid [A] stays off. Paper is directed to the upper copy tray. In the sort/stack, the printer, and the duplex modes, the junction gate solenoid is energized. The junction gate [B] is opened and paper is directed to the lower part.

– Inverter entrance gate solenoid –

When the inverter entrance solenoid [C] is energized, the inverter entrance gate [D] is opened. Paper is sent lower. The solenoid turns on in the printer or the duplex modes.





(Duplex mode) (Print mode)

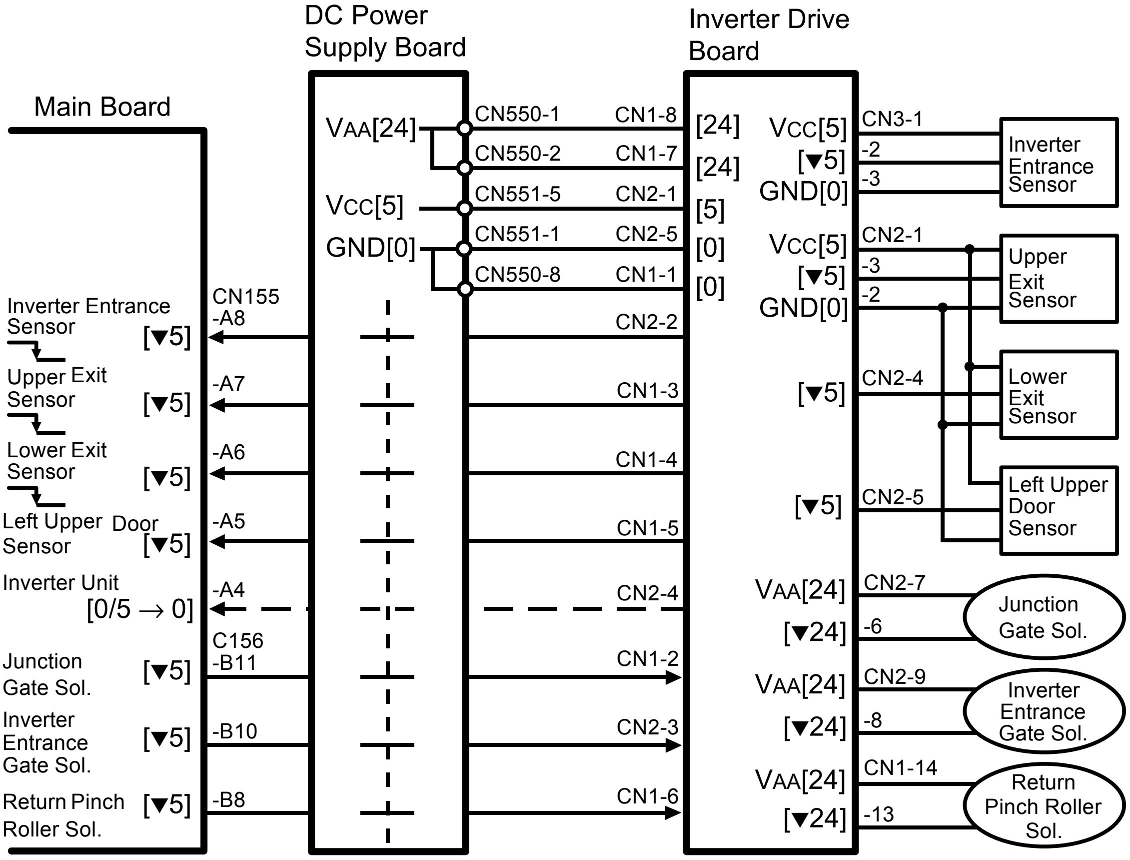
– Return pinch roller solenoid –

The return pinch roller solenoid [A] operates both the return gate [B] and the return pinch roller [C]. In the duplex mode, the return pinch roller solenoid is energized. The return gate is opened to direct the paper to the duplex unit along the right side of the return roller [D]. In the print mode, the return pinch roller solenoid is also energized. However, soon after the copy passes the inverter entrance sensor [E], the solenoid is de-energized. When the return gate is closed, paper goes down along the left side of the return roller. Then, the return pinch roller solenoid is energized. The return pinch roller (idle roller) is pressed against the return roller and the paper is fed back to the lower copy tray.

Sol. / Mode	Junction Gate Sol.	Inverter Entrance Gate Sol.	Return Pinch Roller Sol.
Normal	OFF	OFF	OFF
Sort/Stack	ON	OFF	OFF
Duplex	ON	ON	ON
Printer	ON	ON	OFF → ON

The above table summarizes the operation of the junction gate, inverter gate, and return pinch roller solenoids.

13.3 INPUT AND OUTPUT CIRCUIT



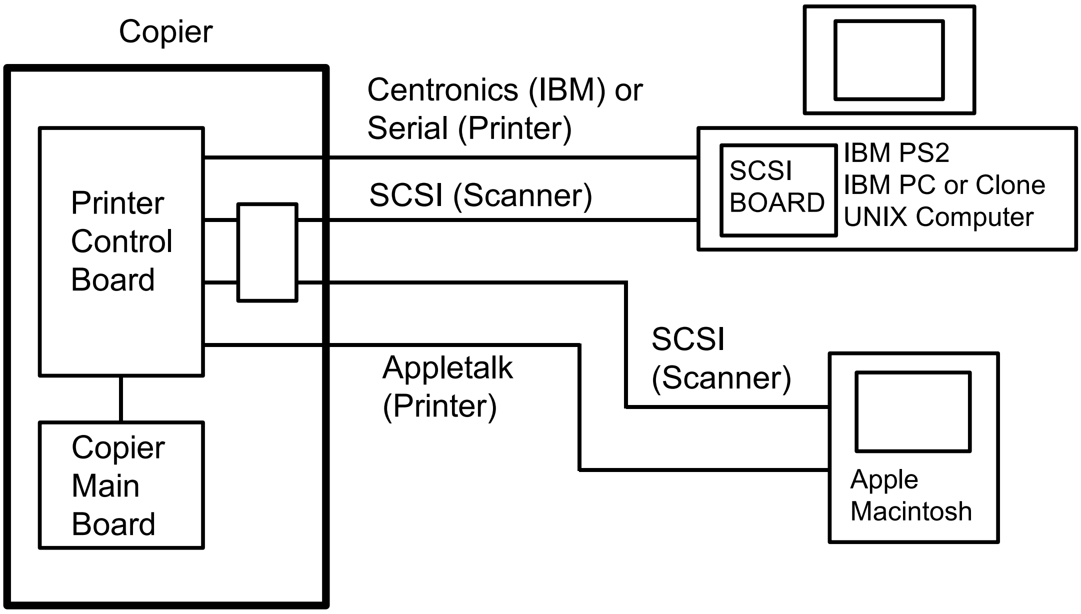
The dc power supply board supplies +24 volts and +5 volts to the inverter drive board. The inverter drive board then gives +24 volts to all solenoids and +5 volts to all sensors to operate them.

The information from the sensors passes through the inverter drive board and the dc power supply board, and then reaches the main board. The CPU monitors the input lines of the sensors.

To energize a solenoid, the CPU drops the connected trigger line from +24 volts to LOW.

14. PRINTER CONTROLLER

14.1 OVERVIEW



– Printer Function –

This model in the printer mode operates as a full featured laser printer peripheral. The system will fully support PostScript and Hewlett Packard LaserJetIIIsi (PCL-5) emulation print files from application software.

It will also support many special features implemented by certain application software packages including large format (11" x 17"/A3) output paper size, duplex printing (when the optional duplex unit is equipped), multiple paper trays and a variety of paper sizes.

These special features are controlled from the application program via the PostScript or PCL-5 (HP LaserJetIII) firmware module.

A host computer can be connected to the main frame through an RS232 serial port, a bi-directional Centronics compatible parallel port, a SCSI (Small Computer System Interface) port, and an AppleTalk compatible RS422 port.

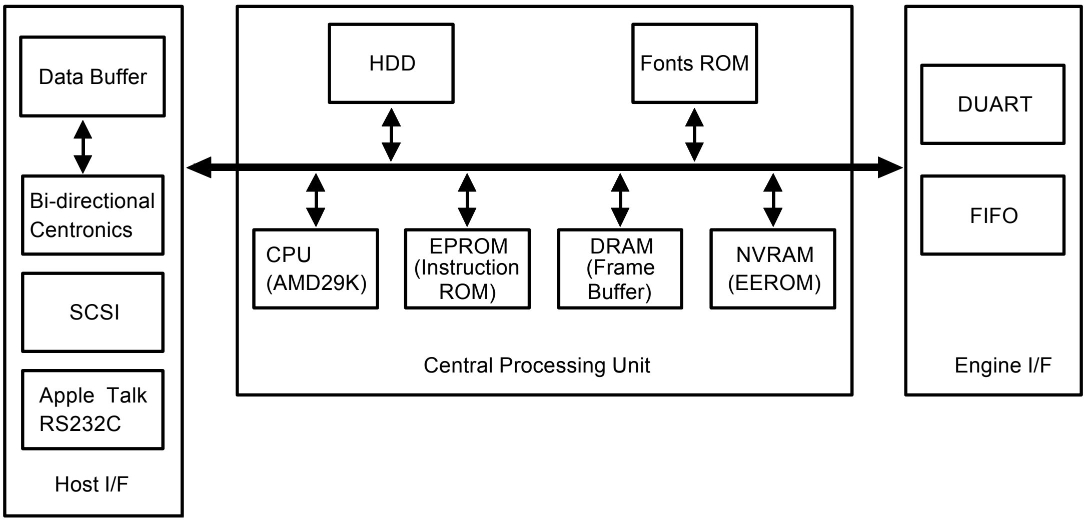
This printer controller provides for printing standard 81/2" x 11"/A4 text pages at the full rated speed of the copier engine (30 pages per minute for LT•LG version, 31 page per minute for A4•A3 version) in either PostScript or HP LaserJetIII emulation. Printing speed for graphics image will be comparable with competing laser printers.

– Scanner Function –

By installing the optional scanner interface board, this model can also be used as a scanner. A host computer can be connected to the scanner interface through a SCSI port.

This scanner function provides the capability for scanning images from the copier exposure glass, and storing those images as a file in standard image formats such as TIFF, compressed TIFF, IMG, or PCX. The image file can then be accessed by other application programs.

14.2 CONTROLLER BOARD



The controller consists of a Central Processing Unit (CPU), a host interface, and a copier engine interface blocks.

14.2.1 CPU Block

The CPU block contains an AM29000 microprocessor and memory modules.

Processor

The AM29000 is a high performance 32-bit RISC (reduced instruction set computer) microprocessor running at a 20 MHz clock rate. This AM29000 processor has a single 32-bit address bus, a 32-bit data bus, and a separate 32-bit instruction bus. This assures the high speed execution of program, the I/O interface control of peripherals, and the copier engine interface control.

Memory Module

There are four basic types of memory in the controller such as instruction ROM, font ROM, DRAMs, and NVRAM (non-volatile RAM).

– Instruction ROM –

The instruction ROM is used to store resident program that the processor will execute. The memory consists of 16 EPROMs (2 Mbits x 16 pcs), 4 Mbytes in total size.

– Font ROM –

The font memory stores resident fonts for Adobe's PostScript and HP's PCL-5 languages. The memory consists of 2 Mbytes of EPROMs (4 Mbit x 4 pcs).

– DRAM –

The DRAM module is mainly used for storing a bit-mapped image for a printer or scanner application. It also can be used for storing system parameters, buffers, and font cache. This module has 4 Mbytes of dynamic RAM chips and 4 Mbytes DRAM SIMM (single in-line memory module) as a base memory. The memory can be expanded up to 12 Mbytes by adding the optional 4 Mbytes DRAM SIMM.

Total Memory Size	Printer Function	Scanner Function
8M	Print up to 11" x 17"/A3 size (simplex) Print up to 81/2" x 14"/B4 size (duplex)	Scan up to 11" x 17"/A3 size image
12M	Print up to 11" x 17"/A3 size (duplex)	Scan up to 11" x 17"/A3 size image

– NVRAM –

The information input via the copier operation panel by the user can be stored in this memory space (e.g., baud rate for serial port and priority settings, etc.)

14.2.2 Host Interface Block

The Host interface block consists of a SCSI interface, a bi- directional Centronics, an AppleTalk, and an RS-232C serial port.

– SCSI Interface –

There are two SCSI chips. One SCSI chip is used to interface the scanner with any host system which has a SCSI port. Another SCSI chip is used for connecting with an external Hard Disk Drive (HDD) storing fonts.

– Bi-directional centronics Interface –

The bi-directional Centronics port allows 8-bit of parallel data transfer between the computer and the controller board, in both directions.

– AppleTalk and RS-232C –

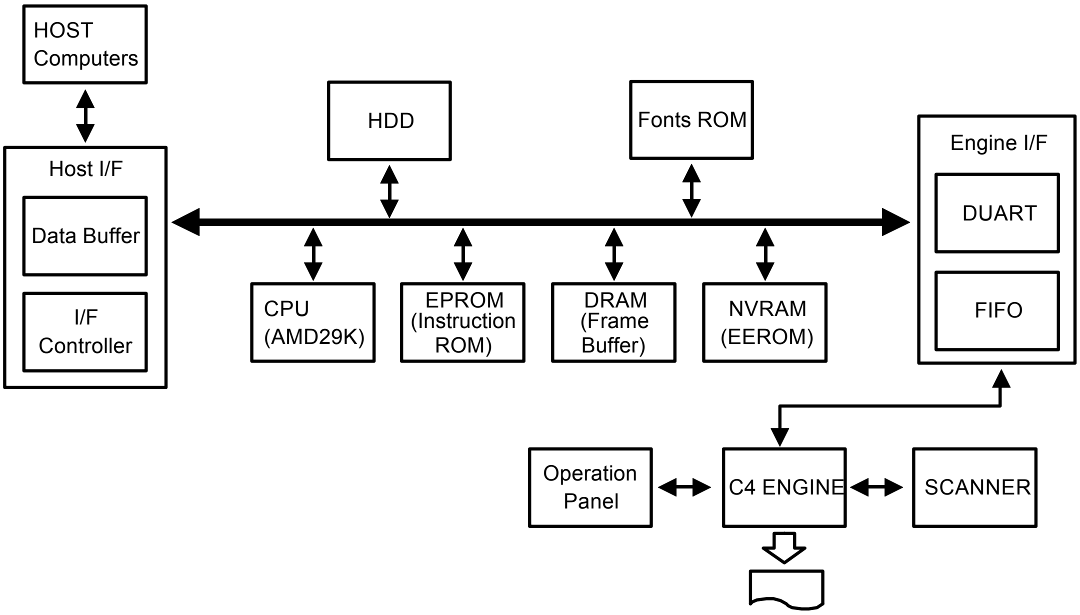
A Z85C3010 Serial Communications Controller (SCC) is used for an AppleTalk and an RS-232C serial port. Z85C3010 has two channels, A and B. The channel A is used for the RS-232C serial port to interface the host computer. The channel B is used as the AppleTalk port.

14.2.3 Copier Engine Interface

The engine interface consists of two basic ports: the printer/scanner video interface and the copier communication interface. The printer/scanner interface uses two IDT72103 (2K x 9 bit FIFOs) in parallel. The 16-bit parallel data is sent to FIFOs and converted to 2-bit serial video data through shift registers for the printer operation. For the scanner operation, 2-bit video data move from the copier engine to FIFOs, and are converted to 16-bit parallel data.

As for the copier communication interface, one channel of the SCN2681 Dual Asynchronous Receiver/Transceiver (DUART) is assigned for the command/status interface between the controller and the copier engine.

14.3 DATA FLOW



1. Print Operation

All image data sent from the host computer is transmitted to the CPU via the data buffer. Also the information input through the copier operation panel is sent to the NVRAM via DUART, then sent to the CPU. The CPU sends the data to the DRAM, where the data is stored as a bit-mapped image. Eventually, the data is sent to the copier main board through FIFO. The image is developed on the copy paper. The EPROMs store all programs which the CPU executes.

2. Test Print Operation

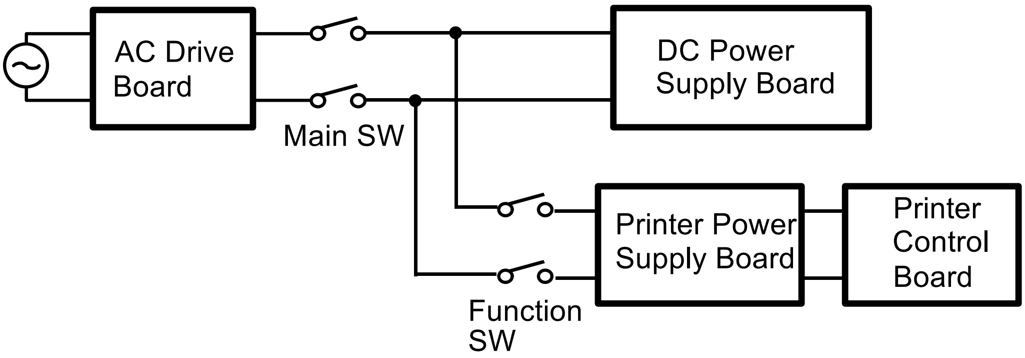
When the Test key on the copier operation panel is pressed, this information is sent to the CPU through the DUART. The CPU then collects the data for the test print stored in the EPROM and the current status information from the NVRAM. All this data is sent to DRAM and then to the copier main board, as in the printer mode.

3. Scanner Operation

First, the host computer sends the scanner command to the CPU. The CPU confirms for the copier main board via DUART if the copier scanner section is ready for scanning the image or not. If it is, it then commands the copier main board to start scanning image.

Moving in the opposite direction as for the print operation, the image data is sent to the DRAM, to the CPU, then to the host computer.

14.4 FUNCTION SWITCH

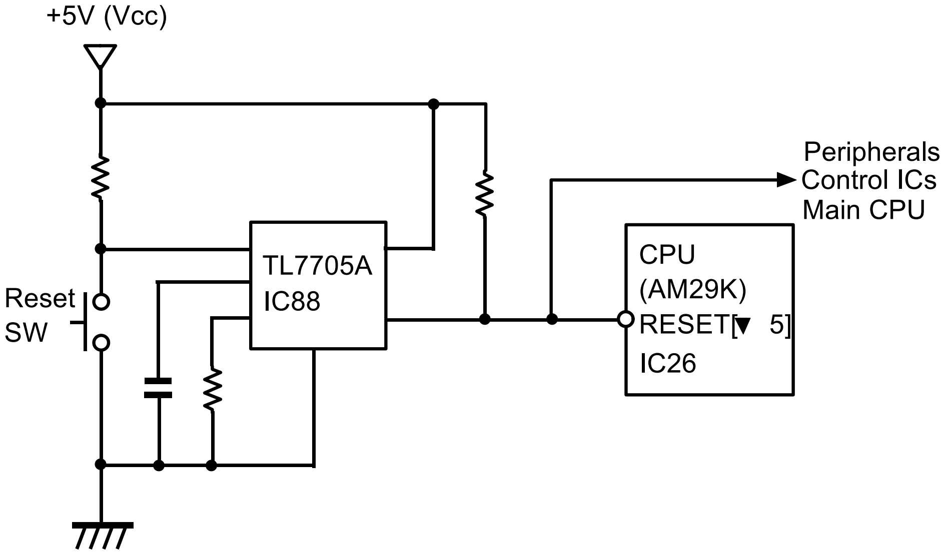


There is a switch called the Function Switch inside the copier. (This switch is located near the fusing unit.) When this switch is turned to the System Disabled position, the ac power line to the printer power supply board is cut. Then the printer and the scanner functions are disabled, but the machine can still be used as a copier.

Even if the machine cannot be operated due to SC624 (Communication Error), the copy function can still be used by turning the function switch to the System Disable position.

NOTE: Whenever switching the position of this function switch, turn the main switch and the anti-condensation switch off first. Change the switch's position and then turn the main switch on again.

14.5 RESET SWITCH



A TL7705A, voltage supervisor, monitors the voltage level and generates the RESET signal when the supply voltage (VCC) falls below 4.5 volts. All control programs are then initialized, but the data stored in the NVRAM is kept as is. This insures a stable power-up reset function for the CPU, peripherals (NVRAM, SCSI chip, DURT chip, Centronics chip, and Serial Communications Controller chip), the control ICs, and the main CPU.

The small switch (SW 1) is located at the front right side of the printer control board. This is the reset switch. When the reset switch is pressed, the supply voltage to the voltage supervisor drops to zero and the machine is reset. This Reset function can also be accessed by the user through the operation panel (printer menu screen). This function may be useful if the printer function hangs.

14.6 OPERATION PANEL MENU

Menus

1st Class	2nd Class
Job Control Menu	– Paper Input * – Page Output * – Duplex * – Jam Recovery – PCL Emulation Menu * – Reset Job Control
Printer Config Menu	– Host Interface * – Port Setup/Emulation * – Time Out – Menu Display Language – Reset Configuration
Scanner Config Menu	– SCSI Device Number
Function Priority	– Copy/Printer/Scan – Printer Only – Scanner Only
Printer Security	– L1: System Control – L2: Printer Control – L3: Job Control
Reset Printer	

(*) Third class menu exists.

The user can set up the printer configuration through the operation panel keys. To access the Menu screen, first change the printer mode to the Off line mode (Press the On line key once.) and press the Menu key. Now, the first class of the menu is opened.

Press twice to open the second class. The above diagram shows only 1st and 2nd class menus. Further, a third class menu might have to be opened, if there is one.

SECTION 3

INSTALLATION

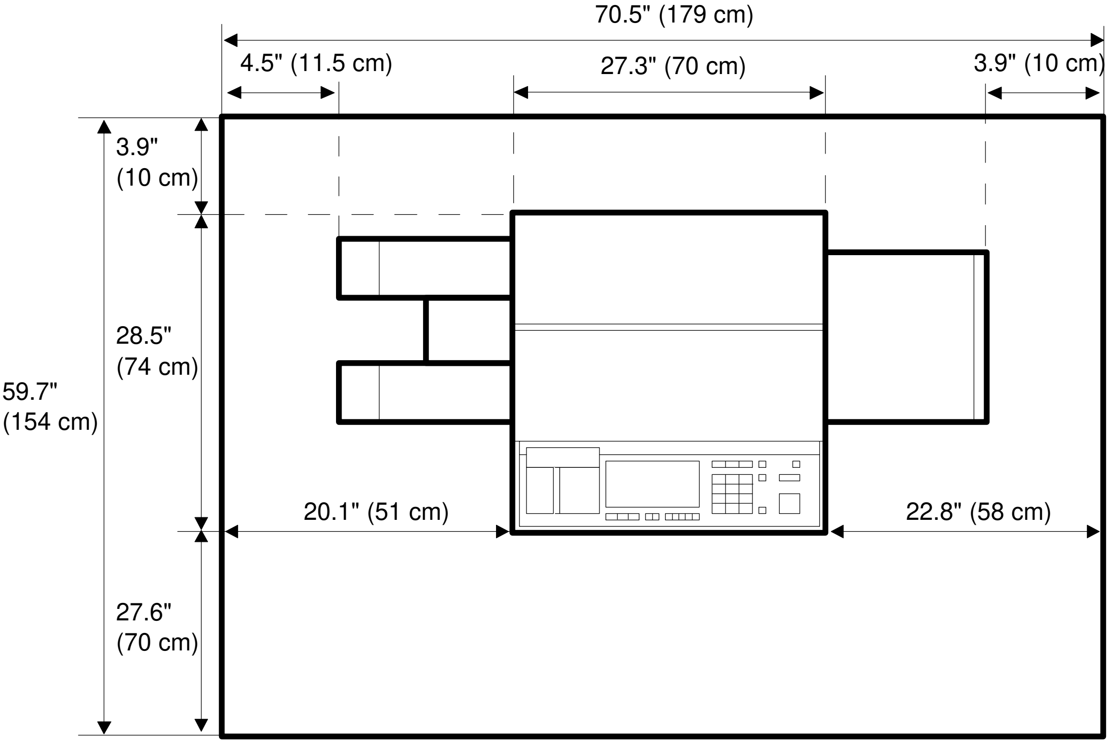
1. ENVIRONMENT

1. Temperature Range:	10°C to 30°C (50°F to 86°F)
2. Humidity Range:	15% to 90% RH
3. Ambient Illumination:	Less than 1,500 lux (Do not expose to direct sunlight.)
4. Ventilation:	- Minimum space 20 m^3 - Room air should turn over at least 30 m^3/hr/person.
5. Ambient Dust:	Less than 0.15 mg/m^3 (4 x 10^{-3}oz/yd^3)

6. If the installed place is air conditioned or heated, place the machine as follows:
   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 in the summer.
   c) Where it will not be directly exposed to reflected heat from a space heater in winter.
7. Avoid placing the machine in an area filled with corrosive gas.
8. Avoid any area higher than 2,000 meters (6,500 feet) above sea level.
9. Place the machine on its table or LCT/duplex unit (options).
10. Avoid any area where the machine may be subjected to frequent vibration.

2. SPACE REQUIREMENTS AND MACHINE LEVEL

2.1 SPACE REQUIREMENTS



NOTE: A space of at least 3.9" (10 cm) at the rear of the machine is necessary for smooth air inlet into the machine.

2.2 MACHINE LEVEL

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

3. POWER REQUIREMENTS

1. Input voltage level:

   115 V/60 Hz: More than 15 A
   220 ~ 240 V/50 Hz: More than 8 A

2. Permissible voltage fluctuation: ±10%.
3. Extension cord: Not recommended.
4. Make sure that the wall-outlet is near the copier and easily accessible.

   NOTE: a) Make sure the plug is firmly inserted in the outlet.
   b) Avoid multi-wiring.

5. Do not set anything on the power cord.

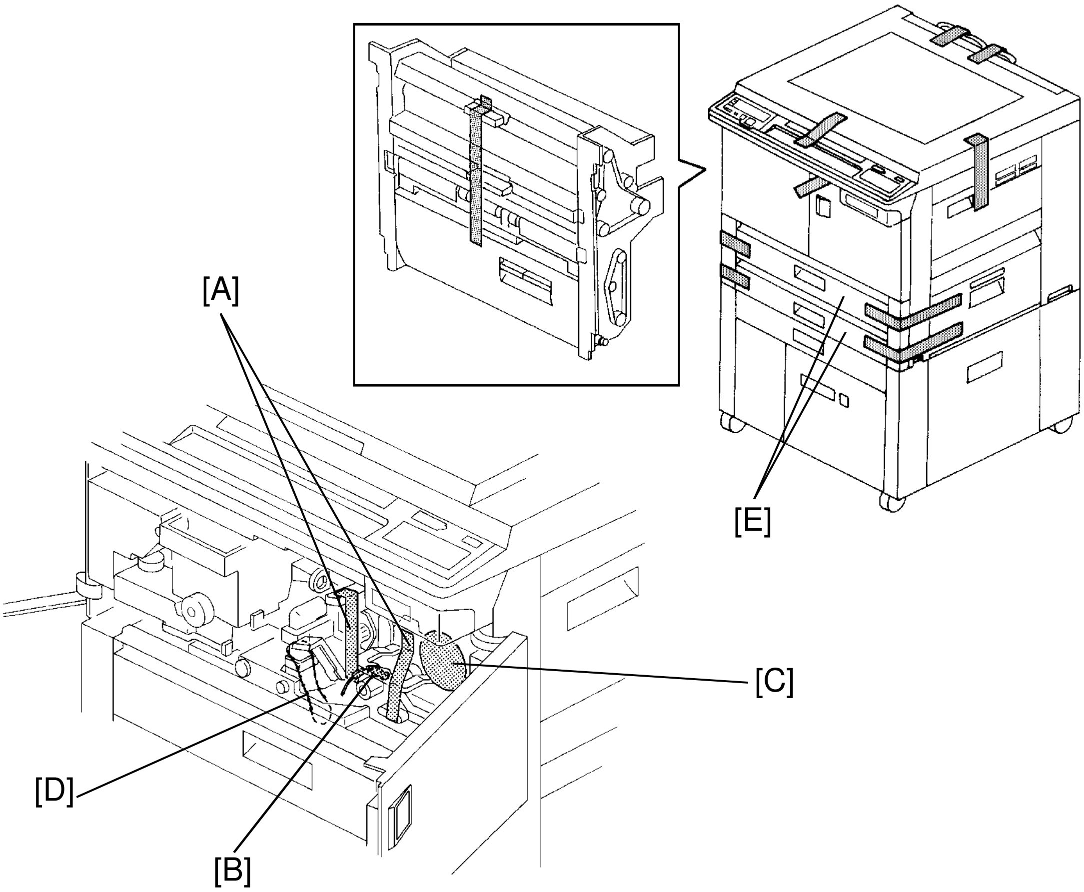
4. ACCESSORY CHECK

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

1. Operating Instructions	1
2. NECR (115 V version only)	1
3. Cassette -- Large	1
4. Cassette -- Small	2
5. Copy Tray	2
6. Envelope for NECR (115 V version only)	1
7. User Survey Card (115 V version only)	1
8. Area Marker Pen	3 (pcs/set)
9. Counter Set Key	1
10. Printer Driver (MAC)	1
11. Printer Driver (Windows)	1

5. REMOVAL OF SHIPPING RETAINERS AND TAPE

NOTE: Since the installation procedure is not packed with the copier as an accessory, always bring this manual with you.

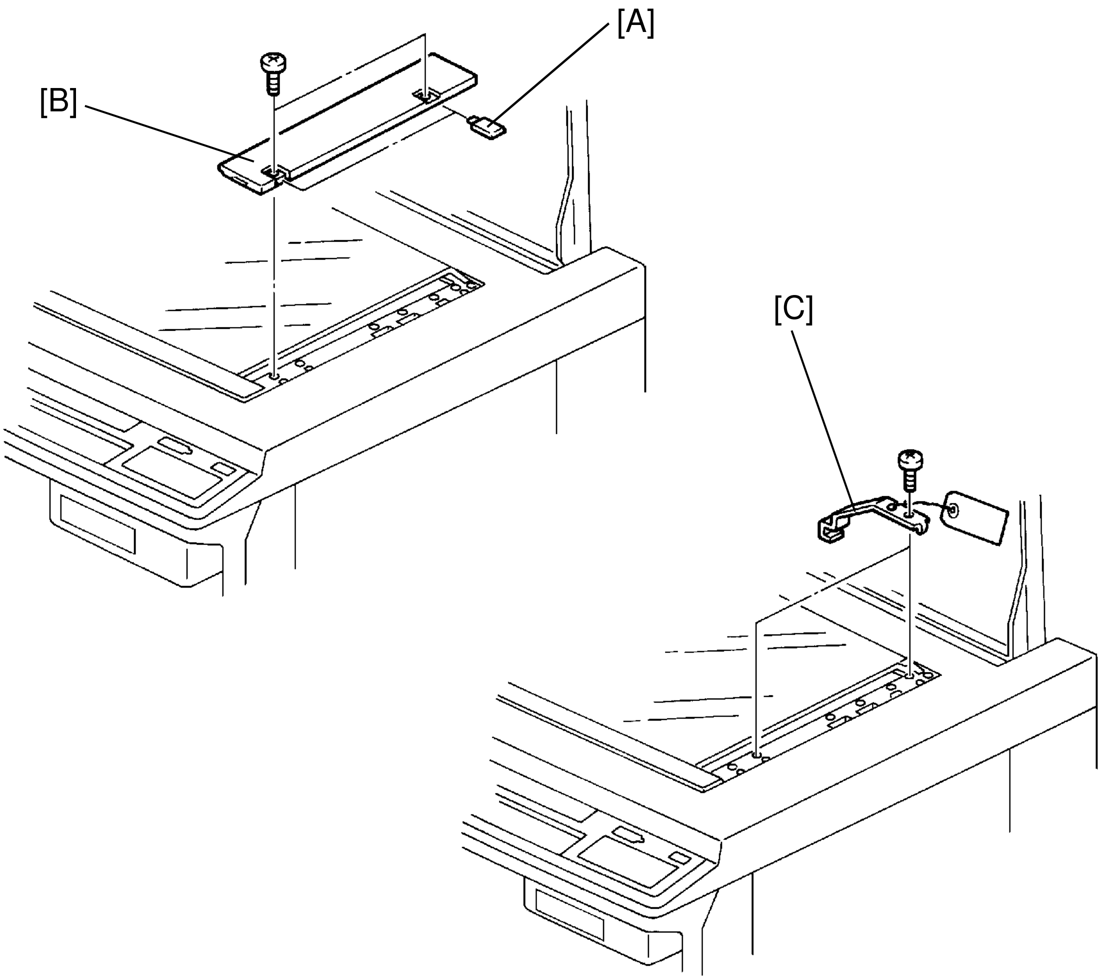


NOTE: Keep the shipping retainers after installing the machine. They will be reused if in the future the machine is transported to an another location.
Proper reinstallation of the shipping retainers is required in order to avoid any transport damage.

1. Remove all strips of tape.

2. Open the front doors and remove the following items:
   Tape [A] (2 pcs)
   Registration Roller Wedge [B]
   Toner Cartridge Inlet Seal [C]
   Cut Fastener [D] around the toner collection bottle.

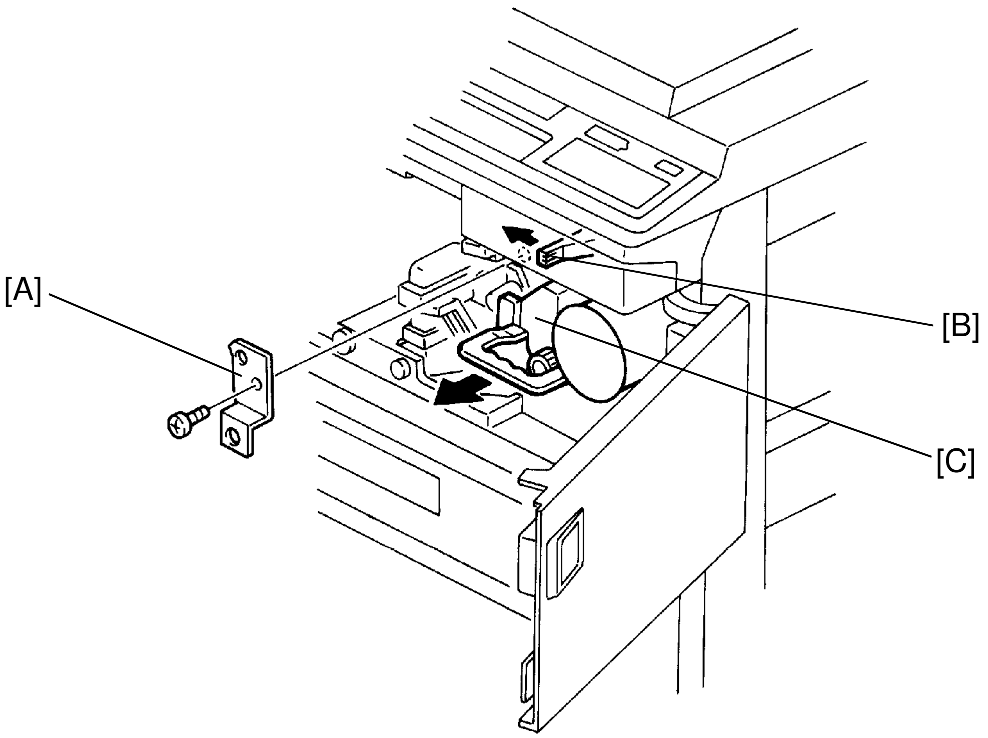
3. Slide out the 2 paper trays [E] and remove the cushions protecting the reverse rollers.



4. Remove the right scale screw covers [A].
5. Remove the right original scale [B] (2 screws).
6. Remove the scanner lock plates [C] (2 screws).
7. Reinstall the right scale.

6. INSTALLATION PROCEDURE

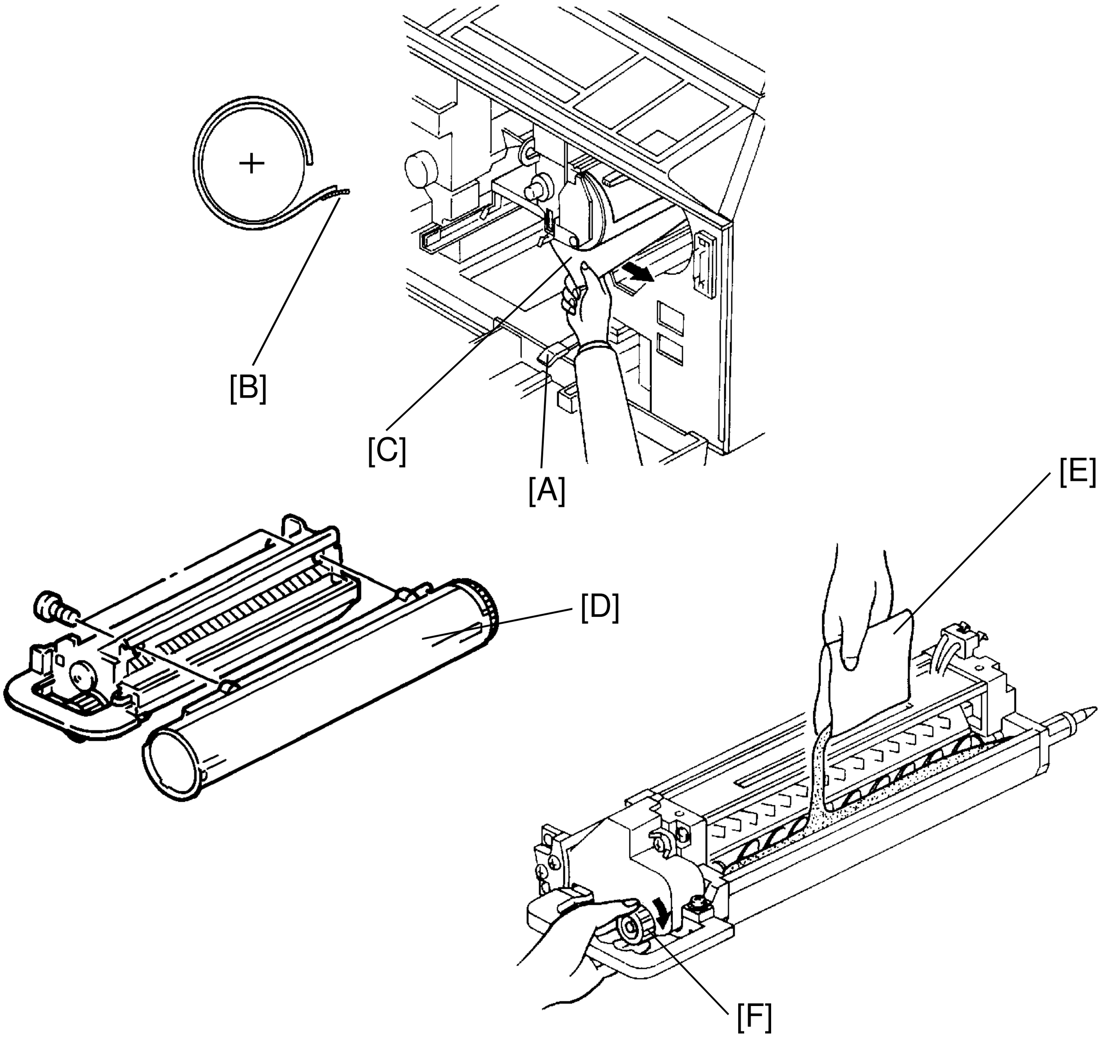
6.1 COPIER INSTALLATION



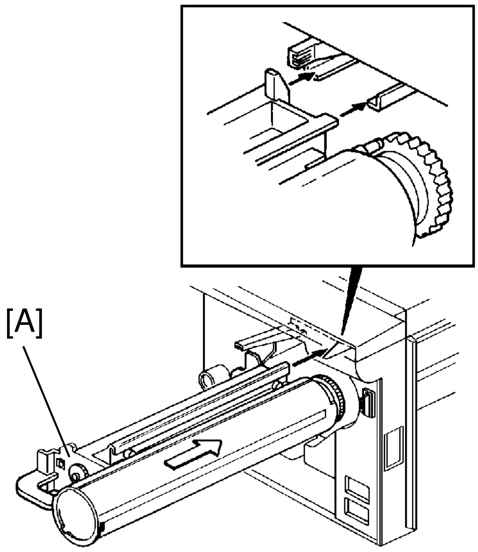
1. Place the machine on the copier table or LCT/duplex unit (options).

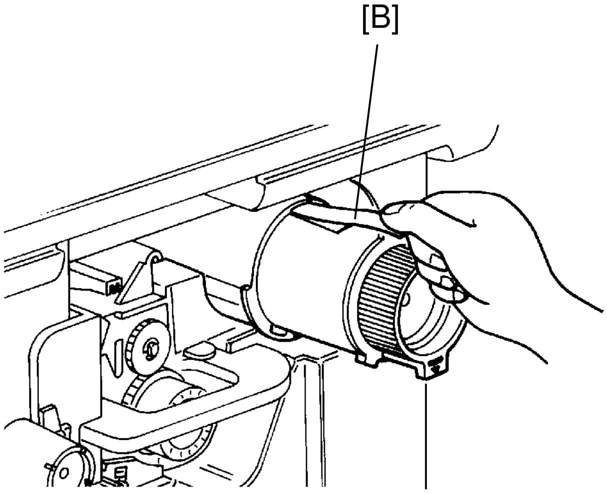
CAUTION: To avoid damage to the drum, make sure to move the development unit to the right (away from the drum) while pulling it out.

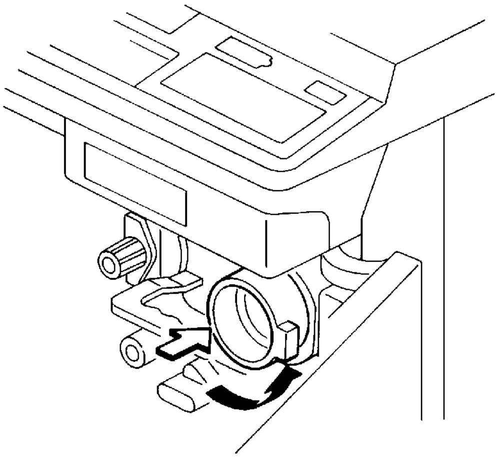
2. Open the front doors and remove the development unit bracket [A] (1 screw).
3. Push the development unit lock lever [B] to the left, and pull out the development unit [C]. Place it on a clean sheet of paper.



4. Lower the T/S corona unit [A] then peel off the seal [B] and remove the drum protective sheet [C] as shown.
5. Separate the toner tank [D] from the development unit (2 screws).
6. Pour one pack of developer [E] (1 kg), into the development unit evenly, while turning the knob [F] clockwise to distribute the developer.
7. Remount the toner tank on the development unit.
8. Make sure that no foreign materials are attached to the development roller.

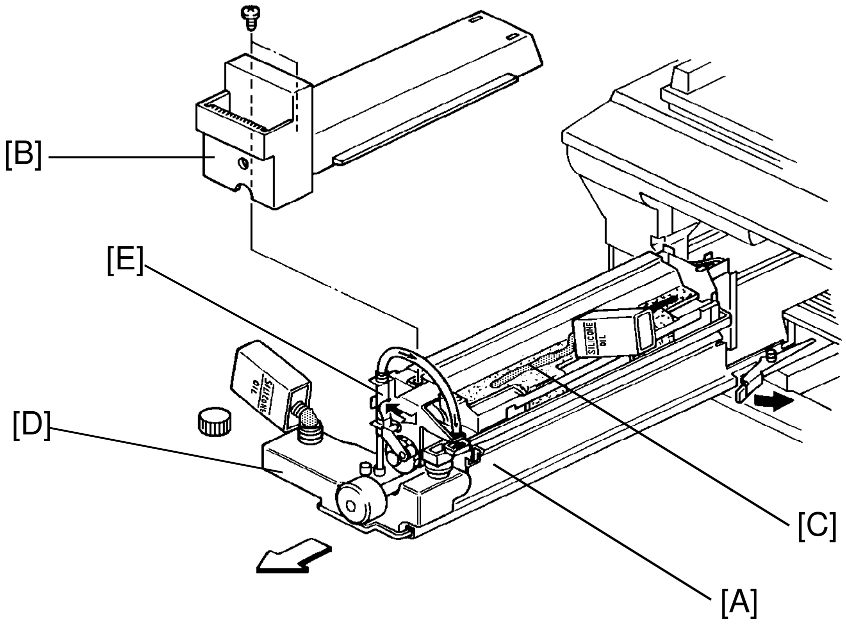




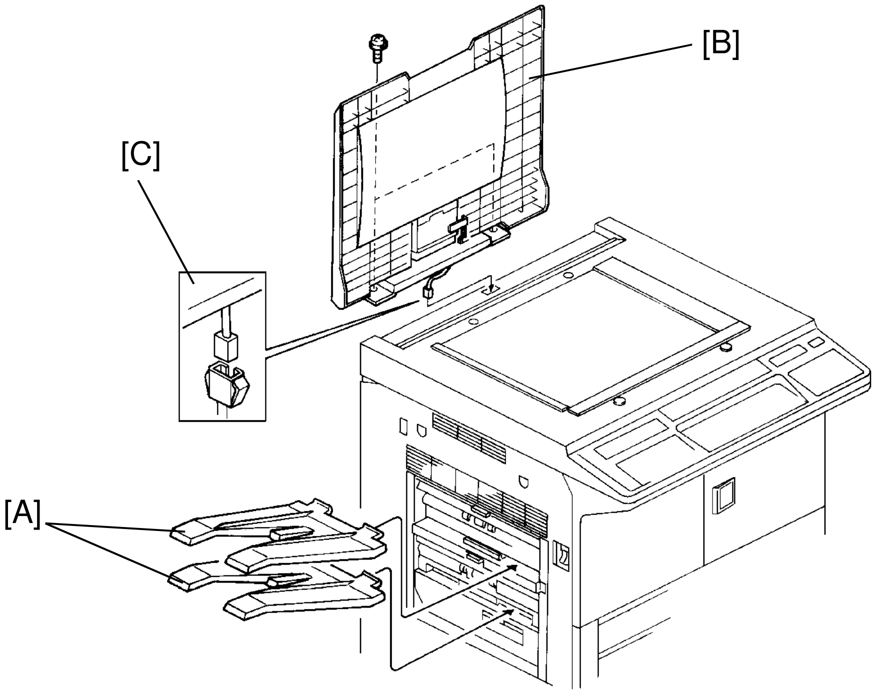


CAUTION: When installing the development unit [A], be sure the development unit rail is properly engaged with the unit guide rail on the copier as shown in the figure.

9. Reinstall the development unit [A] until it locks.
10. Raise the T/S corona unit.
11. Shake the toner cartridge well. While peeling the sealing tape [B], insert the cartridge until it stops. Turn it counterclockwise to the lock position.



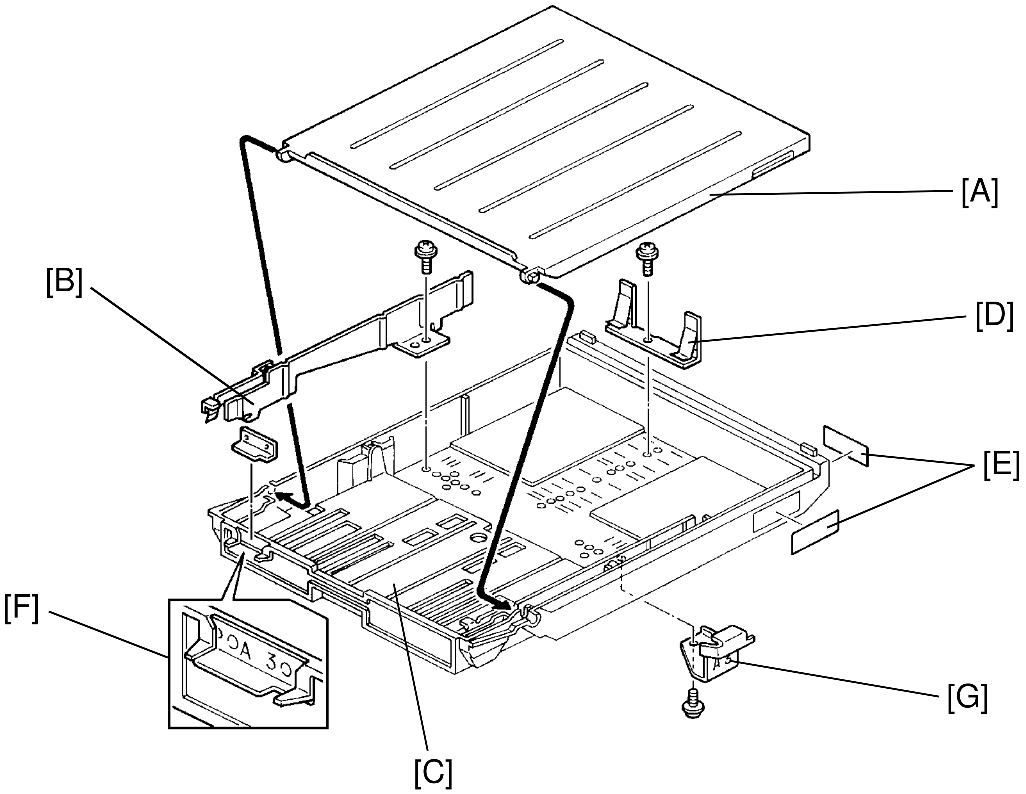
12. Pull out the fusing unit [A] to the lock position and remove the fusing unit cover [B] (2 screws).
13. Prime the oil supply pad [C] with silicone oil.
14. Fill the oil tank [D] with silicone oil to its max level.
15. Manually operate the oil pump lever [E] and confirm the proper operation of the silicone oil supply system.
16. Reassemble the fusing unit and return it to its original position.



17. Close the doors and set the copy trays [A].

    NOTE: Steps 18 and 19 are required only to install the optional platen cover [B].

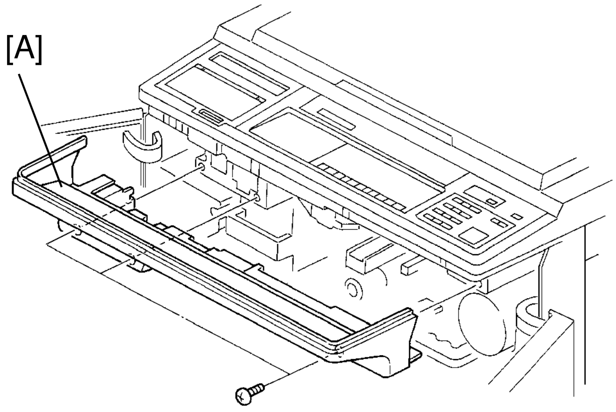
18. Couple the platen cover sensor connector [C] with the copier.
19. Install the platen cover [B] (2 screws).

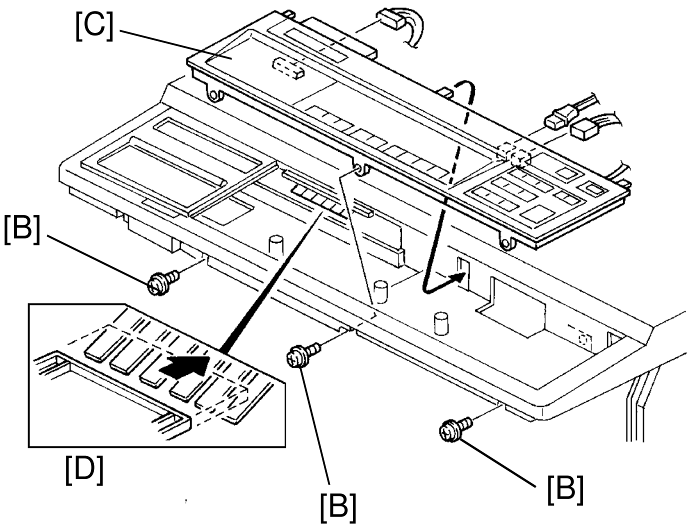


NOTE: Steps 20 to 26 are for changing the paper size setting.

20. Remove the cassette cover [A].
21. Remove the side fences [B] (1 screw each) and the bottom plate [C] (2 positioning pins).
22. Re-position the rear fence [D] in the desired paper size position (1 screw).

    NOTE: Paper size positions are shown on the inside of the cassette.
23. Reinstall the bottom plate confirming the positioning pins have clicked into place.
24. Reinstall the side fences in the desired paper size position.
25. Attach the proper paper size decals [E] on the cassette at the positions shown.
26. Attach the front [F] and side [G] actuators and insert the cassette to the copier.





NOTE: • Step 27 to 32 are for language changing.
• Language can be changed only for copier function.

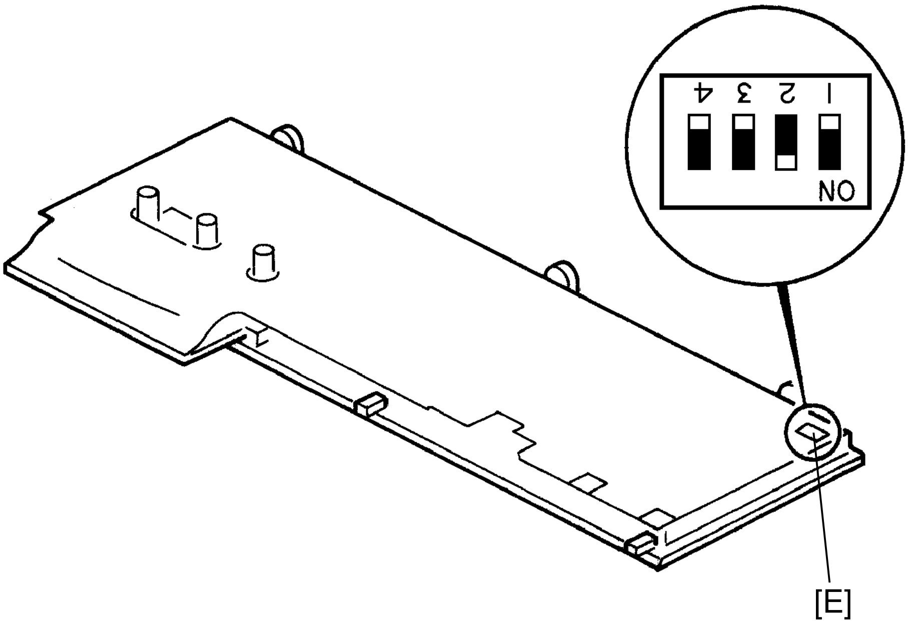
27. Open the front doors.

28. Remove the operation panel bottom cover [A] (3 screws).

29. Remove the 3 screws [B] securing the operation panel [C].

30. Remove the operation panel [C] by lifting the front side and pull it out (3 connectors).

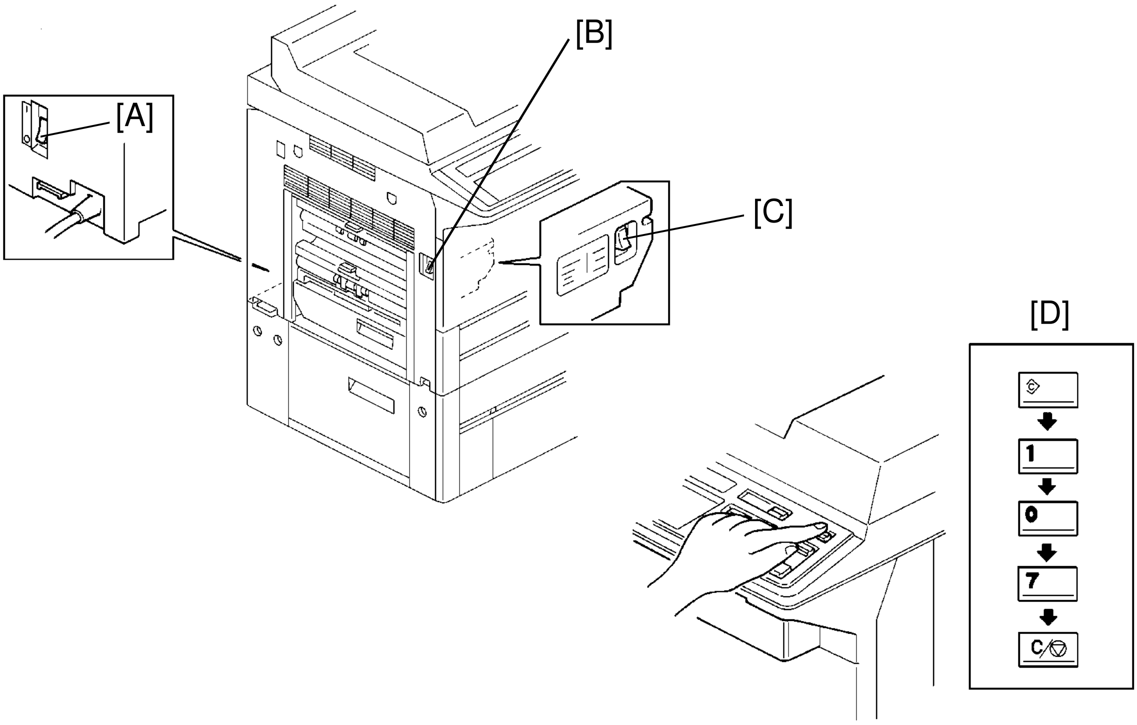
NOTE: When reinstalling the operation panel, make sure that the pegs fit in the slots, and that the wedge slides in above the grounding contacts as in the figure [D].



31. Change the language setting using the DIP switch [E] as the following table.

32. Reinstall the operation panel.

DIP SW No. / Language	1	2	3	4
English (U.S.A.)	ON	OFF	OFF	OFF
English (Europe)	OFF	ON	OFF	OFF
Germany	ON	ON	OFF	OFF
French	OFF	OFF	ON	OFF
Italy	ON	OFF	ON	OFF



NOTE: Before plugging in the machine, make sure of the following:
The main switch [A] is **OFF**.
The anti-condensation switch [B] is **OFF**.
The function switch [C] is **ON**.

33. Plug in the machine, then turn on the anti-condensation switch [A] and the main switch [B].

34. Enter the SP mode as follows [D]:
    a) Press the clear modes key.
    b) Input 107 using the number keys.
    c) Hold the Clear/Stop key until the service SP mode is displayed on the indicator.

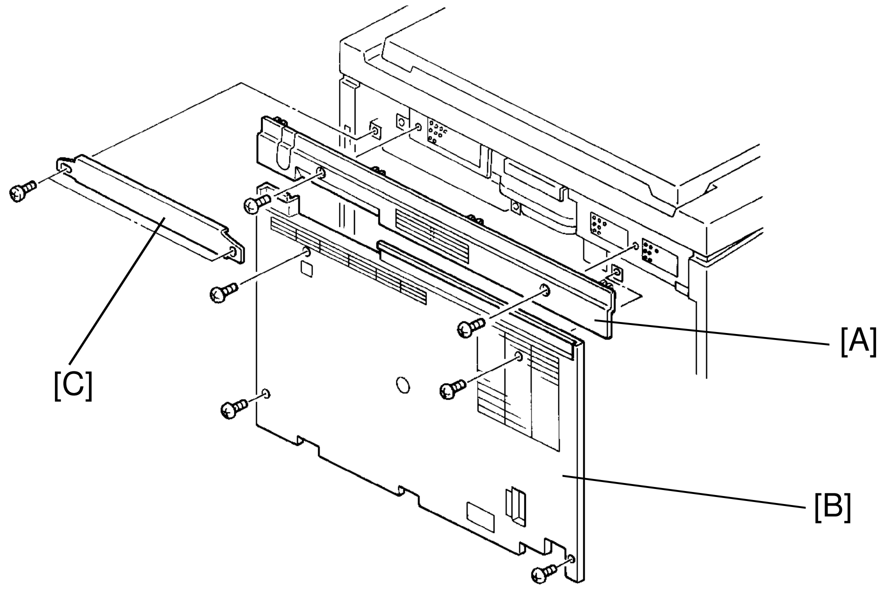
35. Perform the following SP mode settings.
    - PM Counter Mode: SP5-501-1, select 1
    - PM Interval Set: SP5-501-2, input 80K
    - Service Tel. No. Set: SP5-812, input phone number
    - Clock Set: SP5-302, input the time and date

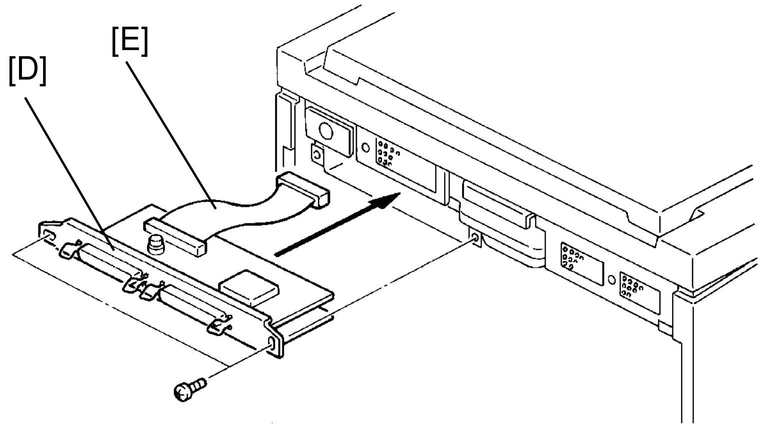
36. Check copy quality and if out of specification, perform the copy image adjustments. (See Copy Image Adjustment section.)

37. Take the printer off-line by pressing the On-Line key so that the indicator is not lit.

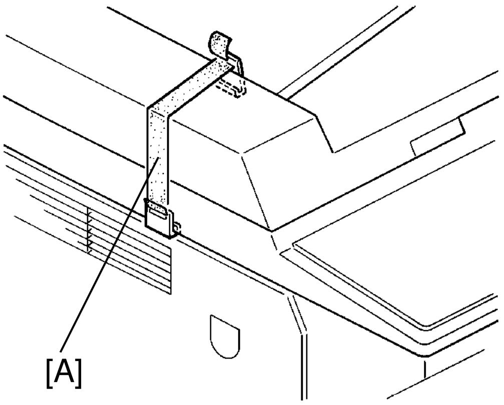
38. Press the Test/Status key to print the test page. Confirm that the status and settings indicated in the test page are all correct.

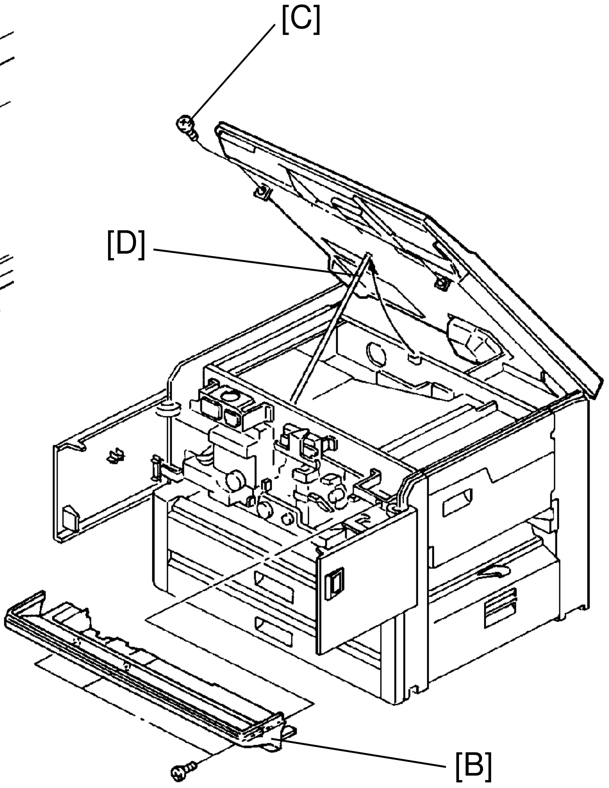
6.2 SCANNER INTERFACE BOARD (OPTION) INSTALLATION





1. Turn off the main switch, and disconnect the power supply cord of the main system.
2. Remove the upper [A] and lower [B] rear covers (6 screws).
3. Remove the cover plate [C] (2 screws).
4. Insert the scanner interface board unit [D] in the cavity with the chips facing up. Make sure the ribbon [E] is in the cavity.
5. Secure the board as shown (2 screws).

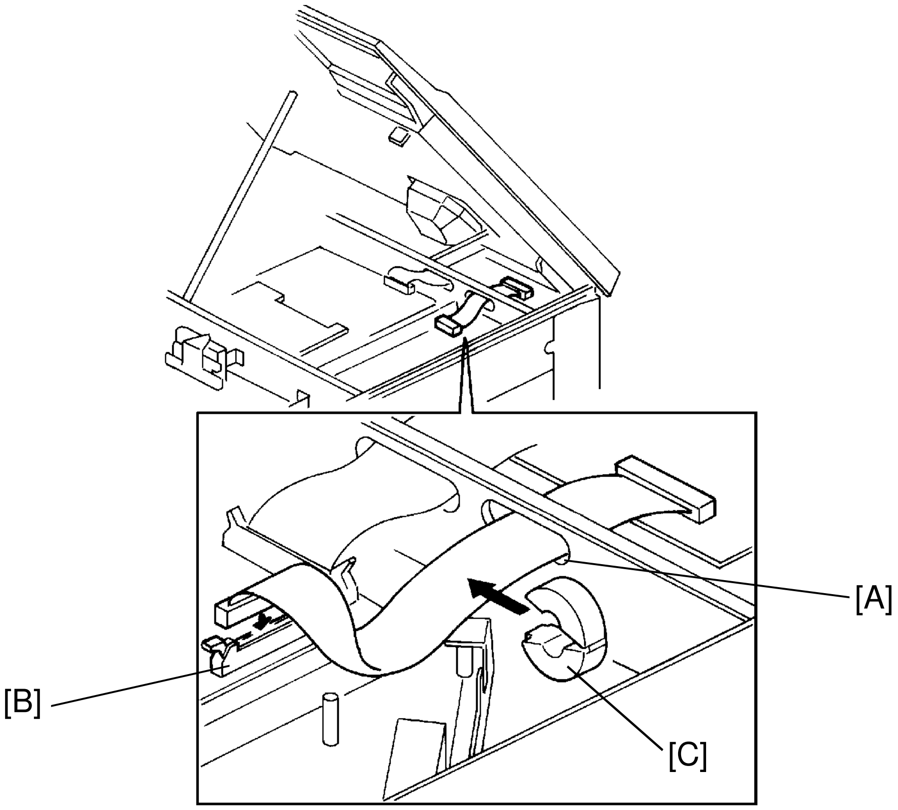




CAUTION: To prevent possible damage to copiers equipped with an optional ARDF, secure the DF with the retainer [A], before lifting the scanner.
The retainer is provided in the DF carton box.

6. Open the front doors.
7. Remove the operation undercover [B] (3 screws).
8. Remove the 2 screws [C] securing the scanner unit.
9. Lift the scanner unit and place the support rod [D] under it. Insert the rod in the right hole.

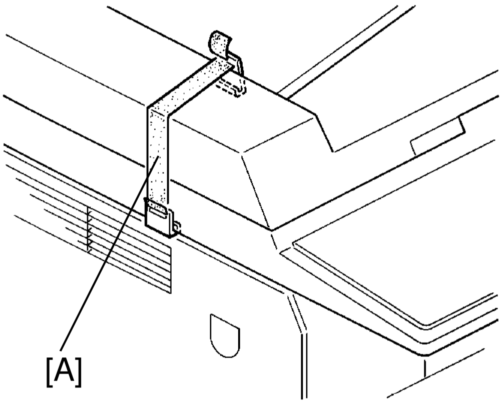
WARNING: Be sure to properly insert the rod to avoid having the unit fall.

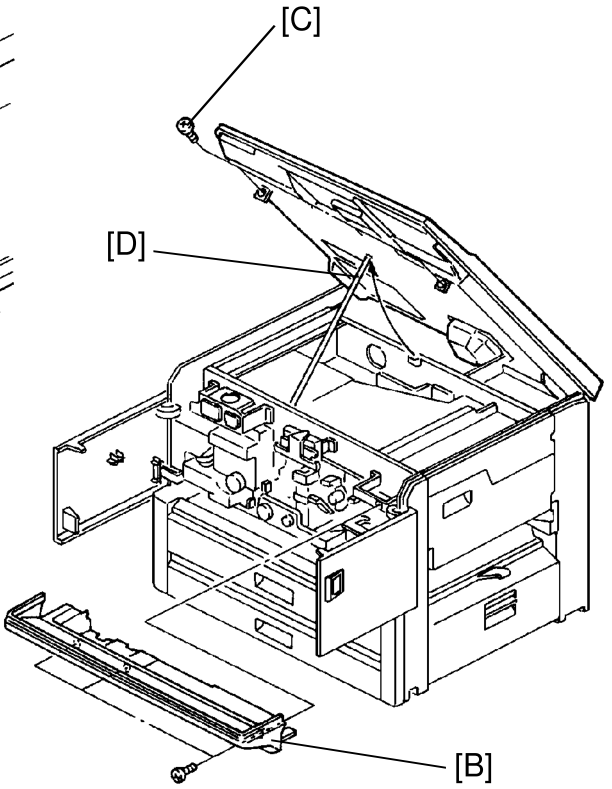


10. Pass the scanner interface board ribbon through the hole [A], and connect it to the printer controller board CN405 [B]. Make sure the red wire in the ribbon is coupled towards the front.
11. Clip the ferrite core [C] around the harness as in the figure.

    NOTE: Be careful not to pinch the harness in the ferrite core.
12. Lower the scanner and reinstall all covers.

6.3 HARD DISK UNIT (OPTION) INSTALLATION

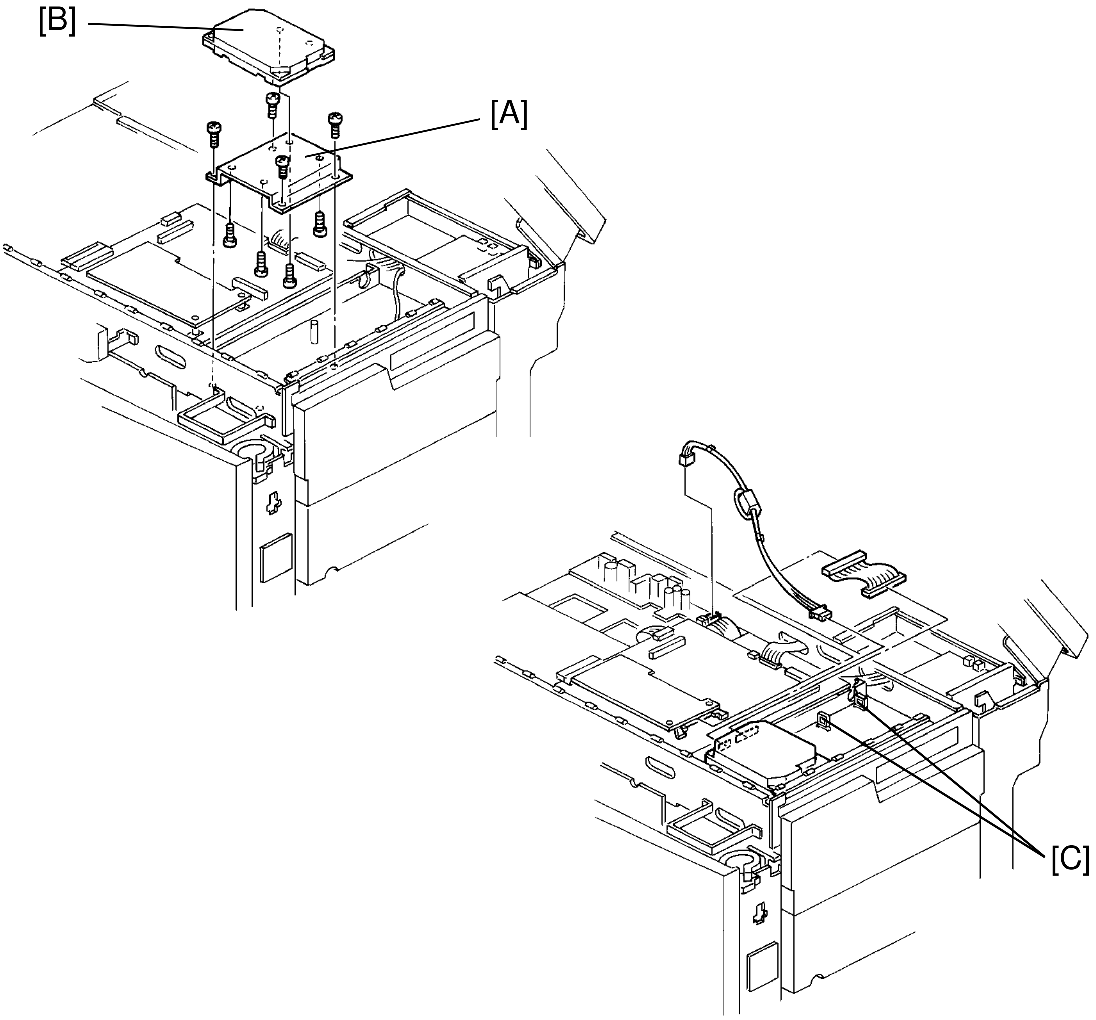




CAUTION: To prevent possible damage to copiers equipped with an optional ARDF, secure the DF with the retainer [A], before lifting the scanner.
The retainer is provided in the DF carton box.

1. Turn off the main switch, and disconnect the power supply cord of the main system.
2. Open the front doors.
3. Remove the operation undercover [B] (3 screws).
4. Remove the 2 screws [C] securing the scanner unit.
5. Lift the scanner unit and place the support rod [D] under it. Insert the rod in the right hole.

WARNING: Be sure to properly insert the rod to avoid having the unit fall.



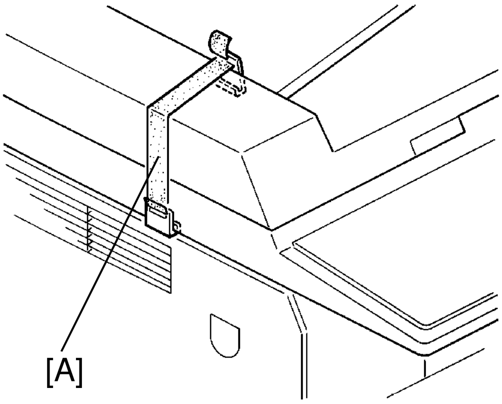
6. Set the HDD bracket [A] to the hard disk drive [B] (4 M3 x 5 screws).

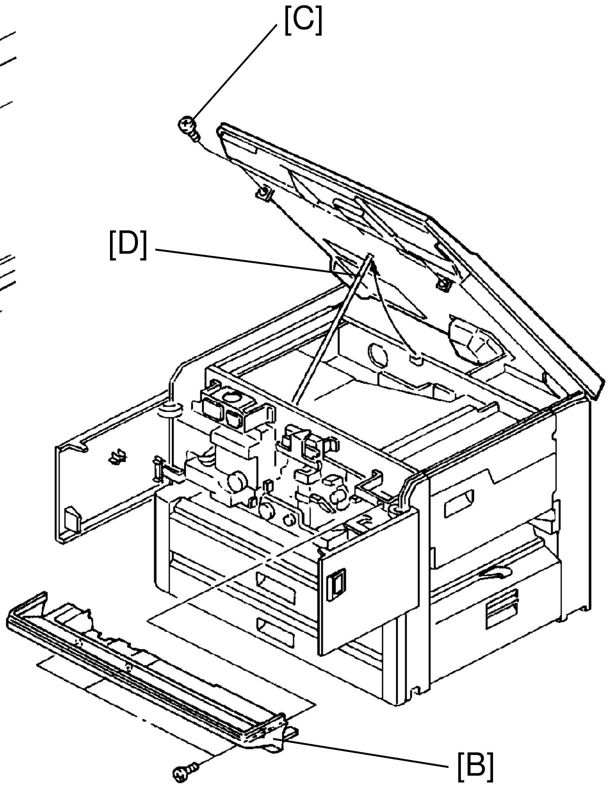
7. Secure the hard disk drive unit to the main system as shown in the figure (4 M4 x 8 screws).

8. Connect the 2 harnesses as in the figure.
   - 4P connector to the printer PSU board CN4.
     Make sure to use the clamps [C].
   - 48P connector to the printer controller board CN406.

9. Lower the scanner and reassemble the main system.

6.4 MEMORY MODULE UNIT (OPTION) INSTALLATION

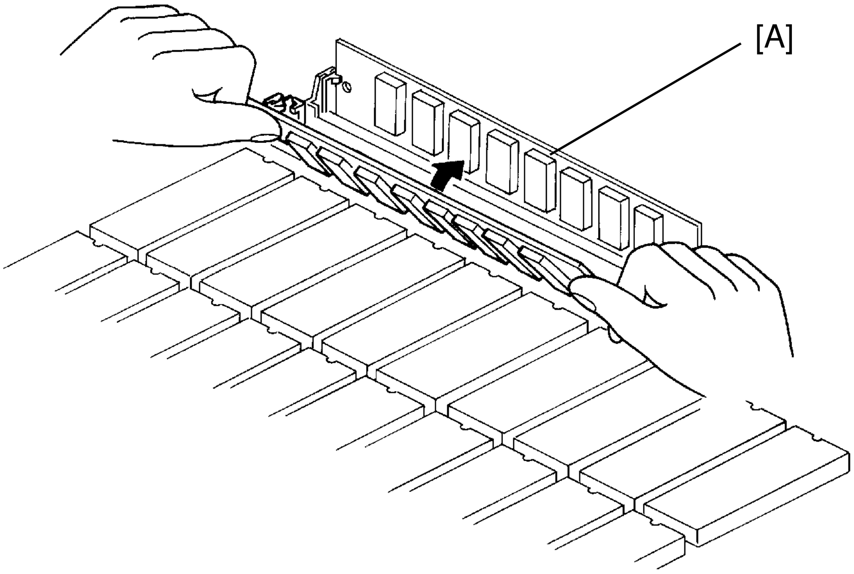




CAUTION: To prevent possible damage to copiers equipped with an optional ARDF, secure the DF with the retainer [A], before lifting the scanner.
The retainer is provided in the DF carton box.

1. Turn off the main switch, and disconnect the power supply cord of the main system.
2. Open the front doors.
3. Remove the operation undercover [B] (3 screws).
4. Remove the 2 screws [C] securing the scanner unit.
5. Lift the scanner unit and place the support rod [D] under it. Insert the rod in the right hole.

WARNING: Be sure to properly insert the rod to avoid having the unit fall.



NOTE: This optional RAM board is interchangeable with the RAM board originally installed.

6. Insert the ram board [A] into the slot, with the chips facing towards you.
7. Push the ram board back until it locks in position.
8. Repeat the above steps for the other board.
9. Lower the scanner and reassemble the main system.

SECTION 4

SERVICE TABLES

1. PM TABLE

C: Clean R: Replace L: Lubricate A: Adjust I: Inspect

ITEM	EM	80 K	160 K	NOTES
SCANNER				
Mirrors and Lens	C	C	C	Optics cloth.
Exposure Glass	C	C	C	Alcohol or water with soft cloth. For units used in low humidity area where static electricity may cause original jams, the glass should be polished periodically with silicone oil.
Platen Cover Sheet	C	C	C	Alcohol or water, replace if too dirty.
Scanner Guide Plate		C	C	Dry cloth
APS Sensor		C	C	
LASER UNIT				
Toner Shield Glass	C	C	C	Alcohol or water
PAPER FEED				
Paper Feed Roller	C	R	R	Water
Separation Roller	C	R	R	Water
Pick-up Roller	C	R	R	Water
Registration Roller		C	C	Alcohol
Transport Belt		C	C	Alcohol or water
Cassette Bottom Plate Pad	C	C	C	Alcohol or water
Registration Sensor		I/C	I/C	Check by placing white paper under the sensor and measuring the output. Clean the sensor only when the output is less than 1.0 V.
AROUND DRUM				
Corona Wires	C	R	R	Dry cloth
Charge Corona Grid		C	R	
Wire Cleaner Pad		R	R	Replace if necessary.
End Blocks and Corona Unit Casing	C	C	C	Dry cloth
Transfer Guide Plate		C	C	
Quenching Lamp Filter		C	C	Dry cloth
ID Sensor	I/C/A	I/C/A	I/C/A	After cleaning, set V_{SG} using SP3-1-2.
Pick-off Pawl	I/C/R	I/C/R	I/C/R	Check, clean and replace if damaged.
Dust Filters and Ozone Filters		R	R	

ITEM	EM	80 K	160 K	NOTES
CLEANING UNIT				
Cleaning Blade		R	R	
Cleaning Brush		R	R	
Cleaning Bias Blade		R	R	
Cleaning Entrance Seal	I/C	I/C	I/C	Check and clean replace if damaged.
Bias Roller		C	C	Clean when the brush is replaced.
Toner Collection Bottle	C			Empty the used toner.
Blade Edge Cleaner	I/C	I/C	I/C	Check and clean. Replace if damaged.
Cleaning Lower Guide Plate		C	C	Dry cloth
DEVELOPMENT UNIT				
Developer			(R)	Replace if necessary
Side Seal	C	C	C	Use a vacuum cleaner.
Development Air Filter		R	R	
Gears			L	Silicon G-501
Toner Supply Clutch			L	Mobil temp 78
FUSING				
Hot Roller			R	
Pressure Roller			R	
Hot Roller Stripper		C	R	
Oil Supply Pad		R	R	
Oil Blade		C	R	
Fusing Entrance and Exit Guide		C	C	
Oil Pump		I/C	I/C	Check and remove paper dust.
Oil Tank	I	I	I	Check and refill or replace the silicone oil. Check and remove paper dust with pipette.
Fusing Gear			L	Nok Barrierta JFE552
Thermistor		I/C	I/C	Check and clean if dirty.
Fusing Idle Gears	R			Need replacement at every 480K.
OTHERS				
Main Drive Chain			L	Mobil temp 78
Drum Drive Belt		I	I	Replace if worn.
Metal Bushing			L	Mobil temp 78
LARGE CAPACITY TRAY				
Paper Feed Roller	C	R	R	Water
Separation Roller	C	R	R	Water

ITEM	EM	80 K	160 K	NOTES
Pick-up Roller	C	R	R	Water
Lift Motor Worm Gear			L	Mobil temp 78
Cassette Bottom Plate Pad	C	C	C	Alcohol
Drive Belt		I	I	Replace if worn.
SORTER				
Transfer Rollers	C	C	C	Alcohol
Exit Rollers	C	C	C	Alcohol
Gears and Bushings	(L)	(L)	(L)	Lubricate only when noisy.
DUPLEX				
Positioning Roller	C	R	R	
Pick-up Roller	C	R	R	Water
Separation Roller	C	R	R	Water
Feed Roller	C	R	R	Water
Transport Rollers		C	C	Alcohol or water
Spring Clutch Shaft			L	Mobil temp 78
Pick-up Arm Bracket			L	Mobil temp 78
Entrance Gate Pin			L	Mobil temp 78
Unit Joint Pin			L	Mobil temp 78

ARDF

ITEM	EM	20 K Originals	40 K Originals	60 K Originals	NOTES (See SP7-205)
Transport Belt	C	C	R	C	Belt cleaner
Separation Belt	C	R	R	R	Alcohol
Separation Roller	C	C	R	C	Alcohol
Feed-in Clutch				L	Mobil temp 78
Belt Drive Motor Gear				L	Mobil temp 78

2. SP MODE

2.1 SP MODE PROCEDURE

There are two types of SP MODE. One consists of UP modes which can be set by the key operator and field engineers. The other consists of SP Modes which can be used by field engineers for adjustment, confirmation of data, and for adjustable mode selections required by users.

1. UP Mode

To access a UP mode, follow the steps below.

1) Press the Clear Modes key. Then hold the C/S key until the UP mode is displayed on the indicator.

◇ + C/⊘

Program Mode
No. 0

2) Enter the desired UP mode number using the number keys, and press the Enter key.

Alternative: Scroll through the UP modes using the Zoom keys, then press the Enter key.

Example: SP mode 4

4 + R/#

either

Program Mode
No. 4

\+ x 4 (or – x 7) + R/#

3) When changing the data, input the data using the number keys and press the Enter key.

Data + R/#

4) Input a new SP number to change to another mode number.

NOTE: When adjusting the data, always reconfirm that the correct data has been input by pressing the Enter key again.

5) Exit the UP mode by pressing the Clear Modes key or by turning off the main switch.

2. Service SP Mode

To access the SP mode, follow the steps below.

1) Press the Clear Modes key and input 107 using the number keys. Then hold the C/S key until the service SP mode is displayed on the indicator.

◇ + 1 + 0 + 7 + C/⊗

```
SP−MODE C1(1)Feed
Set Class1 No.    1
```

2) Enter the class 1 number using the number keys and press the Enter key.

Class 1 No. + R/#

```
SP−MODE C1(1)Feed
Set Class2 No.    1
```

1: Paper Feed Transport and Fusing

```
SP−MODE C1(2)Drum
Set Class2 No.    1
```

2: Around Drum

```
SP−MODE C1(3)Process
Set Class2 No.    1
```

3: Process Control

```
SP−MODE C1(4)Scanner
Set Class2 No.    5
```

4: Scanner

```
SP−MODE C1(5)Mode
Set Class2 No.    1
```

5: Operation and Mode

```
SP−MODE C1(6)Periph.
Set Class2 No.    1
```

6: Peripheral

```
SP−MODE C1(7)Logging
Set Class2 No.    1
```

7: Logging Data

NOTE: Before pressing the Enter key, the class 1 program number can be set with the Zoom keys.

3) Enter the class 2 number using the number keys and press the Enter key.

Class 2 No. + R/#

NOTE: Before pressing the Enter key, the program number for class 2 can be changed by using Zoom keys.

4) When choosing the other item under class 2, using the Zoom keys.

5) When changing the data, input the data using the number keys.

Data + R/#

NOTE: For the class 2 program number can be set with the Zoom keys before pressing the Enter key.

Example: Development bias adjustment.
[2-201: Class 1-(2), Class 2-(201)]

6) To correct or checking the data for another SP mode, press the Clear Modes key and input a new SP mode number.
When pressing the Clear Mode key, the previous menu will be displayed.

7) Exit the SP mode by pressing the Clear Modes key until the stand by mode is displayed.

NOTE: All program modes (UP and SP mode) are available when the main motor is not operating.

2.2 MEMORY CLEAR PROCEDURE MAIN CONTROL BOARD

There are three ways to clear memory. They are memory all clear, counter clear 1, and counter clear 2.

1. Memory All Clear

Function:

Everything in RAM is Cleared.

Procedure:

1) Enter the service SP mode (see SP Mode Procedure).

2) Enter the Memory All Clear Mode as follows.

5 + R/# + 8 + 0 + 1 + R/#

3) Press "1".

1

4) Press the Full Size key, APS key and Enter key at the same time.

100 , ▣ , R/#

NOTE: The beeper will sound three times.

5) Exit Memory All Clear Mode by pressing the clear modes key.

2. Counter Clear 1

Function: The following counters are cleared.

- SC Counter
- Jam Counter

Procedure:

1) Enter service SP mode (see SP Mode Procedure).

2) Enter the Counter Clear 1 Mode as follows.

7 + R/# + 8 + 0 + 7 + R/#

3) Press "1".

1

4) Press the Full Size key, APS key, and Enter key at the same time.

100 , ⧉ , R/#

NOTE: The beeper will sound three times.

5) Exit the Counter Clear 1 Mode by pressing the clear modes key.

3. Counter Clear 2

Function: The following counters are cleared.

- Main Motor ON Time
- Copy Counter
- SC Counter
- Jam Counter
- Job Program
- PM Counter
- User Code Mode Counter

Procedure:

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the Counter Clear 2 mode as follows.

7 + R/# + 8 + 0 + 8 + R/#

3) Press "1".

1

4) Press the Full Size key, APS key, and Enter key at the same time.

100 , ⧉ , R/#

NOTE: The beeper will sound three times.

5) Exit the Counter Clear 2 Mode by pressing the Clear Modes key.

2.3 NV RAM (MEMORY) CLEAR PROCEDURE
– Printer Control Board –

Function:

All settings input through the printer menu keys are cleared.

Procedure:

1. Take the printer off-line by pressing the On-Line key so that the indicator is not lit.
2. Press the Menu key.
3. Press the up arrow or down arrow key (∧ or ∨), if necessary, until you see System Security displayed on the guidance display.
4. Press the Enter key.
5. Enter "9999" at level 1 (L1).
6. Press the Clear key and then the Enter key on the printer function panel.

NOTE: If a strange image appears in the print mode, try performing the NV RAM clear.

2.4 USER CODE

The user code function restricts copy operator access and controls the number of copies made.

NOTE: a) Up to 20 user codes can be registered.
b) "0 0 0 0" cannot be used as a user code.
c) User codes are sorted automatically and displayed from the smallest user code in the range.

1. Entering the User Codes Mode

1) Disconnect the key counter shorting connector. (The key counter shorting connector is inside of the right inner cover.)

2) Enter the SP mode (see SP Mode Procedure).

3) Enter the User Code Mode as follows.

[5] + [R/#] + [4] + [0] + [1] + [R/#]

4) Press 1 and the Enter key.

[1] + [R/#]

2. How to Set a User Code

A user code can be set by SP5-405 or the UP17.

3. How to Change a User Code

A user code can be changed by SP5-406 or UP18.

4. How to Clear a User Code

A user code can be cleared by SP5-407 or UP19.

1) Clearing one user code:
After entering the User Code Clear Mode, enter the user code you want to clear and press the Enter key twice.

2) Clearing a particular range of user codes:
After entering the User Code Clear Mode, enter the smallest user code in the range, and press the Enter key. Then enter the largest user code in the range, and press the Enter key.

5. How to Check a Counter

Each user code counter can be checked by SP5-402 or UP15.

NOTE: Press the Zoom Up or Zoom Down key to see next user code's counter.

6. How to Clear Counters

User code counters can be cleared by SP5-404 or UP16.

1) Clearing one user code counter.
After entering the User Code Counter Clear Mode, enter the user code you want to clear and press the Enter key twice.

2) Clearing counters in a particular range of user codes.
After entering the User Code Counter Clear Mode, enter the smallest user code in the range, and press the Enter key. Then, enter the largest user code in the range, and press the Enter key.

3) Clearing all counters.
After entering the User Code Counter Clear Mode, enter "1" and press the Enter key. Then enter "9999" and press the Enter key.

2.5 SC HISTORY CHECK

This mode registers the history of SC occurrences. Up to 40 occurrences, including those coming from optional functions, can be registered in memory. After 40 registrations, the oldest occurrence in memory is deleted to make room for the new one.

1. Procedure

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the SP History Check Mode as follows.

7 + R/# + 9 + 0 + 1 + R/#

3) Press 1 and the Enter key.

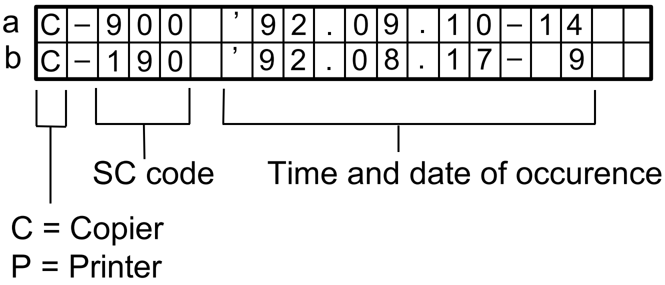
1 + R/#

4) When changing to another occurrence press the Darker key to go to the next one, or the Lighter key to go back.

5) Exit the SP History Check Mode by pressing the Clear Modes key.

2. How to Read the SC History Display

Example:



a	C	–	9	0	0		’	9	2	.	0	9	.	1	0	–	1	4		
b	C	–	1	9	0		’	9	2	.	0	8	.	1	7	–		9		

a) An SC 900 (Total Counter Error) occurred on September 10th. 1992 at 2 p.m.

b) An SC 190 (IPU Board Error) occurred on August 17th. 1992 at 9 a.m.

3. Clear SC History Check Mode

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the SC History Clear Mode as follows.

[7] + [R/#] + [9] + [0] + [2] + [R/#]

3) Press 1, then press the Full Size, APS and Enter key at the same time.

[1] + [100] , [⧉] , [R/#]

NOTE: The beeper will sound three times.

2.6 JAM HISTORY CHECK

This mode registers the history of jam occurrences. Up to 50 occurrences can be registered. After 50 registrations, the oldest occurrence is deleted from memory to make room for the new one.

1. Procedure

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the Jam History Check Mode as follows.

$\boxed{7} + \boxed{R/\#} + \boxed{9} + \boxed{0} + \boxed{3} + \boxed{R/\#}$

3) Press 1 and the Enter key.

$\boxed{1} + \boxed{R/\#}$

4) To view other occurrences, press the Darker key to go to the next one, or the Lighter key to go back.

5) Exit Jam History Check Mode by pressing the Clear Mode key.

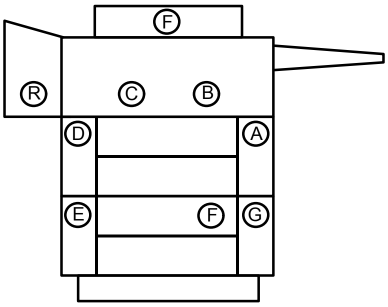
2. How to Read the Jam History Display

Example:

a	R						’	9	2	.	0	8	.		1	−	1	6		
b	B						’	9	2	.	0	6	.	1	5	−	1	1		

Location

Time and date of occurence



a) A jam occurred at area R on August 1st 1992 at 4 p.m.

b) A jam occurred at area B on June 6th 1992 at 11 a.m.

3. Clear Jam History Check Mode

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the Jam History Clear Mode as follows.

$\boxed{7}$ + $\boxed{\text{R/\#}}$ + $\boxed{9}$ + $\boxed{0}$ + $\boxed{4}$ + $\boxed{\text{R/\#}}$

3) Press 1, then press the Full Size, APS and Enter key at the same time.

$\boxed{1}$ + $\boxed{100}$, $\boxed{⧉}$, $\boxed{\text{R/\#}}$

NOTE: The beeper will sound three times.

2.7 INPUT CHECK MODE

1. Input Check Mode Procedure

This mode displays sensor data.

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the Input Check Mode as follows.

   5 + R/# + 8 + 0 + 3 + R/#

3) Enter the input check mode number, and press the Enter key.

   NOTE: a) "0", "1", or an analog value appears on the display.
   b) The data cannot be printed out.

4) When changing to another input check mode, press the Enter key twice and then input the new number.

5) Exit the Input Check Mode by pressing the Clear Modes key.

2. Input Check Modes

No.	SENSOR	STATUS	
		0	1
1	ID Sensor	Voltage	
2	APC (Auto Power Control)	Voltage	
3	LD 5 V (Voltage for Laser Diode)	Voltage	
4	Thermistor (Fusing Temperature)	Temperature	
5	V_{SP}	Voltage	
6	V_{SG}	Voltage	
7	Toner Color	Black	
8	Side Paper Size Data	Paper Size	
9	1st Tray Paper Size Data	Paper Size	
10	2nd Tray Paper Size Data	Paper Size	
11	Oil End Sensor	Oil is detected	Oil end
12	Toner Overflow Sensor	No Toner overflow	Toner overflow
13	Toner End Sensor	Toner end	Toner OK
14	Main Motor Ready	Main motor not ready	Main motor ready
15	Polygon Mirror Motor Ready	Polygon motor not ready	Polygon motor ready
16	Right Upper Door Switch	Cover closed	Cover opened
17	Manual Feed Tray Sensor	Tray closed	Tray opened
18	Front Door Safety Switch	Front door closed	Front door opened
19	Side Paper Lift Sensor	Sensor actuated	Sensor not actuated
20	1st Paper Lift Sensor	Sensor actuated	Sensor not actuated
21	2nd Paper Lift Sensor	Sensor actuated	Sensor not actuated
22	1st Lower Limit Sensor	Sensor actuated	Sensor not actuated
23	2nd Lower Limit Sensor	Sensor actuated	Sensor not actuated
24	1st Paper Set Sensor	1st paper tray is not set	1st paper tray is set
25	2nd Paper Set Sensor	2nd paper tray is not set	2nd paper tray is set
26	2nd Relay Sensor	Sensor not actuated	Sensor actuated
27	Side Relay Sensor	Sensor not actuated	Sensor actuated
28	1st Relay Sensor	Sensor not actuated	Sensor actuated
29	Registration Sensor	Sensor not actuated	Sensor actuated
30	Upper Exit Sensor	Sensor not actuated	Sensor actuated
31	Test SW	Switch off	Switch on
32	DIP SW (Main Board)	Switch off	Switch on
33	Japanese Version Only		
34	Duplex Unit Sensor	Unit is not installed	Unit is installed
35	LCT Unit Sensor	Unit is not installed	Unit is installed

No.	SENSOR	STATUS	
		0	1
36	Inverter Unit Sensor	Unit is not installed	Unit is installed
37	Sorter Unit Sensor	Unit is not installed	Unit is installed
38	Thermofuse	Thermofuse is disabled	Thermofuse is enabled
39	Manual Feed Tray Paper Size Data	Paper size	
40	Total Printing Dots	Total dots	
41 to 66	No Function		
67	Right Lower Door Switch (Duplex Unit)	Cover closed	Cover opened
68	Left Lower Door Sensor (Duplex Unit)	Cover closed	Cover opened
69	Duplex Paper Sensor (Duplex Unit)	Sensor actuated	Sensor not actuated
70	Duplex Entrance Sensor (Duplex Unit)	Sensor actuated	Sensor not actuated
71	Inverter Entrance Sensor (Duplex Unit)	Sensor not actuated	Sensor actuated
72	Inverter Exit Sensor (Duplex Unit)	Sensor not actuated	Sensor actuated
73	Duplex Unit Sensor (Duplex Unit)	Unit is not installed	Unit is installed
74	Jogger H.P. Sensor (Duplex Unit)	Not at H.P.	At H.P.
75	Upper Relay Sensor (Duplex Unit)	Sensor not actuated	Sensor actuated
76 to 80	No Function		
81	Right Lower Door Switch (LCT)	Cover closed	Cover opened
82	Upper Limit Switch (LCT)	Switch off	Switch on
83	Tray Lower Limit Sensor (LCT)	No paper in the LCT	Paper in the LCT
84	LCT Unit Sensor (LCT)	Unit is not installed	Unit is installed
85	Lower Tray Button Switch (LCT)	Switch is not pushed	Switch is pushed
86 to 96	No Function		
97	Inverter Entrance Sensor (Inverter Unit)	Sensor not actuated	Sensor actuated
98	Upper Exit Sensor (Inverter Unit)	Sensor not actuated	Sensor actuated
99	Lower Exit Sensor (Inverter Unit)	Sensor not actuated	Sensor actuated
100	Left Upper Door Sensor (Inverter Unit)	Door closed	Door opened

2.8 OUTPUT CHECK MODE

1. Output Check Mode Procedure

NOTE: The data cannot be printed out.

1) Enter the SP mode (see SP Mode Procedure).

2) Enter the Output Check Mode as follows.

5 + R/# + 8 + 0 + 4 + R/#

3) Enter the output check mode number, and press the Enter key.

4) Enter "1" and press the Enter key to energize the mode.

5) Enter "0" and press the Enter key to stop the job.

6) When changing to another output check mode, press the Enter key twice and then enter the new number.

7) Exit Output Check Mode by pressing the Clear Modes key.

2. Output Check Mode Table

No.	LOAD
1	Side Pick-up Solenoid
2	1st Pick-up Solenoid
3	2nd Pick-up Solenoid
4	Side Paper Feed Clutch
5	1st Paper Feed Clutch
6	2nd Paper Feed Clutch
7	1st Tray Lock Solenoid
8	2nd Tray Lock Solenoid
9	Registration Clutch
10	Relay Roller Clutch
11	Main Motor
12	Cleaning Solenoid
13	Toner Supply Solenoid
14	Side Paper Lift Motor
15	1st Paper Lift Motor
16	2nd Paper Lift Motor
17	Grid Bias
18	Charge Corona Bias
19	Bias 1
20	Bias 2
21	Transfer Corona Bias
22	Separation Corona Bias
23	Cleaning Bias
24	PCC (Pre Cleaning Corona)
25	Quenching Lamp
26	Ozone Fan 1
27	Ozone Fan 2
28	Ozone Fan 3
29	ID Sensor LED
30	Printer Controller Ozone Fan
31	Optics Fan
32	Development Clutch
33 to 48	No Function
49	Pick-up Solenoid (Duplex)
50	Paper Feed Clutch (Duplex)
51	Paper Tray Lock Solenoid (Duplex)
52	Duplex Drive Clutch (Duplex)
53	Relay Clutch (Duplex)
54	Duplex/LCT Motor (Duplex)
55	Duplex Entrance Gate Solenoid (Duplex)
56	Relay Pinch Roller Solenoid (Duplex)
57	Fork Gate Solenoid 1 (Duplex)
58	Fork Gate Solenoid 2 (Duplex)
59	Duplex Position Roller Solenoid (Duplex)
60	Stopper Solenoid (Duplex)
61 to 64	No Function
65	Pick-up Solenoid (LCT)
66	Paper Feed Solenoid (LCT)
67	Relay Clutch (LCT)
68	LCT Motor (LCT)
69	Tray Motor (LCT)
70	Lower Tray Button LED (LCT)
71 to 80	No Function
81	Junction Gate Solenoid (Inverter)
82	Inverter Entrance Solenoid (Inverter)
83	Return Pinch Roller Solenoid (Inverter)

2.9 UP MODE TABLE

NOTE: 1. In the Function column, comments are in italics.
2. In the Data column, the default value is printed in bold letters.

No.	ITEM	FUNCTION	DATA	Service SP mode No.
1	All Indicators ON	Turns on all indicators on the operation panel.		5-1
2	ADS Level Selection	Select a small number if the copy is too light in ADS mode.	1 ~ 7 levels 4	5-106
3	Marker Density	Changes the detection level of the marker line. Select a larger number to prevent marker line from appearing on the copy. Select a small number to ensure marker line detection.	1 ~ 7 levels 5	5-201
4	Center Line on Double Copy	Selects the type of center line in the double copy mode.	1: Broken line 2: Solid line 3: Center marks 4: No line	5-202
5 to 14	Open	No function		
15	User Code Total Copy Counter Check	Displays each user codes total copy counter. After entering this mode, either input a user code or use the Zoom Up/Zoom Down key to select the user code.	–	5-402
16	User Code Counter Clear	Clears each user code counter. See User Code section.	–	5-404
17	User Code Setting	Register a user code (4 digit number). Select one from 0001 to 9999.	–	5-405
18	User Code Change	Changes a user code. Input the old user code number and press the Enter key. Then input the new user code and press the Enter key.	–	5-406
19	User Code Clear	Clears a user code. See User Code section.	–	5-407
20	30 second Toner Supply	30 second toner supply to increase low toner concentration due to long copy runs with heavy originals.	0: No 1: Yes	2-207

2.10 SP MODE TABLE

NOTE: 1. In the Function column, comments are in italics.
2. In the Data column, the default value is printed in bold letters.

Mode No.				FUNCTION	DATA
Class 1	Class 2				
1 Paper Feed, Transport and Fusing	1		Printing Leading Edge Registration Adjustment	Adjusts the printing leading edge registration using test pattern type 10. *When using this mode, the value of SP no. 2-101-1 should be 2. Use the point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.*	+9 ~ –9 *1 mm/step 0: Default
	2	1	Printing Side-to Side Registration Adjustment (Side Cassette)	Makes the printing side-to-side of a copy fed from the side cassette using test pattern type 10. *When using this mode, the value of SP no. 2-101-3 should be 2. Use point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.*	+9 ~ –9 *1 mm/step 0: Default
		2	Printing Side-to Side Registration Adjustment (1st Cassette)	Makes the printing side-to-side of a copy fed from the 1st cassette using test pattern type 10. *When using this mode, the value of SP no. 2-101-3 should be 2. Use point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.*	+9 ~ –9 *1 mm/step 0: Default
		3	Printing Side-to Side Registration Adjustment (2nd Cassette)	Makes the printing side-to-side of a copy fed from the 2nd cassette using test pattern type 10. *When using this mode, the value of SP no. 2-101-3 should be 2. Use point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.*	+9 ~ –9 *1 mm/step 0: Default
		4	Printing Side-to Side Registration Adjustment (3rd Cassette)	Makes the printing side-to-side of a copy fed from the 3rd cassette using test pattern type 10. *When using this mode, the value of SP no. 2-101-3 should be 2. Use point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.*	+9 ~ –9 *1 mm/step 0: Default

Mode No.				FUNCTION	DATA
Class 1	Class 2				
1 Paper Feed, Transport and Fusing	2	5	Printing Side-to-Side Registration Adjustment (Manual Feed)	Makes the printing side-to-side of a copy fed from the manual feed using test pattern type 10. When using this mode, the value of SP no. 2-101-3 should be 2. Using point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.	+9 ~ –9 *1 mm/step 0: Default
		6	Printing Side-to-Side Registration Adjustment (Duplex Unit)	Makes the printing side-to-side of copy fed from the duplex unit using test pattern type 10. When using this mode, the value of SP no. 2-101-3 should be 2. Use point key to select + or –. The specification is $2^{+1}_{-1.5}$ mm.	+9 ~ –9 *1 mm/step 0: Default
	3	1	Registration Buckle Adjustment (Side Cassette)	Adjusts the amount of paper buckle in at the registration area.	0 ~ 20 *1 mm/step 11: Default
		2	Registration Buckle Adjustment (1st Cassette)		0 ~ 20 *1 mm/step 13: Default
		3	Registration Buckle Adjustment (Other Cassette)		0 ~ 20 *1 mm/step 13: Default
	4		Open	No function	
	5				
	6		Center Line Side Registration on Double Copy	Adjusts the center line position. Use point key to select + or –.	+9 ~ –9 *1 mm/step 0: Default
	7		Manual Feed Paper Size Display	Displays the paper width sensor data for the manual table.	
	101		Open	No function	
	102				
	103		Fusing Idling Time	Heats up the fusing unit after warm-up. Use this mode for low room temperature.	0: 0 sec. 1: 30 sec. 2: 60 sec.

Mode No.				FUNCTION	DATA
Class 1	Class 2				
1 Paper Feed, Transport and Fusing	104		Fusing Temperature Control Method	Selects the fusing temperature control method. When room lights flicker due to low wall power, select the phase control "1".	0: Switching 1: Phase
	105		Fusing Temperature Adjustment	Adjusts the fusing temperature. 0: 75 means 175°C	0: 75 2: 85 1: 80 3: 90
	106		Fusing Temperature Display	Displays the fusing temperature.	
	900		Inverter Mode	Copies feed out through the inverter unit. Use this mode to check the inverter function.	0: No 1: Yes
2 Around Drum	1	1	Grid Bias Adjustment	Adjusts the grid bias. When the data is increased, the voltage value is increased.	0 ~ 255 67: Default
		2	Grid Bias Adjustment (ID Sensor)	Adjusts the grid bias of the ID pattern. When the data is increased, the voltage value is increased. Do not change the value.	0 ~ 255 128: Default
	101	1	Printing Leading Edge Margin	Adjusts the leading edge erase margin. When the leading edge registration is adjusted, this value should be 2.	0 ~ 9 *1 mm/step 2: Default
		2	Printing Trailing Edge Margin	Adjusts the trailing edge erase margin. When the leading edge registration is adjusted, this value should be 2.	0 ~ 9 *1 mm/step 2: Default
		3	Printing Left Side Margin	Adjusts the left side erase margin. When the side registration is adjusted, the value should be 2.	0 ~ 9 *1 mm/step 2: Default
		4	Printing Right Side Margin	Adjusts the right side erase margin. When the side registration is adjusted, the value should be 2.	0 ~ 9 *1 mm/step 2: Default
	102		Open	No function	
	103		LD Bias Display	Displays the LD bias. (PWM data)	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
2 Around Drum	104		ID Sensor Pattern Density Adjustment	Adjusts the LD power of the ID pattern. When the data is increased, the pattern density becomes light. Do not change the value.	0 ~ 15 15: Default
	105		Center Line Density on Double Copy	Adjusts the center line density by changing the LD power. When the data is increased, the line density becomes light. Using this mode, only the center line density can be adjusted.	0 ~ 15 15: Default
	106		Test Pattern Density	Adjusts the test pattern density by changing the LD power. When the data is increased, the density becomes light.	0 ~ 15 9: Default
	107	1	Edge Level – 1	Adjusts the edge level in binary processing. When the data is increased, the edge of image to be cleared.	0 ~ 15 9: Default
		2	Edge Level – 2		
		3	Edge Level – 3		
		4	Edge Level – 4		
		5	Edge Level – 5		
		6	Edge Level – 6		
		7	Edge Level – 7		0 ~ 15 15: Default
	108		Polygon Mirror Motor Off	Turns off the polygon mirror motor in the standby mode to lower the noise level.	0: No 1: Yes
	201	1	Development Bias Off	Adjusts the development off bias (Non image area). When the data is increased, the bias is increased. Do not change the value.	0 ~ 255 244: Default
		2	Development Low Bias	Adjusts the development low bias. When the data is increased, the bias is increased. Do not change the value.	0 ~ 255 107: Default
		3	Development High Bias	Adjusts the development high bias. When the data is increased, the bias is increased. Do not change the value.	0 ~ 255 64: Default

<table>
<tr><th colspan="4">Mode No.</th><th rowspan="2">FUNCTION</th><th rowspan="2">DATA</th></tr>
<tr><th>Class 1</th><th>Class 2</th><th></th><th></th></tr>
<tr><td rowspan="14">2
Around Drum</td><td rowspan="2">201</td><td rowspan="2">4</td><td rowspan="2">ID Sensor Bias Adjustment</td><td>Adjusts the development bias of the ID pattern.</td><td>0 ~ 4
2: Default</td></tr>
<tr><td colspan="2"><table><tr><td>Display</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td></td><td>Lowest</td><td>Low</td><td>Normal</td><td>High</td><td>Highest</td></tr><tr><td></td><td>–490</td><td>–460</td><td>–430</td><td>–400</td><td>–370 (V)</td></tr></table></td></tr>
<tr><td colspan="2">202</td><td>Open</td><td>No function</td><td></td></tr>
<tr><td colspan="2" rowspan="2">203</td><td rowspan="2">Standard ID Sensor Bias Adjustment</td><td>Adjusts the standard development bias of the ID pattern. When the data is increased, the bias is increased.</td><td rowspan="2">0 ~ 255
100: Default</td></tr>
<tr><td>Do not change the value.</td></tr>
<tr><td colspan="2">204 to 206</td><td>Open</td><td>No function</td><td></td></tr>
<tr><td colspan="2">207</td><td>30 sec. Toner Supply</td><td>30 seconds toner supply to recover low toner concentration due to long copy runs with heavy originals.</td><td>0: No
1: Yes</td></tr>
<tr><td rowspan="5">208</td><td rowspan="2">1</td><td rowspan="2">Toner Supply Mode</td><td>Selects the toner supply control.</td><td rowspan="2">0: D
1: F
2: DF
3: A</td></tr>
<tr><td>0: Detect Supply mode
1: Fixed Supply mode
2: Detect Supply mode + Fixed Supply mode
3: Auto Supply mode</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Toner Supply Amount</td><td>Adjusts the toner supply ratio when the fix or detect supply mode is selected.</td><td>0: N
1: L
2: H
3: HH</td></tr>
<tr><td colspan="2"><table><tr><td>Display</td><td>N</td><td>L</td><td>H</td><td>HH</td></tr><tr><td>Detect</td><td>30</td><td>15</td><td>45</td><td>60 (%)</td></tr><tr><td>Fixed</td><td>7</td><td>4</td><td>11</td><td>14 (%)</td></tr></table></td></tr>
<tr></tr>
<tr><td colspan="2">209</td><td>ID Check Interval</td><td>Alternates the check interval for the image density sensor.</td><td>0: 10 copies
1: 5 copies</td></tr>
<tr><td colspan="2">210</td><td>Add Toner Supply</td><td>Supplies additional toner during toner end copy runs. Select a bigger number to have longer toner supply. When a set number of copies is made during toner end copy runs, the main motor continues to run for a certain period to feed more toner.
1.4 sec x n (n = 4 ~ 9)</td><td>4 ~ 9
8: Default</td></tr>
</table>

<table>
<tr><th colspan="4">Mode No.</th><th rowspan="2">FUNCTION</th><th rowspan="2">DATA</th></tr>
<tr><th>Class 1</th><th colspan="2">Class 2</th><th></th></tr>
<tr><td rowspan="15">2
Around Drum</td><td colspan="2" rowspan="2">211</td><td>Toner Add Level</td><td>n = V_{SP}/V_{SG} x 100 selection</td><td rowspan="2">0: N
1: LL
2: L
3: H</td></tr>
<tr><td colspan="2"><table><tr><th></th><th>0</th><th>1</th><th>2</th><th>3</th></tr><tr><td>V_{SP}</td><td>0.31 V</td><td>0.44 V</td><td>0.36 V</td><td>0.27 V</td></tr><tr><td>n</td><td>1/13</td><td>1/9</td><td>1/11</td><td>1/15</td></tr><tr><td>Toner</td><td>Normal</td><td>Lowest</td><td>Low</td><td>High</td></tr><tr><td>Display</td><td>N</td><td>LL</td><td>L</td><td>H</td></tr></table></td></tr>
<tr><td colspan="2">212</td><td>Toner Near End Level</td><td>Toner End Level in addition to detected V_{SP}.<table><tr><th>0</th><th>1</th><th>2</th></tr><tr><td>0.20 V</td><td>0.25 V</td><td>0.15 V</td></tr><tr><td>N</td><td>L</td><td>H</td></tr></table></td><td>0: N
1: L
2: H</td></tr>
<tr><td colspan="2">213</td><td>Toner End Copy Run</td><td>Enter "1" if originals with high image areas are frequently used.</td><td>0: 50 copies
1: 20 copies</td></tr>
<tr><td colspan="2" rowspan="2">301</td><td rowspan="2">Transfer Corona Current Adjustment</td><td>Adjusts the transfer corona current. When the data is increased, the current value is increased.</td><td rowspan="2">0 ~ 255
128: Default</td></tr>
<tr><td>Do not change the value.</td></tr>
<tr><td colspan="2">401</td><td>Separation Corona Current Adjustment</td><td>Selects the paper separation timing from the drum.</td><td>0: 4 mm
1: 8 mm
2: 0 mm</td></tr>
<tr><td rowspan="4">402</td><td rowspan="2">1</td><td rowspan="2">DC Separation Corona Current Adjustment</td><td>Adjusts the separation corona current. When the data is increased, the current value is increased.</td><td rowspan="2">0 ~ 255
204: Default</td></tr>
<tr><td>Do not change the value.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AC Separation Corona Current Adjustment</td><td>Adjusts the separation corona current. When the data is increased, the current value is increased.</td><td rowspan="2">0 ~ 255
190: Default</td></tr>
<tr><td>Do not change the value.</td></tr>
<tr><td rowspan="4">403</td><td rowspan="2">1</td><td rowspan="2">DC Edge Separation Current Adjustment</td><td>Adjusts the discharge corona current. When the data is increased, the current value is increased.</td><td rowspan="2">0 ~ 255
110: Default</td></tr>
<tr><td>Do not change the value.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">AC Edge Separation Current Adjustment</td><td>Adjusts the discharge corona current. When the data is increased, the current value is increased.</td><td rowspan="2">0 ~ 255
190: Default</td></tr>
<tr><td>Do not change the value.</td></tr>
</table>

Mode No.				FUNCTION	DATA
Class 1	Class 2				
2 Around Drum	501	1	DC PCC Current Adjustment	Adjusts the PCC current. When the data is increased, the current value is increased. Do not change the value.	0 ~ 255 100: Default
		2	AC PCC Current Adjustment	Adjusts the PCC current. When the data is increased, the current value is increased. Do not change the value.	0 ~ 255 140: Default
	901		Total Printing Dots Display	Displays the total printing dots when the auto toner supply mode is selected. SP# 2-208-1	
3 Process Control	1	1	ID Sensor Setting	Sets the bias for the ID sensor. Do not change the value.	0 ~ 255 The value that appears is result of performing SP3-1-2.
		2	ID Sensor (VSG) Level Setting	Sets the VSG to 4 V automatically. Select "1" and press the Enter key to start. Stops automatically once adjustment is completed.	0: No 1: Yes
	101		Open	No function	
	102				
	103		VSG/VSP Check	Last detection data for VSG and VSP is displayed to judge whether sensor cleaning or adjustment is necessary or not. Selects "1" and press the Enter key to see the VSG and VSP values.	0: No 1: Yes
4 Scanner	1 to 6		Open	No function	
	7		Scanner Lamp Heater Temperature Display	Displays the exposure lamp heater temperature.	
	8		Vertical Magnification Adjustment	Adjusts magnification in the paper feed direction. Use the point key to select + or–.	–1 ~ +1 *1%/step 0: Default
	9		Open	No function	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
4 Scanner	10		Scanner Leading Edge Registration	Adjusts sub-scanning (leading edge) registration. Use the point key to select + or –. See Scanner Registration Adjustment for specification.	–9 ~ +9 *0.5 mm/step 0: Default
	11		Scanner Side-to-Side Registration	Adjusts main scanning (side-to-side) registration. Use the point key to select + or–. See Scanner Registration Adjustment for specification.	–6 ~ +6 *0.5 mm/step 0: Default
	12	1	Scanner Leading Edge Margin	Adjusts the leading edge erase margin. After adjusting this margin, the leading edge margin on copy may change.	0 ~ 9 *0.5 mm/step 1 mm: Default
		2	Scanner Trailing Edge Margin	Adjusts the trailing edge erase margin. After adjusting this margin, the trailing edge margin on copy may change.	0 ~ 9 *0.5 mm/step 1 mm: Default
		3	Scanner Left Side Margin	Adjusts the left side erase margin. After adjusting this margin, the left side margin on copy may change.	0 ~ 9 *0.5 mm/step 1 mm: Default
		4	Scanner Right Side Margin	Adjusts the right side erase margin. After adjusting this margin, the right side margin on copy may change.	0 ~ 9 *0.5 mm/step 1 mm: Default
	13		Scanner Free Run	Operates the scanner without scanning an original. Press the "#" key to start. Press the Clear key to stop	0: No 1: Yes
	101		Horizontal Magnification Adjustment	Adjusts magnification perpendicular to the direction of paper feed. Use the point key to select + or –.	–1 ~ +1 *0.1%/step 0: Default
	301		Original Size Display (APS)	Displays the original size of an original placed on the exposure glass in APS mode.	
	402		Marker Mode Select	When the marked area image in binary processing. Select "1". 0: Dithering 1: Binary	0: No 1: Yes
	403		Binary Processing Select	Selects the binary processing. 0: 16 level grayscale processing 1: Photo uses binary processing 2: Letter uses binary processing 3: Binary processing	0: No 1: P 2: L 3: L & P

Mode No.				FUNCTION	DATA
Class 1	Class 2				
4 Scanner	404		γ Adjustment in the Letter Mode	Adjusts the γ curve (contrast level) in the letter mode. When select "1", the image becomes light.	0: Normal 1: Lower
	405		Background Numbering Density	Selects the background numbering density.	0: Light 1: Dark
	406		Marker Detect Density Level	Selects the detection level of the marker pen. When the density of the marker pen is light, select "2" or "3".	0: Normal 1: Low 2: High 3: Very High
	407	1	MTF Level Selection in Letter Mode	Select a bigger number for clear reproduction of low contrast originals.	0: Lighter 1: Normal 2: Darker
		2	Smoothing Level Selection in Photo Mode	Select a bigger number for clear reproduction of low contrast originals.	0: Lighter 1: Normal 2: Darker
		3	MTF Level Selection in Letter and Photo Mode	Select a bigger number for clear reproduction of low contrast originals.	0: Lighter 1: Normal 2: Darker
	408		AGC (Auto Gain Control) Level Display	Displays the AGC level.	
	409		Auto Shading Level Display	Displays the auto shading level.	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
5 Operation and Mode	1		All Indicators ON	Turns on all indicators on the operation panel. UP no. 1.	
	2		Feed Station Priority	Selects feed station priority at power on.	0: 1st 1: 2nd 2: 3rd 3: Side
	3		APS Priority	Whether the APS (Auto Paper Selection detecting) mode is on or not after pressing the Mode Clear key.	0: Yes 1: No 2: Yes with ADF only 3: Non APS
	4	1	ADS Priority – Letter Mode	In letter mode, auto image density is selected.	0: Yes 1: No
		2	ADS Priority – Photo Mode	In photo mode, auto image density is selected.	0: Yes 1: No
	5		Original Mode Priority	Selects the Letter, the Letter/Photo, or the Photo mode.	0: Letter 1: Letter/Photo 2: Photo
	6		Open	No function	
	7		Copier or Printer Priority	Selects the copier or printer mode at power on. Only "0", "2", and "3" can be used.	0: Copier 2: On line printer 3: Off line printer
	8		Beeper ON		0: Yes 1: No
	9 to 11		Open	No function	
	12		Simultaneous selection of both directions for size magnification	Enter "0" if both vertical and horizontal ratios are always the same.	0: Yes 1: No
	13		Count Up/Down	"Up" means counting copies completed. "Down" means counting remaining copies.	0: Up 1: Down
	14		ADS + Manual Density	When entering "1", the manual density key is operational in ADS mode.	0: No 1: Yes
	15		Open	No function	
	16				
	17		Maximum Copy Quantity	Limits the maximum copy quantity that can be entered.	1 ~ 999 999: Default

Mode No.			FUNCTION	DATA
Class 1	Class 2			
5 Operation and Mode	18	Wait Message Display	"SCN" lights while the scanner lamp heater is on, and "SEQ" lights while the fusing lamp is on.	0: No 1: Yes
	101	Auto Reset Time	Selects auto reset time. Do not set at "2".	0: 1 min. 1: 3 min. 2: No 3: Manual set (SP5-105)
	102	Auto Reset to Standby Mode	Returns to standby mode after auto reset. Use this mode together with SP2-108 (Polygon Mirror Motor off).	0: No 1: Yes
	103	Limitless Paper Feed	If same size paper is located in more than two feed stations, when paper end occur in one station, paper feed automatically shifts to the other station.	0: Yes 1: No
	104	A3 (DLT) Double Count	Entering "1" means that when making A3 (DLT) copies, the counters count 2 copies. Use only when you have a service contract with user to count A3/DLT as two copies.	0: No 1: Yes
	105	Auto Reset Time for Manual Set Mode	Selects auto reset time for the manual set mode. • This can be set only when SP5-101 is set at "3". • More than "180" means no reset.	0 ~ 180 (sec) 30 = Default
	106	ADS Level Selection	Select a small number if the copy is too light in ADS mode. UP2	1 ~ 7 4: Default
	112	Non-standard Size Manual Feed Copy	Use when loading non-standard size paper for the manual feed. Press the program key and input size data after opening the manual feed table.	0: No 1: Yes
	113	Open	No function	
	114			
	115	Drum Exposure (printing) Leading Edge Registration Adjustment in Duplex Mode	Adjusts the leading edge margin in duplex mode. The leading edge margin can be adjusted.	0: 5 mm 1: 0 mm

Mode No.				FUNCTION	DATA
Class 1	Class 2				
5 Operation and Mode	201		Markered Area Image Density	Adjusts the image density of the markered area. When the data is increased, the image density become light.	1 ~ 7 4: Default
	202		Center Line on Double Copy	Selects the type of center line in the double copy mode. UP4.	1: Broken Line 2: Solid Line 3: Center Marks 4: No Line
	302		Clock Set	Used for the SC history check and the jam history check. Enter month, date, year, day, and time (24 hour clock) by the Number keys and the Recall/Enter key.	Jan.: 1 Sun.: 1 Feb.: 2 Mon.: 2 etc. etc.
	401		User Code Mode	Enables the use of 20 user codes. Disconnect the key counter shorting connector.	0: No 1: Yes
	402		User Code Total Copy Counter Check	Displays each user code total copy counter. After entering this mode, either input a user code or use the Zoom Up/Zoom Down key to select the user code. UP15.	
	403		Open	No function	
	404		User Code Counter Clear	Clears user code counters. See User Code section. UP16.	
	405		User Code Setting	Registers a user code (4-digit number). It is possible to set 20 user codes. Select one from 0001 to 9999. UP17.	
	406		User Code Change	Changes a user code. Input the old user code number and press the Enter key. Then input the new user code and press the Enter key. UP18.	
	407		User Code Clear	Clears a user code. See the User Code Clear. UP19.	
	501	1	PM Counter Mode	To enable the PM counter.	0: No 1: Yes
		2	PM Counter Interval	Sets the interval of the PM counter.	1 ~ 999K 80K: Default

Mode No.			FUNCTION	DATA
Class 1	Class 2			
5 Operation and Mode	801	All Memory Clear	Clears everything stored in RAM.	0: No 1: Yes
			See Memory Clear Procedure.	
	802	Scanner/Printer Free Run	Operates the scanner and printer without scanning a original and feeding paper.	0: No 1: Yes
			Press Enter key to start. Press Clear key to stop.	
	803	Input Check	Displays the sensor signal.	
			See the Input Check Mode section.	
	804	Output Check	Checks electrical parts, such as motors, clutches and solenoids.	
	805 to 807	Open	No function	
	808	Destination Code Check	Displays the destination code.	0: JPN 1: NA 2: EUR
			JPN: Japan NA: North America EUR: Europe	
	809	Open	No function	
	810	Service Call Recovery	Recovers the service call. After pressing "1", press the 100% key, APS key, and Enter key at the same time. The beeper will sound three times.	0: No 1: Yes
	811	Open	No function	
	812	Service Telephone Number Set	Up to 13 digits. In call service conditions, set telephone number is displayed.	
	901	Printer Free Run	Operates the printer without feeding paper.	0: No 1: Yes
			Press the Enter key to start. Press the Clear key to stop.	
	902	Test Pattern Printing	Prints the printer test patterns.	Test Pattern No. 1 ~ 14
			Input the test pattern no. Input the number of copies you want. Select the paper size, then press Start key to print.	
	930	MF Self Check	Factory use only	
	990		Factory use only	
	998		Factory use only	
	999		Factory use only	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
6 Peripheral	1		Auto Mode Time Select in ARDF	Selects the auto mode time in ARDF mode. Selects the time before the next original is fed into the ARDF automatically without pressing the start key.	0: 4 sec. 1: 60 sec.
	2		Detection of Various Original Size by DF	To enable originals of different sizes to be placed together in the DF for APS.	0: No 1: Yes
	3		Sort Auto Selection	Sort mode is automatically selected when more than 2 originals are set on the DF table, and the entered copy quantity is between 3 and 30. A sorter and DF must be installed on the machine.	0: No 1: Yes
	4		Open	No function	
	5		Auto feed out from duplex tray in the case of an odd number of originals in the DF	In duplex mode, last paper remaining in the duplex tray is automatically fed out if odd number of originals are set in DF. Duplex and DF must be installed on the machine.	0: No 1: Yes
	6		Scanner Side Registration in DF	Adjusts main scanning (Side to Side) registration in the DF. Use the Point key to select + or–. • The specification is 0 ± 2 mm. • A DF must be installed on the machine.	–9 ~ +9 *0.5 mm/step 0.0 mm: Default
7 Logging Data	1		Copy Operation Time	Displays total working hours of the main motor.	
	2	1	Total Original Counter	Displays the total number of originals. The total number includes all originals counted for the copy mode and the optional scanner mode.	
		2	Total Original Counter in the Copy Mode	Displays the total number of originals in copy mode.	
		3	Total Original Counter in the Optional Scanner Mode	Displays the total number of originals in option scanner mode.	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
7 Logging Data	3	1	Total Copy Counter	Displays the total number of copies. Use this mode when checking the timing of the PM part replacement. The total number includes the copies counted for the copy and printer modes.	
		2	Total Copy Counter in Copy Mode	Displays the total number of copies in the copy mode. Same as above.	
		3	Total Copy Counter in Printer Mode	Displays the total number of copies in printer mode.	
	101	1	A3/11" x 17" Copies	Displays the total number of A3/11" x 17" copies.	
		2	B4/8 1/2" x 14" Copies	Displays the total number of B4/8 1/2" x 14" copies.	
		3	A4/8 1/2" x 11" Copies	Displays the total number of A4/8 1/2" x 11" copies.	
		4	B5/5 1/2" x 8 1/2" Copies	Displays the total number of B5/5 1/2" x 8 1/2" copies.	
		5	Other Size Copies	Displays the total number of copies not of the paper sizes mentioned above.	
	201		Total Scan Counter	Displays the total number of scans. Use this mode when checking the timing of the PM part replacement. The total number includes all scans made in the copy and option scanner modes.	
	202		Open	No function	
	203				
	204	1	Side Cassette Copies	Displays the total number of copies made using the side cassette.	
		2	1st Tray Copies	Displays the total number of copies made using the 1st Tray.	
		3	2nd Tray Copies	Displays the total number of copies made using the 2nd Tray.	
		4	Manual Feed Tray Copies	Displays the total number of copies made using manual feed tray.	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
7 Logging Data	204	5	Duplex Copies	Displays the total number of copies made using the duplex unit. The LCT/Duplex unit must be installed on the machine.	
		6	LCT Copies	Displays the total number of copies made using the LCT unit. The LCT unit or LCT/Duplex unit must be installed on the machine.	
	205		DF Original Feed Quantity	Displays the total number of originals fed by the DF. DF must be installed on the machine.	
	301	1	Reduction Copies	Displays the total number of reduced copies.	
		2	Enlargement Copies	Displays the total number of enlarged copies.	
		3	25 ~ 50% Zoom Copies	Displays the total number of 25~ 50% zoom copies.	
		4	200 ~ 400% Zoom Copies	Displays the total number of 200 ~ 400% zoom copies.	
		5	400 ~ 800% Zoom Copies	Displays the total number of 400 ~ 800% zoom copies.	
		6	Directional Magnification Copies	Displays the total number of directional magnification copies.	
	302		Open	No function	
	303	1	Double Copy Mode Copies	Displays the total number of double copy mode copies.	
		2	Background Numbering Copies	Displays the total number of background numbering copies.	
	304	1	Duplex Copies	Displays the total number of duplex copies counting front and back.	
		2	DF Copies	Displays the total number of copies made using the DF.	
		3	Sort Copies	Displays the total number of sort copies.	
		4	Photo Mode Copies	Displays the total number of photo mode copies.	
		5	Letter/Photo Copies	Displays the total number of letter/photo copies.	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
7 Logging Data	401	1	SC Total Counter	Displays the total number of service calls.	
		2	SC Counter	Displays the total number of each service call.	
	501		Total Jam Counter	Displays the total number of jams.	
	502		Total Jam – Printer	Displays the total number of jams in the printer.	
	503		Total Jam – Scanner	Displays the total number of jams in the scanner.	
	504	1	Jam – A Position (Relay Sensor)	Displays the total number of jams at position A. Relay sensor not ON.	
		2	Jam – B Position (Registration Sensor)	Displays the total number of jams at position B. Registration sensor not ON.	
		3	Jam – C Position (Exit Sensor)	Displays the total number of jams at position C. Fusing exit sensor not ON. Exit sensors not ON.	
		4	Jam – D Position (Inverter Entrance Sensor)	Displays the total number of jams at position D. Inverter entrance sensor not OFF.	
		5	Jam – E Position (Inverter Entrance Sensor)	Displays the total number of jams at position E. Inverter entrance sensor not ON.	
		6	Jam – F Position (Duplex Entrance Sensor)	Displays the total number of jams at position F. Duplex entrance sensor not ON.	
		7	Jam – G Position (LCT/Duplex Relay Sensors)	Displays the total number of jams at position G. Relay sensors not ON (LCT/Duplex).	
		8	Jam – Sorter	Displays the total number of jams in the sorter section.	
		9	Jam – Side Cassette	Displays the total number of jams in the side cassette section.	
		10	Jam – 1st Tray	Displays the total number of jams in the 1st tray section.	
		11	Jam – 2nd Tray	Displays the total number of jams in the 2nd tray section.	
		12	Jam – Manual Feed Tray	Displays the total number of jams in the manual feed tray section.	

Mode No.				FUNCTION	DATA
Class 1	Class 2				
7 Logging Data	504	13	Jam – LCT	Displays the total number of jams in the LCT section.	
		14	Jam – Duplex	Displays the total number of jams in the duplex section.	
	801	1	Production Date for Main ROM (Main Board)	Displays the production date of the sequence ROM.	
		2	Production Date for Sequence ROM (Main Board)	Displays the production date of the sequence ROM.	
		3	Production Date for Scanner ROM (IPU Board)	Displays the production date of the scanner ROM.	
		4	Production Date for Operation ROM (Op-port PCB)	Displays the production date of the operation ROM.	
		5	Production Date for MF ROM (Printer I/F Board)	Displays the production date of the MF ROM.	
	802		Open	No function	
	803		PM Counter Check	Displays contents of the PM counter.	
				When the PM count is exceeded, the message "PM call service" appears on the display.	
	804		PM Counter Reset	Resets the PM counter. Use after performing PM. After pressing "1", press 100% key, APS key, and Enter key at the same time. The beeper will sound three times.	0: No 1: Yes
	805		Used Toner Counter	Displays the total number of copies after the used toner overflow sensor is activated.	
	806		Used Toner Counter Clear	Clears the used toner counter. After pressing "1", press 100% key, APS key, and Enter key at the same time. The beeper will sound three times.	0: No 1: Yes
				Clear used toner counter after empty the used toner.	

Service Tables

Mode No.			FUNCTION	DATA
Class 1	Class 2			
7 Logging Data	807	All Counter Clear	Clears all counters.	0: No 1: Yes
			See the Memory Clear Procedure section.	
	808	SC & Jam Counter Clear	Clears the service call and jam counters.	0: No 1: Yes
			See Memory clear Procedure section.	
	901	SC History Check	Displays the SC history.	0: No 1: Yes
			See the SC History section.	
	902	SC History Clear	Clears the SC history.	0: No 1: Yes
			See the SC History section.	
	903	Jam History Check	Displays the jam history.	0: No 1: Yes
			See the Jam History section.	
	904	Jam History Clear	Clears the jam history.	0: No 1: Yes
			See the Jam History section.	

3. SERVICE TABLES

3.1 DIP SWITCH DIP SW101 (Main Board)

SW No.	Function
1	APC (Auto Power Control)

NOTE:
- When the main switch is turned on, the DIP SW101 setting must be off.
- This DIP switch is used when replacing the main PCB. (See section 5 Laser Unit APC Adjustment section.)

DIP SW101 (IPU Board)

<table>
<tr><th>SW No.</th><th>Function</th></tr>
<tr><td>1</td><td>Exposure Lamp Test</td></tr>
<tr><td>2</td><td>Scanner Free Run</td></tr>
<tr><td>3</td><td rowspan="3">VPU Adjustment
<table>
<tr><td>3</td><td>4</td><td>5</td><td></td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0 Level (Black) Adjustment</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>White Level Adjustment</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>Background Adjustment without ADS mode</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Background Adjustment with ADS mode</td></tr>
</table></td></tr>
<tr><td>4</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td>Scanner Test Pattern Print
Press Start bottom to print</td></tr>
<tr><td>7</td><td>Factory use</td></tr>
<tr><td>8</td><td>Factory use</td></tr>
</table>

NOTE: When the main switch is turned on, the DIP SW101 setting must be normal (all switches are OFF).

3.2 TEST POINTS

Main Board

Symbol	Function
TP 101	0 V (GND)
TP 102	+ 24 V
TP 103	Printer I/F Synchronize Signal
TP 104	+ 5 V
TP 105	0 V (GND)
TP 106	Thermistor (+)
TP 107	APC Base Voltage
TP 108	APC Voltage
TP 109	2nd Lower Limit Sensor

IPU: Image Processing Unit

Symbol	Function
TP 101	0 V (GND)
TP 102	+ 12 V
TP 103	– 12 V
TP 104	+ 5 V
TP 105	+ 24 V
TP 121	0 V (GND)

VPU: Video Processing Unit

Symbol	Function
TP 207	Odd Video Analog Data
TP 208	Even Video Analog Data
TP 209	Video data
TP 210	0 V (GND)

Printer Control Board

Symbol	Function
TP 5	Receiving Data (RXD)
TP 6	Transmission Data (TXD)
TP 58	0 V (GND)
TP 59	0 V (GND)
TP 60	+ 5 V

3.3 VARIABLE RESISTORS

Main Board

VR No.	Function
VR 101	LD Standard Voltage Adjustment Initial Value: 3 ± 005 V

VPU

VR No.	Function
VR 201	White Level Adjustment
VR 202	
VR 203	0 Level (Black) Adjustment
VR 204	
VR 205	Background Adjustment (without ADS mode)
VR 206	Background Adjustment (with ADS mode)

C, G, B, BR, Power Pack

VR No.	Function
VRC–C	Do not touch this volume
VRC–BR	Do not touch this volume

NOTE: C, G, B, BR, biases can be adjusted in the SP mode.

3.4 LED

Main Board

LED No.	Function
101	Main Process
103	Sequence Process

NOTE: When the LED is blinking, the process is normal.

IPU

LED No.	Function	Status
101	CPU Condition	When the LED is blinking, the CPU condition is normal.
102	Exposure Lamp Condition	The LED will be lit when the exposure lamp signal is enabled.
103	Exposure Lamp Heater Condition	The LED will be lit when the exposure lamp heater signal is enabled.
104	FGATE Signal Condition	The LED will be lit when the FGATE signal is available.

Printer Control Board

LED No.	Function	Status
1	+ 5 V Supply	When the LED is lit, + 5 V is supplied from the printer PSU.

3.5 PUSH SWITCH

Printer Control Board

LED No.	Function	Status
SW 1	System Reset	Push this switch to reset the main system.

3.6 INTERFACE SPECIFICATIONS

This section provides information about the types of connectors or cables needed to connect this machine to a host computer or print server.

RS-232C Serial Interface

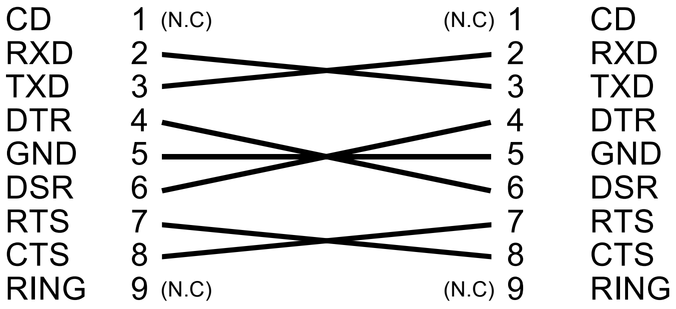
This machine has a 9-pin connector for serial port interfaces. Most IBM-compatible computers have a serial port designated COM1 that has a 9-pin connector. Some computers may also have another serial port designated COM2 with a 25-pin connector. You can use either port to connect to the machine.

The following table shows the 9-pin designations and associated signals for serial communications.

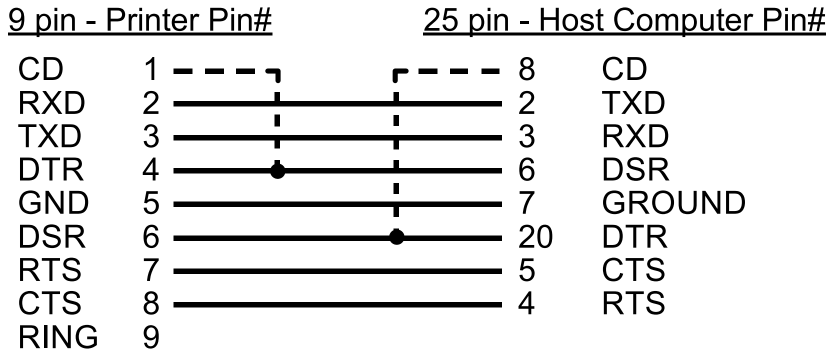
SIGNAL	PIN	PIN	SIGNAL
Carrier Detect CD	1	6	DSR Data Set Ready
Receive Data RXD	2	7	RTS Request To Send
Transmit Data TXD	3	8	CTS Clear To Send
Data Terminal Ready DTR	4	9	RING Ring (not used)
Signal Ground GND	5		

The two wiring diagrams below show the signal paths for 9-pin-to-9-pin cabling and 9-pin-to-25-pin cabling.

(1) 9 pin - Printer Pin# 9 pin - Host Computer Pin#

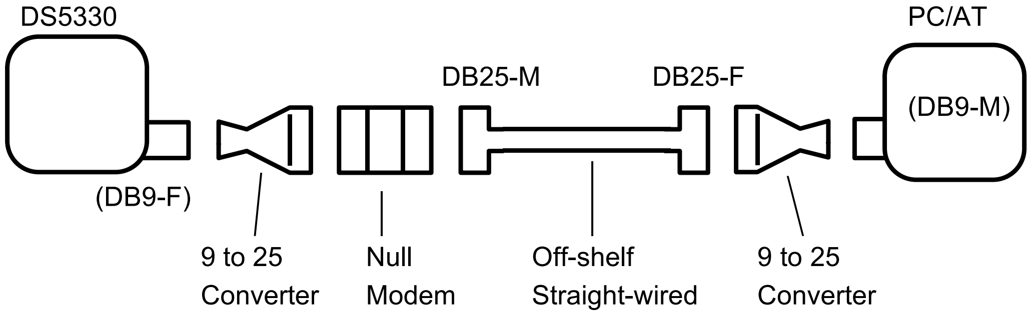


(2)

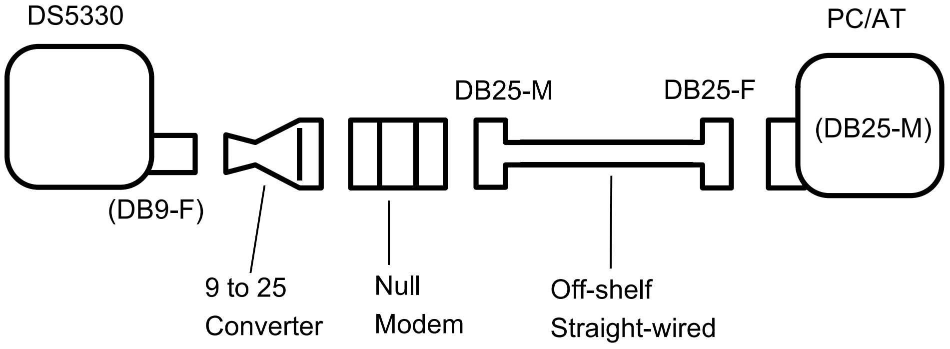


A combination of a 25-pin serial cable, a null modem, and 9-pin-to-25-pin adapter is most likely used to make a serial connection. This is because the 9-pin connector on an IBM-compatible computer is most often used for a mouse and serial printer cables are for designed for 25-pin connectors.

The following diagram shows how to connect the machine to a computer that has a 9-pin serial port.



The following diagram shows how to connect the machine to a computer that has a 25-pin serial port.



NOTE: A serial cable that has been modified to include the null modem wiring can also be used so that a separate null modem connector is not needed.

DIN-8 (RS-422 Serial/LocalTalk)

The DIN-8 connector is usually used to connect the printer to an Apple Macintosh using LocalTalk cables. The following table shows the RS-422/LocalTalk pin designations and associated signals.

PIN	SIGNAL	
1	(N/C)	Not Connected
2	SYNC	Sync. (not used)
3	TXD–	Transmit Data –
4	GND	Signal Ground
5	RXD–	Receive Data –
6	TXD+	Transmit Data +
7	(N/C)	(not used)
8	RXD+	Receive Data +

Parallel Interface

The Centronics parallel port is usually used to connect your printer to an IBM-compatible personal computer or print server. The following table shows the Centronic parallel pin designations and associated signals.

SIGNAL		PIN	PIN	SIGNAL	
Strobe	STROBE	1	19	GND	Signal Ground
Data	D<0>	2	20	GND	Signal Ground
Data	D<1>	3	21	GND	Signal Ground
Data	D<2>	4	22	GND	Signal Ground
Data	D<3>	5	23	GND	Signal Ground
Data	D<4>	6	24	GND	Signal Ground
Data	D<5>	7	25	GND	Signal Ground
Data	D<6>	8	26	GND	Signal Ground
Data	D<7>	9	27	GND	Signal Ground
Acknowledge	ACK	10	28	GND	Signal Ground
Busy	BUSY	11	29	GND	Signal Ground
Paper Error	PE	12	30	GND	Signal Ground
Select Out	SELOUT	13	31	INIT	(not used)
Auto Feed	AUTOFD	14	32	ERROR	Error
(not connected)	(N/C)	15	33	(N/C)	(not connected)
(not connected)	(N/C)	16	34	(N/C)	(not connected)
(not connected)	(N/C)	17	35	(N/C)	(not connected)
Select In	SELIN	18	36	SELIN	Select In

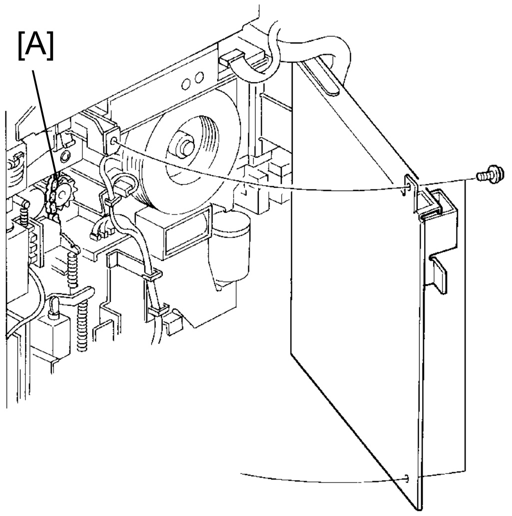
4. LUBRICANT TABLE

The locations of the parts to be lubricated at PM are shown in the following figures.

NOTE: Clean each part before lubricating.

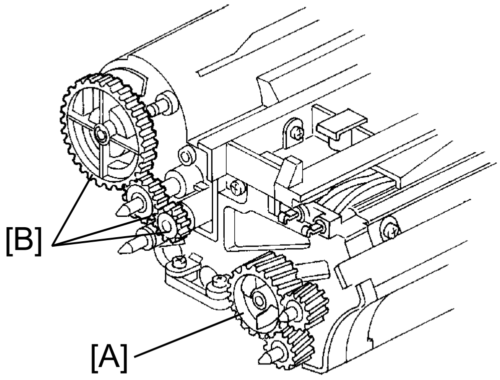
1. Drive Chain Section

   Use Mobil Temp 78.
   Open the main board plate
   (2 screws) Lubricate the drive chain
   [A] with Mobil Temp 78 every 160 K
   copies.

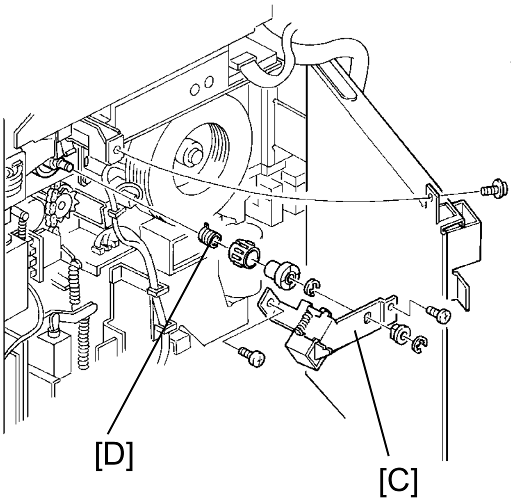


2. Development unit.

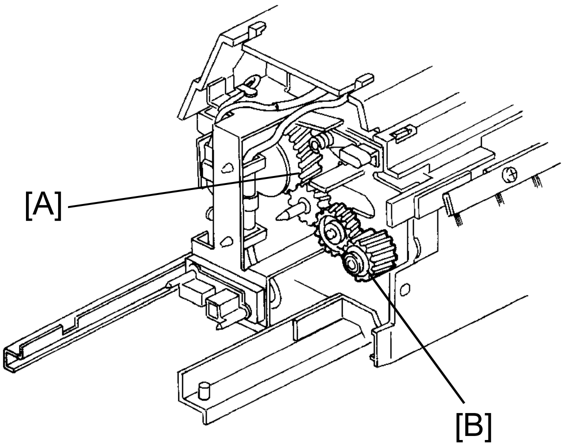
   a) Gears
   Use Silicone Grease G-501.
   Lubricate the drive gear [A] and
   toner supply gears [B] with
   Silicone Grease G-501 every
   160 K copies.



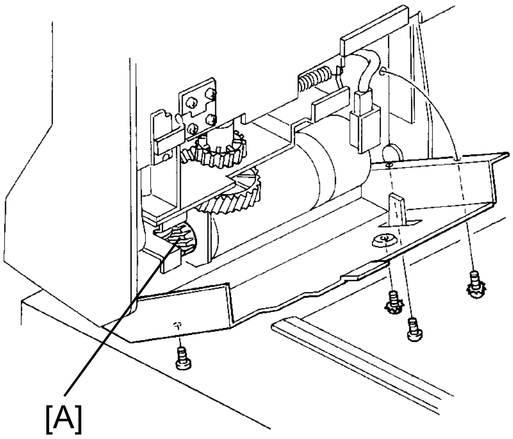
   b) Toner Supply Clutch
   Use Mobil Temp 78.
   Open the main board plate (2
   screws) Remove the toner
   supply clutch bracket [C] (2
   screws). Lubricate the toner
   supply clutch [D] with Mobil
   Temp 78 every 160 K copies.



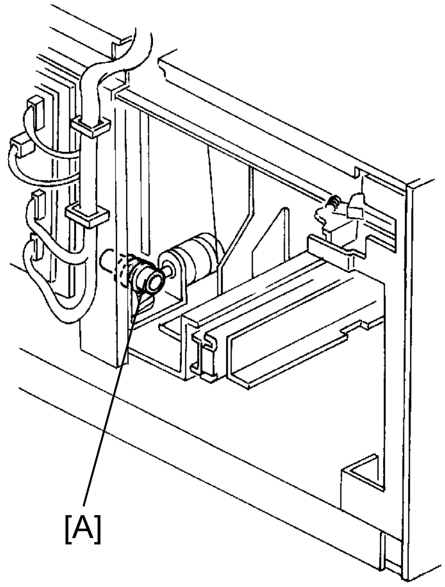
3. Fusing Unit
   Use Nok Barrierta JFE552.
   Lubricate the hot roller gear [A] and drive gear [B] with Nok Barrierta JFE552 every 160 K copies.



4. ARDF
   a) Belt Drive Motor Gear
      Use Mobil Temp 78.
      Lubricate the belt drive motor gear [A] with Mobil Temp 78 every 6 K originals.
   b) Feed-in Clutch
      Use Mobil Temp 78.
      Refer to the Feed-in Clutch Lubrication section in DF manual.



5. LCT
   Use Mobil Temp 78.
   Remove the rear lower cover (3 screws). Lubricate the lift motor worm gear [A] with Mobil Temp 78 every 160 K copies.

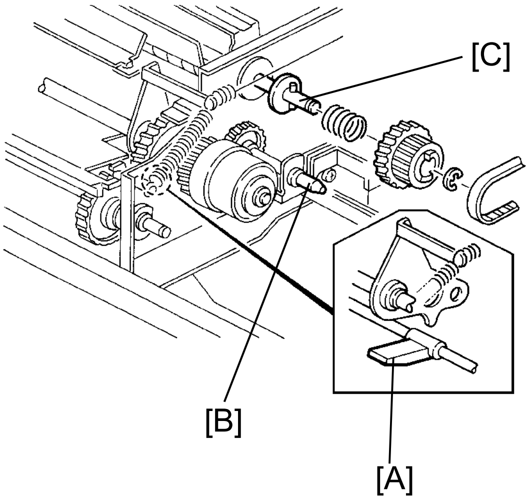


6. Duplex

a) Pick-up Arm Bracket
Use Mobil Temp 78.
Pull out the duplex unit.
Lubricate the pick-up arm bracket [A] with Mobil Temp 78 every 160 K copies.

b) Unit Joint Pin
Use Mobil Temp 78.
Pull out the duplex unit.
Lubricate the unit joint pin [B] with Mobil Temp 78 every 160 K copies.

c) Spring Clutch Shaft
Use Mobil Temp 78.
Take out the duplex unit.
Lubricate the spring clutch shaft [C] with Mobil Temp 78 every 160 K copies.



5. SERVICE REMARKS

5.1 GENERAL CAUTION

1. Make sure that the machine is unplugged before servicing the copier, because AC voltage is supplied even when the main switch is off.
2. Whenever switching the function switch, turn the main switch and the anti-condensation off first. Then, change the switch’s position and turn the main switch and the anti-condensation on again.
   If the function switches is changed while the main switch is in the ON position, SC624 (Communication Error) may light or operation may hang up.

5.2 DRUM

The organic photoconductor (OPC) drum is comparatively 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 with a dry cloth or clean 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 inserting or pulling the drum unit out of the copier to avoid 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 according to local regulations.
11. When installing or removing the drum, the following should be performed to avoid damaging the drum.
    a) Remove the development unit.

b) Remove the cleaning unit.
c) Remove the charge corona unit.
d) Remove the PCC corona unit.
e) Lower the T&S corona unit.

5.3 CHARGE CORONA

1. Clean the corona wire by sliding the corona unit in and out. (The cleaner pads come into contact with the corona wire when the corona unit is slid all the way out.) The wire and casing can also be cleaned with water or dry cloth. Do not use sandpaper or a solvent.
2. Do not touch the corona wire and the grid plate with oily hands. Oil stains may cause uneven image density on copies.
3. Make sure that the corona wire is correctly positioned between the cleaner pads and that there is no foreign material (iron filings, etc.) on the casing.
4. Clean the grid plate with a blower brush (not with a cloth).
5. When installing the corona wires, do not bend or scratch the wire to avoid any uneven charge. Also, make sure that the wires are correctly set in the grooves of the end blocks.

5.4 OPTICS

1. When installing the exposure glass, make sure that the red marked side of the glass faces up. This side is specially treated against static electricity.
2. Clean the exposure glass with glass cleaner and a dry cloth to reduce the amount of static electricity on the glass surface.
3. Use water or alcohol with a cloth to clean the mirrors and lens.
4. Do not bend or crease the exposure lamp flat cable.

5.5 LASER UNIT

1. Do not remove the LD unit board’s screws. Doing so would throw the LD unit out of adjustment.
2. Do not turn the volumes with white paint. They were adjusted in the factory.

3. The polygon mirror and Fθ lenses are very sensitive to dust. Never open the optical housing.
4. Before removing the optical housing, mark the position of the wedge with a pencil. If the wedge is not replaced in its proper position, image quality will be affected.
5. Do not touch the mirrors with bare hands.
6. Do not bend or crease the fiber optics for the synchronization detector.

5.6 DEVELOPMENT

1. Be careful not to nick or scratch the development roller.
2. Place the development unit on a sheet of paper after removing it from the copier.
3. Never loosen the three screws securing the doctor plate. The position of the doctor plate is set with a special tool and instrument 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 according to local regulations.
6. When removing or installing the development unit, be careful not to damage the drum surface by the entrance seal on the development unit.
7. Do not loosen any screws with white point. They are fixed at the factory using special tools.
8. Never load different types of developer and toner into the development unit. Doing so will cause poor copy image and toner scattering.

5.7 TONER SUPPLY

1. Clean the image density sensor with a blower brush.
2. Do not touch the image density sensor with bare hands.
3. VSG setting is required in the following cases:
   a) When the image density sensor is replaced.
   b) When the drum has been replaced.
   c) When there have been problems with toner supply.
   d) When "Clean ID Sensor" is indicated.

5.8 TRANSFER, SEPARATION AND PCC

1. Clean the corona casing with a damp or dry cloth.
2. The corona wires can be cleaned only with a dry soft cloth. Using water or alcohol may damage the wire coating.
3. Clean the corona end blocks with a blower brush and alcohol.

5.9 CLEANING UNIT

1. Be careful not to damage the edge of the cleaning blade.
2. Do not touch the cleaning brush with bare hands.
3. When inserting the cleaning unit into the copier, be sure that the cleaning unit rail is properly engaged with the unit guide rail on the copier.
4. When removing or installing the cleaning unit, be careful not to damage the drum surface with the cleaning unit housing.
5. Dispose of used toner according to local regulations.

5.10 FUSING UNIT

1. Be careful not to damage the edges of the hot roller strippers or their tension springs.
2. Do not touch the fusing lamp and hot roller with bare hands.
3. Make sure that the fusing lamp does not touch the hot roller.
4. After replacing the oil blade and oil supply pad, prime with silicon oil.

5.11 PAPER FEED

1. Do not touch the surface of the pick-up, feed, and reverse rollers.
2. The paper size detector bracket must be positioned correctly to align with the actual paper size and avoid paper misfeeds.

5.12 DOCUMENT FEEDER

1. When installing or removing the document feeder, make sure that the document feeder is in the open position.
2. Before lifting the scanner, to prevent possible damage, secure the DF with the retainer.

3. A build-up of static electricity on the exposure glass can cause originals to misfeed. Apply silicon oil to the glass to reduce the amount of friction.

5.13 DUPLEX UNIT

1. Do not touch the surface of the pick-up roller, separation inverter, and exit rollers.

5.14 SORTER UNIT

1. Do not touch the sorter rollers with bare hands.

5.15 OTHERS

1. After replacing the main board, performs the APC adjustment using VR 101 on the main board.
2. When the RAM is cleared by SP801, the following data for drum current should be returned to the factory setting in accordance with the SP Mode Factory Set Data Table provided inside the operation panel bottom cover.

SP MODE FACTORY SET DATA TABLE

Serial Number ______________________

Mode No.	Description	Data (PWM)
2-1-1	Grid Bias	
2-1-2	Grid Bias (ID Sensor)	
2-201-3	Bias High	
2-201-2	Bias Low	
2-201-1	Bias OFF	
2-203	Bias (ID Sensor)	
2-301	Transfer	
2-403-2	Separation - Edge (AC)	
2-403-1	Separation - Edge (DC)	
2-402-2	Separation (AC)	
2-402-1	Separation (DC)	
2-501-2	PCC (AC)	
2-501-1	PCC (DC)	

3. The password - 2463 (C4MF) is reserved for service representatives, and lets them enter the system security menu even if that menu has been protected.

6. SPECIAL TOOLS AND LUBRICANTS

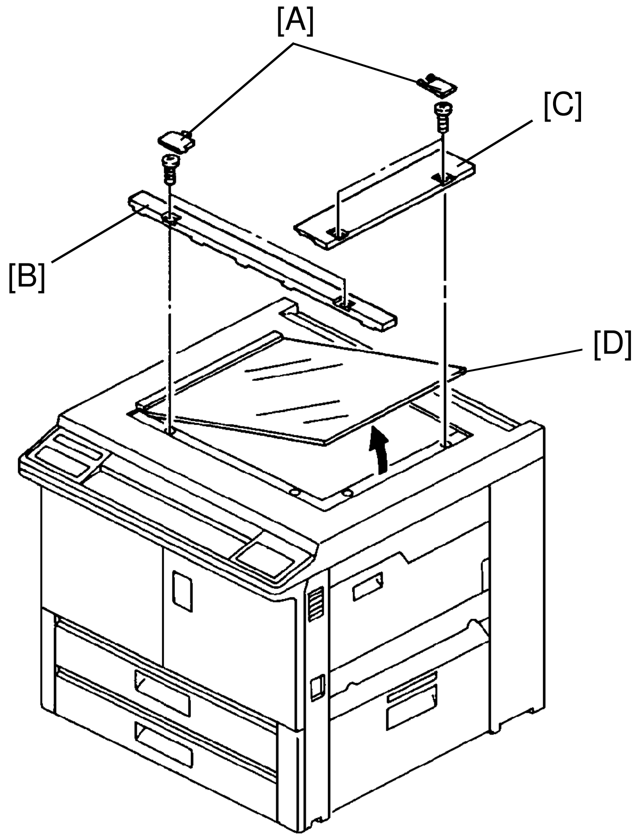
Part Number	Description	Q'ty
A0069103	Scanner Wire Clamp (Omega Clamp)	1
A0129101	Scanner Positioning Pin	1
A0129501	Scanner Positioning Pin (4 pcs/set)	1 set
A0129110	Resolution Chart - 400 dpi (1 pc)	1
54209516	Test Chart - OS-A3 (10 pcs/set)	1 set
54209502	Test Chart - OS-A3 (100 pcs/set)	1 set
54209507	Digital Multimeter	1
54479078	Heat Resistant Grease (MT-78)	1
52039501	Silicon Grease G-501	1
A0089502	Silicon Grease G40M	1
54209560	Silicon Oil	1
A0289300	Grease - Nok Barrierta JFE552	1

SECTION 5

REPLACEMENT AND ADJUSTMENT

1. SCANNER UNIT

1.1 EXPOSURE GLASS REMOVAL



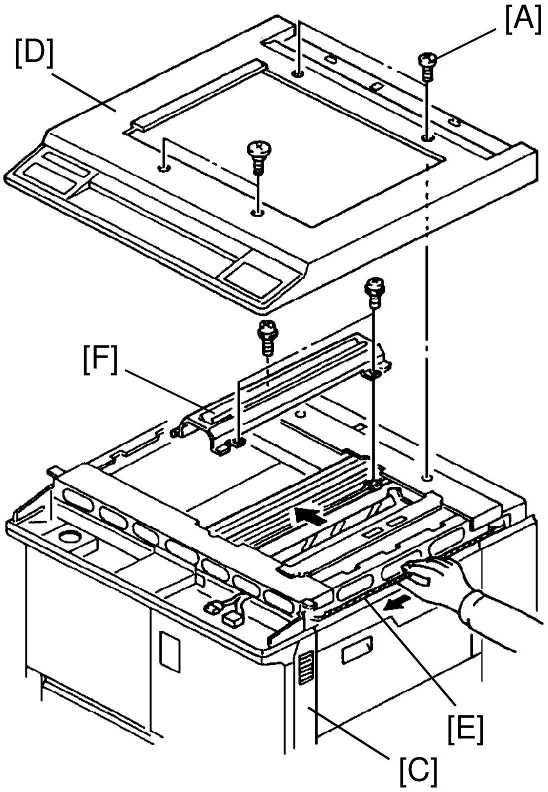
CAUTION: M4-6 flat head screws should be used for [B] and [C].

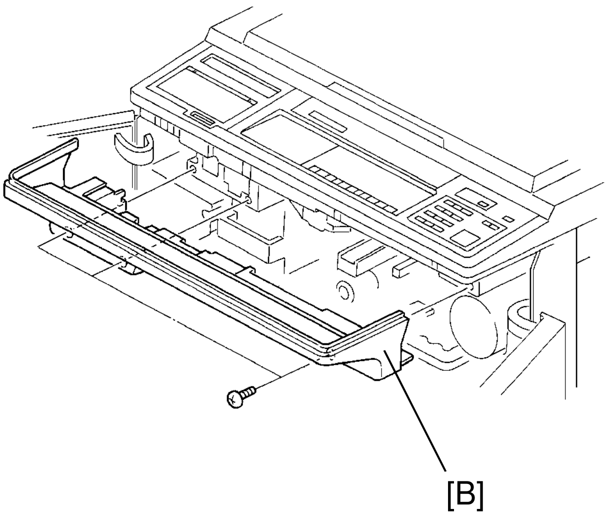
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Slide out the 4 screw covers [A].
3. Remove the front [B] and right [C] (2 screws each).
4. Slightly lift up the right edge and by holding it firmly, slide out the exposure glass [D].

NOTE: a) Place the exposure glass on a sheet of paper in order not to scratch the surface.

b) When reinstalling the exposure glass, make sure the corner with the red mark is installed at the rear left corner.

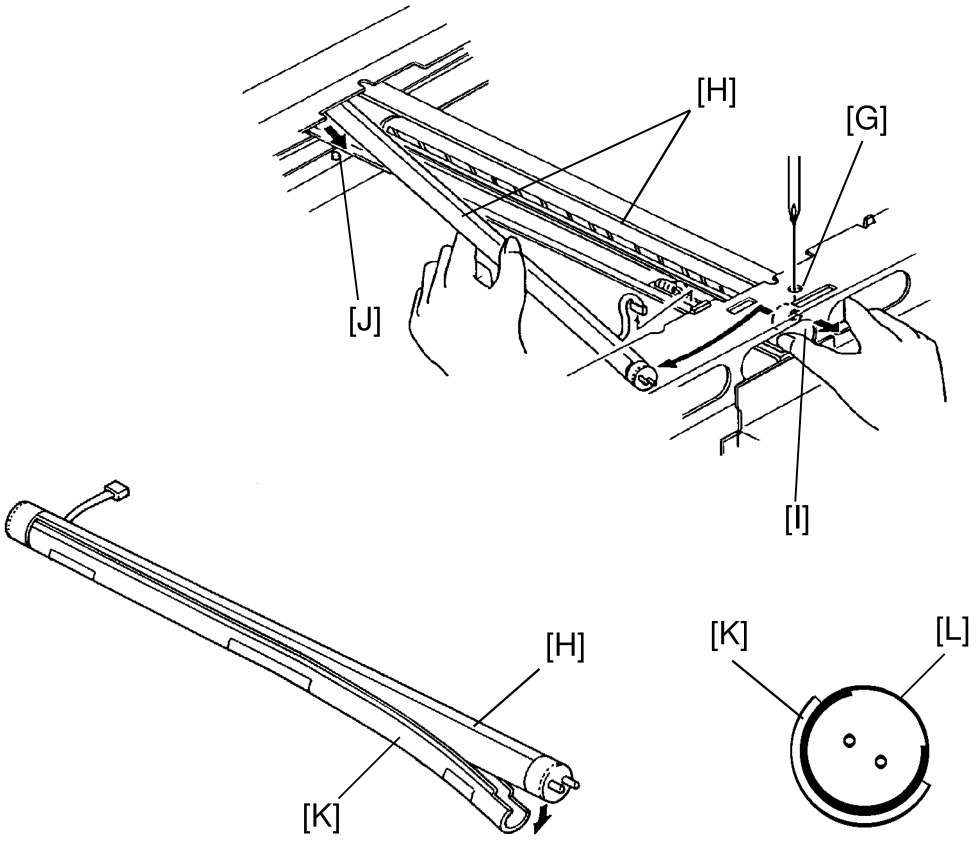
1.2 SCANNER LAMP AND HEATER REPLACEMENT





CAUTION: a) 2 screws [A] should be M4 x 6 which are shorter than other screws.
b) When handling the heater harnesses, be careful not to damage them.

1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the platen cover (2 screws, 1 connector) or the DF unit (see DF unit section).
3. Remove the exposure glass. (See Exposure Glass Removal section.)
4. Open the front doors and remove the operation panel bottom cover [B] (3 screws).
5. Remove the right front cover [C], and upper cover with the operation panel [D] (4 screws, 2 connectors, 1 ground screw).
6. Using the scanner wire [E], move the 1st scanner to the center slot.
7. Remove the scanner lamp cover [F] (3 screws).



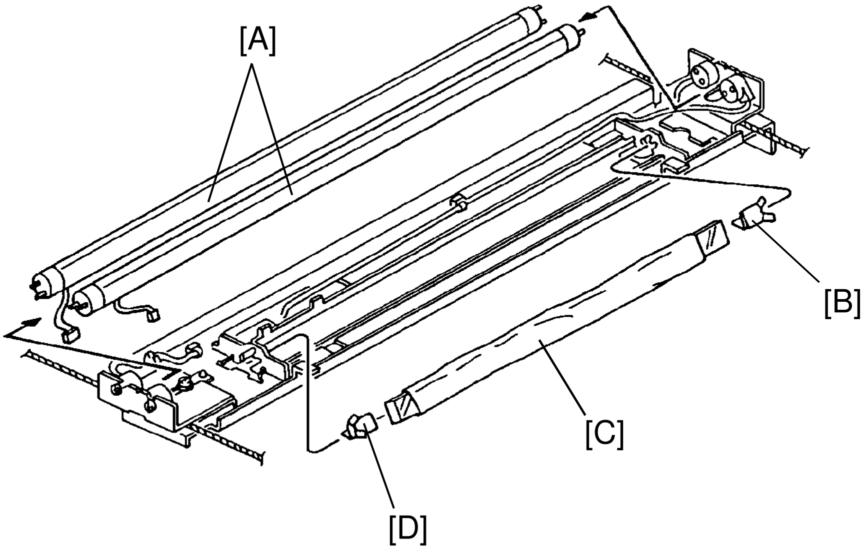
8. Loosen the screw in the bracket [G] securing the exposure lamps [H] by placing the screw driver through the hole as in the figure.
9. While pushing the left scanner lamp away, pull the bracket [I] towards you, so the front side of the lamp will become free. Then remove the left lamp from the rear socket [J] as in the figure (1 connector).
10. Follow the same procedure for the removal of the right scanner lamp.
11. Separate the scanner lamp [H] and the heater [K].
12. Put the heater on the new scanner lamp.

NOTE: a) The heaters are not interchangeable. (To the right: 2P connector, to the left: 4P connector.)

b) When putting the heater on the new scanner lamp, make sure that the crear part [L] of the lamp is located as shown above.

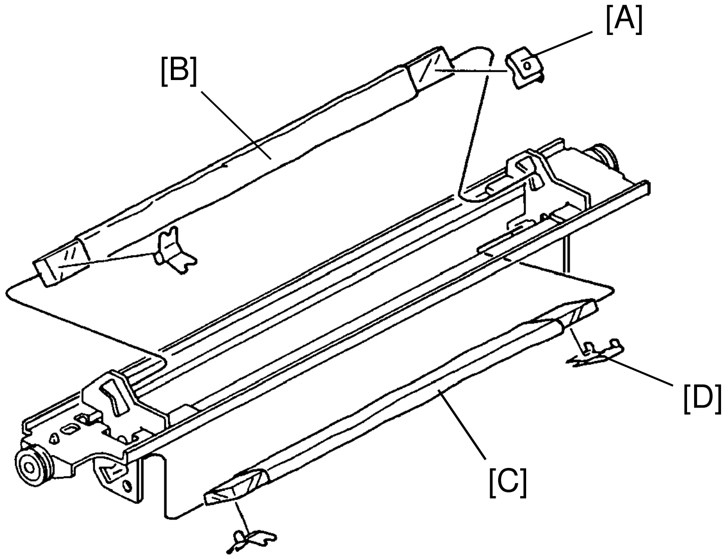
c) When reinstalling the scanner lamp cover [F], fix the 3 screws while pushing it to the right.

1.3 1ST MIRROR REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the scanner lamps [A]. (See Scanner Lamp Replacement section.)
3. Release the rear spring plate [B].
4. Swing the mirror [C] and then release the front spring plate [D].
5. Tear off the ends of the protective paper covering the new mirror. Reinstall the front spring plate [D] then reinstall the mirror [C] in the slot.
6. Set the rear spring plate [B].
7. Remove the protective paper and check the stability of the mirror.

1.4 2ND AND 3RD MIRROR REPLACEMENT



NOTE: Always remove the 2nd mirror when replacing the 3rd mirror.

-- Preparation –

1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal section.)

-- Removal --

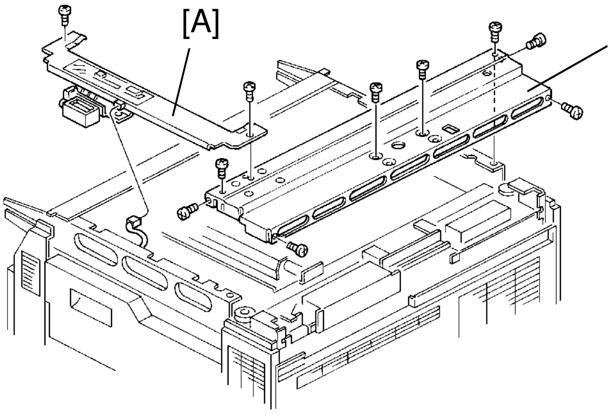
3. Remove the rear spring plate [A].
4. Remove the 2nd mirror [B] by sliding it gently to the rear side.
5. Follow the same steps to remove the 3rd mirror [C].

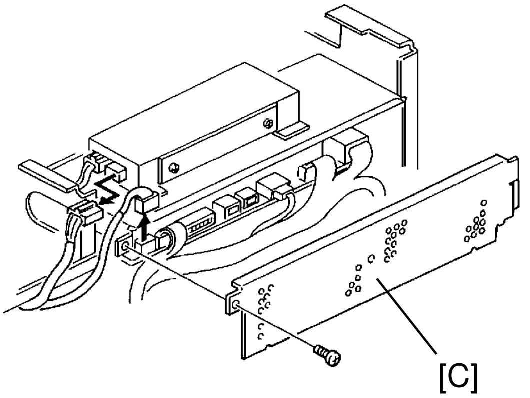
-- Installation –

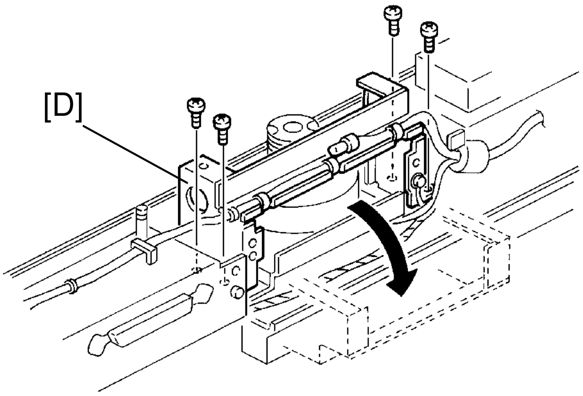
6. Tear off the ends of the protective paper covering the new mirror.
7. Install the rear spring plate [D] then the 3rd mirror.
8. Install the front spring plate and check the stability of the mirror.
9. Remove the protective sheet.
10. Perform the same procedures and install the 2nd mirror.

NOTE: Make sure there is no play in the mirror positions. If there is, slightly reshape the shipping plates to correct this.

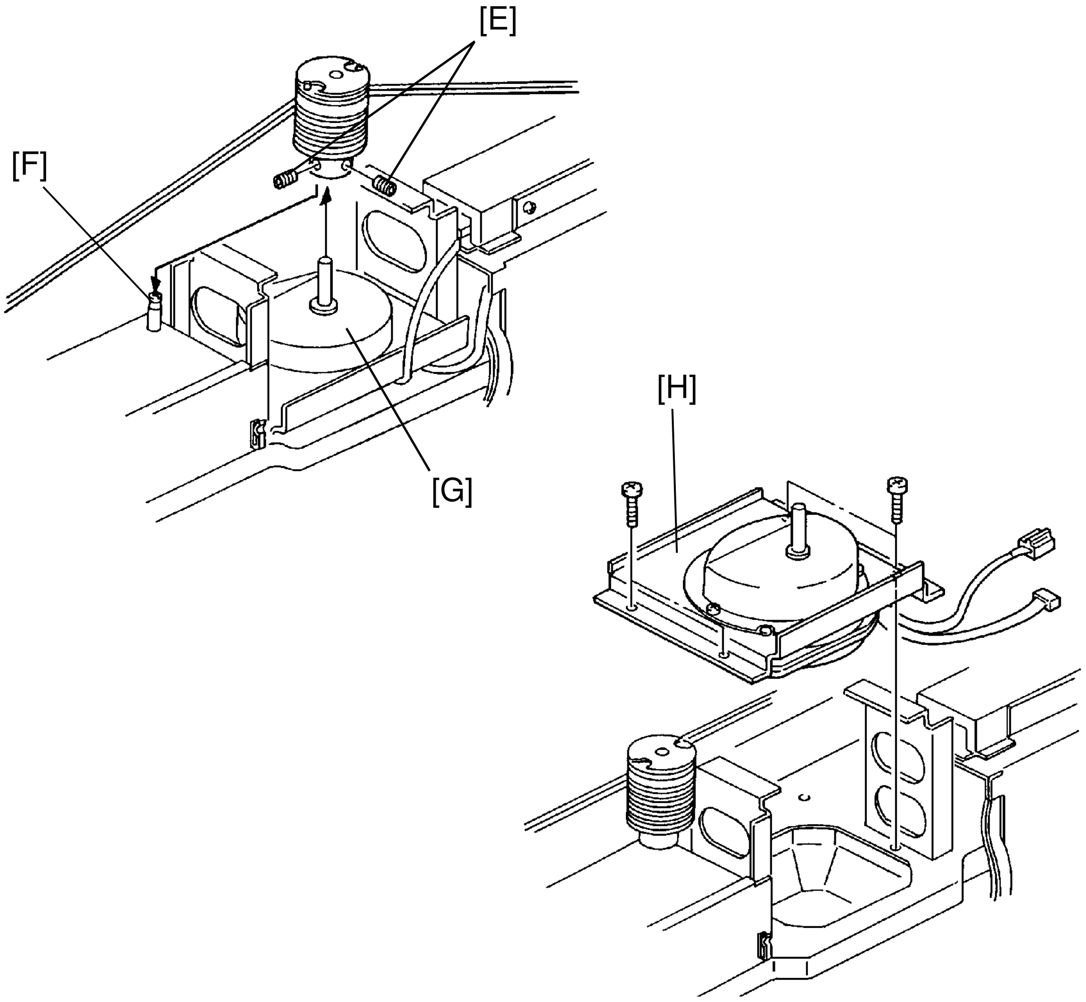
1.5 SCANNER MOTOR REPLACEMENT







1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the exposure glass. (See Exposure Glass Removal section.)
3. Remove the following parts:
   a) Platen cover or the DF unit. (See Installation Procedure section.)
   b) Operation panel bottom cover. (See Scanner Lamp section.)
   c) Upper cover with the operation panel. (See Scanner Lamp section.)
   d) Rear upper cover (2 screws).
   e) Left cover
4. Remove the right scale supporting bracket [A] (2 screws, 1 connector).
5. Remove the rear scanner plate [B] (8 screws).
6. Remove the IPU board cover [C] (3 screws).
7. Move the supporting frame [D] out of the way (4 screws).



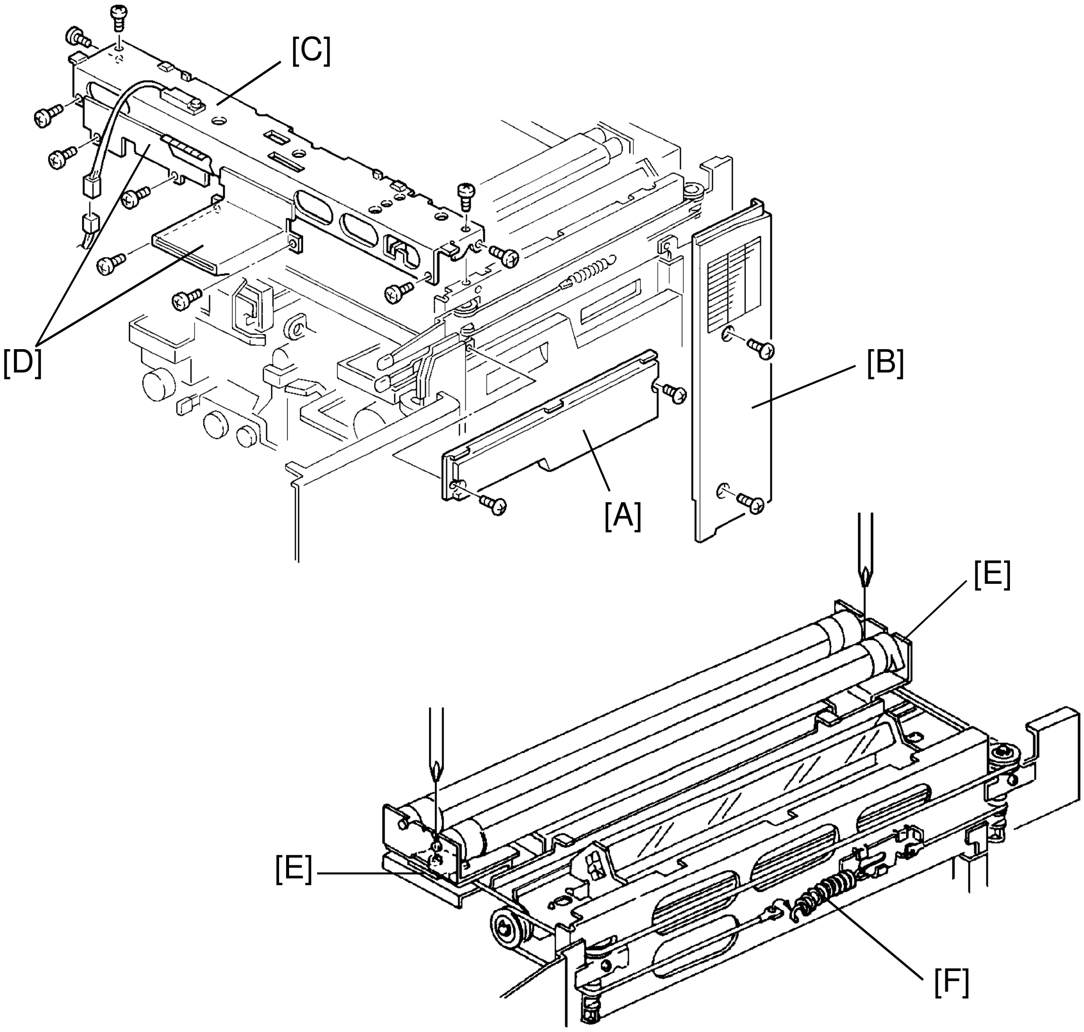
8. Loosen the 2 Allen screws [E] and secure the wires with a scanner wire clamp.

   NOTE: Set the drive pulley on the stud [F] located at the right side of the scanner motor [G].

9. Replace the scanner motor [H] (4 screws, 2 connectors).

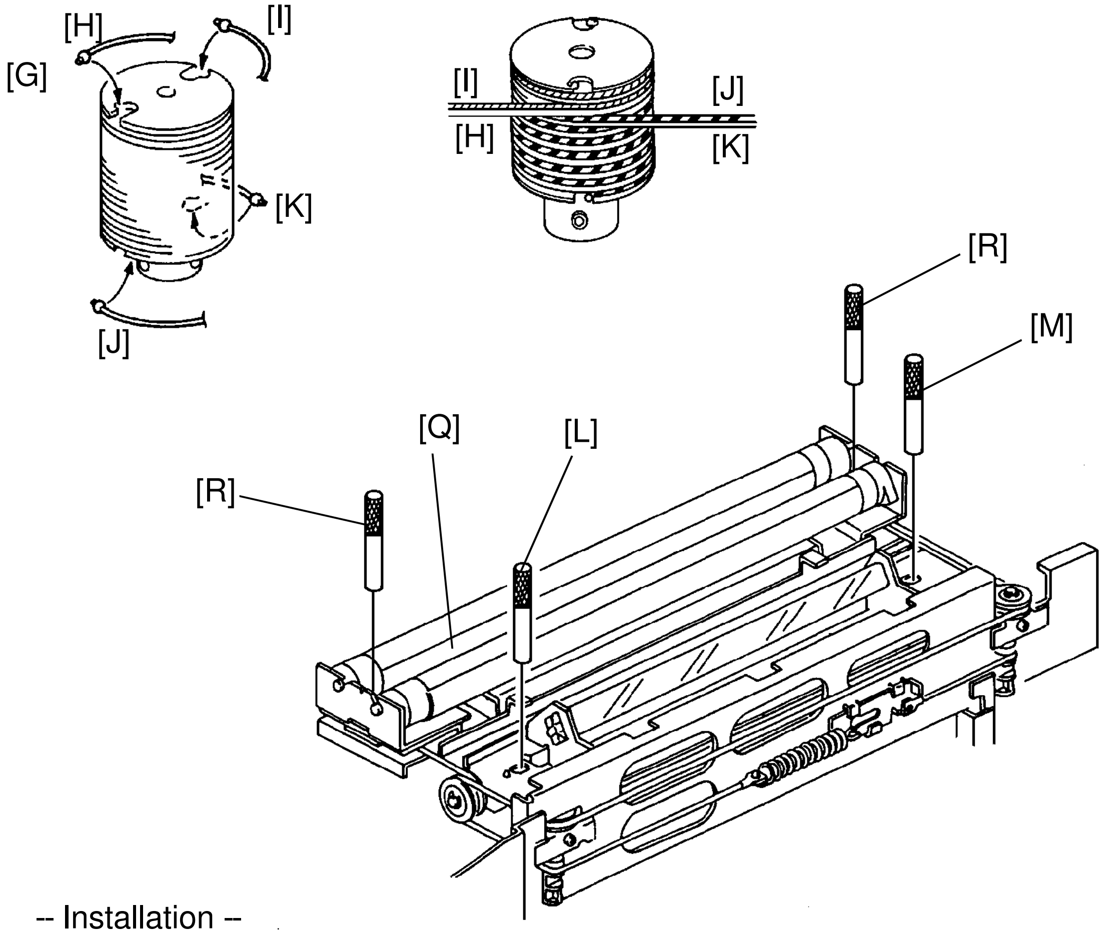
   NOTE: When reinstalling the new scanner motor, make sure to keep the harnesses well clear of the motor.

1.6 SCANNER WIRE REPLACEMENT



-- Removal --

1. Perform steps 1 to 6 of section 1.5, Scanner Motor replacement.
2. Remove the right upper cover [A] and the right rear cover [B] (2 screws each).
3. Remove the front scanner plate [C] along with the two brackets [D] (10 screws, 1 connector). (Be careful of sharp edges on brackets.)
4. Loosen the front and rear brackets [E] securing the wire to the 1st scanner as shown in the figure.
5. Remove the tension spring [F] located above the manual feed table and remove the scanner wires.

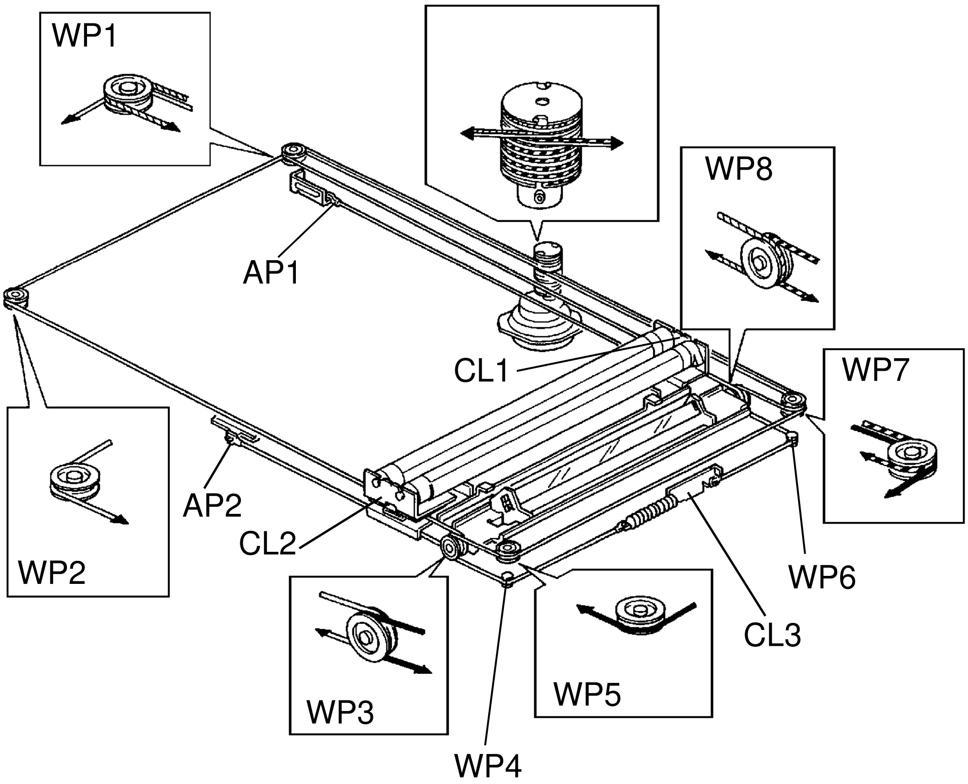


-- Installation --

6. Remove the scanner drive pulley [G] (2 Allen screws).
7. Install the 4 scanner wires on the pulley by using the Allen screw hole as a reference (see illustration):

   Clear gray wire, 2 turns [H]
   Steel blue wire, 1½ turns [I]
   Red wire, 6½ turns [J]
   Black wire, 5½ turns [K]

   Secure with a scanner wire clamp.
8. Fix the pulley on the motor shaft, making sure there is a gap of 0.5 mm between the pulley and the motor.
9. Secure the 2nd scanner with the two pins [L, M] by using the holes located furthest to the right.

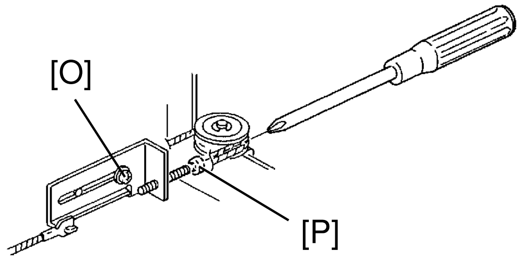


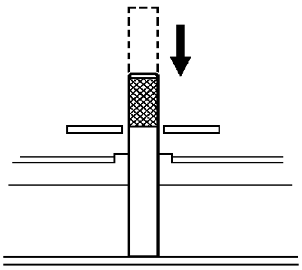
10. Run the scanner wires over the pulleys in the following order: clear gray -- black -- steel blue – red, as shown in the figure. From the scanner wire pulley, run each wire in the order prescribed below.

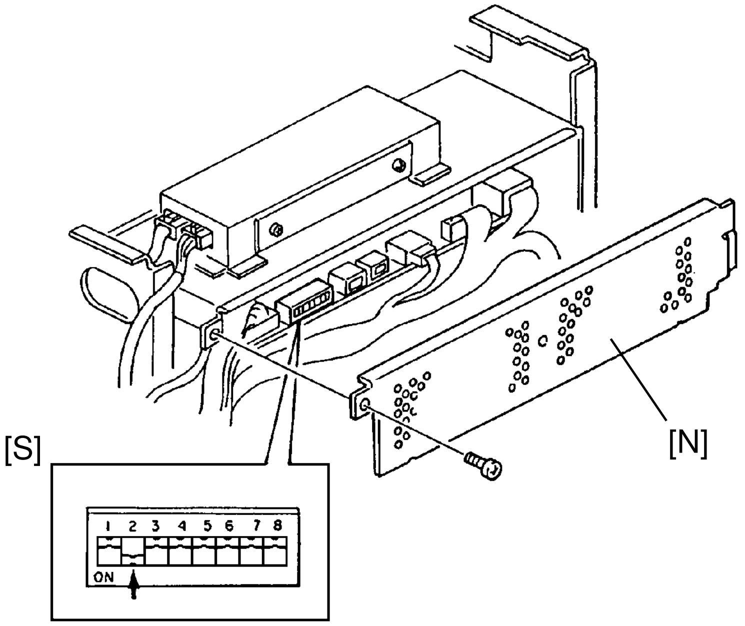
a) Clear gray wire to:	**b) Black wire to:**
(1) the lower groove of WP1 to	(1) the lower groove of WP7 to
(2) the lower groove of WP2 through	(2) the lower groove of WP5 to
(3) the front clamp CL2 to	(3) the outer groove of WP3 over
(4) the inner groove of WP3 to	(4) WP4 and hook to tension spring and
(5) the anchor point AP2.	(5) the hook to tension clamp CL3.

c) Steel blue wire to:	**d) Red wire to:**
(1) the upper groove of WP1 through	(1) the upper groove of WP7 to
(2) the rear clamp CL1 to	(2) the outer groove of WP8 over
(3) the inner groove of WP8 to	(3) WP6 and
(4) the anchor point AP1.	(4) the hook to tension clamp CL3.

11. With the pins still holding the 1st scanner in position, secure the screws of clamps CL1 and CL2.







-- Scanner adjustment --

12. Remove the IPU board cover [N] (3 screws) and the left cover (4 screws).
13. Loosen the bracket fixing screw [O] located at the upper left corner of the scanner unit.
14. Pull out the rear positioning pin [M] and insert it again, making sure the pin does not pass through the rail completely.
15. Adjust the position of the 2nd scanner with the adjusting screw [P] until the rear pin falls into the hole in the rail.
16. Check that the front pin [L] falls into the hole without being forced.
17. Secure the bracket fixing screw [O].
18. Manually position the 1st scanner [Q] to the position over its pin holes, (see illustration on the installation section) and install the positioning pins [R].
19. Clamp the front and rear brackets [E] securing the wire to the first scanner.

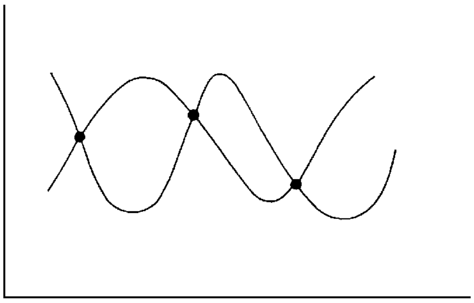
20. Remove all positioning pins [L, M, R].
21. Turn on DIP SW1 on the IPU board [S].
22. Turn on the main switch and confirm that the scanner lamps are on.
23. After initialisation, turn off DIP SW1.
24. Turn on DIP SW2 and perform a free run for about 5 minutes to condition the scanner wires.
25. Turn off DIP SW2.

NOTE: Do not turn the main switch off before performing the focus adjustment.

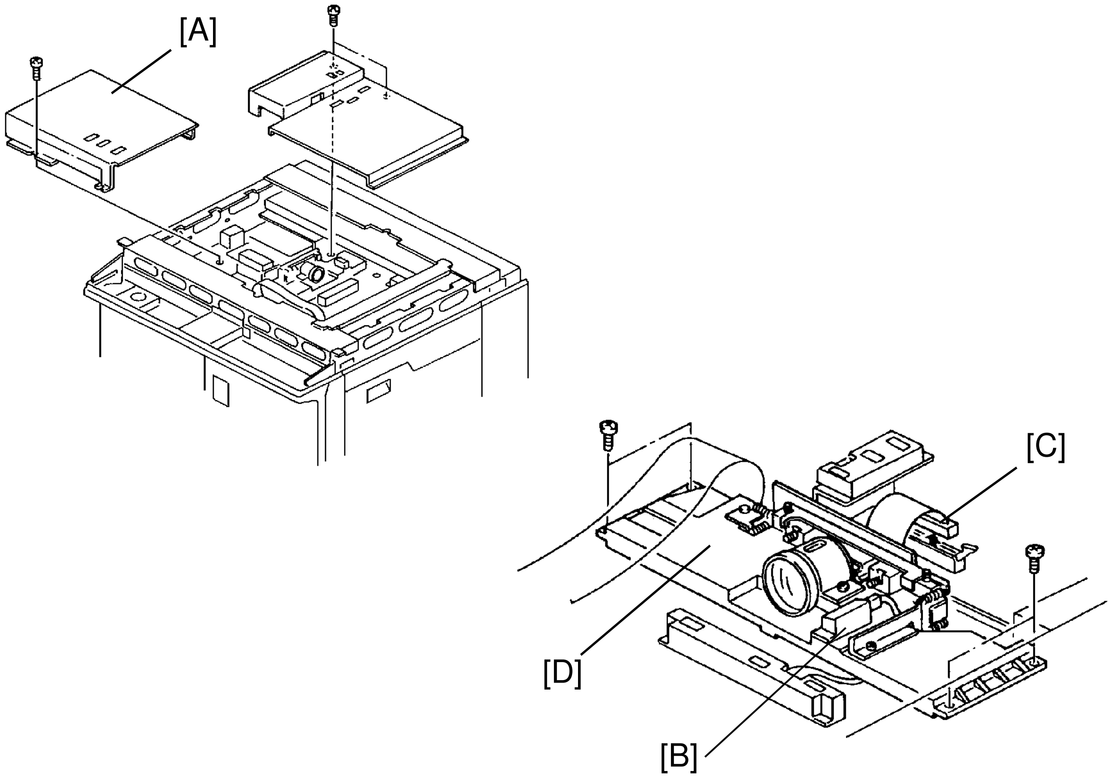
-- Focus adjustment --

26. Remove the lens cover (10 screws).
27. Replace the front [C] and rear scanner plates.
    Set the positioning pins in the 1st scanner.
28. Loosen the front and rear brackets [E] securing the wire to the first scanner.

    NOTE: Make sure that the scanner lamp cover is installed.
29. Install the exposure glass and turn on DIP SW1 [S] on the IPU board.
30. Set the resolution chart to scan the 200 dpi area.
31. Connect TP207 (CCD: odd) and TP210 (GND) of the VPU board to the oscilloscope.
32. Move the scanner wire while observing the wave form.
33. When the oscilloscope display shows 4 cross points or less, see the figure, stop moving the scanner wire.
34. Fix the 1st scanner wire and remove the positioning pins.
35. Manually return the scanner around the home position and scan the 200 dpi area of the test chart. Check the cross points again. There should be 4 or less.



1.7 SENSOR BOARD UNIT ASSEMBLY REPLACEMENT

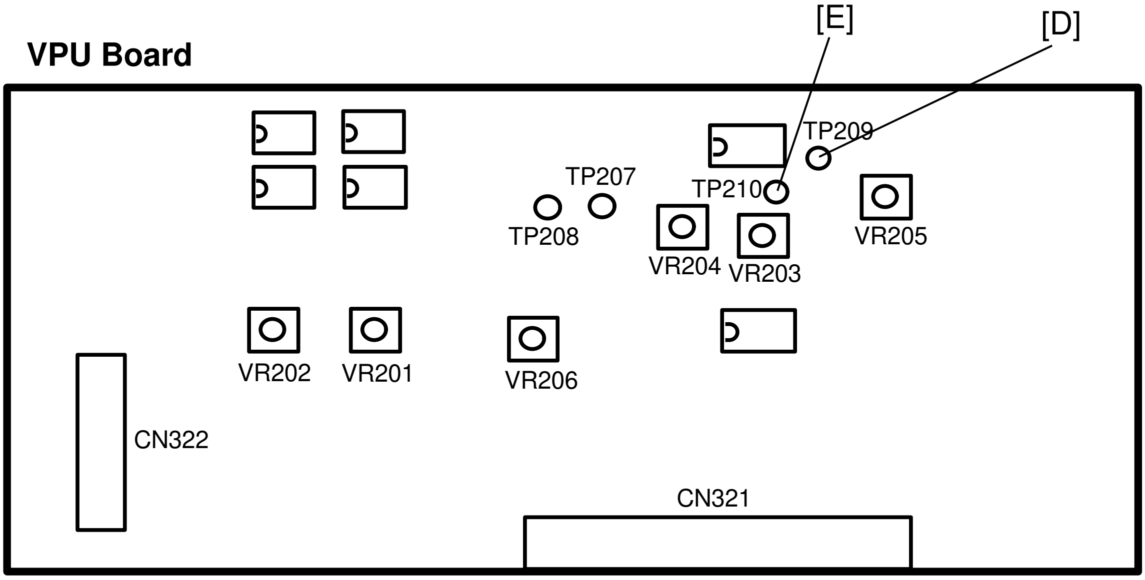


NOTE: Make sure to remove the screws indicated.

-- Removal --

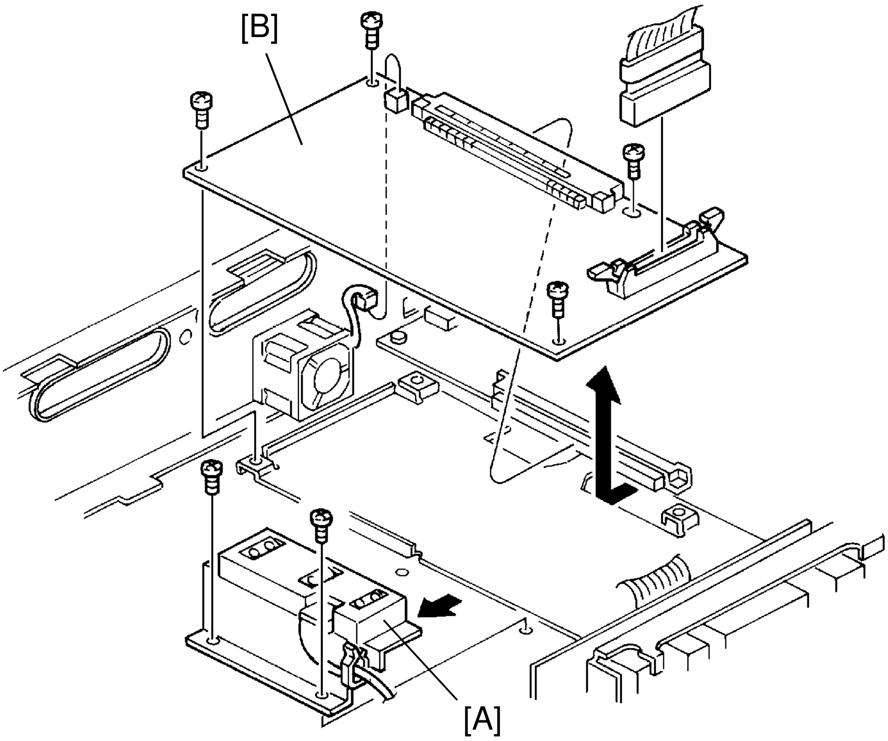
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Perform steps 1 to 5 of the Scanner Lamp and Heater Replacement section.
3. Remove the lens cover [A] (10 screws).
4. Remove the original width sensor [B] (1 screw).
5. Disconnect the harness [C] from the VPU board, as shown.
6. Replace the sensor board unit assembly [D] (4 screws).
7. Perform the white level adjustment.

-- White Level Adjustment --



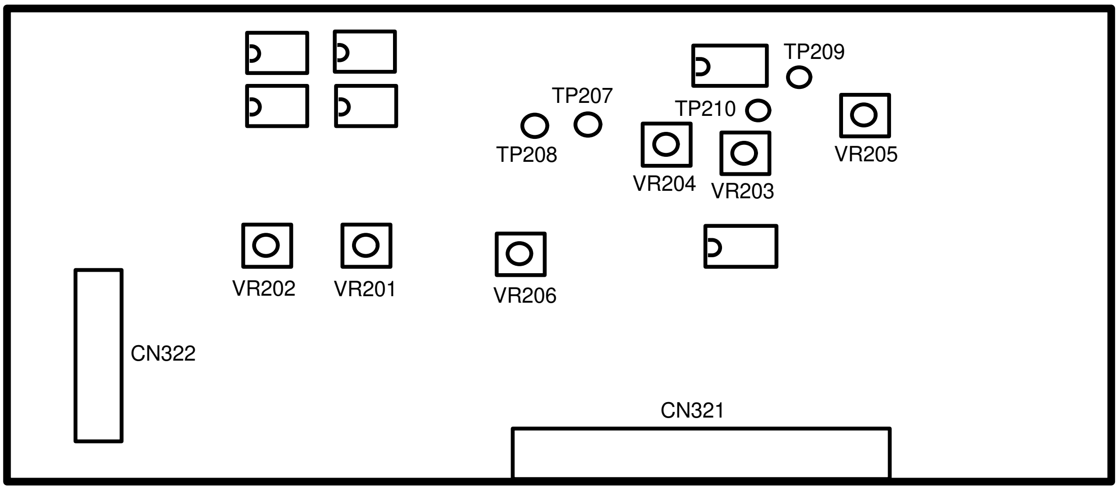
8. Connect TP209 (video signal) [D] and TP210 (GND) [E] on the VPU board to the oscilloscope.
9. Install the exposure glass, place the resolution test chart on it, to scan the white area.
10. Remove the rear upper cover (2 screws) and the IPU board cover (3 screws).
11. Turn on the main switch and turn on DIP SW1 on the IPU board. Confirm that the scanner lamps are on.
12. Adjust VR201 on the VPU board to obtain 3.0 V at peak voltage.
13. Adjust VR202 on the VPU board to obtain 3.0 ± 0.2 V voltage.

1.8 VPU BOARD REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the following parts.
   - DF or platen cover
   - Exposure glass
   - Operation panel bottom cover
   - Top cover with the operation panel
   - Upper rear cover
   - IPU board cover
   - Lens cover (10 screws)
3. Move the APS sensor bracket [A] out of the way (2 screws).
4. Replace the VPU board [B] (4 screws, 3 connectors).
5. Reinstall the right original scale and install the exposure glass.
6. Perform all the following adjustments.

VPU Board



-- 0 level adjustments --

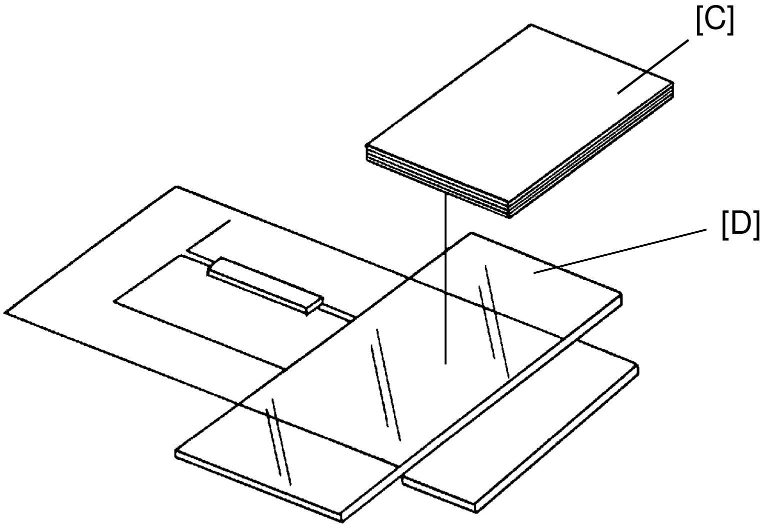
7. Plug in the machine and turn on the main switch.
8. Turn on Dip SW3 on the IPU board. Check that the 4 LED's (No. 101, 102, 103, 104) on the IPU board are all on.
9. Follow the procedure below if all the LED's are not on.

LED (Rear view of the copier)	
104 103 ● ●	102 101 ● ●
Adjust by using VR204	Adjust by using VR203

-- White level adjustment --

10. Turn on Dip SW3 and 4 on the IPU board.
11. The exposure lamp will light and illuminate the underside of the right original scale. It will take about 10 minutes for the lamps to stabilize.
12. Check that the 4 LED's on the IPU board are all on.
13. Follow the procedure below if the LED's are not all on.

LED (Rear view of the copier)	
104 103 ● ●	102 101 ● ●
Adjust by using VR202	Adjust by using VR201



14. Manually move the 1st scanner to the center.
15. Place about 10 sheets of white paper [C] on the exposure glass [D] as in the figure.

-- Background level adjustment (Non-ADS mode) --

16. Turn on DIP SW3, 4, and 5 on the IPU board.
17. Check that the 4 LED's on the IPU board are all on.
18. Follow the procedure below if the LED's are not all on.

LED (Rear view of the copier)			
104 ●	103 ●	102 ●	101 ●
Adjust by using VR205			

-- Background level adjustment (ADS mode) --

19. Turn off DIP SW3 (DIP SW4 and 5 are on) on the IPU board.
20. Check that the 4 LED's on the IPU board are all on.
21. Follow the procedure below if the LED's are not all on.

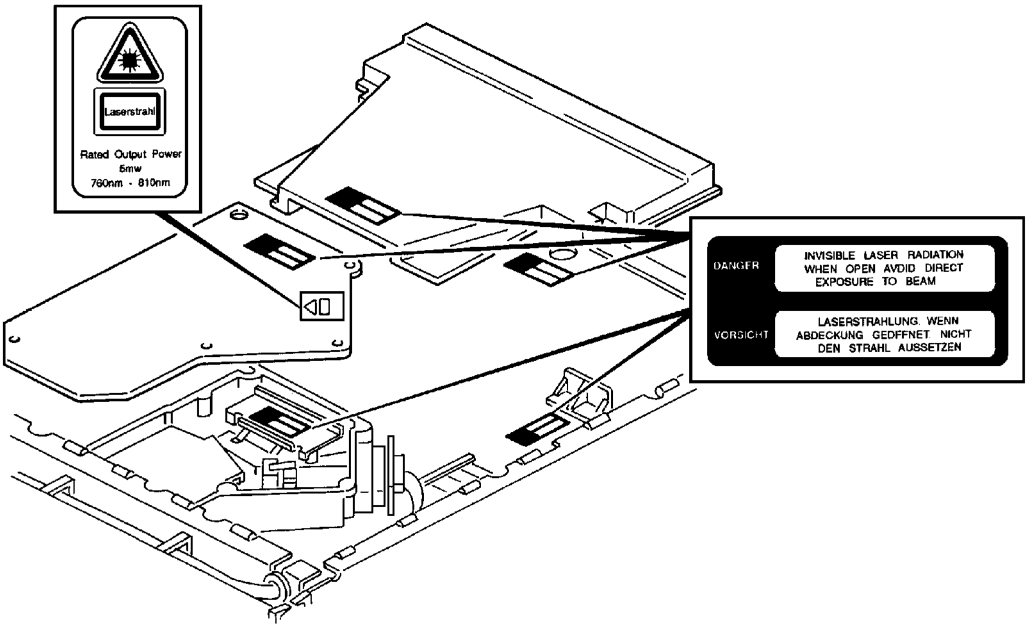
LED (Rear view of the copier)			
104 ●	103 ●	102 ●	101 ●
Adjust by using VR206			

2. LASER UNIT

2.1 WARNING

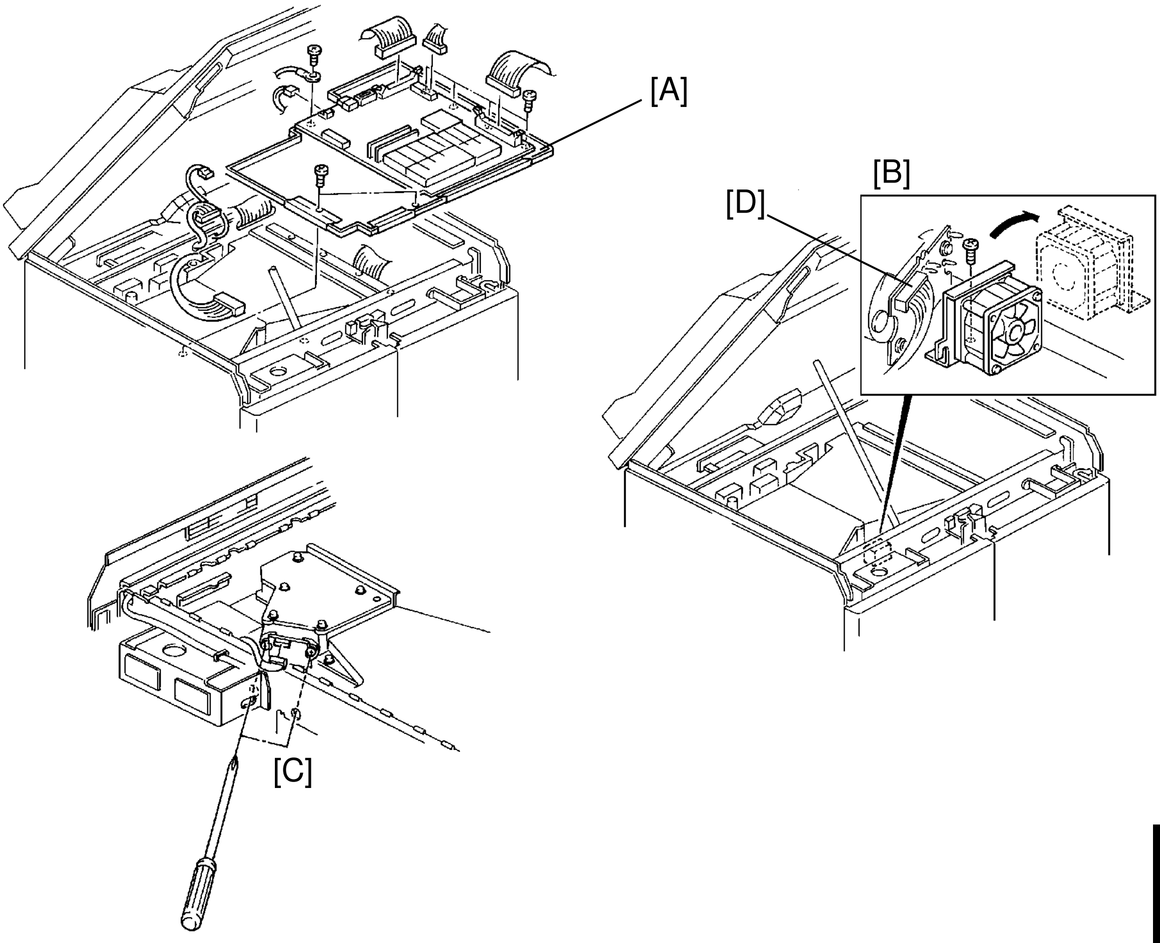
WARNING: Turn off the main switch and the anti-condensation switch, then unplug the machine switch before attempting any of the procedures in this section. Laser beams can seriously damage your eyes.

– CAUTION DECAL –



Six caution decals are located in the Laser Unit as shown above.

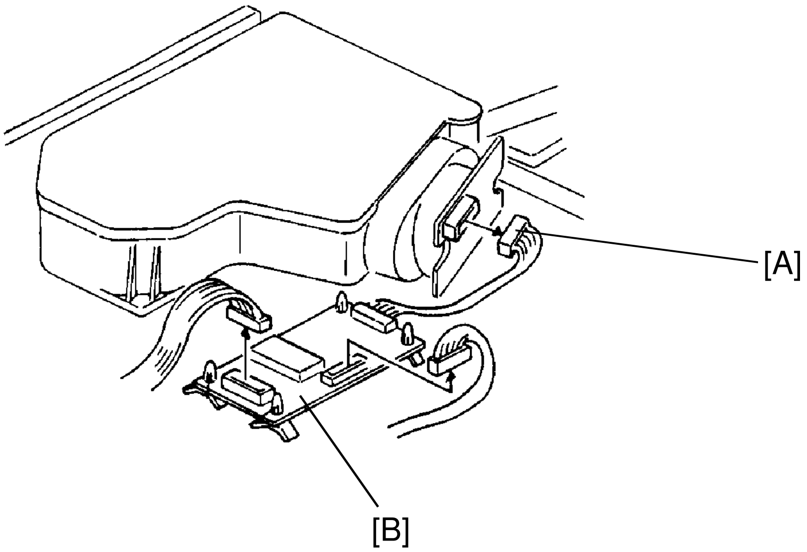
2.2 LD UNIT REPLACEMENT



CAUTION: a) Do not remove the LD unit board's screws (step 5). Doing so would throw the LD unit out of adjustment.
b) When replacing the LD unit, make sure the white connector socket is up.

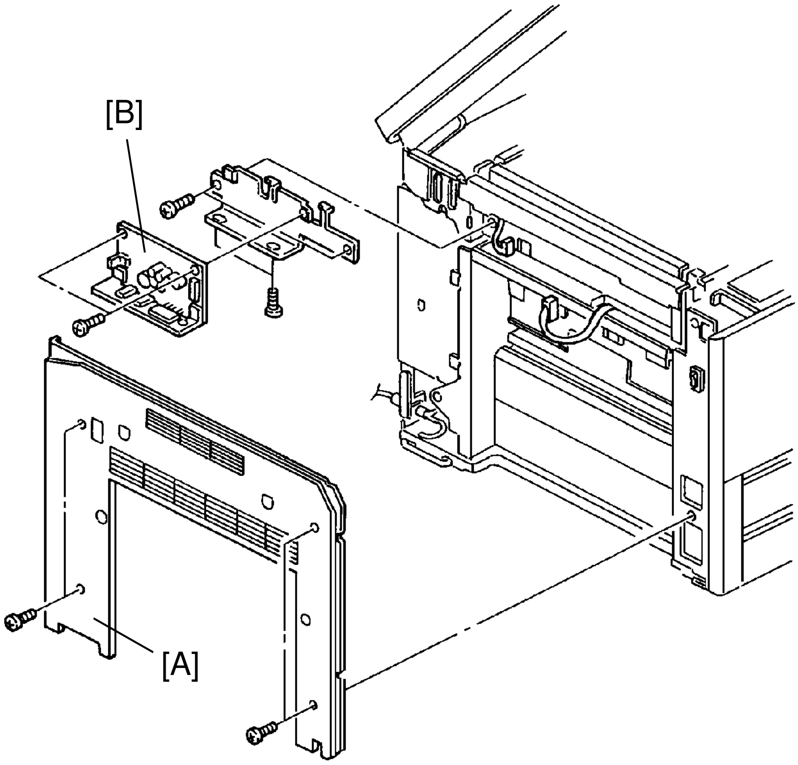
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Secure the scanner unit. (See Securing the Scanner Unit section.)
3. Remove the laser unit cover [A] (7 screws and 7 connectors). Leave the printer controller board attached, as shown in the figure.
4. Move the LD unit fan [B] out of the way (1 screw). Leave the bracket on the unit.
5. Locate the two LD unit holding screws [C] and remove them with a long screwdriver. Undo the connector CN101 [D].

2.3 PWM BOARD REPLACEMENT



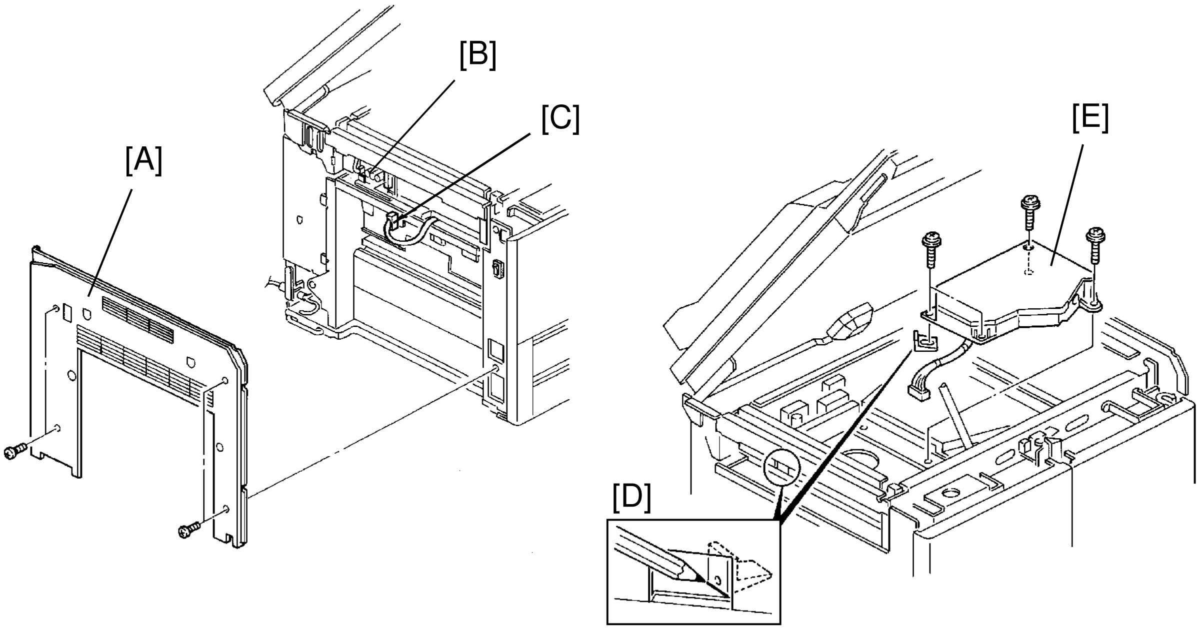
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Secure the scanner unit. (See Securing the Scanner Unit section.)
3. Remove the laser unit cover, with the printer controller board attached. (See step 3 of the LD Unit Replacement section.)
4. Unplug the connector [A] from the LD unit.
5. Disconnect the two connectors from the PWM board [B] as shown in the above figure.
6. Remove the PWM board.

2.4 POLYGON MOTOR BOARD REMOVAL



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Secure the scanner unit. (See Securing the Scanner Unit section.)
3. Remove the left cover [A] (4 screws).
4. Remove the polygon motor board [B] with the bracket on (2 screws, 2 connectors).

2.5 OPTICAL HOUSING UNIT REPLACEMENT



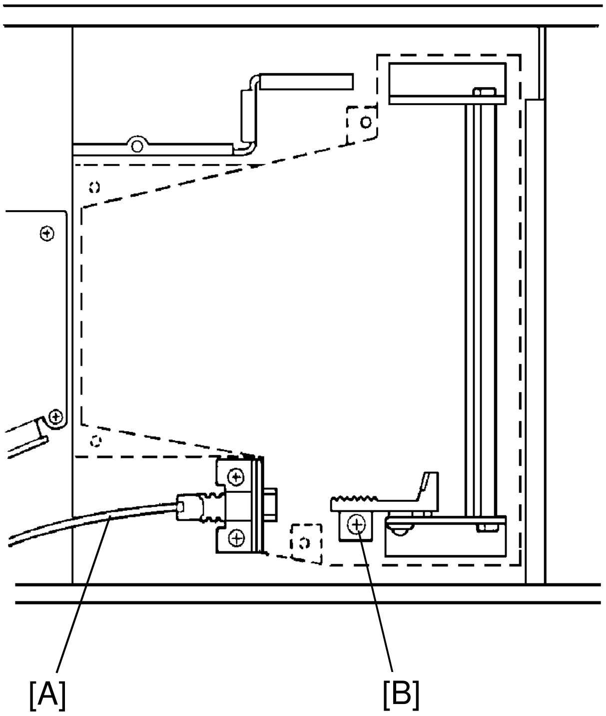
CAUTION: The polygon motor is very sensitive to dust. Never open the optical housing.

1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Secure the scanner unit. (See Securing the Scanner Unit section.)
3. Remove the laser unit cover with the printer controller board attached. (See step 3 of the LD Unit Replacement section.)
4. Remove the left cover [A] (4 screws).
5. Remove the polygon motor board [B] with the bracket on. (See Polygon Motor Board Removal section.)
6. Disconnect the LD unit connector CN101 [C].
7. Mark the position of the wedge [D] with a pencil, as shown above.

CAUTION: If the wedge is not replaced in its proper position, image quality will be slightly affected.

8. Remove the optical housing unit [E] (4 screws).
9. Remove the LD unit. (See LD Unit Removal section.)

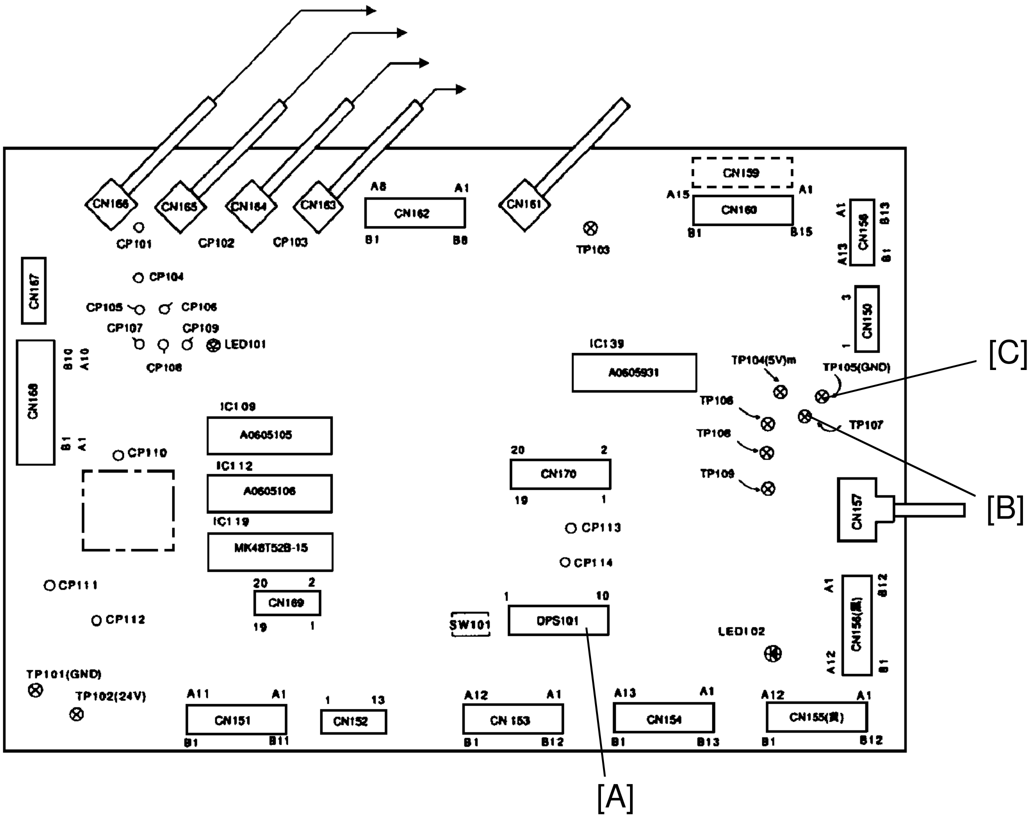
2.6 LASER SYNCHRONIZING DETECTOR FIBER (OPTICAL FIBER)



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Secure the scanner unit. (See Securing the Scanner Unit section.)
3. Remove the laser unit cover, with the printer controller board attached. (See step 3 of the LD Unit Replacement section.)
4. Disconnect the optical fiber cable [A] from the laser unit.
5. Remove the rear cover (4 screws).
6. Disconnect the optical fiber cable from CN161 on the main board.
7. Remove the optical fiber cable.

CAUTION: Do not loosen the screw [B] securing the synchronizing mirror bracket. Doing so would cause the service call condition (SC#322 Laser Synchronization Incorrect).

2.7 APC ADJUSTMENT



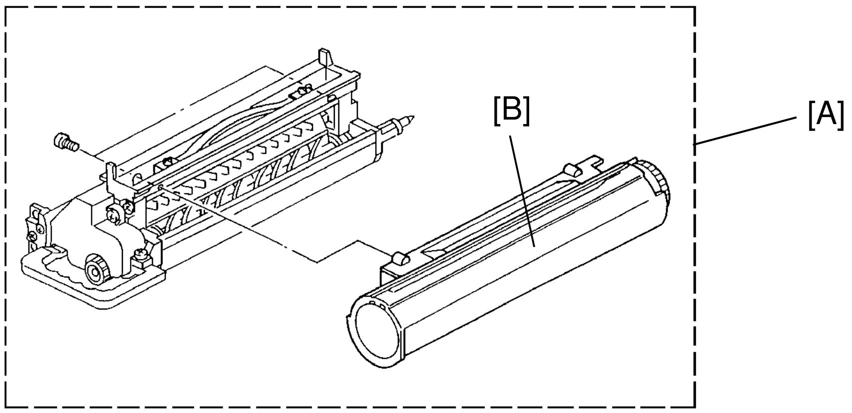
Adjust the APC whenever you replace the main board.

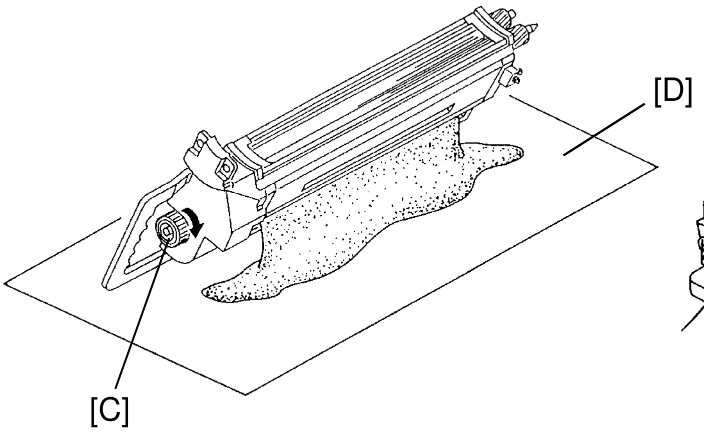
1. Turn on the main switch.
2. Turn on DIP SW101 on the main board [A].
3. Measure the voltage between TP107 [B] and GND [C], on the main board.
4. After installing the new main board, adjust the voltage to the value measured in step 2, using VR101.

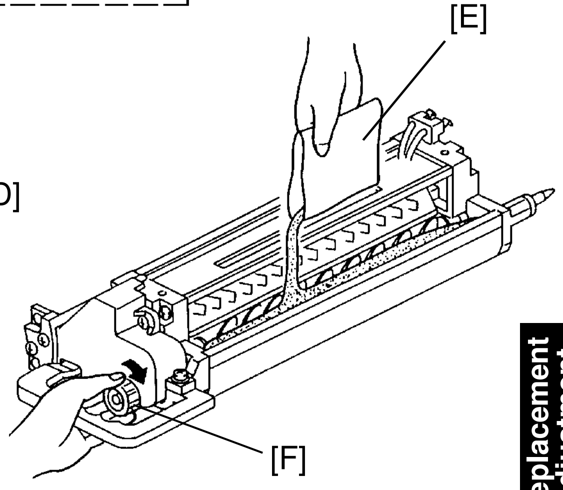
   NOTE: If the voltage cannot be measured in step 2, adjust the voltage to 3 ± 0.05 V.

3. DEVELOPMENT AND TONER SUPPLY

3.1 DEVELOPER REPLACEMENT



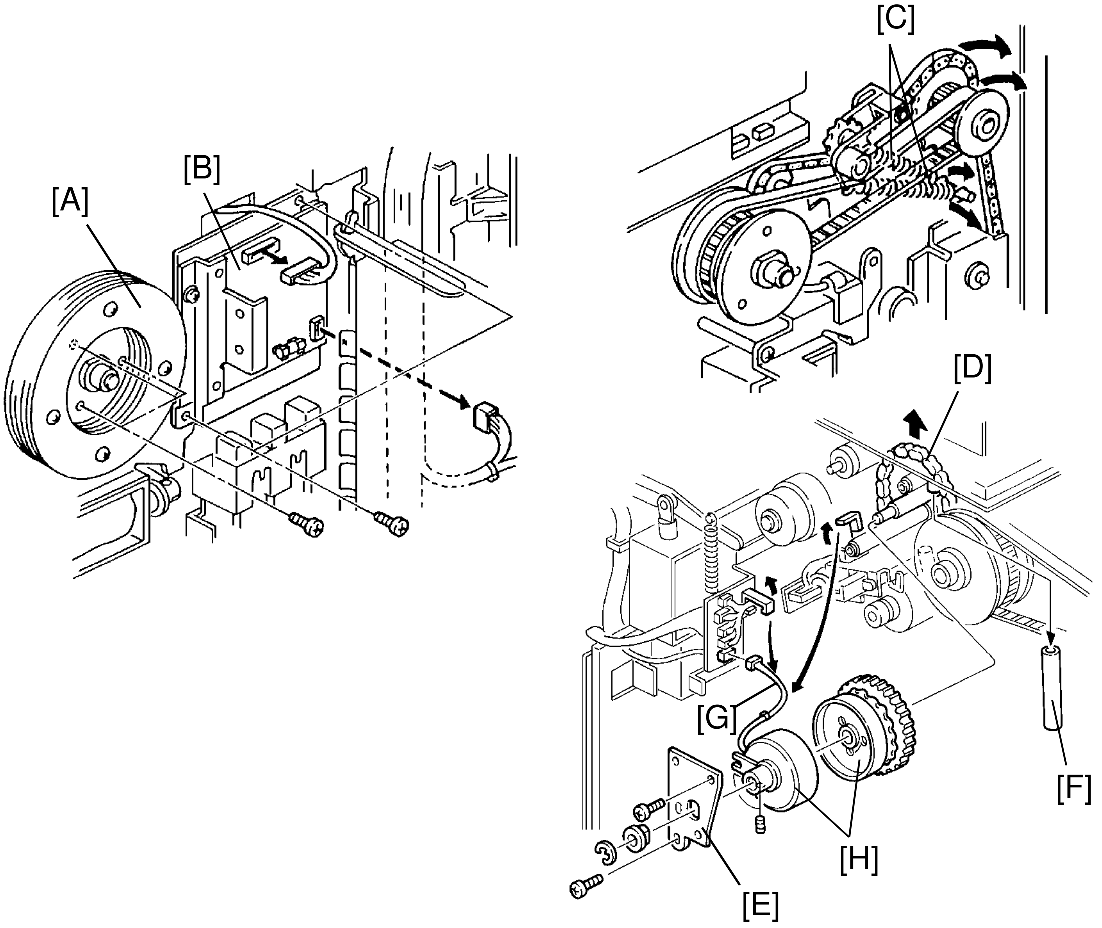




1. Remove the development unit bracket (1 screw) and pull out the unit.
2. Set the development unit [A] on a large sheet of paper and remove the toner supply unit [B] (2 screws).
3. With the unit's inlet facing downwards, turn the paddle knob [C] clockwise. The developer will fall out onto the paper [D].

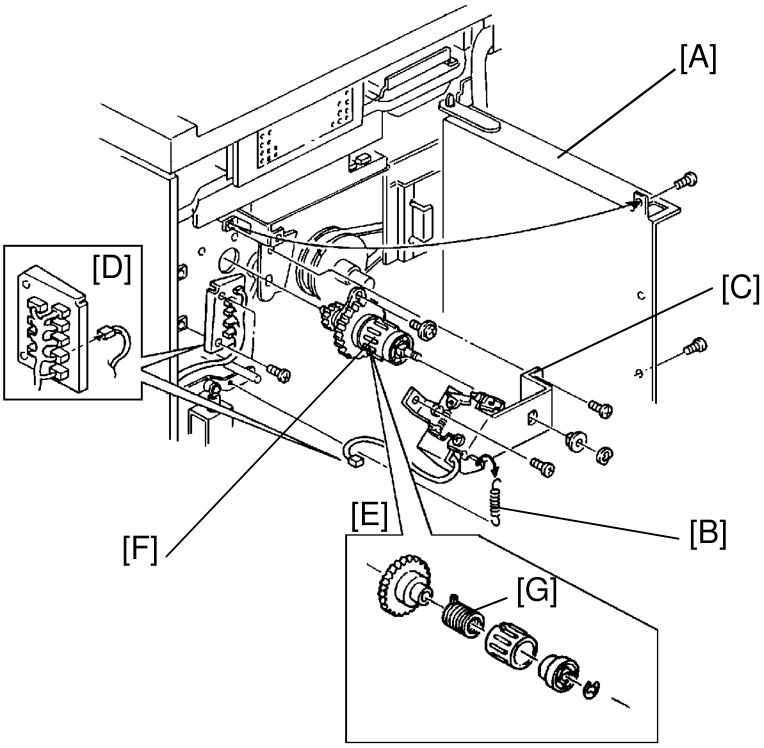
   NOTE: Dispose of the used toner according to local regulations.
4. Make sure that no developer remains on the development roller or in the development unit.
5. Pour one pack of developer [E] into the development unit while turning the paddle roller knob [F].
6. Reassemble the unit and set the development unit in the machine.

3.2 DEVELOPMENT ROLLER CLUTCH REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the main control board. (See Main Control Board Replacement.)
3. Perform the Toner Supply Clutch Replacement section steps 1 through 5, and remove the toner supply solenoid bracket.
4. Remove the fly wheel [A] (3 screws).
5. Remove the main motor drive board [B] (2 screws, 2 connectors).
6. Remove the 2 tension springs [C].
7. Take the drive chain [D] off the gears.
8. Remove the clutch bracket [E] (1 E-ring, bushing).
9. Remove the air duct pipe [F].
10. Free the development roller clutch harness [G] (2 clamps, 1 connector).
11. Remove the development roller clutch [H] (2 Allen screws).

3.3 TONER SUPPLY CLUTCH REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover (4 screws).
3. Swing open the main PCB [A] (2 screws).
4. Remove the pick-up solenoid pressure lever spring [B] from the toner supply solenoid support bracket [C].
5. Disconnect the connector [D] of the toner supply solenoid [E].
6. Remove the toner supply solenoid support bracket [C] (2 screws, 1 E-ring, 1 bushing).
7. Remove the toner supply clutch unit [F] (1 screw).
8. Disassemble the clutch, clear the clutch hub, spring, and gear, and lightly grease the spring [G] with Mobil Temp 78.

NOTE: a) When reassembling, make sure that the chamfered end of the clutch sleeve is outside. Also, make sure the right angle projection of the spring is on the inside notch of the sleeve.

b) When reinstalling the toner supply solenoid support bracket, make sure it is properly engaged in the groove of the development roller clutch stopper.

3.4 Vsg SETTING

NOTE: Vsg drops when the sensor becomes dirty after making many copies. Therefore, the sensor should be cleaned before Vsg is set.

1. Turn off the main switch and open the front doors.
2. Pull out and clean the ID sensor.
3. Install the ID sensor and close the front doors.
4. Perform Vsg setting SP3-1-2. The machine will adjust and set Vsg automatically.

NOTE: Perform Vsg setting whenever the following occurs:

- ID sensor replacement
- Drum replacement
- Toner density disorder (dark or light)

3.5 SP MODES

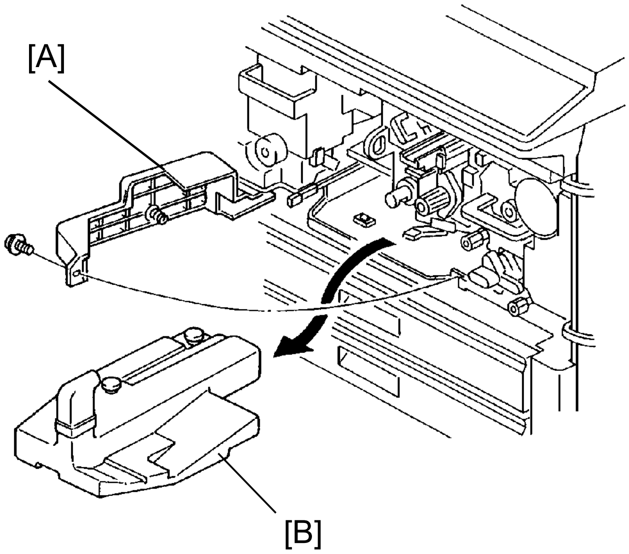
The following modes on the development and toner supply are adjustable.

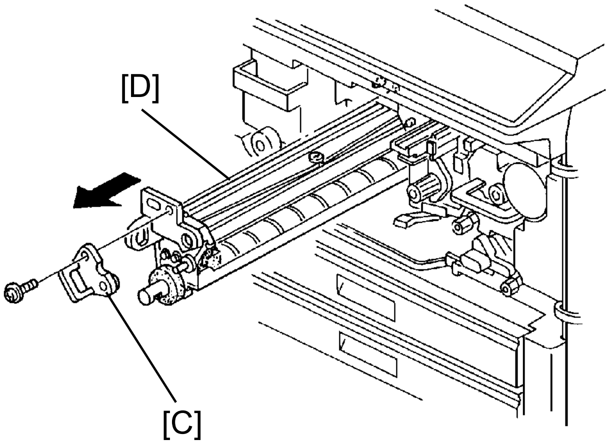
SP2-207	Feeds toner for on additional 30 seconds to recover from a low toner concentration condition.
SP2-208-1	Selects the toner supply control.
SP2-208-2	Adjusts the toner supply ratio when the fix, or detect + fix, supply mode is selected.
SP2-209	Alternates the check interval for the image density sensor.
SP2-210	Additional toner supply during toner end copy runs.
SP2-201-4	n=Vsp/Vsg x 100 selection. Adjusts the development bias of the ID pattern.
SP2-212	Toner end level in addition to detected Vsp.
SP2-213	Adjusts the timing of the toner end checked by the ID sensor.
SP3-1-2	Sets Vsg to 4 volts automatically.
SP3-103	Last detection data for Vsg and Vsp is displayed.

NOTE: Refer to the section 4 (Service Tables) for additional information on the above mentioned SP modes.

4. CLEANING

4.1 CLEANING UNIT, AND TONER COLLECTION BOTTLE REMOVAL

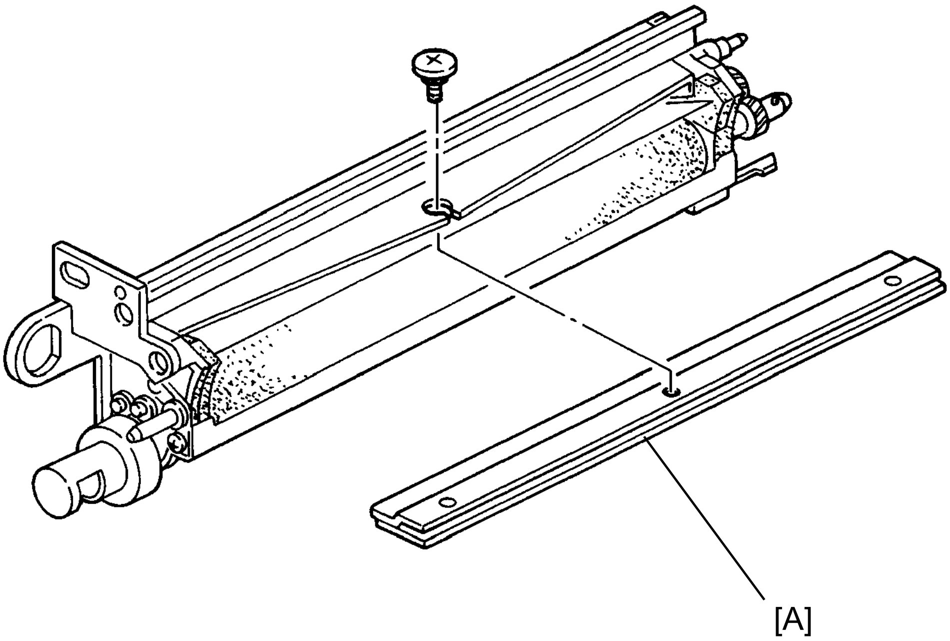




1. Turn off the main switch and open the front doors.
2. Remove the PCC corona unit. (See PCC Corona Unit Removal section.)
3. Swing the toner collection bottle cover [A] to the left (1 screw).
4. Remove the toner collection bottle [B] (1 connector).
5. Remove the positioning plate [C] (1 screw).
   NOTE: Hold the cleaning unit to remove the plate easily.
6. While turning the cleaning unit clockwise a little, pull out the cleaning unit [D] and place it on a large sheet of paper.

CAUTION: Toner may drop from the front side of the toner pipe.

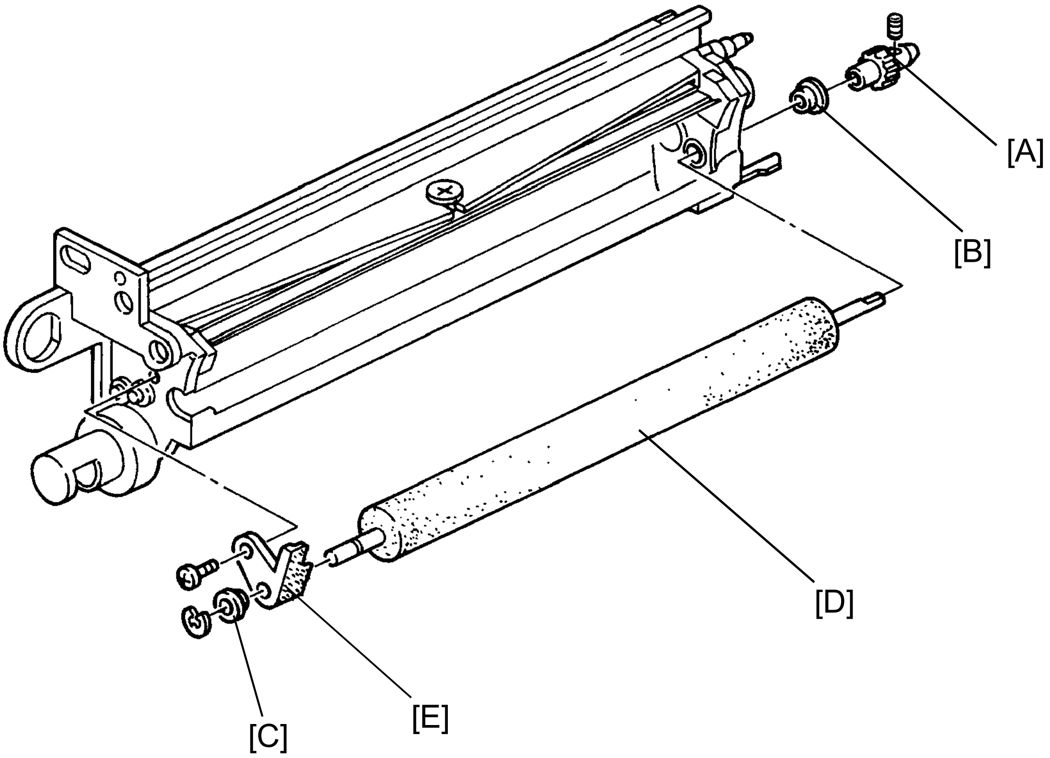
4.2 CLEANING BLADE REPLACEMENT



1. Pull out the cleaning unit. (See Cleaning Unit Removal section.)
2. Remove the cleaning blade [A] (1 screw).
3. Install the new cleaning blade.

CAUTION: a) Be careful not to touch the edge of the new blade.
b) After installing the blade, make sure that the blade swivels.

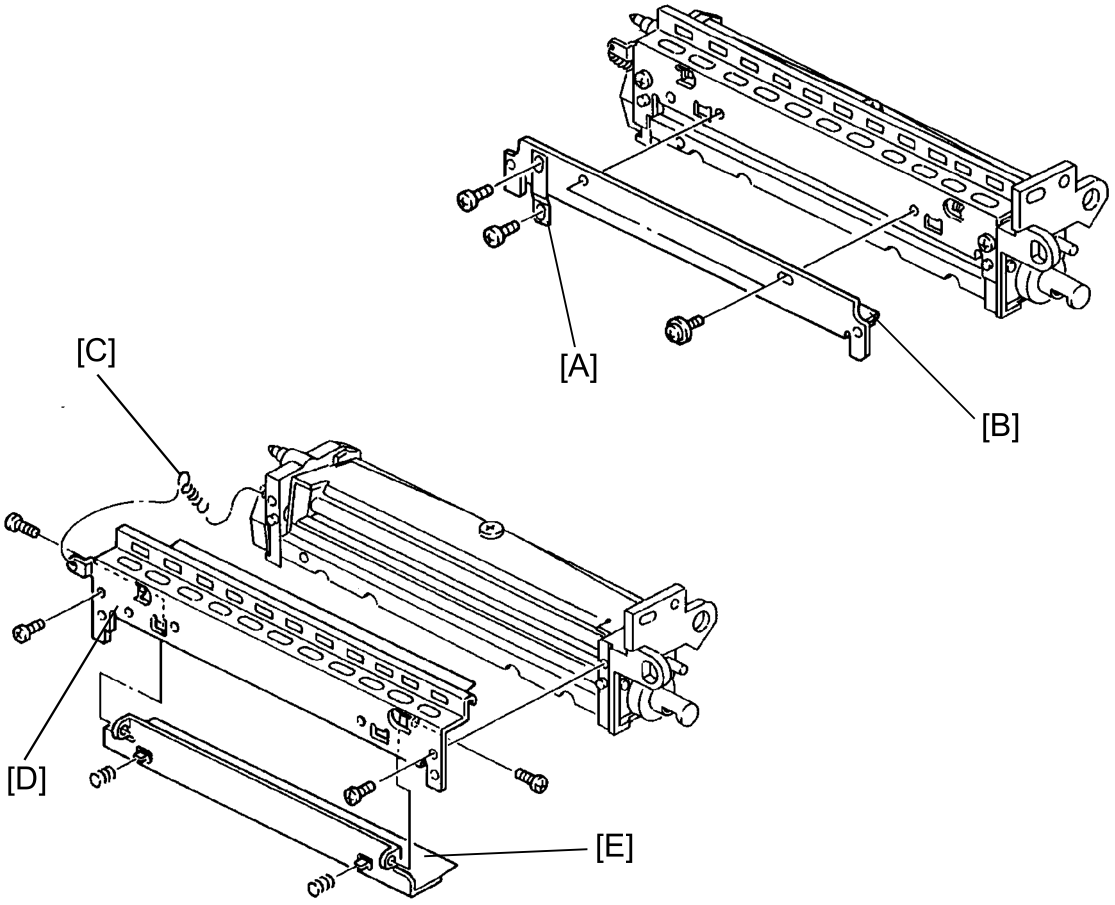
4.3 CLEANING BRUSH REPLACEMENT



1. Pull out the cleaning unit. (See Cleaning Unit Removal section.)
2. Remove the cleaning unit drive gear [A] (1 Allen screw), and the bushing [B] from the rear end of the cleaning brush shaft.
3. Remove the bushing [C] from the front end (1 E-ring).
4. Take out the cleaning brush [D] with the brush shaft holder [E] (1 screw).
5. Take the brush shaft holder off the front end.
6. Install the new cleaning brush and reassemble the unit.

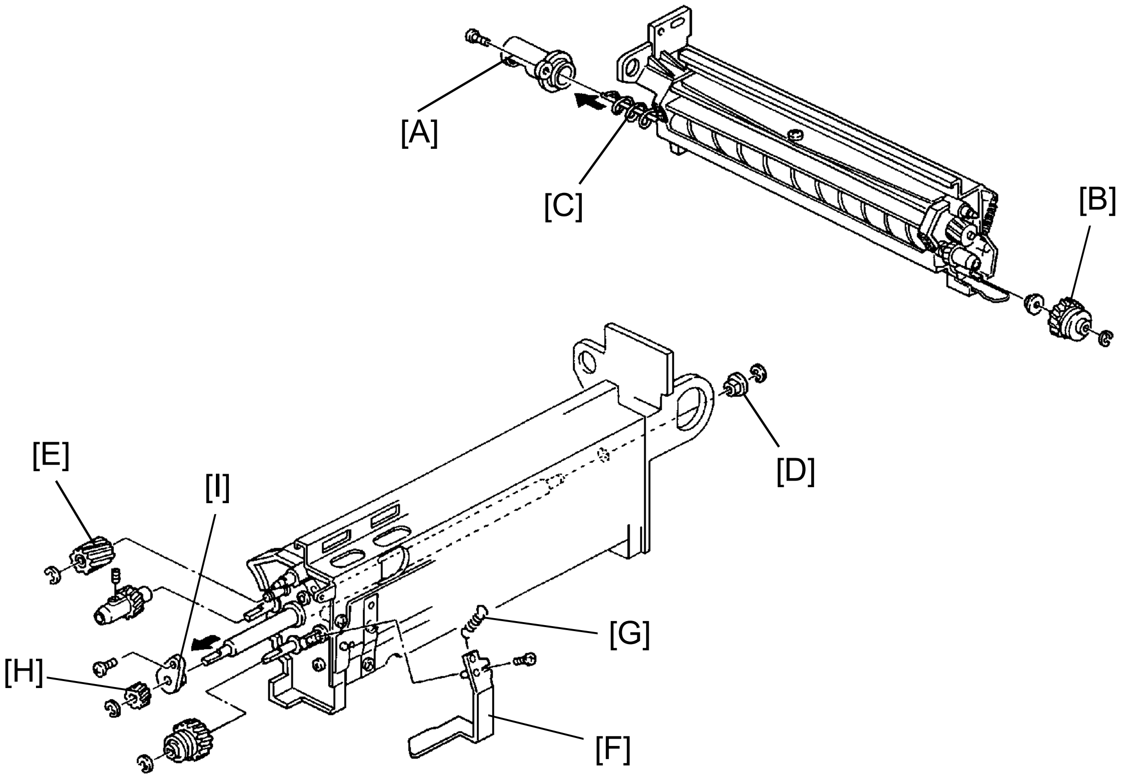
CAUTION: a) Do not touch the new brush; handle only the shaft.
b) Do not use any other type of screw for the drive gear [A]. (Use only M4 x 8 allen screw)

4.4 BIAS ROLLER BLADE AND BLADE EDGE CLEANER REPLACEMENT



1. Pull out the cleaning unit. (See Cleaning Unit Removal section.)
2. Remove the grounding plate [A] (2 screws).
3. Remove the bias roller blade [B] (2 screws).
4. Unhook the blade release spring [C].
5. Remove the casing [D] (2 screws).
6. Remove the blade edge cleaner [E] from the casing, (2 screws).

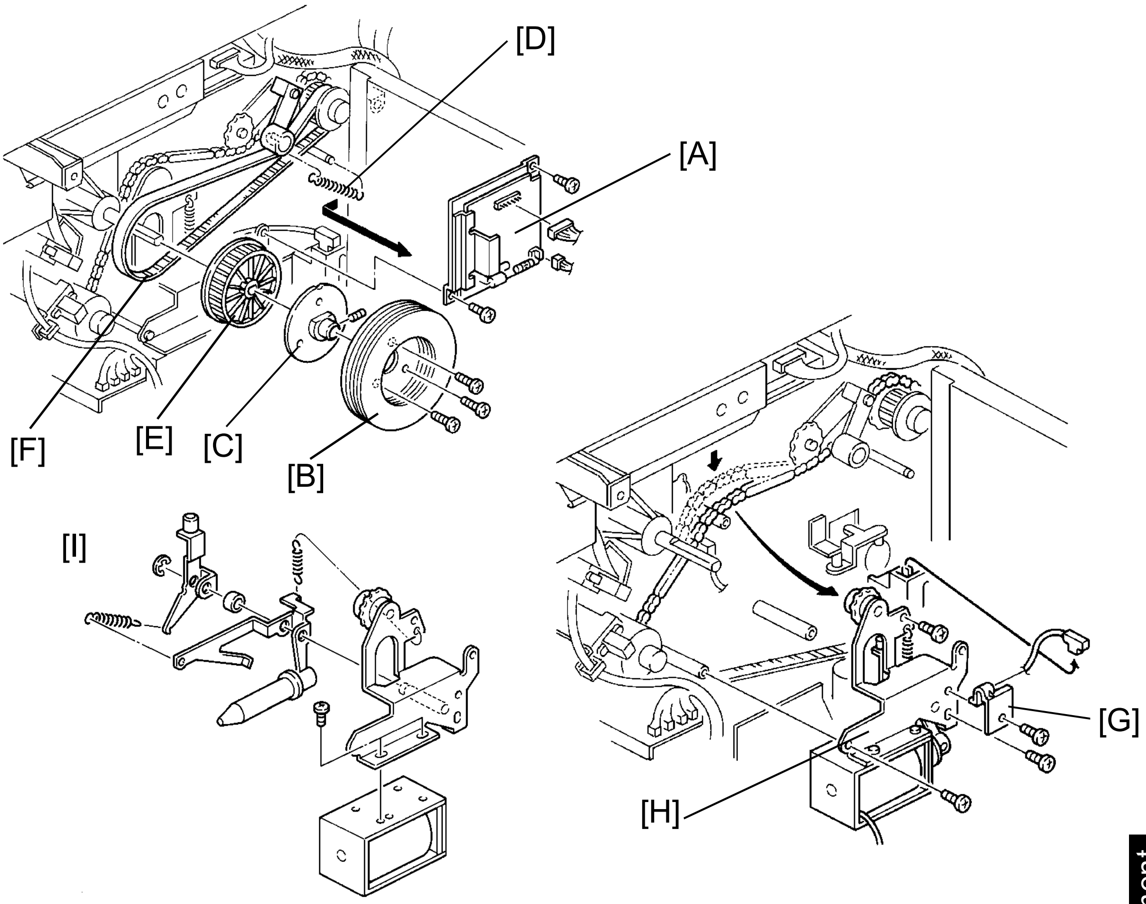
4.5 TONER COIL AND BIAS ROLLER REPLACEMENT



1. Pull out the cleaning unit. (See Cleaning Unit Removal section.)
2. Remove the cleaning brush. (See Cleaning Brush Replacement section.)
3. Remove the toner collection coil cover [A] (1 screw).

   NOTE: Toner may drop from the unit when removing the toner coil.
4. Remove the cam gear [B] (1 E-ring 1 bushing), and remove the toner coil [C] from the front side.
5. Remove the bushing [D] of the cleaning bias roller (1 E-ring).
6. Remove the idle gear [E] (1 E-ring).
7. Remove the pressure arm [F] (1 screw) and the spring [G].
8. Remove the spring plate (1 screw).
9. Remove the cleaning bias roller gear [H] (1 E-ring).
10. Remove the bias roller blade. (See the previous page.)
11. Remove the bias roller bracket [I] and pull out the bias roller [L] from the rear.

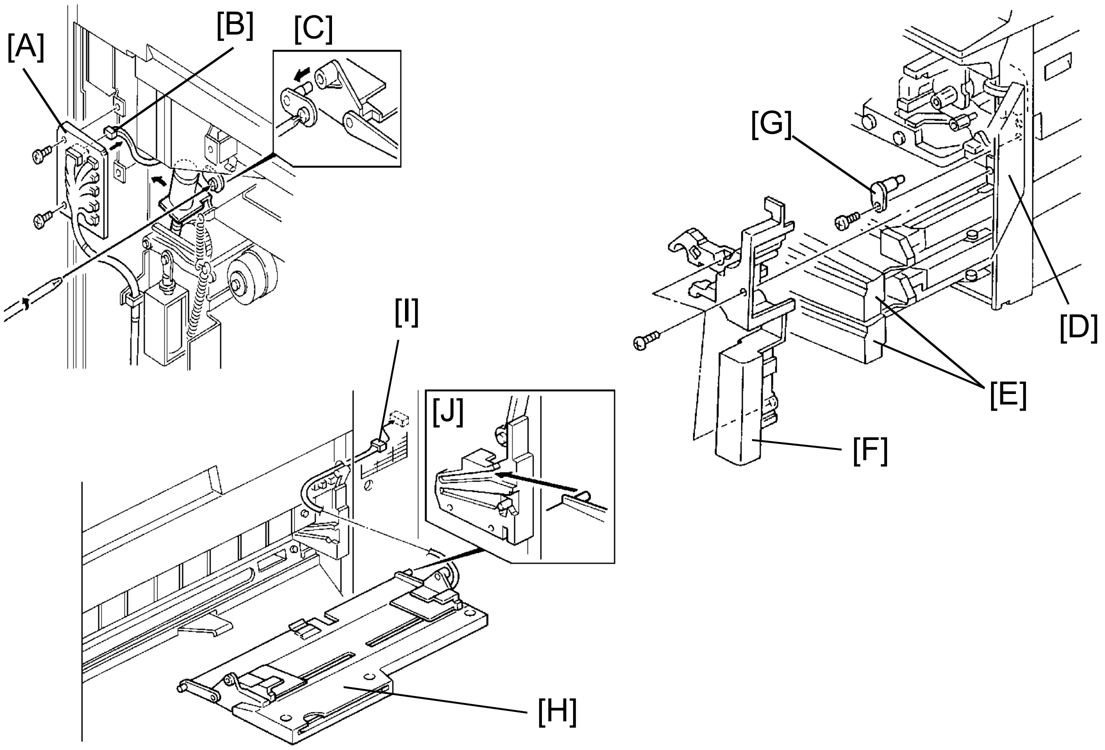
4.6 CLEANING BLADE SOLENOID REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover (4 screws) and swing open the main control board (2 screws).
3. Remove the main motor drive board unit [A] (2 screws, 2 connectors).
4. Remove the fly wheel [B] (3 screws).
5. Remove the flange [C] (1 Allen screw).
6. Remove the timing belt pressure spring [D].
7. Remove the pulley [E] and the timing belt [F].
8. Remove the cable clamp [G] (1 screw).
9. Remove the cleaning blade solenoid unit [H] (3 screws, 1 connector).
10. Disassemble the unit and replace the cleaning blade solenoid as show in the figure [I].

5. PAPER FEED

5.1 MANUAL FEED TABLE REMOVAL

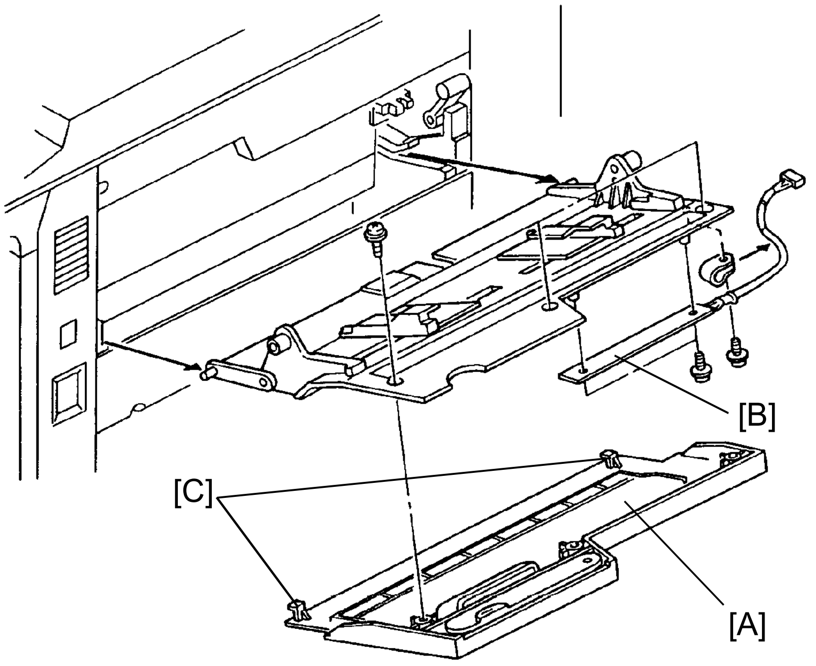


NOTE: Do not remove the stud [C] in step 3.

1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover (4 screws).
3. Remove the harness bracket [A] (2 screws) then disconnect the 5 P connector of the paper size sensor [B].
4. Loosen the screw of the stud [C].
5. Remove the operation panel under cover (3 screws).
6. Remove the right front door then pull out the 2 cassette trays [E].
7. Remove the right inner cover [F] (3 screws).
8. Remove the stud [G] (1 screw).
9. Pull out the manual feed table [H].

NOTE: When reinstalling, make sure of the following:
a) Insert the harness [I] through the window before reinstalling the table.
b) The pegs should be installed on the upper rail [J].

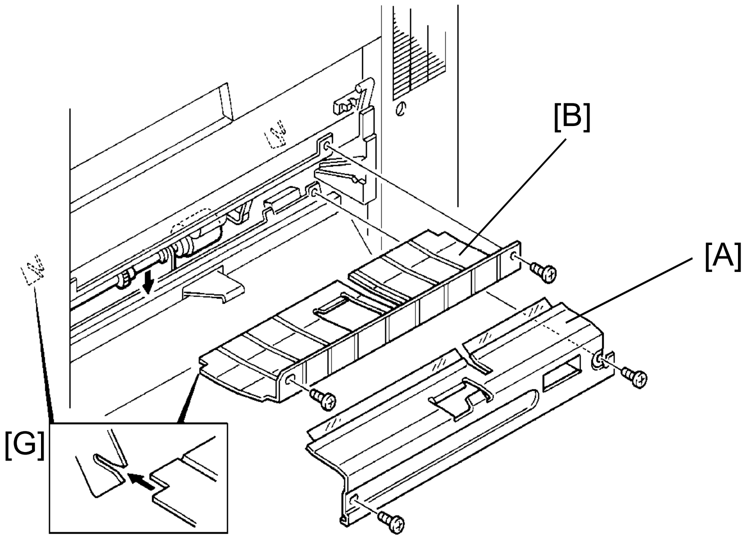
5.2 MANUAL PAPER FEED WIDTH SENSOR REPLACEMENT

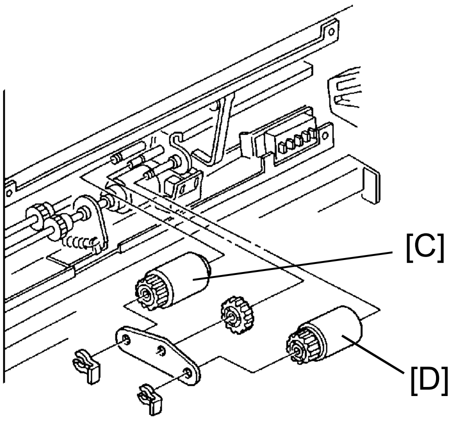


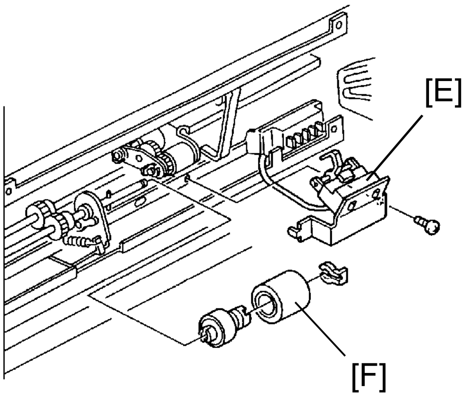
1. Remove the manual feed table. (See Manual Feed Table Removal section.)
2. Remove the manual feed table cover [A] (3 screws).
3. Replace the manual paper feed width sensor [B] (3 screws, 1 harness clamp).

NOTE: When reinstalling, make sure that the pegs [C] enter the slot.

5.3 PAPER FEED, PICK-UP, AND REVERSE ROLLER REPLACEMENT (MANUAL FEED TABLE)





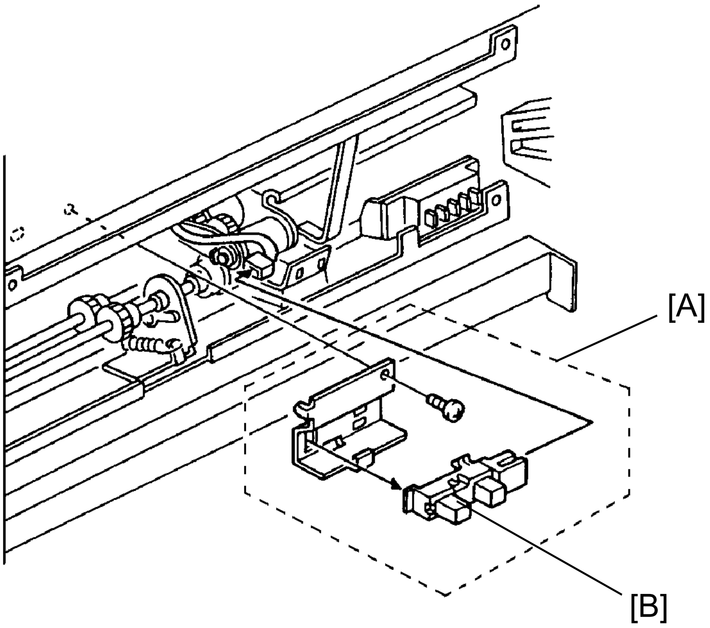


NOTE: The rollers are not interchangeable. Do not touch the surface of the rollers.

1. Remove the manual feed table. (See Manual Feed Table Removal section.)
2. Remove the reverse guide plate [A] (2 screws).
3. Remove the feed guide plate [B] (2 screws) while pulling down the reverse roller shaft as shown in the figure.
4. Replace the paper feed roller [C] and the pick-up roller [D] (1 snap ring each, holder and gear).
5. Move the first relay sensor unit [E] out of the way (1 screw) and replace the reverse roller [F] (1 snap ring).

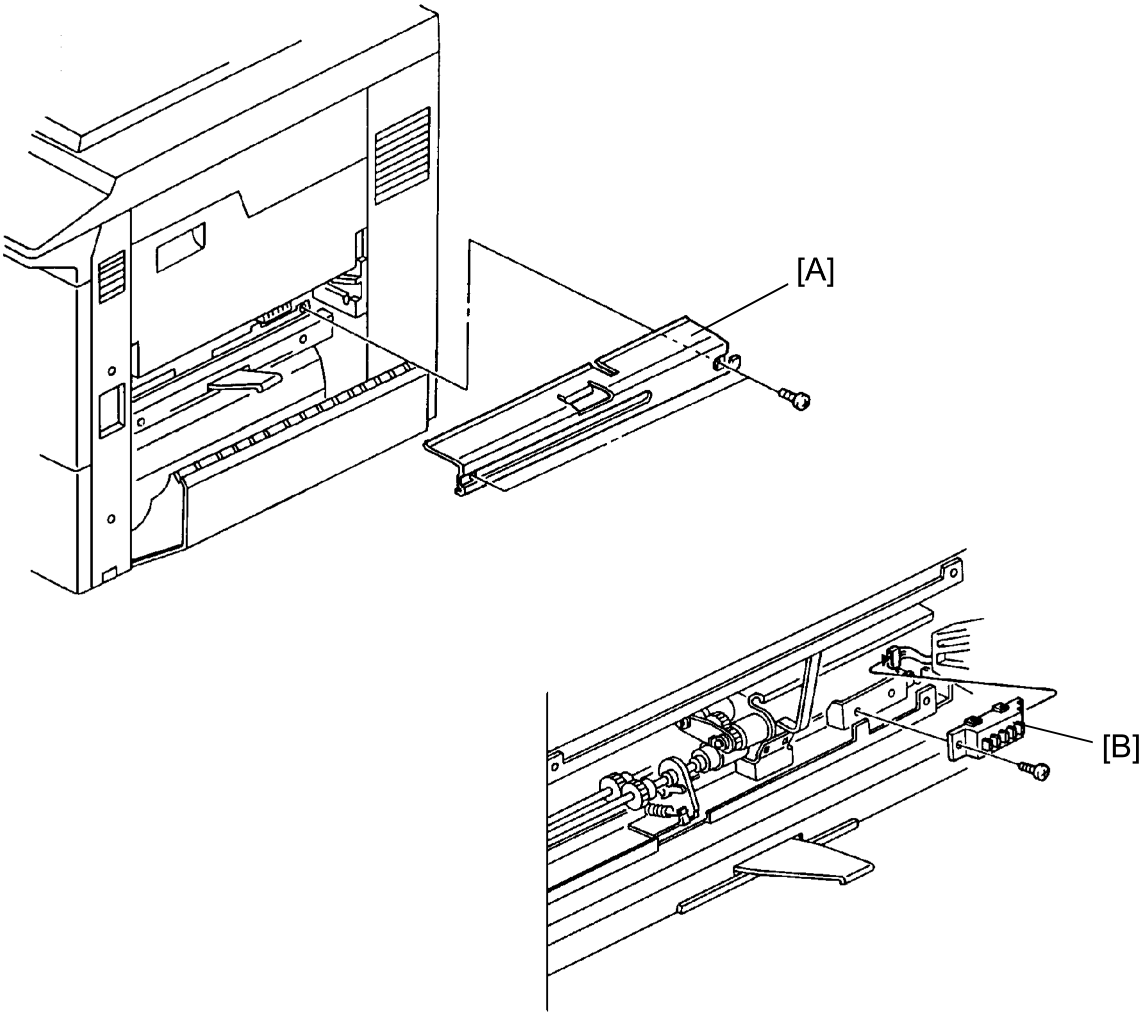
NOTE: When reinstalling the feed guide plate [B] make sure the pegs enter the slots [G] as shown in the figure.

5.4 MANUAL FEED PAPER END SENSOR REPLACEMENT



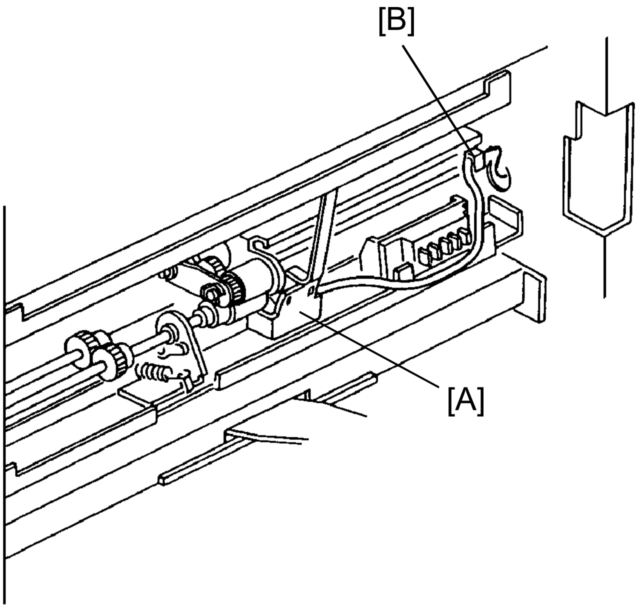
1. Remove the manual feed table. (See Manual Feed Table Replacement section.)
2. Remove the reverse guide plate and the feed guide plate. (See Roller Replacement section.)
3. Remove the manual feed paper end sensor unit [A] (1 screw, 1 connector).
4. Replace the sensor [B].

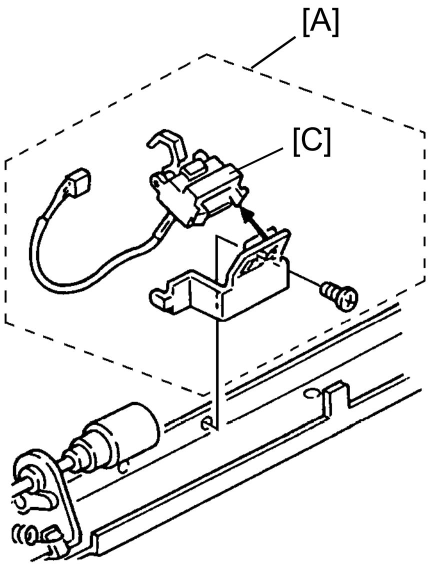
5.5 SIDE PAPER SIZE SENSOR REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the reverse guide plate [A] (2 screws).
3. Replace the side paper size sensor [B] (1 screw, 1 connector).

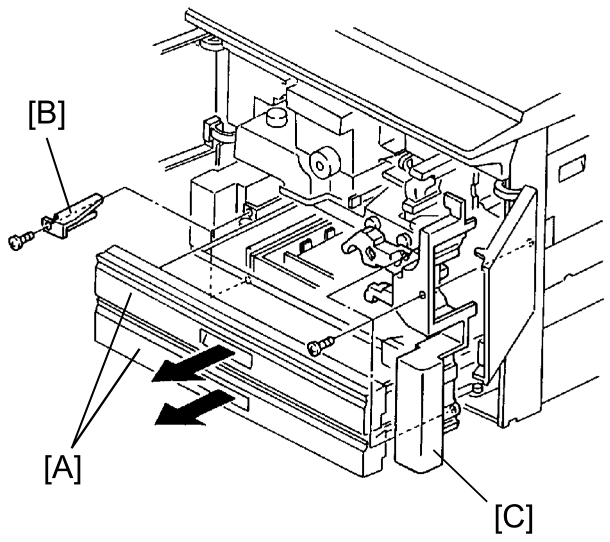
5.6 FIRST RELAY SENSOR REPLACEMENT

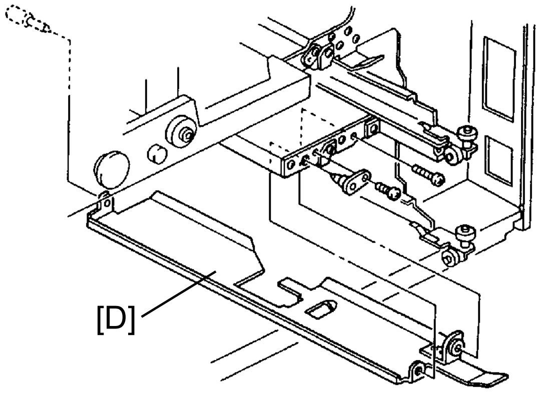


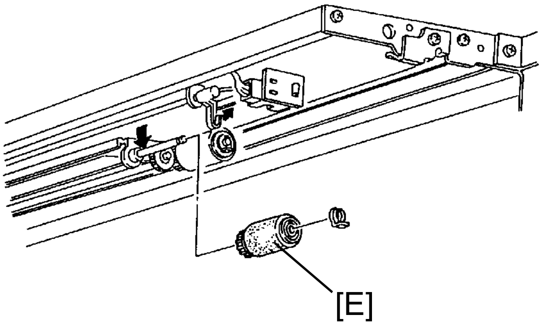


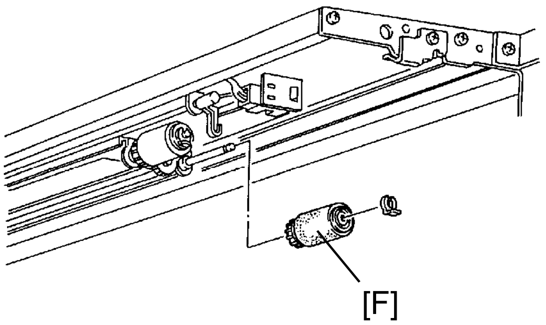
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the reverse guide plate (see Paper Size Sensor Replacement section).
3. Remove the rear lower cover (4 screws).
4. Remove the first relay sensor unit [A].
5. Remove the connector from the clamp [B] and replace the sensor [C].

5.7 PAPER FEED AND PICK-UP ROLLER REPLACEMENT (1ST AND 2ND FEED UNIT)





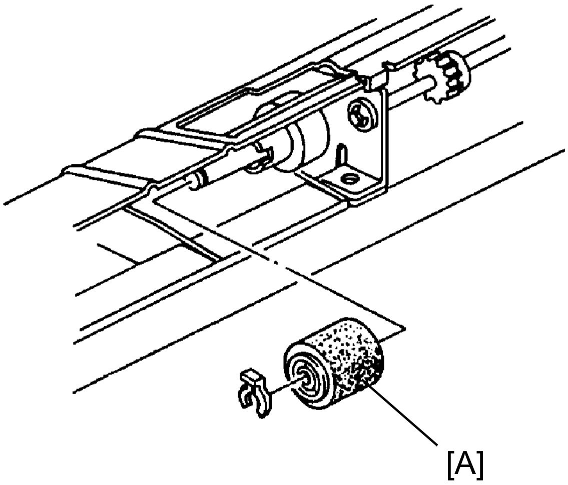




NOTE: The procedures are the same for both trays.
Make sure not to touch the rollers with bare hands.

1. Turn off the main switch.
2. Pull out the cassette tray [A].
3. Remove the stopper bracket [B] (1 screw), and remove the cassette tray [A].
3. Open the front doors and remove the right inner cover [C] (3 screws).
4. Remove the guide plate [D] (2 screws).
5. Replace the pick-up roller [E] and the paper feed roller [F] (1 snap ring each).

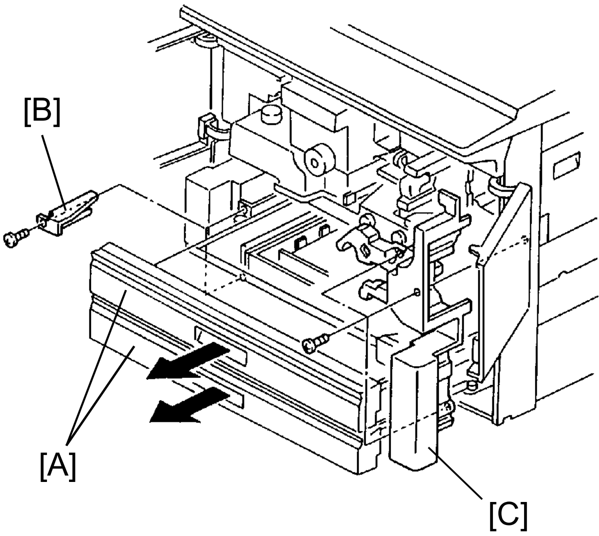
5.8 REVERSE ROLLER REPLACEMENT (CASSETTE TRAY)

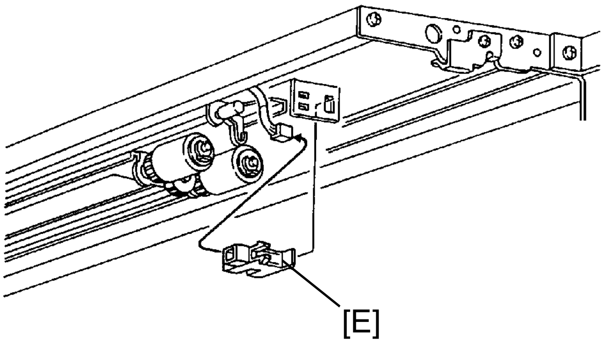


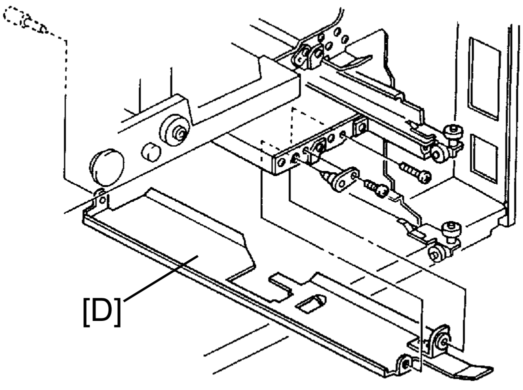
NOTE: The procedures are the same for both trays.
Make sure not to touch the rollers with bare hands.

1. Pull out the cassette tray.
2. Replace the reverse roller [A] (1 snap ring).

5.9 PAPER END SENSOR REPLACEMENT (CASSETTE TRAY)



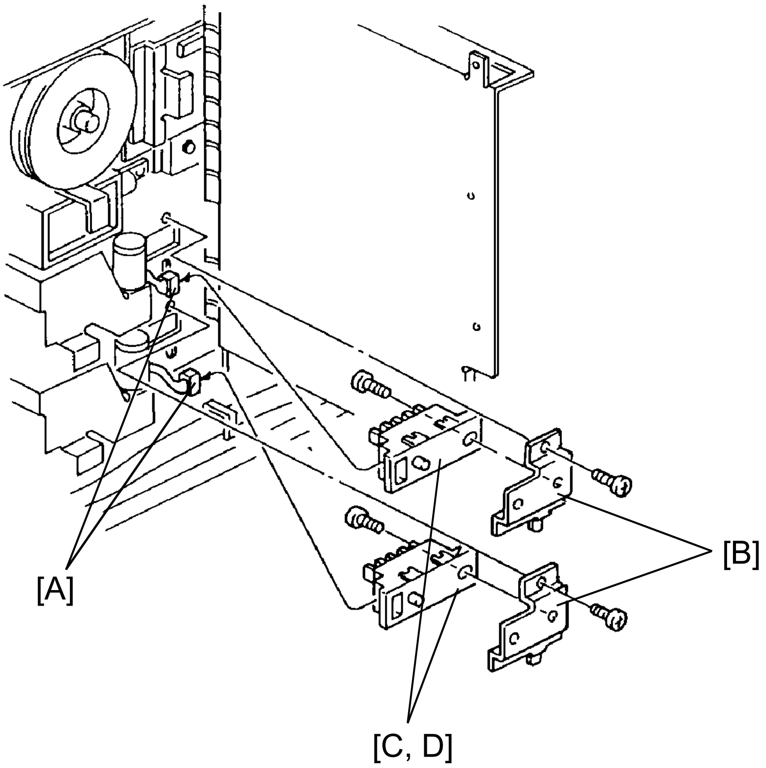




NOTE: The procedures are the same for both trays.

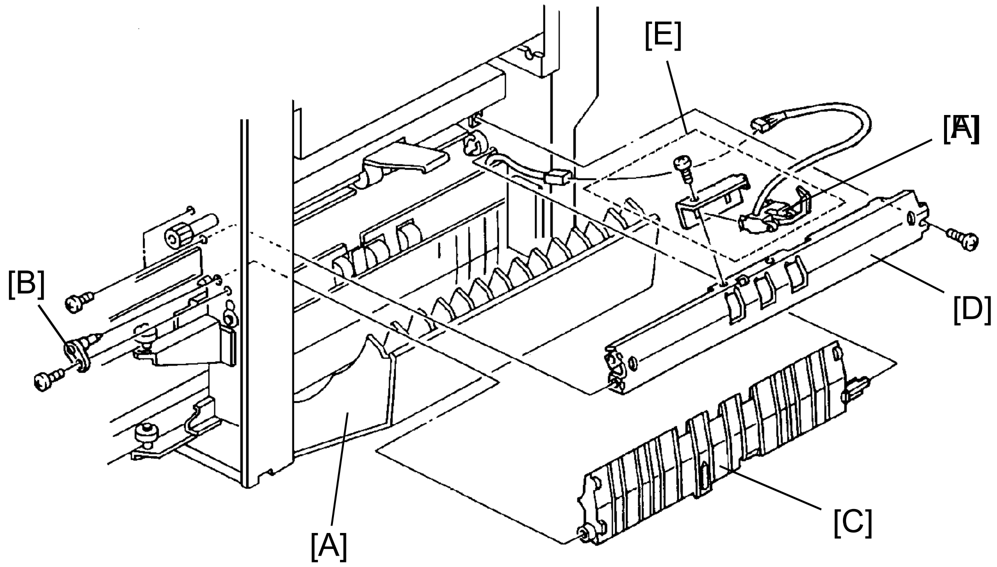
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Pull out the cassette tray [A].
3. Remove the stopper bracket [B] (1 screw) and remove the cassette tray [A].
4. Open the front doors and remove the right inner cover [C] (3 screws).
5. Remove the guide plate [D] (2 screws).
6. Replace the paper end sensor [E].

5.10 1ST/2ND PAPER SIZE SENSOR REPLACEMENT



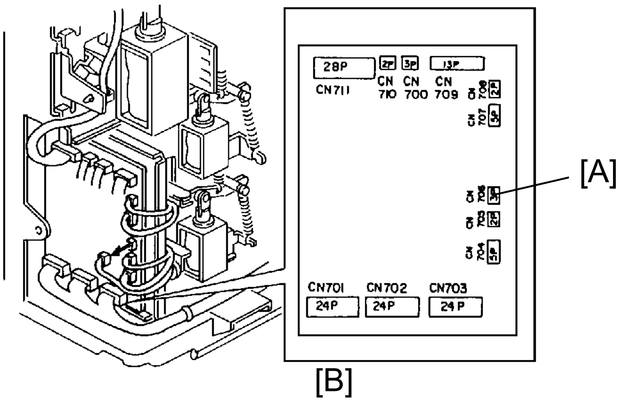
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the T/S PCC power pack. (See T/S PCC Power Pack Replacement section.)
3. Disconnect the connectors [A] of the paper size sensors.
4. Remove both sensors with the bracket [B] on (1 screw each).
5. Replace the 1st and 2nd paper size sensor [C, D] (1 screw each).

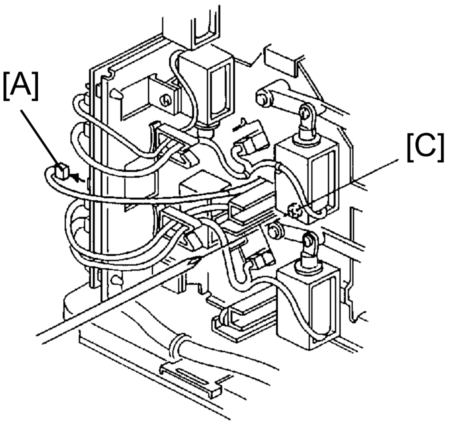
5.11 FIRST RELAY SENSOR REPLACEMENT

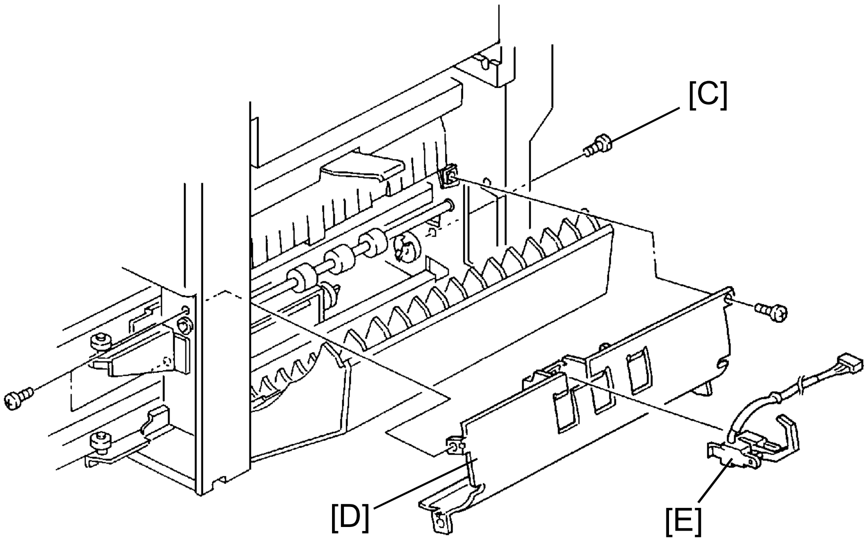


1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Open the front doors and pull out the cassette trays.
3. Remove the following parts:
   - Operation panel under cover (3 screws)
   - Right inner cover (3 screws)
   - Right door
4. Open the copiers right door [A].
5. Remove the turn guide holder [B] (1 screw).
6. Remove the upper turn guide [C].
7. Remove the roller guide plate [D] (3 screws, 1 connector).
8. Remove the sensor unit [E] (1 screw).
9. Replace the first relay sensor [F].

5.12 RELAY SENSOR REPLACEMENT

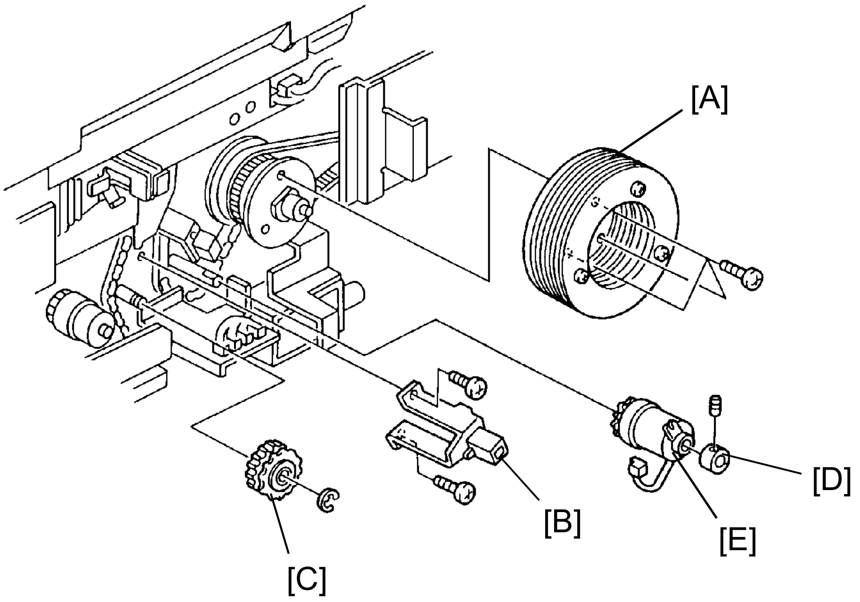






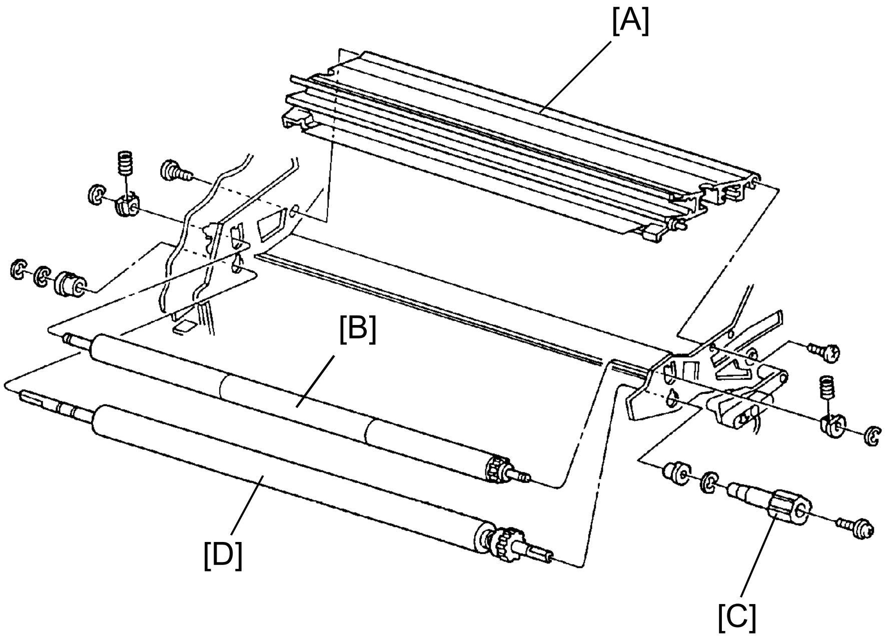
1. Perform First Relay Sensor Replacement section 1 through 6.
2. Remove the rear lower cover (4 screws) and the right rear cover (2 screws).
3. Disconnect CN706 [A] on the dc drive board [B].
4. Remove the screw [C] from the rear of the copier.
5. Remove the roller guide plate [D] (2 screws).
6. Replace the relay sensor [E].

5.13 REGISTRATION CLUTCH REPLACEMENT



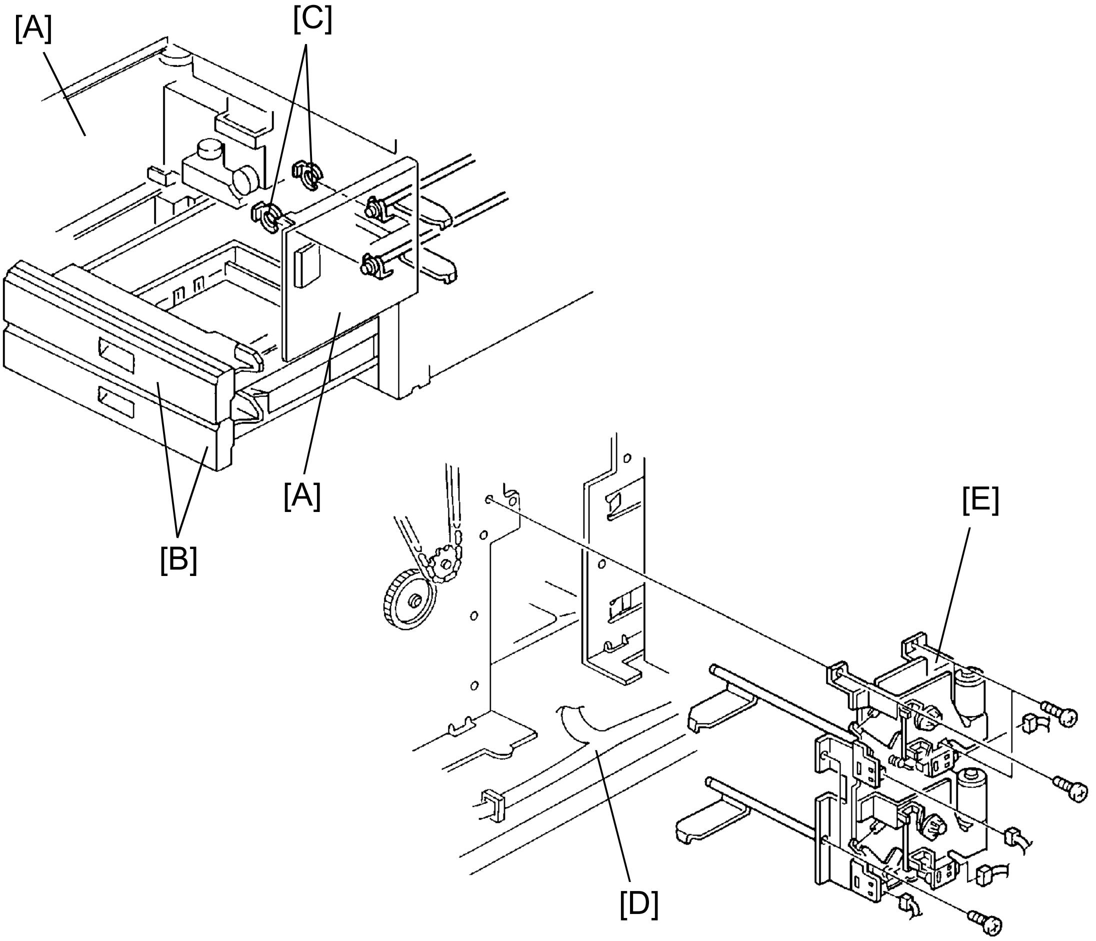
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover (4 screws).
3. Swing open the main PCB (2 screws).
4. Remove the drum fly wheel [A] (3 screws).
5. Remove the registration sensor support bracket [B] (2 screws).
6. Remove the drive gear [C] (1 E-ring).
7. Remove the collar [D] and replace the registration clutch [E] (1 Allen screw each).

5.14 REGISTRATION ROLLER REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the following parts:
   - Drum unit (see Drum Replacement section)
   - Registration sensor board
   - T/S corona unit
   - ID sensor board
   - Right inner cover (3 screws)
3. Remove the registration clutch. (See Registration Clutch Replacement section.)
4. Remove the guide plate [A] from the front (2 stepped screws).
5. Remove the upper registration roller [B] from the front (2 E-rings, 2 bushings, 2 springs).
6. Remove the knob [C] (1 screw).
7. Remove the lower registration roller [D] (3 E-rings, 2 bushings).

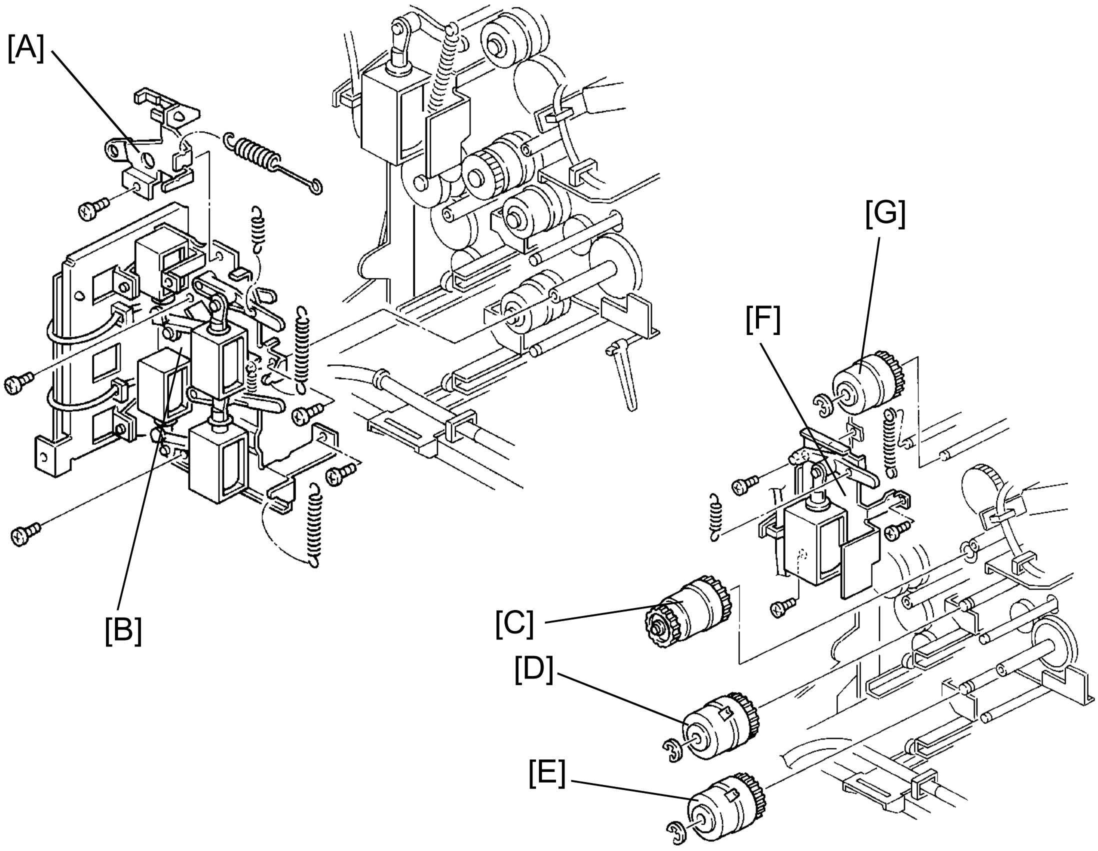
5.15 CASSETTE LIFT UP UNIT REMOVAL



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Open the front doors [A] and pull out the cassette trays [B].
3. Remove the snap rings [C].
4. Remove the rear lower cover and swing open the main PCB (2 screws).

   NOTE: When removing the cassette lift up unit, make sure not to damage the harnesses [D].
5. Remove the cassette lift up unit [E] (5 screws, 6 connectors, 4 clamps).

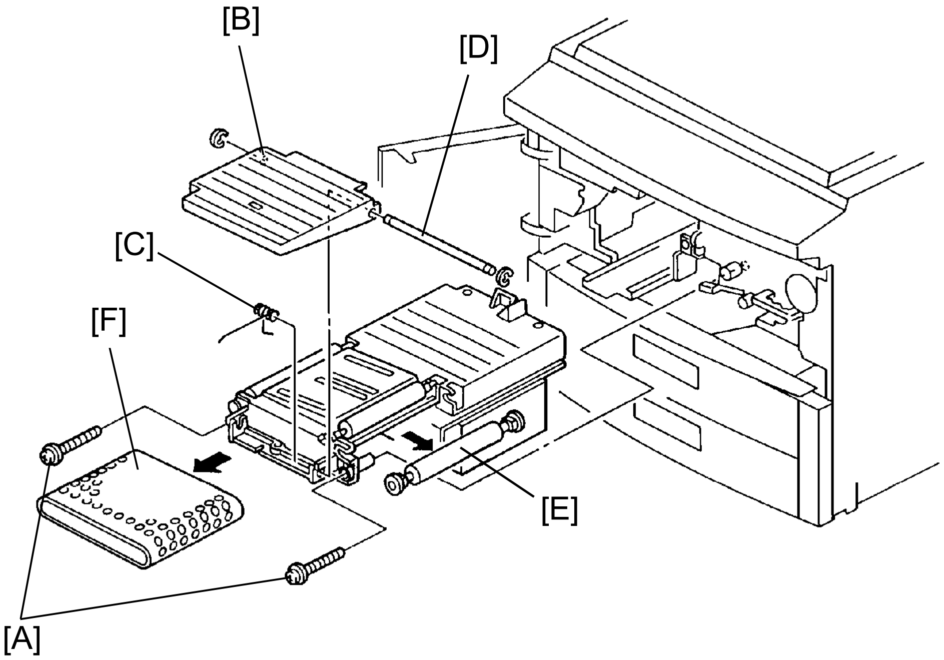
5.16 SIDE PAPER FEED, RELAY ROLLER, 1ST PAPER FEED AND 2ND PAPER FEED CLUTCH REPLACEMENT



1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover (4 screws) and the right rear cover (2 screws).
3. Swing open the main control board (2 screws).
4. Remove the securing bracket [A] (2 screws, 1 spring).
5. Remove the dc drive board unit along with the pick-up and tray lock solenoid unit [B] (4 screws, 3 springs, 14 connectors).
6. Replace the relay roller clutch [C] (1 connector).
7. Replace the 1st paper feed clutch [D] (1 E-ring, 1 connector).
8. Replace the 2nd paper feed clutch [E] (1 E-ring, 1 connector).
9. Move the side pick-up solenoid unit [F] out of the way (2 screws, 1 spring) and replace the side paper feed clutch [G] (1 E-ring, 1 connector).

NOTE: When reinstalling, make sure all the clutch stoppers are engaged.

5.17 TRANSPORT UNIT REMOVAL AND BELT REPLACEMENT



1. Remove the drum unit. (See Drum Replacement section.)
2. Remove the screws [A], and take out the transport unit.
3. Remove the front transport guide [B] as shown (1 E-ring, 1 spring [C], and 1 shaft [D]).
4. Remove the transport roller [E] by pulling it to the right.
5. Remove the belt [F].

NOTE: a) Smooth surface of the belt is for the rollers (inside). The front transport guide [B] should be lifted by the spring [C].

b) When re-installing the transport unit, connector for transport fan is located behind solenoid and drive chain.

5.18 NON STANDARD SIZE PAPER FROM MANUAL FEED TABLE

1. Enter the SP mode.
2. SP5-112, non-standard paper size manual feed, select 1.
3. Exit the SP mode and open the manual feed table.
4. Press the program key and input paper size data referring to the message display.

(LT/LG ver.)	(A4/B4 ver.)
Input Size Data V = _ _ _ _ " H = _ _ _ _"	Input Size Data V = _ _ _ _ mm H = _ _ _ _mm

V: Min. 4"/100 mm, MAX. 11"/297 mm
H: Min. 5.5"/148 mm, MAX. 40"/999 mm

NOTE: If vertical and horizontal input is opposite, paper jam or abnormal image location may occure.

5.19 SP MODES

The following modes on the paper feed unit are adjustment

SP1-1	Adjusts the leading edge margin using test pattern type 10.
SP1-2-1	Makes a blank margin on the left side of a copy fed from the side cassette using test pattern type 10.
SP1-2-2	Makes a blank margin on the left side of a copy fed from the 1st cassette using test pattern type 10.
SP1-2-3	Makes a blank margin on the left side of a copy fed from the 2nd cassette using test pattern type 10.
SP1-2-4	Makes a blank margin on the left side of a copy fed from the 3rd cassette using test pattern type 10.
SP1-2-6	Makes a blank margin on the left side of a copy fed from the manual feed using test pattern type 10.
SP1-2-7	Makes blank margin on the left side of copy fed from the duplex unit using test pattern type 10.
SP1-3-1	Adjusts the amount of paper buckle in at the registration area.
SP1-3-2	
SP1-3-3	
SP1-6	Adjusts the center line position.
SP1-7	Displays the paper width sensor data for the manual table.

NOTE: Refer to section 4 (Service Tables) for additional information on the above mentioned SP modes.

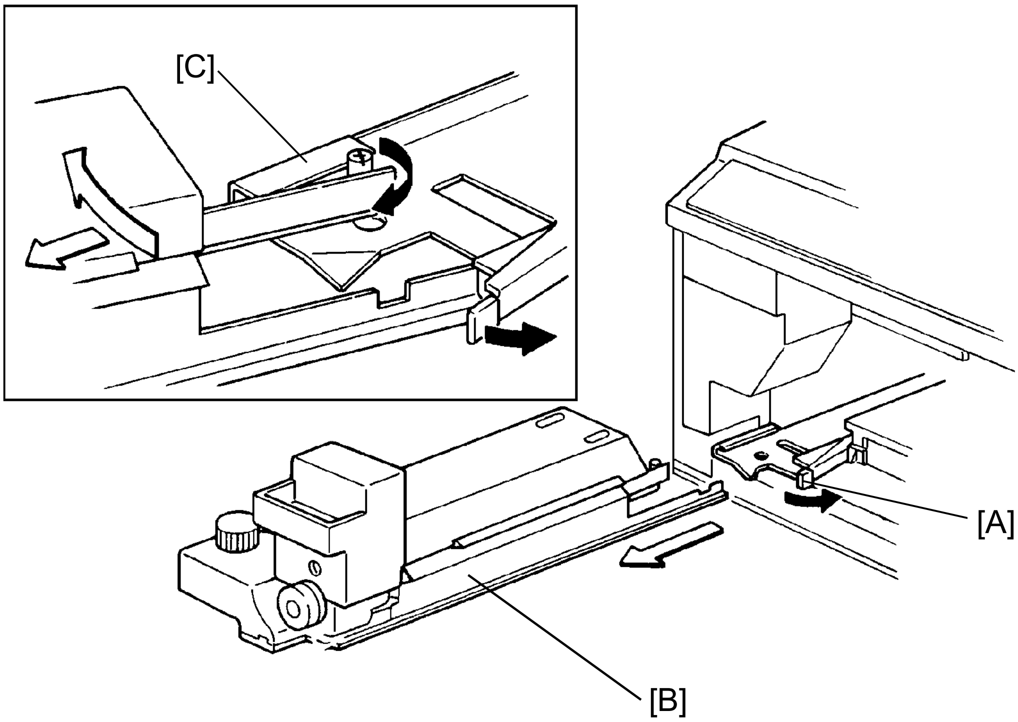
These are the available Check modes for the paper feed unit:
INPUT CHECK MODE SP5-803
OUTPUT CHECK MODE SP5-804
JAM HISTORY CHECK MODE SP7-903

Refer to section 4 (Service Tables) for additional information.

6. FUSING

6.1 FUSING UNIT REMOVAL

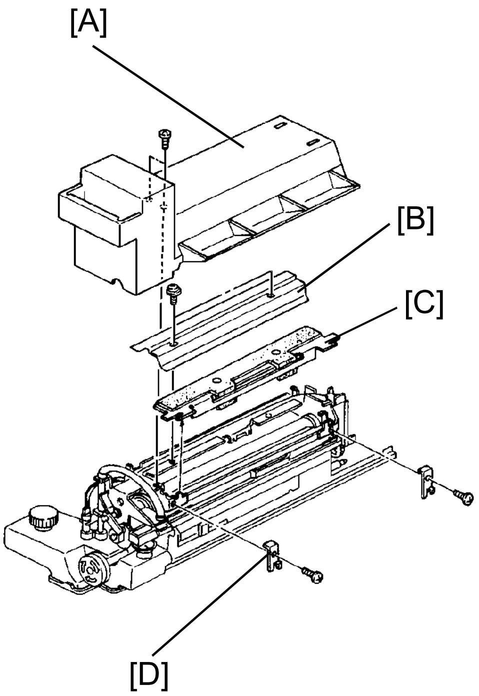
CAUTION: Allow time for unit to cool before performing the following procedures.

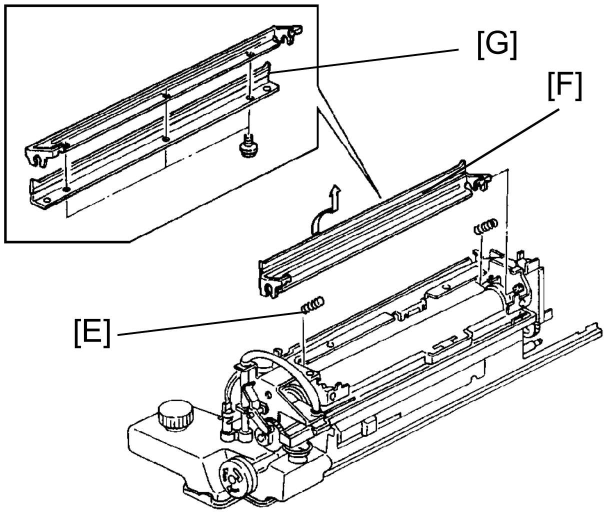


1. Open the front doors.
2. Push the fusing unit release lever [A] to the right.
3. Pull out the fusing unit [B] until it is fully extended.
4. Push the fusing unit release lever to the right, move the fusing unit to the left to disengage the stopper pin [C], and remove the unit.

   NOTE: Keep the fusing unit in an upright position so that silicone oil does not spill.

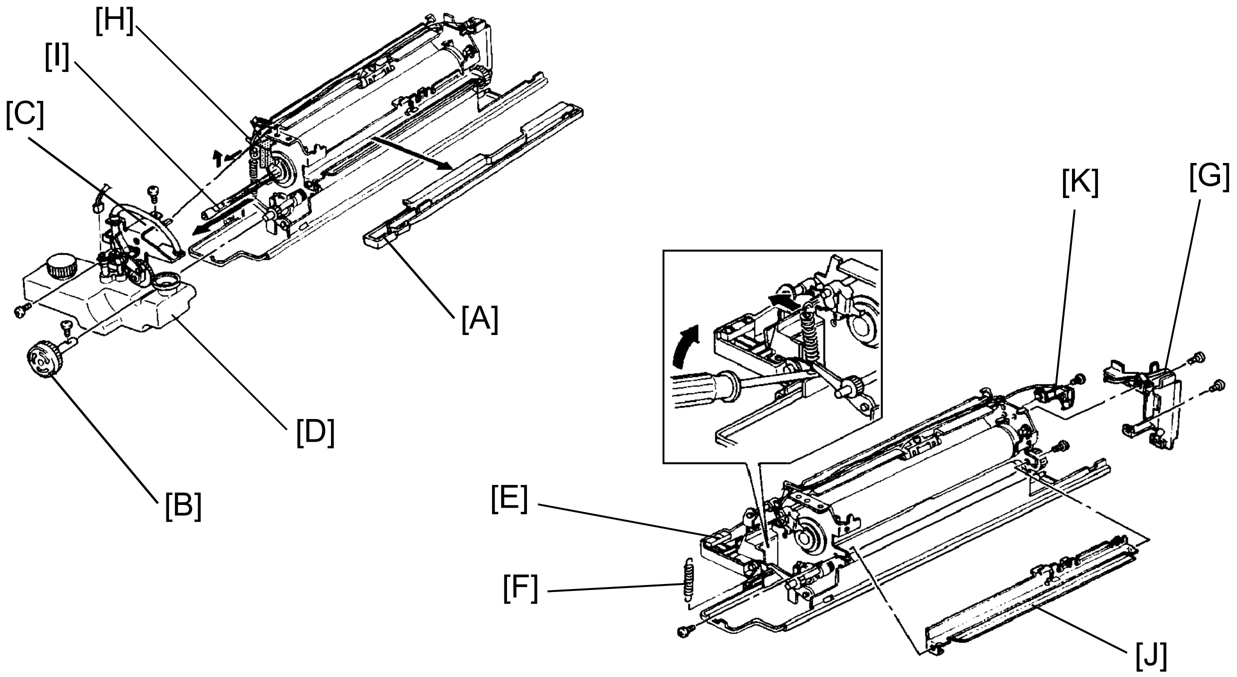
6.2 OIL SUPPLY PAD AND OIL BLADE REPLACEMENT





1. Remove the fusing unit. (See Fusing Unit Removal section.)
2. Remove the fusing unit cover [A] (2 screws).
3. Remove the pressure plate [B] (2 screws).
4. Remove the oil supply pad [C] (2 screws and 2 clamp plates [D]).
5. Unhook the two tension springs [E].
6. Turn and remove the oil blade assembly [F].
7. Remove all screws (3) from the oil blade assembly and remove the blade [G].

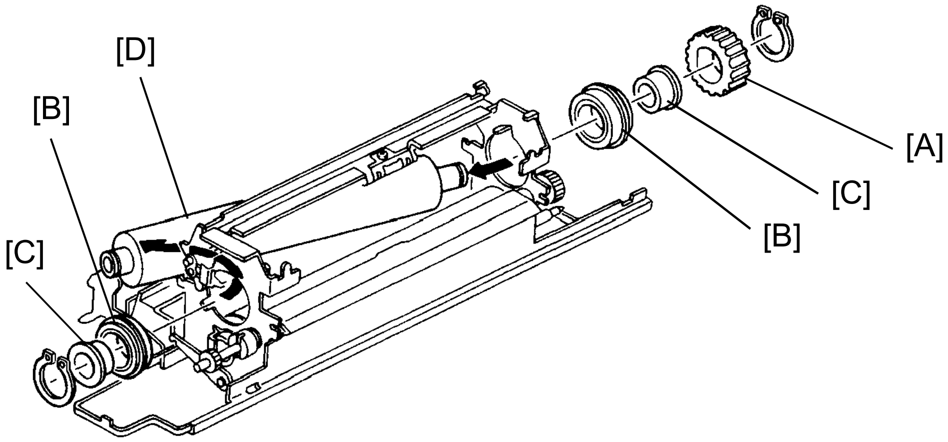
6.3 HOT ROLLER REPLACEMENT

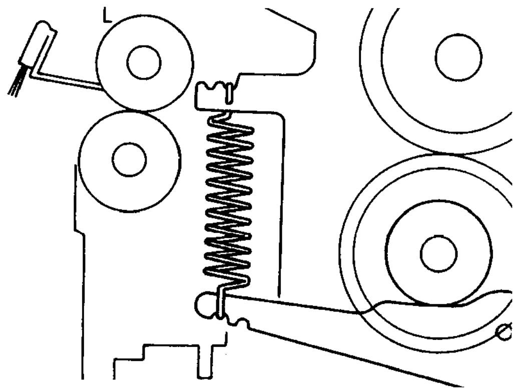


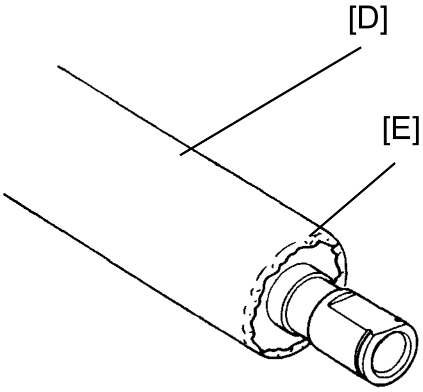
1. Remove the oil blade. (See Oil Blade Replacement section.)
2. Remove any excess oil from the area surrounding the oil sump [A], and remove the oil sump.
3. Remove the fusing unit knob [B] (1 screw).
4. Remove the oil pump mechanism [C] with the oil tank [D] (2 screws and 1 connector).
5. Swing down the fusing exit assembly [E] and unhook the pressure springs [F].
6. Move the harness support bracket [G] out of the way (2 screws).
7. Remove the front lamp terminal [H] (1 screw) and remove the fusing lamp [I] (2 connectors).

CAUTION: Do not touch the fusing lamp with oily fingers because oil marks may damage the lamp.

8. Remove the thermistor bracket [J] (2 screws).
9. Remove the rear lamp terminal [K] (1 screw and 1 hook).



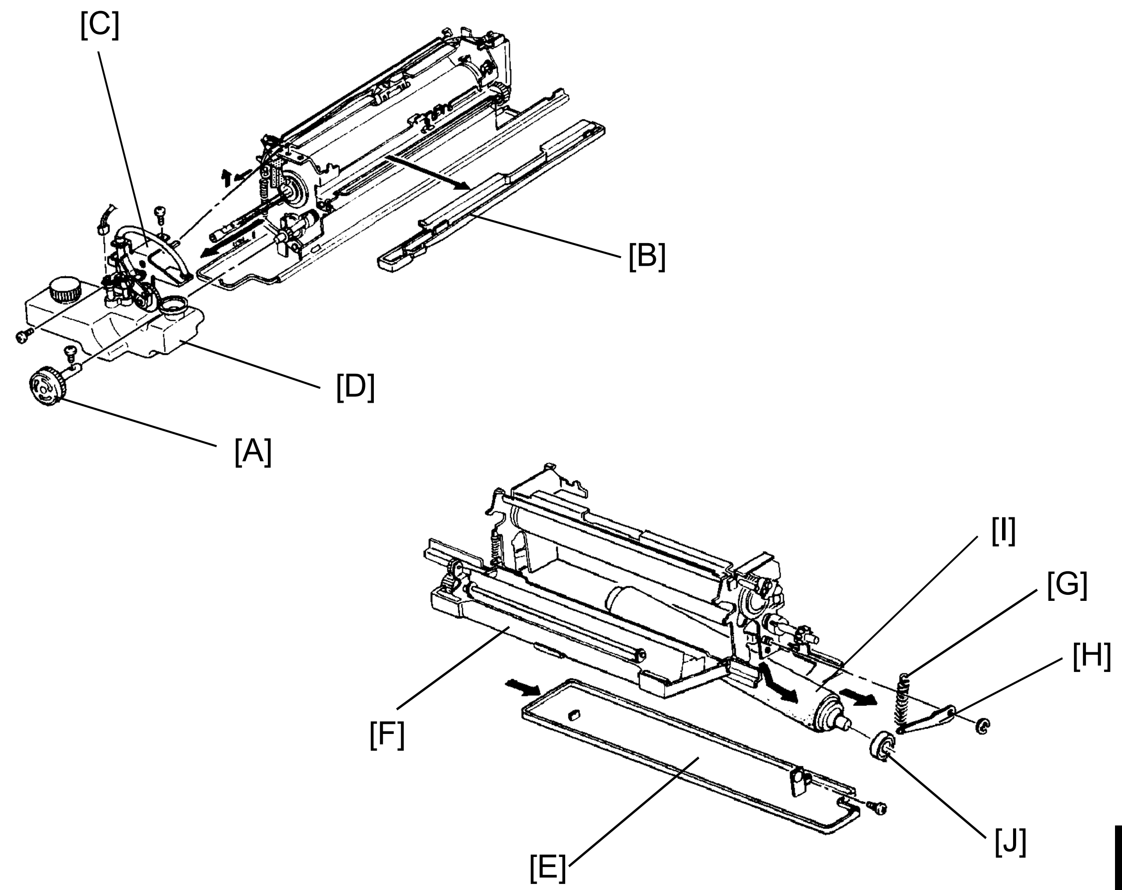




10. Remove the hot roller gear [A], bearings [B], and the collars [C] from both ends of the hot roller [D] (1 C-ring each).
11. Slide the hot roller slightly to the rear and remove the hot roller as shown.
12. Tear the protective paper [E] from the ends of a new hot roller and install it.
13. After the new hot roller is installed, remove the protective paper.

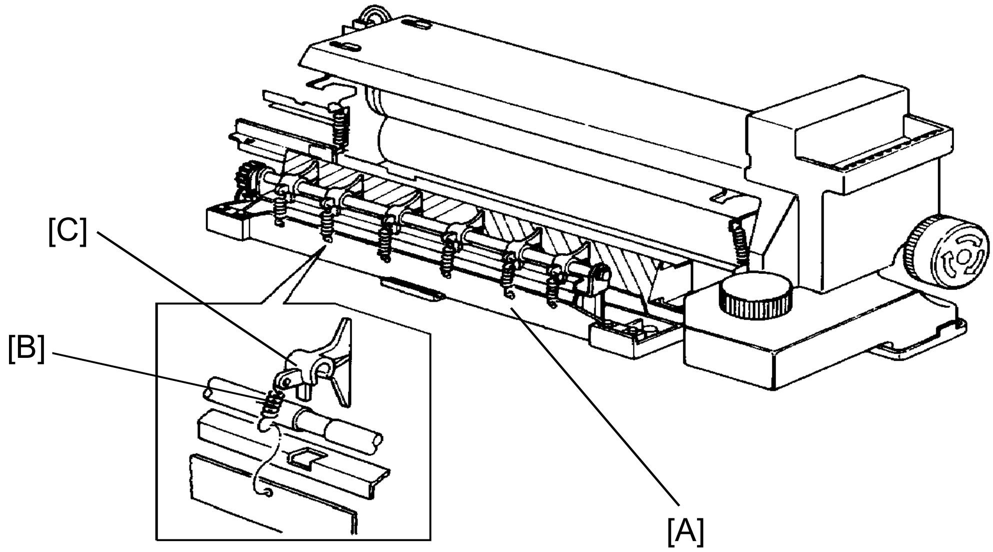
NOTE: a) When reinstalling the fusing lamp, make sure it does not touch the inside of the hot roller.
b) Make sure that both lamp terminals are firmly pressed by the terminal plate, and the screw for the lamp harness is tight.
c) To apply standard fusing pressure, hook the spring as shown.

6.4 PRESSURE ROLLER REPLACEMENT



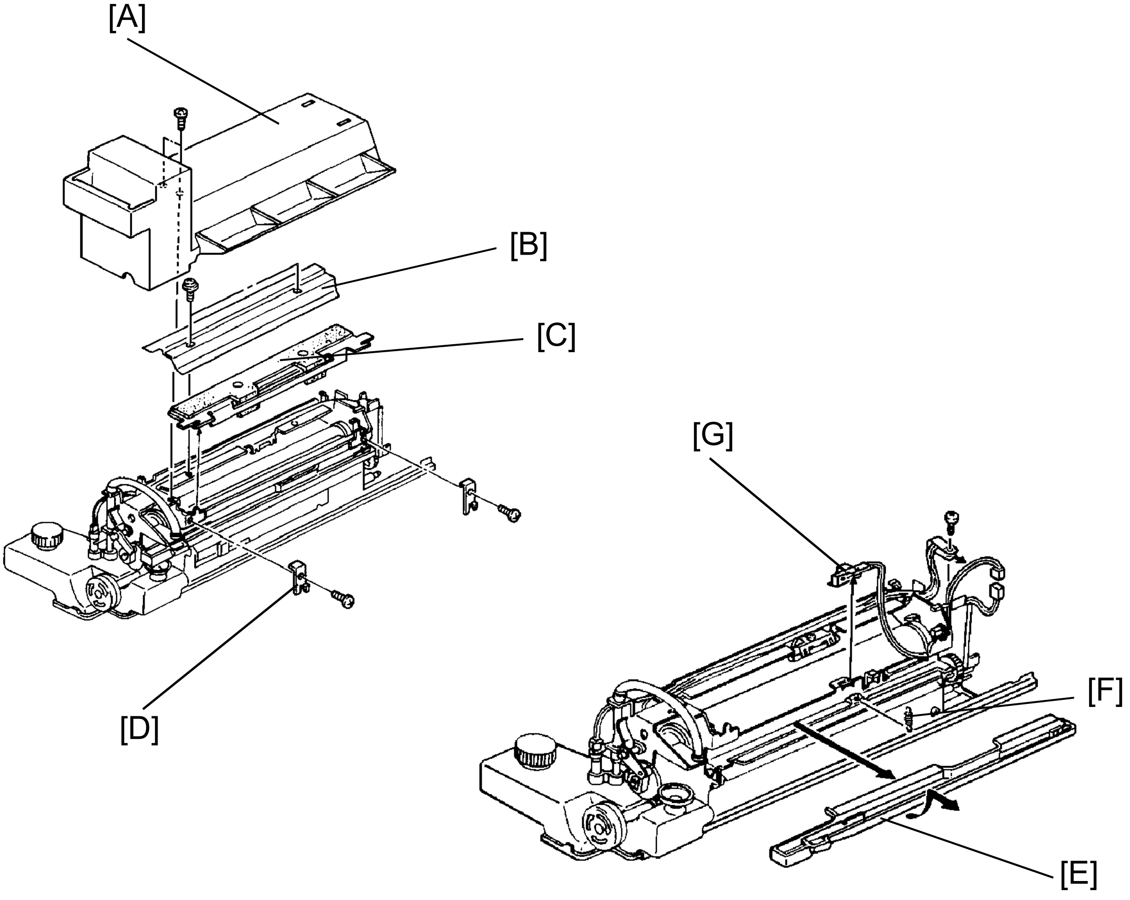
1. Remove the oil blade. (See Oil Blade Replacement section.)
2. Remove the fusing unit knob [A] (1 screw).
3. Remove any excess oil from the oil sump and remove the oil sump [B].
4. Remove the oil pump mechanism [C] with the oil tank [D] (2 screws and 1 connector).
5. Remove the oil pan [E] (1 screw).
6. Open the fusing exit assembly [F].
7. Remove the front pressure spring [G].
8. Remove the front pressure lever [H] (1 E-ring).
9. Lift the upper part of the fusing unit and remove the pressure roller [I].
10. Install the bearings [J] on the new pressure roller.

6.5 HOT ROLLER STRIPPER REPLACEMENT



1. Pull out the fusing unit and open the fusing exit assembly [A].
2. Unhook the springs [B] and remove the hot roller strippers [C].
3. Install new strippers and connect the springs.
   NOTE: It is best to replace strippers and springs as a set.

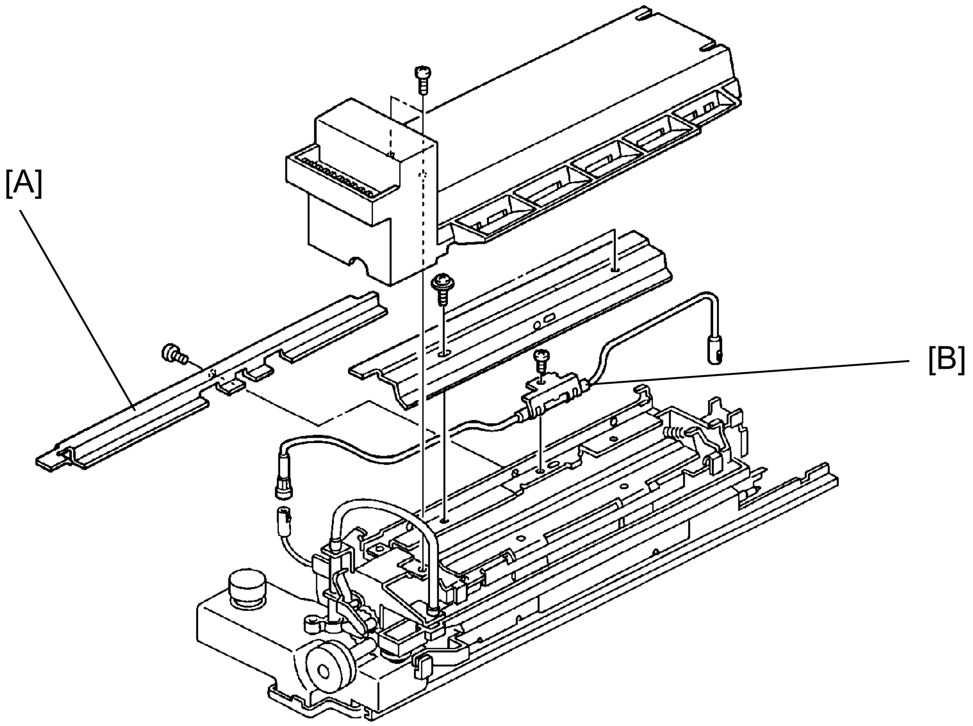
6.6 THERMISTOR REPLACEMENT



1. Remove the fusing unit.
2. Remove the fusing unit cover [A] (2 screws).
3. Remove the pressure plate [B] (2 screws).
4. Remove the oil supply pad [C] (2 screws and 2 clamp plates [D]).
5. Remove any excess oil from the oil sump and remove the oil sump [E].
6. Unhook the thermistor spring [F].
7. Remove the thermistor wire from the metal wire clamp and remove the thermistor [G] (1 connector).
8. Replace the thermistor and reassemble.

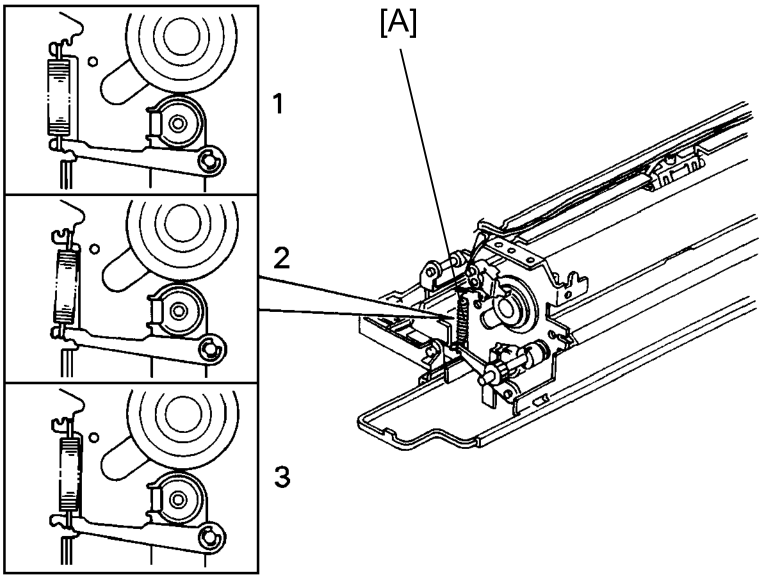
   NOTE: Make sure that the thermistor is properly in contact with the hot roller.

6.7 THERMOFUSE REPLACEMENT



1. Perform steps 1 to 3 of the "Thermistor Replacement" procedure.
2. Remove the thermofuse bracket [A] (1 screw).
3. Disconnect the old thermofuse [B] (2 connector) and install a new one.

6.8 FUSING PRESSURE ADJUSTMENT

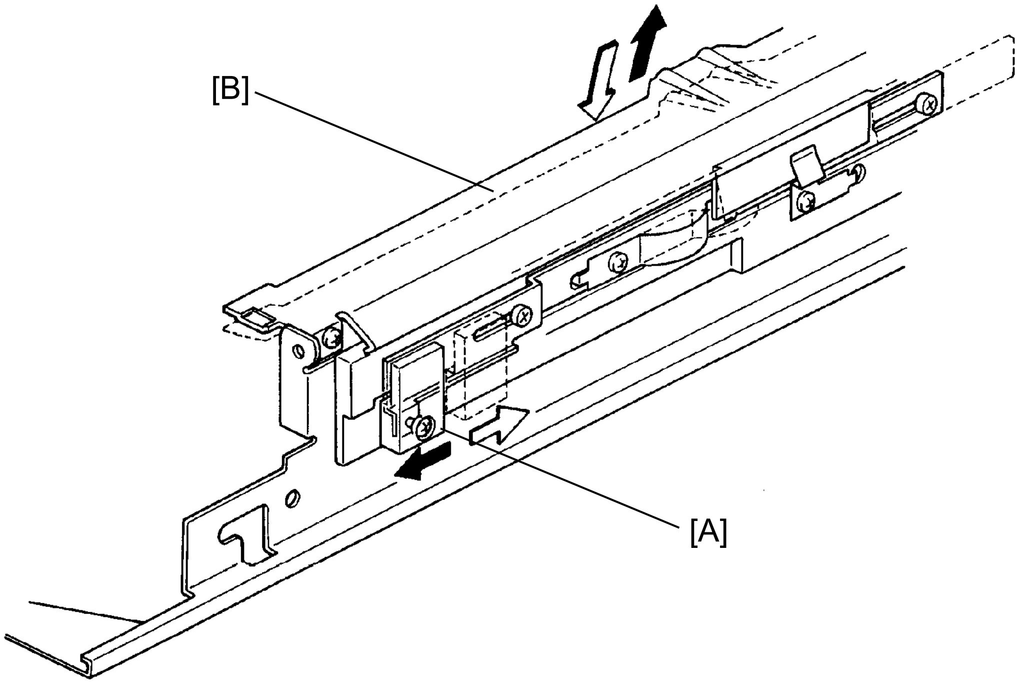


1. Remove the fusing unit.
2. Remove the fusing unit cover (2 screws).
3. Remove the fusing unit knob (1 screw).
4. Remove the oil pump mechanism along with the oil tank (2 screws, 1 connector).
5. Move the pressure springs [A] to the desired position. See the following table:

Setting	Fusing Pressure	
1	Weak	
2	Normal	*Factory Setting
3	Strong	

NOTE: Position the front and rear springs in the same way.

6.9 ENTRANCE GUIDE HEIGHT ADJUSTMENT



1. Pull out the fusing unit.
2. Move the knob [A] to the front to raise the fusing guide plate [B].
3. Move the knob to the rear to lower the fusing guide plate.
   (The movement range is 1 mm.)

   NOTE: Normally the entrance guide is set in the lower position (factory setting). Set it in the upper position if paper creasing occurs.

6.9.1 SP Modes

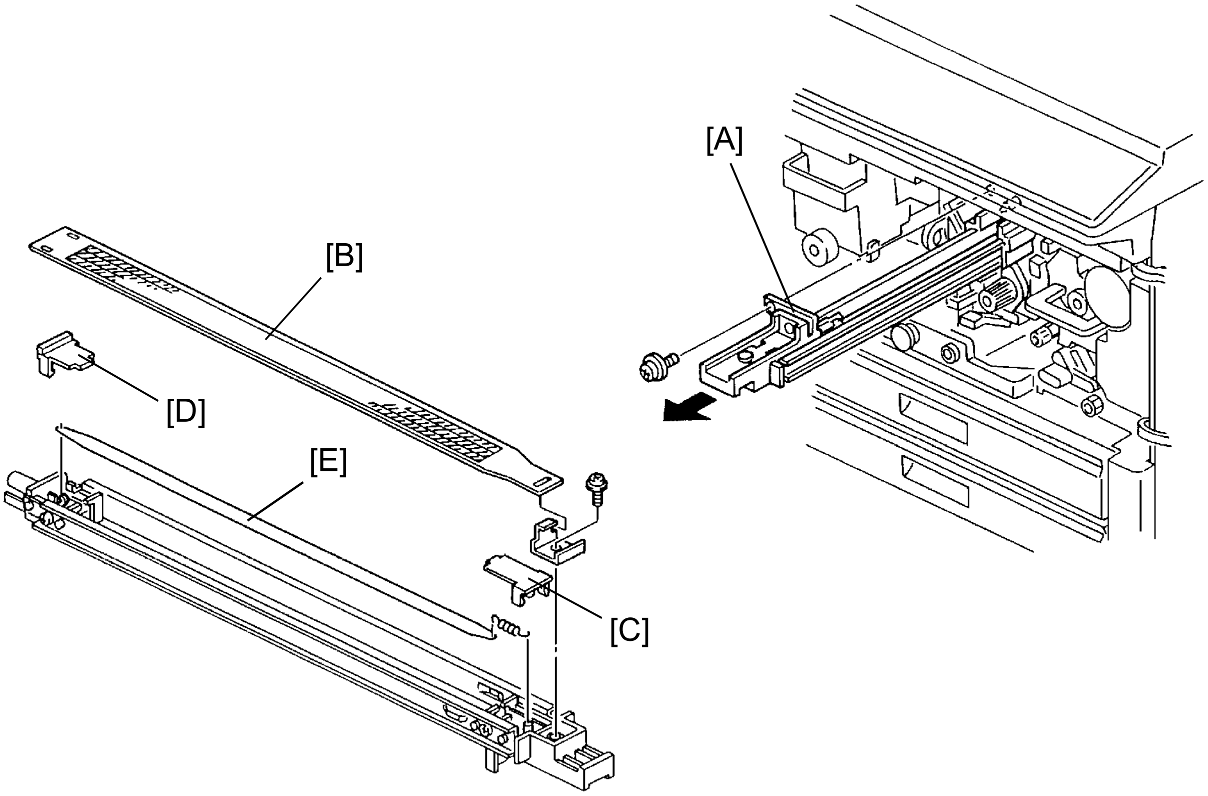
The following modes on the fusing unit are adjustable.

SP1-103	Heats up the fusing unit after warm-up.
SP1-104	Selects the fusing temperature control method.
SP1-105	Adjusts the fusing temperature.
SP1-106	Displays the fusing temperature.

NOTE: Refer to section 4 (Service Tables) for additional information on the above mentioned SP modes.

7. CORONA UNIT AND DRUM UNIT

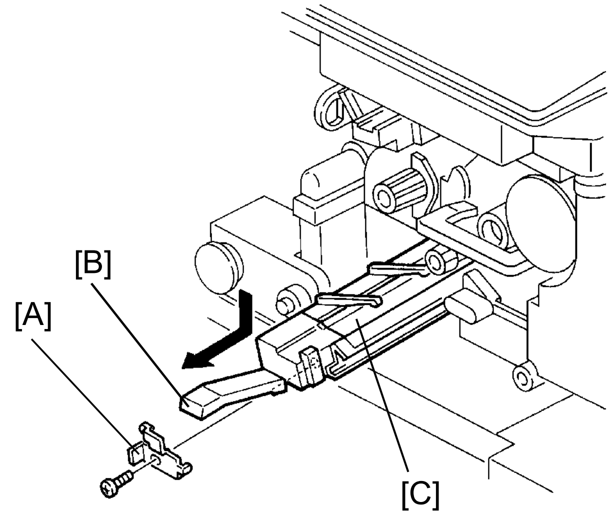
7.1 CHARGE CORONA WIRE AND GRID REPLACEMENT

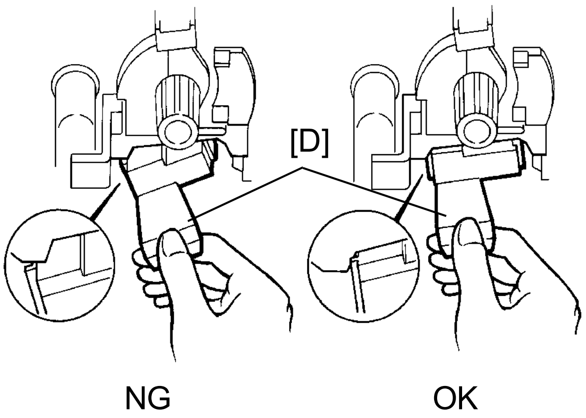


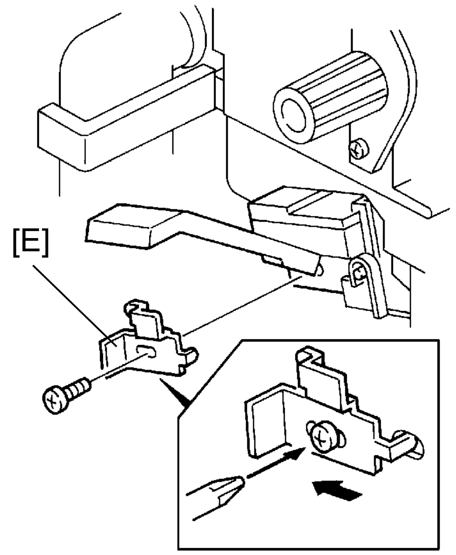
1. Open the front doors.
2. Remove the charge corona unit [A] (1 screw).
3. Lift out the cleaner and remove the grid [B] (1 screw).
4. Remove the front end block cover [C] and the rear end block cover [D] from under the unit.
   (Insert screw driver from the top of the unit.)
5. Remove the corona wire [E].

NOTE:
- a) Make sure the corona wire is positioned in between the cleaner pads.
- b) Do not handle the new corona wires with bare hands.
  Oil from your hands going on the wire may cause uneven charge on the drum.
- c) Do not rub the corona wires with rough material (sandpaper etc.) as this will damage the wires.
- d) When removing or installing the end block covers, be careful not to break off the side hooks.

7.2 TRANSFER AND SEPARATION UNIT REMOVAL







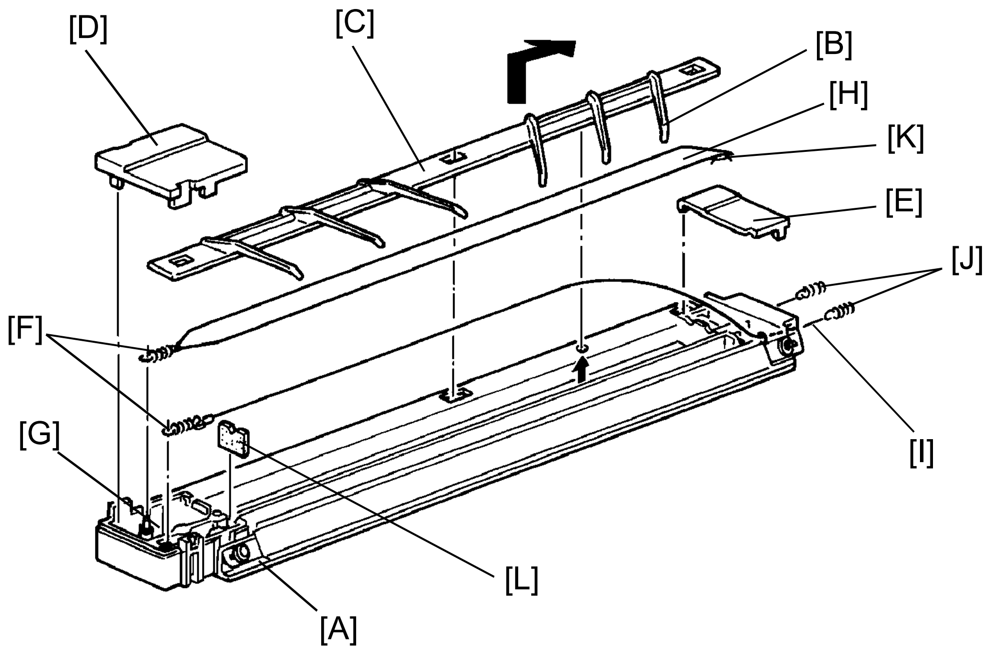
Replacement
Adjustment

1. Open the front doors.
2. Remove the T/S unit securing bracket [A] (1 screw).
3. Push lever B1 [B] down and pull out the unit [C]

– to install –

1. Slide the unit in its tracks all the way in.
2. Lift lever B1 [D] and confirm that the end block is properly engaged (see illustration).
3. Reinstall the bracket [E] with the hook in the hole, and slide it left as much as possible (1 screw).

7.3 T/S CORONA WIRE REPLACEMENT



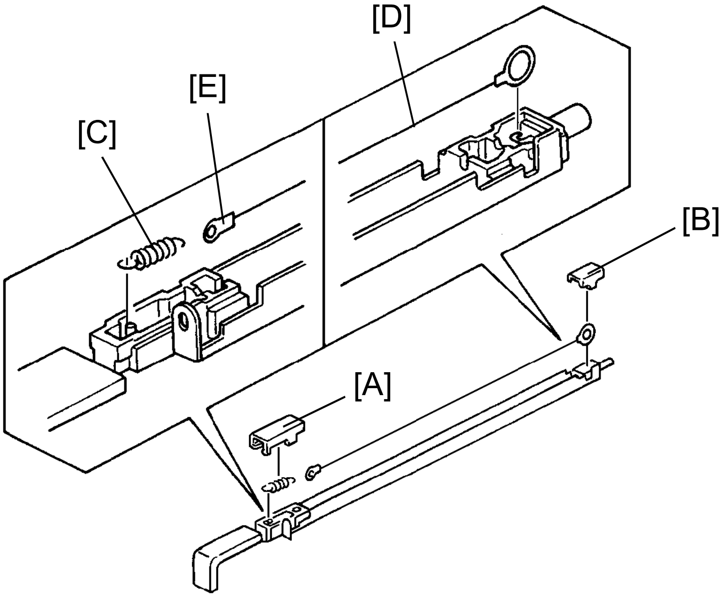
1. Pull out the transport and separation unit [A]. (See Transfer and Separation Unit Removal section.)
2. Pull up the second arm [B] (from the rear side) of the paper guide [C], and slide it to the rear side. Then, remove the guide from the corona unit.
3. Remove the front [D] and rear [E] endblock covers.
4. Unhook the tension springs [F] from the front anchor posts [G] and remove the old corona wires [H].
5. Clean the corona paper guide, the endblock and covers, and the corona unit casing with a blower brush and dry cloth.
6. Install new wires.

NOTE: Thread the small eyelet [I] of the new transfer corona wire through the hole in the rear endblock and hook it onto the terminal spring [J]. The separation corona wire joint [K] should be positioned inside the rear endblock.
The rubber pad [L] is positioned inside the front endblock.

CAUTION: Make sure that the pin and three stoppers on the paper guide are properly positioned. If not, the drum will be damaged.

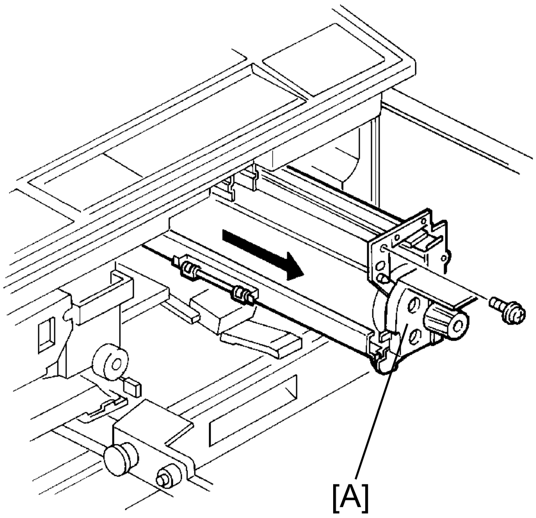
7. Install the endblock covers and the paper guide.

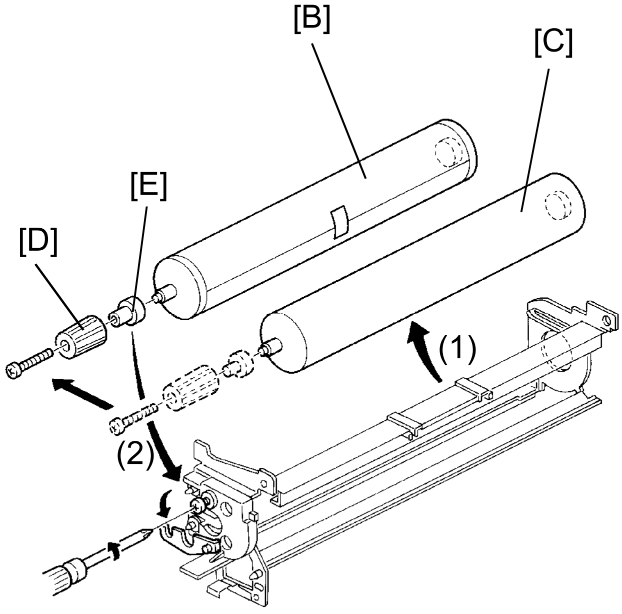
7.4 PCC CORONA WIRE REPLACEMENT



1. Remove the PCC unit (1 screw).
2. Remove the front [A] and rear [B] endblock covers.
3. Unhook the tension spring [C].
4. Install a new wire [D].
   NOTE: The small eyelet [E] of the wire is for the tension spring.

7.5 DRUM REPLACEMENT

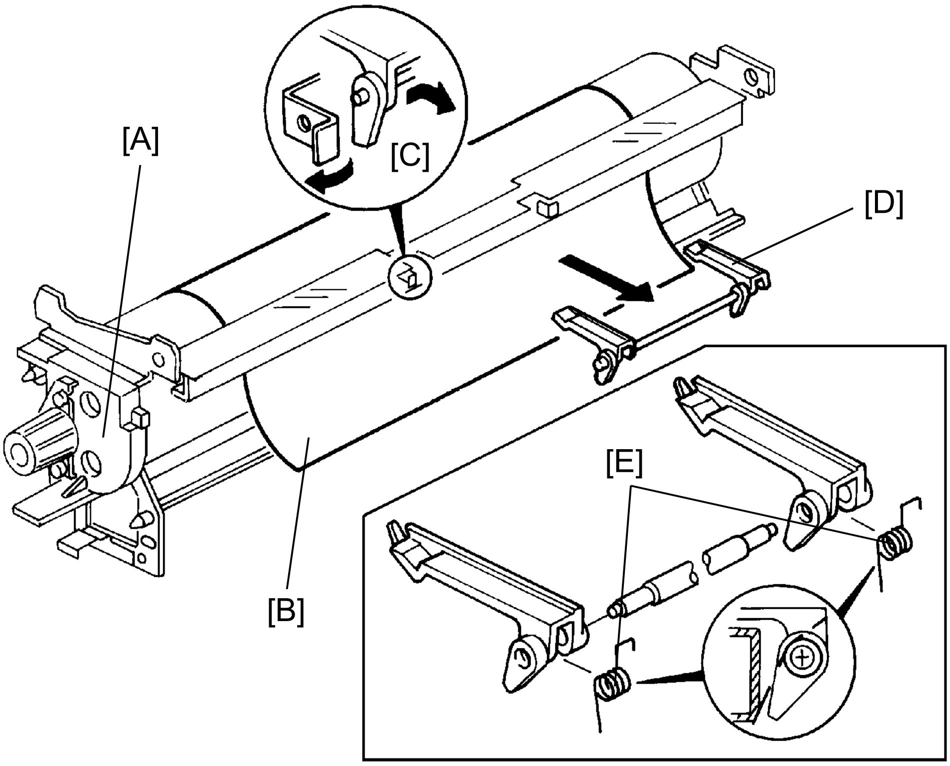




1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Open the front doors, and lower the T/S corona unit.
3. Remove the following parts:
   - Development unit (1 screw)
   - Charge corona unit (1 screw)
   - Toner collection bottle (1 screw, and 1 connector)
   - PCC unit (1 screw)
   - Cleaning unit (1 screw)
4. Remove the drum unit [A] (1 screw).
5. Loosen the hook [B] (1 screw).
6. Remove the drum [C].
7. Remove the knob [D] and the knob collar [E] (1 screw) and install them to the new drum [F].
8. Install a new drum with the protective paper left on it.

   NOTE: The protective paper should be pealed off after the drum is installed.
9. Turn on the switches and perform SP3-1-2 (Vsg setting).

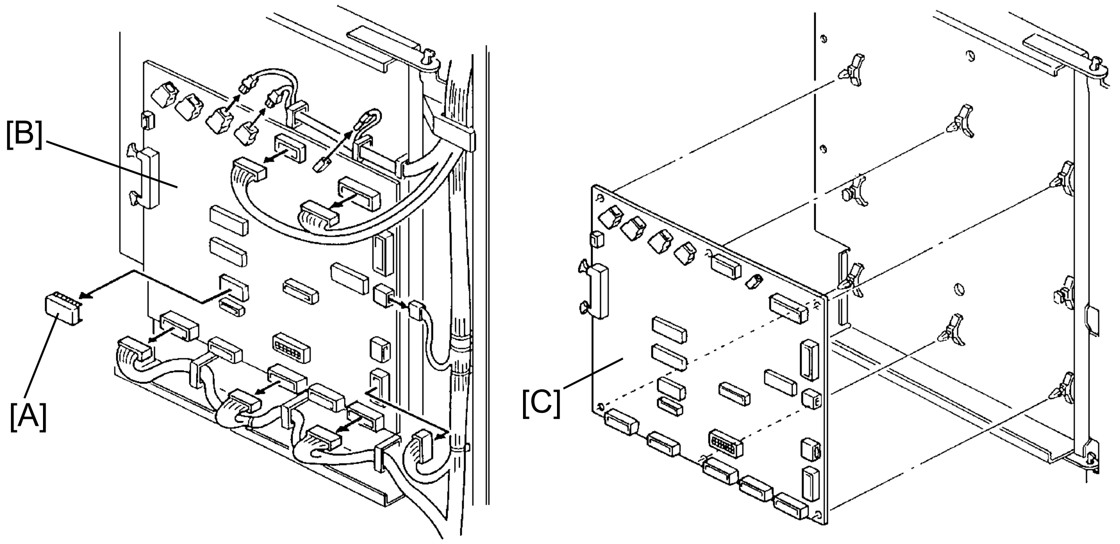
7.6 PICK-OFF PAWL REPLACEMENT



1. Remove the drum unit [A]. (See Drum Replacement section.)
2. Place a sheet of paper [B] on the drum.
3. Slightly bending the plate spring [C], remove the pawls [D] with the shaft.
4. Install new pawls.
5. Be sure that the pressure spring [E] is positioned as shown, and that the pawls are in contact with the drum when installed.

8. ELECTRICAL COMPONENT UNIT

8.1 MAIN CONTROL BOARD REPLACEMENT

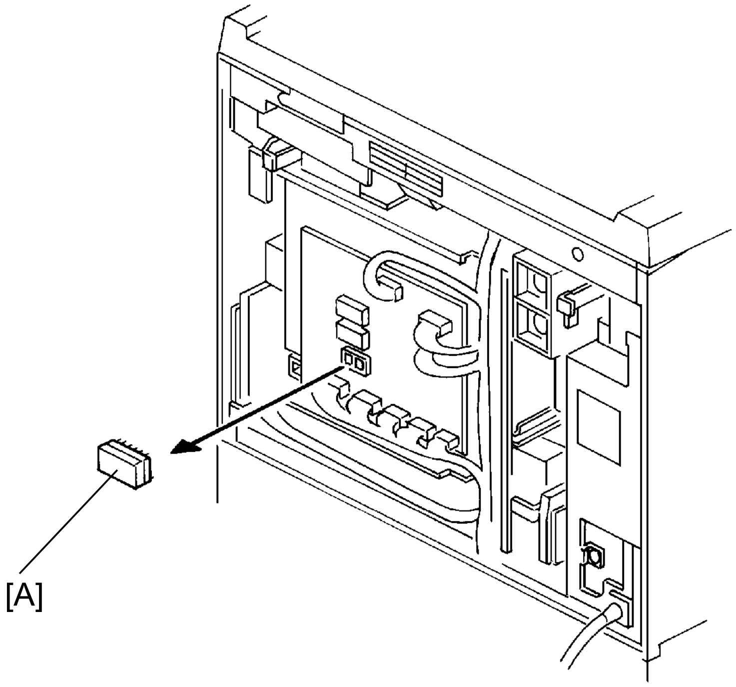


CAUTION: The RAM pack on the main control board has a lithium battery which can explode if replaced incorrectly. Replace the battery only with an identical one. The manufacturer recommends replacing the entire RAM board. Do not recharge or burn this battery. Used batteries must be handled in accordance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

1. Perform the APC adjustment steps 1 and 3. (See Laser Unit APC Adjustment section.)
2. Turn off the main switch and the anti-condensation switch, then unplug the machine.
3. Remove the RAM pack (IC119) [A].
4. Disconnect all the connectors from the main control board [B].
5. Replace the main control board [C] (6 locking supports).
6. Install the RAM pack [A] on the new main control board.
7. Turn on the main switch and perform the APC adjustment. Adjust the voltage to the value measured before the replacement.
8. Reinstall the unit and check copy quality.

NOTE: When connecting the fiber optics cables, make sure the color of the cable matches the color of the socket.

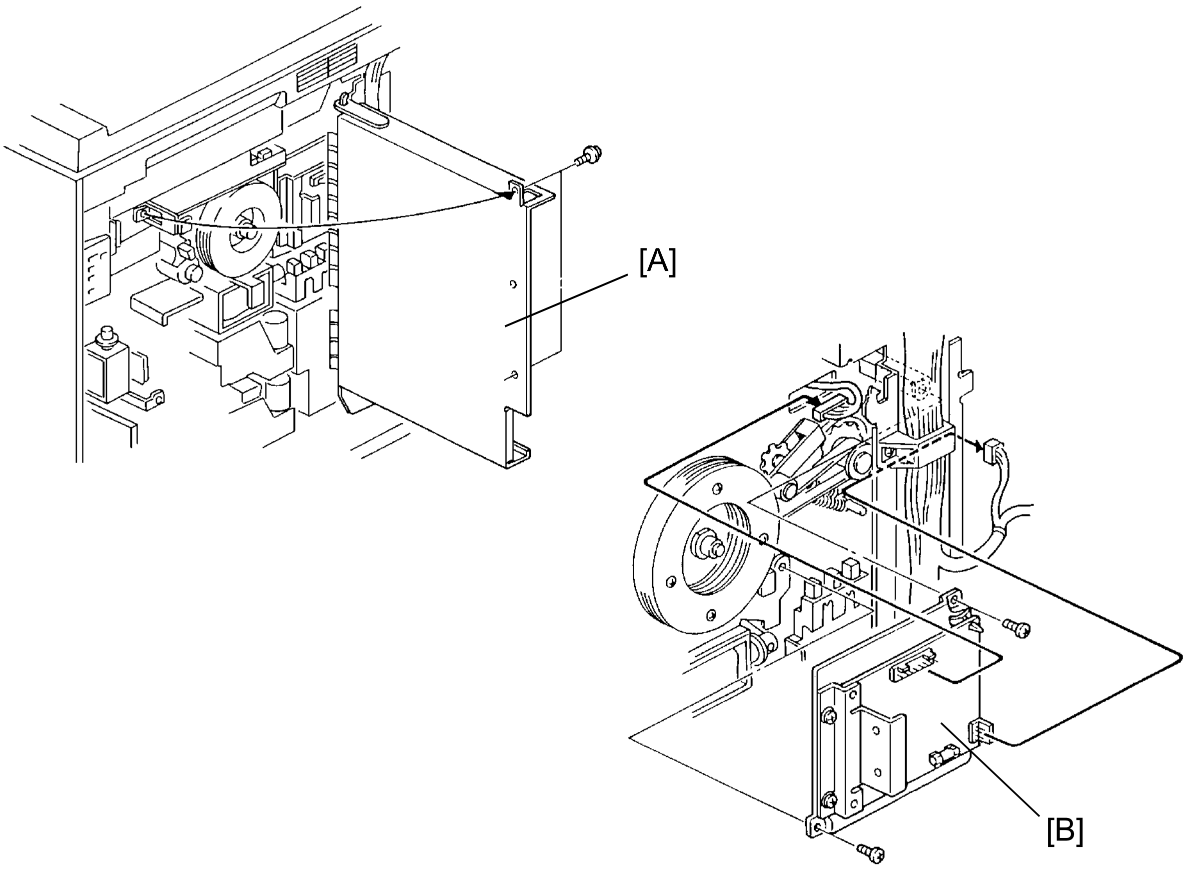
8.2 RAM PACK REPLACEMENT



CAUTION: The RAM pack on the main 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.

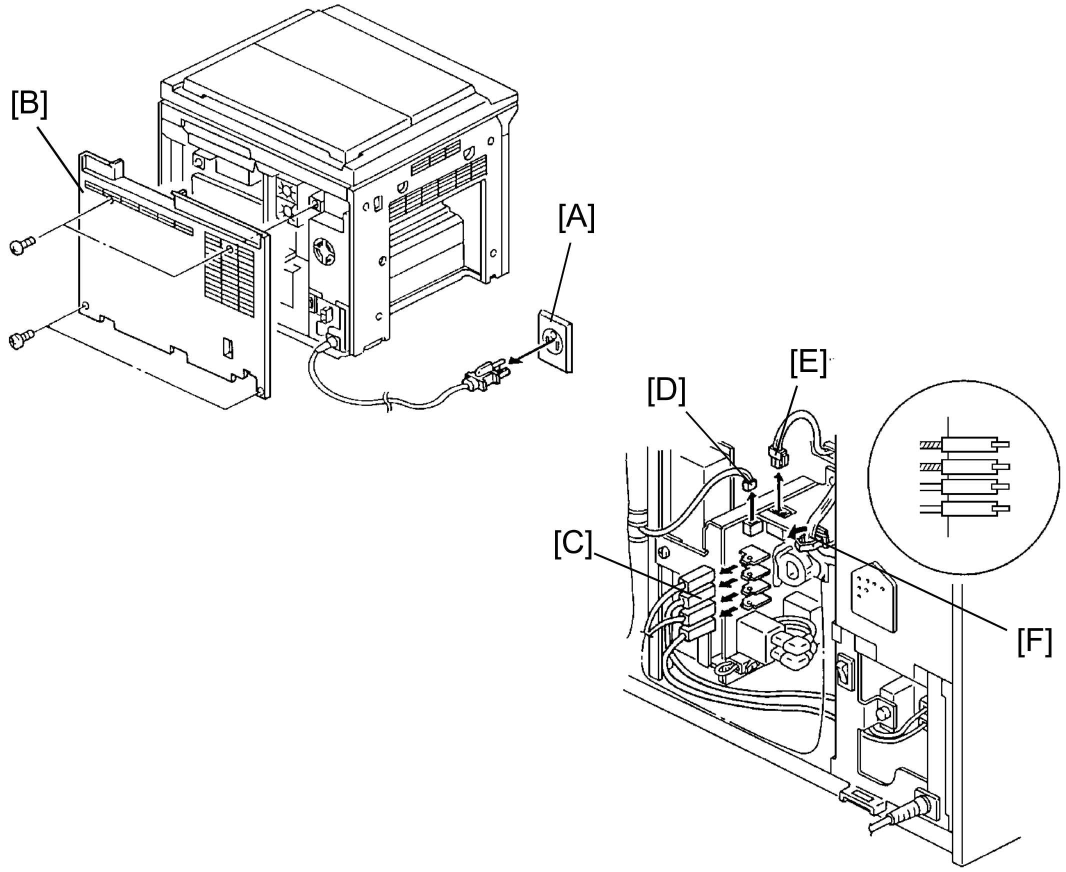
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover (4 screws).
3. Replace the RAM pack (IC119) [A].
4. Reassemble the copier and plug it in.
5. Perform the memory all clear (SP5-801) and follow the necessary procedure. (See Memory All Clear Procedure in Service Program Mode, Service Table section.)

8.3 MAIN MOTOR DRIVE BOARD REPLACEMENT

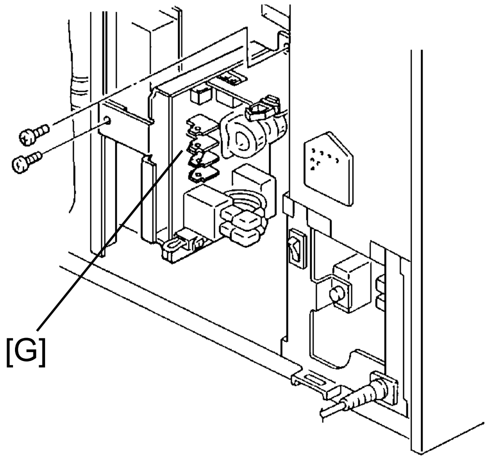


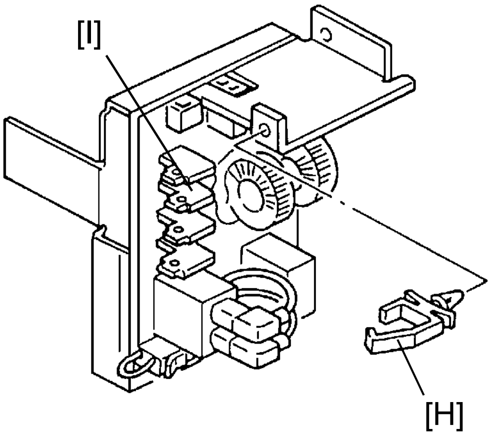
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the rear lower cover.
3. Swing open the main PCB unit [A] (2 screws).
4. Replace the main motor drive board [B] (2 screws, 2 connectors).

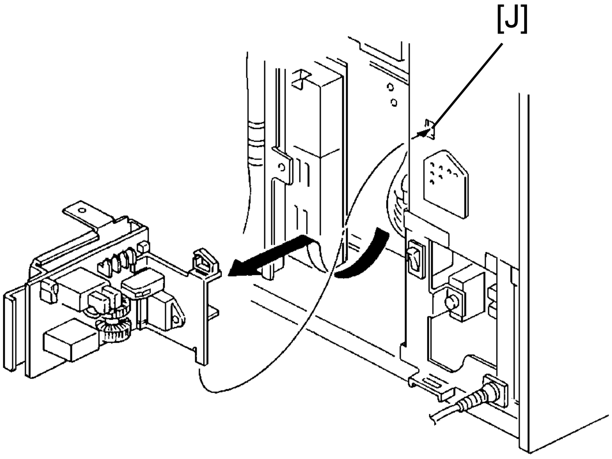
8.4 AC DRIVE BOARD REPLACEMENT



1. Turn off the main switch and unplug the machine [A].
2. Remove the rear lower cover [B] (4 screws).
3. Disconnect the following connectors:
   - 4 1P connectors [C]
   - 1 2P connector [D]
   - 1 3P connector [E]
4. Free the harnesses from the clamp [F].



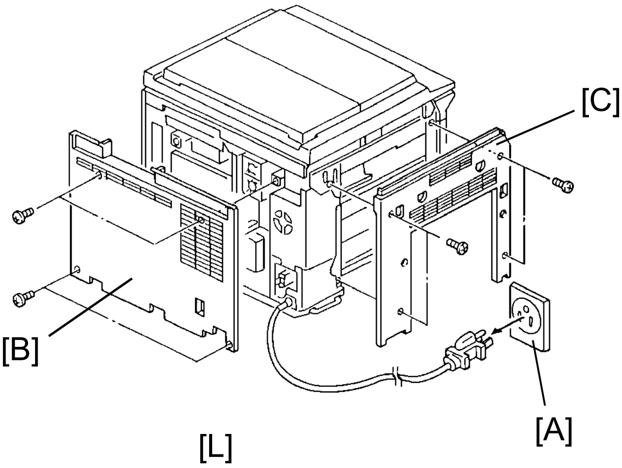


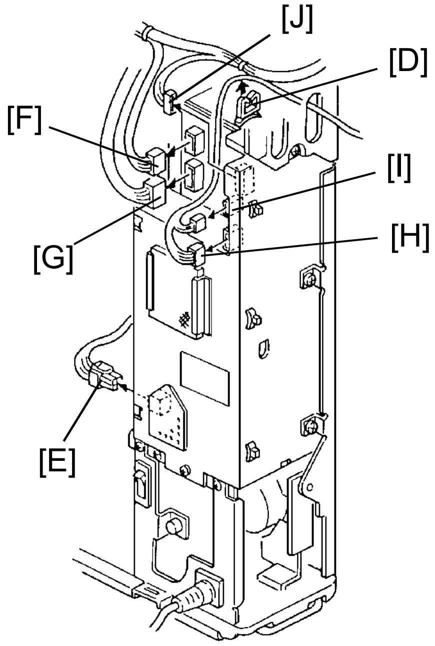


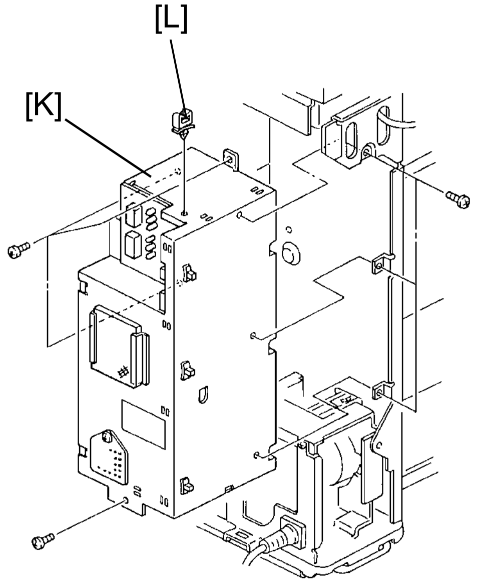
5. Remove the ac drive board unit [G] (2 screws).
6. Remove the clamp [H] from the unit and replace the ac power supply board [I].

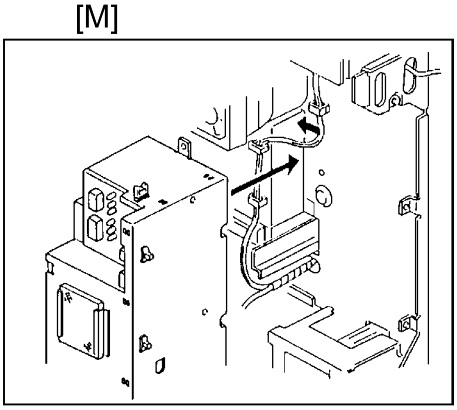
NOTE: When reinstalling, make sure that the peg enters the slot [J] as shown in the figure.

8.5 DC POWER SUPPLY UNIT REPLACEMENT





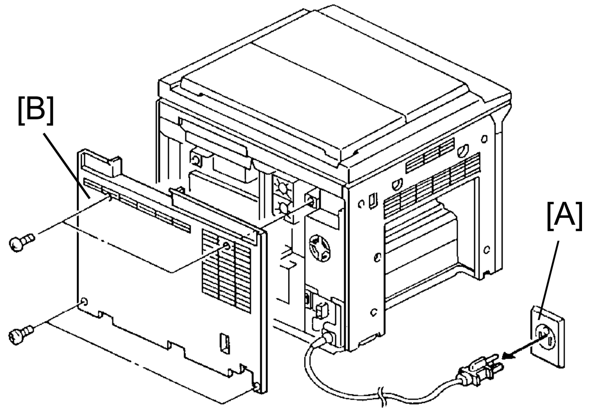


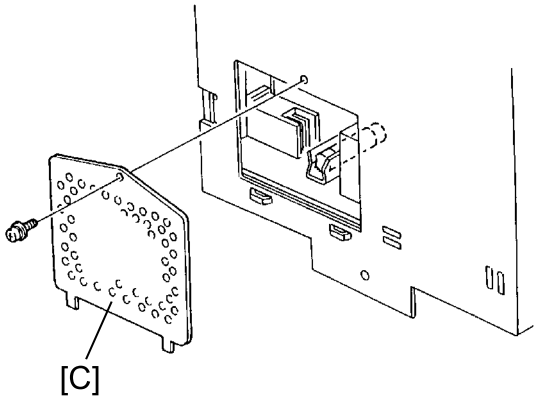


1. Turn off the main switch and the anti-condensation switch, then unplug the machine [A].
2. Remove the rear lower cover [B] and the left cover [C] (4 screws).
3. Free the harnesses from the clamp [D].
4. Disconnect the following connectors:
   CN1 [E], CN2 [F], CN4 [G], CN59 [H], CN551 [I], CN590 [J]
5. Remove the dc power supply unit [K] (7 screws).
6. Remove the clamp [L] from the unit and replace the dc power supply unit.

NOTE: When reinstalling, make sure to clear the surrounding harnesses as in the figure [M].

8.6 FUSE REPLACEMENT



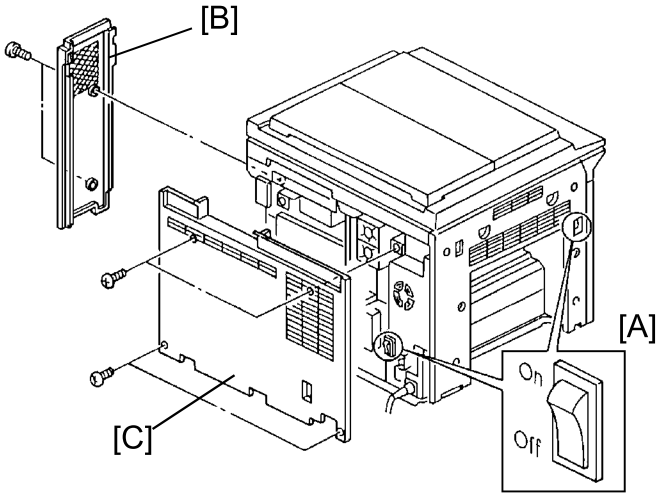


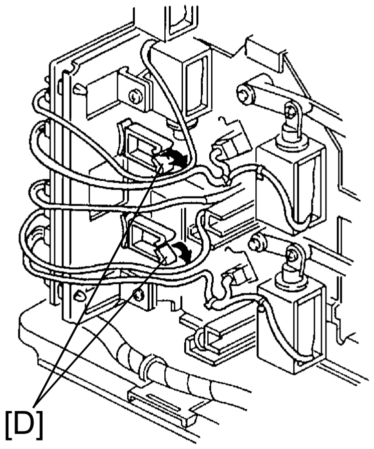
1. Turn off the main switch and the anti-condensation switch, then unplug the machine [A].
2. Remove the rear cover [B].
3. Replace the burned out fuse on the dc power supply unit in the following way:

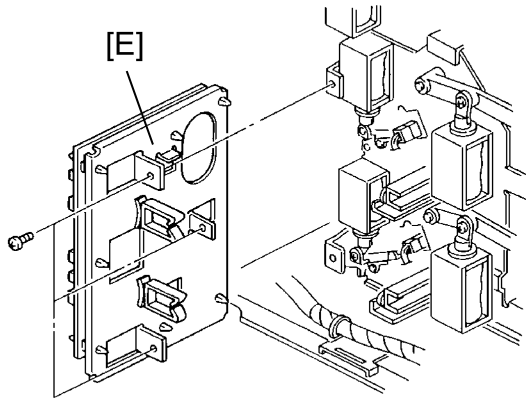
   a. FS0
      1. Remove the cover [C] (1 screw).
      2. Replace the fuse (P/N 11070710).

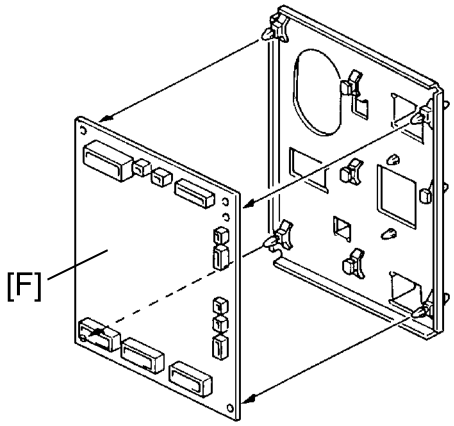
   b. FS1 ~ FS4
      1. Replace the fuse (P/N 11070392).

8.7 DC DRIVE BOARD REPLACEMENT



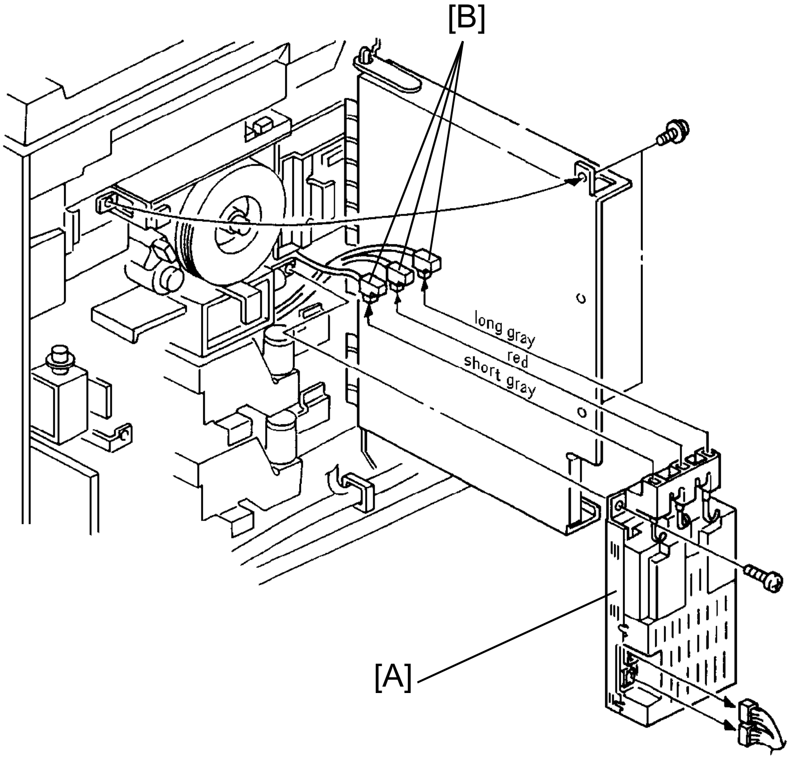






1. Turn off the main switch and the anti-condensation switches [A], then unplug the machine.
2. Remove the right rear cover [B] (2 screws).
3. Remove the rear lower cover [C] (4 screws).
4. Free the harnesses from the clamps [D].
5. Disconnect all the connectors that are visible.
6. Remove the dc drive board unit [E] (3 screws, 3 connectors).
7. Replace the dc drive board [F].

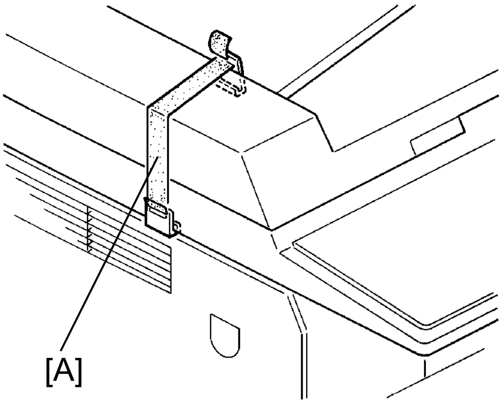
8.8 T/S - PCC POWER PACK

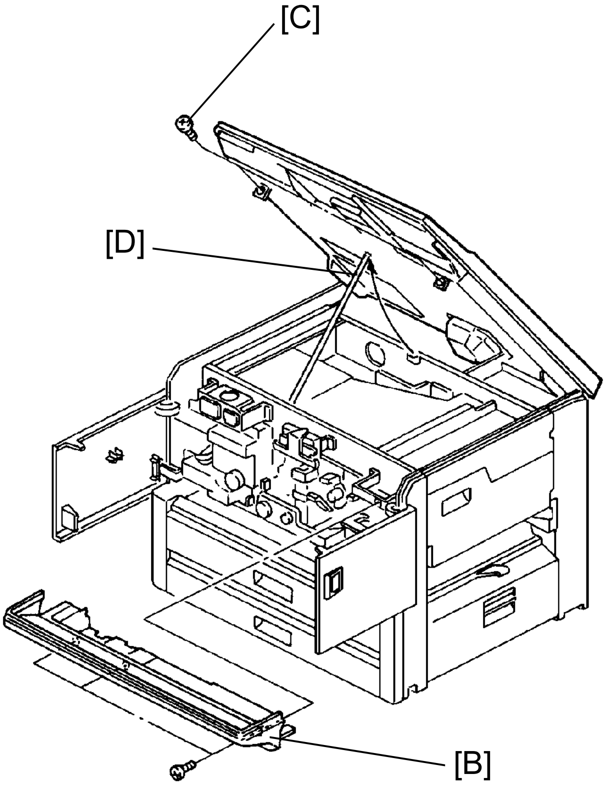


CAUTION: When replacing the T/S - PCC power pack [A], make sure to connect the three connectors [B] back to their original position.

1. Remove the cassette lift up unit. (See Cassette Lift Up Unit Removal section.)
2. Remove the T/S - 1PCC power pack [A] (1 screw, 5 connectors).

8.9 PRINTER CONTROL BOARD REPLACEMENT

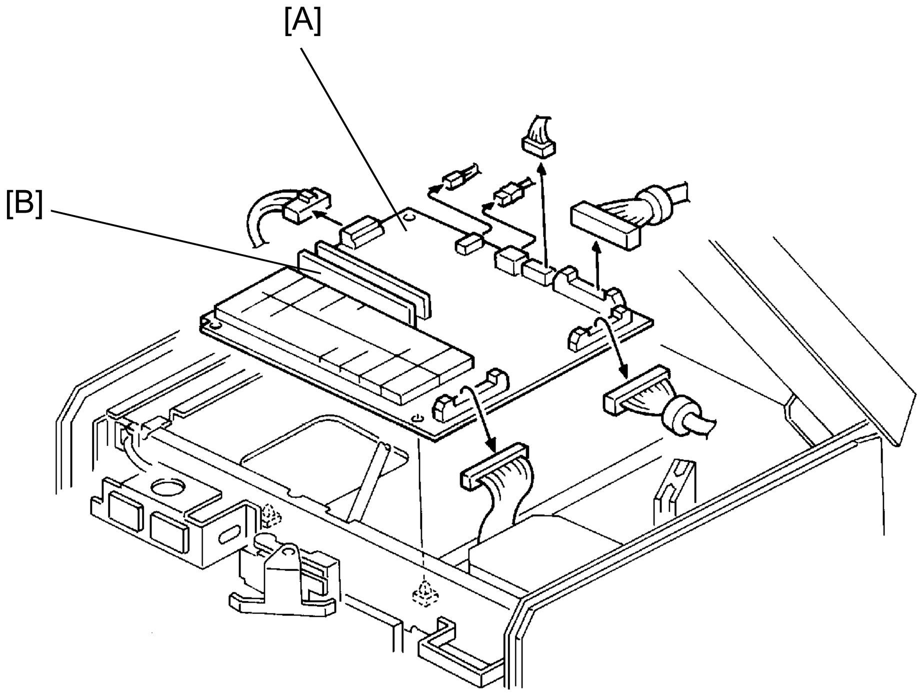




CAUTION: To prevent possible damage to copiers equipped with an optional ARDF, secure the DF with the retainer [A], before lifting the scanner.
The retainer is provided in the DF carton box.

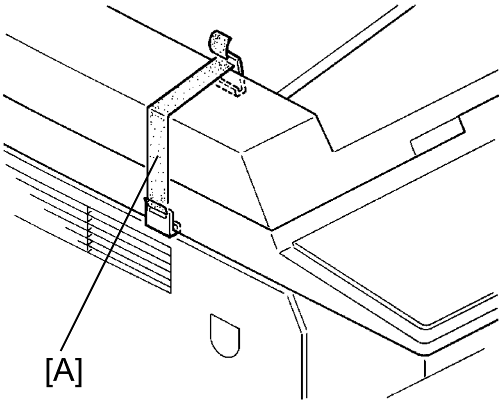
1. Turn off the main switch, and disconnect the power supply cord of the main system.
2. Open the front doors.
3. Remove the operation undercover [B] (3 screws).
4. Remove the 2 screws [C] securing the scanner unit.
5. Lift the scanner unit and place the support rod [D] under it. Insert the rod in the right hole.

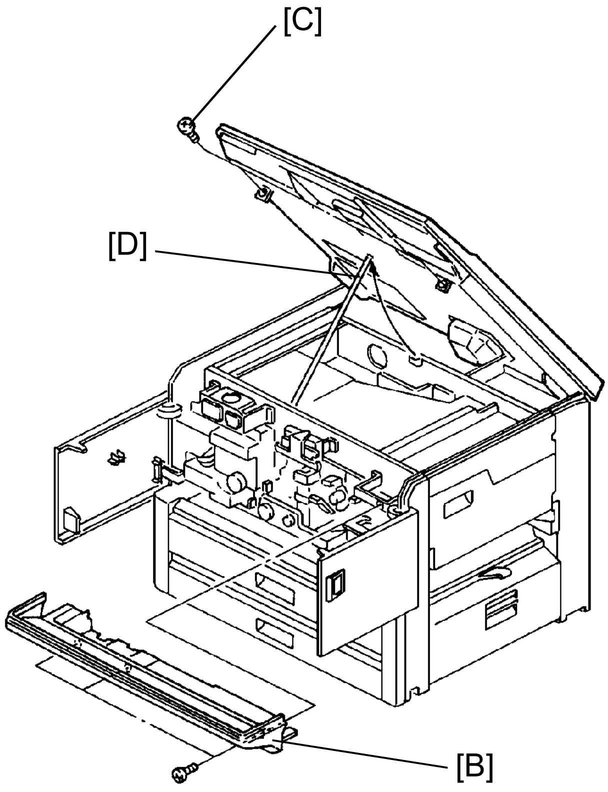
WARNING: Be sure to properly insert the rod to avoid having the unit fall.



6. Disconnect all the connectors from the printer control board.
7. Replace the printer control board [A] (4 locking supports).
8. Remove all memory module units (1 or 2) [B] from the old control board and install them to the new one. (See Memory Module Unit Installation section.)
9. Reassemble the copier and plug it in.
10. Perform NV RAM clear (see NV RAM (Memory) clear procedure in the Service Table Section).

8.10 PRINTER POWER SUPPLY PCB REPLACEMENT

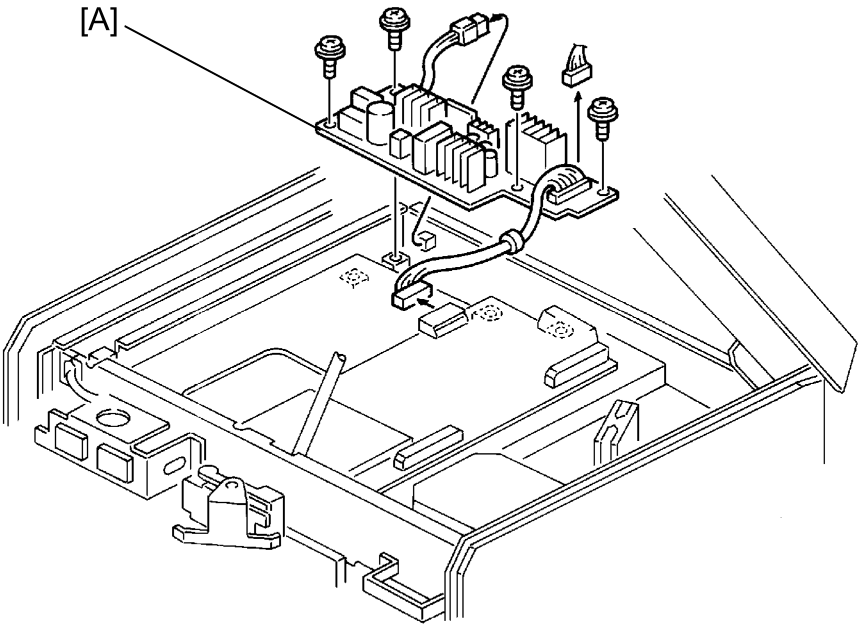




CAUTION: To prevent possible damage to copiers equipped with an optional ARDF, secure the DF with the retainer [A], before lifting the scanner.
The retainer is provided in the DF carton box.

1. Turn off the main switch, and disconnect the power supply cord of the main system.
2. Open the front doors.
3. Remove the operation undercover [B] (3 screws).
4. Remove the 2 screws [C] securing the scanner unit.
5. Lift the scanner unit and place the support rod [D] under it. Insert the rod in the right hole.

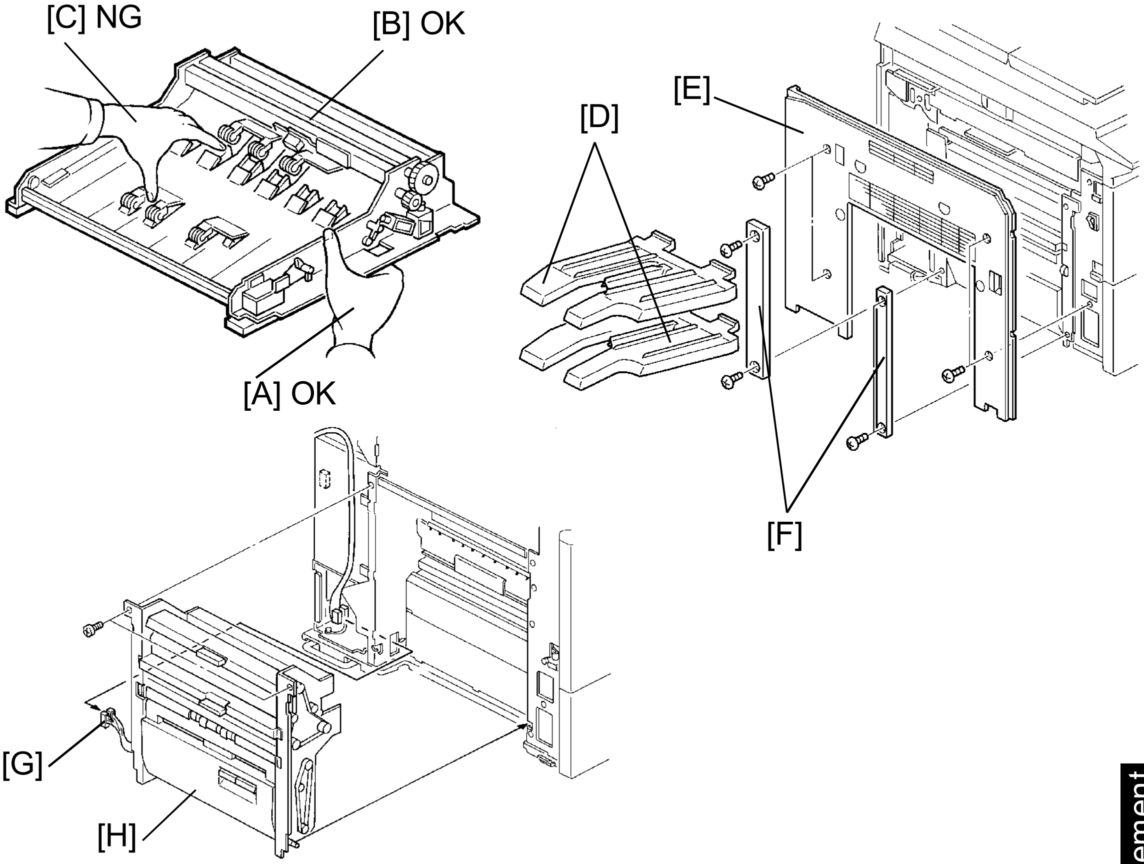
WARNING: Be sure to properly insert the rod to avoid having the unit fall.



6. Disconnect all the connectors from the printer power supply board.
7. Replace the printer power supply board [A] (4 screws).
8. Reassemble the copier.

9. INVERTER UNIT

9.1 INVERTER UNIT REMOVAL

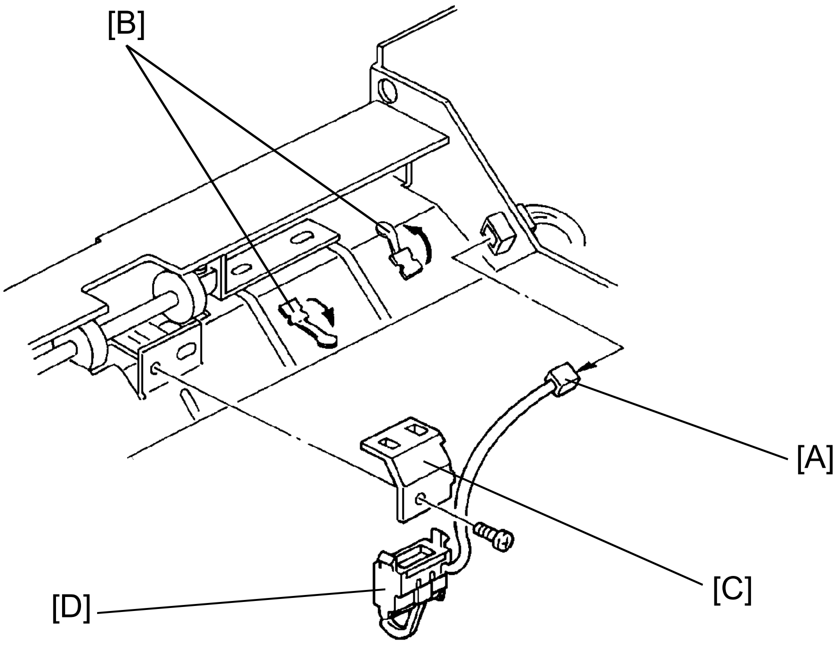


CAUTION: Always handle the inverter unit by the side frame [A] or the unit's stay area [B].
Never handle the unit by the transport guide plate [C]. This will cause damage to the unit.

1. Turn off the main switch and the anti-condensation switch, then unplug the machine
2. Remove the 2 copy trays [D].
3. Remove the copier left cover [E] (4 screws).
4. Remove the inverter unit side covers [F] (2 screws each).
5. Disconnect the 8P and 5P connectors [G] from the main copier.
6. Remove the inverter unit [H] (2 screws).

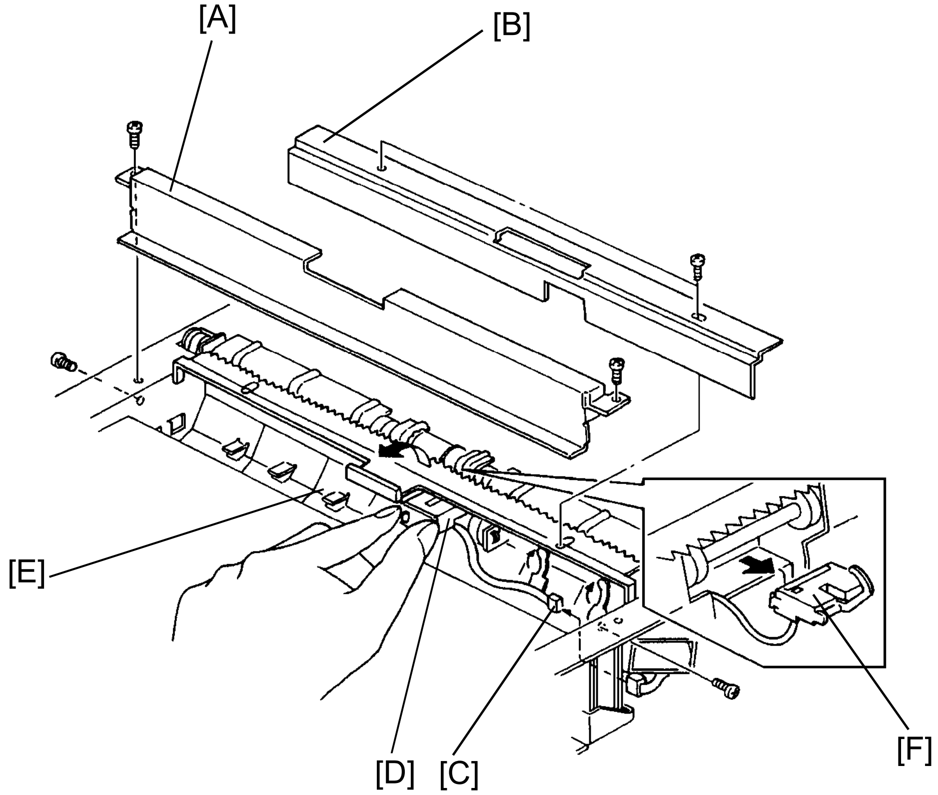
   NOTE: When reinstalling the unit, make sure not to damage the harnesses.

9.2 UPPER EXIT SENSOR REPLACEMENT



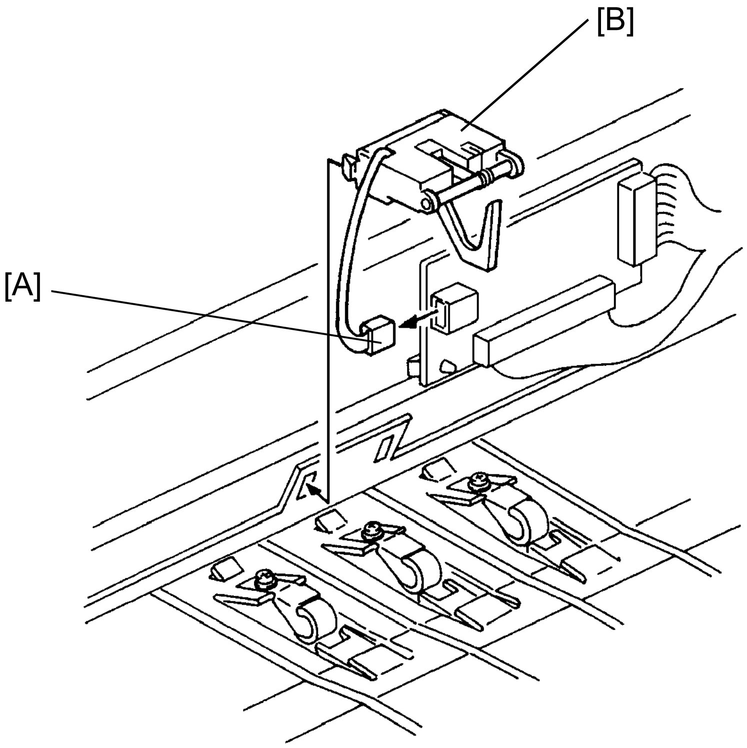
1. Remove the inverter unit from the copier. (See Inverter Unit Removal section.)
2. Disconnect the connector [A] and free the harness from the metal clamps [B].
3. Remove the upper exit sensor with the bracket on [C] (1 screw).
4. Replace the upper exit sensor [D] and reinstall the unit.

9.3 LOWER EXIT SENSOR REPLACEMENT



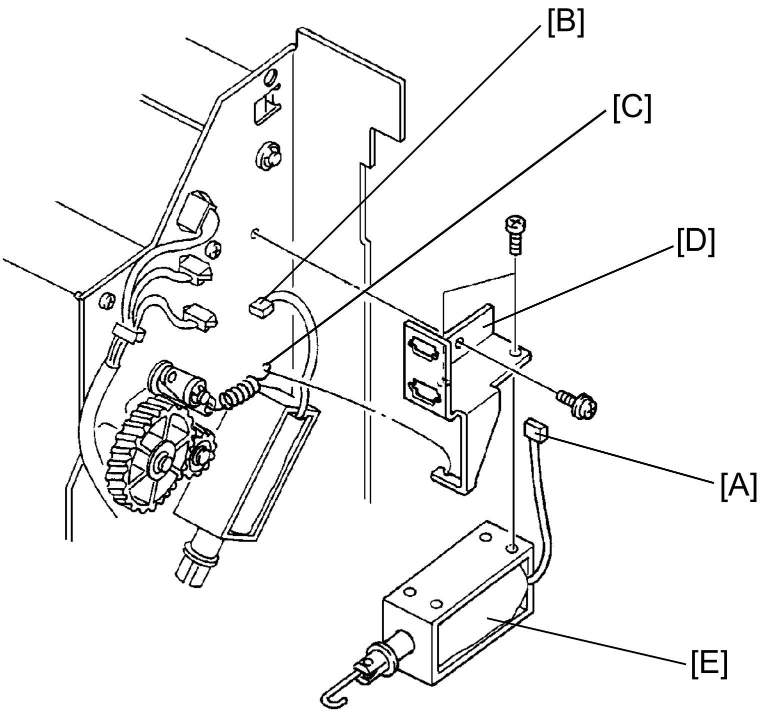
1. Remove the inverter unit from the copier. (See Inverter Unit Removal section.)
2. Remove the copy tray stay [A] (4 screws).
3. Remove the lower guide cover [B] (2 screws).
4. Disconnect the connector [C] and free the harness from the metal clamps.
5. Free the lower exit sensor [D] from the sensor bracket as shown in the figure.
6. Lift the lower guide plate [E] and pull out the lower exit sensor [F].
7. Replace the sensor and reinstall the unit.

9.4 INVERTER ENTRANCE SENSOR REPLACEMENT



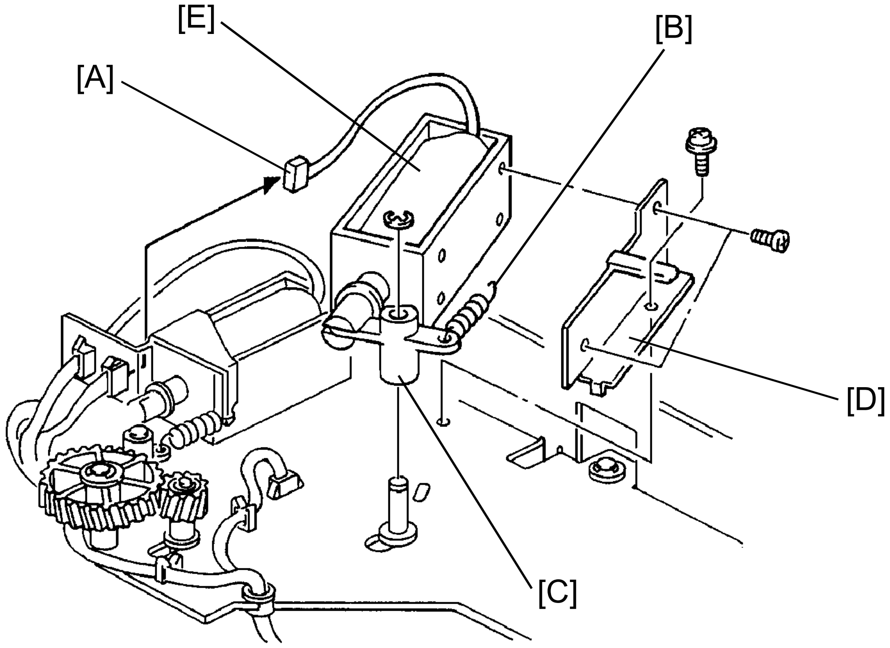
1. Remove the inverter unit from the copier. (See Inverter Unit Removal section.)
2. Disconnect the connector [A] of the inverter entrance sensor [B].
3. Remove the inverter entrance sensor [B].
4. Replace the sensor and reinstall the unit.

9.5 JUNCTION GATE SOLENOID REPLACEMENT



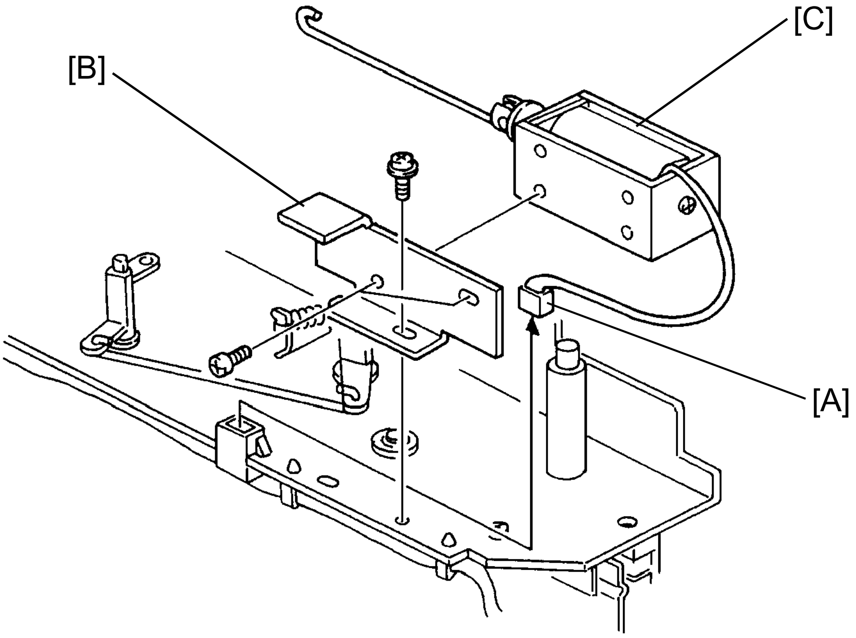
1. Remove the inverter unit from the copier. (See Inverter Unit Removal section.)
2. Disconnect the junction gate solenoid connector [A] and the inverter entrance solenoid connector [B].
3. Remove the junction gate solenoid spring [C].
4. Remove the junction gate solenoid supporting bracket [D] (1 screw).
5. Replace the junction gate solenoid [E] (2 screws).

9.6 INVERTER ENTRANCE SOLENOID REPLACEMENT



1. Remove the inverter unit from the copier. (See Inverter Unit Removal section.)
2. Disconnect the inverter entrance solenoid connector [A] and remove the solenoid’s spring [B].
3. Remove the E-ring securing the solenoid lever [C].
4. Remove the inverter entrance solenoid supporting bracket [D] (1 screw).
5. Replace the inverter entrance solenoid [E] (2 screws).

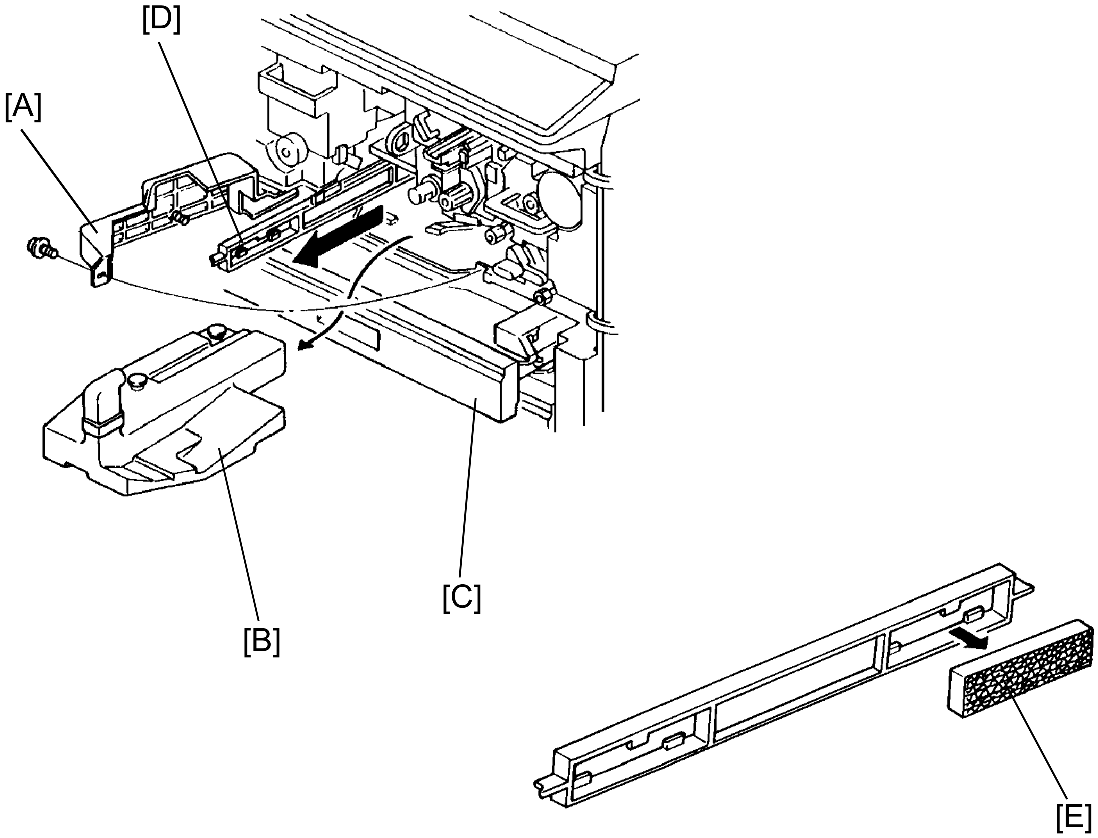
9.7 RETURN PINCH ROLLER SOLENOID REPLACEMENT



1. Remove the inverter unit from the copier. (See Inverter Unit Removal section.)
2. Disconnect the return pinch roller solenoid connector [A].
3. Remove the return pinch roller solenoid supporting bracket [B] (1 screw).
4. Replace the return pinch roller solenoid [C] (2 screws).

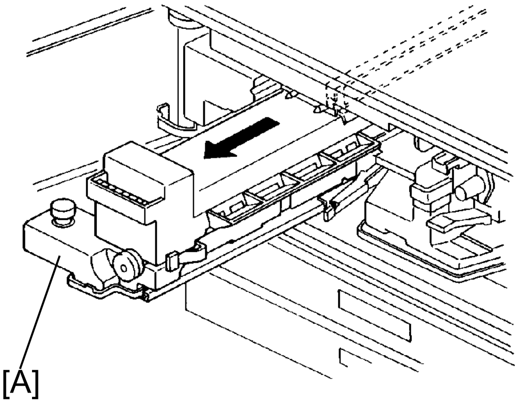
10. OZONE FILTER

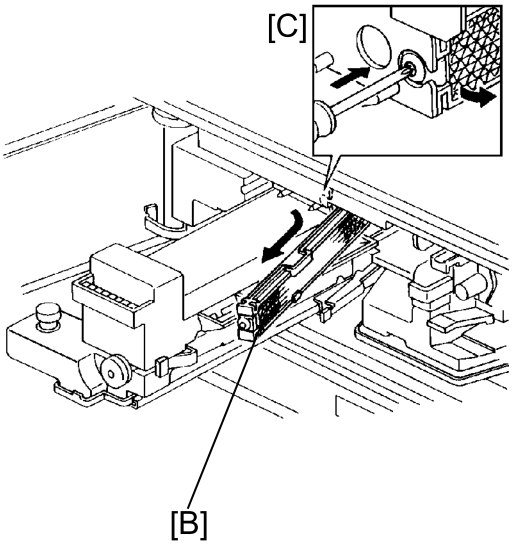
10.1 TRANSPORT OZONE FILTER REPLACEMENT

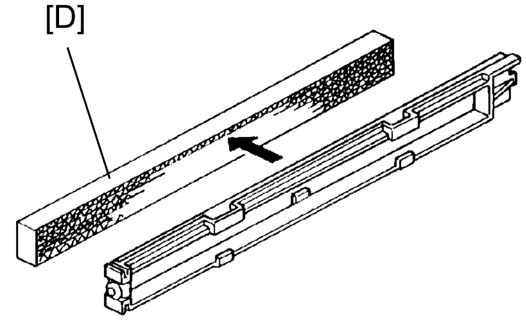


1. Turn off the main and anti-condensation switches.
2. Open the front doors.
3. Lower the T/S corona unit and remove the PCC unit (1 screw).
4. Swing open the toner collection bottle cover [A] (1 screw) and pull out the toner collection bottle [B] (1 connector).
5. Pull out the 1st paper feed table [C].
6. Pull out the transport ozone filter unit [D].
7. Replace the transport ozone filter [E].

10.2 EXHAUST OZONE FILTER REPLACEMENT



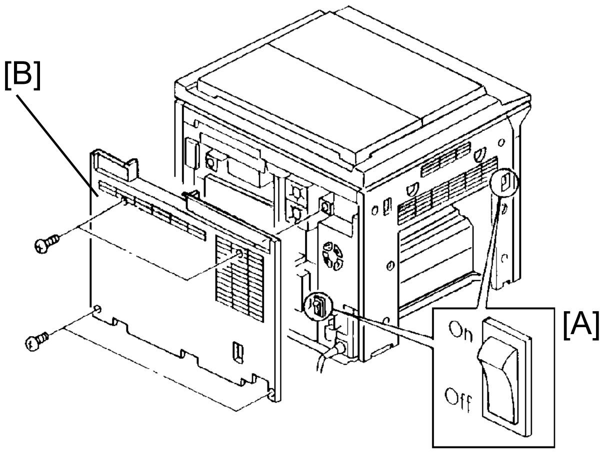


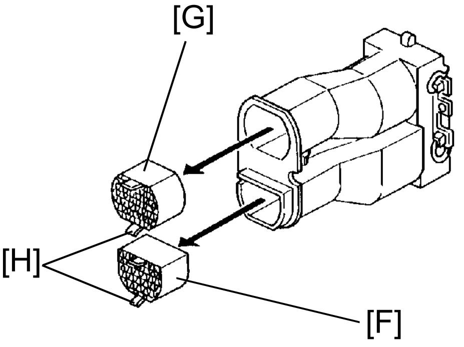


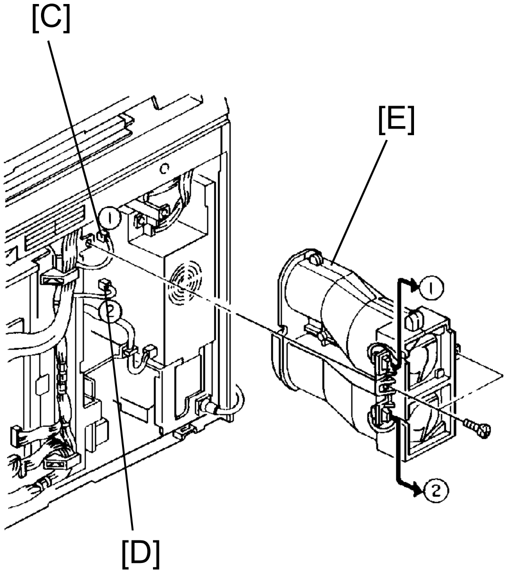
1. Turn off the main and anti-condensation switches.
2. Open the front doors.
3. Slide out the fusing unit [A] about half way.
4. Remove the exhaust ozone filter unit [B] by pushing the lock and sliding it to the right [C].
5. Replace the exhaust ozone filter [D].

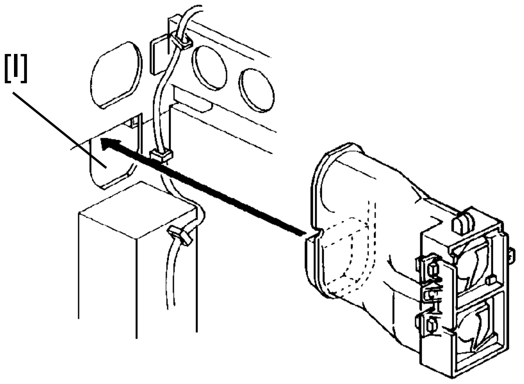
   NOTE: When reinstalling the exhaust ozone filter unit to the copier, make sure that the unit is firmly secured to its lock position.

10.3 EXHAUST DUCT OZONE FILTER AND PRINTER OZONE FILTER REPLACEMENT







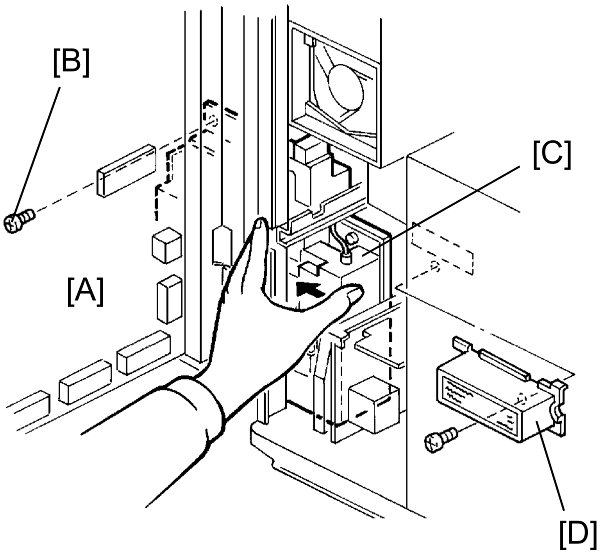


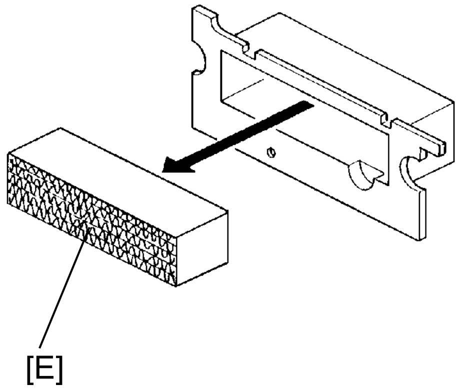
1. Turn off the main and anti-condensation switches [A].
2. Remove the rear lower cover [B] (4 screws).
3. Disconnect the 2 connectors [C, D] of the exhaust unit [E].
4. Remove the exhaust unit [E] (2 screws).
5. Replace the exhaust duct ozone filter [F] and the printer ozone filter [G].

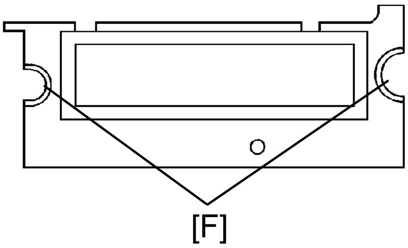
   NOTE: a) When reinstalling the new ozone filters, make sure the tabs are facing outside as shown in the figure.

   b) Make sure the exhaust unit is firmly reinstalled to its locked position [I].

10.4 FUSING OZONE FILTER REPLACEMENT



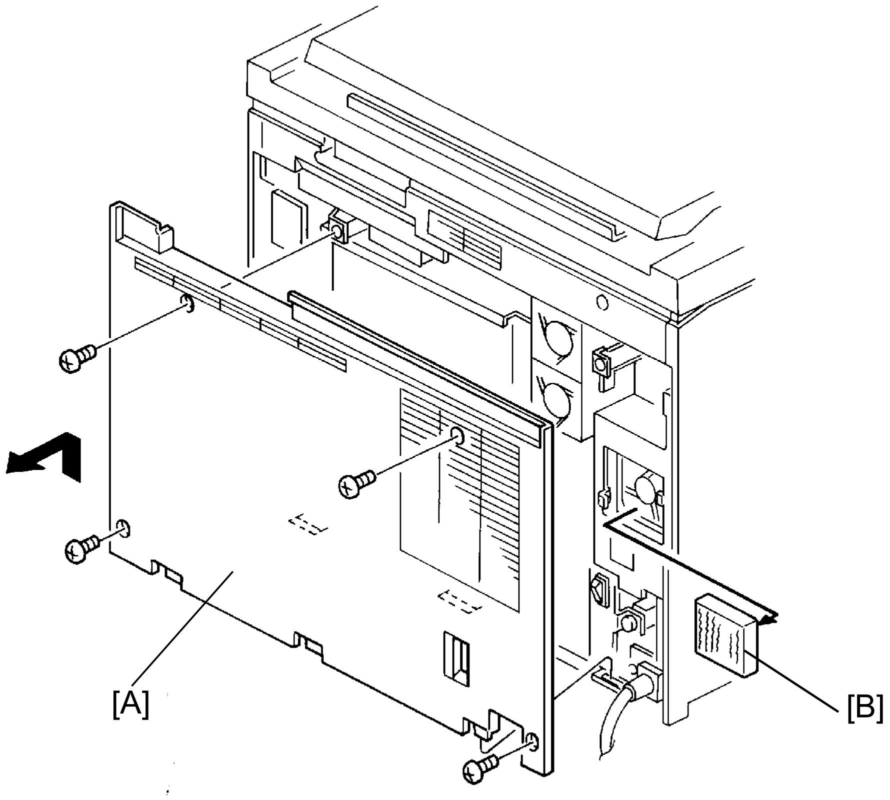




1. Turn off the main and anti-condensation switches.
2. Remove the rear lower cover (4 screws).
3. Swing open the main PCB plate [A] (2 screws).
4. Remove the screw [B] securing the PCC power pack [C].
5. Remove the fusing ozone filter unit [D] (1 screw) while pushing the power pack [C] out of the way.
6. Replace the fusing ozone filter [E].

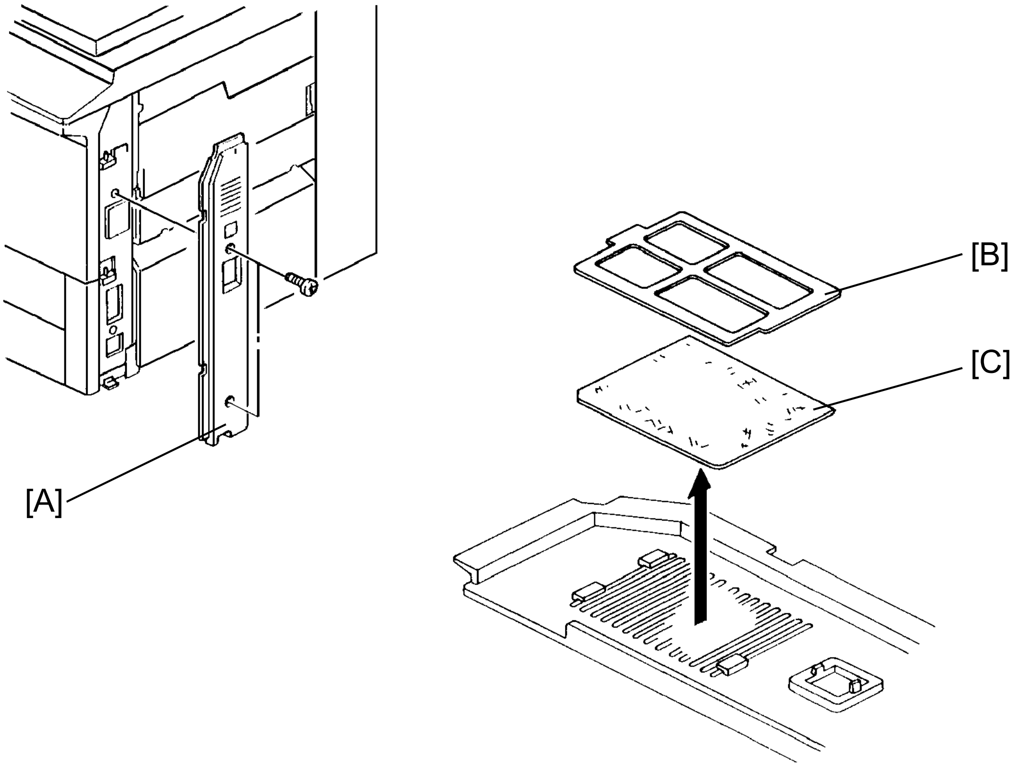
   NOTE: When reinstalling the unit, make sure the unit is firmly secured and that the harnesses fit in the holes [F].

10.5 DC POWER SUPPLY OZONE FILTER REPLACEMENT



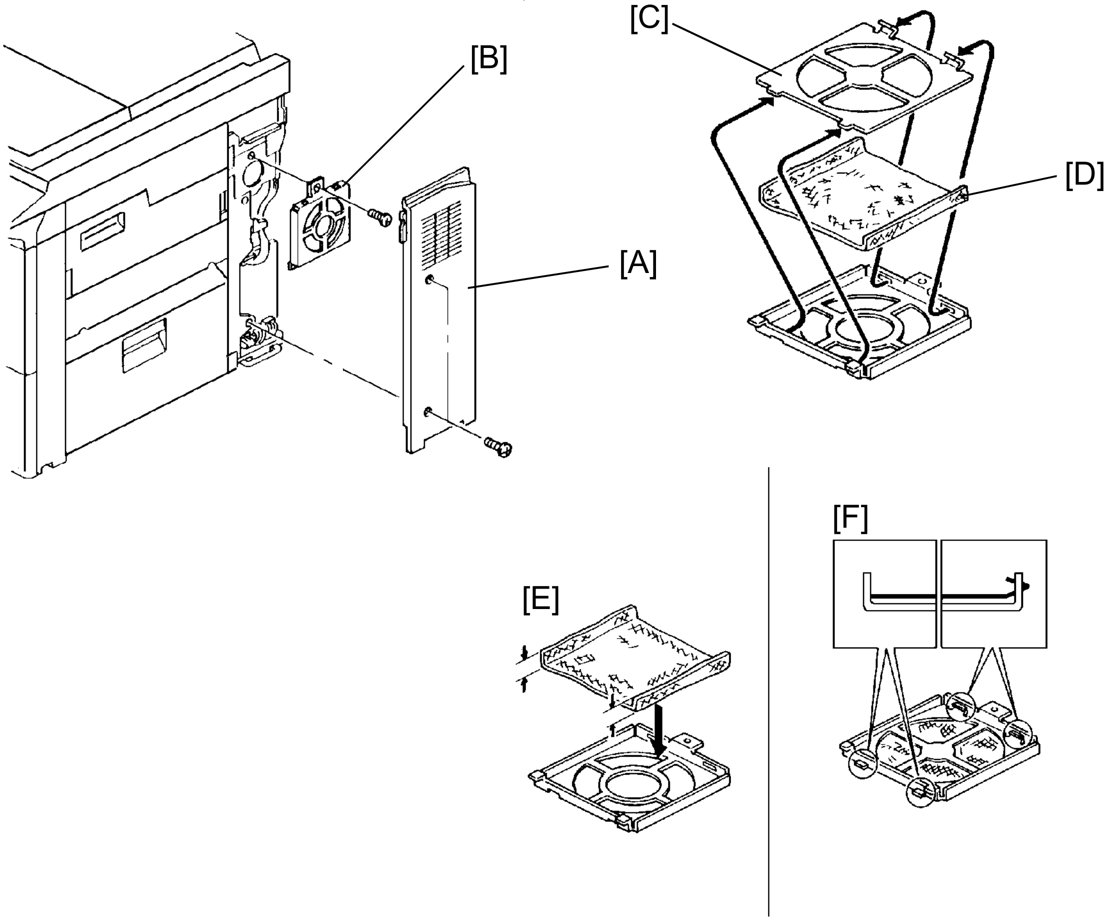
1. Turn off the main and anti-condensation switches.
2. Remove the rear lower cover [A] (4 screws).
3. Replace the dc power supply ozone filter [B].

10.6 RIGHT UPPER DUST FILTER REPLACEMENT



1. Remove the right front cover [A] (2 screws).
2. Remove the plastic support [B].
3. Replace the right upper dust filter [C].

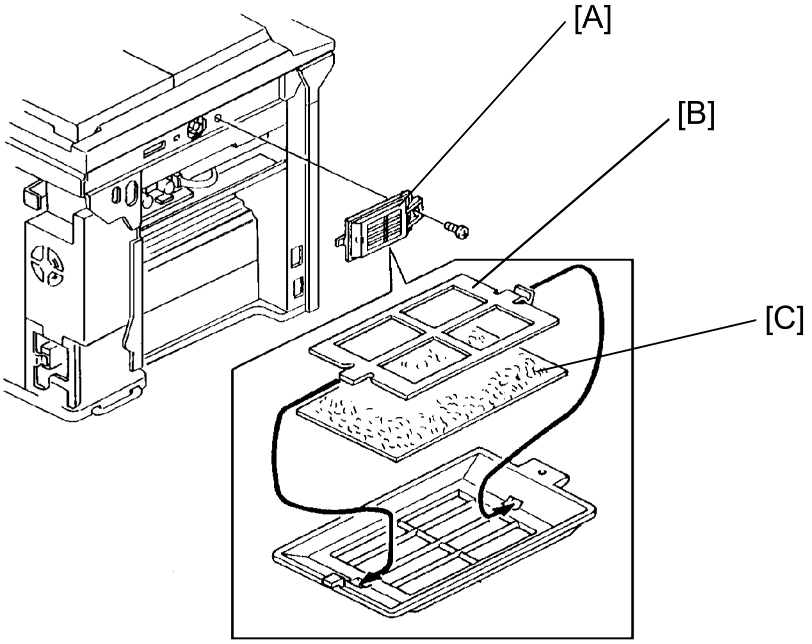
10.7 CHARGE FAN DUST FILTER REPLACEMENT



1. Turn off the main and anti-condensation switches.
2. Remove the rear lower cover (4 screws).
3. Remove the right rear cover [A] (2 screws).
4. Remove the charge fan dust filter unit [B] (1 screw).
5. Remove the metal support [C].
6. Replace the charge fan dust filter [D].

   NOTE: Reinstall the new filter as shown in the figure [E].
   Make sure to set the metal support plate’s pegs in the slots [F].

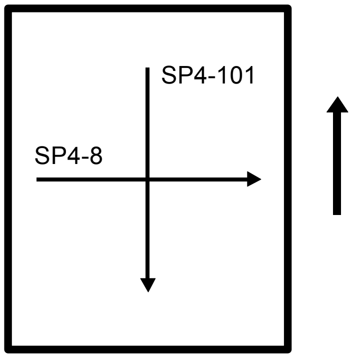
10.8 OPTICS DUST FILTER REPLACEMENT



1. Turn off the main and anti-condensation switches.
2. Remove the left cover (4 screws).
3. Remove the optics dust filter unit [A] (1 screw).
4. Remove the metal support [B].
5. Replace the optics dust filter [C].

11. COPY IMAGE ADJUSTMENT

11.1 COPY MAGNIFICATION



[Standard]

- Vertical Magnification:
  Less than ± 0.5%
- Horizontal Magnification:
  Less than ± 1.0%

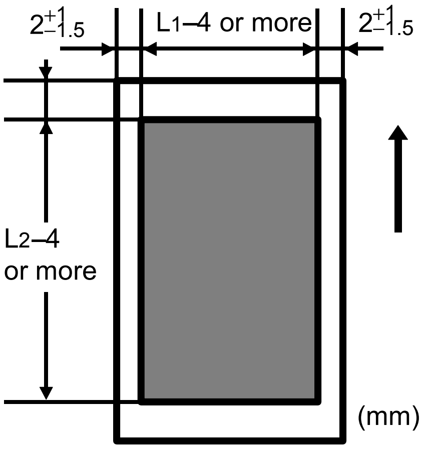
[Adjustment]

- Vertical: by SP4-8 from –1 to + 1% (1% step)
- Horizontal: by SP4-101 from –1 to + 1% (0.1% step)

Press the decimal point key to alternate + and –.

11.2 PRINTING REGISTRATION ADJUSTMENT

[Standard]



L1 = Paper width
L2 = Paper length

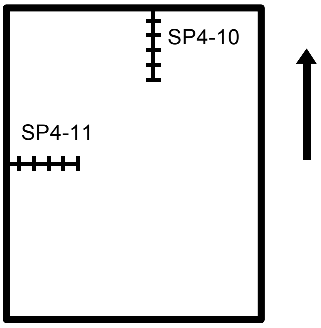
1. Check that the following printing margins are set at their default value (2 mm).
   - SP2-101-1 Leading edge margin (printing)
   - SP2-101-2 Trailing edge margin (printing)
   - SP2-101-3 Left side margin (printing)
   - SP2-101-4 Right side margin (printing)
2. Print out the test print pattern from each paper feed unit, using SP5-902-10, and confirm which paper feed unit is out of standard.

3. Adjust the printing leading edge registration using SP1-1.
4. Adjust the printing side-to-side registration for each paper feed unit:

Side cassette:	SP1-2-1
1st paper feed unit:	SP1-2-2
2nd paper feed unit:	SP1-2-3
Optional LCT:	SP1-2-4
Manual feed:	SP1-2-5
Optional duplex unit:	SP1-2-6

11.3 SCANNER REGISTRATION ADJUSTMENT

NOTE: Perform or check the "PRINTING REGISTRATION ADJUSTMENT" before the following scanner registration adjustment.



[Standard]

- Leading Edge: 0 ± 2 mm
- Left Side: 0 ± 2 mm

1. Place a 150 mm scale perpendicular to the right scale on the exposure glass and make a copy from one of the feed stations.
2. Adjust the scanner leading edge registration using SP4-10.
3. Place the 150 mm scale perpendicular to the front scale on the exposure glass and make a copy.
4. Adjust the scanner side-to-side registration using SP4-11.

11.4 AUTO IMAGE DENSITY ADJUSTMENT (SP5-106)

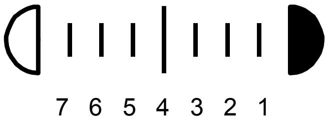


Image Density in Auto Image Density Mode can be adjusted by SP5-106.
If it is too light, select smaller number. And if it is too dark, select greater number.
Standard setting is 4, and adjustable range is 1 (darkest) to 7 (lightest).

11.5 MTF LEVEL SELECTION

(Letter Mode: SP4-407-2, Letter Photo Mode: SP4-407-3)

Reproduction level from low contract original is adjustable by the above SP modes. Standard setting is 1, and adjustable range is 0 to 2.

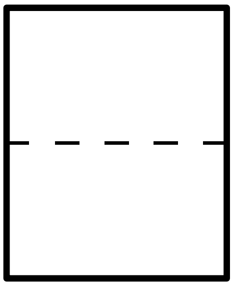
When set at 2, low contrast original can be reproduced better. However, stains on the original or the exposure glass becomes clearly reproduced as well. The marker on the original for save are mode will be visible mush harder. Instead, in 0 setting, low contrast original can be poorly reproduced. However stains on original or the glass will not be reproduced. Also, the marker stain on copy is reduced.

Therefore, only when the users request good reproduction from low contrast original (even if the darker manual setting can not give satisfactory copy,) select 2.

11.6 MARKERED AREA IMAGE DENSITY (SP5-201)

Image density in Marker Line Save Area Mode can be adjusted by SP5-201.
Standard setting is 4, and adjustable range is 1 to 7.
If it is too light, select smaller number. And if too dark, select greater number.

11.7 CENTER LINE REGISTRATION OR DOUBLE COPY (SP1-6)

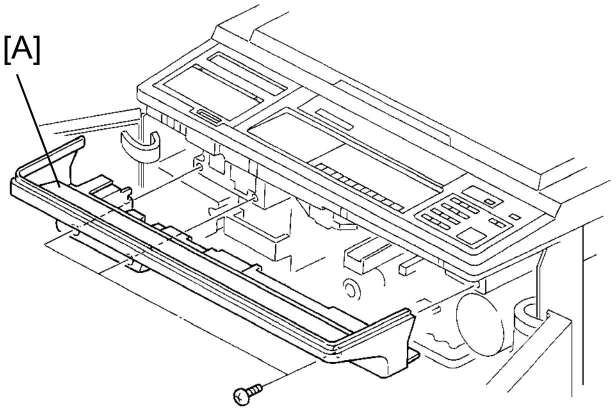


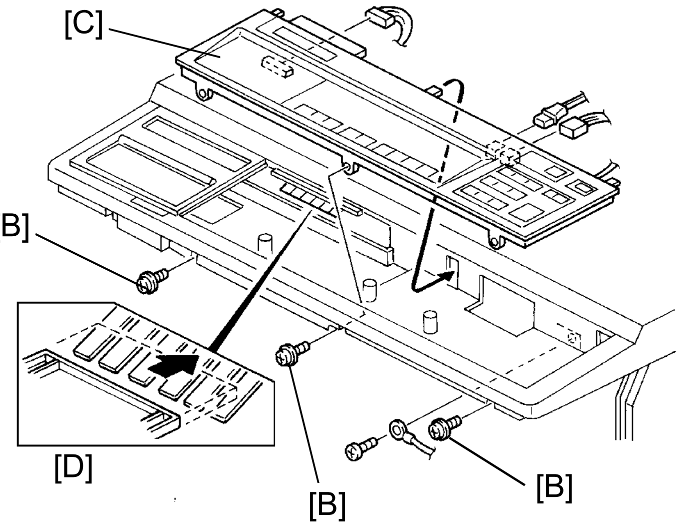
Center line position on double copy can be adjusted by SP1-6.

- Adjustable range:
  –9 to +9 mm in 1 mm step
- Press the decimal point key to change + and –

12. OTHERS

12.1 OPERATION PANEL REPLACEMENT

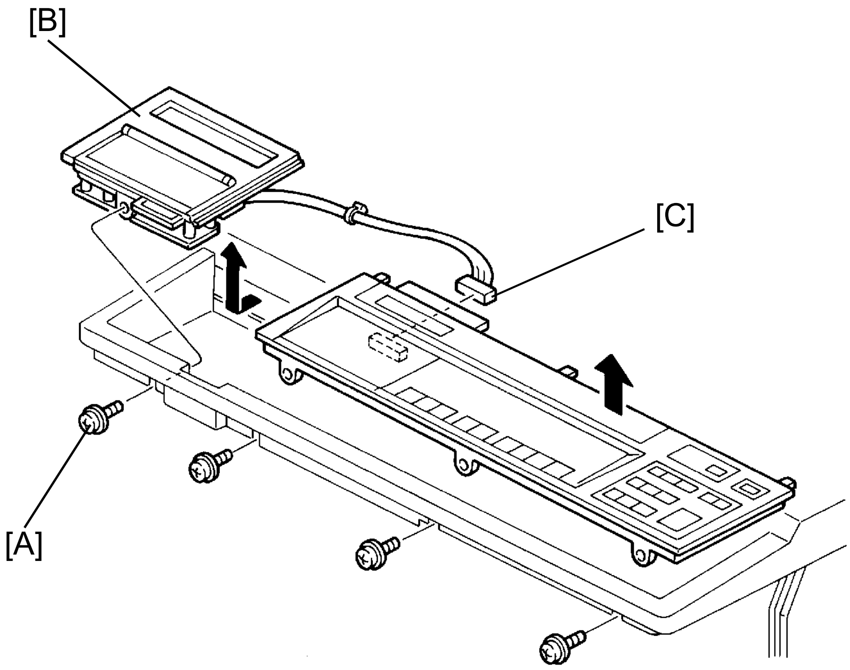




1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Open the front doors.
3. Remove the operation panel bottom cover [A] (3 screws).
4. Remove the 3 screws [B] securing the operation panel [C].
5. Remove the operation panel [C] by lifting the front side and pull it out (3 connectors, 1 ground wire).

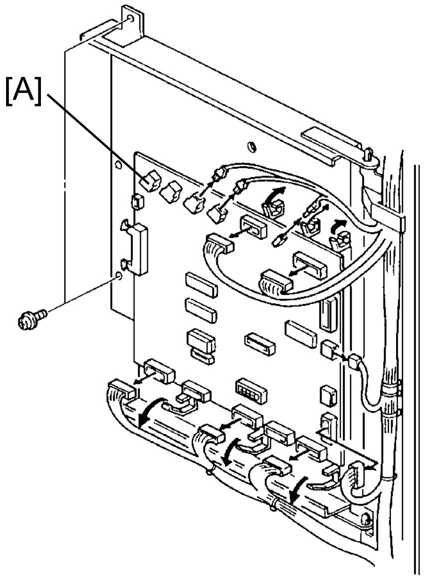
NOTE: When reinstalling the operation panel, make sure that the pegs fit in the slots, and that the wedge slides in above the grounding contacts as in the figure [D].

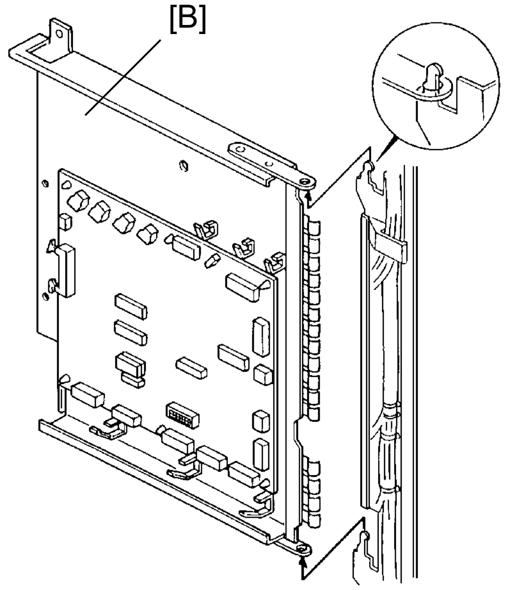
12.2 PRINTER OPERATION PANEL REPLACEMENT

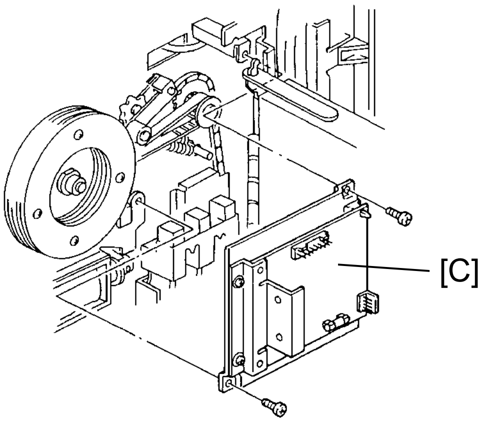


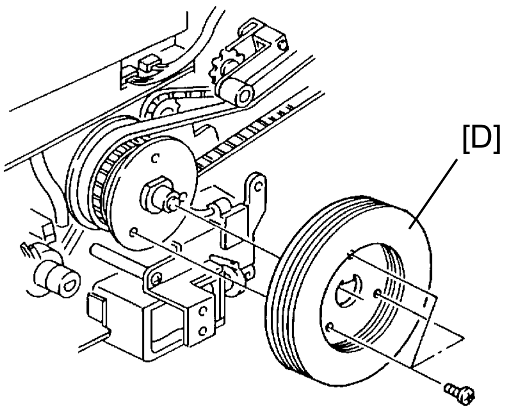
1. Perform the operation panel replacement section procedures 1 through 5.
2. Remove the screw [A] securing the printer operation panel [B].
3. Lift the front side of the panel and pull it out slightly.
4. Disconnect the connector from the operation panel's side [C] and replace the unit.

12.3 MAIN MOTOR REPLACEMENT

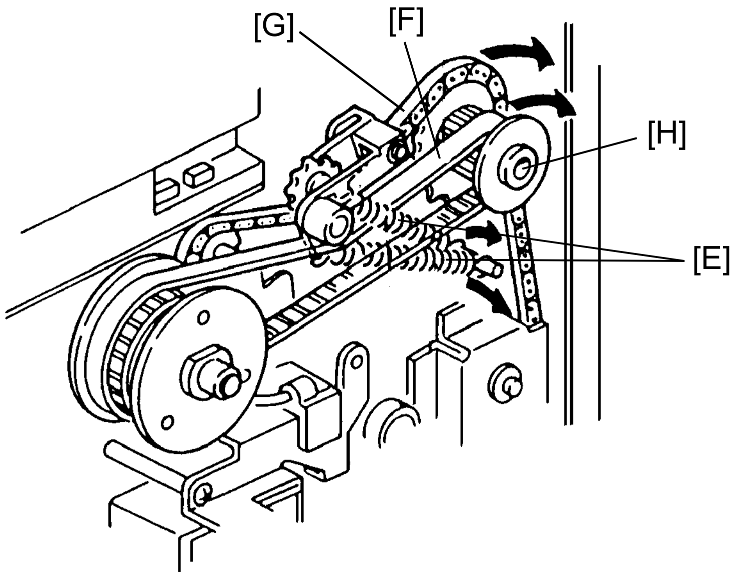


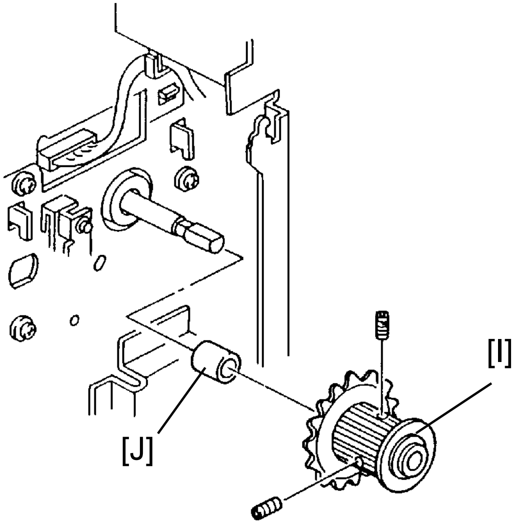


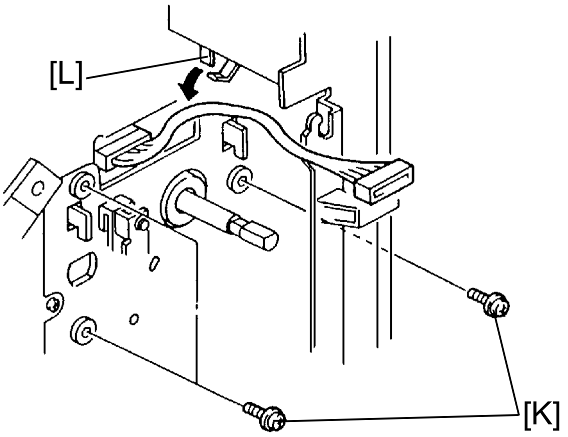




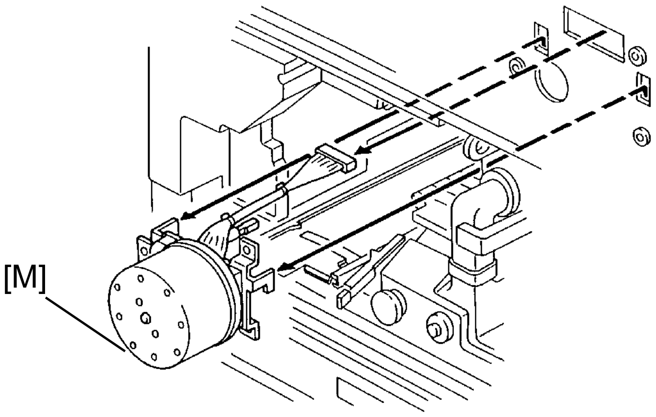
1. Turn off the main switch and the anti-condensation switch, then unplug the machine.
2. Remove the fusing unit. (See Fusing Unit Removal section.)
3. Remove the rear lower cover (4 screws).
4. Disconnect all connectors on the main PCB [A] and free the harnesses form the clamps.
5. Remove the main PCB unit [B] (2 screws).
6. Remove the main motor drive board unit [C] (2 screws, 2 connectors).
7. Remove the fly wheel [D] (3 screws).

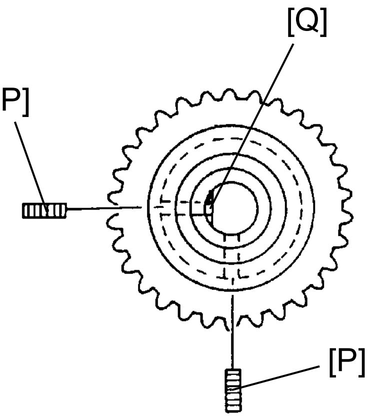


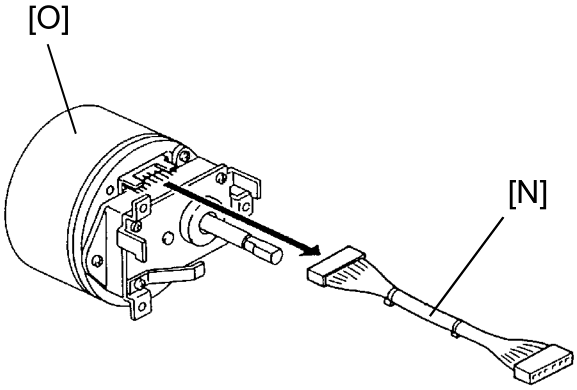


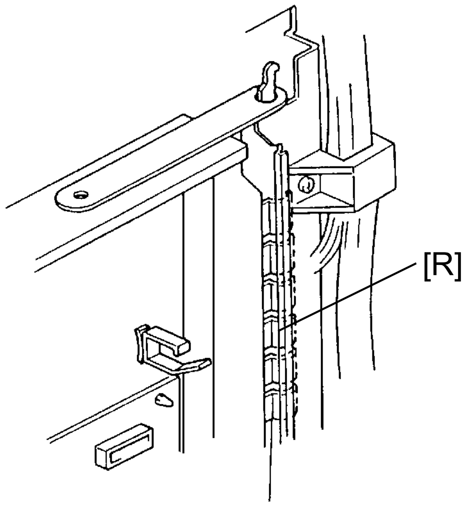


8. Remove the 2 springs [E]. (The springs are interchangeable.)
9. Remove the timing belt [F] and the chain [G] from the main motor sprocket [H].
10. Remove the main motor sprocket [I] (2 Allen screws), and the collar [J].
11. Remove the 3 screws [K] securing the main motor. Free the harness from the clamp [L].









12. Lift and pull out the main motor unit [M] from the front side.

13. Disconnect the connector [N] and replace the main motor [O].

NOTE: When reinstalling, make sure of the followings:

a) Reinstall the sprocket [I] all the way in until it hits the collar [J].
b) Secure the Allen screw [P] to the shaft’s cut surface [Q].
c) Set the main PCB units grounding contacts [R] behind the bracket.

SECTION 6

TROUBLESHOOTING

1. COPY QUALITY

Whenever any abnormal copy images appear, carry out the following test patterns to determine where the problem occurs.

- Test Pattern 1 (Main CPU)
  Set SP5-902-5 (Grid Pattern) and press the Start key.
- Test Pattern 2 (IPU)
  Turn on DIP SW101-6 on the IPU board and press the Start key.

If an abnormal image does not appear on both test patterns, then the printing section works well without any problem. Therefore may be something wrong with the scanning section.

1.1 BLANK COPY (WHITE COPY)

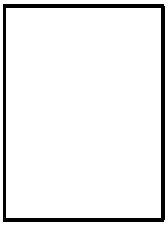
– Phenomenon –

White copy

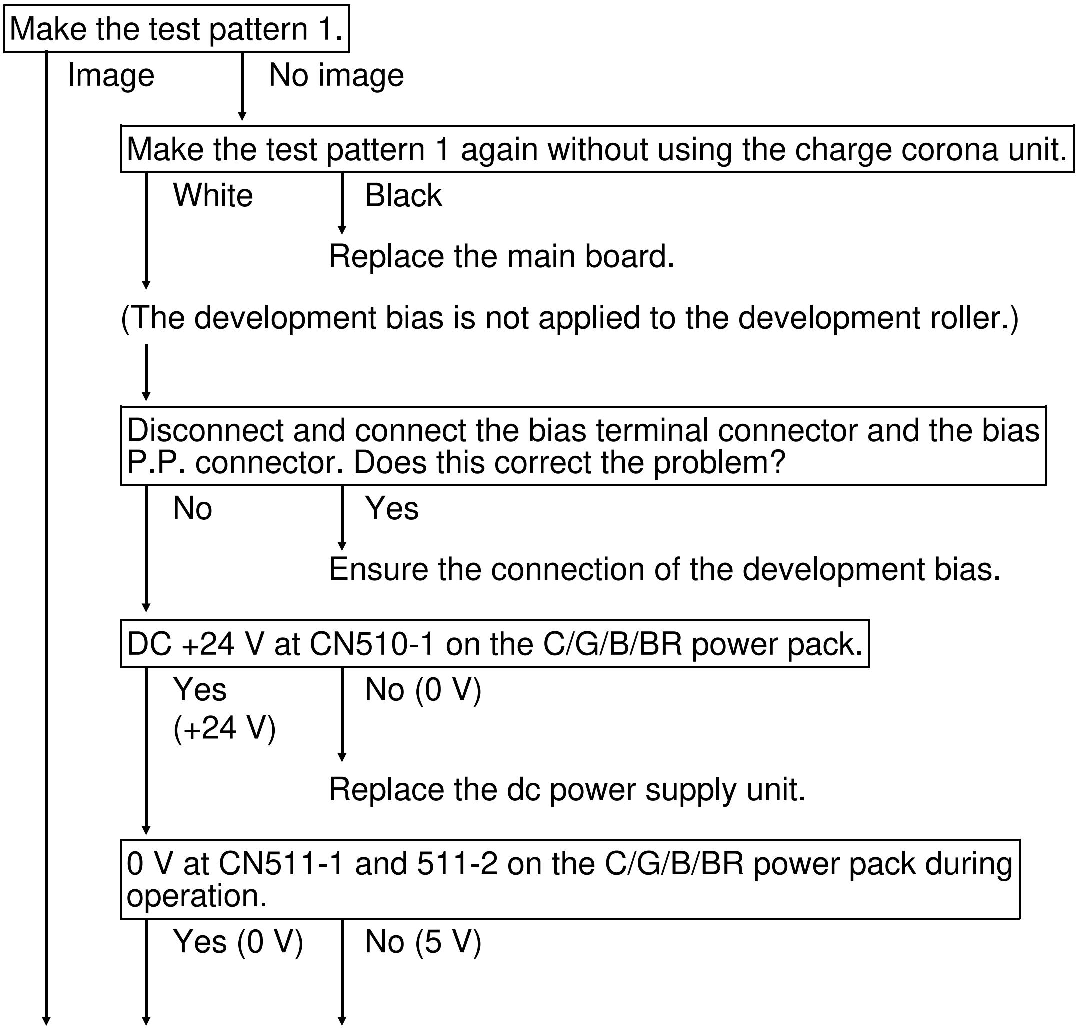
– Possible Cause –

1. Development bias is not applied.
   - Poor contact of high voltage (C/G/B/BR P.P.) lead wire
   - C/G/B/BR power pack failure

2. Defective PCBs.
   - Defective IPU board
   - Defective VPU board
   - Defective SBU board
   - Defective main board



– Action –



Make the test pattern 1.

Image

No image

Make the test pattern 1 again without using the charge corona unit.

White

Black

Replace the main board.

(The development bias is not applied to the development roller.)

Disconnect and connect the bias terminal connector and the bias P.P. connector. Does this correct the problem?

No

Yes

Ensure the connection of the development bias.

DC +24 V at CN510-1 on the C/G/B/BR power pack.

Yes (+24 V)

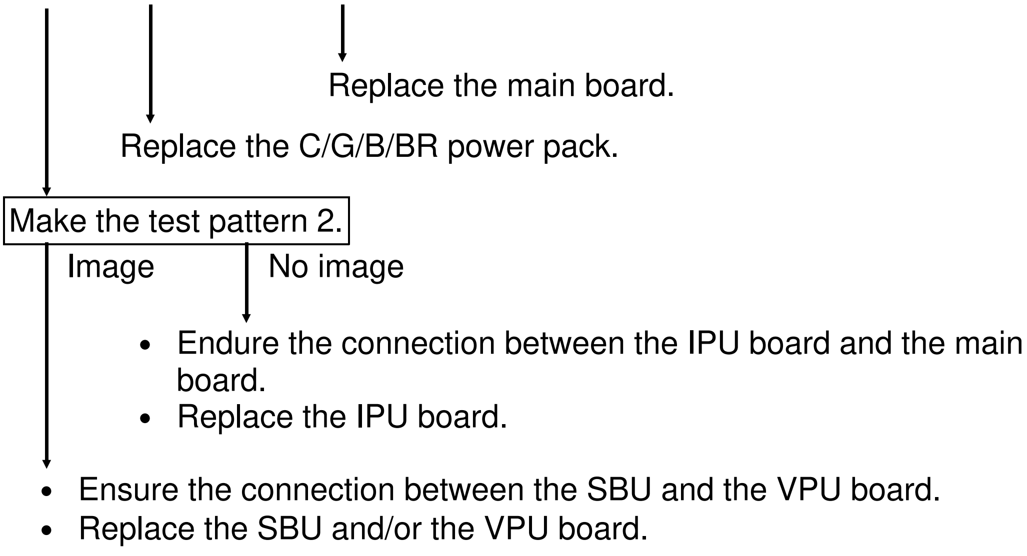
No (0 V)

Replace the dc power supply unit.

0 V at CN511-1 and 511-2 on the C/G/B/BR power pack during operation.

Yes (0 V)

No (5 V)



Replace the main board.

Replace the C/G/B/BR power pack.

Make the test pattern 2.

Image / No image

- Endure the connection between the IPU board and the main board.
- Replace the IPU board.

- Ensure the connection between the SBU and the VPU board.
- Replace the SBU and/or the VPU board.

1.2 FAINT IMAGE

– Phenomenon –

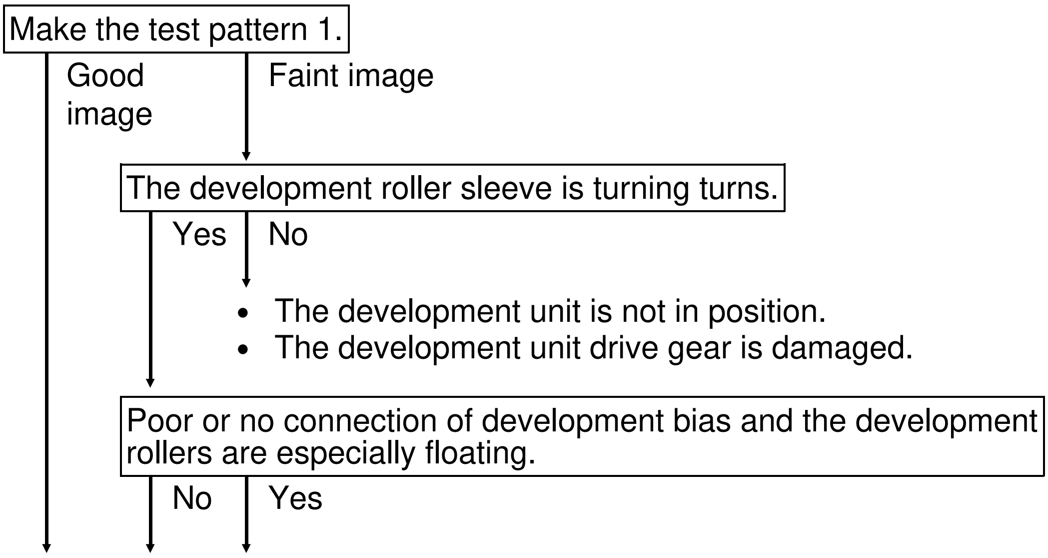
Faint image (Image is slightly or partly visible.)

– Possible Cause –

1. Development roller does not rotate.
   - Broken drive gears
   - Defective development drive clutch

2. Floating development bias.
3. Poor drum sensitivity.

– Action –



Make the test pattern 1.

Good image / Faint image

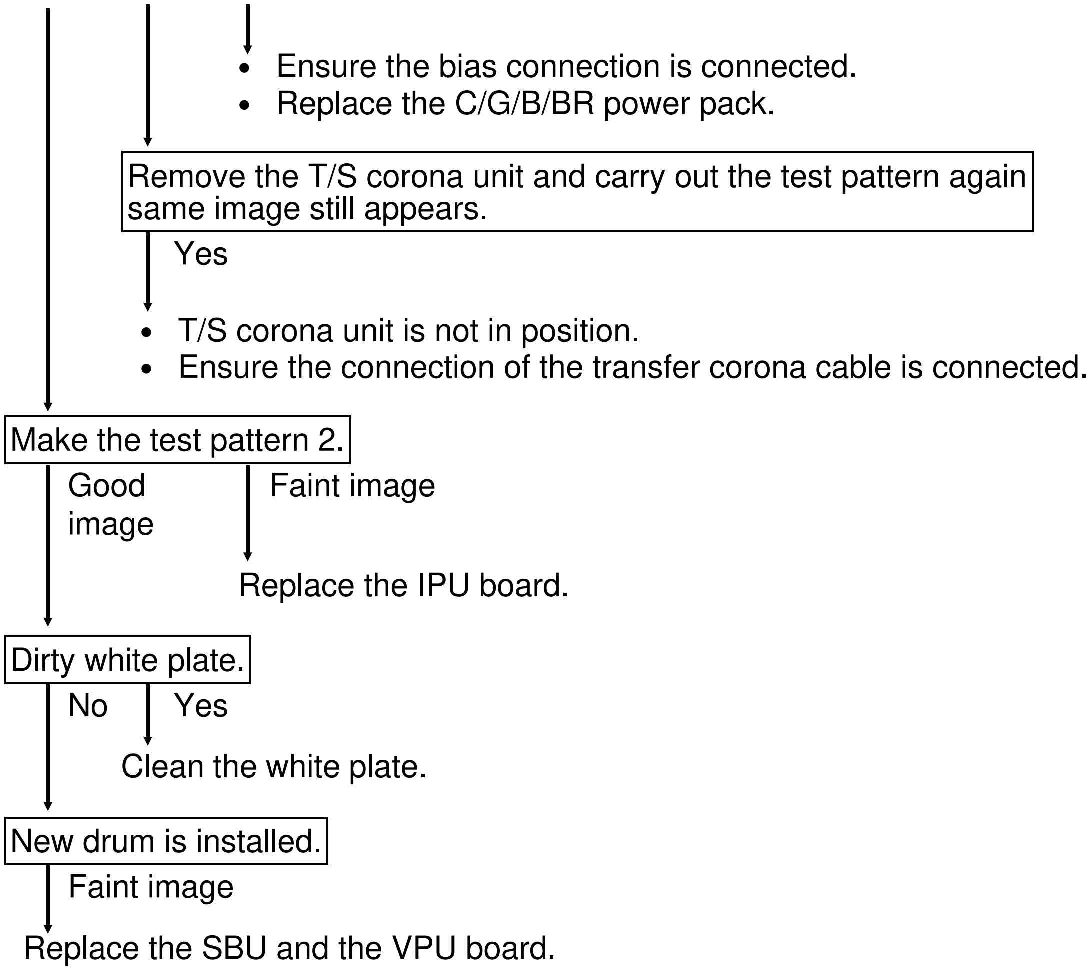
The development roller sleeve is turning turns.

Yes / No

- The development unit is not in position.
- The development unit drive gear is damaged.

Poor or no connection of development bias and the development rollers are especially floating.

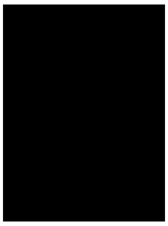
No / Yes



1.3 BLACK SOLID COPY

– Phenomenon –

Black solid copy



– Possible Causes –

1. C/G/B/BR power pack failure.
2. Poor contact of the charge corona wire.
3. Defective PCBs.
    - VPU board
    - IPU board
    - SBU board

– Action –

Make the test pattern 1. Is there a white margin on all four sides of the copy?

Yes | No

Pull the charge corona unit out and make the test copies. Was the image density of test copies made without the corona unit higher than the copies previously mode?

No | Yes

If copy ID without the charge corona unit is higher.

1. Check white level.
    - If it remains at 0 V, replace the VPU.
    - If it remains at 3 V, replace the IPU.

If copy ID without the charger corona unit is almost same.

1. Check the following points.
    - Charge unit is not in position.
    - Charge power cable is disconnected.

2. Check the voltage at CN156-A6 during the copy cycle.
    - If it remains at 5 V, replace the main board.
    - If it drops to 0 V, replace the C, G, B, BR power pack.

The SBU has the problem.

1. Check whether the connection of the harness between SBU and VPU is correct or not.
    - If not, reconnect the harness.
    - If correct, replace the SBU.

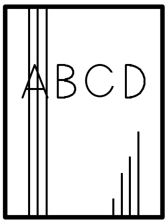
1.4 VERTICAL BLACK LINES

– Phenomenon –

Vertical black lines appear on the copy.

– Possible Cause –

1. Dirty Optics.
2. Scratches on the drum.
3. Edge of the cleaning blade deformed.
4. Scratches on the hot roller.



– Action –

Make the test pattern 1. Do any vertical lines appear

Yes No

Optical path has a problem

1. Check the optic path (dust on the mirrors etc.).
2. Make a copy without the lamp grid above the lamps. If a correct copy is made, replace the lamp grid.

Plotter area has the problem.

Check the following items.

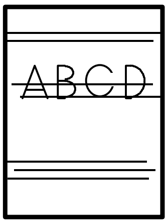
1. Surface of the drum.
2. Cleaning function is incorrect.
3. Surface of the hot roller.
4. Fusing stripper.

1.5 HORIZONTAL BLACK LINES/BANDS

– Phenomenon –

Horizontal black lines or bands appear on the copy.

– Possible Causes –



1. White level is incorrect.
2. Defective CCD, IPU or VPU boards.
3. Poor connection of the front safety switches.
4. LD synchronization signal is not generated.
5. Development bias failure.

– Action –

Make the test pattern 1. Do any horizontal lines appear?

Yes No

1. Check the white level.

   Check whether the 4 LED's on the IPU board are all on or not. If not, adjust the white level.

   NOTE: To adjust the white level, refer to the white level adjustment on page 5-10.

2. Defective CCD, IPU or VPU boards. Replace the CCD, IPU or VPU.

   NOTE: After replacing there boards, perform the 0 level and white level adjustments.

Is the door open indicator often lit?

No | Yes

The front safety switch has a poor connection.

Tighten the screws of the operation panel under the cover, or replace the front safety switches.

Is the LD synchronization signal generated during the copy cycle?

No | Yes

Replace LD unit.

Is the development roller bias within specification?

No | Yes

Adjust the development bias.

Replace LD unit.

1.6 DIRTY BACKGROUND

– Phenomenon –

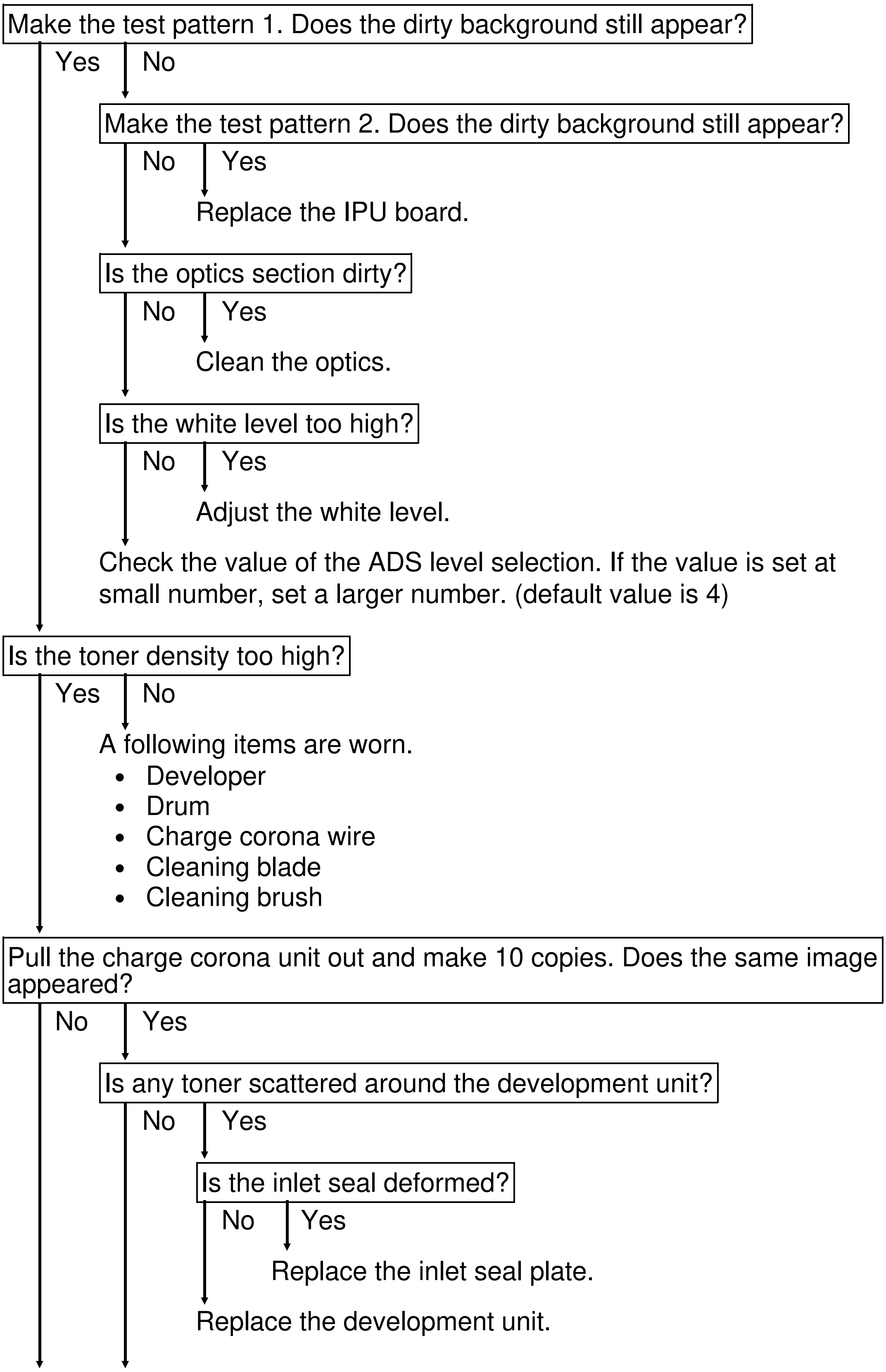
1. Dirty background at image density level 4 (manual setting).
2. ADS copies have a dirty background.

– Possible causes –

1. Dirty optics.
2. Toner scattering.
   - High toner density.
   - The inlet seal of the development unit is stripped off.
   - The doctor gap is too wide.

3. The white level is too high.
4. ADS level selection is incorrect.
5. The development bias is grounded.
6. Defective IPU board.

– Action –

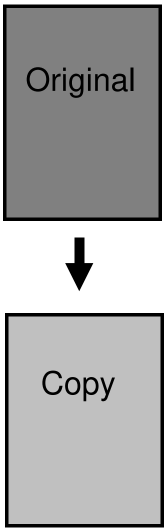

Make the test pattern 1. Does the dirty background still appear?
Yes
No
Make the test pattern 2. Does the dirty background still appear?
No
Yes
Replace the IPU board.
Is the optics section dirty?
No
Yes
Clean the optics.
Is the white level too high?
No
Yes
Adjust the white level.
Check the value of the ADS level selection. If the value is set at small number, set a larger number. (default value is 4)
Is the toner density too high?
Yes
No
A following items are worn.
• Developer
• Drum
• Charge corona wire
• Cleaning blade
• Cleaning brush
Pull the charge corona unit out and make 10 copies. Does the same image appeared?
No
Yes
Is any toner scattered around the development unit?
No
Yes
Is the inlet seal deformed?
No
Yes
Replace the inlet seal plate.
Replace the development unit.

Check the setting of the drum to the drum holder.
If incorrect, reinstall the drum.

Check the following items.

- The output data of the ID sensor (V_{SG}, V_{SP}).
- Whether or not the customer performed the 30 second toner supply function.
- ID sensor setting (SP3-1-1).

1.7 LOW IMAGE DENSITY



– Phenomenon –

A low image density copy appears.

– Possible Cause –

1. Dirty white plate.
2. Defective IPU board.
3. The electrical parts of the scanner has a problem.
4. Defective LD unit.
5. Dirty shield glass.

– Action –

Make the test pattern 1. Is a low image density copy made?

Yes | No

Dirty white plate?

No | Yes

Clean the white plate.

Is the white level within specification?

No | Yes

Replace IPU board.

Adjust the white level.
If the white level cannot be adjust, the following items defective.

- Scanner lamps
- Lamp stabilizer
- VPU
- CCD (scanner board unit)

NOTE: After replacing the VPU or CCD (scanner board unit), perform the 0 level and the white level adjustments.

Does the low image density appeared on the over-all copy?

No Yes

Dirty shield glass?

No Yes

Clean the shield glass.

Replace the LD unit.
If the same image still appears, check the following items.

- Charge corona wire
- T/S corona wire
- Development unit

Perform the 30 seconds toner supply mode then make a copy.
Does the same image appear?

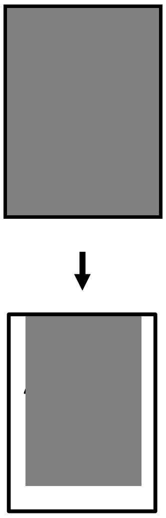
Yes No

Change the value of the ID check interval (SP2-209) from "0" to "1". If this does not solve the problem, change the value of toner supply amount (SP2-208-2) or toner add level (SP2-211).

Check the following items.

- Relationship between the toner bottle and hopper.
- Development bias.
- Replace the developer.

1.8 BLANK AREA



– Phenomenon –

A blank area appears on the copy.

– Possible Causes –

1. Operation mistake.
2. Defective paper size sensor.
3. Defective main board.

– Action –

Make the test pattern 1. Does the blank area appear?

Yes No

Is non-standard paper being used in the manual feed table?

Yes No

Check whether the correct paper size has been input. If not, input the correct paper size.

Does the paper size detector sensor detect the correct paper size?

Yes No

Check the following items.

- Paper size detector plate.
- Paper size detector sensor.

If the above items are detective then replace them.

Does the manual feed table open correctly when the manual feed table is used.

Yes No

Open the manual feed table correctly and make a copy, then make a copy.

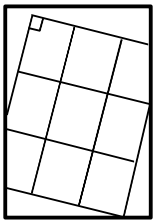
Replace the main board.

Replace the main board.

1.9 SKEWED COPY IMAGE

– Phenomenon –

The copy image is skewed.



– Possible Causes –

1. Side fences are not correctly positioned.
2. Side fences are deformed or broken.
3. Incorrect registration buckle adjustment.
4. Friction between the separation roller and the feed roller.
5. Incorrect DF high adjustment.

– Action –

Make the test pattern 1. Does the skewed image appear?

Yes | No

Is the angle between the front and right original scales at 90°?

Yes | No

Adjust the angle.

Perform the DF hight adjustment. (Refer to the DF hight adjustment, P32 in the Document Feeder.)

Are the side fences correctly positioned?

Yes | No

Position them correctly.

Are the side fences deformed or broken?

No | Yes

Replace the side fences.

Is the friction between the separation and the feed rollers poor?

No | Yes

Check the paper feed mechanism.

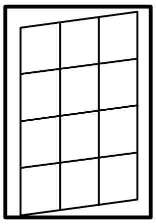
Check or adjust the value of the registration buckle adjustment (SP1-3-1 ~ -3).

1.10 SKEWED COPY IMAGE (Parallelogram Shape)

– Phenomenon –

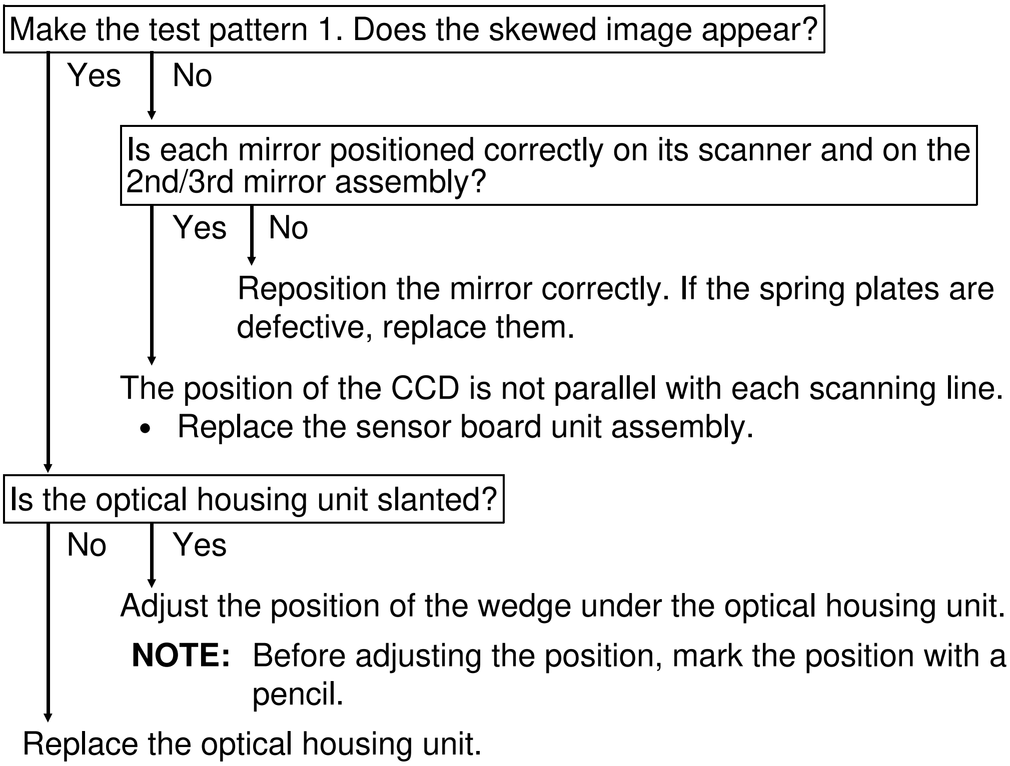
The copy image is skewed (parallelogram shape).
The side of the copy image is straight, but the leading and trailing edges are skewed.

– Possible Causes –



1. 2nd/3rd mirror assembly is not parallel with the 1st scanner.
2. Mirrors are in the wrong position.
3. Slant the optical housing unit.

– Action –



Make the test pattern 1. Does the skewed image appear?

Yes No

Is each mirror positioned correctly on its scanner and on the 2nd/3rd mirror assembly?

Yes No

Reposition the mirror correctly. If the spring plates are defective, replace them.

The position of the CCD is not parallel with each scanning line.

- Replace the sensor board unit assembly.

Is the optical housing unit slanted?

No Yes

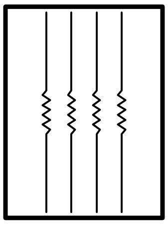
Adjust the position of the wedge under the optical housing unit.

NOTE: Before adjusting the position, mark the position with a pencil.

Replace the optical housing unit.

1.11 ABNORMAL IMAGE

1) Jitter or Wavy Lines



– Phenomenon –

The jitter or wavy lines appear on the copy.

– Possible Causes –

1. Scanner cannot move smoothly.
2. The polygon motor or the motor driver board is defective.

– Action –

Make the test pattern 1. Does the jitter image appear?

Yes | No

Is the rear frame deformed?

No | Yes

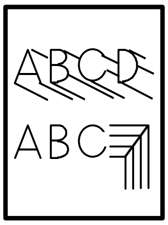
Replace the rear frame. (Parts Catalog, page 10, index 17)

The scanner cannot move smoothly.
Check the scanner movement by the scanner free run mode.

Unstable polygon motor rotation.

Replace the polygon motor and motor driver as a set.

2) Distorted Images



– Phenomenon –

The distorted image appear on the copy.

– Possible Causes –

1. Poor connection between IPU and VPU.
2. The main board is defective.

– Action –

Make the test pattern 1. Does the distorted image appear?

Yes No

Check the connection between IPU and VPU.

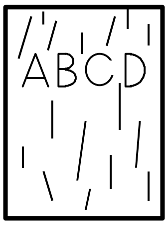
Especially, CN306-B15 pin is not connected.
If the connection is correct, replace the IPU board.

Replace the main board.

1.12 STREAKED COPY

– Phenomenon –

Streaked copies are appear.



– Possible Causes –

1. Dirty charge corona wire.
2. Dirty optics.

– Action –

Make the test pattern 1. Does the streaked copy appear?

No

Clean the optics area.

Clean the charge corona wire.

1.13 COPIES DIRTY ON THE REVERSE SIDE

– Phenomenon –

The reverse side of a copy appears dirty.

– Possible Causes –

1. Incorrect height of the guide mylar.

– Action –

Adjust the height of the guide mylar.

1.14 TONER SCATTERING

– Phenomenon –

Toner scatters from the development unit.

– Possible Causes –

1. Toner density is too high.
2. Inlet seal on the development unit is out of position.
3. Developer has deteriorated.

– Action –

Is the toner density too high?

No | Yes ↓

Refer to the section (DIRTY BACKGROUND).

↓

Is the inlet seal deformed?

No | Yes ↓

Replace the inlet seal plate.

↓

Replace the developer.

2. SERVICE CALL CONDITIONS

CODE #100 - SCANNER LAMP ERROR

- Definition -

The peak value of the video data from the standard white plate is not sufficient.

– Possible Cause –

- White plate is not in position
- Scanner lamps become older
- Scanner lamp connectors not in position
- CCD defective
- VPU board defective

CODE #104 - SCANNER LAMP HEATER OPEN

– Definition –

The scanner lamps’ temperature (detected by the scanner lamp thermistor) cannot reach 20°C in time.

– Possible Cause –

- Scanner lamp heaters circuit open
- AC drive board defective
- Main board defective

CODE #105 - SCANNER LAMP OVERHEAT

– Definition –

The scanner lamps’ temperature goes over 100°C.

– Possible Cause –

- Scanner lamp heaters circuit shorten
- AC drive board defective
- Main board defective

CODE #106 - SCANNER LAMP THERMISTOR OPEN

– Definition –

The output from the lamp thermistor becomes zero.

– Possible Cause –

- Scanner lamp thermistor circuit open
- Main board defective

CODE #120 - SCANNER HOME POSITION ERROR 1

– Definition

The scanner H.P. sensor remains deactivated (photo-transistor stays on) after the main switch is turned on.

– Possible Cause –
- Scanner H.P. sensor defective
- Scanner movement too heavy
- Scanner drive motor defective
- IPU board defective
- Scanner drive board defective

CODE #121 - SCANNER HOME POSITION ERROR 2

– Definition –

The scanner H.P. sensor remains activated (photo-transistor stays off) after the main switch is turned on.

– Possible Cause –
- Scanner H.P. sensor defective
- Scanner movement too heavy
- Scanner drive motor defective
- IPU board defective
- Scanner drive board defective

CODE #125 - NO ENCODER SIGNALS

– Definition –

There is no encoder signal from the scanner motor for 200 ms.

– Possible Cause –
- Scanner movement too heavy
- Scanner drive motor defective
- IPU board defective
- Scanner drive board defective

CODE #126 - INCORRECT ENCODER SIGNAL

– Definition –

The phase angles of the encoder output signals (scanner direction) are not detected when the scanner starts.

– Possible Cause –
- Scanner movement too heavy
- Scanner drive motor defective

- IPU board defective
- Scanner drive board defective

CODE #190 - IPU BOARD ERROR (CPU)

– Definition –

The CPU in the IPU board is defective.

– Possible Cause –
- CPU in the IPU board defective

CODE #191 - IPU BOARD ERROR (SRAM)

– Definition –

The SRAM in the IPU board is defective.

– Possible Cause –
- SRAM in the IPU board defective

CODE #192 - SCANNER UNIT LIFT SENSOR ERROR

– Definition –

The scanner unit lift sensor is activated (photo-transistor stays off).

– Possible Cause –
- Scanner unit lift sensor difective
- Scanner unit is lifted
- IPU board defective

CODE #194 - DIRTY STANDARD WHITE PLATE

– Definition –

Any of the data for the white shading is too low.

– Possible Cause –
- Dirty standard white plate

CODE # 320 - POLYGON MIRROR MOTOR ERROR

– Definition –

The CPU does not receive the Polygon Ready signal within 30 seconds after sending the Polygon ON signal.

– Possible Cause –
- Polygon mirror motor defective
- Polygon mirror motor drive board defective
- Main board defective

CODE #321 - NO LASER START SIGNAL

– Definition –

The main CPU does not send the Laser Start signal (FGATE) to the sequence CPU within 20 seconds after it receives the Write Ready signal from the sequence CPU.

– Possible Cause –

- Main board defective

CODE #322 - LASER SYNCHRONIZATION INCORRECT

– Definition –

The CPU does not receive a laser synchronizing detector signal.

– Possible Cause –

- DC power supply board defective
- PWM board defective
- Main board defective
- Synchronizing detector cable defective
- Synchronizing mirror not in position

CODE #323 - LASER CONTROL MALFUNCTION

– Definition –

The auto power control (APC) signal does not reach 3 volts.

– Possible Cause –

- LD unit defective
- Main board defective

CODE #500 - MAIN MOTOR ERROR

– Definition –

The CPU does not receive the Main Motor Ready signal within 1 seconds after sending the Main motor ON signal.

– Possible Cause –

- Main motor defective
- Main motor drive board defective
- Main board defective

CODE #501 - CASSETTE LIFT-UP DELAY (SIDE)
CODE #502 - CASSETTE LIFT-UP DELAY (1ST)
CODE #503 - CASSETTE LIFT-UP DELAY (2ND)

– Definition –

The lift sensor remains deactivated (photo-transistor stays on) 15 seconds after the lift motor is turned on.

– Possible Cause –

- Lift motor defective
- Lift sensor defective
- Cassette bottom plate movement too heavy

CODE #522 - JOGGER HOME POSITION ERROR 1

– Definition –

The jogger H.P. sensor remains deactivated (photo-transistor stays on) during the jogger fences' initialization.

– Possible Cause –

- Jogger motor defective
- Jogger H.P. sensor defective
- Jogger fence movement too heavy
- Main board defective
- LCT dc drive board defective

CODE #523 - JOGGER HOME POSITION ERROR 2

– Definition –

The jogger H.P. sensor remains activated (photo-transistor stays off) during the jogger fences' initialization.

– Possible Cause –

- Jogger motor defective
- Jogger H.P. sensor defective
- Jogger fence movement too heavy
- Main board defective
- LCT dc drive board defective

NOTE: To clear the SC #541, #542, #543, #545, and #546, the following procedure should be required for the safety purpose.

- Set SP 5-810 to 1: yes.
- While holding the Full-size key and the A.P.S. (auto paper select) keys, press the Enter key.
- Confirm that the beeper sounds three times.
- Then turn the main switch off.
- Wait 10 seconds and turn the main switch on.

CODE #541 - FUSING THERMISTOR OPEN

– Definition –

The Fusing Thermistor data does not lower below 4.92 volts 15 seconds after the fusing lamp is turned on. Or for another 20 seconds after this 15 seconds, the data does not change more than 0.08 volts.

– Possible Cause –

- Fusing thermistor open
- Fusing unit not in position
- Main board defective

CODE #542 - FUSING WARM-UP ERROR

– Definition –

The fusing temperature does not reach 175°C 5 minutes after the main switch (main relay) is turned on.

– Possible Cause –

- Fusing lamp open
- Fusing thermofuse open
- Fusing thermistor not in position
- Main power (relay) defective
- AC drive board defective
- Main board defective

CODE #543 - FUSING OVERHEAT

– Definition –

The fusing temperature reaches over 220°C.

– Possible Cause –

- Fusing thermistor short
- AC drive board defective
- Main board defective

CODE #545 - FUSING STAND-BY ERROR

– Definition –

The fusing lamp stays on for 70 seconds in the ready condition.

– Possible Cause –

- Fusing thermistor short
- AC drive board defective
- Main board defective

CODE #546 - FUSING TEMPERATURE FLUCTUATION

– Definition –

The CPU detects the big temperature change (more than 10°C) 3 times a minute.

– Possible Cause –

- AC drive board defective
- Main board defective

CODE #600 - MAIN BOARD COMMUNICATION ERROR (OP. PANEL)

– Definition –

There is no response, even if the main board sends a command.

– Possible Cause –

- Harness/cable poorly connected
- Operation panel board
- Main board
- Cable and harnesses

CODE #601 - MAIN BOARD COMMUNICATION ERROR (IPU)

– Definition –

There is no response, even if the main board sends a command.

– Possible Cause –

- Harness/cable poorly connected
- IPU board
- Main board
- Cable and harnesses

CODE #602 - MAIN BOARD COMMUNICATION ERROR (PWM-LD)

– Definition –

There is no response, even if the main board sends a command.

– Possible Cause –

- Harness/cable poorly connected
- PWM board
- LD control board
- Main board
- Cable and harnesses

CODE #620 - MAIN BOARD COMMUNICATION ERROR (ADF)

– Definition –

There is no response, even if the main board sends a command.

– Possible Cause –

- Harness/cable poorly connected
- DF main board
- Main board
- Cable and harnesses

CODE #621 - MAIN BOARD COMMUNICATION ERROR (SORTER)

– Definition –

There is no response, even if the main board sends a command.

– Possible Cause –

- Harness/cable poorly connected
- Sorter main board
- Main board
- Cable and harnesses

CODE #624 - MAIN BOARD COMMUNICATION ERROR (PRINTER CONTROLLER)

– Definition –

There is no response, even if the main board sends a command.

– Possible Cause –

- Harness/cable poorly connected
- Printer controller board
- Main board
- Cable and harnesses

NOTE: If the function switch is changed while the main switch is in the ON position, this code may light. Turn the main switch and the anti-condensation switch off first. Then, change the switch's position and turn the main switch on again.

CODE #900 - TOTAL COUNTER ERROR

– Definition –

During a copy cycle the CPU does not receive a total counter reed switch on signal.

– Possible Cause –

- Total counter poorly connected
- Total counter defective

CODE #901 - TOTAL COUNTER SHORT

– Definition –

The CPU always receives a total counter reed switch on signal.

– Possible Cause –

- Total counter defective

CODE #902 - ID SENSOR ERROR

– Definition –

The CPU does not detect the ID sensor pattern through the ID sensor output 2 times in succession.

The Vsg becomes smaller than 2.5 volts or the Vsp becomes greater than 2.5 volts..

– Possible Cause –

- ID sensor board defective
- ID sensor board poorly connected
- Main board defective

3. BLOWN FUSE CONDITION

Copier

Component	Condition	Symptom
FS0 (125 V 15 A) (250 V 6.3 A) (DC Power Supply Board)	Open	The copier does not turn on when the main switch is turned on.
FS1 (125 V 6.3 A) (250 V 6.3 A) (DC Power Supply Board)	Open	"Paper jam A" or both "Paper jam A" and "Paper jam G" indicators are lit when copies are made.
FS2 (125 V 6.3 A) (250 V 6.3 A) (DC Power Supply Board)	Open	"SC320" is displayed when copier starts idling or during the copy cycle.
FS3 (125 V 6.3 A) (250 V 6.3 A) (DC Power Supply Board)	Open	"SC100" is displayed when copier starts idling or during the copy cycle.
FS4 (125 V 6.3 A) (250 V 6.3 A) (DC Power Supply Board)	Open	"SC125" is displayed when copier starts idling or during the copy cycle.
F1 (125 V 8 A) (Main Motor Drive PCB)	Open	"Paper jam A" or both "Paper jam A" and "Paper jam G" indicators are lit when copies are made.

LCT/Duplex

Component	Condition	Symptom
F1 (125 V 6.3 A) (250 V 6.3 A) (Tray DC Drive Board)	Open	"Reset the duplex tray" is displayed when copier starts idling. "Paper jam G" indicator is lit when copies are made.